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IDHS ROLES AND MISSIONS INTELLIGENCE ANALYSTS ASSOCIATE

Science Applications International Corporation

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The Intelligence Analysts Associate (IAA) is a new approach to processing incoming intelligence data that maintains the data as "purely" as possible, yet allows it to be presented to the analyst in a variety of ways that allow him/her to recognize patterns and relationships. Using this approach IAA transforms incoming textual data into a form that can be displayed as pictures, a presentational format that allows rapid identification of patterns in the data.

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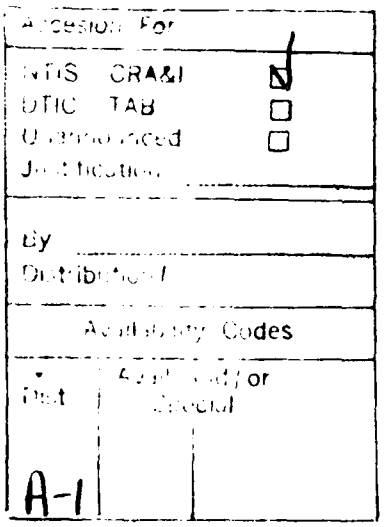

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1 Introduction

The Intelligence Analysts Associate (IAA) is a new approach to processing incoming intelligence data that maintains the data as "purely" as possible, yet allows it to be presented to the analyst in a variety of ways that allow him/her to recognize patterns and relationships. Using this approach IAA transforms incoming textual data into a form that can be displayed as pictures, a presentational format that allows rapid identification of patterns in the data.

The IAA consists of three segments: the Natural Language Processing Segment (NLPS), the Event Data Base (EDB) and the Graphics Display Segment (GDS), see Figure 1.

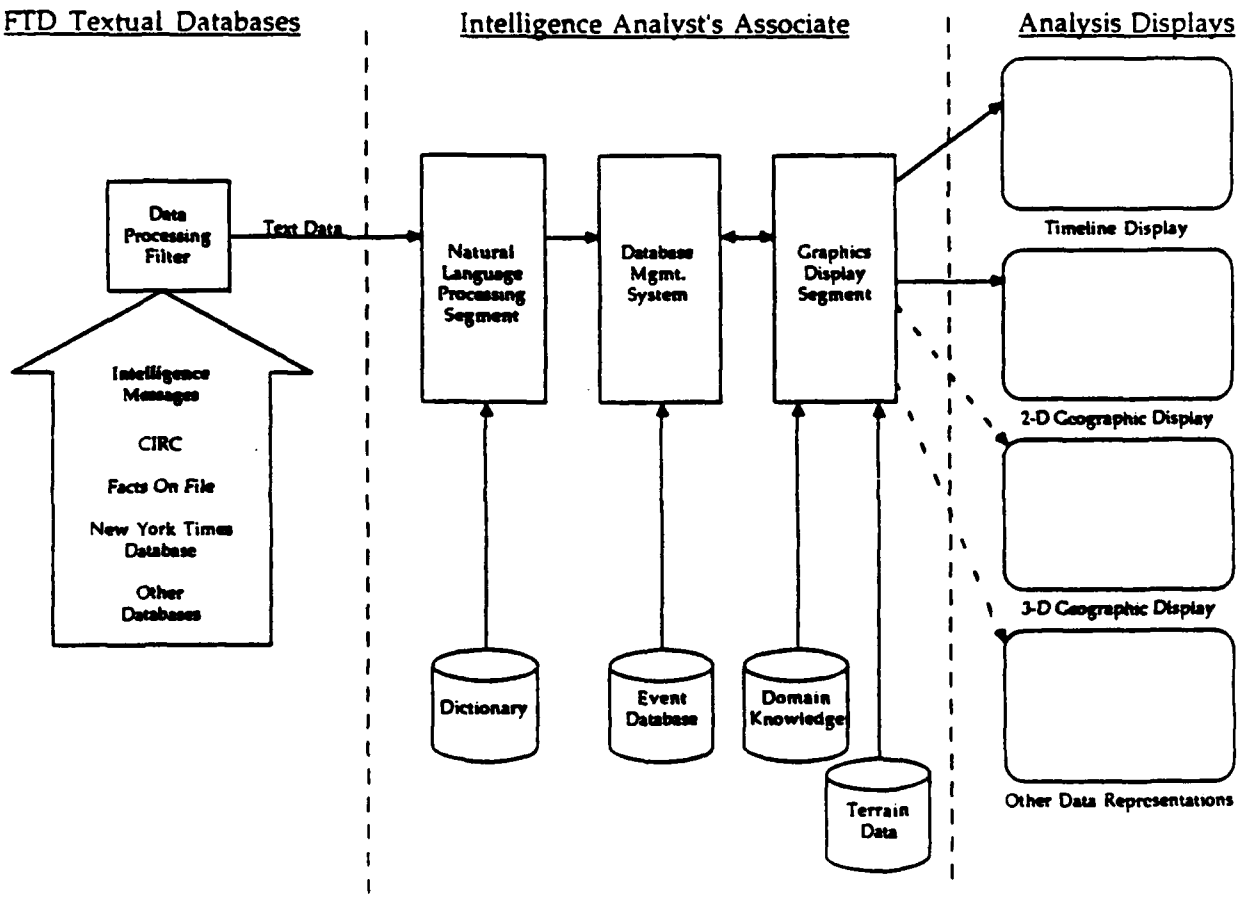

Figure 1: Conceptual Overall Flow

The NLPS transforms textual data into event records that represent "who did what to whom". The EDB stores the event records and provides the interface between the NLPS and the GDS. The GDS operates in two basic modes, Setup Mode and Display Mode. Setup Mode allows the analyst to quickly categorize the data into "bins". Display Mode allows the user to select which of the "bins" are to be displayed and which representation, such as a timeline or a 2-D map, is to be used.

1.1 Purpose

This document will address the operation of and user interaction with the Graphic Display Segment (GDS) of the IAA system. Currently, the GDS operates as a single-user system hosted on an IBM PC/AT with Professional ORACLE as the data base management system with a limited event data base. The data base contains information regarding activities in Afghanistan and the map data available to the GDS is the area immediately surrounding Afghanistan.

2 Background

The IAA is primarily intended to support the application of empirical methods for developing cybernetic models of military operations.

This is an initial attempt at automating the use of cybernetic theory to help the analyst identify and study the relationships between the entities that comprise a complex, dynamic system, such as Soviet troop control. These entities are considered to be variables of varying importance and relationships within the system. Resource variables (R) are applied to maintain essential variables (E) within specified limits when disturbance variables (D) force these essential variables out of limits. For example, a commander might request additional troops (R) if an enemy attack (D) reduced the number of troops (E) to an unacceptable level. For more information on cybernetic theory with a sample application see "A Cybernetic Analysis of Soviet Troop Control", DST-1800R-075-88 by Dr. D. Howland.

