

INTEGRATION OF SPACE CAPABILITIES IN THE QUADRILATERAL: CONCEPTUAL CHALLENGES

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by

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

INTEGRATION OF SPACE CAPABILITIES IN THE QUADRILATERAL:
CONCEPTUAL CHALLENGES, by Brian Thomas Graham, 119 pages.

The 2022 National Defense Strategy identifies countering the multi-domain threat of China as the first national defense priority. The United States envisions multiple regional partners integrating their forces into a cohesive coalition to thwart Chinese ambitions. The US is laying the groundwork for this new coalition, demonstrating new concepts and capabilities to counter China across multiple domains, including the space domain. However, the envisioned coalition is immature and not integrated conceptually or practically. This study assessed challenges posed by new operating concepts and space capabilities to a Quadrilateral-focused coalition in the Indo-Pacific. It found that significant barriers exist to strengthening the Quad due to lack of attention to technical requirements for coalition operations and operating concept mismatches. However, Quad space capabilities and interests are aligned. Rationalization, Information Sharing and Space Domain Awareness present the most significant opportunities to build military coalition maturity within the Quadrilateral to counter Chinese activities in the Indo-Pacific.

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ACRONYMS

A2/AD	Anti-Access/Area-Denial
DOD	Department of Defense
JADC2	Joint All-Domain Command and Control
MDO	Multi-Domain Operations
MDTF	Multi-Domain Task Force
USINDOPACOM	United States Indo-Pacific Command

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CHAPTER 1

INTRODUCTION

Background

In 2020, India completed a geospatial intelligence-sharing agreement with the United States.¹ India and the United States signed an agreement to begin a defense exchange between United States Space Command (USSPACECOM) and India's Defense Space Agency for space situational awareness in 2022.² Japan renewed its commitment to bilateral efforts with the United States to ensure space security in 2020.³ In 2021, Japan lodged an official protest over the presence of armed foreign vessels and commercial fishing vessels violating its territorial waters.⁴ Australia agreed to purchase nuclear submarines from the United States in September 2021.⁵ They quickly followed up this

¹ Vivek Raghunvanshi, "India, US Sign Intel-Sharing Agreement Amid Tension With Neighboring China," *Defense News*, October 28, 2020, <https://www.defensenews.com/space/2020/10/28/india-us-sign-intel-sharing-agreement-amid-tension-with-neighboring-china/>.

² Office of the Spokesperson, "Fourth Annual U.S.-India 2+2 Ministerial Dialogue," (Media Note, U.S. Department of State, April 11, 2022), <https://www.state.gov/fourth-annual-u-s-india-22-ministerial-dialogue/>.

³ U.S. Mission Japan, "Joint Statement – The Seventh Meeting of the Japan-U.S. Comprehensive Dialogue on Space," U.S. Embassy & Consulates in Japan, August 27, 2020), <https://jp.usembassy.gov/joint-statement-7th-japan-us-comprehensive-dialogue-on-space/>.

⁴ Kawashima Shin, "China's Worrying New Coast Guard Law," *The Diplomat*, March 17, 2021, <https://thediplomat.com/2021/03/chinas-worrying-new-coast-guard-law/>.

⁵ Douglas Peifer, "French Anger Over the AUKUS Trilateral Security Partnership Explained," *Journal of Indo-Pacific Affairs* (September 21, 2021),

action by establishing Defence Space Command in March 2022.⁶ The common tie to these disparate actions is the People's Republic of China (PRC).

Under Xi Jinping, China rapidly transformed into a peer competitor seeking to undermine the rules-based international order. China has exerted unfounded territorial and maritime claims in Asia, waged an aggressive diplomatic and economic coercion campaign, and modernized its forces to compete against the United States.⁷ In particular, Chinese military modernization has significantly increased the risk to security in the Indo-Pacific. The People's Liberation Army adopted an Anti-Access and Area-Denial (A2/AD) concept to deny the ability of other nations to access its perceived sphere of influence.⁸ Chinese activities supporting the employment of an A2/AD concept, including extraterritorial claims and island construction, further reinforce a strategy seeking to undermine the international order.

Not content with terrestrial ambitions, China has aggressively modernized and militarized its space activities. It intends to threaten U.S. and partner space capabilities through offensive space control. China views the U.S. as reliant on space capabilities to

<https://www.airuniversity.af.edu/JIPA/Display/Article/2782767/french-anger-over-the-aucus-trilateral-security-partnership-explained/>.

⁶ Julian Kerr, "Space Command Begins Operations," *Australian Defence Magazine*, March 24, 2022, <https://www.australiandefence.com.au/defence/cyber-space/space-command-begins-operations>.

⁷ Lavina Lee, *Assessing the Quad: Prospects and Limitations of Quadrilateral Cooperation for Advancing Australia's Interests* (Sydney, Australia: Lowy Institute, May 2020), 2.

⁸ U.S. Department of Defense (DOD), *Indo-Pacific Strategy Report: Preparedness, Partnerships, and Promoting a Networked Region* (Washington, DC: U.S. Department of Defense, June 1, 2019), 8.

wage its preferred style of warfare.⁹ It has developed a suite of kinetic and non-kinetic offensive capabilities designed to deny or destroy U.S. and partner space capabilities.¹⁰ It simultaneously is modernizing its space capabilities to enable its A2/AD concept.¹¹ China's civil-military fusion in space has heralded its rise as a peer competitor to the United States in the space domain.¹²

Recognizing this new challenge, the United States realigned its National Security Strategy and approach to the Indo-Pacific region. The Interim National Security Strategic Guidance in 2020 and the previous National Security Strategy in 2017 demand U.S. military modernization, readiness to compete, and building partnerships with like-minded states.¹³ The 2022 unclassified National Defense Strategy Fact Sheet identifies countering the multi-domain threat of the PRC as the first priority for national defense.¹⁴ The Department of Defense (DOD) established a new Joint Warfighting Concept, Expanded

⁹ Mark Stokes, Gabriel Alvarado, Emily Weinstein, and Ian Easton, *China's Space and Counterspace Capabilities and Activities* (Washington, DC: The U.S.-China Economic and Security Review Commission, March 30, 2020), 3, https://www.uscc.gov/sites/default/files/2020-05/China_Space_and_Counterspace_Activities.pdf.

¹⁰ Ibid., 39.

¹¹ Ibid., 19.

¹² Ibid., 3.

¹³ U.S. President, *Interim National Security Strategic Guidance* (INSSG) (Washington, DC: The White House, 2021), 8.

¹⁴ Office of the Secretary of Defense, "Fact Sheet: 2022 National Defense Strategy," (Department of Defense, Washington, DC, March 28, 2022), 1, <https://media.defense.gov/2022/Mar/28/2002964702/-1/-1/1/NDS-FACT-SHEET.PDF>.

Maneuver, in 2021.¹⁵ The services are independently developing their concepts to defeat A2/AD concepts. The Army adopted Multi-Domain Operations in 2018.¹⁶ However, the *Interim National Security Strategic Guidance* recognizes the need for partnership to effectively compete with China.¹⁷ In 2017, the United States revived the Quadrilateral Security Dialogue (Quadrilateral or Quad) to coordinate the defense of the rules-based international order.¹⁸

The Quadrilateral Security Dialogue is an informal mechanism to coordinate the interests and activities of India, Japan, Australia, and the United States in the Indo-Pacific region.¹⁹ The Quadrilateral summits provide a venue for economic, diplomatic, informational, and military cooperation to promote a liberal, rules-based international order. The most recent summit resulted in increased COVID-19 vaccine aid, increased coordination for maritime-domain awareness, economic initiatives, and technological

¹⁵ Theresa Hitchens, “The Joint Warfighting Concept Failed, Until It Focused On Space And Cyber,” *Breaking Defense*, July 26, 2021, <https://breakingdefense.com/2021/07/the-joint-warfighting-concept-failed-until-it-focused-on-space-and-cyber/>.

¹⁶ U.S. Army Training and Doctrine Command (TRADOC), TRADOC Pamphlet (PAM) 525-3-1, *The U.S. Army in Multi-Domain Operations 2028* (Ft. Eustis, VA: U.S. Army Training and Doctrine Command, December 6, 2018), i.

¹⁷ U.S. President, *INSSG*, 10.

¹⁸ Justin Diehl, “Indo-Pacific Deterrence and the Quad in 2030,” *Journal of Indo-Pacific Affairs* (Spring 2021): 3.

¹⁹ *Ibid.*

partnerships.²⁰ Most importantly, the leaders reaffirmed their commitment to promoting the security of the current order and deterring those seeking to undermine it.²¹

While not publicly specified, the Quadrilateral intends to constrain Chinese aggression. Much like the United States, the other members of the Quadrilateral are modernizing their military concepts and capabilities to deter or defeat China. In 2017, India produced its first public capstone joint doctrine.²² Australia's Defense Strategic Update in 2020 requires new concepts, forces, and capabilities to respond to new challenges.²³ Japan is building a Multi-Domain Defense Force.²⁴ United States Indo-Pacific Command (USINDOPACOM) has tested and employed the Army's new Multi-Domain Task Force in theater since 2018.²⁵ These new and emerging concepts, along

²⁰ The White House Briefing Room, "Joint Statement from Quad Leaders," (The White House, Washington, DC, September 24, 2021), <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/24/joint-statement-from-quad-leaders/>.

²¹ Ibid.

²² Abhijnan Rej and Shashank Joshi, "India's Joint Doctrine: A Lost Opportunity," (ORF Occasional Paper, Observer Research Foundation, Delhi, India, January 2018), 2.

²³ Australian Government, Department of Defence, *2020 Defense Strategic Update* (Sydney, Australia: Commonwealth of Australia, 2020), https://www1.defence.gov.au/sites/default/files/2020-11/2020_Defence_Strategic_Update.pdf.

²⁴ Tetsuo Kotani, "The Multi-Domain Defense Force: Assessment and Challenges," (JIIA Strategic Comments (No. 6), The Japan Institute of International Affairs, Tokyo, Japan, December 28, 2018), 1, https://www2.jiia.or.jp/en/article_page.php?id=15.

²⁵ Robert Brown, "Head of US Army Pacific Command Talks Multidomain Challenges in the Region," interview by Jen Judson, *Defense News*, November 25, 2018, <https://www.defensenews.com/interviews/2018/11/26/head-of-us-army-pacific-command-talks-multidomain-challenges-in-the-region/>.

with supporting forces, are responses to Chinese aggression and fielded A2/AD concepts in the Indo-Pacific.

Space operations and capabilities are a significant pillar of those supporting forces. The new concepts from each member of the Quadrilateral all recognize space as a warfighting domain. The United States recently re-established USSPACECOM to fight in the space domain.²⁶ The Army's Multi-Domain Task Force demonstrates the evolving American approach to the space domain and tactical and operational forces.²⁷ Japan is establishing a Space Surveillance capability and focusing on defensive space control.²⁸ Australia has established new defense projects to provide additional satellite communication capability and a space electronic warfare capability.²⁹ The Australian Defence Space Command mirrors the establishment of USSPACECOM.³⁰ India recently tested a direct ascent anti-satellite weapon system in 2019 and plans to test and procure additional and varied space control systems.³¹ Members of the Quad have quickly

²⁶ Brandon Davenport, "On Implementing a Space War-Fighting Construct: A Treatise on Applied Frameworks from Other Domains," *Air & Space Power Journal* 34, no. 1 (Spring 2020): 63.

²⁷ Chief of Staff of the Army, "Army Multi-Domain Transformation: Ready to Win in Competition and Conflict," (Chief of Staff Paper #1, Headquarters, Department of the Army, Washington, DC, March 16, 2021), 12.

²⁸ Kotani, "The Multi-Domain Defense Force," 2.

²⁹ Peter Dutton, "Defense explores options for Space Electronic Warfare," Australian Department of Defence, July 29, 2021, <https://www.minister.defence.gov.au/minister/peter-dutton/media-releases/defence-explores-options-space-electronic-warfare>.

³⁰ Kerr, "Space Command Begins Operations."

³¹ Rajat Pandit, "Satellite-killer Not a One-off, India Working on Star Wars Armoury," *Times of India*, April 7, 2019, <https://timesofindia.indiatimes.com/>

adopted varying approaches to military space capabilities with an eye on space as a warfighting domain and current competition and a potential conflict with China.

Problem Statement

Members of the Quadrilateral are simultaneously developing new warfighting concepts and space capabilities designed to deter China. These concepts and capabilities reflect each member's unique position, capabilities, and interests. The Quadrilateral itself, recently resurrected, is an immature and informal organization. There is little multilateral coordination of military responses and integration of warfighting concepts. Joint Doctrine and literature recognize that coordinated and exercised partnerships are key to effective coalition warfare. USINDOPACOM, as the preeminent U.S. military command in the Indo-Pacific, must build these relationships and partner capacity per the 2019 Department of Defense Indo-Pacific Strategy Report.³² Failure to coordinate space capabilities and employment concepts within the Quadrilateral will reduce the effectiveness of a future coalition including USINDOPACOM, putting the ability to deter Chinese aggression at risk.

Purpose of the Study

The researcher will examine the emerging operating concepts of the Quadrilateral Security Dialogue and identify obstacles to USINDOPACOM's ability to integrate partner and U.S. space capabilities into an effective coalition framework. It will provide

[india/satellite-killer-not-a-one-off-india-working-on-star-wars-armoury/articleshow/68758674.cms?from=mdr](https://www.india/satellite-killer-not-a-one-off-india-working-on-star-wars-armoury/articleshow/68758674.cms?from=mdr).

³² DOD, *Indo-Pacific Strategy Report*, 8.

recommendations to USINDOPACOM to improve unity of effort based on analysis of factors identified during research.

Research Questions

What challenges do the differing concepts and space capabilities of the Quadrilateral Security Dialogue pose to USINDOPACOM's ability to build an effective coalition?

The study will address the below secondary research questions to identify the key factors and obstacles to provide a logical and coherent answer to the primary research question:

1. How are members of the Quadrilateral implementing their operating concepts in the Indo-Pacific?
2. What space capabilities are members of the Quadrilateral operating or developing for use in the Indo-Pacific?
3. What challenges do space operations and capabilities pose to achieving unity of effort in a coalition framework?

Assumptions

The researcher relies on several assumptions. The first assumption is that all public domain information is accurate or not intentionally deceptive. This assumption is imperative when studying foreign operating concepts. Study findings from intentionally flawed or deceptive concepts would produce inaccurate results. Further, the study assumes that the fielded, planned, or programmed capabilities supporting operational concepts will remain relevant through 2035. While individual capabilities and programs

may vary or evolve, the base offered function must remain relevant for the study results to hold. The study focuses on learning concepts while building coalitions; the study assumes that operational concepts are mature by 2035 based on public statements from members of the Quadrilateral. The study assumes that the current military relationships within the Quadrilateral will remain steady, neither developing into a formal alliance nor dissolving. Finally, the researcher assumes that China will remain the primary threat to security in the Indo-Pacific region and will not significantly alter its current strategic approach.

Definition of Terms

Multi-Domain Operations – “Operations conducted across multiple domains and contested spaces to overcome an adversary’s (or enemy’s) strengths by presenting them with several operational and/or tactical dilemmas through the combined application of calibrated force posture; employment of multi-domain formations; and convergence of capabilities across domains, environments, and functions in time and spaces to achieve operational and tactical objectives.”³³

Operating Concept – “An operating concept derives a method for employing force capabilities to achieve a stated objective or aim within the context of a specified operating environment or against a specified force challenge.”³⁴

³³ TRADOC, TRADOC PAM 525-3-1, GL-7.

³⁴ Chairman of the Joint Chiefs of Staff (CJCS), *Guidance for Developing and Implementing Joint Concepts* (Washington, DC: Joint Chiefs of Staff, August 17, 2016, A-1.

Quadrilateral Security Dialogue – An informal group consisting of India, Australia, Japan, and the United States designed to promote shared interests in the Indo-Pacific region.³⁵

Anti-Access/Area-Denial – “Anti-access and area denial systems create strategic and operational stand-off that separates the elements of the Joint Force in time, space, and function.”³⁶

Space Operations – “Space operations are those operations impacting or directly utilizing space and ground-based capabilities to enhance the potential of the United States and multinational partners.”³⁷

Scope

The researcher will assess the operating concepts of the Quadrilateral as well as existing or planned space capabilities to conduct multi-domain operations. The researcher will examine how the United States has employed multi-domain space concepts in the Indo-Pacific. The study will compare the concepts and identify implications of the comparison for USINDOPACOM. The study will not examine other potential security partners either in the Indo-Pacific region or external to it.

³⁵ Smitha Narayanan Kutty and Rajesh Basrur, “The Quad: What It Is – And What It Is Not,” *The Diplomat*, March 24, 2021, <https://thediplomat.com/2021/03/the-quad-what-it-is-and-what-it-is-not/>.

³⁶ TRADOC, TRADOC PAM 525-3-1, vii.

