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Communications Interoperability Technical Report

TR-14-2008

North East Avalon Interoperability Study

April 2008

Prepared by:

Williance Resources Inc. on behalf of:

Newfoundland and Labrador Fire Emergency Services

For the:

**Communications Interoperability Technology Interest Group
Canadian Police Research Centre**

Acknowledgements

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Fire Emergency Services (FES)

CITIG Northern Avalon Interoperability
Assessment

Radio Assessment Report

March 31, 2008

Volume I of III



"Broadcast – Telecom – Utility Site Solutions"





March 31st, 2008

Dennis Shea,
Manager, Plans and Operations
Fire and Emergency Services
50 Parade Street
St. John's, NL, A1C 4C7

Subject: CITIG Northern Avalon Interoperability Assessment Report

Dennis;

We are pleased to present the Final Report for the CITIG Northern Avalon Interoperability Study. This report documents the current radio systems of 35 fire departments and 14 first responder and support agencies and the interoperability among these agencies as defined in the project charter.

We look forward to receiving your feedback. If you have any questions, please feel free to contact us.

Sincerely,

Shawn Williams, P.Eng.
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Acknowledgements

The project team would like to acknowledge everyone who gave freely of their time to respond to the survey form and interview. For the 35 fire departments, and 14 other agencies, the majority of the information was collected in the evening from people who gave freely of their leisure time. Without the cooperation of representatives of the fire departments and other agencies, this report would not be possible.

This project has been funded by the Canadian Interoperability Technology Interest Group ("CITIG"). Without their support, this project would not be able to proceed, and their contribution is gratefully acknowledged.

The Amateur Radio community has contributed to the increased focus on interoperability and moving the process towards a successful conclusion. Their contribution is acknowledged and appreciated.

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Executive Summary

Fire and Emergency Services (FES-NL) issued an Request for Proposals (RFP) to complete a “Northern Avalon Interoperability Assessment” (the “Study”). A contract was awarded to Williance Resources to execute this study on February 7th, 2008.

The objectives of the Study are to describe the radio communication systems for first responders on the Northern Avalon Peninsula, document the current degree of interoperability between first responders in the context of the definition of Interoperability given in Section 1.2, highlight best practices; and make base line recommendations to advance the interoperability initiative.

Volume II contains the completed survey forms.

This Study is the first phase in evaluating and enhancing interoperability in Newfoundland and Labrador among all first responder agencies.

The Study assessed the existing radio and interoperability capabilities of 35 fire departments and 14 other agencies on the Northern Avalon Peninsula. Refer to Section 1.1 for a list of the study group. The Study did not include an assessment of the suitability of individual responder radio systems relative to their operational requirements and practices or an evaluation of their operational methods.

The Study also included a validation trial where 4 tabletop exercises were undertaken. The intent of the exercise was to ensure the data was clearly understood, the presentation was logical and the general level of interoperability for key areas was understood. Volume III reports on the outcome of the Validation Trial.

The methodology, described in Section 2, followed standard research practice with three phases: project initiation, data collection and reporting. SAFECOM's Interoperability Continuum (SAFECOM is a communications program of the Department of US Homeland Security), which is a widely accepted framework, was selected as the key framework against which the data would be evaluated. From the Interoperability Continuum, only governance and technology (2 of 5 areas) were in-scope for the study.

Based on the information collected and analyzed during the Study, and comparison with SAFECOM's Interoperability Continuum (Figure 1.2), it is concluded that:

- the current level of **governance** in the Study Area is at the **low** end of the continuum with a blend of “individual agencies working independently” and “informal coordination between agencies”.
 - 74% of FD's have informal agreements with neighbouring FD's and share frequencies;
 - SJRFD has informal agreements with 6 FD's, NR, and CCG;
 - RNC has informal agreements with 3 FD's, NR, CCG, SJRFD, and St. John's Airport;
 - There does not appear to be regular collaboration between key multi-disciplinary staff;
 - There is no formalized group working towards provincial interoperability;

- There is a budgetary disparity between large and small municipalities that impacts the availability of radio equipment; Expenses, such as radio licensing fees, may inhibit interoperability in smaller communities or agencies with limited to no budgets.
- the current level of **technology** in the Study Area is at the **low** end of the continuum with a blend of “swapping radios” and some sharing of existing frequencies.
 - There are three types of radio systems in use: VHF FM, UHF FM equipment and trunked radio systems. There are technical incompatibilities between these systems;
 - 88% of FD's have technically compatible radio systems.
 - For the 31 FD's with VHF systems, there are 14 simplex frequencies and 10 duplex frequency sets. Provincially, FD's could have a large number of frequencies. This creates problems for organizations like the RNC which have to interact with a large number of FD's;
 - There does not appear to be shared channels, proprietary shared systems or standards based shared systems.

1. Introduction

The Government of Newfoundland and Labrador recently integrated the Fire Commissioner's Office and the Emergency Measures Organization to form a new agency of the Department of Municipal Affairs called Fire and Emergency Services - Newfoundland and Labrador (FES-NL).

FES-NL is responsible for the development and maintenance of effective provincial emergency preparedness, response and recovery measures with a view to mitigating the human suffering and loss of property caused by actual or imminent emergencies and disasters in Newfoundland and Labrador.”

The Northern Avalon Interoperability Study (the “Study”) assesses the existing radio and interoperability capabilities of several fire departments and other agencies on the majority of the Northern Avalon Peninsula. The Study also includes a validation trial. Refer to the Project Charter dated February 29th. 2008.

This study is the first step in an Interoperability Initiative to enhance interoperability between first responders. The primary objectives of this study are to acquire baseline information on radio frequency (RF) communication systems and interoperability practices. The information collected during this Study is a necessary input to the successive phases of the Interoperability Initiative.

1.1. The Study Group

The study group includes 49 organizations, as shown in Table 1.1, that representing first responders or support agencies in the Study Area, the Northern Avalon Peninsula. This table assigns an abbreviation for each organization that is used throughout this report.

