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Preliminary Evaluation of Exercise SALISH SEA 2017: Full Scale Exercise

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IMPORTANT INFORMATIVE STATEMENTS

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Scientific Letter

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Background

The Commander of Maritime Forces Pacific (MARPAC)/Joint Task Force Pacific (JTFP) is also the Search and Rescue Region (SRR) Commander. It is his or her mission to prevent or minimize injury and loss of life through the expeditious and effective use of all available resources in the event of a major marine disaster (MAJMAR) in the Pacific Search and Rescue (SAR) area of responsibility [1]–[4]. Should a MAJMAR event involving a large capacity vessel such as a cruise ship or ferry occur, thousands of lives might be at stake. The federal, provincial, and local authorities' collective response to an event of this nature is critical to the successful response to such an incident. The purpose of Exercise SALISH SEA 2017 (EX SASE 17) was to provide an opportunity to exercise this scenario, identify areas to refine the procedures and to build public confidence in a unified response to a MAJMAR event [5],[6]. EX SASE 17 was designed as a progressive series of exercises based on the "crawl, walk, run" strategy: a Table Top Exercise (TTX), an Emergency Operations Centre Exercise (EOCX), and a Full Scale Exercise (FSX). MARPAC/JTFP Chief of Staff Plans and Operations (N3/J3) asked the MARPAC Operational Research Team (ORT) to lead the exercise evaluation for MARPAC/JTFP, as well as coordinate the evaluation between participating agencies. The client and exercise stakeholders requested preliminary results be delivered quickly and disseminated as widely as possible to assist all participating agencies with improvement planning.

The first exercise in the series, TTX SASE 17, took place on 16 May 2017 where the after-action analysis identified a number of issues, as well as recommendations to improve the MAJMAR contingency plans and the execution of other EX SASE 17 components [1]. EOCX SASE 17 was conducted on 19 September 2017 with a reduced scope compared to that of the TTX; it primarily tested communications and situational awareness between Emergency Operations Centres. The EOCX reiterated many of the observations from the TTX, and provided some additional recommendations for the FSX [2]. Finally, the FSX occurred on 25–26 October 2017; this letter documents the analysis and observations[1] from the FSX, but for the sake of completeness, it reiterates some of the relevant recommendations from the previous events. While there are significant lessons to be garnered from this exercise and an improvement action plan will be developed by each participating agency within their mandate, the exercise was felt to be a success and beneficial to all participants.

[1] Under Article 2.5 of the Tri-Council Policy Statement 2—Chapter 2, this project is exempt from review by the DRDC Human Research Ethics Board.

Annex A summarizes the FSX design, scenario, and data collection process for reference. The overall exercise evaluation methodology, measures, and indicators against the following inter-agency exercise objectives [6] are documented in the Exercise Evaluation Guide (EEG) [7]:

A. Validate compliance with existing major marine disaster plans and their interoperability[2];
B. Identify and validate casualty management processes;
C. Identify methods of sharing Situational Awareness (SA) and maintaining a Common Operating Picture (COP); and
D. Confirm the incorporation of lessons learned from previous "major marine disaster" exercises and events[3].

Each participating agency had their own set of organizational-level training objectives complementing these main objectives. For the CAF, these were:

- Activation of Battle Watch Operation Centre (BWOC)/ COP link between federal/provincial and local authorities' Emergency Operations Centres (EOC)[4];
- Validation of handover procedures (change of operational control (CHOP)) between CAF Operations Centres (Joint Rescue Coordination Centre (JRCC), Regional Joint Operations Centre (RJOC), BWOC); and
- Validation of JRCC and JTFP CONPLANs MAJMAR [3],[4] (essentially the same as exercise Objective A).

Additional information for other agencies can be found in the reference the Exercise Plan (ExPlan) [9]. The preliminary results are summarized following a brief description of the assessment methodology.

FSX Design and Assessment Methodology

The first day of the full-scale exercise included the evacuation of a Coastal Class ferry due to a simulated fire on board, the on-water rescue of 97 persons from a life raft, and transportation of personnel to shore for triage and treatment. In addition, the exercise included the simulated evacuation of the remaining passengers and crew for transport to reception centres on Salt Spring Island. The field activities during the exercise were coordinated through multiple EOCs operated by federal, provincial, and local agencies. The second day of the exercise focused on the environmental response (ER) and containment strategies in the area to protect specific environmentally sensitive areas, as well as salvage of the vessel. The employed scenario was consistent with the one used for the TTX [1] and the EOCX [2].

Each organization or agency had unique training objectives and critical tasks that influenced the development of its specific Exercise Evaluation Guide. Because of the high degree of required inter-agency coordination, a common EEG [7] capturing the high-level evaluation plan relative to the main exercise objectives, was proposed by the MARPAC ORT. Each evaluator was provided with the relevant EEG, associated Exercise Evaluation Forms, the Controller/Evaluator (C/E) Handbook [10], and an exercise communications log for the venue that they were assigned to evaluate.

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[2] The plans directly considered by the ORT included the Joint Rescue Coordination Centre (JRCC) MAJMAR plan [2], and the draft JTFP MAJMAR Contingency Plan [3].
[3] Note that this definition has been modified slightly from the original objective, as the employed scenario did not involve "mass casualties". Broadening it to include all forms of major marine disaster events ensures that a more relevant cross-section of lessons learned documents are cross-referenced.
[4] Via evaluation of the draft standard operating procedures [8].

The exercise was conducted in a no-fault learning environment wherein capabilities, plans, systems, and processes were evaluated, rather than a comparative assessment between organizations or an assessment of the participants personally. The high-level assessment focused primarily on the four overall exercise objectives, so the evaluation plan [7] was broken down into four sections, one for each of the overall exercise objectives identified in the main body of this letter. For the ease of data collection and overall exercise design, JTFP chose to integrate their organizational training objectives within the overall exercise objectives; this letter will speak to the results separately.

Results

Objective A

Figure 1 illustrates the recorded compliance with the JRCC and JTFP MAJMAR CONPLANs (Objective A). It is important to note here that the task compliance is dependent upon the recording of such tasks as complete; if the controllers/evaluators were unable to assess if the tasks were completed due to the lack of information presented by the players or their logs, then the tasks were recorded as incomplete.

The relative compliance for the JRCC CONPLAN taskings (within each exercise component's scope) increased from 46% for the TTX to 56% for the EOCX to 74% for the FSX, Interestingly; the TTX had the most tasks within scope for the exercise. It is not known if this is because of the eminently flexible and broad nature of table-top war-gaming, narrowing of appropriate tasks over time as planners developed expertise in the field, or a combination of the two. As the JTFP CONPLAN was not drafted at the time of the TTX, no initial comparison from the TTX to the EOCX can be made. Once the draft was available, the relative compliance for the EOCX was 54%, which then rose to 90% for the FSX. As this included an increase of tasks in scope, it indicates a significant increase in compliance. For the FSX, there was a 73% compliance with the draft BWOC SOP.

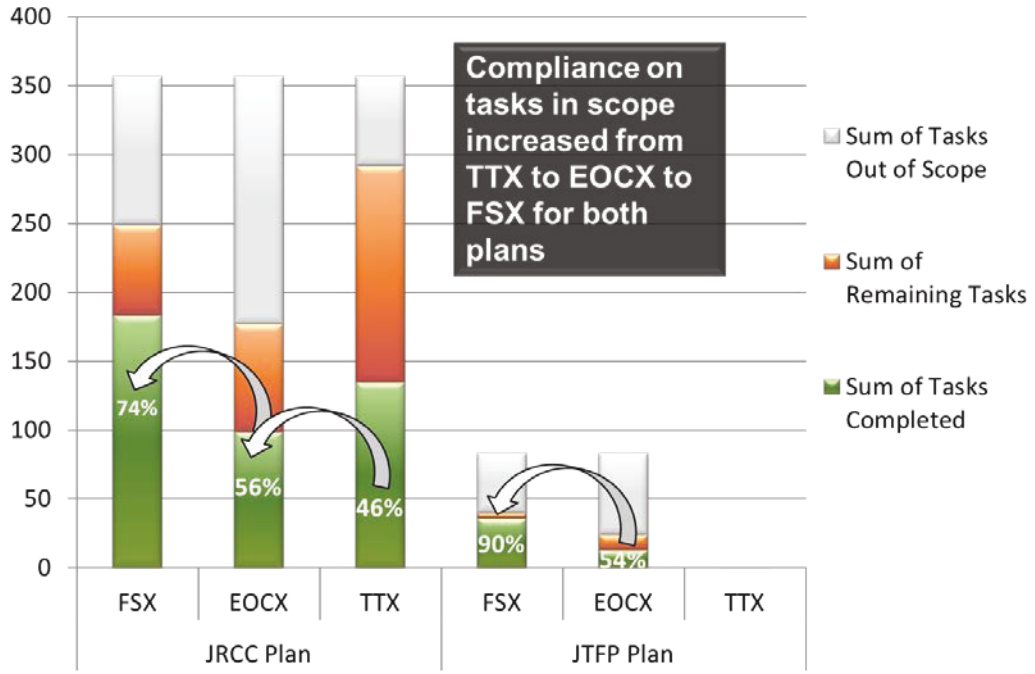


Figure 1: *Compliance with MAJMAR Plans (% of the tasks within the EOCX scope).*

The main gaps in compliance with the MAJMAR plans existed at a) the formal reporting and logging[5] of the location, type, readiness, and updated status over time of SAR response units that could be assigned to rescue operations, and b) the formal notification and logging of communications between federal and provincial/local/other organizations. It was often not clear what one organization was expecting another to do upon the delivery of certain pieces of information, inferring an implicit organizational difference in communications protocols and response. As a result, the exercise planning process is viewed as a valuable tool to highlight how information flows between various levels of government and types of organisations.

For JTFP, the organizational training objective to validate handover procedures between CAF Operations Centres logically fits within the evaluation of Objective A. It is a plan, process, or procedure that can be considered in terms of compliance with the various tasks listed, and to check if the plan, process, or procedure fulfills the intended purpose (to answer the question: is the plan, process, or procedure correct?). Given that command transfer from the SAR phase of the MAJMAR to the ER and consequence management phase of the response is covered under CAMSAR [11] in terms of message content, the handover procedure was completed with a phone call between the SRR Commander and the CCG Assistant Commissioner, Western Region. Such a CHOP then includes the internal handover between CAF EOCs – for this type of incident, as the activity shifts from a SAR to provincial requests for assistance. Participant feedback suggested that the plan was executed successfully and handover was achieved.

Objective B

Objective B had two distinct capability targets to achieve during the exercise: 1) assessing the accuracy of passenger/casualty tracking and reporting and 2) assessing the efficiency and effectiveness of the casualty triage system. For part (1), the no-fail tracking of the CAF volunteers was achieved using head counts and nominal roll calls at key points in the exercise. The remainder of the passenger/casualty tracking assessment required summary counts to be formally reported to a single authority in order to ensure that all simulated casualties were processed, tracked, and reported/recorded appropriately. Figure 2 and Figure 3 provide a visual indicator of the information reported over time to various EOCs, as strictly given in the electronic logs or email traffic[6] recorded during the exercise. Additional information was recorded by the evaluators that would significantly alter the information picture flow provided in Figures 2 and 3; however, the purpose here initially is to examine what was recorded by the players themselves.

