



CAN UNCLASSIFIED



DRDC | RDDC  
technology | science | technologie

# Emergency Air Operations Project

## *Aviation Management Interoperability for Emergency Response and Recovery: System Requirements*

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-C256

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*.

Disclaimer: This document is not published by the Editorial Office of Defence Research and Development Canada, an agency of the Department of National Defence of Canada but is to be catalogued in the Canadian Defence Information System (CANDIS), the national repository for Defence S&T documents. Her Majesty the Queen in Right of Canada (Department of National Defence) makes no representations or warranties, expressed or implied, of any kind whatsoever, and assumes no liability for the accuracy, reliability, completeness, currency or usefulness of any information, product, process or material included in this document. Nothing in this document should be interpreted as an endorsement for the specific use of any tool, technique or process examined in it. Any reliance on, or use of, any information, product, process or material included in this document is at the sole risk of the person so using it or relying on it. Canada does not assume any liability in respect of any damages or losses arising out of or in connection with the use of, or reliance on, any information, product, process or material included in this document.



SELKIRK SYSTEMS INC.

# **EMERGENCY AIR OPERATIONS PROJECT**

## **(AVIATION MANAGEMENT INTEROPERABILITY FOR EMERGENCY RESPONSE AND RECOVERY)**

**CSSP-2014-CP-2005**

# **System Requirements**

**Selkirk Systems Inc.**

**Version:** Emergency Air Operations Project -System Requirements V 3.4

## Contents

Introduction and Purpose of this Document .....	4
Roles.....	4
Requester .....	4
Approver/Prioritizer .....	4
Implementer .....	4
Resource Requesting .....	5
Resource Request Workflow.....	5
Resource Request Information Requirements .....	6
Functionality Required within the System.....	8
Resource Request Stages and Actions .....	9
Prioritization Levels.....	10
Provincial Level (Leader's Intent).....	10
Strategic Level.....	11
Tactical Level.....	11
Requirements for Recommended Strategic Prioritization.....	12
Air Mission Typing.....	12
BC Emergency Management System (BCEMS) Goals .....	12
Recommended Priority Matrix.....	13
Manual Prioritization of Resource Requests.....	14
Planning and Tasking Requirements.....	14
Common Operating Picture .....	14
Requirements.....	14
MASAS.....	15
Information Security and System Access .....	15
Information Security .....	15
System Access .....	15
User Authentication, Authorization, and Accounting.....	15
Interoperability Exchange .....	18
Data Elements.....	20
Data Retention .....	23
Appendix A - System Requirements Analysis.....	24
Appendix B - Analysis of Resource Request Elements.....	24

Figure 1: Roles.....	5
Figure 2: Resource Request Workflow.....	5
Figure 3: System Information Flow and Actions .....	9
Figure 4: Resource Request Stages .....	10
Figure 5: Prioritization Levels.....	12
Figure 6: Recommended Priority Matrix.....	14
Figure 7: System Administration.....	17
Figure 8: Requester System interaction with IE API .....	18
Figure 9: Approver/Prioritizer System interaction with IE API .....	19
Figure 10: Implementer System interaction with IE API.....	19
Table 1: Resource Request Information Requirements.....	7
Table 2: System Functionality Requirements .....	8
Table 3: System Access List .....	15
Table 4: System Permissions .....	16
Table 5: Data exchanged with permissions .....	22
Table 6: Specific permissions for Status Changes .....	23

## Introduction and Purpose of this Document

This document provides the current understanding of the requirements of the Emergency Air Operations Project. At its most basic level this project requires the communication and manipulation of information between Emergency Operations Centers (EOC) and the Province to ensure the most effective and efficient use of scarce aviation resources. This information flow must communicate the resource need (request), the need to fulfill this request over other requests (priority), and the assignment of a resource to the need (allocation). This exchange of information may occur using a variety of existing systems connected via the Strike-Slip interoperability exchange as well as through Strike-Slip web tools built specifically for this project.

## Roles

Three primary roles have been identified in the business flow. In a full-scale catastrophic event, these roles will be filled by different individuals and likely multiple people filling single roles. In the day-to-day implementation of this business practice one individual may take on multiple roles.

Requests for resources will typically be made from the field level and progress from the Command and Control organizations to the Support and Coordination organizations. As each level is no longer able to fulfill the request for assistance, the request moves up to the next level of coordination. This will often follow a field to local office to regional organization to provincial organization line of assistance. There may also exist a Federal level of assistance above the provincial level (Figure 1).

The requirements for this system are defined around the business practice of requests from local offices being submitted to a centralized organization for prioritization and approval. This centralized organization will then prioritize and implement these requests for resources.

## Requester

The Requester role will submit the information required into the system. This role will typically be fulfilled by a member of an Emergency Operations Center (EOC). The business practice of receiving resource requests from field personnel is very mature within all agencies and is not affected or impacted by this project.

## Approver/Prioritizer

The Approver/Prioritizer role will receive the requests from multiple sources, prioritize those requests based on the strategic provincial goals, and approve or deny the request. This role is centralized to enable decision-making at a high level of authority and across multiple jurisdictions. Depending on the scale and impact of the incident/event, this role may be filled by individuals from multiple agencies and organizations.

## Implementer

The implementer role will receive the prioritized and approved requests for resources, task specific agencies that control air resources, and execute the request. This role will likely not be co-located with the Approver/Prioritizer role and may have multiple groups representing multiple agencies and organizations capable of procuring, tasking, and managing aviation assets.

