

Canadian
Forces
College

Collège
des
Forces
Canadiennes



Decentralizing Control for RCAF Pan-Domain Operations

Major Sebastien Gagnon

JCSP 49

Service Paper

Disclaimer

Opinions expressed remain those of the author and do not represent Department of National Defence or Canadian Forces policy. This paper may not be used without written permission.

© His Majesty the King in Right of Canada, as represented by the Minister of National Defence, 2023.

PCEMI n° 49

Étude militaire

Avertissement

Les opinions exprimées n'engagent que leurs auteurs et ne reflètent aucunement des politiques du Ministère de la Défense nationale ou des Forces canadiennes. Ce papier ne peut être reproduit sans autorisation écrite.

© Sa Majesté le Roi du Chef du Canada, représenté par le ministre de la Défense nationale, 2023.

CANADIAN FORCES COLLEGE - COLLÈGE DES FORCES CANADIENNES

JCSP 49 - PCEMI n° 49
2022 – 2023

Service Paper – Étude militaire

DECENTRALIZING CONTROL FOR RCAF PAN-DOMAIN OPERATIONS

Major Sebastien Gagnon

“This paper was written by a candidate attending the Canadian Forces College in fulfilment of one of the requirements of the Course of Studies. The paper is a scholastic document, and thus contains facts and opinions which the author alone considered appropriate and correct for the subject. It does not necessarily reflect the policy or the opinion of any agency, including the Government of Canada and the Canadian Department of National Defence. This paper may not be released, quoted, or copied, except with the express permission of the Canadian Department of National Defence.”

« La présente étude a été rédigée par un stagiaire du Collège des Forces canadiennes pour satisfaire à l'une des exigences du cours. L'étude est un document qui se rapporte au cours et contient donc des faits et des opinions que seul l'auteur considère appropriés et convenables au sujet. Elle ne reflète pas nécessairement la politique ou l'opinion d'un organisme quelconque, y compris le gouvernement du Canada et le ministère de la Défense nationale du Canada. Il est défendu de diffuser, de citer ou de reproduire cette étude sans la permission expresse du ministère de la Défense nationale. »

DECENTRALIZING CONTROL FOR RCAF PAN-DOMAIN OPERATIONS

AIM

1. The Russia invasion of Ukraine has exemplified that the world is not beyond peer-on-peer conventional conflict. Western nations, adept at conducting operations in the middle east are now re-focusing to prepare for potential full-scale combat. This paper will demonstrate how the Royal Canadian Air Force (RCAF) needs to adopt a *decentralized control* model to complement its existing command and control (C2) approaches to operate against emerging threats in contested, denied, or degraded environments.

INTRODUCTION

2. The RCAF strategy states that “Canada is no longer a sanctuary” as we can be threatened across all domains.¹ Future Canadian Armed Forces (CAF) operations are likely to occur in non-permissive environments, with an electromagnetic spectrum that will be degraded, contested, or denied.² Canada’s defence policy, *Strong, Secure, Engaged*, highlights that for the CAF “to succeed in unpredictable and complex security environments, defence will field an agile, well-educated, diverse, and combat-ready military.”³ Consequently, the RCAF must adapt to meet these demands through harnessing “the full capability of 21st century computing and invest further in state-of-the-art tools such as modernized command and control information systems.”⁴

3. The RCAF’s strategy identified artificial intelligence, machine learning, cloud computing, sensor fusion, and quantum technology as emerging capabilities which will “shorten decision times...streamlining processes and/or automat[e] tasks.”⁵ These technologies will allow the RCAF to meet the challenges of complex pan-domain operating environments by creating a “systems of systems” to enable interoperability.⁶ Furthermore, this will poise the RCAF to succeed in contested electromagnetic environments by creating “resilient, redundant, and adaptive technologies.”⁷ However, the RCAF strategy does not address the necessary changes needed in C2 to thrive in these environments. As such, this paper will first look at the RCAF tenet of *centralized control, decentralized execution*, it will then provide an overview the concept of *decentralized control* in pan domain operations, and lastly discuss how the RCAF could change its C2 approaches to respond to emerging threats.

¹ Department of National Defence, Royal Canadian Air Force, *RCAF Strategy* (Ottawa, DND Canada, 2023), 5.

² Department of Defense, *Summary of the Joint All-Domain Command and Control Strategy* (Washington, D.C., JADC2 Cross-Functional Team, 2022), 2.