Incoming intelligence messages are a primary source of information on the D, E and R variables associated with Soviet troop control, as well as many other threat areas. Unfortunately, the analyst doesn't have time to read all the messages that come in each day, let alone identify each of the D's, E's and R's and recognize relationships between them. IAA is intended to support the analyst by transforming textual messages into event records that represent "who did what to whom", aiding the analyst in categorizing the data, and displaying the data in ways that will highlight relationships for the user.

3 Definitions

THE FOLLOWING DEFINITIONS SHOULD BE REVIEWED AND UNDERSTOOD BEFORE CONTINUING:

Abstract List - this is a compendium of the data contained in selected fields of a group of event records. The list is comprised of the unique occurences of words in the ACTOR ("who"), OBJECT ("whom"), INSTRUMENT ("with"), LOCATION ("where at"), and DESTINATION ("where to") fields of the event records. This list may be sorted alphabetically or by a weighting factor based on the number of occurences of each word, see Figure 2.

RECORDS FROM EVENT DATA BASE THAT FULFILL AOI/TOI CRITERIA

MSG_ID	21	22	23
SECT_ID	0	0	0
DATE_STAMP	09-1-87 1745	09-3-87 1745	09-3-87 0900
LOCATION	KABUL AIRPORT		
DESTINATION			
ACTOR	SOVIET TRANSPORTS	SOVIET PARATROOPERS	MUJEHADEEN
QTY ACTOR	5		
VERB	LEAVING	BLOCKED	CLEARED
STATE VERB			
OBJECT		ROAD TO KHOST	ROAD TO KHOST
QTY OBJECT			
BENEFACTIVE			
INSTRUMENT			
QTY INSTRUMENT			

ABSTRACT
ALPHABETIC

KABUL AIRPORT	1
MUJEHADEEN	1
ROAD TO KHOST	2
SOVIET PARATROOPERS	1
SOVIET TRANSPORTS	1

ABSTRACT
OCCURENCE

ROAD TO KHOST	2
KABUL AIRPORT	1
MUJEHADEEN	1
SOVIET PARATROOPERS	1
SOVIET TRANSPORTS	1

Figure 2: Abstract Lists

Alias - a word that is assigned to a variable, see Figure 3. Each alias will have a symbol or icon associated with it.

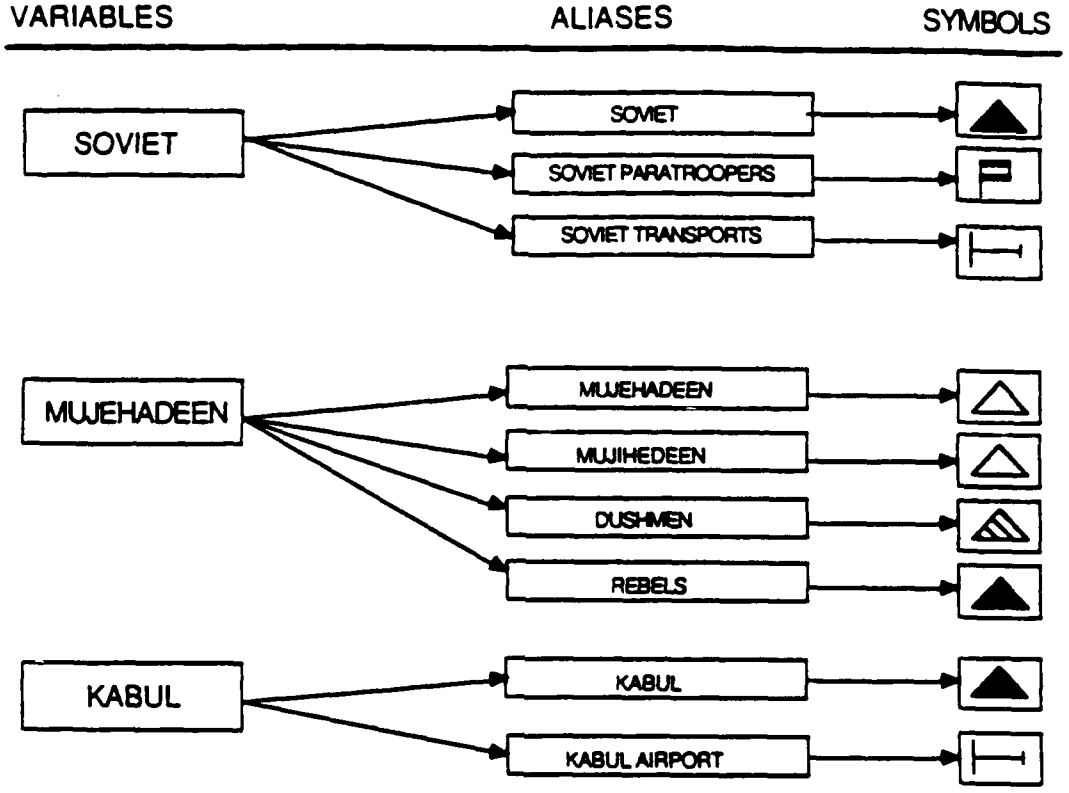

Figure 3: Variable/Alias/Symbol Associations

AOI - area-of-interest, a geographical rectangle determined by latitudinal and longitudinal boundaries

Event Record - a data base record that contains the "who did what to whom", includes the "with what" and the "where and when", see Figure 4. When in the Data Configuration menu option the user will be able to view the event record(s) associated with an item in the Abstract List and when in the Timeline or Map display the user will be able to view the event record(s) associated with a symbol on the displays. When viewing an event record a window appears that contains the fields of the event record and a symbol in the upper right corner, see Figure 5. To "close" this window position the cursor on the symbol and "click" the left mouse button. If there are multiple records another record will appear, continue to close them until no more appear.

