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Supervisory Control System for Ship Damage Control: Volume 8 — User's Manual

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13. ABSTRACT (<i>Maximum 200 words</i>) The <i>DC-SCS User's Manual</i> provides you with a concise introduction and general reference to the layout and use of the system's many features. It is designed for a user who has never touched or seen the system before, but who has some knowledge of Navy vessels and the various commands that can be issued on them.			
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SUPERVISORY CONTROL SYSTEM FOR SHIP DAMAGE CONTROL:
VOLUME 8 – USER’S MANUAL

1. About This Manual

1.1 How This Manual is Put Together

The *DC-SCS User’s Manual* provides you with a concise introduction and general reference to the layout and use of the system’s many features. It is designed for a user who has never touched or seen the system before, but who has some knowledge of Navy vessels and the various commands that can be issued on them.

This manual is divided into seven sections and an Appendix. **About this Manual** contains a description of this manual and the various conventions used throughout it. **Starting DC-SCS 2000** explains the process needed to actually start the system and start monitoring the vessel. Sections 3 through 5 below explain the many intricacies of the Visualization and User Interface, and give directions on using the command menus. Section 6 describes the Scenario Generator, a demo project that currently consists only of a working interface, and Section 7 shows how to implement a pre-specified scenario (Scenario 7) with the system. Section 8 shows instructions for using the One-Click interface.

1.2 Conventions

This manual is written with conventions that are designed to clarify and draw attention to certain kinds of information. This is done to help the user easily navigate the menu and execute commands or options without error. The names of menus, commands, panels, and buttons are in boldface. They are spelled just as they appear on the screen. The names of directories are italicized. Pictures of various dialogs and menus are included just as they appear on the screen, but not exactly to scale.

2. Starting DC-SCS 2000

2.1 Loading the One-Click Module

To start the system, the One-Click interface must be loaded first. It is a small application that automatically loads the system’s many modules correctly and in the right order. To start the One-Click Interface, follow the steps below:

1. In the Task Bar, hit **Start**; then select **Run**
2. Type *D:\dcs\oneclick.exe*
3. Hit **Enter**

The One-Click Interface should now be loaded.

2.2 Loading the Visualization and User Interface

To load the Visualization of the ship as well as the User Interface, simply click the GO button of the One-Click interface. The Visualization should appear after a few seconds, followed by a DC-ARM 2000 introduction screen which will quickly disappear. Next, a small dialog should appear, labeled Server Information (Figure 1), asking for a server IP (Internet Protocol) address and Port Number.

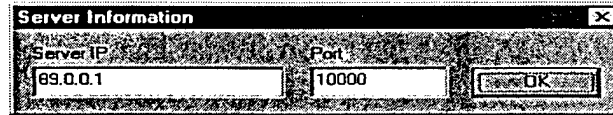


Figure 1. Server Information dialog box

For the **Server IP** field, enter the IP address of the computer that data is to come from (e.g., Ex-USS *Shadwell* Server IP, or local machine's IP if running the server on same machine as the system). Finally, enter the **Port** on which the server is running, and click **OK**. The main user interface should now load. Notice how the One-Click Interface has transformed into a large red button with the word **STOP** on it (Figure 2).



Figure 2. One-Click Interface Stop button

Note: If a VBCollector Error Box appears after the main user interface has loaded, this means that the IP or Port number entered is invalid. To re-enter the server information, hit **STOP** on the One-Click Interface, and then start over from the beginning of this section. An example error is shown in Figure 3.



Figure 3. Example error message

To change the options of the One-Click Interface, see the Appendix.

2.3 Exiting the System

Shutting down the system is simple. Simply click the red **STOP** button on One-Click Interface, and all the modules will be automatically shut down. Finally, close the One-Click Interface by clicking the "x" in the upper right hand corner. The system has been successfully shut down.

3. The DC-SCS 2000 Visualization

3.1 Description

The current Visualization is used to display the ex-USS *Shadwell* [Carhart, et.al., 1992] and its intricate compartment system. It currently supports numerous features, including selection of individual compartments, blinking upon rapid increases in temperature or smoke, and alerting the user to state changes in given compartments. State changes are visualized by altering the color of the compartment. There are presently two color schemes supported, one representing the temperature, and the other representing the Classifier reasoning states. The temperature color of the compartment is chosen based on the Upper and Lower Zone temperatures for a specific compartment, with the larger of the two determining the compartment's color. Both color schemes are explained in subsequent sections. The Visualization additionally shows smoke opacity in compartment.

3.2 Changing the Default View of the Ship

When the Visualization first loads, there should be two dialogs just to its left. To change the current orientation of the ship, click on the dialog with the title "View Camera Controls." Using the dialog is very simple. Experiment with moving the ship around, zooming in and out by clicking the appropriate buttons. If for some reason the dialog does not appear on the screen, or if there are problems locating it, right click anywhere on the interface and then select the View Controls option. The dialog will appear on your screen as shown in Figure 4.

- Camera Zoom**
 - Zoom In Zoom In (Move Closer)
 - Zoom Out Zoom Out (Move Away from the Ship)
- Camera Position**
 - Up Move the Ship Up
 - Left Move the Ship Left
 - Right Move the Ship Right
 - Down Move the Ship Down
 - Forward Move the Ship Forward
 - Back Move the Ship Back
- Camera View Point**
 - Look Up Look From Above at the Ship (Bird's Eye View)
 - Look Down Look from Below
 - Look Left Look from Left (Rotates Ship Counterclockwise)
 - Look Right Look from Right (Rotates Ship Clockwise)

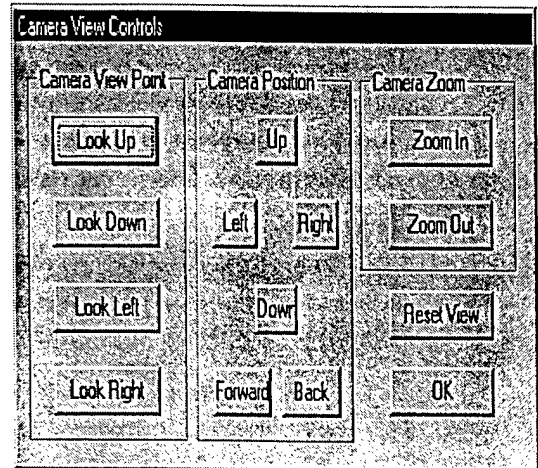


Figure 4. Camera view controls dialog

If for some reason the Visualization is moved out of place or to an undesirable location the view can easily be reset to its default position by doing the following:

1. Right-click anywhere on the Visualization
2. Select **Reset View** from the bottom of the popup menu

The view should now be reset to its original state.

Experienced users can use the advanced viewing commands; see Section 8 for more information.

