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## STATUS QUO IS NOT AN OPTION: EVOLVING SEARCH AND RESCUE CONCEPTS TO MATCH EMERGING TRENDS

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MASTER OF DEFENCE STUDIES

**STATUS QUO IS NOT AN OPTION: EVOLVING SEARCH AND RESCUE  
CONCEPTS TO MATCH EMERGING TRENDS**

By Major Rhonda Stevens

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**LIST OF ABBREVIATIONS**

AOR	Area Of Operations
ASG	Airborne Support Group
ATS	Air Traffic Service
CAF	Canadian Armed Forces
CAMSAR	Canadian Aeronautical and Maritime Search and Rescue
CAS	Chief of Air Staff
CASARA	Civil Air Search and Rescue Association
CBC	Canadian Broadcasting Corporation
CCG	Canadian Coast Guard
CCGS	Canadian Coast Guard Ship
CJOC	Canadian Joint Operations Centre
CONPLAN	Contingency Plan
C-NLOPB	Canadian-Newfoundland and Labrador Offshore Petroleum Board
CRS	Chief of Review Services
DHH	Directorate of History and Heritage
DND	Department of National Defence
DRDC	Defence Research and Development Canada
ELT	Emergency Locator Transmitter
EMO	Emergency Management Organization
GDP	Gross Domestic Product
GSAR	Ground Search and Rescue
IAMSAR	International Aeronautical and Maritime Search and Rescue

ICAO	International Civil Aviation Organization
ICSAR	Interdepartmental Committee of SAR
IMO	International Maritime Organization
JRCC	Joint Rescue Coordination Centre
LMSAR	Lead Minister Search and Rescue
MAJAID	Major Air Disaster
MCTS	Marine Communications Traffic Services
MLA	Member of Legislative Assembly
MND	Minister of National Defence
MRSC	Maritime Rescue Sub-Centre
NSP	National Search and Rescue Program
OAG	Office of the Auditor General
OGD	Other Government Department
RAF	Royal Air Force
RCAF	Royal Canadian Air Force
RCC	Rescue Coordination Centre
RCMP	Royal Canadian Mounted Police
RCN	Royal Canadian Navy
RCN	Rotary Wing
SAR	Search and Rescue
SAREX	Search and Rescue Exercise
SARSAT	Search and Rescue Satellite
SQN	Squadron
SOLAS	International Convention for Safety of Life at Sea
SRR	Search and Rescue Region

SRS .....	Search and Rescue Sub-Region
SSE .....	Strong Secure Engaged
TC .....	Transport Canada
TSB .....	Transportation Safety Board
UK .....	United Kingdom
UNCLOS .....	United Nations Convention on the Law of the Sea
US .....	United States
USCG.....	United States Coast Guard

## ABSTRACT

Delivering an effective and efficient Search and Rescue (SAR) service to Canadians is a core mandate of the government of Canada and is a service that Canadians rely on every day. As a result of climate change, new trends are emerging that will impact SAR operations, resulting in the need for improvements to the SAR response and prevention pillars of the National SAR Program (NSP). Unpredictable and extreme weather patterns along with changing topography including an increasingly accessible Arctic will change activity patterns. These changes bring with them increased safety demands to which Canada must be capable of responding in an effective and efficient manner.

To this end, Canada's SAR history, present day SAR system, emerging environmental trends and finally considerations for an improved response and enhanced prevention were examined. As a country that is often looked upon as a world leader in SAR and one with an obligation to serve its people, an enhanced SAR response posture that can reach anyone, anywhere, anytime within Canada's area of operations (AOR) is required. As every Canadian has a role to contribute to SAR, a holistic prevention program is also necessary. Enhancing these two pillars of the NSP will optimize the effectiveness and efficiency of Canada's SAR system and will ultimately be the difference between life and death.

## ACKNOWLEDGEMENTS

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Finally, I wish to acknowledge the true heroes, the dedicated Search and Rescue responders who continuously put the needs of others before themselves “*So That Others May Live.*” Rescue!

## STATUS QUO IS NOT AN OPTION: EVOLVING SEARCH AND RESCUE CONCEPTS BY PREPARING FOR THE FUTURE

### INTRODUCTION

“Mayday Mayday Mayday We’re Going Down” quite often are the last words transmitted by those in distress. They are also the same words that launch Search and Rescue (SAR) crews into action. Such was the case during the early morning hours on 24 November 1988. In high seas about 200 nautical miles southeast of Sable Island, a 6000 tonne freighter named *Katia* was taking on water and with the situation worsening, the vessel’s Captain declared a mayday and requested assistance. Upon receiving the transmission, the Joint Rescue Coordination Centre (JRCC) Halifax immediately launched a Labrador helicopter and a Buffalo airplane from 413 SAR Squadron in Summerside, Prince Edward Island.<sup>1</sup> Battling snow showers, raging winds, severe seas and extreme distances, the SAR crews persevered without hesitation and conducted a daring rescue that involved great risks saving all 27 lives. This SAR incident was one of the largest ocean rescues at the time that generated headline news across the country.<sup>2</sup>

It is now 30 years later, and the response to SAR incidents unfolds in very much the same manner. Granted, there have been equipment upgrades and technological advancements, but overall the SAR concepts themselves have gone unchanged. Canadians continue to heavily rely on this service but the nature and complexity of SAR incidents are no longer the same. This is in large part due to the changing environment and the unpredictability it generates and it begs important questions for Canada. Will the status quo guarantee the efficient and effective SAR service delivery to Canadians

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<sup>1</sup>D.J. Baker, *A History of 413 Squadron*, (Burnstown ON: General Store Publishing House 1997), 118-120.

<sup>2</sup>Ibid.

tomorrow and in the future? When another event such as the *Katia* unfolds or more recent events such as the crash of First Air Flight 6560 of 2011 in Resolute Bay or the capsized whale watching vessel *Leviathan II* of October 2016 off Tofino British Columbia, can Canada with complete confidence embark on a no-fail mission with the system in place? With the current capabilities in place such as three rescue coordination centres, an inventory of SAR aircraft, Coast Guard vessels located strategically throughout the country, and the support of volunteers, the presumed answer is yes; Canada can accomplish such rescues. However, new challenges are emerging due to factors involving climate change such as unpredictable and extreme weather patterns along with changing topography leading to an increasingly accessible Arctic. A rise in activity levels are changing the boundaries and scope of behaviours impacting existing vulnerabilities and resulting in unintended consequences. These changes bring with them increased safety demands to which Canada must be capable of responding.

In an era of unpredictability, Canada cannot stand on the sidelines passively and rely on status quo, hope, or luck as a means to an end. The Canadian Armed Forces (CAF) is the principle agency responsible for the effective operation of the federally coordinated aeronautical and maritime SAR system and also for the provision of air resources in response to aeronautical and maritime SAR incidents.<sup>3</sup> The Canadian government released its Defence Policy *Strong, Secure, Engaged (SSE)* on 7 June 2017 and highlighted SAR as one of its topic priorities and core missions.<sup>4</sup> The Minister of National Defence (MND) Harjit Sajjan affirmed that in terms of Canada's SAR

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<sup>3</sup>Department of National Defence/Canadian Coast Guard, B-GA-209-001/FP-001-DFO 5449, *Canadian Aeronautical and Maritime Search and Rescue Manual*, (Ottawa: DND/CCG, 2014), 1.06.1, 1 of 4.

<sup>4</sup>Department of National Defence, *Strong Secure Engaged Canada's Defence Policy*, (Ottawa: Minister of National Defence, May 2017),14.

responsibility, the CAF is ready and able to assist Canadians who are in peril. For the first time, Canada's defence policy commits a 20-year funding commitment for new investments.<sup>5</sup> In addition to the promise of funding, this policy is unique in the means by which it was developed. The policy was not developed with a dollar figure or gross domestic product (GDP) percentage in mind, but rather through open and comprehensive consultation with Canadian citizens that saw more than 20,000 people participate and provide their perspective on what is important to Canada.<sup>6</sup> The clear consensus was that the safety of Canadians is the top priority. Having 75 years of SAR experience to build upon and an assurance that protecting Canadians will continue to remain an overarching priority of the CAF, now is the time to be proactive in identifying key areas of improvement to match emerging trends and shape Canada's future SAR system.

The National SAR Program (NSP) is designed, postured and ready to aid persons in distress when the need arises. The program consists of a system of systems approach, incorporating a diverse group of government, military, industry and volunteer organizations to collaboratively provide SAR services. By the virtue of its history, expertise and capabilities, the CAF is looked to as a national leader for SAR, and therefore needs to be front and centre with the most robust system available, especially considering that the end state is saving lives.

A recently released Standing Senate Committee report *Reinvesting in the Canadian Armed Forces: A Plan for the Future May 2017* identifies challenges associated with SAR operations in Canada. The environment is extremely challenging with an expansive area of operations, and the varied and demanding climate along with

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<sup>5</sup>Harjit Sajjan, speech, Defence Policy "Strong, Secure, Engaged" Ottawa, 7 June 2017.

<sup>6</sup>Ibid.

the country's widely dispersed population pose difficult challenges.<sup>7</sup> As highlighted by the Department of Public Safety in their Quadrennial SAR Review:

Against this backdrop, commercial and recreational activity in Canada is high, with some twelve million aircraft movements and over six million recreational boaters out on the water every year, and with Canadians and foreign tourists engaging in popular – and often risky – outdoor sports and recreation activities. This is the demanding context that drives the national SAR system – a system that is called upon to respond to more than 15,000 calls each year, and which provides assistance to over 25,000 people.<sup>8</sup>

This high level of activity combined with the unpredictability of the environment and the threat of climate change will result in new challenges for Canada's SAR system.

Reaching all corners of Canada's area of operations (AOR) in an efficient manner will be the difference between life and death. A decade ago, few organizations had the ability to operate in the Arctic; however climate change and advanced technology are leading to an increasingly accessible Arctic. Over the past two years, Arctic maritime activity has continued to evolve with notable activities such as the maiden voyage of the *Crystal Serenity* cruise ship through the North West Passage enabling 1725 crew and passengers onboard to partake in a novel experience of sailing in Canada's far North.<sup>9</sup> During the defence policy announcement, the MND stated: "Change is a fact of life. Technology and the changing nature of conflict itself have fundamentally altered the landscape on which we operate. That rapid change will continue, so we must be more

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<sup>7</sup>House of Commons, Standing Senate Committee on National Security and Defence, *Reinvesting in the Canadian Armed Forces: A Plan For the Future* (Ottawa: May 2017), 57.

<sup>8</sup>Department of National Defence, *Quadrennial Search and Rescue Review* (Ottawa: Public Works and Government Services Canada, 2013), 5, <https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/archive-nss-qdrnrl-rvw/archive-nss-qdrnrl-rvw-en.pdf>.

<sup>9</sup>Crystal Cruises, "Northwest Passage Explorer," last accessed 2 December 2017, <http://www.crystalcruises.com/voyage/details/northwest-passage-explorer-7320>.

agile than in the past.”<sup>10</sup> This increased agility not only includes focus on the response to SAR incidents but also to preventing them.

Given that SAR is a no fail mission, this study will prove that improvements to the response and prevention pillars of the NSP consistent with the emerging environmental and activity trends in Canada are required to optimize the effectiveness and efficiency of Canada’s SAR system. The main focus of this research will be centred on the CAF’s primary area of responsibility: aeronautical and maritime SAR; however, a section of this paper will delve into the NSP structure factoring in Ground SAR. This paper aims to analyze the CAF’s contribution to the response and prevention pillars of the NSP and to assess if the current system is capable of effectively delivering this lifesaving service to all Canadians, at any location in Canada, now and in the future. This study will specifically consider challenges unique to the Arctic region, and will also explore the overarching prevention piece of SAR with focus on enhancing collaboration, legislation and education initiatives.

There are two key reasons why this study is important. First, as captured by the most recent Commander of the Canadian Joint Operations Command (CJOC) in his latest SAR directive, “[it is] through the domestic SAR operation, [that] the citizens of Canada see their Canadian Armed Forces in action, protecting Canadian[s] and those that find themselves in peril throughout the vast Canadian SAR region, no matter their nationality.”<sup>11</sup> Canada has an obligation to provide an effective SAR service, one that Canadians can rely on. Secondly, as highlighted in the Royal Canadian Air Force (RCAF)

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<sup>10</sup>Harjit, Sajjan, speech, Defence Policy ..., 7 June 2017.

<sup>11</sup>Department of National Defence, *Canadian Joint Operations Command SAR Directive 01-2017*, (Canadian Joint Operations Command: file 3385-1/RDIMS 421945, May 2017), 1 of 4.

*Future Concepts Directive 2016*, optimizing SAR posture and capabilities to best respond to SAR incidents is important due to the size of the country, anticipated increase in commercial and civilian flying and maritime operations as well as increased accessibility and seasonal use of the Arctic.<sup>12</sup> Canada is changing and the SAR system must evolve to remain effective. In order to explore how this evolution can happen, this study is divided into four chapters.

Chapter one will explore the history of SAR in Canada and provide background on how the RCAF became responsible for aeronautical SAR and for SAR coordination. It will also set the context behind the expansion of the RCAF responsibilities including maritime SAR and will demonstrate how and why Canada's SAR system is shaped the way it is today.

Chapter two will examine the present SAR system in Canada, focusing specifically on the AOR, roles and responsibilities of key stakeholders, and the CAF's response posture. A review of the SAR agreements and partnerships that impact the SAR response delivery will highlight the multi-departmental approach and the complexity and uniqueness of the system. Furthermore, chapter two will explore the risks and challenges that SAR responders in Canada encounter taking into account the vastness of the Canadian Search and Rescue Region (SRR) and the various magnitudes of disasters that can occur. A review of selected key SAR missions will be used to highlight the challenges of operating in a unique environment.

Chapter three will analyze the CAF's contribution to the response pillar of the NSP highlighting the debate and controversy that it often generates. A comparison to

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<sup>12</sup>Department of National Defence, *Future Concepts Directive Part 2: Future Air Operating Concept* (Ottawa: DND Canada, 15 August 2016), 8.

nations that conduct similar types of SAR operations and also to the civilian entity of Cougar Helicopters will be conducted to relate how Canada's SAR service rates in comparison to other countries and providers. This chapter will also examine the CAF's summer SAR posture trial initiative as well as address the suitability of the CAF's location of primary SAR assets to determine if these current SAR concepts are effective or require modifications. Lastly, chapter four will consider the SAR prevention pillar of the NSP focusing on collaboration, legislation and education. In addition, it will offer recommendations and propose the way forward to re-shape current SAR concepts and better align them with emerging trends.

### **Research Methodology and Literature Review**

The rapid change and unpredictability associated with climate change in Canada has proven to be an issue of significant focus and concern. Nevertheless, the impact it will pose on the conduct of SAR operations is an area of study that has been broached but not sufficiently explored. A series of recent studies recognize environmental trends and impacts that are emerging in Canada<sup>13</sup> and also identifies challenges that are associated with this change, especially in Canada's Arctic.<sup>14</sup> Academic literature specifically dedicated to Arctic challenges has increased over the past decade, as the north is becoming more accessible and generating new interest.

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<sup>13</sup>Sources include: Department of National Defence, *Strong Secure Engaged Canada's Defence Policy*, (Ottawa: Minister of National Defence, May 2017).

House of Commons, Standing Senate Committee on National Security and Defence, *Reinvesting in the Canadian Armed Forces: A Plan For the Future* (Ottawa: May 2017).

<sup>14</sup>Sources include: Danys, Poitras, "Search and Rescue in the Arctic," in *Canadian Armed Forces Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned*, Fredericton: University of New Brunswick The Gregg Centre for the Study of War & Society Book Series, no.1, (2017). Franklyn, Griffiths, Rob Huebert, and P. Whitney Lackenbauer, *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*, (Waterloo: Wilfrid Laurier University Press, 2011).

Primary sources drawn from government and the Department of National Defence (DND) reinforce the importance of the CAF's contribution to SAR but also highlight the fact that investments and optimization to the system will be required in the future. Short-term initiatives and trials of varying levels have been published in CAF operational level documents but studies and assessments regarding the future of SAR operations that includes analytics and factors such as costs, resources, and lives affected has yet to be promulgated. The CAF operational level documents branch and stem from the overarching primary source material used in this study such as the International Aeronautical and Maritime SAR Manual (IAMSAR), United Nations Convention on the Law of the Sea (UNCLOS) and other International SAR treaties, conventions and agreements that provide the legal basis for SAR.<sup>15</sup> In addition, evidence from reports, inquiries and investigations that included the Auditor General's Report on SAR, the Offshore Helicopter Safety Inquiry and various aeronautical and maritime Transportation Safety Board reports from SAR incidents proved to be valuable to this study and supported the need for additional research.<sup>16</sup>

Although somewhat limited, secondary sources were drawn upon to provide insight into SAR activities and the realism and challenges that SAR responders confront.

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<sup>15</sup>Sources include: International Maritime Organization / International Civil Aviation Organization, *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*, Volumes I-III (London: IMO/ICAO, 2003). Department of National Defence/Canadian Coast Guard, B-GA-209-001/FP-001-DFO 5449, *Canadian Aeronautical and Maritime Search and Rescue Manual*, (Ottawa: DND/CCG, 2014). United Nations, International Maritime Organization, "International Convention on the Law of the Sea, (UNCLOS), 10 December 1982.

<sup>16</sup>Sources include: Office of the Auditor General of Canada, *2013 Spring Report of the Auditor General of Canada*, Chapter 7: Spring 2013. Newfoundland and Labrador Public Inquiry, *Offshore Helicopter Safety Inquiry* (St. John's, NL: Canada - Newfoundland and Labrador Offshore Petroleum Board, October 2010). Transportation Safety Board, "*Marine Investigation M05N0072, Capsizing and Loss of Life Melina & Keith II Bonavista, Newfoundland and Labrador, 70nm E 12 September 2005.*" Transportation Safety Board, "*Marine Investigation M15P0347, Capsizing and Loss of Life Leviathan II Clayoquot Sound, British Columbia 25 October 2015,*" 14 June 2017. Transportation Safety Board, "*Aviation Investigation Report A11H0002, Controlled Flight Into Terrain, Bradley Air Services Limited (First Air) Boeing 737-210C, C-GNWN Resolute Bay, Nunavut 20 August 2011.*"

An initiative by the CAF that serves as a beneficial source of information and enhances the accuracy of secondary sources is the addition of camera equipment to SAR aircraft and aircrew that captures still and live imagery from the mission and serves as a critical tool in communicating the SAR message to Canadians.<sup>17</sup> The guideline for this initiative is captured in the CAF's Search and Rescue Imagery Directive.

Finally, research of SAR history proved to be challenging due to limited resources. Secondary sources such as the SAR squadron history books, the Para Rescue trade historical account and works by writers such as the famous Canadian aviation author Larry Milberry provides valuable insight on the overall evolution of the RCAF history and specifically the origin of SAR in Canada. Extensive research has been conducted in this field over the past few years by a number of RCAF officers and SAR professionals including Clint Mowbray and James Pierotti. Their research examined the many changes that occurred within the RCAF SAR organization in the past due to resources, demand, and technology and supports the notion that the SAR system continues to evolve and without due consideration of lessons learned from the past, the organization will continue to repeat previously made mistakes.<sup>18</sup> These works have been recognized as potentially being the most thorough accounts of RCAF SAR history available.<sup>19</sup>

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<sup>17</sup>Department of National Defence, *Search and Rescue Imagery Directive 2016* (Ottawa, Canadian Joint Operations Command: file 3350-1, 26 February 2016).

<sup>18</sup>Ibid., 3.

<sup>19</sup>Sources include: G.Y Smith, *Seek and Save: The History of 103 Rescue Unit* (Erin: The Boston Mills Press, 1990). Para Rescue Association of Canada, *That Others may Live: 50 Years of Para Rescue in Canada, 1944-1994* (Astra, ON: Para Rescue Association of Canada, 1994). Larry Milberry, *Air Transport in Canada: Volume 1* (Toronto: CANAV Books, 1997). Clint Mowbray, "Lessons Forgotten? A Historical Examination of the RCAF Search and Rescue Organization" (Joint Command and Staff Program Master of Defence Studies, Canadian Forces College, 2014). James Pierotti, "Reluctant to Rescue: The RCAF and the Search and Rescue Mandate, 1939-1959," (Royal Military College of Canada: March 2016).

**Conclusion**

Having originated in Canada more than 70 years ago during a time of necessity, the SAR service of today is very much in demand and one that Canadians can count on. The safety and protection of all Canadians continues to be a priority for the government of Canada. Recognizing that the current system must evolve to adapt to future challenges is necessary to maintain an effective and efficient system. To understand the basis of the system in place today and the needs for the future, examining the history of the RCAF SAR organization is a logical place to start.

## CHAPTER 1 - SEARCH AND RESCUE IN CANADA – HOW IT CAME TO BE

*I believe that the more you know about the past, the better you are prepared for the future.*

~ Theodore Roosevelt

### **Introduction**

Commencing this study with an examination of the history of Canada's SAR system is important to provide context regarding the system that is in place today. As with any historical study, the linkages between the past and present provide valuable lessons and insights that can be built upon moving forward. Understanding why and how the system was conceived, its organizational background and the assignment of responsibilities and resources will better assist with framing the challenges of today.

Prior to the establishment of an organized SAR system in Canada, rescues were conducted on an ad hoc basis generally by anyone who had a means of reaching those in distress.<sup>20</sup> In particular, bush pilots were instrumental in effecting many rescues especially those in remote locations. The ingenuity and perseverance of these pilots foreshadowed what would eventually become a formal rescue system. The birth of powered flight combined with the expansion of this novel concept during the outbreak of the Second World War generated the need for a reliable and organized system to save lives. This chapter will explore how this organized system came to be and capture some of the most relevant rescues that paved the way to where Canada's SAR system is today.

### **The Concept of Aviation Takes Off**

The notion of powered flight was achieved in the early 1900s with the success of the Wright brothers who amazed the world with the first powered aircraft flight and inspired the creation of additional flying machines. It was less than a decade later on 23<sup>rd</sup>

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<sup>20</sup> Mowbray, *Lessons Forgotten ...*, 6.

February 1909, that aviation pioneer and engineer from Baddeck, Nova Scotia, John A. McCurdy, placed aviation on the map in Canada when he successfully made the first powered flight in the country in the Silver Dart. These fascinating innovations drove aviation enthusiasts to learn more, driving research and experimentation through trial and error. McCurdy credited for making the first ocean flight from Florida to Cuba was forced to ditch in the ocean after his aircraft experienced an engine failure.<sup>21</sup>

The plan established for his rescue consisted of a chain of six United States (US) Naval ships stretched along the entire 96-mile distance between the southern tip of Florida to Havana, each one within sight of the next. The ships were used to aid McCurdy to remain on course by flying from ship to ship following the smoke that each vessel would belch into the sky as a signal. In the unfortunate event of a mishap, McCurdy would be within sight of at least one and maybe two of the ships that could rescue him from the water. By all accounts, this rescue plan was brilliant. With land in sight and on the cusp of setting a new aviation achievement, McCurdy's engine shut down requiring the US Navy torpedo boat USS *Terry* to race to the scene and pluck McCurdy out of the water.<sup>22</sup>

Although it was the accomplishment of this long distance flight that garnered attention from the world, the rescue plan cannot go unnoticed, as it was unbelievably remarkable, executed perfectly with McCurdy not even getting his feet wet.<sup>23</sup>

Interestingly enough, these original rescue ideas that were conceived for the first flight

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<sup>21</sup>Leslie, Roberts, *There Shall be Wings: A History of the Royal Canadian Air Force*. (London: George G. Harrap, 1960), 6.

<sup>22</sup>Thomas, Van Hare, "The Online Magazine of Aviators, Pilots and Adventurers since 1997," *Historic Wings*, last accessed 4 March 2018, <http://fly.historicwings.com/2013/01/mccurdys-crossing/>.

<sup>23</sup>Ibid.

over water are still incorporated more than a century later in SAR methods and procedures around the world.

### **The Birth of an Idea - “The Race Against Death”**

The popularity of aviation continued in Canada over the next decade with the aviation industry expanding significantly. Professional militaries quickly recognized the strategic value of aircraft during the First World War. Flying schools and camps were created to train personnel to operate and maintain aircraft and by the end of the war, approximately 13,000 trained aviators and mechanics returned to civilian life looking for a means to use their new weapon of war during peacetime.<sup>24</sup> To encourage the development of aviation after the Great War, Britain offered each colony a gift of surplus aircraft, with Canada’s share including more than 100 First World War-era machines of various types.<sup>25</sup> The value of having aircraft that could access remote locations in a short amount of time was recognized. It did not take long before authorities began calling upon pilots, specifically bush pilots for a purpose that would garner attention and praise from around the world – saving lives.

