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Tactical Planning Workstation Functional Description

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Fort Leavenworth Field Unit
Systems Research Laboratory

U.S. Army Research Institute for the Behavioral and Social Sciences

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This report describes the features of the Tactical Planning Workstation. The Workstation s developed as a platform for prototyping staff information and decision aids and conduct- g research on staff performance. This functional description owes an overview of the pabilities of the Workstation and tells how a staff user would interact with the system to rform general information processing tasks or specific tactical planning tasks. The report cludes descriptions of the hardware, networking, input and control techniques, data base, splays, and functions of the Workstation.

The Workstation was developed by the Experimental Development, Demonstration and Integration Center or EDDIC. Related reports are available on detailed software documentation and er interface evaluation. The Tactical Planning Workstation is being used to conduct soldier rformance research on choices of tactical courses of action.

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Tactical Planning Workstation Functional Description

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This report presents an overview of the capabilities of a prototype information system for combat staffs. The system, referred to as the Tactical Planning Workstation, was developed in the Fort Leavenworth Field Unit's command and control laboratory. The optimal strategy for development of new command and control systems is to emulate and evaluate those systems on a small scale, assessing how soldiers would benefit from the systems before proceeding with expensive full-scale development. The purpose of the Workstation is to demonstrate an integrated set of information and decision aids for planning division level operations and other echelons that have dedicated staffs that perform command and control functions. The Workstation is being evaluated to determine the utility of its demonstrated capabilities. Workstation software has been transported to other Army laboratories and activities for independent assessment. The Tactical Planning Workstation is being successfully used to test and identify requirements for transition to the Army Tactical Command and Control System.

EDGAR M. JOHNSON
Technical Director

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TACTICAL PLANNING WORKSTATION FUNCTIONAL DESCRIPTION

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CONTENTS (Continued)

TACTICAL PLANNING WORKSTATION FUNCTIONAL DESCRIPTION
SYSTEM OVERVIEW

This report describes the user interaction style and decision support concepts of the Tactical Planning Workstation. After outlining the system capabilities in the first section, the base system configuration is described. Following the hardware, software, and networking overview, the operational use of the system is described by summarizing appropriate scenario data manipulations and how staff planning tasks are performed using the Workstation. Three additional sections describe how the system is controlled, how system output is received, and how specific user interface styles are implemented.

In order to generate and assess staff performance requirements for command and control (C^2) systems the Army Research Institute developed a laboratory testbed facility called the Experimental Development, Demonstration, and Integration Center (EDDIC). This facility provides an environment to observe soldier performance supported by tactical C^2 systems. In this laboratory environment, scientists conduct specific experiments for Army C^2 proponents.

Integral to the EDDIC facility is an automated C^2 system known as the Tactical Planning Workstation. It provides a sophisticated state-of-the-art automation capability that supports C^2 processes while also supporting research. The automation features allow many of the normal staff activities to be performed without the extensive resources required in a field environment. The Workstation may be used as a single unit in support of an individual staff officer or may be networked to integrate the efforts of multiple staff officers working on a common problem. It provides the user with a graphic and textual display of a tactical scenario and supports the user in performance of tasks associated with normal staff functions such as providing information, making estimates, making recommendations, preparing plans and orders, and supervising the execution of orders. While the Workstation can support all of these functions to varying degrees, the initial focus and application centers on decision making at the division level.

The Tactical Planning Workstation supports execution of C^2 by providing decision support capabilities. Table 1 lists these capabilities.

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Table 1

Decision Support Capabilities

- Create and display tactical overlays

- Display battlefield situation data

- Display doctrinal reference and planning information

- Create, transmit, and receive messages

- Create staff products

- Provide computer-based aids

The Workstation organizes information and tools into five functional areas. These areas are the users' "means" to access support provided by the Workstation. A mouse control is used to point at and click on displayed objects to activate support. The five areas are described below.

VIEW REFERENCE. This function provides the user with various staff planning factors extracted from Army manuals, such as Staff Officer's Handbook, FC 101-5-2. Equipment and weapon characteristics, authorized personnel strengths, and information on opposing force units can be called up for easy reference and extracted for estimates or reports.

VIEW SITUATION. This function provides the user with access to scenario specific information. A user can view battlefield information in text, map, and graphic forms.

VIEW MESSAGE. This function provides the user with access to incoming messages.

BUILD PRODUCTS. This function provides the user with the capability to create products. Users create messages, plans, reports, and overlays with this function.

TOOL. This function provides the user with computer-based tools to assist in developing staff products. Current tools include a scratch pad, calculator, and the Task Organization and Status Tool (TOAST). Many other decision support capabilities are integrated in the other functions.

The Tactical Planning Workstation is a powerful, yet extremely flexible, automated system that is designed to maximize user efficiency by providing a user-friendly interface and direct manipulation of on-screen objects supported by a multi-window, multi-tasking environment. Table 2 provides a list of features incorporated into the Workstation.

Table 2

Tactical Planning Workstation Features

Tactical Planning Workstation Functions

Staff product development
> preformatted outlines for reports, estimates, and orders
> drawing capabilities for developing graphics overlay in support of standard Army
>> symbology
> standard text editing functions
> find, copy, cut, and paste from existing files to build staff products

Tactical situation information
> organized into personnel, intelligence, operations, and logistics sections
>> for user convenience
> accessed by walking menus (allowing quick exploration and query)

Reference Data
> library of selected data from FM 101-10-1 (Technical and Logistical Data) and FC 101-
>> 5-2 (Staff Officer's Handbook)
> personnel strengths, battle losses, prisoners of war
> threat composition, strength, equipment, and characteristics
> U.S. Army organizations, equipment, and characteristics
> consumption and usage rates for Class I, III, V supplies

Communications
> sharing of in-progress work with other workstations, ("electronic collocation")
> transmission and receipt of command and control products, reports, and overlays

Messages
> message traffic permitted with other LAN members
> message type selection and destination are menu options
> preformatted messages
> message waiting alert and queuing
> message save file

(table continues)

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Soldier Interface

User-controlled windows
- support multi-task environment
- comparison and assimilation of multiple source information
- comparison of reference information to current situation data
- "customized" maps and other windows
- user-defined windows quickly recalled from icons
- user-adjusted size, position, scrolling, overlap, filing

"Point and click" mouse selection
- enhanced entry and query speed
- most operations use three button mouse control

On-screen object manipulation
- direct modifications, e.g., unit locations and task organization trees

Menus
- pull-down, walking (cascading) menus simplify displays
- pop-up menus provide status and modification of features

Colors
- monochromatic shading for text windows and background
- colors reserved for map displays and unit status reports
- color usage consistent with military map conventions

Tactical Maps

Map Control
- user modified for specific task performance
- digitized
- declutterable by user command
- elevation query using "point and click" provides grid coordinates and elevation of selected points
- automated map legend (features are interactively highlighted)
- highlighting (query feature from legend for locating features on the map)
- user-selected map scales

Map Backgrounds
- vegetation (same as standard military maps)
- elevation banding (contours shaded in 75 m intervals)
- shaded relief (terrain appreciation)
- none (allows focus on tactical overlay information)

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Map Features
>road networks by road type, including railroads
>hydrography (man-made and natural)
>built-up areas
>Universal Transverse Mercator (UTM) grids
>miscellaneous features (bridges by weight and class, power stations, dams, tunnels,
>>fords, and airfields)

Architecture

Hardware
>Sun workstation
>high quality (1152x900 pixels), 19-inch color monitor (64 colors)

Compatibility
>X Windows protocol
>UNIX operating system
>Ada and C programming languages
>Maneuver Control System (MCS) data elements and data base architecture
>Ethernet and TTC/IP protocol
>Combined Arms Center network

Application

Research and Evaluation
>emulates (potential) future C^2 environment
>automated performance data capture system
>experiment control workstation interface to operational workstations

Prototyping
>functional prototypes for complete user interaction
>system concept for hosting multiple task aids and tools
>integrated user interface concept for future enhancements

SYSTEM CONFIGURATION

Hardware Description

The Tactical Planning Workstation is a distributed network system consisting of a file server and numerous workstations (see Figure 1). The primary workstation is a Sun 3/160C color Sunstation manufactured by Sun Microsystems, Incorporated. Operating as a stand-alone computer or as a node of a distributed network, each Sun workstation delivers the power of a dedicated 32-bit architecture central processing unit (CPU) and includes four megabytes of memory, a large bit-mapped multi-window display, and a mouse pointing device. The workstation includes a high quality, 1152 X 900 pixel, 19-inch color monitor that can display up to 64 plus two overlay colors from a palette of over 16 million displayable colors. A laser printer may be netted with the file server if required.

Software Description

Applications software has been initially developed to display data and to perform automated functions in support of staff planning activities of selected members of the division command group; namely, the G2 and the G3. Software languages used are Ada and C, and the operating system is UNIX. Flexible use of software functions throughout the workstations on the network is accomplished using the X-Windows protocol.

General software capabilities include:

- Store, process, and display graphic positional information of units and control measures; unit status information; and task organization and order of battle data.

- Store and display planning factors and situational information for all coordinating staff functional areas.

- Transfer information to support staff planning functions.

- Store and display product information and formats to support staff planning activities.

- Record, process, and display time-tagged experiment transaction data for analytical and feedback purposes.

Networking

The workstations are netted in a local area network (LAN); more specifically, an Ethernet. An Ethernet is a LAN which is optimized for high-speed data exchange between information processing equipment.