³⁷ Chairman of the Joint Chiefs of Staff (CJCS), Joint Publication (JP) 3-14, *Space Operations* (Washington, DC: Joint Chiefs of Staff, April 10, 2018; incorporating Change 1, October 26, 2020), I-2.

Limitations and Delimitations

Limitations: The time available limits the researcher to the detriment of further exploration within the topic. This is a qualitative study and may not provide generalizable conclusions. The case study approach does not provide a sufficient sample size for statistical rigor for mixed-methods approaches. As the study focuses on emerging concepts, it does not have significant prior research on the topic. The June 2021 signed U.S. Joint Warfighting Concept has no current unclassified summary or version.

Delimitations: The study will use only publicly available information to remain at the unclassified level. The researcher relies on sources published in English as it is the author's native language and the shared language of the majority of the study's subjects. The study will focus on the U.S. Army's contribution to the Joint Force through Multi-Domain Operations and the Multi-Domain Task Force due to it providing the most comprehensive example currently in use. The researcher will focus on space capabilities to constrain the breadth of the study. The study further narrows space capabilities to Space Domain Awareness, Offensive Space Control, and Defensive Space Control. The researcher will not assess other space capabilities, such as orbital warfare, space access and launch, or space sustainment. The study will limit itself to the Quadrilateral to maintain focus and scope of the study to align with time limitations. The researcher will employ NVivo to conduct code aggregation from source documents; the researcher does not have access to NVivo's natural language processing algorithm to describe its biases.

Significance of the Study

The researcher will provide USINDOPACOM with considerations for coordinating military multi-domain activities of the Quadrilateral to achieve unity of

effort in a loose coalition. Military planners in the Quadrilateral will benefit from an understanding of partner space capabilities, how to build capacity and ensure deterrence, and understand potential national caveats or limitations on the employment of capabilities.

Summary

China is a rapidly rising power with ambitions challenging the security of the Indo-Pacific. Its actions resurrected the Quadrilateral Security Dialogue as an international partnership designed to ensure the free and open Indo-Pacific. Concurrently, China's military capabilities and modernization are driving similar evolutions of operating concepts and capabilities in the Quadrilateral. In particular, the recognition of space as a warfighting domain is driving new operating concepts and capabilities in the theater. This situation poses a challenge to USINDOPACOM's ability to build military capacity and readiness within a coalition to deter China.

This problem drives the primary research question concerning how USINDOPACOM integrates these space capabilities and concepts into an effective coalition. The results of the study will identify key factors and their relationship within the context of the Quadrilateral and the Indo-Pacific. These findings will provide a basis for recommendations for USINDOPACOM. These recommendations will focus on actions to achieve theater strategic objectives in the Indo-Pacific and support fulfilling national objectives.

CHAPTER 2

LITERATURE REVIEW

Introduction

The rise of an adversarial China has evoked responses from the Quadrilateral to meet the challenges China poses. In particular, each member of the Quadrilateral is updating their operating concepts for their forces and adding new capabilities to address challenges in emerging warfighting domains. In particular, Quadrilateral members display a broad recognition of the space domain as a warfighting domain and space capabilities as key to defeating the Anti-Access/Area-Denial concept. This trend reinforces the importance of the primary research question: What challenges do the differing concepts and space capabilities of the Quadrilateral Security Dialogue pose to USINDOPACOM's ability to build an effective coalition?

The secondary research questions guide the literature review by needing specific literature to answer them. How are members of the Quadrilateral implementing their operating concepts in the Indo-Pacific? What space capabilities are members of the Quadrilateral operating or developing for use in the Indo-Pacific? Finally, what challenges do space operations and capabilities pose to achieving unity of effort in a coalition framework?

Themes tied to the facets of the research questions organize the literature review chapter: Developing U.S. Concepts, Quadrilateral Security Dialogue Concepts, Space Operations and Capabilities, and Challenges to Unified Action within Coalitions. These themes organize the current literature into their respective communities. The review groups the topics in this manner to reveal their intersections and to address the primary

research question. The literature review demonstrates the current state of how the U.S. plans to employ space capabilities within USINDOPACOM and how other Quadrilateral members are developing their capabilities and concepts.

As this is an emerging area under active development, the literature review will have a significant recency bias in primary and secondary sources. Primary source selection will focus on published operating concepts from national-level defense organizations, such as the Japanese Ministry of Defense, published doctrine, and public statements, testimony, and published documents from leaders in the region. Other sources of similar quality are budget documents, published capability solicitations, strategy documents, and force design documents from relevant government organizations within the Quadrilateral. Primary source selection in the literature review is both minimal and limited to where clarity or descriptiveness is necessary.

Secondary sources are the primary focus of the literature review. Secondary sources will include government-solicited or funded reports on relevant topics and academic or professional journals providing analysis of topic areas. Keyword searches involving combinations Multi-Domain Operations, Space Operations, Coalition, Multi-National Force, and Indo-Pacific found both secondary and primary sources. Additional source selection methods include a review of government publications and cross-referencing professional and academic bibliographies. The author assessed the reliability and reputability of any source, government or otherwise, on a case-by-case basis. Some criteria include whether or not the source is peer-reviewed, has an adequate citation for its claims, or, in the case of government sources, they are publicly available and consistent with other public statements.

Developing U.S. Concepts

The current U.S. strategy for the Indo-Pacific calls for military modernization to deal with rising threats, a ready and available force as a deterrent, and strong commitment to partnerships with allies and like-minded states in the region.³⁸ Part of the modernization and ready force challenge is implementing new concepts of operation to deal with the military problems posed by China.³⁹ The unifying theme to emerging service concepts is simultaneously operating in all domains, particularly the space domain. While all services are pursuing new concepts containing space requirements, the Army's is both the most advanced and the only one supported by a fielded capability: the Multi-Domain Task Force (MDTF).⁴⁰ USINDOPACOM has exercised and learned with this unit since 2017.⁴¹

USINDOPACOM and United States Army Pacific (USARPAC) rely on the MDTF to provide experience in multi-domain operations in the Indo-Pacific region. They participate in bilateral and multilateral exercises several times annually, including keystone exercises such as RIMPAC, Yama Sakura, Orient Shield, and Talisman Sabre. The last four years of exercises revealed several key themes regarding the U.S. Army's MDTF and contribution to a joint MDO environment. The MDTF and staffs at the corps

³⁸ DOD, *Indo-Pacific Strategy Report*, 21.

³⁹ Nathan P. Freier and John H. Schaus, "INDOPACOM through 2030," *Parameters* 50, no. 2 (Summer 2020): 30.

⁴⁰ Carol V. Evans, "Providing Stability and Deterrence: The US Army in INDOPACOM," *Parameters* 51, no. 1 (Spring 2021): 31.

⁴¹ Brown, "Head of U.S. Army Pacific Command Talks Multidomain Challenges in the Region."

and theater army level are not trained or experienced in planning for space or cyber operations in support of joint commanders.⁴² Further, the exercise construct lacks sufficient detail or scenario support for MDO operations, hampering learning outcomes for participants and USINDOPACOM.⁴³ The exercises also focus on conflict rather than competition, ignoring the competition phase as a key component of the MDTF's designed contribution to the joint force and MDO.⁴⁴

The intelligence collection and analysis capacity and process both within the MDTF and in the higher echelon staffs is immature. It does not meet the required pace or detail to support the MDTF's targeting capabilities.⁴⁵ In particular, lessons from all major exercises continuously identify an inability of higher echelon staff to prioritize and execute timely intelligence collection to support the dynamic targeting envisioned in the MDO concept.⁴⁶ Legacy information systems, inexperience with new joint systems, poor interoperability between service systems and USINDOPACOM, and untrained or inexperienced staff are the key contributors to the shortfalls in USINDOPACOM's ability

⁴² Center for Army Lessons Learned (CALL), *Pacific Sentry 19-3 Multi-Domain Task Force Joint Lessons Learned Information System Collection Report* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2019), 8.

⁴³ Center for Army Lessons Learned (CALL), *Talisman Sabre 19 Initial Impressions Report* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2019), 29.

⁴⁴ Center for Army Lessons Learned (CALL), *The Multi-Domain Task Force Quick-Look Report Competing Across Multiple Domains* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2020), 21.

⁴⁵ *Ibid.*, 21.

⁴⁶ CALL, *Talisman Sabre 19 Initial Impressions Report*, 33.

to provide intelligence support to targeting and to execute targeting and fires with the MDTF.⁴⁷ USINDOPACOM is currently addressing this shortcoming through their Indo-PACNET Mission Partner Environment (MPE), a multinational computer system designed to share information between coalition partners on separate enclaves.⁴⁸

The services are ahead of the joint force, which has not articulated a clear, unifying concept.⁴⁹ Service parochialism and the inherently complex nature of multi-domain operations exacerbates the problem raised by no joint concept.⁵⁰ The parochialism challenges the USINDOPACOM's comprehension of how the services will integrate, synchronize, and provide capabilities; the joint comprehension shortfalls further complicate planning with multinational partners.⁵¹ Joint All-Domain Command and Control (JADC2) is an emerging response to the complexity posed by MDO and lack of unifying joint concept. The emerging concept relies on Artificial Intelligence (AI) to

⁴⁷ CALL, *The Multi-Domain Task Force Quick-Look Report Competing Across Multiple Domains*, 12.

⁴⁸ George I. Seffers, "INDOPACOM Builds Mission Partner Environment," *Signal*, November 1, 2021, <https://www.afcea.org/content/indopacom-builds-mission-partner-environment>.

⁴⁹ Tom Greenwood and Pat Savage, "In Search of a 21st-Century Joint Warfighting Concept," *War on the Rocks*, September 12, 2019, <https://warontherocks.com/2019/09/in-search-of-a-21st-century-joint-warfighting-concept/>.

⁵⁰ David E. Johnson, *Shared Problems: The Lessons of AirLand Battle and the 31 Initiatives for Multi-Domain Battle* (Santa Monica, CA: RAND Corporation, 2018), 6.

⁵¹ Greenwood and Savage, "In Search of 21st Century Warfighting Concept."

bridge these problems; however, AI remains an emerging technology area ill-understood by military decision-makers and facing ethical challenges.⁵²

Critiques of current command and control hierarchies and planning methodologies identify that they are unable to meet the data collection, processing, analysis, and decision demands of MDO.⁵³ The Air Tasking Order cycle generates multiple Microsoft Office documents and formats for orders generation and tasking.⁵⁴ These documents are often not standardized or retained and accessible for sufficient length of time to provide the dataset that JADC2 requires to enable AI driven decision-making.⁵⁵

The Air Operations Center is the historic center for integrating joint fires in support of the joint commander. They are not staffed, equipped, or trained to handle the data complexity, scale, or speed of a MDO conflict.⁵⁶ They suffer from both system and process stovepipes and cycles slower than potential adversaries, particularly China.⁵⁷ They also exhibit a high degree of control over operations, undermining the joint

⁵² Sherrill Lingel, Jeff Hagen, Eric Hastings, Mary Lee, Matthew Sargent, Matthew Walsh, Li Ang Zhang, and David Blanchett, *Joint All-Domain Command and Control for Modern Warfare: An Analytic Framework for Identifying and Developing Artificial Intelligence Applications* (Santa Monica, CA: RAND Corporation, 2020), 9.

⁵³ Ibid., 50.

⁵⁴ Ibid., 52.

⁵⁵ Ibid., 52.

⁵⁶ John R. Hoehn, *Joint All-Domain Command and Control: Background and Issues for Congress*, Congressional Research Service Report for Congress R46725 (Washington, DC: Library of Congress, last updated July 2021), 2.

⁵⁷ Ibid.

philosophy of mission command.⁵⁸ The United States Air Force (USAF) recognizes this challenge in the new Air Force Doctrine Publication 1 (AFDP 1) which emphasizes distributed control as a component of the mission command philosophy.⁵⁹ AFDP 1 defines distributed control as the delegation of planning and coordination of activities to dispersed locations or subordinate echelons.⁶⁰ This evolution is in response to a service and joint perception of overly prescriptive control over complex operations across multiple domains.⁶¹ However, the concept of distributed control focuses on who has control over forces, not addressing key components of enabling MDO such as authorities, transitions between echelons of control, and inherent risks posed by changing philosophies of control.⁶² USAF service exercises to identify these friction points are immature and insufficiently focused on the challenges posed by MDO.⁶³

JADC2 envisions the coordination of cross-domain effects and systems flexibility and with speed commensurate with emerging warfighting challenges.⁶⁴ However, it is

⁵⁸ Lingel, et al., *Joint All-Domain Command and Control for Modern Warfare*, 53.

⁵⁹ Sandeep Mulgund, “Evolving the Command and Control of Airpower,” *Wild Blue Yonder* (April 2021), <https://www.airuniversity.af.edu/Wild-Blue-Yonder/Article-Display/Article/2575321/evolving-the-command-and-control-of-airpower/>.

⁶⁰ U.S. Air Force, Air Force Doctrine Publication 1, *The Air Force* (Washington, DC: U.S. Air Force, 2021), 13.

⁶¹ Mulgund, “Evolving the Command and Control of Airpower”.

⁶² Lingel, et al., *Joint All-Domain Command and Control for Modern Warfare*, 51.

⁶³ *Ibid.*, 57.

⁶⁴ *Ibid.*, 7.

challenged by non-interoperable tactical information networks among services, lack of systems to handle the required scale of data and analysis to support decision making, nor does it address time-constrained decision making in a multi-domain environment.⁶⁵ This theme is consistent with the Army and USINDOPACOM's experiences in exercising the MDTF, with questions of control and authorities continually plaguing the exercise results and lessons learned.⁶⁶

Further, the emerging concepts are not theories of victory; they are concepts of either command and control or countering A2/AD systems.⁶⁷ In particular, critical literature identifies all service concepts as excessively tactically focused, not providing clear operational or strategic employment thought.⁶⁸ These concepts, despite claiming a focus on all domains, remain largely legacy joint concepts focusing on more traditional cross-domain fires, such as ground-based anti-ship missile systems.⁶⁹ This reflects service priorities for modernization and readiness, not clear requirements from or alignment with how USINDOPACOM envisions competing against and prevailing in a conflict with China. A clear concept of employing space capabilities remains elusive.

⁶⁵ Lingel, et al., *Joint All-Domain Command and Control for Modern Warfare*, 51. 8.

⁶⁶ CALL, *The Multi-Domain Task Force Quick-Look Report Competing Across Multiple Domains*, 12.

⁶⁷ Huba Wass De Czege, *Commentary on "The US Army in Multi-Domain Operations 2028,"* (Carlisle Barracks, PA: Strategic Studies Institute, U.S. Army War College, April 2020), xix.

⁶⁸ Greenwood and Savage, "In Search of 21st Century Warfighting Concept."

⁶⁹ Evans, "Providing Stability and Deterrence," 28.

The review of the literature highlights two major themes: U.S. concepts are immature and U.S. concepts suffer from a lack of synchronization. The concepts focus on the military problems posed by China and Russia. Critiques of concepts or implementation focus on maturity, links between services and joint functions, command and control, and effects synchronization. They focus on the gap between service independent development and joint implementation and the challenges that raises; they do not focus on how combatant commanders resolve the challenges not aligned with their area of responsibility. Available literature does identify weaknesses in addressing the integration of new domains into concepts; however, they do not examine the implications of those gaps.

Quadrilateral Security Dialogue Concepts

The Quadrilateral Security Dialogue is a loose political arrangement of the United States of America, Australia, Japan, and India.⁷⁰ It is not a formal alliance and focuses on high-level coordination and cooperation across all elements of national power.⁷¹ Despite an extended decade of inactivity, it has recently reinvigorated itself to confront the challenge of China.⁷² However, its member states primarily cooperate in a bilateral or

⁷⁰ Lavina Lee. *Assessing the Quad: Prospects and Limitations of Quadrilateral Cooperation for Advancing Australia's Interests* (Sydney, Australia: Lowy Institute, May 2020), 1.

⁷¹ Ibid., 19.

⁷² Ibid., 2.

trilateral fashion with little overlap in activities.⁷³ Analogous organizations in the Indo-Pacific suffer from differing national interests, low cohesion, and low commitment of forces or resources to organizational goals.⁷⁴

The warfighting concepts for each member highlight this trend. Australia's concept relies on a unique geopolitical situation, not operating with allies.⁷⁵ It identifies the geopolitical constraints of existing and operating within the Indo-Pacific region, in particular the neighboring states and Oceania, and focuses on maritime strike and air defense to protect Australia.⁷⁶ The Australian Defence Force (ADF) provided a new concept for command and control in 2019 focused on a collaborative decision-making network with decentralized control and execution.⁷⁷ Like JADC2, it identifies the need for AI integration to manage the data and decision-cycle of future warfare.⁷⁸ Current work within the ADF has highlighted the challenges that AI and trust pose to exercising new AI-enabled control methods within the Australian understanding of Mission

⁷³ Justin Diehl, "Indo-Pacific Deterrence and the Quad in 2030," *Journal of Indo-Pacific Affairs* (Spring 2021): 11.

