Steel Mac™
LIMITED

SteelMac Limited, Unit 27 New Harbours, Gibraltar

GHS Stability Program

Specification sheet

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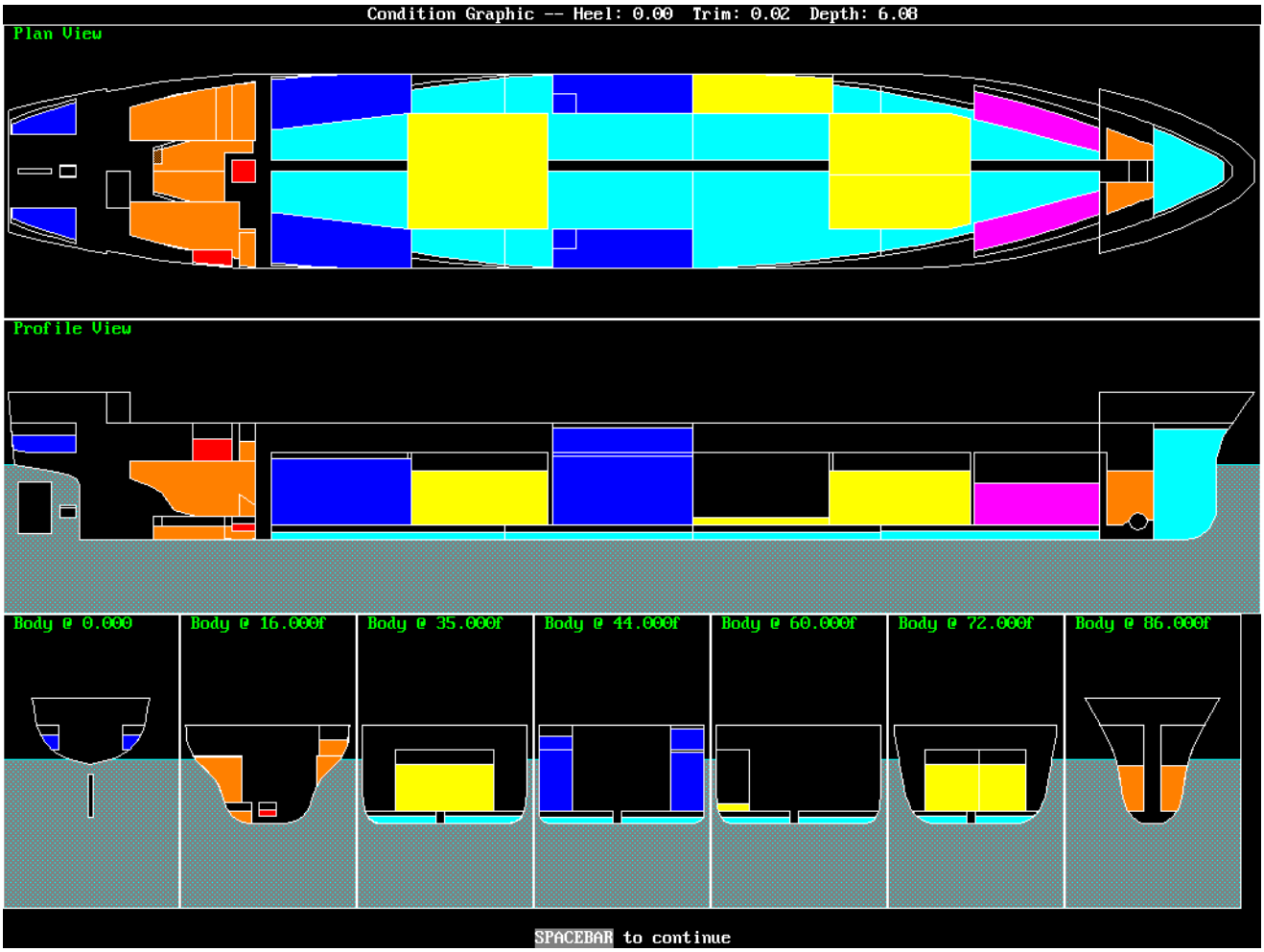


GHS is a software system for the design and evaluation of all types of ships and floating structures. It addresses flotation, trim, stability and strength by calculating the forces involved using mathematical/ geometrical models of the vessels.

