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THE FIRST STEP TOWARDS ADDRESSING THE RCAF'S CBRN CAPABILITY DEFICIENCY

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AIM

1. The Royal Canadian Air Force (RCAF) is unable to operate in a Chemical Biological Radiological and Nuclear (CBRN) environment, and this is concerning based upon the recent activities of some western adversaries.[1] This paper was written with the assumption that the Canadian Armed Forces (CAF) would not operate in a contaminated area for an extended period of time, but rather, the CAF could find itself participating in the evacuation of personnel (e.g. a non-combatant evacuation operations, military withdraw, etc.) following a CBRN event (e.g. attack, accident, epidemic, etc.). As such, this paper will review the general requirement to temporarily operate an air mobility aircraft within a CBRN environment, provide potential courses of action to develop a CBRN capability, and recommend a plan to rectify this deficiency.[2]

INTRODUCTION

2. The risk of a CBRN event is on the rise, so the Canadian military needs to develop an ability to respond. Nation-states, such as Russia, Iran, and North Korea are actively advancing their nuclear weapon programs, and these activities have resulted in the United States withdrawing from the 1987 Intermediate-Range Nuclear Force (INF) Treaty and the Joint Comprehensive Plan of Action (a.k.a. "the Iran deal").[3] The Assad

[1] Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*. (Ottawa: DND Canada, 2017), 41; Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*. (Ottawa: DND Canada, 2017), 69.

[2] Emphasis should be placed upon a chemical threat and the equipment and procedures to mitigate chemical agents. That CBRN equipment and procedures should also provide adequate protection against biological agents and the hazards associated with particular matter produced by a nuclear weapon/accident.

[3] Arms Control Association, "*The Intermediate-Range Nuclear Forces (INF) Treaty at a Glance*," Last modified August 2019, https://www.armscontrol.org/factsheets/INFtreaty; The New York Times, "*Trump*

Regime used sarin and chlorine chemical weapons multiple times during Syria's ongoing "civil" war.[4] Di'ash (a.k.a. ISIL or ISIS), a non-state actor, developed and used chemical weapons several times while attempting to establish a caliphate.[5] The Government of Canada may also choose to assist an ally following a CBRN accident (e.g. a nuclear reactor breach, a release of toxic industrial materials, an epidemic, etc.). Canada also has treaty and alliance obligations that require member-states to maintain a CBRN defense capability.[6] The CAF needs to develop a CBRN capability so that it can provide the government with a means to respond following a CBRN event.

3. Providing assistance after a CBRN event is in-line with Canadian values and would likely involve a whole-of-government response. It is unlikely that the Government of Canada would put citizens into harm's way; therefore, it is incumbent upon the CAF to develop a flexible and robust capability to operate within a CBRN environment. Moreover, Canada's Defense Policy acknowledges the threats posed by CBRN weapons/devices and directs the CAF to develop a joint initiative to address these

Abandons Iran Nuclear Deal He Long Scorned," Last modified 8 May 2018, https://www.nytimes.com/2018/05/08/world/middleeast/trump-iran-nuclear-deal.html; Nuclear Threat Initiative, "*North Korea*," Last modified August 2019, https://www.nti.org/learn/countries/north-korea/

4 Arms Control Association, "*Timeline of Syrian Chemical Weapons Activity, 2012-2019*," Last modified March 2019, https://www.armscontrol.org/factsheets/Timeline-of-Syrian-Chemical-Weapons-Activity

[5] The New York Times, "*ISIS Used Chemical Arms at Least 52 Times in Syria and Iraq, Report Says*," Last modified 21 November 2019, https://www.nytimes.com/2016/11/21/world/middleeast/isis-chemical-weapons-syria-iraq-mosul.html

[6] Department of National Defense, DAOD 8006-0, *Chemical, Biological, Radiological and Nuclear Defence*, (Ottawa, DND Canada, 2019), para 4.11.

threats.[7] Neither the Canadian Army (CA) nor the Royal Canadian Navy (RCN) can respond quickly enough on their own, so the RCAF would likely be tasked to support.

