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FIREMAID: COMPARTMENT EDITOR

S. R. KENNETT, G. I. GAMBLE AND B. SUENDERMANN

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FIREMAID: Compartment Editor

S.R. Kennett, G.I. Gamble and
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Abstract

This document forms the instruction manual for the compartment editor of the fire management training aid, called FIREMAID.

FIREMAID is a graphics based, interactive ship fire fighting simulator, which can be based on a range of naval ships.

The compartment editor enables the creation or alteration of ship description files as well as the development of scenarios for the fire simulation.

DSTO MATERIALS RESEARCH LABORATORY

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Materials Research Laboratory
Cordite Avenue, Maribyrnong
Victoria, 3032 Australia

Telephone: (03) 246 8111
Fax: (03) 246 8999

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1. Introduction

This manual describes the program COMP-EDIT. It was written to enable an instructor to define and modify ship compartment details and set up fire incident scenarios on FIREMAID data disks [1]. The COMP-EDIT program is included on the COMPARTMENT EDITOR disk.

The file structure of a FIREMAID data disk is described to allow new ship data disks to be set up or images to be added to an existing ship data disk. Some knowledge of AMIGADOS, the Amiga computer's operating system, and familiarity with a text editor is necessary to create a new data disk.

The examples used in this manual will refer to the data disk set up for an FFG-7 frigate.

2. Data Disk Structure

The following section describes the files contained on the FIREMAID data disks which contain the description of the ship and a number of possible fire incidents.

The logical label [2] for all ship data disks is "SHIPDATA". Both the FIREMAID program and COMP-EDIT refer to the data disk by this logical label when accessing the data files.

Two directories, *pics* and *sdata*, are contained on the data disk .

The directory *pics* contains the screen image files. These images are digitised images of the ship's damage control diagrams and are used to set up the ship description. Although it is not strictly necessary, it is recommended that the images be stored in this directory. The *ship.plan* file in the *sdata* directory determines the image locations by also including the data path on the SHIPDATA disk through the pics directory.

The ship images must exist before the COMP-EDIT program is used. Some of the digitised images used to describe an FFG-7 are shown in Figure 1. The top four decks of an FFG-7 have been split into 3 images per deck for the image array. The images can be obtained from digitising sections of the damage control boards or by drawing the images, using computer packages such as DELUXEPAINT [3] or DIGIVIEW [4]. It is recommended that each image overlaps its neighbour (on the same deck) so as to include a major frame (or bulkhead) which is common to the neighbouring image. All other overlapping information will be disregarded. Thus each image will have unique compartments.

It is recommended that each image have no more than 30 compartments, otherwise information displayed by the FIREMAID program may become too cluttered to clearly comprehend.

The *sdata* directory contains the following files:

comp.dat
desc.n (*n* =1, 2, 3..)
scores
flooding.information
firestart.dat
ship.plan

The *scores* file, the *desc.n* files and the *firestart.dat* file are the output files of COMP-EDIT's "New Incident" option. The *scores* file is used by the FIREMAID program for performance evaluation and storage. The *desc.n* files contain a description of each incident stored in the *firestart.dat* file. The *flooding.information* file contains data necessary to calculate stability values for the ship concerned. The data is stored numerically in the following format (e.g. for an FFG-7) :

1	Density of liquid (ie water)
3900	Ship mass (tons)
12	Width of ship at deck level (metres)
13	Total height of ship (metres)
136	Total lenght of ship (metres)
45	Angle of hull to horizontal (degrees)
4	Height of centre of mass (metres)
7.5	Height of deck (metres)

The file *ship.plan* must exist before using COMP-EDIT. It contains information on the screen image files used by COMP-EDIT. The number of decks, the number of images per deck and a list of image names are stored in *ship.plan*. An example of the file format of *ship.plan* for an FFG-7 is as follows:

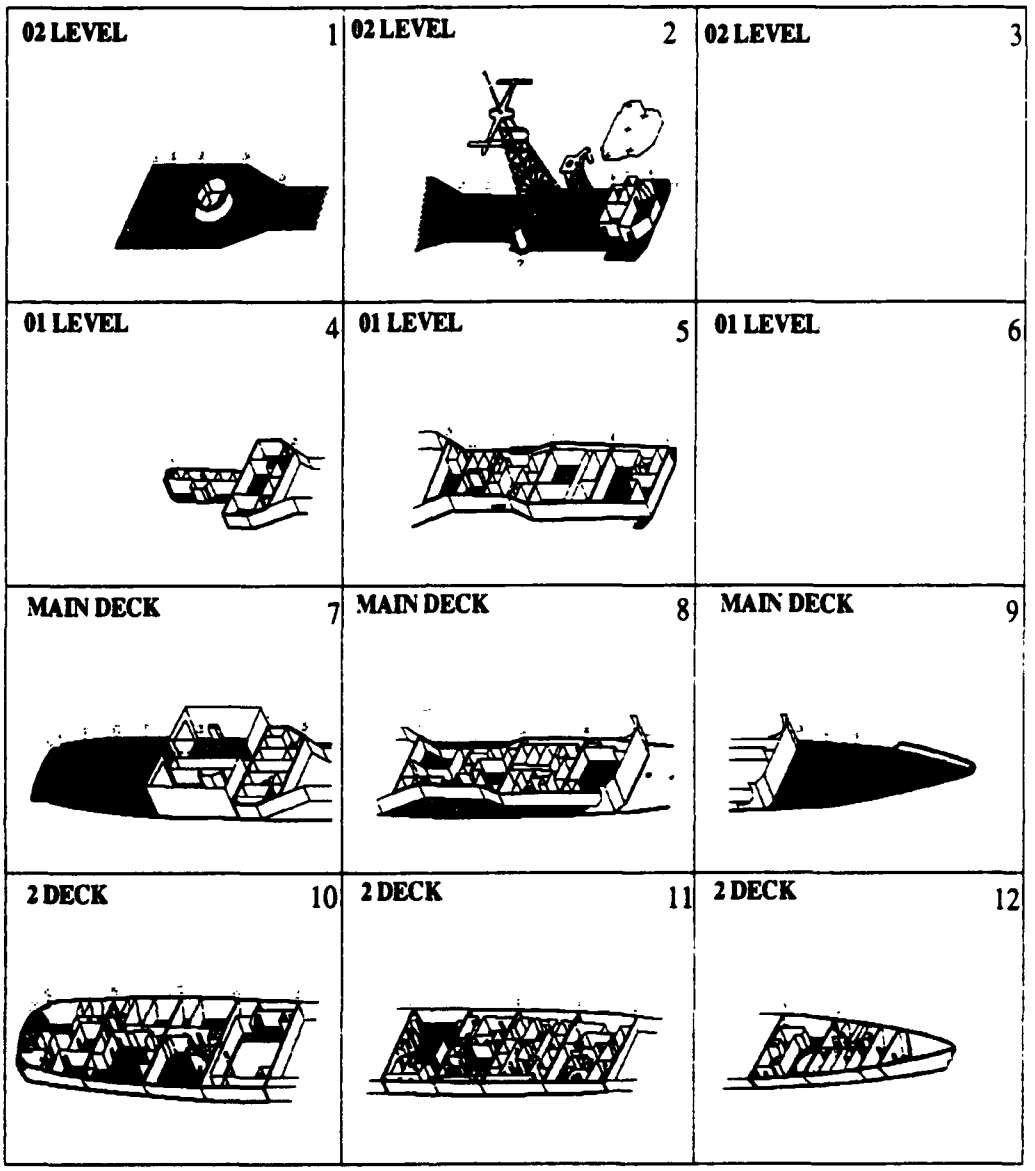

Figure 1: *The FIREMAID suite of programs use digitised images of a ship's damage control boards. This figure shows the top four decks of a FFG-7, which are the first twelve images listed in the* ***ship.plan*** *file.*

7	Number of decks
3	Number of images per deck
4	Home deck
"shipdata:pics/02level-back"	
"shipdata:pics/02level-middle"	
"shipdata:pics/02level-forward"	
"shipdata:pics/01level-back"	
.	List of image files
.	
.	
"shipdata:pics/2plat-forward"	
"shipdata:pics/hold-back"	
"shipdata:pics/hold-middle"	
"shipdata:pics/hold-forward"	
"O 2 level"	
"O 1 level"	
"main deck"	
"2 deck"	
"3 deck"	Name of each deck
"4 deck"	
"5 deck"	

For an FFG-7, with three images per deck and seven decks, a total of twenty-one images describe the entire ship. The "home" deck in this case has been chosen as the fourth deck down in the image array (see Fig. 1), or 2-deck. The central image of the "home" deck (or the right-of-centre image for an even number of images per deck) is displayed regularly during the execution of COMP-EDIT, as a reference image for the image array. Thus the home deck should be chosen for quickest access to all other images in the array. The image file names (including logical data paths) are then listed so that the first image depicts the aft section of the topmost deck and the last image depicts the forward section of the lowest deck. This produces a sequence similar that shown in Figure 1. The last section of ship.plan contains the name of each deck as verbalised during execution of the FIREMAID program.