⁷⁴ Artem Sherbinin, "Enforcing Sanctions on North Korea is an Opportunity for Cooperation at Sea," *War on the Rocks*, March 16, 2021, <https://warontherocks.com/2021/03/enforcing-sanctions-on-north-korea-presents-an-opportunity-for-cooperation-at-sea/>.

⁷⁵ Mark Mankowski, "Does the Australian Army need Multi-Domain Operations?" *The Cove*, September 24, 2019, <https://cove.army.gov.au/article/does-the-australian-army-need-multi-domain-operations>.

⁷⁶ Ibid.

⁷⁷ Vice Chief of the Defence Force, "ADF Concept for Command and Control of the Future Force," (Ministry of Defence, Canberra, Australia, 2019), 11.

⁷⁸ Ibid., 36.

Command.⁷⁹ The ADF's Multi-Domain Strike concept is classified. However, public statements from the ADF contain similar language to the U.S. Army's Multi-Domain Operations concept.⁸⁰

Powerful neighboring states ground India's joint warfighting approach in a land domain emphasis.⁸¹ While India is modernizing space and cyber capabilities at the Ministry of Defence Level and creating new organizations to develop and operate space and cyber capabilities, they are poorly resourced compared to the traditional services and not integrated into a joint force.⁸² The Army's current operating concept is an updated version of historic large scale combat operations and the imperative for large, combined-arms formations.⁸³ The Indian Army is not keeping pace with peer threats and their transition to new operating concepts incorporating emerging technologies, new domains, and new theories of command and control.⁸⁴ Critics identify a stagnant service culture focused on traditional offensive combined-arms maneuver to seize territory as the

⁷⁹ Kevin Yiwei Huang, "Mission Command and Artificial Intelligence: Obstacles to Integration," Australian Army Research Centre, 2021, <https://researchcentre.army.gov.au/library/land-power-forum/mission-command-and-artificial-intelligence-obstacles-integration>.

⁸⁰ Vice Chief of the Defence Force, "ADF Concept for Multi-Domain Strike."

⁸¹ Rej and Joshi, "India's Joint Doctrine," 3.

⁸² Arzan Tarapore, "The Army in Indian Military Strategy: Rethink Doctrine or Risk Irrelevance," (Working Paper, Carnegie India, New Delhi, India, August 2020), 2, <https://carnegieindia.org/2020/08/10/army-in-indian-military-strategy-rethink-doctrine-or-risk-irrelevance-pub-82426>.

⁸³ Ibid., 11.

⁸⁴ Ibid.

primary source of the absence of innovation.⁸⁵ This culture is prevalent across the services.⁸⁶ This places India in a different position than other members of the Quadrilateral, with a defence ministry led effort to develop capabilities not integrated into stagnant and rear-looking service operating concepts.

Japan's evolutions closely mirror its alliance with the United States.⁸⁷ Of these states, only the Japanese concept expressly details the role of space capabilities.⁸⁸ However, these capabilities are focused on defensive space control and assuring access to space capabilities for the Japanese Self-Defense Forces (JSDF).⁸⁹ Japan does concurrently outline a defensive role for both cyber and electronic warfare capabilities and emphasizes their development within a multi-domain or information context.⁹⁰ Otherwise, consistent with their constitutional constraints and service culture, the JSDF's emerging multi-domain operating concept focuses on homeland defense through air and missile defense, cross-domain fires, particularly targeting the maritime domain, and the required supporting communications links to command and control those forces.⁹¹

⁸⁵ Tarapore, "The Army in Indian Military Strategy," 14.

⁸⁶ Ibid., 12.

⁸⁷ Daisuke Akimoto, "Japan's Multi-Domain Defense Force: The Space, Cyber, and Electromagnetic Domains," (Institute for Security & Development Policy, Stockholm, Sweden, September 2021), 3.

⁸⁸ Kotani, "The Multi-Domain Defense Force," 2.

⁸⁹ Akimoto, "Japan's Multi-Domain Defense Force," 3.

⁹⁰ Ibid., 6.

⁹¹ Ibid., 7.

Studies of potential coalition military action within the Quadrilateral focus on the U.S. military and do not significantly discuss the role of coalition forces.⁹² The body of those existing studies predominately comes from bilateral exercises with the U.S. and a partner nation, typically Japan or Australia. There is no significant work assessing or comparing member concepts broadly or for space in particular. Common themes throughout the coalition partners are one of emerging or modernizing concepts not fully understood or implemented. Literature examines the concepts in three general approaches: an analysis of published doctrine or concepts, analysis of fielded or programmed capabilities, military activities with other members of the Quad. This suggests the areas of focus for an examination of Quad members' space capabilities and integration into a coalition.

Space Operations and Capabilities

Doctrine and literature broadly concur on organizing space capabilities into two general mission areas: Space Force Enhancement and Space Control.⁹³ The available literature is likely biased towards U.S. doctrine as it is one of the few major sources of information discussing the subject area. Space Force Enhancement broadly contains roles that enable friendly forces – e.g., positioning, navigation, and timing capabilities.⁹⁴ Space Control doctrinally includes Space Domain or Space Situational Awareness, Defensive Space Control, and Offensive Space Control. Space Domain Awareness involves tracking

⁹² Diehl, “Indo-Pacific Deterrence,” 3.

⁹³ CJCS, JP 3-14, C-2.

⁹⁴ Ibid., II-2.

space objects and has a long history of U.S. led coalition operations.⁹⁵ Defensive Space Control focuses on protecting allied or partner space assets from adversary action.⁹⁶ Offensive Space Control contains capabilities that can deny, disrupt, deceive, degrade, or destroy adversary space capabilities.⁹⁷

Most literature focuses on strategic or national level cooperation for space capabilities.⁹⁸ There is a bias to discuss orbital capabilities for Space Force Enhancement.⁹⁹ Even literature suggesting how to integrate offensive actions focuses on orbital warfare or the strategic supremacy of United States Space Command (USSPACECOM).¹⁰⁰ The Geographic Combatant Commander's role, if specified, tends to focus on coordination with USSPACECOM. Every author highlights the constraints technology places on coalition action in space: interoperability, information sharing, and command and control issues.¹⁰¹ Cooperation between states has focused on Space

⁹⁵ Michael Gleason and Charity Weeden, *Alliance Rationales & Roadblocks: A U.S.-Canada Space Study* (Colorado Springs, CO: Center for Space Policy and Strategy, April 2018), 8.

⁹⁶ CJCS, JP 3-14, II-3.

⁹⁷ *Ibid.*, II-2.

⁹⁸ Rachel S. Cohen, "Building the New Space Coalition," *Air Force Magazine*, March 26, 2021, <https://www.airforcemag.com/article/building-the-new-space-coalition/>.

⁹⁹ *Ibid.*

¹⁰⁰ Davenport, "Implementing a Space War-Fighting Construct," 69.

¹⁰¹ Gleason and Weeden, *Alliance Rationales & Roadblocks*, 5.

Situational Awareness.¹⁰² Even the North Atlantic Treaty Organization, a strong and robust alliance, has underdeveloped integration of space operations into coalition operations.¹⁰³ Gaps in the literature exist in discussing how to employ space capabilities, such as those in the Multi-Domain Task Force, in support of a Geographic Combatant Commander. In particular, gaps exist in the analysis of the integration of partner space capabilities into coalition operations. The literature contains key themes of information sharing, command and control, and coalition member space operations activity tolerance.

Challenges to Unified Action in Coalitions

Multi-domain operations pose a challenge to joint operations; they necessarily pose a large challenge to coalition operations as well. Doctrine and other sources all highlight the key challenges as rationalization and interoperability, information and intelligence sharing, and command and control.¹⁰⁴ JP 3-16, *Multinational Operations* defines rationalization as “any action that increases the effectiveness of a multinational force through more efficient or effective use of resources committed to the multinational force.”¹⁰⁵ The same source defines interoperability as “the enhancement of multinational

¹⁰² Aaron Bateman, “America Needs a Coalition to Win a Space War,” *War on the Rocks*, April 29, 2020, <https://warontherocks.com/2020/04/america-needs-a-coalition-to-win-a-space-war/>.

¹⁰³ Ibid.

¹⁰⁴ U.S. Joint Force Staff Joint Force Development J7, *Cross-Domain Synergy in Joint Operations Planner’s Guide* (Suffolk, VA: U.S. Department of Defense, January 14, 2016), 8.

¹⁰⁵ Chairman of the Joint Chiefs of Staff (CJCS), Joint Publication 3-16, *Multinational Operations* (Washington, DC: Joint Chiefs of Staff, February 12, 2021), I-8.

forces' ability to execute assigned tasks through technology, doctrine, procedures, communications, and training.”¹⁰⁶ Information sharing is closely linked with intelligence sharing and both pose problems with access, controls, and technical methods of sharing.¹⁰⁷ Command and control challenges are posed not only by the form of the coalition command structure but also by caveats.¹⁰⁸ The role of national caveats in contentious force employment issues is a significant one for coalitions.¹⁰⁹ Posing a significant challenge to effectively employing cross-domain capabilities in a coalition context, offensive space operations are historically politically divisive.¹¹⁰ Further, they highlight issues with timeliness, the challenges in technical coordination that low unity of command poses, and poor interagency and multinational coordination.¹¹¹

Analysis of contemporary coalition operations with technical capabilities, such as Combined Joint Task Force – Operation Inherent Resolve (CJTF-OIR), reinforce these

¹⁰⁶ CJCS, JP 3-16, I-10.

¹⁰⁷ Ibid., VI-5.

¹⁰⁸ Patrick A. Mello, “National Restrictions in Multinational Military Operations: A Conceptual Framework,” *Contemporary Security Policy* 40, no. 1 (August 6, 2018): 37.

¹⁰⁹ Ibid., 38.

¹¹⁰ Rachel S. Cohen, “Building the New Space Coalition,” *Air Force Magazine*, March 26, 2021, <https://www.airforcemag.com/article/building-the-new-space-coalition/>.

¹¹¹ U.S. Joint Force Staff Joint Force Development J7, *Cross-Domain Synergy in Joint Operations Planner's Guide*, 18.

challenges.¹¹² The coalition did not coordinate interagency technical activities due to deficits in planning and command and control.¹¹³ The U.S., in a lead-nation coalition structure, failed at internal coordination due to interservice and interagency cultures and processes.¹¹⁴ This poses challenges to multi-domain operations and coalition operations due to the competition-focused concepts requiring interagency support. However, the coalition did demonstrate remarkable maturity in coalition information sharing and effects synchronization required of a multi-domain conflict. An analysis of the coalition found that coalition members attended and synchronized their technical capabilities at intelligence and targeting boards at the coalition headquarters.¹¹⁵ This collaboration led to a responsive and effective use of technical operations, such as cyber activities, intelligence collection efforts, and military information support operations.¹¹⁶ The coalition spent significant time reviewing legal authorities for operations to ensure alignment with national caveats and synchronization of effects within the coalition.¹¹⁷ This most recent coalition example demonstrates some U.S. proficiency in coalition

¹¹² U.S. Department of Defense Inspector General (DOD IG), *Evaluation of Combined Joint Task Force – Operation Inherent Resolve* (Washington, DC U.S. Department of Defense, February 25, 2020), 13.

¹¹³ DOD IG, *Evaluation of Combined Joint Task Force*, 7.

¹¹⁴ *Ibid.*

¹¹⁵ *Ibid.*, 13.

¹¹⁶ *Ibid.*, 14.

¹¹⁷ *Ibid.*, 9.

information, intelligence, and effects coordination in a new and immature coalition, with potential lessons for USINDOPACOM and the Quadrilateral.

USINDOPACOM holds multiple annual exercises with members of the Quadrilateral. RIMPAC 2018 serves as a base for understanding a potential Quadrilateral coalition as it established a Combined Coalition Task Force (CCTF) to coordinate the multinational and multidomain operations.¹¹⁸ It exercised the Army's Multi-Domain Task Force in a coalition construct as well as identified authorities and command and control challenges that multi-domain operations pose in the Indo-Pacific region.¹¹⁹ Key insights include identifying the requirement for additional joint liaison officers within the joint force and coalition force to share information, explain capabilities, and coordinate effects.¹²⁰ The CCTF did not have sufficient network access to control subordinate multi-domain and coalition elements.¹²¹ The services and partners used differing targeting processes from the joint targeting process, confusing and duplicating CCTF targeting and effects efforts.¹²² RIMPAC 2018 identified challenges to controlling multi-domain fires within the joint force and a coalition construct due to expertise deficits, control

¹¹⁸ Center for Army Lessons Learned (CALL), *Initial Impressions Report: Multi-Domain Operations in RIMPAC 2018* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2018), 4.

¹¹⁹ *Ibid.*, 11.

¹²⁰ *Ibid.*, 19.

¹²¹ *Ibid.*, 18.

¹²² *Ibid.*, 23.

challenges due to networks and sharing, and lack of standardization of processes or doctrine in the coalition.

Yama Sakura 75 and Orient Shield 19 highlight these challenges even in mature bilateral alliance operations between the United States and Japan.¹²³ In Yama Sakura 75, the U.S. Joint Task Force, headed by U.S. Army Japan, did not develop a shared understanding with the Japanese Ground Self-Defense Force Northern Army and Joint Task Force Courage.¹²⁴ This shortfall in understanding inhibited effective mission command in the coalition exercise through a manual recreation of information, intelligence, and operations data at the task force level.¹²⁵ Japanese forces did not understand which authorities were needed or how to get them to conduct multi-domain operations in the space and cyber domains, limiting coalition effectiveness.¹²⁶ Coalition task force planners did not understand their multi-domain capabilities, delegating control to subordinate echelons and losing ability to synchronize multi-domain effects.¹²⁷

Orient Shield 19 highlighted the challenges of information and intelligence sharing. Foreign disclosure proved a bottleneck for sharing with Japanese forces, with a recommendation to leverage AI and the emerging JADC2 concept to automate data

¹²³ Center for Army Lessons Learned (CALL), *Initial Impressions Report: Yama Sakura 75 Integrating Multi-Domain Capabilities into Bilateral Operations* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2019), 7.

¹²⁴ Ibid., 8.

¹²⁵ Ibid.

¹²⁶ Ibid., 10.

¹²⁷ Ibid., 23.

sharing and disclosure.¹²⁸ It highlighted the requirement for a coalition task force headquarters to ensure a common information environment for the coalition as subordinate units lack expertise, equipment, and personnel to independently integrate.¹²⁹ The coalition task force did not support the Multi-Domain Task Force in developing multi-domain targets, demonstrating a lack of proficiency and understanding across echelons on how to employ these capabilities.¹³⁰ Basic standardization to conduct cross-domain operations remained absent.¹³¹ These exercise results highlight that even in a mature alliance, the partner nations faced challenges in sharing information, controlling subordinate forces, and using mutual processes to achieve end-states, challenges all exacerbated by the emergence of multi-domain concepts.

Talisman Sabre 19 was a joint exercise between the U.S. and Australia emphasizing multinational coordination for multi-domain operations.¹³² A key component of this exercise was the assignment of the Multi-Domain Task Force to a coalition joint task force led by the Australian 1st Infantry Division.¹³³ This exercise reinforced earlier findings. Delegation and alignment of authorities during phases of

¹²⁸ Center for Army Lessons Learned (CALL), *Orient Shield 19 Multi-domain Task Force Joint Lessons Learned Information System Collection Report* (Ft. Leavenworth, KS: U.S. Army Combined Arms Center, 2019), 7.

¹²⁹ *Ibid.*, 9.

¹³⁰ *Ibid.*, 15.

¹³¹ *Ibid.*, 20.

¹³² CALL, *Talisman Sabre 19 Initial Impressions Report*, 1.

¹³³ *Ibid.*, 2.

conflict are key to multi-domain capabilities and require close and continuous coordination between coalition partners to ensure unity of effort.¹³⁴ Operating outside of a U.S.-led coalition worsened the intelligence collection and sharing problem for multi-domain capabilities, as the MDTF relied on the coalition staff, which did not have appropriate access to either the capabilities themselves or intelligence support required for targeting.¹³⁵ The tactical units again lacked sufficient communications equipment and network access to integrate their tactical execution into operational planning or command and control.¹³⁶ The problem of rationalization was identified with the coalition not effectively employing the MDTF capabilities due to lack of targeting guidance and duplicative employment against targets engaged by traditional fires.¹³⁷ However, the integration of Australian 7th Signal Regiment's cyber and intelligence capabilities in the coalition task force complimented the capabilities of the MDTF, demonstrating continued bilateral development towards an Australian MDTF-like capability designed to expand coalition capability rather than duplicate existing U.S. capabilities.¹³⁸

There are specific critiques of the United States and UNSINDOPACOM's ability to fight a multi-domain or all-domain force against China.¹³⁹ The criticisms focus on an

¹³⁴ CALL, *Talisman Sabre 19 Initial Impressions Report*, 7.