One of the mercy flights to be conducted in Canada was by a man whose insight and compassion for saving lives would eventually become a legend.<sup>26</sup> An experienced bush pilot and First World War flying ace, Wilfred (Wop) May was a leading post-war aviator in Canada. His connection to mercy missions came about when the Alberta government called upon him in January 1929 to carry out a life-saving mission in very challenging conditions. Word was slowly spreading that a businessman in Fort Vermillion

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<sup>24</sup>Roberts, *There Shall be Wings ...*, 1960), 31.

<sup>25</sup>Ibid., 34-35.

<sup>26</sup>A mercy flight is defined as an aircraft flight to bring a seriously ill or injured person to hospital from an isolated community.

Alberta was seriously infected with diphtheria, and the anti-toxin inoculation was required to save his life and prevent an outbreak at the isolated post.<sup>27</sup>

After a brief assessment of the situation and without hesitation, Wop May accepted the humane mission albeit in extreme conditions. In an open cockpit aircraft, sub-zero degree temperatures, he flew over dense timberland and sparsely populated country successfully delivering the medicine, which saved the life and also prevented an epidemic outbreak. The world became extremely interested in the mission known as “the race against death,” and with media assistance public support for bush pilots and their new role of saving lives increased.<sup>28</sup> Wop May himself conducted 24 mercy flights between 1932 and 1934 in addition to numerous searches for aircraft that had gone missing.<sup>29</sup> A hero in every right for the many lives he saved as a bush pilot, Wop May’s legacy had only begun. A decade later, he found the para-rescue service in Canada, a service still used today to save lives.<sup>30</sup>

Courageous and innovative pilots eagerly stepped forward in the most challenging conditions when called upon to render assistance without knowing that their deeds were paving the way to a formalized search and rescue system. Another remarkable bush pilot whose perseverance and grit is worthy of credit is Grant McConachie. On an autumn day in October 1932 in the midst of the fall freeze, 23-year old McConachie from Edmonton eagerly accepted the challenge of conducting a rescue flight to a remote region 150 miles north of Edmonton. The call was urgent as two men were in desperate need of medical aid after the stove in their trappers cabin exploded leaving them both with severe burns.

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<sup>27</sup>Sheila Reid, *Wings of a Hero: Canadian Pioneer Flying Ace Wilfrid “Wop” May* (St. Catharines, ON: Vanwell Publishing, 1997), 41, <http://www.wopmay.com/rcaf-air-rescue-service/>.

<sup>28</sup>Para Rescue Association of Canada, *That Others may Live: 50 Years of Para Rescue in Canada, 1944-1994* (Astra, ON: Para Rescue Association of Canada, 1994), 11.

<sup>29</sup>Larry Milberry, *Air Transport in Canada: Volume I* (Toronto: CANAV Books, 1997), 83-84.

<sup>30</sup>Para Rescue Association of Canada, *That Others may Live ...*, 29.

Not overly experienced, McConachie had practiced barnstorming a few months earlier and received some first aid instruction from a doctor.<sup>31</sup>

The flight was deemed ‘too risky’ to allow a doctor to go, so McConachie took with him a box of medical supplies and his mechanic. The mission required significant innovation and perseverance to complete due to many obstacles and challenges along the way. An austere landing area at the remote location required an extremely innovative take off that involved tying the tail of the aircraft to a tree along a slope to extend the takeoff distance. Fortunately, this unconventional and daring invention resulted in McConachie saving two lives that would have otherwise perished.<sup>32</sup> The courage of bush pilots such as Grant McConachie and Wop May not only saved lives but also introduced search and rescue methods that would foreshadow the official formation of SAR in Canada.<sup>33</sup>

### **Organized SAR - Air-Sea Rescue Evolves**

At the same time that mercy flights and rescue missions were being conducted in a non-organized fashion, the possibilities of aviation in a frontier country were growing. This expansion resulted in the requirement for aviation regulation, control and safety, which led to the creation in June 1919 of Canada’s first governing body for aviation, the Air Board. In fact, as Leslie Roberts noted, “Canada was the first country to enact rules covering the whole domain of flight.”<sup>34</sup> Under the Air Board, a non-permanent force, the Canadian Air Force evolved which four years later on 1 April 1924 became a permanent force known as the Royal Canadian Air Force (RCAF). The RCAF centred its focus on peacetime applications of aviation that included supporting other government

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<sup>31</sup>Rex Cranmer, “From Bush to Jet,” Redfusion Media, last accessed 4 March 2018, <http://www.redlandsfortnightly.org/papers/bushjet.htm>.

<sup>32</sup>Ibid.

<sup>33</sup>Para Rescue Association of Canada, *That Others may Live ...*, 10.

<sup>34</sup>Ibid., 32-33.

departments through activities such as aerial mapping, photography, forestry, and communications.<sup>35</sup> As a result, Canadian air force pilots became known as “bush pilots in uniform.”<sup>36</sup> Very little flying was conducted over water and the presence of considerable merchant shipping was regarded sufficient to render assistance.<sup>37</sup>

It was in the early years of the Second World War that the world rapidly responded to the urgent need for an organized air and sea rescue service. With the outbreak of hostilities, aircraft production was increased around the world and aerial combat was extensive resulting in forced landings and crashes. The Battle of Britain in 1940 had confirmed that combat operations over water would require some form of an organized Air-Sea Rescue capability. In 1942, the Air Force Headquarters determined that there was an urgent need for a Flying Control Organization with an embedded Air-Sea Rescue capability based on the model established by the Royal Air Force (RAF) during the Battle of Britain; one organization for sea search and rescue and the other for land.<sup>38</sup>

The RCAF Air-Sea Rescue was less robust than the RAF model, and was faced with a number of deficiencies.<sup>39</sup> RCAF aircraft became essential for conducting overwater searches for wartime aircraft that had crashed or ditched but had no survival equipment to drop and no means to conduct the rescue. With the Royal Canadian Navy's

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<sup>35</sup>W.A.B, Douglas, *The Creation of a National Air Force. The Official History of the Royal Canadian Air Force Volume II*, (Toronto: University of Toronto Press, 1986), 65-75.

<sup>36</sup>Allan Douglas English, *The Cream of the Crop: Canadian Aircrew, 1935-1945*, (Montreal: McGill-Queen's University Press, 1996), 11.

<sup>37</sup>Para Rescue Association of Canada, *That Others may Live ...*, 12.

<sup>38</sup>Norman, Franks, *The RAF Air Sea Rescue Service in the Second World War*, (Havertown: Pen and Sword, 2016), 2-4.

<sup>39</sup>DHH, 181.009 (D4389), RCAF File S202-85-2, WAC No.2 Group Standing Orders for ASR Jun to Sep 42, September 1942, “Draft Standing Orders for Air/Sea Rescue Services in the RCAF.”

efforts dedicated to deep-sea battle and limited government vessels and volunteer personnel, the RCAF was the only organization with rescue resources close to shore.<sup>40</sup>

Despite the establishment of a rudimentary system with limited resources, the system worked due to the will to save lives - any life: even those of the enemy. Norman Eastmead, one of the first Royal Air Force Air-Sea rescue crewmembers of 1940, sums up nicely the role of SAR responders:

At the beginning of the war there were a lot of dog fights going on over the channel, and we had to be at sea for anyone who fell out of the sky to bring them home again, so that was basically our job. Pilot rescue, and bomber crews. We never asked for a passport, it never worried us whether they were Army, Navy, Air Force, male, female, it made no difference to us, it was always some mother's son or daughter. If it was a German we picked up, we brought him back to England, POW camp, at least he went home to Mum at the end of the war. The Air-Sea Rescue covered the whole world ... No definite figures have been put out for the number of rescues, but it has been estimated that some twentyfive [sic] thousand lives were saved world wide. That's a lot of mother's sons.<sup>41</sup>

The same layers of passion and dedication that existed then continue to exist now. SAR is one of the few areas where people are not judged or discriminated. The objective is to save lives.

While maritime rescue had escalated, bush pilots such as Wop May also saw an increase in overland rescues. The construction of the Alaska Highway in response to Japanese encroachments on this American state put demands on aviation, with thousands of aircraft flying from Edmonton to Alaska in support of the project. Most American pilots were unaccustomed to the bitter cold temperatures, icing, and other conditions

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<sup>40</sup>Clayton Evans, *Rescue at Sea: An International History of Lifesaving, Coastal Rescue Craft and Organisations* (London: Conway Maritime Press, 2003), 208.

<sup>41</sup>British Broadcasting Corporation (BBC), "WW2 People's War, An archive of World War Two memories," last updated 15 October 2014, <http://www.bbc.co.uk/history/ww2peopleswar/stories/28/a5717928.shtml>.

associated with bush flying in the North.<sup>42</sup> Wop May who at the time was in charge of No. 2 Air Observer School in Edmonton was flooded with calls to search for lost planes, and lost crews totally untrained to take care of themselves in the wilderness. On many of the searches where the crashed aircraft was located, it was usually too late to save anyone onboard. Determined and inspired to find a rescue solution, Wop May organized and developed a para-rescue team that would be able to parachute into the crash site and administer first aid.<sup>43</sup> This initiative turned out to be one of the first parachute rescue teams of its kind in the world.<sup>44</sup> It is still functional and effective today, 74 years later and credited for saving thousands of lives.

### **The RCAF Becomes Responsible for SAR**

As the war came to an end, the federal government recognized the need for a structured SAR system in Canada. To this point, the majority of SAR missions stemmed from wartime necessity with municipal agencies or the Royal Canadian Mounted Police (RCMP) involved with coordination efforts. In 1944, the government established an Interdepartmental Committee on Search and Rescue (ICSAR) chaired by RCMP with the task of examining the SAR organization and providing recommendations.<sup>45</sup> The findings were presented to cabinet in December 1945 who recognized the requirement for a professional SAR service but proposed that it be created using existing military resources and be led by the Department of National Defence (DND) for Air.<sup>46</sup> The government

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<sup>42</sup>Philip H. Godsell, *Pilots of the Purple Twilight: The Story of Canada's Early Bush Flyers*, (Toronto: Ryerson Press, 1995), 219-221.

<sup>43</sup>Sheila, Reid, *Wings of a Hero ...*, 89.

<sup>44</sup>Para Rescue Association of Canada, *That Others may Live ...*, 14.

<sup>45</sup>G.Y Smith, *Seek and Save: The History of 103 Rescue Unit* (Erin: The Boston Mills Press, 1990), 11.

<sup>46</sup>Department of National Defence, Aide Memoire on SAR submitted with Memorandum for Cabinet Defence Committee: procurement of SA16B Aircraft, from Minister of National Defence, 26 Jan 1959, (DHH) Appendix A.

approved this principle, and in January 1946, appointed the RCAF to assume formal chairmanship of ICSAR with the overall responsibility to coordinate and supervise SAR.<sup>47</sup>

Under the lead of the RCAF, the ICSAR committee consisted of existing services in cooperation. The RCMP, Royal Canadian Navy (RCN), Canadian Army, Departments of Transport, Justice and Fisheries together formulated and submitted a plan to Cabinet that would maximize use of existing equipment and facilities.<sup>48</sup> The plan was approved on 18 June 1947. This date marks the official birthdate of the RCAF SAR system, commencing the RCAF's formal obligation to provide resources and coordinate air rescues in Canada.<sup>49</sup> The collaboration of the 'existing services in cooperation' predicated the system of systems approach still used today.

Another organization that was instrumental to the expansion of SAR in Canada and around the world was the International Civil Aviation Organization (ICAO). The ICAO consisted of 52 nations and was originally created to promote the safe and efficient development of civil aviation.<sup>50</sup> As a member of the ICAO, Canada established itself as a world leader in SAR early by assuming responsibility for international air traffic in Canadian territory and areas adjacent to both the east and west coasts. In January 1947, ICAO recommended that its members establish a Rescue Coordination Centre (RCC) to coordinate search activities. Although this recommendation was made prior to the RCAF having been formally appointed to lead SAR in Canada, the RCAF anticipated direction

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<sup>47</sup>Ibid., 1.

<sup>48</sup>Ibid., 31.

<sup>49</sup>Mike Mroz, "CF Search and Rescue turns 50," Roundel 4, no. 11 (Sep 1997): 10.

<sup>50</sup>David, MacKenzie, *ICAO: A History of the International Civil Aviation Organization* (Toronto: University of Toronto Press, 2010), 28,40,51.

was forthcoming and in consultation with ICSAR members opened its first RCC in Halifax.<sup>51</sup>

ICAO further recommended the establishment of a long-range search aircraft network to provide coverage for the entire Atlantic Ocean and advised nations to consider the use of helicopter technology. The RCAF committed to this task by pulling three long-range Lancaster aircraft from storage and converting them from bomber configuration to SAR. The same was done with the Dakotas, Norseman and Canso flying boats. Seven Sikorsky H-5 helicopters were also purchased, of which five were used for SAR. In total, 34 aircraft were allocated for primary SAR and distributed across the country at ten locations. Additionally, the Para-Rescue Technicians conceived by Wop May had been integrated into the RCAF and assigned to the rescue squadrons. The evolution of RCAF SAR continued under Organization Order 855 which saw the RCAF decentralize SAR to command levels and operations were conducted by Rescue Units under the control of one of five new RCCs located throughout the country.<sup>52</sup> It should be noted that although air resources were called upon from the RCAF to respond to distress calls, additional resources from other squadrons, the RCMP, or the RCN could be requested to assist as is still done today.

After a full year in operation, DND produced a report capturing the volume and types of SAR cases that the RCAF carried out in its first year as an organized entity. It stated that “One hundred and sixteen missions were undertaken during the year, of which forty-two were searches for missing aircraft, thirty-five for missing vessels, twenty-eight for the evacuation of sick or injured persons and eleven for the provision of medical

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<sup>51</sup>Para Rescue Association of Canada, *That Others may Live ...*, 31.

<sup>52</sup>*Ibid.*, 33, 40.

assistance.”<sup>53</sup> The prosecution of these missions resulted in the RCAF flying approximately 2,600 hours. As the awareness of this SAR service spread amongst the public, the volume of cases increased, doubling in its second year validating the requirement for an organized system.<sup>54</sup> Despite the success of this new system, it did come with its challenges.

### **Leaps and Bounds – Continued Transformation (1950 – Present)**

Although primarily responsible for coordinating air rescues in Canada, the RCAF on an informal basis used its resources to respond to approximately the same amount of maritime cases in its first year of operation. The RCCs were operated by RCAF officers with minimal to nil marine experience. Despite the majority of federal departments being members of ICSAR, coordination of maritime SAR was one area that lacked clarity. This may have been in part due to Canada having become a partner in the International Convention for Safety of Life at Sea (SOLAS) of 1948<sup>55</sup> approximately the same time the RCAF assumed responsibility for aeronautical SAR. In accordance with SOLAS,

#### *Regulation 33 Distress Situations, Obligations and Procedures:*

The master of a ship at sea which is in a position to be able to provide assistance on receiving information from any source that persons are in distress at sea, is bound to proceed with all speed to their assistance, if possible informing them or the search and rescue service that the ship is doing so.<sup>56</sup>

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<sup>53</sup>Department of National Defence, Report of the DND for the Fiscal Year Ending March 31, 1949 (Ottawa: King’s Printer, 1949), 15.

<sup>54</sup>Department of National Defence, Report of the DND for the Fiscal Year Ending March 31, 1950 (Ottawa: King’s Printer, 1950), 15.

<sup>55</sup>SOLAS, “Chapter V – Regulation 33 – Distress Situations: Obligations & Procedures,” last accessed 18 April 2018, <https://mcanet.mcga.gov.uk/public/c4/solasv/regulations/contents.htm>.

<sup>56</sup>Ibid.

Most federal ships were unaware that they were obliged under SOLAS to render assistance to vessels in distress.<sup>57</sup> As a result, cabinet direction was issued clarifying the situation and stating that the RCAF was to coordinate all maritime SAR through the RCCs and that all government ships were to partake in marine SAR.<sup>58</sup> A few years later, Marine Officers were stationed at the RCCs to assist with coordination of maritime cases.

Over the years, a number of initiatives evolved that contributed to SAR operations. Perhaps one of the most significant developments was the emergency distress beacon commonly referred to as an Emergency Locator Transmitter (ELT). This piece of equipment has contributed to reducing search times but has also increased the requirement for education and training due to false alarms. Legislation in Canada mandated the carriage of these beacons on aircraft in June 1974.<sup>59</sup> The investment in the SAR Satellite (SARSAT) system has also aided in detecting beacons located anywhere in Canada and has been beneficial especially considering the geographical size of Canada and its diverse terrain. These devices are value-added tools but are only useful if carried and when they work.

The post-Cold War era of the early 1990s saw major defence restructuring due to a growing deficit and perceived reduction in security threat.<sup>60</sup> This led to the closure of 14 military bases across the country including some SAR bases.<sup>61</sup> Both Edmonton and Summerside were included in the closures; however SAR Squadrons were formed in

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<sup>57</sup>Privy Council Office, Cabinet Conclusions, 10 July 1951, 3-4, Available: <http://www.bac-lac.gc.ca/eng/discover/politics-government/cabinet-conclusions>.

<sup>58</sup>Ibid.

<sup>59</sup>COSPAS-SARSAT.INT, "Cospas-Sarsat System Mission," last accessed 20 April 2018, <https://www.cospas-sarsat.int/en/>.

<sup>60</sup>Michael, Rostek, "A Framework for Fundamental Change? The Management Command and Control Re-Engineering Initiative." *Canadian Military Journal* 5, no. 4 (Winter 2004-2005): 65-72.

<sup>61</sup>Department of Finance, *The Budget Speech: Delivered in the House of Commons by the Honourable Michael H. Wilson* (Ottawa: DoF, 27 April 1989), 6, <http://www.budget.gc.ca/pdfarch/1989-sd-eng.pdf>.

Winnipeg and Greenwood, Nova Scotia. The RCCs were reduced from five to the three that are in operation today. An additional cost saving measure included a fleet rationalization program that saw most of the Buffalo aircraft replaced with the CC130 Hercules. However, despite the many reductions, one contract that did remain on course was the procurement of the EH101 Cormorant helicopter that replaced the Labrador helicopters in 2001.<sup>62</sup> Multiple areas of change took place during this period but as a whole, the overall construct and philosophy behind SAR operations continued to mirror the concept by which it was conceived.

### **Conclusion**

The evolution of the SAR system in Canada stems from a rich national history generated by innovation, curiosity and necessity. The willingness to assist those in distress and push boundaries and limits as illustrated by the bush pilots was awe inspiring and the start of a concept that would continue to evolve. The impact of both world wars led to the need for an organized SAR system not only in Canada but also around the world. The gracious assistance from the British in providing surplus equipment along with the collaboration through organizations such as ICAO and ICSAR, contributed to the progression of an organized SAR system in Canada. Although SAR was formally conceived out of necessity 70 plus years ago in a wartime era, the demand for a professional and organized rescue system exists. The next chapter will examine the SAR system in place today and highlight some of the current challenges. This will enable the study to be progressed to consider future change and how/if it will impact the current SAR system.

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<sup>62</sup>The author was at 442 Squadron (Sqn) Comox employed as the Deputy Sqn Operations Officer when the first Cormorant arrived.

## CHAPTER 2 – TIME IS TICKING: HOW THE CALL FOR HELP IS ANSWERED

*The National Search and Rescue (SAR) Objective is to prevent loss of life and injury through SAR alerting, responding and aiding activities that use public and private resources.*

-- Canadian Aeronautical and Maritime Search and Rescue Manual  
Chief of Defence Staff and Commissioner Canadian Coast Guard

### Introduction

Whether engaged in aeronautical, maritime or land-based activity for business purposes or recreation, the SAR system in Canada is activated every day to varying degrees often resulting in the need for assistance from SAR responders. On average each year, the JRCCs, the agencies responsible for coordinating, controlling and conducting all aeronautical and maritime SAR missions in Canada,<sup>63</sup> respond to 10,000 SAR incidents.<sup>64</sup> While Canada has one of the most challenging SAR regions of responsibility in the world, it has an effective SAR system; a unique one based on an escalation of response that depends on everyone from the local citizen up to and including federal resources. Canadians benefit from this service and at no cost, yet many are not aware of how the system is activated, who will respond or how long it will take until they find themselves in a situation requiring it.

SAR is a no-fail mission for the CAF. As the Auditor General concluded in the *2013 SAR Posture Review Report*, “the Department of National Defence and the Canadian Armed Forces remain committed to continuous review and improvement of the CAF contribution to the National SAR Program.”<sup>65</sup> This chapter will provide an overview of how the SAR system in Canada operates and the roles and responsibilities of key

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<sup>63</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, Section C-0.06(E), 8 of 20.

<sup>64</sup>Department of National Defence, *Federal Search and Rescue Operational Governance Committee Annual Report 2016* (Ottawa: Canadian Joint Operations Command: file 3385-1, March 2017).

<sup>65</sup>Office of the Auditor General of Canada, *2013 Spring Report of the Auditor General of Canada*, Chapter 7: Spring 2013, [http://www.oag-bvg.gc.ca/internet/English/parl\\_oag\\_201304\\_07\\_e\\_38192.html](http://www.oag-bvg.gc.ca/internet/English/parl_oag_201304_07_e_38192.html).

stakeholders. It will also describe some of the risks and challenges that SAR responders encounter and provide an overview of a critical pillar to the NSP, prevention.

## **SAR SERVICE IN CANADA TODAY**

### **Canada's SAR Area of Responsibility**

The Canadian SAR system consists of a comprehensive framework with many moving pieces that encompasses one of the most vast and diverse regions of the world. Canada's SAR area of responsibility (AOR) incorporates 18 million square kilometres of land and water. This area extends from the US border northward to the high Arctic including the North Pole, eastward across the Atlantic Ocean approximately 1000 nautical miles from the nearest point of land in Newfoundland and westward over the Pacific Ocean roughly 600 nautical miles west of Vancouver Island.<sup>66</sup> The diverse and sprawling geography includes sparsely settled and austere terrain, mountainous regions, and also the longest coastline in the world.

In Canada, the provision of aeronautical SAR and maritime SAR services is a federal government mandate with the Canadian federal AOR being divided into three SRRs as depicted in Figure 2.1 and named based on the location of its respective JRCC. The defined dimensions of Canada's three SRRs were designed in accordance with the ICAO agreements for aeronautical SAR and under the International Maritime Organization (IMO) agreements for maritime SAR<sup>67</sup> but is still an area of recent discussion as witnessed during the ongoing Senate Committee study on Maritime SAR.<sup>68</sup>

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<sup>66</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 1.04, 1,2 of 4.

<sup>67</sup>Ibid., 1.04.1, 1 of 4.

<sup>68</sup>Note: The Senate Committee is conducting a study on Maritime SAR in Canada. Further details regarding the ongoing study are contained at <https://sencanada.ca/en/committees/pofo/>. The SRR dimensions was an area of interest brought forth by a Senator during a hearing in October 2016 in Halifax, NS where the author testified before the hearing, <http://www.cbc.ca/news/canada/nova-scotia/search-and-rescue-senate-committee-1.3825466>.

Concerns over the location of primary SAR resources in a vast region that is steadily changing as a result of climate change combined with increased activity, tend to generate uncertainty and concerns for the future.



**Figure 2.1. Canada's Search and Rescue Regions and Asset Location**

Source: Search and Rescue Canadian Armed Forces webpage ([www.forces.gc.ca](http://www.forces.gc.ca))

International guidelines outline a variety of factors that each state must consider when establishing a SRR bearing in mind that each SRR is part of a global system. The overarching reason behind the establishment of defined regions throughout the world is to ensure that primary responsibility for coordinating SAR services for that geographic area is assumed by some state; limits to a region should not be viewed as barriers to assisting persons in distress.<sup>69</sup> As concluded by the Auditor General in the *2013 SAR Posture Review*, this structure that has been the product of continuous adaptation over the last 60 years in Canada has proven highly effective.<sup>70</sup>

<sup>69</sup>International Maritime Organization / International Civil Aviation Organization, *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*, Volumes I-III (London: IMO/ICAO, 2003), Vol IAMSAR Manual Vol 1, 2-8.

<sup>70</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, Chapter 7, Section 2a.