In Figures 2 and 3, the indigo colored regions indicate where correct/cross-validated information passed between organizations. The red regions indicate incorrect or inconsistent data that may or may not be have been corrected at a later point in time or via other communications means/methods. The time at which the record of such information is passed is marked approximately at the midpoint of the bar representing the passage of information to the EOC. Of critical note here is the apparent disconnect between the federal partners and the provincial/local authorities. Information generally passes between federal partners (if with some time delay); however, there was often no recorded information flow in the logs to and from provincial and local partners. It is difficult to attribute the direct cause of this, as examples of communication failures, data logging failures or inconsistencies with actual events, or misunderstandings / miscommunications were all noted as present by the evaluators. However,

[5] For example, tasks may have been completed that were not logged in detail in the electronic logs of the associated EOC, and without a direct recording or patch into the lines of the player's communications channels, the local evaluator may have missed if such details were passed.
[6] As reported/carbon copied to the common exercise email address.

these logs do not include voice communications (such as chat, phone, radio or in-person), instant messaging, or other communications methods that did not output to an electronic log.

In terms of the accuracy of the passenger tracking and reporting, it can be seen from Figure 2 that uncertainty existed surrounding the crew count and whether or not it was included in the “persons on board” (POB) count – until first responders were able to confirm the information. In the logs made available for analysis, the lack of communications was noted from the provincial down to the local level. Time delays were noted as involved parties were further removed from the scene.

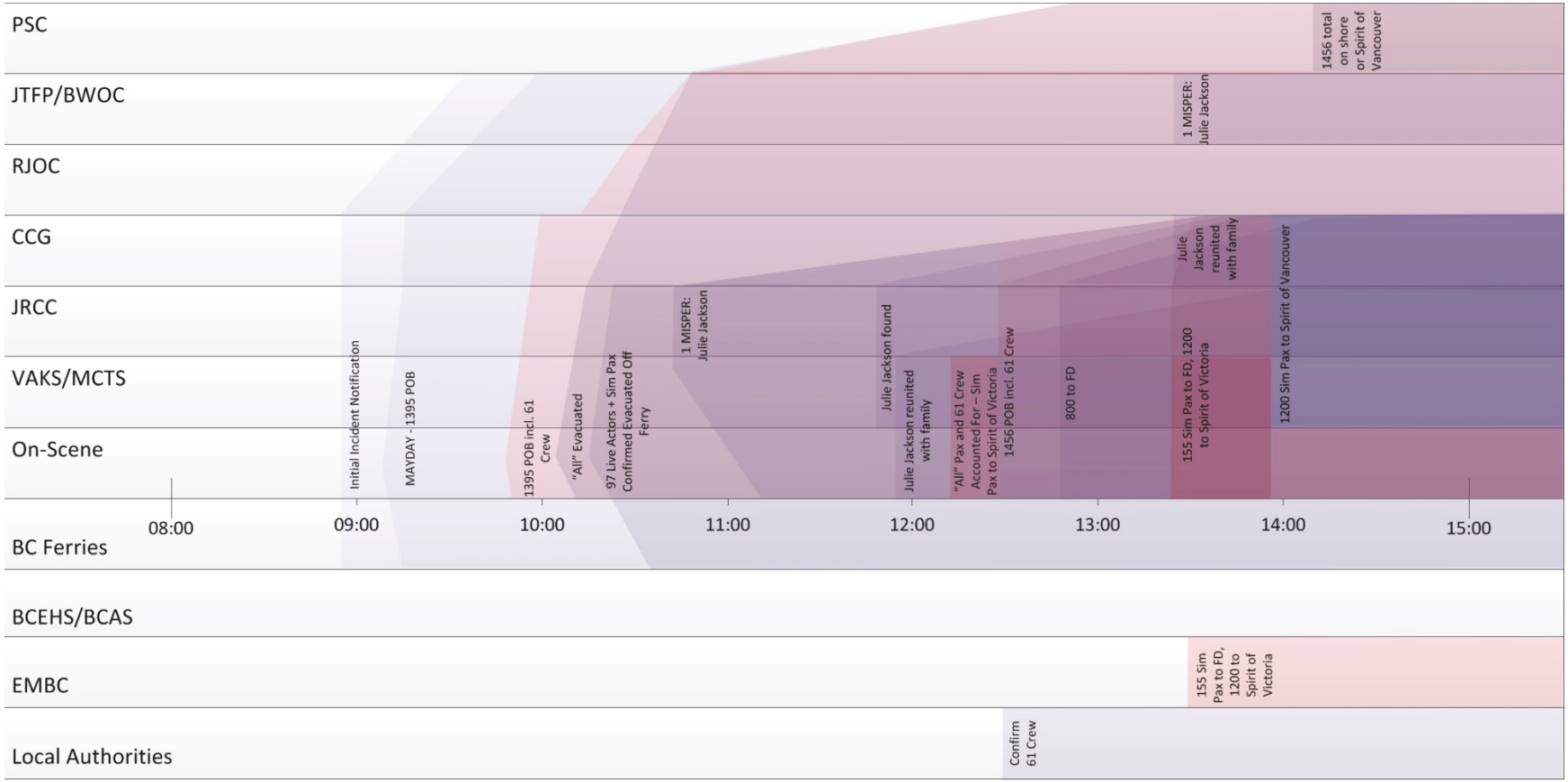
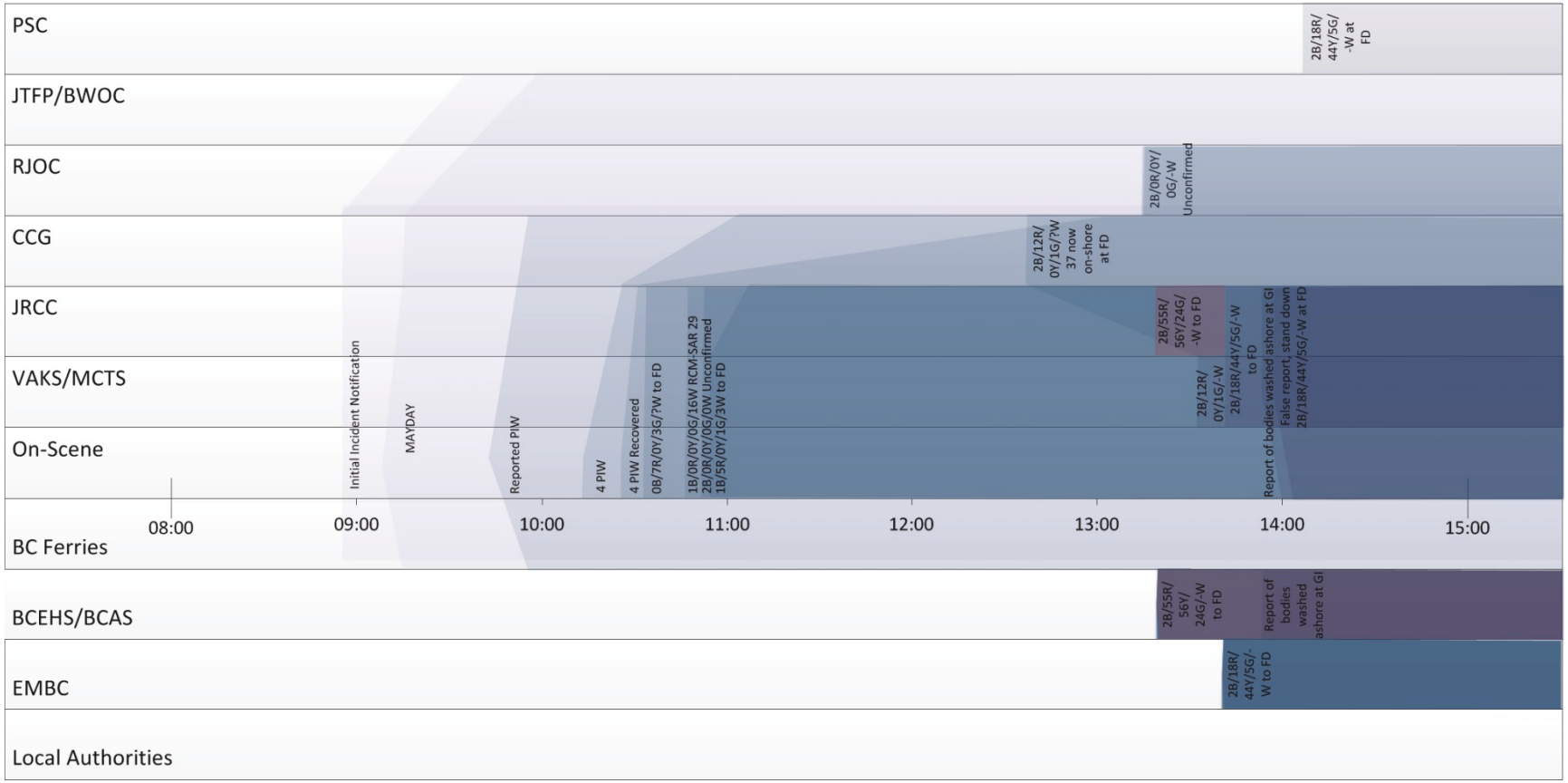


Figure 2: *Passenger tracking and reporting over time on Day One of the exercise.*



Correct/cross-validated information passed between organizations.
Incorrect or inconsistent data that may or may not be have been corrected at a later point in time or via other communications means/methods.

Figure 3: *Casualty tracking and reporting over time on Day One of the exercise.*

Figure 3 reports on the initial accuracy of the casualty tracking and reporting, noting that individual units were reporting information for a period of time before a consolidated roll-up was provided by the On-Scene Coordinator (OSC). While not expressly stated as an objective, when broken down by the category of patients,[7] inconsistencies appeared in the final numbers of each type of casualty (shown in red) – especially the total number of red (R) category patients. Initial estimates reported up to 55 R and 56 yellow (Y) category casualties, versus the final 18 R and 44 Y; a difference of over 50% of follow-on hospital care requirements. In the logs made available for analysis, the lack of communications was noted to both the broader federal government level as well as the local authorities; this likely indicates a reliance on alternative communications methods. Time delays were noted as involved parties were further removed from the scene.

Data were collected during the exercise in order to support the assessment of the efficiency and effectiveness of the casualty triage system. BCEHS took the lead on collecting the triage tags, patient disposition cards, timings and patient commentary / feedback to perform the assessment. However, due to time constraints, this analysis could not be completed in time for the publications of this letter.

Objective C

For this preliminary analysis, the assessment of the shared SA and COP was captured through the passage of major platform[8] position records (of note, only two appeared in more than one record set – the CCGS BARTLETT and the M/V COASTAL RENAISSANCE, assessed here). All source electronic logs that were made available (including the JRCC log, the Marine Communications Traffic Services Centre (MCTS) log, and email communications) were compared against the last known Automatic Identification System (AIS) report available for the platform from an unclassified Global Command and Control System-Maritime Command Interface+ (GCI+) data query from the RJOC (considered relative "ground truth"[9] for the purposes of this evaluation). The accuracy of the position and the time latency of the platform position reports were evaluated in order to develop Figures 4 and 5 (plotted by reporting source, with ship of report noted in brackets in legend). The purpose of these figures is to compare the quality / accuracy of the situational awareness as the information passes between organizations; the greater the differences, the longer the time between the inter-agency report and the last known AIS position (where ship velocity is also a factor).

