Defence Research and Development Canada | Recherche et développement pour la défense Canada

CAN UNCLASSIFIED

DRDC | RDDC
technologysciencetechnologie

Emergency Air Operations Project

Aviation Management Interoperability for Emergency Response and Recovery : Return on Investment

Steve Newton
Selkirk Systems Inc.

Prepared by:
Selkirk Systems Inc.
Suite 4, 415 Dunedin Street
Victoria (BC), V8T 5G8 Canada
Contractor Document Number: CSSP-2014-CP-2005
PSPC Contract Number: W7714-156075/001/SV
Technical Authority: Daniel Charlebois, Defense Scientist, DRDC – Centre for Security Science
Contractor's date of publication: March 2018

Defence Research and Development Canada

Contract Report
DRDC-RDDC-2018-C254
January 2019

CAN UNCLASSIFIED

Canada

IMPORTANT INFORMATIVE STATEMENTS

This document was reviewed for Controlled Goods by Defence Research and Development Canada using the Schedule to the *Defence Production Act*.

SELKIRK SYSTEMS INC.

EMERGENCY AIR OPERATIONS PROJECT

(AVIATION MANAGEMENT INTEROPERABILITY FOR EMERGENCY RESPONSE AND RECOVERY)

CSSP-2014-CP-2005

Return on Investment

Selkirk Systems Inc.

Version: V1

Contents

Introduction and Purpose of this Document

The CSSP Project "Aviation Management Interoperability for Emergency Response and Recovery" CSSP-2014-CP-2005" has developed (1) an Air Operations Plan, Procedures, and Checklists for the activation, operation, and capability of an Air Operations Branch tasked with managing scarce aviation resources, and (2) an enabling technology suite (Interoperability Exchange, Strikeslip Tools) that allows standards based exchange of information between agency systems relating to air operations branch business.

This document is the Return on Investment Analysis, described in the "Canadian Safety and Security Program Project Charter: Aviation Management Interoperability for Emergency Response and Recovery CSSP-2014-CP-2005" as follows:

> "Return on Investment analysis to inform longer term financial and strategic program planning for preparedness and operational sustainability."

The document provides a background on ROI calculations for disaster risk reduction, outlines the ROI formula used, and draws some conclusions about the potential return on investment available from the use the aviation management interoperability exchange.

Return on Investment Calculation

The following basic approach has been adopted to determine the ROI.

Investment: Ongoing investment required to maintain the established Air Branch Capability, which includes

1. Investment required to maintain air operations plans
2. Investment required to staff and exercise the air operations branch annually, and
3. Investment necessary to support and maintain the enabling technology

Return: Potential positive impact that a planned, exercised, staffed, and technology enabled air operations branch can effect in terms of:

1. Increased operational efficiency in use of aircraft during a large scale disaster
2. Potential reduction of damages and suffering resulting from a more efficient and faster response thru the effective use of aviation resources

ROI Calculation: Given the range of potential investment and return elements, and the general lack a direct numerical calculation methodology for returns[i], the ROI is not explicitly calculated. Rather, in keeping in the goal of the deliverable, a broader understanding of the costs to support the current capability established within the project and the potential benefits or returns, are discussed.

Investment

The deliverable goal is to inform longer term financial planning. Therefore, the investment side of the return on investment model examines the ongoing costs to operate and maintain the capabilities developed within the project, without consideration for upgrades. It does not consider the initial costs to develop the capability; only forward going costs are considered. Accordingly, the investment part of the ROI calculation is determined to be composed of the following cost centres:

1. Investment required to maintain air operations plans
2. Investment required to staff and exercise the air operations branch annually, and

3. Investment necessary to support and maintain the enabling technology

Investment Required to Maintain the Air Operations Plans

Initial complete drafts of the Interagency Air Operations Plans have been drafted and are being iteratively tested and refined throughout the current project. The amount of maintenance required for these plans has been identified as an annual review and update, and any modifications or changes arising from results of the annual exercises. Therefore, the required investment is estimated to be 6 days of annual staff time split amongst agencies (See Table 1). Contingency for any anomalous events, such as significant changes in regulatory requirements and/or agency legal mandates is not included.

