

Sinclair[®] & Macmillan ZX Spectrum[®]

Science Horizons

CARGO



CASSETTE 48K RAM

SCIENCE HORIZONS
CARGO

Acknowledgements

Software developed by Five Ways Software.

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Educational aims

Cargo demonstrates the careful planning that is needed in loading a cargo ship to enable it to carry maximum cargo without risking the safety of the ship and crew.

The program shows how the Plimsoll line is used to show the limit to which a ship should be loaded. (Historical notes about the Plimsoll line are given in **Background information**.)

Cargo illustrates how the salinity (saltiness) of oceans and waterways affects how much cargo a ship can carry. This is shown on the Plimsoll line which has different marks for different kinds of water (see diagram).

The program demonstrates that storms and high seas are more frequent in certain areas than others, and the user must take account of these risks in order to make a safe journey.

In trying to load a ship safely, the user will see that it is important to consider the distribution of cargo in a ship. Overloading will cause a ship to sink, and bad distribution of load may lead to the ship capsizing.

Cargo helps users to understand the idea of density by showing that cargoes of the same *size* can have different *masses* (or 'weights').

Loading the program

Make sure your ZX Spectrum® is connected as explained in the Sinclair ZX Spectrum® manual.

Check that the tape is at the beginning.

Type **LOAD** then press **ENTER**
Start the tape.

The message **Loading please wait** should appear on the screen. The program takes about 3 minutes to load.

Running the program

When the program has loaded, you must choose your rank from **Master, Chief Officer, Second Mate** and **Cadet**. Remember you can be promoted or demoted at the end of the game depending on how well you cope!

Press **SPACE** to move around the ranks.
Press **ENTER** to choose.

You must now choose which ports you want to include in the game. You can have a short game using just 2 of the ports, or play for longer with any number of ports up to the maximum of 7.

Decide which ports you would like. Press **Y** for yes or **N** for no for Chicago, then press **SPACE** to move on and repeat for each port on the screen.

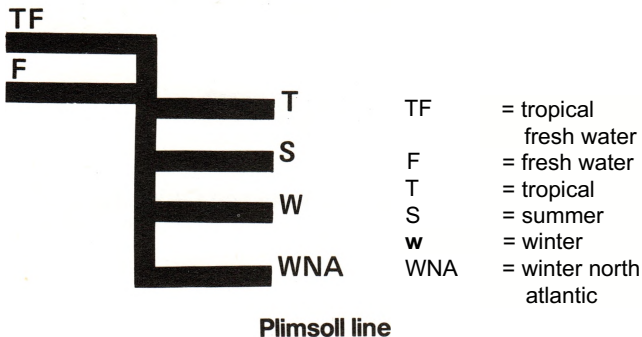
If you are happy with your choice, press **ENTER** to confirm.

You will now see a map with the ports marked by their initials. Your chosen ports are highlighted. A cargo table is given to show how much cargo you have for each port.

Press **SPACE** to select your starting port.
Press **ENTER** to confirm.
Press **SPACE** to select your first port of call.
Press **ENTER** to confirm.

Now you can start to load your ship with cargo.

On the top left of the screen you can see the Plimsoll line, with a red arrow marking the limit for loading. The block of blue indicates how low the ship is in the water. You will see this move up as you load, showing how the ship becomes lower in the water.



Loading your ship

At the bottom right of the screen you can see some cargo at the quayside ready for loading.

Different grades are shown in different colours:

- black - greatest mass ('heaviest')
- scarlet
- magenta (pink)
- green
- cyan (pale blue) - smallest mass ('lightest')

The numbers of each grade of cargo are shown.

The loading picture is all set ready to load the cargo for your first destination, starting with the heaviest grade (black) cargo, into the hold at the aft of the ship.

If you want to load cargo for a different destination, or a different grade of cargo, or load the cargo into a different hold then:

- press **D** for a different destination,
- press **G** to change the grade of cargo,
- press **H** to change the hold.