Table 1.1, Organizations in the Study

Organization	Abbreviation
35 Fire Departments (does not include the SJRFD)	FD
Memorial University of Newfoundland, Campus Enforcement & Patrol	MUN
St. Johns Regional Fire Department	SJRFD
Govt of NL Transportation and Works	DTW
Canadian Red Cross	CRC
Canadian Coast Guard	CCG
Department of National Defence	DND
Govt of NL Natural Resources, Forestry	NR
Royal Newfoundland Constabulary	RNC
The Salvation Army	TSA
Ground Search and Rescue	GSAR
Eastern Health Authority	Eastern
Newfoundland and Labrador Hydro	Hydro
Mt. Pearl Police	MPP
St. John Ambulance	SJA

To assist with the presentation of the information, the 49 organizations were divided into four like groups, as shown in Table 1.2. Each group tends to have similar characteristics in terms of role or technology. No priority has been assigned to any group. The grouping is purely as an aid to analysis and presentation of acquired information.

The Study Area includes large municipalities, small municipalities and rural areas. Hence, lessons learned from the Study will be applicable province wide.

Table 1.2, Organizational Groups

Group 1	Group 2	Group 3	Group 4
Fire Departments (Outside of St. John's)	First Responder Agencies	Support Agencies	Non-Governmental Organizations (NGO's)
35 FD's	RNC SJRFD Eastern Health CCG RCMP MPP	DTW NR Hydro MUN DND	CRC TSA SJA GSAR
This group consists of a volunteer or blended fire departments	24/7 Ops Centres Repeaters Budgets Training	Dispatch Centres, Repeaters, Secondary role during incidents	On-scene support services, as required. Tactical radio comm's

1.2. Objectives

The objectives of this report are to:

- Provide a general description of the state of radio communications for the first responders that exists on the Northern Avalon Peninsula;
- Describe the current degree of interoperability between first responders in the context of the definition of Interoperability given in Section 1.2 (see below);
- Highlight best practices; and
- Make base line recommendations to advance the interoperability initiative.

1.3. Definition of Interoperability

(For the purposes of this Study)

“Interoperability is the ability of emergency response agencies to talk to one another via radio communication systems—to exchange voice and/or data with one another on demand, in real time, when needed and when authorized.”

In the broader sense of interoperability, SAFECOM defines Interoperability as *“In general, interoperability refers to the ability of emergency responders to work seamlessly with other systems or products without any special effort.”*

In the context of this Study, interoperability is defined primarily as the Incident Commander’s (IC – the person that is in command of resources at the incident) ability to hail and communicate with first responders from any organization via RF Radio, and represented by the following key questions:

When your agency is the Incident Commander:

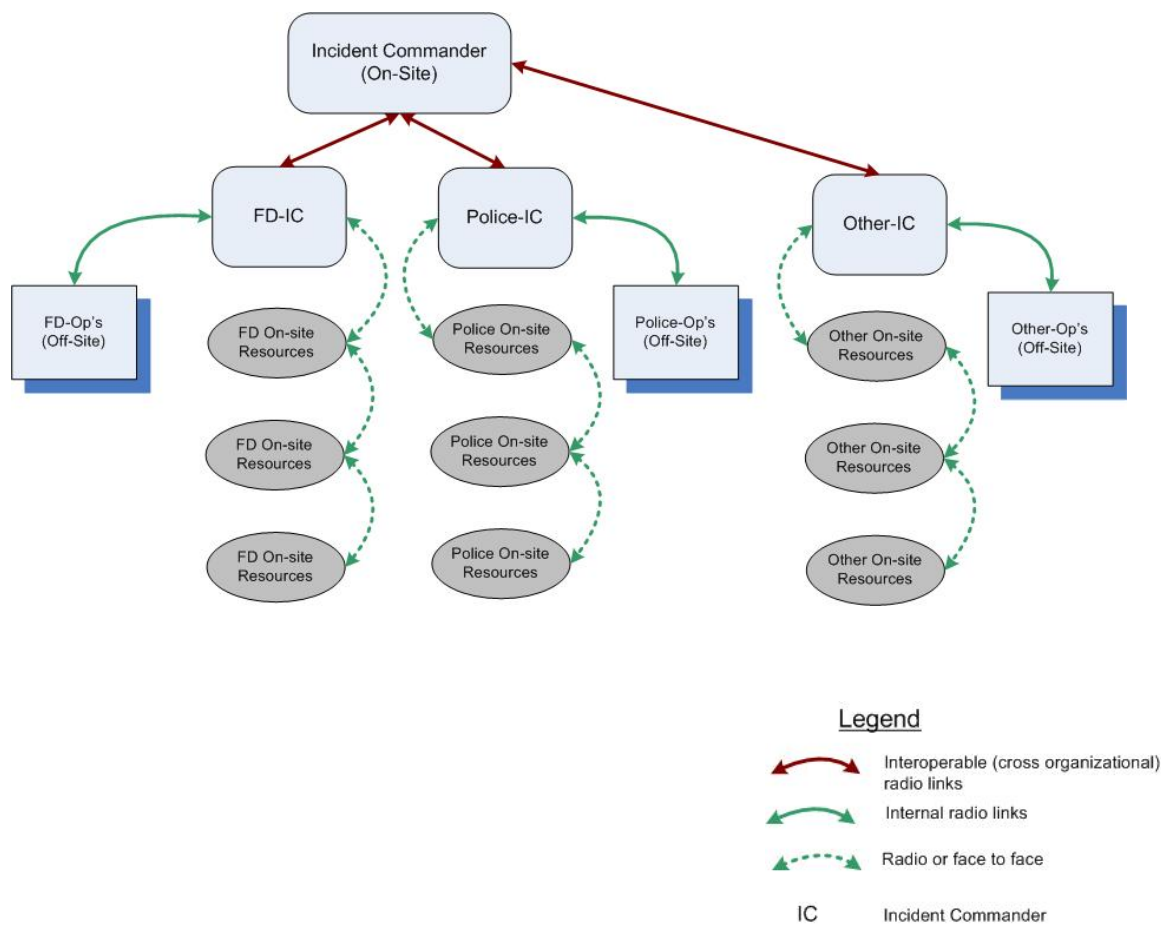
1. How does your IC hail/request first responders from other agencies to the incident site?
2. How does your IC and first responders from other agencies communicate on the incident site?