TOI - time-of-interest, a time span determined by a beginning date and ending date (hour, day, month, and year)

FIELDS	SAMPLE RECORDS		
MSG_ID	21	22	23
SECT_ID	0	0	0
DATE_STAMP	09-1-87 1745	09-3-87 1745	09-3-87 0900
LOCATION	KABUL AIRPORT		
DESTINATION			
ACTOR	SOVIET TRANSPORTS	SOVIET PARATROOPERS	MUJEHADEEN
QTY ACTOR	5		
VERB	LEAVING	BLOCKED	CLEARED
STATE VERB			
OBJECT		ROAD TO KHOST	ROAD TO KHOST
QTY OBJECT			
BENEFACTIVE			
INSTRUMENT			
QTY INSTRUMENT			

Figure 4: Sample Event Records

MSG_ID: 32 SECT_ID: 0 ?
E GMT: 9-1-84 0:00 LOCAL: 8-311-84 20:0

A L/L: 34.35E 69.10N
U DEST: _____
ACTOR: 5 SOVIET TRANSPORTS
VERB PHRASE: DEPARTING ON A SE COURSE
OBJECT: ___ _____
INTRUMENT: ___ _____
BENEFACTIVE: _____
LOCATION: KABUL INTERNATIONAL
DESTINATION: _____

Figure 5: Viewing Event Record Window

Variable - the name of a "bin" or category that words (aliases) may be assigned to, see Figure 3. By default a variable is automatically made an alias to itself.

Zoom-box - a black frame that will appear on a map screen that shows the current area-of-interest(AOI). A zoom-box may be moved and re-dimensioned using the mouse. Re-dimensioning a zoom-box is done by placing the cursor on the zoom-box and moving the cursor while simultaneously depressing the left mouse button. Moving a zoom-box is done by placing the cursor where the lower left corner of the box should be and "clicking" the left mouse button.

When in the AOI/TOI Selection menu option the user will be able to select the geographical area using a zoom-box. When is the Map Display menu option the user will be able to "zoom in on" a selected area using the zoom-box.

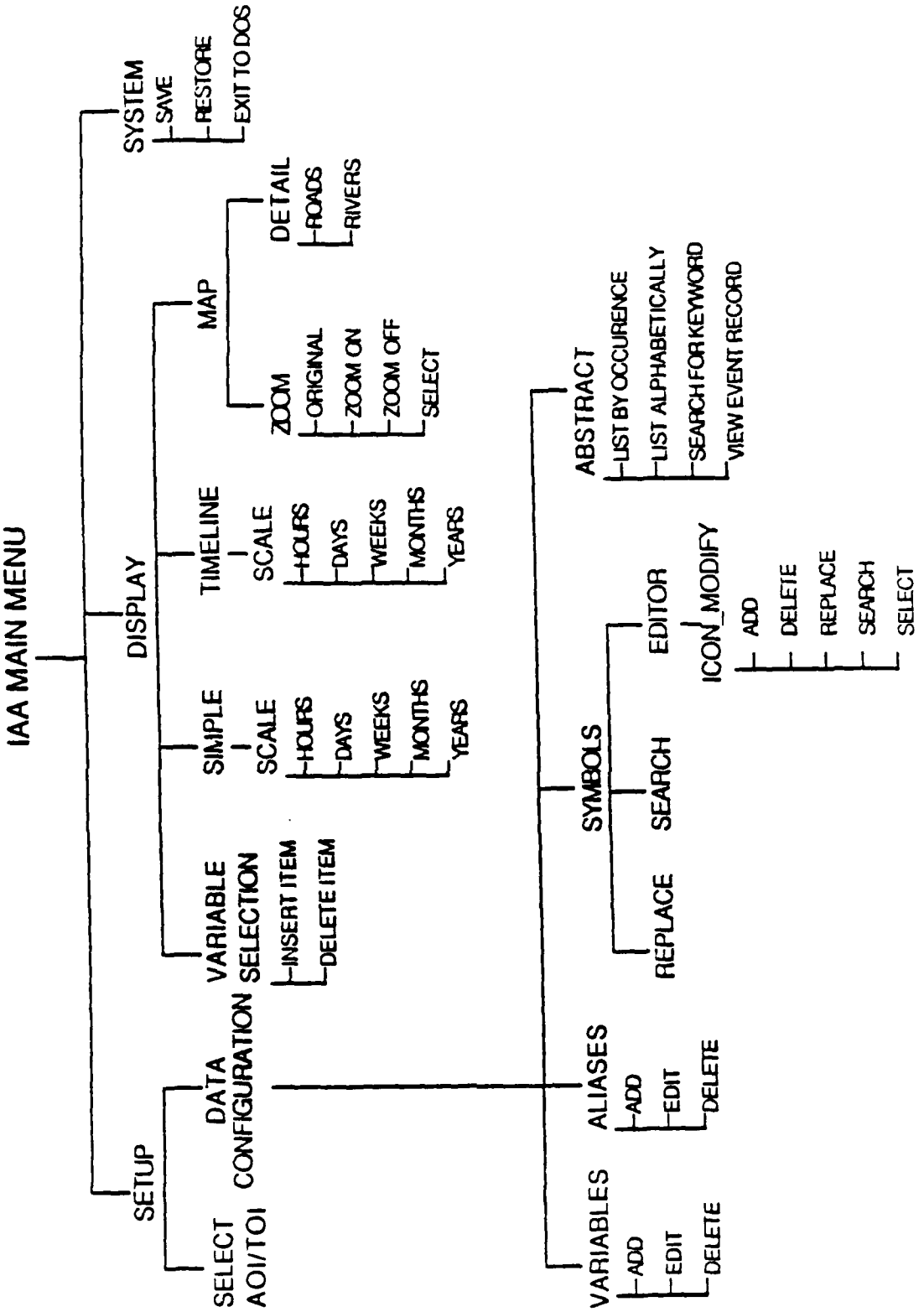

Figure 6: Available Menu Options

4 Operation

The user will be using a two-button mouse and various keyboard entries to interact with the GDS. Generally, the left mouse button is the selector and the right opens a "pull-down" menu bar. This means that a menu will be shown across the top of the screen while the right mouse button is depressed and when the cursor is within a selection the options under that selection will appear. The user will select an option by moving the cursor until the desired option is highlighted and then releasing the right mouse button. Available menu options are shown in Figure 6.

There are two basic modes within the Graphic Display Segment (GDS), the Setup Mode and the Display Mode. The Setup Mode is used when the user is selecting his area-of-interest and time-of-interest (AOI/TOI) and assigning the data into "bins" or variables. The Display Mode is where the user would select and order the variables to be displayed and select which display to use. The options available to the user will be described in greater detail in the following sections. AN OVERVIEW OF A TYPICAL INTERACTIVE SESSION WITH THE GDS WOULD BE AS FOLLOWS:

MODE	USER ACTIONS	SYSTEM RESPONSES
Setup	Activates the program	
		Loads current: Symbol Library Variable/Alias/Symbol pairs Display List
	Selects an AOI/TOI	
		Selects and loads event records that fulfill AOI/TOI criteria and creates Abstract List of these records
	Selects Data Configuration Option	
		Displays the current Symbol Library, Variable/Alias/Symbol pairs, and the Abstract List.
	Reviews and/or modifies current Variable/Alias/Symbol pairs	
		Updates displays and data base to reflect user modifications

Display	Selects Display List Option	
		Displays the current Display List and Variable/Alias/Symbol pairs
	Reviews and/or modifies current Display List	
		Updates Display List and data base to reflect user modifications
	Selects MAP or TIMELINE display	
		Display selected variables
	Study, make a hypothesis, and repeat above steps as necessary	

Figure 7: Overview of a Sample Session

4.1 Setup Mode

The Setup Mode is where the user selects the AOI/TOI and sets up the Variable/Alias/Symbol definitions.

