

# An Indigenous ethical model for drone operations in Canada

Jacob Taylor 

Indigenous Health Sciences, University of North Dakota School of Medicine and Health Sciences, Grand Forks, ND 58202-9037, USA

Corresponding author: **Jacob Taylor** (email: [jacob.n.taylor@und.edu](mailto:jacob.n.taylor@und.edu))

---

## Abstract

Drones will revolutionize various aspects of Canadian society. Medical cargo drones are transporting crucial supplies and biological samples, such as blood plasma and organs. This article explores Indigenous ethical dimensions of integrating drones in Canadian contexts, represented by the acronym DRONE that embodies the following key principles: D: Decolonize—This principle advocates for methodologies that aim to rectify historical injustices and align research with Indigenous customs and storytelling. R: Respect, Reciprocity, Relationship, and Relevance—These principles emphasize equity, mutual respect, and relationship-based collaboration in drone technology. O: Ownership, Control, Access, and Possession—OCAP® recognizes Indigenous self-determination in research and development projects, focusing on data ownership and control. N: Natural Law—This principle underscores the importance of respecting the environment and harmonious relations between Indigenous communities and the natural world in drone projects. E: Economic Development—Acknowledging the significance of Indigenous economies and addressing historical financial barriers, the drone industry can contribute to economic prosperity in Indigenous communities. These principles are an ethical imperative to fostering trust in Indigenous communities. Partnerships guided by the DRONE framework facilitate culturally sensitive, ethically sound, and effective solutions, advancing inclusivity and responsible technological innovation.

**Key words:** drone, Indigenous, ethics, health care, framework, principles

## Introduction

The Canadian Aviation Regulations (CARs) regulate drone service providers in Canada. Part IX of the regulations contains most rules for remotely piloted aircraft under 25 kg in maximum take-off weight (Transport Canada 2023). These regulations mostly center on rules related to the registration of pilots and aircraft and how both operate safely in the national airspace. Part IX of the CARs is the only mandatory framework for drones in health care or Indigenous settings. However, Canadian scholars indicate that there is also a need for consensus around an ethical framework for the use of drones for mainstream health care. Cargo drones in health care are at a level of experimentation in society that should follow the ethical guidelines for biomedical research (Cawthorne and Robbins-van Wynsberghe 2020). Other scholars have expanded the sentiment, demonstrating the need for an ethical framework across all humanitarian applications of drone technology (Wang et al. 2021). In Canada, ethical concerns about humanitarian drone activity have been discussed since 2012 (Card et al. 2012). Ethical considerations for drone use in health care and other settings must center around protecting the recipients of drone services beyond the safety considerations and regulations already in place for providers of drone services.

Certain groups in Canada have been identified in research and society as vulnerable and needing greater protection prudence. Indigenous people (First Nation, Metis, and Inuit) are considered a vulnerable population (Red Cross, no date). Indigenous people are considered a vulnerable population in Canada for several historic, social, and systemic reasons, not limited to historical trauma (i.e., residential schools), social, economic, and health disparities, overrepresentation in the justice system, geographic isolation, and systemic racism. As a vulnerable population with special governmental status in Canada due to Treaty history, it is logical that mainstream ethical frameworks will need to be modified or expanded to include Indigenous ways of knowing and being.

This paper will discuss an Indigenous ethical framework for drone applications that should be employed whenever drone providers or services engage with First Nation, Metis, or Inuit communities.

Several cargo drone pilot projects have focused on health care conducted in Canada with Indigenous communities. Findings from these projects have been featured in peer-reviewed publications (Schall 2019; Flemons et al. 2022; Snouffer 2022), with others highlighted in media (Drone Delivery Canada 2020; InDro Robotics 2021; UBC Faculty of Medicine 2021). These health care projects involved newly de-

veloped technology but little real-world operational time and lacked Indigenous operational partners, which means that the projects tested applications of an unproven technology on a vulnerable population. As such, the projects should have implemented practices for the protection of human participants, such as those found through an Institutional Review Board (IRB) process, namely and in plain language:

- informed consent (autonomy)
- maximization of benefits and minimization of harms (beneficence)
- that the groups involved be selected fairly (justice)

The cited projects do not have IRB statements included with the publications or descriptions of how human participants were protected. There is a need to analyze these projects from the lens of the Indigenous participants. It is important to understand how well the participants perceive they were protected, were fairly selected, and ultimately benefitted after agreeing to participate in the pilot projects.