From Figure 4, positional reports that were verbally passed regarding each reported ship's location were up to 2.6 nm off the last known AIS position. This distance could potentially have a large impact on rendezvous and actual operations in the dark, under inclement weather, or in complex geographic areas (islands, mountains, etc.). Also of note is the stability of the reports for the BARTLETT WHEELHOUSE. This becomes the ship of the SRR Commander, and also the OSC. The reports towards the last half of day appear to be accurate; incidentally–the last 5–6 reports all indicate that the BARTLETT does not move

[7] While not all casualty tracking systems employed in the exercise utilize identical color schemes to categorize patients, they all use a stoplight system to indicate severity of injury (with white (W) to indicate non-injured and black (B) to indicated deceased). The classification of injuries could also vary depending on the stage of the patient at the time of triage (which would vary over the course of an incident in real life), or a higher level of care could have a different opinion of how to categorize the patient. Source tracking was not utilized here.

[8] All platforms that played in the exercise are given in Annex A.3.

[9] It is understood that AIS data is not error-free and additional analysis has been completed to confirm the validity of the points against which the reports were corroborated.

(corroborated with CCG reports that the vessel was at anchor then) and the same ship position is reported multiple times. As it so happens, this position is the closest of all platform positions to the last reported AIS position.

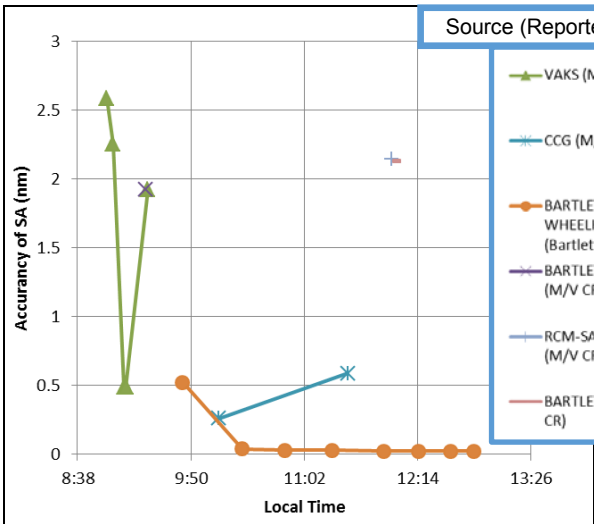


Figure 4: *Accuracy of SA (in nm) on Day One of the exercise.*

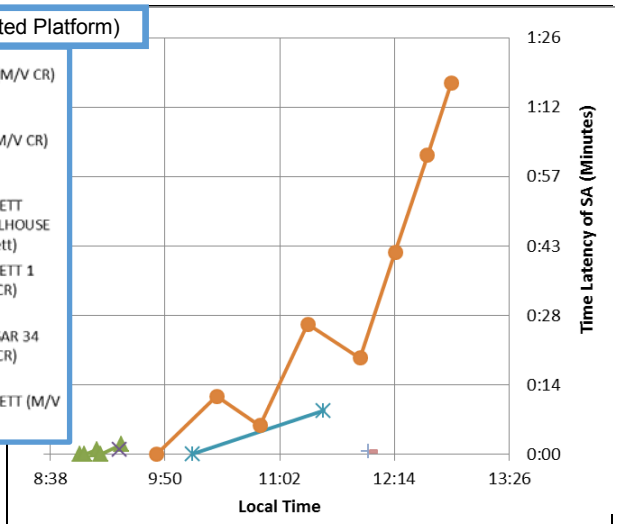


Figure 5: *Time latency (minutes) of SA on Day One of the exercise.*

The time latency of the position reports as compared to the original exercise start time in Figure 5 would seem to indicate that most reports are 10 minutes or less from the last reported AIS position. The only exception is the BARTLETT WHEELHOUSE, which has an increasing time latency report for the duration of the exercise. It would appear that the last AIS report occurs mid-morning for the BARTLETT and all subsequent reports are compared to this one. A ship at anchor will report in on AIS less frequently than one underway.

Objective D

Annex B documents a high-level summary and reference list of applicable lessons learned (LL) that were identified for potential incorporation into this exercise. Any LL from any previous "major maritime disaster" exercises and events that are within the scope and mandate of participating organizations to tackle for EX SASE 17 are listed there. A stoplight assessment is provided on the set of constituent LL in order to roll-up the results into a quick visual to be able to determine to overall state of progress. Overall, approximately half of the lessons learned have been incorporated into the large-scale disaster planning process.

Participant Feedback

Participants' feedback was collected in order to assess the utility of the exercise with respect to the overall understanding of own organization's and other organizations' responsibilities and communications requirements. Participants were nearly unanimous in their opinion that EX SASE 17 was successful and provided an excellent inter-and intra-agency training opportunity. The majority of the participants who responded agreed that because of the FSX, they had improved understanding in all almost areas of communications requirements, roles and responsibilities, handover procedures, and the various applicable emergency management plans utilized at the federal, provincial, and local levels. The only exception was for individual participant's understanding of the means, methods, or systems other participating organizations are responsible for communicating over throughout a MAJMAR.

An overwhelming majority of respondents indicated that they felt that the exercise improved preparedness for future responses. Many participants felt that the themes arising around communications/information dissemination, the MAJMAR CONPLANS, scenario realism, training, and technical issues were recurring issues from past exercises and events. This means that previously identified “lessons learned” have not yet been addressed, and are, in fact only “lessons noted”. Refer to Annex C for more comprehensive participant feedback.

Recommendations and Conclusion

The findings from the FSX below reinforce those from the TTX [1] and EOCX [2]. The recommendations from the lessons noted during the exercise can be grouped into three categories; the first category looks at the MAJMAR plans and procedures, the second category looks at how to improve the exercise series, and the third contains “lessons noted” for implementation.

MAJMAR Plans and Procedures:

- Consider revising the CONPLANs for JRCC and JTFP to reflect:
  - The holistic response required to address SAR, ER, and consequence management;
  - Best practices as identified during the series of exercises;
  - The legal framework and operational command of marine and air SAR assets as directed by CAMSAR [11]; and
  - The appropriate plan hierarchy as outlined in the CAF Operational Planning Process [12].

  This would simplify coordination across JTFP components, limit duplication of effort, and avoid potentially conflicting tasks assigned by the two CONPLANs to the JTFP chain of command. Components, such as JRCC, could then develop appropriate subordinate CONPLANs or supporting plans (SUPLANs) for their respective elements that would support the overarching JTFP CONPLAN.
- Consider revising all agencies’ CONPLANs to work in an integrated fashion to handle the progression of such an incident. This process needs to be collaborative and reflect appropriate legislative authorities. There may be many ways to achieve this (for example, under a single organization with the mandate to develop a single CONPLAN, multiple plans that fit together neatly like puzzle pieces from individual organizations with individual mandates, or overlapping plans that provide a seamless interface in a blend of the two), and not all may be immediately feasible under existing governance.
- Clearly map/define the Command and Control (C2) structure (tasking ability), reporting chains (communication lines/means) and required timelines over the duration of the MAJMAR event. Annex D contains a set of initial concepts for C2 and information flow (with communication lines/means) diagrams based on the structure observed during EX SASE 17. These can be utilized as a starting point for further discussion and development.
- Develop formalized communications plans and notification checklists, and include them as annexes to the CONPLAN.
- Develop and document an explicit data priority/trust scheme to ensure that inconsistencies in data from information transfers are handled in a rigorous manner.

Exercise Series Design:

- Explicitly integrate the involvement of Public Affairs (PA) early in the process to ensure that the potential impact that media (including social media) is not marginalized or ignored in the scenario development. Consider the bottom up and lateral flow of information and its impact on the event. The effect of running a parallel exercise for PA

alone severely diminished the synergistic effects of exercising together, as well as the consequences of potential PA-related injects (such as high-volume media and public calls, the sway of public opinion, managing response lines and information delivery in the face of social media).

- Establish a regular series of exercises (TTX or CPX with simulated tactical forces) and perform objective, qualitative, and quantitative evaluations to determine if action items from improvement plans are being followed up appropriately. All organizations would benefit from conducting regular training to address a variety of contingencies to ensure both the familiarity of the staff with the planning and execution, and at the same time reinforce knowledge of respective CONPLANs and facilitate their improvements and continued relevance. Formalizing the process in an accountability agreement would provide further stability and eliminate dependencies on personal relationships established.
- Increase the scenario complexity for specific cases. EX SASE 17 has established that a large-scale inter-agency maritime exercise can be held safely in benign weather, and achieve the majority of the exercise and organizational training objectives. This is far from the worst-case scenario that could potentially occur. Therefore it is incumbent upon the planners to look at variables such as weather, platform type, number and type of casualties (including demographics), incident location, availability and location of SAR response and evacuation units, infrastructure constraints, logistics chains, and the failure modes and effects that could potentially delay, deter, or eliminate the response to such a disaster. Exploring challenging scenarios using table-top wargaming would allow enable planners to work through options without compromising safety of participants.

Lessons Noted:

- Establish a simple, robust, platform-independent format(s) or system(s) for situational awareness, coordination of assets, and casualty tracking and reporting. This should include a vetted baseline data repository for major capabilities disposition, status, and availability in the SRR Commander's area of responsibility.
- Establish a means for sharing a true Common Operating Picture between primary agencies.

Prepared by: Cheryl Eisler, Dr. Peter Dobias (DRDC – Centre for Operational Research and Analysis) and Dr. Trisha Huber (DRDC – Atlantic Research Centre).

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Annex A: FSX SASE 2017 Design

A.1 Exercise Scope

FSX SASE 2017 was a full-scale exercise.[10] It included the evacuation of a Coastal Class ferry, the on-water rescue of 100 persons from a life raft, transportation to shore for triage and treatment. In addition, the exercise included a simulated evacuation of passengers for transport to reception centres on Salt Spring Island. Exercise play was limited to those organizations who would typically respond during a MAJMAR.

Day 1 of the exercise focused on the response protocols for a fire onboard a BC ferry, the evacuation of a high capacity vessel, Search and Rescue (SAR), and the treatment and transport of the passengers and crew evacuated from the ferry. Day 2 of the exercise focused on the coordination of a unified response to limited discharge from the ferry, protection of the environment, and initiation of salvage of the vessel.

The primary exercise training audience included the following agencies (in alphabetical order):

- BC Ferries;
- British Columbia Emergency Health Services (BCEHS);
- Canadian Armed Forces (CAF);
- Canadian Coast Guard (CCG) – lead agency;
- Emergency Management British Columbia (EMBC); and
- Public Safety Canada (PSC).