The file *comp.dat* contains the bulk of the data describing the ship including all bulkheads, compartments and associated information. It is extensively modified during the operation of the COMP-EDIT program.

One last file, called *status.scrn*, must exist on the *shipdata* disk. This is a picture file used by the FIREMAID program but is not used by the COMP-EDIT program.

3. *Editor Instructions*

A ship is best defined in the following order. Firstly, major bulkheads or frames are defined for each ship image. Secondly, compartment locations (and contents) are to be defined with reference to these frames. The compartments must then be linked to their neighbouring compartments, so that, finally, fire incidents can be set up for use in the FIREMAID program.

To define the vessel in this manner, three menu titles are provided - FRAMES, ROOMS and CONTROL. The menu heading will appear when the right mouse button is pressed. These menus and their options will be described in the following sections.

For the sake of brevity in these instructions we will define the following:

Click "object" – This will mean position the mouse pointer over the "object" then press and release the left mouse button.

Select "item" from the menu – Move the mouse pointer to the title bar at the top of the screen (where "Compartment Editor" is printed), and press and hold the right mouse button. While still holding the right mouse button down, move across to highlight the desired menu title, then descend to the menu "item" required (which will highlight when the mouse is over it) and release the mouse button over your selection.

Keyboard entry – Remember to press the RETURN key after all keyboard inputs – where the cursor remains on the same line, to complete your entry.

Image manipulation – To move off the "home" ship image and onto another image, press the arrow keys (up, down, left, right) on the keyboard.

To use the COMP-EDIT program, turn on the computer and insert the COMPARTMENT EDITOR disk into the disk drive.

It will take the program a minute or so to load. When fully loaded the program will show a screen which will ask you to insert a data disk. Once the disk drive light is off, eject the compartment editor disk from the disk drive, and insert the data disk which contains all the information about the ship. (For example, for the FFG-7 this is labeled "FFG DATA").

Click the left mouse button once (as instructed) and the program will start. An image of a deck section will appear, with the instruction to "Make a selection from the menu".

4. *Frames*

Before any compartments can be created on the ship, the key bulkheads, or frames, must be defined as reference points. The program uses this bulkhead information to determine neighbouring compartments both horizontally through bulkheads and vertically between decks. Two adjacent images sharing a common bulkhead should both have the bulkhead defined, as seen in Figure 2. Adjacent images without common bulkheads are considered to have no neighbours on the adjacent image. If no common bulkheads are defined between decks, the procedure to link compartments (section 6.2) will take slightly longer, but vertical neighbours will be linked.

The bulkheads are defined using the FRAMES menu. The following subsections describe the functions of the FRAMES menu.

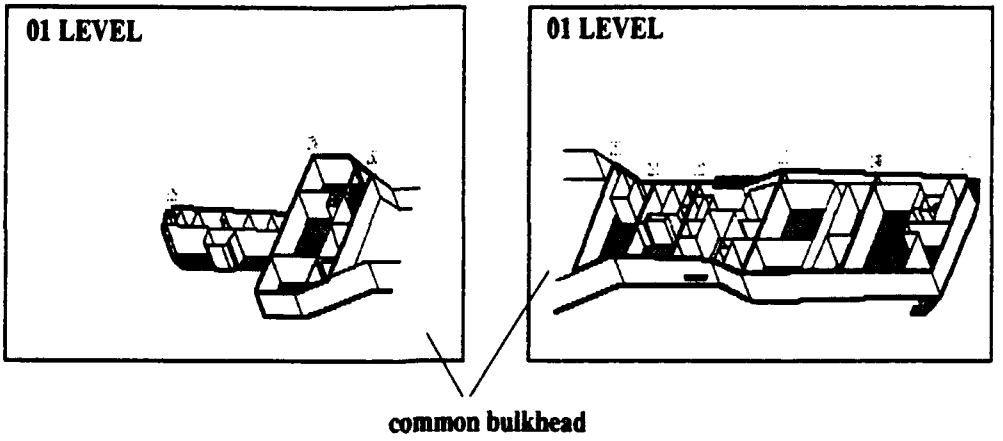

Figure 2: Adjacent images require a common bulkhead to be defined.