4.1.1 Select AOI/TOI

Since the GDS is currently limited to the Afghanistan area, the map of the entire geographic area available will appear on the screen. The location of every record currently in the EDB will be annotated on this map with a small red cross or x. A zoom-box will appear on the map framing the default AOI which contains all the records in the EDB. The text below the map gives the latitudinal and longitudinal limits represented by the zoom-box and the time- span of the records in the EDB that are within this area, see Figure 7.

The user can select the default AOI/TOI by returning to the main menu or the AOI/TOI can be modified by moving and/or re-dimensioning the zoom-box as described in Section 3.0 and then returning to the main menu. As the zoom-box is altered and moved, the text below the map is modifed to reflect the current AOI/TOI.

4.1.2 Data Configuration

The Data Configuration window is set up in a three column format: the left column contains a list of the current variables, the center column is a list of the current symbols

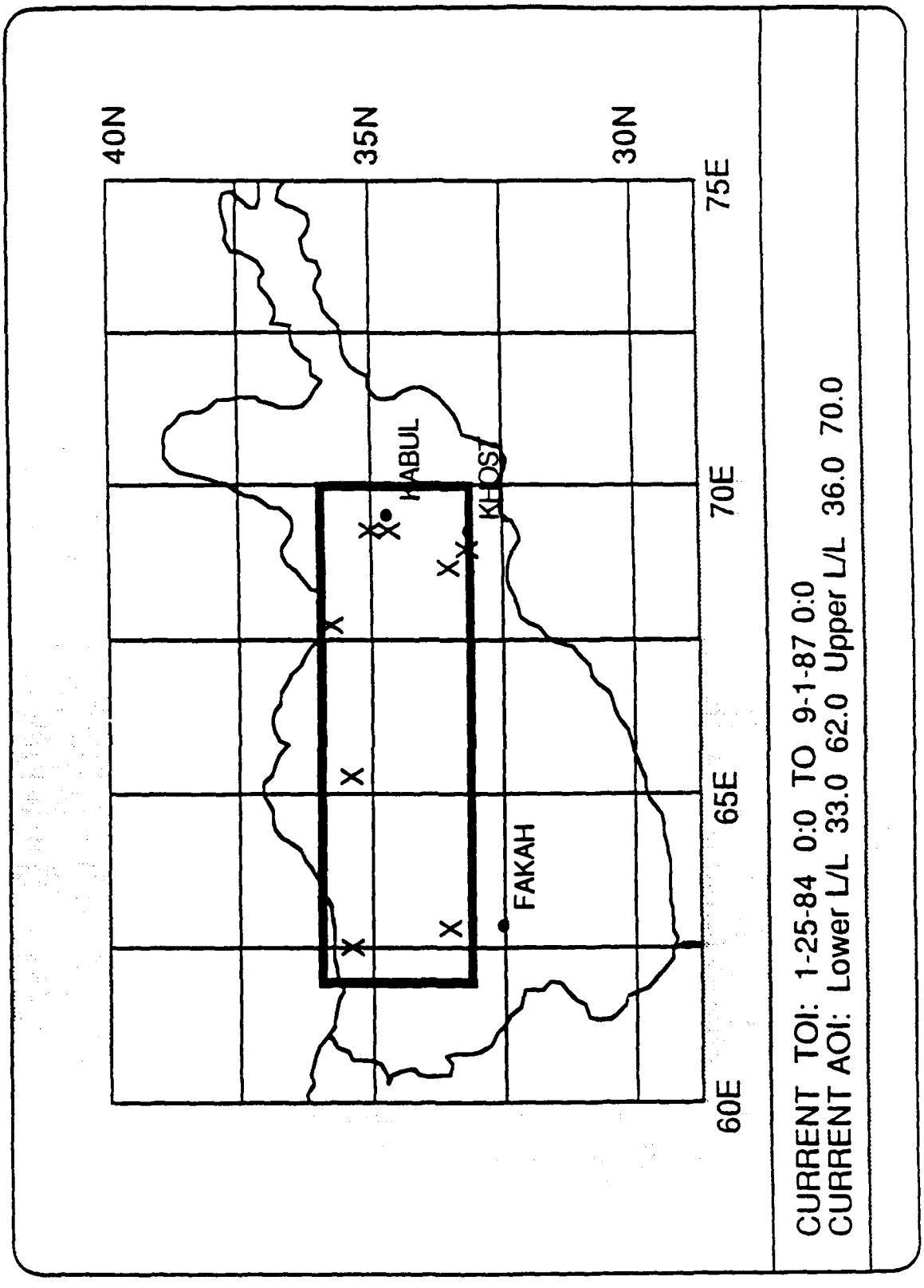

Figure 8: AOI/TOI Selection Window

in the symbol library, the right column contains the abstract list for the records that fulfull the current AOI/TOI. The variable list and the symbol library are user-modifiable, the abstract list is a "read-only" list, see Figure 8.

An item in these columns may be selected by placing the cursor on the item and "clicking" the selector mouse button, an item may be de-selected by positioning the cursor over a currently selected item and "clicking" the selector mouse button. When a variable is selected a window or display area appears that contains the aliases for that variable and the symbol associated with each alias, see Figure 9. When a symbol is selected the definition or descriptor of that symbol is displayed at the bottom of the screen. Only one item can be selected within a column; that means selecting one may de-select another.

4.1.2.1 Variables

Adding Variables There are two ways to add a variable: 1) select a word in the Abstract List using the selector mouse button and then select the "Add" option under the "Variables" menu selection, 2) Select the "Add" option under the "Variables" menu option while nothing is highlighted in the Abstract List. This will cause a prompt window to appear which allows the user to enter a variable name from the keyboard, see Figure 10.

When a variable is added it becomes the selected variable and the alias window appears with the default alias associated with the default symbol (a question mark), this symbol can be replaced with another or left as is.

Editing Variables First, select the variable to be modifed, then select the "Edit" option under the "Variables" menu selection. A prompt window will appear with the selected variable in it. Using the keyboard the user may now edit the variable name. The edit will be completed when the user hits the "Enter" key. Note that when the variable is modified the default alias is also modified.