Experiment Control

An experiment control workstation facilitates the conduct of research experiments. The researcher can control the experiment parameters, monitor actions being taken, and view data that are collected automatically and stored for future analysis. From a dedicated workstation, the experimenter can interface with the subject and perform a variety of tasks. He may portray the role of a commander or staff officer to emulate group interactions. The system captures data on user performance, including window interactions, data queries and manipulations, and message transactions. The data collected can be transferred to a data base management system providing for its analysis. Workstations are supported by a file server and an optional laser printer. Figure 1 depicts one possible configuration of the Tactical Planning Workstation network.
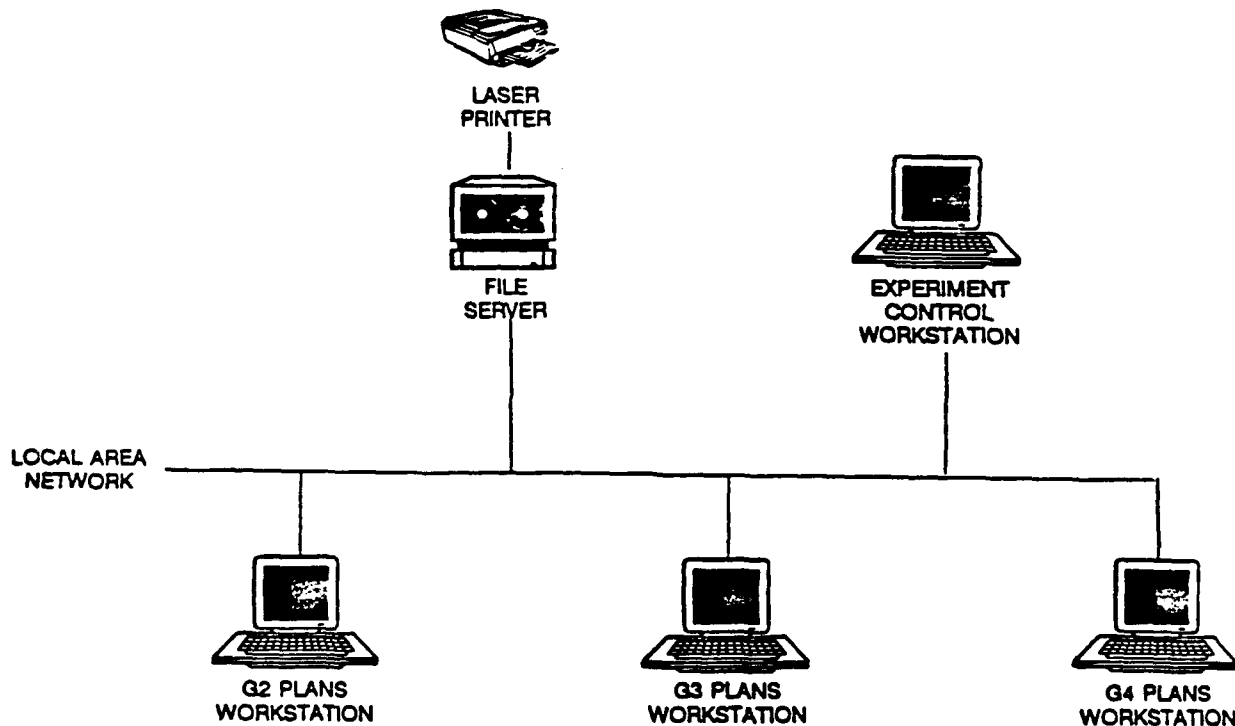

Figure 1. Tactical Planning Workstation Network with Experiment Control Station.

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ROLE IN TACTICAL RESEARCH

The Workstation is designed principally for experimentation on G3 (operations staff officers) requirements. The system has been designed to support networking of multiple workstations and can support multiple staff officers over a local area network (LAN). G1 (personnel) G2 (intelligence), and G4 (logistics) products are available through information queries. Table 3 indicates how the Tactical Planning Workstation supports staff planning.

In the current configuration, the Tactical Planning Workstation uses data from a U. S. division level offensive scenario set in West Germany (Fallesen, Michel, and Carter, 1989). The U. S. division is opposed by a combined arms army. To stimulate realistic staff performance in test exercises, the scenario provides tactical situation information that would be available to a division planning staff. The imbedded scenario provides data for driving the Workstation features and conducting user experimentation. Upon user request, the data are presented as standard staff reports that emulate information presentation in the field. Users may perform the following activities on the scenario data at the Workstation.

- Change unit locations (friendly and enemy)

- Create or modify battlefield control measures (boundaries, phase lines, axis of advance, objectives, and critical events)

- Create or modify operation plans

- Modify existing task organization

An off-line dBASE III PLUS™ capability is used by the experimenter for other modifications to the scenario data base:

- Add new units

- Change the organization and/or equipment of existing units

- Adjust unit strengths by percent or by numbers

- Task organization of forces

- Add, change, or delete plans

- Add, change, or delete control measures.

The Workstation also supports tactical command and control research by automatically recording significant user interactions with the system. Analysis of this recorded

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data assists the researcher in examining how users process information. Following is a list of activities which are automatically recorded and time tagged during system operation:

- The opening and closing of every window

- All requests for information

- Any changes to situational data

- All messages passed between workstations

At the conclusion of an experiment all recorded data are converted to ASCII files for transfer to a dBASE IV™ data analysis program. This program serves as a repository for all experiment data and permits data summary and analysis.

(A detailed description of the dBASE™ interface is contained in the Tactical Planning Workstation Software Description, Packard, McClanahan, Zarse, and Ross, in publication.)

Table 3

Tactical Planning Workstation Support for General Purpose and Staff Planning Tasks.

Tasks	How Users Interact with Workstation to Perform Tasks
Mission Receipt	- View order and tactical overlay
Analysis of the Situation/Situation Assessment	- View battlefield graphics and tactical overlays - Perform queries of tactical situation information and reference factors
Threat Evaluation	- Review graphics, intelligence reports, reference information, and threat situation information - Customize tactical displays for focused information - Use scratch pad to record assessments

(table continues)

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Tasks	How Users Interact with Workstation to Perform Tasks
Mission Analysis	- Review inputs to estimate process (higher orders, commander's intent, estimates, etc.) - View battlefield graphics and tactical overlays
Assumptions	- View situation data to support assumption development - Use to record assumptions
Determination of courses of action	- Use graphics to visualize concept of operations - Use to record courses of action (text) - Sketch courses of action
Warning Orders	- Use text formats to write orders - Pass message to subordinate units
Gathering facts	- View battlefield graphics and tactical overlays - Perform queries of tactical situation information and reference factors - Perform record keeping
Arraying forces	- View battlefield graphics and tactical overlays - Perform queries of tactical situation information and reference factors - Use calculator - Use Build Products – operations overlay capability for opposing forces (OPFOR) array

(table continues)

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Tasks	How Users Interact with Workstation to Perform Tasks
	- Use Task Organization and Status Tool (TOAST) to view unit status and make changes - Use to record force arrays
Determine Critical Events	- Review situation data - Use to create operations overlay - Use Course of Action Assessment Tool (COAAT) - Enter Critical Events onto tactical overlay - Use to record critical events
War-gaming Critical Events	- View battlefield graphics and tactical overlays - Perform queries of tactical situation information and reference factors - Visualize concept of operations - Use calculator - Use COAAT for steps, options, and record war-game results
Comparing Courses of Action	- Use COAAT for scaling, weighting, and viewing results
Developing Unit Taskings	- Use Operations Order or FRAGO format to prepare orders
Information Exchange/Product Dissemination	- Pass messages to another staff member or command post - Use Local Area Network - Operate in a shared or individual mode

USER CONTROL AND INPUT

User interaction is accomplished by use of the Sun workstation display, keyboard, and mouse. The Workstation combines windows, walking menus, direct manipulation of on-screen objects, and user-friendly language to facilitate ease of operation. This approach reduces training time and facilitates greater user acceptance of the system.

Mouse

Control of the on-screen cursor is performed using a three button mouse. The user selects operations and performs tasks by mouse manipulation. This technique is commonly referred to as "point and click." The three buttons on the mouse are used as follows:

Left Button

Once the cursor is moved to the desired location, the left button is used to select the desired item for processing.

Middle Button

This button serves two functions. First, it may be used when initializing a new window to obtain the proper size and position on the monitor. Also, this button is used to reposition graphic maps displayed on the monitor. In this case, the cursor is moved to a point on the map the user would like to have recentered within the window, then the middle button is depressed. The map is redrawn with the selected point becoming the new center point.

Right Button

This button is used to obtain menus. After the cursor has been moved to an area of interest within the menu window, the right button is depressed to display menus that allow various functions. The user keeps the right button depressed as he moves to the right through a walking menu until the desired operation is highlighted. Upon release of the button, the selected function will occur.

Keyboard

The Workstation keyboard is used like a typewriter. Keyboard input has been minimized by using a mouse control. The keyboard is used only for labeling items (such as windows, icons, plans, and control measures), and filling out forms and reports, or making notes. Special function keys are not used.