3.3 Selecting Compartments and the Selection Properties Sheet Dialog

By selecting a compartment, the user can obtain information about it. Each compartment has an upper and lower temperature, smoke opacity, and its own inventory, as well as a specific identifier on the ship. To select a compartment, follow the steps below:

1. Left-click on the compartment to select
2. Right-click on the interface and click on the **Select** option in the popup

3.3.1 Information Available at the Select Tab

The numbers in this description correspond to the large numbers in Figure 5:

1. Compartment description such as: "Passage", "Communication Center",
2. Compartment name: Selecting a deck will show all corresponding compartments in the **Compartment** space to the right of the deck option. Selecting a specific compartment will (a) select that compartment in the Visualization, surrounding it with a blinking red-and-white line, and (b) update the current information in section 3 (**Details**) of this dialog box.
3. **Details**: Shows the upper and lower temperature sensor readings, smoke opacity, and Classifier status of the selected compartment.
4. Toggle options:
 - a. **Blinking On/Off** - Turn off the blinking of notification of high temperature.
 - b. **Set Fire Boundary for Comp.** - Notify a fire boundary about the bulkheads of a selected compartment
5. Visual modes: **Temperature** (Figure 6), **Classifier** (Figure 7), and **Smoke** (Figure 8). Each one will show its respective color scheme.