Activity	Organization	# Staff	# Days	Day Rate Wages	Estimated Cost
Pre-Exercise Planning	EMBC	1	2	$ 450	$ 900
	BCWS	1	2	$ 450	$ 900
	BCEHS	1	2	$ 450	$ 900
				Total	$ 2,700

Table 1 Investment Required for Annual Air Operations Plan Updating

Investment Required to Staff and Exercise the Air Operations Branch Annually

It is paramount that the business practices associated with the Provincial Air Operations Branch be top of mind in all participating organizations, and this can achieved with a regular commitment to integrated plan review and exercising annually. The investment required to prepare for, staff, and exercise annually has been estimated below. The estimates assume a table top exercise is being conducted by Provincial government personnel from the three primary signatory agencies only. Any other non-government agencies that would participate would be on an as needed basis as a function of the larger exercise goals. It should be noted that alternative opportunities to activate the air branch in cooperation and support of other exercise initiatives are recommended. Any staff time requirements and/or financial costs including travel would be specific to these other exercise activities. To maintain an annual exercise and review regime with Provincial government staff only is shown in Table 2 below, including effort for Emergency Management British Columbia (EMBC), British Columbia Wildfire Services (BCWS), and British Columbia Emergency Health Services (BC EHS).

Activity	Organization	# Staff	# Days	Day Rate Wages	Day Rate Travel	Estimated Cost
Pre-Exercise Planning	EMBC	1	5	$ 450	$ 200	$ 3,250
	BCWS	2	2	$ 450	$ 200	$ 2,600
	BCEHS	2	2	$ 450	$ 200	$ 2,600
Exercise Delivery	EMBC	2	2	$ 450	$ 200	$ 2,600
	BCWS	4	2	$ 450	$ 200	$ 5,200
	BCEHS	4	2	$ 450	$ 200	$ 5,200
Post-Exercise Review & Plan Revision	EMBC	2	4	$ 450	$ 200	$ 5,200
	BCWS	4	3	$ 450	$ 200	$ 7,800
	BCEHS	4	3	$ 450	$ 200	$ 7,800
					Total	$ 42,250
Cost Per Agency						
EMBC	$ 11,050					
BCWS	$ 15,600					
BCEHS	$ 15,600					
Total	$ 42,250					

Table 2 Investment Required for Annual Air Operations Branch Exercise

Investment Required to Operate and Maintain the Enabling Technology

The investment required has been further decomposed into the following costs centres:

- Ongoing cost to operate
- Ongoing cost to maintain

It should be noted that potential investment will be required to connect individual systems to the Interoperability Exchange. However, these are considered one time capital costs, and have not been addressed here as they would be a function of the architecture and security requirements of those various systems at the time.

Cost to Operate

The cost to operate the capability is dependent upon the operational model that is adopted. Three alternatives have been identified and are outlined below, and are largely dependent upon the hosting costs. A fourth option, cease operation, has not been considered in this document. As noted below, only the first option is costed at present, and shall be used for the basis of the hosting investment required until further information regarding other options becomes available.

The following assumptions have been made:

- Transition Plan and EMBC Strategic Plan will inform which of the operational models indicated above best meets the needs of EMBC, the Province of BC, and the larger public safety community.
- No costs have been considered to transition the capability to the identified operational hosting facility
- Costs have been identified based on a demand model where:
    - Demand based scalability, a feature of the data exchange, is utilized
    - Typical system use results in nominal server loads, so minimal cost envelopes are desirable
    - High peak loads will result in the event of a disaster, and costs are of less importance than availability and performance
- Costs to connect to other systems; the interoperability exchange provides self-describing REST web services that modern software applications can easily integrate with. Therefore, costs to connect the systems are considered nominal provided an appropriate security model is available. These are one time, potentially capital costs, and have not been included here.