Deleting Variables First, select the variable to be deleted, then select the "Delete" option under the "Variables" menu selection. A prompt will appear requesting a verification of the delete by a Y or N keyboard entry by the user before completing the delete function. Note that a variable that is a member of the current Display List cannot be deleted.

4.1.2.2 Aliases Since aliases cannot be accessed unless a variable is selected the following discussions assume that a variable has been selected and the alias window is open.

Figure 9: Data Configuration Window

Figure 10: Alias Window When a Variable is Selected

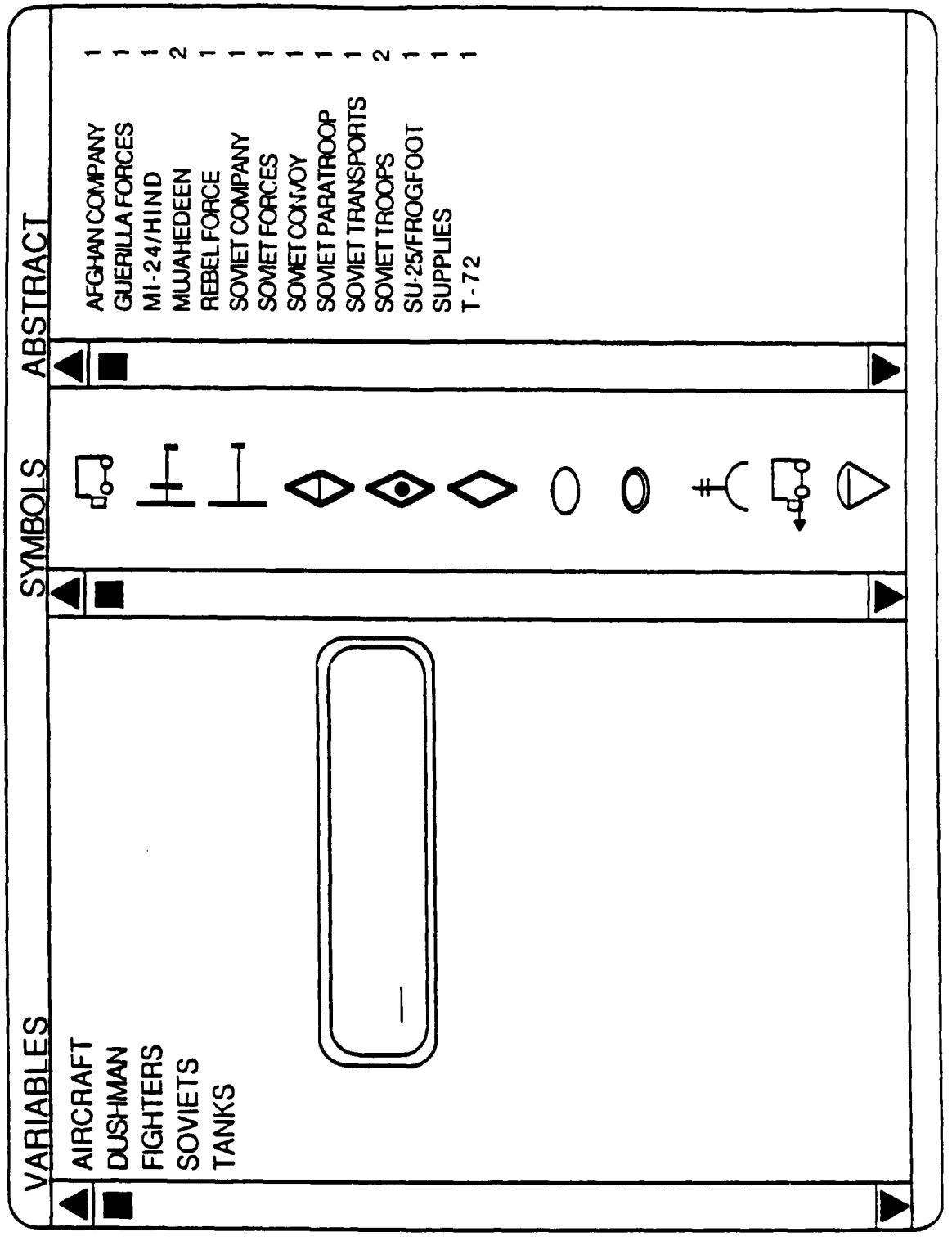

Figure 11: Adding an Variable Name From the Keyboard

Adding Aliases There are two ways to add an alias: 1) select a word in the Abstract List using the selector mouse button and then select the "Add" option under the "Aliases" menu selection, 2) Select the "Add" option under the "Aliases" menu option while nothing is highlighted in the Abstract List. This will cause a prompt window to appear that allows the user to enter an alias name from the keyboard.

When an alias is added it becomes the selected alias associated with the default symbol (a question mark). This symbol can be replaced with another or left as is, see Figure 11.

Editing Aliases First, select the alias to be modifed, then select the "Edit" option under the "Aliases" menu selection. A prompt window will appear with the selected alias in it. Using the keyboard the user may now edit the new alias name. The edit will be completed when the user hits the "Enter" key. Note that the default alias (the alias matching the variable) cannot be modified.

Deleting Aliases First, select the alias to be deleted, then select the "Delete" option under the "Aliases" menu selection. Note that the default alias for a variable cannot be deleted.

4.1.2.3 Symbols

Replace Symbols are associated with aliases, since aliases cannot be accessed unless a variable is selected. The following discussion assumes that a variable has been selected and the alias window is open.

The steps to associate a symbol with an alias, whether the new symbol is replacing the default symbol or another, are as follows: the user selects the alias in the open alias window, then selects the new symbol in the symbol column. To complete the action, select the "Replace" option under the "Symbols" menu selection.

Search The "Search" option under the "Symbols" menu selection allows the user to search for symbols whose descriptors contain a specific word. When the "Search" option is selected a prompt box appears that allows the user to enter the word to search the symbol descriptors for. Note that both upper and lower case are treated as upper case internally.