## SAR Coordination

The call for assistance cannot be predicted. It can happen at any hour of any day anywhere and range in severity from a vessel sinking in the middle of the ocean to an aircraft crashing in the high Arctic or in the mountains. Often distress cases are at the mercy of Mother Nature or circumstances beyond control. Each SRR is equipped with a JRCC that is the “hub” of Canada’s SAR system responsible for effectively coordinating multi-agency responses to aeronautical and maritime SAR.<sup>71</sup> The JRCCs are staffed by specialist SAR operators from the RCAF and the Canadian Coast Guard (CCG) 24 hours a day seven days a week. SAR Coordinators are experts in the field who continuously examine a wide variety of information and data including current and future environmental data such as weather systems, winds, waves, and ocean currents to collate the best and appropriate response when the SAR system is activated.<sup>72</sup>

Experience has shown that in most areas there is an operational advantage of harmonizing aeronautical and maritime SRRs as it minimizes confusion over which authority should be alerted when a distress situation arises at and over a geographic point.<sup>73</sup> A decision was made in 1977 to further sub-divide the Halifax SRR into two sub-regions assigning the responsibility for coordinating maritime SAR operations in the Gulf of St. Lawrence waters to the Maritime Rescue Sub-Centre (MRSC) Quebec and the waters surrounding the province of Newfoundland and Labrador to MRSC St. John’s.<sup>74</sup> The premises behind this division was to enhance maritime SAR co-ordination through

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<sup>71</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 4.02, 1 of 2.

<sup>72</sup>Based on author’s experiences as Officer in Charge of Joint Rescue Coordinator Centre Halifax 2014-2017. These tasks are included in the Terms of Reference for both Aeronautical and Maritime Coordinators in CAMSAR.

<sup>73</sup>IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual* ..., 2-8.

<sup>74</sup>Julian Renaud, “Federal cutbacks force closure of Coast Guard bases,” *Halifax Media Co-op*, 3 June 2013, <http://halifax.mediacoop.ca/fr/story/federal-cutbacks-force-closure-coast-guard-bases/17769>.

improved communications and local knowledge and to expedite the initiation of appropriate action enabling a timely response to SAR incidents within the respective Search and Rescue Sub-Region (SRS).<sup>75</sup>

Recent political contention sparked controversy and change regarding the two MRSCs. As part of budget cuts in 2012, the Conservative government closed MRSC St. John's transferring SAR operations to JRCC Halifax.<sup>76</sup> The closure sparked an outcry and widespread criticism from opposition politicians and east coast residents. The 500 incidents that MRSC St. John's would have responded to in an average year were handled without issue by the SAR Coordinators at JRCC Halifax.<sup>77</sup> However, further changes are expected in the upcoming months as the Liberal government has promised to re-open MRSC St. John's by May 2018.<sup>78</sup> As priorities change, SAR officials and responders adapt to ensure that the end result of saving lives remains the top priority. As the official SAR motto indicates,<sup>79</sup> the cost of a human life is priceless.

### **SAR Response**

Many Canadians, particularly those who engage in recreational aeronautical and maritime activities, profess that they have never heard of a JRCC; and this often leaves the question of how the JRCCs are alerted of a distress call. There are a variety of

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<sup>75</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 2.06.3, 1 of 4; Department of National Defence/Canadian Coast Guard, B-GA-209-001/FP-001-DFO 5449, National Search and Rescue Manual, (Ottawa: DND/CCG, 2000), Chapter 3, 15-16. <http://docshare02.docshare.tips/files/7106/71063338.pdf>.

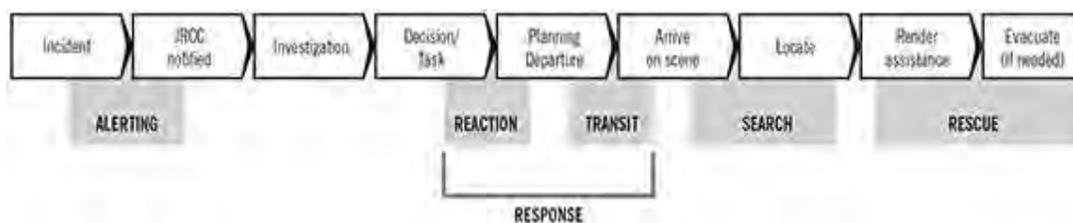
<sup>76</sup>Canadian Coast Guard, ARCHIVED – What We Do Everyday – 2013-2016 IBHRP, last modified 12 May 2015, <http://www.ccg-gcc.gc.ca/Publication/IBHRP-2013-2016/What-We-Do-Everyday>.

<sup>77</sup>Canadian Coast Guard, ARCHIVED - Canadian Coast Guard Information Kit NL Search and Rescue, last modified 11 July 2013, <http://www.ccg-gcc.gc.ca/eng/CCG/Publications/Information-Kit/Newfoundland-and-Labrador#NFLAB>.

<sup>78</sup>Minister of Fisheries, Oceans and the Canadian Coast Guard Mandate Letter, 19 August 2016, <https://pm.gc.ca/eng/minister-fisheries-oceans-and-canadian-coast-guard-mandate-letter>. Minister Fisheries and Oceans Canada, *2017-2018 Departmental Plan*. [http://www.dfo-mpo.gc.ca/rpp/2017-18/2017-18\\_DP-EN.pdf](http://www.dfo-mpo.gc.ca/rpp/2017-18/2017-18_DP-EN.pdf).

<sup>79</sup>The Canadian Search and Rescue motto is “That others may live.”

communication networks that provide timely alerting and detection services to JRCCs including 911 agencies, Marine Communication Traffic Services (MCTS), Air Traffic Services (ATS) and satellites emergency beacons to name a few. A standard SAR mission begins once the JRCC has been made aware of a potential distress and begins to investigate. Any activation of the SAR system requires JRCC coordinators to assess the degree of the emergency by determining what phase of emergency exists: uncertainty, alert or the distress phase as depicted in a standard incident timeline in Figure 2.2 below. Depending on the type of incident and information available, the entire process could take a few minutes or a few days.



**Figure 2.2 -- Timeline Demonstrating All Phases of a SAR Mission.**

Source: Search and Rescue Posture Review 2013, September 2013, Chapter 5.3, p. 6.

A boater who fails to notify someone that they have safely returned to port or a pilot who neglects to close a flight plan after safely landing are examples that can trigger the uncertainty phase. On 17 July 2016 at 0430 hours, an emergency beacon was activated 360 nautical miles east of St. John's NL alerting JRCC Halifax that the sailing vessel *Oman Sail* was potentially in the distress phase. The JRCC immediately established communications with the crew of the vessel to learn that it had capsized injuring the skipper who required immediate evacuation. Four other crewmembers were

clinging to the distressed sailboat. SAR aircraft and CCG vessels were dispatched to provide assistance and recover the crew from their stricken vessel.<sup>80</sup>

CAF primary SAR assets which include the Cormorant and Griffon helicopters and the Hercules and Buffalo aircraft are located strategically across the country at five military bases: Gander, NL; Greenwood, NS; Trenton, ON; Winnipeg, MB; and Comox, BC. The *Evaluation of the DND/CAF Contribution to the National Search and Rescue Program* in January 2015 determined that ensuring that primary SAR aircraft are staged in the best locations to respond to incidents is a key measure of effectiveness. Factors that were considered in determining these locations included historical distribution of incidents, the influence of weather patterns and the co-location of forces with supporting infrastructure.<sup>81</sup> The geographic size and uneven population distribution of Canada, as well as environmental conditions, pose significant challenges for SAR. The location of these bases is a topic of regular review and controversy especially when dealing with incidents in the far north that will be further explored in the next chapter.

When aircraft are tasked to respond to a SAR incident, as was the case with the sailing vessel *Oman Sail*, the time of day determines the response time a SAR crew has to be airborne responding to the distress. A SAR response posture of 30 minutes is maintained during what is considered regular weekday work hours of Monday to Friday between 0800 and 1600 hours. Primary SAR aircraft maintain a two-hour readiness posture on evenings and weekend.<sup>82</sup> What this means is that during the weekday, aircrew

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<sup>80</sup>Department of National Defence, *JRCC Halifax 2016 Annual Historical Report*, (Halifax: OIC JRCC #1325-1, February 2017). Note: Marine SAR Case “Sailing Vessel Oman Sail – Capsized” occurred on 17<sup>th</sup> July 2016, 11.

<sup>81</sup>Department of National Defence, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program (Final) January 2015*, (Ottawa: 1258-216 Chief of Review Services, January 2015), <http://www.crs-csex.forces.gc.ca/reports-rapports/pdf/2015/239p1028-eng.pdf>.

<sup>82</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 2.10.3, 1 of 2.

are at their respective base and the aircraft is available and ready to respond to a SAR incident within 30 minutes of notification. As the distress call for the *Oman Sail* was made earlier than 0800 hours, the Cormorant crew from Gander and Hercules crew from Greenwood were in the two-hour state of readiness.<sup>83</sup>

Many Canadians including politicians and media recurrently scrutinize CAF's SAR readiness posture. In particular, they dispute that a two-hour response posture on the weekends and during the evenings is unacceptable since activity does not terminate at four o'clock each day. This is another area that will be further explored in the next chapter to determine if this system is appropriate and worthy of such criticism and also to consider how other SAR entities operate. How does a timely response occur if the CAF primary SAR crews are on two-hour response posture more than half of the time? It is through reliance and hope that other organizations and opportunities will be available and positioned to assist in a timely fashion. This collaboration was vital to the rescue of the crew on the *Oman Sail*. No one agency can assume the complex task of SAR itself. There is a common military saying that, "Hope is not a valid COA (course of action)."<sup>84</sup> When lives are at stake, the system cannot simply rely on hope.

The effective management of SAR events and SAR responses requires close coordination between all participants including the CAF, the CCG, neighbouring SRRs, international partners, and the network of federal, provincial, municipal and civilian organizations, as well as volunteers that make up the SAR system. Canada is participant in a number of international organizations and has agreed to adopt SAR standards and

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<sup>83</sup>Department of National Defence, *JRCC Halifax 2016 Annual Historical Report*, (Halifax: OIC JRCC #1325-1, February 2017). Note: Marine SAR Case "Sailing Vessel Oman Sail – Capsized" occurred on 17<sup>th</sup> July 2016.

<sup>84</sup>Jeremy Weber, "Hope is Not 'A' Strategy: It's The Only Strategy," War Room United States Army War College, 27 February 2018, last accessed 18 April 2018, <https://warroom.armywarcollege.edu/articles/hope-not-strategy-strategy/>.

practices in accordance with the *Convention on International Civil Aviation*, the *International Convention for the Safety of Life at Sea (SOLAS)*, 1974, *International Convention on Maritime Search and Rescue*, 1979 and the *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*, 2011.<sup>85</sup> These agreements between SAR agencies from Canada and bordering countries are important and necessary to facilitate enhanced coordination and mutual support whilst minimizing costs and ensuring efficient use of resources. This seamless coordination is employed on a regular basis (Figure 2.3) and is vital for distress cases such as the *Oman Sail* that are significant distances from land or primary SAR bases. In this example, multiple entities including CAF aircraft, CCG vessels, a vessel of opportunity,<sup>86</sup> offshore oil platforms (used to refuel the helicopter and extend its range from shore), as well as provincial health authorities were crucial for a successful rescue.



**Figure 2.3 -- Close Cooperation Amongst Agencies at Sea**  
Source: South Shore Breaker 29 November 2016.

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<sup>85</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 5.01.2, 1 of 4.

<sup>86</sup>A Vessel of Opportunity (VOO) is any vessel whether government, military, or civilian that is close enough and capable of responding to a search and rescue incident.

This cooperation between agencies and authorities is of particular importance when considering SAR mandates and jurisdictions. As noted previously, CAF and CCG are the federal agencies responsible for aeronautical and maritime SAR. Public Safety and Emergency Preparedness Canada notes that “Provincial and territorial governments are responsible for searches for missing persons including those who are lost or overdue on land or inland waters - commonly known as Ground Search and Rescue (GSAR), and often delegated to the police service of jurisdiction.”<sup>87</sup> Although these lines of jurisdiction are frequently misconstrued by members of the public or media, the responsibility of the NSP which resides within Public Safety and Emergency Preparedness Canada bridges the efforts of federal, provincial, territorial, and local SAR authorities, as well as the volunteer community towards a common goal: saving lives.<sup>88</sup> The many moving pieces to any one SAR operation is extensive and requires every person at all levels within the organization to understand their role and contribution to the end state as there is no room for error. Added to the complexity of the operation is the unpredictability and risks associated with each mission that pose challenges and often showcase SAR to various degrees of controversy in the public spotlight.

### **Risky Business**

A vast and rugged geography combined with a varied and demanding climate pose risks and challenges for SAR responders in Canada and will continue to do so in the future. Senior CAF officials highlighted in the May 2017 Senate Committee report *Reinvesting in the Canadian Armed Forces: A Plan for the Future* that “Search and

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<sup>87</sup>Public Safety Canada, “National Search and Rescue Program,” last modified 27 September 2017, <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rspndng-mrgnc-vnts/nss/prgrm-en.aspx>.

<sup>88</sup>Ibid.

rescue teams are subject to the tyranny of time and distance.”<sup>89</sup> Primary SAR aircraft can often take up to 12 hours to reach certain locations within Canada’s AOR and CCG vessels can take days dependent on location and weather. The greatest areas of vulnerability within Canada’s SRR are those that extend over the ocean beyond 200 nautical miles from land and in the Arctic region. Without a dedicated SAR asset in these areas, the reliance on SAR partners and support from neighbouring SRRs is vital.

The reliance on partnerships was put to the test in the early hours on 6 June 2017. Twenty-two sailboats competing in a transatlantic yacht race from Plymouth, UK to Rhode Island, US hosted by the Royal Western Yacht Club were caught in a storm that race officials describe as ‘once in a lifetime.’<sup>90</sup> As the yachts were all located in the Halifax SRR at the time of the distress, JRCC Halifax assumed responsibility and launched a major rescue operation. After encountering a massive and unexpected storm that produced 15-metre high waves and 60-knot winds, distress notifications were issued from five of the sailing vessels at various locations in the Atlantic Ocean as shown in Figure 2.4.

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<sup>89</sup>Senate, Report of the Standing Senate Committee on National Security and Defence, *Reinvesting in the Canadian Armed Forces: A Plan for the Future*, May 2017, 57, [https://sencanada.ca/content/sen/committee/421/SECD/reports/SECDDPRReport\\_FINAL\\_e.pdf](https://sencanada.ca/content/sen/committee/421/SECD/reports/SECDDPRReport_FINAL_e.pdf).

<sup>90</sup>BBC News, “Yacht crews rescued after Atlantic storm,” last modified 10 June 2017, <http://www.bbc.com/news/uk-40234274>.



**Figure 2.4 – Transatlantic Yacht Race Vessels in Distress**

Source: RWYC, Yellow Brick, Google, 10 June 2017

Coordination efforts with neighbouring SRRs from the United States, Portugal and the United Kingdom took effect. The CAF primary fixed wing SAR aircraft were tasked from Greenwood, NS and Trenton, ON to maintain communications with the distressed vessels and provide updates to JRCC Halifax. Patrol aircraft from Portugal and the United Kingdom also joined the rotation to ensure continuous contact with the vessels in distress was maintained. Two CCG ships, a Royal Canadian Navy frigate, two civilian tankers, and a luxury cruise ship were also tasked to assist. The estimated time for Canadian ships to arrive on scene was 24 to 72 hours. The range of four of the vessels in distress was beyond reach for the SAR helicopter. The 73-year old sailor from the sailing vessel *Tamarind* was rescued unhurt 72 hours after initially declaring distress by the cruise ship *Queen Mary II*. The Gander Cormorant rescued the sailor on the sailing vessel *Furia* that was closest to land approximately six hours after the distress was declared.<sup>91</sup>

<sup>91</sup>JRCC Halifax SAR Records. The author was the Officer in Charge JRCC Halifax during this rescue.

Media outlets around the world captured the events unfolding in the middle of the Atlantic Ocean with headlines such as “Atlantic rescue operation launched after UK racing yachts are sunk and damaged by hurricane force winds.”<sup>92</sup> A successful rescue by all accounts, it could not have happened without the close collaboration of many parties. Another point to note about this rescue effort is that none of those rescued were Canadian citizens. Again, the uniqueness and dedication of the SAR system with its focus on saving the person regardless of their origin, wealth, status, or the reason behind their mishap is one that the organization is privileged to uphold.

This rescue operation drives home the many risk factors and uncertainties that envelop SAR operations and raises questions that need to be considered. Is the reliance on vessels of opportunity as a primary means of timely rescue for SAR incidents at the far limits of Canada’s AOR the best practice? Are there improvements or changes to the SAR system that could have decreased the rescue time? In this case, the challenges of location, weather, distance, time, and the number of simultaneous distress incidents were all factors contributing to the amount of time it took to complete the rescue.

Maritime SAR cases are not only challenging due to distance and time but as evident in the previous example, the coastlines and three oceans in Canada’s SRR offer some of the world’s most unforgiving environmental conditions. Low-pressure weather systems can rapidly roll into an area and cause havoc. Severe sea states and gale force winds, freezing spray, ice cover and fog are but a few of the conditions that operators in the environment and SAR responders must be prepared to face. Waves can reach up to 30

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<sup>92</sup>Will Worley, “Atlantic rescue operation launched after UK racing yachts are sunk and damaged by hurricane force winds,” *Independent*, 20 June 2017, <http://www.independent.co.uk/news/world/americas/atlantic-ocean-rescue-uk-racing-yachts-hurricane-winds-crew-members-saved-newfoundland-canada-a7783681.html>.

metres in height and winds measuring 160 kilometres per hour are not uncommon;<sup>93</sup> cold water temperatures reduce survival times. In the spring and summer months, large blankets of fog reduce visibility and icebergs drifting into shipping lanes present a new set of challenges.<sup>94</sup>

These environmental conditions have contributed to some of Canada's worst maritime disasters including the *Ocean Ranger* (1982), fishing vessel *Andrea Gail* (1991), fishing vessel *Miss Allyn* (2013), and tour vessel *Leviathan II* (2015) to name but a few. These have become etched in history with songs, movies and books recounting the heart wrenching tales. Activities dependent on the ocean make a substantial contribution to the Canadian economy with ocean sector activities generating more than 345,000 direct jobs.<sup>95</sup> New maritime economic activities have emerged over the years including tourism, aquaculture, offshore oil and gas exploration and more raising the question of whether or not the SAR system in place is robust enough to support increasing activity.

Land based SAR incidents present their own series of challenges especially in a country with such diverse and unforgiving geography. At times, adequate preparation and training are not enough to counter what can and will go wrong. On 8 June 2017, JRCC Victoria was alerted of an overdue aircraft with two people onboard that had departed Lethbridge, Alberta enroute to Kamloops, British Columbia and disappeared without a trace to never be seen again. With the communication and emergency beacon technology available today, many question how this could happen. Ironically, this plane was

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<sup>93</sup>Canadian Coast Guard, "Maritime Search and Rescue (SAR) in Canada," last modified 27 April 2018, [http://www.ccg-gcc.gc.ca/eng/CCG/SAR\\_Maritime\\_Sar](http://www.ccg-gcc.gc.ca/eng/CCG/SAR_Maritime_Sar).

<sup>94</sup>"How to protect offshore oil platforms from roaming icebergs," *The Economist*, 22 June 2017, last accessed 18 April 2018, <https://www.economist.com/news/americas/21723891-it-best-lasso-them-how-protect-offshore-oil-platforms-roaming-icebergs>.

<sup>95</sup>Department of Fisheries and Oceans, "*Maritime Sector in Canada Canadian Maritime Sectors Direct, Indirect and Induced Employment (Jobs) 2012*," Ottawa, last modified 6 October 2016, <http://www.dfo-mpo.gc.ca/stats/maritime/tab/mar-tab6-eng.htm>.

equipped with an ELT but a signal was never detected.<sup>96</sup> After two weeks of searching for a small airplane in an area excess of 37,000 square kilometres consisting of high mountain peaks, thick tree cover and hampered by rain, hail, snow and extreme turbulence and downdrafts, the search efforts were called off.<sup>97</sup> SAR officials noted that “geography was against [them]...it demands respect.” Even those who understand the environment and all that it offers are not immune to uncertainty.

Indigenous peoples have inhabited the Arctic for thousands of years. Today, they make up approximately 10 percent of the estimated four million people living in Arctic areas; while in Canada they represent about half of the nation’s Arctic population.<sup>98</sup> Strong ties to the land remain a key element of Arctic Indigenous peoples who despite the influences of the modern world still continue traditional activities relying on the natural environment for their subsistence needs. However, climate change poses a new threat to all who operate in the north as the environment changes and shapes itself in a new form. In March 2016, a 62-year-old male and also the territory’s Member of Legislative Assembly (MLA) had set out with his 16-year-old son and another companion on a snowmobile excursion that to most southerners would be considered a substantial expedition. The trio left Iqaluit by snowmobile enroute to Qikiqtarjuaq, 470 kilometres

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<sup>96</sup>Major Justin, Olsen, “Missing Aircraft SAR Cranbrook BC June 2017,” email to author 22 April 2018. Justin Olsen is the Officer in Charge of the Joint Rescue Coordination Centre Victoria, agency responsible for coordinating aeronautical SAR incidents in British Columbia.

<sup>97</sup>Bryan, Passifiume, “After two weeks search called off for plane missing in mountains near Cranbrook, BC,” *Calgary Herald*, last modified 20 June 2017, <http://calgaryherald.com/news/local-news/after-two-weeks-search-called-off-for-plane-missing-in-mountains-near-cranbrook-b-c>.

<sup>98</sup>Arctic Council, “Arctic Peoples,” last modified 3 November 2016, <https://www.arctic-council.org/index.php/en/our-work/arctic-peoples>.

north via Pagnirtung. When the group failed to arrive in Pagnirtung, territory officials activated a GSAR search.<sup>99</sup>

As previously mentioned, the responsibility for a GSAR resides with territorial authorities. However, due to the size of the search area, Nunavut Emergency Management Organization (EMO) requested assistance from the CAF. The snowmobilers were using the sun's position in the sky as their means of navigation and according to EMO Nunavut, "the men had run into some caribou, it was storming out, they went after the caribou, got turned around in the weather, and got off course."<sup>100</sup> Experts of living on the land, the group built two igloos to protect themselves from wind and cold. The search area was extensive and the weather conditions harsh with temperatures reaching minus 33 degrees Celsius. Searchers covered approximately a 15,000 square kilometre area working in grid systems.<sup>101</sup>

It was a civilian territory chartered Twin Otter aircraft flying its last grid that spotted snowmobile tracks 183 kilometres south of Iqaluit that led to the three missing travellers. This case attracted national attention with CBC news headlines that read, "Nunavut MLA missing for a week found alive on Baffin Island."<sup>102</sup> Despite having a unique relationship and knowledge of the land, the forces and unpredictability of Mother Nature can cause situations to change. By their planned route, the men should have been

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<sup>99</sup>Sarah, Rogers, "Fourth day of search yields no sign of missing Nunavut snowmobilers," *Nunatsiaq News*, 30 March 2016, [http://nunatsiaq.com/stories/article/65674fourth\\_day\\_of\\_search\\_efforts\\_yields\\_no\\_sign\\_of\\_missing\\_snowmobilers/](http://nunatsiaq.com/stories/article/65674fourth_day_of_search_efforts_yields_no_sign_of_missing_snowmobilers/).

<sup>100</sup>CBC News, "Nunavut MLA missing for a week found alive on Baffin Island Trio built 2 igloos to protect themselves from wind and cold," last updated 1 April 2016, <http://www.cbc.ca/news/canada/north/missing-mla-pauloosie-keyootak-found-1.3513174>.

<sup>101</sup>Ibid.

<sup>102</sup>Ibid.

travelling north but were located almost 200 kilometres south of their intended route as depicted in Figure 2.5.



**Figure 2.5 – Snowmobilers departed Iqaluit enroute to Qikiqtarjuaq via Pangnirtung a total distance of 470 kilometers**  
Source: Google

Regardless of whether or not the SAR is aeronautical, maritime or ground based and whose mandate it is to respond, the Arctic region presents challenges to all involved due to weather, time and distance. Polar low-pressure systems, extreme cold temperatures, combined with darkness for half of the year are realities of life in the Arctic. Timing is a crucial factor when it comes to search and rescue missions and dependent on the rapid availability of assets. In the Arctic region, this can pose a particular challenge with primary CAF assets located at southern bases. The CAF *Arctic Campaign Plan* released in October 2017 acknowledges that joint 24/7 capabilities to respond to those in distress in Canada’s Arctic must be maintained and that a concept plan needs to be developed to address specific Arctic SAR requirements.<sup>103</sup>

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<sup>103</sup>Department of National Defence, “Arctic Campaign Plan – Operational Design Endorsement,” (Ottawa: Commander Canadian Joint Operations Centre, 12 October 2017).