Walking Menus

As described above, a walking menu can be obtained by moving the cursor to an area of interest and depressing the right button. Upon selection of a menu item, the user should check the right side of the menu item for an arrow (–>). If an arrow appears, this indicates that additional menus regarding the selected topic are available. The user must slide across the menu item to the arrow to expose the submenu. This process is repeated whenever the arrow is present. Figure 2 is a sample of a walking menu. In the example, the operator is querying the data base to learn about the equipment status of 3rd Bde as of 021800 Sep. Menu selections are LOGISTICS –>, EQUIPMENT STATUS –>, 3 BDE 16 DIV –>, 021800 SEP. The walking menu temporarily overwrites the window to which it is linked. When a selection has been made, the walking menu disappears.
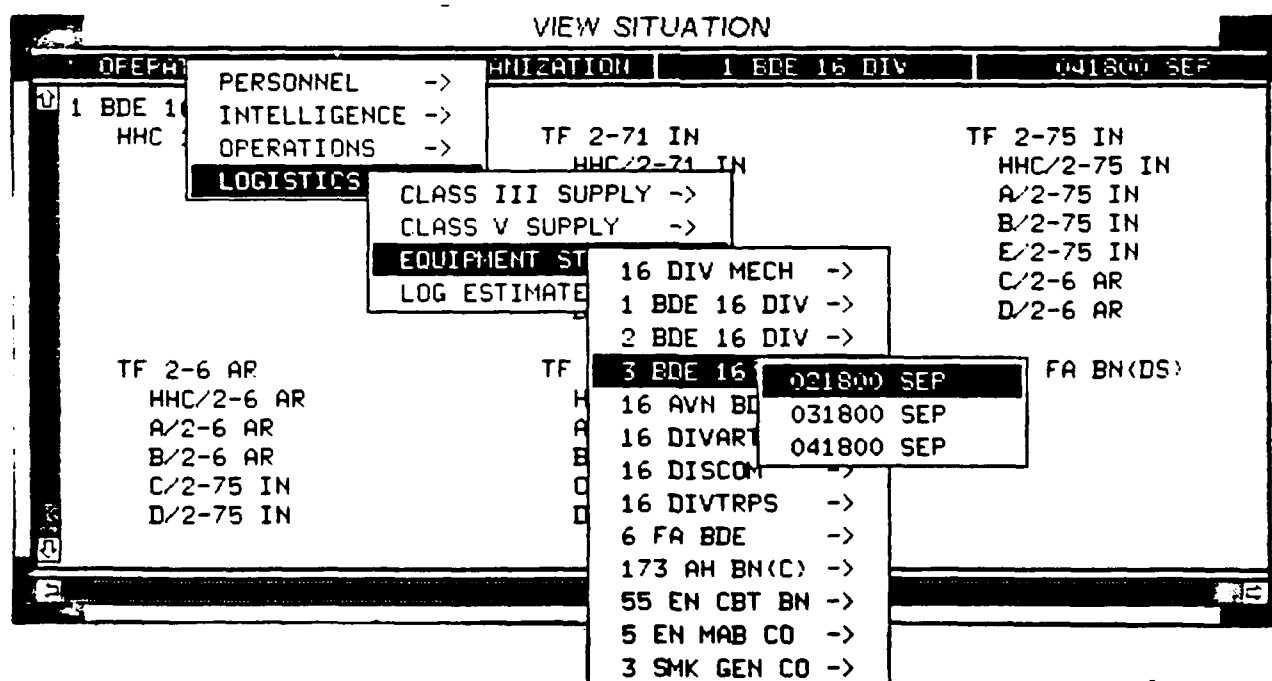

Figure 2. Walking menu.

Walking menus are a means of selecting desired functions. They also provide the user a method for quickly reviewing the structure of the data base. By sliding the mouse while depressing the right (menu) button, the user can explore the data base structure. The operator views single branches of the menu and is not presented the entire menu tree all at once.

Pop-up Menus

Pop-up menus permit control and transfer of data displayed in a window of the monitor. Various pop-up menus exist within the system and are accessed by the mouse. They are used instead of walking menus when there are few choices. They provide an indication of appropriate choices at a given time. Figure 3 is an example of pop-up menus. To make a selection, the user moves the cursor to the desired choice and depresses the left button. Displayed are options available for window manipulation. (Note that there are no arrows on the right side of the menu on pop-up menus in contrast to the walking menu.)

FRAME

Close and Stack
Move
Resize
Expose
Hide
Redisplay
Zoom
Icon Name
Window Name
Terminate
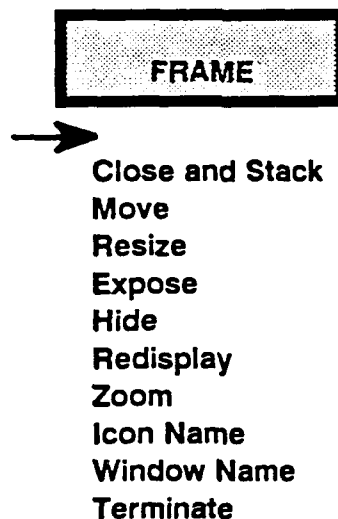
Figure 3. Pop-up menu.

Direct Manipulation Dialogue Using Objects

This feature is designed to simplify system operation and minimize train-up time. The concept for this function is that the user exercises control and obtains information on anything displayed on the screen by simply moving the cursor to the item and selecting it with the mouse. This feature is used for moving unit symbols to new locations, for drawing and modifying control measures, and selecting units from task organization charts.

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Windows

The Workstation displays text and graphic data within windows. Multiple windows can be activated on the screen and permit multiple operations to be displayed simultaneously. The size and position of the windows are easily adjusted by the user employing the mouse. Each window may display different types of information. The displays within each window on the monitor correspond to specific functions selected by the user.

For example, a staff planner may be developing a course of action statement and sketch. He may have one window displaying the higher headquarter's order, another window with his commander's intent statement, another with the latest intelligence summary, another with typical threat organizations and strengths, and another where he is creating an operations overlay sketch.

Each window contains scrolling bars that permit rapid access to data not displayed on the screen. Through manipulation of windows, the user has flexible control of use of the display screen.

Text Editing

The Tact'cal Planning Workstation fully supports text editing. All editing functions are accomplished using the mouse and/or the keyboard. Editing functions which an exercise participant may perform include:

- Entering text

- Selecting text through a find, copy, cut, and paste technique wherein text may be changed in an existing window or may be transferred between windows. As an example, the mission statement received in a FRAGO from a higher headquarters may be transferred to a subordinate unit's operations plan (OPLAN) or staff estimate, eliminating the need to retype the information.

OUTPUT DISPLAYS

System output is displayed on a high resolution color monitor. The monitor will display textual information, digitized maps, and standard tactical overlay information. The system can provide the user printed copies of displayed information with the addition of a laser printer. Information presented to the user is in a military format thereby increasing user acceptance and, again, reducing training time.

Maps and Overlays

Tactical maps are generated and displayed on the monitor based upon digitized terrain data supplied by the Defense Mapping Agency (DMA). DMA data provide information on terrain, elevation, vegetation, hydrography, built-up areas, and man-made features. Map scales currently presented in the system are 1:80,000, 1:160,000, 1:400,000, and 1:800,000. While these scales do not correspond directly to standard tactical map scales, the information and detail displayed are identical to DMA tactical maps. The scales allow the display of more ground coverage in the same screen area than the traditional scales (1:50,000; 1:100,000; 1:250,000; 1:500,000).

Terrain features appearing on the Workstation may be highlighted to facilitate terrain analysis and identify key terrain.

In addition to displaying terrain features, unit symbology and control measures are displayed over the maps to produce tactical situation overlays.

Text

Text is displayed in windows. Depending on the window selected, information may be read, copied, created, deleted, or moved. Scrolling bars in the windows facilitate rapid perusal of textual information. Text types include:

- Individual staff section estimates

- Intelligence summaries

- Orders

- Planning guidance

- Current operations summaries.

In older battlefield computer systems, users were required to enter specific commands or words using the system keyboard. Users had to memorize mandatory command words or use manuals that prescribed the precise methodology. This process required training of the user and is often viewed as one of the major drawbacks of any user computer interface. Additionally, the process of entering data in the form required by the system is often a source of frustration to users and is a major factor in inefficient operations. The Tactical Planning Workstation replaces most of the keyboard data entry process with a "point and click" mouse operation. Users are able to perform required operations by using the mouse to move the cursor to an on-screen symbol and "clicking" a mouse button. Options are displayed on the screen, not buried away in function keys or elsewhere on the keyboard, or in manuals.

Following is a discussion of the user interface style of the Tactical Planning Workstation.

Buttons and Icons

The Tactical Planning Workstation provides a master menu of functions available at all times. This menu is represented by "buttons" that are displayed at the top of the screen. They remain in this position during all operations and are continuously available to the user by mouse manipulation. Figure 4 depicts the top part of the screen showing the master menu buttons.
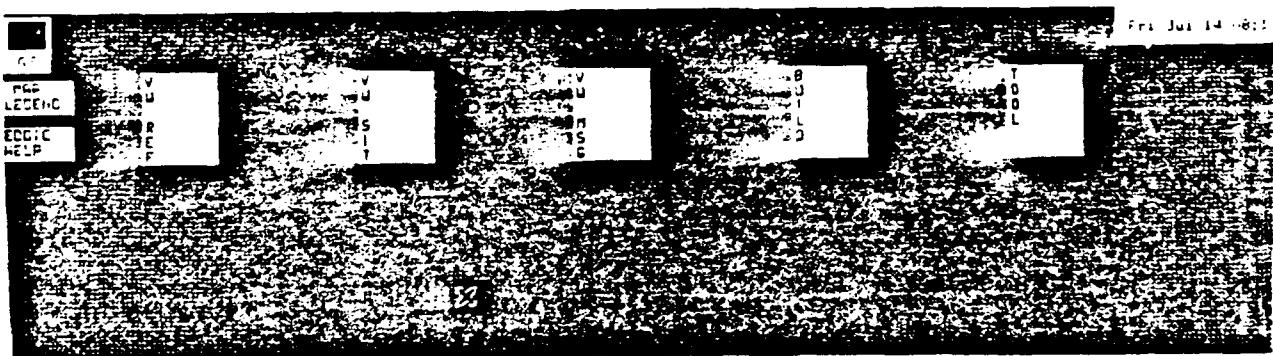

Figure 4. Buttons.

Each of the buttons allows the user access to specific functions. Following is a brief description of each function.

VW REF
(View Reference) Contains data that consist of basic information for division staff officers. Information is static in nature and does not refer to a specific unit. Includes selected information found in Army FMs and TMs, such as planning factors for consumption of supplies.

VW SIT
(View Situation) Contains dynamic battlefield data for a given tactical scenario. Represents information and reports normally available to a division staff during a tactical exercise.

VW MSG
(View Message) Used to alert the user of incoming messages and to manage queues of incoming and saved messages.

BUILD
(Build Product) Used to support the creation of staff products. The Workstation operator creates textual information, reports, messages, and graphic overlays in this window.

