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OVERVIEW OF DATA FUSION WORK FOR LAND ELECTRONIC WARFARE

by

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DEFENCE RESEARCH ESTABLISHMENT OTTAWA

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ABSTRACT

Electronic warfare (EW) is a land combat function. EW produces tactical intelligence information which, if timely, can affect the outcome of the battle.

Automation is required for the EW/intelligence cycle to stay inside the ever-narrowing window of the commander's opportunity to respond to and impact battlefield situations. Data fusion will automate the EW analysis process to provide timely situation assessments.

Data Fusion and Correlation Techniques Testbed (DFACTT) is a system designed in Canada to respond to the Canadian EW requirement. It is user verified and field proven. DFACTT is also the vehicle for long term research into the more esoteric AI aspects of EW analysis including multisensor fusion. DFACTT is made up of a number of workstations which, together, automate the land EW process as practised by Canada's EW Squadron.

RÉSUMÉ

La Guerre électronique est une des fonctions du combat terrestre. Elle génère des renseignements tactiques qui, au moment opportun, peuvent influencer le résultat d'une bataille.

Grâce à l'automatisation, le cycle de la guerre électronique et du renseignement peut maintenant s'imbriquer plus aisément dans le processus de commandement, toujours plus rapide et astreignant pour affronter et maîtriser les situations tactiques. La fusion de données automatise le processus de la guerre électronique de façon à obtenir des évaluations tactiques au moment propice.

Le Banc d'Essai en Fusion de Données et en Techniques de Corrélation (DFACTT) a été conçu au Canada pour répondre aux besoins de guerre électronique canadiens. Il a été mis à l'épreuve par les usagers mêmes et sur le terrain. DFACTT supporte également la recherche à long terme dans les aspects plus ésotériques d'intelligence artificielle reliés aux analyses de guerre électronique dont fait partie la fusion multi-senseur. DFACTT se compose d'une quantité de poste de travail qui, lorsque reliés, automatisent le processus de la guerre électronique terrestre tel que pratiqué par l'escadron de guerre électronique canadien.

EXECUTIVE SUMMARY

Electronic warfare is a land combat function. The electronic warfare system produces tactical intelligence information which, if timely, can affect the outcome of the battle.

Why Automation and why data fusion?

Automation is required for the EW/intelligence cycle to stay inside the ever-narrowing window of the commander's opportunity to respond to and impact battlefield situations.

Data fusion will automate the EW analysis process to provide timely situation assessments.

Data Fusion and Correlation Techniques Testbed (DFACTT) can impact immediate Canadian Army EW procurements. It is a system designed in Canada to respond to the Canadian EW requirement. It is user verified, field proven and the technology transfer has already been done with Canadian industry. DFACTT can also impact on future procurements for Land Tactical EW Equipment. It is also the vehicle for long term research into the more esoteric AI aspects of EW analysis function automation.

The Data Fusion and Correlation Techniques Testbed (DFACTT) is a number of workstations which, together, automate the land EW process as practised by Canada's EW Squadron. The deployment of DFACTT in the EW Squadron is shown in Figure A. It is made up of the following workstations:

Search/Intercept Operator Workstation:
Automates control of intercept receivers, intercom system and the transmission of gists and DF alerts to the analyst's database (sensor automation).

FEWOC and EWCC Workstations:
Automates transmission/receipt of messages and provides tools for jammer mission and communications links planning (EW asset management).

MICCI (Mantis Integrated Command and Control Interface):
Automates the transmission of emitter locations to the analyst from the master and tasks from the analysts to the master. Automates the use of the emitter locating system at each DF detachment (sensor automation).

Analyst Workstation:

Automates the receipt of sensor information (DF and intercept) as well as other digital messages (i.e., from EWCC). Provides tools for the analysts to determine the battlefield situation including automated sensor information display, database, sensor tasking tools, reference tools, replay of recorded audio, some correlation/fusion tools and automates the transmission of reports on the battlefield situation.

Test/Training (Simulator) Workstation:

A tool to provide 'live' data to the system without requiring deployment of the DF baseline and intercept operators. Used mainly for system testing, but has training applications. Input of test scenarios is through a map display, and includes input of audio (voice) information for the conversations.

The development methodology followed to create the system, rapid prototyping, is a major part of its innovation. The system development is following a rapid prototyping or fast development cycle in order to respond to the changing needs of the EW process. Requirements are defined in an iterative manner (develop, test, demonstrate; develop, ...).

The technology used for development of the system includes a full object-oriented development system leading to a fully object-oriented implementation of the application. Smalltalk is the language of implementation, and the system currently runs on a DOS platform.

A major part of the development cycle is the field trials during which user feedback is recorded for inclusion in the next prototype version of the system. There have been a number of trials, mostly informal, in which users have participated in order to have their input into the system functions.

The future for DFACTT is diverse. Work is on-going to improve the system for further use by the land EW element including more automation (expert systems for indications, warnings, and templating) and interfaces to new sensors being developed and procured. An upgraded simulation system is to be produced based on the current test/training tools in the system.

Work on the object-oriented development system will allow migration of the application onto many diverse hardware platforms with no changes to the application layer.

Support is also to be provided for the fusion system needs of other environments such as strategic EW and the Navy.