Collaboration and presence in the Arctic occurs on a regular basis with CAF both leading and participating in Arctic SAR Exercises (SAREXs) at a national and international level and through diplomatic measures and Arctic governance with like-minded countries and partners. Canada is a member of the Arctic Council; a high-level intergovernmental forum that addresses issues faced by the eight Arctic States and its indigenous peoples<sup>104</sup> and is also signatory to *The Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* signed in Nuuk, Greenland in May 2011.<sup>105</sup> Commonly known as the Arctic SAR Agreement, it builds upon previous United Nations and existing agreements with a mandate to strengthen aeronautical and maritime SAR cooperation and coordination between Arctic states.<sup>106</sup> Exercises such as Operation NANOOK<sup>107</sup> are held in the Arctic region on a yearly basis and enables the CAF to train in the actual environment alongside SAR partners exercising the complex coordination whilst strengthening partnerships and enhancing practices.

Despite the environment having always been dynamic in the Arctic and requiring constant adaptation, the May 2017 Senate Committee report on the Arctic heard CAF and CCG officials acknowledge that the majority of SAR-related challenges relate to their ability to be undertaken in Canada's Arctic region.<sup>108</sup> SAR officials during the hearing

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<sup>104</sup>Arctic Council, "Arctic Council: A Backgrounder," last updated 3 January 2018, <https://www.arctic-council.org/index.php/en/>.

<sup>105</sup>Ibid. In May 2011, Canada and the seven other Arctic Council member states (Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States) signed *The Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* in Nuuk, Greenland.

<sup>106</sup>Arctic Council, *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic*, May 2011, <https://oaarchive.arctic-council.org/handle/11374/531>.

<sup>107</sup>Operation NANOOK is an annual military exercise conducted in the Arctic where the CAF trains and works with international military and security partners to enhance response to threats to security and environment in the North. It has taken place each year since 2007. <http://www.forces.gc.ca/en/operations-canada-north-america-recurring/op-nanook.page>.

<sup>108</sup>Report of the Standing Senate Committee on National Security and Defence, *Reinvesting in the Canadian Armed Forces: A Plan for the Future* ..., 58. The eight Arctic states include Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States.

stressed that the Arctic environment is growing increasingly complex as melting Arctic sea ice opens up new maritime trade routes and that Canada must be prepared for the additional risks associated with higher levels of human and commercial activity in the region.<sup>109</sup> CAF officials further noted that a forward-looking defence policy for Canada, *Strong Secure Engaged* should be fundamental to addressing the range of existing and emerging challenges in the Arctic.<sup>110</sup>

Post-incident investigations conducted by the Transportation Safety Board (TSB) and on occasion through an independent inquiry, produce findings and recommendations. For example, following the tragic helicopter crash of Cougar 491 on 12 March 2009 that killed 17 people, the Offshore Helicopter Safety Inquiry was established by the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) to determine and recommend improvements to the safety regime to ensure the risks of helicopter transportation of offshore workers were as low as possible.<sup>111</sup> The inquiry saw an urgent need for a SAR operation dedicated to the offshore industry, one that could crucially reach people in an emergency situation in a drastically reduced time,<sup>112</sup> leading to the implementation of a dedicated and fully equipped independent SAR service provided by Cougar Helicopters Inc.

Similarly, a review of GSAR related protocols was conducted by the CAF

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<sup>109</sup>Report of the Standing Senate Committee on National Security and Defence, *Reinvesting in the Canadian Armed Forces: A Plan for the Future* ..., 59.

<sup>110</sup>*Ibid.*, 59.

<sup>111</sup>*Offshore Helicopter Safety Inquiry*, (Newfoundland and Labrador: Triware Technologies Inc, 2009), <http://www.oshsi.nl.ca>.

<sup>112</sup>*Offshore Helicopter Safety Inquiry, Report and Recommendations arising from the Transportation Safety Board's Report*, (Newfoundland and Labrador: The Honourable Robert Wells Commissioner, July 2011), 142. On February 8, 2010, the C-NLOPB received an interim recommendation from Commissioner Wells in relation to Search and Rescue response times. As a result of this correspondence the C-NLOPB provided the operators with a directive, dated February 12, 2010, which highlighted the urgent need for a SAR service dedicated to the offshore industry.

following the tragic death of 14-year-old Burton Winters in Labrador in February 2012. This resulted in the enhancement of GSAR protocols and processes between CAF and Other Government Departments (OGDs).<sup>113</sup> Although lessons learned and change post incident are invaluable and necessary, leaning forward to recognize and implement improvements prior to such tragedies is required.

### **SAR Education and Prevention**

The NSP is divided into two pillars: SAR response and SAR prevention.<sup>114</sup> Saving lives by enhancing SAR prevention is a key objective of the NSP. Prevention measures are designed to focus on owners and operators most commonly involved in SAR incidents, aimed at reducing the number and severity of distress calls.<sup>115</sup> While the CAF has been designated as the principle responder to aeronautical SAR incidents, the responsibility for the provision of the Aeronautical SAR Prevention Program under the authority of the *Aeronautics Act* resides with Transport Canada (TC).<sup>116</sup> A similar prevention program exists for Maritime SAR. Under the Minister of Transport, TC holds the responsibility to enforce Canadian legislation and international rules intended to ensure safety of life at sea. It is through education programs, regulation and enforcement executed in close collaboration with the CAF and CCG SAR authorities, that these program are best optimized to achieve effectiveness.

The prevention pillar is not a one-department responsibility; it requires a coordinated effort from all NSP partners. For example,

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<sup>113</sup>Department of National Defence, *Recommended Amendment to GSAR-Related Protocols* (Ottawa: Commander Canada Command File # 03385, 17 February 2012).

<sup>114</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, 1.01, 1 of 2.

<sup>115</sup>*Ibid.*, 1.01, 1 of 2.

<sup>116</sup>*Ibid.*, 1.08.3, 1 of 3.

at the federal level, the Department of National Defence, through the National Search and Rescue Secretariat, offers information on how to prevent incidents, alert the system and survive pending rescue. These publications and presentations are used extensively by the SAR community for awareness and outreach events. Parks Canada ensures proper signage on trails, and provides up-to-date hazard information to visitors. Environment Canada enables Canadians to make informed decisions on changing weather, water and climate conditions, while Transport Canada sets and enforces important safety standards for aeronautical and marine transportation, including recreational boating.<sup>117</sup>

SAR operations tend to generate significant interest with the public especially for incidents that result in the loss of life. The number of agencies and partners involved in SAR coordination and response combined with the social media influences in place today requires effective and timely communication. Accurate delivery of the message to the Canadian Public is essential to build confidence and trust and to provide an understanding behind the complexities and risk associated with each and every mission. The media is also a key component of the SAR education and prevention piece.<sup>118</sup>

A tragedy can occur in the blink of an eye and with no warning. Without the proper survival equipment such as life jackets, immersion suits, alerting devices such as ELTs chances of survival rapidly diminish. What was supposed to be an enjoyable day of whale-watching off Tofino, BC for 27 tourists on 25 October 2015 turned from good to bad in a matter of seconds when a large, breaking wave struck the tour vessel *Leviathan II* causing it to flip and capsize (Figure 2.6) sending all 27 people onboard into the Pacific Ocean.<sup>119</sup> The investigation found that not all passengers including those on the outer deck of the vessel were wearing flotation aids and it also noted that the emergency radio

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<sup>117</sup>Department of National Defence, *Quadrennial Search and Rescue Review ...*, 9.

<sup>118</sup>Department of National Defence, *Search and Rescue Imagery Directive 2016*, (Ottawa: Canadian Joint Operations Command: file 3350-1, 26 February 2016).

<sup>119</sup>Transportation Safety Board, “*Marine Investigation M15P0347, Capsizing and Loss of Life Leviathan II Clayoquot Sound, British Columbia 25 October 2015*,” 14 June 2017, 5, <http://www.bst-tsb.gc.ca/eng/rappports-reports/marine/2015/m15p0347/m15p0347.pdf>.

beacon onboard was delayed by approximately 20 minutes before transmitting a signal, thus hindering chances of survival for those in cold water without a flotation aid. TSB noted in their report that it was only by chance that a crew member was able to spot a flare in the wreckage and use it to draw attention from nearby fishing boats that notified search and rescue.<sup>120</sup> This unfortunate event resulted in the drowning deaths of six people, five Britons and a man from Australia. Tragedies such as this one really points to the need for a robust SAR prevention and education program in Canada. We owe this to Canadians and to the families of those being rescued.



**Figure 2.6 -- The bow of the Leviathan II, a whale watching boat capsized near Vargas Island in Clayoquot Sound, BC.**

Source: *MacLean's Magazine* 14 June 2017. Photograph by Adam Chilton

## Conclusion

No two SAR cases transpire in the same manner. Each call for assistance presents a unique set of challenges that pose risk. These can range from weather conditions, topography, distance, time of day or a host of other factors, but in the end, the reliance is

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<sup>120</sup>Transportation Safety Board, “*Marine investigation M15P0347, Capsizing and loss of life Leviathan II ...*,” 6,30.

on the professionalism and expertise of SAR stakeholders and a well-managed and functioning SAR system. The remainder of this study will build upon some of the topics already presented and will provide an analysis regarding key areas that affect the two pillars of the NSP: SAR response and SAR prevention. SAR response posture and the current location of SAR bases are areas that need to be further analyzed especially in considering the changes that are taking place within the AOR, of note in the Arctic region. In addition, tragedies such as the *Leviathan II* raise the question regarding whether the prevention pillar is at an appropriate standard or if further change or adjustments to the system in place is required to prevent the loss of life.

## CHAPTER 3 – FACING REALITY – EMERGING TRENDS

### Introduction

Exploring challenges and emerging trends that will have an impact on the demand for SAR in the future is an important requirement to continue delivering SAR excellence in Canada. Having entered into the seventh decade as a formalized system, today's NSP in many facets mirrors the program that was originally conceived at the end of the Second World War. This is not necessarily bad, especially when considering a fundamental aspect of the program – people.

The highly skilled, resilient, and dedicated SAR responders have been and continue to be the glue that bonds all aspects of the program. Their genuine spirit of collaboration and passion to operate in the most challenging conditions to save lives is instrumental. The responders, however, are only one piece to the SAR equation. The life and death consequences of SAR operations – the “no-fail” characteristic of this mission,<sup>121</sup> demands that all aspects of the program be considered and continuously adapted to match emerging trends.

As captured in the previous chapter, the environmental unpredictability and impact of climate change are impacting SAR operations especially with respect to how, when, and where SAR resources are deployed. These changing patterns especially in Canada's Arctic region have resulted in increased commercial and tourist activity with new boundaries being tested every year. Humans are curious beings and as potential SAR clientele expand and broaden their limits, the SAR system must remain one step ahead by maintaining a robust and effective system that instils confidence in Canadians.

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<sup>121</sup>Department of National Defence, *Quadrennial Search and Rescue Review ...*, 14.

Multiple studies and reports have been produced over the past five years that highlight current and future challenges within the Canadian SAR system and acknowledge that NSP stakeholders must remain committed to continuous improvement.<sup>122</sup> Drawing on the analysis and findings, this section will delve into an area that often generates controversy yet is the backbone to the NSP and vital to SAR operations – SAR response times. The analysis will focus on the CAF’s response role within the SAR system and ultimately lead to considerations that will contribute to enhancing the SAR system and better align it with future trends.

## **SAR RESPONSE TIMES**

### **Background Behind the CAF’s SAR Response Times**

Through its affiliation in the SOLAS Convention, the International Convention on Maritime Search and Rescue, and the Convention on International Civil Aviation, Canada has accepted the obligation to provide aeronautical and maritime SAR co-ordination and services within the Canadian SRR on a 24-hour basis.<sup>123</sup> Unique factors such as climate, landscape, physical features and transportation patterns create a different set of problems for each SRR influencing how a country determines the composition of services, facilities and equipment to best meet its needs. In terms of reaction time, the minimum state of readiness for RCAF primary SAR aircraft to be airborne when tasked to respond to a SAR incident is 30-minutes between 0800 and 1600 hours Monday to Friday and two

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<sup>122</sup>Official SAR documents released in the past five years include but are not limited to: *2013 Spring Report of the Auditor General of Canada: Federal Search and Rescue Activities, Quadrennial Search and Rescue Review* December 2013, *Chief of Review Services Evaluation of the DND/CAF Contribution to the National Search and Rescue Program* January 2015, *Reinvesting in the Canadian Armed Forces: A Plan for the Future* May 2017.

<sup>123</sup>IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual ...*, IAMSAR Vol 1 Chap 1, 1.3.1, 1-2.

hours on evenings and weekends for 100 percent of SAR incidents.<sup>124</sup> Considering the majority of SAR incidents are of a maritime nature<sup>125</sup> and that offshore oil and gas or fishing industries do not cease daily operations at 1600 hours, it is reasonable that Canadians would want to know how and why these hours were chosen. Add to it the fact that night time operations come with the additional challenges of darkness and colder temperatures, the logic of having a longer response window at night is often difficult for most to comprehend. Understanding how these SAR response times were established will provide the foundation for this analysis.

In 1958, the RCAF explored options to standardize SAR operations across the country and one important change was to SAR aircraft response times. Originally, SAR aircraft launch times consisted of a 30-minute standby basis during normal working hours and a one-hour standby basis during off-duty hours and holidays.<sup>126</sup> It is ironic that in 1958, a time with fewer SAR incidents than the system responds to today,<sup>127</sup> the response times were at a higher standard. Concerns regarding the SAR launch times were brought forward by Rescue Unit Commanders across the country whose units were unable to meet the one-hour aircraft response time after hours due to a variety of reasons of which the

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<sup>124</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual* ..., 2.10, 1 of 2. Department of National Defence, *Canadian Joint Operations Command SAR Directive 01-2017*, Canadian Joint Operations Command: file 3385-1/RDIMS 421945, May 2017, 3.

<sup>125</sup>Major David Cameron, "CJOC Federal SAR OGC Annual report 2017," email to author 21 February 2018. David Cameron is the CJOC SAR 2. In 2017, the JRCCs handled 9346 total SAR cases of which 1257 were Aeronautical, 5764 Marine, 982 Humanitarian, 237 Unknown and 1106 outside the Canadian AOR. CAF assets were tasked 975 times. Breakdown by region: Halifax SRR 2581, Trenton SRR 3679 and Victoria SRR 3086.

<sup>126</sup>LAC, RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Memorandum to COps from A/DTRO W/C J.G. Showler, 28 May 1958, "SAR – Standby Policy." Note: The 1958 SAR orders was the CAP 342.

<sup>127</sup>Major David Cameron, "CJOC Federal SAR OGC Annual report 2017," email to author 21 February 2018. . Of the 9346 SAR cases Canada's JRCCs handled in 2017, CAF assets were tasked 975 times. In 1956, RCAF assets responded to 223 SAR missions. James Pierrotti, "Reluctant to Rescue: The RCAF and the Search and Rescue Mandate, 1939-1959, (MA Thesis, War Studies, Royal Military College of Canada: March 2016), 72. DHH, DND, *Report of the Department of National Defence for the Fiscal Year 1954-55* (Ottawa: Edmond Cloutier, 1956), 56.

root of the problem was lack of personnel.<sup>128</sup> For example,

In Winnipeg, Manitoba, the concern was that 11 Communications and Rescue Flight did not have the personnel to meet a one-hour launch after normal working hours; indeed, the Flight suggested either an increase in personnel establishment or a reduction from a one-hour launch, after hours to a two hour launch.<sup>129</sup>

The Air Force Headquarters addressed these concerns and produced an in-depth report that detailed how many personnel were required to fulfil the SAR mandate with the response times issued in the orders. It concluded that rescue units were severely undermanned and in order to mitigate the problem, 100 new positions would need to be established for SAR or another hour would have to be added to after hour launch times increasing it from one-hour to two-hours.<sup>130</sup> To remain in line with the existing government policy of minimizing resources, the Chief of Air Staff (CAS) elected to reduce the SAR launch times, after hours and on holidays, to two hours.<sup>131</sup> It appears that the premises behind choosing these SAR response times that are still the regulated times today was manning levels and cost, and reports indicate that there is no statistical evidence to show that these times were chosen to align with the occurrence of SAR incidents.<sup>132</sup> Justifiably, the use of a model today that was established sixty years ago will precipitate debate and discussion especially on the heels of tragedy.

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<sup>128</sup>James Pierrotti, “Reluctant to Rescue: The RCAF and the Search and Rescue Mandate, 1939-1959,” (Royal Military College of Canada: March 2016), 75.

<sup>129</sup>Library and Archives Canada (LAC), RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Letter to AOC TC from A/Group Cdr, W/C J.L. Berven, 1 April 1958, “SAR – Standby Basis.”

<sup>130</sup>Ibid.

<sup>131</sup>LAC, RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Letter to MAC, TC, TAC, and ADC from CAS, signed by W/C J.G. Showler, 11 June 1958, “SAR – Standby Commitment.”

<sup>132</sup>Bohdan L. Kaluzny, “Optimal alignment of search and rescue response posture with historical incident occurrence,”(Ottawa: DRDC – Centre for Operational Research and Analysis: DRDC-RDDC-2014-R12, April 2014), 2.

## Debate and Controversy

In the wake of tragedy, it is not uncommon for news outlets to criticize Canada's SAR system. Common refrains are that "Canada lags behind in search and rescue" and "Search and rescue response times 'inadequate,'"<sup>133</sup> and most agree that more needs to be done. Less than a year following the March 2009 crash of Cougar helicopter 491 in the frigid North Atlantic approximately 60 kilometres east of St. John's NL, Members of Parliament and defence critics put forth a motion in the House of Commons that sparked headlines and asserted:

Canada lags behind international search and rescue norms. ... [This] motion urges the government to recognize the responsibility of the Canadian Forces for the protection of Canadians and to take such measures as may be required for Canada to achieve what is a common international readiness standard of 30 minutes at all times, from tasking to becoming airborne, in response to search and rescue incidents.<sup>134</sup>

It so happens that SAR response times are not set internationally, but as described in the IAMSAR Manual are left at the discretion of each country.<sup>135</sup> The manual stresses, "the most important element in improving the effectiveness of SAR services is the reduction in the elapsed time between when an incident occurs and when the persons in distress are rescued."<sup>136</sup> The Cougar helicopter crash into the Atlantic Ocean illustrates how crucial time is. At the moment of the crash, the CAF SAR helicopter normally located in Gander NL was in Sydney NS conducting training in a location that was a two-

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<sup>133</sup>"Search and rescue response times 'inadequate': union", *The Canadian Press*, 2 February 2011, <https://www.ctvnews.ca/search-and-rescue-response-times-inadequate-union-1.603112>.

<sup>134</sup>House of Commons, *House of Commons Debates. Official Report (HANSARD)* 146, no. 113, Monday, April 30, 2012, <http://www.ourcommons.ca/DocumentViewer/en/41-1/house/sitting-113/hansard>.

<sup>135</sup>IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual* ..., IAMSAR Vol 1 Chap 6, 6.52. Note: IAMSAR manual is designed to assist each nation in meeting their own SAR needs and fulfilling the obligations they have accepted under the various conventions.

<sup>136</sup>*Ibid.*, 6.5.1.

hour flying time from the incident location.<sup>137</sup> A backup Cougar helicopter that required configuration for SAR operations took approximately one hour to reach the sole survivor from the helicopter crash.<sup>138</sup> Seventeen others perished. Although the ICAO manual states that “Information derived from survival data and incidents involving fatalities indicates that two (2) hours is generally the average critical time within which persons in distress must be rescued in order to survive,”<sup>139</sup> the Cold Exposure Survival Model used by the JRCCs indicate that survival times in frigid waters are significantly less.<sup>140</sup> At the time of the Cougar helicopter crash, the sea temperature was zero degrees Celsius and there was a wind chill of minus six.<sup>141</sup> Considering a significant portion of Canada’s SAR AOR is over water and the majority of SAR cases in Canada each year are of a maritime nature, it is imperative that Canada maintains an effective SAR system.

Another tragedy that prompted SAR procedure reviews and generated findings and recommendations from the TSB regarding SAR response times occurred during the afternoon of 12<sup>th</sup> September 2005 off Bonavista, NL. A small fishing vessel, the *Melina and Keith II*, (Figure 3.1) with eight crew members on board was hauling nets when the

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<sup>137</sup>Royal Canadian Air Force, “CH-149 Cormorant,” last modified 22 June 2017, <http://www.rcfarc.forces.gc.ca/en/aircraft-current/ch-149.page>. A CH-149 Cormorant helicopter average speed is 278 km/hr or 150 kts/hr. Note: Distance from Sydney NS to St. John’s NL direct is approximately 320nm and the Cougar incident occurred an additional 35nm offshore.

<sup>138</sup>Transportation Safety Board, “*Aviation Investigation A09A0016, Main Gearbox Malfunction/Collision with Water Cougar Helicopters Inc. Sikorsky S-92A, C-GZCH St. John’s, Newfoundland and Labrador, 35 NM E, 12 March 2009,*” last accessed 5 April 2018, 4, <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2009/a09a0016/a09a0016.pdf>.

<sup>139</sup>IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual IAMAR* 6.5.2.

<sup>140</sup>The Cold Exposure Survival Model (CESM) was designed by Allan A. Keefe and Peter Tikuisis and is utilized at all JRCC’s in Canada. The model is designed to provide the SAR expert with sufficient background and understanding of CESM to facilitate the development of accurate incident scenarios and interpret the model predictions for any SAR incident. Further information on the model can be found at the following webpage: [www.dtic.mil/get-tr-doc/pdf?AD=ADA489046](http://www.dtic.mil/get-tr-doc/pdf?AD=ADA489046).

<sup>141</sup>Transportation Safety Board, “*Aviation Investigation Collision with Water Cougar ..., 19.*”

vessel took on water through the side fishing door and subsequently capsized.<sup>142</sup>



**Figure 3.1 – Fishing Vessel *Melina and Keith II***

Source: TSB Marine Investigation Report, 2.

According to the TSB report, the vessel capsized at 1529 hours Newfoundland local time but a Cormorant SAR helicopter from Gander was not tasked by MRSC St. John's to respond until 1650 hours during the two-hour response posture period. The helicopter became airborne one hour and twenty minutes after it was tasked an additional 50 minutes longer than if it were tasked during the 30-minute SAR posture window. The eight-crew members on the *Melina and Keith II* clung to the overturned fishing boat for two hours at which time the boat slipped beneath the surface. Two men who did not know how to swim drowned right away while the others clung to debris waiting for rescue. A fishing vessel assisted with the rescue but one man slipped beneath the surface twenty minutes before the SAR helicopter arrived on scene, generating many questions in the investigation phase post-accident. Four of the crewmembers were rescued and four of the crew lost their lives.<sup>143</sup>

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<sup>142</sup>Transportation Safety Board, “*Marine Investigation M05N0072, Capsizing and Loss of Life Melina & Keith II Bonavista, Newfoundland and Labrador, 70nm E 12 September 2005*,” last accessed 5 April 2018, 1, <http://www.tsb.gc.ca/eng/rappports-reports/marine/2005/m05n0072/m05n0072.pdf>.

<sup>143</sup>Ibid., 6.

Tragedies such as these certainly generate debate over areas for SAR improvements. The Standing Senate Committee on Fisheries and Oceans during their hearing in March 2017 expressed concern over the two-tier SAR response times<sup>144</sup> with Senator Christmas asserting the following:

The question that begs itself is why does [the CAF] have a two-tiered system? As best as I can tell, it's all about resources. It's all about personnel. It's all about staffing. They just don't have the resources to put a crew on standby during the weekends and holidays ... There doesn't seem to be enough resources within the Canadian Forces dedicated to SAR, and I find that very troubling.<sup>145</sup>

These are indeed valid concerns. Although the CAF is often recognized as a world leader for SAR response, the question must be asked: is Canada out front paving the way for other nations to follow and adapting its system to meet evolving trends in a timely manner?