When another agency is the IC:

1. How does the IC (from another agency) hail/request first responders from your agency to the incident site?
2. How do your first responders and the IC communicate on the incident site?

Figure 1.1 is a graphical representation of the lines of communication at an incident.

Figure 1.1, On-site Communications



1.4. Analysis Framework and Scope

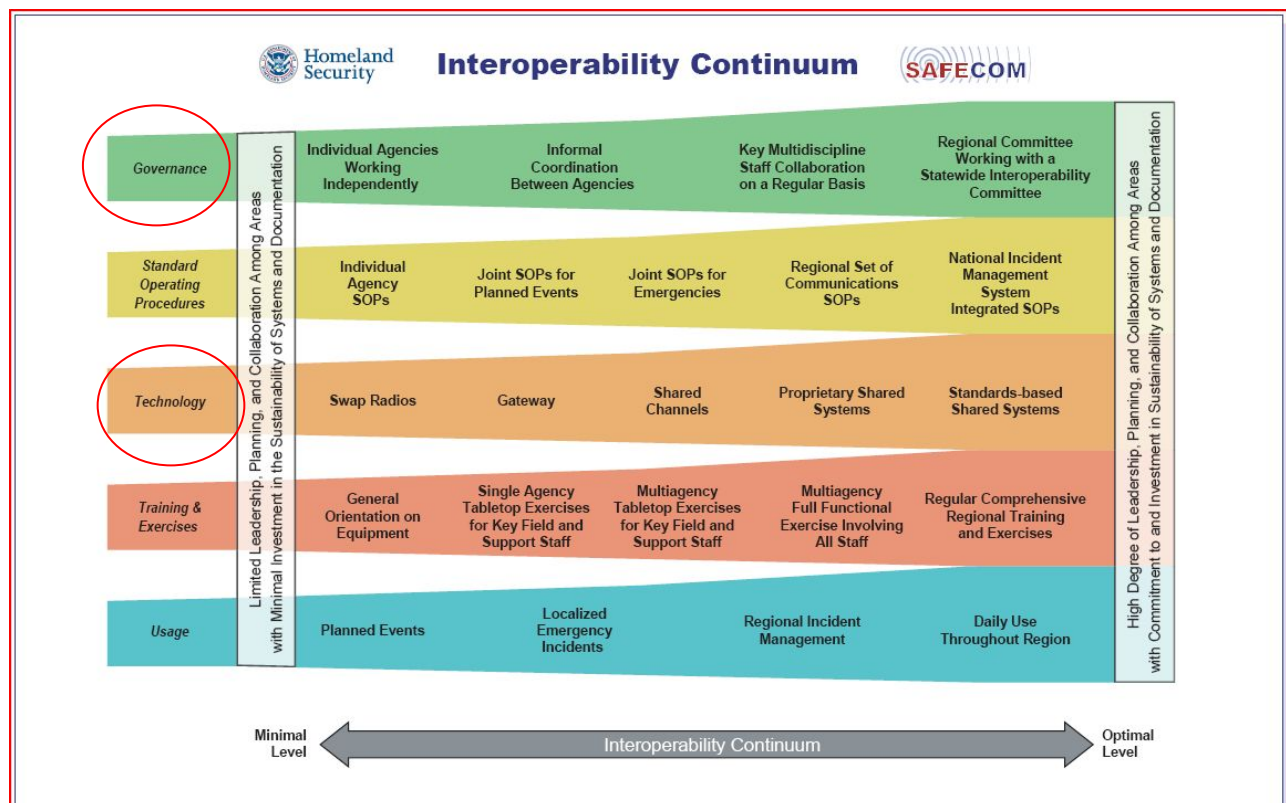
SAFECOM is a communications program of the Department of US Homeland Security. SAFECOM provides research, development, testing and evaluation, guidance, tools, and templates on interoperable communications-related issues to local, tribal, state, and Federal emergency response agencies.

SAFECOM’s Interoperability Continuum, as shown in Figure 1.2, has been widely adopted throughout North America and therefore was selected as the key framework for the assessment of the existing radio and interoperability capabilities of the Northern Avalon. The Continuum contains five elements: Governance, Standard Operating Procedures, Technology, Training & Exercises and Usage. “(See www.safecom.com)

The continuum notes 5 key interoperability elements down the left side of the diagram. In each row to the right of each element, there are descriptions of increasing interoperability as one proceeds to the right. The diagram is meant to allow first responder agencies to determine where they currently are within this framework. It also allows them to look ahead to where they feel they should be and to assist with planning a strategy to achieve appropriate interoperability in all areas.

The scope of the Study was commissioned to focus on two of the five elements, Governance and Technology as is circled in the diagram.

Figure 1.2, Safecom’s Interoperability Continuum



2. Methodology

The methodology employed in the Study was designed to enhance consistent, high quality data collection, and includes the following steps:

1. Design a specific survey form for fire departments
2. Design a specific survey form for other agencies
3. Collect information from fire departments and other agencies
4. Perform a detailed review of the collected information
5. Design and write the final report
6. Conduct a validation tabletop exercise
7. Report presentations and review

Completion rate of the survey was excellent with all 35 fire departments responding to the survey and 13 of the 14 agencies responding.

The RCMP was not able to respond within the time scale of the study period. References and understandings of their systems noted in this report were gained from general information collected from other responders.

3. Study Findings

3.1. Operational Overview

3.1.1. Hailing Resources to an Incident

- One of the prime requirements of an interoperability system and radio systems is to provide the incident commander (IC) with the ability to hail resources from other agencies to the incident. Generally Fire and Police department are the “on-scene” incident commanders. Support Agencies such as ambulance operators and NGO’s (Non-Government Organizations) typically do not carry out the role of Incident Commander.
- An incident commander hails (requests) additional resources to the incident scene through a defined set of procedures:

3.1.2. FD’s as Incident Commander

- The incident commander radios to the fire hall, where a temporary dispatch centre has been set-up for the duration of the incident. The dispatcher generally arranges any other resources at the request of the Incident Commander via a telephone landline;
- or
- The incident commander, utilizing a cellular phone, calls the dispatch centre or the specific “other” first responder resource needed at the incident. If cellular coverage is not available, the Incident Commander or a delegate will drive to the nearest point of cellular coverage (typically a hill top) and place the call;
- or

(Cont.)