¹³⁵ *Ibid.*, 3.

¹³⁶ *Ibid.*, 8.

¹³⁷ *Ibid.*, 6.

¹³⁸ *Ibid.*, 36.

¹³⁹ Kyle D. Scott, "Joint-All Domain Operations is Missing All-Domain Command & Control Support," (Paper, U.S. Naval War College, May 15, 2020), 10.

underdeveloped command and control structure to employ forces to achieve the limited windows of all-domain superiority necessary for concept success.¹⁴⁰ They identify legal constraints for force employment, immature understanding of command relationships with space capabilities, and sheer complexity and staff unpreparedness as barriers to command and control.¹⁴¹ There are additional observations that the scale of data available in the contemporary operating environment and in a multi-domain context already overwhelm U.S. system capacity to process and analyze to support decision-making.¹⁴² There are significant and unaddressed hurdles of data, information, or intelligence sharing between coalition partners, let alone the follow-on steps of coordinating and rationalizing operations.¹⁴³ All these criticisms are demonstrated during multinational exercises in the Indo-Pacific.

The literature available is predominantly prospective and drawing from similar challenges posed in coalition operations by other complex integration of capabilities. There is a bias towards the North Atlantic Treaty Organization (NATO) model of a cohesive, integrated alliance command structure; no significant study is available looking at space operations in parallel coalitions, the command structure that best fits the current

¹⁴⁰ Kyle D. Scott, “Joint-All Domain Operations is Missing All-Domain Command & Control Support,” (Paper, U.S. Naval War College, May 15, 2020), 17.

¹⁴¹ Miranda Priebe, Douglas C. Ligor, Bruce McClintock, Michael Spirtas, Karen Schwindt, Caitlin Lee, Ashley L. Rhoades, Derek Eaton, Quentin E. Hodgson, and Bryan Rooney, *Multiple Dilemmas: Challenges and Options for All-Domain Command and Control* (Santa Monica, CA: RAND Corporation, 2020), 34.

¹⁴² Lingel et al., *Joint All-Domain Command and Control for Modern Warfare*, 29.

¹⁴³ Ibid.

state of the Quadrilateral. The exception to this, for USINDOPACOM, is the existing and growing body of exercise lessons learned. Key themes include discussing barriers of information and intelligence sharing, rationalization and interoperability, command and control, experience, and planning synchronization.

Summary

The literature review covered several areas to address the primary research question. Each area provided key insights into factors in the problem of integrating space capabilities from differing nations into a coalition. Literature covering U.S. developments revealed a disjointed approach to emerging operating concepts. Particular attention revealed challenges to command and control and effect synchronization across domains espoused in the concepts. The Quadrilateral's operating concepts do not fair better in cohesiveness. Further, it highlighted the importance of assessing the triad framework of concept, capability, and coalition integration.

Space operations literature highlighted the technical and organizational challenges to employing space capabilities in coalitions, from information sharing to interoperability. Legal or policy concerns appear both in space operations literature and coalition literature. Coalition literature, in particular, highlights challenges of information sharing, experience, and command and control. Synthesizing these insights into themes will provide a framework for analyzing the primary source literature.

The insights fall into two categories: challenges to maintaining coalition unity of effort or challenges to synchronizing coalition operations. Unity of effort faces challenges of rationalization, interoperability, national caveats or restrictions, differing or immature concepts, and information sharing. Synchronization of operations fails due to capabilities

and employment, information sharing, command and control, and experience levels.

Information sharing is the key factor appearing in both categories. These factors will focus reading of primary sources to analyze how Quadrilateral states plan to employ and cooperate with space capabilities in the Indo-Pacific.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter covers the research methodology to resolve the research questions. The primary research question is: What challenges do the differing concepts and space capabilities of the Quadrilateral Security Dialogue pose to USINDOPACOM's ability to build an effective coalition? The secondary research questions require answering before the synthesis of data can answer the primary. The secondary questions are: How are members of the Quadrilateral implementing their operating concepts in the Indo-Pacific? What space capabilities are members of the Quadrilateral operating or developing for use in the Indo-Pacific? Finally, what challenges do space operations and capabilities pose to achieving unity of effort in a coalition framework?

Qualitative content analysis is the appropriate research approach to answer these questions. The nature of the research questions directs the study to a qualitative approach.¹⁴⁴ The major themes identified in the literature review, challenges to unity of effort and challenges to coalition operation synchronization, call for a contextual understanding of the problem. This chapter details the rationale behind the method selection. The literature review indicated that there are several primary sources to study coalition concepts and space capabilities. That will direct the discussion of the data collection approach to support the qualitative content analysis method. The literature

¹⁴⁴ John W. Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 5th ed. (Lincoln, NE: Independent, 2020), 32.

review similarly provides the theory support for the coding to extract data from the collected primary sources. Review of method literature informed the conduct of data analysis following data collection. Finally, this chapter examines ethical considerations in this study.

Method

The primary research question directs inquiry by asking what challenges exist. This question identifies the research as exploratory inquiry into the nature of the problem.¹⁴⁵ This approach calls for a holistic assessment of the problem set to answer the questions.¹⁴⁶ Further, there is no requirement to control the subjects of the study, eliminating a key factor in choosing to pursue a quantitative versus qualitative design.¹⁴⁷ The holistic assessment requirement, the nature of exploratory research, and the lack of requirement to control all match a key feature of a qualitative approach: emergent design.¹⁴⁸ Emergent design recognizes that qualitative inquiry will highlight features or factors of the problem that require modifying the initial research design to account for discovery during research.¹⁴⁹ This approach also flows from the secondary research

¹⁴⁵ Sudhakar Teegavarapu and Joshua D. Summers, “Case Study Method for Design Research,” (Paper presented at the Proceedings of International Design Engineering Technical Conferences, New York, NY, August 2008), 3.

¹⁴⁶ Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 206.

¹⁴⁷ Teegavarapu, “Case Study Method for Design Research,” 4.

¹⁴⁸ Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 206.

¹⁴⁹ Ibid.

questions whose framing asks questions related to how or what. The alignment of all research questions as qualitative questions identifies the qualitative method as the primary research method approach over mixed-methods or quantitative.

Specifically, the researcher employed qualitative content analysis. Content analysis is examining documents, interviews, recordings, and other media to extract data and contextualized meaning.¹⁵⁰ This design detects and standardizes meaning through the use of coding of the source data.¹⁵¹ Once collected, the data analysis assesses meaning and contextual understanding of the data.¹⁵²

This study prioritized a content analysis approach. It does so over other approaches due to the exploratory nature of an emerging problem within the context of existing theory. Grounded theory approach could reveal a theoretical model to understand the problem studied.¹⁵³ However, existing joint doctrine and literature form the basis of a theoretical model to understand the problem. Time and access preclude instruments such as surveys or interviews from consideration. The choice to exclude other data collection instruments does limit the validity of the study due to limited triangulation of findings.¹⁵⁴

¹⁵⁰ Florian Kohlbacher, "The Use of Qualitative Content Analysis in Case Study Research," *Qualitative Social Research* 7, no. 1 (January 2006): 8.

¹⁵¹ Ibid..

¹⁵² Ibid., 10.

¹⁵³ Frederick Alleni Mfinanga, Rofina Martin Mrosso, and Stephen Bishibura, "Comparing Case Tudy and Grounded Theory as Qualitative Research Approaches," *International Journal of Latest Research in Humanities and Social Sciences* 2, no. 5 (2019): 55.

¹⁵⁴ Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 33.

Finally, a case study methodology is an appropriate design to approach the problem. However, the researcher did not select this approach due to the emerging nature of the problem. Case studies require a deep and rich understanding of the particular problem studied.¹⁵⁵ While there are obvious potential cases within the study, the problem is too immature to provide sufficient depth to adequately employ a case study instrument. However, the study relied on case study methodology to frame and bound the content analysis sources to increase the rigor and validity of the study.¹⁵⁶

The problem statement frames the challenge posed by integration and coordination of concepts and space capabilities in the Quadrilateral to deter China. The literature review highlights a paradigm that frames this problem: U.S. joint doctrine on achieving unity of effort in a multinational coalition. The paradigm identifies unity of command, employment, rationalization, interoperability, information and intelligence sharing, and national caveats as significant factors in achieving unity of effort. Further, given the technical and sensitive nature of space capabilities, the capabilities themselves and their employment concepts and effects require integration into a research framework.

The proposed theoretical framework to answer the secondary research questions is a triad of operating concept, space capability, and coalition integration. This allows for assessing the various components identified within the literature review in a manner that separates the individual components for study while preserving the ability to assess links between components of triad. The U.S. joint doctrine documents providing the literature

¹⁵⁵ Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 32.

¹⁵⁶ Ibid.

framing for the triad are CJCSI 3010.02E, *Guidance for Developing and Implementing of Joint Concepts*; JP 3-14, *Space Operations*; and JP 3-16, *Multinational Operations* respectively.

Selecting U.S. joint doctrine as the theoretical underpinning of this study has strengths and weaknesses. First, the approach is relatively mature and accepted. The U.S. employed and refined this paradigm in major conflicts such as Operation Desert Storm, Operation Enduring Freedom, Operation Iraqi Freedom, and Operation Inherent Resolve. NATO also employs an evolution of this paradigm. It forms the base for most studies assessing multinational operations. Finally, it is the paradigm that USINDOPACOM employs to organize its multinational operations, making it a valid lens of analysis.

There are drawbacks to the approach. Reviewed literature studying coalition operations focuses on U.S. approaches due to the U.S. having led most major multinational operations during the evolution of the concept. This history reveals a potential confirmation bias in the identification of the factors, within both the literature and the content analysis. It relies on Western military thought and traditions; adopting this theoretical understanding in a content analysis risks missing key contextual meaning from partner nations who do not fully embrace those traditions.

Employing emergent design and lessons drawn from case study literature can mitigate some bias. The case study literature helped bound the source identification and selection; the emergent design provided the researcher the flexibility to identify new factors within each case that might reveal specific divergences from theory. In this study, the primary documents consisted of published concepts, doctrine, and capabilities from the member states of the Quadrilateral. The researcher chose additional sources, such as

published interviews, to the source collection to provide additional contextual analysis and increase the rigor and validity within the design. The factors identified from the literature review formed the basis of the coding to examine how they are identified, used, and understood in the source material.

In summary, the researcher constructed a research method derived from qualitative research tools to meet the requirements of the research questions. The primary tools are a qualitative content analysis with a framing of the research area informed by case-study design. The theory of the problem comes primarily from doctrinal literature on coalition operations and critical literature on emerging concepts and space operations. This theory helped both construct the cases and select documents for analysis as well as provide factors and factor coding for data collection and analysis. The method employed an iterative coding design to extract data from the documents, validate it against theory, and where required, update coding to extract additional or new data. From there, the research design assessed factor frequency and context and interpret the results. The method contains an emergent design branch to handle new factor identification during data extraction that was not discovered during the iterative coding process. This method is depicted in Figure 1 below.

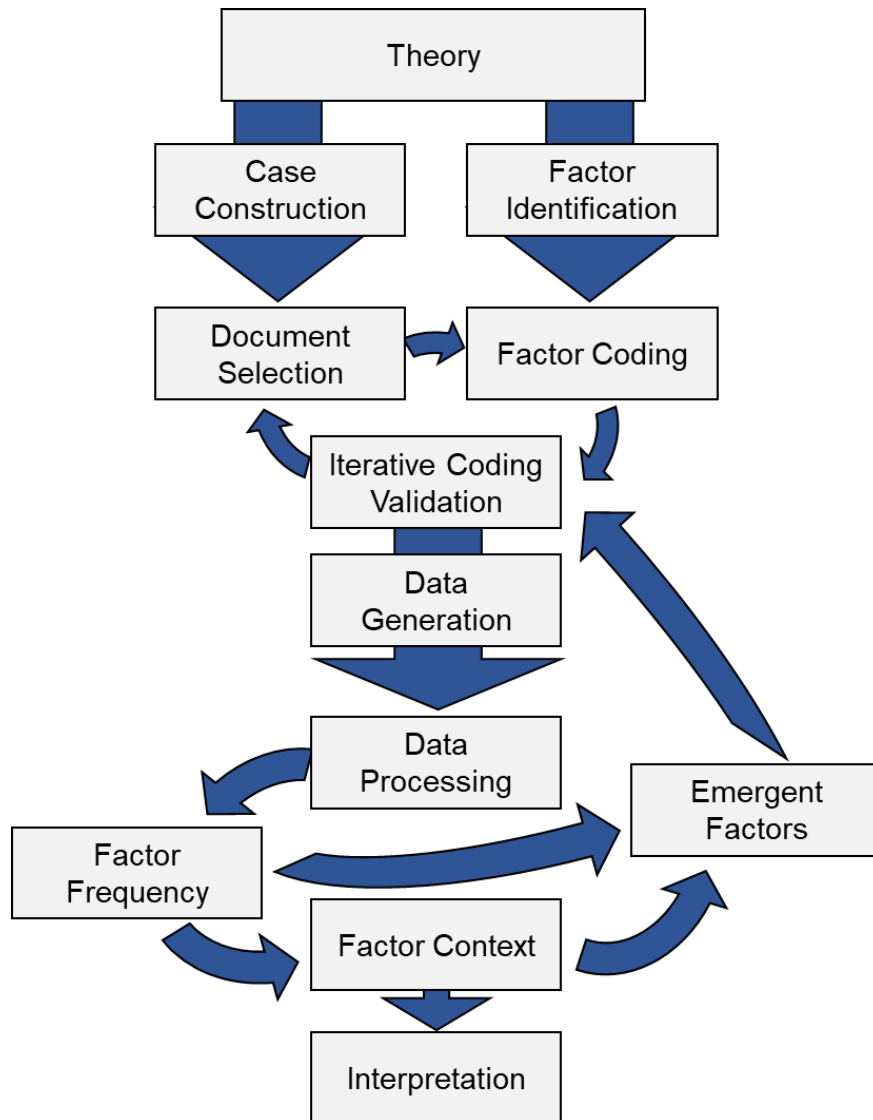


Figure 1. Method Design

Source: Created by author using data from Florian Kohlbacher, “The Use of Qualitative Content Analysis in Case Study Research,” *Qualitative Social Research* 7, no. 1 (January 2006): 4-26.

Data Collection

Qualitative content analysis focuses on extrapolating information from sources to identify themes and provide contextual meaning.¹⁵⁷ Content analysis can focus on multiple source typologies, from documents to interviews.¹⁵⁸ Documents provide significant advantages to an exploratory study with an extant theoretical frame.¹⁵⁹ They provide significant contextual information, from historical background to current framing.¹⁶⁰ Document analysis supports an emergent research design within a qualitative analysis, as they may reveal additional factors or questions not considered by the framing theory.¹⁶¹ Finally, looking at documents in a time-ordered manner may reveal evolutions or changes in the context that are important to answer the research questions.¹⁶²

Documents themselves have benefits and drawbacks as a primary source selection. They enable data source selection rather than broad data collection, they have high public availability, they are stable repositories of data, and have benefits of covering a broad range of time or issues related to the problem.¹⁶³ However, they may not have

¹⁵⁷ Kohlbacher, “The Use of Qualitative Content Analysis in Case Study Research,” 14.

¹⁵⁸ Creswell, *Research Design Qualitative, Quantitative, and Mixed Methods Approaches*, 33.

¹⁵⁹ Glenn Bowen, “Document Analysis as a Qualitative Research Method,” *Qualitative Research Journal* 9, no. 2, (August 2009): 29.

¹⁶⁰ *Ibid.*, 30.

¹⁶¹ *Ibid.*

¹⁶² *Ibid.*, 31.

¹⁶³ *Ibid.*

sufficient detail in every case to identify coded data or may suffer from biased selectivity.¹⁶⁴ The researcher addressed these shortfalls through seeking amplifying data sources within each secondary research question. Document source assessment balances completeness, breadth, balance of content, and purpose.¹⁶⁵ The researcher attempted to mitigate bias through the framing below.

The bounding of the problem into specific sub-sets aligned on the members of the Quadrilateral inform which content required analysis. This bounding aligned the data sources into four quasi-cases: the United States, India, Japan, and Australia. Each state publishes concepts, joint doctrine, or has publicly acknowledged space capabilities. Each state also has national and strategic leadership providing public statements and interviews concerning space capabilities, concepts, or the Quadrilateral. These documents formed the base body of evidence for the content analysis. This approach mitigated biased selectivity between cases as it collected similar documents from each case. It does not address bias selectivity present in all cases. A deliberate focus on government-published documents that align with the broad categories from theory limited the study's scope. The extent of selectivity bias is a function of theory indicating that concepts, doctrine, and capabilities are the primary documentary requirements to answer the research questions.

The secondary research questions assessed the varying components of the problem statement and primary research question. Theory indicated several factors to the problem. These factors form the basis of the codes required to extract information from

¹⁶⁴ Bowen, "Document Analysis as a Qualitative Research Method," 32.