### **SAR Response of Other Entities and Nations**

Following the crash of Cougar helicopter 491, the Commission of Inquiry report examined the level of search and rescue available to the NL offshore industry and found that “response times fell well below the standards applicable in other offshore oil operations.”<sup>146</sup> The response capability in the North Sea oilfields and elsewhere in the offshore exploration and production world were conducted by the Inquiry Commissioner noting that wheels-up response times for both United Kingdom and Norwegian SAR

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<sup>144</sup>In accordance with CAMSAR 2.10.3, the Tier 2 SAR readiness posture refers to a dedicated aircraft and crew capable of becoming airborne within two hours.

<sup>145</sup>House of Commons, Standing Senate Committee on Fisheries and Oceans, *Minutes of Proceedings and Evidence*, no. 11, 8 March 2017, 11:60.

<sup>146</sup>Newfoundland and Labrador Public Inquiry, *Offshore Helicopter Safety Inquiry* (St. John's, NL: Canada - Newfoundland and Labrador Offshore Petroleum Board, October 2010), 4, [http://www.cnlopbc.ca/pdfs/ohsi/ohsir\\_vol1.pdf?lbisphpreq=1](http://www.cnlopbc.ca/pdfs/ohsi/ohsir_vol1.pdf?lbisphpreq=1). Note: The Public Inquiry is designed to make recommendations to improve safety in helicopter operations in the Canada-NL offshore.

helicopters is 15 minutes. The Inquiry Commissioner Honourable Robert Wells also noted that:

Our offshore environment is as hostile as or more hostile than any other in the world. I believe that, of necessity, the level of helicopter search and rescue available to the C-NL [Canada – Newfoundland and Labrador] offshore should be as good as we can provide and, ideally, as good as exists elsewhere in the world. I say that because our conditions are severe and our distances are great. In most instances, helicopter rescue from land would be the only hope ... Circumstances therefore dictate that at the very least, our helicopter SAR response should be world-class, specifically because of our hostile offshore environment.<sup>147</sup>

The Inquiry found that the response time of the CAF SAR aircraft was too lengthy, and it became obvious to the Inquiry that a SAR response needed to be improved.<sup>148</sup> As a result, Cougar Helicopters implemented a full time 24 hour seven day a week dedicated SAR service with a 20-minute wheels-up response time to support the offshore oil industry. This was on par with other world-class offshore entities and would better serve the Canada – Newfoundland and Labrador offshore workers and their families. As a maritime nation, economic activity expands far beyond the oil and gas industry off NL. With 243,000 kilometres of coastline, the dependability on the fishing industry and increased transportation of goods is equally important and as risky as operations in the offshore oil industry. How can one segment of the offshore industry be supported with a 20-minute SAR response service and the other with a two-hour service?

In terms of the legal basis for SAR services, all countries that are party to the international conventions and agreements of UNCLOS, ICAO and IMO must provide certain aeronautical and maritime SAR coordination and standards. Article 98, paragraph two of UNCLOS provides the following statement: “Every coastal State shall promote the

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<sup>147</sup>Ibid., 186.

<sup>148</sup>Ibid., 187-188.

establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the water.”<sup>149</sup> It is at the discretion of the Canadian government to determine what type of SAR service is “adequate and effective” for Canadians; however it should be noted, “the international community expects these commitments to be fulfilled by all State parties.”<sup>150</sup> A comparison of the Canadian SAR system response times with those of other countries around the world is beneficial to consider for this analysis.

A study of SAR response times and how emergency preparedness is managed in other countries around the world was conducted by Seacom International located in St. John’s NL, and the results were delivered by the company’s President, Paul Clay at a National Defence Committee in February 2011.<sup>151</sup> Seacom International specializes in emergency management for large industries that operate in remote and dangerous locations with approximately 70 percent of their business relating to the maritime industry.<sup>152</sup> The study acquired insight into how emergency preparedness is managed in other countries and included the SAR response times. The countries that will be considered for this research all have SAR services available 24 hours a day, 365 days a year.

By way of comparison, the United States Coast Guard, a federal government agency, maintains a SAR response posture of 30 minutes 24 hours seven days a week.

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<sup>149</sup>UN General Assembly, *Convention on the Law of the Sea*, (UNCLOS), 10 December 1982, last accessed 6 April 2018, <http://www.refworld.org/docid/3dd8fd1b4.html>.

<sup>150</sup>IMO/ICAO, *International Aeronautical and Maritime Search and Rescue Manual ...*, IAMSAR Vol 1 Chap 1, 1.3.1.

<sup>151</sup>House of Commons, Standing Committee on National Defence, *Minutes and Proceedings of Evidence*, no. 43, 1 February 2011, <https://openparliament.ca/committees/national-defence/40-3/43/paul-clay-1/only/>.

<sup>152</sup>Company Listing, “Seacom International Inc.,” last accessed 5 April 2018, <http://www.seacomcanada.com>.

Their helicopters have 30 minutes to become airborne when tasked to respond to a SAR mission. Private industry in the US also participates in marine offshore oil and gas SAR operations with Cougar helicopters maintaining a 20-minute response time during the day and a 45-minute response time at night in the Gulf of Mexico.<sup>153</sup> Although the response assets in the United Kingdom are civil assets operated by Bristow Helicopters Ltd., the Coast Guard manages the operation. The Maritime and Coast Guard agency response times are 15 minutes between 0800 and 2200 and 45 minutes between 2200 and 0800.<sup>154</sup> The Royal Norwegian Air Force SAR helicopters have a 15-minute response posture at all times.<sup>155</sup> The Republic of Ireland has response times of 15 minutes and 45 minutes for day and night respectively.<sup>156</sup> Finally, the Australian Defence Force has a 30-minute wheels-up response time.

Although these countries all vary in size, volumes of distress cases, and departments that provide the asset or service, they all share a common SAR mandate as maritime nations with a demand to provide SAR response in a timely manner. Each of these countries have similar response times to Canada during the daytime; however the glaring difference is the greater evening and weekend response time of two hours in Canada. Recognizing that SAR response consists of a coordinated effort, the air power

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<sup>153</sup>House of Commons, Standing Committee on National Defence, *Minutes and Proceedings of Evidence*, no. 43, 1 February 2011, <https://openparliament.ca/committees/national-defence/40-3/43/paul-clay-1/only/>.

<sup>154</sup>Bristow Search and Rescue, “UK Search and Rescue Partners – Frequently Asked Questions,” last accessed 5 April 2018, <http://www.scottishmountainrescue.org/wp-content/uploads/2014/05/Bristows-SAR-H-FAQ.pdf>.

<sup>155</sup>House of Commons, Standing Committee on National Defence, *Minutes and Proceedings of Evidence*, no. 43, 1 February 2011.

<sup>156</sup>Department of Transport, *Irish National Maritime Search and Rescue (SAR) Framework*, (Irish Coast Guard, 2 March 2010), 34, <http://www.dttas.ie/sites/default/files/publications/maritime/english/irish-national-maritime-search-and-rescue-sar-framework/sar-framework.pdf>.

characteristics of speed and reach<sup>157</sup> mean that the fastest way to rescue someone in distress is generally using aeronautical resources. What is the actual demand for services in Canada during evenings and weekends? Does the current response time of two hours meet the needs of Canadians in all areas of the country or could the system be improved?

### **CAF Summer SAR Posture Trials**

Analyzing SAR data on a regular basis to ensure that it aligns with activity levels and meets the demands of those who might require the service is important. It is also an area that was found to be lacking in the 2013 SAR performance audit conducted by the Office of the Auditor General (OAG).<sup>158</sup> The overall purpose of this type of audit is to determine how well the government manages its activities, responsibilities and resources. In terms of SAR response posture, findings revealed that the current scheduled states of readiness for CAF SAR aircraft do not coincide with the time of greatest need. The RCAF's objective is to meet the 30 minute and two hour response times for 100 percent of incidents; however in the period covered by the audit, the RCAF SAR aircraft met the assigned response times for 85 percent of incidents (2,281 out of 2,675 SAR cases) and at times departed earlier than the standard time.<sup>159</sup> Although reasons for delays were recorded, at the time of the report, systematic analysis was not conducted to determine whether or not improvements were needed. The OAG study further concluded "the current state of readiness does not reflect the busy periods of commercial fishing and recreational activity" and that to improve the current system without increasing the number of hours worked, a shift of the 8am to 4pm schedule by an hour or more could

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<sup>157</sup>Department of National Defence, B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*, (Trenton, ON: Canadian Forces Aerospace Warfare Centre, November 2016), 14.

<sup>158</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, Chapter 7, Para 7.23.

<sup>159</sup>*Ibid.*, 7.23. Note: the OAG audit covered the period between 1 April 2007 to 1 November 2012.

improve coverage.<sup>160</sup> As the Auditor General report notes, “Shifting the regular weekly schedules could have increased readiness for SAR alerts by 9 percent in the Victoria SAR region, 32 percent in the Trenton region, and marginal amounts in the Halifax region.”<sup>161</sup> Although somewhat alarming, recognizing and acknowledging that a problem exists is the first step to making improvements.

DND agreed with the audit findings and immediately began to review its approach to ensure it captured and systematically analyzed data to examine the performance of SAR assets ensuring they met the needs of Canadians now and in the future.<sup>162</sup> One month after the audit results were revealed, the MND and Lead Minister for SAR, the Honourable Peter MacKay announced the initiation of the first Quadrennial SAR Review that would represent an important first step in developing a comprehensive perspective of the NSP and chart the programs future course.<sup>163</sup> The CAF embarked on a three year phased trial where the 30-minute response posture times were shifted in each SRR during the summer months, to more closely align with (historical) times of increased activity. As the CJOC SAR directive noted, “Each fall, the SAR mission statistics from the summer were evaluated by CJOC and Defence Research and Development Canada (DRDC), and the following summer posture adjusted, with the goal of achieving a seasonally optimal SAR posture in all three SRRs.”<sup>164</sup> An example of the 2017 summer SAR posture schedule by region is illustrated in Table 3.1.

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<sup>160</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, 7.24.

<sup>161</sup>*Ibid.*, 7.25.

<sup>162</sup>Department of National Defence, *Canadian Joint Operations Command SAR Directive 01-2017* (Ottawa: Commander Canadian Joint Operations Command: file 3385-1/RDIMS 421945, May 2017), 9.

<sup>163</sup>Department of National Defence, *Quadrennial Search and Rescue Review ...*, 1.

<sup>164</sup>National Defence, *Canadian Joint Operations Command SAR Directive 01-2017 ...*, 9.

Sqn	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
442	0800-1600	RP2	RP2	0800-1600	0800-1600	1000-1800	1000-1800
435	0830-1630	0830-1630	0830-1630	0830-1630	0830-1630	RP2	RP2
424	0900-1700	0900-1700	RP2	RP2	0900-1700	1200-2000	1200-2000
413	RP2	RP2	0900-1700	0900-1700	0900-1700	0900-1700	0900-1700
103	1000-1800	1000-1800	1000-1800	RP2	RP2	1000-1800	1000-1800

**Table 3.1 – Summer SAR Posture in 2017.**

**Note: Posture commences in May and ends at the beginning of September and varies by each SAR Squadron.**

Source: CJO SAR Directive 2017, 8.

Attempts to find the perfect response posture has been ongoing since 2013 but as SAR is unpredictable and can occur at any place at any time on any day, it makes these efforts to find a perfect part-time solution challenging. In addition to this summer SAR posture schedule, the SRR Commanders can also adjust the SAR asset posture times to meet periods of local/regional-increased activity within their SRR.<sup>165</sup> For example, the opening day of a fishery in NL and NS often sees hundreds of fishers take to the waters before the sun rises at a time when SAR crews are holding a response posture of two hours. Events such as the Marblehead Yacht race which consists of 75 vessels sailing from Boston to Halifax over a two week period 24 hours seven days a week while SAR crews are at their respective bases on a two hour response time also triggers extra monitoring and at times adjustment of the SAR posture schedule.<sup>166</sup>

Indeed, such initiatives are forward-thinking with efforts of strengthening the SAR system and striving for improved response, but they support the notion that the standard 30-minute posture from 0800-1600 and two hour evening and weekend posture

<sup>165</sup>National Defence, *Canadian Joint Operations Command SAR Directive 01-2017* ..., 9.

<sup>166</sup>As Officer in Charge of JRCC Halifax from 2014-2017, the author is very familiar with this event and had firsthand experience in coordinating the SAR posture for this event. Official information regarding the Marblehead Yacht Race can be found at <https://www.marbleheadtohalifax.com>.

times are not the 100 percent solution for SAR within Canada's SRR. It does, however, leave the question of why not establish a permanent solution vice conducting trials and implementing provisional solutions for a system that is unpredictable and one where time is a major critical factor between life and death. Is it that a slight adjustment to the SAR posture to match seasonal activity and periods of high demand is the most efficient remedy at the present time or are underlying factors such as costs and resources driving this solution? It would appear that limited resources are a significant factor after newspapers in NL published highlights from a response letter sent to the Mayor of Gander from the MND, Peter MacKay in March 2010 regarding improved SAR response times. MacKay's letter said providing an around-the-clock 30-minute response time at Gander would require more money and resources than Ottawa appears willing to provide. And such a move, he wrote, "would at best yield only marginal improvement" to the overall service.<sup>167</sup> As one newspaper article noted, "Often it is the case that rescue resources are hours, as opposed to mere minutes, away regardless of the response posture – a critical consideration for those operating in severe and extreme environments."<sup>168</sup>

Having adapted to the current response posture in 1958 in a time of resource drawbacks, it would appear that cost and resources are driving factors 60 plus years later. Seasonal posture shifts tend to suggest that the level of activity has not remained the same, which is definitely reason for further in-depth analysis. It is too late once tragedy strikes. With the shift of formal leadership in Canada, priorities and initiatives regarding SAR regularly change as evident with the closing of the MRSC St. John's in 2012 followed by its re-opening five years later as well as the dwindling in initiatives such as

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<sup>167</sup>Andrew, Robinson, "SAR Status Quo is fine with MacKay," *The Evening Telegram*, 19 March 2010, <https://www.pressreader.com/canada/the-telegram-st-johns/20100319/281809985072872>.

<sup>168</sup>Ibid.

the Quadrennial Review. To ensure continuity moving forward and to provide Canadians with the best service possible, a permanent solution must be implemented.

### **SAR ASSET LOCATION**

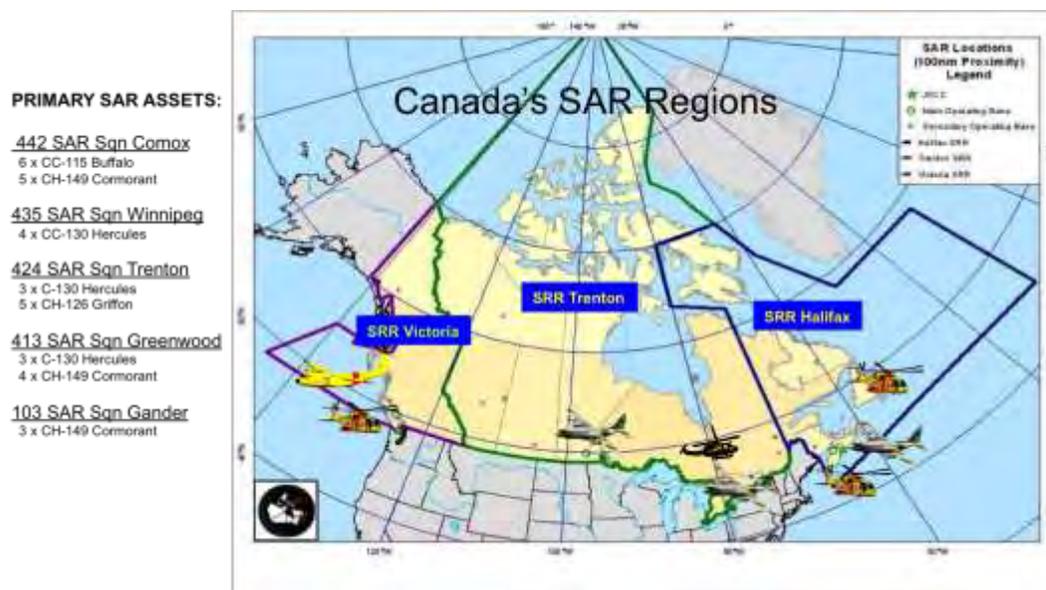
The location of primary SAR assets at various military installations across Canada goes hand in hand with the importance of SAR response times. The time it takes for a SAR aircraft to become airborne in conjunction with the time it takes for it to reach the incident scene are vital in affecting the outcome of a SAR distress incident. When considering survival times and exposure to the elements, these two items combined are priority. Having a robust and enhanced SAR response time is one step towards a rapid rescue but if the SAR incident occurs hundreds or even thousands of miles from the SAR asset location, this generates additional concern and logistical challenges that requires the search for and reliance on additional measures and back up resources.

As previously highlighted in this paper, the main factors influencing the location of the CAF primary SAR assets include historical distribution of incidents, influence of weather patterns and co-location of forces with infrastructure.<sup>169</sup> The CAF contribution to the NSP consists of three JRCCs, five bases (aircraft squadrons), and eight high readiness CAF air SAR resources (four helicopters and four fixed-wing aircraft).<sup>170</sup> Each SRR has one of each aircraft type on standby posture for an immediate response (see Figure 3.2).

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<sup>169</sup>Department of National Defence, “About Search & Rescue,” last modified 15 March 2018, <http://www.forces.gc.ca/en/operations-canada-north-america-current/sar-canada.page>.

<sup>170</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, 2.01.1 & 2.10.5.



**Figure 3.2 – CAF's Primary SAR Asset Location**

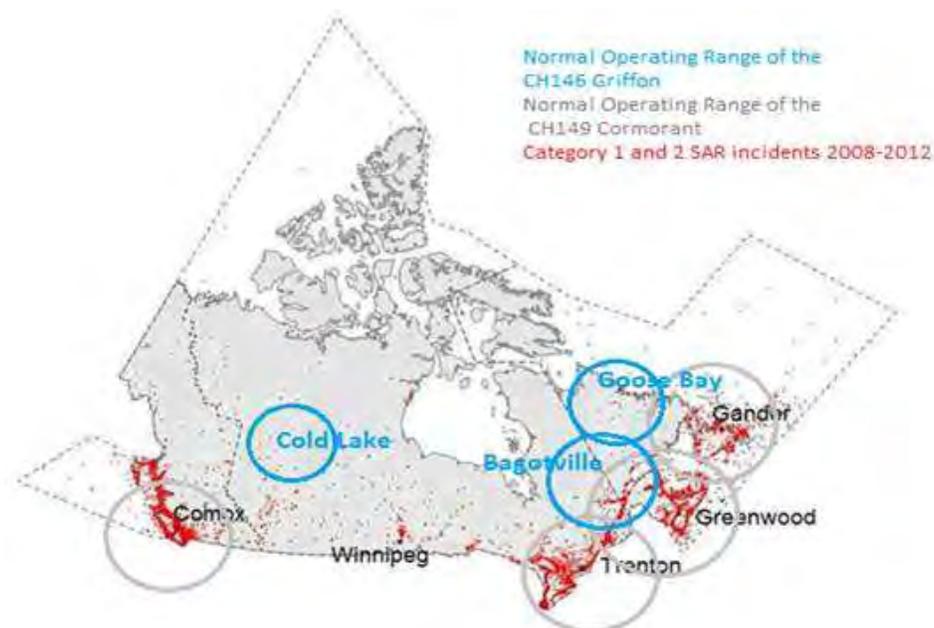
Source: CJOC Commands -#365430-v1-SAR\_CONPLAN\_for\_the\_North, 6.

The location of CAF resources is a controversial topic that has garnered much debate over the past decade especially in terms of SAR response to incidents in Canada's Arctic region and offshore. Multiple studies have been completed at DRDC (in 2005, 2011, and 2013) to assess the appropriateness of current base locations.<sup>171</sup> The Chief of Review Services captured the findings of these studies in the 2015 NSP Evaluation noting that 90 percent of all Category 1 and 2 SAR incidents are concentrated in the southern portion of the Canadian SAR AOR and within operating range of rotary assets based in Gander NL, Greenwood NS, Trenton ON and Comox BC.<sup>172</sup> Figure 3.3 depicts the theoretical operating range of primary and secondary rotary wing SAR assets and also

<sup>171</sup>National Defence, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program* ...,18.

<sup>172</sup>Ibid., 19. A Category 1 SAR case is defined as a distress case where a person or persons are threatened by grave and imminent danger and require immediate assistance. A Category 2 case is defined as a potential distress where the potential exists for a Category 1 case if timely action is not taken - i.e., an immediate response is required to stabilize a situation in order to prevent distress. (CAMSAR 8.03) Note: The Rotary Wing (RW) asset located at 8 Wing Trenton is the CH-146 Griffon helicopter, and the remaining primary SAR bases with the exception of Winnipeg have the CH-149 Cormorant helicopters as the primary SAR RW asset. Goose Bay, Bagotville, and Cold Lake have CH-146 Griffon helicopters as secondary SAR assets.

highlights the general location for Category 1 and 2 SAR incidents between 2008 and 2012.



**Figure 3.3 -- Operating Range of Rotary Wing Assets at Each Location and Corresponding Incidents from 2008 to 2012.**

Source: Chief of Review Services, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program*, 2015, 19.

The results showcased in this depiction and also captured in recent reviews appear to send a message that assets are stationed in ideal locations across Canada's AOR; however this information no longer represents a complete picture of activity levels and trends taking place today. There are a number of aspects that cannot be overlooked when considering the appropriateness of current base locations, with the first and foremost of these being the distance from Canada's Arctic.

As outlined in the *Agreement on Cooperation on Aeronautical and Maritime Search and Rescue in the Arctic* signed in 2011, Canada's Arctic region in terms of SAR

is defined as the area north of 60 degrees latitude.<sup>173</sup> This area represents a large portion of Canada's AOR and poses significant risk: "The significant transit distances required to reach the edges of our AOR, as well as the limited number of communities and refuelling opportunities, effectively make RW [Rotary Wing] response (whether CH146 or CH149) impractical."<sup>174</sup> The majority of Canada's Arctic region resides within the Trenton SRR with the eastern portion under the control of the JRCC Halifax as depicted in Figure 3.4.<sup>175</sup>



**Figure 3.4 -- Areas of responsibility for SAR in Canada**

Source: CAMSAR Chapter 1, 1.04

The northern region is remote and vast with limited roads to support ground response and barren landscapes offering limited shelter or protection from the elements. It's a region known for its inhospitable climates that will push the limits of the hardest souls including SAR professionals who specialize and train in Arctic environments. In

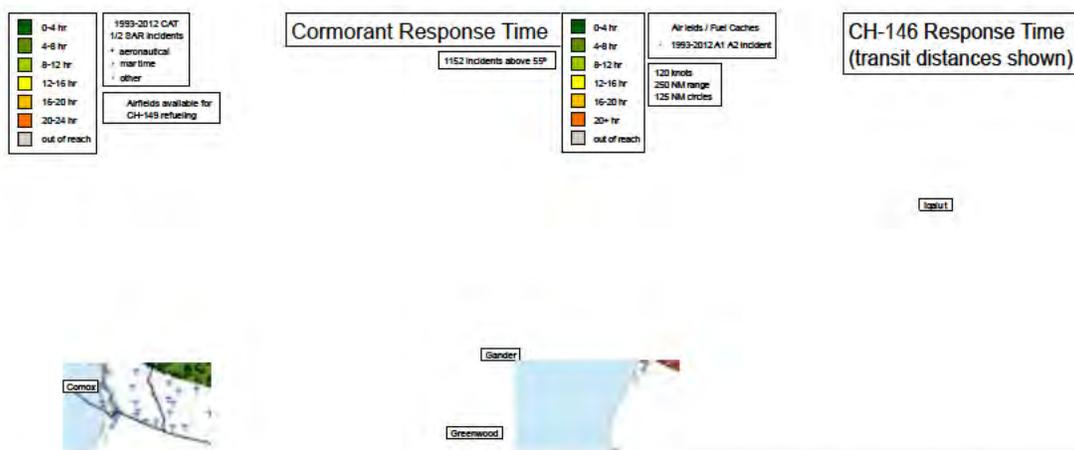
<sup>173</sup> Arctic Council, *Agreement on Cooperation Aeronautical and Maritime Search and Rescue in the Arctic*, Arctic Council Secretariat, 12 May 2011.

<sup>174</sup> National Defence, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program ...*, 20.