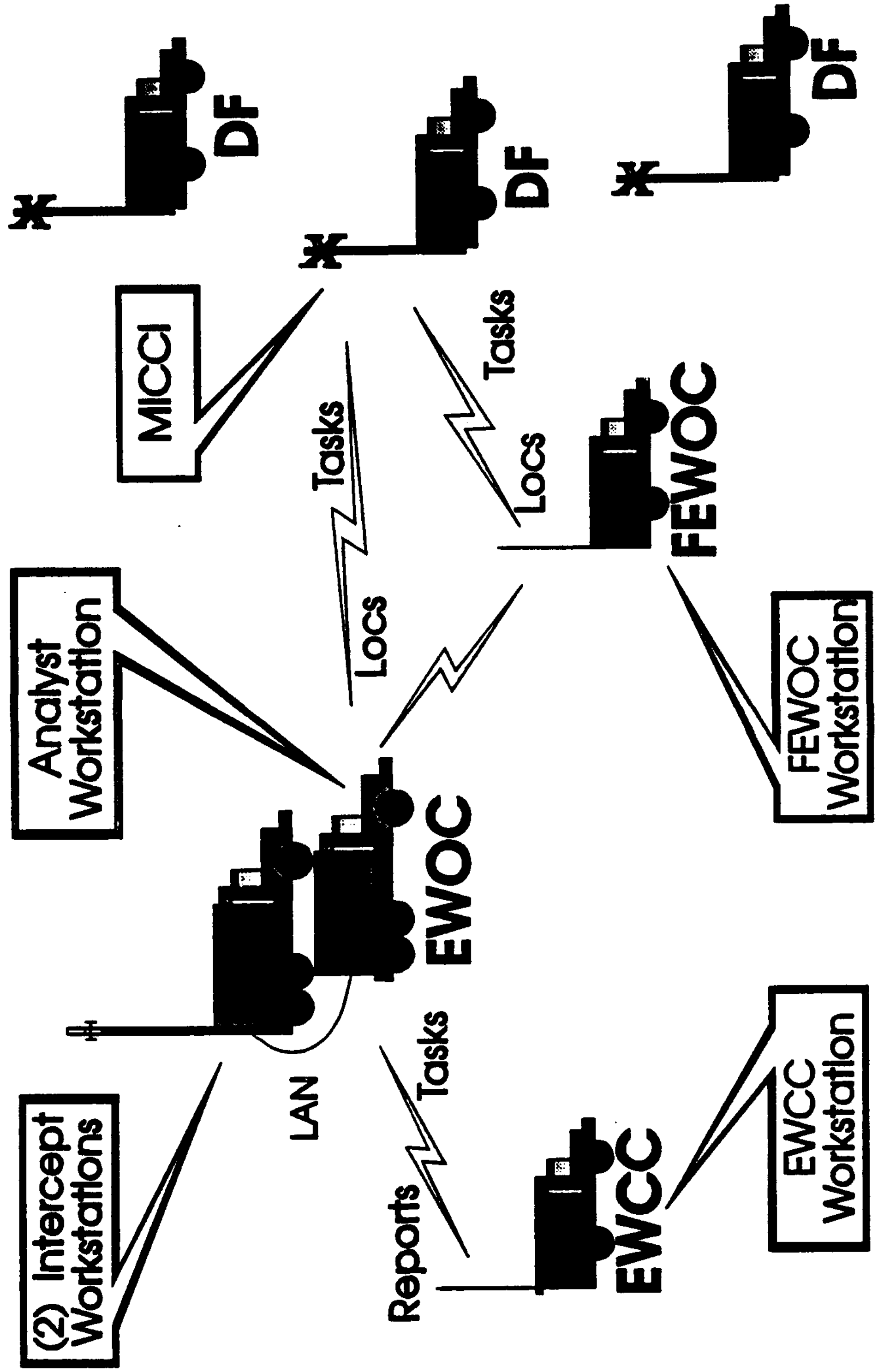

FIGURE A: DFACTT DEPLOYMENT

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1.0 INTRODUCTION

1.1 Aim

To design and implement, using a rapid prototyping development method, electronic warfare sensor information analysis and correlation algorithms suitable for a multiprocessor system. The system will act as a testbed for algorithms to be used by the Canadian land electronic warfare control and analysis system. Such a system is necessary to provide the EW assessment of the battlefield situation within the ever-narrowing time window when the commander has an opportunity to respond to and impact the battlefield situation.

1.2 Background

ESM analysis techniques are used in electronic warfare to provide enemy situation information and immediate threat warning to the commander. The information comes from interpretation of the incoming sensor data from EW sensors such as direction-finding equipment and radio intercept equipment. Presently the assessment and interpretation of the incoming information is done manually and the information produced is not always timely. Analysis techniques will automate the interpretation process. Control techniques are required to effectively steer the sensors to provide the information required to substantiate the interpretations of the analysts. The control techniques combine with the analysis to form a feedback control system wherein the incoming information drives the analysis which then produces steerage for the sensors to provide information. Figure 1 depicts the analysis process.

When more than one type of sensor is involved in the interpretation to produce the estimate of the enemy situation, some form of multisensor fusion is taking place. The data from different sensor types must be combined or fused in some way to support or reject the current estimate of the situation. In EW, the sensors are communications emitter location systems and intercept receivers, and radar identification and location equipment. Information from other sources, such as sightings of enemy forces can also feed into the EW analysis process.

The Data Fusion and Correlation Techniques Testbed (DFACTT) development produced software to provide the following system functions which can be accessed by the algorithms: object database and interfaces, map background interface, map overlay interface, data acquisition interfaces, system bootstrap code, and a scenario/simulator for testing the system in the absence of