Other participating organizations included:

- Federal
  - Department of Fisheries and Oceans (DFO);
  - Environment and Climate Change Canada (ECCC);
  - Parks Canada;
  - Royal Canadian Mounted Police (RCMP) Marine; and
  - Transport Canada (TC).
- Provincial Ministries and Agencies
  - BC Ministry of Environment and Climate Change Strategy (BC MOECCS);
  - Health Emergency Management British Columbia (HEMBC);
  - Ministry of Forest, Lands, and Natural Resource Operations (FLNRO);
  - Government Communications and Public Engagement (GCPE);
  - Inter-Governmental Relations Secretariat (IGRS);
  - British Columbia Coroners Service (BCCS);
  - Ministry of Transportation and Infrastructure (MoTI); and
  - Emergency Social Services (ESS).

[10] Full scale exercises (FSX) are typically the most complex and resource-intensive type of exercise. They involve multiple agencies, organizations, and jurisdictions and validate many facets of preparedness. FSXs often include many players operating under cooperative systems such as the Incident Command System (ICS) or Unified Command. In an FSX, events are projected through an exercise scenario with event updates that drive activity at the operational level. An FSX is usually conducted in real-time, in a stressful environment that is intended to mirror a real incident. Personnel and resources may be mobilized and deployed to the scene, where actions are performed as if a real incident had occurred.[13]

- Local or Regional Agencies
  - Capital Regional District (CRD);
  - Salt Spring Island (SSI) Emergency Management;
  - Salt Spring Island Fire Department; and
  - First Nations.
- Non-Government Organizations
  - Royal Canadian Marine Search and Rescue (RCM-SAR).

A list of the key exercise players, core planning staff, and necessary contact information/communications channels is documented in the Exercise Plan [9] and Communications Plan [14].

A.2 Exercise Locations

This exercise included a combination of field activities and command posts/emergency operations centres. The primary exercise area was located in Trincomali Channel, as noted in Figure A-1, near the marked location (green anchor) of the disabled vessel; the casualty reception point (CRP) was located nearby on Salt Spring Island at Fernwood Dock (red cross). The following Command, Control, and Coordination Centres participated in EX SASE 17:

- Battle Watch Operations Centre (BWOC);
- BC Ferries Emergency Operations Centre (EOC);
- BCEHS Emergency Operations Centre Dispatch;
- CCG Marine Communications Traffic Services Centre (MCTS) – Victoria (VAKS);
- CCG Regional Operations Centre (ROC);
- EMBC Provincial Emergency Coordination Centre (PECC);
- EMBC Vancouver Island Provincial Emergency Operations Centre (VI PREOC);
- Environmental Response Incident Command Post (ICP) at IOS;
- Joint Rescue Coordination Centre (JRCC) Victoria;
- Regional Joint Operations Centre Pacific (RJOC(P));
- Salt Spring Island Emergency Operations Centre (EOC);
- Transport Canada Regional Situation Centre (SitCen); and
- Multi-Agency Incident Command Post at Institute of Ocean Sciences.

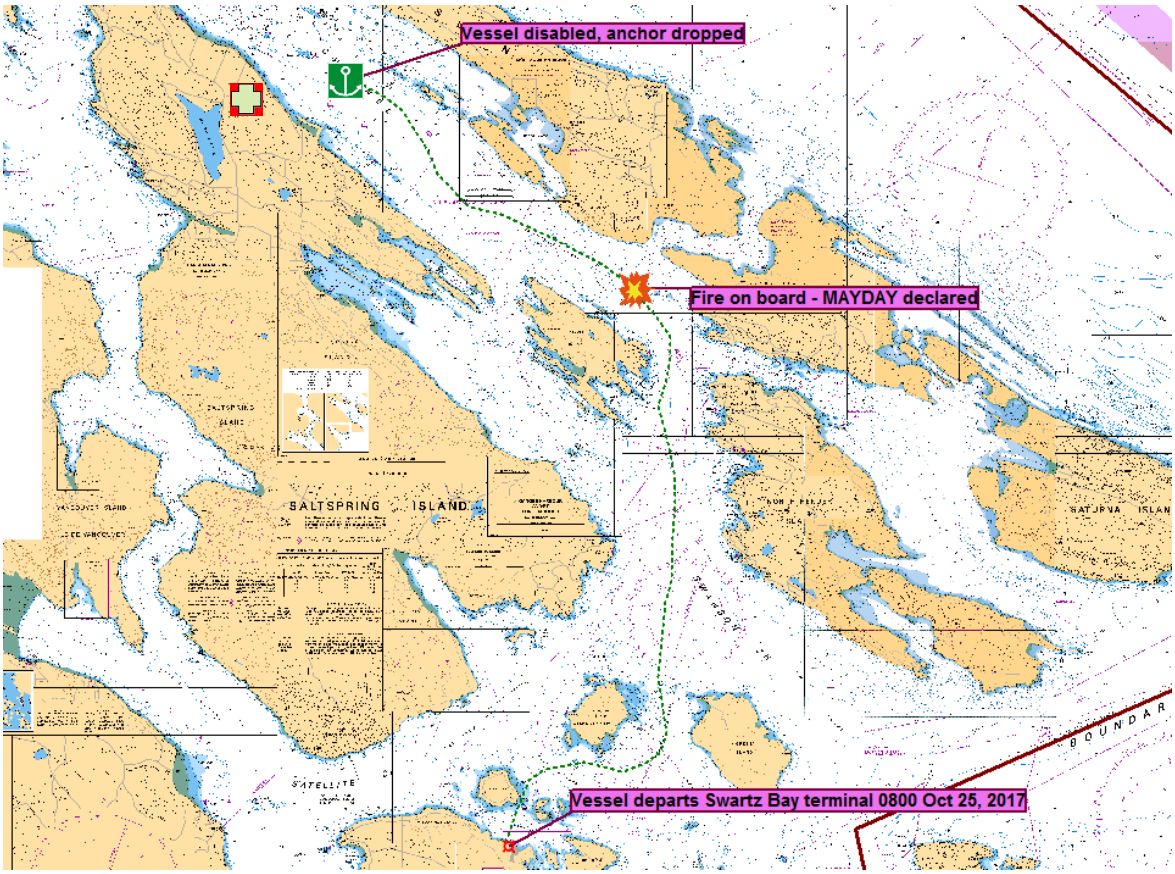

Figure A.1: *Exercise area and vessel track (reproduced from reference [9]).*

A.3 Scenario

The following scenario was used for the EX SASE 2017 [6]:

> *On Wednesday, October 25, 2017, BC ferry COASTAL RENAISSANCE departed Swartz Bay Terminal at 0800 (PST) bound for Tsawwassen Terminal (via the typical route through Swanson Channel, Active Pass and across Strait of Georgia). The vessel is carrying 1,395 passengers, 61 crew members, and 275 vehicles (including 12 semi-trailers and 20 passenger buses). Prior to navigating Active Pass, the heavily loaded ferry will experience an explosion on the lower vehicle deck followed by a rapidly spreading uncontainable fire, disabling the vessel. The vessel anchors in Trincomali Channel. The "Abandon ship" order is given and a complete evacuation will be carried out. The JRCC initiates the Major Marine Disaster Plan.*
>
> *All passengers and crew are transported to shore where provincial and local agencies coordinate the triage, treatment, and transport of all evacuees. After the SAR response is completed, the fire on board the ferry is extinguished. The responding federal and provincial agencies initiate ER activities and develop plans to salvage the vessel. Provincial and local agencies operate Reception Centres and plan for the safe transportation of all remaining passengers and crew off Salt Spring Island.*

The platforms included in the exercise were:

- Motor Vessel (M/V) COSTAL RENAISSANCE;
- 1 X 100 Passenger BC Ferry Liferaft;

- 1 BCF Tender;
- CCGS BARTLETT and RHIB (BARTLETT 1);
- CCGS Hovercraft SIYAY;
- CCGS Cape Naden;
- RCM SAR 20/25/29/31/34/36;
- RCMP Catamaran Lindsay;
- Parks Canada Landing Craft;
- HMCS Regina;
- 442 Sqn CH-149 Cormorant;
- 442 Sqn CC-115 Buffalo;
- 443 Sqn CH-124 Sea King;
- 407 Sqn CP-140 Aurora;
- USCG 87' Patrol vessel ADELIE;
- USCG Dolphin MH-65C; and
- TC NASP Dash 8.

As well as the following exercise control platforms:

- CCGS Cape Kuper and RHIB – Safety Boat;
- RCM-SAR Sooke Unit – Safety Boat;
- Orca Class 'Renard' – VIP Boat;
- Prince of Whales charter – VIP Boat; and
- CCG Helo (Bell 429) – Media.

Because the exercise was of limited duration and scope, certain details were simulated. The physical description of what would fully occur at the incident sites and surrounding areas was relayed to players by simulators or controllers. A Simulation Cell (SimCell) performed the roles and interactions of nonparticipating organizations or individuals; this included:

- Additional marine assets to evacuate the total simulated number of passengers and crew from the M/V COASTAL RENAISSANCE along with a simulated hovercraft to transfer those passengers to a simulated BC Ferry;
- Additional response resources necessary to rescue the simulated casualties; and
- Timing of all rescues in addition to the one life raft with 97 live actors who were evacuated from the ferry down the chute.

A.4 Exercise Play and Data Collection

Players were given certain guidelines to ensure a safe and effective exercise [15]–[17]. In some cases, assumptions were made to ensure participants' safety, even if it meant some loss of the exercise realism. Hence, some portions of the response to the scenario may have seemed somewhat artificial to first responders. However, every effort was made by the Core Planning Team to balance realism with safety and to create an effective learning and evaluation environment.

Before the exercise, the participants were to review appropriate organizational plans, procedures, and exercise support documents. Visual aids were employed to distinguish various types of participants (players, controllers, and observers/evaluators).

During the exercise, the players were to respond to exercise events and information as if the emergency was real, unless otherwise directed by an exercise controller. Controllers would only give out the information they were specifically directed to disseminate. Players were expected to obtain other necessary information through existing emergency information

channels. Evaluators were co-located with players in order to observe play, monitor communications, log player actions, and document individual, team, and organizational performance based on the exercise objectives, in accordance with the various agencies' Exercise Evaluation Guides (EEGs).

To collect as much objective data as possible, the observers/evaluators employed Exercise Evaluation Forms that were tailored to site- and player-specific tasks. Tasks were broken out with respect to training and exercise objectives. In addition, evaluator logs for capturing notes about play were used. Evaluators were also asked to note if an obvious cause or underlying reason resulted in players not meeting a critical task. Any electronic communications logs kept by an EOC that could be provided to the exercise evaluation team at the unclassified level were also utilized.

At the end of each day, there was a hot wash at each individual venue; participants and observers were debriefed to ensure the capture of as much information as possible. A participant feedback survey, tailored to the primary participating agencies, was made available online and in PDF/paper format upon the completion of the exercise. Qualitative assessments were collected and consolidated from the direct observations by the evaluators and the collected feedback during the post-exercise hot washes, the controller/evaluator de-brief, and the participant feedback survey.

Annex B: Summary of Lessons Learned Evaluation

Table B.1 documents the high-level lessons noted from previous major events within the scope of this particular exercise and stoplight assessment as to whether or not the constituent lessons have been learned and the results have been incorporated in this exercise (Objective D).