4.1 Add Frame

Select "Add Frame" from the menu.

To add a frame, type in the image number to which the frame is to be added (where image numbers increase from aft to forward, and down decks, as seen in Fig. 1). The image will then be shown on the screen and the frame number requested. Type in the frame number (pressing the RETURN key afterwards). Position the mouse over an end point of the new frame and click the left button. A red spot will appear at the selected position (the x,y coordinates of this position appear on the screen). Then move the mouse to the other end of the frame and click again. Another red spot appears. The frame is now defined as the straight line between these two point. The sides of the vessel are defined by straight lines between two adjacent frames.

To add further frames on the same image repeat the process, by entering the frame number and clicking on the frame end points. For frames on another image, press the RETURN key when the next frame number is requested, enter "A" to continue adding (or RETURN to stop) and enter the new image number when requested.

If an existing frame is in the wrong location (that is, the mouse was positioned incorrectly) then this frame may be redefined by entering the same frame number and repositioning the mouse to click over the correct frame end points.

Frames may be entered in any sequence as they will be automatically sorted into ascending order.

4.2 List Frames

The selection of "List Frame" from the FRAMES menu will display a list of the existing frames in the compartment data file.

The image number is shown in blue, followed by the list of frame numbers and their corresponding lower and upper end point coordinates on that image.

Clicking the mouse will display the next page of frame numbers and pressing any keyboard character will exit "List Frame".

4.3 *Delete Frame*

An existing frame can be totally deleted from an existing compartment data file by selecting "Delete Frame" from the FRAMES menu.

Once selected, type in the number of the image on which the frame is located, and then the frame number. You will be alerted to any errors. The deletion has been made when the words "Make a selection from the menu" appear on the screen.

5. *Rooms*

The ROOMS menu allows the addition and alteration of compartments within the structure of the vessel created using the FRAMES menu.

Compartments are placed in the data file such that each compartment has a particular record number. Any additions, changes or listings of a particular compartment must reference the relevant record number.

Note that the items in this menu should be considered only after the vessels major frames have been defined in the data file, by using the FRAMES menu.

Awkwardly shaped compartments may be defined several times to encompass the shape of the original. Thus a long corridor may have several sections, on adjacent images.

The following subsections describe the options available on the ROOMS menu.

5.2 *Add Room*

Select "Add Room" from the menu to add a compartment to the compartment data file. Compartment details are entered with this item, with a line by line prompt. Firstly, you are prompted for the compartment label, or location marking, and then the compartment's descriptive name, which are both obtained from damage control board plans. (Press the RETURN key to complete each of these inputs.)

A description of the compartment contents may now be added. The contents of the previous compartment are listed as the default contents. You may have an empty compartment, in which case hit "Y" (yes), or wish to update the contents by hitting RETURN. A green highlighted area defines the maximum space you have to type in. The text will automatically wrap around onto the next line. Alternatively, the RETURN key will start a new line for more text. To stop adding contents, press the RETURN key on the beginning of a new line.

The next group of compartment descriptors are (in order) flammability, fuel load, automatic fire fighting factor and manual fire fighting factor. These must all be calculated from prior knowledge of the ship [5], and scaled to fit the range 1 to 255. Hitting the RETURN key without a number will set the previous value (shown in brackets) to be the new value for this compartment.

The relative ventilation of a compartment is entered as a number between 1 and 10. A value of 1 indicates poor ventilation and 10 indicates the best possible ventilation in the ship.

The manning level for action, cruising and damage stations are entered individually. A compartment is considered occupied if the compartment is manned for more than ten minutes in each hour. A maximum of 31 men are allowed in each compartment.

Details of the alarm systems are included next. If there are no sensors present, enter "N". If the compartment has any alarm systems, enter a "Y" (yes), then for each sensor type - flooding, smoke or heat - enter a "Y" or a "N" if present or not, respectively.