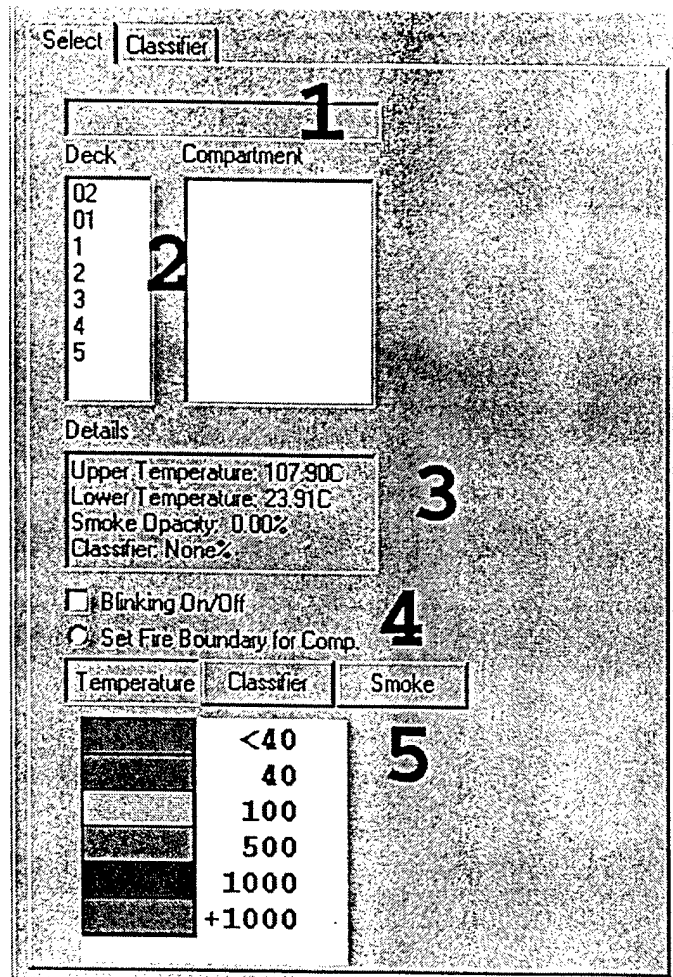


Figure 5. Selection property dialog

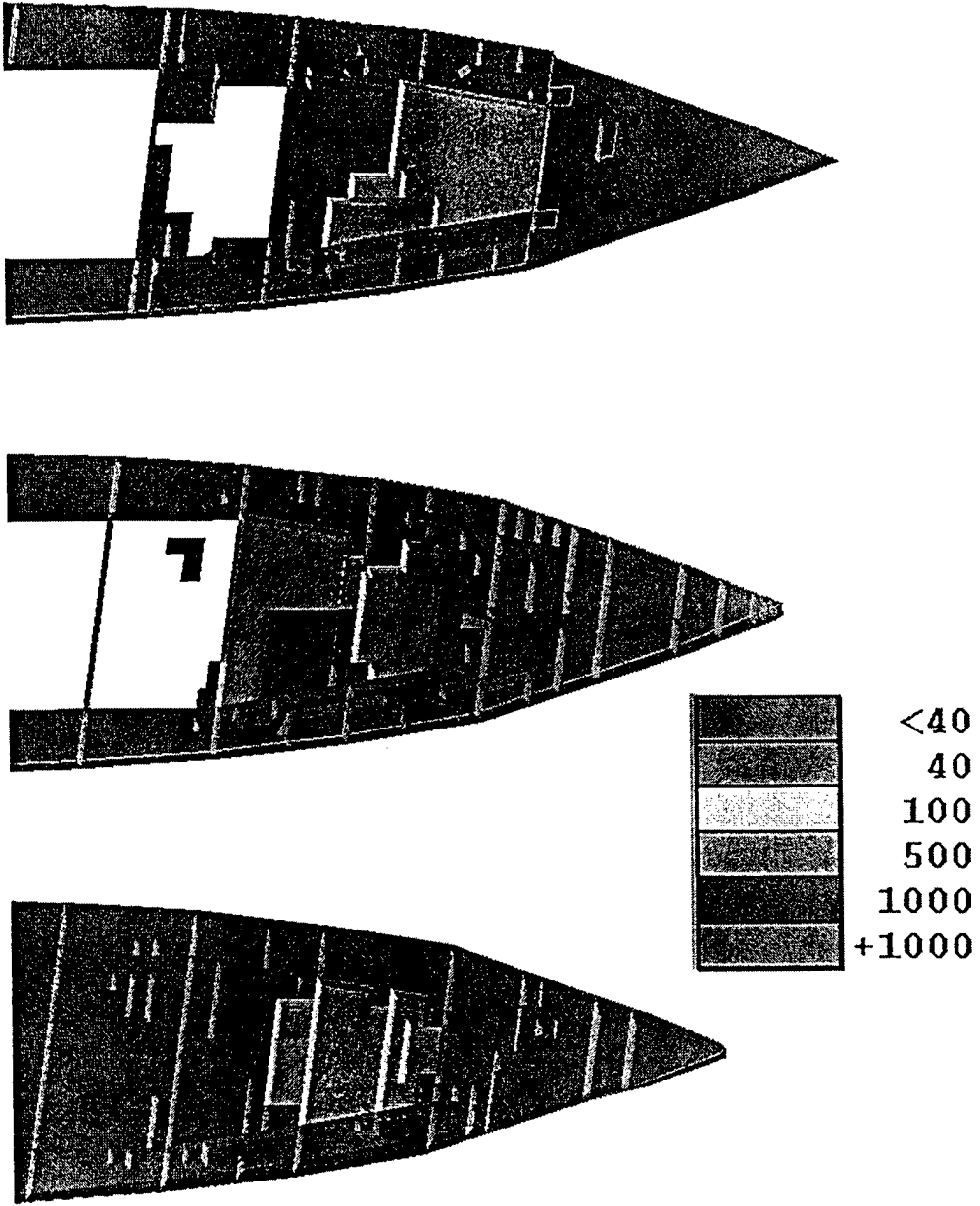


Figure 6. Example of temperature

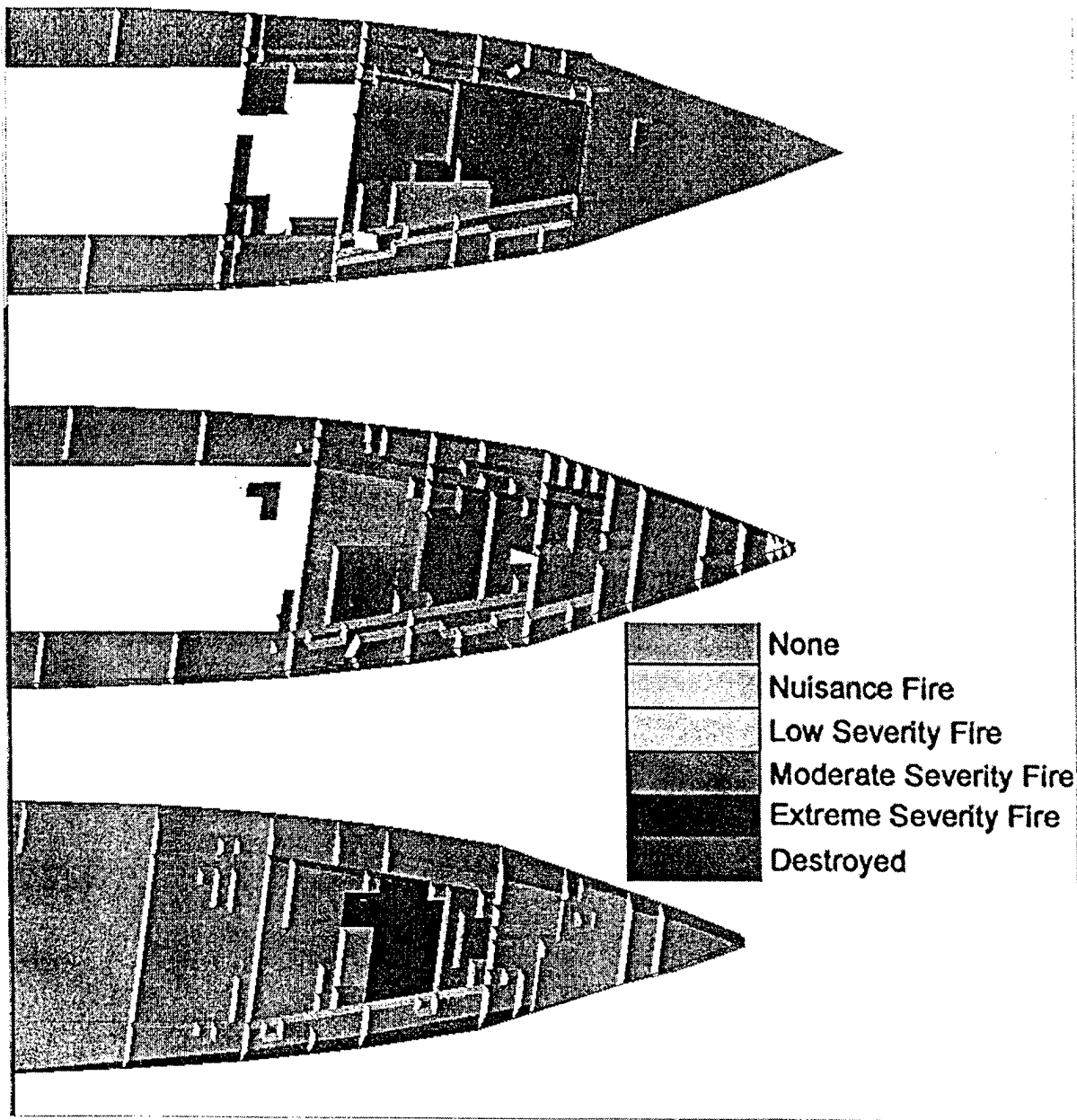


Figure 7. Example of Classifier

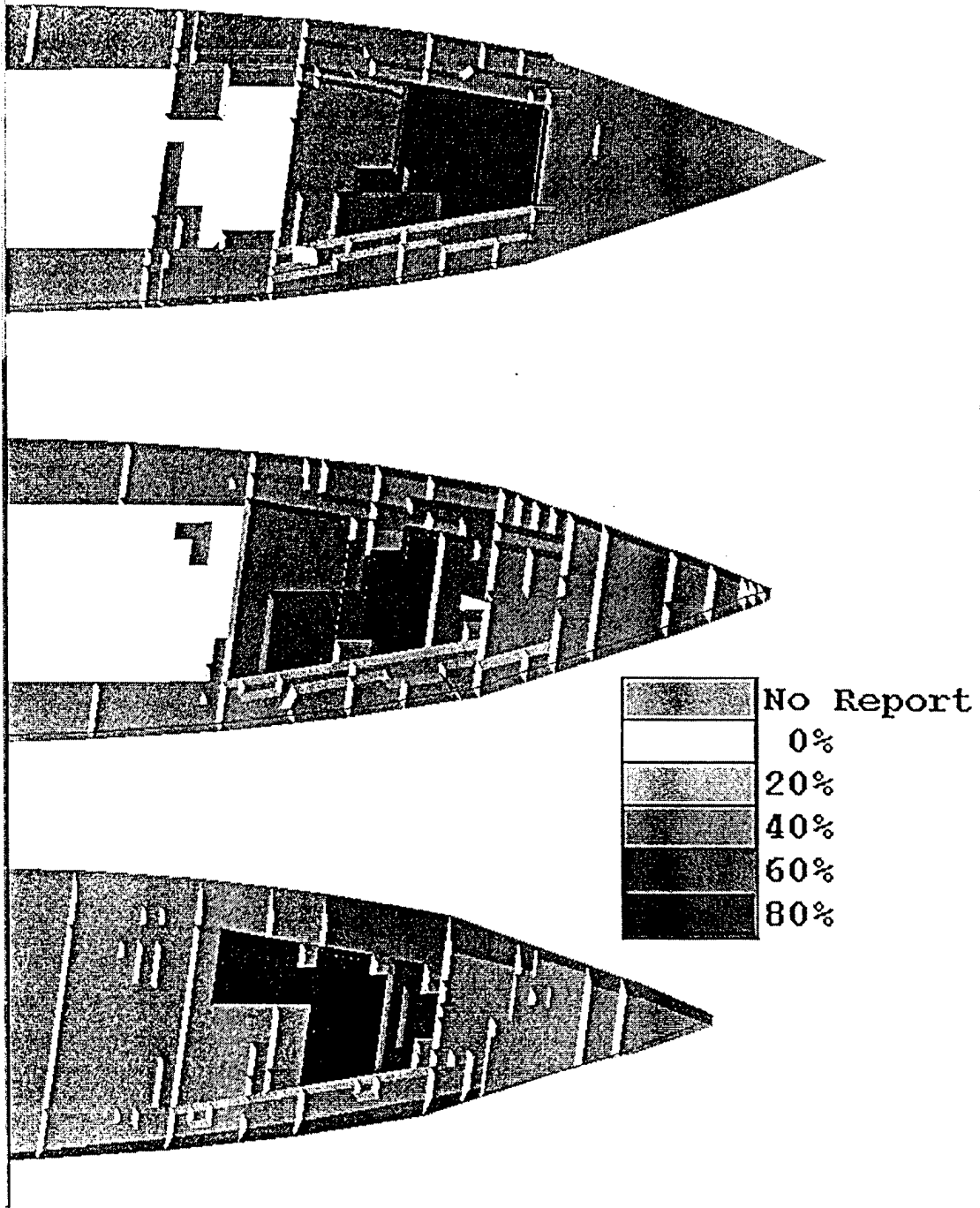


Figure 8. Example of smoke

3.3.2 Information Available at the Classifier Tab

The Classifier Menu (Figure 9, left) gives the probability, if any, of certain types of fires occurring in the selected compartment, based on its current upper and lower temperatures and smoke opacity.

**Tab 3 –
Classifier Menu**

Graph Region

