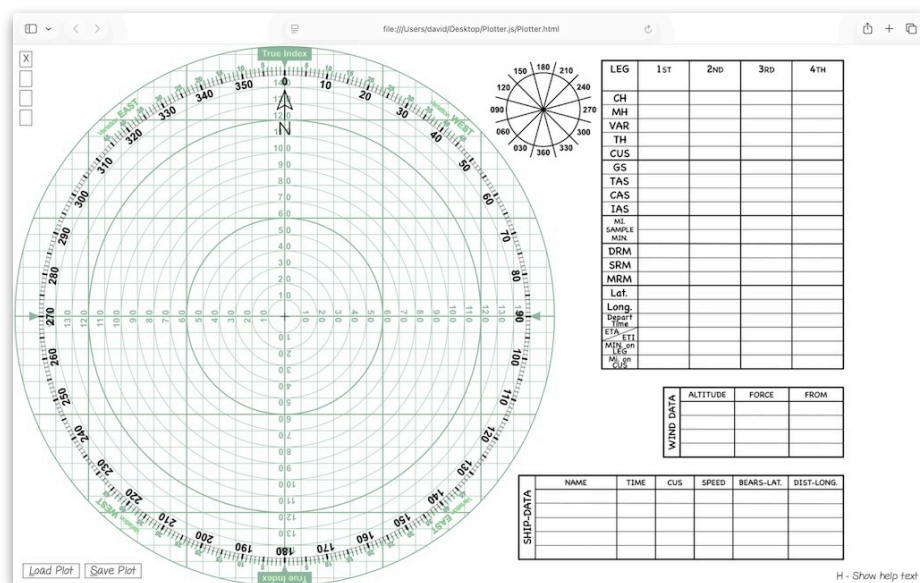
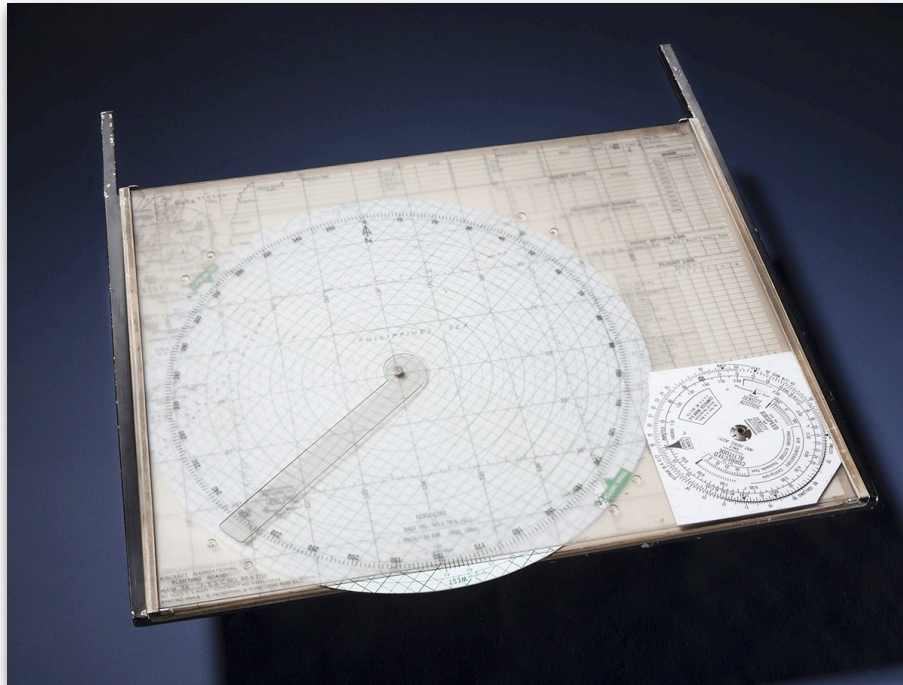


Plotter.js

A (simple) simulation of a Mk. 3 plotting board.



Introduction

The Mk. 3A Plotting board was a ubiquitous navigation tool used by US Naval aviators in WW2. It could be used as a small area plot from which bearings and distances could be measured. It could also solve wind triangle and intercept problems as well as numerous other navigation tasks.

