


Air Force Modeling, Simulation & Training



DRDC Toronto's Multi-Task trainer participated in First WAVE as one of four CF-18 virtual aircraft.

Modeling and Simulation (M&S) is a key component of the wide-ranging program of transformation (including advanced mission training) in Canada's Air Force today. Numerous M&S projects, sponsored by the Chief of the Air Staff (CAS), are intended to increase air power capabilities affordably and effectively. These projects are coordinated via the annual CAS Planning Guidance, through linkages between the various projects, and with unifying events and exercises.

Of these projects, the CF-18 Advanced Distributed Combat Training System (ADCTS) was the first predicated on the power of the internet to connect crews through advanced simulations.

Budget pressures and a changing security context have reduced opportunities to train in live settings. However, live flying constraints, such as electronic warfare, weapon employment, and the array of targets and opponents available, do not apply in a well-managed virtual environment. R&D has repeatedly demonstrated the effectiveness of training in shared Virtual Environments.

ADCTS will implement, starting in 2005, a system of networked cockpits between Air Wings in Bagotville, Quebec and Cold Lake, Alberta. Because the aircrew can "see" each other visually and electronically, team training can take place in a shared environment of sufficient complexity to challenge the most experienced operators.

Using industry standard protocols for distributed simulation, ADCTS cockpits can link with Navy and Army environ-

ments for joint training. The Distributed Mission Operations system in the United States can also link with the ADCTS for combined mission rehearsals.

ADCTS has played a lead role in exposing the Air Force to the concept of distributed simulations. All Air Force capabilities, especially those that could involve combat in complex settings, have included the capacity to link to other weapon systems and to share data bases in their training simulation plans.

Maritime Helicopter, Aurora and Griffon Training Systems, as well as Command and Control operators, can connect to a shared synthetic environment, be it for complex war gaming, or to access M&S content on a DND network.

Realizing that modern forces operate in joint settings, the Air Force M&S structure supports Navy, Army and Joint operations, and includes agreements with other DND stakeholders to pursue common interests in Distributed Mission Operations and to share M&S content.

The Air Force co-operated with DND's Information Management Group,

the Deputy Chief of Defence Staff's Geomatics and Experimentation Centres, and Defence R&D Canada in a NATO-distributed simulation nicknamed, *First WAVE*. Canada networked with six other NATO countries to conduct the largest real-time combined air combat simulation ever attempted.

Canada contributed simulation sites in Bagotville, Mirabel and Montreal, Quebec; Ottawa and Toronto, Ontario; Winnipeg, Manitoba; and Cold Lake, Alberta. The *First WAVE* simulation ran for two weeks in November 2004, and produced a wealth of lessons learned to define future NATO systems. In separate tests, the Canadian performance provided a solid basis on which to proceed with other joint and combined distributed exercises.

The Air Force currently leads planning teams for a joint synthetic exercise nicknamed, "War In a Box", or WIB for short.

WIB task teams are planning the links between the Maritime Warfare Centre in Halifax, the Director of Land Synthetic Environments in Kingston, and Defence R&D and Air Force virtual cockpits in Toronto, Bagotville and Gagetown. The DCDS CF Experimentation Centre in Ottawa provides task team members and permits access to the IM Group which manages CF Experimentation Network. WIB will increase DND's ability to plan and execute complex joint scenarios, using as a

Maj Parsons and Capt Dietert, of DAR 7, operate a First WAVE Exercise portal. The portal permits onlookers, like LGen (ret'd) Pennie (background, right), to view the exercise from any eye point desired.



The Air Force has determined the effectiveness of Virtual Environment for crew mission training, engineering and system management. Technical work is progressing to define a modular architecture and joint simulations are underway. However, success in an M&S system cannot be guaranteed without effective management of the content generated. The Air Force has sponsored a project called the Air Force Integrated Information and Learning Environment (AFIILE). This provides the capability to store and manage MS&T content in an on-line, web-based service. Via AFIILE, DND members will have assured and secure access to models, simulations, training documentation and other items of value to their training or technical programs. AFIILE will provide the means to distribute maps, weather information, intelligence reports, tasking orders and face-to-face briefing and debriefing for complex simulations, be they for combat missions or maintenance procedures.