- Green Line Probability of a fire not occurring in the compartment
- Yellow Line Probability of a nuisance fire occurring in the compartment
- Red Line Probability of a serious fire occurring in the compartment

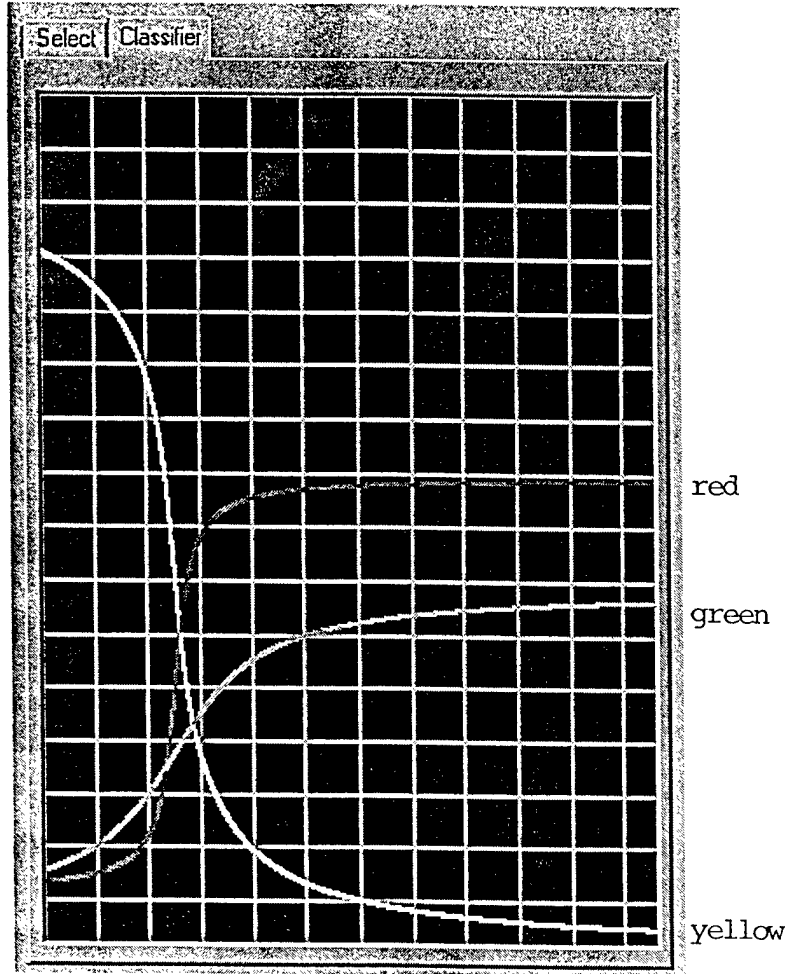


Figure 9. Classifier Menu for Selected Compartment

4. The DC-SCS 2000 User Interface

4.1 Description

The User Interface (Figure 10) is an integral part of the system. It allows the user to send commands, issue reports, and effectively monitor the current state of the system. The complete User Interface is pictured below, with short identifiers for each part to make the subsections easier to understand.