- In the case of very limited communications availability on scene, the IC may rely on another first responder's communication system (EG. police) for communications. The incident may also dictate that personnel may have to drive to a neighbouring community to access additional resources.

3.1.3. Other First Responder Agencies as Incident Commander

- Police or SJRFD will call their Operations Centres via radio. The Operations Centers will then coordinate other resources as required via the appropriate dispatch centre.
- SJRFD calls Eastern Health for ambulance dispatch via phone.
- Outside St. John's, the IC must call regional hospitals or the ambulance service directly via cell or land line.

3.2. Communications Technology Assessment

3.2.1. Group 1 - Fire Departments (35)

- There are 35 fire departments in the Study (Refer to the table in Appendix 1). These organizations are volunteer organizations or are a blend of volunteers and paid staff. They respond with "best effort" response, depending on the availability of fire fighters and their location relative to the community when the incident occurs.
- 31 of the 35 FD's have some form of radio systems
- 12 fire departments (34%) have some extended radio coverage provided by a repeater(s), which is owned and operated by the fire department.
- 19 fire departments (54%) have VHF radios for on-scene communications.
- 4 fire departments (12%) operate on other radio equipment such as family radio service (FRS) equipment (this is non-licensed and open to public use)
- For those with radio equipment (the 88%), all systems are VHF FM systems and appear to be technically compatible.

Cell Phones and Pagers

- 94% of the 841 first responders carry a pager. Four FD's do not use a pager system. These pagers are owned by the Fire Department, and provide an effective low cost means to hail appropriate personnel to the incident. Most fire fighters also carry a personal cell phone.

3.2.2. Group 2 - First Responder Agencies

- This group consists of six organizations: CCG, Eastern Health, RCMP, RNC, MPP and SJRFD. Refer to the table in Appendix 2. All organizations in Group 2 have 24 hour Operations Centres that maintain radio contact with their first responders and can dispatch resources at any time (Note: MPP have a daytime dispatch center and all after hours calls are routed directly to a police vehicle cellular phone),. Many have stated standards for level of service. They are professionally managed, staffed and resourced.

-
- This group has trained users and extensive investment in radio communications, which consists of a network of repeaters providing coverage throughout their operational areas. Non-police systems were universally VHF FM systems that appear to be technically compatible. The RNC and RCMP have trunked radio systems that have technical compatibility issues with non-trunked VHF systems.
 - CCG's radio system provides service to primarily marine areas, but there is land coverage. CCG typically use only marine frequencies.

3.2.3. Group 3 - Support Agencies

- This group consists of four organizations: Hydro, NR, DTW, MUN, and DND. Refer to the table Appendix 2. Some organizations in Group 3 have 24 hour Operations Centres, but some operate dispatch centres during their operational hours only. They are professionally managed, staffed and resourced.
- This group has extensive investment in radio communications, which consists of repeaters providing coverage throughout their operational areas, and user training.
- NF Hydro and the Department of Transportation and Works (DTW) lease a VHF Trunked radio system from a service provider (Aliant Fleet Net).
- DND have a system designed to be deployed for the duration of a specific incident; however, it is extremely low band VHF (30 –70 MHz) and is therefore technically incompatible with any other organization in the Study. MUN uses a UHF FM system. NR utilizes a VHF FM system which appears to be compatible with other VHF FM systems.

3.2.4. Group 4 - Non Government Organisations

- This group consists of four organizations: TSA, CRC, SJA, GSAR. Refer to the table in Appendix Two. Organizations in Group 4 may not have operations centres. These groups rely extensively on volunteers. They typically provide support services for victims and other responders.
- Group 4 organizations have radios, but typically no network of repeaters.
- GSAR has a mobile communications unit, which houses a variety of communications equipment. This mobile unit is compatible with most other agencies and is frequently employed as the on – scene control centre.
- CRC and TSA also have mobile communication units that are equipped with Amateur HF, VHF and UHF radio, commercial VHF radio and a cellular phone/fax.

3.3. Governance Assessment

Understanding Governance

The principle of **Governance** makes decisions that define expectations, grant power, or verify performance. It consists either of a separate process or of a specific part of management or leadership processes. Sometimes people set up a committees or task groups to administer these processes and systems.

In the context of the Study, Governance includes the actions of the management to build relationships with other organizations. Governance discusses the relationships between organizations in terms of how relationships are formed, defining the mechanics of the relationships, and setting expected levels of performance of the relationship.

3.3.1. Fire Departments

This group includes all 35 fire departments with the exception of SJRFD. SJRFD is assessed in the next chapter, as it is a member of Group 2.

Table 3.1 identifies which fire departments and other organizations have some form of interoperability agreement with each other by assigning a letter to each group with some interoperability. All agreements appear to be informal, with no written document or procedures. (Note: CCG is not represented in Table 3.1 and it has no agreements with any FD.)

Table 3.1, FD Governance

Fire Department	Other FD's	Ambul	Police	SJRFD	Group 3	Group 4
Avondale	A					
Colliers	A					
Conception Harbour	A					
Holyrood	AH					
Bay Roberts	B	Y				
Spaniard's Bay	B					
Upper Island Cove	B	Y				
Victoria	B					
Carbonear	B D	Y				
Harbour Grace	B D	Y				
Cupids	B E					
Bay de Verde	C					
North Shore	C	Y				
Old Perlican	C	Y				
Salmon Cove-Perry's Cove	D					
Brigus	E	Y				
Heart's Delight-Islington	F	Y				
Whiteway	F					
Logy Bay-Middle Cove-Outer Cove	G			Y		
Pouch Cove	G		Y	Y		
Torbay	G		Y	Y		
Portugal Cove-St. Phillip's	G H			Y		
Conception Bay South (CBS)	H	Y	Y	Y		
Cavendish						
Green's Harbour-Hopeall						
Hant's Harbour						
Harbour Main						
Heart's Content						
Heart's Desire						
New Perlican						
Seaside (South Dildo)						
Wabana						
Whitbourne		Y				
Winterton		Y				
Witless Bay				Y		

For example, there are four FD's in Group A: Avondale, Colliers, Conception Harbour and Holyrood. These four FD's have shared radio frequencies. Note that Holyrood is also a member of Group H. Therefore Holyrood can talk with the members of Group H as well.