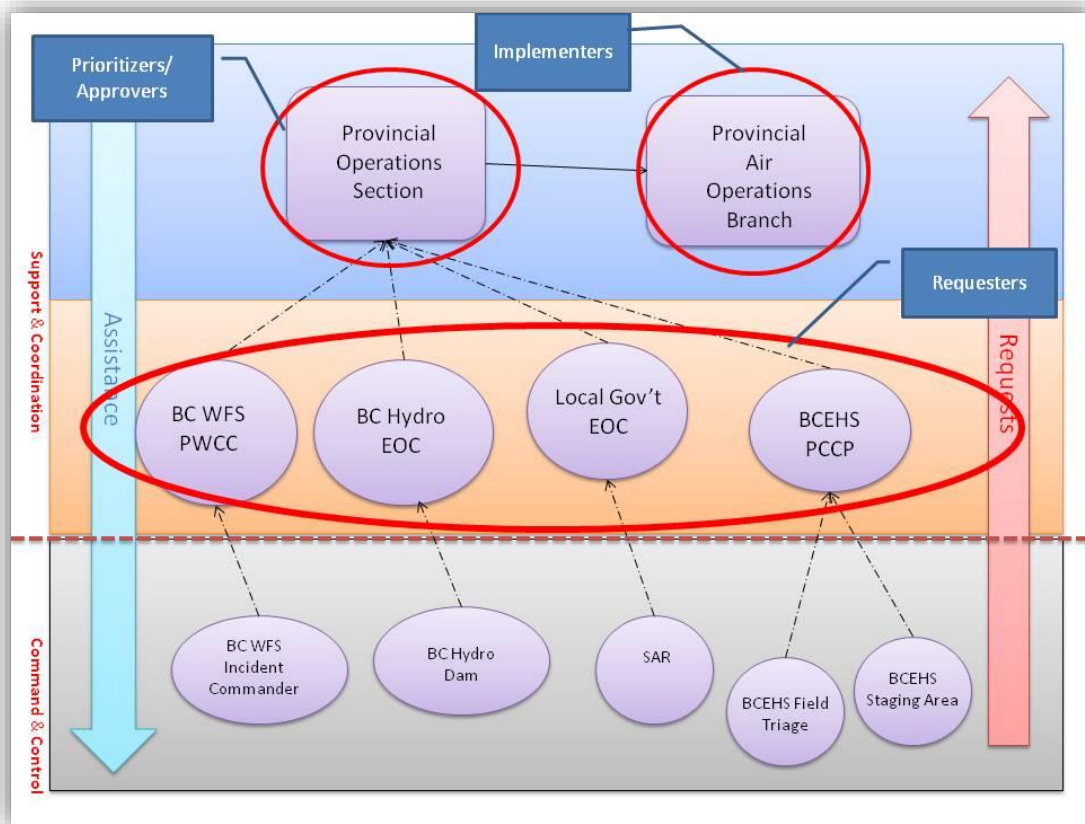


Figure 1: Roles

## Resource Requesting

### Resource Request Workflow

The overall flow of information begins with a request for air asset assistance and ends when air assets have completed the specific task requested. Each request will be prioritized based on provincial strategic goals. An agency with available air assets will be tasked to complete all or part of the request.

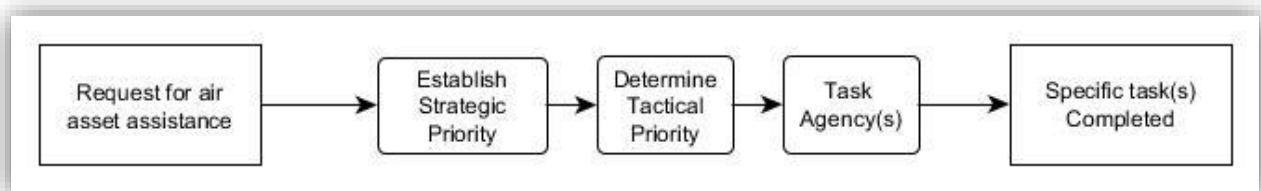


Figure 2: Resource Request Workflow

The following assumptions are included in this flow:

- The demand created for air assets may come from a variety of agencies/organizations. Each agency or organization making a request will have their own internal procedures for validating

and approving the need for aircraft and the subsequent request. The project exercises have demonstrated that the business practice of the personnel in the field requesting an aircraft from the agency's operations center is very robust for the majority of agencies/organizations. Therefore, the protocols and business practices of requesting aircraft from the operations center by field personnel have not been specifically addressed in this project (See Figure 1).

- Within each agency and organization, the business practices and protocols for capturing demand for aircraft, prioritization of that demand, and allocation of existing aircraft assets is quite robust for the majority of agencies and organizations. For many agencies it is only when the demand for resources outstrips the operations center's capability to procure and/or manage an increase in air assets that the agencies begin to be challenged with the use of existing business practices and protocols. The business practices around requesting assistance from other agencies in either supplying or procuring additional aircraft or supporting an increased fleet are lacking.
- The business practices, workflow, and technology do not support the prioritization of demand from one agency/organization against another. The majority of everyday business is conducted using air assets within individual agencies and the protocols necessary to evaluate the demand from one agency against another is nonexistent.
- In the early stages of the disaster, BCEHS will likely be a large consumer of aircraft. Due to the complexity of the triage necessary to move patients, their requests for air support will have additional layers of prioritization prior to being submitted to the province. However, the requests from BCEHS will still require strategic prioritization at the provincial level amongst all the demand and then tactical priority to determine the best available aircraft(s) to complete objectives.
- Requests submitted to the province will be prioritized using the BCEMS goals within the Operations Section and provided to the Air Operations Branch. The Air Operations Branch will determine the best agency to be tasked based on availability of capable aircraft.
- A common inventory of air resources available will be maintained that will encompass all the agencies with air assets that could be potentially tasked.
- The Air Operations Branch will provide air assets to the requesting agency or provide mission support as requested.

This workflow and assumptions provide the bases for the requirements to the complete system. These requirements will be examined within this document by defining the specific roles within the system that must be accommodated; the information that must be passed between the roles; and the actions conducted by each of the roles on the information being passed.

### Resource Request Information Requirements

Through scenario based testing, a baseline of information that must be passed through the system in order to complete the information flow has been identified. Table 1 identifies this information that must be collected by the requester and passed to the implementers and what the information is used for within the system.

Field Name	Definition	Used in the System
Resource Kind	Resource Kind	Filter demand to Air Requests



Mission Type	Configurable list to delineate the type of mission requested	Determine Strategic Priority
BCEMS Goals	List of 8 BCEMS goals	Determine Strategic Priority
Strategic Priority	Priority based on provincial goals and objectives	Determine Tactical Priority
Urgency	Indicator of when the resource is required	Determine Tactical Priority
Requesting EOC	Name of the office placing the request in the system	Track status of request
Date of Request	Date Request is created in the system	Track status of request
Requesting Agency/Org	Name of the entity making the request from the field	Information Only
Resource Type	Type of Aircraft	Determine Tactical Priority
EMBC Task Number	Number provided by EMBC for event/incident	Information Only
Mission Description	Description of the mission	Determine Strategic and Tactical Priority; Tasking Assignment; Validate as Air Request; and Deconflict with other requests
Resource is required	Date/time the resource is required to arrive at the destination	Determine Tactical Priority; Track status of request; and Allow feedback to Requester
Specialized Equipment	Description of equipment required for the mission	Determine Tasking Assignment
# of Passengers	Number of personnel to be moved not including flight crew	Determine Tasking Assignment
Payload	Number of lbs of cargo to be moved	Determine Tasking Assignment
Pickup Description	Landing zone for pickup/ start of mission	Determine Tasking Assignment and Deconflict with other requests
Destination Description	Landing zone for destination/ completion of mission	Determine Tasking Assignment and Deconflict with other requests
Primary EOC Contact	Name, position, contact information of individual in the EOC making the request	Track status of request
Primary Field Contact Name	Name and contact information for individual in the field making the request	Information Only

**Table 1: Resource Request Information Requirements**

## Functionality Required within the System

As the information in the request for air resources is passed between the roles in the system, specific functionality is required within the system in order to manage air assets in the most efficient and effective manner. Table 2 describes the basic functionality requirements of the system to facilitate decision-making by the system users and Figure 3 shows the interaction between systems and users.