If no symbols are found whose descriptor contains that word, the user is notified and the action is complete. Otherwise the first symbol found is highlighted in the symbol column, causing it's descriptor to appear at the bottom of the screen. A command line also appears on the bottom of the screen that allows the user to see the (P)revious or

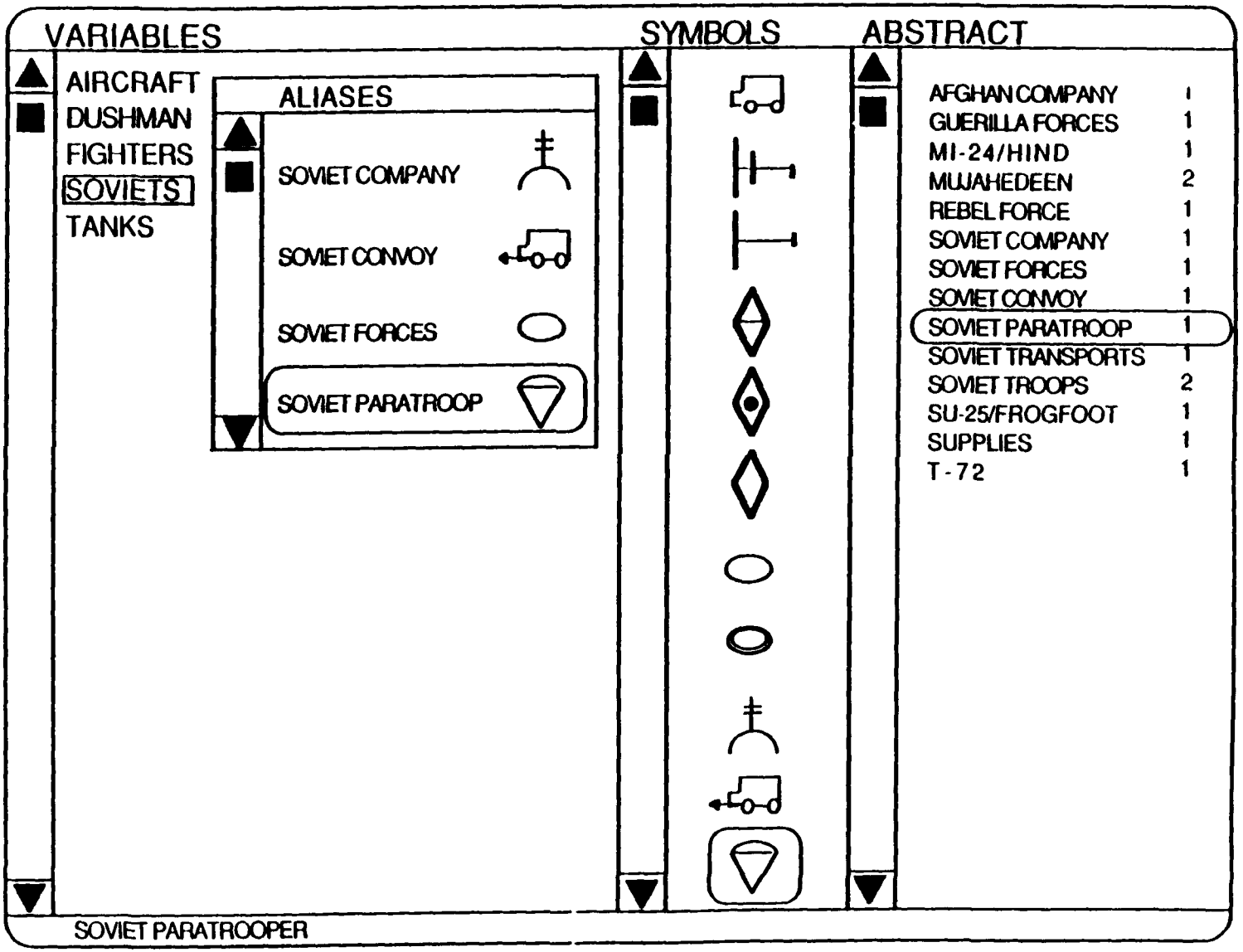

Figure 12: Adding an Alias

(N)ext symbols or to (E)xit using inputs from the keyboard. The "Search" option must be exited from before other actions can be taken.

4.1.2.4 Abstract

List by Occurence The default presentation of the Abstract List is alphabetical with the occurence factor on the right side of the column. To view the Abstract list in order by the occuance weighting factor, select the "List by occurence" option under the "Abstract" menu selection. The occurence weighting factor is simply the number of times that each item appears in the group of event records in the ACTOR, OBJECT, INSTRUMENT, LOCATION, and DESTINATION fields.

List Alphabetically The default presentation of the Abstract List is alphabetical with the occurence factor on the right side of the column. To return to this ordering select the "List Alphabetically" option under the "Abstract" menu selection.

Search Abstract List The "Search" option under the "Abstract" menu selection allows the user to search for entries in the abstract list that contain a specific word. When the "Search" option is selected a prompt box appears that allows the user to enter the word of interest. Note that both upper and lower case are treated as upper case internally.

If no items are found in the abstract list that contain the word, the user is notified and the action is complete. Otherwise the first item found is highlighted in the abstract list column. A command line also appears on the bottom of the screen that allows the user to see the (P)revious or (N)ext item or to (E)xit using inputs from the keyboard. The "Search" option must be exited from before other actions can be taken.

View Event Record A key factor in the IAA is the capability for the user to trace the information in the displays to the original message. One way of doing this is the View Event Record feature.

First, the user selects an item of interest in the Abstract List, then selects the "View Event Record" option under the "Abstract" menu selection. An event record window appears with the default symbol in the upper right corner. To "close" this window position the cursor on the symbol and "click" the selector mouse button. If there are multiple records that contain this item another record will appear; continue to close them until no more appear.

4.2 Display Mode

The Display Mode is where the user selects and orders the variables to be displayed and the format to display them in.

4.2.1 Variable Selection

The Variable Selection window is set up in a two column format: the left column contains a list of the current variables, the right contains the current Display List. When in this mode the variable list is "read-only" and the Display List is user-modifiable, see Figure 12.

An item in these columns may be selected by placing the cursor on the item and "clicking" the selector mouse button. An item may be de-selected by positioning the cursor over a currently selected item and "clicking" the selector mouse button. When a variable is selected, a window or display area appears that contains the aliases for that variable and the symbol associated with each alias. Only one item can be selected within a column; that means selecting one may de-select another.

4.2.1.1 Display List The Display List is where the concept of the OTHER category or variable becomes crucial. The OTHER category is the "catch-all" variable for any events that are not aliases of the variables selected for display. This is a method for displaying events of possible interest to the user that he may not be aware of. The OTHER category cannot be deleted and will always be the last variable in the display list. This means that it will be at the bottom of the screen when using the TIMELINE display, see Figure 13.

Insert Item To insert a variable at the end of the Display List (before the OTHER category): 1) select a variable in the Variable List using the selector mouse button and 2) then select the "Insert Item" option under the "Display List" menu selection.

To insert a variable elsewhere: 1) select the variable in the Display List that the new entry is to be above, 2) select a variable in the Variable List using the selector mouse button and 3) then select the "Insert Item" option under the "Display List" menu selection.

There is a limit of 12 entries in the display list, excluding the OTHER category.

Delete Item To delete a variable from the Display List (other than the OTHER category): 1) select the variable in the Display List, and 2) then select the "Delete Item" option under the "Display List" menu selection.

