Creative Systems, Inc.
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GHS Training Book
GHS 训练手册

中英文对照

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Introduction 前言

The GHS software is primarily for ship stability and strength in view of regulatory standards. But it is also well-suited to simulating the behavior of any body, floating or not, where ground reactions and other forces may be present. It is often used in simulation-oriented settings such as salvage, crane ships and heavy-lift operations, to name a few. It also has an on-board configuration, known variously as GHS Load Monitor, GHS-LM or simply GLM, where it becomes an efficient “electronic stability book” that naval architects provide for their clients, augmenting the traditional paper T & S books.

GHS 软件主要用于根据规范校核稳性和总纵强度，还适用于模拟船舶运动、浮态性能、搁浅反作用力和其他可能出现的力。常用于模拟仿真，比如打捞作业、起重船和重型起重作业。还提供船舶装载仪系统，GHS Load Monitor（GHS 装载仪），即 GHS-LM 或者简称 GLM，总体工程师通过 GLM 为客户提供有效的“电子稳性手册”，充实传统纸质稳性手册。

GHS derives nearly all of its results directly from 3-dimensional geometry models of the ship hull and its interior arrangements.This is unlike some competing software that use intermediate tables for the sake of efficiency. Because GHS has a highly-efficient calculating engine, it performs the essential volume integrations very quickly, and so is able to provide both speed and the accuracy inherent in using the “first principles” approach.

GHS 基于船体及舱室布置的三维模型直接得出计算结果。不同于其他软件，为提高计算效率直接线性插值表格。GHS 拥有极其高效的计算引擎，快速计算体积基本要素，因此 GHS 把能够把快速性和准确性作为“第一法则”。

The Purpose of this Document 本手册目的

This document serves as text for the standard 3-day introductory GHS training course.It assumes no initial familiarity with GHS. It does assume familiarity with personal computers under the Windows operating system.

本手册提供三天培训教程。培训内容针对于不熟悉 GHS 的学员，学员需自备带有 Windows 操作系统的个人电脑。

The important concepts and principles upon which GHS is built are presented in some detail, but in other respects this is not a complete user's guide to the program. The GHS User's Manual is the complete reference document. Most of the User's Manual is conveniently accessible through the Help menu in the GHS program.

本手册详细介绍 GHS 主要概念及工作原理，在细节性方面，未完整阐述该程序使用说明。完整介绍请参考 GHS 用户手册，还可以通过程序帮助菜单浏览大部分用户手册内容。

Topics are presented in a particular order that builds on material presented previously. Sometimes the explanation of a program feature is split to provide necessary prerequisite information only where it is needed while avoiding information overload before it is needed. Therefore this should be read in its natural order, not at random.

本手册课题顺序按照以往培训实例而定。为避免重复叙述，有时某程序功能分解成几部分，只在需要时加以解释。因此，应按顺序阅读本培训手册。

By the time you finish going through this document you will know how to get useful work done with GHS, and you will be oriented well enough to make good use of the User's Manual to extend your knowledge.
阅读完本手册后，可初步掌握如何使用 GHS 进行工作，同时可储备相当的知识更好的使用用户手册拓展知识。

No attempt is being made here to cover every detail of GHS. The emphasis is on simplicity. It is left to the user to build on this foundation as needed, with the User's Manual as the main source of information, possibly augmented with advice from the GHS technical support team or the online help.
本文并未介绍 GHS 所有功能细节，而是简要阐述。让用户根据需要建立 GHS 的基础，把用户手册作为信息的主要来源，还可以寻求 GHS 技术团队的帮助或者在线帮助

www.GHSport.com/support contains all the latest
网站 www.GHSport.com/support 包含所有最新的:

- Training Guides, Tutorials & Wizards
- 培训指南，辅导和向导

- Bulletins, Questions & Answers, Did You Know articles, and sample Run Files
- 公告、问题及答案、相关文章和运行文件样例