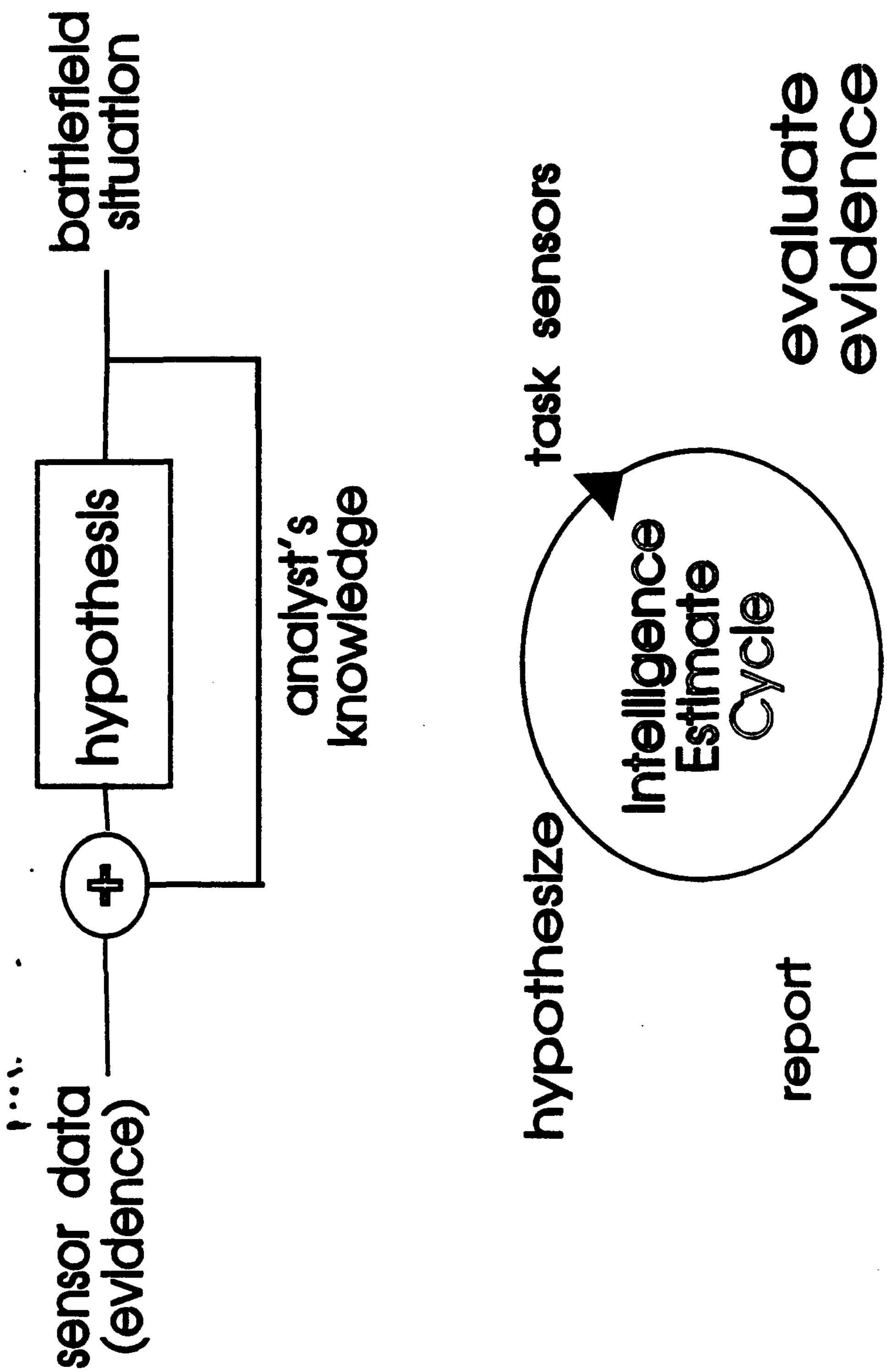

FIGURE 1: EW ANALYSIS PROCESS

real signals. A PC-compatible platform was used as both the development and target environment. Future systems will use Sun Sparc development systems where the target computer is a parallel processing, VMEbus based system. The software development tool, ENVY/Developer[1], is a software configuration management system for a multi-user version of Smalltalk.

1.3 Scope

A complete system was developed utilizing the EW sensors fielded in the EW squadron. The two main components of the DFACTT are the hardware/software required to collect, process and distribute information, and the algorithms needed to automatically correlate and display this data for the operators and analysts (data fusion). This paper discusses the system, its fusion aspects, the rapid protoyping methodology used to develop the system, and the future of the system.

2.0 DFACTT FUNCTIONS

The DFACTT interfaces to current EW sensor systems and helps the analysts and intercept operators to work together to produce better situation assessments and responses to requests for intelligence. The lines of control within the EW cell have analysts tasking operators of sensors and sensor information returning to the analyst. If the sensor results are useful to the analyst, the task continues until the incoming information is no longer useful. Priority targets and targets of opportunity are also exploited by the sensors to continuously produce data for the analysts. In order to operate most efficiently, both the sensor operators and the analysts must have efficient support tools. The workstation environment developed for each one attempts to maximize the output of information.

The DFACTT is a modular system, so new capability can be added as the base capabilities are tested and approved by users. Expandability is necessary so the testbed can be used to develop new ideas in the area of data fusion and correlation techniques. The basic DFACTT provides software that aids both the analyst and intercept operator. The analyst has more time to analyze the data (not just generate paper work) and the operator can concentrate on entering the important gisted information and callsigns.

The DFACTT therefore includes tools to automate the analysts' mundane tasks including cross-referencing incoming messages by frequency and network, display of incoming location data, and developing a nickname dictionary. It also includes software to help the analyst correlate information to determine

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[1] ENVY is a trademark of Object Technology International

the battlefield situation. For the sensor operators, automatic input of locations from the DF equipment as well as signal level, frequency, and modulation type from the radios are implemented. A report generation capability is included so that the electronic data can be used to produce military messages for transmission over the radio to the appropriate commander.

Data communications software provides a basis for the transmission and receipt of sensor data as well as reports. Communications between the intercept sensor and the analyst workstation are carried out via Ethernet. Communications between the emitter locating sensors and the analyst workstation are via combat net radio data communications (RF modem) to the serial port of the analyst workstation.

2.1 Intercept Sensor Operator Functions

The duties and functions of the land EW communication intercept sensor operator were examined and a number of automation techniques have been incorporated into DFACTT to improve the effectiveness of the intercept operator. The operator's main duties are to locate and monitor enemy radio transmissions. An EW operator workstation is required to automate the tasks of retrieving information from the receiver, performing RF spectral search operations, producing intercept reports, and recording the audio data.

Graceful degradation capabilities are also built into the operator workstation so that work can carry on even if the rest of the DFACTT is not working, or if the connection is lost between the operator and the analyst. If the DFACTT analyst workstation is not working, the operator can elect to output each conversation to a text file on floppy, or to store as DFACTT readable files on the floppy. When the system is back up, the analyst workstation can read in the files in either format. If the Ethernet connection is lost, the reports can be automatically sent over a serial link instead of the Ethernet if the appropriate cable is laid.

2.1.1 Intercept Operator User Interface

The primary user interface consists of a window containing an automated intercept report entry form. Most fields are automatically updated including time, radio frequency, signal strength, bandwidth, and modulation type. The following are descriptions of all the fields:

- List of recently intercepted and entered conversations
- Time up/time down of active transmission
- Net designation of active transmission

- Call signs of active transmission
- Receiver parameters: frequency, modulation type, bandwidth, and signal strength
- Message text typed in by operator

From the data entry form the operator can use menus or function keys to perform the following functions:

- Switch callsigns during a conversation
- Save conversation
- Record audio data
- Automatically generate standard format intercept reports for the analyst
- Tune VHF receivers
- Task the computer to perform an automated search of a specified frequency range on an unused receiver.

2.1.2 Tasking Window

The tasking windows contain a list, and all details, of tasked frequencies/networks to be monitored, as provided by the analyst. With one keystroke, the operator can have the tasked parameters setup on his receiver, and start monitoring.

2.1.3 Audio Record and Playback

The operator can record the audio signal he is intercepting in a digital format on the hard disk. Replay is then available so conversation editing can be done before sending it to the analyst. This feature is useful when the intercepted language is not the first language of the intercept sensor operator.

2.1.4 Search Function

In order to relieve the operator of the mundane task of manually tuning the receiver through a range of frequencies to detect an enemy transmission, a computer controlled spectral search facility was incorporated into the DFACTT. The operator can specify the frequency range to be scanned or can task the computer to monitor a number of known frequencies for any activity. The computer records the exact centre frequency, signal strength, and time of any activity it detects in its assigned range. The computer can be instructed to avoid any of a list of frequencies. It can also be instructed to immediately notify the operator of the detection of a priority transmission and automatically tune the operator's receiver to it if so desired. Details of these searches can be passed to the analyst for traffic analysis purposes.

2.2 Analysis Functions

The aim of the analyst workstation software is to automate the database creation for information arriving from intercept operators and from the emitter locating sensors. Such automated software leaves the analyst free to analyse the data rather than entering incoming information.

The analyst's job is to analyse the information collected by the sensors attached to the EW cell. Part of that job is to create a database by cross-referencing all incoming information. The cross-referencing is done in ways that show up usual patterns of activity and allow the analysts to determine which units are on the battlefield.