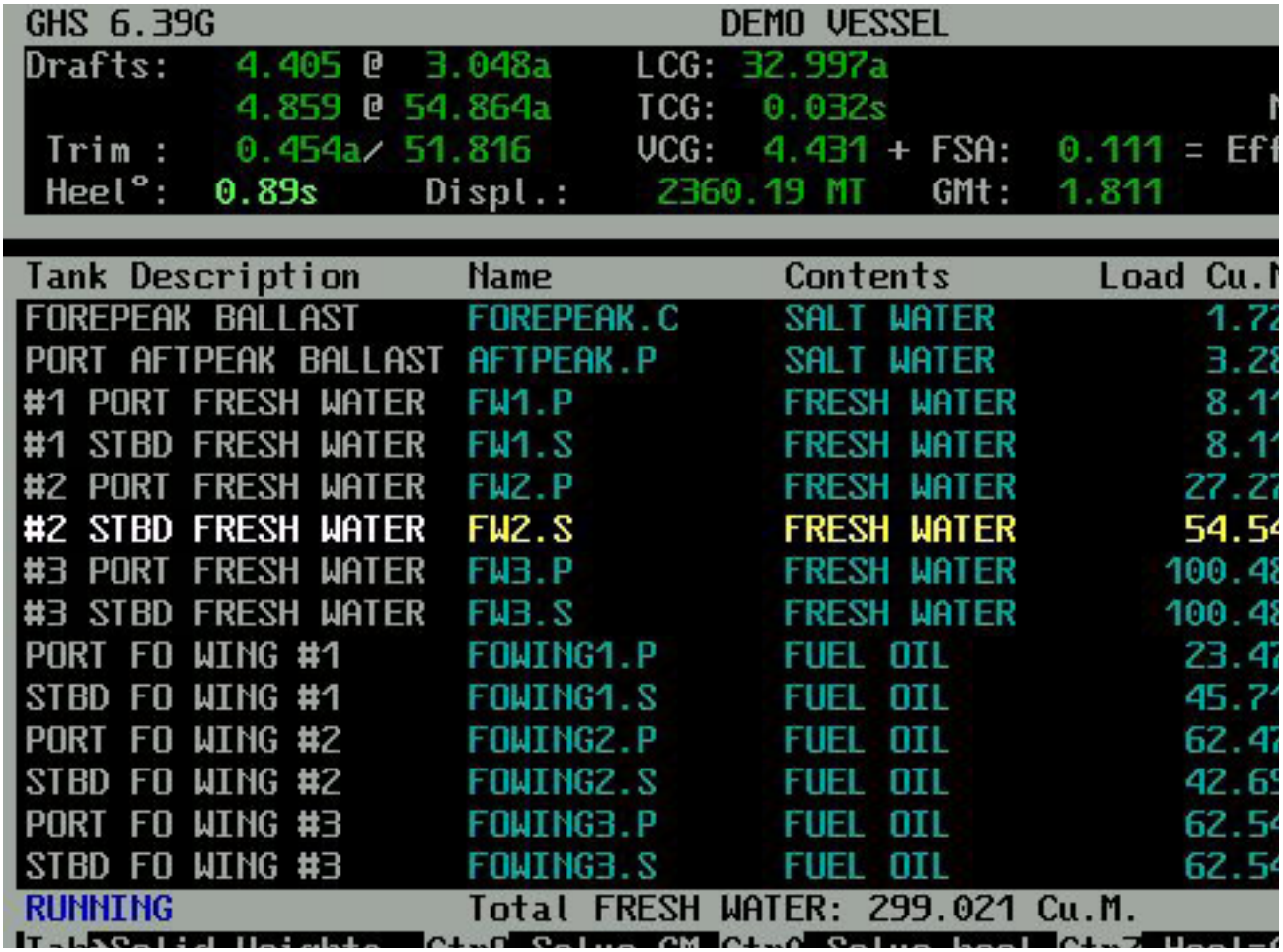
Developed by Creative Systems, GHS has become widely recognized as the most productive tool of its kind. It is continually being extended and improved to ensure its continued leadership and excellence in response to increasing sophistication of stability standards and computing technology. GHS is well-proven, reliable, respected by regulatory agencies and in constant use by major design firms and shipyards.

GHS is truly general-purpose. Not only does it handle ship hulls, but also anything that floats or contains liquid - or both. It has been used to analyze and/or design submarines, SWATHs, dry docks, drilling platforms, 10-foot sailboats, 300-meter freighters, floating bridges, and even a floating golf green. GHS addresses simple and complex stability issues including intermediate stages of flooding, spilling of cargo, and optimizing against complex stability criteria.

GHS boasts of several cutting dege features such as:

- Handling of complex stability criteria.
- True CG shifts of tank contents both transversely and longitudinally for better realism and accuracy.
- Tank modes for flooding, damage, spilling, water-on-deck and many others.
- Heeling about any axis (essential for some shapes - drilling units for example - and where longitudinal stability is a problem).

- Wind heeling moments derived from the geometry at any heel, trim and axis angle.
- Ease of modeling complex structures and interior spaces.
- Detailed and flexible graphics depicting conditions of flotation, flooding and tank loading.
- Ground modeling for vessels partly or totally supported by the ground.
- Multi-body capability for interactions between vessels.