System Requirement	Definition	Role
Aggregate demand for valid air assets	Collection of all the requests that are valid as requiring aircraft for objective completion	System
Aggregate air resources	Collection of all air resources available for assignment	Implementer
Determine and assign Strategic Priority to individual requests	Evaluate each request against provincial level goals	Approver/Prioritizer
Determine Tactical Priority	Determine which request will be completed by which aircraft in which order	Implementer
Provide feedback throughout the system to all roles	Provide all roles with updates to changes in status of a request (See Resource Request Stages and Actions Section)	System
Determine tasking assignment	Identify the most efficient and effective aircraft to complete the objective(s) of the request and the agency that maintains operations control of that aircraft. This may require splitting a request into multiple taskings.	Implementer
De-conflict requests	Provide a comparison of current and incoming requests to avoid duplication of aircraft assignments to meet the same objective(s)	Approver/Prioritizer & Implementer

Table 2: System Functionality Requirements

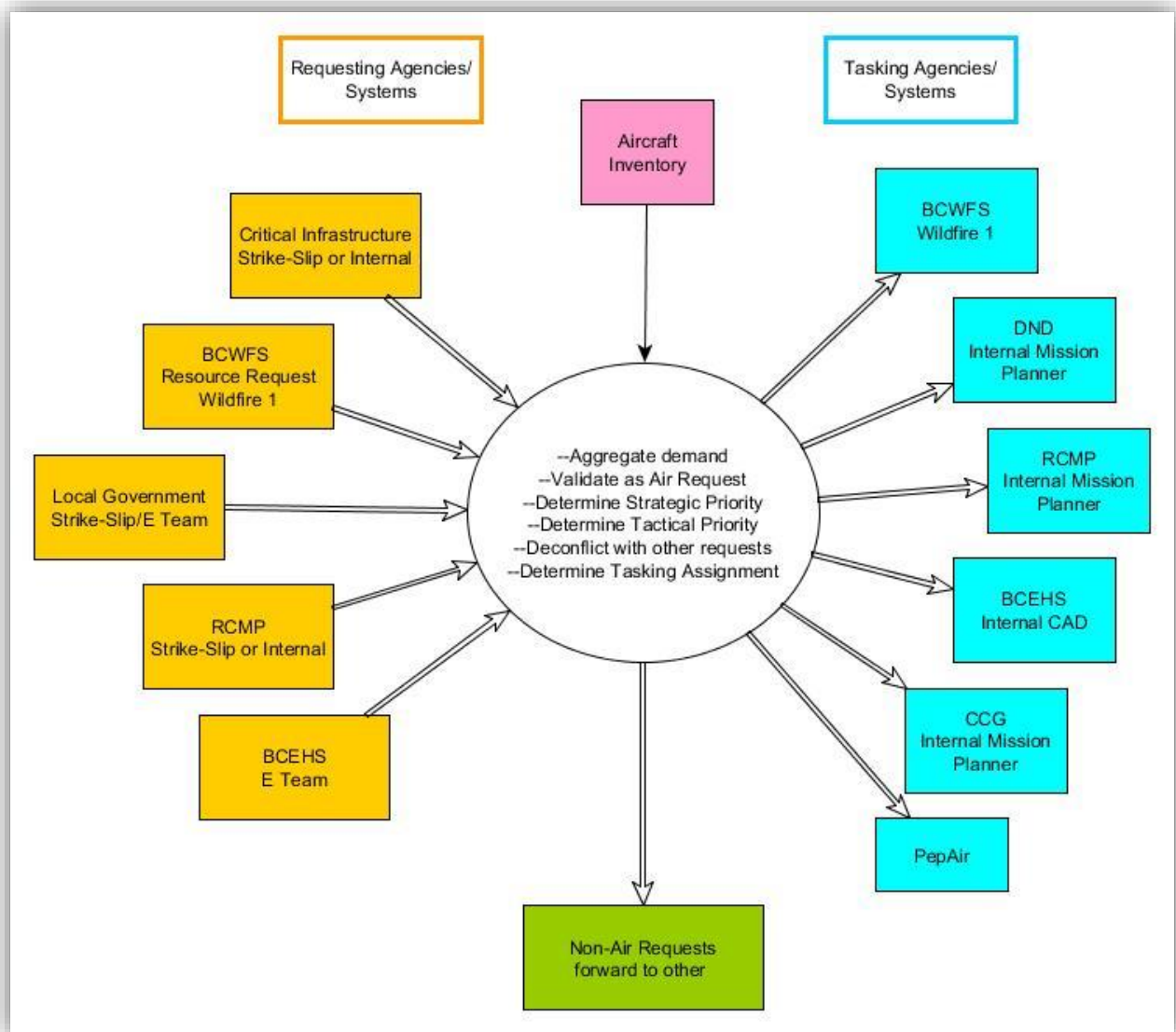


Figure 3: System Information Flow and Actions

## Resource Request Stages and Actions

Through concentrated testing with local municipal EOCs and the province, the stages of a request with the associated actions required to move the request between stages has been identified (Figure 4). The five stages of a request are defined as:

- Request - the initial stage of a request that is entered by creating a new request by a Requester or from a submitted request being rejected by the Approver/Prioritizer. From this stage a Requester can submit the request to move it to the Review Stage or delete the request to move it to the Abort Stage.
- Review - this stage of a request is entered by a request being submitted by a Requester. From this stage an Approver/Prioritizer may reprioritize the request and approve the request which moves it to the Queue Stage or reject the request, moving it back to the Request Stage, or deny

the request which moves it to the Abort Stage. The Requester may cancel the request moving it to the Abort Stage.

- Queue - this stage of a request is entered by a request being approved by an Approver/Prioritizer. From this stage the Implementer may decline the request, moving it back to the Review Stage, assign a resource to the request which moves it to the Assignment Stage, or abort the request which moves it to the Abort Stage. The Approver/Prioritizer may also unapprove the request moving it back to the Review Stage or deny the request moving it to the Abort Stage. The Requester may cancel the request moving it to the Abort Stage.
- Assignment - this stage of a request is entered by a request having a resource assigned to it by an Implementer. From this stage all the roles may complete the request which moves it to the Finished Stage. The Implementer can abort the request which moves it to the Abort Stage.
- Finished/Aborted - these two stages end the request. The Finished Stage can be entered once a resource has been assigned, any of the roles can complete the request. The Aborted Stage is entered from multiple stages by all roles to end a request without completing it.

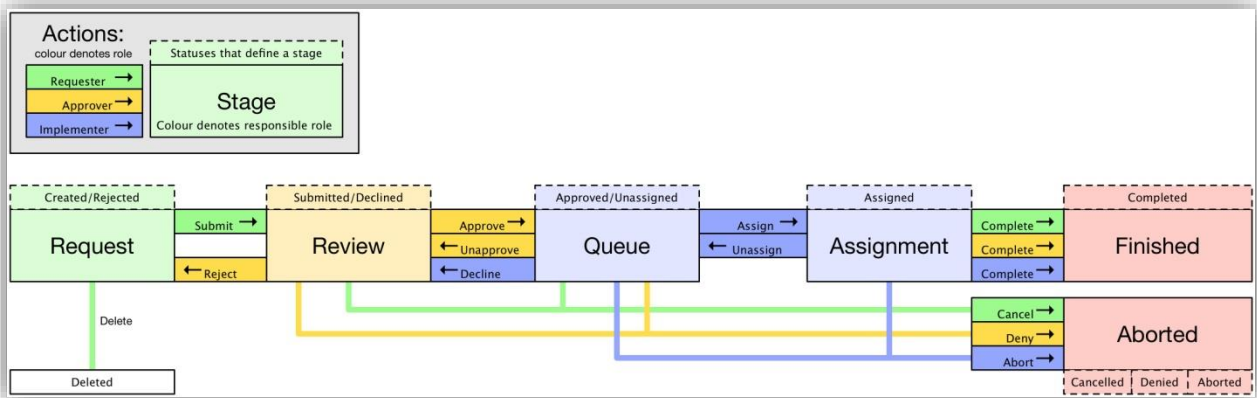


Figure 4: Resource Request Stages

## Prioritization Levels

Multiple levels of prioritization have been identified within the resource requesting and resource allocation process. These have been analyzed and three different levels of prioritization have been identified (Figure 5). The current iteration of the system has focused primarily on the Strategic Level of prioritization.