TOOL
(Tools) Access to various tools and aids for the operators.

CNTRL
(Control) Only initiated from the experiment control workstation for system control or to simulate a staff or commander's involvement in an exercise.

After a user has selected one of the buttons, a window will appear on the monitor. This window will allow the user to perform a variety of functions. The user may repeat this process and have multiple windows displayed simultaneously. After the information in the window is used, the window may be terminated. Alternatively, it can be saved for future use even though not displayed. This function is called close and stack. If this option is exercised, the window will disappear and an icon will appear above the appropriate button representing the closed window. Figure 5 depicts stacked icons.
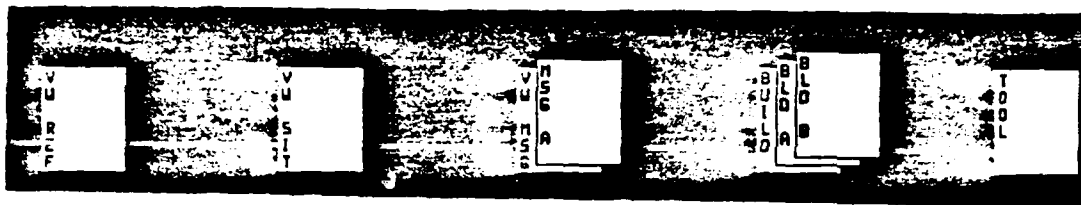
Figure 5. Icon stacking.

Help

Users are provided on-line guidance when they select the Help button positioned in the upper left-hand corner of the monitor (see Figure 4). Descriptive information is instantly available to the user precluding the lookup of information in a manual. Figure 6 is an example of information available by selecting the Help button. A diagram showing the entire data base layout may be viewed using the help button. Figure 7 is a sample of the reference data base layout displayed with the help button.

HELP WINDOW

The EDDIC folders displayed on the top of the screen provide the interface for you to access the data and tools in EDDIC. The following folders are provided:

VW REF	-	View technical reference material
VW SIT	-	View current and past situation products
VW MSG	-	Process incoming messages
BUILD	-	Build and transmit command and control products
TOOL	-	Decision aids to help you in the assigned task

In addition to the EDDIC folders, there are three buttons displayed in the upper left corner of the screen. The top button is the Workstation Console and is used only to terminate an EDDIC session. The Map Legend button provides an explanation of the colors on the digital map. The EDDIC Help button provides help on the use of EDDIC.

Figure 6. Help window.
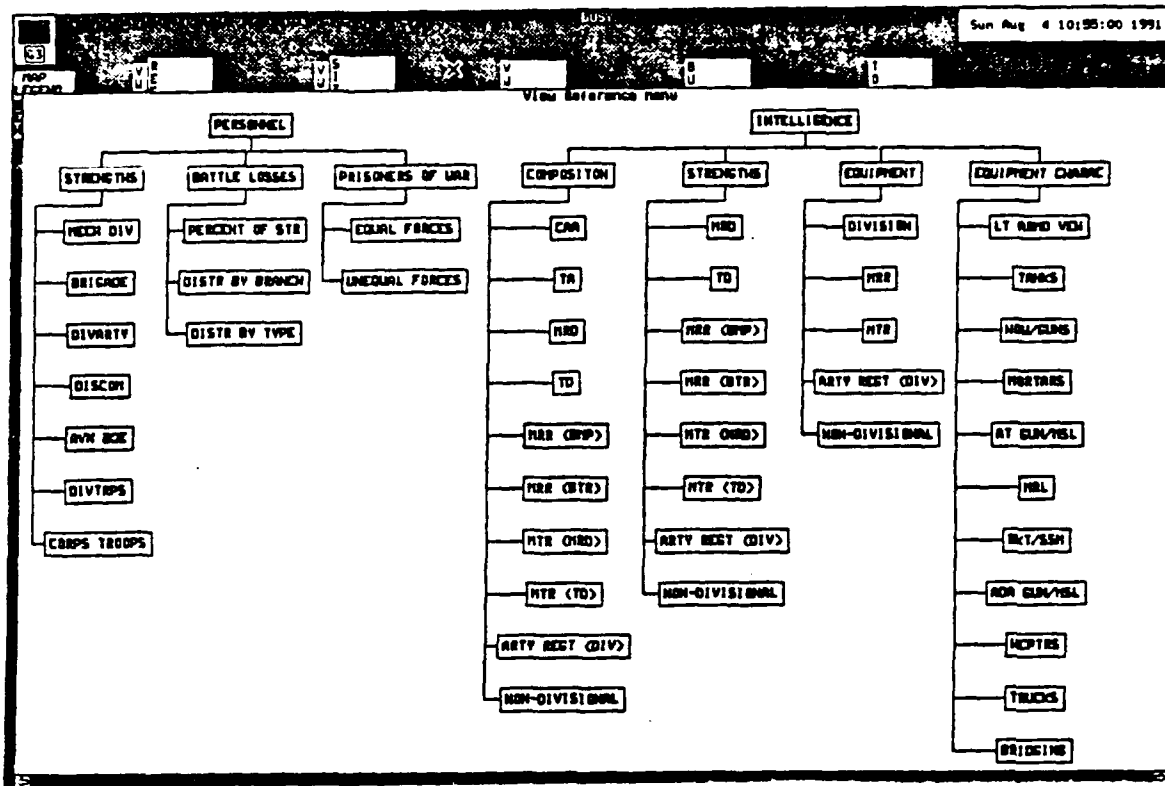
Figure 7. Reference data base design (personnel and intelligence) using help function.

Window Operations Functions

The use of multiple windows is intended to enhance the simplicity, utility, and applications of the Tactical Planning Workstation. Each window is designed to display a predefined category of information or to perform specific functions. This design is described below.

View Reference Window

This window displays reference data to the user. It replicates information contained in field manuals, technical manuals, and other basic reference materials that are deemed necessary for the user to perform selected tasks. Planning factor data necessary for support of staff officers are readily available to workstation users. A walking menu presents the information. The reference data available through this window are independent of the tactical situation. This capability greatly reduces the need for individuals to depend on external reference materials. The user accesses the data by selecting the "View Ref" button and using

a walking menu. Figure 8 shows the organization of the reference data base and the paths necessary to obtain specific information.

Figure 9 is a sample of a selected reference information query on the authorized personnel in a maneuver brigade of a mechanized division. A title bar, shown in reverse video (white characters on a dark background) shows the path of choices previously selected in the walking menu to open the window. The parts of the title are also active menu options. If the user wants to change the contents of the window, selecting one of the title captions will bring up the walking menu associated with that caption. For example, in Figure 9, the user could select "strengths" and be prompted to make a new choice from the menu of "strengths", "battle losses," or "prisoners of war" (refer again to Figure 8).
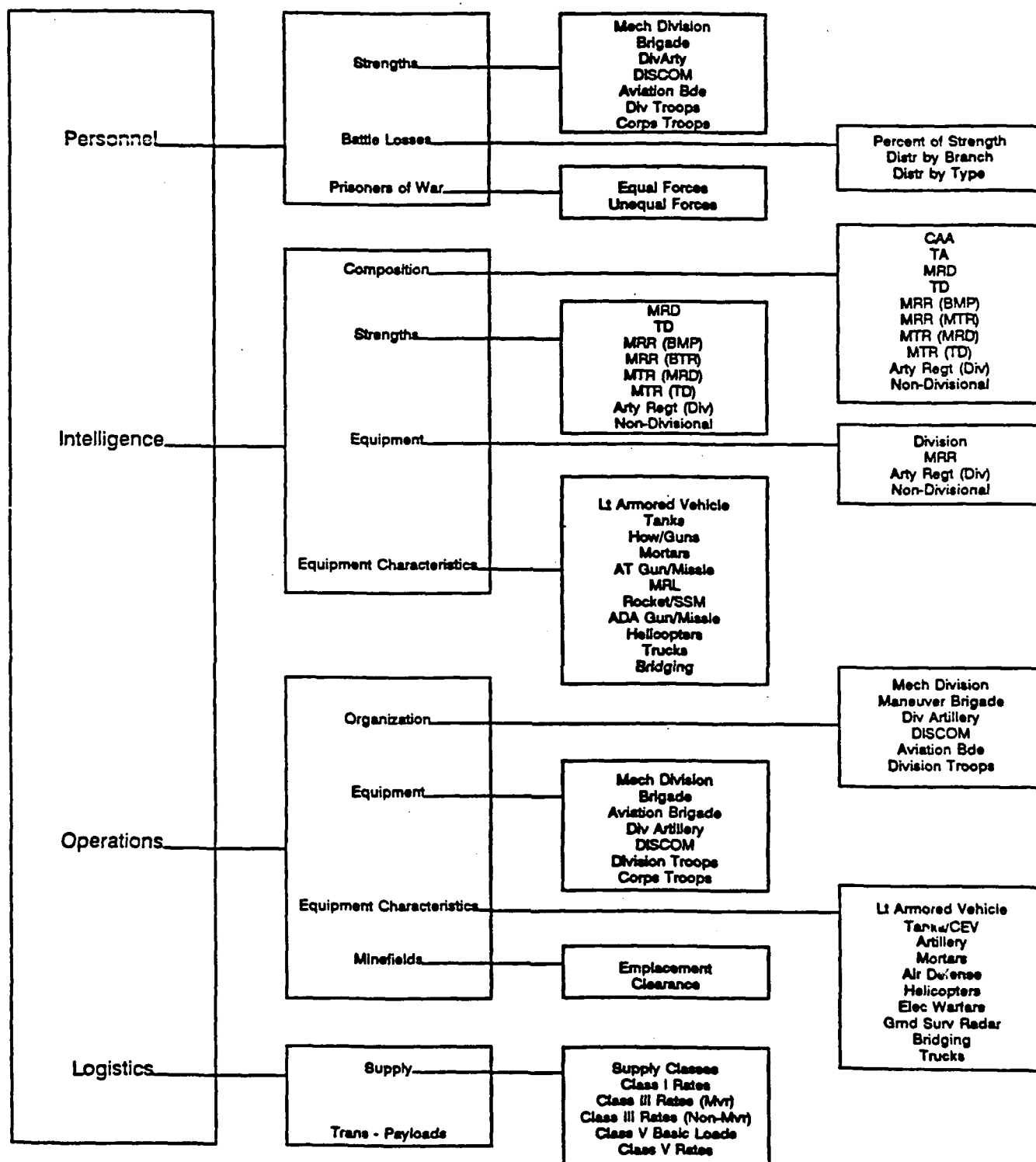
Figure 8. Organization of the reference data base.

