“Covering the Bases:” Development of a Framework for Defence Force Planning Scenarios

Brief to 15th ICCRTS
Shaye K. Friesen
DRDC CORA Defence Scientist / Strategic Analyst
Santa Monica, CA
Outline

• Project Motivation
• Methodology
  – Field Anomaly Relaxation
  – Scenarios – The What
  – Appropriateness
• Application
• Illustrative Screenshots
• Some Observations for Command and Control
• Status and Way Ahead
Project Motivation

• Scenarios are a key inject to Capability Based Planning
  – Original set of 11, 1999
  – Extended to 18, 2005-06
  – Canada First Defence Strategy (CFDS), 2008
• There is a need to address uncertainty of a limited scenario set
  – Full spectrum missions
  – Multiple campaign themes
  – Broad range of operational areas
    • Domestic, Continental, International etc.
• Provide analytical evidence for scenario development
  – Test different military capabilities
  – Design a robust and agile force
Methodology

• A scenario analysis tool has been developed by DRDC CORA
  – Informed by lessons learned

• We are using the tool to characterize the force planning scenarios and assess gaps that may require new scenario development

• Evaluation, through field anomaly relaxation, of plausible scenario combinations
  – Contributes to a systematic and defensible process

• The software tool has been built in cooperation with defence industry partners in Canada
Defining Scenarios – The What

The Force Planning Scenario (FPS) set provides a representative lay down of the situations in which the Canadian Forces anticipates conducting operations and allows, through the study of these scenarios, different approaches to delivering capability to be explored. The scenarios depict a range of indicative domestic, continental and international events and possibilities across the full spectrum of conflict.

- Chief of Force Development Handbook
Field Anomaly Relaxation

- Field Anomaly Relaxation is a version of Morphological Analysis
- Involves the evaluation of a scenario set using a series of filtrations that eliminate inconsistencies to arrive at the final set

<table>
<thead>
<tr>
<th>Table 1: Matrix of Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A1</td>
</tr>
<tr>
<td>A2</td>
</tr>
<tr>
<td>B1</td>
</tr>
<tr>
<td>B2</td>
</tr>
<tr>
<td>C1</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>D1</td>
</tr>
<tr>
<td>D2</td>
</tr>
<tr>
<td>D3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: Filtering Inconsistent/Implausible Configurations</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

Taken from DSTO, “Some Methods for Scenario Analysis in Defence Strategic Planning”, 2009

Defence R&D Canada • R & D pour la défense Canada
Appropriateness

• Traditional Morphological Analysis not well-suited
  – Too many relationships and combinations to consider

• The goal of the FAR is to develop a manageable number of scenarios to support planning
  – Series of filters to arrive at a scenario set
  – Feasibility rating
  – Averaged value for each scenario

• The final result is a feasibility assessment
  – Inconsistencies are eliminated
  – Refine and prioritize most significant scenarios

Moving from “Possible” to “Plausible”
Applying FAR (1/2)

- **Step 1:** Form a view of the future
- **Step 2:** Design a language fine enough to describe the view of the future
- **Step 3:** Test the internal consistency of all combinations of Factors implied by the language of Step 2.
- **Step 4:** String configurations into sequence to form scenario outlines
Applying FAR (2/2)

1. Form a view of the future

2. Define a language to describe the future

3. Evaluate combinations of Factors/Variables

4. Apply results to create scenario outlines
Step 1: Form a View of the Future

Canada First Defence Strategy outlines the vision of the CF capabilities through six core missions that address the future security environment:

1. Conduct daily domestic and continental operations, including in the Arctic and through NORAD;
2. Support a major international event in Canada, such as the 2010 Olympics;
3. Respond to a major terrorist attack;
4. Support civilian authorities during a crisis in Canada such as a natural disaster;
5. Lead and/or conduct a major international operation for an extended period; and
6. Deploy forces in response to crises elsewhere in the world for shorter periods.
Step 2: Develop a Language to Describe the Future

- Framework dimensions are designed to capture all relevant aspects of the Future Security Environment
  - Build on previous scenario development efforts
  - Capable of expansion to accommodate different perspectives and classes of users (e.g., policy, capability manager)
  - Broken into three categories:
    - Drivers: Includes the core elements of future scenarios. These driver dimensions are used to evaluate the range of plausible scenarios in evaluating the set as a whole
    - Descriptors: Used to characterize the important details within a scenario. Descriptors are necessary for developing individual scenarios to ensure they are suitable for mission analysis and Capability Based Planning
    - Derivatives: Includes all dimensions that are invoked by a particular scenario
Scenario Framework Dimensions: Drivers, Descriptors and Derivatives

Only Drivers were applied in developing plausible scenario combinations

<table>
<thead>
<tr>
<th>LEGEND</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Driver</td>
</tr>
<tr>
<td></td>
<td>Descriptor</td>
</tr>
<tr>
<td></td>
<td>Derivative</td>
</tr>
</tbody>
</table>

Defence R&D Canada    •    R & D pour la défense Canada
Step 3: Evaluate combinations of variables

- For each driver factor, conduct pair-wise comparison
- Apply a value from 0-4, then save values
- Progress to next variable
Step 3: Pair-wise Comparison Matrix

- The pair-wise comparison matrix provides a mechanism to review data

|-----------------------------|------------------------|-------------------|---------------------|--------------|----------------|-----------------|-------------------|-------------|---------|--------|-------------|---------|----------|----------|-------------|-------------|---------|----------------|---------------|----------------|-----------------|----------------|----------------|-----------------|----------------|------------------|-----------|
Step 4: View Results for Analysis

- Histogram shows plausibility values for each variable
Create or Modify Scenario Set

- User characterizes scenarios by selecting relevant check boxes for each form

- Allows user to insert data, scroll through existing scenarios, generate reports etc.
Some Observations for Command and Control

• What works well
  – Broad, comprehensive and tailorable approach
  – A tangible “leave behind” decision support capability
  – Structure for capturing current knowledge based on diverse range of inputs
  – Common set of terms and language

• What doesn’t work well
  – Satisfying the concerns of all stakeholders
  – Using the scenario tool to justify expensive capability investment decisions, or solve all acquisition concerns
  – Framework dimensions and values are subjective
  – Challenge to contain the number of variables and scenarios
Summary and Way Ahead

• We are evolving this tool as a web-based platform
  – Enable comparative analysis of multiple frameworks
• Validation
  – Populated with historical case studies
• “Fit For, but not With”
  – Support to ongoing capability assessments
Questions?