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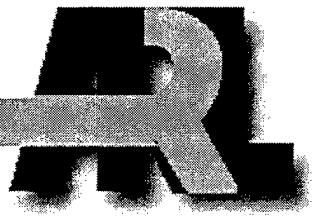

Intelligence Production Model Version 6.00 for Windows: User's Manual

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ARL-CR-436 JANUARY 1999

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under contract

DAAL01-94-C-0048

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Abstract

This is the user's manual for the Intelligence Production Model (IPM) Version 6.00. The manual provides step-by-step instructions for setting up and running the IPM, viewing and processing output, and maintaining files generated during model runs. The manual includes a section to aid the user in model design, as well as a dictionary of terms. The IPM is a software application that simulates how the quality of information and information processing performance in a military intelligence production system affect the quality of military intelligence required to meet the commander's needs. By simulating the functions and processes in developing a collection plan, conducting data analysis and fusion, and disseminating intelligence products, the model enables users to simulate the entire intelligence collection and production system from a human perspective. Also, the model can simulate information operations against the intelligence battlefield functional areas and can identify how "defective" information degrades the quality of intelligence. Outputs from the model include how information quality is enhanced or degraded during varying scenario parameters, soldier and task characteristics, and environmental factors, as well as how and what types of human errors degrade the quality of intelligence during the specified model conditions. Detailed model outputs can be used to identify specific design or remedial requirements for the military intelligence systems, personnel, or training.

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INTELLIGENCE PRODUCTION MODEL
VERSION 6.00 FOR WINDOWS™: USER'S MANUAL

INTRODUCTION

This is the user's manual for the Intelligence Production Model (IPM) Version 6.00. The manual provides step-by-step instructions for setting up and running the IPM, viewing and processing output, and maintaining files generated during model runs. The manual includes a section to aid the user in model design, as well as a dictionary of terms in Appendix A.

BACKGROUND

The IPM has been in development since 1991. The first executable version of the model was released in 1992 and was used primarily by the model researchers and developers in continuing efforts. The first user-oriented version of the IPM, Version 3.1.4, was released in August 1994, followed by Version 4.60, 1 year later, and Version 5.00+ in October 1996. Each successive version of the IPM encompassed major enhancements of both the application software and user interface. Version 5.00+ was the first version of the IPM to actually be put in the hands of its intended users. This was also the last version of the model to be DOS™ based and the first version written only in Borland C++®. (Previous versions of the model were written using GURU Expert Systems, Version 3.1, Micro Data Base Systems, Inc.)

The current 6.00 Version represents a number of enhancements and optimizations. The process of user validation resulted in a number of enhancements of the user interface, the model logic and rules, as well as new methods for output representation. In addition, the model application software itself was converted to a Windows™-based application written in Visual C++®. Redesign efforts to move the model into a Windows™ environment included a major restructuring of the user interface approach to setting up and viewing model results. Model code was also redesigned to be more object oriented, the largest gain being a major reduction in the time required to run a test case, from an average of 15 minutes to an average of 45 seconds on a personal computer.

DESCRIPTION

The IPM is a software application that simulates how the quality of information and the information processing performance in a military intelligence (MI) production system affect the quality of military intelligence required to meet the commander's needs. By simulating the

functions and processes in developing a collection plan, conducting data analysis and fusion, and disseminating intelligence products, the model enables users to simulate the entire intelligence collection and production system from a human perspective. Also, the model can simulate information operations against the intelligence battlefield functional areas and can identify how "defective" information degrades the quality of intelligence. Outputs from the model include how information quality is enhanced or degraded under varying scenario parameters, soldier and task characteristics, and environmental factors, as well as how and what types of human errors degrade the quality of intelligence under the specified model conditions. Detailed model outputs can be used to identify specific design or remedial requirements for the military intelligence systems, personnel, or training.

OPERATION

The new user should first review the model design worksheets provided in Section 5. These worksheets will guide the user through the process of identifying issues and objectives and setting up the variables required to execute a test case. Each worksheet corresponds to an input screen the user will see when setting up a test case on the IPM. Included is a test case planning interview sheet that should help to focus both setup of the model and interpretation of the model output results. Each of the steps required to execute a test case is described below:

a. The user may describe his or her overall modeling objectives in terms of scope, issue, and approach. These settings are used to produce suggestions for parameter settings of variables that follow.

b. The user may accept the suggested settings or do his or her own variable setups to describe the operational goal and units of the modeled intelligence production scenario in terms of command requirements, environment, and intelligence production tasks.

c. Scenario parameters are processed to identify a set of default collection assets. Default assets are those that would normally be organic to a particular echelon. The user may select assets in addition to the default assets to model collection resources available from higher echelons. Users may also choose to eliminate certain default assets from their scenario to model contingency operations. There is also a mechanism with which the user may define and use "prototype" collection models. Assets are modeled in such a way that they collect "attributes" of information, rather than data bits. Information attributes are such things as temporal and behavioral, so modeled assets collect information "about" time or information "about" behavior. Appendix A contains complete definitions of these variables.

d. Finally, the user may manipulate task variables pertaining to the performance of discrete and/or implied tasks in the MI production process. These variables describe the organizational and environmental conditions under which production tasks will occur. Default settings for these variables will already have been applied because of settings of the scenario variables, but the user is encouraged to review and edit these for finer control of the modeling variables. Appendix A contains complete definitions of these variables.

USER DESCRIPTION

Users of the IPM may be classified by their modeling objectives, such as planning, training development, and so forth. The IPM has been designed as a "normed" domain representation of the general MI production process. The IPM is a rule-based model, essentially non-deterministic, meant to represent a modeling concept, that is, modeling information quality and performance in MI production. Computer literacy is not required to use the IPM program.

SECTION 1: INSTALLATION OF SOFTWARE

Introduction

Intelligence Production Model Version 6.00 for Windows™

This software represents the computerization of the IPM. The concepts and methodologies of the IPM were developed by an interdisciplinary team of psychologists, subject matter experts in MI, and modeling and software engineers. This version is the result of several years of research and design, as well as at least two versions of software applications.

System Requirements

To run the IPM, the following minimum system features must be present:

- Intel 486 or compatible central processing unit
- 8 megabytes of random access memory
- 5 megabytes of free hard disk space[1]
- Windows™ 3.1 or Windows™ 95

[1]This is just to install the software. Each execution of the model writes files onto the hard drive. Each test case run requires as many as 750 kilobytes of additional hard disk space. The archiving utility described in file management utilities is used to free hard disk space and store test cases on floppy disks. The number of model runs that can be stored on the hard drive is purely dependent on the amount of available space.

Please note, the IPM will run on a 386 but will run *significantly* slower.

Installing the Software

Step 1
Insert the floppy disk labeled "IPM Install Disk 1" into your floppy drive.

Step 2
From the DOS™ prompt (or a DOS™ window if you are in Windows™), switch to the drive letter of your floppy drive; for example, type **A:** if "A" is the letter of your floppy drive. Press **Enter**.

Step 3
Type **INSTALL** and press **Enter**.

Step 4
When prompted, enter the drive letter where you want the IPM installed, for example, **C**.

Step 5
The program will begin installing itself. When prompted, insert each successive disk of the install set into the floppy drive. Press **Enter** to proceed.

Step 6
When the installation is complete, you will be returned to the DOS™ prompt. If you are not in Windows™, go into Windows™ now by typing **WIN** (or **Exit** if in a DOS™ window) and pressing **Enter**.

For Windows™ 3.x

Step 7
From program manager, choose the **File** menu and select **New**. At the prompt, select **Program Group** and then click on **OK**. In the **Description** field, type "IPM for Windows" and press **Enter**.

Step 8
Choose the **File** menu again and select **New**. At the prompt, select **Program Item** and then click on **OK**. Enter the following information in each field, pressing TAB to cycle through the fields. Note that all slashes are backslashes. Also, **C:** indicates the drive letter where the IPM was installed. Type a different drive letter if you installed the IPM to other than the C: drive. After you have entered this information, press **Enter** or click on **OK**.

- **Description:** IPM
- **Command Line:** C:\IPCM\IPM.EXE
- **Working Directory:** C:\IPCM
- **Shortcut Key:** None

Step 9
Choose the File menu again and select **New**. At the prompt, select program item and then click **OK**. Enter the following information in each field. (This process is the same as for Step 8.)

- **Description:** File Management
- **Command Line:** C:\IPCM\FILEMAN.EXE
- **Working Directory:** C:\IPCM
- **Shortcut Key:** None

After these steps are completed, you should have a new program group in program manager, with an icon allowing you to conveniently run the IPM. A sample test case with output reports is given in the **SAMPLES** directory.

For Windows™ 95

Step 7
Using **Windows™ Explorer**, find the file **IPM.EXE** in subdirectory **C:\IPCM**. Left click and drag this file to the desktop to create a shortcut. Close Windows™ Explorer. Right click on the IPM icon now on the desktop, select **properties**, and click on the **shortcut** page. Make sure the following fields have the entries as shown below:

- **Target**: C:\IPCM\IPM.EXE
- **Start in**: C:\IPCM
- **Shortcut Key**: None
- **Run**: Normal window

Click on **OK**. You can now run the IPM from the desktop by double clicking on the icon.

Step 8
Using **Windows™ Explorer**, find the file **FILEMAN.EXE** in subdirectory **C:\IPCM**. Follow the same procedures as in Step 7 to create a shortcut to this application on the desktop. The fields in **Properties-Shortcut** should have the following entries:

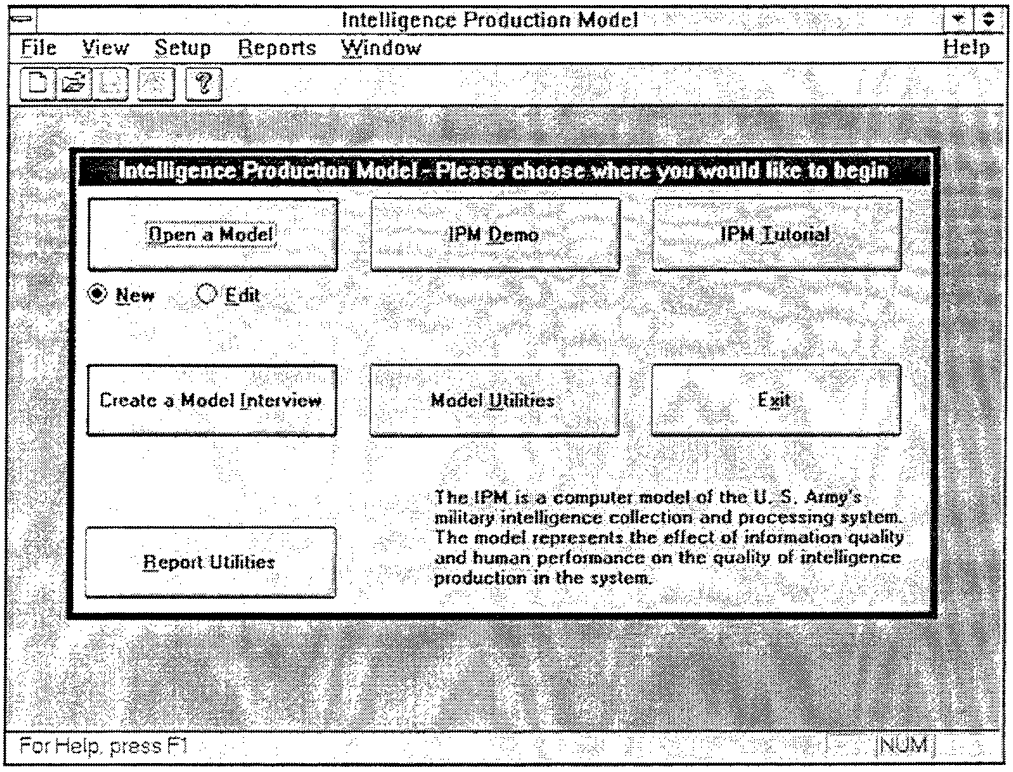
- **Target**: C:\IPCM\FILEMAN.EXE
- **Start in**: C:\IPCM\
- **Shortcut Key**: None
- **Run**: Normal window

Click on **OK** to accept. You can now run the IPM file manager from the desktop by double-clicking on this icon.

SECTION 2: CREATING A NEW TEST CASE

The Introduction Screen

When the program is first started, an introductory screen appears with a brief description of the IPM and a number of options for beginning.

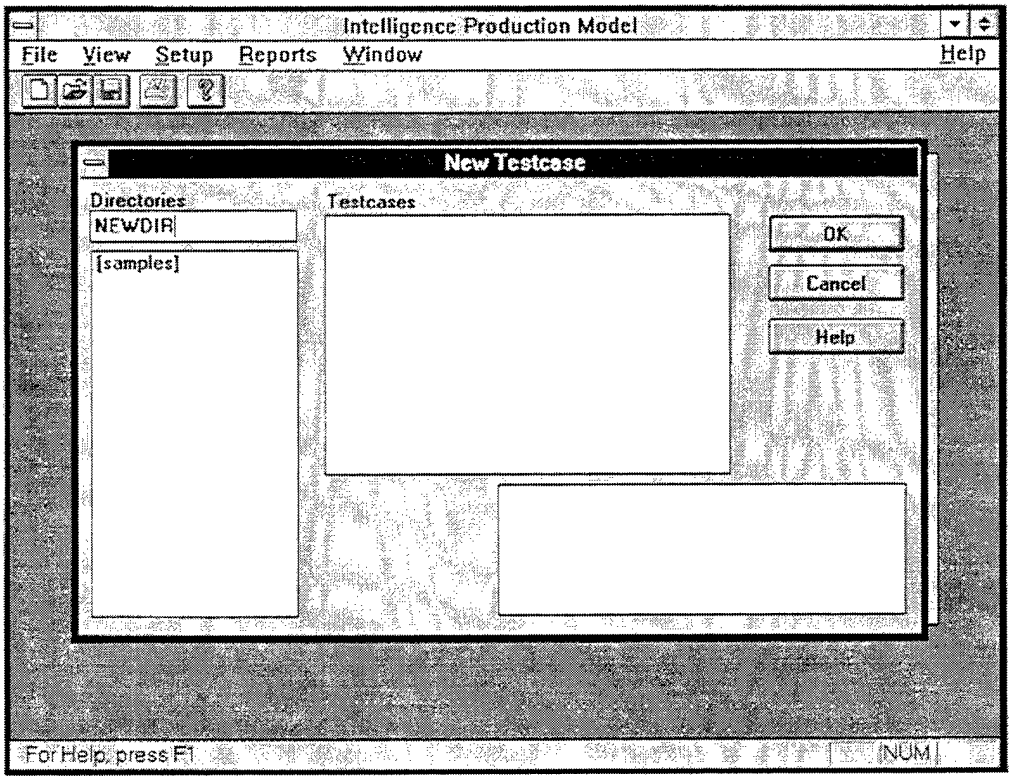


To create a new test case,

- Click on the **Open a Model** button.

New Test Case

The new test case screen appears, prompting the user to select where the test case should be stored.



CANCEL returns to the previous window.

Existing test cases may not be opened from this window.

To put the new test case in a new subdirectory named NEWDIR,

- Click on the **Directories** box.
- Type **NEWDIR**.
- Click on **OK**.

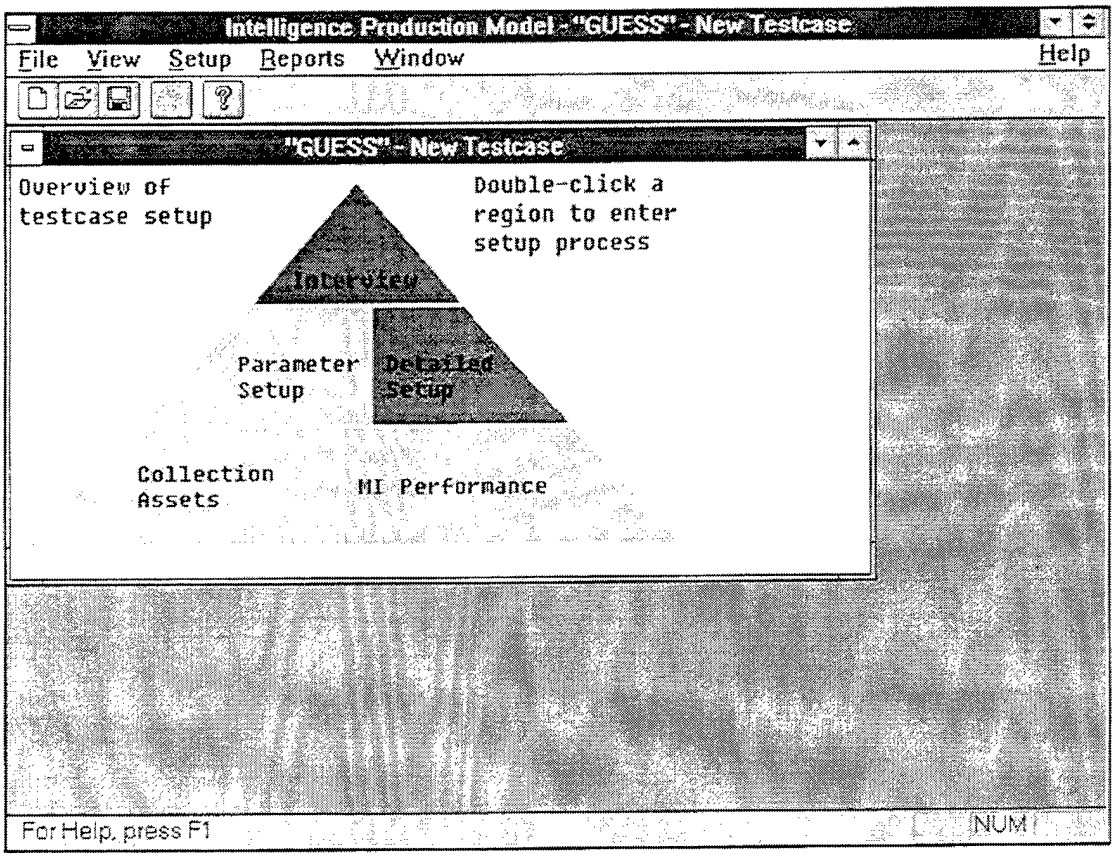
To put the new test case in an existing subdirectory,

- Click on any of the existing subdirectory names (example **[samples]**.)
- Click on **OK**.

NOTE: When an existing subdirectory name is selected, a list of the existing test cases in that subdirectory will appear in the test cases box. To view a description of any test case, click on that test case.

The Overview Pyramid

The overview pyramid screen serves as the status indicator for a test case setup. The color of each pyramid section indicates whether the user has visited this section or if related changes should be re-visited.



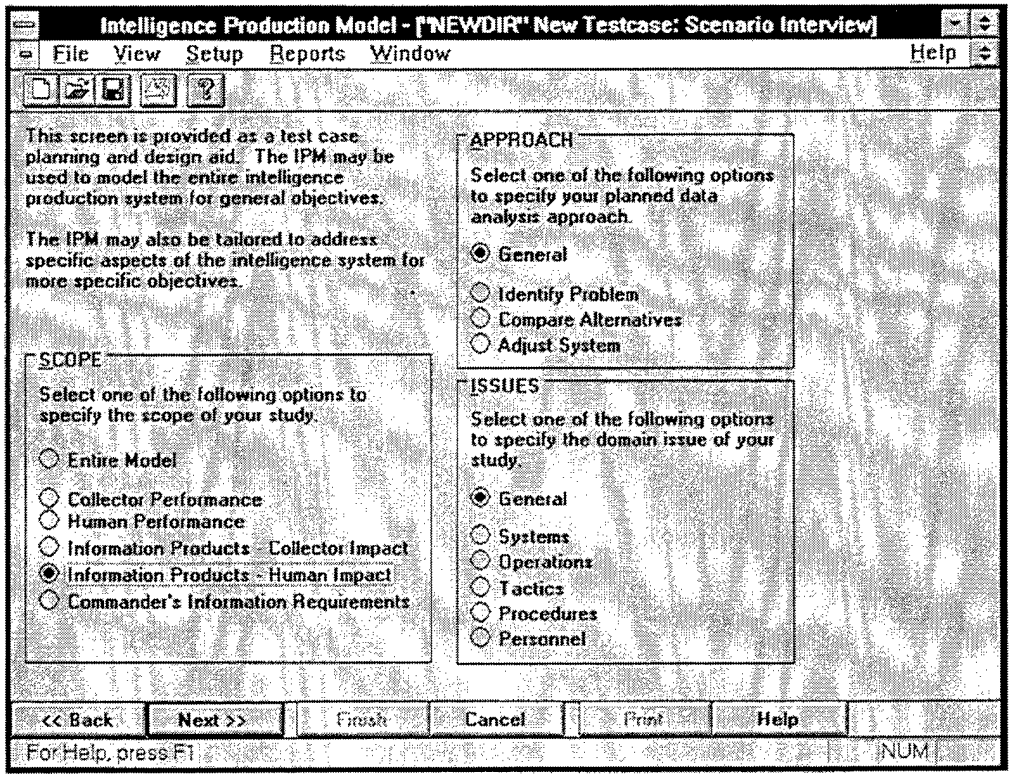
Each of the setup options is also available under **setup** .

To begin setting up the test case,

- Double-click on the top portion of the pyramid labeled **Interview**.

Scenario Interview

The scenario interview screen enables the user to specify his or her study objectives for the test case being modeled in terms of the following high-level scenario descriptors as shown on the screen below.



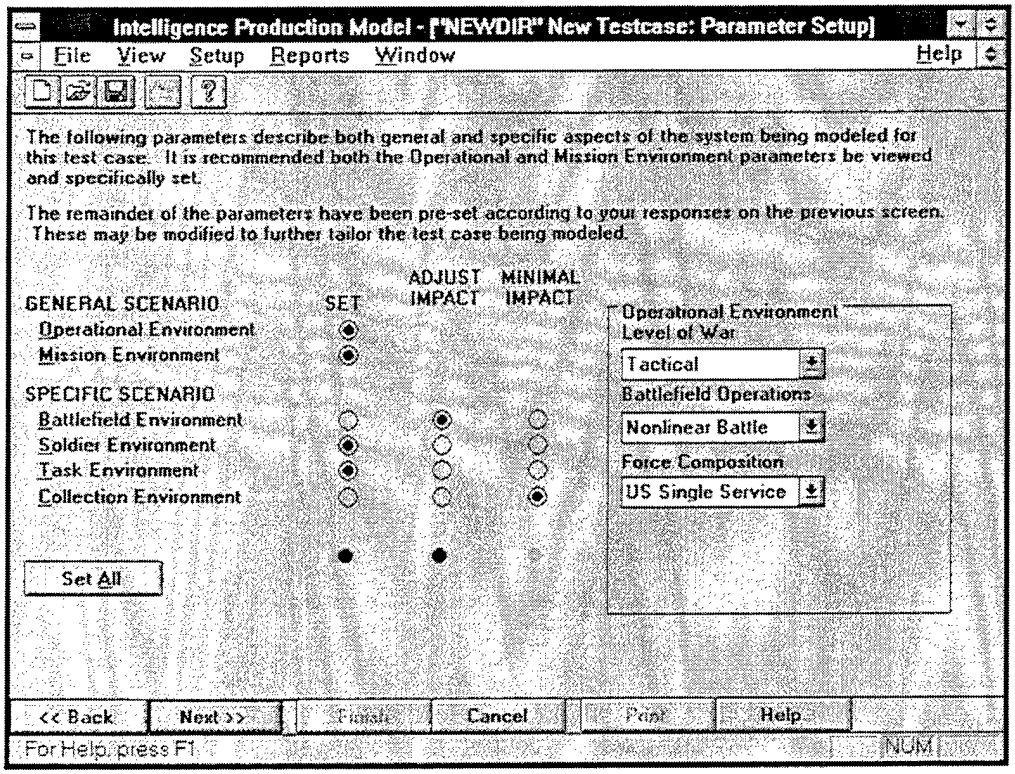
To customize this test case, limit its scope to the impact of human performance on intelligence products:

- In the **SCOPE** box, click on the radio button next to **Information Products - Human Impact**. This will provide recommendations for setting parameters on the next screen.
- Click on the **Next >>** button.