Option 1 – Maintain hosting in a Canadian Data Centre

This option migrates the capability from its current hosting to a data centre offered as a cloud hosted subscription based commercial offering. As identified in the Transition Plan, the suitability of this option, and selection of the specific hosting facility, will be dependent upon the ongoing Privacy and Security Impact Assessments as required by the Province of BC Office of the Chief Information Officer (OCIO). For the purposes of this analysis, representative costs for this class of service have been identified, and are listed below based on Amazon Web Services (AWS) hosted in Montreal, Canada.

Monthly cost to operate – nominal load: $600 / month x 12 months = $7,200

Incident cost to operate – surge load (required x5 capacity) : $600 / month x 5 = $3,000 month

Option 2 – Migrate hosting to a BC Provincial Government Data Centre

This option migrates the hosting to a BC Provincial Government designated data centre. Details for this option await the completion of the Privacy and Security reviews being completed for the OCIO, and identification of an appropriate hosting facility should the Government of BC adopt this approach.

Option 3 – Migrate hosting to the CanOps Facility

Canadian Public Safety Operations Organization (CanOps) is a not-for-profit organization that was recently created in 2014 to provide operational support to the first responder and public safety community. CanOps has been contracted to provide governance administration, business operations, communications and outreach, and user technical help for the national Multi-Agency Situational Awareness System (MASAS). For more information regarding CanOps, consult www.canops.org.

Given the similar interagency public safety based data exchange capability provided by the Interoperability Exchange in this project only for resource information vs situational awareness information, CanOps could be considered as a logical place for the project capabilities to migrate.

As of the date of this document, CanOps is conducting a Request For Information to select a technical service provider and to establish its own operating model. Therefore no cost information is available for this document at this time.

Cost to Maintain

Software maintenance is the ongoing process of ensuring software remains functional in a changing environment and maintaining performance. It assumes that maintenance is addressing any changes required to the software or related libraries, build environments current over a span of three years, without accounting for fundamental shifts or changes in overall environment and tooling.

In this case, software maintenance applies to the Interoperability Exchange, and any of the tools that were developed in the project that will remain in use. It does not include maintenance and support of the other agency systems of record connected.

For the purposes of this analysis, software maintenance has been estimated at 2.5% of the total project costs, or $25,000 per year.

Summary of Investment Required

Based on the above information, the following summary (Table 3) can be produced.

Investment Type	**Annual Investment Estimated ($CAD)**
Investment required to maintain air operations plans	$2,700
Investment required to staff and exercise the air operations branch annually	$42,250
Investment required to host the Interoperability Exchange annually (Option 1)	$7,200
Investment necessary to maintain the Interoperability Exchange	$25,000

Table 3 Total Annual Investment Required to Maintain Air Ops Capability

Return

Calculating the return component of the return on investment of operating an Air Operations Branch is more challenging to identify for several reasons:

- No formally established inter-agency air branch for non-wildfire emergency operations has been operating in BC, or to the project's knowledge, across Canada. Therefore, a before and after comparison cannot be used to identify the net impact in efficacy that a technology enabled air branch can provide. Similarly, a dollar value cannot be established for the enhanced safety factor that an integrated and coordinated multi-agency air operations branch would likely establish.
- Disasters are not routinely occurring, so that increased efficiency in execution has no historical direct measures. Typically, in the earliest stages of emergency response where human lives are a factor, costs have usually been a secondary concern only to become more prominent considerations as the risk and threat diminishes.

- Of the three signatory agencies, at the time of writing of this document, BCEHS maintains performance metrics that inform program management decisions around their aviation fleet daily operations. BCWS maintains a non-enterprise internal tool based on an Access 2.0 data engine that captures metrics related to utilization and costs, but are descriptive only and not used to make program management decisions. EMBC has no suitable data related to aviation operations.

Several approaches have been considered:

1. Option 1 – Direct Approach: Calculate the return based directly on an estimated increase in efficiency achieved thru efficient use of aircraft during response and recovery operations
2. Option 2 – Indirect Approach: Potential reduction of damages and suffering resulting from a more efficient and faster response thru the effective use of aviation resources

Option 1 – Direct Cost Savings Thru Increased Efficiency

This option looks at the potential increase in efficient in the use of the aircraft on a large response. The response to hurricane Katrina [ii]has been used as a baseline for the potential number of sorties per day (Table 4).