¹⁶⁵ Ibid., 33.

the selected documents. To restate, the factors identified from theory are Concept of Employment, Space Capability, Rationalization, Unity of Command, Interoperability, Information and Intelligence Sharing, and National Caveats. Table 1: Factors and Initial Coding displays the alignment of codes to factors. These codes provided the initial marking of the documents for review and assessment of the data gathering methodology. Figure 2: Method Application demonstrates how codes eventually link to answering the primary research question. The factors may share codes with other factors; contextual understanding derived from the literature helped discriminate which data suited multiple factors or one primarily. Further coding refinement occurred post initial coding and data capture to address gaps or new coding requirements or factors in the documents, leading to data analysis.

Table 1. Factors and Initial Coding

Research Question	Factors	Factor Coding
Concept of Employment	Concept of Employment	Effect(s), Deny, Disrupt, Deceive, Degrade, Destroy, Targeting, Competition, Conflict, Dominate, Superiority
Space Capability	Space Capability	Space Control, Electronic Warfare, Anti-Satellite, Defensive Space, Offensive Space, Jamming, Interference
Coalition Integration	Rationalization	Allies, Partners, Coalition, Capability Gap, Integration
	Unity of Command	Integration, Coordination, Command, Control, Command and Control, Orders
	Interoperability	Command and Control, Network, Communications, Operations Center, Standard(s), Language, Doctrine
	Information / Intelligence Sharing	Agreements, Intelligence Sharing, Targeting, Operations Center, Fusion, Fusion Center, Working Group(s), Access
	National Caveats	Caveats, Restrictions, Legal, Authorities

Source: Created by author.

Data Analysis

Qualitative content analysis of documents is an interactive and iterative process.¹⁶⁶ Theory and reading of the documents supported coding for data and creation of categories for analysis and interpretation.¹⁶⁷ The process of coding and transposing document content into categorical data is imperative to assign meaning across multiple documents for comparison.¹⁶⁸ It also ameliorates concerns about the imprecision of language usage, author skill, or translation errors.¹⁶⁹ Once coded, the data allowed for interpretation and comparison across documents and cases to assess how factors from theory interact with the research questions.¹⁷⁰ The analysis process linked specific words and phrases into themes or factors for analysis.¹⁷¹ Figure 2: Method Application demonstrates how codes are aggregated into the factors for frequency analysis. This looping process is a feature of an emergent design in exploratory qualitative research. Once the data was sufficiently identified by theory or emerging from the data, the interpretation began.¹⁷²

¹⁶⁶ Bowen, “Document Analysis as a Qualitative Research Method,” 33.

¹⁶⁷ Ibid.

¹⁶⁸ Ibid.

¹⁶⁹ Ibid.

¹⁷⁰ Ibid., 34.

¹⁷¹ Leanne M. Wood, Bernadette Sebar, Nerina Vecchio, “Application of Rigor and Credibility in Qualitative Document Analysis: Lessons Learnt from a Case Study,” *The Qualitative Report* 25, no. 2 (February 2020): 465.

¹⁷² Ibid.,

Interpretation focused on frequency analysis to establish the relative significance each quasi-case places on each theoretical factor relating to the research questions. Where there were significant divergences, convergences, or outliers in the frequencies, the researcher returned to those codes and documents to perform a contextual analysis. Figure 2 shows how each case looked at various codes distinctly within a factor, requiring analysis to determine why the differences appeared. The contextual analysis helped create a coherent understanding of why those phenomena occur.¹⁷³ Finally, the study evaluated contextual understanding against the expectation of theory to determine where theory aligns or diverges from experience.¹⁷⁴

¹⁷³ Wood, “Application of Rigor and Credibility in Qualitative Document Analysis,” 466.

¹⁷⁴ Ibid.

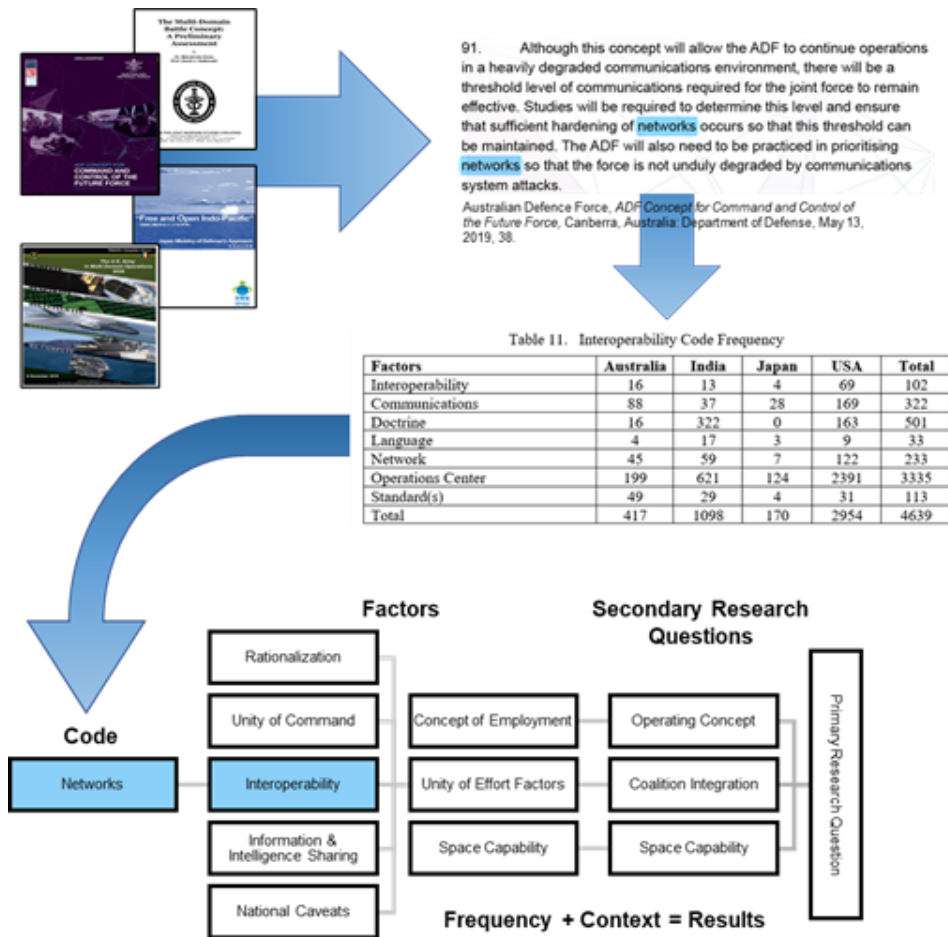


Figure 2. Method Application

Source: Created by author.

The researcher employed the following terminology during the data analysis: factor response rate, code response rate, internal response rate, and code share. Factor response rate indicates how frequently a factor appears by case or source type. Code response rate is how frequently a given code appears within a factor; it is also analyzed across case or source type. Internal response rate refers to how a state individually views factors or codes. Code share discusses how a code appears in context to other codes

within a factor. Discussions of response rate will assess their meaning based on relative comparison to other factors or codes. Theory does not provide an expected frame to analyze the response rate against an expected frequency outcome.

In this study, the coded data aligned with the factors identified from the theory. The differences or similarities in the frequencies prioritized the contextual analysis of the documents. Where appropriate, the contextual analysis determined if those factors are helping or hindering the problem. The contextual analysis sought to identify how those factors interact with the primary research question through the contextual answering of the secondary research questions. Figure 2 demonstrates how the collected data and subsequent analysis links to the secondary research questions. The data interpretation assessed the results against the theoretical understanding of the factors and their expected interactions with the secondary research questions. The researcher presented these results in a narrative assessment with supporting data tables. The theory interactions of factors with reframed secondary research questions are in Table 2 below.

Table 2. Theoretical Interaction of Factors with Research Questions

Secondary Research Question & Related Factors	Coalition Integration				
	Rationalization	Unity of Command	Interoperability	Information & Intelligence Sharing	National Caveats
Operating Concept	Reinforce	Hinder	Reinforce	Reinforce	Hinder
Space Capability	Reinforce	Hinder	Reinforce	Reinforce	Hinder

Source: Created by author.

Ethical Considerations

The researcher did not survey or interview individuals for data to analyze. Document utility per theory formed the basis of assessing documents suggested by experts. The study discarded or ignored documents failing that criterion to maintain internal validity. Aligning with the identified constraint, no classified information was valid source material for this study.

Summary

The researcher employed a qualitative content analysis approach informed by case study design. The researcher relied on theory to assess factors to answer the secondary research questions through text coding and extraction. Frequency variations formed the base run of the data analysis and cued additional analysis for a contextual understanding of the factors and their interactions with the secondary research questions. The researcher then compared results against the expectations from theory and analyzed the differences between theory and the results.

CHAPTER 4

ANALYSIS

Introduction

This chapter will cover the data analysis to answer the primary and secondary research questions. The primary research question addresses overall barriers to integrating space capabilities into the Quadrilateral: What challenges do the differing concepts and space capabilities of the Quadrilateral Security Dialogue pose to USINDOPACOM's ability to build an effective coalition? The secondary research questions are framed around a triad of operating concept, space capability, and coalition integration. The secondary questions are: How are members of the Quadrilateral implementing their operating concepts in the Indo-Pacific? What space capabilities are members of the Quadrilateral operating or developing for use in the Indo-Pacific? Finally, what challenges do space operations and capabilities pose to achieving unity of effort in a coalition framework?

The research method transformed the secondary research questions into factors to capture within the primary sources. Assessing how these factors appear as data and with contextual analysis will answer the secondary research questions, allowing the synthesis of the answers to inform answering the primary research question. This chapter will cover the results of the factor and code analysis from the primary sources. It will discuss the results of the emergent design from the initial factor and coding analysis. Next, the chapter will discuss the results of the frequency and contextual analysis of the primary sources. This section includes comparative country analysis results where appropriate. It

will then highlight differences between types of source documents and conclude with a summative country-level analysis of the code and factor results.

Emergent Design Results

The research approach for this qualitative content analysis relied on coding to identify and capture the presence of the theoretical factors answering the secondary research questions and consequently the primary research question. One of the key pillars of content analysis is the emergent design and understanding that comes through reading and interpreting the text. The researcher accomplished this through a reading of the source documents and the usage of NVivo as a research tool to search and aggregate codes. The identified factors and descriptive components of them generated the codes used in the research. U.S. doctrine and concepts documents that provided the theoretical framework to assess the primary sources and provide the factors' descriptive components. For example, JP 3-16, *Multinational Operations* describes Interoperability as possessing several components, such as language and doctrine.¹⁷⁵ The process did not reveal any significant missed factors while identifying several coding iterations required to better capture the factors. Please see Table 1 for initial coding.

First, cooperation was a significant missing code within Concept of Employment. This code meets theoretical expectations to cover the entire conflict continuum; its initial omission derived from U.S. conceptual employment's focus on conflict. It was the third most frequently mentioned code within the factor once accounted for. Its inclusion is necessary for a more accurate analysis. Within the Space Capability factor, the research

¹⁷⁵ CJCS, JP 3-16, I-11.

approach captured Directed Energy, Space Domain Awareness, and Space Situational Awareness as significant discussions within the source documents.

Within factors assessing coalition integration, the researcher added a code covering multinational to the Rationalization Factor. The researcher removed Access as a code from the Information & Intelligence Sharing factor due to comingling with the Anti-Access/Area-Denial language as the overwhelming cause of code appearance. Within the National Caveats factor, policy appeared frequently enough within the source documents to warrant addition as a code and due to its links to other codes such as restriction or authorities.

The researcher also employed NVivo to auto-code and collate factors within all source documents. Then the researcher compared research factors to significant autogenerated themes to assess potential gaps in understanding the specific research questions. The researcher ran the coding for the top hundred most frequently appearing factors. The process did not uncover any significant research question-related gaps; Space Capability was the most frequently mentioned autogenerated factor, which aligns with the existing factor framework. The most referenced non-inclusion was capabilities; the researcher excluded it due to its broad construction and numerous diverging references (e.g. cyber, air defense, etc). Appendix A: Auto-coded Factor Results identifies the top 24 themes, which are ones appearing more than 100 times within the documents. The appendix includes a brief analysis of selected auto-coded factors and the rationale for exclusion from design.

Factor Results

Overall

The overall factor frequency conforms to the triad of concept, capability, and coalition integration. The countries mentioned the concept factor 3,138 times (8.8%), space capability at 13,076 (36.6%), and factors capturing coalition integration at 19,514 times (54.6%). The dataset holds a strong bias towards results from the United States (59.4% of overall results). The American overrepresentation is likely the result of researcher bias in instrument creation as identified in Chapters 1 and 3. The researcher is using doctrinal framing and language derived from the United States, which partially explains higher response rates. Another explanation is that the source documents from the United States are typically longer and more detailed than comparable and available documents from the other states. The consistency of result frequency by each factor for the other states indicates the research design and document source selection are valid.

Table 3 displays the raw frequency count results, and Table 4 displays response rate results for the factor and code extraction from the source documents. Appendix B: Factor Frequency Data contains the raw factor response rate by code. Japan has the overall lowest rate of response to factors. India and Australia have comparable response rates. Concept of Employment has the lowest response rate out of factors directly aligned with answering a secondary research question. This is likely related to classification challenges; states may not discuss full concepts at an unclassified level. Australia specifically mentions classified concepts, such as their concept for MDO.¹⁷⁶ An

¹⁷⁶ Australian Government, Department of Defence, “ADF Concept for Multi-Domain Strike,” Force Exploration Hub, accessed March 24, 2022, <https://defence.gov.au/vcdf/forceexploration/adf-concept-Multi-Domain->

alternative explanation is that some member states do not have explicitly defined operating concepts.

Within factors identifying challenges to coalition integration, two trends emerged. First, National Caveats and Rationalization appear undermentioned compared to other factors. Second, Unity of Command and Intelligence and Information Sharing appear at near the same frequency (6,695 versus 6,229), indicating a shared level of attention to these factors within a coalition. Further tables contain rates of response as a percentage of either that factor's presence internally to each case or how factors compare across cases for total mention. This construct enables both an understanding of how each case assesses the importance of various factors and a comparative analysis between states.

Table 3. Overall Factor Frequency Results

Factors	Australia	India	Japan	United States	Total
Concept of Employment	440	430	263	2005	3138
Space Capability	2523	2261	945	7347	13076
Rationalization	258	166	31	897	1352
Unity of Command	1414	1143	246	3892	6695
Interoperability	417	1098	170	2954	4639
Information / Intelligence Sharing	741	1189	376	3923	6229
National Caveats	139	201	55	204	599
Total	5932	6488	2086	21222	35728

Source: Created by author.

Table 4. Overall Factor Response Rate Results

Factors	Australia	India	Japan	United States	Factor Rate
Concept of Employment	7.42%	6.63%	12.61%	9.45%	8.78%
Space Capability	42.53%	34.85%	45.30%	34.62%	36.60%
Rationalization	4.35%	2.56%	1.49%	4.23%	3.78%
Unity of Command	23.84%	17.62%	11.79%	18.34%	18.74%
Interoperability	7.03%	16.92%	8.15%	13.92%	12.98%
Information / Intelligence Sharing	12.49%	18.33%	18.02%	18.49%	17.43%
National Caveats	2.34%	3.10%	2.64%	0.96%	1.68%
Country Rate	16.60%	18.16%	5.84%	59.40%	

Source: Created by author.

The Concept of Employment Factor

The factor Concept of Employment addresses the first secondary research question: How are members of the Quadrilateral implementing their operating concepts in the Indo-Pacific? Theory from Table 2 states that understanding the impact of this factor on the secondary research questions requires a contextual analysis. Overall, Concept of Employment represents 8.78% of the factor response rate from the primary sources. The classified nature of actual concepts, as already identified in the case of Australia, may partially explain this result. Additionally, the United States has several classified concepts, including JADC2, the Joint Warfighting Concept, and the USINDOPACOM Warfighting Concept.¹⁷⁷ However, other rationales may exist, such as the researcher's and theory's language bias toward American Joint Doctrine.

Where a state's concept emphasizes the conflict continuum matters. Conflict sees India and Australia outpacing Japan significantly (16.73% and 13.19% versus 0.27% share of overall mentions). Appendix B, Table 14: Concept of Employment Rate Results displays the data. Competition sees the United States overrepresented (82.39% mentions), with only Australia also seeing a significant role in competition at 12.82%. However, the results significantly differ in cooperation. The United States plummets to 20.39% of the mentions while Australia (25%) and Japan (37.06%) see significant conceptual roles during cooperation. Further, the United States only mentions cooperation 5.74% of the time internally across Concept of Employment codes, compared to the 44.85% average of

¹⁷⁷ Theresa Hitchens, "INDOPACOM Drafts Regional Strategy for All-Domain Ops," *Breaking Defense*, March 15, 2021, <https://breakingdefense.com/2021/03/indopacom-drafts-regional-strategy-for-all-domain-ops/>.

the other states. Together, this implies a significant difference in concept, with other members of the Quadrilateral seeing a broad role during cooperation versus the United States focusing on competition.

