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Modeling future force demand:
Force Mix Structure Design

BACKGROUND

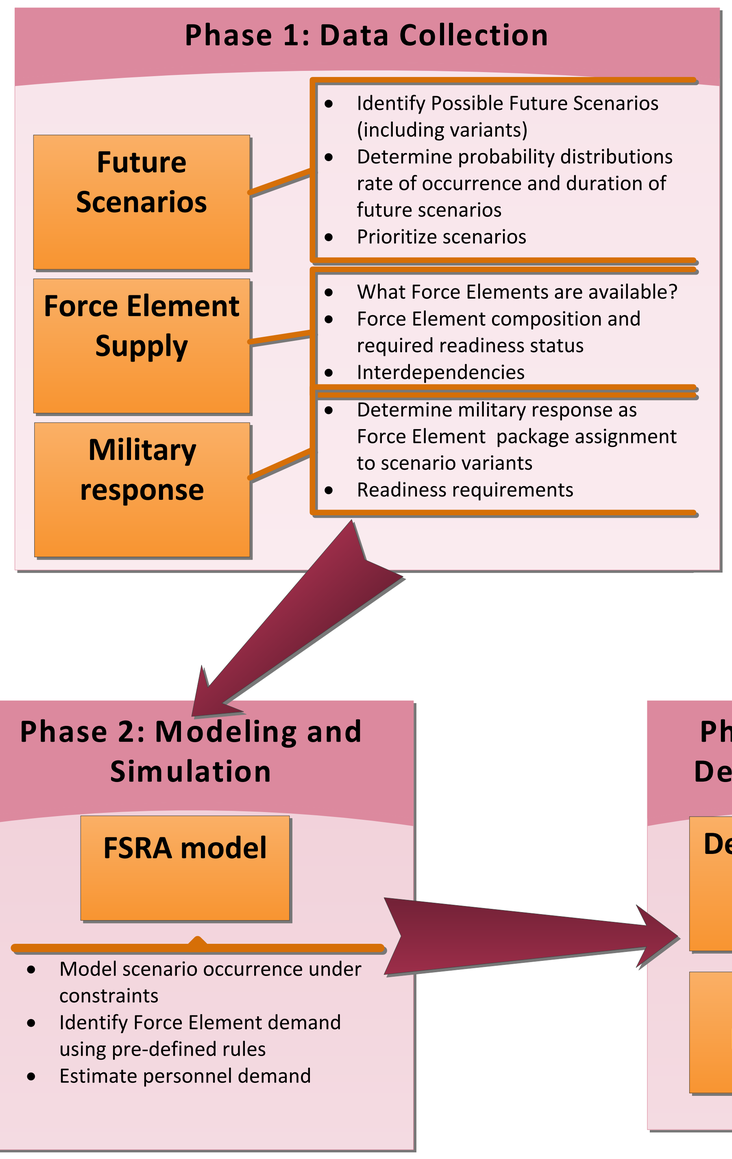
The Canadian Defence strategy *Strong, Secure, Engaged* (SSE) published in 2017 outlined the Government of Canada's defence priorities. Not only it stated what type of engagements the Canadian Armed Forces (CAF) should expect, they also specified the level of effort CAF should be able to exert concurrently. Specifically, the CAF should be able to simultaneously defend Canada, including responding concurrently to multiple domestic emergencies in support of civilian authorities, meet its NORAD and NATO commitments, and contribute to international peace and stability through two sustained deployments of 500-1500 personnel, one time-limited (6-9 months) deployment of 500-1500, two sustained deployments of 100-500 personnel, two time-limited deployments of 100-500 personnel, one Disaster Assistance Response Team (DART) deployment, and one Non-Combatant Evacuation Operation.

The analysis, a part of the Force Mix Structure Design (FMSD) component of the Defence Plan 2018-2023, is to be executed in three stages. During the first stage presented here, the analysis of the structure for Force Employment is being executed; follow-on stages will analyze the Force Generation and Institutional Elements of the CAF.

A Monte-Carlo-based methodology was developed and implemented. A set of future employment scenarios was created specifically for the FMSD; the military response to these scenarios was contextualized for different broad military effect focus areas (maritime, land, air, joint) and in differing operational support contexts (level of austerity, host nation support, logistics considerations etc.). The outcome of this future demand analysis can then be compared against current force element inventories to identify gaps, shortfalls or affluences, and enable follow-on analysis of various courses of action to address deficiencies or to understand, manage and mitigate risk.

FMSD as a Supply Demand Problem

In its very nature, the question whether a force structure suffices for potential future operational demand is a supply-demand analysis. The supply is represented by the existing available force inventory, and the demand is represented by the expected CAF response requirements. This problem is highly complex, as it requires a variety of force elements on the supply side to account for differing effects delivery options in varied operational contexts.