³ Department of National Defence, *Strong, Secure, Engaged* (Ottawa: DND Canada, 2017), 14.

⁴ Department of National Defence, *Minister Anand Announces Continental Defence Modernization to Protect Canada*, 20 June 2022, Accessed on 26 February 2023, <https://www.canada.ca/en/department-national-defence/news/2022/06/minister-anand-announces-continental-defence-modernization-to-protect-canadians.html>

⁵ RCAF Strategy, 5.

⁶ Ibid., 9.

⁷ RCAF Strategy, 8.

DISCUSSION

Centralized Control, Decentralized Execution

4. Generations of RCAF personnel have worked in an air force based on the concept of *centralized control, decentralized execution*. A key tenet of the RCAF, this approach to C2 ensures that high-demand air force capabilities are managed via a central operational headquarters called the Air Operations Centre (AOC).⁸ As such, the AOC can receive the wanted effects from all the components, prioritize them, pair them with available assets, and issue orders to task air force units to support in accordance with the commander's vision. The AOC is the *centralized control* portion of the RCAF tenet for modern air force operations.

5. The commander, through the AOC, employs the theatre air control system (TACS) which consists of "the organizations, units, personnel, equipment and procedures necessary to plan, direct and control air operations as well as coordinate air operations with other components."⁹ The United States Marine Corps (USMC) describes their TACS, called the Marine Air Command and Control System (MACCS) as the "commander's weapons system" whose collection of C2 agencies enables them to employ their aviation assets in real-time.¹⁰ Key tactical C2 agencies of the TACS that are applicable to this paper are the Control and Reporting Centre (CRC) and the Tactical Air Control Party (TACP) as they serve important tactical C2 roles in air-land integration (ALI) and airspace management. Due to scope, this paper will not discuss amphibious, littoral, or open-ocean operations due to the CAF's minor role in those areas which would be better suited for other allies to address.

6. The CRC is a ground-based C2 agency that is subordinate to the AOC which conducts the "*decentralized execution* of all defensive-air, offensive-air, and airspace-management activities within an assigned area."¹¹ CRCs ingest multiple sensors to create the Recognized Air Picture (RAP) which they share using data links. CRCs also provide air battle management of AOC tasked assets to ensure execution is in accordance with the commander's intent and priorities. In Canada, the standing CRC is the 21st Aerospace Control and Warning Squadron, callsign SIDECAR, located at 22 Wing in North Bay, Ontario. The CRC role can also be accomplished by airborne assets such as the United States Air Force (USAF) Airborne Warning and Control System (AWACS).

7. The TACP is a "liaison and control element aligned with the land force manoeuvre units" who act as advisors on air power and assist in the "planning, requesting, coordinating, and controlling of air effects."¹² When AOC assigned assets will be operating in support or in the vicinity of land forces, TACPs provide that key tactical C2 to coordinate land and air forces for

⁸ Department of National Defence, B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*, (Trenton: CFAWC, 2016), 16.

⁹ Department of National Defence, B-GA-402-001/FP-001, *Royal Canadian Air Force Doctrine: Command and Control*, (Trenton: CFAWC, 2018), 27.

¹⁰ Robbin Laird, "Ways Ahead for C-2 Enabled Marines in Distributed Operations for Peer Fight," *Second Line of Defense*, 2 August 2021, Accessed on 26 February 2023, <https://sldinfo.com/2021/08/ways-ahead-for-c-2-enabled-marines-in-distributed-operations-for-the-peer-fight/>

¹¹ RCAF Command and Control, 28.

¹² RCAF Command and Control, 29.

the maximum effect. Personnel working in CRCs and TACPs will be in constant communication to ensure the safe control and transfer of aviation assets, airspace, and information which are the foundation to effective ALI. In Canada, all TACPs are part of the 2 Air Expeditionary Wing (2 AEW) but remain co-located with the Canadian Army (CA) units they support.¹³