In order to support the analysis function of the EW operation, the present tasks of the analysts were examined and from this the required automation to support their tasks has been determined. The analyst workstation has a mapping user interface with overlays, an EW database, a report generator, and control interfaces to the other elements.

Graceful degradation considerations have also been included in the analyst workstation so that work can carry on even if the communications links to the sensors are degraded. If the automatic emitter locating system input is not working, manual data input is available. If the automatic Ethernet connection to the intercept sensor is not working, an automatic serial link can be used or the messages can be input manually (from floppy or typed in). As work carries on, the database is automatically saved for retrieval should the system crash.

2.2.1 Mapping User Interface

The mapping user interface acts as a window into the database. Any information that can be geographically referenced can be retrieved from the database using a pointing device on an icon on the displayed mapping interface. Software for the DFACTT also allows background display of detailed topographic maps that have been scanned digitally, or digital vector maps (such as Digital Chart of the World). The maps are stored in memory and/or on disk. The system will allow referencing of geographic data that is in areas for which background maps are not available, because the mapping user interface is not tied to the background map display. A map grid (UTM coordinates) is always available. The following features are available to the analyst via the mapping user interface:

- Overlay NATO standard symbols and graphic drawing symbols (lines, circles, arrows) on the map (representing objects)

- Choosing a symbol on the map returns data based information about the object, and allows operations to view, modify, and change the details of the object
- New objects can be created based on selected objects on the map (for instance multiple emissions from locations in proximity can be clustered to form a single emitter entity)
- Smooth pan out the sides of the on-screen map window using a pointing device
- Zoom in on areas of the map to the resolution of the scanned data; symbols are to scale so that when the area covered by map is larger, symbols are smaller so less of the area is covered by the symbol
- Seamless database of maps for an area, but if maps aren't available then the background is a neutral colour and overlays will still work
- Choosing and moving a symbol on the screen changes its coordinates in the underlying representation of the object it represents
- Underlying objects record their location history.

2.2.2 Real-time Data Acquisition Display

A real-time interface to the overlays on the mapping user interface is provided. Data acquisition software that updates the database with geographic information thus automatically overlays the information on the map using the appropriate symbology. This function is referred to as automatic parsing of incoming data. The interface is used to accept and display as dots on the map the emitter location input (both communications and radar). The system can also accept formatted sighting messages which are tagged with a location. Using the overlay functions of the system, the user can then select multiple dot symbols and indicate that they are either a group (network) or are the same object (cluster) and their characteristics can be merged in the database.

2.2.3 EW Database

The database for storage of the dynamic EW information is a cornerstone of the system. The software includes a database which contains the following information:

- emitter locations with frequency, time tags, source, and error
- message gists and signal data with frequency and time tags
- units identified
- nets identified
- net/callsign/frequency correlation
- spectrum activity histograms

- radar location and identification information
- codeword dictionary

The use of an object-oriented database allows the person using the information to store objects even with incomplete information about the objects. Since their identification is determined in stages, as information comes in about an object it can evolve into a more known state without having to be classified into a fixed field format when too little information is known about it.

There are several database search functions built into the system to allow access to the data in ways other than through the mapping user interface. The browsers include a codeword finder to search for particular words in conversations, a conversation finder to search for particular or groups of conversations, a network finder to search for networks with certain characteristics, and a unit finder to retrieve the units of interest.

2.2.4 Communications Links

The EW analysis depends on the information provided from various sensors and from other sources. The sensors must be controlled, and information collected as necessary from the other sources. This control and collection software is required in the workstation so the analysts can make best use of their assets and be sure to get the most timely information from all sources. The analyst can thus generate tasking messages. These messages contain sensor steerage information and must be routed to the particular sensors.

The control layout for the EW situation is as follows. The analyst receives requests for information about the current situation from outside the EW cell. These requests are broken down into tasks for the intercept sensors and the emitter locating sensors.

The intercept sensors are controlled through one search operator who scans the frequency range of interest and assigns other operators to active frequencies. The emitter locating sensors are controlled through a list of tasked frequencies on which they are to locate the emitters.

As sensor information is taken in, it is passed to the analysts who collate, correlate and analyse the information and determine the answers to the original requests from outside the EW cell. They then formulate written responses to the querying party and send them out over the data link. There are defined military formats for such communication, and particular information requirements. Reporting assistant software is included to generate the appropriate formats and addresses for messages. The information produced in the DFACTT is formatted into standard military messages (Tactical Reports, EW Summaries) by the system. The analyst specifies the information to be included in the message such as the text of the conversation and emitter locations that the report involves, whereas the date, the addressee/addressor, and the message classifications is filled in automatically.

Communications between the intercept sensor and the analyst workstation are carried out via Ethernet. Communications between the emitter locating sensors and the analyst workstation are via combat net radio data communications (RF modem) to the serial port of the analyst workstation. Communications outside the EW cell are also carried out via combat net radio data communications (RF modem).

2.3 Scenario Generation

Scenario generation software can simulate the sensor inputs to the DFACTT so that the testbed can be tested without requiring access to the actual sensors. The simulator works in either analyst only or analyst-operator mode. Analyst-only mode exercises the analyst functions by producing a database for the analysts containing the sensor information (assuming the operators are capturing all information). Analyst-operator mode requires that operators be at their posts and only information they intercept is entered into the database.

The sensor inputs that are simulated are as follows:

Radio Direction Finding Sensor (60 results per minute)

- time of reading, location, error on location, frequency
- input as ASCII text messages over an RS-232 connection

Radio Traffic (voice)

- time of transmission, conversation, callsigns, network
- input directly to the database if in analyst-only mode
- replayed over audio headphones for operators in analyst-operator mode

The scenario generator keeps a log of all the sensor data it generated during a run so that the performance of the testbed can be evaluated by comparing the possible data to what was actually captured by the DFACTT operators and analysts.

3.0 MULTI-SENSOR FUSION

The analysis work involves multi-sensor fusion. Multi-sensor fusion is the process of taking information about the same situation from different sensors and using the correlations between the information to improve the estimate of the situation being observed. The synergism gained by using this correlation of dissimilar incoming information allows the whole of the information gained to be more than just the sum of its parts.

The job of land EW analysis is to determine the current situation using communications EW sensors (intercept receivers and emitter locating equipment). The analysis work also benefits from collateral information from other sources, such as IR or radar sensors, or reports with confirmed facts about certain situations.

Sensor data can be fused at different levels of complexity. The raw data must first be collated and grouped into sets that may represent views of the same entity. This collation tries to reduce the amount of raw data by assigning multiple sensor measurements to the same object which is suspected to have produced the parameters measured. The collated data from the different sensors must then be correlated so that all the sensor measurements on the same object can be identified. Only when all the information on the object that has been amalgamated can the fusion of data to determine information about the object begin. This process is illustrated in Figure 2.