### Provincial Level (Leader's Intent)

The Provincial Central Coordination level of emergency management structure manages the overall provincial government response and prioritizes provincial government objectives in response to the emergency requirements of the other levels. In BC, that is currently articulated as the BC Emergency Management System (BCEMS) Goals and provides a simple recommended priority when coupled with the type of mission requested.

## Strategic Level

This organizational level is responsible for overall request prioritization and resource allocation.

As identified in the BC Earthquake Immediate Response Plan, BCEMS will guide the response with the provincial emergency management structure fully activated with integration from decision makers, all levels of government, critical infrastructure owners, NGOs, and the private sector. This may lead to a Provincial Earthquake Response and Recovery Centre (PERRC) being established to provide overall coordination of response actions. Depending on the extent and severity of the event, the PERRC, the Provincial Emergency Coordination Center (PECC), or a Provincial Regional Emergency Operations Centre (PREOC) will maintain provincial strategic objectives.

*Definition:* A high-level evaluation of the requests for aviation assets against the current status of the response, the type of mission requested, and the BCEMS goals.

### *Requirements:*

- Receive request for resources which includes a mission type and BCEMS goal to be met
- Aggregate all requests for resources and validate as requiring air assets
- Identify the recommended priority based on Mission Type and BCEMS goal (see Figure 6)
- Review recommended priority for approval of request
- Deconflict requests against other requests
- Maintain resource inventory summary

## Tactical Level

This organization level is responsible for mission tasking and specific aircraft allocation to missions. The Air Operations Branch will be within the provincial organization and will work directly for the Operations Section. The tactical prioritization will be based on aircraft availability and capability, strategic priorities, and daily provincial objectives.

*Definition:* An operational level management of specific mission requests and the planning and execution of those missions to maximize effectiveness and efficiency of aircraft use.

### *Requirements:*

- Receive requests for air assets
- Receive request priority
- Allocate the most effective and efficient aircraft to accomplish the objective(s) of the request
- Maintain aircraft availability list
- Conduct Flight Watch/flight following
- Track landing zone availability
- Support air crews

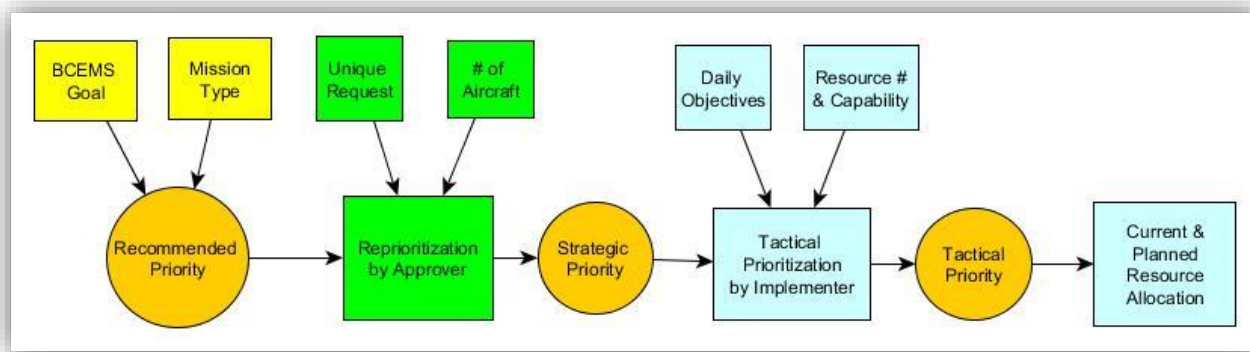


Figure 5: Prioritization Levels

## Requirements for Recommended Strategic Prioritization

The assumption is that at some point during the event, the number of requests for aircraft will be greater than the number of aircraft available to carry out those missions. Therefore, a prioritization mechanism needs to be in place to allow decision-makers from multiple agencies/organizations to understand the scope and effect of each request and be able to prioritize those requests against each other.

In order to efficiently and effectively prioritize requests, a Recommended Priority is provided to the Approver/Prioritizer(s) as well as a summary of pertinent information on which to base a decision. There may be a requirement to be able to configure this Recommended Strategic Priority matrix by system administrators.

### Air Mission Typing

An efficient way to communicate the scope and effect of an aircraft to a request is through categorization of the types of missions that are requested. By using a list of Mission Types, the resource request can be quickly communicated to the Approver/Prioritizer(s). The current list includes 20 Mission Types. It is reasonable that this list will need to be configurable based on agency and/or event.

### BC Emergency Management System (BCEMS) Goals

BCEMS is a comprehensive management scheme that ensures a coordinated and organized provincial response and recovery to any and all emergency events. It is designed to:

- Standardize the process for the delivery of a multi-ministry, multi-agency coordinated response to all emergencies
- Guide key ministries and crown corporations in preparing their emergency plans
- Clarify the functions of various supporting provincial ministries during a response

The BCEMS Goals are:

- Provide for the safety and health of all responders
- Save lives
- Reduce suffering
- Protect public health

- Protect government infrastructure
- Protect property
- Protect the environment
- Reduce economic and social losses.

### Recommended Priority Matrix

EMBC has combined the Mission Type and the BCERMS Goal into a matrix to provide the Approver/Prioritizer with a Recommended Priority (Figure 6). This Recommended Priority will provide the Approver/Prioritizer with a first cut at prioritization and can be quickly accepted as the assigned Priority. This requirement of providing an efficient and effective mechanism to prioritize and approve requests begins with the assignment of a Recommended Priority.

There is a possible requirement to prioritize resource requests, not just into three priority bins (high, medium, low) but in sequential order. This requires the Recommended Priority to assign numbers to each request to track its specific position in the priority list. These ordinal numbers are generated according to the matrix in Figure 6.