Assumptions:

- Each aircraft can fly 20 sorties per day
- Each sortie is 30 minutes
- The majority of helicopters required in initial response phase would be Type 2 (medium lift) with an hourly cost per flight hour, all found including fuel & support personnel = $3200
- These numbers of sorties are actuals from Hurricane Katrina and are representative of what BC could realistically experience in a large catastrophic earthquake in the Lower Mainland and Vancouver Island areas. This model assumes that an organization that can manage these numbers effectively also has dynamic scalability to manage surge demands as well.
- Where 50% of the flight legs are assumed full, then that means twice as many sorties to complete the mission
- Where 75% of the flight legs are assumed full, then that means 1.5 times as many sorties to complete the mission

Cost Calculations

- Cost = (hourly cost per flight hour)x(hours flight time)x(# aircraft required)
- 75% Flight Legs Full = Cost x 1.5
- 50% Flight Legs Full = Cost x 2

	Number of Sorties Flown at Hurricane Katrina by Air National Guard						
Date	# Daily Sorties	Sorties per Day per A/C	# Aircraft Required	Hours Flight time	Cost	Assume 75% of Flights Legs Full	Assume 50% Flights Legs Full
30-Aug	512	20	26	10	$ 819,200.00	$ 1,228,800.00	$ 1,638,400.00
31-Aug	548	20	27	10	$ 876,800.00	$ 1,315,200.00	$ 1,753,600.00
01-Sep	876	20	44	10	$ 1,401,600.00	$ 2,102,400.00	$ 2,803,200.00
02-Sep	1236	20	62	10	$ 1,977,600.00	$ 2,966,400.00	$ 3,955,200.00
03-Sep	1020	20	51	10	$ 1,632,000.00	$ 2,448,000.00	$ 3,264,000.00
04-Sep	1352	20	68	10	$ 2,163,200.00	$ 3,244,800.00	$ 4,326,400.00
05-Sep	1016	20	51	10	$ 1,625,600.00	$ 2,438,400.00	$ 3,251,200.00
06-Sep	1104	20	55	10	$ 1,766,400.00	$ 2,649,600.00	$ 3,532,800.00
07-Sep	1176	20	59	10	$ 1,881,600.00	$ 2,822,400.00	$ 3,763,200.00
08-Sep	828	20	41	10	$ 1,324,800.00	$ 1,987,200.00	$ 2,649,600.00
09-Sep	292	20	15	10	$ 467,200.00	$ 700,800.00	$ 934,400.00
10-Sep	180	20	9	10	$ 288,000.00	$ 432,000.00	$ 576,000.00
11-Sep	224	20	11	10	$ 358,400.00	$ 537,600.00	$ 716,800.00
12-Sep	388	20	19	10	$ 620,800.00	$ 931,200.00	$ 1,241,600.00
13-Sep	248	20	12	10	$ 396,800.00	$ 595,200.00	$ 793,600.00
14-Sep	236	20	12	10	$ 377,600.00	$ 566,400.00	$ 755,200.00
15-Sep	248	20	12	10	$ 396,800.00	$ 595,200.00	$ 793,600.00
			Totals		$ 18,374,400.00	$ 27,561,600.00	$ 36,748,800.00

Table 4 Return Calculation Based on Increased Efficacy in Aircraft Use

Clearly, there is a substantial costs savings potential in the many millions of dollars range when the flight legs are maximized for effectiveness.