A basic data tagging scheme for the collation and correlation operations is used by the system. The collation and correlation operations can only use information provided to them from the sensors. The basic tag data presently available is frequency and time. Location is used as a coordinating tag if available.

Intercepted conversations are correlated with emitter locations through nodes. Time and frequency are used to indicate which conversation was occurring while the location was being taken. Further information can be derived if the emitter location time falls unambiguously during one message of a conversation. The from-callsign of the message (clear voice intercept) can be assigned to the emitter at the location, and tells who was located at the emitter, as shown in Figure 3. Further information in the correlated intercepted conversation can serve to indicate the identity and activity of the unit using the emitter.

Once emitters have been located, the analyst can also determine and designate networks, as shown in Figure 4. If the emitter locating sensor has, over a continuous period of time on

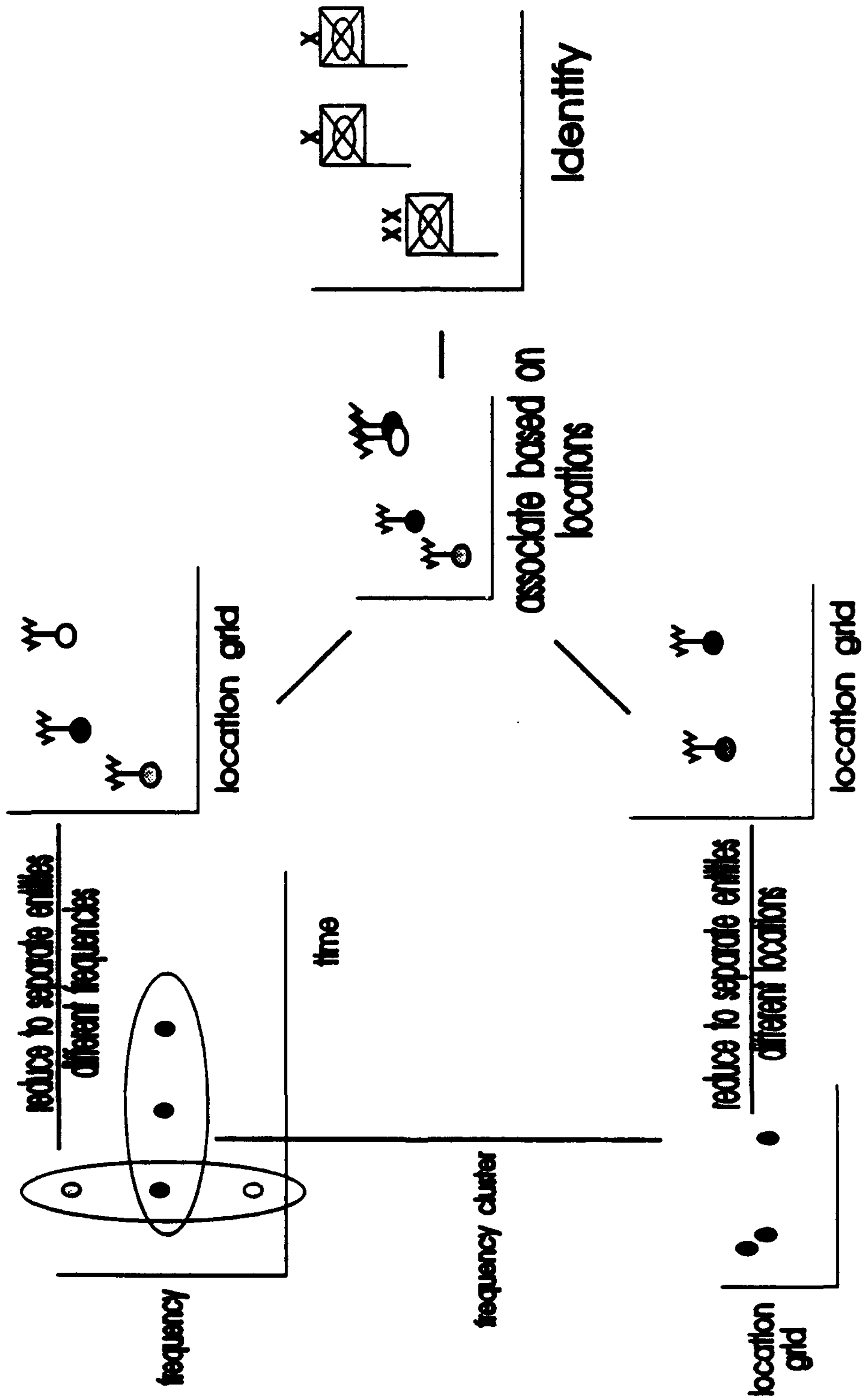

FIGURE 2: FUSION FOR LAND EW

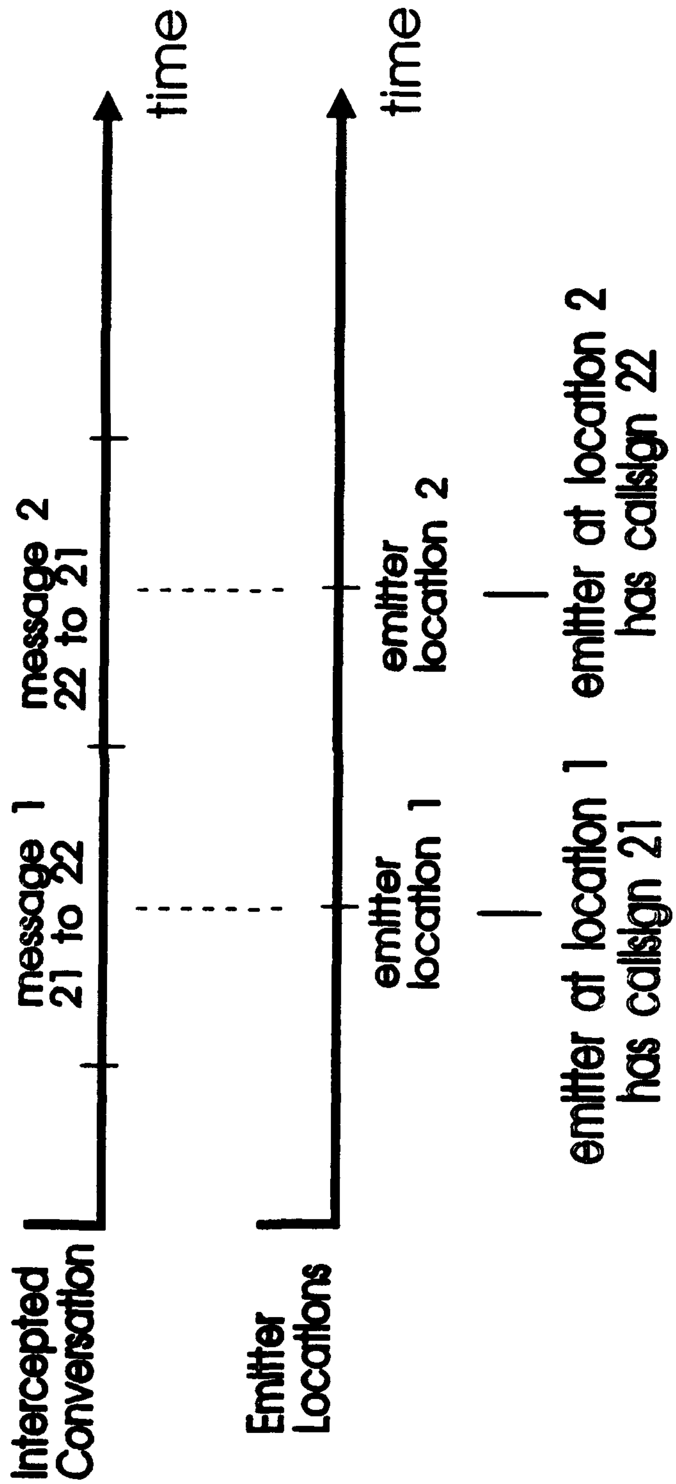

FIGURE 3: FUSION: EMITTER LOCATIONS WITH MESSAGE INTERNALS

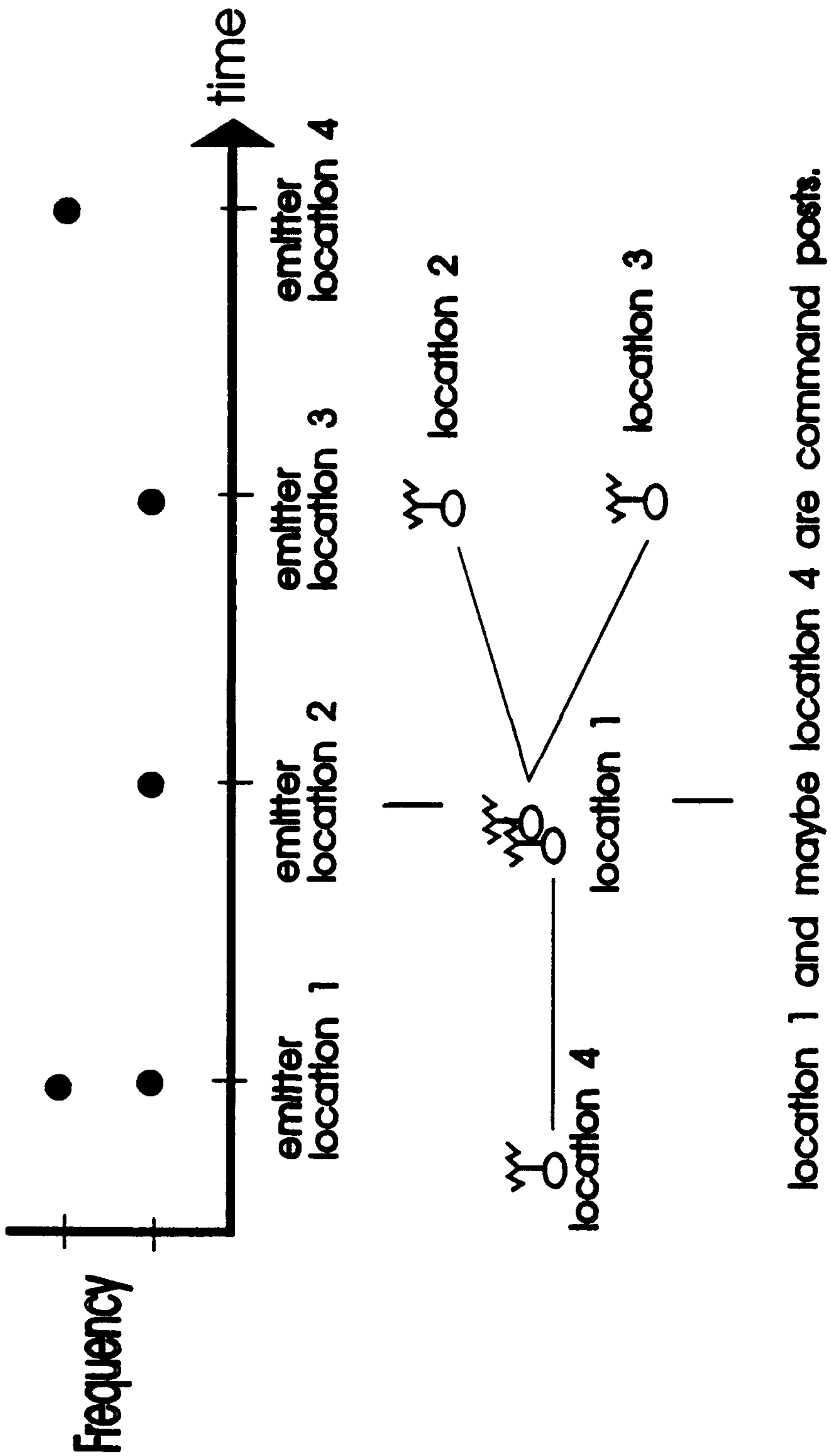

FIGURE 4: FUSION: EMITTER LOCATIONS WITH FREQUENCY/TIME

the same frequency, located several distinct emitters, they are likely communicatingover the same network. This information can be assigned to the network objects involved. Given the spatial layout of the emitters participating in a network, analysts can often determine which emitter is located at a command post. These hypotheses should then be confirmed using the correlation with clear voice intercepts or other source information.

Fusion can also involve the use of a priori knowledge of the enemy forces. Doctrinal templates indicate how an enemy force would deploy on a battlefield while doing a particular activity, and include specific details about their communications patterns, emitting equipment and callsigns. Correlation of doctrinal templates with the currently perceived battlefield situation (based on the EW sensor data) can also provide the analysts with hypotheses as to the activities, command levels, and unit types of the involved entities on the battlefield. The fusion system can compare these templates to the current tactical data to see if the battlefield layout matches, as shown in Figure 5. The fusion system can also indicate if a particular confirming piece of sensor data is missing from the tactical data. For instance, the system could indicate that the tactical data is indicative of an assault river crossing if the sensors could pick up a particular type of emitter. Such an indication would allow the analysts to steer the sensors to try to pick up the confirming data.

