

# Experimentation



User-centred, simulation-based – Experimentation is used to support every decision made. Be it a system design, acquisition, capability management, or research and development program - all of these require the evaluation of alternatives and all involve various forms of experimentation. Leveraging simulation, CAE provides advanced experimentation support to conduct user-centred trade-off studies where alternative requirements, technologies, design solutions, and plans and procedures are explored.

## Reconfigurable simulation-based experimental environments

Simulation is a cornerstone to CAE's experimental approach. Constructive simulation studies are used to study new concepts and designs and to predict human task performance and workload. Virtual simulation studies are used to study human-in-the-loop task performance, workload, and situational awareness at the individual and team level.

CAE's experimentation labs provide reconfigurable simulation environments that our teams regularly use for visualization of experimentation, allowing us to provide efficient simulation-based experimentation for clients.



## The right scenarios drive the right study

Most studies define the experimental scenario within which the evaluation will occur. Effective consultation with management, operational, and maintenance communities results in the definition of valid scenarios for experimentation. Structured analysis sessions with stakeholders focus the experiment on the highest prioritized scenarios to be tested and evaluated within the bounds of the decision space. CAE's global repository of experimental scenarios for the defence and public safety and security sectors is used to design effective, detail-specific scenarios for experiments.



## Measures that matter

In any experiment, the definition of measures is critical. Clients who need experiments and evaluations need to make decisions, and their decisions are based on the variables that matter to them and their businesses. Systematic, unbiased consultation of stakeholders leads to the definition of measures that matter and requires the full capability of our user-centred approaches for analysis, design, and experimentation.

## Your place or ours? The CAE battle lab network

Many clients appreciate the value of simulation-based experimentation. Many of them have their own simulation laboratories. On these projects, we provide support designing and conducting their experiments. Often our support extends to configuring and operating our clients' simulation environments for visualization and experimentation. Other clients, however, would rather not invest in simulation laboratories. On these projects, they take advantage of our laboratories which are equipped with the latest simulation tools and technologies.

At times, these two capabilities are used in combination. Our simulation environments are networked with our client's simulation environments to conduct collaborative, distributed simulation experiments or alternative designs at the system or capability level.



## Just-in-time complexity

An experiment is conducted to help a client community make a decision in a timely, cost effective fashion. Defining study complexity and using the right amount of visualization or simulation to support that study are critical components of our user-centred, simulation-based approach to experimentation. When studying new system or capability designs, we use different tools for visualizing and simulating concepts, capability designs, or detailed system designs as part of our Capability Engineering and Design Approach™, our Synthetic Environment Based Acquisition, and our Human Systems Integration methodologies.

## Capability engineering and design approach (CEDA™)

Only in a simulation-based environment can a capability be truly experienced. To physically model a capability is impossible. The vast nature of a capability – its personnel, processes, and systems – make running a live exercise of it in its entirety too costly in dollars, manpower, and equipment for any military force, multi-agency emergency response team, or critical infrastructure team. Simulation provides the perfect solution for running capability-based experiments.

CAE has developed a Capability Engineering and Design Approach (CEDA™) that integrates our team's unique skill sets in the fields of Capability Engineering, Human System Integration, and Modelling and Simulation to conduct user-centred, simulation-based analysis, design, and experimentation of capabilities.

Constructive simulation environments are used to support capability experimentation by offering distributed command team simulation environments. These environments allow multiple levels of command to work at simulation stations and “command” their units. These experiments raise the fidelity of the evaluation of alternative architectures to include human-in-the-loop evaluations of alternative command relationships. These simulation environments allow command and control personnel to experience alternative capability configurations in a cost-effective, reconfigurable environment.

## Program example – JSMARTS II experiment

The JSMARTS II Experiment was a collaborative experiment between industry, government, and academia. The goal was to demonstrate how existing defence modelling and simulation capability can be used in civilian emergency management environments, yielding a new capability in emergency management simulation and analysis. In a distributed simulation, our team simulated a radiological scenario occurring in Ottawa, Canada. In a simulation-based command centre, incident commanders coordinated the sensor search efforts of multiple first responders. The experiment was developed using the principles of capability engineering. Using capability metrics, CAE analyzed the capability created through the integration of these technologies.

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