APPROACH and **ISSUES** may also be set to further customize a test case but presently only serves as a reminder to the user.

Parameter Setup

The parameter setup screen enables the user to setup intermediate level parameters describing the scenario.



Operational environment is the default display category. Click on **SET** next to the **soldier environment** category to view those parameters.

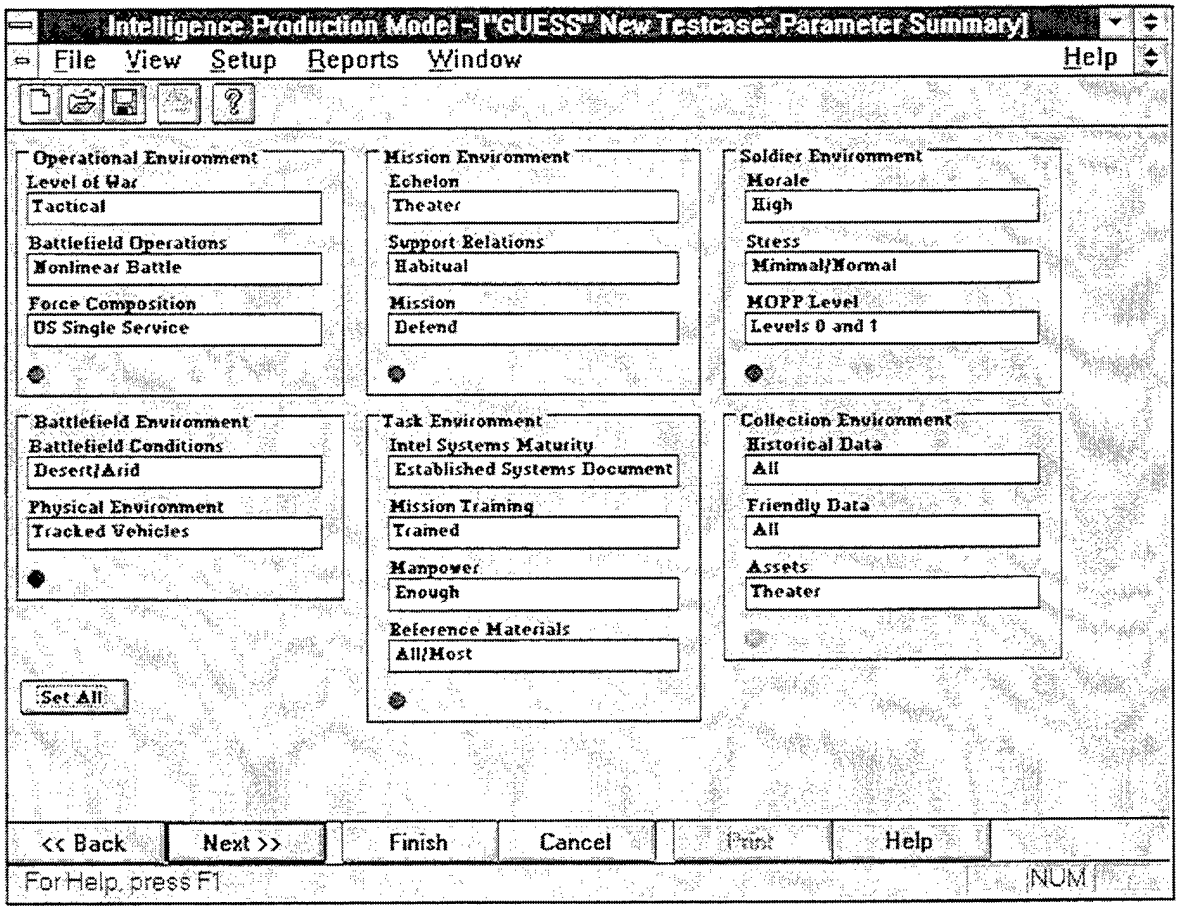
The IPM has set these up automatically, based on the **Scope** selected in the previous screen.

- Click on the **Next >>** button to go on.

NOTE: Each parameter in those general or specific scenario categories selected as SET should be specifically and carefully set by the user to describe the associated scenario (example, operational environment). Parameters selected as ADJUST IMPACT may be manipulated as a group, where each changes according to its corresponding impact (least to most). Parameters selected, as MINIMAL IMPACT will be automatically set to have the least amount of impact on the outcome of the test case.

Parameter Summary

The parameter summary screen lists the settings for all parameters.



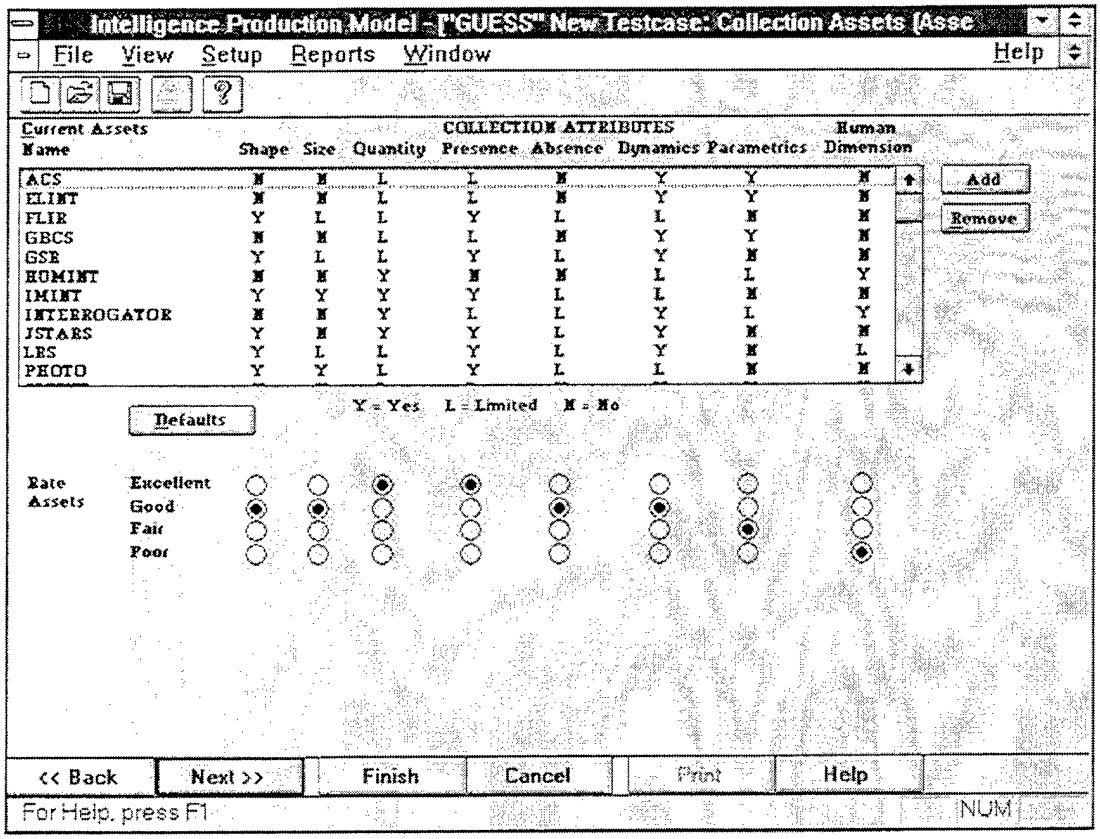
Set all enables all parameters to be specifically set from this screen.

<<Back returns to the previous screen, saving any changes made on this screen.

- Click on **Next >>** to accept the parameters as they are.

Asset Ratings

The asset ratings screen enables the user to rate the contribution of the collection assets used in the scenario. The assets shown below are the default set automatically selected according to parameters set in the prior screen. Asset ratings (e.g., excellent, good...) have also been automatically set according to attributes of the selected assets.



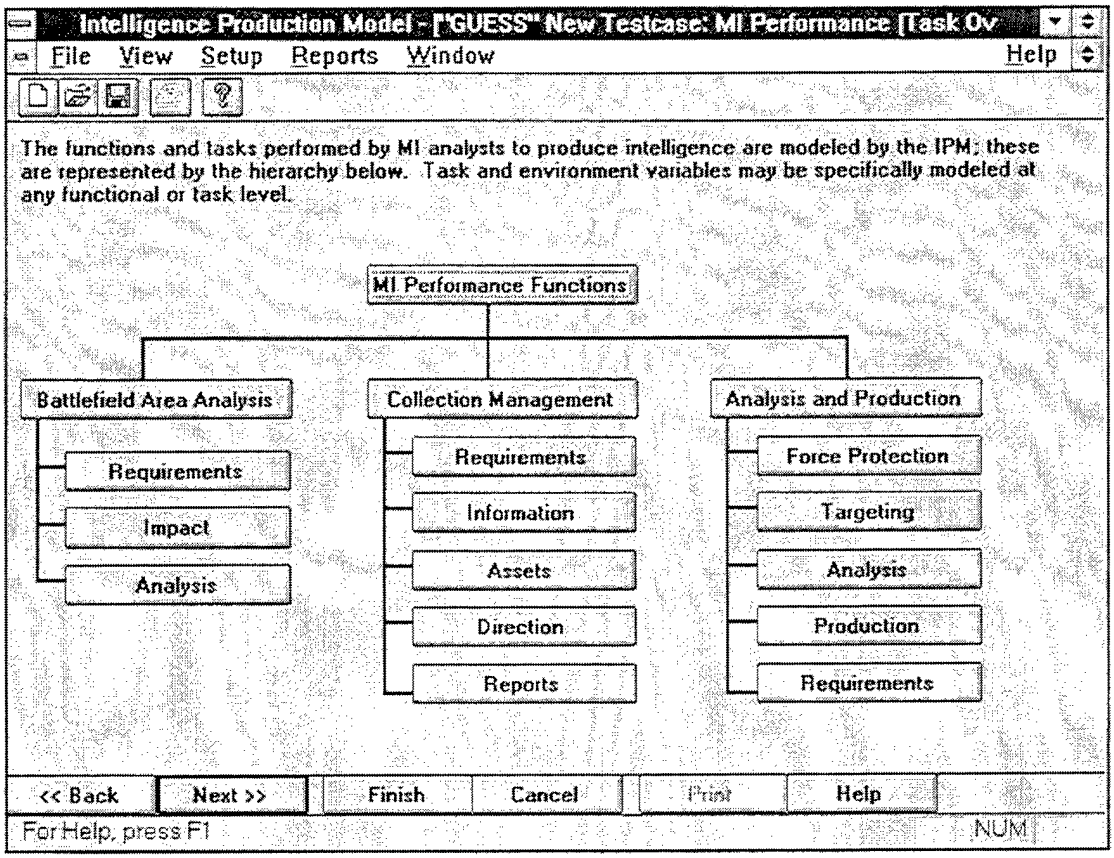
Add goes to a new window where new assets may be defined or existing ones may be selected from the asset database.

Remove deletes the selected asset from the current asset list.

- Click on **Next >>** to accept the collection assets and ratings.

Performance Task Overview

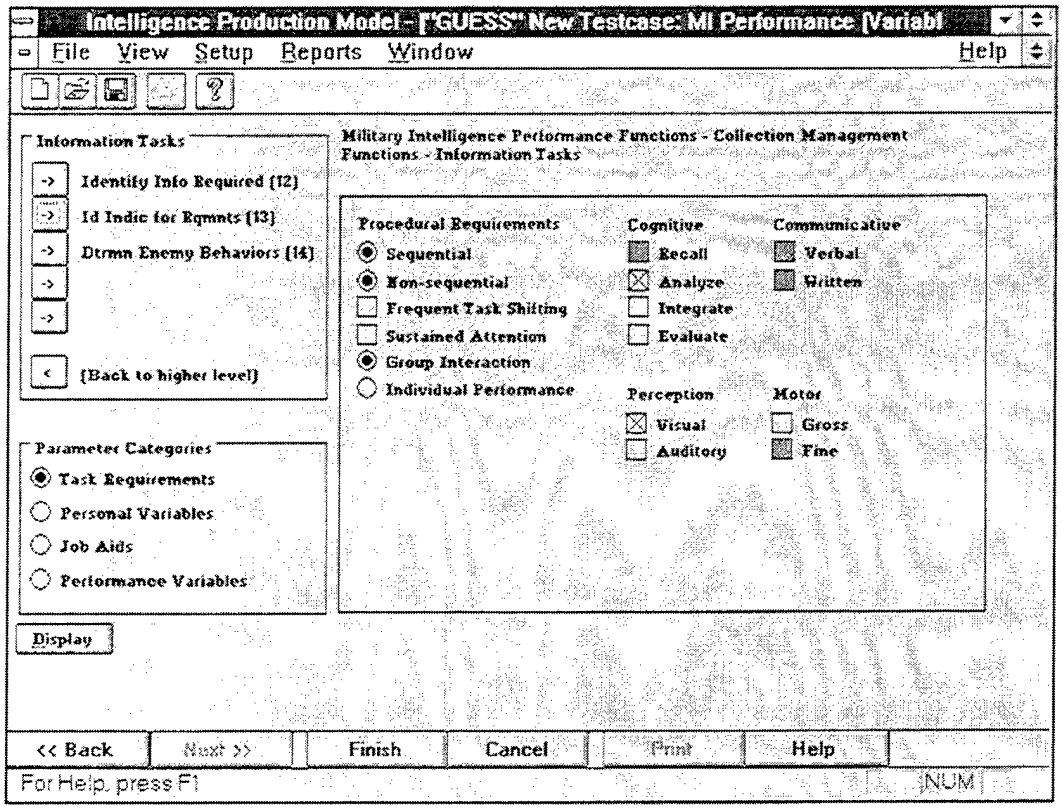
The performance task overview screen shows the hierarchical breakdown of military intelligence production tasks.



- Click on **Next >>** to go to the setup screen for these tasks.

Performance Variable Setup

The performance variable setup screen enables the user to set up variables for each individual task. These variables describe the task requirements and characteristics and the operating environment in which these tasks are being performed. These variables are pre-set according to settings of previous parameters and may be reviewed and changed by the user in groups or individually.

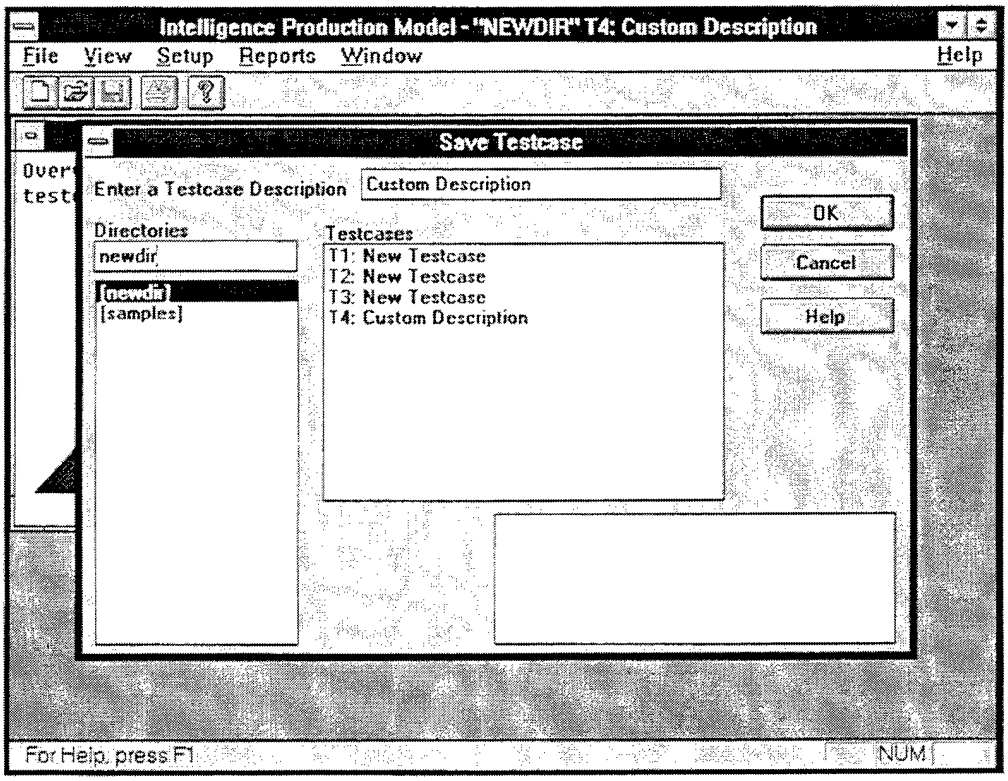


Settings for all tasks are indicated by shaded boxes and multiple radio button settings.

- Click on **Finish** to accept the settings and conclude the setup process.

Saving a Test Case

The new test case will be saved in the directory specified earlier (e.g., **NEWDIR**).

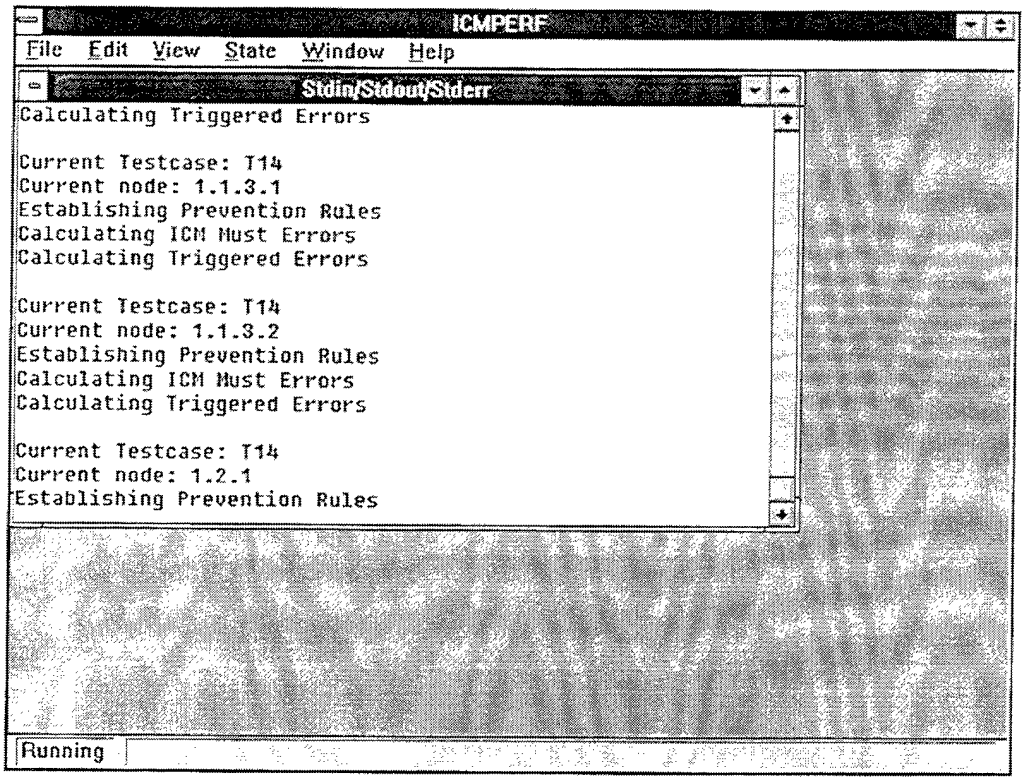


To save the newly created test case,

- Click on the **File** menu at the top.
- Click on **Save**.
- A box will appear indicating the directory and test case number under which the test case was saved. The software automatically provides the test case number.

Running a Test Case

The user must run the newly created test case before the output reports can be viewed.



- Click on the **File** menu at the top.
- Click on **Run Test Case.**
- A screen will appear, displaying a variety of information during model execution. When it is done, the overview pyramid will be restored.

Congratulations! You have successfully set up and run a complete test case. The next section guides you through the various text and graphical reports that can now be viewed.

SECTION 3: IPM MODEL OUTPUT

Output Reporting

There are two modes of output reporting: summary and detailed. The summary level of output reports has been formatted into a series of graphics displayed on the computer monitor, which summarize the data, leading the user or analyst to easily identify particular "deficiencies" or the general state of information and performance in the modeled scenario.

The detailed level of output reporting is data formatted into textual reports. Textual output data are of three types:

a. Summary data that describe on a few pages the conditions shown graphically in the first level. Historical data that show the variables settings as entered by the user, along with the directory and test case number.

b. Detailed data that show the "state" of information and human performance for each node in the information and performance modules.

Summary Output Data

There are four graphic screens and one textual summary screen available under the report menu. Each of these screens is described in the following sections.

Information Quality

One measure of performance represented in the IPM has to do with *information quality*. The quality of information is important, generally, as it affects the performance of the human analysts in the intelligence production system and as it affects the utility of the intelligence products to its user. Information quality in the IPM is used to describe both aspects of information, its value to the user as a "raw material" for building intelligence products, and its value as an intelligence product itself. Quality, in particular, is used to represent the difference between the "value" of information provided versus the "value" of information required. In the IPM, the standard for value required is the commander's information requirements, which vary according to the scenario being modeled. Information value as it pertains to the analyst during modeling of performance is explained later in this section.

Information is represented in the IPM, both logically and graphically, as a network of nodes and links. "Nodes," in the context of information quality, represent information *about* a

particular intelligence domain, such as forces, weather effects on terrain, and enemy course of action (ENCOA). The links between nodes represent the relationship between information domains, that is, where and how information about A, B, and C can be transformed by the intelligence production system to produce information about D. For example, an intelligence analyst transforms information *about* **enemy activity** and information *about* **enemy forces** into richer information about **enemy capabilities**.

Information is stored, processed, and valued in terms of a content profile, as opposed to actual content. This content profile uses a system of information dimensions and attributes of dimensions that assign ordinal value to the information represented by a node. Information value, then, is described in terms of its completeness and specificity for each of five dimensions: behavioral, temporal, spatial, structural, and quantity. Each information node, then, has value (from 1-all/specific to 5-none/cryptic) assigned to 10 measures: the completeness of information about behavior, the specificity of information about behavior, the completeness of information about location (spatial), the specificity of information about location, and so forth. Complete definitions of all terms are listed in Appendix A.

The first screen simply depicts the structure of the information hierarchy. The second and third screens depict (1) information quality and value due to collection only (assuming no impact of analyst performance on information value), and (2) information quality and value due to the entire production process. This is more thoroughly explained in following sections. Nodes in these two screens use a color scheme that is based on the comparison of information value in a node as contributed by the scenario being modeled to information value in a node as required by the scenario being modeled.