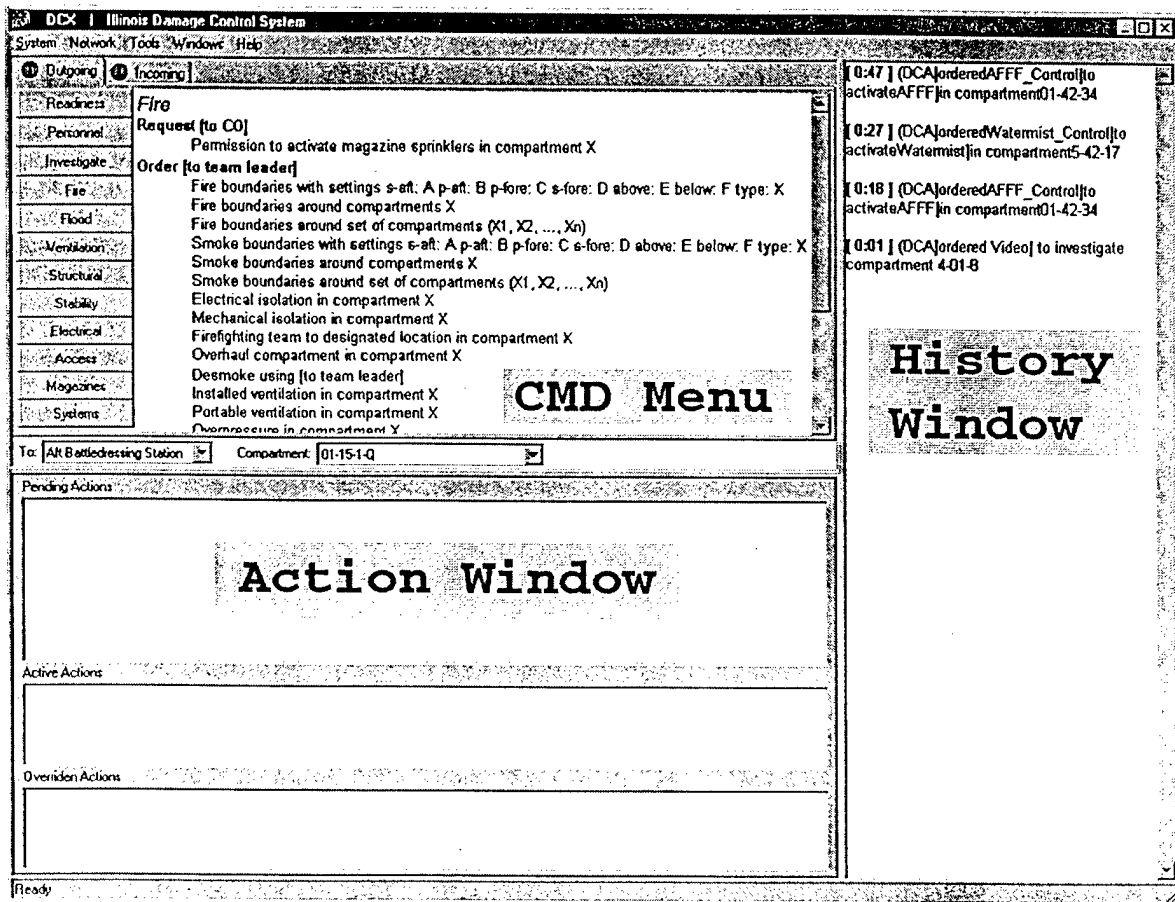


Figure 10. The DC-SCS 2000 User Interface

5. Using the Command Menu

The Command Menu (Figure 11) allows the user to issue numerous orders. To navigate the Command Menu, click on the appropriate tab (e.g. **Readiness**, **Personnel**, **Investigate...**). Options can then be selected that relate to that tab. When the mouse is placed over an option, the option will be highlighted; clicking it will actually complete that order.

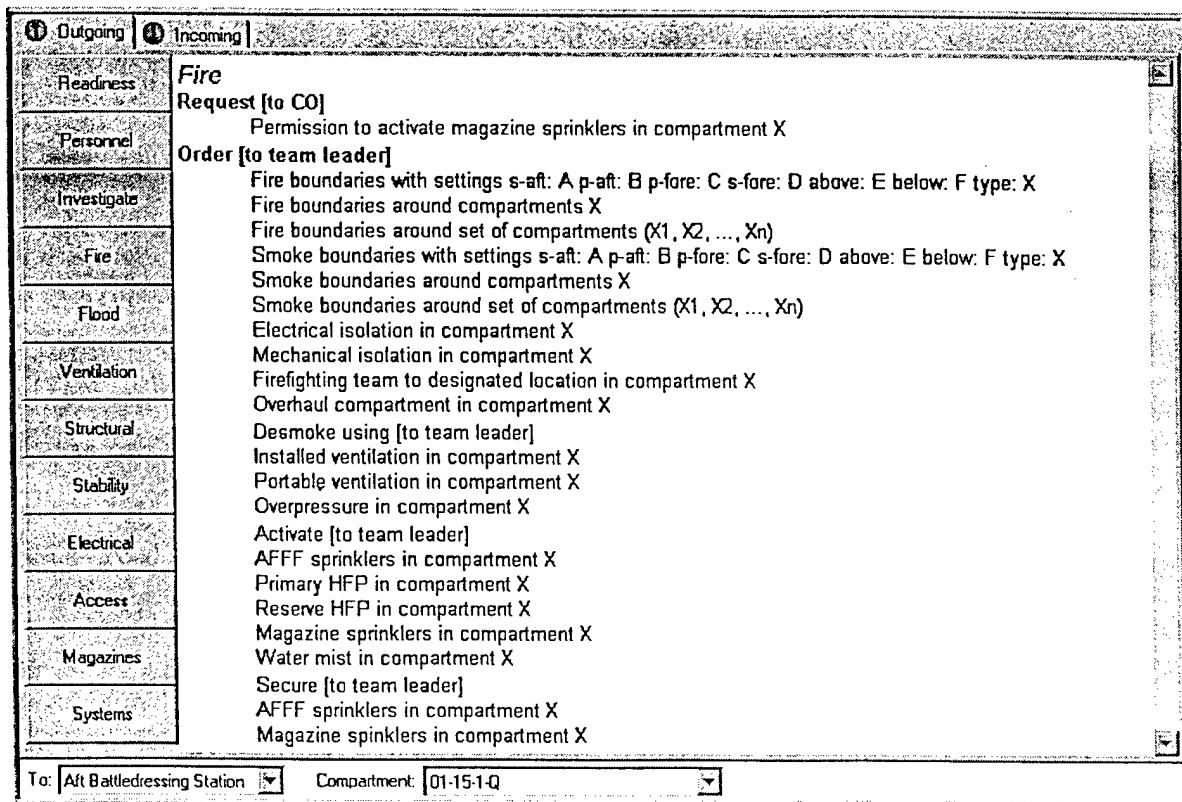


Figure 11. Command Menu

Example of using the above menu:

To **Order GQ**:

1. Click the **Outgoing** tab in the Command Menu
2. Click the **Readiness** button
3. Highlight and click the **Order GQ** option under the Order subheading

Note: Some commands require specifying a recipient, which can be done in the list box labeled **To**: at the bottom of the Command Menu, and also specifying a compartment to act on, which can also be selected at the bottom of the Command Menu in the list box labeled **Compartment**.

5.1 Using the Action Window

The three boxes in the lower-left of the full-screen interface comprise the Action window (Figure 12). The three panes of the window are labeled **Pending**, **Active**, and **Overridden Actions**.

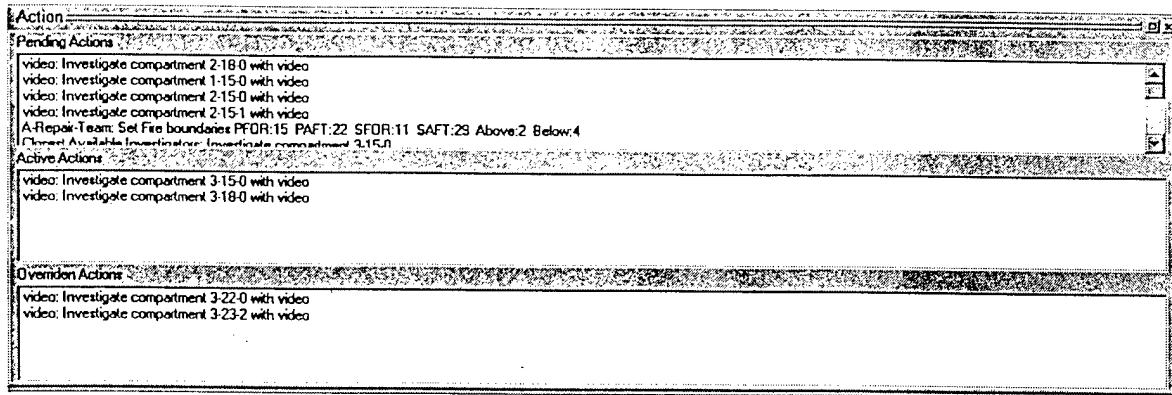


Figure 12. The Action window

The first box, **Pending Actions**, displays in real time all the recommendations of our behind-the-scenes expert system, MinervaAE. Once MinervaAE has reported its recommended course of action, the DCA is encouraged to provide feedback to the expert system. In this interface, MinervaAE can accept two inputs: activating a proposed action, and overriding one.