	A	B	C	D	E	F	G	H	I	J	K
1	BCERMS Category	Ordinal Value	**lower ordinal values = higher priority; if tied then BCERMS Value is tie breaker; #20 "other" is flagged for human eye every time???	1. Safety & Health of Responders	2. Save Lives	3. Reduce Suffering	4. Protect Public Health	5. Protect Govt CI	6. Protect Property	7. Protect Environment	8. Reduce Economic & Social Losses
2			BCERMS Value	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8
3	1	1.0	Airborne command & control	2.1	3.2	4.3	5.4	6.5	7.6	8.7	9.8
4	1	2.0	Rapid damage assessment/situational awareness/aerial imagery	3.1	4.2	5.3	6.4	7.5	8.6	9.7	10.8
5	1	3.0	Aerial communications relay	4.1	5.2	6.3	7.4	8.5	9.6	10.7	11.8
6	2	4.0	Search & rescue	5.1	6.2	7.3	8.4	9.5	10.6	11.7	12.8
7	2	5.0	Move disaster response personnel (public safety personnel, police, firefighters, emergency medical service & personnel, emergency workers)	6.1	7.2	8.3	9.4	10.5	11.6	12.7	13.8
8	2	6.0	Emergency evacuations	7.1	8.2	9.3	10.4	11.5	12.6	13.7	14.8
9	2	7.0	Transport medical teams & supplies	8.1	9.2	10.3	11.4	12.5	13.6	14.7	15.8
10	3	8.0	Classified flights & public security)	9.1	10.2	11.3	12.4	13.5	14.6	15.7	16.8
11	3	9.0	Critical infrastructure - Lifeline Utilities	10.1	11.2	12.3	13.4	14.5	15.6	16.7	17.8
12	3	10.0	Critical human needs assessment	11.1	12.2	13.3	14.4	15.5	16.6	17.7	18.8
13	3	11.0	Medical evacuation	12.1	13.2	14.3	15.4	16.5	17.6	18.7	19.8
14	3	12.0	Public evacuation & relocation	13.1	14.2	15.3	16.4	17.5	18.6	19.7	20.8
15	4	13.0	Transport life sustaining supplies	14.1	15.2	16.3	17.4	18.5	19.6	20.7	21.8
16	5	14.0	Critical infrastructure - Non-lifeline Utilities	15.1	16.2	17.3	18.4	19.5	20.6	21.7	22.8
17	5	15.0	Aerial firefighting	16.1	17.2	18.3	19.4	20.5	21.6	22.7	23.8
18	5	16.0	Ongoing damage assessment	17.1	18.2	19.3	20.4	21.5	22.6	23.7	24.8
19	7	17.0	Environmental monitoring	18.1	19.2	20.3	21.4	22.5	23.6	24.7	25.8
20	8	18.0	Recovery support	19.1	20.2	21.3	22.4	23.5	24.6	25.7	26.8
21	8	19.0	VIP & media flights	20.1	21.2	22.3	23.4	24.5	25.6	26.7	27.8
22		20.0	Other	21.1	22.2	23.3	24.4	25.5	26.6	27.7	28.8



Figure 6: Recommended Priority Matrix

## Manual Prioritization of Resource Requests

The Prioritizer/Approver may need to change a priority from the Recommended Priority. The original Mission Type and BCEMS Goal will be maintained in the system but the priority level can be manually adjusted. This change requires a justification from the Prioritizer/Approver.

## Planning and Tasking Requirements

One of the primary functions of the Air Operations Branch is to assess requests for air assets and determine the most efficient and effective use of the limited supply of aircraft to meet the objectives of the highest priority needs. Multiple agencies may supply aircraft to the provincial aircraft inventory and will maintain operational control over their fleet. BCWS will be the primary agency to procure civil aircraft and may either maintain operational control of those aircraft or allocate them to other agencies.

Requests for air assets will receive a tactical prioritization based on the request and the available aircraft. This tactical prioritization may also be effected by specific daily objectives determined by the province. Examples of daily objectives may be a requirement to focus assets on a geographic area, a specific objective (i.e. decanting a hospital), or focus on a specific Mission Type or BCEMS Goal.

Requirements for Planning and Tasking include:

- Inventory of available aircraft
- Ability to assign multiple aircraft to a single request
- Ability to assign multiple requests to a single aircraft
- Ability to schedule aircraft to highest priority requests that have not yet been accomplished
- Ability to split requests into single objective tasks for aircraft assignment
- Ability to determine tactical priority based on daily objectives

## Common Operating Picture

The demand for aviation assets must be displayed spatially to provide the Approver/Prioritizer with the relationship between centers of demand and capacity to execute the requests. This provides an important feedback loop to the Approver/Prioritizer around the ability of the system to accommodate the demand.

## Requirements

In the role of Requester, the following requirements are identified:

- Ability to determine if other requests have been placed to meet the same objectives
- Ability to see other events occurring in the area (MASAS)
- Ability to evaluate demand for air assets in a specific area of concern

In the role of Approver/ Prioritizer, the following requirements are identified:

- Ability to evaluate the number and priority level of requests in specific areas
- Ability to see other events occurring in a specific area (MASAS)

In the role of Implementer, the following requirements are identified:

- Ability to plan flights using fuel locations, verified landing zones, staging areas, etc
- Ability to capture updated information from field locations



## MASAS

Canada's Multi-Agency Situational Awareness System (MASAS) is an information aggregation system that facilitates sharing situational awareness within the public safety community. Information shared relates to incidents and planned events. It includes public alerts, risks to responders, and community profiles. MASAS provides a key component of information to the aviation requesting process by providing a spatial depiction of events and incidents relative to the demand for scarce resources.

## Information Security and System Access

### Information Security

To date, no participating agency has identified any information element as having specific security or distribution requirements.

### System Access

The community of practice has not completely identified the system access policies that would apply to this system in use. A core group of key users have been identified, as shown in Table 3. However, the community has not identified a conclusive concept of operations of what information a user should have access to within a role when access is granted. Some possibilities identified are:

- Full access to all current and historical information
- Access to only current information
- Access to only certain information that the user or user's agency has been granted access to, for example on a per event basis

System access requirements will have a direct impact on other exchange requirements, such as data retention and data segmentation.

Initial Agencies Identified as Requiring Access
EMBC – Emergency Management BC
BC EHS – BC Emergency Health Services
BCWS – BC Wildfire Services
DND – Department of National Defence
CCG - Canadian Coast Guard
TC – Transport Canada
RCMP – Royal Canadian Mounted Police

Table 3: System Access List

## User Authentication, Authorization, and Accounting

The following roles and associated permissions have been identified (Table 4). These roles will require different authorizations:

**Requester:** Requesting on behalf of an Emergency Operations Centre (EOC)

- Identified by –
  - Name
  - Position
  - EOC – Agency

**Approver/Prioritizer:** working at the Regional Emergency Operations Centre (REOC)

- Identified by –
  - Name
  - Position

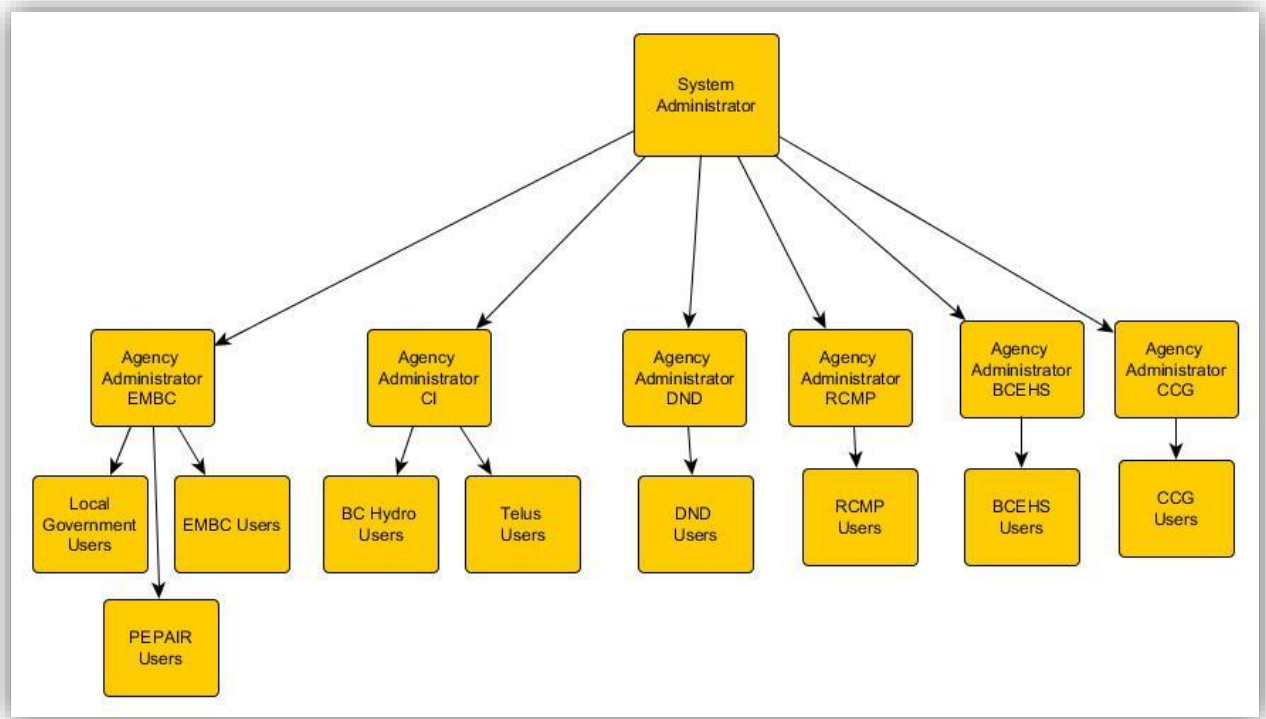
**Implementer:** The entity responsible for mission planning and dispatching

- Identified by –
  - Name
  - Agency

Permission	Requester	Approver/Prioritizer	Implementer
View Request Forms	All	All	All
View Requests on map	All	All	All
Filter icons on map	All	All	All
View list of requests	All	All	All
Create requests	Yes	No	No
Submit requests	Only same EOC and Position	No	No
Resubmit requests	Only same EOC and Position	No	No
Reject requests	No	All	No
Deny requests	No	All	All
Cancel requests	Only same EOC and Position	No	No
Assign Aircraft	No	All	All
Complete request	No	Yes	Yes
Delete request	Only same EOC and Position	No	No
Change Priority	No	All	No

**Table 4: System Permissions**

The system administration includes three tiers: System Administrator, Agency Administrators, and Users (Figure 7).



**Figure 7: System Administration**

The authorities for each are as follows:

System Administrator:

- Sets configuration for event
- Invites Agencies
- Disables Agencies
- Invites Users
- Authorizes/enables Users
- Disables Users
- Sets roles for Users

Agency Administrators:

- Invites Users
- Authorizes/enables Users
- Disables Users
- Sets role for Users

Users:

- Requests access in Role (Requester, Approver, Implementer)

## Interoperability Exchange

The exchange of information from the perspective of each role is outlined in the figures below. The information exchanged from the Requester's system to all other authorized participants, via the Interoperability Exchange, is shown in Figure 8. The information exchanged with an Approver/Prioritizer's system is shown in Figure 9 **Error! Reference source not found.** and with an implementer's system in Figure 10. The data described is passed to the data interoperability exchange and permissions are enforced on the API dependent on the User's role. Specific data elements are outlined in the section below.