In order to diagnose the value of information produced by the scenario being modeled, the user should recognize that there are three possible sources of value:

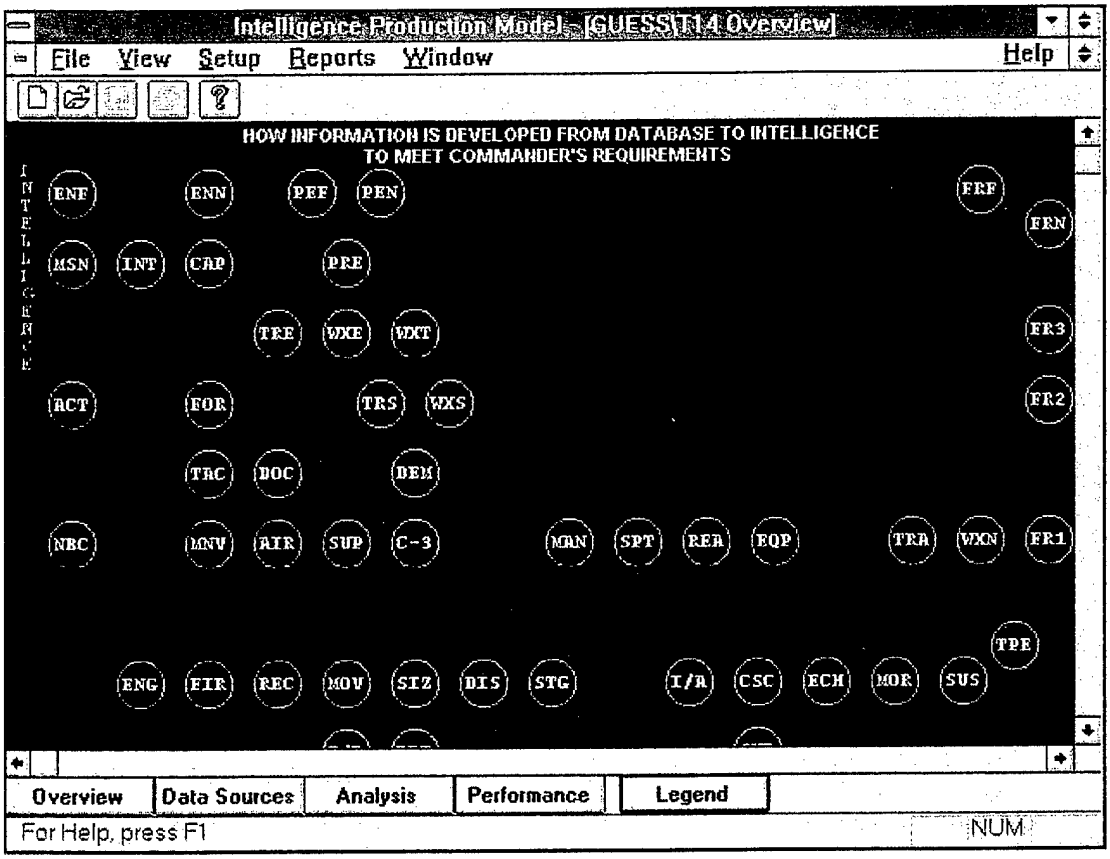
a. Value due to what was collected by assets being modeled and the availability of historical information and friendly data.

b. Value in one node due to the value of information in contributing nodes, that is, value passed to a "parent" node from its "child" nodes.

c. Value due to the impact of poor performance, given the premise that poor analyst performance in the form of errors will affect the value of the information produced to be used by subsequent and/or ultimate users.

Information Quality Overview

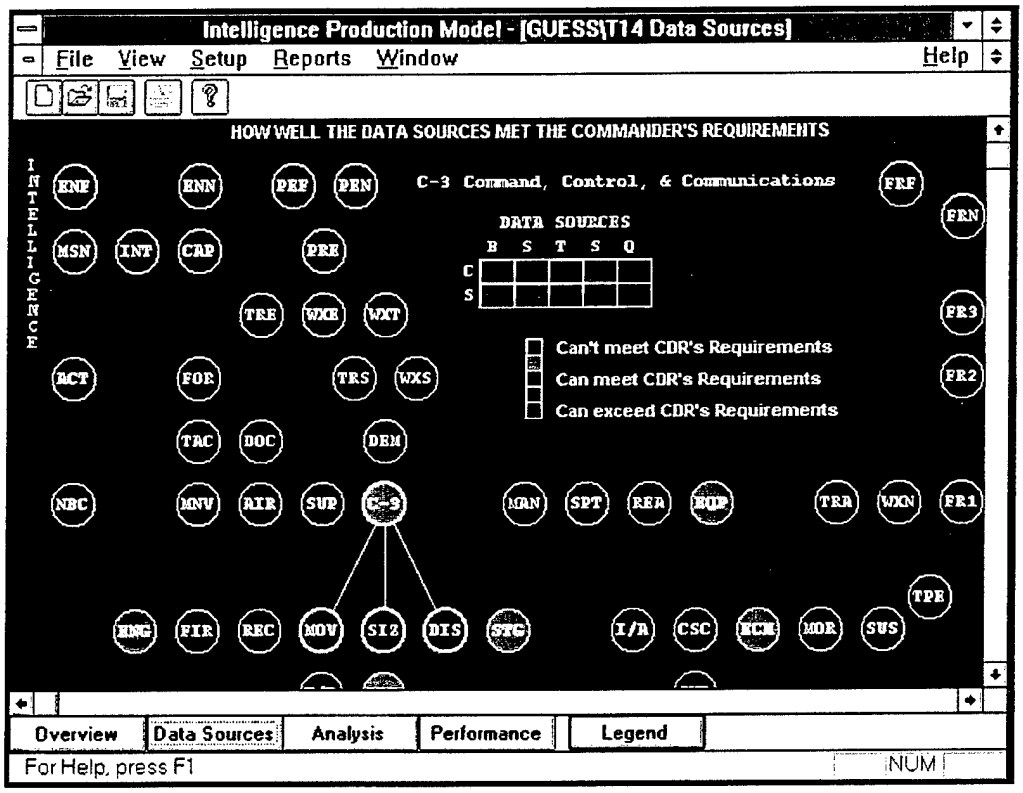
This screen is meant only to give an overview of the information structure.



- From the view menu, click on **Information Quality Overview** or click on the **Overview** button from any other graphics report.

Data Sources

The "How Well the Data Sources Met the Commander's Requirements" screen depicts the *quality* of information due to data sources. Data sources are (1) the collection assets described in the model setup, and (2) information already available to the organization being modeled by the scenario variables "Availability of Background Data" and "Availability of Friendly Data." These data sources populate the database nodes, and data are then "processed" into information and intelligence



C = completeness
S = specificity
B = behavior
S = spatial
T = temporal
S = structural
Q = quantity

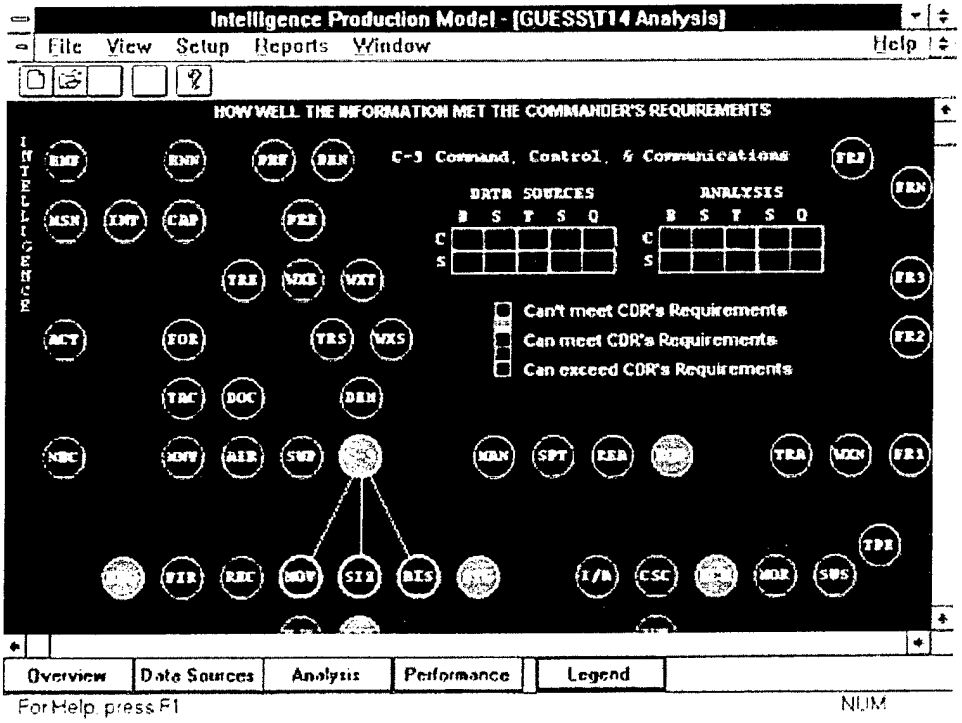
Nodes are displayed in color on the computer monitor

- From the **Reports** menu, click on **Data Source Quality**, or click on the **Data Sources** button from any other graphics report.
- To view the quality of each of the 10 measures in a single node, click on that node.
- Information quality in each node is noted by its color as defined in the legend on the right-hand center of the screen:
  - RED – Few or none of the 10 measures in this node have sufficient information value to meet the commander's information requirements.
  - BROWN – Some of the 10 measures in this node have sufficient information value to meet the commander's information requirements.
  - GREEN – Most or all of the 10 measures in this node have sufficient information value to meet the commander's information requirements.
  - CYAN – Some of the 10 measures in this node have information value that exceeds the commander's information requirements.
  - BLUE – Most or all of the 10 measures in this node have information value that exceeds the commander's information requirements.
- To show selected nodes' relationship to their children and/or parents, select **Node Trace** from the **Reports** menu and choose **Predecessors** (downward trace) or **Successors** (upward trace). Choose **Clear** to erase all current traces from the map.

Information Quality

The "How Well the Information Met the Commander's Requirements" screen depicts the *quality* of information due to data sources *and* analyses, that is, the performance of actual functions and tasks by analysts using data to produce intelligence. The quality of information depicted here may then be due to the quality of the information collected and available, and the "quality" of information produced due to performance in the analysis process. This screen recognizes that poor information may lead to poor performance, and poor performance may lead further to poor information.

The user should note both information quality due to analysis, and information quality due to data sources are displayed for the chosen node. The upper right-hand corner of the display shows two sets of boxes, each divided into two rows of five boxes with a colored fill. The 10 boxes on the right show the measures of actual information following performance, and the 10 boxes on the left show the measures of actual information before analysis, due only to data sources and the contribution from child to parent. When these are different, that is, the boxes under **Analysis** are different from the boxes under **Data Sources**, it is due to the impact of poor performance, and post-analysis value will always be equal to or worse than value due only to collection.



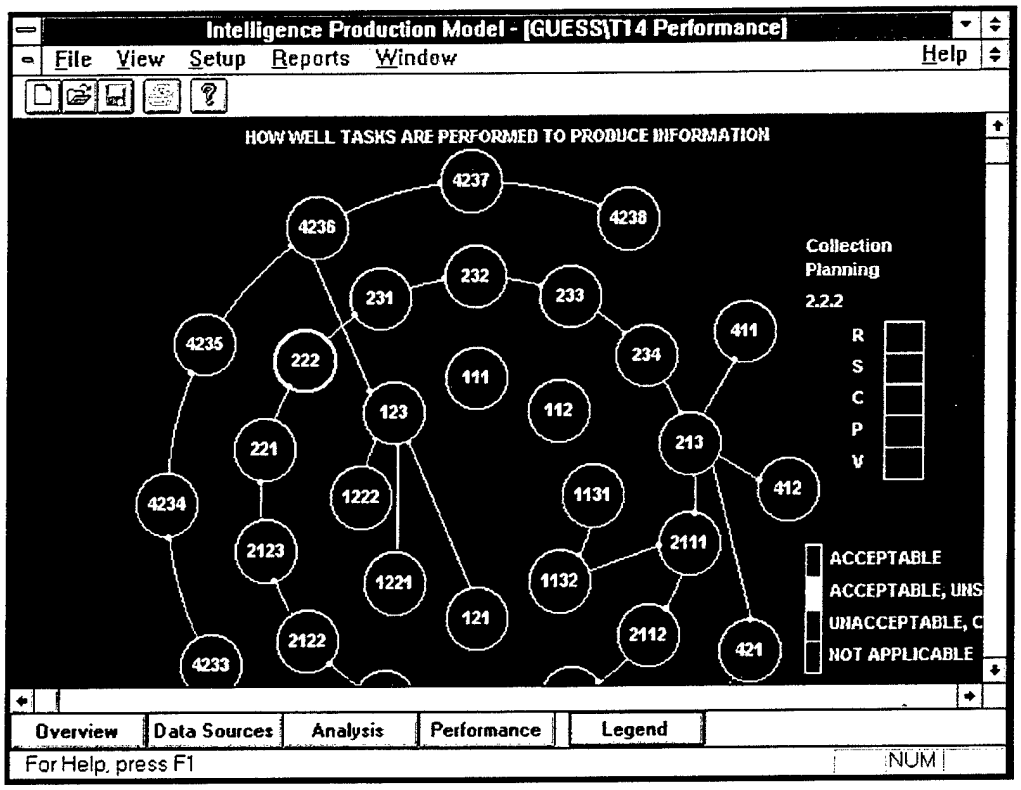
- From the **Reports** menu, click on **Information Quality** or click on the **Analysis** button from any other graphics report.
- The interface is the same as for the data sources screen.

Performance Assessment

The tasks performed during information processing by intelligence analysts are also graphically represented by nodes and links on the screen titled "How Well Tasks are Performed to Produce Information." Each node represents a task performed by an analyst in the process of transforming information and data into an intelligence product. Links between nodes do not represent work flow, but that the information product of one task is used by other tasks.

The measure of performance represented here pertains to human performance, that is, how well the analysts perform their tasks. The potential for errors in performance to occur are created, or "modeled," by the conditions under which tasks are being performed—both environmental and operational. Appendix A contains complete definitions of these conditions. Each task has a certain tolerance to the accumulated effect of potential errors which, when exceeded, are treated as an actual error, that is, one that has a discrete and measurable impact on information.

Information in the performance model is maintained in terms of five "information states" which, again, value information in terms of content attributes. Information value in the performance model refers to its utility to the ultimate user—either another task or an external user—as a production resource or "raw material." These attributes are again valued on a scale of one to five, best to worst respectively, and are relevance, specificity, completeness, perishability, and validity. Information state starts at an exemplar level that defines the "ideal" level for each attribute for a particular task. Actual errors occurring in a task then have either no impact or a negative impact on each attribute, depending on the severity of that error as it pertains to that task's information product. A generic example of this would be an error, "did not collect all information necessary to perform a task?" which would have an impact on the completeness state of the information product produced in that task. Also, because that information product is passed to another task, the final state of the information is passed in terms of its potential for creating errors in a subsequent task. Appendix A contains the definitions of these measures and each level within a measure.



To diagnose a deficient node in the performance screen, click on that node. Performance is rated in terms of the final state of the information product due to the aggregate impact of actual errors committed by the analyst in that task. Performance in each node is noted by its color: green, yellow, red, or black, as defined in the legend at the lower right-hand corner of the screen.

- RED - One or more information state attributes have been degraded to the extent that the information product may not be usable.
- YELLOW - One or more information state attributes have only been moderately degraded, but any additional errors could render the information unusable.
- GREEN - None of the information state attributes has been degraded or has been degraded only slightly.
- BLACK - Certain types of case studies focus on task performance only in certain functional areas.

Summary of Contributors Report

The critical nodes shown on the previous information screens are listed in this summary report with their contributing factors. Contributing factors come from one, two, or all three of the following sources:

a. Errors caused by operator, operational, or task characteristics specified in the setup of a test case.

b. Errors propagated from previous tasks, that is, errors resulting from deficient information products passed from other tasks where performance was poor. The information state of these other tasks is converted to equivalent errors before being passed to subsequent tasks.

c. Errors due to the quality of data/information coming from the data source nodes.

The summary report will again point to variable settings in the model, which have contributed to deficiencies in information quality. This report may be printed by clicking on the **Print** button on the tool bar at the bottom of the report.

Detailed Reports

Each of the following reports is available from the report menu, either on screen or in hard copy. It would be useful to have a sample of each of these reports available when reading the following descriptions.

Error Impact Summary (Performance by Node) - The final information state for each attribute is summarized for each task in which the impact of errors degraded one or more attribute levels to three or worse. *Unacceptable performance*, because of the degradation of information attributes to four or worse, is annotated with an "**." *Acceptable but unstable performance* is annotated with an "*" and is designated as such because of a high potential for small changes in task performance conditions to degrade such performance to an unacceptable level.

Error Impact Report (Performance by Node) - A detailed, node-by-node report that shows the individual impact of errors on levels of attributes of the information state for a particular task.

Triggered Errors (Performance by Node) - All "triggered" or actual errors are reported for each task, including the condition that created the potential for each, and the magnitude of the

contribution. The magnitude of potential is reported as "50," "75," or "100"—roughly equivalent to a level of confidence that an error will actually be triggered. A confidence factor of 100 associated with a trigger condition, for example, always triggers the relevant error.

Error Distributions (Performance by Node) - A summary of the distribution of confidence factors for every condition, the error(s) to which they contribute potential, and the threshold for potential is reported for each node. The threshold for error potential in any node is a distribution for each confidence factor (50 and 75) which, when exceeded by the accumulation of potential contributed by task conditions, will cause the error to actually be triggered.

Model Setup - All intermediate parameter settings used to model the scenario in question are contained in this report.

Performance Node Setup - This report contains all the variable settings describing the conditions for each performance task.

Data Source and Analysis - The numeric value for each {CS/BSTSQ} measure is shown for each information node for data source, analysis, and information required. Deficient values are annotated with an "*."

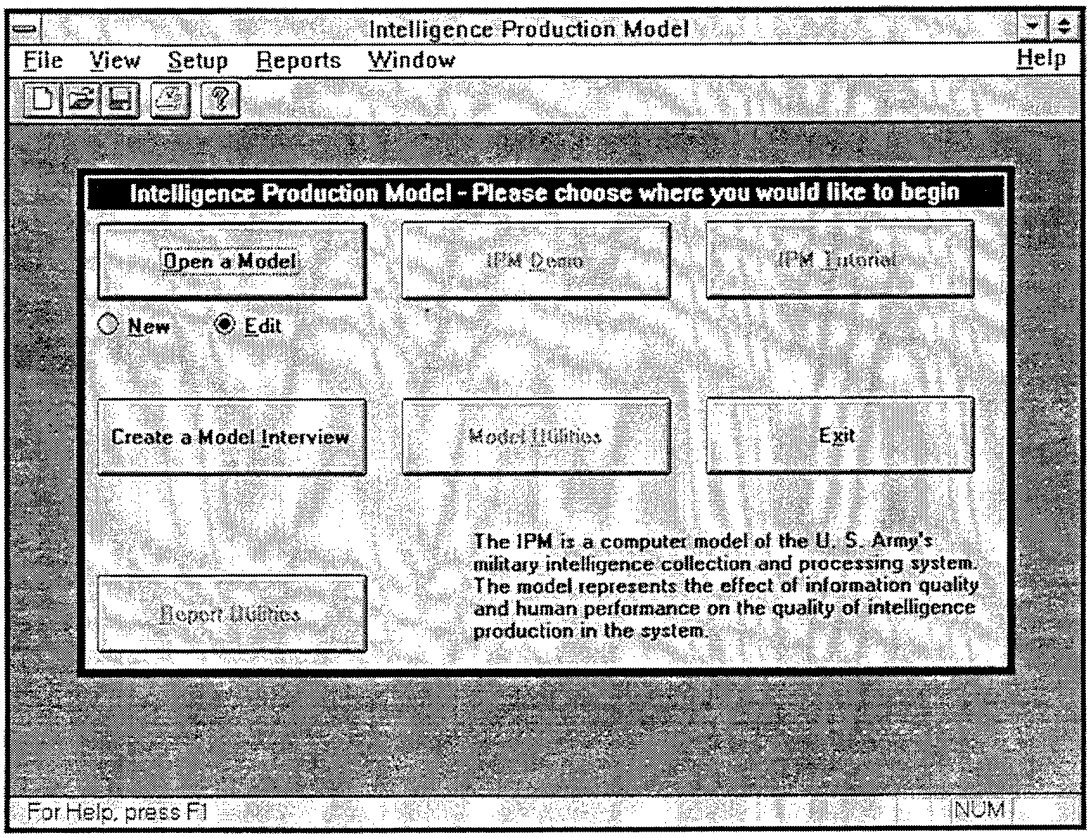
SECTION 4: MODIFYING A TEST CASE

Introduction

In the first section, the user was guided through the process of setting up a new test case, accepting most of the default or automatic settings. This section describes the steps a user would take to modify various elements of an existing test case. The test case created in Section 2 is being used as the demonstration test case. Note that many of these steps can be used when setting up a new test case as well.

The Introduction Screen

When the program is first started, an introduction screen appears with a brief description of the IPM and a number of options for beginning.

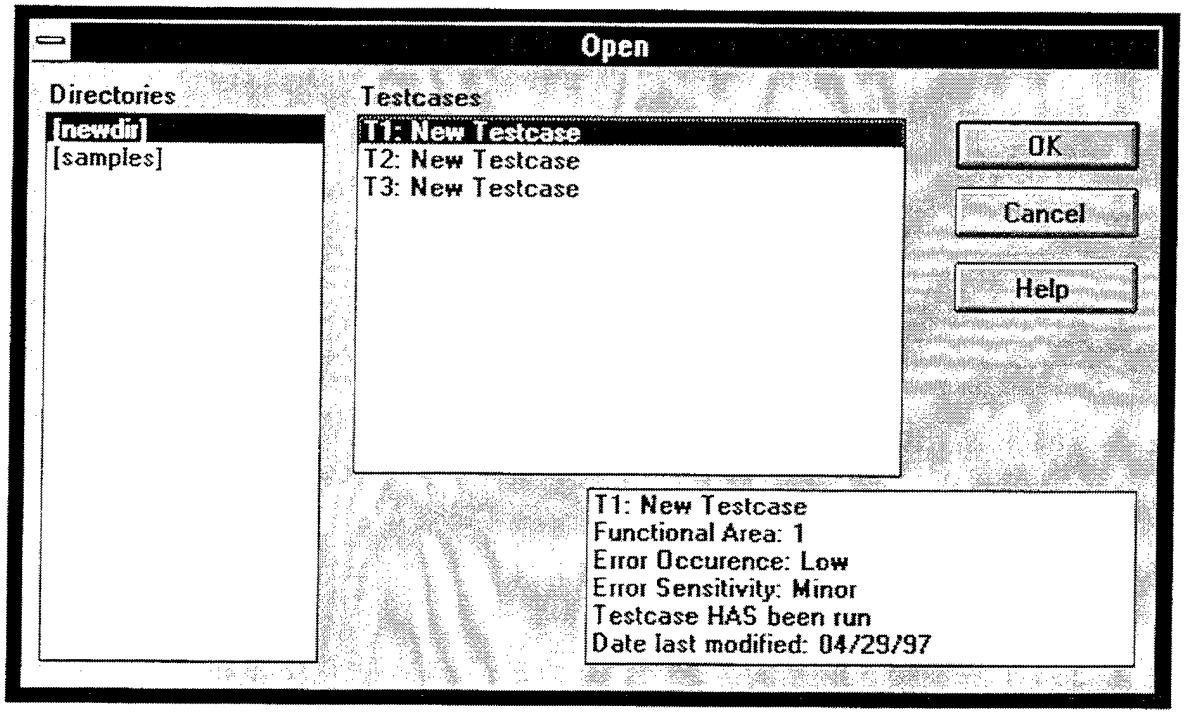


To load an existing test case,

- Click on the radio button next to **Edit**.
- Click on **Open a Model**.

Open Test Case

The open test case screen appears prompting the user to select the location where the test case is stored and which test case to load from that location.