There were no significant differences in mention rates for effects (e.g. deny) or other codes. Minor differences include the code of deceive, dominate, and targeting. The United States talks about deceit as an effect the most (88.46%); however, even the United States mentions it at approximately half the rate of the other effects. No country talks about dominate in a meaningful way, implying a converging vision of the military problem set around superiority or parity. This may represent member state beliefs regarding the feasibility of achieving dominance; conversely, it could reflect an unwillingness to discuss dominance at an unclassified level. Finally, Japan holds only a 1.57% mention of the code targeting, which aligns with the constraints upon the Japanese Self Defence Force.¹⁷⁸

The broad alignment on types of effects within the Concept of Employment factor suggests this factor will reinforce the integration of space capabilities and unity of effort within the Quadrilateral. However, the differing responses within Concept of Employment during phases of conflict provide evidence for the challenges the emerging concepts will pose to unity of effort. While the United States has an external-to-the-Quadrilateral focus on competition, other members focus internally on cooperation. The

¹⁷⁸ Nobuo Kishi, “Japan to Scrap 1% GDP Cap on Defense Spending: Minister Kishi,” *Nikkei Asia*, May 20, 2021, <https://asia.nikkei.com/Editor-s-Picks/Interview/Japan-to-scrap-1-GDP-cap-on-defense-spending-Minister-Kishi>.

interaction this factor has with the National Caveats factor will also illustrate potential concept constraints that may hinder unity of effort.

The Space Capability Factor

The factor Space Capability addresses secondary research question two: What space capabilities are members of the Quadrilateral operating or developing for use in the Indo-Pacific? Table 2 demonstrates a need for contextual analysis, as the codes for Space Capability have different implications for the secondary research questions. As shown in Table 4, codes tied to this factor appear 36.6% of the time in the source documents, indicating a strong presence and consideration among the Quadrilateral states. Japan mentions it the least as a share of overall Space Capability code appearance (7.23%). However, Japan internally mentions it the most out of all factors at a 45.3% rate of all the factors, which is the highest rate among Quadrilateral members. In all cases, it is the single largest mentioned factor by internal mentions across all members of the Quadrilateral.

The member states display broad agreement on conceptual space capabilities as demonstrated by their code response in Appendix B, Table 15: Space Capability Rate Results. Code responses for Space Situational Awareness and Space Domain Awareness combined to display the largest share of Space Capability discussed by any state, with each state mentioning it for 38.38% of the time of their total Space Capability code responses. Defensive Space saw a 1.59% deviation in mention among states, with the average mention at a 13.97% share of codes for Space Capability. Japan displayed the highest rate of mention at 16.19% and India the lowest at 11.37%.

Offensive Space code possessed only a 1.14% deviation between code response rates, indicating the states broadly see the same level for the role of offensive space control. This is remarkable given the total response rate of 1,962 responses, demonstrating little variance over the large sample size. India showed the most discussion of Electronic Warfare at a 20.74% rate internally, compared to the average 9.42% code response. Overall, the Quadrilateral members mentioned Offensive Space as 15% of the total Space Capability codes, slightly higher than defensive space. Codes dealing with more specific capabilities, such as anti-satellite, directed energy, interference, or jamming saw almost no mention throughout the source documents. This is likely the result of focusing on effects and concepts, rather than specific capabilities, due to challenges of classification. The exception seems where states have publicly demonstrated the capability, such as India with its direct ascent anti-satellite missile capability (response rate of 37.5% of all mentions of anti-satellite). A fuller understanding of the interaction between the secondary research questions and these codes within the factor requires a conjoined regression analysis with the concept codes. Limited exploration of this interaction will occur in the Country Results section.

The results demonstrate states do not openly discuss specific capabilities, preferring to mention the broader categories in an open or public environment. The overall code response rate to the Space Capability factor indicates that the states equally weigh defensive and offensive space capabilities while primarily discussing space domain awareness. The data analysis indicates that the planned or mentioned space capabilities within the Quadrilateral align, suggesting that the factor will assist the loose coalition to gain cohesion and build unity of effort.

The Rationalization Factor

Rationalization is the first of five factors capturing aspects of the final secondary research question: What challenges do space operations and capabilities pose to achieving unity of effort in a coalition framework? Table 2 theory suggests that high attention to Rationalization should reinforce unity of effort. Of the 54.62% response rate for factors linked to this research question, Rationalization is the second-lowest at 3.78% of total responses (Table 4). This immediately suggests that member states are not publicly discussing coalition integration of space capabilities, either due to classification of concept, classification of planning, political rationales, lack of know-how, or lack of current interest. Rationalization itself as a code with a specific meaning showed remarkably little response, only having 7, or 0.52%, of total responses for codes related to the Rationalization Factor (see Appendix B, Table 9: Rationalization Code Frequency).

The bulk of the responses to the Rationalization Factor come from mentions of working with other members of the Quadrilateral or other states. Partners (34.62%), Allies (15.9%), and Multinational (12.65%) account for the majority of the code responses to the Rationalization Factor (Table 4). Coalition sees a rate of mention at only 6.36%. The code Allies appears in Japanese and American sources at almost twice the rate of Australia and India (Appendix B, Table 16: Rationalization Rate Results). The multinational code results display this result prominently. Australia and India both show a 3% share of total code response internally as compared to a 12.9% (Japan) and a 17.06% (United States) response rate. Partners, the most frequent code response within the factor, sees this trend equalize across states except India, which only mentions it at 13.25% internally. While an argument exists that these words are relatively

interchangeable, they imply a preference towards a less restrictive or formal envisioning of the Quadrilateral (partners and multinational preferred language over allies and coalition), which is consistent with its history but at odds with identified trends towards expanding the Quadrilateral's membership.

Integration as a code holds the majority of the remaining response rate at 27.59%. Two cases appear here: India and Japan. India mentions integration 69.88% of the time internally, which is an outlier. Contextual analysis of reading the source documents shows this rate as somewhat misleading. While India does discuss integration, its primary mentions are what the United States would view as solving problems of jointness, not multinational rationalization. The exception to this internal focus is in public statements, a discussion occurring later in this chapter in Results by Source Document Type. Japan only discusses integration at a 6.45% rate internally among the Rationalization Factor. This response rate is partially due to its low overall response rate to the Rationalization Factor (1.49%) and partially due to a higher response rate to other factors discussing this secondary research question.

Significantly, while member states mention integration, states do not discuss which integration activities occur. No state discusses capability gaps within the states or the Quadrilateral; capability gap only sees a mention of 2.35% of total code response (Appendix B, Table 9: Rationalization Code Frequency). Combined with the low rate of Rationalization as a code response, the states appear to hold preferences to work together in an informal framework rather than deliberately integrating capabilities. The discussed integration does not design rationalized capabilities nor cover capability gaps within the Quadrilateral, implying a focus on other factors related to Unity of Effort in the

Quadrilateral. Further, the absence of attention to this factor may hinder operating concept implementation within the Quadrilateral, as states generate duplicate or non-complimentary capabilities or approaches within their concepts.

The Unity of Command Factor

Given the low code response rate for formalizing the Quadrilateral within the Rationalization Factor, Unity of Command responses may also pose challenges to unity of effort. Table 2 highlights a different response per secondary research question. Unity of Command should hinder the implementation of concepts within a coalition context as the concepts consolidate. However, higher attention to Unity of Command should reinforce the Space Capability and Unity of Effort components of the research question. Unlike Rationalization, it represents 18.75% of the total factor response (Table 4). Unity of Command as a code itself appears an average of 20.58% of the time with an average deviation of 2.1% (Appendix B, Table 17: Unity of Command Rate Results). Contextual analysis, in conjunction with the Rationalization results, reveals that Unity of Command primarily refers to internal command within the member forces. While the response rate is significantly higher as a factor than Rationalization, it indicates a concern with national unity of command, not Quadrilateral or coalition unity of command.

The code Command and Control appears at a share of 36.27% of the factor response (Appendix B, Table 10: Unity of Command Code Frequency). More significantly, when separating command from control, the member states respond in two groups. As seen in Table 17, Australia and India discuss control (22.14%, 18.9%) more frequently than command (17.4%, 17.94%). Japan and the United States discuss command (18.29%, 23.28%) more than control (16.37%, 11.72%). Integration and

orders, the remaining codes of the Unity of Command factor, only comprise 2.17% of the code response within this factor (Table 10). Member states do not frequently discuss coalition integration or orders concerning Unity of Command. This implies a lack of regard for the problem of issuing orders to or integrating within the Quadrilateral.

These results suggest there are potential differing sensitivities to capability employment and challenges to integration within the Quadrilateral based on acceptance of risk or other factors. Combined with the contextual understanding that the high rate of response for Unity of Command focuses on national forces, this factor does not appear significant for members of the Quadrilateral when connected to coalition operations. Given this relative absence from a coalition discussion, this factor also does not pose any challenges to national operating concept implementation or generation of space capabilities.

The Interoperability Factor

The third factor addressing the secondary research question concerning Unity of Effort in the Quadrilateral has a factor response rate of 12.98% overall (Table 4). Interoperability should, per theory, reinforce unity of effort. Interoperability as a code only appears 2.2% of the time within the factor. (Appendix B, Table 11: Interoperability Code Frequency). The code Operations Center stands out as the overwhelming code response at a 71.89% response rate within the factor. Further, while this is partially due to the overwhelming response frequency to this code by the United States, no other member falls below a 47.72% (Australia) response rate to this code within the factor (Appendix B, Table 18: Interoperability Rate Results). This result may stem from the history of

multinational operations centers in the Indo-Pacific region for coordinating other, non-military activities.¹⁷⁹

Doctrine as a method to ensure interoperability has the next highest code response rate within the factor at 10.8% (Table 11). Again, India stands out as an outlier with a response rate of 29.33% (Table 18). Similar to the discussion on integration, the Indian case of response for doctrine concentrates on increasing jointness within its armed forces. In particular, interoperability within their doctrine focuses on their Army and Air Force.¹⁸⁰ Contrastingly, the United States modernizes its doctrine and focuses on improving jointness through multi-domain operations.¹⁸¹ However, the United States is explicitly testing its emerging doctrine with members of the Quadrilateral, focusing on interoperability with their armed forces within the context of the emerging American doctrine and forces as seen in Chapter 2.

Networks, standards, and communications combine to hold a 14.4% response rate within the interoperability factor. Given the focus on Operations Centers, this response rate seems low due to the requirements to communicate with and within an operations

¹⁷⁹ “The United States’ Enhanced & Enduring Commitment to the Pacific Islands Region,” (prepared remarks, East-West Virtual Webinar, November 19, 2020), <https://www.pacom.mil/Media/Speeches-Testimony/Article/2421973/the-united-states-enhanced-enduring-commitment-to-the-pacific-islands-region/>.

¹⁸⁰ Integrated Defence Staff, Ministry of Defence, *Joint Doctrine for Air-Land Operations* (New Delhi, India: Delhi Area Printing Press, March 25th, 2010), 39, https://www.ids.nic.in/IDSAdmin/upload_images/doctrine/Jt%20Doc%20Air%20Land%20Operations-Mar%202010.pdf.

¹⁸¹ Phil Davidson, “Transforming the Joint Force: A Warfighting Concept for Great Power Competition,” (prepared remarks at West 2020, San Diego, CA, March 3, 2020), <https://www.pacom.mil/Media/Speeches-Testimony/Article/2101115/transforming-the-joint-force-a-warfighting-concept-for-great-power-competition/>.

center. Given that standards only see mention at 2.44% of the overall factor response and the low rate for Interoperability as a code, Quadrilateral members may view these codes as technical problems that do not merit significant discussion in concepts or doctrinal documents. Australia is the sole exception, matching the lower response rate for operations centers with a higher response rate than any other country for communications (21.1%), network (10.79%), and standard(s) (11.75%). In particular, the code for language is nearly absent (0.71% of overall factor response); this may result from a shared language between three of the members of the Quadrilateral. This assumption has some merit; however, even Japan discusses language at only 1.76% of its total code response within this factor.

Overall, the focus on operations centers codes within the Interoperability factor indicates that the primary sources do not address the entire factor of Interoperability. This poses significant challenges to developing unity of effort within the Quadrilateral, as a lack of interoperability will inherently hinder coalition operations and recommend less well-integrated coalition command structures. However, the lack of attention may ease operating concept implementation within the Quadrilateral, as members do not have to align their concepts with or explicitly address within their concepts how to technically integrate into the Quadrilateral.

The Information and Intelligence Sharing Factor

Theory from Table 2 suggests this factor is one of the most reinforcing factors within the final secondary research question. The overall factor response rate within the source documents aligns with the theoretical expectation, as it comprises 17.43% of the overall factor response and is the largest factor response aligned with Unity of Effort

within the Quadrilateral (Table 4). Operations Center(s) again appears as the largest code within the factor at a 53.54% frequency share (Appendix B, Table 12: Information and Intelligence Sharing Code Frequency). This continues the historic trend identified in interoperability within the Indo-Pacific region and members of the Quadrilateral.

This factor combined information and intelligence sharing as one variable within the research design; however, they are distinct functions. Their code results bear this interpretation out, with information sharing (24.87%) appearing at twice the rate within the factor as intelligence sharing (12.14%). This result indicates that states are more willing to discuss the less technical or revealing level of information than intelligence, potentially hindering unity of effort in the Quadrilateral.

The differing member results are enlightening. India sees no significant difference in the rate of mention between the two; Australia sees a 29.8% decrease in the rate of mention from information to intelligence sharing (Appendix B, Table 19: Information and Intelligence Sharing Rate Results). Japan shows a 52.5% decrease; the United States shows an extreme 66.06% rate decrease of mention between the two codes. Given the United States' advocacy for the Quadrilateral and push for multinational exercises and integration, the extreme decrease in any discussion of intelligence sharing indicates a significant barrier to the continued maturation of the Quadrilateral as a potential coalition.

To continue this trend, the code for Fusion Center only appeared at 1.67% of the total factor code share (Table 12). States less willing to share intelligence within the coalition do not appear to discuss fusion centers with multinational partners. India again appears as the outlier here, with a result of almost two average deviations higher than

other states in discussing fusion centers (Table 19). The code for targeting reveals the same trend, with India just under two average deviations above the average of the member states. Together, this allows for interpretation of the data that India envisions a significant role for fusion centers and sharing intelligence to enable targeting. However, this interpretation continues the trend of representing an increased focus on jointness internally between the Indian Army and the Indian Air Force. Other members either see low rates of response for fusion centers and targeting; in particular, Japan only holds a 0.53% share of the targeting code, aligning with their defensive outlook and policies (Table 19). This analysis indicates a role for fusion centers in sharing information to build shared situational understanding if not intelligence sharing.

The remaining codes within this factor are agreements (0.88% of factor share) and working group (4.86% of factor share). Only Australia at 3.51% of its internal code mentions shows any rate of discussion over the role of agreements; however, the agreements response rate is due to the inclusion of foreign policy discussions and economic and diplomatic agreements in one of the source documents (2017 Foreign Policy White Paper). Working groups are consistently higher among other members of the Quadrilateral than the United States, which is almost two deviations below the average (1.84% to an average of 9.35% code mention). Contextual analysis indicates this is due to other states referencing working groups as methods to solve particular problems with other states and where they seek cooperation; within the United States case, the phrase almost entirely appears within the construct of Boards, Bureaus, Cells, Centers, and Working Groups as a staff organization function. Taken with the United States' emphasis on the Rationalization Factor, this implies that other states continue to seek

informal methods, including working groups, to coordinate the quadrilateral while the United States does not significantly mention this approach.

The code results within this factor indicate that the current source documents, as a sample of state approaches, prefer to maintain an informal and looser approach within the Quadrilateral. In particular, the results indicating variations in information and intelligence sharing openness challenge the theory from Table 2 that attention within this factor would reinforce Unity of Effort. The trend in the Indo-Pacific to share information does not necessarily translate to sharing intelligence, which would hinder the military maturation of the Quadrilateral. Sharing information may assist in developing and coordinating space capabilities, particularly where there is broad alignment in code frequency (e.g., space domain awareness).

The National Caveats Factor

National Caveats are the final factor aligned with the research question addressing Unity of Effort within the Quadrilateral. Theory from Table 2 indicates that more attention to this factor would hinder Unity of Effort. Overall, the factor has the lowest response share of all factors at 1.68% (Table 4). As a code itself, it only appears seven total times for a 1.17% code frequency share within the factor. The emergent design identified that policy was a potential missing code explaining part of the low rate of response of caveats as a code. While theory and doctrine use the term caveat, in practice, the primary sources chosen for this analysis do not employ it as a term.