8. The tenet of *centralized control, decentralized execution* has been battle-tested and successful since the Vietnam War. However, when compared to the complexity of the peer-to-peer conflicts on the horizon, *centralized control, decentralized execution*'s success to date could be attributed to it being used in comparatively permissive environments.¹⁴ The TACS system that enables the AOC to provide *centralized control* is hugely dependent on data-link systems developed in 1975, while ageing airborne C2 systems that enable air forces to fight forward have experienced mission capable ratings between 60 to 66 percent.¹⁵ Adversaries have advanced their technologies to establish Anti-Access Area-Denial (A2AD) capabilities which will force tactical C2 assets further from the fighters (trending toward low-observable) at the frontline conducting operations.¹⁶ By design, low-observable fighters must adhere to Emission Controls (EMCON) which would impede their ability to contribute to the RAP for the AOC. As such, AOCs who requires real-time information and feedback to conduct *centralized control*, would be denied that ability and be crippled to respond or adapt to dynamic situations.¹⁷ With the drive to maintain decision-superiority to remain inside the enemy's Observe-Orient-Decide-Act (OODA) loop, it is necessary to investigate the how other air forces intend to maintain their advantage.

Agile Combat Employment (ACE) and Joint All-domain C2 (JADC2)

9. In 2021 the USAF released a doctrine note describing the concept of ACE. It highlighted that "all-domain long-range fires have placed air bases at significantly increased risk," while also recognizing that all domains will exist in a state of "fluctuating levels of superiority."¹⁸ ACE is defined as "a proactive and reactive operation scheme of maneuver executed within threat timelines to increase survivability while generating combat power."¹⁹ The key aspect of ACE is the agility of the force to move and manoeuvre at a pace that complicates adversary targeting while still retaining the ability to provide combat power in accordance with the commander's intent.²⁰ This approach to air force operations is a change from the norm and reflects more the jargon typically used by the army when describing manoeuvre warfare.

¹³ Sandra Price, "RCAF Tactical Air Control Party Resource Constraints and Implications for Operation," (Joint Command and Staff Program Paper, Canadian Forces College, 2021), 1.

¹⁴ Stefan Morell, "Optimizing Joint All-domain C2 in the Indo-Pacific," *Air University Online*, accessed on 28 February 2023, 66, https://www.airuniversity.af.edu/Portals/10/ASPI/journals/Volume-35_Special_Issue/V-Morrell.pdf.

¹⁵ *Ibid.*, 65.

¹⁶ *Ibid.*

¹⁷ *Ibid.*, 67.

¹⁸ United States Air Force, Doctrine Note for the USAF, AFDN 1-21 (Maxwell, AL: Curtis E. Lemay Center, 2021), 1 and 5, https://www.dctrine.af.mil/Portals/61/documents/AFDN_1-21/AFDN%201-21%20ACE.pdf

¹⁹ ACE, 1.

²⁰ *Ibid.*, 2.

10. “ACE shifts operations from centralized physical infrastructures to a network of smaller, dispersed locations that can complicate adversary targeting” and ensure force survival.²¹ The dispersal of forces can occur proactively to deter the enemy while re-assuring allies or reactively based on threat of attack.²² Similar to army doctrine, the distribution of forces and fluctuating domain superiority will necessitate mission command to allow forces to operate with limited guidance according to the commander’s intent.²³ Nested on a foundation of reliable and redundant communications, mission command under ACE “supports combat effectiveness during the inevitable fog and friction of war.”²⁴ Consequently, the enemy will be in a “state of analysis paralysis” trying to make sense of the force dispersal inhibiting their ability to make decisions and setting the conditions for the friendly application of combat power.²⁵

11. JADC2 is intended to “sense, make sense, and act at all levels and phases of war, across all domains, and with partners to deliver information at the speed relevance.”²⁶ In essence, JADC2 is a US Department of Defense (DoD) wide data management and sharing initiative to support future operations. By dictating “common data standards and architecture, with standardized key interfaces and services to access, aggregate, manage, store, process, and share data,” the DoD can easily share information amongst its services enabling a system of systems approach.²⁷ Through the employment of machine learning and Artificial Intelligence (AI), commander’s will be positioned to make timely decisions based on the best and most applicable information available within the enemy’s own decision cycle ensuring decision superiority.²⁸ This approach will give each element access to each others information which until now has been inaccessible or delayed. Combined with advance computing and processing, commanders working within tactical C2 units will be better prepared to operate in using mission command employing ACE. So, what of the RCAF’s tenet of *centralized control, decentralized execution*?

Centralized Command, Distributed Control, Decentralized Execution

12. The combination of JADC2 and mission command under the ACE scheme of manoeuvre shifts air force’s operations from *centralized control, decentralized execution* to employing under a *centralized command, distributed control, and decentralized execution* construct.²⁹ For air forces to ensure their subordinate commander’s success, they will need to mirror army and marine concepts of mission command. This would include the need to “create a shared understanding, provide clear commander’s intent, use mission-type orders (MTO)...exercise disciplined initiative, and accept prudent risk.”³⁰ Combined with “delegated and conditions-

²¹ Ibid., 3 and 4.