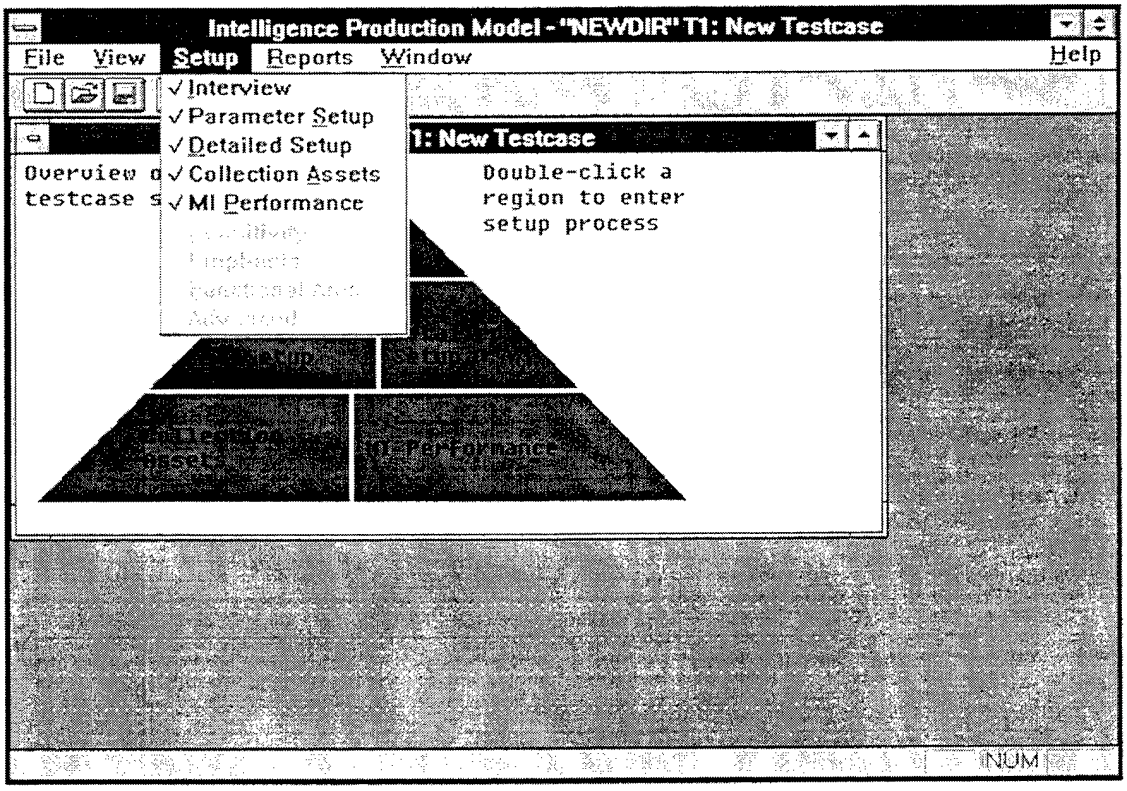
The test case in the **[samples]** directory may also be used in **[newdir]** is not available. Examples will still be generally applicable.

To open the test case created in Section 1,

- Click on **[newdir]** in the **Directories** list.
- Click on **T1: New Test Case** in the **Test Cases** list.
- A window at the bottom shows summary information about the selected test case.
- Click on the **OK** button to load the test case.

Options for Modifying Test Cases

The pull-down menu under **Setup** shows the options for modifying parameters in a test case. The user may specifically select one of these categories to modify from the pull-down menu, or these categories may be selected from the overview pyramid.

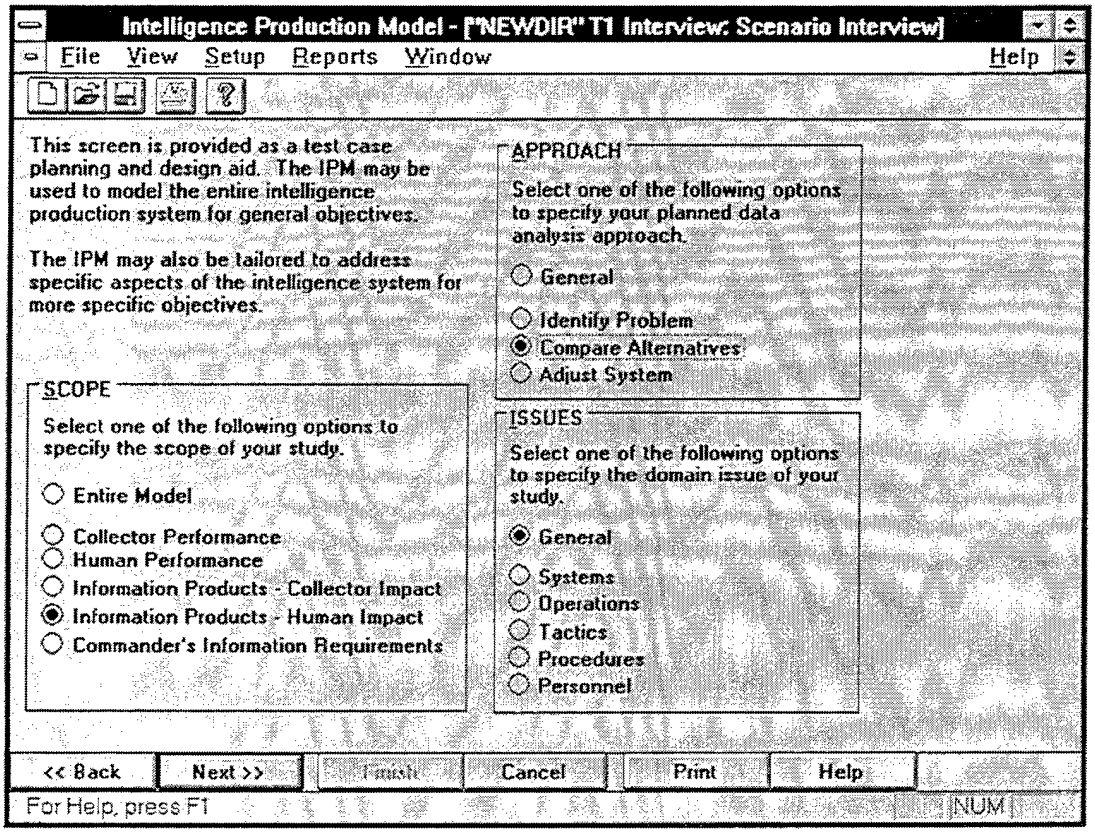


The options are listed below. Go to the page indicated next to each option:

NOTE: Modifications of parameters in any of these screens may result in automatic settings in later screens. A prompt will notify the user that these changes may occur, at which time, the user may elect to accept or reject the impact of these changes.

Modifying Interview Settings

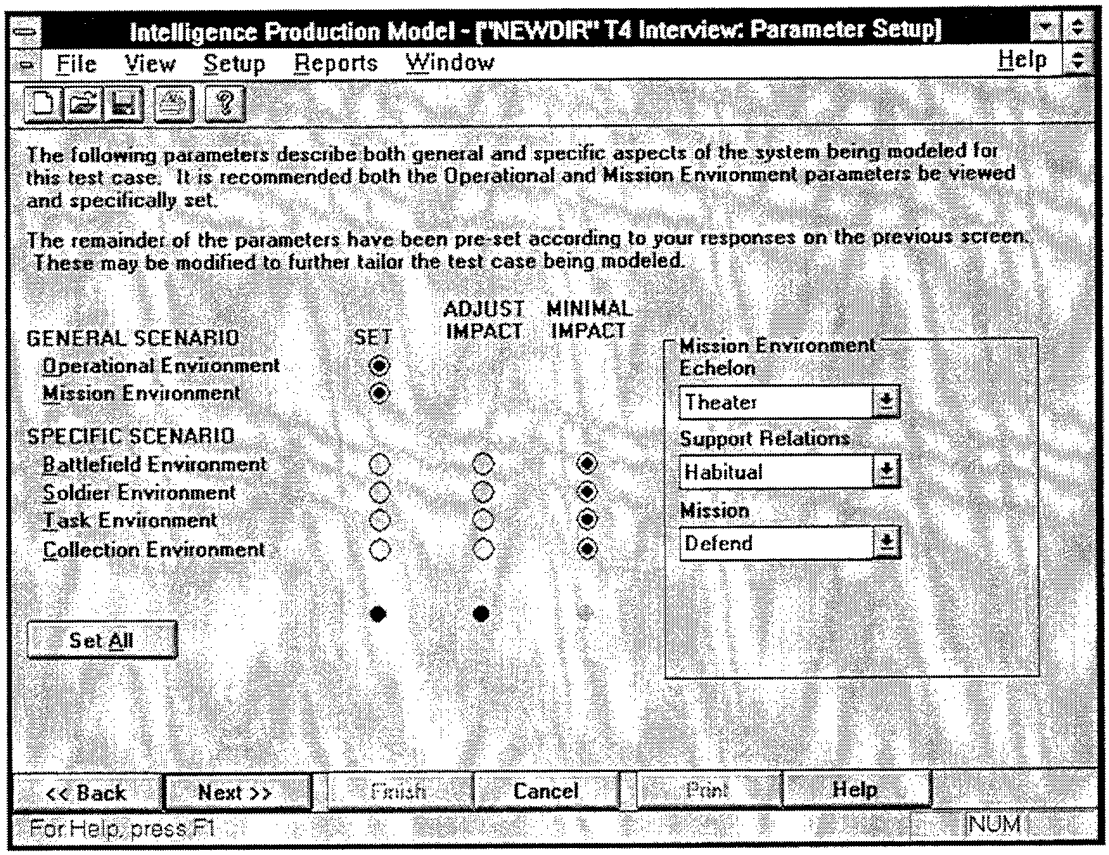
The user may modify any of the interview settings, depending on his or her objective for the current test case. When comparing alternatives, for example, it is unlikely that changes would be made in the test case at this level.



Only a change in **Scope** will have an effect on subsequent settings. Changes in either **Approach** or **Issues** are only recorded and will have no effect on subsequent settings.

Modifying Scenario Parameters

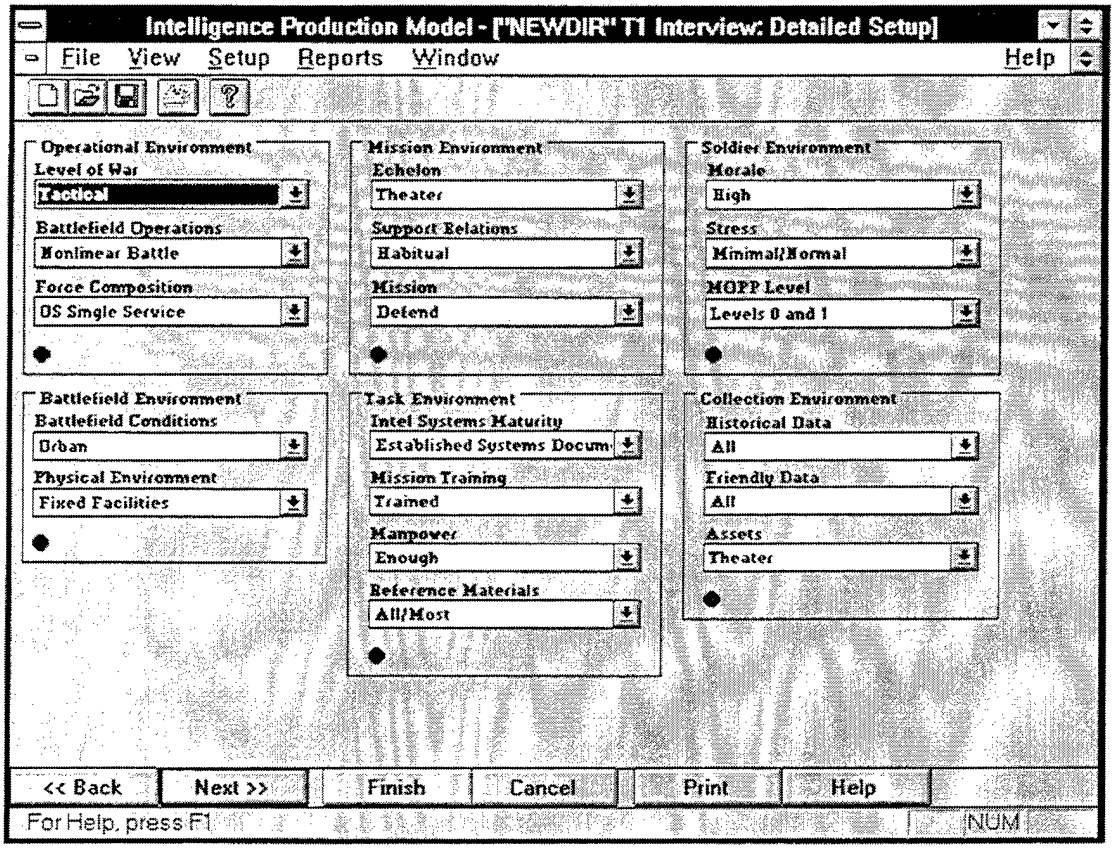
The parameter setup screen enables the user to set up intermediate level parameters describing the scenario.



- Click on the **Set** button next to mission environment under the **General Scenario** category to modify these parameters. Click on the pull-down boxes at the right to view and select different settings for each parameter (e.g., *echelon*).
- Click on the **Adjust Impact** button next to soldier environment under the **Specific Scenario** category to set the parameters as a group. Use the scroll bar at the right to vary the parameters, from settings that have a minimal impact on the model to settings that have the most impact on the model.
- Click on the **Minimal Impact** button next to collection environment under the **Specific Scenario** category to have all the parameters set to have a minimal impact on the model. The parameters at the right may be viewed but not changed in this mode.
- Click on **Set All** and **Next >>** to view all the parameters at once and set each one individually in the following window.

Modifying Scenario Parameters (detail)

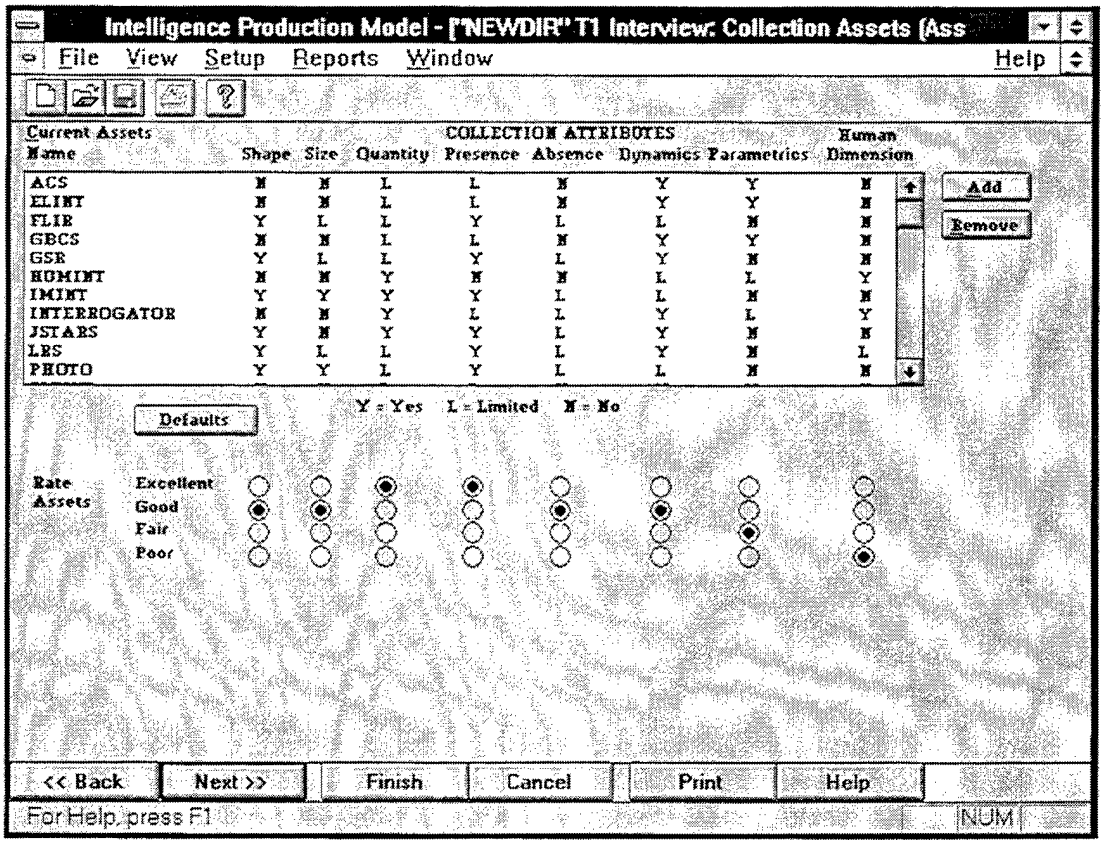
The detailed setup screen enables the user to view all scenario parameters at once and set each parameter individually. This gives the user maximum flexibility in defining the scenario to be modeled.



- Click on the pull-down box for a parameter to view its possible settings. Click on the desired setting; this selection will be reflected in the window.

Modifying Asset Ratings

The asset ratings screen enables the user to rate the contribution of the collection assets used in the scenario. The assets selected for this scenario are listed in the **Current Assets** window as shown below. The assets that are initially in this list are the default set for the echelon selected in the **Asset** parameter of the parameter setup screen.

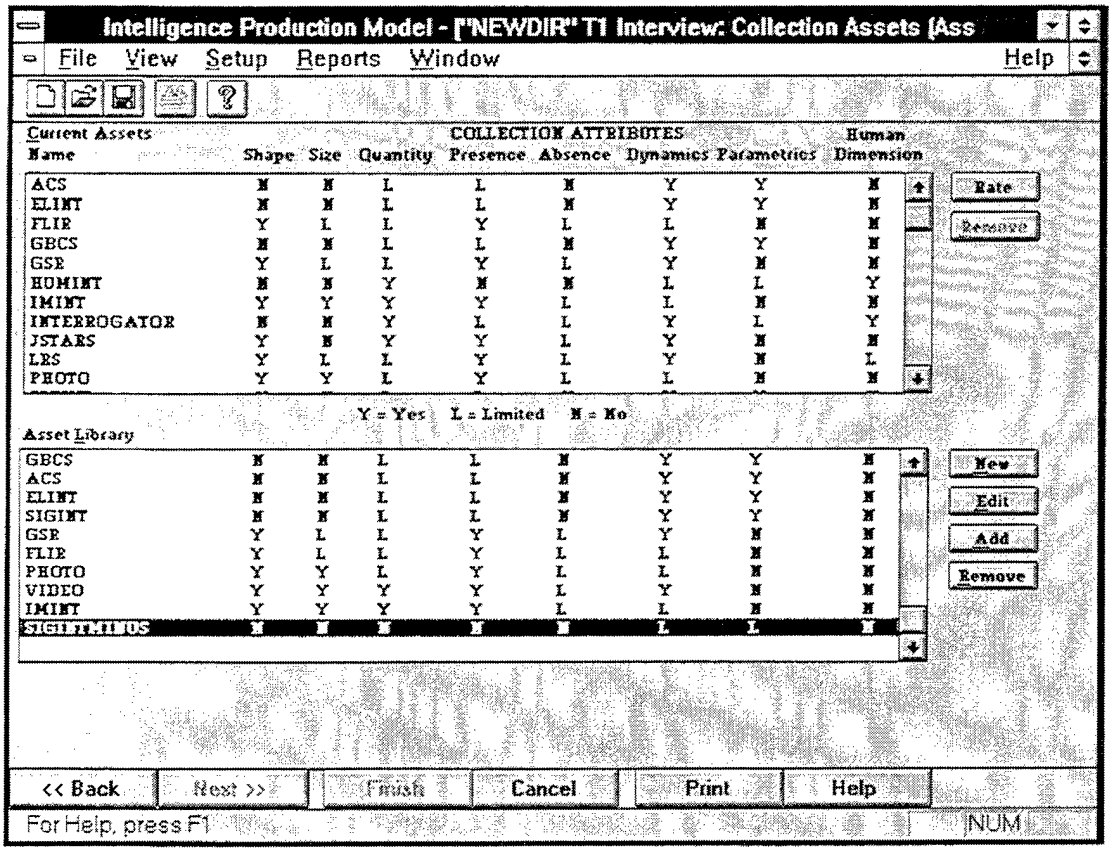


The **default** button will return the current asset list to the defaults specified in earlier parameter settings.

- To remove an asset from the list, click on that asset in the **Current Assets** window and then click on the **Remove** button.
- Click on the **Add** button to add additional assets from the asset library.
- Click on the button under the appropriate column (**Excellent, Good, Fair,** or **Poor**) for each of the eight collection attributes to rate the asset suite's contribution to that particular information attribute (e.g., information about *shape, size, quantity*, and so forth). An asset's rating is due in part to its general ability (**Y=yes, L=limited, N=no**) to collect information about an attribute and partly to details of the scenario being modeled.

Using the Asset Library

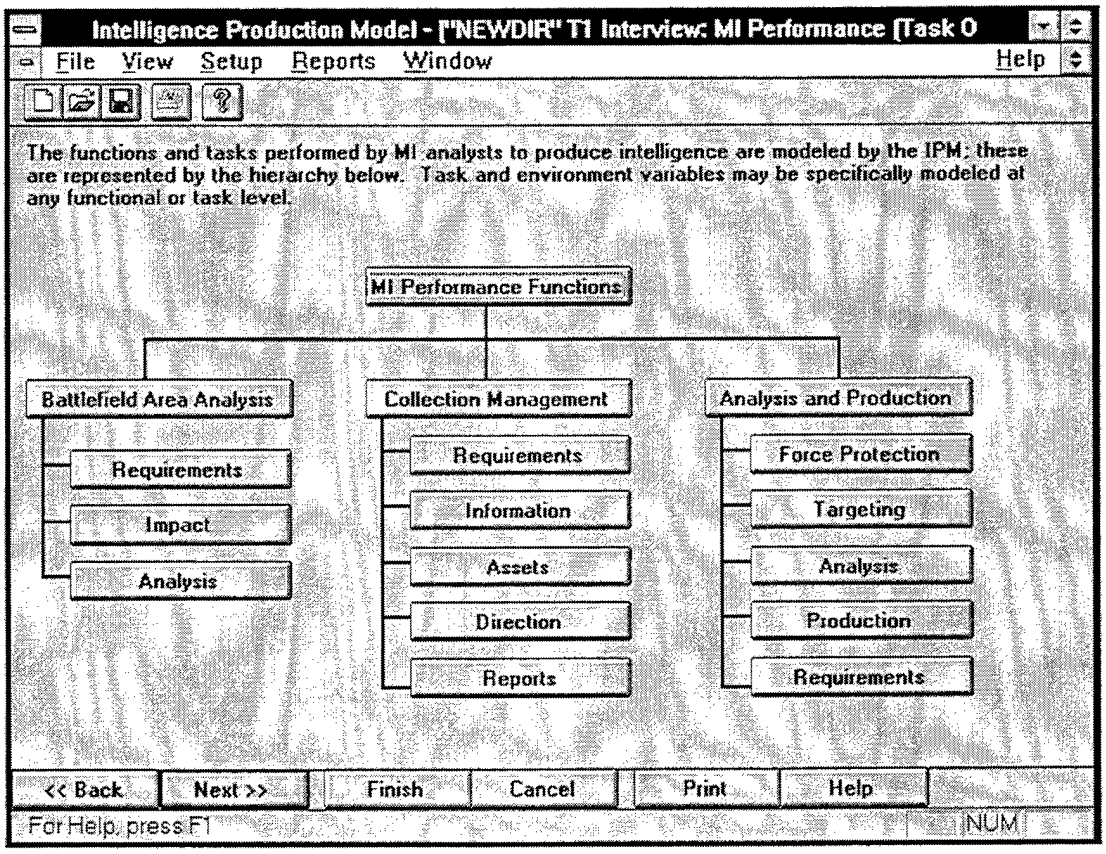
The asset library contains a list of all generic assets as well as all assets created in this and other modeling exercises. This window enables the user to modify existing assets, create new assets, and remove or add these assets to the collection suite for the scenario being modeled.