Fusion can thus aid the analyst in determining the battlefield situation. The aim of the analyst is to take the EW specific sensor data, and generate from it a picture of the activities on the battlefield. The picture of the battlefield is produced in non-sensor specific language to be passed into the intelligence cycle. This is one of the main products used by the intelligence centre, in conjunction with estimates produced by other intelligence producing sub-systems, to produce the overall estimate of the current and future battlefield situation.

4.0 RAPID PROTOTYPING DEVELOPMENT METHOD

The system development is following a rapid prototyping or fast development cycle, Figure 6, in order to respond to the changing needs of the EW process. Requirements are defined in an iterative manner (develop, test, demonstrate; develop, ...). Requirements and actual system hardware and software are thus developed in concert, based on the user's view of what is needed. There is a tendency during system development to find necessary but unforseen requirements which should be incorporated into the system design. The rapid prototyping methodology allows immediate incorporation of such developing requirements into the system and concurrently developing system description (traditional requirement document).

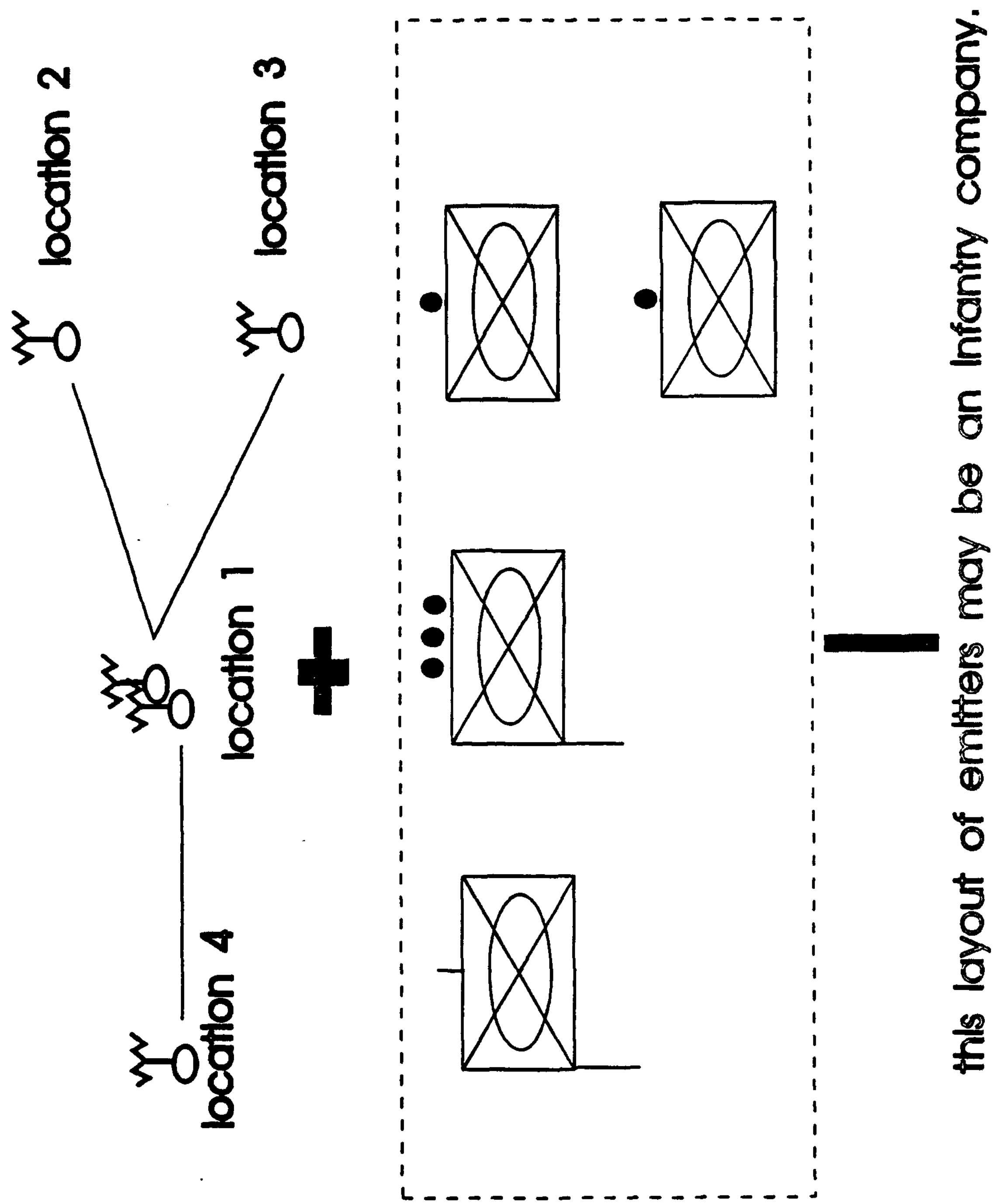

FIGURE 5: FUSION: EMITTER LOCATIONS WITH TEMPLATES

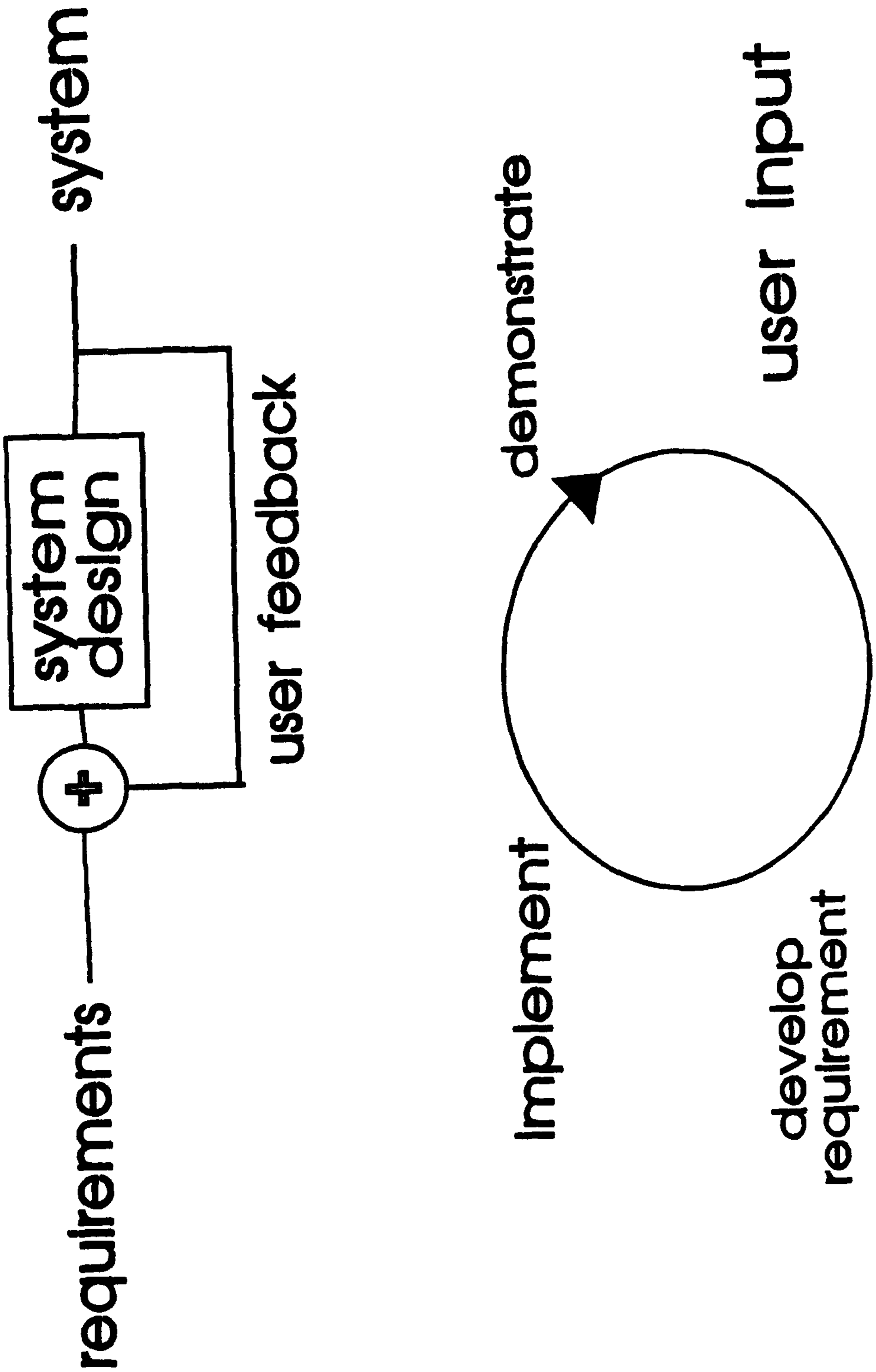

FIGURE 6: RAPID PROTOTYPING

In about 1986 DREO saw an area, based on a Canadian requirement to develop an automated electronic warfare control and analysis system, in which R&D could contribute in the relatively short term. DREO undertook to become 'smart consumers' by building a prototype EW analysis system. An initial (lab only) system was demonstrated to some members of the EW user community in 1989, and through their input a better idea of what was actually needed was determined. In May 1991, the improved prototype system was demonstrated to the EW squadron while they were on an exercise at Carp (near DREO). They then took DFACTT (and a few scientists) to CFB Petawawa for an informal trial. With these experiences in mind, the system was further developed and re-tested at Petawawa in November of 1991. The next goal was a formal trial at Exercise RV92 at the user's request. The system has been installed in the EW squadron since March of 1992. DREO continues software development in the lab, and as improvements are ready, they are transferred to the computers at the squadron in Kingston.

The technology used for development of the system includes a full object-oriented development system leading to a fully object-oriented implementation of the application. Smalltalk is the language of implementation, and the system currently runs on a DOS platform. Its use has facilitated the rapid prototyping methodology. The Smalltalk system used includes tools for managing teams of programmers developing object oriented software, generally considered to be a difficult problem. The tool makes particular people owners of classes of objects, so all code (which can be developed by any of the other programmers) must be released by the owner. Theoretically, the owner will check that all code integrates well, and new methods added by other programmers will not affect the operation of the objects.

5.0 FIELD TRIALS

A major part of the rapid development cycle is the field trials during which user feedback is recorded for inclusion in the next prototype version of the system. There have been a number of trials, mostly informal, in which users have participated in order to have their input into the system functions. The following list indicates the trials carried out and their aims:

Jan 1991

