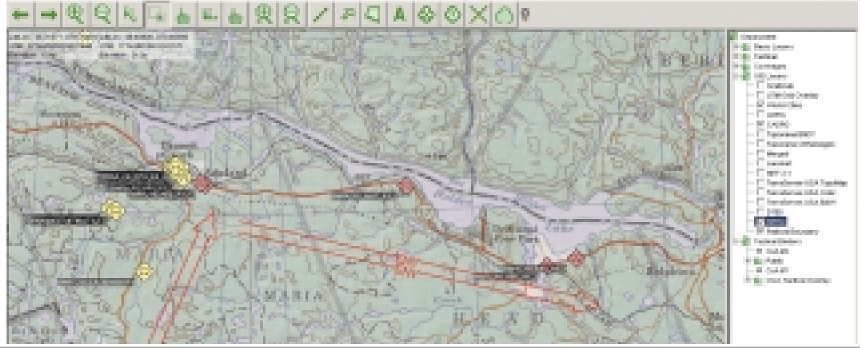


ISTAR

Intelligence, Surveillance, Target Acquisition and Reconnaissance

During the course of Land Forces (LF) ISTAR 05, an experiment that took place in association with this summer's reserve exercise for LFCA held in Petawawa, EX STALWART GUARDIAN, constructive simulation was called upon to perform in the concept development and experimentation role rather than the more traditional collective training role. Of particular interest to the planners was the decision-making process of the Commander, as affected by the tasking of sensors and the subsequent management of the return flow of sensor products.

There is serious concern surrounding the Commander's lack of necessary equipment to view the situation in real time, allowing him focused, informed and rapid decisions. Specifically, tools for the analysis and electronic dissemination of intelligence are lacking. New technology must be called upon to provide these tools in co-evolution with new processes designed to draw situational awareness both from the opposing forces and from NDHQ.

Sensors hold a vital place in today's battle space. Electronic warfare technology, weapon locating systems, human intelligence, airborne and ground-based electro optical and infra red sensors and digital imaging all combine to offer a clear view of a surveillance zone of several thousand square kilometers.

Coupled to these sensors, the advent of relatively simple platforms such as the Unmanned Aerial Vehicles (UAV) bring junior commanders much needed local capability. All of this capability however requires a much larger analysis effort to extract relevant information that can lead to the desired battle-winning decision. Can the All Sources Intelligence Center cope with the onslaught of data and the required analysis effort required to mold mountains of data into much needed information and knowledge?

LF ISTAR is an omnibus project within DND. Now drawing towards the end of its definition phase, the project is charged with developing, delivering and evolving an integrated, interoperable ISTAR capability that will improve the ability of decision makers to visualize the battle space, manage ISTAR resources in the planning and implementation of actions allowing mission success. It lies squarely on the CDS' critical path towards "knowledge based, command centric, strategically relevant and tactically decisive forces." To this end, the LF ISTAR program office considers the operational requirements from the user, and subjects them to a "Systems Engineering" approach designed to satisfy those needs. This drives the ISTAR program through its spiral development where the start point is known but the end result is revealed only as successive trials guide the project teams along an increasingly refined definition path. In the end, the deliverable must be a system of systems linking sensors, decision-makers and weapon systems in such a way that information can be translated into a synchronized and overwhelming military effort at optimum tempo designed to destroy the enemy's coherence and confidence in his ability to fight.

> The role of ISTAR is to integrate the intelligence process with the surveillance, target acquisition, & reconnaissance assets, in order to improve the commander's Situational Awareness and to enable successful actions.

LF ISTAR decided to use simulation technology to visualize the future.

STRIVE CGF is CAE's next-generation synthetic tactical environment and computer-generated forces (CGF) package. It is an off-the-shelf software product that simulates a real-time virtual battlefield for air, land, sea and space applications. It provides a suite of friendly, neutral and enemy forces entities as well as customizable behaviour suitable to fulfill all immediate requirements for training, simulation based acquisition, concept development and experimentation or other requirements.

ISTAR 05 showed that STRIVE can form the backbone of any synthetic environment used in all CF supported simulation domains. STRIVE's ability to visualize spatially referenced entities in concert with the main Synthetic Environment principles of authoritative representation, harmonization across capability components, economy of effort and ensuing cost effectiveness makes it an attractive tool within the spiral development process where the end state is revealed late and subject to the "we'll recognize it when we see it work" test.

It is important to remember however that while the tool is important, quickly and simply federated synthetic environments are key. In-house expertise of STRIVE is kept to a minimum with preference given to outsourcing specialized support as required. Defence Research and Development Canada Ottawa's Future Forces Synthetic Environment contract with an industry coalition led by Greenley and Associates offered the ideal contract vehicle for this simulation based concept development and experimentation project.

During ISTAR 05, STRIVE was called upon to challenge the management of data and information emanating from network-centric operations. These new operations are often referred to as "command and sense" and could be even further labeled as "no command without sense." The challenge is to refrain from overwhelming traditional command functions and the duties of field staff with raw sensor output. OP ATHENA triggered the rapid acquisition of several operational ISTAR sensors and the problem is here, now. From now on, no LF mission will be launched unaffected by this issue.

It seems that for each aspect of emerging sensor technology a corresponding adverse effect occurs. EO/IR sensors are now quite advanced, cheap and miniaturized, allowing UAVs to be small enough for local commanders to easily operate for tactical, over the next hill or next neighbourhood views.