- To add a new asset, click on **New** and fill in the blanks for the new asset name and **Y, L, N** for its collection capabilities.
- To edit an existing asset, select that asset in the lower asset library box, and click on **Edit**. If this is an organic asset, it must be renamed (e.g., SIGINTMINUS). If this is a user-created asset, its attributes may be modified and the asset saved under the same or a different name.
- To add an asset from the library to the current asset list, select that asset in the asset library box and click on **Add**.
- To remove an asset from the library, select that asset in the asset library box and click on **Remove**.
- To remove an asset from the current asset list, select that asset in the current asset box and click on **Remove**.
- To return to the original assets screen, click on **Rate**.

Modifying MI Performance Tasks

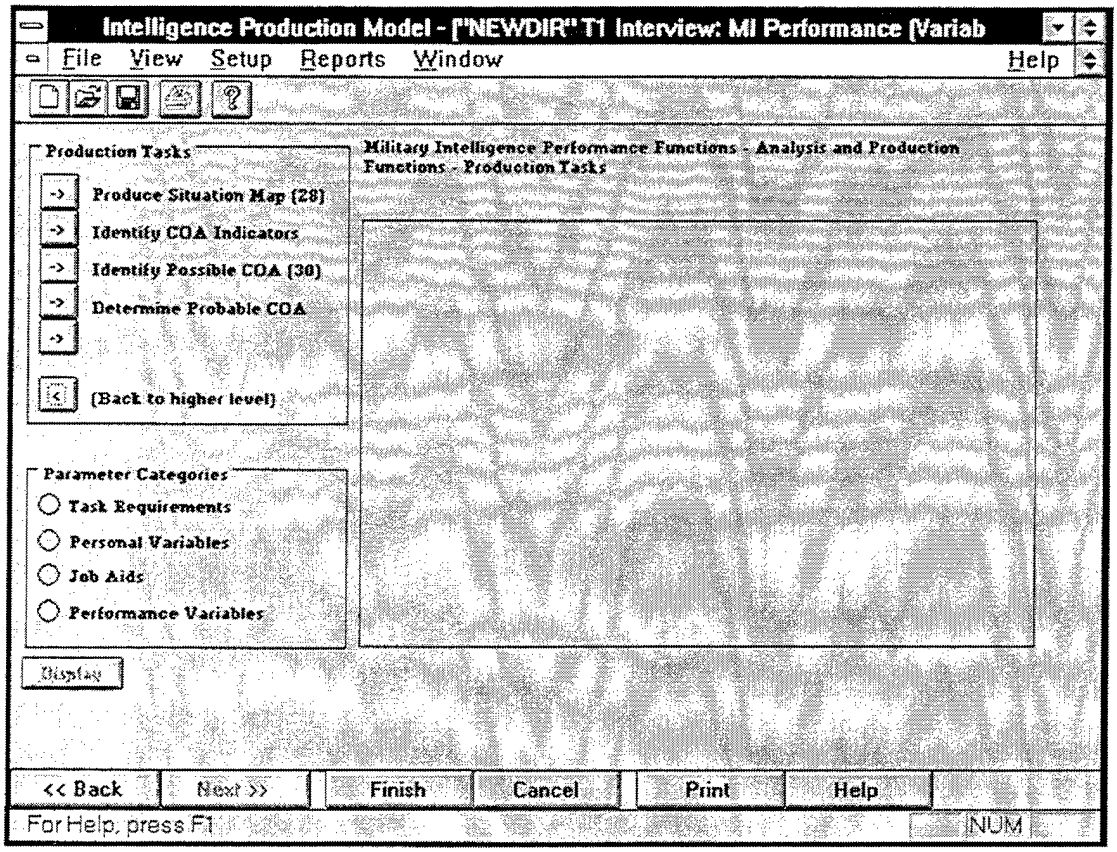
The user may modify the characteristics of the tasks being performed in the scenario being modeled. Modifications may be done from the highest level (MI performance functions), at some intermediate level (analysis and production tasks), or at the individual task level (produce situation map).



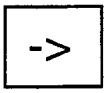
- Click on any box within the hierarchy to model all tasks in that hierarchy. For example, click on **Production** in the analysis and production branch.

Modifying MI Performance Tasks (1)

The user now sees the four tasks that are categorized as production tasks: (1) produce situation map, (2) identify COA indications, (3) identify possible COA, and (4) determine probable COA. Task characteristics may be defined for these tasks as a group or may be defined task by task.

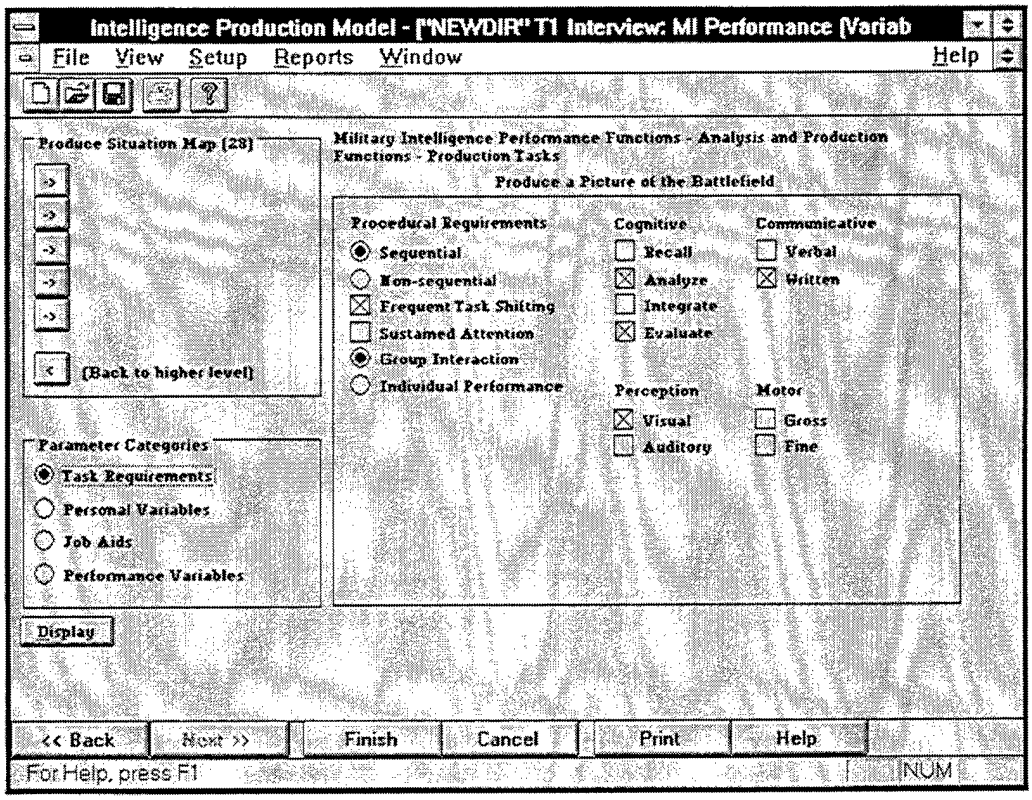


- To define task characteristics for the entire group of production tasks, click on one of the characteristics parameter categories (i.e., **Task Requirements, Personal Variables, Job Aids**, or **Performance Variables**).
- To define task characteristics for a single task, for example, **Produce Situation Map,** click on the button next to that task. The following screen shows the results of that action.



Modifying MI Performance Tasks (2)

The user has elected to modify the task characteristics of the task **Produce Situation Map**. The first characteristic parameter, **Task Requirements**, has been selected. See Appendix A for a working definition of these terms and their possible settings. Section 6 also contains the entire performance task and parameter categories matrix.



A box (☐) next to a characteristic indicates none, one, or more of these characteristics may be selected.

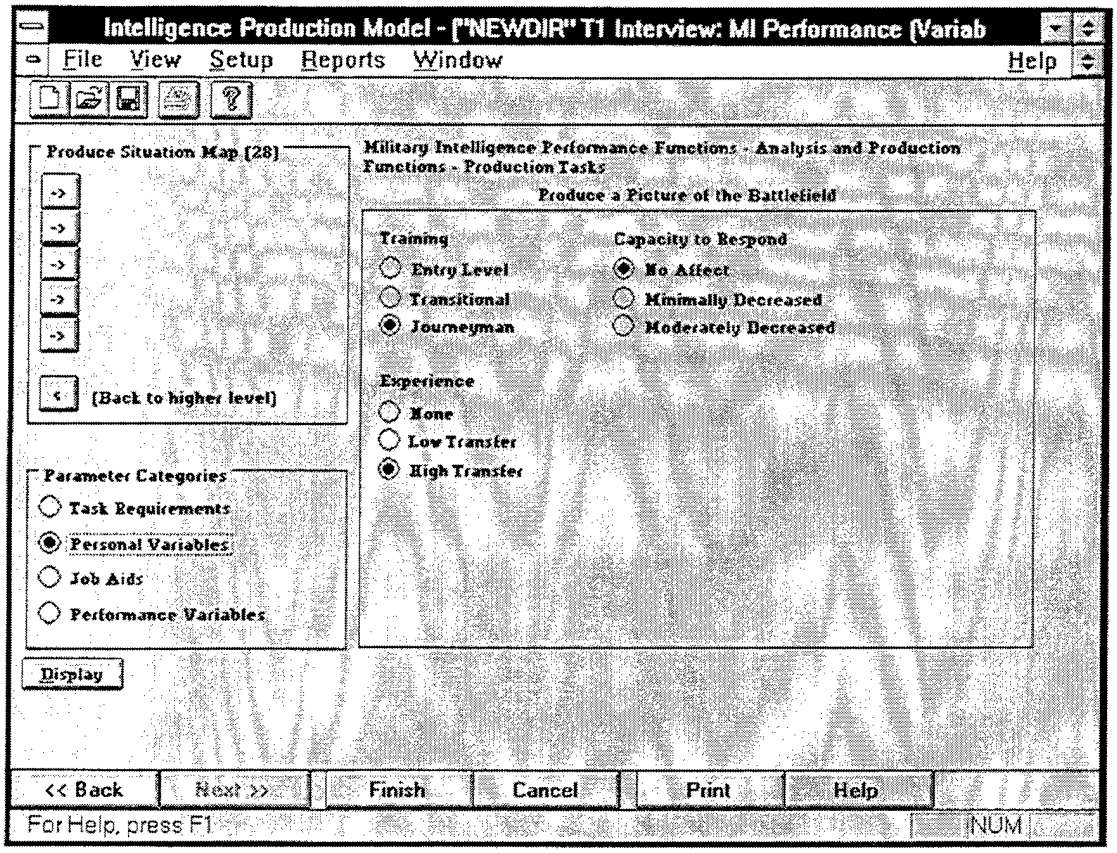
- Click on a box in any requirements set (e.g., **Procedural Requirements**, **Cognitive**, **Communicative**, and so forth) to select (☒) or de-select (☐) that element as a requirement of the task. For example, the user may decide that this particular task has a **cognitive requirement** that the analyst has the ability to both analyze and evaluate.

A circle (○) next to a characteristic indicates that only one of the sets may be selected.

- Further, this task has the characteristic that it will be performed non-sequentially with group interaction (for this scenario). Click on the radio button (•) next to *non-sequential* in the **Procedural Requirements** set.

Modifying MI Performance Tasks (3)

The user has elected to modify the task characteristics of the task **Produce Situation Map.** The second characteristic parameter, **Personal Variables**, has been selected. See Appendix A for a working definition of these terms and their possible settings. Section 6 also contains the entire performance task and parameter categories matrix.



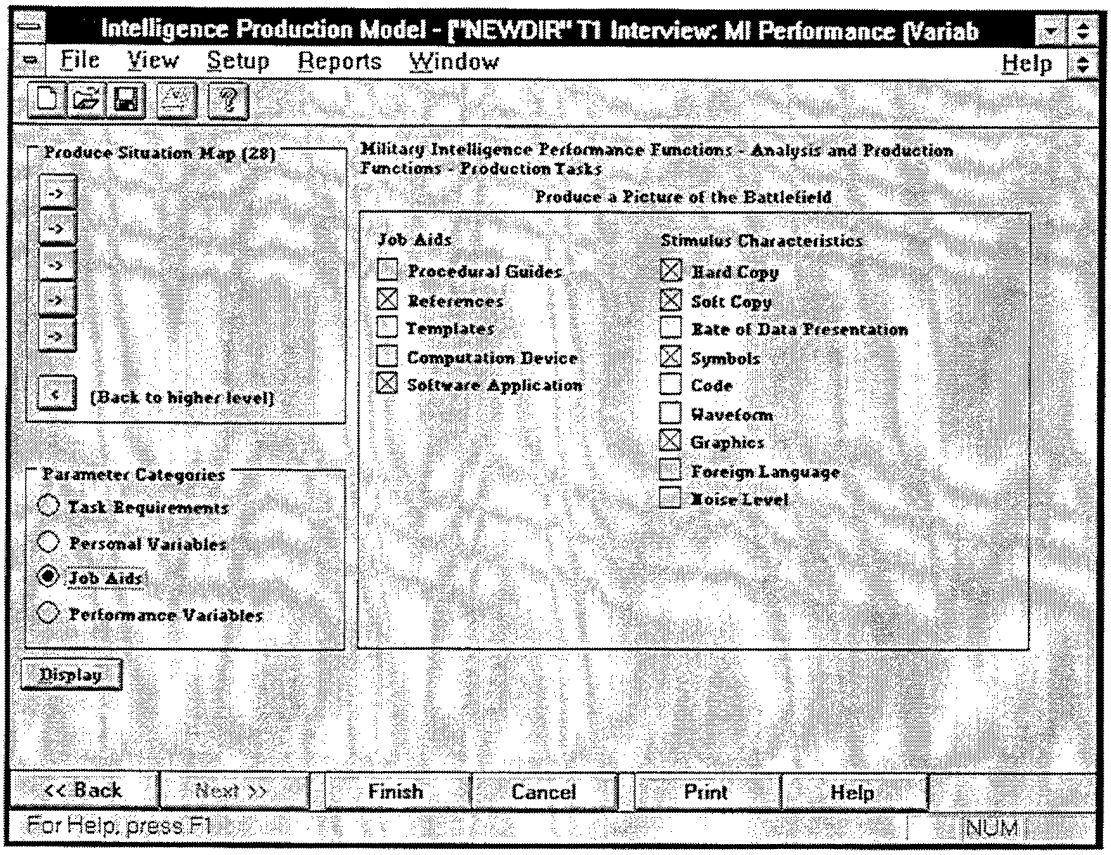
The analyst(s) being modeled has the following personal characteristics: he or she has journeyman level training, low transfer experience, and a minimally reduced capacity to respond because of the conditions of the scenario being modeled.

Click on the radio buttons under one of the personal variable sets; note that only one of the levels may be selected at a time.

- Click on the radio button (•) next to *low transfer* under the **Experience** set.
- Click on the radio button (•) next to *minimally decreased* under the **Capacity to Respond** set.
- Click on **Job Aids** in the parameter categories box and go to the next page.

Modifying MI Performance Tasks (4)

The user has elected to modify the task characteristics of the task **Produce Situation Map**. The third characteristics parameter, **Job Aids**, has been selected. See Appendix A for a working definition of these terms and their possible settings. Section 6 also contains the entire performance task and parameter categories matrix.

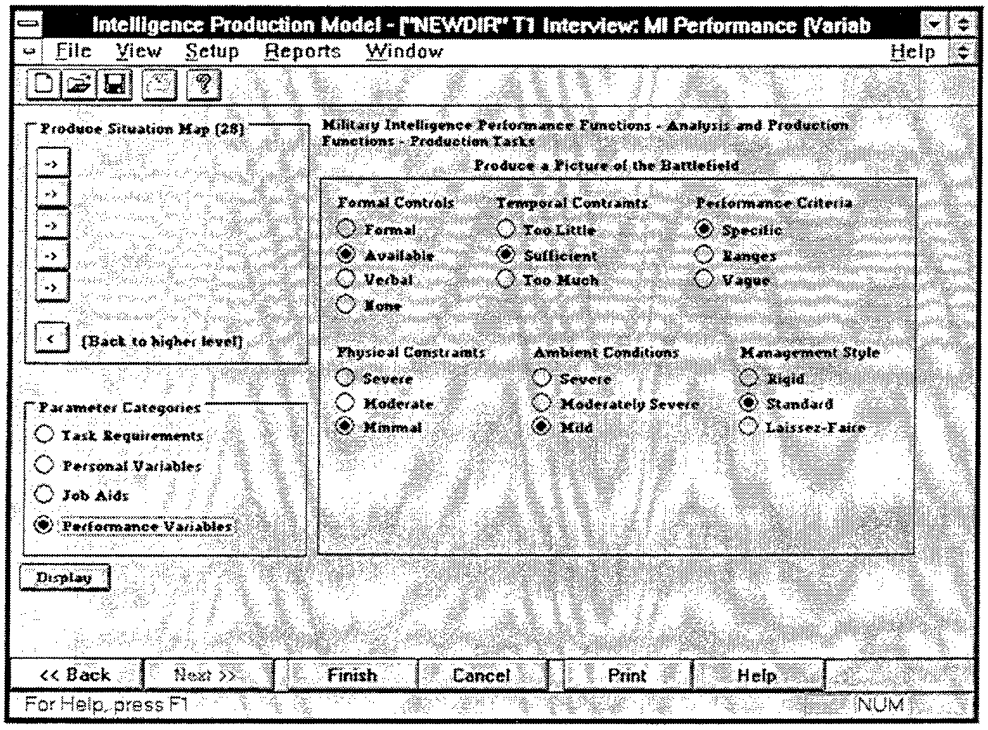


The task being modeled will check the effect of removing automation software from the job aids available to the analyst. To compensate for the loss of software, the analyst will be provided with a computation device. Note, the removal of software also changes the stimulus characteristics of this task; all stimulus characteristics will be removed.

- Click on the box ([X]) next to *computation device* under **Job Aids** to select this job aid, and on the box ([ ]) next to *software application* to de-select this job aid.
- Click on the box ([ ]) next to *hard copy*, *soft copy*, *symbols*, and *graphics* to de-select these job aids.
- Click on **Performance Variables** in the parameter categories box and go to the next page.

Modifying MI Performance Tasks (5)

The user has elected to modify the task characteristics of the task **Produce Situation Map**. The fourth characteristic parameter, **Performance Variables**, has been selected. See Appendix A for a working definition of these terms and their possible settings. Section 6 also contains the entire performance task and parameter categories matrix.



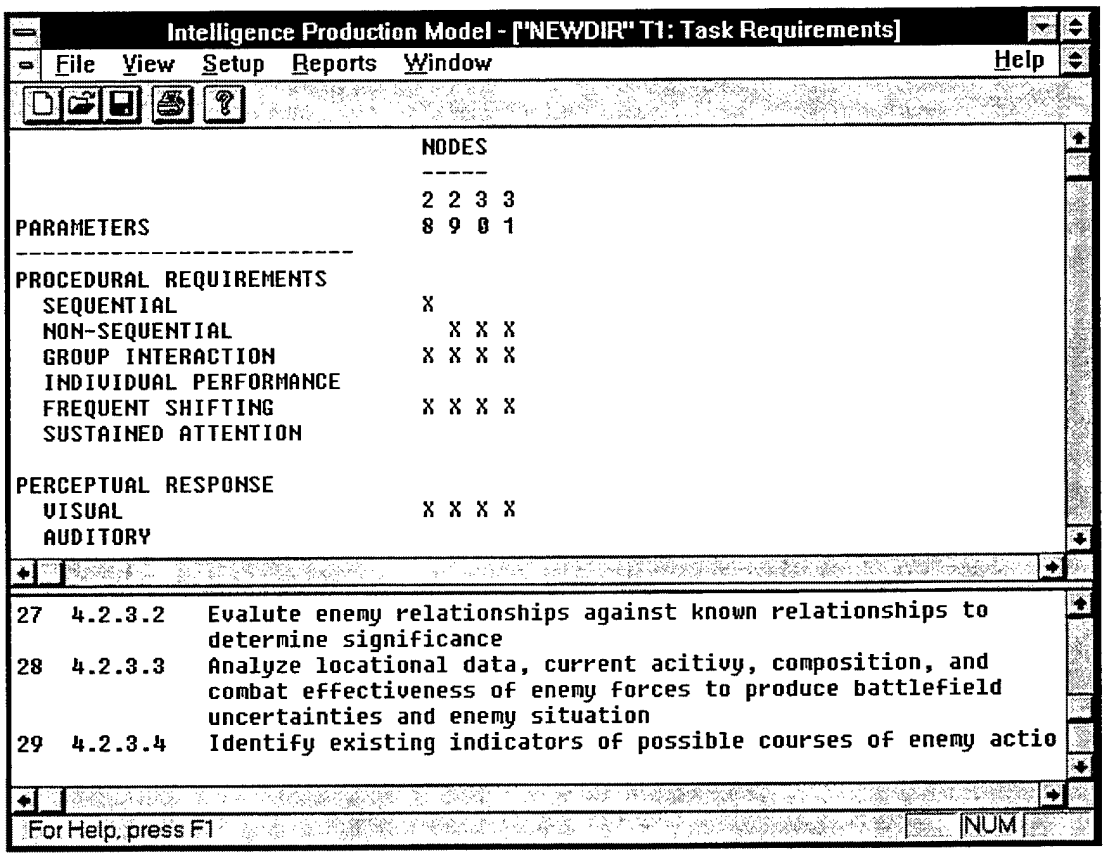
The task being modeled will investigate the effect of having no formal control and a laissez-faire management style.

- Click on the radio button (•) next to *none* under **Formal Controls** to select this performance variable, and on the radio button (•) next to *laissez-faire* under **Management Style**.
- Click on the "back to higher level" button, followed by the task requirements button. The resulting display shows all settings for these four tasks. A shaded box (☐) indicates at least one of these levels is set for at least one of the current hierarchy's tasks. For example, the four tasks under production tasks each have at least one of *analyze, integrate*, or *evaluate* set under the **Cognitive** set. When multiple radio buttons are shown as selected, the meaning is the same. For example, produce situation map is set for nonsequential; one or more of the other four tasks is set for sequential.
- To select auditory under perception for all production tasks, click on the proper box. Now all four tasks are set the same. This quick set option may be used at any level in the hierarchy.

> It is okay to "click" around and become more familiar with these variables. Settings are saved only when the **next>>** action is taken.

Modifying MI Performance Tasks (6)

Click on the display button to view this screen. The top half of this screen shows a part of the performance task and parameter categories matrix according to the selections the user has made. The bottom half of the screen shows task name, number, and node designation. Both windows may be re-sized, and both are scrollable.



- Click on the "X" in the upper right-hand corner (Windows™ 95) or on close under the smaller bar in the upper left-hand corner (Windows™ 3.x) to close this window. DO NOT close the application; this is under the larger bar in the upper left-hand corner if the model is being run under Windows™ 3.x.

This test case may be saved and executed as described in Section 2. The user may also exit without saving.