The aim of this trial was to get the system out of the lab and into a field environment. (Two vehicles were borrowed from the squadron). An extended length (2 hour) scenario was developed with multiple emitters (but simulated DF location input), and several scientists acted as intercept operators and analysts.

May 1991: Exercise Omega Strike (Squadron Level)
The aim of this trial was to demonstrate the capabilities of the system to the squadron, and to operate with an actual deployed DF system and intercept operators.

Nov 1991: Exercise Maximum Effort (Regimental Level)
The aim of this trial was to have the squadron analysts and sensor operators use the system and provide feedback on the available functions.

May 1992: Exercise Rendezvous 92 (Division Level)
This was a formal trial, commissioned by DLR 4 through FMC for which a trial report is to be produced by the squadron. Functions of DFACTT as well as the communications links and installation of the system were to be tested, in order to provide feedback to the procurement activities.

Aug 1992: Exercise Oxford
The aim of this trial was to complete the objectives of the DFACTT trial directive that were not addressed at RV92. There were no DREO scientists in attendance so feedback was passed by written user comments and discussions following the exercise.

June 1993: Exercise Omega Strike
August 1993: Gagetown Exercise
The aim of these trials was to have the squadron analysts and sensor operators use the system (re-training) and provide feedback on the available (and new) functions. (no DREO scientists in attendance).

6.0 FUTURE

Data Fusion and Correlation Techniques Testbed (DFACTT) can impact immediate Canadian Army EW procurements. It is a system designed in Canada to respond to the Canadian EW requirement. It is user verified, field proven and the technology transfer has already been done with Canadian industry. DFACTT can also impact on future procurements for Land Tactical EW Equipment. It is also the vehicle for long term research into the more esoteric AI aspects of EW analysis function automation.

Work is on-going to improve the system for further use by the land EW element. A new computer controlled intercom is in the works, as is more automation (expert systems for indications and warnings/templating) and interfaces to new EW sensors being developed at DREO (Badger, ACES) and being procured (TRILS, AERIES, Palantir).

Work on the object-oriented development system will allow migration of the application onto many diverse hardware platforms with no changes to the application layer. Hardware platforms will include the Sun Sparc family of processor, and VME-bus based 680x0 processors for use in rugged environments.

Support is also to be provided for the fusion system needs of other environments such as strategic EW and the Navy.

Finally, an upgraded simulation system is to be produced based on the current test/training tools in the system.

DOCUMENT CONTROL DATA

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(U) Electronic warfare (EW) is a land combat function. EW produces tactical intelligence information which, if timely, can affect the outcome of the battle.

(U) Automation is required for the EW/intelligence cycle to stay inside the ever-narrowing window of the commander's opportunity to respond to and impact battlefield situations. Data fusion will automate the EW analysis process to provide timely situation assessments.

(U) Data Fusion and Correlation Techniques Testbed (DFACTT) is a system designed in Canada to respond to the Canadian EW requirement. It is user verified and field proven. DFACTT is also the vehicle for long term research into the more esoteric AI aspects of EW analysis including multisensor fusion. DFACTT is made up of a number of workstations which, together, automate the land EW process as practised by Canada's EW Squadron.

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