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Figure 9. Sample view reference window.

View Situation Window

This window provides access to the Situation Data Base. It is used to display situational data such as overlays, operations orders and plans, staff estimates, and other information which exists for a particular situation. Data displayed in this window may be moved to the Build Product window or to the Tools window as necessary. The user accesses the data by selecting the "View Sit" button and associated walking menus. Figure 10 shows the organization of the situation data base and the paths necessary to obtain specific information. Figure 11 is a sample of a selected situation window presenting the task organization of a brigade in a mechanized division using the View Situation window.

Figure 10. Organization of Situation Data Base.

```
OPERATIONS        TASK ORGANIZATION      1 BDE 16 DIV        041800 SEP

1 BDE 16 DIV
   HHC 1 BDE 16               TF  2-71 IN              TF  2-75 IN
                                HHC/2-71 IN              HHC/2-75 IN
                                A/2-71 IN                A/2-75 IN
                                B/2-71 IN                B/2-75 IN
                                E/2-71 IN                E/2-75 IN
                                C/2-10 AR                C/2-6 AR
                                D/2-10 AR                D/2-6 AR


   TF  2-6 AR                 TF  2-10 AR              2-32 FA BN(DS)
      HHC/2-6 AR                HHC/2-10 AR
      A/2-6 AR                  A/2-10 AR
      B/2-6 AR                  B/2-10 AR
      C/2-75 IN                 C/2-71 IN
      D/2-75 IN                 D/2-71 IN
```

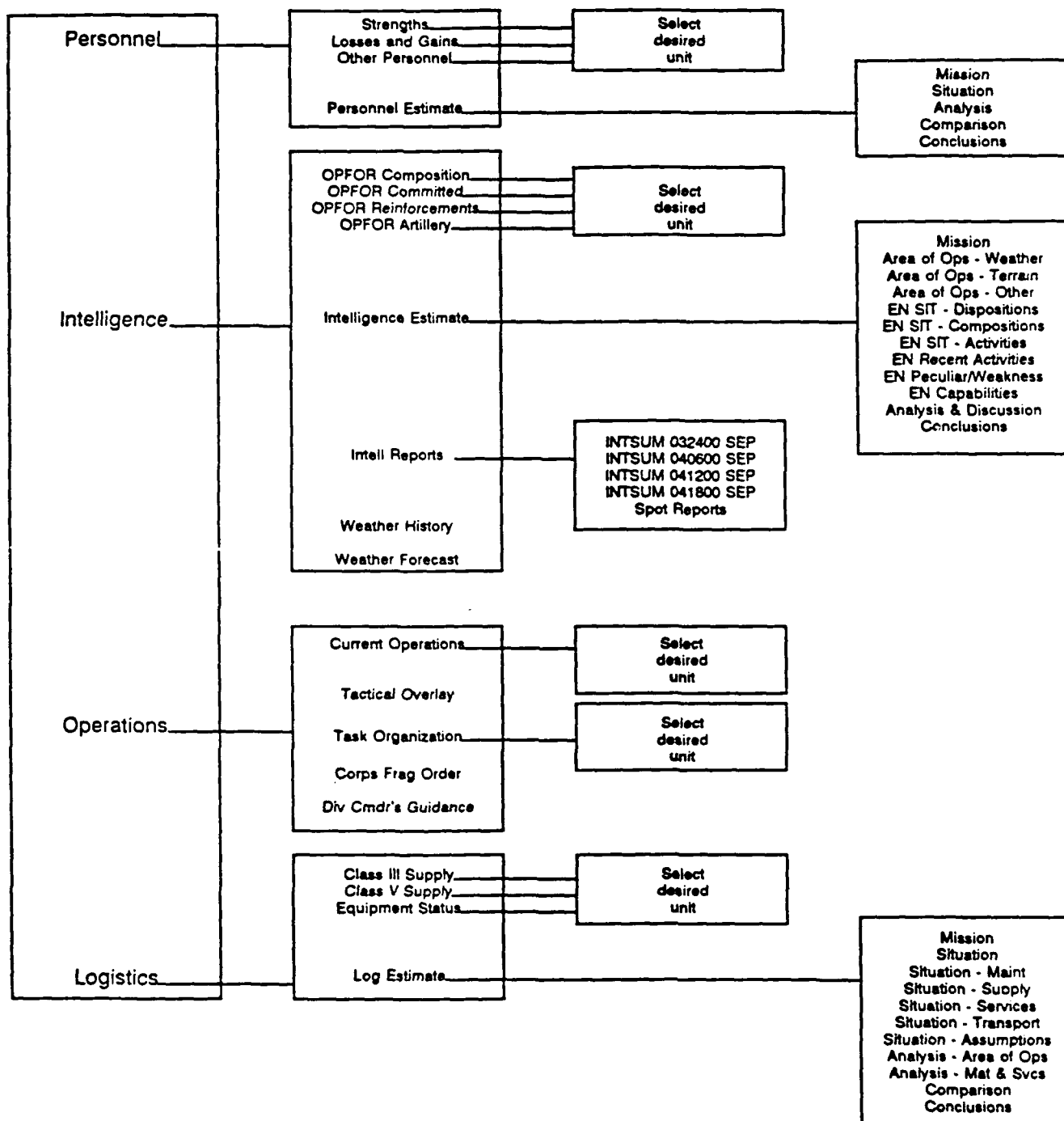Figure 11. Sample View Situation Window.

In addition to textual information, tactical maps and overlays are available to the user. These maps and overlays are accessed by use of the walking menu. After calling up a View Situation window, the user selects Operations and then Tactical Overlay. A map of the relevant terrain will appear in the window. At any time, the user may modify the display of the map. Various features (grids, contours, roads, hydrography, built-up areas, and miscellaneous features), can be turned on or off. Shaded relief, vegetation, elevation banding, and none background types are available. Four different map scales are also available.

Tactical overlay information can also be customized. This information is organized into friendly units and control measures and enemy units and control measures. In this window, the user may specify the display of types of units (e.g., combat, combat support, combat service support) along with their names and symbology and also any control measures, such as boundaries, points, and other battlefield geometry. Figure 12 depicts the structure and functions of map and overlay display and creation. A more detailed description is provided in the section on Graphics on page 30.

The Tactical Planning Workstation provides a map legend describing what each map color stands for. The map legend is also an interactive display tool. When a legend item is selected with the mouse, each element of that type is highlighted in the map window(s). This feature can be used to perform location queries of map objects or terrain types (e.g., bridges or highest terrain).

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Map Features

Any or All
Grids
Contours
Roads
Hydrography
Built-up Areas
Misc Features

Map Background

Shades Relief
Vegetation
Elevation Banding
None (Blank)

Map Scales

1 : 80,000
1 : 160,000
1 : 400,000
1 : 800,000

Elev & UTM Query

Show BLUEFOR Units

Any or All
Combat Units
Combat Support Units
Combat Svcs Support Units
Division
Brigade
Battalion
Company
Unit Name
Unit Symbol

Any or All
Points
Lines
Areas
Routes
Obstacles
Crossings
Fire Plan
Map Label

Show BLUEFOR Cntrl Msrs

Type

Echelon

Any or All
EAC
Corps
Division
Brigade
Battalion

Tactical Overlay

Show OPFOR Units

Any or All
Committed Units
Reinforcing Units
Artillery Units
Division
Regiment
Battalion
Company
Unit Name
Unit Symbol

Any or All
Points
Lines
Areas
Routes
Obstacles
Crossings
Fire Plan
Map Labels

Show OPFOR Cntrl Msrs

Type

Echelon

Any or All
Army
Division
Regiment
Battalion

* Create BLUEFOR CM

* Create OPFOR CM

Axis of Advance - Main
Axis of Adv - Supporting
Boundary
Critical Event
Objective
Phase Line
Map Label

Airfield
Bridge
Building
City
Lake
Map Reference
Mountain Peak
Road Intersection
Town
Village