To perform either an activation or an override:

1. Click the mouse on the text of the proposed action
2. Drag it to either of the other two windows, **Active** or **Overridden**

Based on the feedback that the DCA provides, MinervaAE will take other actions. For instance, if our Bayesian Crisis Recognition procedures deduce the presence of a critical fire in a compartment, MinervaAE will recommend that the DCA order the investigation of the compartment with video (provided the compartment is equipped with a video camera).

To alert MinervaAE that the DCA is executing the proposed action:

- Drag this action to the **Active** window.

In the above example, MinervaAE will then wait until it receives reports, given elsewhere in the User Interface, of the results of the video investigation.

If the DCA instead drags one of MinervaAE's proposed actions to the **Overridden** window, MinervaAE will record that the action was not executed, and will not expect input. However, at any time, the DCA may drag any action from the **Overridden** window to the Active window, thereby canceling the Override command. MinervaAE will then begin to expect input exactly the same as if the action had been dragged to **Active** initially.

5.2 Using the History Menu

The History window (Figure 13) displays both incoming and outgoing commands, as well as a history of all the alarms on the ship and finally a demo menu where the user can issue reports of fires.

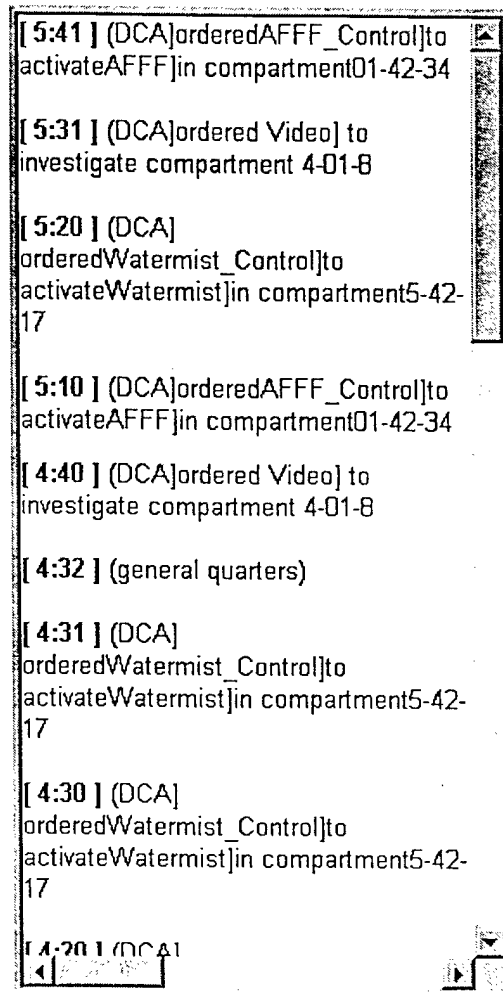


Figure 13. History window

6. The Scenario Generator Interface

6.1 Description

The user can specify the type of crisis, difficulty level, and then create a new scenario. There are also options to modify, reclassify, and delete old scenarios. The scenarios can be run with or without live emulation as well.

6.2 Starting the Scenario Generator

To run the Scenario Interface complete the following steps:

- In the Task Bar Hit **Start** then select **Run**
- Type *D:\scen gen demo\scenlaunch.exe*
- Hit **Enter**

The Scenario Generator should now be started

Figures 14 through 16 show screens from the Scenario Generator interface.

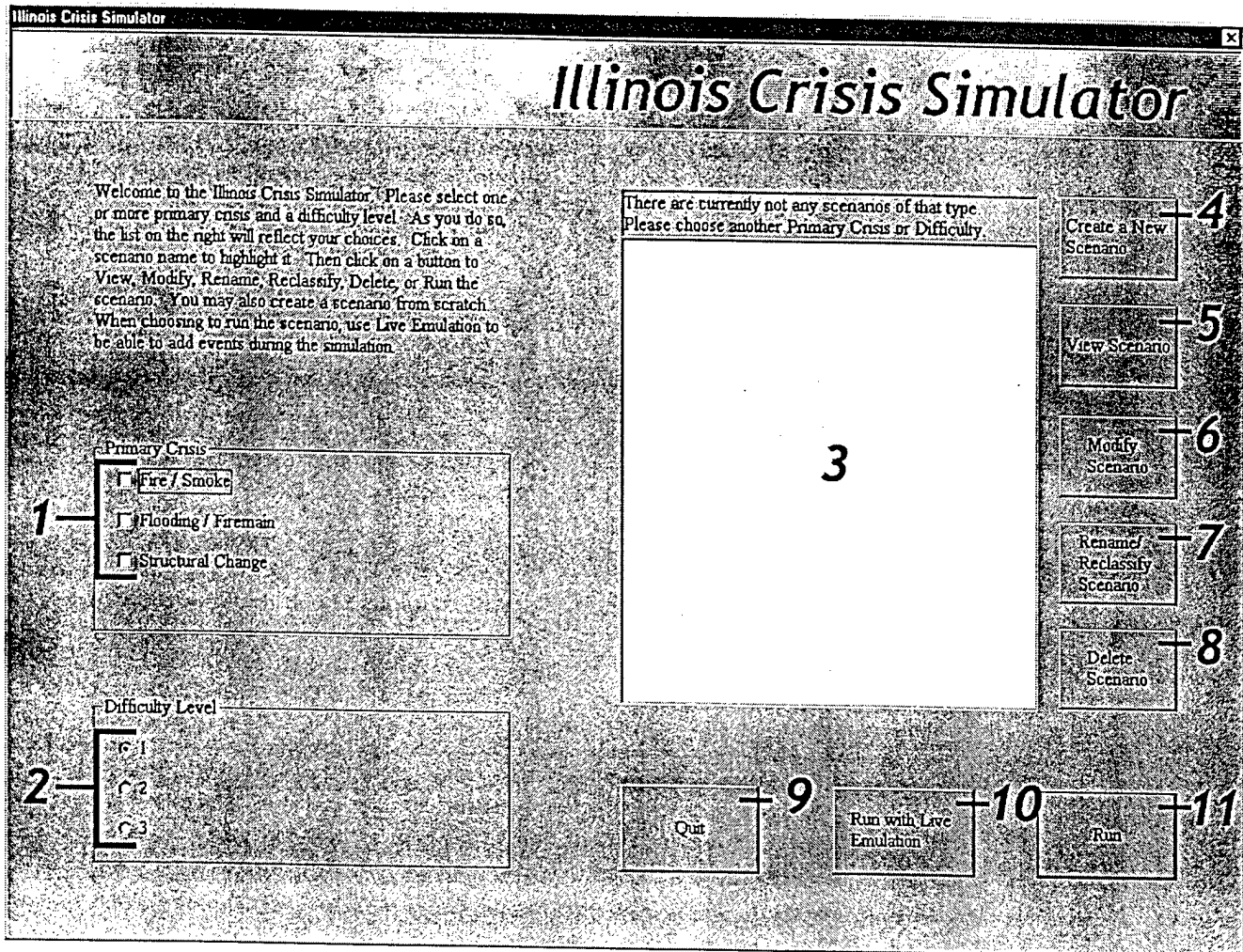


Figure 14. Scenario generation main menu

1. **Primary Crisis** – Select what types of events occur in the scenario.
2. **Difficulty Level** – Select the number of events in the scenario.
3. **Scenario List** – Listing of scenarios in the database that match criteria to the left.
4. **Create a New Scenario** – Go to the scenario creation tool.
5. **View Scenario** – View the events of the currently selected scenario.
6. **Modify Scenario** – Modify the events of the currently selected scenario.
7. **Rename/Reclassify Scenario** – Change the name or the classification of the currently selected scenario.
8. **Delete Scenario** – Remove a scenario from the database permanently.
9. **Quit** – Exit ICSSG.
10. **Run with Live Emulation** – Edit a scenario while it is running (for future version).
11. **Run** – Start the simulator with the events of the currently selected scenario.