It was mounted to slides underneath the instrument panel and could be pulled out for use during flight.



Fig 1.

A Mk. 3A plotting board installed in an aircraft.

The board also included a Mk. 8 Navigational computer attached to the right lower corner. This was a circular slide rule which could be used to solve time, speed, and distance problems as well as unit conversions and other mathematical problems related to navigation. The actual Mk. 8 also had functions to determine true airspeed, density altitude, and for altitude corrections. The computer in this program is missing some of the features of the actual Mk. 8.

How to Use

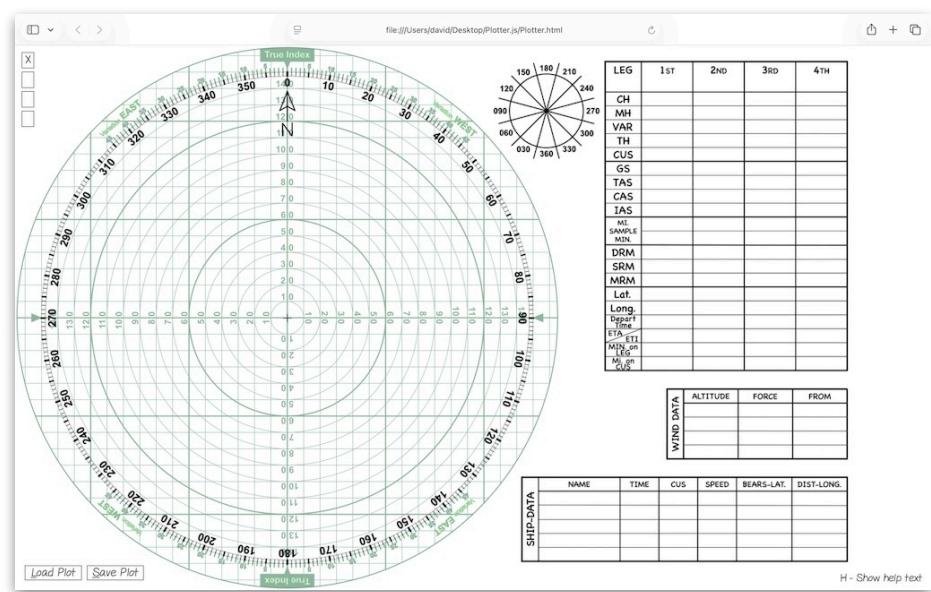


Fig. 2
A blank Plotter screen.

When you open the program you will start with a blank plot as in Fig. 2.

The circular area to the left is the plotting area. The tables are for you to keep track of relevant navigation information. They are purely graphical. You cannot click on them or manipulate them in any way.

ROTATING THE GRAPH

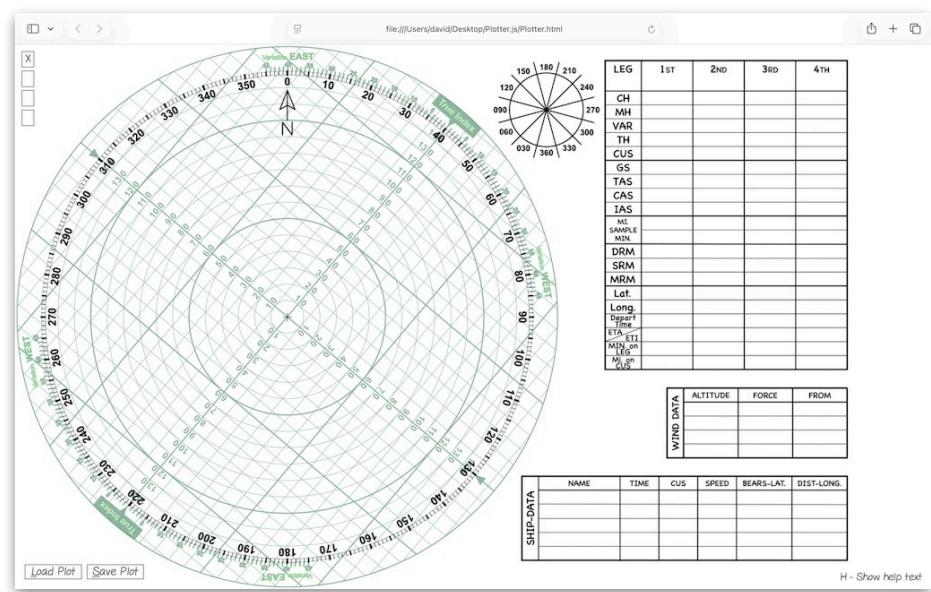


Fig. 3
The graph rotated 40 degrees.