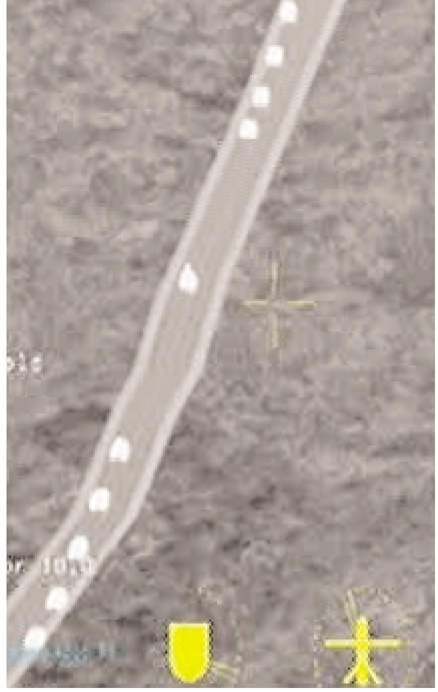
The demise of film (which required resources and management) in favour of direct digital feed, allows for endless streams of imagery, which in turn calls for interpretation and deconfliction. While the local commander may be satisfied with his local "picture," his feeds must still be fused with information emanating from other sensor sources for the best possible situational awareness across the total area of interest.

NDHQ will be adding feeds from other agency sensors, which in turn need fusing into the common operating picture. While certainly a tall order, the ensuing fidelity of awareness will ultimately drive the optimum granularity of the commander's tactical options and resulting plan.

While most will agree that there is indeed a "blizzard of information" problem, there exist few metrics to scope out the size of the issue. Other than placing the requisite number of sensors in the field properly stimulated by a live and expensive, non eco-friendly field force and credible tactical scenario, the only plausible and affordable way of illustrating the size of the problem is to turn to a constructive simulation with a synthetic environment of suitable resolution.

CAE's STRIVE was successfully called to carry out this role. Loaded with terrain data including Petawawa, Algonquin Park, Hwy 17 and surroundings, it was decided to model the approach of reinforcements to the tactical situation played out in EX STALWART GUARDIAN. This was an attractive solution as it geographically deconflicted real and virtual forces while creating common tactical considerations linked to the speed and composition of the advance.

These time and space considerations were ideal for triggering sensor deployment taskings. Both real and virtual sensor platform deployment were subjected to the mission planning considerations of both the All Sources Cell (ASC) and the Reconnaissance and Surveillance Squadron. In this fashion, the virtual force remained very much a part of the exercise without



interfering with real training operations. An image generator was used to extrude a third dimension from 2D terrain, furnishing realistic features such as buildings, roads and trees where appropriate. Vehicles hiding in the woods were convincingly half-obscured and somewhat camouflaged for daytime viewing, dramatically revealing themselves under the white or black hot IR display.

Four sensor platforms were modeled: the CP-140 AURORA aircraft, the SPERWER and SILVER FOX UAVs, and finally the Coyote. All platforms were modeled according to unclassified parameters, as was each of their EO/IR sensors. As the sensor operator associated his view to each platform, all optical capabilities of that sensor were equally associated. Once this was configured, a group of four engineers could respond to the R&S taskings for sensor missions. One engineer to monitor the system, one for computer-generated forces, one interface controller for sensor products and one sensor operator.

In ISTAR 05, the areas under scrutiny were invariably portions of Hwy 17 and off-road bivouac areas. Still or video images could then produce an important level of detail to the analysts. The main information included armoured vehicle identification, composition of convoy, strength and progress. Information consisted of both images and contact reports.

Once satisfied that the synthetic environment would correctly model and log the chosen interactions between entities and produce the imagery required, the focus fell on having these products stimulate operational command systems to create the information handling challenge. For this, PMO LF ISTAR asked Oerlikon to modify its existing Air Picture Universal Gateway, designed to transfer the Air Defence Anti-Tank System Local Air Picture into the Operational Database (ODB) to play the same role for STRIVE by taking its log, showing what is in effect contact reports, and transferring specific information into the ODB. Once in the ODB, the information was then replicated as necessary to any ODB client of the Command Information System in use.

All imagery, real or virtual was sent to an image repository for analysis as required. Critical here, for the virtual product, was the need to save system metadata along with the imagery to geo-reference the image within the analyst's system folder. Oerlikon was given the task of taking STRIVE sensor jpeg images and linking with its metadata to achieve the National Imagery Transmission Format 2.1 that is required of all images. Once complete, virtual and real images could be handled in exactly the same way thus producing a volume of sensor products sufficiently dense to challenge the chain of command in analyzing the results against the commander's intent, exploiting opportunities, matching products to requests and imposing network stress in general.

Finally, DRDC Ottawa's RADARSAT II simulator was networked in order to listen to STRIVE's Higher Level Architecture network and take all entity locations. This allowed the virtual entities to be displayed alongside real ground moving target indicators.

ISTAR 05 aims were met for all to see when a realistic blizzard of information was created with a minimum of effort, illustrating the scope of the analyst's task. It became obvious that current procedures surrounding sensor products are in need of serious review, and much work is now required to bring about the optimum mix of training, personnel, technology and procedures which will allow a concise course of options to emerge from the mountains of untreated sensor data that can be expected on future missions. FL

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