Another part of the answer is certainly about efficiency - especially with complex vessels where the number of load and damage cases becomes very large. Efficiency means doing a job accurately, correctly and on schedule. Computers naturally do things accurately, but whether a job is done correctly still depends on the person who prepares the inputs for the computer - and people tend to make mistakes. GHS helps to reduce a common source of errors with its macro commands that reduce repetition within the input data. And when mistakes have to be corrected, it takes little extra effort to rerun even a long report.

A large part of why GHS is special has to do with its modern approach which goes well beyond traditional methods. The difference this makes is not so noticeable in its list of features. But once you discover the direct, simulation-oriented approach that GHS encourages, you will never want to see another cross curve. (If someone insists on seeing cross curves, you can still get them from GHS.)

System organization

The GHS system is organized by function. There is a main program, which handles all of the usual stability computations, both intact and damaged. From there it branches out to several modules that perform special functions. Some of these modules are optional, making it possible to acquire only those functions that are necessary.

The essential modules that come with the main program are,

- SE: Section Editor - a specialized, interactive, solid modeler that creates, modifies and displays geometrical models of any vessel.
- PM: Part Maker - an efficient parametric solid modeler best for createing tanks and appendages.
- MC: Model Converter - converts models from other formats, including SHCP, HEC, DXF, OFE, IDF, PIAS and SEASAFE.

The optional modules are,

- CG: Condition Graphics - Illustrates the loaded condition of any vessel.
- LS: Longitudinal Strength - shear, bending, stress, and deflection.
- LE: Load Editor - a timesaver for working out loading conditions.
- AF: Advanced Features - includes IMO probabilistic damage.
- FL: Floodable Lengths - mainly for preliminary design.
- TS: Tank Soundings - various special formats.
- MB: Multi-Body - Allows GHS to model the interactions of multiple vessels.
- GS: Grain Shift - calculates volumetric heeling moment for grain cargos.
- HM: Hull Maker - a parametric hull model generator.
- GHSCOM - allows access to GHS within other applications.
- PI: Programming Interface - allows using GHS directly in other programs.

The Main Program

The hydrostatic approach to ship stability is essentially a simple matter of balancing idealized weight and buoyancy forces, but it can become surprisingly complicated when the effects of liquid in tanks and flooding compartments are considered. GHS does not ignore these complexities; rather it brings them to light and helps you think them through.

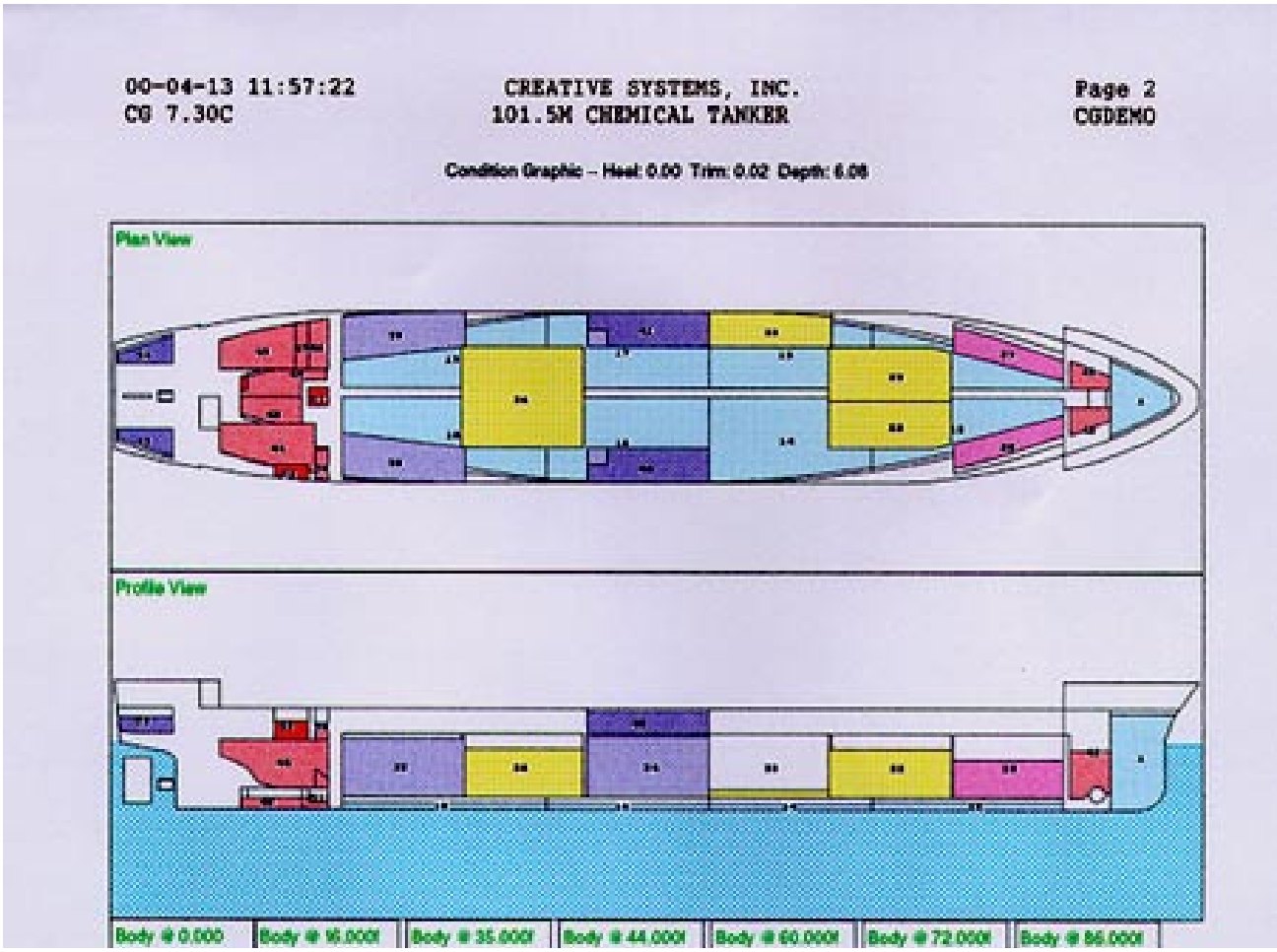
When you approach a stability analysis you have to make some decisions about how much detail there should be. You build a geometrical model of the vessel with the appropriate degree of detail. Then you run GHS with the model to simulate the vessel's ability to withstand heeling moments in various conditions - to an appropriate degree of detail. Preliminary designs can be modeled with less detail so that they can be quickly cycled through modification phases. Final designs will have more detail.