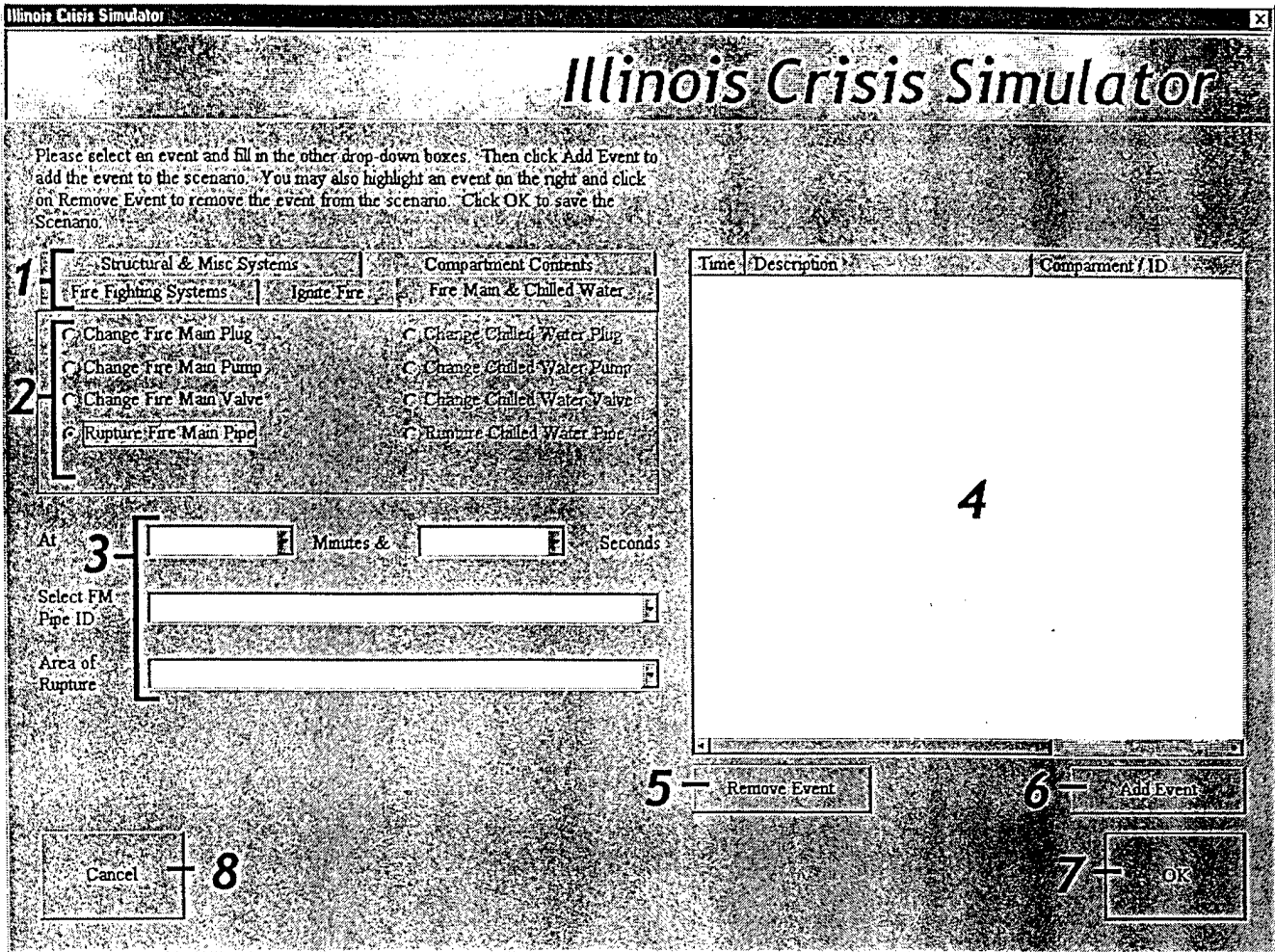


Figure 15. Scenario generation create/modify menu

1. **Event Categories** – Click on a tab to list events of the selected type.
2. **Event Types** – Click on an event type to fill in information about it.
3. **Event Information** – Fill in the information for the event you desire to create.*
4. **Event Listing** – List of events in current scenario.
5. **Remove Event** – Highlight an event and click this button to remove it.
6. **Add Event** – Fill in the information on the left and click this button to add the event to the scenario.
7. **OK** – Click when finished adding/removing events to save the scenario.
8. **Cancel** – Click to cancel any changes made and to return to the main menu

* Different events need different information. Some will have dropdown boxes while others may only have 2-4 selections. You need to fill in or choose all options before you may add the event.