* Start New OPPLAN

New Shared OPPLAN
New Personal OPPLAN

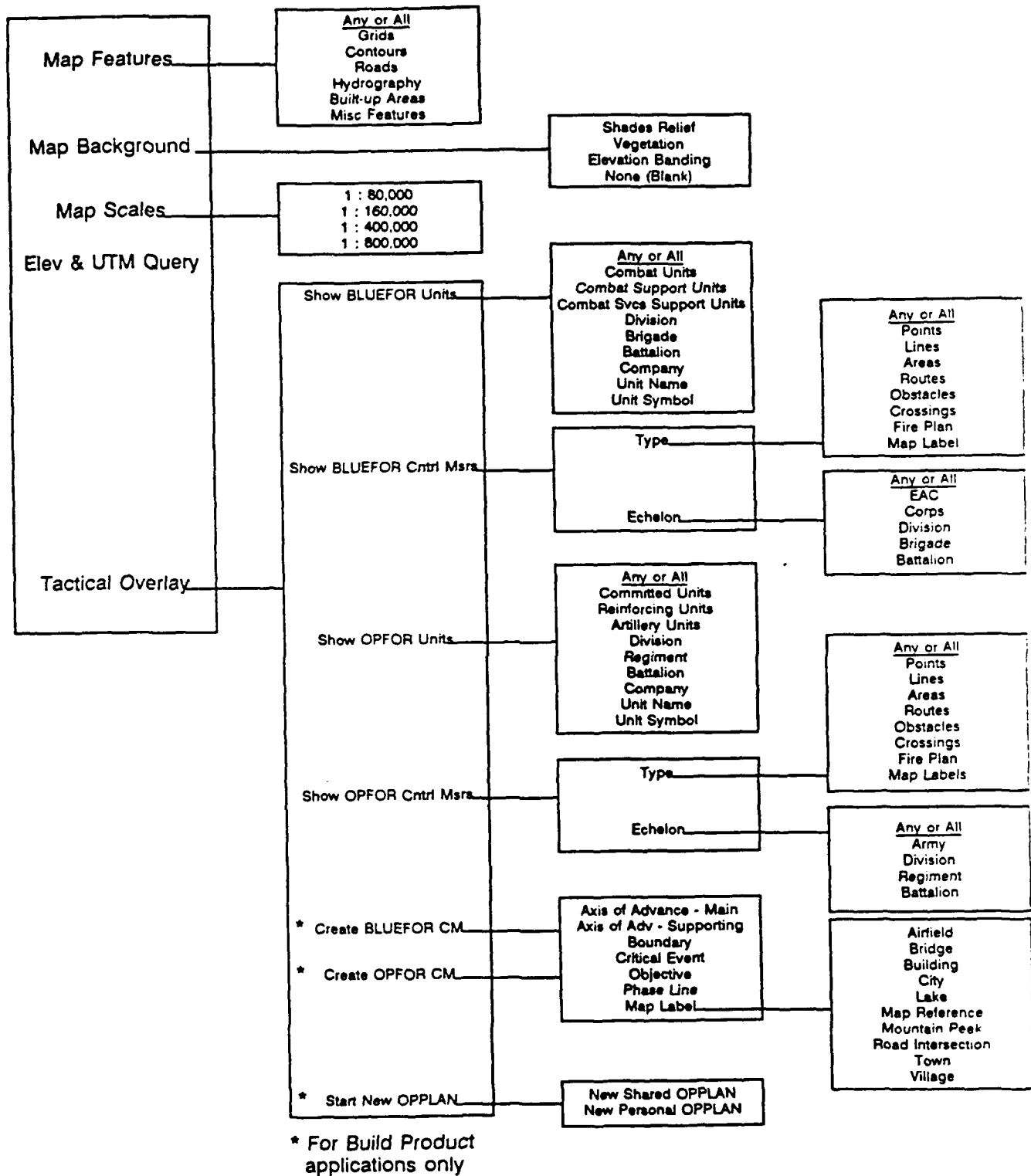* For Build Product
applications only

Figure 12. Map structure.

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View Message Window

This window is used to view incoming messages transmitted by a user on another system on the local area network (LAN). The messages may be textual or maps with tactical overlay information. After the message has been reviewed and automatically logged, the user can store or dispose of the message. Additionally, the message can be retransmitted to another user on the LAN. An alerting device on the View Message button will alert users to receipt of a message (see Figure 13). Figure 14 shows a sample incoming message on the View Message Window.
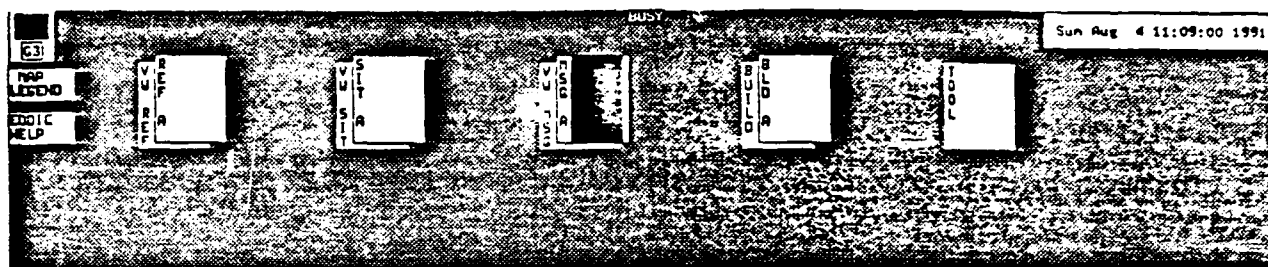

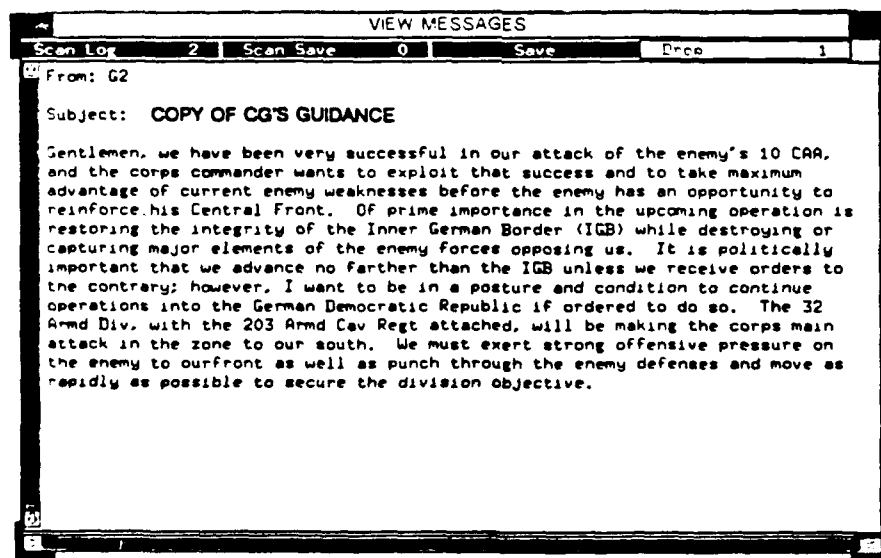Figure 13. Master menu showing view message button and message alert.

Figure 14. View message window with a sample message.

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Build Product Window

This window is used to build products (messages, reports, plans and orders, and overlays) consistent with the intent of a given exercise or experiment. Standard report formats are available for use with normal menu manipulation. Information from other windows may be copied directly into this window as necessary. Outgoing messages are created and sent from this window. Any product created in this window will be stored in the Product Data Base and is available for recall in the View Situation window. Information can be copied from this window to the Tools window if required. Tactical overlays, which depict friendly and enemy units, boundaries, and control measures, are created using this window. A more detailed discussion of maps and overlays is provided in the section on Graphics.

Map information and tactical overlay information may be viewed and manipulated as described previously in the View Situation Window paragraph. However, in the Build Product Window, the user may also create or modify tactical overlay information for both friendly and enemy units. Currently, the user may create or change boundaries, axes of advance, objectives, points, phase lines, and selected map labels. Also, unit symbology may be moved to represent planned locations. These capabilities are further discussed in the section on graphics.

Finally, a user may start a new Operations Plan for future operations and specify if his work on the plan is to be shared with other workstations or is for his own use.

Tools Window

This window is designed to provide the user with various aids for supporting staff functions. Current capability features three aids. The first, Scratchpad, allows a user to make notes, copy information from other windows, and organize information. Standard text editing functions are performed with the use of a pop-up menu. The user can copy reference and situation material to the scratchpad and add his own notes and comments.

The second aid accessed in the tools window is the task organization and status tool (TOAST). TOAST is an interactive aid that permits a user to review and make changes to a task organization of friendly units. TOAST uses a "tree structure" chart that reflects the current tactical situation, common in format to that used in FC 101-5-2, The Staff Officers Handbook. The user may reorganize his organization by selecting a unit and moving it to another headquarters. This change modifies the data base, not just the organizational chart on the screen. Figure 15 is an example of this aid. The user can point with a mouse at any unit and obtain status information relevant to the selected unit. Two levels of detail are available to the user when selecting status information. Either a detailed or summary report can be produced and displayed in tables or "mercedes" charts similar to the formats specified for the Maneuver Control System (MCS), Version 10. Figures 16 and 17 are examples of

these reports. As an aid to the user, the screen display may be effectively enlarged by dividing horizontally or vertically to focus on specific units.

The third aid is a calculator that can assist the user in performing simple mathematical calculations.
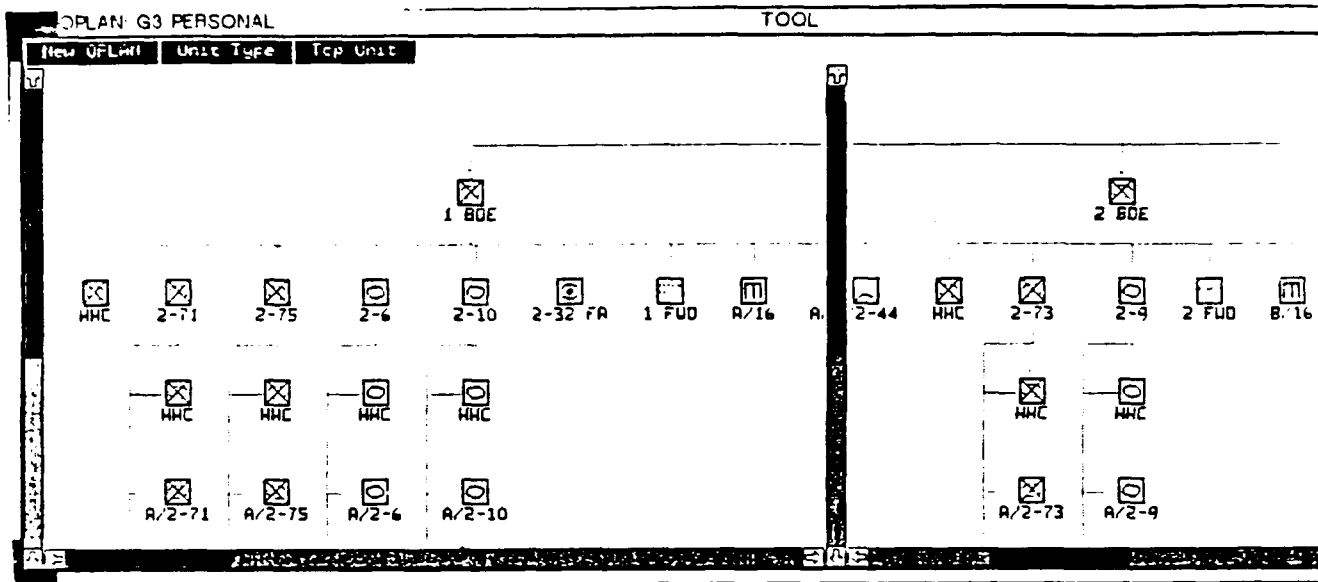

Figure 15. Task Organization Tool.