DISCUSSION

4. The RCAF should assign resources to develop a CBRN capability in accordance with the *CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defense Operations'* five enabling components:[8]

a. Detection, Identification, and Monitoring;

b. CBRN Information Management;

c. Physical Protection;

d. Hazard Management; and,

e. Medical Countermeasures and Support.

This section of the paper will proceed by evaluating each of the enabling components, describe the required resources, and provide potential courses of action.

Enabling Component - Detection, Identification, and Monitoring (DIM)

5. DIM reconnaissance and surveillance teams are responsible for detecting CBRN threats, identifying agent(s), delineating the contaminated area, and monitoring for any

[7] Department of National Defence. *Strong Secure Engaged: Canada's Defence Policy*. (Ottawa: DND Canada, 2017), 54; Ibid., 86.

8 Department of National Defense, B-GL-005-380/FP-101, CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defence *Operations* (Ottawa: DND Ottawa, 2013),

changes.[9] These teams use a variety of passive and active sensors to provide updates to the information management team about the situation.

Enabling Component - CBRN Information Management

6. CBRN Information Management teams are responsible for processing CBRN defence-related information and managing the systems to disseminate CBRN defence data and hazard predictions.[10] The CBRN Information Management team is also responsible for managing the other CBRN teams and maintaining the CBRN operational picture.

Enabling Component - Physical Protection

7. This component encapsulates individual and collective protection so that personnel can continue to operate in a CBRN hazard environment, and includes measures to protect facilities and equipment (e.g. aircraft).[11] The CAF's traditional CBRN individual protective equipment is incompatible for use during aircraft operations. Aircrew CBRN systems are designed to provide above-the-neck protection, allow headsets to be plugged into the aircraft's radio suite, and connect to the aircraft oxygen system in the event of an emergency. This equipment protects aircrew personnel during

9 Department of National Defense, B-GL-005-380/FP-101, *CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defence Operations* (Ottawa: DND Ottawa, 2013), 3-16.

10 Department of National Defense, B-GL-005-380/FP-101, *CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defence Operations* (Ottawa: DND Ottawa, 2013), 3-17.

11 Ibid.

air operations and ground egress. Aircrew CBRN equipment, such as the XM69 or M50 gas masks, are currently not available for RCAF personnel.[12]

Enabling Component - Hazard Management

8. Hazard Management includes measures to limit the impact of a CBRN event. Hazard management is based upon the principles of pre-hazard precautions, exposure control, and decontamination.[13] The decontamination process can be broken into three phases. The first phase involves decontaminating personnel, the second phase involves decontaminating equipment (e.g. an aircraft), and the third phase involves treating hazardous by-products. The CA recently acquired the Decontamination Rapid Delivery System to decontaminate vehicles; but the army is not trained to decontaminate an aircraft.[14] The process to decontaminate an aircraft involves "weathering" (stand-alone in an isolated environment), "air washing" (flying the aircraft), and washing the aircraft with hot soapy water.[15] This procedure requires specialized equipment, which is laborious, time-consuming, requires large amounts of water, and generates a large amount of hazardous waste requiring disposal.[16] There are other strategies, such as using

12 United States Air Force. Air Mobility Command. "*New aircrew masks tested at Dover*." Last modified 8 Marc 2016, https://www.amc.af.mil/News/Article-Display/Article/785873/new-aircrew-masks-tested-at-dover/; Air Force Technology. "*Yokota C-130J Super Hercules aircrews to receive new gas mask*." Last modified 15 February 2019, https://www.airforce-technology.com/news/yokota-c-130j-super-hercules-gas-mask/

13 Department of National Defense, B-GL-005-380/FP-101, *CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defence Operations* (Ottawa: DND Ottawa, 2013), 3-17.

14 Trudel, Colin, email message to Kyle Welsh, 18 October 2019.

15 Oak Ridge National Laboratory, D*econtamination Strategy for Large Area and/or Equipment Contaminated with Chemical and Biological Agents using a High Energy Arc Lamp (HEAL)* (Tennessee: Department of Energy, 1 April 2009), v.