For an analogy, in Africa, similar interactions between local populations and non-local operators moving medical-related products by drone have been documented as technology experimentation. One Africa-based study examines the local population's perspective on a new cargo drone project in health care (Wang 2021). The study highlights that interviewees from the health sector raised questions around why these non-local operators were "testing things out on Malawians before giving them to others". This work was not well accepted by the community because the operators were not able to "make their need our need" (Wang 2021). This work demonstrated that the local population had unmet concerns surrounding a cargo drone operation that was being implemented for health care purposes in their area. The investigators highlight the need for an ethical framework for projects using drone technology in Africa. A qualitative investigation is needed to determine whether Indigenous groups in Canada feel similar sentiments.

### DRONE: an Indigenous ethical framework

Without qualitative data to validate an ethical framework for drone operations in partnership with Indigenous groups in Canada, valuable resources may still guide drone operations with Indigenous community participation. As an aspirational objective, literature from general Indigenous research ethics, education, and development work in Canada is integrated into an Indigenous ethical framework conveniently encapsulated in the acronym DRONE.

- **D:** decolonize
- **R:** reciprocity, relationship, and relevance
- **O:** ownership, control, access, and possession
- **N:** natural law
- **E:** economic development

Each of these characteristics provides an Indigenous ethical framework for drone use that will be discussed below; readers are encouraged to examine these concepts further.

### D: decolonize

Maori scholar Linda Tuhiwai Smith popularized "decolonize" in her 1999 book *Decolonizing Methodologies: Research and Indigenous Peoples*. She "urges researching back and disrupting the rules of the research game toward practices that are more respectful, ethical, sympathetic, and useful vs racist practices and attitudes, ethnocentric assumptions, and exploitative research" (Smith 1999). Regardless of the topic, decolonizing the approach to research in any Canadian-based project involving Indigenous people is a crucial aspect of ethical research. This includes shifting the power dynamic to the Indigenous population to redress many historical atrocities involving no meaningful Indigenous decision-making (National Centre for Truth and Reconciliation 2023). As described by Tuhiwai Smith, this also includes conducting research that respects Indigenous customs and ways of knowing, integrating the community approach to storytelling, and data collection. Regarding research and interventions focused on developing drone technology with Indigenous communities, partners must be flexible and open to the community leading the project. This requires that the community be fully informed about the project's benefits and risks and that it may direct where those risks and benefits are allocated among stakeholders. For research and initiatives related to the development of drone technology in Indigenous communities, it is imperative that project partners remain adaptable and receptive to community leadership. Following Tuhiwai Smith's principles, it is crucial to conduct drone operations in a way that respects Indigenous traditions and ways of knowledge, while integrating community-based storytelling and data collection methods.

### R: respect, reciprocity, relationship, and relevance

These principles of practice are directly from *First Nations and Higher Education: The Four R's—Respect, Relevance, Reciprocity, Responsibility* by Verna J. Kirkness and Ray Barnhardt (Kirkness and Barnhardt 1991). This text was designed to help universities achieve equitable access to their education programs for Indigenous people. The residential school program—a deeply disreputable historical initiative in Canada that forcibly separated Indigenous children from their families, subjected them to cultural assimilation, and caused immeasurable harm—aggressively asserted the history of colonization in Canada (National Centre Truth and Reconciliation 2023). Universities have arguably embraced the equity challenges that resulted. However, only some industries in Canada have employed these lessons, and many still need to foster equity pathways within their spaces. For the drone industry and associated developments, it is crucial to learn from the colonial history mitigation strategies that education has spotlighted. This means that in dealings with Indigenous communities, in business or research, drone proponents find ways to solve a local Indigenous problem (relevance) and share the benefits of the project's success (reciprocity) while protecting the community from the risks of the project (relationship) and incorporating cultural protocols wherever possible (respect).

## O: ownership, control, access, and possession (OCAP)

“OCAP® was established in 1998 during a meeting of the National Steering Committee (NSC) of the First Nations and Inuit Regional Longitudinal Health Survey. [...] Over time, the NSC evolved into the First Nations Information Governance Committee, which, following a mandate from the Assembly of First Nations Chiefs-in-Assembly in 2009, became the First Nations Information Governance Centre (FNIGC), an incorporated non-profit, on April 22, 2010” (The First Nations Information Governance Centre, no date). OCAP® is known as a “framework at the forefront of First Nations research ethics” (Mashford-Pringle and Pavagadhi 2020) as it provides a structure of research that prioritizes the self-determination of Indigenous peoples and recognizes their authority and autonomy. Applying OCAP® means that Indigenous people determine the purpose of research and development projects, how the projects are conducted and managed, which researchers or developers are involved, who gets to see and share the results, and how those results are displayed.

For the Canadian drone sector, employing this framework is complying with the National Indigenous Governmental orders that have been embraced across community research and business paradigms. As a lot of data are collected by drone operations, applying the OCAP® framework means providing a complete list of all the data collected to the Indigenous participants in a data agreement. This agreement must bestow full ownership of all data to the Indigenous participants. This allows them to decide how it is made available, how it may be utilized and shared, and where it is stored.