SECTION 5: FILE MANAGEMENT UTILITIES

Introduction

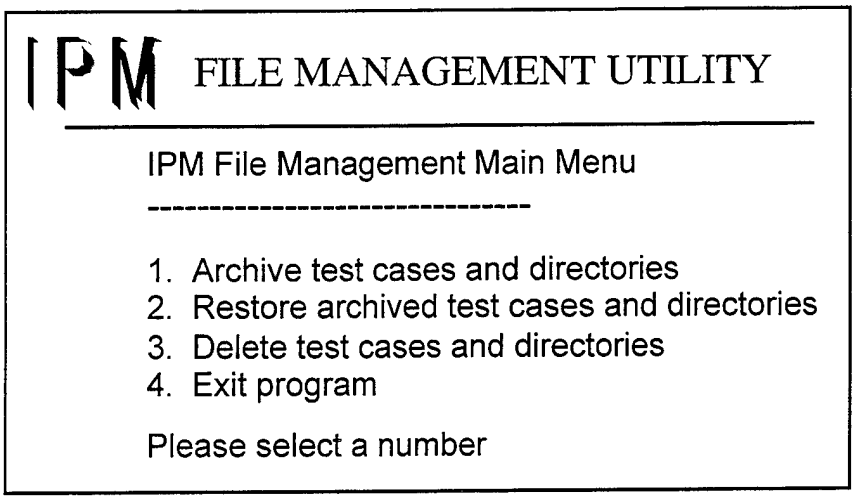
Files containing test case descriptions and output results require a significant amount of space on the hard drive. In order to manage test case files and allow the user to share test cases between computers, the file management utility gives the user the following abilities:

a. Archive Test Cases and Directories. Copies test case files and their output files from the hard drive to a floppy disk (either **A** or **B**), in a single file with the extension ".IPA." These test cases should then be deleted from the hard drive.

b. Restore Archived Test Cases and Directories. Copies test case setup files from a floppy drive to the proper directory on the hard drive. Test case results from these test runs may also be restored. In order to restore test cases to their original directory name on the hard drive, that sub-directory should *not* already exist.

c. Delete Test Cases and Directories. Removes test case files from the hard drive, including the setup files if desired.

Starting the File Management Utility



- From program manager, double-click the **File Management** icon in the **IPM for Windows** program group. (In Windows™ 95, double-click on the file manager icon on the desktop.)
- Type the number (**1**, **2**, **3**, or **4**) of the desired selection.
- Follow the instructions given for each operation. These operations are described in detail on the following pages.
- When finished, type the number **4**.
- To escape to the main menu at any point, leave an entry blank and press **Enter.**

Archiving Test Cases

To copy or archive test cases from the hard drive to a floppy disk, choose Option **1** from the main menu.

```
TESTCASES FOUND IN THE "granada2" DIRECTORY

Test                                Func  Error Sensitivity
Case  Desription                    Area  Occurrence Impact  Ran  Date
-------------------------------------------------------------------
T1    TED1                          1     Low        Major   Y    06/20/96
T3    Eff Med                       1     Low        Medium  Y    06/20/96
T4    TED1                          1     Low        Major   Y    06/20/96
T5    Eff Min                       1     Low        Minor   Y    06/20/96
T6    ErrMed EffMaj                 1     Med        Major   Y    06/20/96
T7    ErrHi EffMaj                  1     High       Major   Y    06/20/96
T8    ErrHi EffMed                  1     High       Major   Y    06/20/96
T9    ErrHi EffMin                  1     High       Minor   Y    06/20/96

Select a testcase to archive, or "All" to archive them all: all

Enter floppy drive letter to archive to (A/B): A


Enter directory name to archive the testcase(s) under: gren1
```

> An archive may require multiple disks. The user will be prompted to insert additional *formatted* disks as needed.

- Type the name of the directory that contains the test cases the user wishes to archive and press **Enter**.
- To archive a single test case, type the number of the test case (e.g., "1," "2," "10") and press **Enter**. To archive all the test cases, type **All** and press **Enter**.
- Type the letter (either **A** or **B**) of the floppy drive where the archive will be copied, then type a file name (as many as eight characters) where the test cases will be archived and press **Enter**. The directory name entered above will be saved with this file.
- When processing is complete, press any key to return to the main menu.

Restoring Test Cases

To restore test cases from a floppy disk, choose Option **2** from the main menu.

```
TEST NAMES IN THE IPM DATA AREA
-------------------------------

SAMPLES          TV_TEST          TESTJM3          JUNK             GUESS
IO2              TESTMOPP         ANGE             TESTSUMM         TESTJR3
JAMIESON         GRANADA2         GRENADA          TESTPERF         JR2_GURU
TESTJR2          TESTJM1          TESTJM2

DEFAULT DIRECTORY NAME: "granada2"
The default directory specified in the archive file already
has testcases in it.  To avoid the possibility of overwriting
some of those testcases, you MUST specify a new or empty
directory in which to restore the archived testcases.

Directory name must not already appear in the list above.
Please enter directory name to restore files to: granada3
```

If the archive spans multiple disks, insert the *last* disk of the archive set *first*. You will be prompted to insert the other disks as needed.

Archives cannot be restored to a directory that already exists.

- Insert the floppy disk where the test cases have been stored into the floppy drive. Type the letter (either **A** or **B**) of the floppy drive where the archive is stored.
- Type the file name where test cases are stored from the list displayed on the screen, and press **Enter**.
- If the directory where test cases were originally stored does not currently exist on the hard drive, type **Y** in response to the prompt. If this directory already exists on the hard drive, type a new directory name (as many as eight characters) and press **Enter**.
- To restore a single test case, type the number of the test case (e.g., "1," "2," "10") and press **Enter**. To restore all the test cases, type **All** and press **Enter**.
- Press **Y** to restore setup files *and* output results. Press **N** to restore only setup files.
- When processing is complete, press any key to return to the main menu.

Deleting Test Cases

To delete test cases from the hard drive, choose Option **3** from the main menu.

```
TESTCASES FOUND IN THE "granada2" DIRECTORY

Test                                Func  Error Sensitivity
Case  Desription                    Area  Occurrence Impact   Ran  Date
-------------------------------------------------------------------------
T1    TED1                          1     Low        Major    Y    06/20/96
T3    Eff Med                       1     Low        Medium   Y    06/20/96
T4    TED1                          1     Low        Major    Y    06/20/96
T5    Eff Min                       1     Low        Minor    Y    06/20/96
T6    ErrMed EffMaj                 1     Med        Major    Y    06/20/96
T7    ErrHi EffMaj                  1     High       Major    Y    06/20/96
T8    ErrHi EffMed                  1     High       Major    Y    06/20/96
T9    ErrHi EffMin                  1     High       Minor    Y    06/20/96

Select a testcase to archive, or "All" to archive them all: all

Enter floppy drive letter to archive to <A/B>: A

Enter directory name to archive the testcase(s) under: gren1
```

- Type the name of the directory that contains the test cases to be deleted and press **Enter**.
- To delete a single test case, type the number of the test case (e.g., "1," "2," "10") and press **Enter**. To delete all the test cases, type **All** and press **Enter.**
- Press **Y** to delete *just* the output results. Press **N** to delete the entire test case. If there are no output results to delete, press **Y** to delete the entire test case. Press **N** to abort and not delete anything.
- When processing is complete, press any key to return to the main menu.

SECTION 6: MODEL DESIGN WORKSHEETS

Introduction

This section has been provided as a test case design aid for the user. Use of these worksheets is in no way required but may help the new user become familiar with the model more quickly.

Each of the following worksheets corresponds to an input screen the user will see when setting up a test case on the IPM. Included is a test case planning interview sheet, which should help to focus model setup for the test case in question. Each worksheet contains the same variables the user will be setting and the options for each. It will help the user to become familiar

with the definitions of these variables (contained in Appendix A) as well as instructions in the IPM user manual that precede this section.

The IPM Functional Performance Model depicts the tasks being modeled in terms of a network model. The flow between nodes represents the information product being passed between nodes. Descriptions of the tasks represented by these nodes are also included in the table that follows the model figure.

All model setup variables for a test case may be obtained from the report of the same name available in the report section of the IPM.

Interview

1. Describe the planned application or case study in terms of the following (pick one from each column):

ISSUE	APPROACH	DOMAIN
Systems	Identify Problems	Materiel
Operations	Compare Alternatives	Doctrine
Tactics	Adjust System	Training
Procedures		Leader Development
Personnel		Organization
		Soldiers

2. QUESTION: State your objective as a question, in terms of the issue and domain.

3. APPROACH: Discuss an analysis approach that will address the nature of the objective.

4. SCOPE: Pick one or more of the following alternatives that best describe the nature of your objective.

___Information Products: Collection Impact

___Information Products: Human Impact

___Collector Performance

___Human Performance

___Commander's Information Requirements Satisfaction

5. SCENARIO ENVIRONMENT: Preview the variables in Worksheet 1. These are used to completely describe your overall scenario environment.

a. Record any assumptions that may influence the selection of a level for each

b. Record any specific rationale to support the selection of particular levels.

6. ASSETS: Review the Assets Worksheet 2. To describe your asset suite, select from existing assets and/or create your own. Rate the contribution of this asset suite to each of the attributes. Record any supporting rationale below. (NOTE: The IPM will provide a set of default assets according to the echelon selected for assets in collection environment. These may be modified at your discretion.)

7. PERSONAL and PERFORMANCE VARIABLES: On Worksheet 3, shaded boxes indicate the default setting for each variable for each function. Review these settings, if appropriate to the selected scope, and adjust as necessary. (NOTE: Settings in the environment variables may impact the defaults.) Record supporting rationale below.

8. TASK REQUIREMENTS and JOB AIDS: On Worksheet 4, shaded boxes indicate the default setting for each variable for each function. Review these settings, if appropriate to the selected scope, and adjust as necessary. Record supporting rationale below.

9. Describe your approach to analyzing the model results (information quality, task performance, analysis performance, and collection suite).

Scenario Environment (Worksheet 1)

Testcase ID: Directory:

GENERAL SCENARIO		SPECIFIC SCENARIO					
OPERATIONAL ENVIRONMENT		*SOLDIER ENVIRONMENT*		*TASK ENVIRONMENT*		*COLLECTION ENVIRONMENT*	
Level of War		**Moral**		**Intel Systems Maturity**		**Availability of Historical Data**	
Tactical		High		Established Systems		All	
Strategic		Average		Established Systems		Most	
Operational		Low		Developmental Systems		Some	
Battlefield Operations		**Stress**		Developmental Systems		None	
Other than War		High		**Mission Related Training**		**Availability of Friendly Data**	
Non-linear Battle		Moderate		Untrained		All	
Linear Battle		Minimal/Normal		Partially trained		Some	
Force Composition		**MOPP Level**		Trained		**Assets**	
Joint Service/Multi-national		Levels 0 and 1		**Manpower**		Theater	
US Single Service		Level 2		More than Enough-Interfering		Army	
MISSION ENVIRONMENT		Levels 3 and 4		More than Enough		Corps	
Echelon		*BATTLEFIELD ENVIRONMENT*		Enough		Division	
Theater		**Battlefield Conditions**		Less than Enough		Brigade	
Army		Arctic/Winter		Less than Enough-Can't		Battalion	
Corps		Desert/Arid		**Reference Materials Available**			
Division		Temperate		All/Most			
Brigade		Rain Forest/Jungle		Some			
Battalion		Mountainous		Little/None			
Support Relationships		Urban					
Habitual		Tents					
Some Past Relationships		No Shelter					
New Non-habitual		**Physical Environment**					
Type of Mission		Fixed Facilities					
Move		**Tracked Vehicle**					
Defend		Tents					
Attack		No Shelter					
Conduct							

Assets and Asset Ratings (Worksheet 2)

Test. ID: Test Directory:

Asset	( )	Shape	Size	Quantity	Presence	Absence	Dynamics	Parametrics	Human Dimension
ACS		N	N	L	L	N	Y	Y	N
ELINT		N	N	L	L	N	Y	Y	N
FLIR		Y	L	L	Y	L	L	N	N
GBCS		N	N	L	L	N	Y	Y	N
GSR		Y	L	L	Y	L	Y	N	N
HUMINT		N	N	Y	N	N	L	L	Y
IMINT		Y	Y	Y	Y	L	L	N	N
Interrogator		N	N	Y	L	L	Y	L	Y
JSTARS		Y	N	Y	Y	L	Y	N	N
LRS		Y	L	L	Y	L	Y	N	L
Photo		Y	Y	L	Y	L	L	N	N
SIGINT		N	N	L	L	N	Y	Y	N
Unit Action		Y	L	L	Y	L	Y	N	L
Video		Y	Y	Y	Y	L	Y	N	N
OTHER:									
RATING:									

ACS = airborne common sensor; ELINT = electronic intelligence; FLIR = forward looking infrared; GBCS = ground-based common sensor; GSR = ground surveillance radar ; HUMINT = human intelligence; IMINT = image intelligence; JSTARS = Joint-Surveillance Target Attack Radar System; LRS = long range surveillance; SIGINT = signals intelligence; Y = Yes; L = Limited; N = No
RATE: E = Excellent G = Good F = Fair P = Poor

Personal and Performance Variables (Worksheet 3)

Test Case: Directory: Light shading indicates the default setting for the variables at each node.

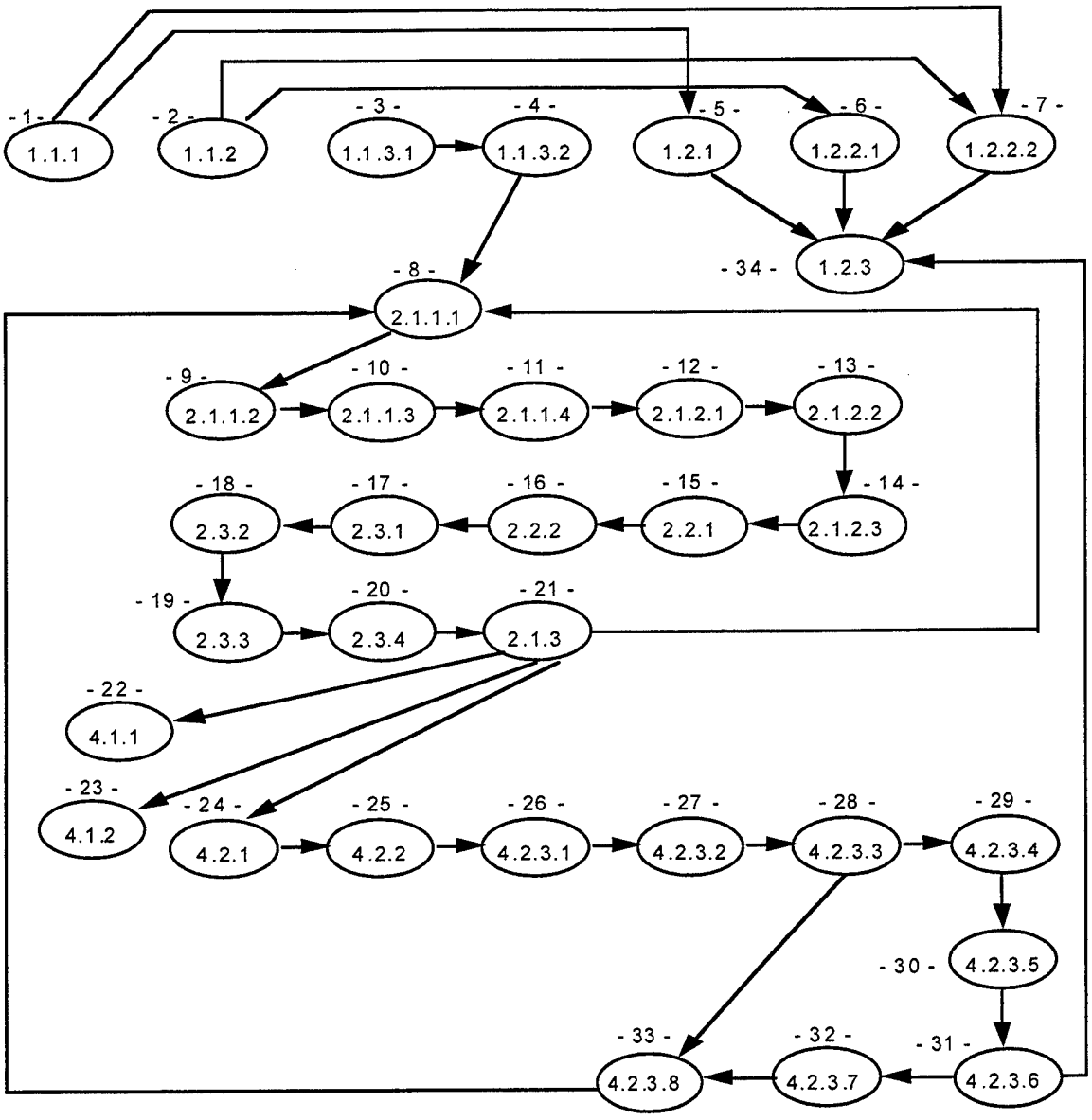
Work Environment Variables	1.1.1	1.1.2	1.1.3.1	1.1.3.2	1.2.1	1.2.2.1	1.2.2.2	1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.1.2.1	2.1.2.2	2.1.2.3	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.3.4	4.1.1	4.1.2	4.2.1	4.2.2	4.2.3.1	4.2.3.2	4.2.3.3	4.2.3.4	4.2.3.5	4.2.3.6	4.2.3.7	4.2.3.8
FORMAL CONTROLS																																	
S1A Formal																																	
S1B Available																																	
S1C Verbal																																	
S1D None																																	
TEMPORAL CONTRAINTS																																	
S2A Too Little																																	
S2B Sufficient																																	
S2C Too Much																																	
PERFORMANCE CRITERIA																																	
S3A Specific																																	
S3B Ranges																																	
S3C Vague																																	
PHYSICAL CONSTRAINTS																																	
S4A Severe																																	
S4B Moderate																																	
S4C Minimal																																	
AMBEINT CONDITIONS																																	
S5A Severe																																	
S5B Moderately Severe																																	
S5C Mild																																	
MANAGEMENT STYLE																																	
S6A Rigid																																	
S6B Standard																																	
S6C Laissez-Faire																																	
TRAINING																																	
S7A Entry Level																																	
S7B Transitional																																	
S7C Journeyman																																	
EXPERIENCE																																	
S8A None																																	
S8B Low Transfer																																	
S8C High Transfer																																	
CAPACITY TO RESPOND																																	
S9A No Affect																																	
S9B Minimally Decreased																																	
S9C Moderately Decreased																																	

Task Requirements and Job Aid Variables (Worksheet 4)

Test Case: Directory: ☐ Light shading indicates the default setting for the variables at each node

	1.1.1	1.1.2	1.1.3.1	1.1.3.2	1.2.1	1.2.2.1	1.2.2.2	1.2.3	2.1.1.1	2.1.1.2	2.1.1.3	2.1.1.4	2.1.2.1	2.1.2.2	2.1.2.3	2.1.3	2.2.1	2.2.2	2.3.1	2.3.2	2.3.3	2.3.4	4.1.1	4.1.2	4.2.1	4.2.2	4.2.3.1	4.2.3.2	4.2.3.3	4.2.3.4	4.2.3.5	4.2.3.6	4.2.3.7	4.2.3.8
JOB AIDS																																	
M1A Procedural Guides																																	
M1B References																																	
M1C Templates																																	
M1D Computation Device																																	
M1E Software Application																																	
STIMULUS CHARACTERISTICS																																	
M3A Hard Copy																																	
M3B Soft Copy																																	
M3C Rate of Data Presentation																																	
M3D Symbols																																	
M3E Code																																	
M3F Waveform																																	
M3G Graphics																																	
M3H Foreign Language																																	
M3I Noise Level																																	
PROCEDURAL REQUIREMENTS																																	
M2A Sequential																																	
M2B Non-Sequential																																	
M2C Group Interaction																																	
M2D Individual Performance																																	
M2E Frequent Task Shifting																																	
M2F Sustained Attention																																	
RESPONSE REQUIREMENTS																																	
PERCEPTION																																	
M4A Visual																																	
M4B Auditory																																	
COGNITIVE																																	
M5A Recall																																	
M5B Analyze																																	
M5C Integrate																																	
M5D Evaluate																																	
COMMUNICATIVE																																	
M6A Verbal																																	
M6B Written																																	
MOTOR																																	
M7A Gross																																	
M7B Fine																																	

IPM Functional Performance Model



IPM Functional Performance Node Descriptions

Test Case:_____ Directory:_____

PERFORMANCE NODE IDENTIFICATION

Node ID	Function ID	Node Description
1	1.1.1	Determine weather information requirements.
2	1.1.2	Determine terrain information requirements.
3	1.1.3.1	Determine information requirements for battlefield planning.
4	1.1.3.2	Determine information gaps.
5	1.2.1	Determine weather impacts on friendly and enemy COAs.
6	1.2.2.1	Determine terrain impacts on friendly and enemy COAs.
7	1.2.2.2	Determine weather impacts on terrain.
8	2.1.1.1	Perform requirements administration to produce intelligence requirements.
9	2.1.1.2	Produce validated requirements.
10	2.1.1.3	Consolidate requirements to combine like requirements.
11	2.1.1.4	Prioritize requirements to produce prioritized list.
12	2.1.2.1	Identify information required for each collection task.
13	2.1.2.2	Identify indicators that will satisfy information requirements.
14	2.1.2.3	Determine enemy nodes, activities, and events that will provide indicators for specific information requests.
15	2.2.1	Determine resource capability and availability.
16	2.2.2	Prepare specific orders and requests (SORs).
17	2.3.1	Perform administration to produce logged SOR.
18	2.3.2	Determine current asset capability and availability to produce specific sensor selection.
19	2.3.3	Develop asset employment plan.
20	2.3.4	Oversee collection mission to produce SOR response.
21	2.1.3	Evaluate response to produce separated critical information needs.
22	4.1.1	Identify and disseminate force protection information.
23	4.1.2	Determine if perishable data represent a valid target.
24	4.2.1	Produce new/updated data records for situation and target development.
25	4.2.2	Identify potential targets.
26	4.2.3.1	Make comparisons between the new information items to determine their relationships
27	4.2.3.2	Evaluate enemy relationships against known relationships to determine significance.
28	4.2.3.3	Analyze locational data, current activity, composition, and combat effectiveness of enemy forces to produce battlefield uncertainties and enemy situation.
29	4.2.3.4	Identify existing indicators of possible enemy COAs.
30	4.2.3.5	Identify possible enemy COAs.
31	4.2.3.6	Wargame enemy COA to determine most likely.
32	4.2.3.7	Determine uncertainties surrounding the COA
33	4.2.3.8	Formulate and disseminate requests for information to obtain clarifying or missing information.
34	1.2.3	Determine most probable enemy COA.

APPENDIX A

DICTIONARY OF TERMS

Information Environment Variable

A measure defined in terms of completeness, of the degree to which a sample of information from the battlefield contains the information elements necessary to satisfy the intelligence producer (internal) and the intelligence consumer (external). This independent variable is used to represent systemic errors in the intelligence production system, regardless of processing performance, when inadequate information is used.

1 and 2. Contain sufficient content to permit intelligence production to substantially meet the most important information requirement.

3. Contains sufficient content to permit intelligence production to meet some of the information requirements.

4 and 5. Contain sufficient content to permit intelligence production to begin to address some of the information requirements.

NOTE: This variable is not set by the user. It is one of the output data points in the detailed reports, which may be responsible for degradation in the quality of information due to data sources. It is reported in the detailed error report as "IVME."

Sensitivity Algorithms

Sensitivity algorithms provide the capability to affect modeling parameters that specify the degree with which *production performance* and *information quality* respond to influences or control variables in the system being modeled. The error occurrence sensitivity algorithm applies to production performance, and the effects of errors on intelligence products apply to information quality. The levels of sensitivity are low, medium, and high for the first, and major, medium, and minor for the latter.