16 Ibid.

a High Energy Arc Lamp (HEAL) photolysis system, which is quicker, generates less waste, and is easier to deploy.[17] The use of an "aircraft condom" to provide a barrier between the outside environment and the cargo compartment of an air mobility aircraft is another invaluable tool to limit the spread of CBRN agents. The CAF does not currently have an aircraft decontamination capability, or "aircraft condoms." An effective CBRN response requires an all-encompassing solution.

Enabling Component - Medical Countermeasures and Support.

9. This component helps diminish the susceptibility to CBRN hazards, determine if personnel have been exposed, and provide medical treatment.[18] There are some unique aircrew considerations. For example, the use of pyrodostigmine bromide (PB) tablets, atropine-oxime, anti-convulsant auto-injectors are different for aircrew personnel.[19] In addition to caring for patients and casualties, the medical countermeasure staff are also responsible for providing medical advice to the local commanders.

Required Resources – CBRN Specialists

10. The RCAF needs CBRN subject matter experts. The Canadian Joint Incident Response Unit (CJIRU) is not staffed to provide on-going support to RCAF operations, so it is incumbent upon the Air Force to develop an integral solution.[20] 1 Canadian Air Division (1CAD) can facilitate this process by assigning a Staff Officer for Force

[17] Ibid.
[18] Department of National Defense, B-GL-005-380/FP-101, *CFJP 3-8.1, Chemical, Biological, Radiological, and Nuclear Defence Operations* (Ottawa: DND Ottawa, 2013), 3-17.
[19] Ibid.
[20] Lepage, Christian, email message to Kyle Welsh, 3 October 2019.

Protection - CBRN. This officer should take the lead in drafting 1CAD's CBRN defence policy and master implementation plan. This plan should include a concept of operation, terms of reference, and list the personnel, material, facility, and training requirements. Staff at the Wing Readiness Training Flights (WRTFs) have specialized training and a mandate to conduct CBRN training, but the WRTFs are often understaffed and lack the resources to conduct collective training exercises.[21] Filling the staff officer and CBRN instructor positions is the first step to improving the RCAF's CBRN defense know-how.

Required Resources - Training

11. Specialized training is required for each of the five enabling components. The Canadian Armed Forces Fire and CBRN Academy (CFFCA) runs several CBRN defense courses each year, including introductory, reconnaissance, surveillance, decontamination, and operation centre courses.[22] Once trained, these CBRN specialists and officers will be required to hold a high readiness posture.

12. NATO's *Aeromedical Training of Aircrew in Aircrew CBRN Equipment and Procedures* publication describes the baseline training for the crew's use of aircrew CBRN equipment.[23] This publication recommends initial and continuation training, with a focus on CBRN threats to air operations, the use of aircrew CBRN equipment, and proficiency under routine and emergency situations. Emergency scenarios, for example,

[21] Department of National Defense, Master Implementation Plan for the Implementation of Enhanced Wing Readiness Training Flights (Ottawa: DND Ottawa, 29 November 2004), 2-1.

[22] Department of National Defense, B-GL-005-380/FP-001, *CFJP 3-8, Chemical, Biological, Radiological, and Nuclear Defence* (Ottawa: DND Ottawa, 2012), 4-3.

[23] NATO. NATO Standardization Office. AAMedP-1.8 EDA V1 E, *Aeromedical Training of Aircrew in Aircrew CBRN Equipment and Procedures*, 2018.

need to include rapid decompression, failure of gas supply to the respirator, toxic fumes in the cockpit/cabin, and emergency egress. This training can be conducted during Operational Training Unit (OTU) courses, and Quarterly Simulator Requirements (QSRs).

Required Resources – Equipment

13. The following is a shortlist of equipment that will need to be acquired and maintained in order to maintain a CBRN response capability: detection and monitoring equipment; aircrew CBRN equipment; individual and aircraft decontamination equipment; and medical countermeasures. Some of this equipment already exists within the CAF, but some resources will need to be procured. For example, the CJIRU has testing equipment, the CA has decontamination equipment, and the Canadian Forces Health Services Group (CF H Svcs Gp) is in the process of acquiring infectious disease containment units to replace the CJIRU ambulance solution.

