CHESS
Commander’s HandhEld Support System

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C2 Decision Support Systems Section
Defence Research and Development Canada — Valcartier
Agenda

• Context
• Information Requirements
• System Functionalities
• Design of User Interface Structure
• High Level Architecture
• Conclusion
Enabling a concept of “Commander on the move”

• In order to remain effective, Commanders must maintain situational awareness, have the ability to remain fully involved in the decision making process linked to both the conduct of current operations and support to the planning process

• Regardless of where they find themselves, Commanders are required to provide timely direction to their staff
Design Approach

• Identification of the requirements of information that commanders need to receive and send

• Identification of the existing systems that provide this information

• Identification of the strategy to be used for the design of the decision support user’s interface

• Elaboration of the structure of the screen that would respect the strategy

• Implementation of the screens and their underlying functionalities
Information Requirements

• To maintain situational awareness at all times, retain the ability to make decisions and exert command authority and, finally, contribute to their headquarter operational planning process, commanders need to be able to:
  – Have access to information related to the context of an operation as well as to the execution of an operation
  – Have access to information related to the planning of an operation
  – Provide to their staff commander’s intent guidance and/or clarification and/or direction
  – Obtain advice related to the planning of an operation
  – Obtain advice related to the execution of an operation
Information to Maintain Baseline Situation Awareness

- Information provided by the following system:
  - Command View
    - Access to briefings and documents
    - Notification and alert
Information to Retain the Ability to Make Decisions and Exert Command Authority

- Information provided by the following systems:
  - Command View
    - Notification and alert
    - Access to briefings and documents
    - Access to mission plans
    - Access to mission reference documents
  - Incident Management System
    - Notification and access to information about incidents in specific zones of interest
    - Geo-referenced information of incidents in specific zone of interest
    - Access to incidents outside their zone of interest
  - EMPA
    - Monitor the progress of a given operation
    - Remain involved in the process of amending the plan to achieve mission success
    - Contribution to hasty planning, cycles, review and approval of fragmentary orders (Frag O) or other instructions
Information to Contribute to Headquarters Operational Planning Process

- Information provided by the following systems:
  - COPlanS
    - Access to planning process battle rhythm;
    - Provide directive and guidance
    - Access to information and outputs of the different stages of the CFOPP (initiation, orientation, COA development, plan development)
    - Approve the different outputs (ex. plan)
  - Command View
    - Access to briefings
  - Incident Management System (IMS)
    - Notification and access to information about incidents in his zone of interest
    - Geo-referenced information of incidents in his zone of interest
Interactions with Existing Information Systems

Command View
- Provides baseline information at strategic and operational level

IMS
- Incidents list
- Incidents map
- Incidents details

COPlanS
- List of Campaign/Operation Plans
- Campaign/Operational Plans
- Battle Rhythm
- OPP stages information and outputs (Initiation, Orientation, COA Development)
- Plan CCIR’s
- Plan Risks

EMPA
- Directives
- Approval

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Generic System Functions

- Provide user identification mechanism to preserve the continuity of the chain of command and maintain its integrity
- Provide access to different communications mechanisms and networks
- Provide commanders with the capability to transmit and receive information in an environment with limited bandwidth and unstable connectivity
- Provide commanders with a notification, alarm and inter-application through different context adapted mechanism to draw their attention to important or time sensitive information
- Receive, store, view and send electronic documents
- Manage personal information including contacts, appointment schedule, calendar, meetings, tasks, emails
Command Support Functions

• Support situational awareness: Situation awareness (past, present, and even predicted) will be accessible from heterogeneous data streams (audio, speech, text, video, maps, etc.) through different access means.

• Participate in the planning process: Access to plans and consultation of planning status.

• Receive notifications related to the status of on-going planning activity, new incidents, mission success criteria, decision points and associated triggers, availability of key planning products.

• Specific text-based chats with other planning personnel, subordinate commanders, current operations staff, superior commanders.

• Conduct audio conversations while viewing briefing documents.