²² Ibid., 3.

²³ Ibid., 3 and 7.

²⁴ Ibid., 8.

²⁵ Ibid., 11.

²⁶ JADC2, 2.

²⁷ Ibid., 7.

²⁸ Ibid., 2.

²⁹ ACE, 3.

³⁰ Ibid.

based authorities,” subordinates will be empowered to exercise “flexibility, initiative, and responsiveness” at the lowest level to ensure decisive action.³¹

13. For the TACS tactical C2 agencies previously discussed, *distributed control (or decentralized control)* will necessitate the RCAF to consider how it employs CRCs and TACPs. Under JADC2, ACE, and mission command constructs, units are no longer dependant on integral sensors such as radars and data links. Instead, these sensors and networks can be deployed as contributors to the system of systems. The operators of CRCs, known as Air Battle Managers (ABMs) and TACPs are then able to plug into the system from distributed locations, employing advanced C2 management systems with AI and machine learning that will curate their information to support decision making. The AOC will enable mission command through sharing intent and MTOs, which would also include dedicated aviation assets who would fall under appropriate subordinate commander. It is important to note that *centralized control, decentralized execution* would still be applicable in permissive environments. Planners must only consider *distributed/decentralized control* in response to the threat environment, noting that significant training would be still be required to ensure its viability.

14. One approach the USAF and USMC are experimenting with is placing ABMs and TACPs into “small, focused, combined teams” as tactical C2 nodes.³² The USAF is testing Tactical Operations Center – Light (TOC-L) as the battle management system which can “relocate quickly, establish advanced datalinks, and connect to a variety of sensors using resilient comms.”³³ The USAF is also concurrently testing their contribution to JADC2, called Advanced Battle Management System (ABMS), in an complex virtual environment priming the USAF to be ready for *decentralized control*.³⁴

15. The USMC has combined their Direct Air Support Center (DASC) and Tactical Air Operations Center (TAOC) into a C2 node called the Multifunction Air Operations Center (MAOC).³⁵ The MAOC will become the primary C2 agency of the Marine Air-Ground Task Force (MAGTF) and be designed to operate in contested environments. The USMC has already deployed a MAOC in support of the North Atlantic Treaty Organization (NATO) “conducting multi-domain awareness.”³⁶ As such, the USAF and USMC are well on their way to meet future

³¹ Ibid., 7, 3, and 5.

³² Deb Henley, “DMOC Brings Next Generation C2 to Life,” *505th Command and Control Wing Online*, 8 June 2022, accessed on 28 February 2023, <https://www.505ccw.acc.af.mil/News/Article/3056251/dmoc-brings-next-generation-c2-to-life/>.

³³ Henley, accessed on 28 February 2023.

³⁴ 505th Command and Control Wing Public Affairs, “Air Force Lab Accelerates Battle Management for PACAF, ABMS CFT, ACC,” *Air Force Online*, 15 February 2023, accessed on 28 February 2023, <https://www.af.mil/News/Article-Display/Article/3299787/air-force-battle-lab-accelerates-battle-management-for-pacaf-abms-cft-acc/>.

³⁵ Deb Henley, “DMOC Brings Winter Fury to INDOPACOM,” *US Indo-Pacific Command Online*, 9 March 2022, accessed on 28 February 2023, <https://www.pacom.mil/Media/News/News-Article-View/Article/2962753/dmoc-brings-winter-fury-to-indopacom/>.

³⁶ Sarah Eason, “Marines Showcase NATO Command and Control Capabilities,” *Marines Online*, 11 May 2022, accessed on 28 February 2023, <https://www.marines.mil/News/News-Display/Article/3027660/marines-showcase-nato-command-and-control-capabilities/>.

challenges by implementing ACE, JADC2, and mission command to enable *centralized command, distributed control, decentralized execution*.

Way Forward for the RCAF

16. The recently released RCAF Strategy speaks thoroughly to the RCAF's goal to harness advanced computing; however, the same strategy for the CAF is not as mature.³⁷ Furthermore, while the RCAF Strategy discusses agility in terms of being “rapidly deployable, scalable, versatile, and relevant” it is unclear if that would extend to ACE, nor is there any mention of mission command or *decentralized control*.³⁸ Thus, while the RCAF is moving towards meeting the technological needs to perform in modern conflict, it lacks any discussion on the needed organizational changes that would enable subordinate commanders to succeed in such environments. The RCAF Strategy addressed how it would adapt for the future but did not challenge its bias that the AOC will continue to provide *centralized control* in that future.