<sup>175</sup> DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, Chap 1, 1.04.

such conditions, time is of the essence for survival requiring rapid rescue response, which often requires helicopter extraction and immediate medical care.

The classic response for a northern SAR case that requires CAF support entails the tasking of a fixed wing SAR Hercules aircraft normally based in Winnipeg and a primary SAR Cormorant either from Gander, NL or Greenwood, NS. Given the speed and range of the Hercules, it would typically be the first CAF asset to arrive on scene, however wind velocity and cloud ceiling may challenge the insertion of SAR Technicians by parachute requiring the reliance on extraction by helicopter. SAR distress incidents in the vicinity of Baffin or Ellesmere Islands will require 12-24 hours to reach by Cormorant helicopter dependent on a number of factors such as weather and enroute fuel stops (see Figure 3.5). To place the extreme distance of Canada's Arctic region from SAR bases in context, consider that Mexico City is closer to Trenton, ON than most of Baffin Island.



**Figure 3.5 – Cormorant & Griffon Helicopter response times to various locations in Canada's AOR**  
Source: CJOCC Commands #365430-v1-SAR\_CONPLAN\_for\_the\_North, 18, 21.

It should be noted that the Griffon SAR helicopter stationed within the Trenton SRR is an interim solution for rotary wing SAR in the region but has a number of limitations including range, size, power and equipment deficiencies such as lack of de-

icing capability that would preclude it from responding to a SAR case in the high Arctic.<sup>176</sup> The logistical challenges that accompany these types of missions cannot be overlooked. Due to the extensive transit distance, simultaneous coordination must occur to have a rested crew in the north ready to relieve the aircrew that flew the machine from its southern base so the search and rescue operation of the mission can immediately commence. While SAR crews transit from the south, civilian and volunteer resources in the north are being mustered with the ‘hope’ that they might be able to locate those in distress and render some form of assistance.<sup>177</sup> Not having a dedicated SAR asset in Canada’s Arctic certainly presents a risk.

It would be remiss to not point out that SAR responses are a collaborative effort consisting of co-operating aircraft, vessels, other craft and installations operating under co-ordination of one of Canada’s JRCCs; however these are not dedicated SAR resources and have limited capabilities. The provision of aeronautical SAR and maritime SAR services in Canada is a federal government mandate with the CAF holding the primary responsibility for the provision of aeronautical SAR services. The CAF is also responsible for the effective operation of the coordinated aeronautical and maritime SAR system.<sup>178</sup> To fulfill this mandate, serve Canadians, and support the international community in accordance with signed agreements, Canada needs to uphold its dedicated SAR response.

A second and important consideration that challenges the appropriateness of SAR asset locations within Canada is the activity level in Canada’s Arctic. It is no secret that Canada’s Arctic region has been experiencing changes over the past decade with

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<sup>176</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, 7.60.

<sup>177</sup>Danys Poitras, “Search and Rescue in the Arctic,” in *Canadian Armed Forces Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned* (Fredericton: University of New Brunswick The Gregg Centre for the Study of War & Society Book Series, no.1, 2017), 401-402.

<sup>178</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, Chap 1, 1.04.

continued warmth resulting in sea-ice melt. Although the environmental change is stimulating and fuelling opportunity, an economy driven by mining exploration, fishing, venture tourism and ecotourism, it is posing risks. The melt of sea-ice is changing landscape features resulting in the need for a major investment in charting. In 2010, John Falkingham, a 30 year employee with the Canadian Ice Service explained to the *Nunatsiaq News* that inadequate charts are the “single biggest issue in the Arctic” and that only one-tenth of Canada’s Arctic waters are charted to modern standards.<sup>179</sup> Minimal charting progress has been made over the past eight years as captured in the official publication of the Canadian Coast Guard’s annual *2018 Notice to Mariners - Aids to Navigation and Marine Safety Bulletin* produced for vessels intending to navigate in Canada’s northern waters.<sup>180</sup> It confirms that today, less than ten percent of Arctic waters are surveyed to modern standards. Added to this navigation challenge are icebergs and small chunks of ice called “growlers” that are extremely hard, float low in the water and are difficult for vessels to spot. In September 2014, a 19-metre Arctic research vessel *Martin Bergmann* ran aground in the Northwest Passage in the early morning hours after it hit a sandy shoal in the Simpson Strait.<sup>181</sup> Thankfully, the vessel was travelling at low speed and no damage or injuries were reported.

The polar cruise industry has seen considerable growth in the past decade and although they have maintained a positive human safety profile, these vessels are not immune to groundings or other issues. The extra layer of complexity with cruise vessels

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<sup>179</sup>Michael Byers, “Canada’s Arctic Nightmare Just Came True: The Northwest Passage is Commercial,” *Globe and Mail*, 20 September 2013, last updated 28 November 2017.

<sup>180</sup>Department of Fisheries and Oceans Canada, *2018 Notice to Mariners – Section A Aids to Navigation and Marine Safety Bulletin*, (Canadian Coast Guard DFO/2018-2001 A3 – Notice 7A, 2018), 1.

<sup>181</sup>CBC News, “Arctic research ship Martin Bergmann runs aground”, 4 September 2014, last updated 4 September 2014, <http://www.cbc.ca/news/canada/north/arctic-research-ship-martin-bergmann-runs-aground-1.2756048>.

is their volume of people, which will bring the SAR response to a whole new level. A close call occurred in August 2010, when the cruise ship *Clipper Adventurer* ran aground on an underwater cliff in Coronation Gulf in the Northwest Passage.<sup>182</sup> A Canadian Coast Guard ship evacuated the 128 passengers (Figure 3.6).



**Figure 3.6 -- Cruise Ship Clipper Adventurer run aground in the Northwest Passage. All 128 passengers had to be evacuated.**

Source: Website of Maritime Lawyer Jim Walker.<sup>183</sup> Photos courtesy of the CCG.

Although there was no loss of life, this incident illustrates the stark reality of risk associated with activity in Canada's Arctic and it should trigger a warning from a risk management standpoint that more needs to be done. Although the overall probability of incidents is low, when they do occur, the risks are high. In August 2016, Adam Lajeunesse, an expert on Arctic and Maritime Policy witnessed firsthand the change taking place within the Arctic region when he accompanied the passengers and crew onboard the cruise ship *Crystal Serenity* and sailed through a portion of the North West Passage. He remarked that the channel is opening up to shipping which will create many

<sup>182</sup>“Cruise ship exploring Northwest Passage runs aground,” *Globe and Mail*, 29 August 2010, last updated 26 March 2017, <https://www.theglobeandmail.com/news/national/cruise-ship-exploring-northwest-passage-runs-aground/article1378559/>.

<sup>183</sup>Figure 3.6 source, <http://www.cruiselawnews.com/2010/08/articles/sinking/clipper-adventurer-cruise-ship-runs-aground-in-the-arctic/>.

new problems for Canada especially in terms of search and rescue.<sup>184</sup> With the primary long-range SAR helicopters requiring more than a day to fly the approximate 2500 kilometres to the Northwest Passage as well as stopping to refuel along the way, this makes what the future in Canada’s Arctic holds worrisome.

In March 2016, Nunavut officials expressed concern over the location of primary SAR assets to CBC News following two near maritime disasters that occurred in the Arctic waters within the Halifax SRR. Although both incidents resulted in a positive outcome with everyone safely rescued, the length of time for rescue assets to arrive was significant. Jerry Ward, Chair of the Nunavut Offshore Allocation Holders Association, says “at some point it's realistic to assume that there could be a loss of life.”<sup>185</sup> The Nunavut fishing industry renewed its call to the government for a SAR base in the North after an incident where the fishing vessel *Saputi* struck ice and took on water in Davis Strait as shown in Figure 3.7.



**Figure 3.7 -- Fishing Vessel *Saputi* taking on water in Davis Strait in February 2016.**  
Source: Photo courtesy Joint Task Force Atlantic (Twitter)

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<sup>184</sup>Alexandra Pope, “Q&A: Arctic policy expert Adam Lajeunesse on the future of Canada’s north,” *Canadian Geographic*, 6 March 2017, <https://www.canadiangeographic.ca/article/qa-arctic-policy-expert-adam-lajeunesse-future-canadas-north>.

<sup>185</sup>Sima Sahar Zerehi, “Nunavut officials press for Arctic search and rescue base,” *CBC News*, 7 March 2016, <http://www.cbc.ca/news/canada/north/arctic-search-and-rescue-needs-1.3477252>.

Due to the *Saputi*'s location, a Danish navy ship was called upon to escort the disabled vessel into Nuuk Greenland.<sup>186</sup> Six months prior to this incident in September 2015, a NL fishing vessel *Atlantic Charger* took on water near the mouth of Frobisher Bay resulting in the crew abandoning ship. The vessel's Captain was successful in transmitting a mayday to JRCC Halifax but due to the location of the incident, the nine-crew members spent 12 hours in a life raft awaiting rescue. They battled frigid temperatures and were exposed to the ocean as they struggled to keep a canopy overhead until a Danish fishing vessel arrived and after multiple attempts in stormy conditions were able to successfully conduct the rescue.<sup>187</sup>

Although collaboration with other agencies is vital to any SAR incident, timely response is equally vital. As important as a vessel of opportunity at sea is for assisting distressed mariners, this is not an established dedicated system. Ed Zebedee, Nunavut's Director of Protection Services, also expressed concern about the lack of dedicated SAR resources stating,

If we have a major incident up here, we are in a very bad position to be able to respond. We are seeing more and more incidents. Our number of searches grows annually and the availability of specialized aircraft to be able to assist is very limited here. Last year there were more than 250 searches in Nunavut, I think our worst day we had eight searches that we were coordinating at the one time.<sup>188</sup>

Although some of the incidents referenced fall within the territorial responsibility under ground SAR, they still may involve a life in distress and require helicopter support.

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<sup>186</sup>The author was the Officer in Charge at JRCC Halifax for both of these SAR cases involving the Fishing Vessel *Atlantic Charger* and the Fishing Vessel *Saputi*.

<sup>187</sup>Jane, Adey, " 'We were damn near killed': Atlantic Charger captain speaks out on survival, rescue," *CBC News*, last updated 15 October 2015, <http://www.cbc.ca/news/canada/newfoundland-labrador/atlantic-charger-captain-1.3269974>.

<sup>188</sup>Sima Sahar Zerehi, "Nunavut officials press for Arctic search and rescue base," *CBC News*, 7 March 2016.

The increase in maritime activity is only one dimension that must be considered as commercial air traffic operating on polar routes has shown a marked rise over the years, increasing 15-fold between 2003 and 2015.<sup>189</sup> In 2016, over 14,000 flights used the polar routes. The risk of an air incident is as equally probable as a maritime incident. On 20 August 2011, a Boeing 737-210C First Air charter flight 6560 enroute to Resolute Bay, Nunavut from Yellowknife, Northwest Territories struck a hill approximately one mile east of the runway while conducting an approach to land in Resolute (Figures 3.8 and 3.9).<sup>190</sup>



**Figure 3.8 -- First Air 6560 accident site**  
Source: TSB Aviation Investigation Report, 32.

<sup>189</sup>Nav Canada, “Polar Routes Past Present Future”, *Nav Canada* (blog), 27 April 2017, <http://blog.navcanada.ca/polar-routes-past-present-future/>.

<sup>190</sup>Transportation Safety Board, “Aviation Investigation Report A11H0002, Controlled Flight Into Terrain, Bradley Air Services Limited (First Air) Boeing 737-210C, C-GNWN Resolute Bay, Nunavut 20 August 2011,” last accessed 5 April 2018, 1, <http://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/2011/a11h0002/a11h0002.pdf>.



**Figure 3.9 -- Accident site looking north**  
 Source: TSB Aviation Investigation Report, 33.

The crash occurred in the morning at 1142 Central Daylight Time. As released in the TSB report, “the aircraft was destroyed by impact forces and an ensuing post-crash fire. Eight passengers and all 4 crewmembers sustained fatal injuries. The remaining 3 passengers sustained serious injuries and were rescued by Canadian military personnel, who were in Resolute Bay as part of a military exercise.”<sup>191</sup>

Incidents such as this one that occur in a remote area of Canada or involve a number of people that would overwhelm the system in place are classified as a Major Aeronautical Disaster (MAJAID) and would require the activation of a contingency plan (CONPLAN) providing resources and measures to respond to a MAJAID incident involving up to 320 survivors. Activation of a MAJAID includes the response of SAR primary assets from all SRRs, the deployment of a twelve-person Airborne Support Group (ASG) and the drop of a MAJAID kit pre-positioned in Trenton, ON.<sup>192</sup> It would

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<sup>191</sup>Transportation Safety Board, “*Aviation Investigation, Controlled Flight Into Terrain*” ... summary.

<sup>192</sup>Department of National Defence, *Conplan Soteria – CAF Response to a Major Air Disaster (MAJAID)*, (Ottawa: Canadian Joint Operations Command: file 3120-1/RDIMS#423219, 11 April 2017, 1-2.

take a primary SAR helicopter from Gander in excess of 12 hours to reach the scene and in excess of 24 hours for the MAJAID resources.<sup>193</sup> Coincidentally, the crash of First Air Flight 6560 occurred next to an airfield at a time when a military exercise was taking place. Had the crash occurred in a remote area inaccessible by road or foot, the transit time of southern-based SAR assets combined with possibly a search to locate the downed aircraft would have left survivors in a dire situation.

Such was the case on 9 September 2013, at 1638 Mountain Daylight Time, when a Canadian Coast Guard helicopter took off from the Canadian Coast Guard Ship (CCGS) *Amundsen* with three people onboard. Its mission was to conduct an ice measurement and reconnaissance mission in the M'Clure Strait, Northwest Territories, but the aircraft failed to return.<sup>194</sup> The CCGS *Amundsen* commenced a search and as outlined in the TSB aviation investigation report, at 1847, debris was spotted. The three occupants were recovered unresponsive using the vessel's fast rescue craft; none of them survived. The helicopter sank in 458 metres of water. The accident occurred during daylight. No 406-Mega Hertz emergency locator transmitter signal was received by the satellite system.

At 1909, the CCGS *Amundsen* phoned Trenton JRCC to request support for a medical evacuation. The closest military air asset, a C130, was in Winnipeg, Manitoba, about 1582 nm away, while the closest marine asset, the CCGS *Henry Larsen*, was in Resolute Bay, Nunavut, about 345 nm away.<sup>195</sup>

While a search for the most appropriate and expeditious air asset occurred, the interim plan was to rendezvous the CCGS *Amundsen* with the CCGS *Henry Larsen* but this never

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<sup>193</sup>The distance from Gander to Resolute Bay is 1853 nautical miles or 3431 kilometres. A CH-149 Cormorant helicopter operates at approximately 150 knots airspeed dependent on factors such as winds and weather.

<sup>194</sup>Transportation Safety Board, "Aviation Investigation Report A13H0002, Collision With Water, Government of Canada, Department of Transport MBB BO 105 CDN-BS-4 (Helicopter) C-GCFU M'Clure Strait, Northwest Territories 9 September 2013, last accessed 5 April 2018, summary and 4, <http://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/2013/a13h0002/a13h0002.pdf>.

<sup>195</sup>Ibid., summary.

happened as at 2008 hours, the requested support for the medical evacuation was cancelled and the three occupants were deceased.<sup>196</sup> It is clear that distress incidents do occur in the Arctic yet conclusions drawn from the many studies regarding SAR asset location focus on where the greatest numbers of incidents occur. Whether it is one person or one hundred, the value of the human life is equal.

The service to all Canadians should be equal. This statement generates the final but one of the most important considerations regarding the location of military SAR assets: why is there no full time SAR air asset located in the northern region to support the communities and those who make their livelihood operating on the land and water? The North has Canada's highest birth rate and as northern communities expand, the public increasingly expects and deserves the same standard of living and societal benefits as residents of southern Canada.<sup>197</sup> However, the northern SAR capabilities and infrastructure are not at the same level of those provided to residents in the southern portion of the country.<sup>198</sup> Nunavut Member of Parliament, Hunter Tootoo suggested during an interview that "the North is so vast and huge it's impossible to have stations everywhere ... the best way is to utilize the resources that are on the ground and that's the people that are out there."<sup>199</sup> He pointed to the creation of 12 new Coast Guard Auxiliaries in Nunavut and Nunavik as one possible solution to bolster SAR in the North. Understanding that volunteers are a large component of the SAR organization, Nunavut's

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<sup>196</sup>Ibid., 4.

<sup>197</sup>Statistics Canada, "Births and total fertility rate, by province and territory (Fertility rate)," last modified 19 October 2017, <https://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/hlth85b-eng.htm>.

<sup>198</sup> Ted Lennox, "It's time... Search and Rescue IN the Arctic!" *FrontLine Defence* 2, no.5 (2005): 1 of 4.

<sup>199</sup>Sima Sahar Zerehi, "Nunavut officials press for Arctic search and rescue base," *CBC News*, 7 March 2016.

Director of Protection Services Ed Zebedee understands that it is not enough.<sup>200</sup> He submits that the territory is not equipped to handle the SAR workload and that coast guard auxiliaries are of limited assistance in the search and rescues of large offshore vessels, as they have no capability for those situations. Zebedee said “the expansion of the fishing industry in the Arctic and the melting of sea ice point to the growing need for a search and rescue base in the North capable of responding to distress calls from medium to large vessels.”<sup>201</sup> Many of the recent discussions regarding change in the Arctic place focus on increased tourism activity but the support to the local populations who are also impacted by the same environmental changes are equally important.

The CAF has launched initiatives in the Arctic region that consists of increased training of Canadian Rangers,<sup>202</sup> additional recruitment of Civilian Air Search and Rescue Association (CASARA) volunteers and collaboration with key partners such as Coast Guard who are also pursuing initiatives including bolstering the volunteer resources of the Coast Guard Auxiliary throughout the north.<sup>203</sup> One of the larger CAF footprints is seen throughout the summer months when military assets are stationed throughout the North to conduct exercises and training. These initiatives are highly beneficial to SAR operations, but in the end, a dedicated SAR helicopter asset with trained crews remains thousands of miles away.

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<sup>200</sup>Ibid.

<sup>201</sup>Ibid.

<sup>202</sup>P. Whitney, Lackenbauer, “The Canadian Rangers: A ‘Postmodern’ Militia That Works,” *Canadian Military Journal* 6, no. 4 (Winter 2005–2006): 49-60, <http://www.journal.forces.gc.ca/vo6/no4/doc/north-nord-03-eng.pdf>.

<sup>203</sup>Department of National Defence, “Arctic Campaign Plan – Operational Design Endorsement,” (Ottawa: Canadian Joint Operations Centre file 3000-1/RDIMS 441648, 12 October 2017) 1-4.

## Conclusion

Change is happening and as a result, the ‘status quo’ approach is no longer viable. The risks are real. As emphasized by the Chief of Review Services (CRS) in the January 2015 *Evaluation of the DND/CAF Contribution to the National Search and Rescue Program*, “ensuring that aircraft are staged in the best locations to respond to incidents is a key measure of effectiveness.”<sup>204</sup> Canada needs to continue to step forward as a SAR leader adhering to the agreements in place. Canada also needs to ensure the SAR resources are postured effectively with properly trained personnel who can respond in a timely manner.

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<sup>204</sup>National Defence, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program ...*,18.

## CHAPTER 4 – THE WAY FORWARD

### SAR Prevention – A Consolidated Effort

Through social media and a variety of other outlets, the SAR spotlight tends to be centred on the response pillar of the NSP vice on prevention. The topic of SAR prevention tends to hold a lower profile perhaps due to the fact that unlike SAR incidents that instantly attract media attention, it requires a push from stakeholders to promote. SAR prevention is a critical pillar within the NSP and it must remain the first priority. As evident from the various tragedies highlighted in this research (*Leviathan II, Melina and Keith II*) unforeseen circumstances can occur in a split second, and without proper safety measures in place, can result in the worst possible outcomes.

### Collaboration is Necessary

The responsibility for the NSP resides within Public Safety and Emergency Preparedness Canada,<sup>205</sup> however, the responsibility for SAR prevention rests with Transport Canada (TC). In the same manner that the response pillar of the NSP requires close collaboration to achieve a positive outcome; the prevention pillar requires the same. The NSP consists of multiple federal departments including CCG, RCMP, Meteorological Service of Canada, TC and DND/CAF. The coordination aspect of SAR prevention amongst the various agencies is effected through ICSAR.<sup>206</sup> The MND is appointed the federal lead minister for SAR (LMSAR) and heads the ICSAR; however the executive director of the National SAR Secretariat acts as the delegated chair of ICSAR meetings

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<sup>205</sup>Public Safety Canada, “National Search and rescue Program,” last modified 27 September 2017, <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rspndng-mrgnc-vnts/nss/prgrm-en.aspx>.

<sup>206</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, Chap 1, 1.05.3.

on behalf of the LMSAR.<sup>207</sup> The chair of ICSAR is responsible for the provision of policy advice and program coordination related to the prevention and response initiatives within the NSP. However, as noted in the CRS 2015 findings, ICSAR has been inactive for at least three to five years resulting in a loss of effective coordination.<sup>208</sup> A separate federal SAR operational governance committee was established by CAF and CCG as a forum for collaboration, yet creating potential duplication while lacking the benefit of overall ICSAR direction.

It is imperative that stakeholders collaborate on a regular basis with support from top management. Both the CAF and CCG have no direct mandate to provide SAR prevention, but instead maintain supporting roles through participation in educational programs and coordination with agencies involved in SAR. The lack of a mandate, however, presents itself as an obstacle especially in terms of resources by way of funding and personnel. The 2013 OAG report presented in its findings “that the responsibilities and authorities for prevention are not as clearly delineated as in the area of response; prevention efforts often fall secondary to the response efforts, and collaboration across the system remains weak.”<sup>209</sup> Understandably, this is less than ideal as prevention and education should be at the forefront of an effective SAR program. A well-defined champion and organizational structure solely for the purpose of SAR prevention would serve as a beneficial tool moving forward.

### **Increased Legislation**

Another powerful tool that would improve safety and increase prevention is

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<sup>207</sup>Ibid., 1.05.5.

<sup>208</sup>National Defence, *The Evaluation of the DND/CAF Contribution to the National Search and Rescue Program ...*, 28, 37.

<sup>209</sup>Department of National Defence, *Quadrennial Search and Rescue Review ...*, 14.

increased legislation. TC has implemented many safety programs that aim to develop and enforce safety regulations and through collaboration with national and international partners prevent and manage security risks in all domains of transportation.<sup>210</sup> Although a variety of rules and regulations exist, there are some areas where safety measures could be increased. To the same degree that the wearing of seatbelts in a vehicle is mandatory to save lives or wearing a bike helmet when riding is compulsory, steps should be taken to enforce measures that can prevent distress when conducting activities in a maritime, aeronautical or remote environment. For example, ensuring proper flotation is worn when conducting activities on the water would increase the chance of survival in a maritime distress situation. Too often, SAR responders are tasked to a maritime incident only to find PFDs stored in a vessels compartment vice being worn. Carrying and registering 406 emergency distress beacons in aircraft is also a measure that if enforced would increase the rescue response and ultimately improve the chance of survival.<sup>211</sup> It is a matter of altering behavior and practices to encourage Canadians to take ownership and responsibility for themselves when pursuing activities that are associated with risk. These are just two examples of areas for improvement but through monitoring trends and measuring effectiveness, other areas of focus will become apparent.

### **Education Initiatives**

Although the organizational structure requires attention, the prevention efforts are by no means at a standstill. There are many initiatives taking place across the NSP

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<sup>210</sup>DND/CCG, *Canadian Aeronautical and Maritime Search and Rescue Manual ...*, Chap 1, 1.08.2.

<sup>211</sup>COSPAS-SARSAT.INT, "Cospas-Sarsat System Mission," last accessed 20 April 2018, <https://www.cospas-sarsat.int/en/>.

organization to reduce the volume and severity of SAR incidents in Canada. Volunteers and federally registered Not for Profit organizations such as SAR Prevention Canada have made great strides in the delivery of programs and support to prevention activities such as the Adventure Smart Strategic Plan aimed at connecting a wide range of stakeholders.<sup>212</sup> As frontline responders, CAF personnel carry out prevention initiatives under the auspices of ‘outreach and awareness’ activities. This is extremely beneficial as a means of connecting with and educating the public; however consideration for permanent resourcing to support such initiatives on a permanent basis would provide greater effect.

Consolidating the education piece and connecting with all demographics across the country through a variety of means such as social media, schools, forums, and outreach events will prevent duplication and reach key audiences. A more holistic and coordinated approach to prevention combined with increased legislation should be pursued with the end state of returning the prevention pillar to the forefront and recognizing it as a core element of the NSP.