When you are not performing some other action you can rotate the green graph by clicking and dragging. Use the index lines on the graph to turn it to a specific angle. This is used for plotting or measuring things with directions such as bearings or headings.

LAYERS

Although it is not accurate to the physical plotting board I have included the ability to use layers to segregate items belonging to different parts of the plot. For example, one layer may be used for the small area plot and another for a vector diagram. The screen area of this program is smaller than the actual surface area of the physical plotting board and so it tends to get crowded quickly.

The layers are controlled by clicking on boxes in the upper left of the window (See Fig. 4). Each box represents a layer.

Items drawn outside of the plotting area are not associated with a layer and are always displayed.

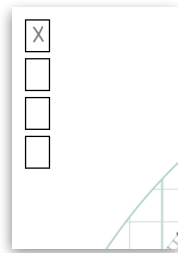


Fig. 4
The layer controls.

SCALE

The plotter has three scales with radii of 150, 200, and 300 NM.

You can cycle between them by pressing the 'S' key. When you change the scale only the current working layer is affected. That is to say that each layer has scale associated with it which will be selected automatically when that layer becomes the working layer.

When you change scale items in the plot area of the current layer will have their positions adjusted accordingly. Items which are drawn outside of the plot are, such as data in the tables, will be unaffected.

When using the plot to measure distances the result will be in nautical miles so the natural speed units to use are knots. Keep this in mind when flying a plane with the airspeed indicator calibrated in MPH.

PLOTTING POINTS

Points are useful when using to plotter as a small area plot to indicate specific locations. They are drawn as a dot with a small surrounding circle. The size of the circle can be increased by pressing the 'Right Arrow' key. Or decreased by pressing left.

To place a point press the 'P' key on the keyboard and the mouse cursor will change to a point. Move it to the location you want and click to place it.

You can cancel placing a point by pressing ESC

DRAWING LINES

Lines are used for vectors, such as wind speed and direction, or headings.

To draw a line press the 'L' key on the keyboard and the cursor will be changed to crosshairs. Move the crosshairs to the beginning of the desired line and click to set the start position. Then move to the desired end point and click again to set the end point. As with points you can cancel by pressing ESC.

The lines used to draw the points and lines can be made darker by pressing the 'Up Arrow' key or lighter by pressing the 'Down Arrow' key. Repeatedly pressing the key will increase the effect.

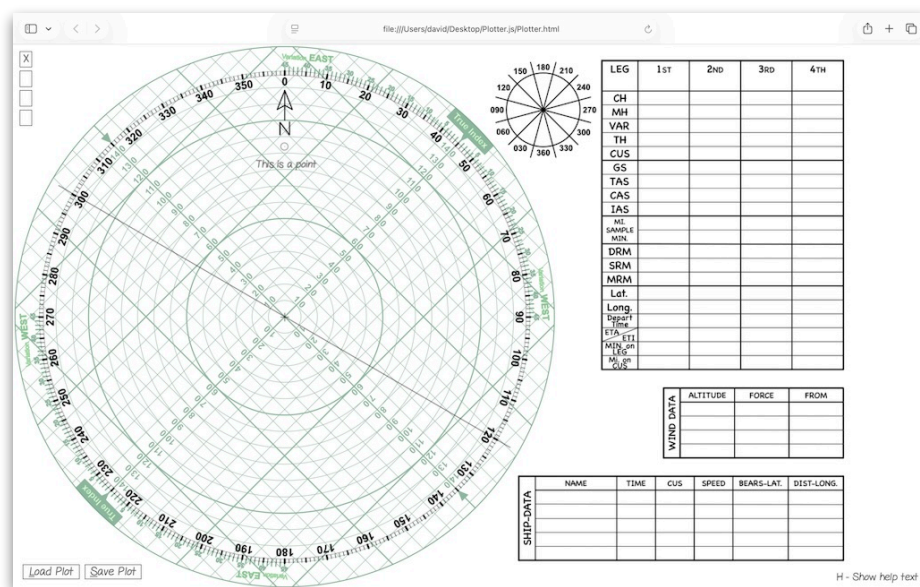


Fig. 5

The plot rotated to 45° with a line, a point, and some text.