The sources did employ Policy, representing a 64.44% share of overall code mentions within the factor (Appendix B, Table 13: National Caveats Code Frequency). The United States was the outlier with a low mention of policy at 29.41%; the average

response was 69.91% (Appendix B, Table 20: National Caveats Rate Results). In the cases of the other members of the Quadrilateral, they employ policy in discussing both what a state will and will not do; the latter is a useful proxy for National Caveats. Japan's policy of self-defense only serves as an example of this employment and interpretation of the code from the source documents. Restrictions as a code, with an average code share of 3.13% and a total code share of 3.84%, was surprisingly not a good code to employ to understand the potential role of caveats. The theory would hold that national caveats place overt and clear restrictions on the employment of capabilities and forces in a coalition; the lack of direct mention of restrictions is notable in this context.

Authorities captured the majority of the remaining code share at 22.7% of the code mentions with the National Caveats factor (Table 13). The United States is again an outlier here, but in the opposite from the case of policy as a code. The United States mentions authorities 52.45% of its internal factor share (Table 20). The other states average an 8.7% internal factor share for the code. Contextual analysis reveals the United States discusses authorities for what it can and cannot do as a proxy method for discussing caveats. Other states mention authorities when tied to specific conceptual employment of capabilities. This is a typical representation of how the primary sources employ the code authorities when connected to capabilities. The significant difference appears that the general usage discusses the ability and direction to use a specific capability while the United States also uses it to discuss what kinds of effects are acceptable, and when, akin to caveats within a multinational force.

Legal as a code only holds 7.85% of the factor share; notably, Japan does not mention legal once throughout its documents (Table 13). This may result from Japan's

constitutional constraints already imposing a legal framework that does not merit additional discussion in the source documents. The low frequency of code responses for the caveat factor indicates that the members of the Quadrilateral do not currently discuss it as a pressing issue. This may result from the preference for informal coordination within the Quadrilateral, where caveats are not as important due to the lack of formal hierarchies or coalitions with command-and-control requirements. While theory holds in Table 2 that National Caveats as a factor would hinder Unity of Effort, the current evidence from source documents indicates that the Quadrilateral is not mature enough for this factor to have significant influence. The absence of this factor from serious rates of discussion may enable national concept development and implementation without overt attention to integration within coalition operations. To the extent that the results hold as the Quadrilateral continues to develop, failure to address these codes may enable the implementation of concepts increasingly difficult to align within the Quadrilateral and achieve unity of effort.

Results by Primary Source Type

The researcher analyzed the results by primary source type to detect if there were any differences between a state's factor or code frequency results between the source types. The sources fell into two categories: written documents and statements. Written documents include doctrine, policies, and concepts. Statements include interviews and public statements such as press releases. Table 5 demonstrates the overall frequency splits between the two sources; statements fell far below in frequency mention than documents at an overall 6.8% share of the factor responses. This may result from the shorter nature of statements versus documents, as statements typically focus on specific

problems rather than the conceptual challenges this research attempts to address, and the public nature of the statements employing different language than documents due to differing audiences.

Table 5. Overall Factor Frequency by Primary Sources

Factors	Documents	Statements	Total
Concept of Employment	3000	138	3138
Space Capability	11493	1583	13076
Rationalization	1244	108	1352
Unity of Command	6507	188	6695
Interoperability	4509	130	4639
Information / Intelligence Sharing	6016	213	6229
National Caveats	531	68	599
Total	33300	2428	35728

Source: Created by author.

The largest areas where statements made inroads into the share from documents were Space Capability at 12.11% factor frequency and National Caveats at 11.35% factor frequency (Appendix B, Table 21: Factor Share in Primary Sources). Space Capability's high rate of mention as a factor aligns with it being the single most mentioned factor overall; however, the high rate of discussion in statements indicates that the Quadrilateral states also consider it strongly enough to discuss the topic with broader audiences than doctrinal documents. National Caveats having a higher rate of mention in statements presents a more curious case.

Space capability codes mentioned by states in statements were the same codes mentioned at higher rates in documents. Space Situational Awareness and Space Domain Awareness remained the highest overall rate of mention in statements at 14.94% and

12.41% frequency (Appendix B, Table 23: Space Capability Factor Share in Primary Sources). The sources mention Offensive and Defensive Space at similarly higher rates; however, unlike the code analysis within the factor displaying offensive space at a higher rate than defensive, the reverse is true in source document frequency. The sources mention Defensive Space as a code at a 15.28% frequency rate versus Offensive Space at 14.37% (Table 23). This appears to result from a slight drop in offensive code frequency in statements versus documents rather than a rise in defensive code frequency.

The National Caveats factor remains a case in which the public statements selected do not use the language from the literature. The statements do not mention Caveats as a code at all (Table 28: National Caveats Factor Share in Primary Sources). India provides the outlying case wherein statements capture discussions of policy (13.47%), legal (12.77%), and restrictions (21.74%) through code frequency (Table 28). Contextual analysis of the statements highlights an open and earnest discussion of offensive space capabilities and rationales to defend their employment.¹⁸²

Summary

This research and data analysis addresses facets of how different concepts and space capabilities pose challenges to Unity of Effort in a Quadrilateral coalition in the Indo-Pacific. Synthesis of the responses to the secondary research questions, represented by factors and their associated codes, answers the primary research question. Concept of

¹⁸² Reddy Satheesh, “Interview: Dr. G. Satheesh Reddy, Chairman, Defense Research and Development Organization (DRDO),” interview by Anil Bhat, *The Diplomatist*, March 7, 2020, <https://diplomatist.com/2020/03/07/the-response-for-make-in-india-has-been-phenomenal/>.

Employment as a secondary research question had the lowest overall response rate (8.8%) and analysis indicates differing understandings of how emergent warfighting concepts fit within the conflict continuum. Space Capability answers its associated secondary research question with broad agreement on the need for Space Domain Awareness and varying degrees of emphasis on other capabilities, which align with differing concepts. Factors addressing Unity of Effort demonstrate a mixed impact on the final research question, with underexplored factors (e.g., Rationalization), ones that indicate potential areas of alignment (Information and Intelligence Sharing), and those indicating divergence within the Quadrilateral (Unity of Command). In total, the results reinforce the perception of the Quadrilateral as an immature structure without strong unity of effort, and it may see difficulties employing space capabilities to deter or defeat China.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The researcher approached assessing the Quadrilateral through a triad of operating concept, space capability, and coalition integration. The data pulled from the primary sources supports several conclusions and several recommendations. The overarching conclusion that Quadrilateral is too immature to integrate differing operating concepts and space capabilities into a coalition drives the recommendations. While space capabilities themselves do not pose significant conceptual challenges to coalition integration, their employment and technical requirements do hinder unity of effort in the Quadrilateral framework. This chapter concludes with an assessment for future research both within this topic area and through differing methodological approaches.

Conclusions

The results from the content analysis support several conclusions. Contextual analysis reveals factor interaction as a significant feature not directly measurable with this research approach. Content analysis with the contextual reading reveals that the emerging warfighting concepts of Quadrilateral members do not mirror each other; however, they can align. The member states' space capabilities discussion focuses on effects and missions rather than specific capabilities. The member states do not address a coalition approach to their capabilities in their concepts and documents.

Factor Interaction

Factor interaction is a recurring theme in the data analysis. Factor interaction represents the observed contextual links between factors that change one or both factors' effects on the research questions. The research design arranged the overall approach into analyzing a triad of concept, capability, and coalition integration. While this implies interactivity, the research approach treated each triad component as a separate secondary research question for an independent analysis. While this is partially a consequence of the research design, the lack of a direct measurable proxy for the factors also complicates assessing their interaction. Contextual analysis reveals links throughout. In particular, the analysis revealed that factors addressing Unity of Effort in a coalition interacted differently from each other when discussing Concept of Employment.

Interoperability and Intelligence and Information Sharing both link to and impact Concept of Employment. In particular, the differing outcomes for the codes of intelligence sharing versus information sharing imply differing interoperability requirements and consequential impacts on Unity of Effort. Rationalization and National Caveats are both under-addressed factors given their potential importance in enabling or constraining a coalition. Contextual analysis, particularly of source document statements, indicates an overall limitation to coalition integration of capabilities. National Caveats deliberately hinder Rationalization, impacting the integration of concepts within a coalition.

The Space Capability factor focused on types of capabilities rather than specific capabilities. Contextual analysis revealed that even this level of abstraction saw differing impacts on Unity of Effort. When discussing defensive space control or space domain

awareness, member states discussed Information Sharing and Interoperability more than when discussing offensive capabilities. This difference is stark when assessing effects and capabilities; while all states discuss disruption or denial with offensive capabilities, only the United States significantly discussed deceit and offensive capabilities. Each capability type changes Concept of Employment or impacts Unity of Effort in differing ways that current contextual analysis did not fully explore.

Quadrilateral Member Assessment

The concepts for the member states reflect their unique circumstances. Australia balances its conceptual approach across cooperation to conflict; Japan focuses on cooperation. India discusses conflict within its concepts. The United States views China with a mindset focused on strategic competition and conflict. The new concepts discussed by the United States focus on prevailing against peer competitors through integrating all domains of conflict in a larger warfighting construct. It envisions space capabilities both enabling friendly forces and providing effects against adversaries. The United States explicitly focuses on using space capabilities to conduct cross-domain attack to penetrate anti-access-/area-denial concepts to enable joint-force maneuver. Figure 3: Selected Results Answering Primary Research Question depicts how member states and space capabilities align within a coalition construct.

Secondary Research Question & Selected Results	Coalition Integration				
	Rationalization	Unity of Command	Interoperability	Information & Intelligence Sharing	National Caveats
Operating Concept	Low Impact	Low Impact	Reinforced	Mixed	Low Impact
Australia	↔	↔	↑	↔	↔
India	↓	↓	↓	↑	↔
Japan	↔	↔	↑	↔	↓
U.S.	↑	↔	↑	↔	↔
Space Capability	Reinforced	Low Impact	Reinforced	Reinforced	Hindered
SSA & SDA	↑	↔	↑	↑	↔
Offensive Space	↑	↓	↔	↓	↓
Defensive Space	↑	↔	↑	↑	↔

Figure 3. Selected Results Answering Primary Research Question

Source: Created by author.

As seen in Figure 3, while the United States addresses challenges posed by multinational operations through attention to Interoperability and Rationalization, it primarily wrestles with all-domain command and control challenges in source documents and statements. The United States has the most mature concept both in development and implementation. This research assumed a primary and leading role for the United States through USINDOPACOM in leading a coalition within the Quadrilateral. Data results reveal that this assumption is both valid and weak. The United States remains internally focused on concepts rather than coalition-focused. However, statements and exercises indicate that it is beginning experimentation and concept learning within a multinational context. U.S. attention to Rationalization and Interoperability through exercises is an area reinforcing coalition integration. USINDOPACOM is simultaneously employing and

fielding new service concepts and equipment within its joint concept while beginning the work of integrating them into a coalition construct.

India represents the greatest difference in the Quadrilateral, with its concepts focused on what the United States would consider a traditional joint-warfighting approach. It envisions a land-dominant warfighting construct fitting its geostrategic situation; India views space capabilities as strategic weapons, not integrated parts of a warfighting concept. In particular, India demonstrates openness to discuss anti-satellite weapons with destructive effects and targeting for space capabilities. This runs directly against the other Quadrilateral members – either in what they are openly discussing or are legally and conceptually willing to undertake. This strategic and destructive focus lowers the ability of USINDOPACOM to integrate India’s capabilities (Figure 3). While India’s new doctrine represents a significant step forward in integrating their land and air services, the doctrine focuses on conflict alone. Their concepts do not significantly discuss the role of the military or space capabilities in competition. Further, India’s emphasis on intelligence sharing and targeting is internal to joint doctrine, rather than demonstrating a multinational focus. As displayed in Figure 3, the relative absence of discussion of codes related to Interoperability, Rationalization, or Unity of Command reinforces the internal focus of the Indian concepts. The data results suggest that the Indian military is too immature to integrate into a centralized coalition employing space capabilities.

Japan presents the opposing case within the Quadrilateral. Its concepts are defensive and represent a deliberate integration of domains and effects. It emphasizes cooperation with partners to deter conflict and discusses space capabilities as linking its

robust defensive concept. Japan identifies space domain awareness and protecting satellite communications links against jamming as the primary role of space capabilities within their concept. As shown in Figure 3, coalition context, Japan continues to display a more deliberate approach to coalition integration, focusing on non-technical Interoperability and Rationalization with partner nations. Japan does not discuss technical coalition integration with any specific focus. It gives near equal discussion for codes such as Network, Standard(s), Interoperability, and Communications. The contextual analysis highlights Japanese focus on a more conceptual discussion of its role, rather than discussing technical implementation barriers or steps. Japan appears ready to integrate into a centralized coalition with its space capabilities; however, its defensive concept, legal restrictions, and supporting capabilities limit its potential contributions in competition with China.

The emerging Australian understanding of employing space capabilities and concepts most closely mirrors the United States. Australia emphasizes cooperation with partner states more than the United States; however, it has a comparable focus on competition and conflict as the United States. Australia views its space capabilities similar to the United States – integrated into an all-domain approach to warfighting. In theory, this would indicate Australia’s Rationalization impact on coalition integration reflects a higher trend than it does in Figure 3. However, Australian primary sources do not support the conclusion, just the potential. Australia’s doctrinal and conceptual alignment does reinforce coalition integration through Interoperability (Figure 3). However, this conceptualization is new. While its current initial development looks similar to developing United States concepts, its maturation along the same path is not a

foregone conclusion. Australia is unique in that it also directly addresses coalition warfighting, explicitly discussing facets within their concepts that integrate Australian Defence Forces into a multinational coalition.

The United States' drive to incorporate new concepts and capabilities does not explicitly address integration into a coalition. Contextualization of this concept within USINDOPACOM sees experimental bilateral demonstrations in exercises; however, these exercises use parallel command structures and not integrated coalitions. The member states have not conducted a Quadrilateral-only exercise to demonstrate capability or provide learning experiences to member states. The concepts do not mirror; India remains a land domain-focused military. Japan's concept is defensive and aligns with constitutional restraints on the use of force. Australia currently closely aligns with the United States, but there is no suggestion within the primary sources of a trend in this alignment. Figure 3 shows an overall low impact of the various operating concepts on coalition integration. This suggests the Quadrilateral remains ill-positioned to develop a strong, centralized coalition to address China throughout the conflict continuum.

Recommendations

Absent a galvanizing event in the Indo-Pacific analogous to what Europe experienced with the Russian invasion of Ukraine in 2022 the Quadrilateral is unlikely to mature rapidly into a coalition. Given the political constraints and the differing concepts from the member states, the United States should focus on areas of alignment identified within this research. Rationalization of the different concepts to fit them together into a coalition warfighting approach is a viable course of action. Establishing dialogues and programs to reinforce and build on areas of alignment will slowly increase coalition

capacity and capability to deter or defeat China. The following recommendations provide a foundation for USINDOPACOM planners to generate momentum toward integrating Quadrilateral space capabilities:

1. Leverage the United States Indo-Pacific Warfighting Concept to hold open discussions with members of the Quadrilateral about how they can integrate their space capabilities into a coalition warfighting concept.

Sharing USINDOPACOM's draft warfighting concept at either a classified or unclassified level with Quadrilateral members can serve as a basis to communicate how the United States views the employment of space capabilities in the region matched against specific adversaries. In particular, focus the discussion on how space capabilities contribute to deterring or defeating China. Through sharing how the United States plans to employ space capabilities, the partner states gain a broader understanding of how they can contribute within their concepts and constraints. In particular, this research would recommend leveraging Japanese defensive space control for coalition satellite communications, deconfliction with Australian capabilities to expand coalition capacity and minimize duplicative targeting, and demonstrations with India to accelerate their concept maturation. This recommendation aligns with the member states' strongly expressed preferences for information sharing. It will also contribute to the common understanding required for Unity of Effort within a coalition.

2. Clarify the role of the Quadrilateral's space capabilities throughout the conflict continuum.

The United States focuses on competition and conflict with China. India eschews competition to focus on conflict and cooperation. Japan prioritizes cooperation activities.

Australia focuses on cooperation but addresses the entire continuum. Though these seem disjointed or misaligned, context from this research indicates that a lack of clarity causes this perception. The United States should clarify with fellow members how and when they envision employing their particular space capabilities and supporting requirements. While offensive capabilities align with conflict, articulating the role of certain effects (e.g., disrupt, deny, deceive) during competition may prove useful in maturing coalition concepts. Building coalition capacity through attention to factors or activities building Unity of Effort describe how the Quadrilateral can organize activities during cooperation and competition.