### **The Way Forward – Future Considerations**

The requirement for an effective and efficient SAR system in Canada remains as important today as it has ever been. By virtue of the country’s vast land and ocean masses, rugged coastline compounded with the threat and unpredictability posed by climate change, now is the time to evolve SAR concepts. Waiting for tragedy to strike before implementing change as has been done in the past is not acceptable. Canada must be ready to respond and reverting to status quo is no longer a viable option.

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<sup>212</sup>“SAR Prevention Canada”, last accessed 6 April 2018, <http://sarpreventioncanada.com/index.php/8-sar-prevention/1-sar-prevention-canada>.

The nation is transforming and facing challenges that have no borders or boundaries. Climate change is emerging and transforming the AOR, in particular the Northern landscape, bringing with it an increased level of risk as it attracts adventurers, tourists, and newcomers to a land with so many unknowns. Included in this risk is the extreme weather patterns, frequencies, magnitudes for which even the most seasoned or conditioned person may not be prepared. These challenges affirm the requirement to ensure that Canada's SAR system has been modified to match such risks and that it is a system capable of supporting Canadians.

It has been recognized through multiple studies and review of past SAR cases, that the current response time of 30-minutes during daytime hours and two hours during evenings and weekends is not the most effective system. As highlighted in chapter three, the Auditor General report from 2013 has submitted that these times are failing to capture the periods that yield the greatest number of SAR incidents especially during the summer months.<sup>213</sup> As a result, the CAF have conducted yearly and seasonal trials and modifications of SAR response times by SRR with efforts to capture busy periods. Postures are also increased sporadically from two hour to 30-minute during periods of increased activity. Finally, the stagger of aircraft response times between bases occurs with an attempt to have an aircraft available should a SAR incident occur in the Arctic.

Acknowledging that these modifications demonstrate an effort towards improvement, they equally illustrate that the system in place is less than ideal. Resources and funding pressures of 1958 generated the two-hour response time and despite much controversy and debate throughout the years it has remained the same. The two-hour SAR response time in Canada exceeds by more than an hour the SAR response times shared by

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<sup>213</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, Chapter 7, 7.22-7.27.

like-minded nations and entities around the world including Cougar Helicopters, United States Coast Guard (USCG), Norway, Ireland, the UK and Australia. Canada is a growing maritime nation with offshore operations taking place 24/7. Maritime activity does not cease at four o'clock on weekdays or on the weekends. The way forward consists of increasing CAF SAR resources to enable a 30-minute response posture at all times. Canadians deserve this and continuing with a band-aid solution must cease.

An enhanced response time is only one measure to improve the overall response posture in Canada. The increase in activity level in Canada's Arctic combined with unpredictable weather conditions directs focus on the location of the CAF primary SAR assets. Although SAR aircraft are recognized for their speed, reach and agility and serve as a principle method for reaching remote and challenging areas, the southern location for these resources is less than ideal especially for incidents in the far North. Historically, the notion that that these locations are best suited to capture the majority of SAR incidents may have been acceptable, but moving forward this is no longer the case. The Arctic is becoming increasingly accessible with new activities emerging such as cruise ships with thousands of people transiting through passages and uncharted waters. This is risky and having the nearest primary SAR air asset located thousands of miles away is not the answer. The way forward is to maintain a primary SAR air asset in the Arctic region. Again, Canadians and in particular the inhabitants of the north deserve this. A seasonal 24/7 SAR forward operating base in a northern location such as Iqaluit or Yellowknife would reduce transit time and expedite the rescue. As SAR is a collaborative approach, partnering with civilian industry such as Cougar Helicopters to share the coverage might be a more feasible approach. This will need to be explored further.

## **Conclusion**

SAR in Canada is every individual's responsibility, and it is a service provided to Canadians at no cost; thus every person has a role to play in the prevention mechanism. Educating the public regarding the topics of safety and prevention must be a priority. Recognizing that SAR prevention is the responsibility of TC, a consolidated and holistic approach should be established that entails defined roles and responsibilities of each department. Increased legislature should be established as well as involvement and support from media, a powerful mechanism in reaching Canadians. The ultimate goal is to protect and save Canadians and continuous education will prove effective on many fronts.

## CONCLUSION

This study set out to prove that improvements to the response and prevention pillars of the NSP are required to match the emerging environmental and activity trends in Canada and to optimize effectiveness and efficiency of Canada's SAR program. The study mainly focused on the response pillar as it pertains to the CAF primary SAR assets with emphasis on response times and asset locations. It considered specifically challenges unique to the Arctic region, and it also explored the overarching prevention piece with focus on enhancing collaboration, legislation and education initiatives.

Chapter one provided the historical context and framework that set the foundation leading up to the origin of SAR in Canada and explored how the system evolved over the early decades, of note looking at the RCAF's SAR responsibilities. The war era was instrumental in influencing the evolution of SAR in Canada, and issues such as resource and funding restraints placed pressure upon a system that was in high demand something that is still relatable today.

Chapter two examined the present SAR system in Canada specifically the AOR, roles and responsibilities of key SAR stakeholders, and the importance and uniqueness associated with coordination and collaboration. It identified that the current SAR response delivered by CAF assets is not the perfect solution and that risks are increasing especially in the Arctic region with challenges and unpredictability's associated with climate change. The importance of SAR prevention and education was emphasized and examples of SAR incidents such as the *Leviathan II* were presented to support the notion that improvements can be made.

Chapter three further analyzed the SAR response pillar of the NSP highlighting deficiencies with the CAF's SAR response times. A comparison to similar nations that are

party to the same international conventions and agreements and who conduct similar types of SAR operations concluded that Canada's set reaction time for aircraft to be airborne is below the level of other countries, particularly during evenings and on weekends when it reverts to a two hour readiness posture. The standard is also lower than civilian SAR entities such as Cougar Helicopters. The Auditor General concluded in 2013 that the CAF's primary SAR asset state of readiness did not align with the busy periods of commercial fishing and recreational activity.<sup>214</sup> Although the CAF attempts yearly to modify the summer SAR posture to capture periods of increased activity, this is not the complete solution; nor is positioning all of the CAF SAR air assets at bases in the south. Increased activity in the North combined with challenges and risks such as uncharted waters and unpredictable weather conditions means that remaining status quo is no longer an option. SAR response posture must be enhanced.

Finally, chapter four recognizes that improvements to the SAR system can and must be made to coincide with emerging trends and ultimately support and protect Canadians. Waiting for tragedy to occur before implementing improvements or change is not the solution. Prevention must be priority with emphasis on collaboration, increased legislation and enhanced education initiatives. The role and responsibility of every department must be clearly defined by the principle agency. Despite best efforts at prevention, being prepared to respond at any time and at any location within Canada's AOR is equally important. The system needs to be improved to ensure an efficient and effective response is available.

This study concluded that today's SAR system, which closely mirrors the system established in the 1950s, requires change and improvement to align with activity levels

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<sup>214</sup>Auditor General, *2013 Spring Report of the Auditor General ...*, 7.24.

and emerging trends that are taking place in Canada today. Granted that such improvements will require creativity regarding resource sustainability, solutions do exist. Increasing CAF SAR resources to enable a 30-minute response posture at all times is recommended. Establishing a seasonal 24/7 SAR forward operating base in a northern location to reduce the transit time is imperative to effective SAR operations. Lastly, close collaboration and a holistic approach by all SAR stakeholders must be implemented to achieve increased results within the SAR prevention pillar.

The support and commitment of the government with respect to protecting Canadians and ensuring their safety is extremely clear in the 2017 defence policy *Strong Secure Engaged*. The policy emphasizes SAR as a core mandate of the CAF and stresses that Canada's military must maintain a robust capacity to respond to domestic emergencies.<sup>215</sup> Alongside the CCG and in collaboration with numerous other stakeholders and volunteers, the CAF responds to approximately 9,000 SAR calls yearly,<sup>216</sup> a clear indication that Canadians depend on this service. Status quo is not the solution. Change must happen now "*So That Others May Live.*"

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<sup>215</sup>Department of National Defence, *Strong Secure Engaged Canada's Defence Policy*, (Ottawa: Minister of National Defence, May 2017), 17.

<sup>216</sup>*Ibid.*, 87.

## BIBLIOGRAPHY

- Adey, Jane. “'We were damn near killed': Atlantic Charger captain speaks out on survival, rescue.” *CBC News*, 14 October 2015. Last updated 15 October 2015. <http://www.cbc.ca/news/canada/newfoundland-labrador/atlantic-charger-captain-1.3269974>.
- Allan, Iris. *Wop May, Bush Pilot*. Toronto: Clarke, Irwin, 1966. <http://www.wopmay.com/rcaf-air-rescue-service/>.
- Arctic Council. “Arctic Council: A Backgrounder.” Last updated 3 January 2018. <https://www.arctic-council.org/index.php/en/>.
- Arctic Council. *Agreement on Cooperation Aeronautical and Maritime Search and Rescue in the Arctic*. Arctic Council Secretariat, 12 May 2011. [https://oaarchive.arctic-council.org/bitstream/handle/11374/531/EDOCS-3661-v1-ACMMDK07\\_Nuuk\\_2011\\_SAR\\_Search\\_and\\_Rescue\\_Agreement\\_signed\\_EN\\_FR\\_RU.PDF?sequence=5&isAllowed=y](https://oaarchive.arctic-council.org/bitstream/handle/11374/531/EDOCS-3661-v1-ACMMDK07_Nuuk_2011_SAR_Search_and_Rescue_Agreement_signed_EN_FR_RU.PDF?sequence=5&isAllowed=y).
- Arctic Council. “Arctic Peoples.” Last modified 3 November 2016. <https://www.arctic-council.org/index.php/en/our-work/arctic-peoples>.
- Arctic Council. “Search and Rescue.” Last accessed on 3 January 2018. <http://www.arctic-council.org/index.php/en/oceans/search-and-rescue>.
- Axworthy, Thomas. “Search and Rescue: Working Together: Opportunities for Canada-U.S. Cooperation on Arctic Search and Rescue.” *Northern Public Affairs* 2, no. 3 (2017). <http://www.northernpublicaffairs.ca/index/magazine/volume-2-issue-3-arctic-search-rescue/search-rescue-working-together-opportunities-for-canada-u-s-cooperation-on-arctic-search-rescue/>.
- Baker, D. J. *A History of 413 Squadron*. Burnstown, Ontario: General Store Publishing House, 1997.
- BBC News. “Yacht crews rescued after Atlantic storm.” Last modified 10 June 2017. <http://www.bbc.com/news/uk-40234274>.
- BBC News. “WW2 People’s War, An archive of World War Two memories.” Last updated 15 October 2014. <http://www.bbc.co.uk/history/ww2peopleswar/stories/28/a5717928.shtml>.
- Bottomley, Nora. *424 Squadron History*. Belleville, Ontario: Hangar Bookshelf, 1985.
- Brewster, Murray. “DND examines reports, costs of improved 24-7 search-and-rescue response.” *The Canadian Press*. 27 April 2014.

- Bristow Search and Rescue. "UK Search and Rescue Partners – Frequently Asked Questions." Last accessed 5 April 2018. <http://www.scottishmountainrescue.org/wp-content/uploads/2014/05/Bristows-SAR-H-FAQ.pdf>.
- Byers, Michael. "Canada's Arctic nightmare just came true: The Northwest Passage is commercial." *Globe and Mail*. 20 September 2013. Last updated 28 November 2017. <https://www.theglobeandmail.com/opinion/canadas-arctic-nightmare-just-came-true-the-northwest-passage-is-commercial/article14432440/>.
- Byers, Michael. "Every Arctic Voyage is a Potential Disaster." *Ottawa Citizen*, 3 September 2010. <http://byers.typepad.com/arctic/2010/09/every-arctic-voyage-is-a-potential-disaster.html>.
- Canada. Canadian Coast Guard. "Archived - What We Do Everyday – 2013." Last modified 12 May 2015. <http://www.ccg-gcc.gc.ca/Publication/IBHRP-2013-2016/What-We-Do-Everyday>.
- Canada. Canadian Coast Guard. "Archived - Canadian Coast Guard Information Kit NL Search and Rescue." Last modified 11 July 2013. <http://www.ccg-gcc.gc.ca/eng/CCG/Publications/Informatio-Kit/Newfoundland-and-Labrador#NFLAB>.
- Canada. Canadian Coast Guard. "Maritime Search and Rescue (SAR) in Canada." Last modified 27 April 2018. [http://www.ccg-gcc.gc.ca/eng/CCG/SAR\\_Maritime\\_Sar](http://www.ccg-gcc.gc.ca/eng/CCG/SAR_Maritime_Sar).
- Canada. Department of Aboriginal Affairs and Northern Development Canada. *Canada's Northern Strategy. Our North, Our Heritage, Our Future*. Ottawa: Minister of Public Works and Government Services, 2009. <http://www.northernstrategy.gc.ca/cns/cns.pdf>.
- Canada. Department of Finance. *The Budget Speech: Delivered in the House of Commons by the Honourable Michael H. Wilson*. Ottawa: DoF, 27 April 1989. <http://www.budget.gc.ca/pdfarch/1989-sd-eng.pdf>.
- Canada. Department of Fisheries and Oceans. *2018 Notice to Mariners – Section A Aids to Navigation and Marine Safety Bulletin*. Ottawa: Canadian Coast Guard DFO/2018-2001 A3 – Notice 7A, 2018.
- Canada. Department of Fisheries and Oceans. "Canadian Coast Guard: Search and Rescue." Last Accessed on 8 April 2018. [http://www.ccg-gcc.gc.ca/eng/CCG/SAR\\_About\\_Sar](http://www.ccg-gcc.gc.ca/eng/CCG/SAR_About_Sar).
- Canada. Department of Fisheries and Oceans. *Maritime Sector in Canada Canadian Maritime Sectors Direct, Indirect and Induced Employment (Jobs) 2012*. Ottawa. Last modified 6 October 2016. <http://www.dfo-mpo.gc.ca/stats/maritime/tab/mar-tab6-eng.htm>.

- Canada. Department of Fisheries and Oceans. Minister of Fisheries Oceans Canada. *2017-2018 Departmental Plan*. [http://www.dfo-mpo.gc.ca/rpp/2017-18/2017-18\\_DP-EN.pdf](http://www.dfo-mpo.gc.ca/rpp/2017-18/2017-18_DP-EN.pdf).
- Canada. Department of National Defence/Canadian Coast Guard, B-GA-209-001/FP-001-DFO 5449, *National Search and Rescue Manual*, (Ottawa: DND/CCG, 2000), Chapter 3, 15-16. <http://docshare02.docshare.tips/files/7106/71063338.pdf>.
- Canada. Department of National Defence. “About Search & Rescue.” Last modified 15 March 2018. <http://www.forces.gc.ca/en/operations-canada-north-america-current/sar-canada.page>.
- Canada. Department of National Defence. “Arctic Campaign Plan – Operational Design Endorsement.” Ottawa: Canadian Joint Operations Command: file 3000-1/RDIMS 441648, 12 October 2017.
- Canada. Department of National Defence. B-GA-209-001/FP-001, *Canadian Aeronautical and Maritime Search and Rescue Manual (CAMSAR)*. Ottawa: DND Canada, 2014.
- Canada. Department of National Defence. B-GA-400-000/FP-001, *Royal Canadian Air Force Doctrine*. Canadian Forces Aerospace Warfare Centre, November 2016.
- Canada. Department of National Defence. *Canadian Joint Operations Command SAR Directive 01-2017*. Canadian Joint Operations Command: file 3385-1/RDIMS 421945, May 2017.
- Canada. Department of National Defence. *Conplan Soteria – CAF Response to a Major Air Disaster (MAJAIID)*. Canadian Joint Operations Command: file 3120-1/RDIMS#423219, 11 April 2017.
- Canada. Department of National Defence. *Evaluation of the DND/CAF Contribution to the National Search and Rescue Program*. Ottawa: Chief Review Services, January 2015.
- Canada. Department of National Defence. *Federal Search and Rescue Operational Governance Committee Annual Report 2016*. Canadian Joint Operations Command: file 3385-1, March 2017.
- Canada. Department of National Defence. *Future Concepts Directive Part 2: Future Air Operating Concept*. Ottawa: DND Canada, 15 August 2016.
- Canada. Department of National Defence. *Leadership in the Canadian Forces: Leading the Institution*. Ottawa: Canadian Defence Academy – Canadian Forces Leadership Institute, 2007.

- Canada. Department of National Defence. *JRCC Halifax 2016 Annual Historical Report*. Halifax: OIC JRCC #1325-1, February 2017.
- Canada. Department of National Defence. "Procurement of SA16B Aircraft." Memorandum for Cabinet Defence Committee from Minister of National Defence." 26 January 1959. (DHH)
- Canada. Department of National Defence. *Quadrennial Search and Rescue Review*. Ottawa: Department of National Defence ADM(PA), 2013.  
<https://www.publicsafety.gc.ca/cnt/rsrscs/pblctns/archive-nss-qdrnrl-rvw/archive-nss-qdrnrl-rvw-en.pdf>
- Canada. Department of National Defence. *Recommended Amendment to GSAR-Related Protocols*. Ottawa: Commander Canada Command File # 03385, 17 February 2012.
- Canada. Department of National Defence. *Report of the DND for the Fiscal Year Ending March 31, 1949*. Ottawa: King's Printer, 1949.
- Canada. Department of National Defence. *Report of the DND for the Fiscal Year Ending March 31, 1950*. Ottawa: King's Printer, 1950.
- Canada. Department of National Defence. *Report of the DND for the Fiscal Year 1954-55*. Ottawa: Edmond Cloutier, 1956.
- Canada. Department of National Defence. *Royal Canadian Air Force Future Concepts Development, Development of RCAF Future Search-and-Rescue Concept*. Ottawa: DND Canada, 2013.
- Canada. Department of National Defence. *Search and Rescue Imagery Directive 2016*. Canadian Joint Operations Command: file 3350-1, 26 February 2016.
- Canada. Department of National Defence. *Search and Rescue Posture Review 2013*. Last modified 23 May 2014. <http://www.forces.gc.ca/en/about-reports-pubs/search-and-rescue-posture-review.page>.
- Canada. Department of National Defence. *Strong Secure Engaged Canada's Defence Policy*. Ottawa: Minister of National Defence, May 2017.
- Canada. House of Commons. *House of Commons Debates. Official Report (HANSARD)* 146, no. 113, Monday, April 30, 2012.  
<http://www.ourcommons.ca/DocumentViewer/en/41-1/house/sitting-113/hansard>.
- Canada. House of Commons. Standing Senate Committee on Fisheries and Oceans. *Minutes of Proceedings and Evidence*, no. 11, 8 March 2017, 11:60.  
<https://sencanada.ca/en/Content/Sen/Committee/421/POFO/11ev-53145-e>.

- Canada. House of Commons. Standing Committee on National Defence. *Minutes and Proceedings of Evidence*, no. 43, 1 February 2011.  
<https://openparliament.ca/committees/national-defence/40-3/43/paul-clay-1/only/>.
- Canada. House of Commons. Standing Senate Committee on National Security and Defence. *Reinvesting in the Canadian Armed Forces: A Plan For the Future*. Ottawa: May 2017.  
[https://sencanada.ca/content/sen/committee/421/SECD/reports/SECDDPRReport\\_FINAL\\_e.pdf](https://sencanada.ca/content/sen/committee/421/SECD/reports/SECDDPRReport_FINAL_e.pdf).
- Canada. National Search and Rescue Secretariat. *Review of SAR Response Services*. Ottawa: National Search and Rescue Secretariat, 1999.
- Canada. Office of the Auditor General. *Report of the Auditor General of Canada to the house of Commons, Chapter 7: Federal Search and rescue Activities*. Ottawa: Office of the Auditor General of Canada Distribution Centre, 2013.  
[http://www.oag-vg.gc.ca/internet/English/parl\\_oag\\_201304\\_07\\_e\\_38192.html](http://www.oag-vg.gc.ca/internet/English/parl_oag_201304_07_e_38192.html).
- Canada. Office of the Prime Minister. Minister of Fisheries, Oceans and the Canadian Coast Guard Mandate Letter 19 August 2016. <https://pm.gc.ca/eng/minister-fisheries-oceans-and-canadian-coast-guard-mandate-letter>.
- Canada. Privy Council Office, Cabinet Conclusions. 10 July 1951. Available:  
<http://www.bac-lac.gc.ca/eng/discover/politics-government/cabinet-conclusions>.
- Canada. Public Safety Canada. *Modernizing Canada's Search and Rescue Governance and Policy Framework Discussion Paper*. October 2016.
- Canada. Public Safety Canada. "National Search and Rescue Program." Last modified 27 September 2017. <https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/rspndng-mrgnc-vnts/nss/prgrm-en.aspx>.
- Canada. Statistics Canada. "Births and total fertility rate, by province and territory (Fertility rate)." Last modified 19 October 2017.  
<https://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/hlth85b-eng.htm>.
- Canada. Transport Canada. *Transportation in Canada Annual Report 2015*: Ottawa, 2015.  
[https://www.tc.gc.ca/media/documents/policy/2015\\_TC\\_Annual\\_Report\\_Overview-EN-Accessible.pdf](https://www.tc.gc.ca/media/documents/policy/2015_TC_Annual_Report_Overview-EN-Accessible.pdf).
- Canada. Transport Canada. *Transportation in Canada Annual Report 2016*: Ottawa, 2016. <https://www.tc.gc.ca/eng/policy/transportation-canada-2016.html>.
- Canada. Transportation Safety Board. "Aviation Investigation A09A0016, Main Gearbox Malfunction/Collision with Water Cougar Helicopters Inc. Sikorsky S-92A, C-GZCH St. John's, Newfoundland and Labrador, 35 NM E, 12 March 2009."

Last accessed 5 April 2018. <http://www.tsb.gc.ca/eng/rapports-reports/aviation/2009/a09a0016/a09a0016.pdf>.

Canada. Transportation Safety Board. "Aviation Investigation Report A11H0002, Controlled Flight Into Terrain, Bradley Air Services Limited (First Air) Boeing 737-210C, C-GNWN Resolute Bay, Nunavut 20 August 2011." Last accessed 5 April 2018. <http://www.bst-tsb.gc.ca/eng/rapports-reports/aviation/2011/a11h0002/a11h0002.pdf>.

Canada. Transportation Safety Board. "Marine investigation M15P0347, Capsizing and loss of life Leviathan II Clayoquot Sound, British Columbia 25 October 2015." Last accessed 5 April 2018. <http://www.bst-tsb.gc.ca/eng/rapports-reports/marine/2015/m15p0347/m15p0347.pdf>.

Canada. Transportation Safety Board. "Marine Investigation M05N0072, Capsizing and Loss of Life Melina & Keith II Bonavista, Newfoundland and Labrador, 70nm E 12 September 2005." Last accessed 5 April 2018. <http://www.tsb.gc.ca/eng/rapports-reports/marine/2005/m05n0072/m05n0072.pdf>.

Canadian Broadcasting Corporation (CBC) News. "Arctic research ship Martin Bergmann runs aground." Last updated 4 September 2014. <http://www.cbc.ca/news/canada/north/arctic-research-ship-martin-bergmann-run>.

Canadian Broadcasting Corporation (CBC News). "Mayday." The Fifth Estate. 30 Sep 2011. <http://www.cbc.ca/fifth/episodes/2011-2012/mayday>.

Canadian Broadcasting Corporation (CBC) News. "Nunavut MLA missing for a week found alive on Baffin Island Trio built 2 igloos to protect themselves from wind and cold." Last updated 1 April 2016. <http://www.cbc.ca/news/canada/north/missing-mla-pauloosie-keyootak-found-1.3513174>.

Canadian Owners and Pilots Association. "Bring common sense to 406 ELT issue." Last accessed 8 April 2018. <http://www.copanational.org/September2008.cfm>.

Canadian Owners and Pilots Association. "ELT Update - Dec 2012." Last accessed 8 April 2018. <http://www.copanational.org/ELTUpdateDecember2012.cfm>.

Coates, Ken S, P. Whitney Lackenbauer, William R. Morrison, and Greg Poelzer. Arctic Front: Defending Canada in the Far North. Toronto: Thomas Allen Publishers, 2008.

Company Listing. "Seacom International Inc." Last accessed 5 April 2018. <http://www.seacomcanada.com>.