• Receive a full briefing presentation remotely.
Design of User Interface

- Gong and Tarasewich (2004)
  - Consistency
  - Reversal of actions
  - Error prevention and simple error handling
  - Reduce short-term memory load
  - Design for multiple and dynamic contexts
  - Design for small devices
  - Design for limited and split attention
  - Design for speed and recovery
  - Design for “top-down” interaction
  - Allow for personalization
  - Design for enjoyment
CHESS Strategy

- Basic Design Guideline
  - Keep the URLs of site entry points short
  - Provide only minimal navigation at the top of the page
  - Ensure that content appears and behaves properly in landscape mode as well as portrait mode

- CHESS Strategy
  - Give access primarily to information required by Commanders
  - Minimize the number of clicks to have access to any information
  - Do not present twice the same information, even if it comes from different native applications
## Identification of the Sources of Information

<table>
<thead>
<tr>
<th>Source Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command View</td>
<td>• Provides baseline information at strategic and operational level (briefs, etc.)</td>
</tr>
<tr>
<td>IMS (Incident Management System)</td>
<td>• Incidents list</td>
</tr>
<tr>
<td></td>
<td>• Incidents details</td>
</tr>
<tr>
<td><strong>Command View + EMPA</strong></td>
<td>• List of Current Operations</td>
</tr>
<tr>
<td>Command View + EMPA</td>
<td>• Current Operations status</td>
</tr>
<tr>
<td>EMPA</td>
<td>• Plan progression details</td>
</tr>
<tr>
<td><strong>Command View + COPlanS + EMPA</strong></td>
<td>• Description of Campaign/Operational Plans</td>
</tr>
<tr>
<td>COPlanS</td>
<td>• List of Campaign/Operational Plans</td>
</tr>
<tr>
<td></td>
<td>• Battle Rhythm</td>
</tr>
<tr>
<td></td>
<td>• OPP stages information and outputs (Initiation, Orientation, COA Development)</td>
</tr>
<tr>
<td></td>
<td>• Plan CCIR’s</td>
</tr>
<tr>
<td></td>
<td>• Plan Risks</td>
</tr>
</tbody>
</table>
Starting with

Ending with
Baseline SA Information
Hot Air Balloon Explosion at BC Place Stadium:

Three members of the Voice of the Homeless are confirmed dead after a hot air balloon exploded into a ball of fire and crashed Friday evening 1 kilometer from BC Place Stadium, in Vancouver, the Opening Ceremony site, injuring 11 and destroying three homes. Voice of the Homeless was trying to disrupt the Opening Ceremony and embarrass Canada through international media coverage.

Keywords: Hot air balloon, Voice of the Homeless, BC Place Stadium, Vancouver.
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Plans

Command View
- Strategic Info
- Operational Info
- IMS
- Current Ops

COPlans
- OP PODIUM
- Contingency Plans
- OP TRAINING
- Operation Turing Test
- JCDS 21 Server Rebuild
- JCDS21 Server Rebuild

Campaigns
- OP PODIUM
  Contingency Plans
  OP TRAINING
  Operation Turing Test
  JCDS 21 Server Rebuild
  JCDS21 Server Rebuild

Campaign
- OP PODIUM
  Strategic Plans:
  - OP PODIUM (Strat Lvl)
  Operational Plans:
  - OP PODIUM (Op Lvl)
  - OP BOISFLOTTANT (TOI CONPLAN)
  - CONPLAN DRIFTWOOD
  - TEST CONPLAN DRIFTWOOD (Dated 23 Oct 08)
  - CONPLAN DRIFTWOOD (JCDS21 Rebuild Demo)
  - CONPLAN DRIFTWOOD (Dated 23 Oct 08)
  - CONPLAN DRIFTWOOD (27 March 09)
  Tactical Plans:
  Description: CF Assistance to Law Enforcement Agencies (ALEA) and ceremonial assistance to Heritage Canada for the 2010 Vancouver Olympic Games.
## Plans

**Campaign**

- **OP PODIUM (Strat Lvl)**

### Strategic Plans:

- OP PODIUM (Op Lvl)
- OP BOISFLOTTANT (VOI CONPLAN)
- CONPLAN DRIFTWOOD
- TEST CONPLAN DRIFTWOOD (Dated 23 Oct 08)
- CONPLAN DRIFTWOOD (JCD821 Rebuild Demo)
- CONPLAN DRIFTWOOD (Dated 23 Oct 08)
- CONPLAN DRIFTWOOD (27 March 09)