3. Invest in Indo-PACNET's Mission Partner Environment (MPE).

Members universally identify information sharing as a significant factor. Building network connectivity to share information and intelligence, creating and sharing standards, and ensuring interoperability all lay the necessary groundwork for improving Unity of Effort in a coalition. To the second recommendation, these activities do not need to wait until conflict begins. In particular, USINDOPACOM should add to its Mission Partner Environment (MPE) on Indo-PACNET the ability to share space-specific information and intelligence, coordinate targeting and capabilities, as well as command and control space operations. As a component of JADC2, the system provides this capability to United States forces; however, as this research indicates, not all Quadrilateral members follow the same construct for domain-agnostic C2. Specifically adding space operations Command, Control, Communications, Computers (C4) Intelligence, Surveillance, and Reconnaissance (C4ISR) capacity to the MPE addresses this difference between members, allowing for state-specific integration. While this

expansion adds complexity to the system, it is a product of operating in a complex coalition environment.

4. Leverage high member-state interest in Space Domain Awareness to build initial coalition capacity for space capabilities.

All Quadrilateral members specify an interest in Space Domain or Space Situational Awareness. Figure 3 demonstrates that this interest strongly reinforces coalition integration. It is the cornerstone of space operations and necessary for both offensive and defensive space control. United States Space Command (USSPACECOM) provides this mission for the United States through the Combined Force Space Component Command's (CFSCC) subordinate units.¹⁸³ The CFSCC already includes an Australian representative; including members from Japan and India is a positive step towards building on member interest in this area. Further, USINDOPACOM and USSPACECOM should look into leveraging member space surveillance capabilities to add to the global sensor network run by the CFSCC. In return, the United States should provide access to classified space surveillance data to improve the information and intelligence sharing necessary to support both Concept Employment and Unity of Effort for the coalition. Once established, this provides a natural avenue for cooperation growth into other, related missions such as building Space Domain Awareness within the electromagnetic environment to support Defensive Space Control activities.

¹⁸³ Combined Space Operations Center, "Combined Space Operations Center / Space Delta 5 Fact Sheet," (United States Space Force, Vandenberg Space Force Base, CA, March 2022), 1.

5. Expand USINDOPACOM and service exercises in the Indo-Pacific with a focus on the integration of space capabilities.

USINDOPACOM runs several multinational and bilateral exercises every year at either a joint or service level. Future planning and funding should align to a purposeful expansion of multi or all-domain operations, including space operations, with each partner during each exercise. This will assist in concept development and maturation, test the investments in the MPE infrastructure identified in recommendation three, and further clarify the rationalization and role of space capabilities within the Quadrilateral. Exercises are essential activities during cooperation as they build defense capacity and contribute to deterrence. Exercise expansion overall aligns with Quadrilateral member preference and is an adaptation USINDOPACOM and the United States should make to its strategy within the Indo-Pacific.

Future Research

This research approach focused on a limited selection of space capabilities within a coalition context. Further research could expand to address remaining space capabilities, such as positioning, navigation, and timing; satellite communication; or space launch. These topics may provide the additional context required to gain a fuller understanding of a potential coalition integration of space capabilities. Selecting the space domain reflects one of two domains recently codified as warfighting domains within the United States. Repeating this analysis addressing cyber domain capabilities and concepts may provide additional key information for the United States necessary to effectively integrate emerging concepts and multidomain capabilities within a coalition.

The researcher chose the Quadrilateral as a framing construct given political and diplomatic efforts at the beginning of the research. Selecting other states or differing emerging constructs (e.g., Quad plus the Republic of Korea and the Socialist Republic of Vietnam) may provide additional context for a potential coalition against China that would likely involve more than just members of the Quadrilateral. Conversely, a detailed study of the United States with one additional member of the Quadrilateral better aligns with the bilateral approach undertaken by key exercises implementing emerging concepts within the states. Australia is a strong candidate for this approach. This approach could provide additional specific data required for effective coalition building.

Technically, this research represents an initial entry into this topic area. Refining the research approach from these outcomes would provide for more targeted future research. In particular, adding more source documents from members states to allow for accounting for oversampling of the United States in data results could reveal more informed results. It would also enable statistical methods to account for oversampling. A transition to a mixed-methods approach through surveys, interviews, and a more robust primary document coding and analysis would strengthen conclusions from this research and provide better data for recommendations. This mixed-methods approach would enable regression analysis from a code matrix generated from the source documents to assess factor interaction discussed in the conclusions section. Finally, given the rapid evolution of the Quadrilateral and member concepts, a longitudinal study to assess changes over time would reveal how the Quadrilateral and its members are maturing.

Summary

The United States faces a challenge of an increasingly assertive and belligerent China in the Indo-Pacific. It and other states have turned to the loose construct of the Quadrilateral Security Dialogue to coordinate national responses to address China's changing role in the region. In particular, the states are updating their warfighting concepts to address new technologies and domains of conflict necessary to compete within and prevail against China in competition and conflict. Space and associated capabilities represent one domain requiring attention. This research indicates that the Quadrilateral member's emerging operating concepts do not clearly align, impacting their ability to employ space capabilities within the coalition and achieve unity of effort against China. The United States should focus on open dialogue with other members of the Quadrilateral. This will ensure a clear and shared understanding of how each state desires to integrate space capabilities into a coalition construct. It should also make significant investments in building out the command-and-control infrastructure for space capabilities within the coalition during cooperation and competition, capitalize on mutual interest in Space Domain Awareness, and reinforce current momentum and success through a robust multinational exercise program focused on deliberate integration of space capabilities within the Indo-Pacific region. Taken together, these actions will build confidence and capacity within the Quadrilateral to leverage space capabilities to add to a credible force to counter Chinese ambitions.

APPENDIX A

AUTO-CODED FACTOR RESULTS

Table 6. Auto-coded Factor Results

Auto-coded Factors	Reference Frequency	Source Document Frequency
Capabilities	476	32
Forces	375	28
Military	315	26
Operations	303	30
Systems	284	32
Space	280	24
Technology	204	29
Security	188	27
Defence	175	16
Information	175	26
Environment	163	25
Joint	154	29
Air	152	24
Power	150	25
Domain	145	23
Command	139	23
National	129	23
Defense	125	19
Warfare	116	18
Support	111	24
Future	109	21
Combat	107	20
Training	106	20
Effects	105	21

Source: Created by author.

NVIVO auto-coding works by searching all primary sources and conducting a holistic frequency analysis of word and phrase usage throughout the entirety of the sources. It then finds associated words and phrases and links them together into themes, called auto-coded factors. This approach is similar to the researcher's approach to

employing theory to frame factors and associated codes to analyze the documents.

NVIVO's results are not biased by theory as they are strictly from the primary sources' frequency and association analysis. The researcher does not have access to the natural language processing model employed by NVIVO to validate the algorithm's quality or potential biases.

As seen in Table 6: Auto-coded Factor Results, no major factor appears missing from the research designed to answer the primary research question assessing the impact of emerging Operating Concepts and Space Capabilities on coalition Unity of Effort. Major results include baseline assumptions of the research (e.g., military is the element of national power studied) or are captured by factors (e.g. space in Space Capability) or are used as codes to factors (e.g., command under Unity of Command).

APPENDIX B

FACTOR FREQUENCY DATA

Table 7. Concept of Employment Code Frequency

Factors	Australia	India	Japan	USA	Total
Competition	91	20	14	585	710
Conflict	149	189	3	789	1130
Cooperation	141	99	209	115	564
Deceive	2	1	0	23	26
Degrade	8	16	0	50	74
Deny	10	7	1	67	85
Destroy	6	17	2	93	118
Disrupt	16	8	11	96	131
Dominate	2	11	0	16	29
Superiority	6	18	21	99	144
Targeting	9	44	2	72	127
Total	440	430	263	2005	3138

Table 8. Space Capability Code Frequency

Factors	Australia	India	Japan	USA	Total
Anti-Satellite	1	3	3	1	8
Defensive Space	338	257	153	1098	1846
Directed Energy	131	64	6	104	305
Electronic Warfare	136	469	42	523	1170
Interference	19	10	4	15	48
Jamming	1	6	3	10	20
Offensive Space	342	309	151	1160	1962
Space Control	645	426	192	1436	2699
Space Domain Awareness	490	460	228	1885	3063
Space Situational Awareness	420	257	163	1115	1955
Total	2523	2261	945	7347	13076

Table 9. Rationalization Code Frequency

Factors	Australia	India	Japan	USA	Total
Rationalization	0	2	5	0	7
Allies	27	9	7	172	215
Capability Gap	5	9	2	16	32
Coalition	25	3	0	58	86
Integration	55	116	2	200	373
Multinational	9	5	4	153	171
Partners	137	22	11	298	468
Total	258	166	31	897	1352

Table 10. Unity of Command Code Frequency

Factors	Australia	India	Japan	USA	Total
Unity of Command	256	223	49	964	1492
Command and Control	559	421	86	1362	2428
Command	246	205	45	906	1402
Control	313	216	41	456	1026
Coordination	10	10	17	20	57
Integration	18	22	2	74	116
Orders	12	46	6	110	174
Total	1414	1143	246	3892	6695

Table 11. Interoperability Code Frequency

Factors	Australia	India	Japan	USA	Total
Interoperability	16	13	4	69	102
Communications	88	37	28	169	322
Doctrine	16	322	0	163	501
Language	4	17	3	9	33
Network	45	59	7	122	233
Operations Center	199	621	124	2391	3335
Standard(s)	49	29	4	31	113
Total	417	1098	170	2954	4639

Table 12. Information & Intelligence Sharing Code Frequency

Factors	Australia	India	Japan	USA	Total
Agreements	26	10	0	19	55
Fusion Center	5	36	8	55	104
Information Sharing	245	203	120	981	1549
Intelligence Sharing	172	194	57	333	756
Operations Center	199	621	124	2391	3335
Targeting	9	44	2	72	127
Working Group	85	81	65	72	303
Total	741	1189	376	3923	6229

Table 13. National Caveats Code Frequency

Factors	Australia	India	Japan	USA	Total
Authorities	11	11	7	107	136
Caveats	0	1	0	6	7
Legal	12	11	0	24	47
Policy	111	167	48	60	386
Restrictions	5	11	0	7	23
Total	139	201	55	204	599

Table 14. Concept of Employment Rate Results

Codes	Australia	India	Japan	United States
Competition	20.68%	4.65%	5.32%	29.18%
Conflict	33.86%	43.95%	1.14%	39.35%
Cooperation	32.05%	23.02%	79.47%	5.74%
Deceive	0.45%	0.23%	0.00%	1.15%
Degrade	1.82%	3.72%	0.00%	2.49%
Deny	2.27%	1.63%	0.38%	3.34%
Destroy	1.36%	3.95%	0.76%	4.64%
Disrupt	3.64%	1.86%	4.18%	4.79%
Dominate	0.45%	2.56%	0.00%	0.80%
Superiority	1.36%	4.19%	7.98%	4.94%
Targeting	2.05%	10.23%	0.76%	3.59%

Table 15. Space Capability Rate Results

Codes	Australia	India	Japan	United States
Anti-Satellite	0.04%	0.13%	0.32%	0.01%
Defensive Space	13.40%	11.37%	16.19%	14.94%
Directed Energy	5.19%	2.83%	0.63%	1.42%
Electronic Warfare	5.39%	20.74%	4.44%	7.12%
Interference	0.75%	0.44%	0.42%	0.20%
Jamming	0.04%	0.27%	0.32%	0.14%
Offensive Space	13.56%	13.67%	15.98%	15.79%
Space Control	25.56%	18.84%	20.32%	19.55%
Space Domain Awareness	19.42%	20.34%	24.13%	25.66%
Space Situational Awareness	16.65%	11.37%	17.25%	15.18%

Table 16. Rationalization Rate Results

Codes	Australia	India	Japan	United States
Rationalization	0.00%	1.20%	16.13%	0.00%
Allies	10.47%	5.42%	22.58%	19.18%
Capability Gap	1.94%	5.42%	6.45%	1.78%
Coalition	9.69%	1.81%	0.00%	6.47%
Integration	21.32%	69.88%	6.45%	22.30%
Multinational	3.49%	3.01%	12.90%	17.06%
Partners	53.10%	13.25%	35.48%	33.22%

Table 17. Unity of Command Rate Results

Codes	Australia	India	Japan	United States
Unity of Command	18.10%	19.51%	19.92%	24.77%
Command and Control	39.53%	36.83%	34.96%	34.99%
Command	17.40%	17.94%	18.29%	23.28%
Control	22.14%	18.90%	16.67%	11.72%
Coordination	0.71%	0.87%	6.91%	0.51%
Integration	1.27%	1.92%	0.81%	1.90%
Orders	0.85%	4.02%	2.44%	2.83%

Table 18. Interoperability Rate Results

Codes	Australia	India	Japan	United States
Interoperability	3.84%	1.18%	2.35%	2.34%
Communications	21.10%	3.37%	16.47%	5.72%
Doctrine	3.84%	29.33%	0.00%	5.52%
Language	0.96%	1.55%	1.76%	0.30%
Network	10.79%	5.37%	4.12%	4.13%
Operations Center	47.72%	56.56%	72.94%	80.94%
Standard(s)	11.75%	2.64%	2.35%	1.05%

Table 19. Information & Intelligence Sharing Rate Results

Codes	Australia	India	Japan	United States
Agreements	3.51%	0.84%	0.00%	0.48%
Fusion Center	0.67%	3.03%	2.13%	1.40%
Information Sharing	33.06%	17.07%	31.91%	25.01%
Intelligence Sharing	23.21%	16.32%	15.16%	8.49%
Operations Center	26.86%	52.23%	32.98%	60.95%
Targeting	1.21%	3.70%	0.53%	1.84%
Working Group	11.47%	6.81%	17.29%	1.84%

Table 20. National Caveats Rate Results

Codes	Australia	India	Japan	United States
Authorities	7.91%	5.47%	12.73%	52.45%
Caveats	0.00%	0.50%	0.00%	2.94%
Legal	8.63%	5.47%	0.00%	11.76%
Policy	79.86%	83.08%	87.27%	29.41%
Restrictions	3.60%	5.47%	0.00%	3.43%

Table 21. Factor Share in Primary Sources

Factors	Documents	Statements
Concept of Employment	95.60%	4.40%
Space Capability	96.58%	3.42%
Rationalization	97.20%	2.80%
Unity of Command	88.65%	11.35%
Interoperability	92.01%	7.99%
Information / Intelligence Sharing	87.89%	12.11%
National Caveats	97.19%	2.81%
Total	93.20%	6.80%

Table 22. Concept Factor Share in Primary Sources

Codes	Documents	Statements
Competition	96.48%	3.52%
Conflict	98.32%	1.68%
Cooperation	85.99%	14.01%
Deceive	100.00%	0.00%
Degrade	100.00%	0.00%
Deny	92.94%	7.06%
Destroy	100.00%	0.00%
Disrupt	98.47%	1.53%
Dominate	82.76%	17.24%
Superiority	99.31%	0.69%
Targeting	99.21%	0.79%

Table 23. Space Capability Factor Share in Primary Sources

Codes	Documents	Statements
Anti-Satellite	75.00%	25.00%
Defensive Space	84.72%	15.28%
Directed Energy	97.70%	2.30%
Electronic Warfare	97.18%	2.82%
Interference	95.83%	4.17%
Jamming	100.00%	0.00%
Offensive Space	85.63%	14.37%
Space Control	88.77%	11.23%
Space Domain Awareness	87.59%	12.41%
Space Situational Awareness	85.06%	14.94%

Table 24. Rationalization Factor Share in Primary Sources

Codes	Documents	Statements
Rationalization	100.00%	0.00%
Allies	91.16%	8.84%
Capability Gap	87.50%	12.50%
Coalition	93.02%	6.98%
Integration	88.20%	11.80%
Multinational	96.49%	3.51%
Partners	93.80%	6.20%

Table 25. Unity of Command Factor Share in Primary Sources

Codes	Documents	Statements
Unity of Command	96.92%	3.08%
Command and Control	97.12%	2.88%
Command	96.79%	3.21%
Control	97.56%	2.44%
Coordination	100.00%	0.00%
Integration	100.00%	0.00%
Orders	98.85%	1.15%

Table 26. Interoperability Factor Share in Primary Sources

Codes	Documents	Statements
Interoperability	96.08%	3.92%
Communications	95.96%	4.04%
Doctrine	98.60%	1.40%
Language	84.85%	15.15%
Network	92.27%	7.73%
Operations Center	97.57%	2.43%
Standard(s)	98.23%	1.77%

Table 27. Information & Intelligence Sharing in Primary Sources

Codes	Documents	Statements
Agreements	87.27%	12.73%
Fusion Center	86.54%	13.46%
Information Sharing	96.90%	3.10%
Intelligence Sharing	96.96%	3.04%
Operations Center	97.57%	2.43%
Targeting	99.21%	0.79%
Working Group	87.13%	12.87%

Table 28. National Caveats Factor Share in Primary Sources

Codes	Documents	Statements
Authorities	96.32%	3.68%
Caveats	100.00%	0.00%
Legal	87.23%	12.77%
Policy	86.53%	13.47%
Restrictions	78.26%	21.74%

Source: All tables created by author.

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