CROSSHAIRS

You can display a set of crosshairs at the mouse cursor location by pressing 'X'. Press 'X' again to remove them. This is VERY useful for accurately placing points on a small area plot.

ENTERING TEXT

Text can be used to label points on the plot or to enter data in the tables. To enter text press the 'T' key. Then, enter your text which will show near the cursor. Once your text has been entered use the mouse to move the text to your desired location and click to place it.

You can enter the degree symbol (°) by pressing CTRL-0 (CONTROL and ZERO).

SELECTING ITEMS

Points, lines and text can be selected for deletion or modification. To select right-click on the plot. The item nearest the cursor is the selected one and will be highlighted in red. Move the mouse to select your desired item. When you are done selecting items press ESC.

Sometimes it is difficult to select an item if it is too close to another one. A good example is a point on a line. To help with this you can left click while selecting to toggle between the two nearest items.

DELETING ITEMS

Points, lines and text can be deleted. To delete an item right-click and move the mouse to select it. Once you've selected the correct item you can press the DELETE key or the 'D' key to delete. After you delete an item the program remains in selecting mode until you press ESC.

If you delete an item accidentally you can restore it by pressing CTRL-Z or the 'U' key.

EDITING ITEMS

Points, lines and text can be edited. Select the desired item by right-clicking and moving the mouse. To change the item press 'e'. Points will jump to the cursor and will be placed in a new position when you click. For lines the end closest to the cursor will jump to the cursor and will be placed when you click. Texts can also be moved in the same way. They can also have their text edited by typing when you are editing them.

If you start editing an item and decide you do not want to change it press ESC and the item will revert to its previous state.

Press ESC to exit selecting mode when you are done with your edits.

Note that CTRL-Z does not undo editing changes. It only restores deleted items.

CALIPERS

The program has calipers to aid in measuring lengths. They can be displayed by pressing the 'K' key and hidden in the same way.

Calipers consist of two parallel lines both perpendicular to the cross index line. One line is the base line and is decorated with small triangles. If you click and drag on this line both lines will

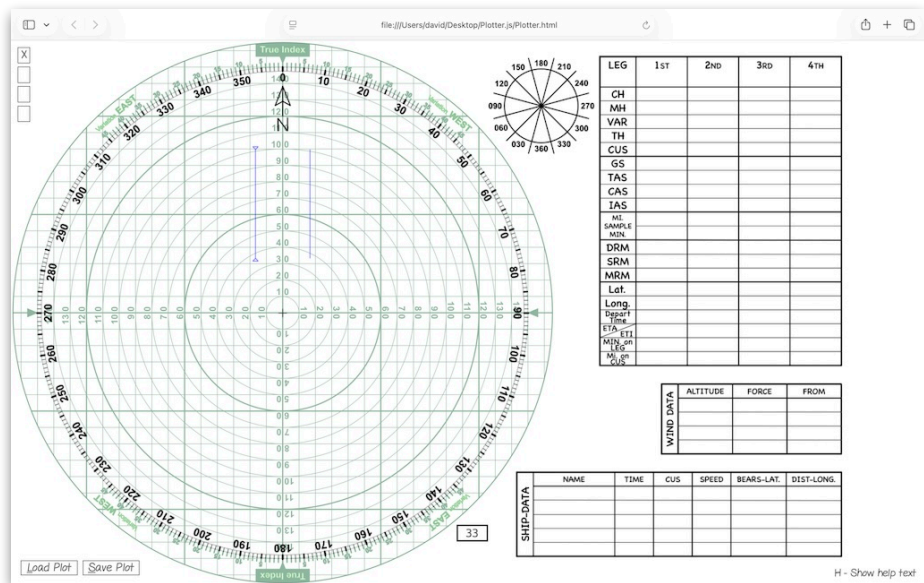


Fig. 6
A plot showing the calipers.

move, maintaining their distance from one another. If you click and drag on the other line you can set the spacing. The calipers will rotate with the graph to measure distances on an angle.