Course of Action (COA) Comparison

14. Tasking personnel into a CBRN environment will be a difficult decision, but it will be easier if personnel are appropriately trained and equipped to do the job.[24] There are three potential COAs that should be considered by the RCAF:

[24] CBRN threats should be considered in a similar fashion to the way that the CAF thinks about firearms. The CA does not have weapon systems to keep them off the battlefield when adversary with a riffle appears, and nor should the RCAF keep aircraft grounded when a CBRN event occurs. The RCAF should take proactive steps to prepare for this form of warfare.

a. COA 1 - Run. This COA calls for the development of a robust CBRN capability that can be task-tailored. The advantage of this COA is that the RCAF would be able to respond without relying upon support from the other elements or external organizations. Additionally, this skillset would improve the RCAF's reputation amongst our allies. The main disadvantage of this COA is that it requires a significant investment in terms of personnel, training, and equipment.

b. COA 2 - Walk. This COA calls for the development of two specialized CBRN capabilities within the RCAF, with an agreement that the other elements will provide the remaining enabling components. For example, the RCAF could agree to provide the Physical Protection component (e.g. the ability to temporally conduct air mobility operations within a CBRN environment), while CJIRU provides DIM and CBRN Information Management enabling capabilities, the CA provides the Hazard Management enabling capability (including aircraft decontamination), and the HSS provides the Medical Countermeasures and Support enabling capability. The advantage of this COA is that the personnel, training, and equipment costs are shared amongst the various elements. The primary disadvantage of this COA is the lack of ownership over the entire CBRN enterprise, which could make it challenging to train and maintain proficiency.

c. COA 3 - Sit. This COA calls for no change – essentially, the RCAF is unable to task aircraft into a CBRN environment. In this case, the CAF needs to inform the Government of Canada and advise their allies about this capability

deficiency so that those organizations can plan accordingly.[25] This COA would result in undesirable second and third-order effects because other government departments would be unable to support initiatives within regions that have a CBRN risk.[26]

CONCLUSION

15. The potential of a CBRN event (e.g. accident, attack, epidemic, etc.) is on the rise, and Canada's Defense Policy has directed the CAF to improve its CBRN capability. It is unlikely that the CAF would operate in a contaminated area for an extended period; however, the RCAF could find itself tasked to support the evacuation of personnel following a CBRN event. Unfortunately, the RCAF is unable to respond to a CBRN event at this time due to a lack of qualified personnel and specialized equipment. The CAF and NATO have similar CBRN defence defense; thus, the RCAF simply needs to implement that doctrine. Developing a CBRN defense capability is in-line with Canadian values and the vision of the RCAF, so the RCAF should take this opportunity to develop a capability before a CBRN event occurs.[27]

RECOMMENDATION

[25] NATO utilizes a system called a *Record of Reservation* to annotate any nation-specific deviations from the STANAG procedures. If the RCAF is unable to comply with the STANAG, then an annotation should be written in the applicable publications that reads, "CAN does not have the required equipment to protect the aircrew engaged in flight operations in a nuclear, biological and chemical warfare environment."

[26] Elizabeth, Gooding, email message to Kyle Welsh, 16 October 2019.

[27] Ibid.; RCAF Vision: An Agile and Integrated air and space force with the Reach and Power (AIRPower) essential to CAF Operations.

16. The RCAF, with the support of the other elements, should proceed with COA 2 – Walk. This is the most reasonable and cost-effective solution. Personnel shortages within the RCAF is probably the most challenging aspect of developing a CBRN capability, therefore splitting the personnel requirement across the elements will help manage that constraint. Cost and procurement is another limiting factor, so capitalizing on the equipment that is already in the military's inventory is worthwhile. Conducting collective training and maintaining a cohesive capability could be a challenge, but there are already international exercises that include CBRN training (e.g. Exercise MOBILITY GUARDIAN 2019). The RCAF should start developing a CBRN capability by focusing on the aspects that are specific to air operations, (e.g. aircrew equipment and training), while engaging the other elements to develop a robust CBRN capability that supports air mobility operations.

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