Press **ENTER** to load your chosen cargo into your chosen hold.

If you keep pressing **ENTER** then the loading will continue until all the cargo for that grade has been loaded.

Press **G** to move to the next grade for that destination, or **D** to move to the same grade for another destination.

As you load the ship you will see the value of the cargo on the screen. This is to show you the score you can achieve for the cargo *if you take it safely to its destination*. You do not score points for cargo until it is at the correct destination port.

If at any time you wish to check how much cargo you have loaded for each destination:

press **T** to see a summary table,
press **T** again to continue loading.

When you have finished loading, press **S** to prepare to sail. You can see the score you have achieved for loading, which will go towards your final score in the game. You will lose points for loading a ship unevenly, or for making it top-heavy, as these increase the risk of capsizing the ship. If you have overloaded the ship you have an increased risk of sinking should you meet unfavourable conditions on your journey. A message will appear to alert you to the fact that you have loaded the ship badly. When you are ready to sail, press **SPACE**.

Sailing

A map appears with all the ports marked.

At the bottom right of the screen you can see the Plimsoll line and the water level.

You are still in port.

Press **ENTER** to begin your journey.

You will see your route plotted out on the map as you go. You will also see the date change so you can record the duration of your

journey. As you move through different oceans and waterways you will meet storms or high seas. If your ship survives these conditions you can press **SPACE** and continue on your journey.

If you capsize due to bad loading, or sink due to overloading, then press **SPACE** to see how long you sailed and how many points you scored.

As you travel you will move through water of different salinity (saltiness). The *higher the* salinity of the water, the more buoyancy it gives to the ship, so the *higher the* ship sails in the water. In water of *lower* salinity the ship's hull will sink *lower* into the water. The red arrow next to the Plimsoll line indicates the maximum load line (i.e. water level against the hull) for the ship, and varies according to the salinity of the water. The blue block on the other side of the Plimsoll line shows you how low your ship actually is in the water.

The program gives you a continuous report on conditions at sea. You will hear a rising note as you move through areas of higher risk. Remember that this relates not only to the area through which the ship is travelling, but also to the time of the year. Conditions will be quite different in March and in September, for example, in an area where monsoons occur.

When you reach your destination

When you arrive safely at your destination, press **SPACE** ready to unload your cargo. The cargo for this port is highlighted on the screen.

Press **ENTER** to unload the cargo. You can keep your finger pressed on **ENTER** until the unloading is complete.

You are now ready to repeat the process. You can select your next port of call from the table and load up the cargo you wish to carry to that port, and to the others on your journey.

Help with your journey

You can choose to travel to all the ports, or to just a few. However many you choose you must decide how much of the cargo you can carry to each port without risking your ship and crew. Your score depends on how much cargo you manage to take to its various destinations. You must plan the type or grade of cargo you take on board - a greater mass of cargo (black cargo is highest mass) gains greater points. In order to survive storms you must make sure you load your cargo safely by loading the densest cargo first (at the bottom of the hold) and spreading it evenly throughout the ship. Too much cargo at either fore or aft of the ship is not safe, neither is 'top heavy' loading. In order to gain maximum points quickly you may wish to plan your journey according to how much cargo is at each port. For example, if there is maximum cargo waiting at Helsinki for the destination Athens, you may wish to make that journey first.

Remember you can load any amount of cargo for your next port, *and* as much as you want for any other port on your journey. This cargo will remain *in transit* until you reach that port. Cargo in transit is unloaded and reloaded at each port but does not score points until it arrives at its correct destination.

When you load your ship, you are making the same kinds of decisions as the greedy merchants for whom the Plimsoll line was invented! Like them, you may want to carry as much cargo as you can but in carrying a big cargo you take a greater risk of sinking or capsizing. You must decide on the risk, load your cargo carefully, and perhaps avoid the routes where you know sea conditions are likely to be unfavourable. If you are more cautious, you may need to make several trips in order to deliver *all* the cargo to *all* the ports.