Table B.1: *Lessons learned (LL) from previous exercises and events.*

High-Level Summary from Previous Exercises and Events	Reference	Incorporated into EX?
1. Governance structure (who's in charge and who's in a support role) and the operational/ decision making model that will be used. This includes the transition to consequence management phase (with ongoing response operations by some organizations, e.g., environment).	[1], [18], [19], [20], [21], [22]	
2. Public Affairs strategy (who is lead, what can be shared by each responding organization) including the management of social media.	[19], [21]	
3. Identification of the mission (a clear statement of the goal of the participating organizations).	[19]	
4. Roles and responsibilities of all response organizations (clearly identified to minimize overlap and reduce duplication of effort).	[19], [22]	
5. Development of an expected event timeline, from initial notification to completion of recovery operations.	[1], [21], [22]	
6. Notification procedures (based on size and scope of incident).	[21], [23]	
7. The requirement for liaison officers or embedded staff (as and where so determined).	[1], [18], [20]	
8. Redundancy in both means and methods of communications.	[22]	
9. Situational awareness: lines of communications (with appropriate back-up channels) and whether SA can be maintained through the use of a software solution. Co-location is one option for maintaining good SA. SA validation and time of observation are also critical to maintaining accurate SA.	[1], [18], [19], [21], [22]	
10. Procedures for sharing classified/ designated information between organizations (identify what constitutes such information, who is entitled to what, how it will be shared securely).	[18]	
11. Implementing an accurate passenger/casualty tracking system in a short period of time for a large quantity of persons.	[22]	
12. The CONOPS should be reinforced through the creation of working groups and reinforced through integrated training and exercises. Although full-scale exercises held at regular intervals are necessary in order to exercise response under realistic conditions, there is great benefit from adopting a complete exercise program including regular drills and small exercises. Without exception participants acknowledged the value of practicing together.	[19], [22]	
13. Requirement for organizational checklists, changes in administrational procedures, processes or infrastructure must first be cleared with agency authorities.	[1], [22]	

Annex C: Summary of Participant Feedback

The online participant feedback survey contained a combination of up to 44 different questions, depending on the respondent's home organization. The purpose of the survey was to solicit feedback on the utility of the exercise, its training value, how well the training objectives were met, and where participants identified areas for improvement (both in the exercise design process and in the actual emergency planning process). The survey had 127 respondents, of which 121 were valid participants in the exercise.

Participants were nearly unanimous in their opinion that EX SASE 17 was successful. They felt that it exposed valuable lessons to be learned and areas for improvement, as well as providing an excellent inter-and intra-agency training opportunity. In the opinion of the participants, the exercise objectives were mostly met. The majority of the participants who responded agreed that because of the FSX, they had improved understanding in almost all areas of, communications requirements, roles and responsibilities, handover procedures, and the various applicable emergency management plans utilized at the federal, provincial and local levels. The only exception without a majority was for individual participant's understanding of the means, methods or systems other participating organizations are responsible for communicating over throughout a MAJMAR.

An overwhelming majority of respondents indicated that they felt that the exercise improved preparedness for future responses. However; the gaps in Table C.1 were identified. Many participants felt that the themes arising from the areas noted for improvement were recurring issues from past exercises and events. This means that previously identified "lessons learned" have not yet been addressed, and are, in fact only "lessons noted".

Table C.1: *Areas noted for improvement by participants.*

Common Theme	Specific Gaps/Areas for Improvement As Noted by Participants
Communication / information dissemination	Clarify chain of command (need detailed command structure)
	Ensure the declaration of a MAJMAR is clear and is disseminated appropriately
	Need better information sharing between on-scene and higher ups
	Clarify handover from SAR to ER
	Include LO's in multiple locations
	Utilize common communications channel for timely sharing of SA
	Utilize consolidated SITREPS
	Need better system for sharing COP (e.g., investigate Public Safety COP tools)
	Need full-time mapper to create and update COP
Shortcomings of JRCC MAJMAR Disaster Plan	Roles and responsibilities need to be clearer (especially role of SRR Commander)

Common Theme	Specific Gaps/Areas for Improvement As Noted by Participants
	Suggest: single organization to respond to SAR
	Suggest: consolidate with JTFP MAJMAR CONPLAN
Scenario Realism	Need more realistic casualty evacuation (CASEVAC) - Move some patients on stretchers from start to finish[11]
	Suggest: multiple patient drop off points, missing passengers, and search patterns
	Engage secondary training audience in scenario development (e.g. RCM-SAR)
	Include more realistic conditions (night, low visibility), bad weather, remote location, panic
Additional Training	More TTX with various scenarios
	More training but with players less familiar with scenario
	Small scale exercises targeting different areas of response
	Create Concept of Operations document (for educational purposes to ensure all agencies are aware of function of other agencies, etc.)
	Ensure all are familiar with EX Communications Plan (and ensure all numbers are functional)
	Suggest: establishment of pre-built briefing tools (situation brief, mission analysis brief, information brief, and decision brief) based on JTFP CONPLAN
	Implementation of ICS for unified command requires greater organization and stronger leadership
Technical Issues	C2 communications need improvement (cell phones not viable back up)
	Split disaster response and search communications
	Separate real time JRCC staff from exercise JRCC staff
	Better enforcement of security
	Ferry needs better public announcement system
	Need to establish better flow of personnel out of triage area
	More washroom facilities
	Additional VHF channel
	Ensure communications compatibility

Participants were then solicited for recommendations to improve regional or national preparedness in the event of a major marine disaster. The primary response was to continue such interagency exercises on a regular basis, and potentially establish a working group to oversee exercise conduct. Incorporating lessons learned from past events and exercises was mentioned, in order to prevent duplication of effort and ensure that real, recurring issues are addressed. One such issue is to develop or utilize better tools for COP and SA sharing. Participants also indicated a need for interagency communication and education, especially with respect to each agency's role. This reinforces the point made during the TTX and EOCX that it is necessary to clearly map/define the C2 structure

[11] Note that this idea was considered by the Core Planning Team and decided against in order to ensure the safety of the participants.

(tasking ability), reporting chains (communication lines/means) and required timelines over the duration of the MAJMAR event [2] and situate all parties involved. [12]

Finally, an improved contingency plan for major maritime disasters should be written, either holistically under a single organization with the appropriate mandate, or a set of integrated plans that work in lock-step together should be developed through the use of a working group or appropriate subject matter experts.

[12] Refer to Annex D for initial concepts for C2 and information flow diagrams.

Annex D: Initial Concepts for Command and Control (C2) Diagrams

The diagrams in this annex were developed based on observed C2 linkages and information flows during the course of EX SASE 17, as well as discussions with participants and unclassified documents available online at the time.

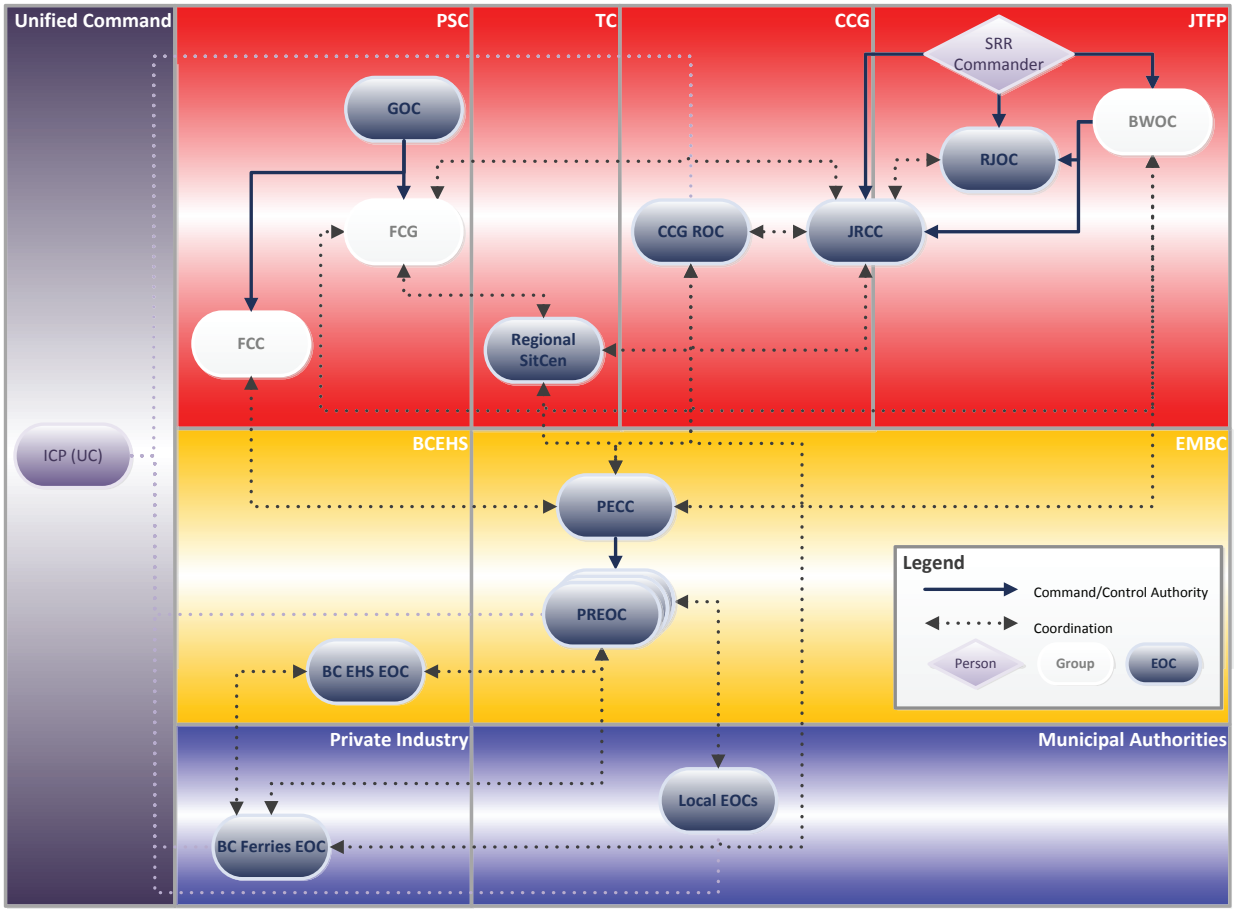

Figure D.1: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – simple view, SAR Phase.*