First, Geometry File 首先，模型文件

GHS uses a convenient and compact geometry model of the ship that includes all of its internal tank and compartment arrangements, and all of its superstructure windage elements. This model is contained in a single computer file we call the Geometry File (typically using the file-name extension .GF). Since all calculations are based on geometry, the first stage of any project is building the geometric model; and the first sessions of this training course will teach you how to create Geometry Files.
GHS 采用方便紧凑的船体模型，包括所有内部液舱、舱室分布和所有上层建筑风模型。模型存储在单独的计算机文件中，称之为 Geometry File（模型文件），通常使用的文件扩展名为.GF。由于所有计算都基于模型，所以展开项目的第一步是建立模型。本教程的第一章节将培训如何创建 Geometry Files（模型文件）。

The Rest of the Model: Fixed Weights vs. Tank Loads 固定重量和液舱装载

The Geometry File, with its tank models, provides for weights and centers of liquid loads, but it does not provide weights of structure and other non-liquid loads. Consider that all of the buoyancy and weight forces derived from the geometry are variable – subject to change – when the vessel changes its draft, heel and trim. On the other side of the equation you have the fixed forces from the weight of structure and loads that have fixed magnitudes and positions on the ship. Therefore we divide the weight items into “Fixed” weights and “Tank” weights (meaning the the weights and centers of tank contents), which implies that Tank weights are variable at least in the locations of their centers. Here is the issue: Fixed weights, including light ship weight and its center, are represented in “Commands” that reside in “Run Files”. So we have two kinds of files: Geometry Files and Run Files.

完整定义舱室的 Geometry File（模型文件）提供了液体装载的重量和重心，但不提供舱室结构重量和其他非液体重量。把根据模型计算的浮力和重力是看做是可变的，随着船舶吃水、纵倾和横倾变化而变化。在等式的另一边是船舶结构重量和船上大小位置固定的装载。因此，将重量项划分为“Fixed”(固定)重量和“Tank”（舱室）重量（指重量和舱室重心），把舱室归类为非 FIXED 重量，也就是说 Tank（舱室液体）的重量是可变的，至少是重心位置可变。这里存在问题：Fixed（固定）重量所含空船的重量和重心需由“Run Files”（运行文件）中的”Commands”（命令）来表示。因此需有两种文件：Geometry Files（模型文件）和 Run Files（运行文件）。

Talking to GHS: Commands, Run Files and Reports 命令、运行文件和报告

GHS is a command-oriented program. All of the input data – all of the information you provide that is not in the Geometry File – is in the form of commands. A command, as we have already noted, can provide such things as Fixed-weight items. Commands also instruct the program about what you want to do with the model.

GHS 是由命令运行的程序。所有输入数据（未在 Geometry File(模型文件)提供的信息）以命令形式表示。如大家所了解的，命令可以提供信息，如 Fixed（固定）重量项。命令还可以指示程序如何处理模型。

A fundamental and important concept is that commands are processed as sequential steps, and the order in which commands are given can be very significant. The program processes commands one at a time. Every time a command is processed, the program takes some action, and in many cases the state of the program is changed as a result. This is actually a very familiar paradigm that we see all around us: everything and everyone reacts to sequential inputs and at any given moment is the result of the history of those inputs.

一个重要的基本概念是，命令是按照顺序来运行的，所以定义命令的顺序非常重要。程序每次只执行一条命令，每执行一次命令，程序将作出相应的反应。在许多情况下，命令顺序将改变程序的结果。实际上这是在我们身边非常熟悉的模式：任何事和任何人根据输入条件作出反应，同时的，之前的结果就会成为历史。

Many people today have trouble understanding sequential processing because of their familiarity with spreadsheets. The spreadsheet appears to process its inputs simultaneously; the position of an item on the page does not necessarily imply a sequence. If not warned about this in advance, they will look at a GHS Run File as a if they were looking at a spreadsheet. They will not realize that command A must precede command B if the program is to have the benefit of commandA when it processes command B.