To play again

To start again (at any time during, or at the end of, a journey)

press **CAPS SHIFT** and **A** together.

To remove the program from memory and load a new one

press **SYMBOL SHIFT** and **A** together.

If at any time you wish to have a print out of the screen, make sure your ZX Printer® is connected as explained in the manual, then press **CAPS SHIFT** and **Z** together.

The Cargo program as a model

The amount and type of cargo used in the program, and the way it is loaded in the ship, is obviously a simplified model of the true situation. However, the principles of safe loading which must be applied in the program do reflect those used in real life.

The storms and high seas which are encountered in the program are based on facts about their actual occurrence. The pattern of where and when storms occur, and how they come about is very complex. Remember that the storms and high seas you experience in the program are caused by strong winds including hurricanes, typhoons, and monsoons. These occur in various parts of the tropics and blow in different directions according to the time of the year. You may like to look at an atlas or globe to look at your journeys and see the winds which bring about the storms you meet en route. You are particularly at risk from storms around Cape Horn, below South America; around the Cape of Good Hope, below Southern Africa; and in the Pacific Ocean around the Philippines. High seas are very likely in the Pacific Ocean to the East of Japan. Some atlases will also show the surface salinity of the oceans. This increases towards the middle of the oceans away from the coasts, and it is higher around the tropics. Remember to notice the season in which you are travelling, as this influences the likelihood of winds (look at the date changing as you sail). In real life these winds would help or hinder a ship's journey depending on whether it was going in the same or opposite direction.

Background information

Salinity

The average salinity of the sea is 35‰ (thirty five parts per thousand). The salinity of water varies, depending on temperature and other conditions, and you will see it change in the program (watch the red arrow) as you move around.

The more saline the water, the more buoyancy it gives. Most people will know that it is easier to float in the sea than in a freshwater swimming pool. This is due to the *salinity* of the sea water. In the Dead Sea people can float very easily (and read a newspaper while they do so!). The high salinity of the Dead Sea (230‰) is due to its position as an inland sea, below sea level, and cut off from the oceans.

Samuel Plimsoll

Samuel Plimsoll (1824-98) became a member of Parliament in 1868. Prior to entering Parliament he spent some time as a coal merchant in London where he witnessed the exploitation of seamen by ship owners, in what he called 'coffin ships'. He was convinced that many ships, and their crew, were lost at sea due to unscrupulous ship owners whose greed tempted them to overload with cargo.

His campaign included the publication of a controversial book, *Our Seamen*, and several aggressive speeches in the House of Commons. He was 'determined to unmask the villains who sent to death and destruction'.

Following his outburst the first Merchant Shipping Act (in 1876) included the compulsory inscription of a load line known as the 'Plimsoll Mark'. This showed the amount of hull (or *freeboard*) which a ship should have above water when loaded. The scale for different seasonal zones (tropical freshwater, etc.) was shown alongside an 'average' loadline - a circle with a horizontal line

through it and the initials L R (Lloyd's Register). These marks still appear on merchant ships today.

Since Plimsoll's time, there have been several International Load Line conventions and the regulations governing the loading of ships have been further refined and expanded to cover the vastly increased maritime traffic covering 'Type A' ships and 'Type B' ships, the freeboards for which can be specified to the nearest millimetre.

Some speeds and distances

It may be interesting to find out more about the kinds of ships which make journeys like the ones in the program.

A rough idea of the real journeys can be given here:

The average speed of a container ship of modern design is 18 or 19 knots. 1 knot is 1 nautical mile per hour which is roughly equivalent to 1.1 miles per hour.

Some of the approximate distances of the journeys in the program are, in nautical miles:

New York - London	3250
New York - Belem	3100
London - Helsinki	1000
New York - Tokyo (via the Panama canal)	9600