COSPAS-SARSAT.INT. "Cospas-Sarsat System Mission." Last accessed 20 April 2018. <https://www.cospas-sarsat.int/en/>.

- Cougar. A VIH Aviation Group Company. "Search and Rescue." Last accessed 16 April 2018. <http://www.cougar.ca/services/SAR/>.
- Cranmer, Rex. "From Bush to Jet." Redfusion Media. Last accessed 4 March 2018. <http://www.redlandsfortnightly.org/papers/bushjet.htm>.
- "Cruise ship exploring Northwest Passage runs aground." *Globe and Mail*. Last updated 26 March 2017, <https://www.theglobeandmail.com/news/national/cruise-ship-exploring-northwest-passage-runs-aground/article1378559/>.
- Crystal Cruises. "Northwest Passage Explorer." Last accessed 2 December 2017. <http://www.crystalcruises.com/voyage/details/northwest-passage-explorer-7320>.
- Douglas, W.A.B. *The Creation of a National Air Force. The Official History of the Royal Canadian Air Force Volume II*. Toronto: University of Toronto Press, 1986.
- English, Alan D. *The Cream of the Crop: Canadian Aircrew, 1935-1945*. Montreal: McGill-Queen's University Press, 1996.
- Evans, Clayton. *Rescue at Sea: An International History of Lifesaving, Coastal Rescue Craft and Organisations*. London: Conway Maritime Press, 2003.
- Franks, Norman. *The RAF Air Sea Rescue Service in the Second World War*. Havertown: Pen and Sword, 2016.
- Godsell, Philip Henry. *Pilots of the Purple Twilight: The Story of Canada's Early Bush Flyers*. Toronto: Ryerson Press, 1955.
- Griffiths, Franklyn, Rob Huebert, and P. Whitney Lackenbauer. *Canada and the Changing Arctic: Sovereignty, Security, and Stewardship*. Waterloo: Wilfrid Laurier University Press, 2011.
- "How to protect offshore oil platforms from roaming icebergs." *The Economist*. 22 June 2017. last accessed 18 April 2018, <https://www.economist.com/news/americas/21723891-it-best-lasso-them-how-protect-offshore-oil-platforms-roaming-icebergs>.
- International Civil Aviation Organization (ICAO). "ICAO/Secretariat/Technical Cooperation Bureau/History." Last accessed 6 March 2018, <https://www.icao.int/secretariat/TechnicalCooperation/Pages/history.aspx>.
- International Maritime Organization (IMO)/International Civil Aviation Organization (ICAO). *International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual*. Volumes I-III. London: IMO/ICAO, 2003.
- Ireland. Department of Transport. *Irish National Maritime Search and Rescue (SAR) Framework*. Irish Coast Guard, 2 March 2010.

- Kaluzny, Bohdan L. "Optimal alignment of search and rescue response posture with historical incident occurrence." Ottawa: DRDC – Centre for Operational Research and Analysis: DRDC-RDDC-2014-R, 12 April 2014.
- Keith, Ronald. *Bush Pilot with Brief-Case. The Incredible Story of Aviation Pioneer Grant McConachie*. Toronto: Doubleday Canada, 1972.
- LAC, RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Letter to AOC TC from A/Group Cdr, W/C J.L. Berven, 1 April 1958, "SAR – Standby Basis."
- LAC, RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Letter to MAC, TC, TAC, and ADC from CAS, signed by W/C J.G. Showler, 11 June 1958, "SAR – Standby Commitment."
- LAC, RG24-E-1-c, Vol. 18,114, SAR – Policy, File 976-1 Vol. 5, Memorandum to COps from A/DTRO W/C J.G. Showler, 28 May 1958, "SAR – Standby Policy." Note: The 1958 SAR orders was the CAP 342.
- Lackenbauer, P. Whitney, and Adam Lajeunesse. "The Canadian Armed Forces in the Arctic: Building Appropriate Capabilities." *Journal of Military and Strategic Studies* 16, no 4 (2016): 7-66.
- Lackenbauer, P. Whitney, and W.A March, editors. "The Historical Dimension of the Canadian Air Force's Experience in the Arctic." *Sic Itur Ad Astra: Canadian Aerospace Power Studies Volume 4: De-Icing Required!* Ottawa: Her Majesty the Queen as represented by the Minister of National Defence, 2012.
- Lackenbauer, P. Whitney. "From Polar Race to Polar Saga: An Integrated Strategy for Canada and the Circumpolar World." *Foreign Policy for Canada's Tomorrow*, no.3. Toronto: Canadian International Council, 2009. <http://opencanada.org/wp-content/uploads/2011/05/From-Polar-Race-to-Polar-Saga-Whitney-Lackenbauer1.pdf>.
- Lackenbauer, P. Whitney. *The Canadian Rangers: A Living History*. Vancouver: UBC Press, 2013.
- Lackenbauer, P. Whitney. "The Canadian Rangers: A 'Postmodern' Militia That Works." *Canadian Military Journal* 6, no. 4 (Winter 2005–2006): 49-60. <http://www.journal.forces.gc.ca/vo6/no4/doc/north-nord-03-eng.pdf>.
- Lavoie, David. "Imaging Technology for Search and Rescue." *Royal Canadian Air Force Journal* 6 no. 1 (Winter 2017): 15-45.
- Lennox, Ted. "It's time... Search and Rescue IN the Arctic!" *FrontLine Defence* 2, no.5 (2005): 1 of 4.

- MacDonald, Adam. "The Militarization of the Arctic: Emerging Reality, Exaggeration, and Distraction." *Canadian Military Journal* 15, no. 2 (Summer 2015): 18-28. <http://www.journal.forces.gc.ca/vol15/no3/eng/PDF/CMJ153Ep18.pdf>.
- MacKenzie, David. *ICAO: A History of the International Civil Aviation Organization*. Toronto: University of Toronto Press, 2010.
- Matthews, Carolyn. *To The Rescue*. Toronto: Dundurn Press, 2005.
- Milberry, Larry. *Air Transport in Canada: Volume 1*. Toronto: CANAV Books, 1997.
- Milberry, Larry. *Air Transport in Canada: Volume 2*. Toronto: CANAV Books, 1997.
- Milberry, Larry. *Canada's Air Force Today*. Toronto: CANAV Books, 1987.
- Milberry, Larry. *Sixty Years: The RCAF and the CF Air Command 1924-1984*. Toronto: CANAV Books, 1984.
- Miller, S.R. "Search and Rescue in the RCAF." *The Roundel* 3, no. 2 (Jan 1951): 14-22.
- Mokler, R.J. *Aircraft Down*. New York: Exposition Press, 1968. Mroz, Mike. "CF Search and Rescue turns 50!" *The Roundel* 4, no. 11 (Sep 1997): 10-11.
- Mowbray, Clinton. "Lessons Forgotten? A Historical Examination of the RCAF Search and Rescue Organization." Joint Command and Staff Program Master of Defence Studies Paper, Canadian Forces College, 2014.
- Mroz Mike, "CF Search and Rescue turns 50," *Roundel* 4, no. 11 (Sep 1997): 10.
- Nav Canada. "Polar Routes Past Present Future." Nav Canada (blog), 27 April 2017. <http://blog.navcanada.ca/polar-routes-past-present-future/>.
- Newfoundland and Labrador Public Inquiry. *Offshore Helicopter Safety Inquiry*. St. John's, NL: Canada - Newfoundland and Labrador Offshore Petroleum Board, October 2010. [http://www.cnlopb.ca/pdfs/ohsi/ohsir\\_vol1.pdf?lbisphpreq=1](http://www.cnlopb.ca/pdfs/ohsi/ohsir_vol1.pdf?lbisphpreq=1).
- Newfoundland and Labrador. *Offshore Helicopter Safety Inquiry*, (Newfoundland and Labrador: Triware Technologies Inc, 2009), <http://www.ohsi.nl.ca>.
- Newfoundland and Labrador. *Offshore Helicopter Safety Inquiry, Report and Recommendations arising from the Transportation Safety Board's Report*, (Newfoundland and Labrador: The Honourable Robert Wells Commissioner, July 2011), 142.
- Newfoundland and Labrador. *Offshore Helicopter Safety Inquiry*, (Newfoundland and Labrador: Triware Technologies Inc, 2009), <http://www.ohsi.nl.ca>.

- Newfoundland and Labrador. Offshore Helicopter Safety Inquiry, *Report and Recommendations arising from the Transportation Safety Board's Report*, (Newfoundland and Labrador: The Honourable Robert Wells Commissioner, July 2011), 142.
- Norway. Ministry of Justice and Police. "The Norwegian Search and Rescue Service." Last accessed 20 April 2018.  
[https://www.regjeringen.no/globalassets/upload/kilde/jd/bro/2003/0005/ddd/pdfv/183865-infohefte\\_engelsk.pdf](https://www.regjeringen.no/globalassets/upload/kilde/jd/bro/2003/0005/ddd/pdfv/183865-infohefte_engelsk.pdf).
- Openparliament.ca. "Mr. Paul Clay (President, Seacom International Inc.) at the National Defence Committee." Last updated February 1st, 2011.  
<https://openparliament.ca/committees/national-defence/40-3/43/paul-clay-1/only/>.
- Para Rescue Association of Canada. *That Others may Live: 50 Years of Para Rescue in Canada, 1944-1994*. Astra, ON: Para Rescue Association of Canada, 1994.
- Passifume, Bryan. "After two weeks search called off for plane missing in mountains near Cranbrook, BC." *Calgary Herald*. Last modified 20 June 2017.  
<http://calgaryherald.com/news/local-news/after-two-weeks-search-called-off-for-plane-missing-in-mountains-near-cranbrook-b-c>.
- Pierotti, James. "Functional Rescue for Search and Rescue Squadrons." *Inform*, No. 31, (May 2017).
- Pierrotti, James. "Reluctant to Rescue: The RCAF and the Search and Rescue Mandate, 1939-1959." Royal Military College of Canada, March 2016.
- Poitras, Danys. "Search and Rescue in the Arctic: A Myth or a Reality?" Joint Command and Staff Program Master of Defence Studies, Canadian Forces College, 2013.
- Poitras, Danys. "Search and Rescue in the Arctic." in *Canadian Armed Forces Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned*. Fredericton: University of New Brunswick The Gregg Centre for the Study of War & Society Book Series, no.1, 2017.
- Pope, Alexandra. "Q&A: Arctic policy expert Adam Lajeunesse on the future of Canada's north," *Canadian Geographic*, 6 March 2017.  
<https://www.canadiangeographic.ca/article/qa-arctic-policy-expert-adam-lajeunesse-future-canadas-north>.
- Reid, Sheila. *Wings of a Hero: Canadian Pioneer Flying Ace Wilfrid "Wop" May*. St. Catharines, Ont: Vanwell Publishing, 1997.
- Reid, Steve. "SAR Discussion." *The Beacon*. 29 September 2017.  
<http://www.ganderbeacon.ca/opinion/letter-to-the-editor/sar-discussion-44528/>.

- Renaud, Julian. "Federal cutbacks force closure of Coast Guard bases." *Halifax Media Co-op*. Last modified 3 June 2013. <http://halifax.mediacoop.ca/fr/story/federal-cutbacks-force-closure-coast-guard-bases/17769>.
- Roberts, Leslie. *There Shall be Wings: A History of the Royal Canadian Air Force*. London: George G. Harrap, 1960.
- Robinson, Robinson. "SAR Status Quo is fine with MacKay." *The Evening Telegram*. Last updated 19 March 2010. <https://www.pressreader.com/canada/the-telegram-st-johns/20100319/281809985072872>.
- Rogers, Sarah. "Fourth day of search yields no sign of missing Nunavut snowmobilers." *Nunatsiaq News*, Last updated 30 March 2016. [http://nunatsiaq.com/stories/article/65674fourth\\_day\\_of\\_search\\_efforts\\_yields\\_no\\_sign\\_of\\_missing\\_snowmobilers/](http://nunatsiaq.com/stories/article/65674fourth_day_of_search_efforts_yields_no_sign_of_missing_snowmobilers/).
- Rostek, Michael. "A Framework for Fundamental Change? The Management Command and Control Re-Engineering Initiative." *Canadian Military Journal* 5, no. 4 (Winter 2004-2005): 65-72. <http://www.journal.forces.gc.ca/vo5/no4/doc/5-4-10-eng.pdf>.
- Royal Canadian Air Force. "CH-149 Cormorant." Last modified 22 June 2017. <http://www.rcaf-arc.forces.gc.ca/en/aircraft-current/ch-149.page>.
- Ruskin, Brent. "Senate group hears 'serious concerns' with search and rescue." *CBC News*. 28 October 2016. <http://www.cbc.ca/news/canada/nova-scotia/search-and-rescue-senate-committee-1.3825466>.
- Sajjaan, Harjit. Speech, Defence Policy "Strong, Secure, Engaged" Ottawa, 7 June 2017.
- Search and Rescue Prevention Canada. "Search and Rescue Prevention." Last accessed 6 April 2018, <http://sarpreventioncanada.com/index.php/8-sar-prevention/1-sar-prevention-canada>.
- "Search and rescue response times 'inadequate': union." *Canadian Press*. In *CTV news*. 2 February 2011, <https://www.ctvnews.ca/search-and-rescue-response-times-inadequate-union-1.603112>.
- Shadwick, Martin. "Reflections on Search and Rescue." *Canadian Military Journal* 13, no. 4 (Autumn 2013): 71. [www.journal.forces.gc.ca/vol13/no4/PDF/CMJ134Ep71.pdf](http://www.journal.forces.gc.ca/vol13/no4/PDF/CMJ134Ep71.pdf).
- Shadwick, Martin. "Rescuing Search and Rescue." *Canadian Military Journal* 11, no. 3 (Summer 2011): 65-67.
- Shadwick, Martin. "Search and Rescue Redux." *Canadian Military Journal* 9, no. 1 (Spring 2008): 102-104. <http://www.journal.forces.gc.ca/vo9/no1/doc/15->

shadwick-eng.pdf.

- Smith, G.Y. *Seek and Save: The History of 103 Rescue Unit*. Erin: The Boston Mills Press, 1990.
- SOLAS. “Chapter V – Regulation 33 – Distress Situations: Obligations & Procedures.” Last accessed 18 April 2018.  
<https://mcanet.mcga.gov.uk/public/c4/solasv/regulations/contents.htm>.
- SOLAS. *International Convention for the Safety of Life at Sea*. London: SOLAS, 10 June 1948. [http://www.imo.org/KnowledgeCentre/ReferencesAndArchives/HistoryofSOLAS/Documents/SOLAS 1948 UK Treaty Series.pdf](http://www.imo.org/KnowledgeCentre/ReferencesAndArchives/HistoryofSOLAS/Documents/SOLAS%201948%20UK%20Treaty%20Series.pdf).
- The Canadian Encyclopedia. “Wilfrid Reid May.” Last accessed 8 April 2018.  
<http://thecanadianencyclopedia.ca/en/article/wilfrid-reid-may/>.
- United Nations. International Maritime Organization. “International Convention on the Law of the Sea, (UNCLOS), 10 December 1982. Last accessed 6 April 2018.  
<http://www.refworld.org/docid/3dd8fd1b4.html>.
- Van Hare, Thomas. “The Online Magazine of Aviators, Pilots and Adventurers since 1997,” *Historic Wings*, last accessed 4 March 2018.  
<http://fly.historicwings.com/2013/01/mccurdys-crossing/>.
- Vaughan, Andrew. “Canada's search-and-rescue system at 'breaking point,' auditor general's report says,” *The Canadian Press*. 30 April 2013.
- Weber, Jeremy. “Hope is Not ‘A’ Strategy: It’s The Only Strategy.” War Room United States Army War College, 27 February 2018. Last accessed 18 April 2018.  
<https://warroom.armywarcollege.edu/articles/hope-not-strategy-strategy/>.
- Weicht, Christopher. *Jericho Beach and the West Coast Flying Boat Stations*. Chemanius, British Columbia: MCW Enterprises, 1997.
- Weissenborn, Jennifer. “Mind the Gap: The Ground Truth Behind an Optimized National Search and Rescue System.” Joint Command and Staff Program Master of Defence Studies, Canadian Forces College, 2016.
- Worley, Will. “Atlantic rescue operation launched after UK racing yachts are sunk and damaged by hurricane force winds.” *Independent*. 20 June 2017.  
<http://www.independent.co.uk/news/world/americas/atlantic-ocean-rescue-uk-racing-yachts-hurricane-winds-crew-members-saved-newfoundland-canada-a7783681.html>.
- Zerehi, Sima Sahar. “Nunavut officials press for Arctic search and rescue base.” *CBC News*, 7 March 2016. <http://www.cbc.ca/news/canada/north/arctic-search-and-rescue-needs-1.3477252>.

Openparliament.ca. "Mr. Paul Clay (President, Seacom International Inc.) at the National Defence Committee." Last updated February 1st, 2011.  
<https://openparliament.ca/committees/national-defence/40-3/43/paul-clay-1/only/>.

Para Rescue Association of Canada. *That Others may Live: 50 Years of Para Rescue in Canada, 1944-1994*. Astra, ON: Para Rescue Association of Canada, 1994.

Passifiume, Bryan. "After two weeks search called off for plane missing in mountains near Cranbrook, BC." *Calgary Herald*. Last modified 20 June 2017.  
<http://calgaryherald.com/news/local-news/after-two-weeks-search-called-off-for-plane-missing-in-mountains-near-cranbrook-b-c>.

Pierotti, James. "Functional Rescue for Search and Rescue Squadrons." *Inform*, No. 31, (May 2017).

Pierrotti, James. "Reluctant to Rescue: The RCAF and the Search and Rescue Mandate, 1939-1959." *Royal Military College of Canada*, March 2016.

Poitras, Danys. "Search and Rescue in the Arctic: A Myth or a Reality?" *Joint Command and Staff Program Master of Defence Studies, Canadian Forces College*, 2013.

Poitras, Danys. "Search and Rescue in the Arctic." in *Canadian Armed Forces Arctic Operations, 1941-2015 Lessons Learned, Lost, and Relearned*. Fredericton: University of New Brunswick The Gregg Centre for the Study of War & Society Book Series, no.1, 2017.

Pope, Alexandra. "Q&A: Arctic policy expert Adam Lajeunesse on the future of Canada's north," *Canadian Geographic*, 6 March 2017.  
<https://www.canadiangeographic.ca/article/qa-arctic-policy-expert-adam-lajeunesse-future-canadas-north>.

Reid, Sheila. *Wings of a Hero: Canadian Pioneer Flying Ace Wilfrid "Wop" May*. St. Catharines, Ont: Vanwell Publishing, 1997.

Reid, Steve. "SAR Discussion." *The Beacon*. 29 September 2017.  
<http://www.ganderbeacon.ca/opinion/letter-to-the-editor/sar-discussion-44528/>.

Renaud, Julian. "Federal cutbacks force closure of Coast Guard bases." *Halifax Media Co-op*. Last modified 3 June 2013. <http://halifax.mediacoop.ca/fr/story/federal-cutbacks-force-closure-coast-guard-bases/17769>.

Roberts, Leslie. *There Shall be Wings: A History of the Royal Canadian Air Force*. London: George G. Harrap, 1960.

Robinson, Robinson. "SAR Status Quo is fine with MacKay." *The Evening Telegram*. Last updated 19 March 2010. <https://www.pressreader.com/canada/the-telegram-st-johns/20100319/281809985072872>.

Rogers, Sarah. "Fourth day of search yields no sign of missing Nunavut snowmobilers." *Nunatsiaq News*, Last updated 30 March 2016. [http://nunatsiaq.com/stories/article/65674fourth\\_day\\_of\\_search\\_efforts\\_yields\\_no\\_sign\\_of\\_missing\\_snowmobilers/](http://nunatsiaq.com/stories/article/65674fourth_day_of_search_efforts_yields_no_sign_of_missing_snowmobilers/).

Rostek, Michael. "A Framework for Fundamental Change? The Management Command and Control Re-Engineering Initiative." *Canadian Military Journal* 5, no. 4 (Winter 2004-2005): 65-72. <http://www.journal.forces.gc.ca/vo5/no4/doc/5-4-10-eng.pdf>.

Royal Canadian Air Force. "CH-149 Cormorant." Last modified 22 June 2017. <http://www.rcaf-arc.forces.gc.ca/en/aircraft-current/ch-149.page>.

Ruskin, Brent. "Senate group hears 'serious concerns' with search and rescue." *CBC News*. 28 October 2016. <http://www.cbc.ca/news/canada/nova-scotia/search-and-rescue-senate-committee-1.3825466>.

Sajjaan, Harjit. Speech, Defence Policy "Strong, Secure, Engaged" Ottawa, 7 June 2017.

Search and Rescue Prevention Canada. "Search and Rescue Prevention." Last accessed 6 April 2018, <http://sarpreventioncanada.com/index.php/8-sar-prevention/1-sar-prevention-canada>.

"Search and rescue response times 'inadequate': union." *Canadian Press*. In *CTV news*. 2 February 2011, <https://www.ctvnews.ca/search-and-rescue-response-times-inadequate-union-1.603112>.

Shadwick, Martin. "Reflections on Search and Rescue." *Canadian Military Journal* 13, no. 4 (Autumn 2013): 71. [www.journal.forces.gc.ca/vol13/no4/PDF/CMJ134Ep71.pdf](http://www.journal.forces.gc.ca/vol13/no4/PDF/CMJ134Ep71.pdf).

Shadwick, Martin. "Rescuing Search and Rescue." *Canadian Military Journal* 11, no. 3 (Summer 2011): 65-67.

Shadwick, Martin. "Search and Rescue Redux." *Canadian Military Journal* 9, no. 1 (Spring 2008): 102-104. <http://www.journal.forces.gc.ca/vo9/no1/doc/15-shadwick-eng.pdf>.

- Smith, G.Y. *Seek and Save: The History of 103 Rescue Unit*. Erin: The Boston Mills Press, 1990.
- SOLAS. "Chapter V – Regulation 33 – Distress Situations: Obligations & Procedures." Last accessed 18 April 2018.  
<https://mcanet.mcga.gov.uk/public/c4/solasv/regulations/contents.htm>.
- SOLAS. *International Convention for the Safety of Life at Sea*. London: SOLAS, 10 June 1948. [http://www.imo.org/KnowledgeCentre/ReferencesAndArchives/HistoryofSOLAS/Documents/SOLAS 1948 UK Treaty Series.pdf](http://www.imo.org/KnowledgeCentre/ReferencesAndArchives/HistoryofSOLAS/Documents/SOLAS%201948%20UK%20Treaty%20Series.pdf).
- The Canadian Encyclopedia. "Wilfrid Reid May." Last accessed 8 April 2018.  
<http://thecanadianencyclopedia.ca/en/article/wilfrid-reid-may/>.
- United Nations. International Maritime Organization. "International Convention on the Law of the Sea, (UNCLOS), 10 December 1982. Last accessed 6 April 2018.  
<http://www.refworld.org/docid/3dd8fd1b4.html>.
- Van Hare, Thomas. "The Online Magazine of Aviators, Pilots and Adventurers since 1997," *Historic Wings*, last accessed 4 March 2018.  
<http://fly.historicwings.com/2013/01/mccurdys-crossing/>.
- Vaughan, Andrew. "Canada's search-and-rescue system at 'breaking point,' auditor general's report says," *The Canadian Press*. 30 April 2013.
- Weber, Jeremy. "Hope is Not 'A' Strategy: It's The Only Strategy." *War Room United States Army War College*, 27 February 2018. Last accessed 18 April 2018.  
<https://warroom.armywarcollege.edu/articles/hope-not-strategy-strategy/>.
- Weicht, Christopher. *Jericho Beach and the West Coast Flying Boat Stations*. Chemanius, British Columbia: MCW Enterprises, 1997.
- Weissenborn, Jennifer. "Mind the Gap: The Ground Truth Behind an Optimized National Search and Rescue System." *Joint Command and Staff Program Master of Defence Studies, Canadian Forces College*, 2016.
- Worley, Will. "Atlantic rescue operation launched after UK racing yachts are sunk and damaged by hurricane force winds." *Independent*. 20 June 2017.  
<http://www.independent.co.uk/news/world/americas/atlantic-ocean-rescue-uk-racing-yachts-hurricane-winds-crew-members-saved-newfoundland-canada-a7783681.html>.

Zerehi, Sima Sahar. "Nunavut officials press for Arctic search and rescue base." CBC News, 7 March 2016. <http://www.cbc.ca/news/canada/north/arctic-search-and-rescue-needs-1.3477252>.