# Tactical Information Fusion

- **Raw intelligence information data is usually fragmented and unreliable.**
- **Automation can help to formulate the best possible intelligence picture.**

## Sorting Out Battlefield Information

No environment presents more obstacles to the successful management of information than the battlefield. The commander needs timely, accurate information about enemy forces¾their disposition, organization and state of readiness¾as well as about his own forces, the terrain, the present and future weather, and so on. The raw data from which this picture must be built comes from many different sources, both cooperative and non-cooperative, some under direct control and others fortuitous; it arrives in many forms and formats; its reliability varies from excellent through questionable to deliberately intended to deceive; and it arrives in an almost random time sequence.

Combat information fusion is the process by which information from the battlefield and other sources is collected, collated, integrated and interpreted to produce the clearest possible picture of the enemy: its location, organization, strength and intent. Since military operations often stretch over periods of many days, this complex interpretation task must be handled smoothly by shifts of analysts, with each new shift picking up where the previous one leaves off, and no chance must be left for information to be lost "in the cracks."

## Help From Computers

Although modern computing assistance can help, it is far from evident just how it should be applied. The Valcartier scientists are addressing this knotty problem with the Advanced Concepts on Tactical Information

Fusion (ACTIF) project, in which a network of powerful workstations provided with software specifically designed to keep track of fragmentary incoming information is used to help subdivide the analysis task into portions appropriate to individual analysts or small teams, and to amalgamate the results into a picture that can easily be assimilated by command staff. All, of course, very quickly, yet with the flexibility to respond to sudden changes in conditions or military objectives.

Powerful text and graphic tools are provided to show instantly how new information confirms or conflicts with the battlesituation as it is understood and to search doctrine and history databases for corroborative information, to help in the difficult task of assessing the reliability of new sightings or reported changes in enemy dispositions. Sophisticated housekeeping software allows updates to be made quickly and facilitates the fusion of new information with elements of the existing picture, even if the two views are partially inconsistent. Backtracking is always permitted, in case new information should flatly contradict that already accepted. And the effect of terrain and meteorological constraints can be considered at all stages.
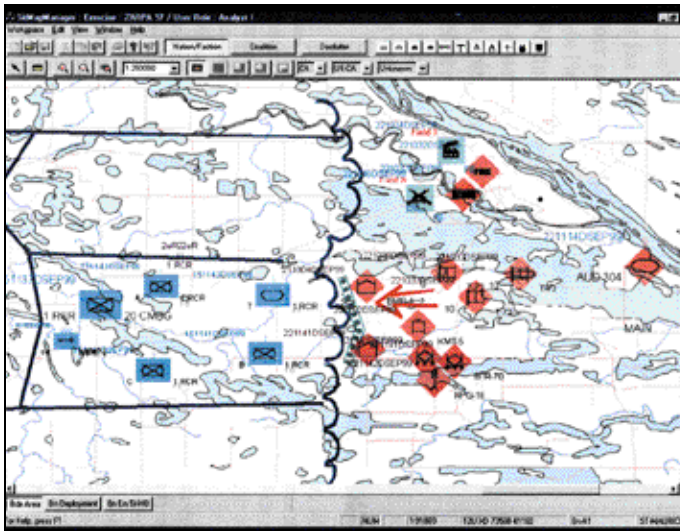


*A tactical Information Fusion Demonstrator used during "Rite Complex 95", an extensive field trial. CF officers were particularly impressed with its ability to show the battle unfolding minute by minute, right before their eyes.*

# Tactical Information Fusion

## Support to Staff

The Tactical Information Fusion¾or TIF¾demonstrator, which preceded ACTIF and is now a component of it, supports three major staff functions of the intelligence processing cell at Division or Brigade headquarters level: that of the Collator, who receives, annotates and stores incoming messages (TIF routes properly formatted messages automatically, greatly easing this task); those of the Intelligence Analysts who, with access to all available information, review the facts in and draw conclusions relevant to their individual areas of exper- tise; and that of the Senior Analyst, who interprets and combines these results into an "all-source" coherent master intelligence picture.



*The Tactical Information Fusion Demonstrator provides a wealth of tools to select and display information relevant to the battle, to compare and combine this information and to explore hypothetical situations.*

It has been used in laboratory experiments, in command-post exercises and in field trials since 1992, and has led to a deep appreciation-by both its developers and its military users-of the difficulties and pitfalls to be encountered in applying automation to this critical command and control area. These trials clearly demonstrate many of the benefits to be gained, and indicate both capabilities that can be automated now and the direction for future research effort.

Capabilities successfully demonstrated using ACTIF tools and concepts could be incorporated into future fieldable system, planned to provide a complete picture of intelligence-related information to command staff at Brigade and Division level.

## A broad Approach

Valcartier two-decade history of involvement in army command and control gives it the military backround, the familiarity with field operations and command procedures and the experience with human-computer interaction in a command post needed to tackle the difficult task of developing automated aids to the intelligence process. The effort owes much of its success to the unflagging cooperation and support of the Canadian Forces, notably the Intelligence Company of the Joint Force HQ and the Intelligence Cell of 2 Brigade HQ, and to the DMR Consulting Group, Inc., which developed most of the software.

Valcartier initial TIF project was significantly enriched by the NATO, Data Fusion Demonstrator project, and the follow-on research activity, ACTIF, was started in 1995 to exploit the NATO results, to enhance joint operations with the air force's Advanced Technology Battlefield Management System (also developed at Valcartier) and to explore integration issues with the proposed Land Force Command and Control Information System. ACTIF will extend the benefits of automation to other important areas of army responsibility, including low-level conflict, internal security and peacekeeping, will demonstrate a useful operational capability to the Canadian Land Forces. Many of the lessons learned in the TIF/ACTIF activities are also applicable to maritime and air command-and-control environments.

## For more information