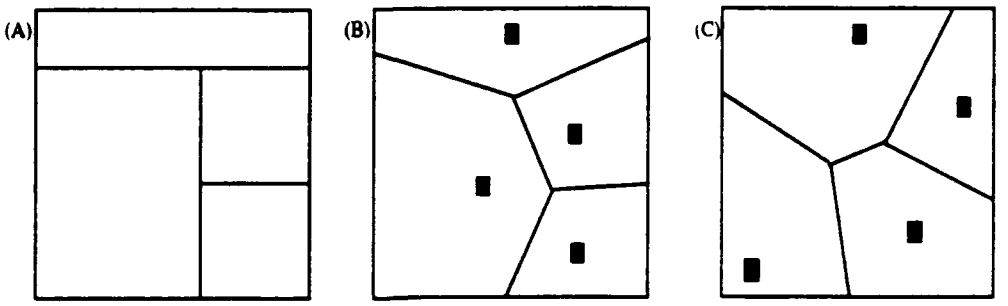

Figure 3: *An idealised section of the damage control board between two bulkheads is shown in 3(a). In 3(b) the program's approximation of figure 3(a) is shown based on the four compartment location points shown. Figure 3(c) shows an incorrect configuration of location points as adjoining walls are incorrect.*

Next, the user is prompted to type in a spoken name for the compartment, which will then be broadcast (based on phonemes [1]). If the spoken name sounds unsatisfactory, you may re-enter the name until satisfied with the result.

The last part of adding a compartment is locating that compartment. The "home" image of the vessel will be displayed on the screen. Using the arrow keys move to the image on which the compartment should be located. Click the left mouse button on the centre of the compartment to define that compartment's location.

The compartment walls are now considered to be bounded by the locus of points midway between this compartments' location point and the locations of the surrounding compartments, as shown in Figure 3. Bulkheads (defined by the FRAMES menu option) form the remaining walls. Figure 3(a) depicts a typical section of a vessel between two bulkheads. Figure 3(b) depicts an approximation of Figure 3(a) based on the location points shown. The exact shape of the compartment is not critical. However the existance of the correct common walls with neighbouring compartments is necessary for prediction of the progress of a fire incident. Figure 3(c) shows how an incorrect compartment location point can affect the common wall position. Therefore consideration of the compartment center point should be made. After clicking on the location of the compartment, the program will display the walls and location points of all the compartments within the two

bulkheads in blue, with the new compartment outlined in red. If the walls are not shown then the chosen compartment location is outside the ship as defined by the bulkheads and the compartment location should be re-entered.

If you are unsatisfied with the positioning of the compartment location, press the "C" key to change the location of the compartment. The COMP-EDIT program displays the "home" image again. Another image may be chosen using the arrow keys. Click on the new location.

The new compartment is now a record in the list of existing compartments. If a compartment had previously been deleted, then the new compartment will take the record number of the deleted one.

To add another compartment, press the "A" key. Otherwise, hit the RETURN key to escape back to the menu.

5.2 *Edit Room*

By selecting "Edit Room" from the menu the details of a particular compartment may be changed. A prompt for each of the characteristics listed in "Add Room" will be given. To leave a detail unchanged, hit the RETURN key. To edit a detail, type in the required alteration. The old entry will be updated.

When promped about alarms, a "Y" or "N" must be entered - the RETURN key will not work. Thus alarm information must be re-entered, even if these details were previously correct.

When you reach the option to adjust the compartment location, hitting the RETURN key means that no-adjusment is made. Typing "Y" (yes) will display the "home" image. To alter the compartment location, choose the correct image (using the arrow keys), and click the mouse on the required location. The editted compartment *locationwill be shown as bordered in red while the immediate neighbours are* bordered in blue.

If you are still unsatisfied with the positioning of the compartment location, press the "C" key to change the location of the compartment. Move to the correct image, and click on the new location.

Press RETURN to escape back to the menu, or press "E" to edit another compartment.

5.3 *Quick List*

By selecting "Quick List" from the ROOMS menu, the compartment record numbers are listed in red, with the corresponding compartment location markings and descriptive names listed horizontally. Clicking the mouse will continue the listing of records, while RETURN will exit back to the menu.