If you press CTRL-K you can toggle on and off an indicator which shows the distance between the caliper lines. You can see it in Fig. 7 to the lower right of the plot area. If you enter a number in this area the calipers will be set to that distance in nautical miles.

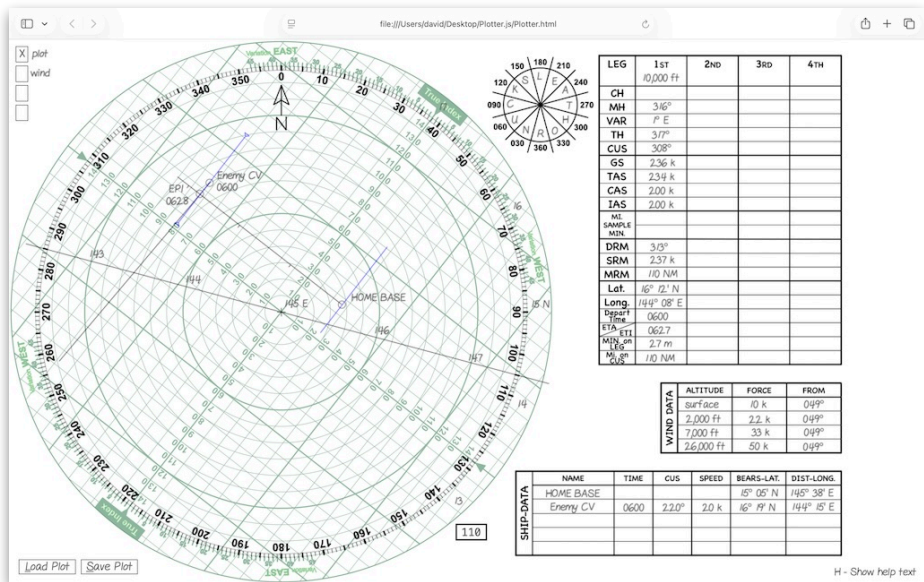


Fig. 7
Calipers set to measure a distance.

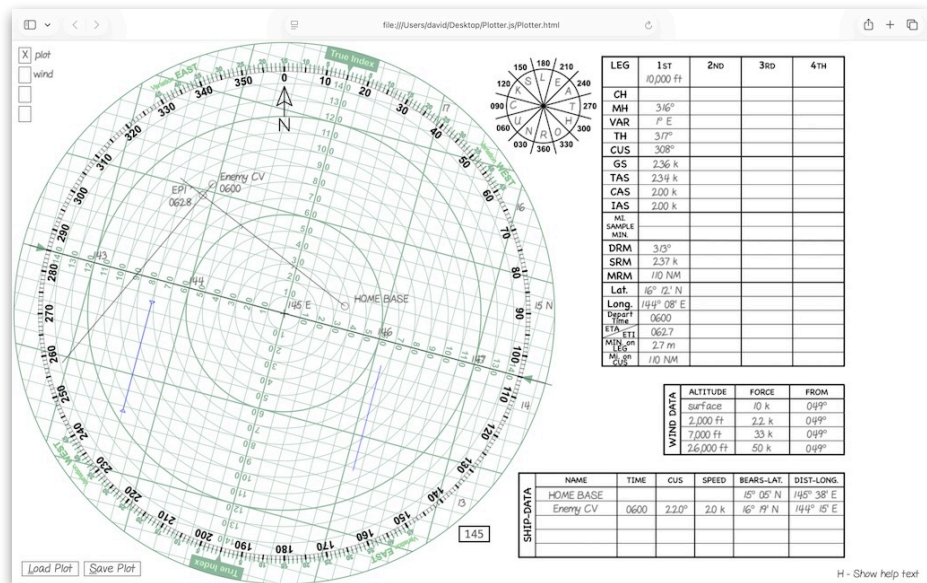


Fig. 8
Graph adjusted to set a center of 15° N by 145° E.