现在，许多人都熟悉电子表格化处理问题，而不理解如何按照顺序处理问题。电子表格可同时处理输入数据；页面上的数据位置不必按顺序排列。如未事先声明，用户会将 GHS Run File（运行文件）按电子表格化处理问题。不一定会意识到，在程序处理命令 B 时需要命令 A 的前提情况，应当将命令 A 先于命令 B。

A Run File is simply the text file where you write your commands. The preferred file-name extension for Run Files is .RF, and they can be created and edited using the text editor that is available within the GHS program.You could type your commands directly into the program, but using a Run File saves you from having to repeatedly enter commands. When you tell GHS to run your Run File, it simply processes the commands

from the file sequentially, line-by-line. Your Run File – in combination with the Geometry File – will produce a Report File. The report could be something simple like the results of an inclining experiment; or it could be an entire Trim and Stability book.

Run File（运行文件）是用于记录命令简单的文本文件。首选的 Run File（运行文件）扩展名是.RF，可以由文本编辑器进行创建和编辑，也可以在 GHS 程序中直接输入命令行，但是用 Run File（运行文件）可以避免重复输入。用 GHS 运行文件，GHS 将按顺序逐行依次读取命令。Run File（运行文件）与 Geometry File（模型文件）结合输出 Report File（报告文件）。报告可以是简单的文件，如倾斜试验报告；还可以是完整的稳性报告。

You could say that the purpose of this training course is to teach you how to write Run Files. Almost everything, including model building, can be done through Run Files.

可以说，本教程目的是培训如何编写 Run Files（运行文件）。几乎所有项目包括建立模型，都可以通过 Run Files（运行文件）来完成。

The GHS Command LanguageGHS 命令语言

There are certain special commands that can be used to make your Run File into more than a simple sequential list. For example, there is the “IF” command, which enables you to execute some commands and not others under certain conditions. These special commands are powerful, and they allow you to do many things that you might not expect would be possible in this type of program. In fact, GHS can be used as a general-purpose programming platform. There is even a special version called GHSOS (for GHS Operating System) that includes the command language without the ship-stability functions.

GHS 有特殊的命令使得 Run File（运行文件）不会简单的按照顺序运行。例如：“IF”命令，在特定条件下能执行指定的命令而非其他命令。这些特殊命令非常实用，可以实现很多意想不到的功能。事实上，GHS 可以是一个多功能的编程平台。甚至有一个特殊的版本称之为 GHSOS（GHS 操作系统），其中命令语言和船舶稳性无关。

The Complete GHS: Optional Modules 完整 GHS 软件：可选模块

During the training course you will have access to the complete set of GHS modules. But since some of these modules are optional, it is possible that you will not find all of them in your own particular GHS configuration. All GHS systems include the essential model-building tools:Section Editor (SE), Model Converter (MC) and Part Maker (PM), and the essential set of calculations with their reports, including both intact and damage stability. The optional modules are,

在培训课程期间，将使用带有完整模块的 GHS 软件。由于某些模块是可选的，所以在个人电脑上 GHS 可能不包含所有模块。GHS 系统包含所有的基本建模工具有： Section Editor（SE）（横剖面编辑器），Model Converter（MC）（模型转换器）和 Part Maker（PM）（模型建模）和报告文件中设置的计算基本要素（包括完整稳性和破舱稳性）。可选模块有：

- Condition Graphics (CG) – displays vessel and tank loads graphically on screen and in reports (highly recommended!).
- Condition Graphics (CG)（图形）– 在界面和报告中显示船舶和舱室装载的图像（强烈推荐使用！）。

- Load Editor (LE) – for interactive load management.
- Load Editor（LE）（装载编辑器）– 人机交互式装载管理。

- Load Editor with windows (LEw) – enhanced Graphic User Interface for LE.
- 装载编辑器窗口（LEw）–增强的 LE 图形用户界面。

- Longitudinal Strength (LS) - computes shear, bending, deflection and torque curves.
- Longitudinal Strength（LS）总纵强度 – 计算剪力，弯矩，中垂/拱和扭矩曲线。

- Floodable Lengths(FL) – produces floodable length curves.
- Floodable Lengths（FL）可浸长度 – 生成可浸长度曲线。

- Tank Soundings (TS) – computes and prints special tank sounding tables for onboard use.
- Tank Soundings（TS）舱室测深 – 计算和编制特殊格式的测深表供船舶使用。