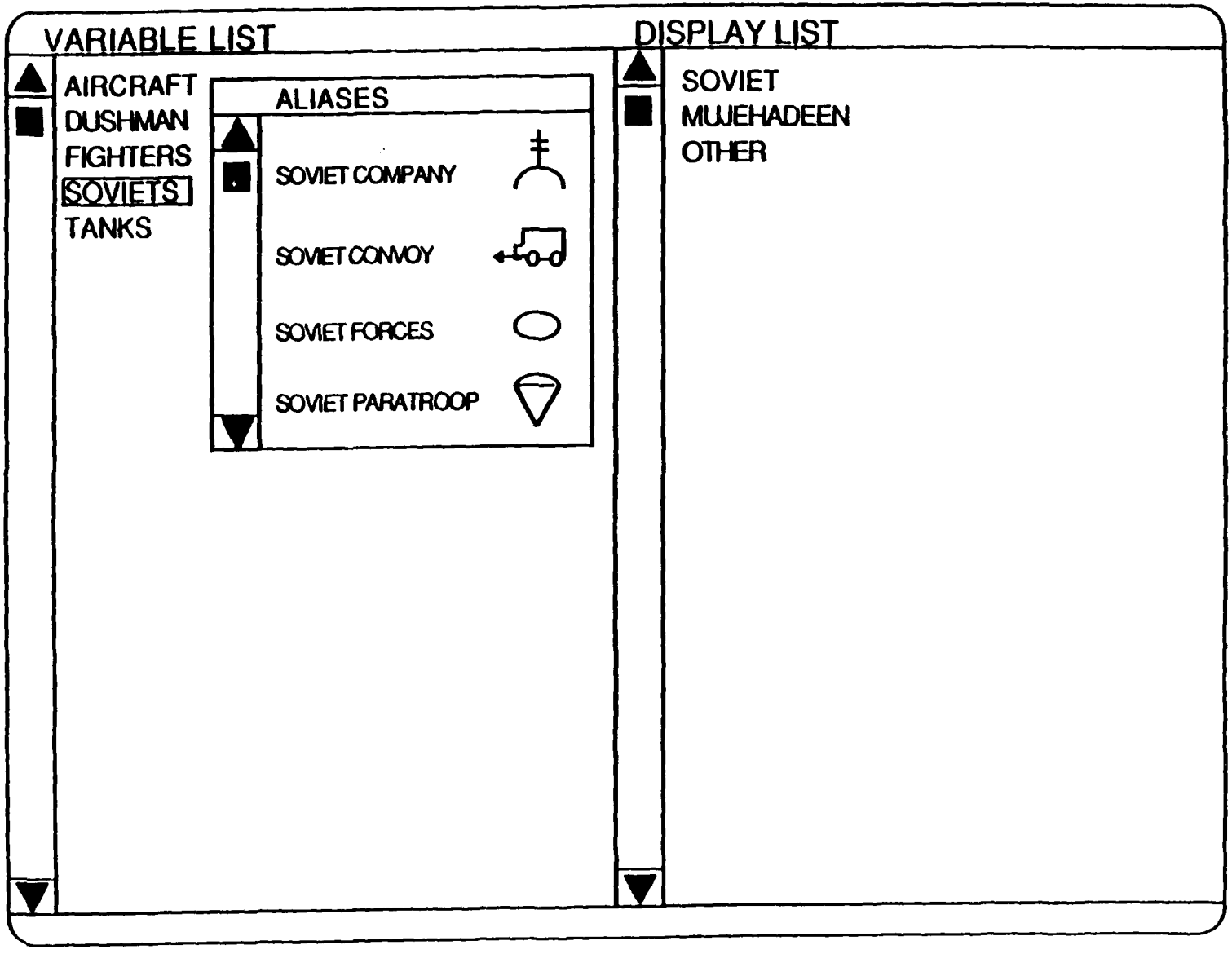

Figure 13: Variable Selection Window

4.2.2 Timeline

The timeline display will appear as shown in Figure 13.

The timeline display has several features:

1) Time can be scaled by HOURS, DAYS, WEEKS, MONTHS, or YEARS using the options under the "Scale" menu selection
2) Can scroll back and forth in time either incrementally (one unit at a time) or in large spans using scroll bar
3) Can view the event record(s) for any symbols on the screen by postioning the cursor on the symbol and "clicking" the selector mouse button

4.2.3 Map

The map display will appear as shown in Figure 14.

The Map display has several features:

1) Can zoom in on a smaller area than AOI
2) Can scroll back and forth in time either incrementally (one unit at a time) or in large spans using scroll bar
3) Can view the event record(s) for any symbols on the screen by positioning the cursor on the symbol and "clicking" the selector mouse button
4) Can select additional levels of geographic detail

4.2.3.1 Zoom When using the "Zoom" feature the user must first select the "Zoom On" option under the "Zoom" menu selection. This causes a zoom-box to appear on the map. After moving and re-dimensioning the zoom-box the user can abort the zoom action by selecting the "Zoom Off" option or he can complete the zoom action by selecting "Zoom Select". To return to the original map the user selects the "Original" option under the "Zoom" menu selection.

4.2.3.2 Detail The initial map displayed depicts country boundaries and major cities. To add major roads and/or rivers the user can use the "ROADS" or "RIVERS" option under the "DETAIL" menu selection. Any subsequent zooming reflects the addition of the roads and rivers.

4.3 System

4.3.1 Save

Not Implemented.