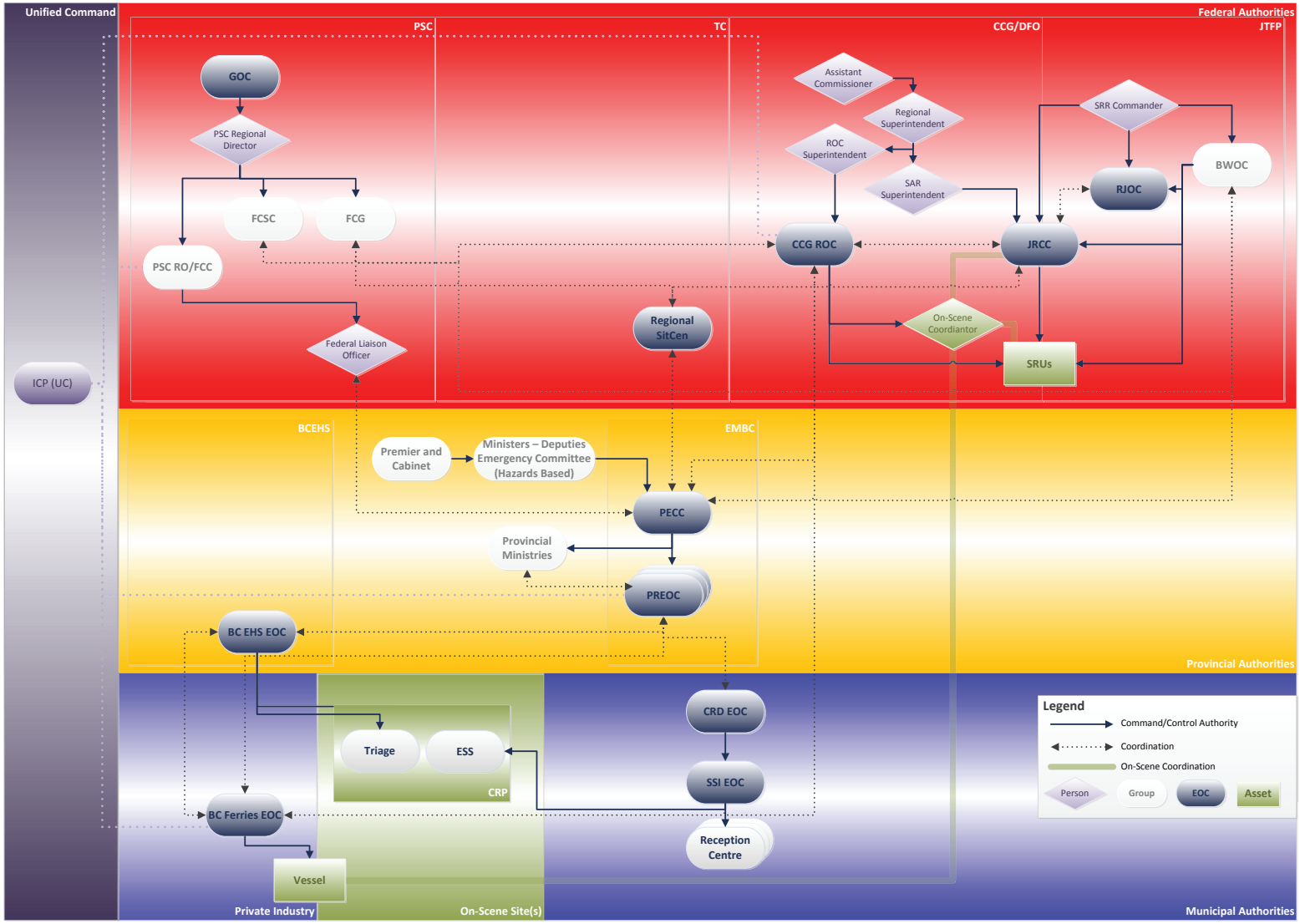

Figure D.2: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – expanded view, SAR Phase.*

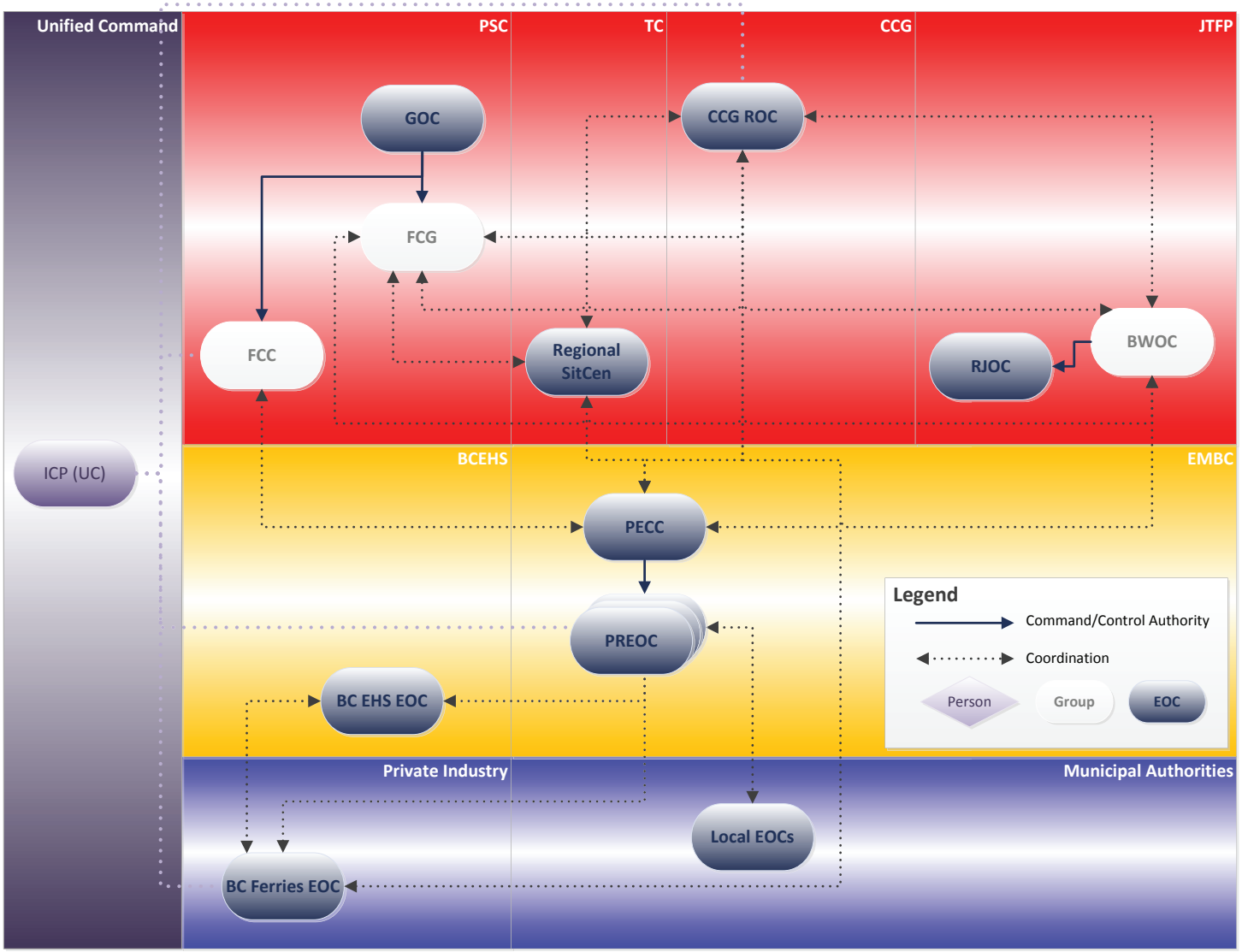

Figure D.3: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – simple view, ER Phase.*

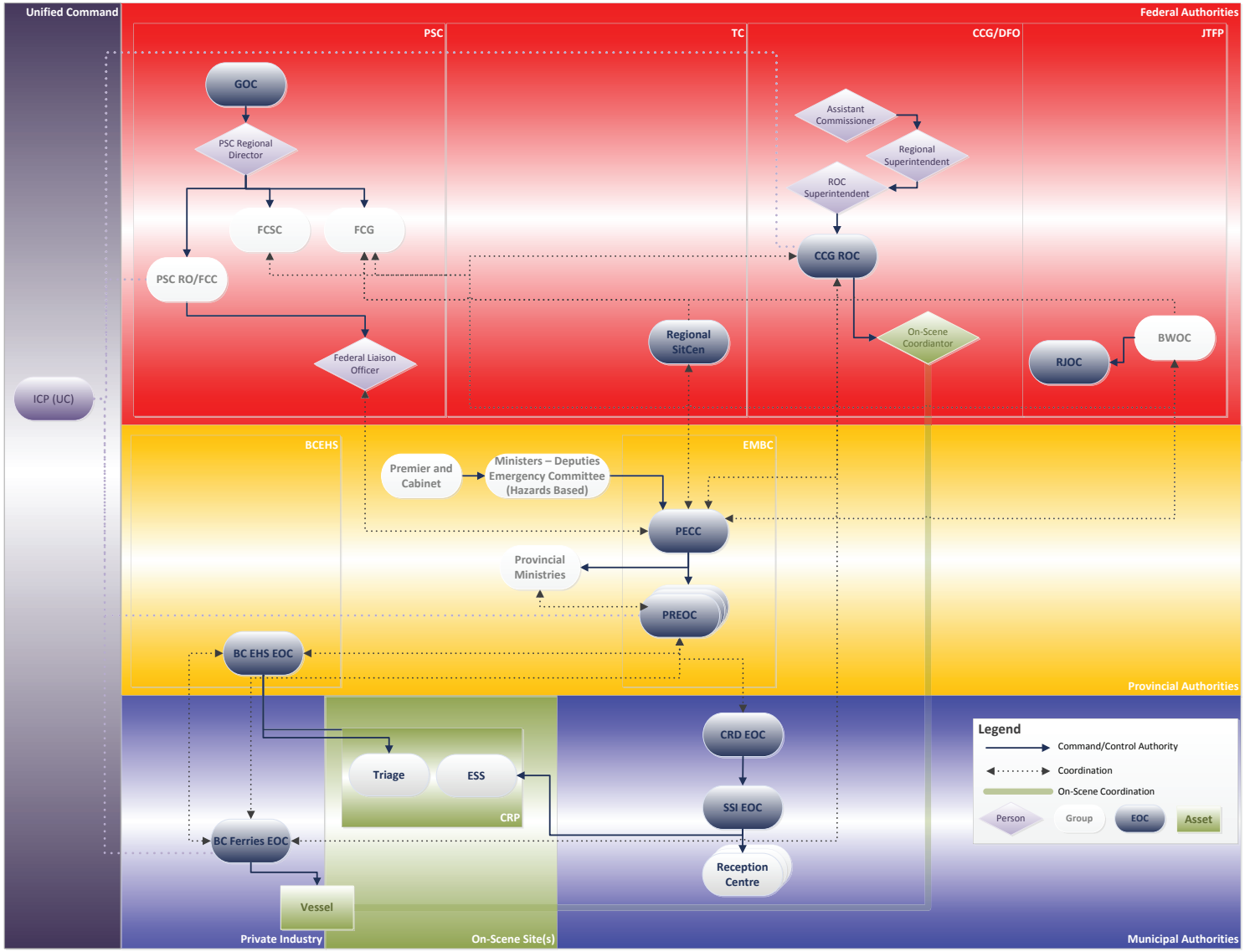

Figure D.4: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – expanded view, ER Phase.*