From the Table in Appendix One and Table 3.1, it can be determined that;

- 4 of 35 FD's do not have a radio system and hence cannot have any interoperability with other FD's or other organizations.
- There are 8 groups of FD's with shared frequencies. Group sizes range from 2 to 8 member agencies. (i.e. there is very limited global interoperability within the FD group)
- 23 of 31 (74%) have an informal agreement to share a specific (not common to all 23) frequency with specific neighbouring FD's. This represents 66% of the entire group of 35 FD's. A key note, however, is this enables only very localized groups (8) of FD's in limited geographical areas to communicate.
- Two of the FD's (6 %) have an informal agreement with the RNC.
- Six FD's have an informal radio interoperability agreement with SJRFD.
- 11 FD's (31 %) have an agreement with an ambulance operator.

Budgetary Comments

- The total annual communications budget of all FD's is \$50,300 (Does not Include SJRFD).
- Of the 35 FD's, 24 FD's reported no dedicated budget for radio communications.
- CBS FD has a significant budget for radio communications of \$17,000 annually.
- Aside from CBS and those with no budget, the average budget is \$3,300 (9 FD's).
- Clearly, smaller communities have difficulty funding radio communications. It was noted that in several cases, local fundraisers are held to secure communications money.

On-scene Communications

- On-scene communications between the incident commander and first responders of other organizations and other support persons is handled by sharing of frequencies when possible, as shown in Table 3.1. In the case of incidents that involve a limited area, the data suggests that face-to-face communications is often the method of information exchange.
- When large geographical areas are involved and in outlying rural areas, the inability to share common frequencies can become very problematic.

3.3.2. First Responder and Support Agencies

Figure 3.1 represents the existing interoperability between first responder and support agencies.

Figure 3.1, Agency Interoperability

SJRFD - (VHF)	SJRFD																			
Eastern Hlth - (VHF/UHF)	Interop	E Hlth																		
RNC - (Trk. VHF)	Uni-Dir	Incomp	RNC																	
RCMP - (Trk. VHF)	Incomp	Incomp	Trk-V	RCMP																
GSAR - (Various)	Interop	interop	interop	interop	G-SAR															
SJ Ambul - (UHF)	No agr	No agr	Incomp	Incomp	Interop	SJ Amb														
CDN Red Cross - (VHF)	No agr	No agr	Incomp	Incomp	Interop	No agr	Red Cross													
Salv-Army - (VHF)	No agr	No agr	Incomp	Incomp	Interop	No agr	No agr	S-Army												
CCG - (Marine VHF/Internal)	Interop	No agr	Interop	Incomp	No agr	No agr	No agr	No agr	CCG											
DND - (Low VHF)	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	DND										
NR - (VHF/ HF AM)	Uni-Dir	No agr	Uni-Dir	Incomp	Interop	No Agr	No Agr	No Agr	No Agr	Incomp	NR									
Hydro - (Trk. VHF)	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Hydro								
DTW - (Trk. VHF)	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Trk-V	DTW							
MUN - (UHF)	Incomp	Incomp	Incomp	Incomp	No Agr	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	MUN						
MPP - (UHF)	Incomp	Incomp	Interop	Incomp	No Agr	No Agr	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	Incomp	No Agr	MPP				

Figure 3.1 shows that the level of interoperability between first responder and support agencies is low.

Comments:

- A significant lack of interoperability is caused by incompatible radio systems between agencies as represented by orange blocks. However, there are some areas where it would be relatively easy to encourage interoperability.
- There are compatibility problems between VHF and UHF systems and also between non-trunked and trunked radio systems.
- Although the RNC use a trunked system, they do have some non-trunked frequencies.
- RNC mobiles are programmed with frequencies from the following organizations: NR, CCG, Pouch Cove, Torbay, CBS and SJRFD. Some units have a radio frequency for St. John's airport.
- NF Hydro and DTW share a trunked analogue radio system with a smart controller at the front end. This system requires special Motorola radios for normal system access. However being that the repeaters are reported as analogue, access to the repeaters may be possible via non-trunked duplex VHF FM radios.
- SJRFD has informal agreements with 6 FD's, NR, CCG, and RNC.

Legend	
Incomp	Incompatible Radio System, no communication possible
Trk-V	VHF Trunked radio system, only compatible with others system users Eg; FleetNet
Uni-Dir	Uni-directional communication (means one agency can be or is specially set up to talk to other agencies Freq.)
No Agr	Technically Compatible (Eg: same radio band such as VHF 150 Mhz), but no agreement
Interop	Bi-direction, informal agreement, compatible equipment and shared freq

-
- Many of the technical issues can be resolved through the utilization of existing standard radio technology.
 - There is also some indication that even where there is technical compatibility, there is considerable room for greater governance.
 - MPP have been given one RNC VHF portable on a permanent loan basis to enable interoperability between these agencies.

Hailing Resources;

- For Group 2 organizations (RNC, RCMP, SJRFD, Eastern Health, CCG), there is sufficient interoperability to hail resources to an incident via their specific operations centres. The remaining organizations typically do not act as incident commanders and, therefore, do not have a requirement to hail resources.

On-scene Communications

- On-scene RF communications between the incident commander and first responders/support agencies is very limited, as is indicated by the large amount of Red & Orange on Figure 4.1. Much of the communications is through face-to-face exchanges. There are however, some shared frequencies amongst agencies during certain incidents.
- GSAR has the ability to provide significant interoperability such as VHF, UHF, Marine, trunked Passport and Air communications through their mobile communications unit.