Based on off-the-shelf Learning Content Management Systems, AFIILE shall also provide the backbone for Air Force e-learning and an eventual connection to DND's life-long learning initiative, the Defence Learning Network. AFIILE has made excellent progress through the DND acquisition process and should begin delivering services in 2005 or early in 2006.

DND's use of Virtual Environments is becoming pervasive and has helped develop a dedicated program of cooperation with the Air Force, Navy, Army and Central staffs, users and operators.

Structured simulations, demonstrations and events keep work focused while technical work continues on MS&T content, simulation architectures and management tools. The Air Force believes that a DND-wide shared Synthetic Environment will provide an effective cooperative means to plan and build Canada's future force structure. **FL**

LCol Rick Thompson, Director of Air Requirements 7, is responsible for Modeling, Simulation and Common Training requirements for the Air Force. DAR 7 members work with Materiel and Information Management Groups to Direct and Manage the Canadian Advanced Synthetic Environment, the Air Force Integrated Information and Learning Environment and Air Technician Renewal capital projects.

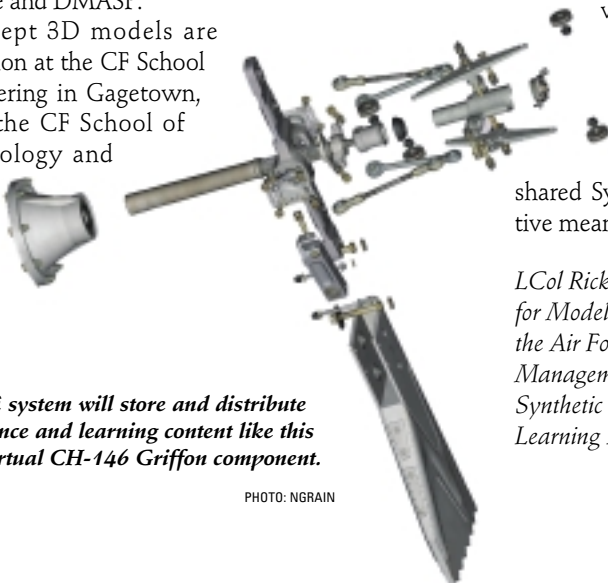
focal point the evacuation of Canadians caught in a foreign war zone. This exercise shall take place in 2006, and will define the protocols and procedures for future joint virtual exercises.

Networking technologies from the same manufacturer can be straightforward, but it is very challenging to effectively network software and equipment that does not share the same internal architecture. The Air Force will issue a definition contract by May 2005 to build on knowledge from the DRDC NTS project to set a style of architecture that can more easily re-use simulation components from third party suppliers. This contract, managed by the Director General of Aerospace Equipment Program Management, Radar and Control Systems is called the *Griffon Mothership*, a name chosen to reflect the client-server relationship envisioned for the simulation architecture.

Project personnel from the Director of Air Requirements and Radar and Control Systems have worked closely with staff at 1 Wing Headquarters in Kingston to promote interoperability with our own Army and Principal Allies. Hence, two Griffon NTS in Gagetown, with the further assistance of DRDC's Director Science and Technology Air, will link with the United States Army's new simulation centre in Fort Rucker, Alabama in a tactical level exercise. Griffon NTS will then go on to participate in War In a Box and subsequent Canadian joint exercises.

In addition to defining a standard architecture approach for the Air Force, the Griffon Mothership activity supports the creation of M&S content. It provides a means to manage resources at the DCDS Mapping and Charting Establishment, so that DND will always have access to quality terrain sets for training and mission rehearsal. Griffon Mothership has a cooperation arrangement with ADM (Materiel) to select a common means of representing three dimensional representations of complex systems and structures for weapon system management and technician training. In a 2004 study, the CF Materiel Group's Director of Materiel Acquisition and Support Programs (DMASP) and the Air Force determined that a web-based, shared, 3D representation of an aircraft system communicated information about that system in less time and with fewer errors than conventional means. This important finding has prompted further cooperation among the Army, Air Force and DMASP.

Proof-of-concept 3D models are now under evaluation at the CF School of Military Engineering in Gagetown, New Brunswick; the CF School of Aerospace Technology and Engineering in Borden, Ontario; and at the Quality Engineering Test Establishment in Gatineau, Quebec.



The AFIILE system will store and distribute maintenance and learning content like this virtual CH-146 Griffon component.

PHOTO: NGRAIN