Damage stability is straightforward with GHS; what happens with loaded or empty tanks with and without damage is all taken care of automatically. True CG shifts in tanks are the norm but the traditional, less-accurate, free surface adjustments are also available.

Heeling moments from the wind plane and other sources are available, as are several kinds of waves. GHS has few restrictions - heel and trim are unlimited (great for salvage work). You can change the heeling axis - heel on a diagonal or even do a fore-and-aft righting arm curve.

Stability criteria are not cast in concrete. You can choose your own limits and roll your own criteria. Tell GHS your criterion and it will find the maximum VCG - even with damage, wind or wave, or all three together.

No description of this program would be complete without further mention of the macro facility. Being command-oriented (vs. menu-oriented, although menus can be used), GHS is actually a language in which you express the design of the report you want to create - using the terms of your own building blocks, which are called “macro commands”. It’s the lever with which you can move a world of data.



GHS Plots

Pictures in a printed report are helpful. The GHS report generator takes the entire output stream, inserts the graphics, and puts the report out on the printer - all automatically. This operation is almost invisible because the program makes all of its decisions automatically. The only decision you have to make is whether you want graphs in your report. If you do, then the report generator does the job with no questions asked. The report generating facility in GHS is actually a complex piece of software, in spite of its apparent simplicity; and a close examination of the quality of output it produces proves the point. Sample report

GHS produces the following kinds of graphs:

- Hydrostatic Properties
- Maximum VCG Curves
- Curves of Form
- Longitudinal Shear, bending, deflection Curves
- Torque Curves of Hull Twisting

- Sectional Area Curves
- GM vs. Tank Loading Curves
- Cross Curves of Stability
- Tank Soundings and Characteristics
- Righting Arm and Area Curves
- User-defined graphs

GHS Extensibility

GHS provides facilities for its own extension and expansion. It gives you the ability to create new features and procedures. This extensibility is of five major kinds:

1) Macro Commands. A macro command is a new command which you design yourself. The concept is that you can encapsulate your own procedures so that they become part of your “customized GHS”. This is an extremely powerful and easily-used feature.

2) Menu Systems. You can design and create various menu- driven “applications” within GHS. A MENU command is provided which, together with macro commands, allows you to create programs for specific applications which can then be used by someone with little or no knowledge of GHS.

3) Templates. Similar to menus but more powerful, templates give you the ability to construct simple or complex dialog boxes. These can be strung together to form “wizards” that guide the user through a complex process.

4) Programming Interface. Virtually any conceivable feature or calculation can be added to GHS with this facility. It gives you access to the underlying data and “hydrostatics engine” for use within another programming environment.

5) File Interfaces. Several kinds of “industry-standard” data files are recognized by GHS. This facilitates communication between GHS and other programs so that you can assemble a system of software extending into areas not covered by GHS.

Extensibility means that you are not locked into one way of doing things. It also increases your options for enhancing and developing GHS to meet specific requirements.