4. Best Practices, Observations, Conclusions and Recommendations

4.1. Best Practices

In general, first responders are very dedicated and passionate about improving their capabilities. They have identified interoperability as a problem and have developed a selection of best practices to mitigate it. Some of the common interoperability practices include:

- Sharing of frequencies;
- Distributing of radios during an incident is a popular method of providing interoperability at multi-response incidents;
- Permanent lending of radio equipment to the operational centre of other agencies for communication channel of last resort; and
- Using a mobile communications unit with multiple communications capabilities and staffed with a trained radio operator.

4.2. Observations

There is a general sense amongst first responders that the current level of interoperability is too low and should be increased. This section documents some general observations about the existing radio systems and interoperability.

Concerning radio systems:

a) Trunked Radio

- Several organizations suggest that trunked radio systems have reduced the degree of interoperability between first responders;
- Trunked radios are designed to improve the utilization of spectrum and to enable several organizations to share a set of frequencies; they often provide more features. However, trunk radios inhibit interoperability, by preventing non-trunk radios for interacting with the system;
- Some radios in a trunked radio system can operate in non-trunked mode allowing communications with agencies that are not normally part of the trunk system. However, this practice disconnects that first responder from their network and dispatcher and organization;

b) Shared Frequencies

- Creating common working frequencies across agencies at an incident may not be operationally effective, particularly at larger incidents. As an example, FD's need to operate on their own working/tactical frequencies to affect the operations of their own resources and therefore only their command person should be able to monitor a common inter-agency frequency.
- As noted in best practice #1, agencies share frequencies. However, there is no common accepted frequency set aside for first responders to use when interoperability is needed.

- When organizations switch to a frequency belonging to another organization (i.e. a shared frequency), they are no longer in contact with their Operations Centre or Dispatcher;

For security reasons, police agencies do not share frequencies. Hence, interoperability must be implemented on non-police frequencies;

c) Coverage

There appears to be sufficient radio geographical coverage throughout the Northern Avalon Peninsula currently owned by publicly funded organizations, such as Government N&L, Natural Resources, Canadian Coast Guard and the Canadian Broadcasting Corporation that could be utilized to greatly increase interoperability;

d) Other

Most FD's have one simplex channel which serves both as a calling channel and an on-scene working channel;

There is a high degree of compliance with Industry Canada's licensing regulations; and

While it not within the scope of the study, training and skills enhancement for radio communications needs to be addressed. Generally, participants felt that there was inconsistent and insufficient training. Further study on this issue is needed.

Concerning cellular telephones and pagers:

- a) Most volunteer fire fighters carry a personal cell phone;
- b) Poor cellular coverage is a limitation when attempting to hail new resources in some low population density areas. A noted area is the Bay De Verde Peninsula;
- c) With the exception of the SJRFD, no one appears to be using satellite telephones; and
- d) 94% of FD volunteers carry a pager.

4.3. Conclusions

Based on the information collected and analyzed during the Study, and comparison with SAFECOM's Interoperability Continuum (Figure 1.2), it is concluded that:

- the current level of **governance** in the Study Area is at the **low** end of the continuum with a blend of "individual agencies working independently" and "informal coordination between agencies".
 - 74% of FD's have informal agreements with neighbouring FD's and share frequencies;
 - SJRFD has informal agreements with 6 FD's, NR, and CCG;
 - RNC has informal agreements with 3 FD's, NR, CCG, SJRFD, and St. John's Airport;
 - There does not appear to be regular collaboration between key multi-disciplinary staff;
 - There does not appear to be a regional committee working towards province-wide interoperability;

(Conclusions Cont.)

- There is a budgetary disparity between large and small municipalities that impacts the availability of radio equipment; Expenses, such as radio licensing fees, may inhibit interoperability in smaller communities or agencies with limited to no budgets;
- the current level of **technology** in the Study Area is at the **low** end of the continuum with a blend of “swapping radios” and some sharing of existing frequencies.
 - There are three types of radio systems in use: VHF FM, UHF FM equipment and trunked radio systems. There are technical incompatibilities between these systems.
 - 88% of FD's have technically compatible radio systems.
 - For the 31 FD's with VHF systems, there are 14 simplex frequencies and 10 duplex frequency sets. Provincially, FD's could have a large number of frequencies. This creates problems for organizations like the RNC which have to interact with a large number of FD's.
 - There does not appear to be a shared channels, proprietary shared systems or standards based shared systems;

4.4. Recommendations

1. **Create a Provincial Interoperability Committee**

A provincial committee to champion and promote interoperability should be established. The committee should have high level representation from all the first responder and support agencies included in the Study.

The committee will build support within the leadership and management of the first responder and support agencies to ensure that interoperability is a priority and the committee should;

- identify funding sources and seek funding for implementation of the strategic plan;
- establish a working group is to develop and implement a strategic plan, as described in the following recommendation;
- Ensure a consultative process is employed and all stakeholders are advised and have the opportunity to participate;
- Oversee the working group to ensure that the goals of the strategic plan are being met, funds are disbursed appropriately and the proposed schedule is maintained;
- Respond to issues escalated by the working group that negatively impact on interoperability or the implementation of the strategic plan.

2. Develop and implement a Strategic Plan for the Interoperability Initiative

A working group should be established to develop and implement a strategic plan to enhance interoperability throughout the Province. The leadership of the working group should be assigned to one organization, which may require additional resources to implement this function. Refer to recommendation #3.

The strategic plan should;

- Be based on SAFECOM'S Interoperability Continuum and research on interoperability efforts in other parts of Canada. Refer to recommendation #4.
- Establish criteria for the selection of components of the plan. Refer to recommendation #6.
- Establish and prioritize the interoperability requirements. Tools such as benefit-cost analysis may be employed. Also see recommendation #8.
- Develop a phased plan which implements the highest priority or best value requirements in the early phases. Each phase of the plan will include a budget, resources, schedule and assignment of responsibilities.

Communications between stakeholders is critical to advancing effective interoperability. Consultation throughout the process will be critical to building and maintaining the support of stakeholders.

3. Identify, assign and fund “off-line” resources to move this process forward.

Existing resources are taxed to complete existing duties. Assigning a new duty to an existing resource will increase the time to implement and challenge the success of the Interoperability Initiative. Additionally, specialized skills may be required.

4. Research other jurisdictions for lessons learned and best practices

Other Canadian and American jurisdictions have improved their interoperability. There is a considerable amount of information available to streamline the process in the Province. Information includes best practices and templates.