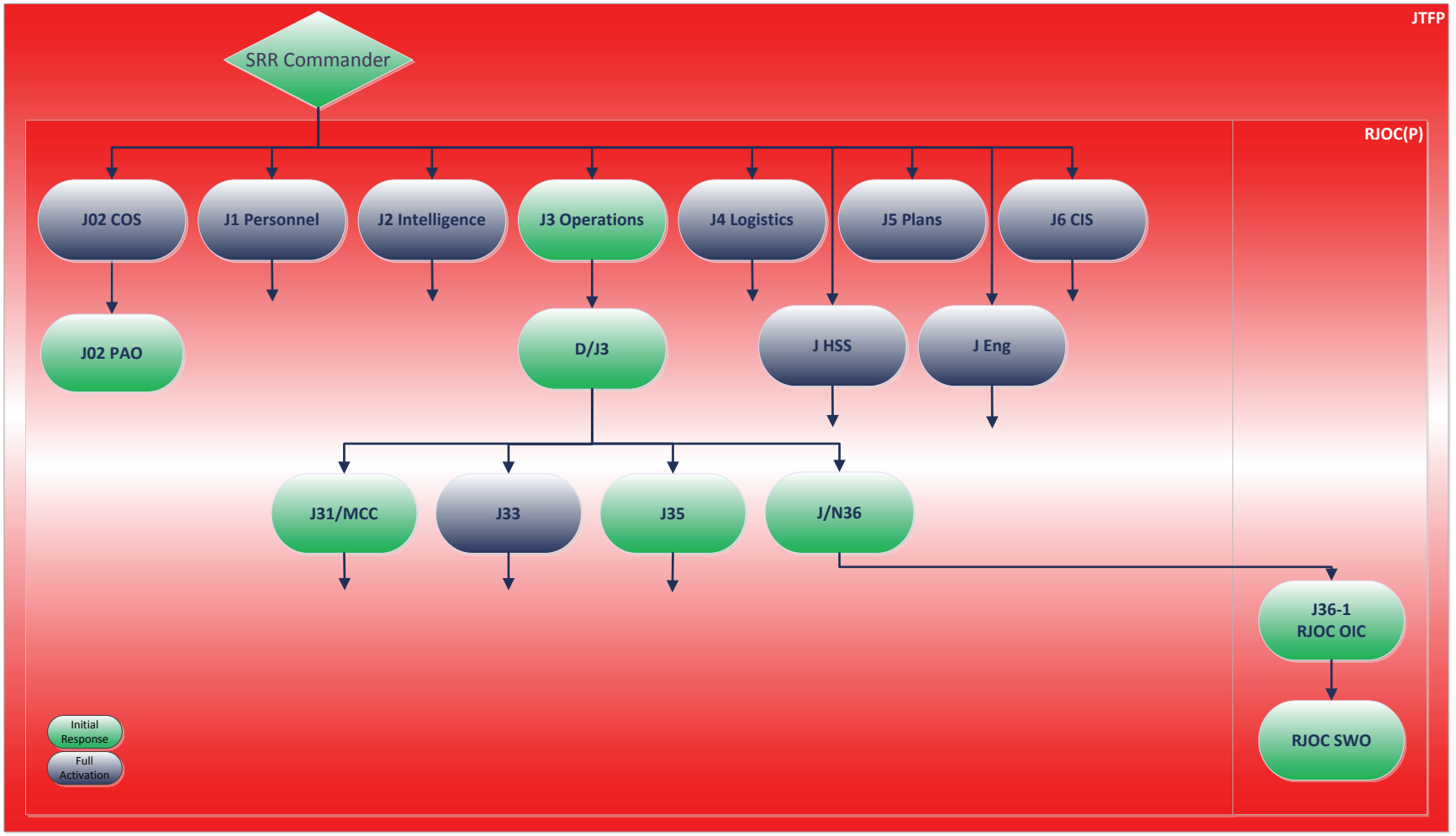

Figure D.5: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – JTFP.*

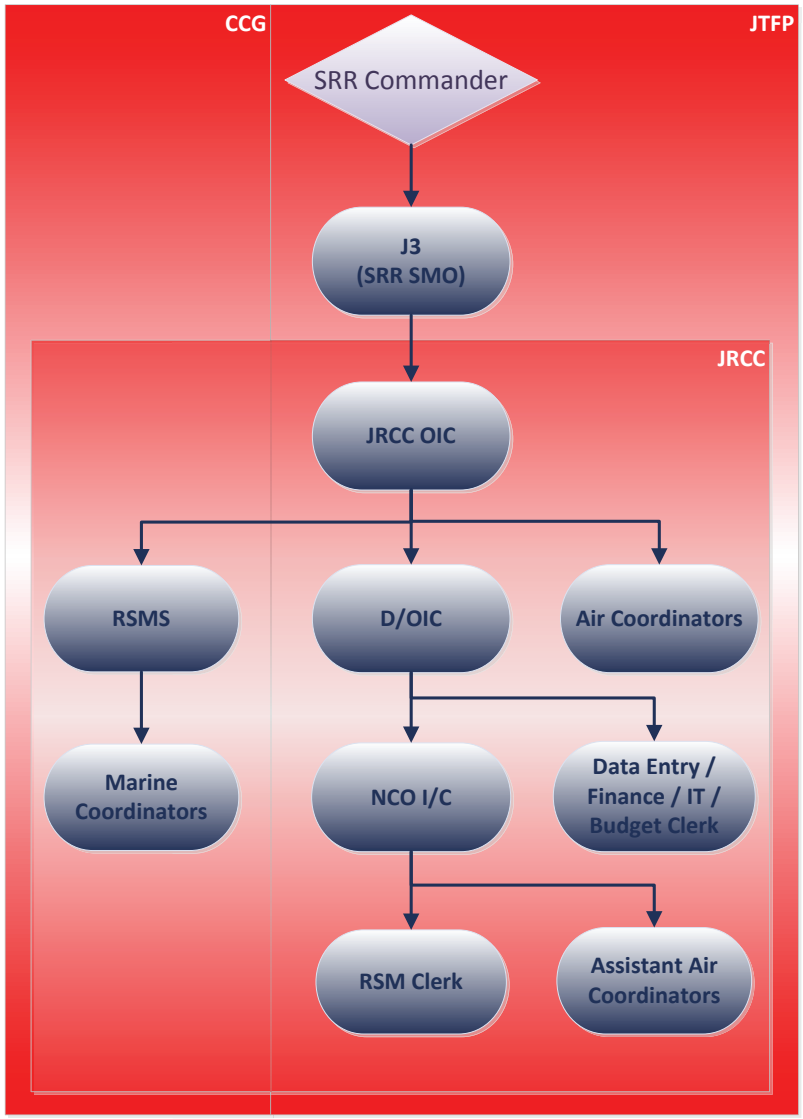

Figure D.6: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – JRCC.*

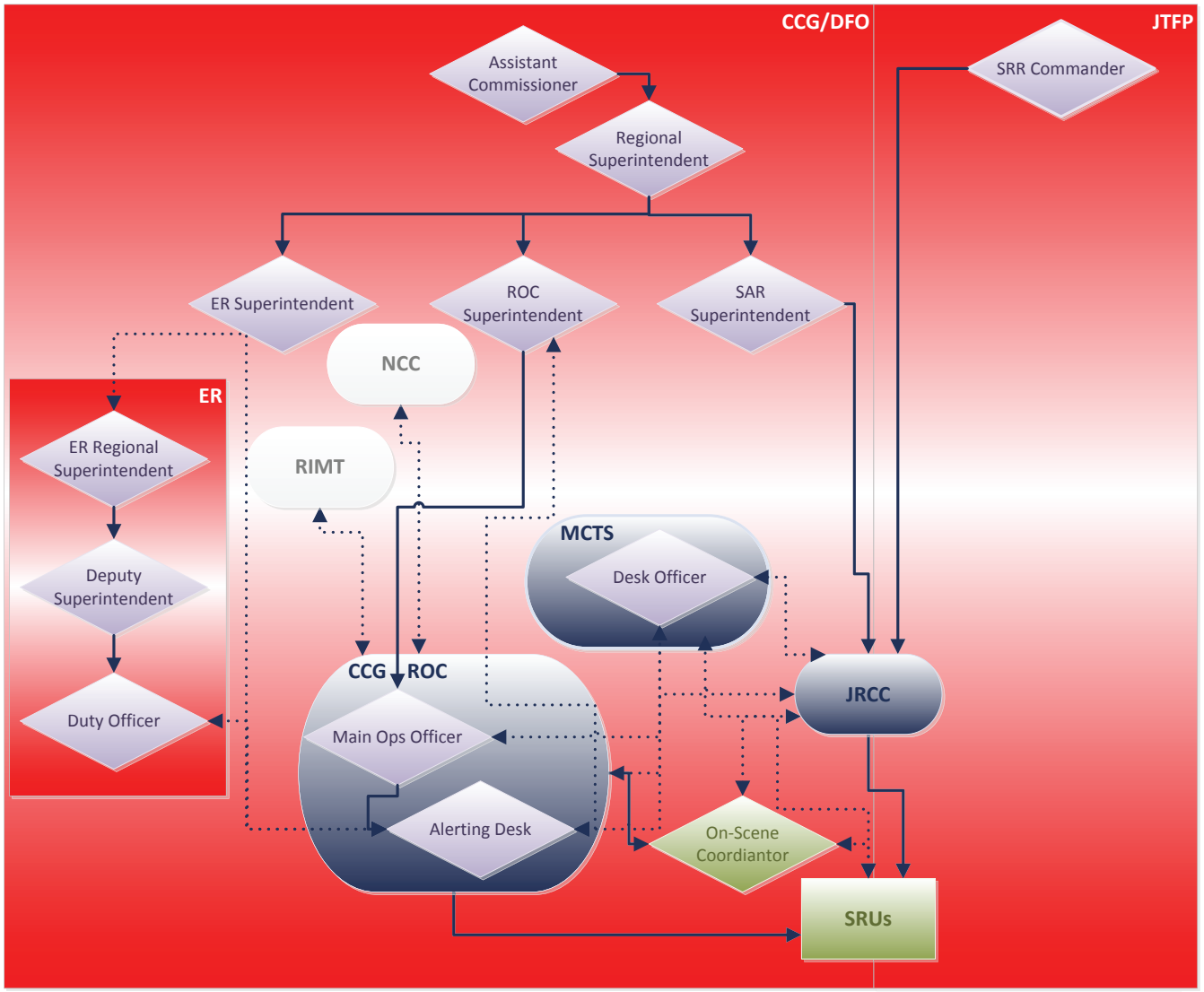

Figure D.7: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry – CCG.*

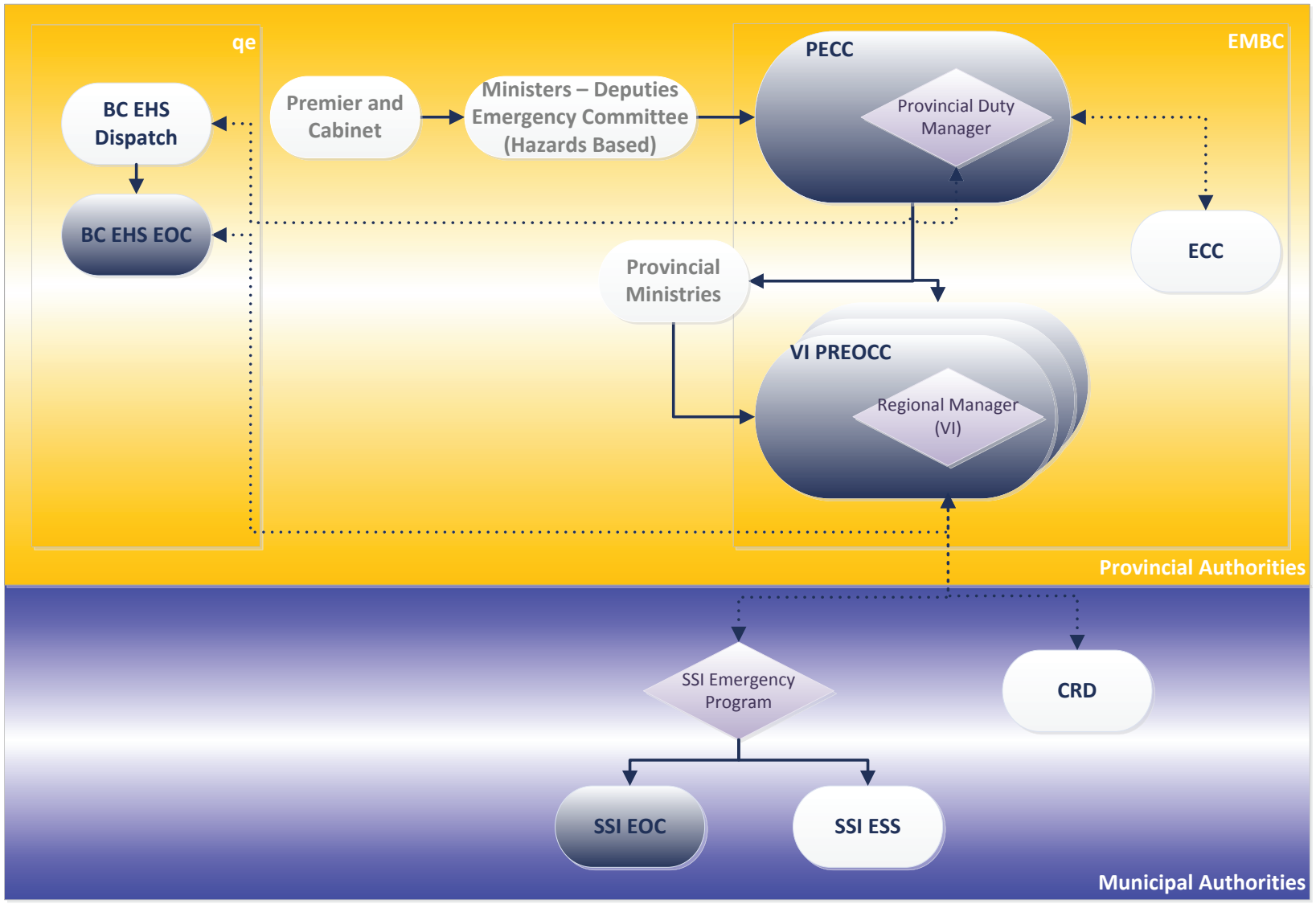

Figure D.8: *Initial concepts for C2 relationships in a major maritime disaster involving a BC ferry –provincial/municipal level.*

