

# Commander's Advisory System for Airspace Protection (CASAP)

- A Distributed Decision Support System based on Multiple Criteria Decision Analysis
- In-depth comparison of courses of action
- A variety of analysis tools

## New Advisor Tool

Rapid developments in artificial intelligence and in other information technology areas, especially in the modelling of decision-making processes, are expected to greatly influence the Command and Control (C2) strategy and structure of the Canadian Forces (CF). Modern aids to decision making that are able to deal effectively with complex operational situations involving masses of current information and prior knowledge are now becoming available to enhance C2 capabilities even more.

For example, the 1 Canadian Air Division / Canadian NORAD Region (1 CAD/CANR) Air Operation Centre (AOC) plans, conducts

and monitors a variety of air activities. In routine operations, C2 decisions are governed by established doctrine, orders and procedures. However, in emergencies (crises, deployments to meet unexpected contingencies or actual conflict), novel approaches are often needed. Because the AOC is the focal point for planning, directing, controlling and monitoring the forces assigned, the development and evaluation of possible courses of actions (CoAs) to respond to the emergency are particularly critical activities. Generating and evaluating possible CoAs is a team effort, with many proposals and evaluations proceeding in parallel before the options can be presented to the Commander for selection.

The scientists have developed a prototype advisor tool to help describe and respond to one of the possible scenarios, an air-space violation. The Commander's Advisory System for Air-space Protection (CASAP) helps the AOC team to describe and share information about such an incident, to develop pertinent CoAs, evaluate them and to determine which one is the most appropriate to the circumstances.

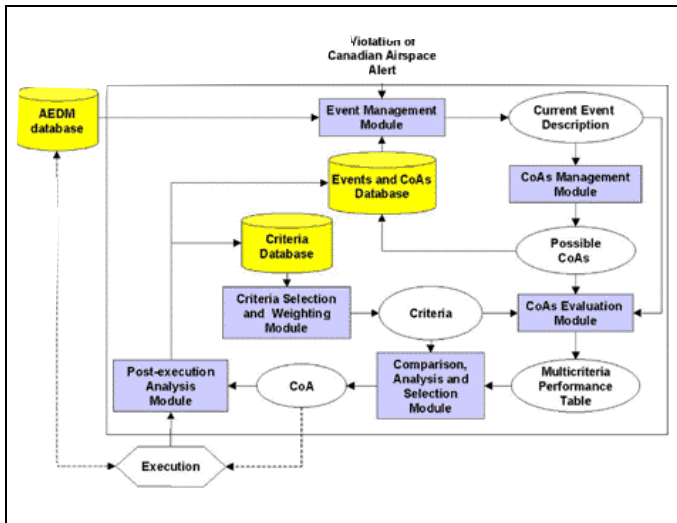


*DRDC Valcartier has been working on developing an advisor tool to help describe and respond to one of the 11 force planning scenarios, an airspace violation incident.*

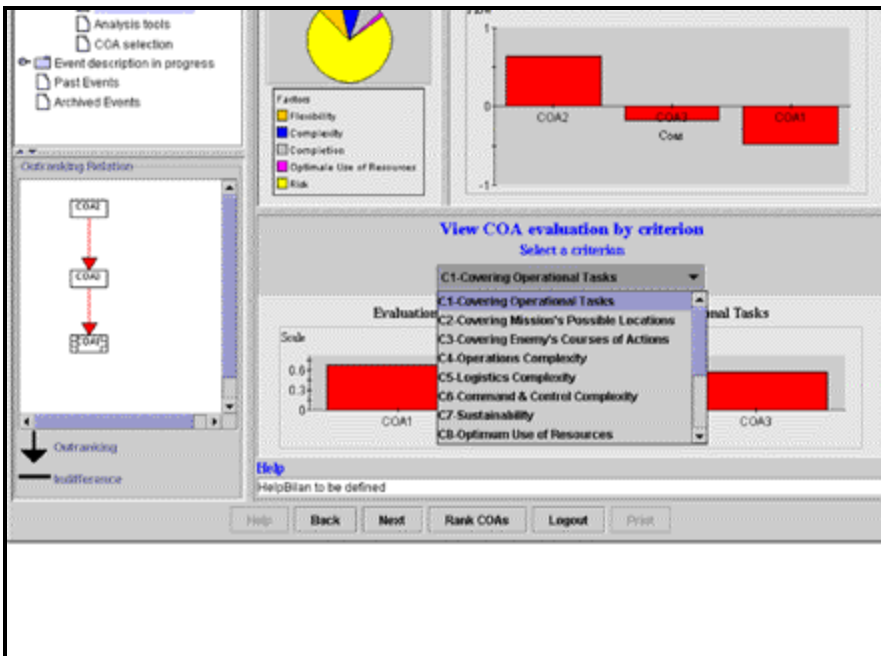
## Approach

CASAP was developed using detailed information on staff organization and responsibility and an in-depth, iterative knowledge-acquisition process. It employs a selection of information representation techniques derived both from established procedures and from observations made on the decision-making activities employed in realistic simulations and exercises. Key areas in which different CoAs must be evaluated have been identified and a set of 14 criteria has been formulated and validated with decision makers. They can be grouped into five areas: flexibility, complexity, sustainability, optimum use of resources, and risk. The evaluation and ranking of the CoAs is achieved within a Multiple Criteria Decision Aids (MCDA) framework, which deals appropriately both with heterogeneous information and incomplete data.

# Commander's Advisory System for Airspace Protection (CASAP)



The Commander's Advisor System for Aerospace Protection (CASAP) functional architecture encompasses six different modules.



The selection module of CASAP presents the ranking and intermediate results to help the Commander in the selection process.

## CASAP Functionalities

CASAP comprises six functional modules. One allows a user to describe a counter-drug event and to share this information with other users. It includes a retrieval facility to search out similar past events and manage the event's database.

A second module assists in the generation and description of CoAs that might be executed to respond to the described event. This module includes the ability to retrieve and duplicate CoAs from past or archived events.

Once a satisfactory set of candidate CoAs is generated, CASAP notifies the Commander. Then the selection process begins. To help in this process, a third module evaluates each CoA according to a set of criteria and computes a priority ranking. The fourth module presents a variety of ways of viewing this ranking and provides different analysis tools, including weight stability analysis and "what-if" analysis based on thresholds or on evaluation criteria. The Commander can communicate with anyone logged on the CASAP system, either to announce the selection of a specific CoA or to request additional candidate CoAs.

After the operational activity outlined in a particular CoA has been executed, a post-analysis module can be used to summarize the lessons learned. CASAP also includes a module to specify the criteria to be used in each type of situation. Although the present system was developed to deal specifically with counter-drug scenarios, this module allows it to be extended easily to other situations, by suitable adjustments to criteria and other parameters.

CASAP is based on a distributed architecture accessed through an intranet browser and implemented with Java applets and servlets. Applets are used on the client side, servlets on the server side to provide access to databases and to evaluate alternative CoAs. The transportation layer used is http.

The Valcartier-developed CASAP would not have been possible without the very close co-operation of the command staff at Fighter Group Headquarters in North Bay. These assistance from the Director of Operational Research was particularly valuable. Valcartier also benefited from the collaboration with several university and industrial partners in the development and application of multicriteria analysis techniques.

## For more information

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