Error Occurrence - One component of the Intelligence Production Model (IPM) models production performance in terms of functions or processes performed by analysts, control variables (work environment and task) which influence the performance of these functions, and errors with a potential to occur because of the influence of these control variables on human performance. Error potential plus sensitivity to the potential for an error to occur determines whether an error actually occurs, that is, "triggered."

Each control variable set for a particular function contributes uniquely to the potential for one or more errors to occur in that function's process. It may contribute to one of five possible degrees of potential: 0, 25, 50, 75, and 100. For each degree of potential, the sum of contributions is accumulated for each function and compared to a pre-set threshold for that function. The sensitivity algorithm looks at which and how many of the degrees for error potential have exceeded the threshold. Depending on the level of sensitivity set for the model,

errors may or may not be triggered. For example, "low" sensitivity means more than one degree of potential must be exceeded.

When modeling a particular scenario, this algorithm is used to describe some aspect of the unit's performance expectation. For example, when analysts are mostly experienced and well trained, they are less likely to actually commit an error even when the potential is high.

Effects of Errors on Intelligence Products - Another component of the IPM model information quality in terms of its measure of completeness and specificity (see Information Quality Measures and Dimensions). This is done in two phases. First, information quality is determined according to what was contributed by its data source, independent of the impact of performance errors. Next, the model logic recognizes that the quality of data and information used by analysts to produce intelligence influences the potential for error (see Information Environment Variable Definitions), and further recognizes that errors in performance may further impact the quality of information and intelligence.

The effect of errors on information, that is, the intelligence products, is determined according to the sensitivity of these data to errors. Errors in groups of functions, such as all functions related to collection management processes, are accumulated, and the sensitivity algorithm applies the impact to the quality measure for the associated information. The degree of the impact is determined by the setting of this algorithm. Errors that occurred in the collection management functions affect information quality in the database nodes, for example.

When modeling a particular scenario, this algorithm is used to describe an expectation that information and intelligence products may or may not respond to performance errors. For example, when information in the historical databases is known to be sketchy and of low quality, errors in the production activities that transform these data into richer information would have a greater impact on intelligence products than if these data were very good.

NOTE: This variable is not currently set by the user. These variables are automatically set at low and minor for "error occurrence" and "effects of errors on intelligence products," respectively. There will be variations of these settings reflected on some older test cases, and the model developers are able to set up test cases using other variations in these settings.

Scenario Environment Variables

These provide the means for specifying the operational environment in which the simulation will run. Scenario environment parameters were developed by decomposing aspects of the operational environment thought to have an effect on the modeled military intelligence (MI) behaviors. Scenario environment settings are a method for inserting a general scenario into the model process. The model has 17 different parameters within these categories that can be used. These parameters also determine default settings for the MI task personal and performance variables using a precedence system. There are six relevant aspects of the operational scenario:

a. Operational Environment

b. Mission Environment

c. Soldier Environment

d. Battlefield Environment

e. Task Environment

f. Collection Environment

Operational and Mission Environment – These parameters describe salient operational and mission-related aspects of the operational environment.

Level of War	This operational parameter defines the entire spectrum of military operations for both warfare and operations other than war. As a rule, the higher the level of war, the higher the echelon; this does not preclude a user from setting an echelon that differs from the level of war.
Tactical	Execution of operations, to win battles and engagements, which are near term and have relatively immediate consequences.
Strategic	National, alliance, or coalition objectives.
Operational	Planning and executing campaigns that further strategic objectives.
Battlefield Operations	This operational parameter describes the predominant characteristic of the battlefield based on the operational continuum.
Other Than War	For any operation other than conflict, including humanitarian missions, counter-narcotics, peacekeeping operations, and so forth
Nonlinear Battle	For conflict (LIC, MIC, HIC) that follows the nonlinear pattern of a lack of well-defined close and rear battlefields, high mobility, high tempo, and a deep attack.
Linear Battle	For conflict (LIC, MIC, HIC) that follows the more traditional pattern of a well-defined battlefield in terms of close, deep, and rear and maintains a clear-cut delineation between offensive and defensive operations.
Force Composition	This operational parameter allows the modeler to choose one of two force compositions.

Joint or Combined	Joint operations conducted by two or more of the Armed Forces of the United States. Combined operations are conducted by forces of two or more allied nations acting together for the accomplishment of a single mission.
U.S. Single Service	Operations are conducted by one branch of the United States Armed Forces.
Echelon • Theater • Corps • Brigade • Army • Division • Battalion	This mission parameter defines the organization level of focus.
Support Relationships	This mission parameter characterizes the support relationship between the MI's organization that performs the intelligence production process and its controlling headquarters. Options are based on the familiarity of operating within the headquarters.
Habitual	Relationship that exists most of the time when the intelligence staffs habitually support the controlling headquarters organization. Standing operating procedures (SOPs) are understood and the intelligence staff habitually uses and understands these SOPs, whether written or unwritten, in satisfying command intelligence requirements.
Some Past Relationship	Although the relationship is not continuously habitual, the intelligence staff has worked with the controlling headquarters sufficiently to understand most SOPs, and the working environments are familiar.
New Non-habitual	This is the first time the intelligence staff has worked with the controlling headquarters. SOPs are unfamiliar and procedures must be learned.
Type of Mission	This mission parameter describes the predominant character of the mission.
Move	Any operation in which movement dominates; both movement to contact and retrograde are examples.
Defend	Any operation in which defense dominates.
Attack	Any operation in which offense dominates.
Conduct	Any operation in operations other than war (OOTW) ("execute" in an alternative).

Soldier Environment - These parameters describe both physical mission-oriented protective posture (MOPP) level and non-physical (stress and morale) transient operator characteristics.

MOPP Level	This parameter allows the modeler to set a MOPP level. Options are categorized according to standard military MOPP levels.
MOPP Levels 0 and 1	Mask, gloves, and boots are carried; clothing is worn or available.
MOPP Level 2	Clothing and boots are worn; mask and gloves are carried.
MOPP Levels 3 and 4	Clothing, boots, and mask are worn; gloves are carried or worn.
Stress	This parameter allows the characterization of the stress level of the unit or section. Selections are based on the modeler's perception of stress levels.
High	Describes the condition of excessive stress that would be expected to have a profound and immediate effect on performance.
Moderate	Describes the condition of slightly more stress than is customary. Prolonged exposure at this level of stress may have an impact on performance, but the impact may not be profound or immediate.
Minimal/Normal	Describe either the condition of lack of stress or of routine stress.
Morale	This parameter allows the characterization of the morale of the section or unit. It is not tied to the level of stress, recognizing that some levels of stress have beneficial impacts.
High	Describes the condition wherein the majority experiences a high level of esprit, unit pride, cohesion, and camaraderie.
Average	Describes the condition wherein the majority routinely experiences individual pride but will exhibit teamwork when required.
Low	Describes the condition wherein the majority feels isolated as individuals; there is no esprit and little to no teamwork.

Battlefield Environment - These parameters describe tangible aspects of the battlefield.

Battlefield Conditions	This parameter describes the physical environment in which the intelligence production process will operate. These options come from those described in FM 100-5, Operations. The modeler chooses the one option that generally captures the operating environment. If more than one option fits the description, then the modeler needs to select the option that the organization has the most potential to operate in or make more than one run of the simulation.
Arctic/Winter	Temperatures remain below zero for extended periods of time. Bodies of water and ground are usually frozen.
Desert/Arid	Weather conditions are excessively dry and can change rapidly. Temperatures range from 300° to 1300° Fahrenheit in a 24-hour period.
Temperate	Weather conditions are moderate.
Rain Forest/Jungle	There is thick vegetation, constant high temperature, heavy rainfall, and humidity.
Mountainous	A land mass that makes maneuvering difficult. The weather can vary.
Urban	The battlefield is in a city setting.
Physical Environment	This parameter describes the condition in which the soldier works.
Fixed Facilities	These are buildings or semi-permanent structures that afford protection from the elements and from enemy fires—considered to be relatively safe.
Tracked Vehicles	These include MIL vans as well as command and staff type tracked vehicles. These provide a fairly safe and stable working environment with fairly adequate work space and some temperature control.
Tents	Although tents provide some protection from the elements, the protection is minimal.
No Shelter	No protection from the elements other than the clothing the participant wears.

Task Environment - These parameters describe the resources available to the unit for performing their tasks.

Reference Materials Available	This parameter describes the sources of information, other than the sensor data and intelligence, available to the scenario. It includes those information sources that aid the soldier in performing his or her job, such as field manuals, SOPs, message templates, and so forth.
All/Most	Better than 85% of required references are available and used to perform a function.
Some	Between 50% and 85% of required references are available.
Little/None	Fewer than 50% of the required references are available.
Intelligence Systems Maturity	This parameter describes the maturity of the intelligence processing systems available to the scenario. The categories listed below are designed to capture the emerging MI "revolution" in processing capabilities. Examples of established versus developmental systems include TRAILBLAZER and ground-based common sensor. The categories of documented and undocumented are meant to convey the extent of documentation (operator's manuals, maintenance manuals, and so forth) provided with a system or system modification. Examples of documented versus undocumented systems might include Microfix and HAWKEYE-Warrior, respectively.
Established Systems Documented	This variable indicates that the system being used has completed development and the documentation for the system is current.
Established Systems Undocumented	This variable indicates that the system being used has completed development but the documentation for the system is not current or complete.
Developmental Systems Documented	This variable specifies that the system being used is still in the development phase and the documentation is as current as can be expected.
Developmental Systems Undocumented	This variable specifies that the system being used is still in the development phase and the documentation is not current.
Manpower	This parameter refers to the number of soldiers available to perform the required tasks.

More Than Enough, Interfering	Describes the situation that occurs when there are so many soldiers assigned to a task that efficiency degrades.
More Than Enough	Describes the situation of having excess soldiers with no detrimental effect.
Enough	Describes the situation of having sufficient numbers of soldiers.
Less Than Enough	Describes the situation of having fewer soldiers than is optimal but without detrimental effects.
Less Than Enough, Interfering	Describes the situation of having insufficient soldiers with a detrimental effect on the ability of the section to accomplish its task.
Mission-Related Training	This parameter is a subjective evaluation of the training status of the organization performing the functions in the intelligence production process. The evaluation is generalized and stated in terms of training status indicators.
Untrained	The organization performing the functions in the intelligence production process has worked and trained together to a proficiency of less than 50% of the required collective tasks.
Partially Trained	The organization has worked and trained together to a proficiency of less than 80% but more than 50% of the required collective tasks.
Trained	The organization has worked and trained together to proficiency of greater than 80% of the required collective tasks.

Collection Environment - These parameters describe the information providing resources available to the unit.

Availability of Friendly Data	This parameter describes the quantity and quality of friendly data available for the organization's area of operations.
Some	Some of the friendly data are available.
All	All inclusive.
Availability of Background Data	This parameter describes the quantity and quality of background data available for the organization's area of operations.
All	All inclusive.

Most	Most of the background data are available.
Some	Some of the background data are available.
None	None of the background data are available.

Assets — This parameter enables the user to specify from which echelon the basic set of collection resources will be drawn, recognizing that assets available in a mission are not always (or even usually) the same as the operational echelon.

- Theater
- Army
- Corps
- Division
- Brigade
- Battalion

Performance Nodes

The task and functions that represent the intelligence production process are modeled in the IPM as a nodal structure of inputs, processes, and outputs. There are 34 nodes, identified by a functional decomposition of "typical" intelligence production functions. This nodal structure is depicted in the User's Manual, Section 6. Each of the 34 functions is defined next. The integer is an identifier used in the input screens of the model. The engineering notation describes the major function identifier and subsequent decomposition of sub-functions, in which 1.0s are battlefield area analysis functions, 2.0s are collection planning functions, 3.0s are collection operations functions[2], and 4.0's are analysis and production functions.

[2]Collection operations functions (3.0) are not modeled as analyst tasks; rather, the results of collection operations are modeled by the assets and sets ratings modules in the IPM.

Node ID	Function ID	Node Description
1	1.1.1	Determine weather information requirements
2	1.1.2	Determine terrain information requirements
3	1.1.3.1	Determine information requirements for battlefield planning
4	1.1.3.2	Determine information gaps
5	1.2.1	Determine weather impacts on FR and EN COAs
6	1.2.2.1	Determine terrain impacts on FR and EN COAs
7	1.2.2.2	Determine weather impacts on terrain
8	2.1.1.1	Perform requirements administration to produce intelligence requirements
9	2.1.1.2	Produce validated requirements
10	2.1.1.3	Consolidate requirements to combine like requirements
11	2.1.1.4	Prioritize requirements to produce a prioritized list
12	2.1.2.1	Identify information required for each collection task
13	2.1.2.2	Identify indicators that will satisfy information requirements
14	2.1.2.3	Determine enemy nodes, activities, and events that will provide indicators for SIRs
15	2.2.1	Determine resource capability and availability
16	2.2.2	Prepare specific orders and requests (SORs)
17	2.3.1	Perform administration to produce logged SOR
18	2.3.2	Determine current asset capability and availability to produce specific sensor selection
19	2.3.3	Develop asset employment plan
20	2.3.4	Oversee collection mission to produce SOR response
21	2.1.3	Evaluate response to produce separated critical information needs
22	4.1.1	Identify and disseminate force protection information
23	4.1.2	Determine if perishable data represent a valid target
24	4.2.1	Produce new or updated data records for situation and target development
25	4.2.2	Identify potential targets
26	4.2.3.1	Make comparisons between the new information items to determine their relationships
27	4.2.3.2	Evaluate enemy relationships against known relationships to determine significance
28	4.2.3.3	Analyze locational data, current activity, composition, and combat effectiveness of enemy forces to produce battlefield uncertainties and enemy situation
29	4.2.3.4	Identify existing indicators of possible enemy COA
30	4.2.3.5	Identify possible enemy COA
31	4.2.3.6	Wargame enemy COA to determine most likely
32	4.2.3.7	Determine uncertainties surrounding the COA
33	4.2.3.8	Formulate and disseminate requests for information to obtain clarifying or missing information
34	1.2.3	Determine most probable enemy COA

Personal and Performance Variables

Operator and operational variables that represent changes in the situation that are being modeled. Operator variables represent aspects of human performance brought to the situation, while operational variables represent aspects of the situation outside the operator and define the conditions under which operators must perform.

Personal Variables

Knowledge Variables	Knowledge is derived through experience and training. It can be estimated by a composite test score based on individual measures, the expected level of training given military occupational status and grade, and experience based on assignments. Since it is difficult to derive possible errors from test scores, training and experience are further defined.
Level of Training:	
Entry Level	Represents the formal training in which basic procedures and the language of the subject domains are expected to be mastered.
Transitional	Represents formal and informal on-the-job type training that augments entry-level training and places the training in an operational context.
Journeyman	Represents full performance level training, including training necessary to continue full performance.
Kinds of Experience:	At issue is the kind of experience brought to the situation that can be transferred or may result in a negative transfer.
None	Any experience would best be represented by basic training.
Low Transfer	Experience in situations different from the current one, based on level of war or theater.
High Transfer	Experience in situations the same or similar to the current one, based on level of war or theater.

Response Variables	These can be physical (e.g., example, body strength, sensory deficiencies, or motor skills ability), physiological (e.g., stress, fatigue, or illness), and psychological (e.g., motivation, intellectual skills, or mental state). At the level of resolution of the model, the major concern is how the capacity to respond may be affected. While there are numerous independent variables that can be identified at a high level of resolution, we have chosen to interpret these variables in terms of an intervening variable.
Capacity to Respond:	
No Effect	Whatever personal variables are present are not expected to affect performance.
Minimally Decreased	While the capacity to respond is decreased, it would not be expected to cause much difficulty in responding. An example might be boredom that results in a transitory lapse into day dreaming.
Moderately Decreased	The capacity to respond is significantly affected. Examples might be long periods without sleep, the effect of depressants, or the death of a close friend.

Performance Variables - Performance or operational variables are outside the operator and define the conditions under which the operator must perform. Within each class of operational variable are categories of the variable, which result in different errors. For example, if time to perform is constrained, we would expect different kinds of errors to be possible than when time to perform is unconstrained. In addition, operational variables are viewed as independently causing errors. That is, one category of operational variables does not trigger other categories of operational variables.

The operational variables are identified, based on a particular battlefield environment, the enemy and friendly mode of conducting warfare, and the sensor complement of the BLUEFORCE. As a result, the operational variables are described at a very low level of resolution and represent a composite of the situation rather than the specifics of a high-resolution taxonomy. There are three classes of operational variables: environmental, management, and performance.

Environmental Variables	The environmental variables describe the general conditions in which the tasks are performed. They include variables relating to the immediate environment (e.g., within the work area) as well as the surrounding environment (e.g., within the command post).
Physical Constraints:	Any variable that physically limits the human in performing the required tasks. Examples of these are MOPP gear, having to work in a constrained work area such as a van or high mobility multi-purpose wheeled vehicle (HMMWV).
High Level	When constraint makes movement of even gross motor behavior difficult.
Moderate	When constraint makes movement cramped but possible with minimum effort.
Minimal	When constraint does not require much effort.
Ambient Conditions:	Any variable that can impose sensory overload on the human. These include any stimulus condition involving heat, cold, noise, glare, and so forth, which are regarded outside the normal range of acceptance.
Severe	Even the appropriate protective equipment or procedures are only partially effective.
Moderate	Protective gear or procedures are effective, if used.
Mild	The sensory conditions are regarded as a minor annoyance.
Management Variables	Management variables include the supervisory, management, and policy controls that impact performance. Some of these variables are dynamic in that they involve the face-to-face and day-to-day operations. Examples of dynamic variables are priorities and suspenses, feedback, reinforcement, and direction and guidance. Other variables are fixed in that they involve written policy and standards that guide or direct behavior. Examples of fixed variables are standing operating procedures, delegations of authority, and doctrine. These variables can have the effect of creating standardization when none is needed and chaos or uncertainty when standardization is appropriate. The different levels of the management variables are not meant to have a good-bad connotation. They trigger different kinds of possible errors.
Management Style:	Management style describes how the day-to-day operations are conducted.

Rigid	Operations are "by the book," without deviation. Flexibility is not permitted even when appropriate. The most frequent management responses are direct orders and punishment for not obeying those orders. The goals tend to be determined by the rules rather than the situation. Everything is high priority.
Standardized	While operations are standardized, flexibility when necessary, is permitted and encouraged. The most frequent management responses are positive reinforcement for appropriate behaviors and guidance with the intent to train when behavior is inappropriate. The goals are defined by the situation. Priorities are determined, based on the goals and resources available. If the priorities are imposed by external sources, goals and resources are changed to meet the priorities.
Laissez-faire	Uses reinforcement, feedback, and punishment randomly and without respect to the appropriateness of the behavior. Goals are determined by each individual. When priorities exist, they are imposed by external sources and are normally ignored.
Formal Controls:	The degree of formalization in the structure of the management control system.
Formal	Policies and procedures are well documented and communicated to everyone. They are readily available for reference.
Available	While policies and procedures are well documented, the individual is responsible for discovering and implementing them.
Verbal	Policies and procedures are mostly verbal and subject to frequent unannounced change.
None	For all practical purposes, policies and procedures do not exist.
Performance Control Variables	Performance control variables are those independent variables that control how a task will be performed.
Temporal Constraint:	Normally, tasks are performed within some time frame as determined by suspenses, priorities, or operating procedures. In addition, the tasks take time to perform. The temporal constraint is the difference between the time it takes to perform a task and the time available for the completion of the task.
Too Little	Time to perform is less than the time required to complete the tasks. In this situation, for example, the suspense might be met by short cutting the required routine.

Sufficient	Time to perform is time enough to complete the tasks. In this situation, there is no time constraint, but there is also no slack time.
Too Much	Time to perform is more than adequate to the task completion. In this situation, there is enough slack time that several different tasks could be accomplished if necessary.
Performance Criteria:	Performance criteria determine how well the task must be done. Usually, performance criteria specify some accepted degree of tolerance. The criteria can be expressed quantitatively, qualitatively, or both.
Specific	Performance criteria are specific and deviations are unacceptable. For example, if a weapon system requires eight digit coordinates in order to hit a target, anything less would be useless.
Ranges	Performance criteria exist as ranges of acceptability.
Vague	Performance criteria are vague or nonexistent.

Task Requirements and Job Aid Variables

Independent variables describe the tasks in terms of their resource and support requirements and characteristics and may be used to represent changes in the operational environment to be modeled. These are optional and selectively set by the analyst during model setup. Trigger variable rules may affect these settings; for example, if there is no software for a task, then there also cannot be soft copy, graphics, or symbology.

Job Aids - Supports that contribute to making task performance easier or more efficient. They must be purposely used by the performer, not transparent. The lack of the job aid does not prevent the task from being accomplished. For example, if one must sense the enemy's use of poison gas, some kind of sensor is used; the sensor is not a job aid since it is required to accomplish the task.

Procedural Guides	Standing operating procedures, letters of instruction, specific guidance contained in operation orders/operation plans (OPORDs/OPLANs) or other documents that describe "how to" perform or implement a function or sub-function. This variable specifies that adequate procedural guides are present to perform a function or sub-function.
References	References, tables, charts, manuals, and maps used in the performance of functions or sub-functions. This variable specifies that adequate references are present.

Templates	Templates are job aids prepared before a function is performed, that coalesce an idea or doctrine into a chart or visual aid, making analysis and comparison to a norm easier. This variable indicates that templates adequate to the performance of the function or sub-function are present.
Computational Devices	Computational devices are devices such as a calculator that are necessary to perform a function or sub-function. They are normally used to perform mathematical calculations—not to process information. These variables indicate that adequate computational devices are present to perform the function or sub-function.
Specific Software Applications	Software application programs include the use of automation to record, correlate, and extract information or data in support of a function or sub-function. This variable indicates that adequate automated tools are available to perform the function or sub-function.

Stimulus Characteristics - Stimulus characteristics determine response requirements. This category examines characteristics of input into the function, which aid or detract from the analyst's ability to perform a function.

Hard Copy Visual	This variable specifies that paper, photograph, overlays, and so forth, are used in performing the function or sub-function.
Soft Copy Visual	This variable is tied to software application programs. Soft copy includes inputs in the form of down links from systems into a computer for data or soft copy imagery and implies computer to computer interface for analysis, rather than passing paper copies of data or information. Both hard copy and soft copy can be selected for the same function.
Rate of Data Presentation	Use of this variable is to specify a high rate of presentation for a particular function or sub-function. If the rate of data presentation is considered manageable for the function or sub-function, then this variable should not be used.
Symbology	Use of this variable indicates that a system of symbols is used in the performance of the function or sub-function.
Code	This is primarily a collection function rather than a function of processing. It will most likely not be used. For now, code input to the process remains as a place holder for when pre-processing occurs as a part of the intelligence processing functions and not a part of single source analysis performed by collection units.

Waveform	Functions the same as code in that it is a place holder for future use. Waveform is a mathematical representation of a wave or a graphic deviation at a fixed point versus time. Few processing functions include the use of waveform representation of information.
Graphics	These include the use of overlays and sketches to represent or replace words. They can also be used to enhance verbiage. Most intelligence processing functions include the use of graphic representations of information.
Foreign Language	Input in the form of foreign language is rare. Usually, analysts receive information in a translated form since most linguists are assigned to collection rather than processing functions. This variable should be used when an organization has linguists translating from a foreign language to perform the processing function or sub-function.
Noise Level	This variable is used to specify that the noise level in performing a function is a distracter from performing optimally. It can include physical noise in the surrounding area that causes an analyst to receive less than clear input or distorted signals in receiving input to the function. This variable generally describes a situation where input arrives predominantly from radio signals and the signal is normally unclear.