17. The RCAF must begin to set the conditions for mission command to be used by its subordinate units. One approach would be to adapt how it exercises tactical C2 like the USAF's TOC-L and the USMC MAOC. The RCAF has two deployable CRC units which provides ABMs, sensors, and communications. The ABMs of these units could be re-assigned to 2 AEW, where they would join the TACPs to form small, tactical C2 teams which could forward deploy, plug into the system of systems, and provide effects. The sensors and communications of the deployable CRCs would still be deployed separately to aid the fight.

18. The tactical C2 teams would provide battle management in all the RCAF missions, in support of a local multi-domain commander which the AOC has assigned dedicated assets to with MTOs. It would be imperative that the tactical C2 teams be agile and able to displace quickly to avoid exploitation from the enemy in line with ACE. As such, there would be a need for multiple, interchangeable teams that would overlap to ensure the air assets receive continual C2. EX Maple Resolve would provide the perfect venture to test, refine, and prove this capability, ensuring the RCAF's continued relevance in the future fight. This approach is just an idea to demonstrate the possibilities; however, a tiger team of subject matter experts (SMEs) would be essential to frame this organizational change properly within appropriate goals and timelines. One good example of mission command which the RCAF has demonstrated, is the Tactical Air Lift (TAL) detachment in Prestwick providing airlift support for aid to Ukraine. The detachment has been empowered to coordinate what they transport, while the AOC supports with diplomatic clearances.³⁹ The flexibility for contributing nations to coordinate directly with TAL det, vice through governments, has allowed the RCAF to have a disproportionate positive effect.

19. Lastly, the implementation of JADC2 necessitates a CAF-wide application to ensure robust access to the system of systems which would bolster RCAF operations into the future.

³⁷ RCAF Strategy, 5.

³⁸ Ibid., 8.

³⁹ Chris Thatcher, “Canada's Air Task Force Prestwick on Delivering Aid in Support of Ukraine,” *Skies Magazine Online*, 19 December 2022, accessed on 28 February 2023, <https://skiesmag.com/features/canadas-air-task-force-prestwick-delivering-aid-support-ukraine/>.

Unfortunately to date, the CAF has not released any guidance on JADC2 to inform its force, or even message to industry that desire.⁴⁰ It is of the utmost importance, considering the ongoing acquisition of modern capabilities, that the CAF establish the data management standards to ensure their ability to contribute to pan-domain operations.

CONCLUSION

20. It is evident that the A2AD capabilities of peer adversaries will necessitate the RCAF to re-consider how it exercises C2 over its forces. As the RCAF would not deploy on its own in a peer-to-peer conflict, it will be forced to be interoperable with its allies. The US has already shown how they intend to re-organize and modernize to meet these threats, even deploying these new concepts as part of NATO. Consequently, the RCAF must adapt to remain relevant necessitating a deliberate approach which would involve technological advancements and organizational changes. Although *centralized control*, *decentralized execution* still applies, the RCAF must be ready for *centralized command*, *distributed control*, *decentralized execution* by harnessing mission command, JADC2, and ACE.

RECOMMENDATION

21. It is the recommended that the RCAF:
- a. Update the RCAF Strategy and Doctrine to include ACE, *decentralized control*, and mission command;
 - b. Establish a tiger team of SMEs to investigate ABM/TACP combination in 2 AEW; and
 - c. Implore the CAF to release a JADC2 strategy.

⁴⁰ Dave Jones and Bruno Perron, “Joint All Domain Command and Control: Is there a CAF Approach,” *Disrupting Defence Online*, 3 August 2022, accessed on 28 February 2023, <https://www.disruptingdefence.com/post/joint-all-domain-command-and-control-is-there-a-caf-approach>