FORCE STRUCTURE READINESS ASSESSMENT TOOL

Data Collection

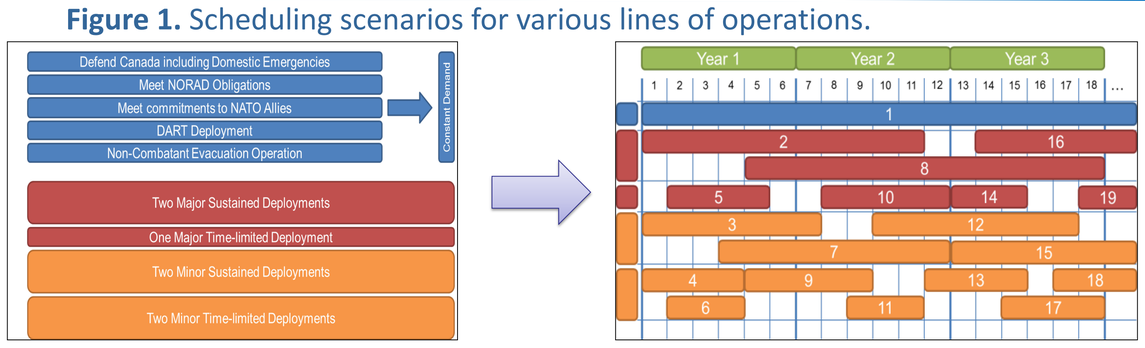
A set of 17 scenarios covering a full range of missions mandated by SSE, with approximately 80 variants was developed specifically for FMSD. Various variants correspond to different operational effect delivery options, and differing operational support. The scenario details, prioritization, and associated notional Force Packages were collected in close collaboration with force generators and force employers. Scenario rates of occurrence and possible duration ranges were determined using a combination of historical analysis and professional military judgement.

On the supply side, data was collected on the existing available Force Elements including their size and detailed composition. This was necessary because Force Employment structures often do not match garrison structures, and garrison structures are responsible, to various extent, for functions beyond Force Employment. Additionally, some deployed structures are task-tailored amalgams drawn upon personnel from across the CAF, and have no corresponding garrison structure. Force Generation and Force Employment stakeholders were requested to identify Force Element variants whenever the size or a composition of the elements differed for varying operational effects or support demands. This allowed for more specific matching of the best Force Element variant to a given scenario variant.

Modeling future operational demand

The Force Structure Readiness Assessment (FSRA) tool randomly computes a scenario combination (using frequency and duration inputs) over a predefined time period (for example, five years). For each available slot**,** a scenario is randomly selected using pre-defined rates of occurrence, assuming that they are from Poisson distribution. The selection is further limited by pre-defined constraints (e.g., number of scenarios of a similar type, or which scenarios were allowed for each line of operations). If a scenario is selected, its notional duration is selected using pre-defined probability distributions. The selected scenario is then assigned to the corresponding slot for an appropriate number of subsequent time steps (e.g., a 6-month scenario will occupy 3 slots). Once the scenario ends, the slot becomes empty again and new selection is conducted. If no scenario was selected, the slot remained empty until the next time step.

Figure 1. Scheduling scenarios for various lines of operations.



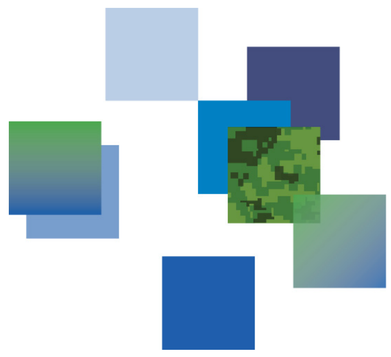
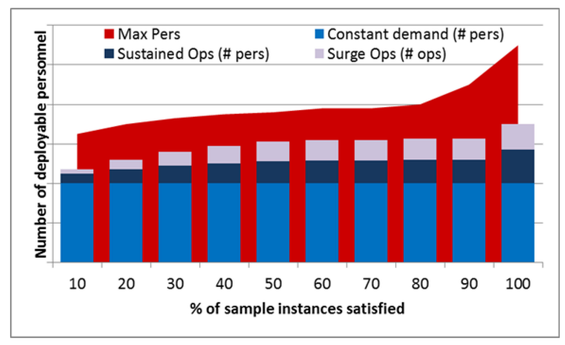


Figure 2. Example of FSRA results (not actual numbers).



Analysis

The preliminary analysis looked at the personnel demand stemming from the employed force elements. Instead of treating each trial period separately, the first round of analysis looked at the cumulative results across all sample points. The following questions were addressed during the preliminary analysis:

- Which Force Elements were used at each sampling point?
- What was the total number of personnel for all Force Elements necessary to meet the concurrency demand for a given percentage of demand?
- What was the maximum number of personnel required to provide all the Force Elements required for a given percentage of demand?
- What was the average ratio of personnel in support of constant demand, sustained operations or surge operations?
- Which Force Elements were used most/not used at all?

SUMMARY

In order to estimate near-future demand on CAF to meet the demands of SSE, an in-house tool called FSRA was developed. A preliminary analysis of the results was done, and further analysis is planned.

- The present analysis did not consider the supply side of the relationship. The information for the supply analysis is now being collected in collaboration with the subject matter experts.
- The relationship between Force Employment demand and supply will inform options for force structure adjustments, and assessment of risks, as well Force Generation and institutional requirements to sustain the Force Employment demand.
- The Force Generation and the Institutional structure will form the bulk of Stage 2 and Stage 3 of the FMSD. Because of the interdependencies, need to consider full life-cycles, and complex training-specific demands (qualified trainers, facilities, platforms, etc.) the current methodology is not expandable in a straightforward manner.

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