Option 2 – Indirect Savings from Improved Response, Lessened Damages and Suffering

Aviation assets, in particular rotary wing, are generally acknowledged as a key asset in disaster response and recovery. Multiple studies have shown that using autolaunch criteria to deploy helicopter emergency medical systems (HEMS) results in expedited patient transport and a reduction in the mortality of major trauma patients[iii]. While most health authorities likely maintain metrics around operating costs of hospital beds, there is not current data readily available that would enable ROI calculations based on the correlation between quicker helicopter response and reduced patient treatments times as a function of these costs. Given the potential nature of destructive impact on the road infrastructure from a catastrophic earthquake, or other similar event, the likelihood of ground ambulance operations being adversely affected in the earlier response stages is well accepted in the larger EM community.

In addition to the British Columbia Earthquake Immediate Response Plan, other emergency management organizations have created the concept of an air operations group to manage the efficient use of aviation resources. Examples are listed below. However, there is little research available that quantifies the impact that the efficient use of air resources, or the use of air resources at all, in response and recovery to large scale disasters.

- Federal Aviation Authority (F.A.A.) Advisory Circular AC No. 00-50 November 13, 1998 Integrating Helicopter and Tiltrotor Assets Into Disaster Relief Planning[iv]
- California Governor's Office of Emergency Services Air Coordination Group Concept of Operations (2016)
- State of Florida, Florida Division of Emergency Management, Emergency Operations Plan (2008)

Outside of aircraft, the return on investment for preparedness activities in literature is also in a very preliminary stage, with most work relating to the cost benefit analysis to physical disaster risk reduction activities, and early warning systems, rather than investment in planning, training, and capability. Some examples of these activities are:

- The International Association of Emergency Managers [v]have proposed a framework be applied to measuring ROI to evaluate the effectiveness of FEMA Emergency Management Performance Grant Program. The framework is based on using Outcome-Driven Objectives and Measures for the Program. This framework could be used to evaluate the effectiveness of the of the air branch in achieving a disaster resilient jurisdiction, but it would require definition of objectives larger in scope than this specific project – i.e. if the objectives existed, the air branch ROI could be evaluated using it.
- The United Nations maintains an office dedicated to disaster risk reduction, The United Nations Office for Disaster Risk Reduction (UNISDR), and its members have brought forward a framework for DRR, the Sendai Framework for Disaster Risk Reduction[vi].
- A study was conducted and published within the International Journal of Disaster Risk Reduction that noted while cost benefit analysis is increasingly being conducted, and "Many results were identified supporting the economic effectiveness of DRR, however, key limitations were identified…"[vii]

It is also generally acknowledged that the future effects of disasters will be large from societal and economic perspective, and are disasters are increasing in frequency and cost, so any increase in efficacy in response will have a positive reduction on both costs and pain and suffering.

- Emergency Management British Columbia Earthquake Immediate Response Plan(2015) estimates that an earthquake of magnitude of 7.3 directly under the city would result in nearly 128,000 injuries, (and 10,000) deaths[viii]
- The Conference Board of Canada estimates that a 1 in 500 year 9.0 magnitude earthquake off the west coast of Canada would result in insurable losses ($42B of direct insurable losses and 15,000 deaths) so large to cause widespread failure of insurance companies[ix]
- Insurance Bureau of Canada (2013) estimates that the number and severity of catastrophic losses (insurable losses over $25M or more) that are occurring annual is increasing.[xxi]