Figure 16. Detail report of 3 Bde status.

1 BDE 16 DIV

	PACING ITEMS	SPT SYSTEMS	PERS	CLASS III	CLASS V	C3 SYSTEMS	UNIT
HHC 1 BDE 16	100%	80%	90%	100%	100%	83%	
TF 2-71 IN	82%	81%	75%	100%	100%	75%	
TF 2-75 IN	84%	86%	84%	100%	100%	88%	
TF 2-6 AR	84%	93%	87%	100%	100%	88%	
TF 2-10 AR	85%	90%	82%	100%	100%	88%	
2-32 FA BN	79%	81%	85%	100%	100%	69%	
1 FWD SPT BN	100%	85%	89%	100%	100%	100%	
A/16 ENGR	100%	87%	84%	100%	100%	100%	
A/2-44 ADA	100%	82%	89%	100%	100%	100%	
1 BDE 16 DIV	84%	87%	82%	100%	100%	84%	

Figure 17. Summary report of 1 Bde units.

Experiment Control

This window is designed to allow the experimenter to interface with another workstation user. This window is available only to the person operating the experiment control workstation. If selected, it can be used to send a message that will be indicated by the appearance of a control icon to the right of the normal five buttons and will be labeled as control. When the participant selects this button with the mouse, the experimenter's message will appear on the monitor. This message can provide information for the participant or query the participant about an action taken or not taken. The participant can either delete the information item or respond to the query and send an answer back to the experimenter.

Graphics

The Tactical Planning Workstation permits users the freedom to customize map displays and overlay information in the most desirable manner for a particular application. This capability allows the user to select desirable features and reduce clutter. Mouse manipulation provides the technique for selecting, modifying, and locating graphic information. After selecting display of overlay information in either the View Situation window or the Build Products window, a map will appear in the window. The user will then begin specifying the map and overlay information he requires. The procedure for manipulating graphic information is the same for both the View Window and Build Product windows with one exception. The Build Products graphic display allows one to create and modify operations overlay data. Figure 12, Map structure, depicts the structure of the walking menus used to display and create graphic data.

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Map Legend

Located in the upper left-hand corner of the monitor is a button labeled Map Legend (see Figure 4). When a map is displayed, the user may find the legend helpful in understanding items of information displayed on the screen. The legend is displayed by moving the cursor to the button and depressing the select (left) button on the mouse. The legend will appear on the left side of the map. By moving the cursor to the legend and depressing the menu (right) button, this menu may be moved or terminated.

When using the legend, the user will find several features extremely helpful. First, the user may move the cursor to any of the items in the legend and depress the select (left) button. The selected item in the legend and on the map with that characteristic will turn white aiding in location, identification, and analysis. Only one item at a time may be selected in the legend and displayed in white on the map. Initially, the user will note that there are blocks of items in the legend that are the same color. These items are depicted on the displayed map in the same color. If the user would like the items within the block to be displayed individually, then that block or feature must be turned on by the user. Before selecting from the map legend, the user should select the appropriate display features using the Map Features or Map Background menus. For example, if the user wishes to analyze the various types of vegetation in a specific area, he must first select a vegetation background or, if a display of all hydrographic areas is desired, the user must first select "hydrography" from the Map Features menu. Figure 18 is a diagram showing the map legend and the associated map features or backgrounds that must be turned on to use the legend.

```
AGRICULTURE, CROPLAND
GRASSLAND
CONIFEROUS FOREST
DECIDUOUS FOREST
MIXED FOREST
CLEARING                                                    (MAP BACKGROUND)
ORCHARDS
BRUSH, SCRUB, DENSE
BRUSH, SCRUB, OPEN                        VEGETATION
WETLANDS
MARSH, BOG, PEAT
NEARLY BARREN
76-150 METERS
151-225 METERS
226-300 METERS
301-375 METERS
376-450 METERS
451-525 METERS                           ELEVATION
526-600 METERS                           BANDING
601-675 METERS
676-750 METERS
751-825 METERS
826-900 METERS
901-975 METERS                                             (MAP FEATURES)
DRY STREAMS
WET STREAMS                              HYDROGRAPHY
LAKES, PONDS, RESERVOIRS
VILLAGES
TOWN                                     BUILT-UP AREAS
CITIES
1 LANE UNIMPROVED ROADS
1 LANE IMPROVED ROADS
2 LANE UNIMPROVED ROADS                  ROADS
2 LANE IMPROVED ROADS
2 LANE IMPROVED MAIN ROADS
>2 LANE IMPROVED ROADS
RAILROADS
BRIDGES <30
BRIDGES 30-59
BRIDGES > 60
POWER STATIONS                           MISC. FEATURES
DAM
TUNNELS
FORDS
AIRFIELDS, HARD
AIRFIELDS, NATURAL
```
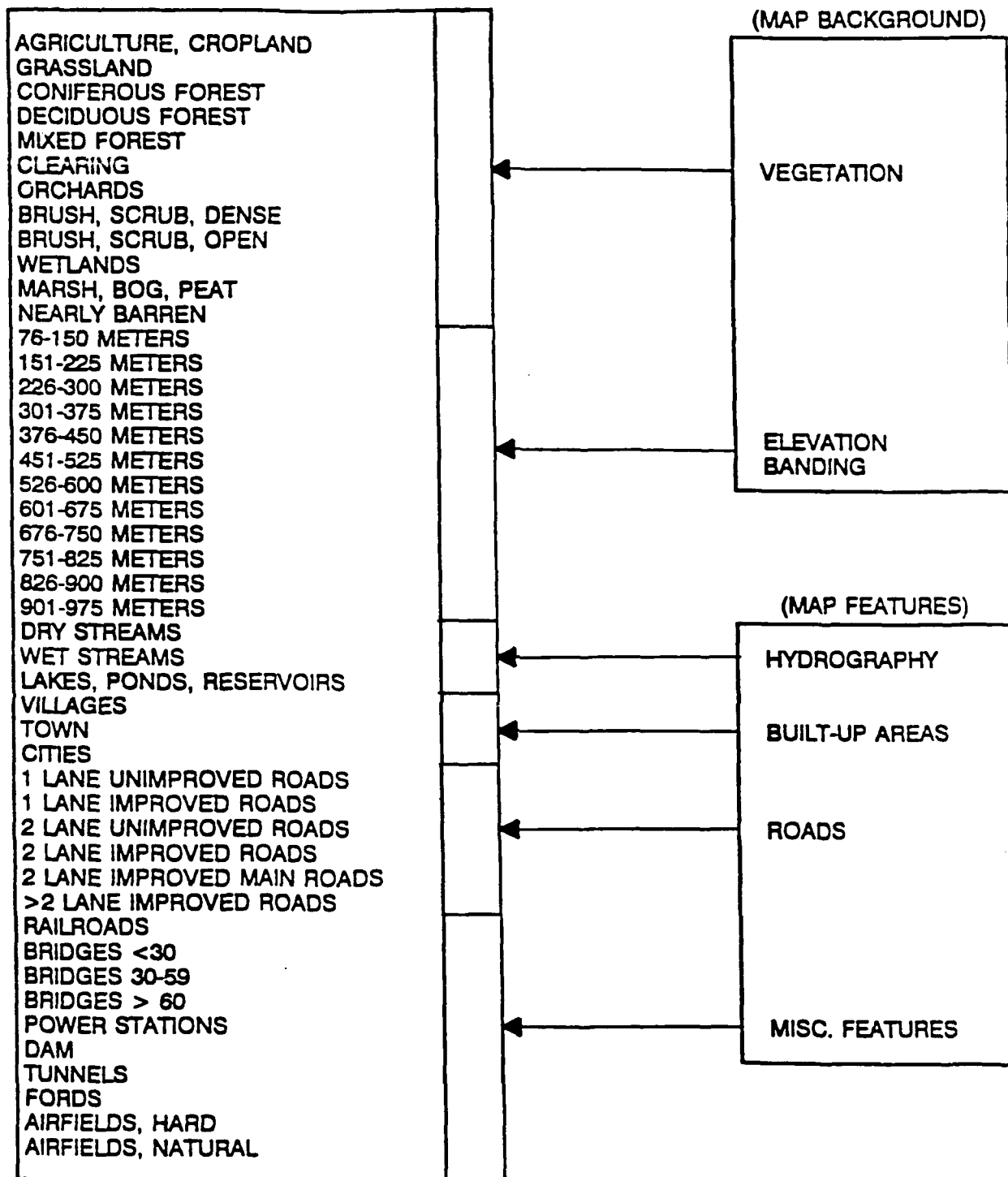
Figure 18. Map Legend and associated features and backgrounds.

Maps and Overlays

If the cursor is positioned on a unit or a control measure, the system will produce information on that object. To obtain a map menu, the user moves the cursor to any other spot on the map and depresses the menu button (right button). After display of the basic map menu, the user will select the desired function. Following is a description of the capabilities and functions.

