

DSTO Uses VR-Link and VR-Forces to Build RAAF Training Solution

The Air Defence Ground Environment Simulator (ADGESIM) was developed by the Defence, Science and Technology Organization (DSTO) to evolve Royal Australian Air Force (RAAF) training systems and prepare personnel for network-centric operations. In some situations, the Australian Defence Force (ADF) had previously had no option but to use live assets to support training. Live training can be expensive in the short-term and can impact on the life cycle cost of military platforms. To address this, the RAAF is adopting distributed simulation technologies, like DIS and HLA. ADGESIM, a network centric aerospace battle management application, is part of this strategy.



VR-Forces open architecture and flexibility made it a natural choice for DSTO's AGGESIM project.

“When we went to defense contractors and explained what we wanted, we received responses to our RFI that were up to fourteen times the available budget, with a time frame of three to five years, and offering only an eighty five to ninety percent solution,” explained Jon Blacklock, Head, Air Projects Analysis, Air Operations Research Branch of DSTO. “Things were changing rapidly in the world. The RAAF had an immediate need for advanced training systems and there was insufficient time to go back to industry with a revised RFI; so DSTO was asked to provide a fix. We had conducted a survey on COTS simulation products as part of our research program, and had **identified VR Forces® and VR-Link® as the only products with a sufficiently open architecture and useable programming interface to support rapid prototyping and development.** Using a mixture of MÄK’s COTS tools and custom-built “thin client” applications, we were able to create ADGESIM in less than six months, for around \$400,000 which is half the original budget. That figure included not only software and development, but hardware and installation too.”

ADGESIM comprises three applications developed by DSTO and YTEK (DSTO engineering contractor) in C++ and closely integrated with VR-Forces and VR-Link. The ADGESIM Pilot Interface is used to create and fly simulated aircraft entities. It presents all the information required for each non-aircrew operator to competently maneuver up to twelve aircraft (or any other entity type) either singly or in formation. Entities can be dropped or resumed for control at any time. All high-resolution entity modeling is done in the background by VR-Forces and ADGESIM entities have been proven compatible with both Australian and US Navy distributed simulation environments. The RAAF routinely runs scenarios with eight Pilot Interface workstations simultaneously without taxing the PC-based ADGESIM system.

The Simulation Manager application populates the virtual environment with large numbers of lower-resolution “background” entities, which it models internally, and is able to schedule or dynamically start high-resolution entities through its interface to VR-Forces. It is a stand-alone application that uses VR-Link to generate Entity State and

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other mission essential Protocol Data Units. Air routes and navigation environment data is integrated directly from Australian and International En-Route documentation sources used by commercial and military pilots. Flight plan information can be read directly from civil air traffic control management systems and converted into scenario events. In this way, it is not unusual to have several thousand civil aircraft operating as part of a C4I network operation. ADGESIM's third component is the Sensor Manager application. Sensor Manager ONIONs (Orthographic Network Input/Output Nodes) simulate real world sensors and systems and acts as a gateway between the ADGESIM DIS synthetic environment and operational aerospace tracking systems. Sensor performance mimics real world complications, including software hiccups, radar and detection problems, weather, and clutter. Sensors include civil and military ground-based 2D and 3D radars, Over-The-Horizon Radar, Automated Dependent Surveillance Broadcast, and a range of airborne and (soon) space-based sensors.

“We were looking for the best bang for our buck,” said *Blacklock*. “That and our short time scale necessitated looking at available COTS products to use as a framework for ADGESIM. Our research led us to choose VR-Forces and VR-Link.”

VR-Forces is a computer generated forces toolkit for generating and executing battlefield scenarios. A fully distributed architecture means that you can divide simulation responsibilities among multiple simulation engines, and control them from one or more remote front end GUIs. Multiple front-ends allow for collaborative scenario generation or training. A C++ API allows you to customize nearly every aspect of the VR-Forces application, or integrate VR-Forces functionality into your applications.

“VR-Forces’ flexibility secured its place in our development,” said *Blacklock*. “The ease of customization and the API were among the biggest reasons we chose it. At the start it lacked a few features on our wish list, but

MÄK’s outstanding tech support helped us fill in the gaps. During the six-month development, MÄK redeveloped their applications and added features in parallel with our development. **It is a testament to MÄK’s professional approach that when we got the release version of VR Forces, we needed just two weeks prior to installation in the first Regional Operations center.** We plugged in our applications and everything just worked.”

VR-Link is a simulation networking toolkit for linking simulations via DIS and HLA. VR-Link simulations can be fully HLA compliant and maintain the DIS compatibility. VR-Link provides a single documented API that abstracts away the details of DIS or HLA networking. When you write your code to the VR-Link API, your applications become natively compliant with DIS, HLA 1.3 and IEEE 1516. VR-Link provides DIS networking for ADGESIM.

“Network centric warfare has changed the paradigm of doing business,” explained *Blacklock*. “Training is no longer just a domestic concern. Programs need to be able to connect globally, and to train as part of an international coalition. ADGESIM is part of this solution.”

“Our approach, COTS applications combined with customized thin client applications, will reduce life-cycle costs and increase the likelihood that projects are delivered on time, on budget, and according to specifications. It’s a risk reduction strategy. A standards-based, distributed simulation architecture, coupled with COTS and thin client applications, as used in ADGESIM, has resulted in a flexible, scalable and highly interoperable application suite.”

DSTO has now negotiated commercial release of ADGESIM through YTEK. The combination of MÄK’s outstanding core products and the flexible ADGESIM suite makes for a powerful niche training capability for networked aerospace and combined arms warfare.

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