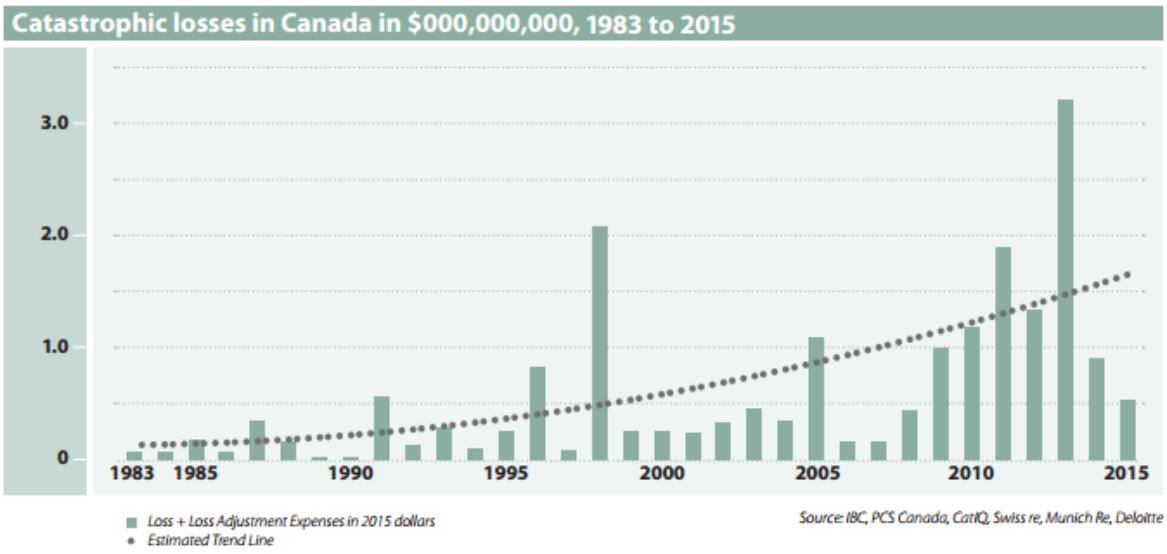

Figure 1 Catastrophic Losses in Canada, $B (Source: Insurance Bureau of Canada)

Overall, while the evidence points towards the conclusion that increased preparedness resulting from a staffed, trained, exercised, and technology enabled Air Operations Branch will have a direct positive impact in improving response, and reducing damages and human suffering, a quantitative effect is difficult to determine. Nevertheless, it should be noted that even a 1% reduction in losses and damages can result in millions of dollars saved.

Annex A - References

[i] Vorhies, Dr. Francis, (2012) The economics of investing in disaster risk reduction, UNISDR, Geneva https://www.massport.com/media/266284/2012-December_Economics-Risk-Reduction.pdf

[ii] Hurricane Katrina: The Defense Department's Role In The Response" at the Hearing Before The Committee On Homeland Security and Governmental Affairs, United States Senate (2007)

[iii] Danielson, Kyle. (2009) Improving Trauma Care in British Columbia Using Early Activation of Helicopter Emergency Medical Services. University of Victoria, Master's Thesis. British Columbia.

[iv] Federal Aviation Authority (F.A.A.) Advisory Circular AC No. 00-50 November 13, 1998 Integrating Helicopter and Tiltrotor Assets Into Disaster Relief Planning https://www.faa.gov/documentLibrary/media/Advisory_Circular/ac00-59.pdf

[v] Preparedness: A Principled Approach to Return on Investment August 11, 2011 International Association of Emergency Managers Falls Church, VA https://www.ndsu.edu/fileadmin/emgt/IAEM_preparedness_principled_approach_81111.pdf

[vi] United Nations International Strategy for Disaster Reduction https://www.unisdr.org/who-we-are/what-is-drr

[vii] Shreve, C.M., Kelman, I. Does mitigation save? Reviewing cost-benefit analyses of disaster risk reduction. International Journal of Disaster Risk Reduction, Volume 10, Part A, December 2014, Pages 213–235 http://dx.doi.org/10.1016/j.ijdrr.2014.08.004

[viii] Province of British Columbia BC. Earthquake Immediate Response Plan, http://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/irp.pdf

[ix] Canada's Earthquake Risk. Macroeconomic Impacts and Systemic Financial Risk: The Conference Board of Canada, 2016 http://www.conferenceboard.ca/temp/5a392bb1-d17f-4610-92b7-a43cfbe66abd/8349_earthquakerisk-rpt.pdf

[x] AIR Worldwide. Study of Impact and the Insurance and Economic Cost of a Major Earthquake in British Columbia and Ontario/Quebec. Toronto: Insurance Bureau of Canada, 2013. http://assets.ibc.ca/Documents/Studies/IBC-EQ-Study-Full.pdf

[xi] Facts of the Property and Casualty Insurance Industry of Canada 2016, IBC, http://assets.ibc.ca/Documents/Facts%20Book/Facts_Book/2016/Facts-Book-2016.pdf

DOCUMENT CONTROL DATA

*Security markings for the title, authors, abstract and keywords must be entered when the document is sensitive

1. ORIGINATOR (Name and address of the organization preparing the document. A DRDC Centre sponsoring a contractor's report, or tasking agency, is entered in Section 8.)