Map Features. When the Map Features choice is selected, a submenu will appear. The user will then select the desired map features (left button). After completion, he will select the "done" box at the bottom of the menu. Any or all of the features listed below may be displayed. An excessive number of features may cause screen clutter and, therefore, users should utilize only those features deemed necessary.

-     Grids. Universal Transverse Mercator (UTM) grids are displayed when this feature is selected. Grid information (two letter, two digit grid designators) is displayed along the left and top edges of the map display. Additionally, any grid coordinate on the map may be displayed by use of the ELEV & UTM Query.

-     Contours. Contour intervals may be displayed by using the Map Features menu. Unlike paper maps, the contour intervals do not list elevation data. Users may use the ELEV & UTM Query to obtain the elevation of any spot on the map. Contour intervals of 25 meters and 50 meters are available with map scales of 1:80,000 and 1:160,000, respectively.

-     Roads. The road network is displayed on all maps in the color shown on the map legend. Initially, all roads ranging from unimproved to improved to railroads are displayed using the same color. If detailed information on roads is required, the user should select "Roads" from the Map Features menu. The system will then display all roads in different colors depicting both type and construction. Even if the feature "Roads" in the Map Features menu is not selected, the user may move the cursor to the map legend for a type of road and push the select button on the mouse. This action will turn the selected item white both in the map legend and on the map itself.

-     Hydrography. The hydrography display is similar to roads. Initially, all hydrographic features are displayed in one color as defined in the map legend. If additional information on hydrographic feature is required, the user should select "Hydrography" from the Map Features menu. This action will display the hydrographic features in different colors as defined by the map legend. The user may select any feature in the map legend and select it causing the selected item to be displayed in white.

-       Built-up Areas. This feature works like the above mentioned map features. If additional information on built-up areas is required, the user should select "Built-Up Areas" from the Map Features menu. The map will then display villages, towns, and cities in different colors as defined in the map legend.

-       Miscellaneous Features. This feature works like the above-mentioned map features. When selected by the user the following information will be displayed in different colors:

    -       Bridges (by weight class)   -   Tunnels
    -       Power stations   -   Fording sites
    -       Dams   -   Airfields

Map Background. As maps are used, the user may require different presentations of tactical map data. The Workstation permits the user to select the most appropriate background for a specific task. By default, a map is displayed with a vegetation background; however, the user may quickly change the background to shaded relief, elevation banding, or no background at all. This process is accomplished by selecting "Map Background" from the map menu. Following is a description of the functions of each background:

-       Vegetation.   Map is displayed with vegetation color-coded as indicated by the Map Legend. The user may select different vegetation features to be highlighted on the map by use of the map legend. Areas which may be highlighted are:

    -       Grasslands   -   Vineyards
    -       Coniferous forest   -   Brush, scrub, dense
    -       Deciduous forest   -   Brush, scrub, open
    -       Mixed forest   -   Wetlands
    -       Clearing   -   Marsh, bog, peat
    -       Orchards   -   Nearly barren

-       Shaded Relief. This map is designed to provide the user a display of the relief of the land. Valleys and peaks are particularly visible using this technique. Mobility corridors may be examined using this display. The shaded relief effect is achieved by displaying "shadows" resulting from a simulated lighting angle.

-       Elevation Banding. A user may be required to perform detailed terrain analysis in determining mobility corridors. With this system, a user may display terrain that is of relatively the same elevation. After selection of elevation banding, a

band width is selected on the map legend. All terrain with elevations in that band will be highlighted. Elevation band selections on the map legend are:

75 - 150 meters	526 - 600 meters
151 - 225 meters	601 - 675 meters
226 - 300 meters	676 - 750 meters
301 - 375 meters	751 - 825 meters
376 - 450 meters	826 - 900 meters
451 - 525 meters	901 - 975 meters

By combining this feature with vegetation maps and shaded relief, a user can determine go, no-go terrain and high speed avenues of approach.

- None. This feature eliminates all background and allows tactical overlay information to be shown on a gray background. For some tasks (e.g., the production of sketch maps), the use of background maps is unnecessary, and this feature allows the user to reduce unnecessary detail for the task being performed.

Map Scales. Tactical maps are generated and displayed on the monitor based upon digitized terrain data supplied by the Defense Mapping Agency (DMA). The map scales generated from these data do not correspond directly to standard tactical map scales (e.g., 1:50,000 or 1:250,000); however, the information and detail appearing on the system geographic displays are identical with that of the DMA tactical maps. Scales used in this system are: 1:80,000, 1:160,000, 1:400,000, and 1:800,000.

Elevation and UTM Query. This feature allows the user to determine the grid coordinates and elevation of any point on a displayed map. After selection of the feature, the user moves the cursor to the desired point and clicks the left button. Elevation and grid coordinates will be displayed. The user may repeat this process by moving the cursor and selecting again.

Tactical Overlay. In this feature, the user may display or create overlay information for both friendly and enemy elements. Unit information and battlefield geometry (boundaries, points, routes, etc.) are displayed on top of the previously selected map background. It should be remembered that in the View Situation window, the user may only review products already in existence. In the Build Products window the user may either display or create graphic information. Figure 12 shows the various overlay information that may be displayed or created.

Ongoing Development

The Tactical Planning Workstation is continuing to be enhanced. Current features are being extended, and new capabilities are being developed. One major area of enhancement is the development of a set of Operations Planning Tools (OPT). OPT will consist of user controlled aids to explore tactical options and to assess their outcome. The Workstation has and continues to be used in proof-of-concept demonstrations and with Army users in simulated tactical exercises. These projects are helping to test requirements for the Army Tactical Command and Control System and to investigate C^2 operations supported by automated techniques.

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GLOSSARY

Build Products - One of the major functions of the Tactical Planning Workstations. Users select this function to build or create new planning products such as reports, orders, and overlays.

Buttons - Objects that appear on the monitor that allow the user to select desired functions. Users move the cursor to the button using the mouse and then depress the left (select) button.

Close and Stack - An operation performed by the user that closes an on-screen window and saves it for later recall. The window, once closed, is represented by a small icon that appears above the five major function buttons. Users may reopen the closed window by moving the cursor to the representative icon and depressing the left mouse button. Multiple icons may be stacked on each button.

Cursor - An on-screen indicator of where the computer system is currently focusing. It is easily moved to other on-screen locations by mouse manipulation. Placement of the cursor is indicated by either a dot (•), an arrow (->), or a large X.

EDDIC - The Experimental Development, Demonstration, and Integration Center is an Army Research Institute facility located at Fort Leavenworth, Kansas, that supports research related to the Army command and control process.

Edit - A function of the text editor. Permits users to manipulate textual data to create or modify documents.

Icons - On-screen representations of previously used and stored windows. Users may select these icons by mouse manipulation.

Map Background - Users may specify a background for any map presentation. Vegetation, shaded relief, and elevation banding backgrounds may be displayed at user request. Additionally, the user may specify no background and create a sketch map that depicts any or all map features, units, and control measures.

Map Features - Users may specify the display of grid coordinates, contour intervals, roads, hydrography, built-up areas, and miscellaneous man-made features.

Map Scales	- Users may specify a map scale for each map displayed in a window. Users may vary the map scale by selecting one from 1:80,000, 1:160,000, 1:400,000, or 1:800,000.
Menus	- As an aid to workstation operators, menus are used extensively. The menu presents the user with on-screen options eliminating the need for memorizing specific words or detailed procedures.
Mouse	- The Tactical Planning Workstation mouse is a three-button optical input device. The left button is used to select, the right button is used to obtain menus, and the middle button is used to recenter maps.
Pop-up Menus	- The user may move the cursor to any item displayed on the monitor. When the cursor is placed on an item and right mouse button depressed, a "pop-up" menu on the item being addressed will be displayed. This menu allows the user to obtain information or to perform functions with the item identified by the cursor.
Product Select Buttons	- After a user has opened a window, a dark band will appear in the top of the window. The user will move his cursor to this band which is called the "product select button." By depressing the right button on the mouse, a menu of products will appear for user selection.
Scrolling Bars	- When a window is opened, scrolling bars are shown at the left and bottom. By use of the mouse, the scrolling bars may be moved thereby moving the text, map, or overlay displayed in the window.
Scrolling Buttons	- At the ends of the scrolling bars are scrolling buttons with directional arrows. The user moves the cursor to the appropriate directional button and depresses the left button. The material displayed in the window will move in the appropriate direction. When using this feature for vertical movement of text, the text will move up or down one line each time the select button is depressed.
Terminate	- This function is used to delete a window when it is no longer needed. Once a window is terminated, the user must query the data base to re-obtain this information

Text Editor

- The Tactical Planning workstation utilizes a text editor that allows the user to perform basic text manipulation such as copy, find, cut, and paste.

TOAST

- TOAST is an acronym that stands for the Task Organization and Status Tool. It is an interactive aid that assists the user in task organizing his forces. A graphic presentation of the current task organization may be modified and the status of units and parent units can be easily obtained.

Tools

- Tools is one of the major functions of the Tactical Planning Workstation. The user may select a scratch pad, calculator, or the Task Organization and Status Tool (TOAST).

View Reference

- (VIEW REF) is the label for one of the five workstation function buttons. Users selecting this button obtain information found in standard Army reference manuals. Reference material includes planning factors, tables of organization and equipment, and general equipment characteristics.

Walking Menus

- Walking menus are obtained by the user moving the cursor to a product select button and depressing the right button. After the button is depressed, the user will be presented with a menu that assists him in selecting the desired option. As the user selects a desired option, another menu will automatically appear. This automatic presentation of subsequent menus relieves the user of the requirement to memorize specific words or protocols.

Windows

- When information is presented to the user, it is displayed in a framed box known as a window. The user may move or resize the window by simple map manipulation.

Zoom

- Zoom is a window feature that expands the vertical presentation of a window to a full monitor display.