"Quick List" is intended for quickly finding the record number of a compartment that you wish to manipulate. If the "Fix Neighbour" option has been invoked then compartments are listed by image number - aft to forward, top deck to bottom deck. Compartments added or editted after a "Fix Neighbour" may be out of order.

5.4 *List a Room*

This option in the ROOMS menu lists all the details of a single compartment. On selecting "List a Room", a prompt for the record number of a compartment is given. On entering the record number, all information previously stored in the data file about that compartment (as entered in the "Add Room" option) is displayed.

The neighbours, bulkhead neighbours and vertical neighbour details list the record numbers of the surrounding compartments. These refer to, respectively, the adjoining compartments within the bulkhead section in which the compartment occurs; any adjoining compartments in the next bulkhead section; and the compartments directly above and below. The neighbour details may be out-of-date if compartments have been added or editted and the "Fix Neighbour" option has not been implemented.

Details of the next compartment (by record number) can be viewed by clicking the mouse. Again, hit the RETURN key to escape to the menu.

5.5 *Delete Room*

A compartment may be deleted from the data file by selecting "Delete Room". Once the compartment record number is typed in, the compartment name and location are listed in red, as a check that this is the correct compartment. You have the choice to delete the compartment or abort the deletion.

Future reference to a deleted compartment will give a "DELETED ROOM" message, unless a new compartment was later added, in which case the deleted record number would be used for the new compartment.

5.6 *Move Room*

Selecting "Move Room" allows for the moving of compartments, between a chosen pair of bulkheads. That is, if a compartment was mis-located it may be relocated within the same pair of bulkheads, without altering the compartment's contents. This option is used to correct wall positionings such as seen in Fgure 3(c). For drastic location moves around the vessel, the "Edit Room" menu option is required.

After selecting "Move Room" the "home" ship image is displayed. Use the arrow keys to obtain the ship image containing the location of the compartment to be moved. Click the mouse between the frames that are on either side of the current location of the desired compartment. The boundaries around all the compartments within these two frames will be shown in blue, and the compartment location points will be shown as yellow squares. Click on the new compartment location. Note that the compartment nearest the mouse click will be the compartment chosen to shift locations. The new location (and new shape) of the compartment will be outlined in red, with the immediate neighbours still bordered in blue.

To move a compartment out of its original boundaries will take several more operations, so "Edit Room" may be quicker.

If the new location is satisfactory then hit RETURN to obtain the menu again. Otherwise, pressing the letter "M" will allow you to repeat the "Move Room" process on any compartment on any image, although the previous image remains on the screen until the arrow keys are used.

5.7 *Print List*

"Print List" will give a hard copy of the "Quick List" option. That is, the compartment location marking and discriptive name of each compartment are listed by record number. To have the compartments sorted by image, the "Fix Neighbours" option needs to be implemented first.

Having selected "Print List", you are given an opportunity to set up the correct printer by using the Amiga Preferences [2] before continuing (The *editor* disk must be placed in the floppy drive). To access Amiga Preferences, hit the keys *Left Amiga* and *N* at the same time, and shrink the active windows on the Workbench screen to access the *editor* icon. This contains the Preferences - the instructions of which are in the Amiga Manual. After changing the printer and exiting the Preferences, return to the COMP-EDIT program screen by pushing the Workbench screen to the back (click on the gadget in the upper right hand corner of the screen). The mouse should then be clicked once in the program screen, and any key pressed to start printing. After a short delay, a request for the *shipdata* disk will be made. Replace the *shipdata* disk and return to the COMP-EDIT program screen as described previously. The program will then print the information, and will indicate completion by printing "Last room has been printed" on the screen.