Selkirk Systems Inc.
Suite 4, 415 Dunedin Street
Victoria (BC), V8T 5G8 Canada

2a. SECURITY MARKING (Overall security marking of the document including special supplemental markings if applicable.)

CAN UNCLASSIFIED

2b. CONTROLLED GOODS

NON-CONTROLLED GOODS
DMC A

3. TITLE (The document title and sub-title as indicated on the title page.)

Emergency Air Operations Project: Aviation Management Interoperability for Emergency Response and Recovery : Return on Investment

4. AUTHORS (Last name, followed by initials – ranks, titles, etc., not to be used)

Newton, S.

5. DATE OF PUBLICATION (Month and year of publication of document.)	6a. NO. OF PAGES (Total pages, including Annexes, excluding DCD, covering and verso pages.)	6b. NO. OF REFS (Total references cited.)
March 2018	12	11

7. DOCUMENT CATEGORY (e.g., Scientific Report, Contract Report, Scientific Letter.)

Contract Report

8. SPONSORING CENTRE (The name and address of the department project office or laboratory sponsoring the research and development.)

DRDC – Centre for Security Science
NDHQ (Carling), 60 Moodie Drive, Building 7
Ottawa, Ontario K1A 0K2 Canada

9a. PROJECT OR GRANT NO. (If appropriate, the applicable research and development project or grant number under which the document was written. Please specify whether project or grant.)	9b. CONTRACT NO. (If appropriate, the applicable number under which the document was written.)
	W7714-156075/001/SV

10a. DRDC PUBLICATION NUMBER (The official document number by which the document is identified by the originating activity. This number must be unique to this document.)	10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)
DRDC-RDDC-2018-C254	CSSP-2014-CP-2005

11a. FUTURE DISTRIBUTION WITHIN CANADA (Approval for further dissemination of the document. Security classification must also be considered.)

Public release

11b. FUTURE DISTRIBUTION OUTSIDE CANADA (Approval for further dissemination of the document. Security classification must also be considered.)

12. KEYWORDS, DESCRIPTORS or IDENTIFIERS (Use semi-colon as a delimiter.)

Emergency Management; Emergency/Crisis Management

13. ABSTRACT/RÉSUMÉ (When available in the document, the French version of the abstract must be included here.)

Aircraft are key assets during response and recovery from large scale emergency events. A critical gap exists in multiagency response to emergency events due to the silo nature of how each responding and affected organization manages their aerial resource needs. For example, a major seismic natural disaster in the BC Lower Mainland is forecast to cause extensive damage to critical infrastructure, disrupt all major ground transportation routes and produce mass casualties. While many organizations have emergency response plans, few are coordinated, and dependence on the same scarce aviation resources is common. Prioritization of use of the resources across different needs will be paramount to maximizing the effectiveness of response and recovery operations. Therefore, the goals of this interoperability technology demonstration project are to: enable a provincial plan and systems interoperability to ensure aviation resources are coordinated and used to maximum efficiency for response and recovery operations; create governance, procedures, and enabling technologies for interoperability between all involved agencies for managing aviation resources; leverage aviation management expertise within the provincial government and experienced response agencies for the benefit of all; maximize the integration of the governance, standard operating procedures (SOP), and enabling technologies developed and proven in this Project into the daily business operations of the organizations involved; with seamless scalability for emergency management (EM) events; create a model for emergency aviation management that can be expanded to other jurisdictions and also nationally; and establish an open, standards-based emergency aviation interoperability architecture for use in British Columbia (BC) and in other jurisdictions—for example nationally via Multi-Agency Situational Awareness System (MASAS).

This document contains the Impact Study for the deployment of the Emergency Management System.