### Operational Plans:

### Tactical Plans:

**Description:**

CF Assistance to Law Enforcement Agencies (ALEA) and ceremonial assistance to Heritage Canada for the 2010 Vancouver Olympic Games.
## Plan Information / CCIRs

**Plan**

<table>
<thead>
<tr>
<th>Item</th>
<th>OP PODIUM (Strat Lvl)</th>
</tr>
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<tbody>
<tr>
<td>Higher Headquarter Plan:</td>
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</tr>
<tr>
<td>Campaign:</td>
<td>OP PODIUM</td>
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<tr>
<td>Planning Level:</td>
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</tr>
<tr>
<td>Type:</td>
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<td>Force Employment Scenario:</td>
<td>Support to Law Enforcement</td>
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<td>Hidden:</td>
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<td>Exercise:</td>
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<td>Commander:</td>
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<td>Notional</td>
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<tr>
<td>D-Day:</td>
<td>10/16/08 8:00 PM</td>
</tr>
<tr>
<td>Description:</td>
<td>Strategic Plan for CF assistance to law enforcement agencies during 2010 Vancouver Olympic Games.</td>
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### Security Involvement of the Intl' Entities and Delegations

- **Name:** Security Involvement of the Intl' Entities and Delegations
- **Importance:** High
- **Closed:** Yes

### Major CF Vulnerabilities

- **Name:** Major CF Vulnerabilities
- **Importance:** Normal
- **Closed:** No

### Security threats to 2010 Games

- **Name:** Security threats to 2010 Games
- **Importance:** Low
- **Closed:** Yes
## Plan Information / Battle Rhythm

### Plan Information

<table>
<thead>
<tr>
<th>Plan</th>
<th>Status</th>
<th>Start Date</th>
<th>End Date</th>
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<tbody>
<tr>
<td>Initiation</td>
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<td>10/6/08 3:33 PM</td>
<td>10/6/08 3:33 PM</td>
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<tr>
<td>Orientation</td>
<td>Completed</td>
<td>10/6/08 3:33 PM</td>
<td>10/7/08 8:08 AM</td>
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<td>10/10/08 11:35 AM</td>
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<tr>
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<td>10/10/08 11:35 AM</td>
<td>10/10/08 11:36 AM</td>
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</tbody>
</table>

**Higher Headquarter Plan:** OP PODIUM

**Campaign:** OP PODIUM

**Planning Level:** Strategic Military

**Type:** Domestic

**Force Employment Scenario:** Support to Law Enforcement

**Classification:** NATO Unclassified

**Hidden:** No

**Exercise:** Yes

**Commander:** j5 usur

**Key Information:** Notional

**D-Day:** 10/16/08 8:00 PM

**Description:** Strategic Plan for CF assistance to law enforcement agencies during 2010 Vancouver Olympic Games.
## Battle Rhythm / Initiation

<table>
<thead>
<tr>
<th>Plan Development</th>
<th>Status</th>
<th>Start Date</th>
<th>End Date</th>
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</thead>
<tbody>
<tr>
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<td>10/8/08 3:33 PM</td>
<td>10/9/08 3:33 PM</td>
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<table>
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<tr>
<th>Plan Review</th>
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<tbody>
<tr>
<td></td>
<td>10/10/08 11:35 AM, planned: 10/9/08 3:33 PM</td>
</tr>
</tbody>
</table>

### Initiation
- **Authorized Movement**: Freedom of movement in conjunction with the Coast Guard, RCMP
- **Guidelines To Staff**: 1. SITUATION: a. General: This
- **Initial Reconnaissance**: See OP PODIUM Op Plan

### Deliverables
Battle Rhythm / Orientation

Commander's Intent

Canada Com will plan, direct and coordinate all activities related to the CF security.