5. Ensure that all Radio systems are working smoothly

Ensure existing radio systems work smoothly. An evaluation of the technology and standard operating procedures may be in order before attempting interoperable communications.

6. Prioritize the Focus

The interoperability requirements of key first responders should be addressed first. There are numerous stakeholders in the response sphere; however, the first responders face the greatest risk and can provide the greatest assistance. Also, some of the first responders respond to a small percentage of incidents. Consider focussing

on those who respond frequently and those that typically have the most critical resources at an incident.

7. Address Regional Funding Disparities

Some smaller communities and NGO's have severe resource problems for their emergency response requirements; this can lead to a disparity between large communities/agencies and smaller communities/agencies. Mechanisms should be considered to centralize the funding of some interoperability components, in order to minimise the disparity. An example may be centralized payment of Industry Canada licensing fees for emergency response radios and/or elimination of fees entirely for specific first responders.

8. Set realistic goals that use commonly deployed hardware. Seek out the small changes with the biggest benefit first

There are some simple steps that could provide significant improvement in interoperability. An example would be establishing a common frequency or frequencies to be used during multi-response incidents that would be used Province-wide. Seek to implement best practices, where possible and practical.

9. Investigate the Provision of Expanded VHF Radio Coverage to Outlying Areas

Some areas of the Province, such as the Bay De Verde Peninsula, have poor cellular coverage, which may significantly limit hailing of resources to incidents in these areas. It may be possible to provide coverage from existing publicly owned radio sites for a nominal cost. It is recommended that the cost of providing VHF FM radio coverage in some areas should be examined.

Appendix One, Fire Departments Summary Sheet

Fire Department	Life Cycle Management.			VFD Resources		Pagers and Cell Phones		Total Quantity of Radios					Radios Manuf & Model			Radio Freq's (MHz)	Licence Number
	Install	Maint	Train	Volunt.	Annual Budget	Pagers (own)	Cell Ph (Depart)	Hhelds	Mobil	Base Stations	Repr	Others	Hhelds	Mobil	Base Stns		
Avondale	DnEast	DnEast	Local	26	\$0	26		4	3		0	0	IC-F14	IC-F21	M- Radius	151.535	3690093
Bay de Verde	DnEast	DnEast	local	18	\$0	18	1	7	3	1	0	0	M-HT600	M-Maxtrac	M-Radius	151.925	3514655
Bay Roberts	Hitech	Hitech	Local	35	\$5,000	35	1	10	4	1	0	0	Y- VX170	Y-FT2800	I-F121F	151.205	3524157
Brigus	DnEast	DnEast	Local	20	\$0	20	0	7	4	1	0	0	Mot SP50	Mot GM300	M333GM	151.415	2743977
Carbonear	Hitech	Hitech	Local	40	\$2,500	40	2	20	4	1	1	0	K-TK2101	Kenwood	GE	69T050 – 163T96	2324965
Cavendish	NA	NA	Local	29	\$0	0	0	0	0	0	0	8	FRS	NA	NA		
Colliers	Hitech	Hitech	Local	25	\$0	25	1	6	3	1	1	0	K-TK260	K-TK78	IC-F12	151.535	3741197
Conception Bay South (CBS)	DnEast	DnEast	Local	40	\$17,000	40	3	17	12	7	1	0	IC-F352	IC-F121	K-TK760	68T750 – 168R21	2192626
Conception Harbour	Nil	Nil	Local	24	\$0	24	1	0	3	1	0	3	FRS	Midland 70-340B		151.535	3704991
Cupids	DnEast	DnEast	Local	20	\$3,000	20	1	6	3	1	1	0	K-TK2170	K-TK762HG	Motorola	58T910 – 163R78	3091983
Green's Harbour-Hopeall	DnEast	DnEast	Local	15	\$0	0	0	3	2	0	0	0	K-TK2102	M-GM300	NA	Town 151.970	3917073
Hant's Harbour	NA	NA	Local	12	\$0	18	1		0	0	0	4	FRS	NA	NA	Pager 154.920	4840616
Harbour Grace	DnEast	DnEast	Local	40	\$8,000	48	3	14	5	1	1	0	M-HT-1000	K-TK762HG	Mid 70336	64T850 – 169R53	2385739
Harbour Main	DnEast	DnEast	Local	10	\$0	15	1	4	3	1	0	0	M- CP200	M-M1225	M-M1225	151.85	3730001
Heart's Content	NA	NA	Local	19	\$0	20	0		2		0	6	FRS	CB Radio	NA	Pager 150.335	4805917
Heart's Delight-Islington	DnEast	DnEast	local	30	\$0	30	1	4	3	1	0	0	K-TK250	M-CP200	M-M1225	151.205	3722548
Heart's Desire	NA	NA	Local	13	\$0	0	0				0	5	FRS	NA	NA		
Holyrood	Hitech	Hitech	Local	22	\$2,800	26	0	18	4	1	0	0	IC-F11	IC-F121	IC-F121S	151.4	3507468
Logy Bay-Middle Cove-Outer Cove	Aliant	Aliant	Local	20	\$2,000	25	1	7	3	1	1	0	M-Visar	M-GM300	M-GM300	59T225 – 164R80	4808888
New Perlican	NA	NA	Local	15	\$0	15	0	2		1	0	0	Kenwood	NA	Kenwood	Town 169.110	3128790
North Shore	DnEast	DnEast	Local	20	\$0	24	1	5	3	1	0	0	M-SP50	Phoenix	M-M120	151.415	4702615
Old Perlican	DnEast	DnEast	Local	22	\$0	30	2	7	3	1	1	0	M-HT600	M-HT300	M-HT100	50T920 – 157R53	5011702
Portugal Cove-St. Phillip's	DnEast	DnEast	Local	27	\$3,000	30	2	10	4	2	1	0	K-TK2170	Mid-701340B	Mid-701340B	67T565 – 162R16	4694920
Pouch Cove	Hitech	Hitech	Local	26	\$0	25	0	8	2	1	1	0	IC- F11	ACD33L	IC-F320	151.505	2403404
Salmon Cove-Perry's Cove	DnEast	DnEast	Local	22	\$0		0	3	2		0	0	Marc- B713	Tait-200	NA	Town 151.295	3330629
Seaside (South Dildo)	Hitech	Hitech	Local	32	\$0	25	2	4	3	1	0	0	IC-F14	IC-F21	IC-F21	161.37	5026832
Spaniard's Bay	Aliant	Aliant	Local	25	\$2,000	25	1	12	3	1	0	0	Y-VX170	Y-FT2850	M-M1225	Pager 153.455	2140881
Torbay	Hitech	Hitech	Local	36	\$3,000	36	3	14	6	1	1	0	K- TK270	K-TK760	IC-F320	50T200 – 153R14	2135006
Upper Island Cove	Shop	Shop	Local	20	\$2,000	20	1	8	3	1	0	0	K- TK2102	Y-FT2800	GE-Phoenix	Town 151.355	4633253
Victoria	DnEast	DnEast	local	30	\$0	35	1	5	3	1	1	0	M-MP93YQ	M33DGC	M33DGC	50T425 – 155R01	4915648
Wabana	DnEast	DnEast	Local	20	\$0	25	0	2	4	1	1	0	K-TK2101	Mid 70-335	M- AAM50	151.145 - 152.135	2533609
Whitbourne	DnEast	DnEast	Local	23	\$0	23	0	8	4	1	0	0	K-TK2102	702301	IC-F121S	169.32	3997881
Whiteway				14	\$0		0	4		0	0	0	K-TK2102	NA	NA	Town 158.220	4924851
Winterton	DnEast	DnEast	Local	23	\$0	25	0	2	2	1	0	0	K-TK248	K-TK762	Mot	151.445	3903305
Witless Bay	DnEast	DnEast	Local	28	\$0	28	2	6		1	0	0	K-TK2170	NA	Uniden	150.905	3347867
Total				841	\$50,300	796	32	227	103	35	12	26					