CENTERING THE GRAPH

You can establish the latitude and longitude of the center point of the graph, after which the program will display the latitude and longitude of the cursor as it is moved around.

To enter the center point first press 'K' to open the calipers. Drag the second line to the left of the base line for western longitudes or to the right for eastern. Enter the longitude of the graph center in the caliper range display box to the lower right of the plot area. Next rotate the graph to set the latitude. Rotate to the right for northern latitudes and left for southern. So the true index should point to 10° for ten degrees north latitude or 350° for ten degrees south latitude.

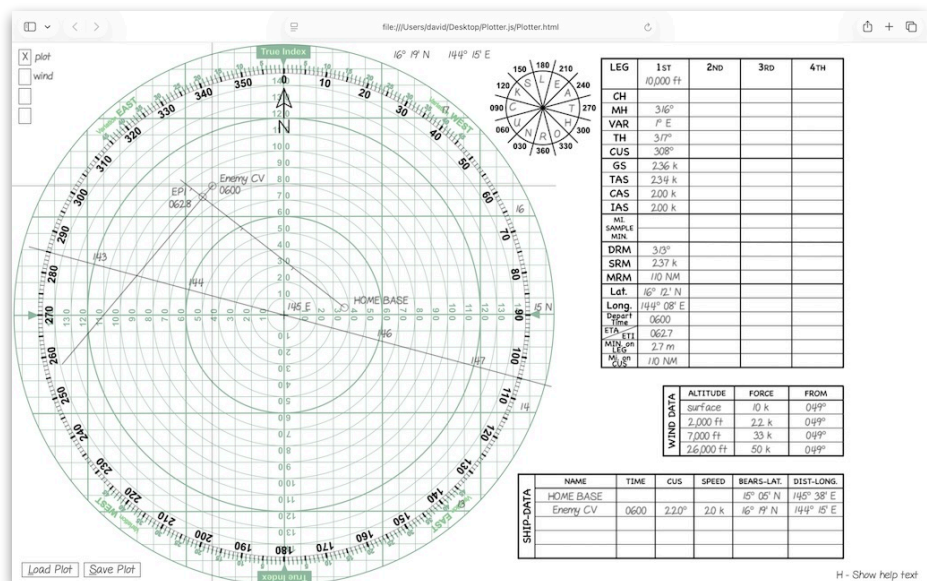


Fig. 9
Plot showing the latitude and longitude of the cursor.

Once the values have been set press CTRL-C to set the center. After this the location of the cursor will be displayed to the upper right of the plot area.

ADDING HASHMARKS

Hashmarks can be added to a line at ten minute intervals based on the entered speed. They can be useful for quickly estimating your position based on your time en route should something occur.

To add the hashmarks open the calipers by pressing 'K'. Type your groundspeed (in knots) into the caliper range box to the lower right of the plot area. Next select the course line you wish to add the marks to and press 'H'.

To remove the hashmarks follow the same procedure but enter zero as your speed.

SAVING AND LOADING

A plot can be saved by clicking on the 'Save Plot'. A dialog will open asking for a file name. Enter a name and click 'OK' to save the file or 'Cancel' if you do not want to save.

Apparently javascript gets nervous about saving data to your computer and so uses the file download feature instead of allowing you to choose where the file will be saved. It will always download to wherever your browser saves files by default. Then you'll have to move it to wherever you want to keep it.

A previously saved file can be opened by clicking the 'Load Plot' button. Navigate to the file you want and select 'Open' to load it or 'Cancel' if you do not want to load anything. When you load a file it completely replaces whatever you had in the plot before.

You can also save and load by typing CTRL-S or CTRL-L respectively.

MARK 8 COMPUTER

The Mk. 8 calculator can be opened (and closed) by tapping the 'C' key. It will appear over the graph area as in Fig. 6. To use it click and drag to turn it to the desired position.