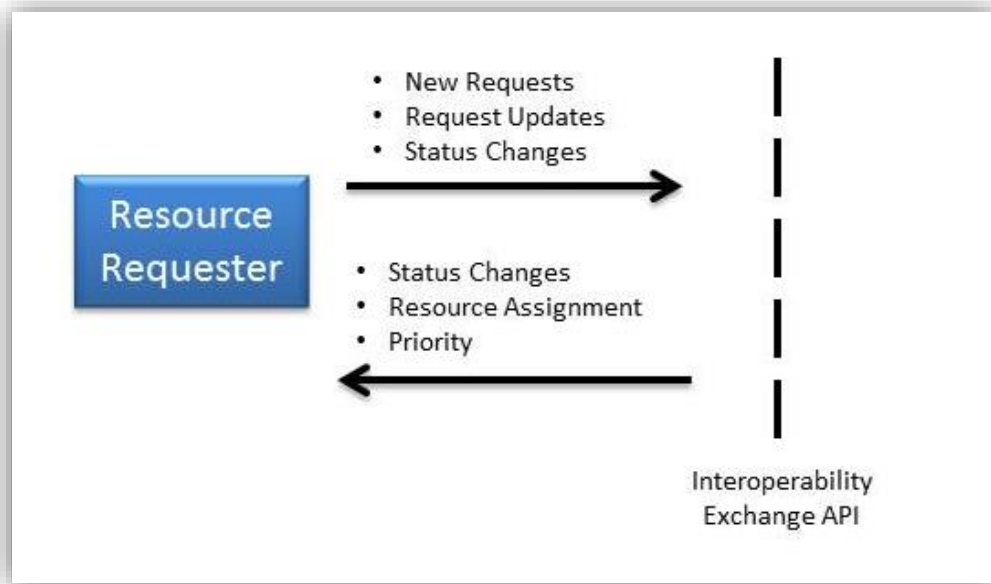


Figure 8: Requester System interaction with IE API

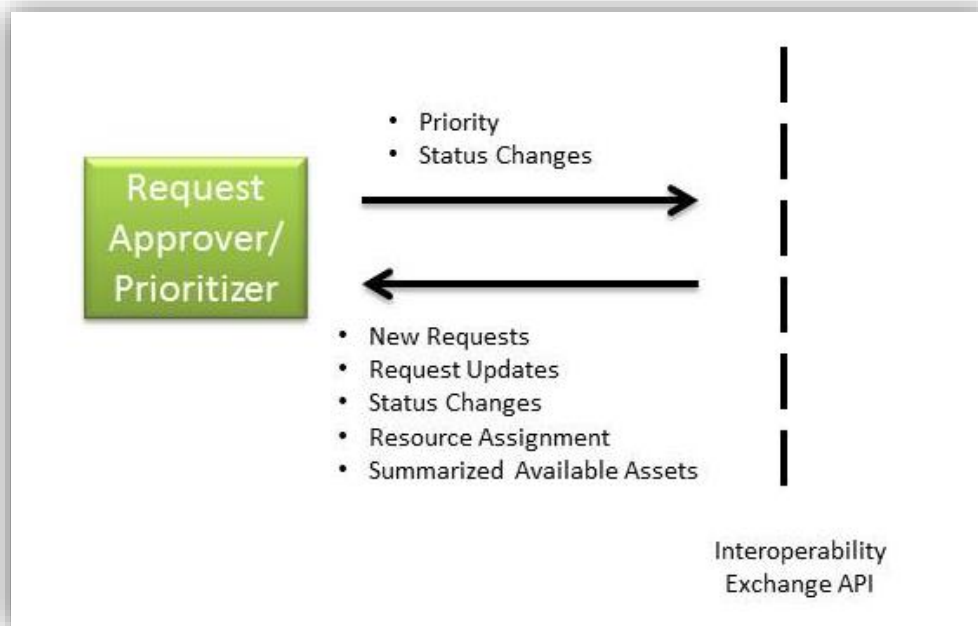


Figure 9: Approver/Prioritizer System interaction with IE API

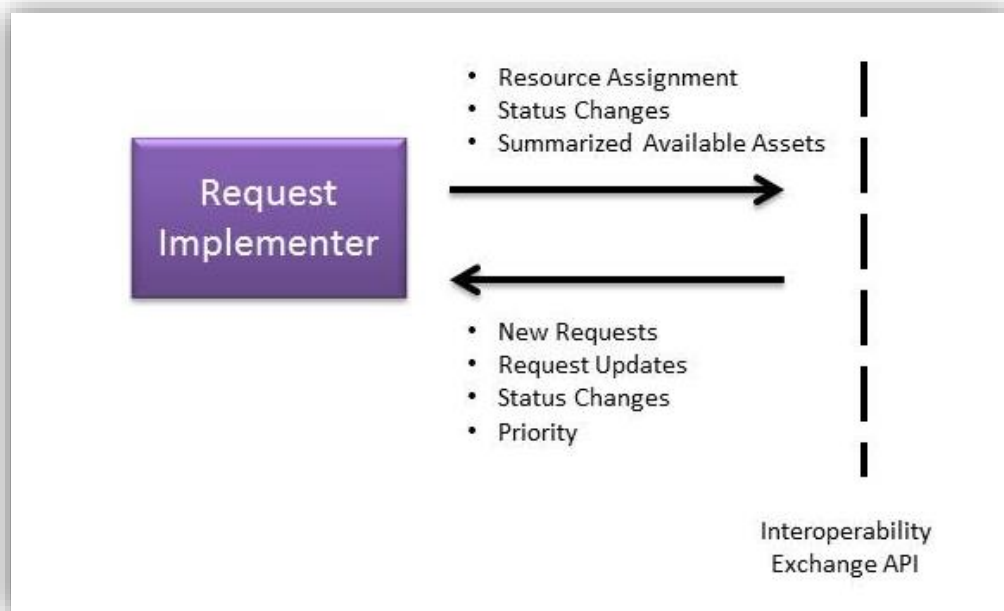


Figure 10: Implementer System interaction with IE API

## Data Elements

The required data elements to be available with the interoperability exchange are described in Table 5 below with specific permissions defined as Create (C), Read (R), and Update (U). The status change permissions (highlighted in yellow in Table 5) are defined in further detail in Table 6. For illustration, the data elements are mapped to Strike-Slip Web UI fields.

Data Element in Strike-Slip Web UI	API Data Element	API Subobject	Definition	Request	Approval	Implement	System
none	id		unique id	X	X	X	CR
none	etteamId			X	X	X	CR
Unique Number	displayName		Unique number identifier	R	R	R	CR
Date/Time Created	creationTimestamp		Date and Time Request was created (system generated)	X	X	X	CR
none	createdByUser		User name of request creator	X	X	X	CR
Last Modified	lastEntityUpdate		Last date and time the request was updated	R	R	R	CR
none	lastUpdateUser		User name of last user to update the request	X	X	X	CR
Pickup Description	locationDescription		Description of the requested pickup location	CRU	R	R	R
Pickup Latitude	latitude		Latitude of the requested pickup location	CRU	R	R	R
Pickup Longitude	longitude		Longitude of the requested pickup location	CRU	R	R	R
Requesting Agency/Org	requestingAgency		Agency submitting the request to the system	CRU	R	R	R
Primary Field Contact: Name	groundContactName		The name of the field contact that requested the aircraft	CRU	R	R	R
Primary Field Contact: Cell	groundContactCell		The cell number of the field contact that requested the aircraft	CRU	R	R	R
Primary Field Contact: Radio Freq	groundContactRadioFreq		The radio frequency to be used to contact the field person requesting the aircraft	CRU	R	R	R
Primary Field Contact: Email	groundContactEmail		The email of the field contact that requested the aircraft	CRU	R	R	R
none	respondingAgency		Currently not used				
Date of Request	requestingTimestamp		Date and Time the Request was created (user controlled)	CRU	R	R	R
Resource is required	requiredByTimestamp		Date and Time the aircraft is required for response	CRU	R	R	R
Resource Type	resourceType		Rotor-wing, fixed-wing, or drone	CRU	R	R	R
Mission Type	missionType		Category of mission as defined by dropdown list	CRU	R	R	R
Urgency	urgency		Timeframe for response (dropdown list)	CRU	R	R	R

Data Element in Strike-Slip Web UI	API Data Element	API Subobject	Definition	Request	Approval	Implement	System
Mission Description	missionDescription		Description of the mission	CRU	R	R	R
Number of Passengers	passengerNum		Number of passengers to be transported	CRU	R	R	R
Payload	payloadLbs		Number of pounds of cargo to be transported	CRU	R	R	R
Specialized Equipment	specializedEquipment		Description of equipment required to be included in the mission	CRU	R	R	R
Requesting EOC	eoc		The name of the EOC submitting the request to the system	CRU	R	R	R
Primary EOC Contact: Name	eocContactName		The name of the primary contact at the EOC placing the request	CRU	R	R	R
Primary EOC Contact: Phone	eocContactPhone		The cell number of the primary contact at the EOC placing the request	CRU	R	R	R
Primary EOC Contact: Email	eocContactEmail		The email of the primary contact at the EOC placing the request	CRU	R	R	R
Primary EOC Contact: Position	eocContactPosition		The position of the primary contact at the EOC placing the request	CRU	R	R	R
none	ordinalValue		Numeric identifier assigned to Mission Type	X	X	X	CR
BCEMS Goal	bcermsValue		BCEMS goal that will be accomplished through this request	CRU	R	R	R
none	priorityValue		Numeric identifier for auto-priority based on Mission Type and Goal	X	X	X	CR
none	priorityOverride		Indicates the auto-priority should not replace the existing value	X	X	X	CR
Priority	priority		High, medium, or low priority auto-calculated from priorityValue	R	RU	R	CR
Destination Description	destinationDescription		Description of the requested destination location	CRU	R	R	R
Destination Latitude	destinationLatitude		Latitude of the requested destination location	CRU	R	R	R
Destination Longitude	destinationLongitude		Longitude of the requested destination location	CRU	R	R	R
Status Changed: Submit; Delete; Approve; Reject; Deny; Cancel; Complete	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	CRU	R	R	R
		comment	Reason for status change	CRU	R	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person	X	X	X	CR

Data Element in Strike-Slip Web UI	API Data Element	API Subobject	Definition	Request	Approval	Implement	System
			changing status				
Status displayed on timeline	currentStatus		Current status of the request	R	R	R	R
Comment displayed on timeline	currentStatusComment		Comments associated to the change in status of the request to the current one	R	R	R	R
EMBC Task Number	embcTaskNumber		Task number assigned by EMBC	CRU	R	R	R
Aircraft ETA	eta		Estimated time of arrival for aircraft to pickup location	R	CRU	CRU	R
Aircraft Assigned	aircraftID		Registration number of aircraft assigned to the request	R	CRU	CRU	R
Aircraft Reason	assignComment		Comments about the aircraft assigned to the request	R	CRU	CRU	R