## N: natural law

Natural law “is the body of laws responsible for maintaining respectful and reciprocal relations between and within First Nations and between the human and non-human family” (Redvers et al. 2020). Simply, appreciation and regard for the environment is an Indigenous ethical value. Drone projects that work with Indigenous communities and people should be mindful of the environmental and societal impacts of their equipment and operations and must employ practices to mitigate any damages.

## E: economic development

Lawrence Schembri retired as Deputy Governor for the Bank of Canada in June 2022. In his last speech in office that May, entitled *Economic reconciliation: Supporting a return to Indigenous prosperity*, he said: “To help restore the prosperity of the Indigenous economy, we want to become trusted partners. We need to work together to overcome the longstanding obstacles faced by Indigenous peoples and the discriminatory practices that contributed to them”, acknowledging that Indigenous economies are good business partners and that historic financial barriers to inclusion are largely to blame for the “debilitating underinvestment in Indigenous communities” (Schembri 2022). The Canadian drone industry has the opportunity to support economic prosperity in Indigenous communities by showing its financials and shar-

ing any revenue and revenue models generated from projects with participating Indigenous communities. For Indigenous communities, own-source revenue generation is of high importance. This year, the National Chief of the Assembly of First Nations responded to the federal budget by stating, “[w]hat we see the federal government do is chronically, intentionally underfund us, and so they’re creating this cycle of poverty”, highlighting the importance of economic development for Indigenous communities (Forester 2023).

## Conclusion and recommendation

Health care and related humanitarian projects in the early stages of development are reasonable grounds for partnerships between drone researchers and operators and Indigenous peoples in Canada. DRONE is an example of an Indigenous Ethical Framework for Drone Operations in Canada. Employing DRONE will help researchers and operators experiment and partner with Indigenous peoples using frameworks that are aligned with strong practices in Canada for Indigenous partnerships. DRONE helps to ensure best practices for protecting vulnerable human participants in research. Indigenous communities are excellent partners for developing new technologies, and it is paramount that those projects be conducted with or by the communities rather than upon or for the communities (Wehipeihana 2013). Using DRONE as an Indigenous Ethical Framework will support projects conducted with Indigenous communities in a good way.

In closing, forming partnerships with Indigenous communities for the development and utilization of drone technology in innovative ways has the potential to lead to more culturally sensitive, ethically sound, and effective solutions, benefiting not only the Indigenous communities but also society at large. It is a strong way to promote inclusivity, respect for diversity, and responsible innovation in technology in Canada.

## Positionality statement

Jacob Taylor is a band member of Curve Lake First Nation, located in Ontario, Canada. He is the CEO of Indigenous Aerospace and has employed the DRONE model in business for many years. He is also a Ph.D. student in the Indigenous Health Science program at the University of North Dakota. Jacob was awarded Western University’s Faculty of Health Sciences Young Alumni Award in 2021 and the Aerial Evolution Association of Canada’s inaugural Indigenous Innovation Award in 2023.

## Article information

### History dates

Received: 1 August 2023

Accepted: 9 November 2023

Version of record online: 19 December 2023

### Copyright

© 2023 The Author(s). This work is licensed under a [Creative Commons Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/) (CC BY 4.0),



which permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are credited.

## Data availability

Data generated or analyzed during this study are provided in full within the published article.

## Author information

### Author ORCIDs

Jacob Taylor <https://orcid.org/0009-0005-5580-9688>

### Author contributions

Conceptualization: JT

Data curation: JT

Formal analysis: JT

Investigation: JT

Methodology: JT

Project administration: JT

Resources: JT

Software: JT

Writing – original draft: JT

Writing – review & editing: JT

### Competing interests

This article was written as a part of a volunteer role with the Aerial Evolution Association of Canada, serving as Chair of the Indigenous Committee. No conflicts are declared.

### Funding information

No funding was involved.

## References

Card, E., Raymond, N.A., and Achkar, Z.A. 2012. The case against humanitarian drones. Open Canada. Available from <https://opencanada.org/the-case-against-humanitarian-drones/> [accessed 26 May 2023].

Cawthorne, D., and Robbins-Van Wynsberghe, A. 2020. An ethical framework for the design, development, implementation, and assessment of drones used in public healthcare. *Sci. Eng. Ethics*, **26**(5): 2867–2891. doi:10.1007/s11948-020-00233-1. PMID: 32578062.

Drone Delivery Canada. 2020. Drone Delivery Canada announces update on Beausoleil and Georgina Island projects. Available from <https://www.newswire.ca/news-releases/drone-delivery-canada-announces-update-on-beausoleil-and-georgina-island-projects-839328635.html> [accessed 26 May 2023].