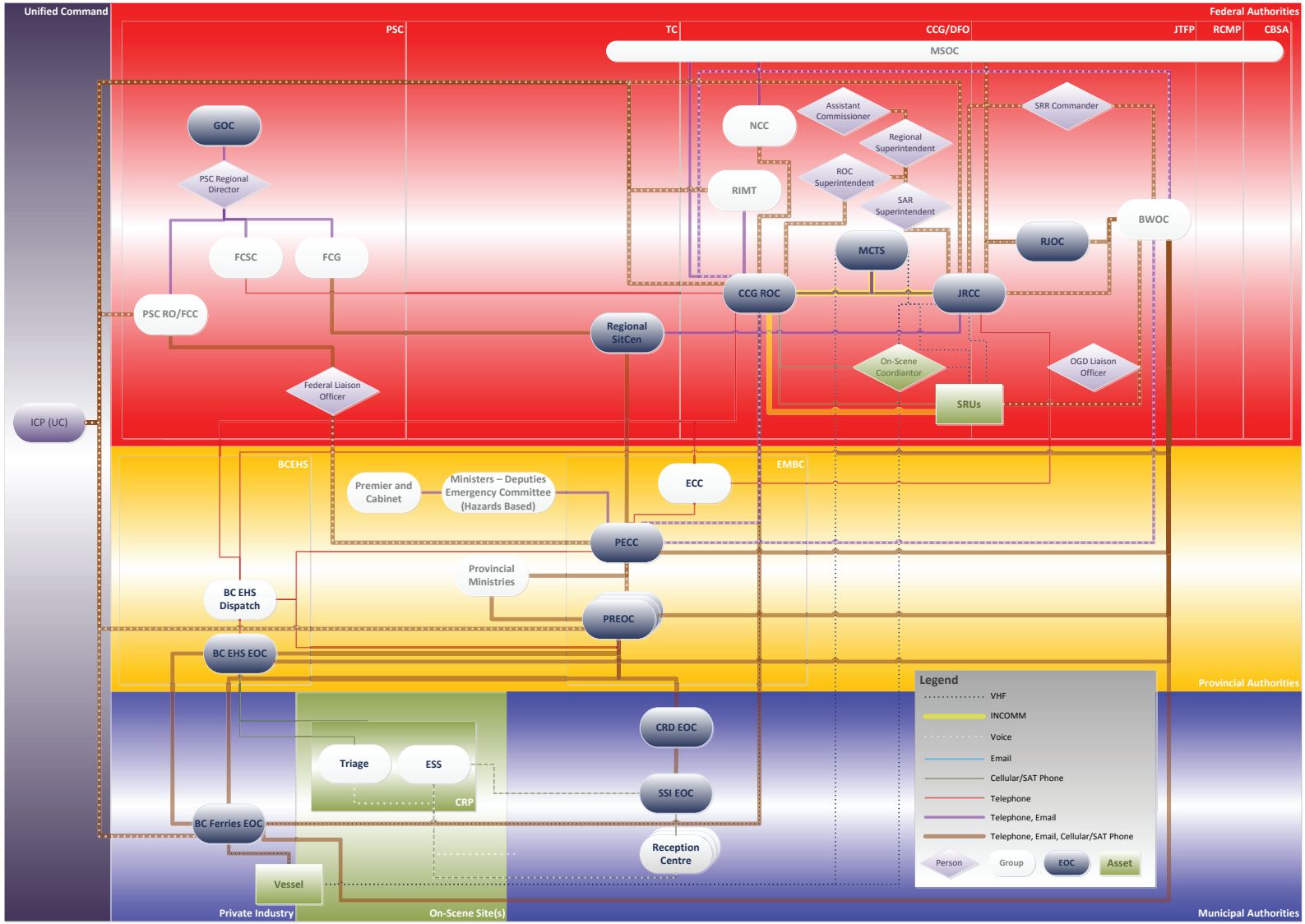

Figure D.9: *Initial concepts for information flow in a major maritime disaster involving a BC ferry – SAR Phase.*

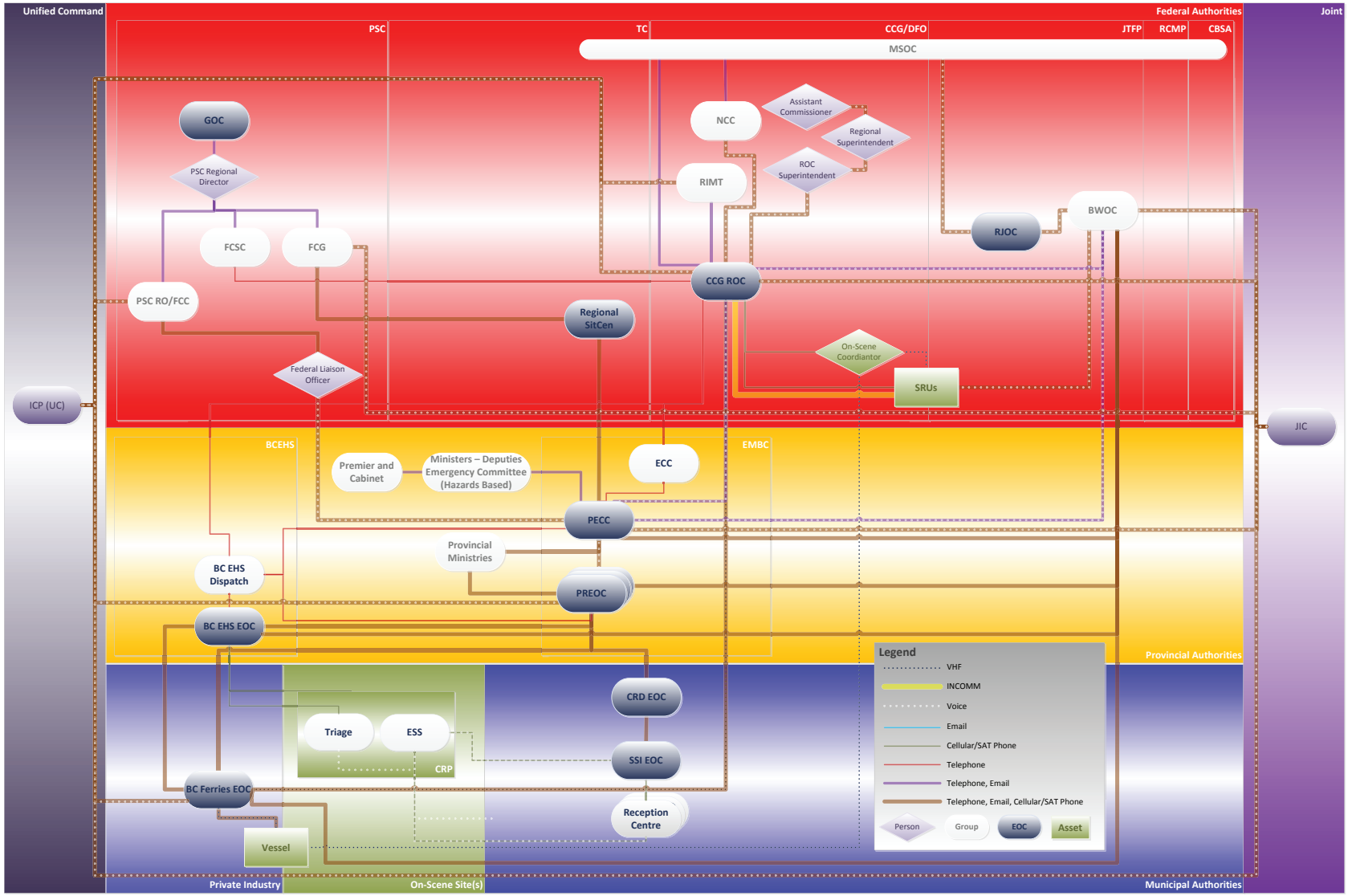

Figure D.10: *Initial concepts for information flow in a major maritime disaster involving a BC ferry – ER Phase.*

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full scale exercise, major maritime disaster, search and rescue, command and control, communication, information flow