Appendix Two, First Responder and Support Agency Summary Sheet

Agency	Life Cycle Management					Resources			Radio System			QTY of Radios ¹			Radios Manuf & Model ⁸			Freq's (MHZ)	Licence
	Design & plan	Install	Maint	Train	Serv. Provid	First Respd	on duty	Annual Budget	Type	QTY Rptr	Avg Age	Hhelds	Mobil	Base Stns	Hhelds	Mobil	Base Stns		
FD	Vendor (DnEast or Hitech)			Local	None	841	841	\$50,300	VHF FM	12	NA	227	103	35	See FD's Data Entry Sheet			See FD's Data Entry Sheet	
SJRFD	Director	DnEast	DnEast	SJRFD	None	160	40	\$48,400	VHF FM	2	<5 yrs	40	30	1	Motorola HT 1250	Kenwood TK760G	Motorola	See Appendix N	
RNC	RNC/RCMP	RNC	DnEast RNC	RNC	RCMP	NA	NA	NA	VHF Trunk Radio	11	~5 Yrs	150	75	6	P7100	M7100	M7100	See Note 5	
Eastern Health	Unknown	DnEast	DnEast	East Health	None	53	12		VHF FM ⁹	1	~5 Yrs	16	8	2	Kenwood TK-3140	Kenwood TK-790	Kenwood TK-7160	See Appendix D	980523
GSAR	Unknown	Nil	Vendor	G-SAR	None	160	160	\$1,400	VHF FM	3	~9 yrs	45	21	0	HT 1000	Kenwood		See App G	
CCG	CCG Internal System				None	30	30		VHF FM	28	< 15 yrs	0	30	0		ICOM M604		156.950	NA
DND	DND Internal				None	NA	NA	NA	VHF FM	0	> 15 yrs	10	7	0		Racal		32 to 75	NA
CDN Red Cross			Aliant		None		7	NA	VHF FM	1	NA	12	4	1	Icom F50	Kenwood	Kenwood 860	143.035-148.015	
SJA	Unknown	DnEast	DnEast		None	40	4	NA	UHF FM	0	NA	14	4	3	TK-3102A	Radius M1125	Midland	453.2125	4757428
TSA	Unknown	Nil	Hitech	TSA	None	92	92	\$200	VHF FM	0	> 20 yrs	3	2		Midland 70-441B	King Radio LPH5141		151.055	4999067
Hydro	Aliant	Aliant & Hydro	Aliant & Hydro	Hydro	Aliant	NA	NA	NA	Passport (2)		< 1 yr	133	282	78	Motorola HT 1250	Motorola CDM 1550 LS	Motorola CDM 1550 LS	See Note 4	
DTW	Aliant	Aliant & GNL	Aliant & GNL	DTW	Aliant	425	340	\$780,000	Passport (2)	52	< 1 yr	24	569	55	Motorola HT 1250	Motorola CDM 1550 LS	Motorola CDM 1550 LS	See Note 4	
NR		Hitech	Hitech		None	300		\$100,000	VHF FM	4		20	15	4	ICOM F50	ICOM F121		171.210 171.390	
MUN	DnEast					NA	NA	\$5,000	UHF FM	2	< 1 yr	60	3	2	Motorola	Motorola	Motorola	Refer to Appendix H	
MPP	Aliant	Aliant	Aliant	Aliant	Aliant	???	???	\$0	UHF FM	1		1	2	1	Motorola	Motorola	Motorola	407.100 / 410.250	491369 4913693 & 5011736
Total						2101	1526	\$985,300		117		755	1155	188					

Notes

1. The quantity of repeaters is for the entire system and is not restricted to the scope of the Study.
2. The Passport Radio Network is a VHF Trunk radio system. Passport is a product of Trident Micro Systems.
3. DTW & Hydro have leased Systems and do not have licence information, as it is held by the contractor. Frequencies on truck radio systems are of limited value.
4. The RNC and RCMP do not release their frequency information for security reasons.
5. RCMP is the life cycle manager of the RNC radio system
6. Manufacturer and model numbers represented may be a) exclusively as indicated or b) the common model(s).
7. Eastern Health Ambulances use VHF mobiles and UHF HHelds.
8. MPP budget is contained in the municipal budget.