Table 5: Data exchanged with permissions

Data Element in Strike-Slip Web UI	API Data Element	API Subobject	Definition	Request	Approval	Implement	System
Status Changed: Submit	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	C	R	R	R
		comment	Reason for status change	C	R	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
Status Changed: Delete	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	C	R	R	R
		comment	Reason for status change	C	R	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
Status Changed: Approve	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	R	CU	R	R
		comment	Reason for status change	R	CU	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
Status Changed: Reject	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	R	C	R	R
		comment	Reason for status change	R	C	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
Status Changed: Deny	statusProcess	id	System generated id for status change	X	X	X	CR



Data Element in Strike-Slip Web UI	API Data Element	API Subobject	Definition	Request	Approval	Implement	System
		status	Name of status	R	C	R	R
		comment	Reason for status change	R	C	R	R
		when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
Status Changed: Cancel	statusProcess	id	System generated id for status change	X	X	X	CR
		status	Name of status	C	R	R	R
		comment	Reason for status change	C	R	R	R
		when	Date and time of status change	R	R	R	CR
Status Changed: Complete	statusProcess	who	User name of person changing status	X	X	X	CR
		id	System generated id for status change	X	X	X	CR
		status	Name of status	R	C	C	R
		comment	Reason for status change	R	C	C	R
Status Changed: Assign	statusProcess	when	Date and time of status change	R	R	R	CR
		who	User name of person changing status	X	X	X	CR
		status	Name of status	R	C	C	R
		comment	Reason for status change	R	C	C	R

Table 6: Specific permissions for Status Changes

## Data Retention

The community of practice has not currently defined what data retention policies are required. Some potential requirements identified are:

- Provide an exchange only capability, with retention policies sufficient to support the exchange of information without the requirement to be the system of record for information exchanged
- Provide a system of record capability that retains some or all information exchanged.

## Data Segmentation

The community of practice has not currently defined what data segmentation policies need to be enforced. Potential requirements are:

- No data segmentation is necessary
- Data must be segmented on an event by event basis
- Data must be segmented on the basis of which agencies participated
- A combination of the above.

## Appendix A - System Requirements Analysis

The high level requirements of the complete system to manage demand for aircraft and resulting completion of objectives include:

- Submit Requests - pass specific minimum information from the Requester through the Approver to the Implementer
- Aggregate Demand for Aircraft - collecting the demand for aircraft for all potential needs from all Requesters regardless of agency, organization, or affiliation
- Strategic Prioritization of Requests - identifying urgency of the request based on the mission and ability to meet provincial goals
- Aircraft Inventory and Status- a database of aircraft and their capabilities that are available for tasking
- Aircraft Tasking - assigning appropriate aircraft to a mission based on mission and aircraft location, mission requirements for aircraft capability, and cost
- De-confliction between Requests - evaluating duplication of requests for aircraft to accomplish the same objective
- Determination and communication of task/objective completion - identifying when a request has been completely fulfilled and communicating that information to Requester
- Aircraft Tracking and Display - real-time capture of location from satellite devices in aircraft and the display of that data
- Procurement - completing contractual requirements necessary to hire aircraft
- Aircraft Dispatching - contacting air carrier for specific aircraft/crew and providing mission detail to flight crew
- Aircraft/Aircrew Support (Logistics) - providing meals, accommodations, fuel, takeoff/landing locations, etc to support the aircraft and/or the aircrew
- Flight Watch - maintaining contact with aircrew to establish tracking and safety requirements
- Interagency Communications – sharing information between other aviation users
- Airspace Management - control of airspace to minimize conflict between aircraft

## Appendix B - Analysis of Resource Request Elements

Existing resource requests for WFS and EMBC were reviewed, compared, and analyzed. Table 1B lists the fields required for the EMBC Request for Resources and the BCWS Aircraft Booking Form. Many fields were deemed only relevant for internal business practices. Table 2B cross-walks the fields in this project's Resource Request to the fields in the EMBC and WFS forms. Fields for the Resource Request were selected based on the current understanding of the proposed business practice of requesting aviation support as well as consolidation, streamlining, and simplification of existing standards.

EMBC - Request for Resources	BCWS - Aircraft Booking (FS819)	Resource Request
Event		
Request #	Account	Unique # (returned)
PEP Task#		EMBC Task Number
Date	Date Required	Resource is Required
Time	Time Required	Resource is

		Required
Precedence Level (Emergency, Priority, Routine)		Priority (High, Medium, Low)
Critical Resource Status		
Requires Approval		
Staff/Agency Requesting	Requested by and phone#	Requesting Agency/Org
Contact Person's Name and Position	User Contact Name	Contact Name & Position
Telephone #	User Contact Phone#	Contact phone
Brief description of problem or task to be accomplished	Purpose	Mission Type/Description
Specific Resource Requested & Number Required	Suggest Type/Carrier	Resource Type
Potential Substitute		
Capacity		# of PAX/ Payload
Supporting Equipment, Fuel, Water		
Personnel Required to Operate/Support		
Transportation Required		
How long is resource needed	Dates Extended to include	
Where to Deliver or Report	Info per flight leg: departure Pt, ETD, Destination, ETA, Hold Time, # of PAX	Lat/Long Geographic
Report to Whom (Name, Title, Agency)		Field Contact
Resource Request completed by (Name and Position)	Branch/Region/District - Program	
Resource Request Approved by (EOC Ops Chief)	Authorized Requisitioning Authority	
Resource Request Approved by (EOC Director)	Authorized Signatory	
	Specialized Equipment	Specialized Equipment
	Cargo Description	
	Passengers listed	
	Passenger weight	
	Cargo Weight	Payload
	Total Weight	
<b>Response</b>		
Resource Available	Booking Confirmed	
# of Resources Deployed		
Request filled by	Booked by	
Time of Deployment		
Estimated Time of Arrival		ETA
	A/C Type	
	Pilot	
	Registration	Registration

	Carrier	
	Phone#	
	Fax or Email	
	Rate/hr	
	Fuel rate	
	Daily Mins?	
	Quoted by	
	After Hours Contact	
	Communications	
<b>Current Business Use</b>		
Request for assistance when local government doesn't have capacity. Not just a/c	Casual Hire of Aircraft	

Table 1B – Resource Requests –Comparison of all elements for EMBC, BCWS, and Air Operations Project Resource Request

EMBC - Request for Resources	BCWS - Aircraft Booking (FS819)	Resource Request
Request #	Account	Unique # (returned)
Staff/Agency Requesting	Requested by and phone#	Requesting Agency
Contact Person's Name and Position	User Contact Name	Contact Name
Telephone #	User Contact Phone#	Contact Method
Brief description of problem or task to be accomplished	Purpose	Mission Type/Description
Where to Deliver or Report	Info per flight leg: departure Pt, ETD, Destination, ETA, Hold Time, # of PAX	Lat/Long Geographic
Capacity	Multiple fields	# of PAX/ Payload
<b>Response</b>		
Estimated Time of Arrival	ETA	ETA
	Registration	Registration

Table 2B - Resource Requests - Common Elements between EMBC, WFS, and Resource Request

**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: System Requirements		
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.)  March 2018	6a. NO. OF PAGES (Total pages, including Annexes, excluding DCD, covering and verso pages.)  26	6b. NO. OF REFS (Total references cited.)  0
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.)  DRDC-RDDC-2018-C256	10b. OTHER DOCUMENT NO(s). (Any other numbers which may be assigned this document either by the originator or by the sponsor.)  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 system requirements for the Emergency Management System.