You cannot create new lines or points with the calculator open but you can add text to the area outside of the plot area. You cannot select items with the calculator open.

Instructions for using the calculator are WAY beyond the scope of this document. It functions very similarly to E6B calculators and instructions for these are readily available on the web.

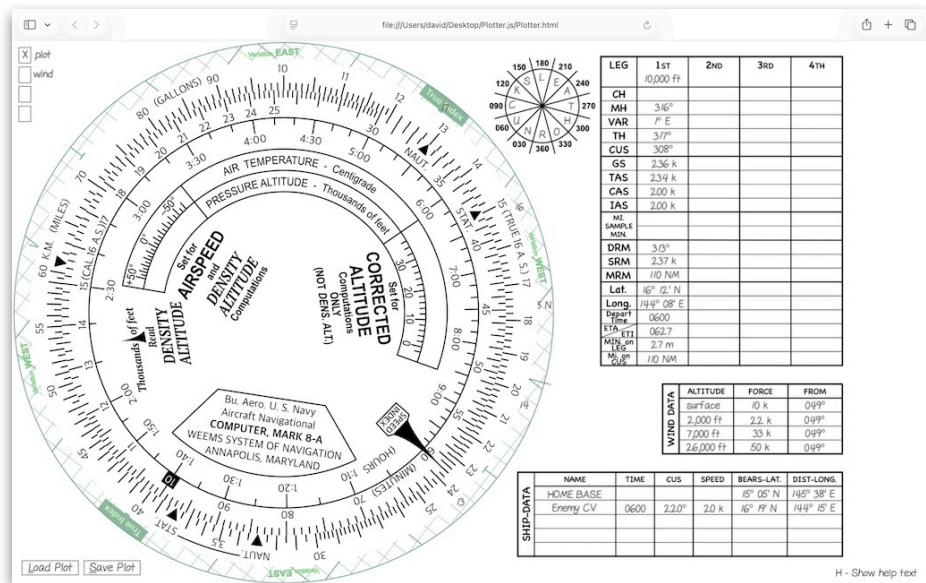


Fig. 10
A plot with the Mk. 8 computer open.

MAP OF THE MARIANAS ISLANDS

You can display a map of the Marianas islands on the current active layer by pressing 'm'. The map is correctly located for a center position of 15°N, 145°E. It will not be useful for any other location.

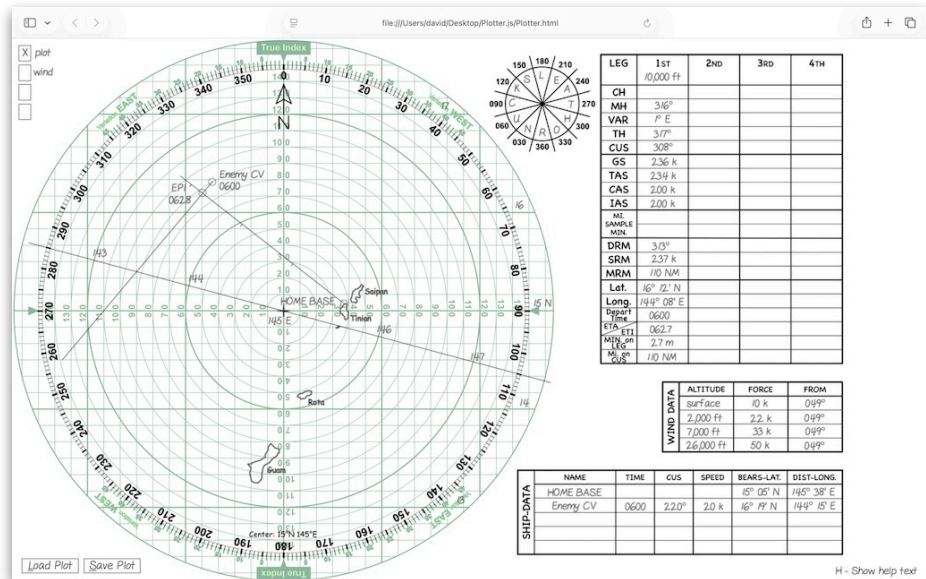


Fig. 11
A plot with the map displayed.