Flemons, K., Baylis, B., Khan, A.Z., Kirkpatrick, A.W., Whitehead, K., Moeini, S., et al. 2022. The use of drones for the delivery of diagnostic test kits and medical supplies to remote First Nations com-

munities during Covid-19. *Am. J. Infect. Control*, **50**(8): 849–856. doi:10.1016/j.ajic.2022.03.004. PMID: 35908822.

Forester, B. 2023. Budget 2023 continues ‘repetitive injustice’ of underfunding First Nations, says national chief | CBC News, CBC. Available from <https://www.cbc.ca/news/indigenous/budget-2023-afn-arc-hibald-1.6794077> [accessed 30 May 2023].

InDro Robotics. 2021. InDro Robotics delivers COVID-19 tests by drone in B.C., InDro Robotics, 23 April. Available from <https://indrorobotics.ca/2021/04/23/indro-robotics-finds-solution-in-delivering-covid-19-tests-in-b-c/> [accessed 26 May 2023].

Kirkness, V.J., and Barnhardt, R. 1991. First Nations and Higher Education: the four R’s—respect, relevance, reciprocity, responsibility. *J. Am. Indian Edu.* **30**(3): 1–15.

Mashford-Pringle, A., and Pavagadhi, K. 2020. Using OCAP and IQ as frameworks to address a history of trauma in indigenous health research. *AMA J. Ethics*, **22**(10): 868–873. doi:10.1001/amajethics.2020.868.

National Centre for Truth and Reconciliation. 2023. Available from <https://nctr.ca/> [accessed 26 May 2023].

Red Cross, Canadian. no date. Definitions-vulnerable-populations\_en.pdf. Available from [https://www.redcross.ca/crc/documents/How-We-Help/Current-Emergency-Responses/COVID-19/Emergency%20Support%20for%20Community%20Organizations/Definitions-Vulnerable-Populations\\_EN.pdf](https://www.redcross.ca/crc/documents/How-We-Help/Current-Emergency-Responses/COVID-19/Emergency%20Support%20for%20Community%20Organizations/Definitions-Vulnerable-Populations_EN.pdf) [accessed 26 May 2023].

Redvers, N., Poelina, A., Schultz, C., Kobei, D.M., Githaiga, C., Perdrisat, M., et al. 2020. Indigenous natural and first law in planetary health. *Challenges*, **11**(2): 29. doi:10.3390/challe11020029.

Schall, B. 2019. Commercial drones potential to reduce climate change in the 21st century. *Joule: Duquesne Energy Environ. Law J.* **7**: 1.

Schembri, L. 2022. Economic reconciliation: supporting a return to Indigenous prosperity. Available from <https://www.bankofcanada.ca/2022/05/economic-reconciliation-supporting-a-return-to-indigenous-prosperity/> [accessed 26 May 2023].

Smith, L.T. 1999. Decolonizing methodologies: research and indigenous peoples. Zed Books, London, England.

Snouffer, E. 2022. Six places where drones are delivering medicines. *Nat. Med.* **28**(5): 874–875. doi:10.1038/d41591-022-00053-9.

The First Nations Information Governance Centre. no date. The First Nations Principles of OCAP®. Available from <https://fnigc.ca/ocap-training/> [accessed 26 May 2023].

Transport Canada. 2023. Flying your drone safely and legally, AARV 13864973. AARV. Available from <https://tc.canada.ca/en/aviation/drone-safety/learn-rules-you-fly-your-drone/flying-your-drone-safely-legally> [accessed 2 June 2023].

UBC Faculty of Medicine, C. 2021. UBC receives \$750 K TD ready challenge grant to deliver health care supplies by drone to remote B.C. UBC Faculty of Medicine. Available from <https://www.med.ubc.ca/news/ubc-receives-750k-td-ready-challenge-grant-to-deliver-health-care-supplies-by-drone-to-remote-b-c/> [accessed 1 June 2023].

Wang, N. 2021. As it is Africa, it is ok? Ethical considerations of development use of drones for delivery in Malawi. *IEEE Trans. Technol. Soc.* **2**(1): 20–30. doi:10.1109/TTS.2021.3058669.

Wang, N., Christen, M., and Hunt, M. 2021. Ethical considerations associated with “humanitarian drones”: a scoping literature review. *Sci. Eng. Ethics*, **27**(4): 51. doi:10.1007/s11948-021-00327-4.

Wehipeihana, N. 2013. A vision for Indigenous evaluation keynote by Nan Wehipeihana, Community Research. Available from <https://communityresearch.org.nz/vision-for-indigenous-evaluation/> [accessed 26 May 2023].