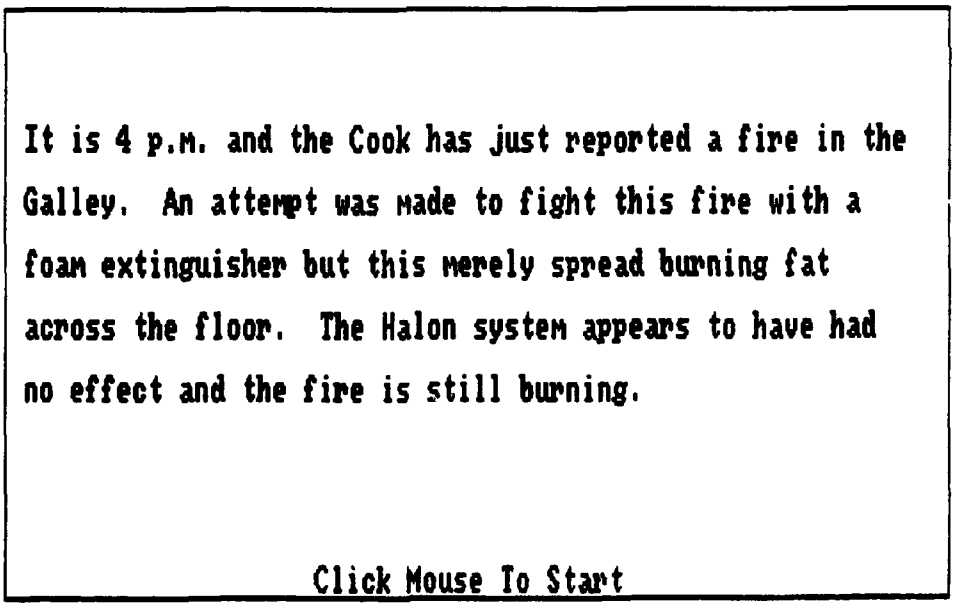

Figure 4: *The current vessel, mission and environment are described on this screen to give an idea of what lies ahead.*

6. Control

Once all compartments have been defined correctly, they must be linked together so that each compartment is referenced to all its neighbouring compartments, both vertically and horizontally. Then fire scenarios can be set up so that the compartment data file and the associated output files can be used by the FIREMAID program.

6.1 New Incident

Selecting "New Incident" allows the creation of one or more fire incidents which will be used by the FIREMAID program to initiate fires. (If multiple incidents are created then the FIREMAID programs will randomly select one.)

Note that the "Fix Neighbour" menu option must be run before selecting a "New Incident" if any updates to the compartment data file have occurred.

Decide how many incidents to create, then answer the listed questions for each incident, hitting the RETURN key after each numeric input.

First, enter the ship state (action station, cruising or alongside), then the number of compartments involved and their respective record numbers. Finally, enter a description of the current mission of the vessel. This is to set the scene at the beginning of the incident for the user of the FIREMAID program. An example mission description is displayed in figure 4. The RETURN key will start a new paaragraph. To end the description, hit RETURN at the start of a paragraph.

Repeat this process for each incident. Note that incidents cannot be edited nor can incidents be appended to an existing list, from within the COMP-EDIT program. Selecting "New Incident" again will overwrite existing scenarios. However, the incidents can be changed or appended using an AmigaDos editor [2]. The mission descriptions, *desc.n* where *n* refers to the incident number, are located on the data disk in the sdata directory. The file *sdata:firestart.dat* contains firstly, the number of incidents, then, for each incident, the number of compartments, the ship state and the compartment record numbers for that incident.

6.2 Fix Neighbour

Selecting "Fix Neighbour" from the control menu is a necessary part of constructing the data file for a particular ship. Once all the frames and compartments have been entered and all modifications are made, select "Fix Neighbour" to sort the compartment records and create the correct connections between neighbouring compartment. This process only needs to be run once, after all data has been entered. However, if further compartments are deleted, added or location moved, then "Fix Neighbour" should be selected again after these changes. Also note that because records are sorted, existing compartments may be assigned new record numbers, and therefore the incident files may no longer produce the incidents for which they were originally designed. In this case, "New Incident" may need to be selected again to update the incident files.

Records are first sorted by image number, then neighbours between common bulkheads are found. Next, vertical neighbours on adjacent decks, and finally neighbours between different bulkheads are obtained. A vessel with approximately 200 compartments defined will take approximately fifteen minutes to complete the process of linking adjoining compartments together.

The sorting of decks and linking of neighbours allows FIREMAID to rapidly reference a compartment, as well as propogate fire in a realistic manner [6].

6.3 Quit

To exit the program during execution, select "Quit" from the menu. The program will exit and put you back to the empty Amiga Workbench screen.

7. References

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AUTHOR(S)
S.R. Kennett, G.I. Gamble and
B. Siendermann

CORPORATE AUTHOR
DSTO Materials Research Laboratory
PO Box 50
Ascot Vale Victoria 3032

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