Procedural Requirements - Procedural requirements describe how a function or sub-function must be conducted.

Sequential	The sub-functions of the task or function should be performed in order. Failure to perform the sub-functions in order may result in making false assumptions or deductions. The setting is made by determining if the steps of a function are performed sequentially under normal circumstances.
Non-sequential	The order of performing sub-functions of a task is not necessarily important to the performance of the function. All nodes must be either sequential or non-sequential. They cannot be neither or both.
Frequent Shifting Between Tasks	This variable captures interruptions in task performance. It probably occurs more often than not, especially in dynamic situations. If, during the performance of a function, the people performing that function must divert their attention to other areas or functions at the same time, frequent task shifting would be present.

Sustained Attention	There are two areas that must be considered in selecting this variable. First, does the task truly require the sustained attention of the performer? Then, is the performer afforded the time and ability to perform the function with few interruptions routinely? If both of these questions can be answered yes, then this is the proper setting. This setting would be selected for such tasks as administrative logging of data or requirements. Perhaps wargaming, if a wargaming session is a formalized process with dedicated time and assets. Only one variable, sustained attention or frequent shifting, can be selected. Selecting neither is not an option.
Group Interaction	The performance of a function or sub-function as part of a group (two or more people) rather than by a single person. Many MI functions are performed by groups rather than individually; for instance, terrain analysis, COA selection, and wargaming are almost always performed in group work sessions.
Individual Performance	This trigger variable is set for those tasks normally performed by only one person. If group interaction is not selected for a function, then individual performance must be selected and vice versa.

Response Requirements - Response requirements are the mental or physical behaviors required to perform a function or that cause the analysts to respond in certain ways in order to perform a function. These response requirements are at a general level. While any task usually requires a combination of responses, one or two response requirements probably dominate. There are four categories of response requirements with different internal settings: perceptual response, motor response, cognitive response, and communicative response. Multiple selections can be made in the same categories.

Perceptual Responses

Visual	In the performance of the function, the analyst must prepare or use visual products. These visuals can be merely textual or may be graphical, as well.
Auditory	The dominant response is through hearing or listening. An example would be extracting data and information about the enemy while reports are being transmitted over a tactical radio system.

Cognitive Responses

Recall	The function requires that the analyst recall information from memory or from a database.

Analyze	This is breaking material into its parts. Many of the intelligence processing functions include analyzing. Make this selection only if analyzing dominates this function.
Integrate/Synthesize	The function or sub-function requires that the analyst create a whole concept by correlating parts.
Evaluate	The function or sub-function requires that the analyst to judge the value of something using criteria. This response is associated strongly with the functions of prioritizing requirements and evaluation worth of information to be used in processing or selecting the best collection assets.

Motor Responses

Gross Motor	Gross motor skills are skills that require little specialized training. They include drawing, drafting, and writing. They also include physical labor such as heavy lifting, running, marching, and swimming.
Fine Motor	Fine motor skills include fine tuning equipment, steering, and so forth, generally those physical tasks with low tolerance for error. These are seldom required in the intelligence production process.

Communicative Responses

Verbal	The function calls for a verbal response only. This is an informal and untraceable response to a question(s).
Written	The function calls for a more formal or recorded response. The response can be in the form of a written product, graphic, or even a briefing. Although briefings are presented verbally, they normally require preparation of briefing notes and graphics. These contents are usually more duplicable than verbally answering a question. Written response can also include updating a database.

Errors

The error framework defines errors, as human behaviors that result in deficient outcomes that are, in the MI domain, deficiencies in intelligence. Errors are classified into general and sub-categories as described next. Definitions of specific errors within these types follow.

Types of Errors

General Procedural Errors	Errors that occur when procedures are executed.
General Process Errors	Errors that occur when a person is involved in a mental process.
Special Case Administrative Errors	Errors pertaining to compliance or noncompliance with administrative procedures and information that exists to constrain, direct, or guide behavior.
Special Case Information Collection Errors	Errors pertaining to compliance or noncompliance with administrative procedures and information that exists to constrain, direct, or guide behavior.
Errors of Commission	Any type error in which data and/or information was used improperly or requirements were not properly executed.
Errors of Omission	Any type error in which data and/or information was not used or considered or requirements were not executed.

APO - Administrative procedural errors of omission.

APO 1	Did not consider the existing administrative constraints, direction, or guidance.
APO 2	Did not consider all the necessary administrative constraints, direction, or guidance.

APRC - Administrative process errors of commission.

APRC 1	Misinterpreted the administrative constraints, direction, or guidance.
CPC -	Collecting information procedural errors of commission.
CPC 1	Collected more data than were required to perform the task.
CPC 2	Collected inappropriate data. There can be levels of inappropriate data, that is, all the data were inappropriate or only a few pieces were inappropriate.
CPC 3	Did not collect all the data necessary to perform the task.
CPC 4	Recording or reporting a signal or signal change when none has occurred.
CPC 5	Recording or reporting a signal or signal change in the wrong direction.
CPC 6	Recording or reporting a target when none is in the field.

CPC 7 Assignment of the target to the wrong class.

CPC 8 Responding to a sub-threshold target change.

CPC 9 Premature response to a target change.

CPC 10 Late response to a target change.

CPO - Collecting information procedural errors of omission.

CPO 1 Failed to monitor the field.

CPO 2 Failure to record or report a signal or signal change.

CPO 3 Failure to record or report the appearance of a target.

CPO 4 Failure to respond to a super-threshold target change.

CPRC - Collecting recalling process errors of commission.

CPRC 1 Recalled more information than was necessary to perform the task.

CPRC 2 Recalled inappropriate information. There can be various levels of inappropriate information.

CPRC 3 Did not recall all the information required to perform the task.

CPRO - Collecting recalling process errors of omission.

CPRO 1 Did not recall any information. A case when the person responded reflexively to the environment.

EPC -

EPC 1 Inadequate magnitude of control actions.

EPC 2 Excessive magnitude of control actions.

EPC 3 Inadequate continuance of control actions.

EPC 4 Excessive continuance of control actions.

EPC 5 Wrong direction of control actions.

GPC - General procedure errors of commission.

GPC 1 Perform the step(s) incorrectly.

GPC 2 Repeat a step when it is not required to do so.

GPC 3 Insert an unnecessary step.

GPC 4 Perform the steps in the wrong order.

GPC 5 Perform a step before there is enough information to justify doing it.

GPC 6 Perform a step too late.

GPC 7 Perform a step that is similar or unrelated to the required one.

GPO - General procedure errors of omission.

GPO 1 Omit a required step.

GPO 2 Stop the procedure before completing all the steps.

GPRC - General process errors of commission.

GPRC 1 Misinterpreted the information being acted upon.

GPRC 2 Gave information more importance than necessary.

GPRC 3 Failed to keep track of sequential reasoning.

GPRC 4 Lost sight of the reason for performing analysis.

GPRO - General process errors of omission.

GPRO 1 Only used part of the information that is required to perform the step.

GPRO 2 Did not reinterpret existing information in light of new findings.

GPRO 3 Did not integrate new information with existing information.

GPRO 4 Did not associate information from different subject domains.

GPRO 5 Did not build models of events from a mix of hypothesis and facts.

GPRO 6 Did not give information as much importance as necessary.

GPRO 7 Did not reweigh the importance of information based on new information.

HPPRC - Hypothesis procedural or process errors of commission.

HPPRC 1	Used incorrect information to verify or refute predictions.
HPPRC 2	Rejected hypotheses without fully testing the predictions.
HPPRC 3	Accepted hypotheses without fully testing the predictions.
HPPRC 4	Tested hypothesis to a point of diminishing returns.
HPPRC 5	Selected an hypothesis having no relationship to current or future possible friendly force or opposing force operations.
HPPRC 6	The hypotheses selected were not supported by the existing information.

HPPRO - Hypothesis procedural or process errors of omission.

HPPRO 1	Did not test any hypotheses.

HPRC - Hypothesis process errors of commission.

HPRC 1	Misinterpreted the information used to verify or refute the hypotheses.

Information State Dimensions

Information is represented by five information state dimensions, relevant to intelligence, that provide a non-domain content description of information. The information output by a given node is characterized by the level of the relevant dimensions (not all dimensions are applicable to all nodes).

Relevance - The meaning that is provided to the output by forming relationships within and between various kinds of information.

Fully Relevant	Output contained the appropriate meaning(s).
Mostly Relevant	Output contained most of the appropriate meaning(s).
Limited/Adequate	The meaning in the output was correct, but not all aspects of meaning were covered.
Limited/Insufficient	Output meaning was partially correct and not all aspects of meaning were covered.

No Relevance	The output was not given meaning.
Wrong Relevance	The output has wrong meaning.

Specificity - The degree output conveys meaning without further interpretation or inference.

Precise	The output is not open to further interpretation or inference.
Precise with Additional Analysis	The output contains little room for further interpretation or inference; interpretation or inference is rather obvious.
Approximate/Useful	The output contains some room for further interpretation or inference.
Approximate with Major Gaps	The output contains considerable room for further interpretation or inference, so much so that it may be confusing.
Ambiguous	The output is open to different meaning.
Cryptic	The meaning of the output is obscure or concealed.

Completeness - The measure of expected content that should be produced by the function.

All	All inclusive.
Most	The output has most of the expected content.
Some/Sufficient	The output has less than the expected content but is sufficient to work with.
Marginal	The output has less than the expected content, probably insufficient to work with.
Insufficient	The output has none of the expected content.

Perishability - The degree to which output retains its temporal relevance. (Temporal relevance for different tasks is different. The measurement is relative to the function, not relative to functional comparisons.)

Lasting	The output retains its relevance over an extended period of time (full life of the OPLAN).

Temporary/Little Impact	The output retains its temporal relevance for most of the life of the OPLAN.
Temporary/Adequate	The output retains its temporal relevance for a limited amount of time, sufficient for its intended purpose.
Transient/Some Utility	The output rapidly loses its temporal relevance, may be sufficient for its intended purpose.
Transient/Little Utility	The output rapidly loses its temporal relevance, probably insufficient for its intended purpose.
Elapsed	The output has lost its temporal relevance.

Validity - The soundness of the output as supported by current facts, doctrine, and historical records.

Fully Substantiated	The output is based on pertinent confirmed data.
Mostly Substantiated	The output is based on pertinent, mostly confirmed data.
Partially Substantiated/Sufficient	The output is based on the data available, some of which are pertinent and confirmed, and the rest questionable or not pertinent.
Partially Substantiated/Insufficient	The output is based on little data, some of which are pertinent, little confirmed, and the rest questionable or not pertinent.
Unsubstantiated	The output is based on conjecture, incorrect, or irrelevant data.

Information Quality Measures and Dimensions

Military intelligence is information describing battle-related circumstances with sufficient detail to convey a dynamic picture of the enemy and the physical environment. Sufficiency of detail is measured in terms of *completeness* and *specificity*. Generalizing about the battlefield, its enemy, and the physical environment can be further described by addressing or including reference to each of the following aspects, or dimensions of completeness and specificity:

Completeness	The degree to which the domain-free content of information is thoroughly and totally described.

Specificity	The degree to which information conveys meaning without further interpretation or inference.
Behavior	What is going on? As something on the battlefield is discerned and things are occurring, the descriptions should include their complete and specific descriptions. For example, behavior includes identifying a maneuvering force as attacking or defending. It includes stating that a tank is moving or firing and moving. It includes those descriptive references that allow the user to distinguish what is transpiring because of variations in activity or behavior. Behavior can be imparted implicitly by distinguishing between a tank and an infantry fighting vehicle and a missile versus tube artillery.
Spatial	Where is it with respect to me? What is directed or discerned on the battlefield is routinely portrayed as a measurable position on the ground or in relation to a distance from a known point area. A grid coordinate on a map is the most specific example. A distance from a city or monument conveys relative location. "West of the Rockies" or "in a sector" is broader spatial references. There are ways to completely and specifically convey spatial relationships given what is being discerned.
Temporal	What are the time factors? They are always embedded within intelligence. It fixes things with regard to the present, past, or future. Its absence or presence conveys urgency and suggests degree of threat.
Structural	What are the parts and how do they fit together? The concept of structure acknowledges that military things are part of larger things. One tank is part of a platoon, a platoon part of a company, and so on. As information about structure becomes more complete and specific, shared knowledge becomes richer. For example, if I know there is a Corps as part of a theater on the field, that conveys more than saying "lots of enemy."
Quantitative	How many? Stating completely and specifically "how many" permits discrete discernment of variability and relative strength.

Information Attributes

Data and information are represented in the IPM in terms of their attributes, that is, what the information is *about*. These attributes are *shape*, *size*, *quantity*, *presence*, *absence*, *dynamics*, *parametrics*, and *human dimension*, and are defined below. This feature enables the IPM to

model information without actual content, as in a message or report that might be produced by an intelligence analyst. Information is therefore said to be "contentless."

Collection activities of the assets described by the scenario are modeled in terms of these information attributes: the inherent information-gathering abilities of a particular collector or asset are described in terms of these attributes, as is the entire asset suite being modeled in the particular scenario. An asset is defined by its contribution, that is, "yes (Y)," "no (N)," "limited (L)," to collected information having attributes of shape, size, and so forth. Then, given the entire asset suite defined for the scenario, the contribution of each is accumulated by the user, and the overall contribution attributable to the scenario is rated for each of the eight attributes as "excellent," "good," "fair," or "poor."

The total contribution of all assets for a single attribute may be evaluated simply in terms of the collection of Ys, Ns, and Ls, or may be adjusted for any peculiarities of the scenario. For example, JSTARS has the ability to collect information about size and quantity; the scenario is taking place in a triple-canopy jungle; the attributes ratings for size and quantity may be described as only "fair."

Shape	The physical configuration of an entity, that is, a tank truck or a battalion in march formation. Examples of assets that normally can collect information about shape are an ACS or GBCS.
Size	The physical extent of an entity, that is, a column of vehicles 2 km long. Examples of assets that normally can collect information about size are FLIR and JSTARS.
Quantity	The count of an entity, that is, 10 infantry fighting vehicles (IFVs). Examples of assets that normally can collect information about quantity are JSTARS and interrogators.
Presence	The existence and location of an entity, that is, a tank at NV263478. Examples of assets that normally can collect information about presence are ACS and HUMINT.
Absence	The lack of existence, that is, nothing detected. Examples of assets that normally can collect information about absence are JSTARS and HUMINT.
Dynamics	The activity of an entity, that is, movement. Examples of assets that normally can collect information about dynamics are ACS and FLIR.

Parametrics	The technical characteristics of an entity, that is, the pulse repetition frequency (PRF) of a radar. Examples of assets that normally can collect information about parametrics are HUMINT and ACS.
Human Dimension	The human characteristics of an entity, that is, state of training or morale. Examples of assets that normally can collect information about the human dimension are FLIR and GSR.

Intelligence Conceptual Map[3]

The intelligence conceptual map (ICM) is a node structure that represents how information is developed from database to intelligence to meet the commander's requirements. An ICM node represents information about some aspect of the battlefield in terms of its *measures* (completeness and specificity) and *dimensions* (behavioral, spatial, temporal, structural, and quantity). Information in particular nodes is successively combined or integrated into ever richer information about some broader aspect of the battlefield. There are essentially three information hierarchies represented in the ICM: enemy, friendly, and physical environment. There are also two levels of information in the hierarchy: the database level that represents discrete bits of information, and the information-to-intelligence level, which represents successively richer information that results from integrating the discrete bits. Each of the nodes in the ICM is defined below; the three-letter code may be used to cross-reference these definitions with the IPM graphical output.

Intelligence Nodes

Current Activity (ACT)	Information about what the enemy has done recently or is doing now; ongoing activity is correlated with information about enemy forces on the battlefield.
Air (AIR)	Information about the disposition, composition, equipment, and location of enemy aerial assets in the area of interest.
Command, Control, and Communications (C3)	Information about the disposition, composition, equipment, and location of enemy command, control, and communication elements in the area of interest.

[3] Not all the abbreviations in this section are acronyms; some are simple abbreviations used as labels in the model output.

Capabilities (CAP)	Information about the enemy's ability to execute various actions; information about both strengths and weaknesses is included.
CS-CSS Unit (CSC)	Information about the disposition, composition, equipment, and location of enemy combat service and combat service support elements in the area of interest.
Demographics (DEM)	Information about all aspects of an enemy population.
Disposition (DIS)	Information about the location and position relationships of enemy forces.
Doctrine (DOC)	Information about how an enemy organizes, trains, sustains, and employs military forces.
Echelon (ECH)	Information about the subordination and echelon relationships of enemy elements such as battalions, regiment, divisions, or corps.
Enemy Future (ENF)	Information about what an enemy will probably do, and when and where he will do it; in other words, the enemy's likely COA(s).
Engineer (ENG)	Information about military engineering activities in the area of interest.
Enemy Now (ENN)	All information about the current state of the enemy; a narrative picture of the battlefield.
Equipment (EQP)	Information about the enemy's inventory of equipment and its capabilities.
Fires (FIR)	All information about enemy fires that support maneuver activities.
Forces (FOR)	Information about all aspects of enemy military organizations; composition, strength, location, and disposition information is correlated with ongoing battlefield activity.
Friendly Operational 1 (FR1)	Information about friendly units, soldiers, and equipment.
Friendly Operational 2 (FR2)	Information about friendly units, soldiers, and equipment.
Friendly Operational 3 (FR3)	Information about friendly capabilities and units.
Friendly Future (FRF)	Information about what our own force will probably do, and when and where they will do it; in other words, the friendly likely COA(s).

Friendly Now (FRN)	All information about the current state of own forces; a narrative picture of the battlefield.
IA Unit (I/A)	Information about enemy infantry and armor units.
Intentions (INT)	Information about what the enemy wants to accomplish.
Maneuver Units (MAN)	Information about enemy maneuver units.
Maneuver (MNV)	Information about enemy maneuver.
Morale (MOR)	Information about the morale, well-being, and willingness to fight of enemy units, which affect their capability in the area of interest.
Movement (MOV)	Information about enemy movement on the battlefield.
Mission (MSN)	Information about the actions the enemy has taken or is taking related to goals, objectives, purposes, and levels of effort involved in each.
Nuclear, Biological, Chemical (NBC)	Information about all aspects of an enemy's ability to conduct or defend against NBC operations.
Physical Environment Future (PEF)	Information about all physical environments (the battlefield and associated air space) which might be used in future operations by enemy or friendly forces.
Physical Environment Now (PEN)	Information about the physical environment currently in use by enemy and friendly forces.
PE Effects (PRE)	Information about when, where, and how the terrain and weather will affect enemy and friendly soldiers, equipment, and operations on the battlefield.
Rates (RAT)	Information about the speed of enemy movement on the battlefield.
Readiness (REA)	Information about available combat potential of enemy units in the area of interest.
Reconnaissance (REC)	Information about enemy reconnaissance and intelligence activities.
Size (SIZ)	Information related to numbers of soldiers and equipment involved in activities.
Supporting Units (SPT)	Information about enemy units that provide support to maneuver units.

Staging Areas (STG)	Information about geographic areas in which the enemy prepares for maneuver and stocks supplies.
Subordinate Units (SUB)	Information about supporting units that provides combat power to maneuver units.
Supply (SUP)	Information about enemy logistics activities.
Sustainment (SUS)	Information about enemy sustainment units, that is, resupplying or repairing, in the area of interest.
Time/Distance (T/D)	Information about movement in terms of time and distances, that is, how long it will take for a unit to get from point A to B.
Tactics (TAC)	Information about how an enemy conducts military operations on the battlefield.
Type PE (TPE)	Information about all aspects of terrain and weather without regard to a specific operation.
Terrain Analysis (TRA)	Information about terrain in the area of potential operations.
Terrain Effects on Equipment (TRE)	Information about the impact of terrain on equipment, soldiers, and operations on the battlefield.
Terrain Situation (TRS)	All information about the specific terrain in use by both the enemy and friendly forces.
Weather Effects on Equipment (WXE)	Information about the impact of weather on equipment, soldiers, and operations on the battlefield.
Weather Conditions (WXN)	Information about weather in the area of potential operations.
Weather Situation (WXS)	All information about current and projected weather in the area of the terrain in use.
Weather Effects on Terrain (WXT)	Information about the impact of weather on the terrain of the battlefield.

Database Nodes - All data about people, military, and activities of another country or geographic area except those that are related to the physical environment. It is divided into the following segments:

Historical Database	All data that are known before a specific situation dictates a military operation. These data provide the foundation for populating the current segments of the database and are divided into the following elements:
Organization and Equipment (HBO)	All data known about the soldiers, units, and equipment of a geographic area or a potential adversary.
Activity (HBA)	All data known about historic and recent military movements, emissions, and mission activities of a geographic area or a potential adversary.
Population (HBP)	All data known about the individuals, organizations, and groups of a geographic area or a potential adversary.
Current Organization and Equipment	All data learned about the soldier's (OES), units (OEU), and equipment (OEE) of a geographic area or a potential adversary after a military operation has been initiated.
Current Activity	All data learned about the military movements (CAM), emissions (CAE), and mission (CAS) activities of a geographic area or a potential adversary after a military operation has been initiated.
Current Population	All data learned about the individuals (CPI), organizations (CPO), and groups (CPG) of a geographic area or a potential adversary after a military operation has been initiated.
Terrain	All data that are known about the topography (TRT), hydrology (TRH), and features (TRF) of a geographic area plus the data learned after a military operation has been initiated.
Weather	All data that are known about the climate (WXC), meteorological (WXM), and light (WXL) of a geographic area plus those learned after a military operation has been initiated.

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REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	January 1999	Final

4. TITLE AND SUBTITLE

Intelligence Production Model Version 6.00 for Windows: User's Manual

5. FUNDING NUMBERS

AMS: 622716.H700011
PR: 1L162716AH70
PE: 6.27.16
Contract No. DAAL01-94-C-0048

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

BDM International, Inc.
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Sierra Vista, AZ 85635

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U.S. Army Research Laboratory
Human Research & Engineering Directorate
Aberdeen Proving Ground, MD 21005-5425

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

ARL-CR-436

11. SUPPLEMENTARY NOTES

The contracting officer's representative (COR) is Beverly Knapp, U.S. Army Research Laboratory, ATTN: AMSRL-HR-MY, Greely Hall, Bldg 61801, Ft. Huachuca, AZ 85613-5000 (telephone 520-538-4704).

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This is the user's manual for the Intelligence Production Model (IPM) Version 6.00. The manual provides step-by-step instructions for setting up and running the IPM, viewing and processing output, and maintaining files generated during model runs. The manual includes a section to aid the user in model design, as well as a dictionary of terms. The IPM is a software application that simulates how the quality of information and information processing performance in a military intelligence (MI) production system affect the quality of military intelligence required to meet the commander's needs. By simulating the functions and processes in developing a collection plan, conducting data analysis and fusion, and disseminating intelligence products, the model enables users to simulate the entire intelligence collection and production system from a human perspective. Also, the model can simulate information operations against the intelligence battlefield functional areas and can identify how "defective" information degrades the quality of intelligence. Outputs from the model include how information quality is enhanced or degraded under varying scenario parameters, soldier and task characteristics, and environmental factors, as well as how and what types of human errors degrade the quality of intelligence under the specified model conditions. Detailed model outputs can be used to identify specific design or remedial requirements for the military intelligence systems, personnel, or training.

14. SUBJECT TERMS

human system information analysis
intelligence information flow analysis
intelligence production system
rule-based modeling

15. NUMBER OF PAGES 100

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	