BIBLIOGRAPHY

- 505th Command and Control Wing Public Affairs. “Air Force Lab Accelerates Battle Management for PACAF, ABMS CFT, ACC.” *Air Force Online*. 15 February 2023. Accessed on 28 February 2023. <https://www.af.mil/News/Article-Display/Article/3299787/air-force-battle-lab-accelerates-battle-management-for-pacaf-abms-cft-acc/>.
- Department of Defense. *Summary of the Joint All-Domain Command and Control Strategy*. Washington, D.C.: JADC2 Cross-Functional Team, 2022. <https://media.defense.gov/2022/Mar/17/2002958406/-1/-1/1/SUMMARY-OF-THE-JOINT-ALL-DOMAIN-COMMAND-AND-CONTROL-STRATEGY.PDF>.
- Department of National Defence. B-GA-400-000/FP-001. *Royal Canadian Air Force Doctrine*. Trenton: CFAWC, 2016. https://publications.gc.ca/collections/collection_2017/mdn-dnd/D2-368-2016-eng.pdf.
- Department of National Defence. B-GA-402-001/FP-001. *Royal Canadian Air Force Doctrine: Command and Control*. Trenton: CFAWC, 2018. https://publications.gc.ca/collections/collection_2018/mdn-dnd/D2-393-1-2018-eng.pdf.
- Department of National Defence. *Minister Anand Announces Continental Defence Modernization to Protect Canada*. 20 June 2022. Accessed on 26 February 2023. <https://www.canada.ca/en/department-national-defence/news/2022/06/minister-anand-announces-continental-defence-modernization-to-protect-canadians.html>.
- Department of National Defence, Royal Canadian Air Force. *RCAF Strategy*. Ottawa: DND Canada, 2023. <https://www.canada.ca/content/dam/rcaf-arc/documents/reports-publications/royal-canadian-air-force-strategy.pdf>.
- Department of National Defence. *Strong, Secure, Engaged*. Ottawa: DND Canada, 2017. <https://www.canada.ca/content/dam/dnd-mdn/documents/reports/2018/strong-secure-engaged/canada-defence-policy-report.pdf>.
- Eason, Sarah. “Marines Showcase NATO Command and Control Capabilities.” *Marines Online*. 11 May 2022. Accessed on 28 February 2023. <https://www.marines.mil/News/News-Display/Article/3027660/marines-showcase-nato-command-and-control-capabilities/>.
- Henley, Deb. “DMOC Brings Next Generation C2 to Life.” *505th Command and Control Wing Online*. 8 June 2022. Accessed on 28 February 2023. <https://www.505ccw.acc.af.mil/News/Article/3056251/dmoc-brings-next-generation-c2-to-life/>.
- Henley, Deb. “DMOC Brings Winter Fury to INDOPACOM.” *US Indo-Pacific Command Online*. 9 March 2022. Accessed on 28 February 2023. <https://www.pacom.mil/Media/News/News-Article-View/Article/2962753/dmoc-brings-winter-fury-to-indopacom/>.

- Jones, Dave and Bruno Perron. "Joint All Domain Command and Control: Is there a CAF Approach." *Disrupting Defence Online*. 3 August 2022. Accessed on 28 February 2023. <https://www.disruptingdefence.com/post/joint-all-domain-command-and-control-is-there-a-caf-approach>.
- Laird, Robbin. "Ways Ahead for C-2 Enabled Marines in Distributed Operations for Peer Fight." *Second Line of Defense*. 2 August 2021. Accessed on 26 February 2023. <https://sldinfo.com/2021/08/ways-ahead-for-c-2-enabled-marines-in-distributed-operations-for-the-peer-fight/>.
- Morell, Stefan. "Optimizing Joint All-domain C2 in the Indo-Pacific." *Air University Online*. Accessed on 28 February 2023. https://www.airuniversity.af.edu/Portals/10/ASPJ/journals/Volume-35_Special_Issue/V-Morrell.pdf.
- Price, Sandra. "RCAF Tactical Air Control Party Resource Constraints and Implications for Operation." Joint Command and Staff Program Paper, Canadian Forces College, 2021. <https://www.cfc.forces.gc.ca/259/290/24/192/Price.pdf>.
- Thatcher, Chris. "Canada's Air Task Force Prestwick on Delivering Aid in Support of Ukraine." *Skies Magazine Online*. 19 December 2022. Accessed on 28 February 2023, <https://skiesmag.com/features/canadas-air-task-force-prestwick-delivering-aid-support-ukraine/>.
- United States Air Force. Doctrine Note for the USAF. AFDN 1-21. Maxwell, AL: Curtis E. Lemay Center, 2021. https://www.doctrine.af.mil/Portals/61/documents/AFDN_1-21/AFDN%201-21%20ACE.pdf.