Deliverables

- MissionAnalysisBrief.ppt 73.216 KB 10/7/08 10:21 AM
- CommandersPlanningGuidance.doc 76,996 KB 10/7/08 10:23 AM
- WarningOrder.doc 35,002 KB 10/7/08 10:25 AM
### Battle Rhythm / COA Development

**Plan** | **Status** | **Start Date** | **End Date**
--- | --- | --- | ---
Initiation | Completed | 10/6/08 3:33 PM | 10/6/08 3:33 PM
Orientation | Completed | 10/6/08 3:33 PM | 10/7/08 8:08 AM
COA Development | Completed | 10/7/08 3:33 PM | 10/7/08 3:33 PM
Plan Development | Completed | 10/10/08 11:34 AM | 10/10/08 11:35 AM
Plan Review | Completed | 10/10/08 11:35 AM | 10/10/08 11:36 AM

**COAs** | **Selected COA - ITF** | **Supported** | **RCMP** | **Interdiction**
--- | --- | --- | --- | ---
Ranking | 1 | 1 | 1 | 1
Selected | | | | |

**Criteria** | **Weight**
--- | ---
Operations Complexity | 7.0
Command and Control Complexity | 9.0
Sustainability | 5.0
Logistics Complexity | 3.0
Collateral Damage | 8.0

**Deliverables**
- InfoBrief.ppt  309.56 KB  10/23/08 7:14 AM
- DecisionBrief.ppt  249.856 KB  10/24/08 10:10 AM
- Troops-to-Task Analysis.xlsx  440.742 KB  10/22/08 7:33 PM
### Plan Information / Threats and Risk Assessment

#### Threats Risk Assessment

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<thead>
<tr>
<th>Threat</th>
<th>Poor International and Domestic Public Opinion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threat Initial Risk</td>
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<tr>
<td>Analysis</td>
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#### Causes

<table>
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<th>Cause</th>
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</table>

#### Residual Risks

<table>
<thead>
<tr>
<th>Coa</th>
<th>Global Residual Risk</th>
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</thead>
<tbody>
<tr>
<td>Selected COA - JTTF Supported RCMP Interdiction</td>
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</tr>
<tr>
<td>Selected COA - JTTF Supported RCMP Interdiction</td>
<td></td>
</tr>
<tr>
<td>COA 1 - JTTF supports RCMP Interdiction</td>
<td></td>
</tr>
<tr>
<td>COA 2 - JTTF Supported RCMP Interdiction</td>
<td></td>
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<tr>
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</tr>
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</table>

**Description:** Strategic Plan for CF assistance to law enforcement agencies during 2010 Vancouver Olympic Games.
Wireless Handheld PC Selected

- **Device Model: HTC Mogul (P4000)***
  - Touch screen and display size and resolution (320x240 pixels, 65k colours)
  - QWERTY slide-in keyboard for easier typing
  - WIFI (802.11 b/g)
  - Bluetooth
  - Expandable memory: MicroSD cards
  - Operating System (OS): Windows Mobile 6 (latest available version at that time)
CHESS in JCDS 21 Test Bed Environment

Legend
- Components developed by the TA15 Team
- Existing components that will be slightly modified or to which we connect
CHESS Network Connectivity Overview
Commander HandhEld Support System (CHESS)

- A tool for real-time exchange of information with key DND systems through a wireless handheld device.
  - Multi-networks communication
  - Limited bandwidth connectivity information delivery services
  - Notification and alerts
  - Electronic documents management services
Concepts Demonstrated

- Access to situational awareness provided by existing baseline systems, ex. CommandView;
- Reception of notifications events/alerts through emails;
- Access to plans and consult planning status provided by COPlanS;
- Collaboration with planning staff to activate planning stages via COPlanS;
- Contribution to the planning by giving guidance or by inserting information or concerns about strategic aspects (e.g. CCIR, Risk Management, Commander’s Guidance);
- Approbation of documents remotely;
- Reception of briefings remotely;
- Capacity to store and retrieve e-mail, manage contacts and appointments;
- Text-based online chat communication over Internet (direct one-on-one or to a group);
- Capacity of audio intervention during a remote briefing.
Future Work

• Refinement of Information Requirements
  – Considering different situations
• Identification of Information Requirements for staff
• Improvement of User Interface
  – interaction and visualisation possibilities
  – automatic adaptation of mobile interfaces to user learned preferences [Smyth et al. 2008]