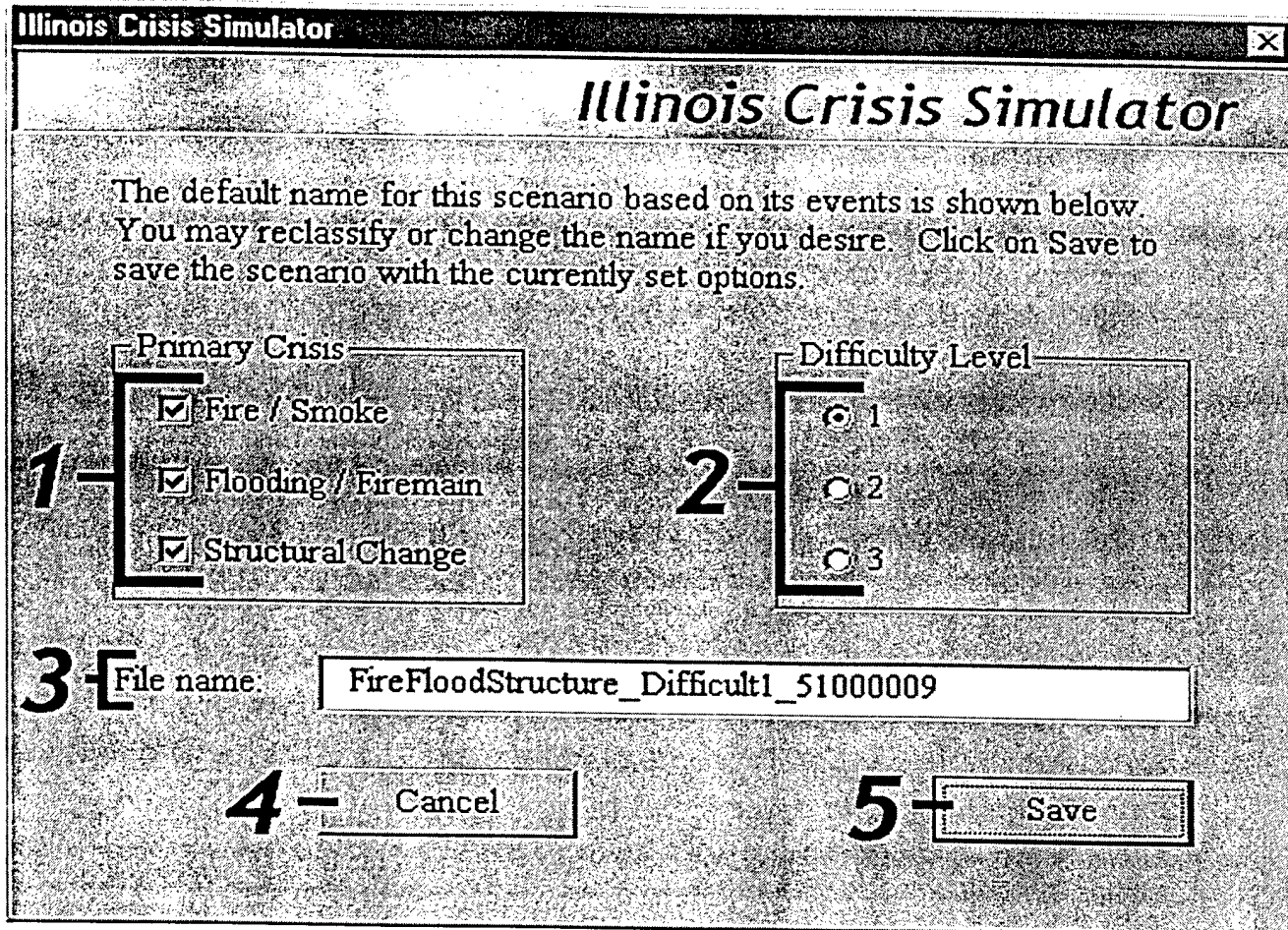


Figure 16. Scenario generation save/rename/reclassify window

1. **Primary Crisis** – Select what types of events occur in the scenario.*
2. **Difficulty Level** – Select the difficulty rating of the scenario.
3. **File Name** – Choose a name for the scenario.
4. **Cancel** – Click to cancel saving, renaming, or reclassifying the scenario.
5. **Save** – Click to make your changes permanent.

* The Save box will fill in classification information and a generic name based on what events are included in the scenario the first time that you save a scenario. You may change any classification information and rename the scenario if you desire.

7. Running Simulation Scenario

7.1 Description

The infamous scenario seven can be simulated easily using the DC-SCS system.

Outline of events in scenario #7 of 98 DC_ARM/ISFE Demonstration Tests [Williams, F.W., et.al., 2000]:

1. Simulation starts at time 0. There is one big pile of wood in compartment 3-18-0-C and one small pile of wood in compartment 2-18-0-C. All vents closed.
2. Compartment 3-18-0-C is ignited at time 30.
3. At time 40, scuttle 9 (from compartment 3-18-0-C to 2-18-0-C) is opened and 3 wall ruptures are added on the same floor. Smoke spreads from compartment 3-18-0-C to compartment 2-18-0-C immediately.
4. At time 120, fire boundaries are set but it may not be effective.
5. At time 160, ventilate (desmoke) compartment 2-18-0-C is started.
6. At time 660, a firemain rupture is set on pipe 85 in compartment 2-22-1-Q. The compartment is flooded, and firemain pressure drops to 5 PSI (originally around 90 PSI).
7. At time 810, the valve (2-23-1) is closed to isolate the firemain rupture, and thus stops flooding in compartment 2-22-1-Q and restores firemain pressure to 90 PSI.
8. At time 1500, fight fire in compartment 2-18-0-C using water. Fire is put out.
9. At time 1700, fight fire in compartment 3-18-0-C using water. Fire is put out.
10. At time 2160, ventilate (desmoke) compartment 3-18-0-C.

7.2 Starting Scenario 7

To start Scenario 7 and the Simulator simply load One-Click as described in starting the system, but this time, before hitting Go, select the **Illinois Simulator Option** instead of **Shadwell Masscomp** [Street, T.T., et.al., 2000]. Everything will load automatically when the user presses **GO** on the One-Click interface. The system will load, and proceed to execute Scenario 7.

8. DC-SCS Users Manual: One-Click Interface Options (Figure 17)

Source of Data

Shadwell Masscomp	Default Selection, Connects to Masscomp Server, user must specify correct IP and Port
Illinois Masscomp Illinois Simulator	Not Yet Implemented Loads the Simulation Automatically, Server IP and Port number not required
Stored Datafile	Loads the Server (c:\cygwin\tmp\server.exe) automatically, use IP = 127.0.0.1 and port = 10030
OnTheFlyGenerator	Not Yet Implemented

Configuration

Default	All windows except Visualization and Interface Hidden
Custom	Allows user to unhide and deactivate certain modules

Scenario Type

Wartime	Sends GQ Message at Startup
Peacetime	Peacetime, NO GQ SET!

User

Documentation

Yes	Not Yet Implemented
No	Not Yet Implemented

The screenshot shows the 'OneClick' application window with the following sections and options:

- Source of Data:** Select the Data Source.
 - Shadwell MassComp
 - Illinois MassComp
 - Illinois Simulator
 - Stored Datafile
 - OnTheFly Data Generator
- Configuration:** Select the startup configuration.
 - Default
 - Custom
- Scenario Type:** Select the Type of Scenario.
 - Wartime
 - Peacetime
- User Documentation:** Would you like to see start-up documentation?
 - Yes
 - No

A 'Go' button is located at the bottom right of the window.

Figure 17. One-Click Interface options

9. References

1. Carhart, H.W., Toomey, T.A. and Williams, F.W., "The ex-USS SHADWELL Full-Scale Fire Research and Test Ship", NRL Memorandum Report 6074 of 6 October 1987, re-issued September 1992
2. Street, T.T., Bailey, J., Riddle, T., Tate, D. and Williams, F. W., Upgrades to Data Handling Capabilities on ex-USS SHADWELL," NRL Ltr Rpt 6180/0229 of 06 June 2000
3. Williams, F.W., Tatem, P.A. Parker, A.J., Strehlen, B.D. Scheffey, J.P., Wong, J.T., Darwin, R.L., Pham, H., Runnerstrom, E., Lestina, T., Bradley, M., Toomey, T.A. and Farley, J.P., "Results of 1998 DC-ARM ISFEE Demonstration Tests," NRL Formal Report, NRL/FR/6180—00—9929, April 25, 2000