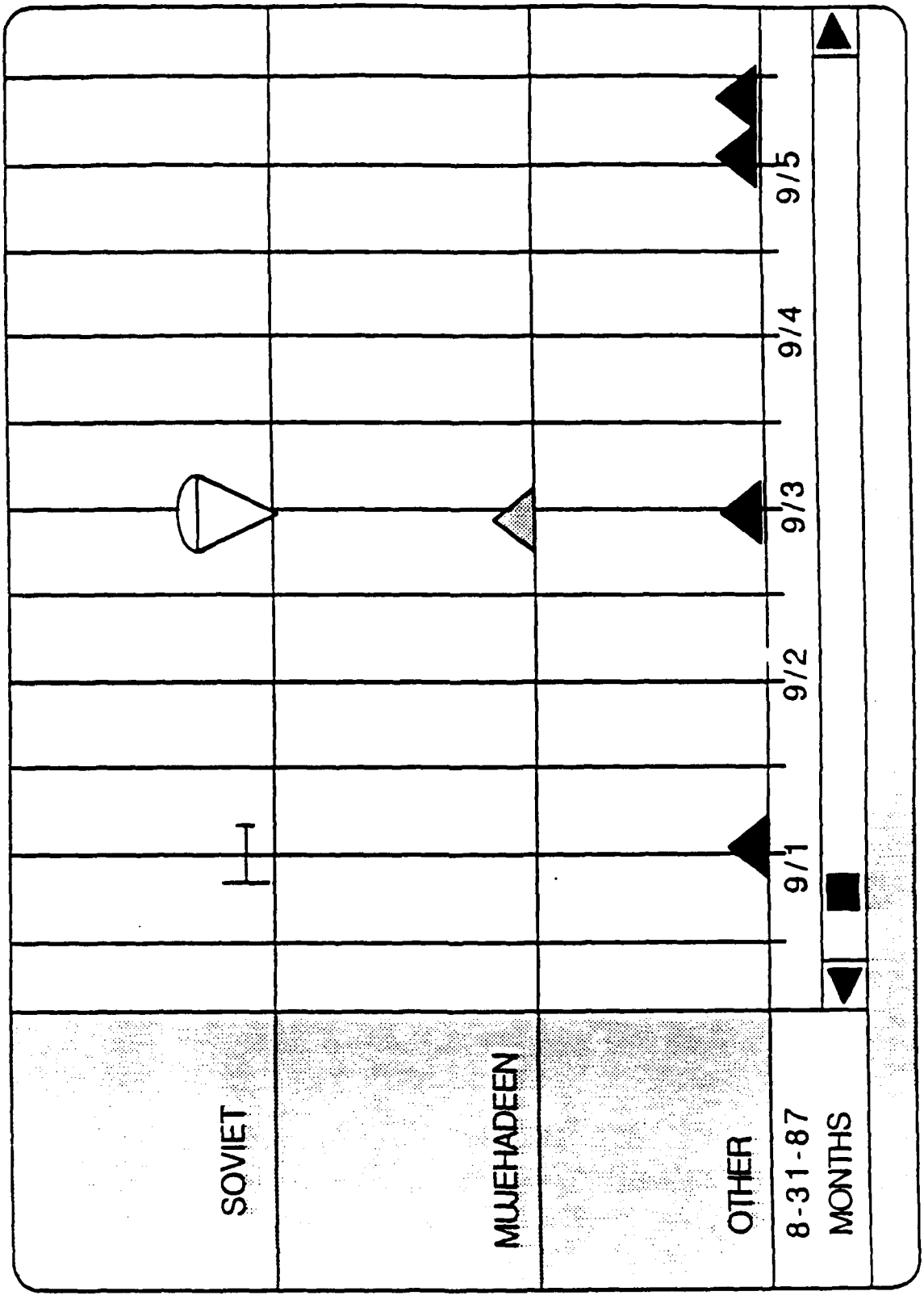

Figure 14: Timeline Display Window

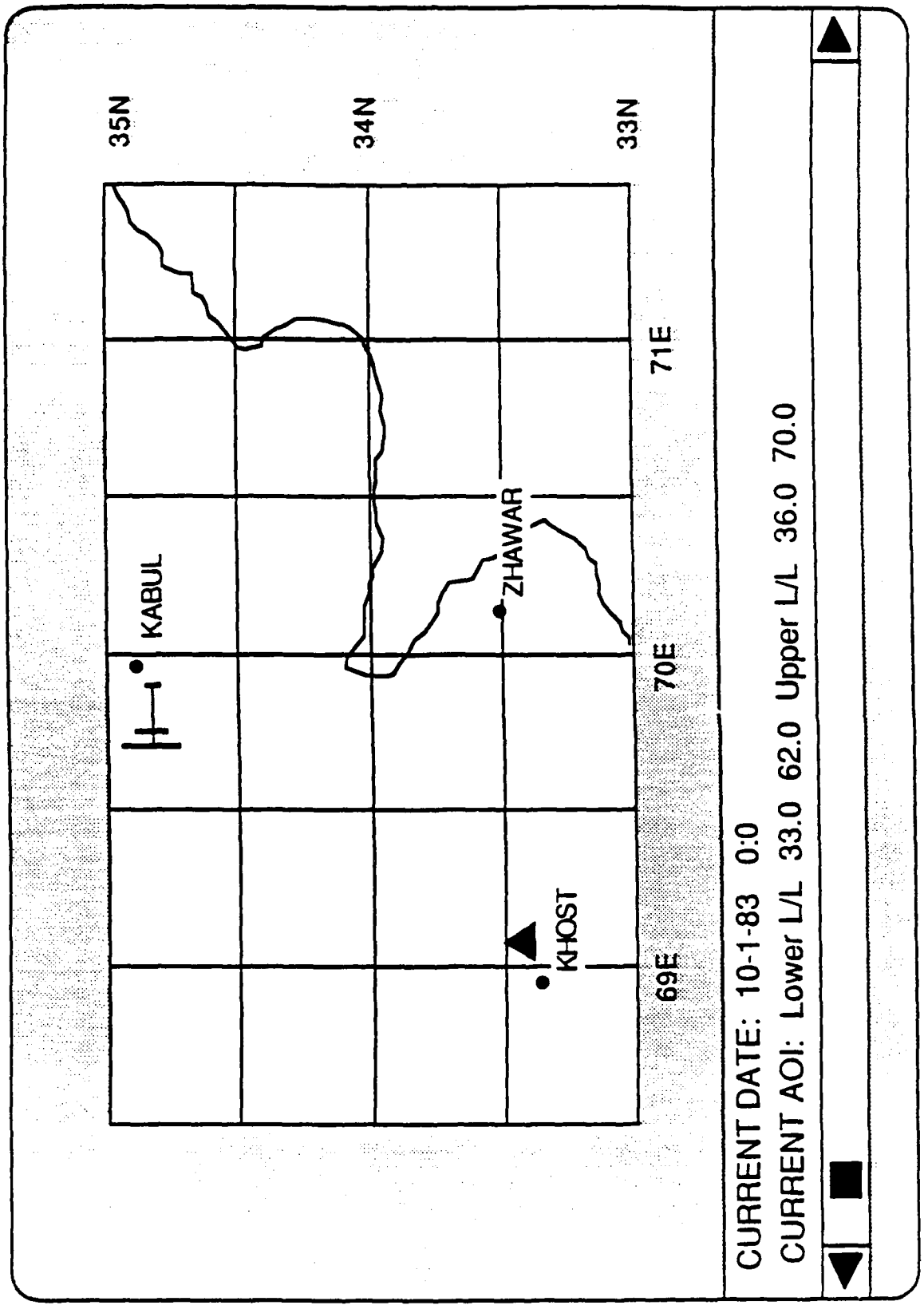

Figure 15: Map Display Window

4.3.2 Restore

Not Implemented.

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