- Advance Features (AF) – probabilistic damage and oil outflow, hopper atability, bonjean tables and also GMT as a function of tank loading for submarine stability.
- Advance Features（AF）（高级功能）– 计算概率破舱稳性、溢油流出\、开体挖泥船稳性、Banjen 曲线表、GMT 以及半潜船稳性。

- Crane (CR) – vessel mounted crane calculations including Crane Operator Output Tables. Enhanced by LEw and CG modules.
- Crane（CR）（浮吊）–船上起重机计算，包括起重机操作员输出表。通过 LEw 和 CG 模块增强。

- Grain Shift (GS) – volumetric heeling moments of bulk cargo in general holds.
- Grain Shift（GS）（谷物移动）– 计算散装货物货舱中的倾侧体积矩。

- Multi-Body (MB) – interactions between two or more floating bodies.
- Multi-Body（MB）（多体）– 两个或多个浮体之间的相互作用。

- Hull Maker (HM) – barge shaped GF file generation based on input parameters such as principal dimensions, sheer, rake, deadrise, bilge radius, etc.
- Hull Maker（HM）（船体生成）– 驳船形 GF 文件生成基于输入参数，如主尺度、舷弧、前倾、舭升高、舭部半径等。

Being an optional module does not necessarily mean that additional software files are involved, though in some cases it does. In all cases, access to these modules is through the GHS main program.

可选模块不是指额外的软件文件，虽然在某些情况下需要额外软件。但可以肯定的是，通过 GHS 才能执行这些模块。

Installation and Setup 安装和设置

The organization of shortcuts, data files, and folders on your computer and/or network is a matter of personal preference and company policy, so it will not be addressed here. However, in any installation, all GHS program files must reside in a single directory (folder). For the purpose of this training, it is recommended you make a new folder in which to install your training version of GHS, keeping it separate from your permanent GHS program folder.

快捷键、数据文件和计算机/网络上的文件夹的组织结构按个人习惯或公司规定排列，所以不在此介绍。但不管怎样，在安装 GHS 时，所有程序文件必须放置在一个单独目录（文件夹）中。由于本次是培训，建议新建一个文件夹安装 GHS 的培训版本，与正式版 GHS 程序文件夹区分开。

GHS uses various devices for copy protection. The most common is a USB dongle. When doing a new installation, do not insert the dongle until prompted to do so.

GHS 有各种加密方式保护版权，最常见的是 USB 加密狗。在安装新软件时，无需插入加密狗，待提示后进行操作。

Among the files that come with GHS you will find one named INSTALL.TXT. It contains complete step-by-step instructions for all types of installations. On a stand-alone computer a new GHS installation, or an update, goes like this:

在 GHS 文件中可以发现 INSTALL.TXT 的文件，此文件包含有完整的安装步骤。在单机版电脑中安装或更新 GHS，步骤如下：

1. Insert the GHS installation CD (or other medium) into your computer.
1. 将GHS安装光盘（或安装包）放入电脑。

2. If "Welcome to GHS" does not appear, run INSTALL.EXE from the CD.
2. 如未出现“Welcome to GHS”，则从CD中运行INSTALL.EXE文件。

3. Click through the installation procedure, following any special instructions that might appear.
3. 根据安装步骤点击安装，可能会出现以下特殊安装提示。

4. If your computer is installing a USB dongle for the first time, insert the dongle into a USB port and confirm any security dialogs that might appear; if New Hardware Wizard starts up, select the automatic option. (If you inserted the dongle before installing GHS, see Troubleshooting in INSTALL.TXT.)
4. 如果电脑是第一次安装USB加密狗，将加密狗插入USB端口，并确认出现的安全对话框，当新硬件向导启动后，选择自动。（如果在安装GHS之前插入加密狗，请参看INSTALL.TXT文件中的排除报错）

Starting Up the Program 程序启动

GHS can be started using a Windows “shortcut”. A shortcut created on the desktop will default to a working folder where the GHS main program file, GHS.EXE, is located. However this should never be used as the working folder. Therefore, be sure to change the “Start in” folder to a working folder where you want to keep your data files for a

particular project. The working folder must never be the GHS program folder, nor should it be a sub-folder within the windows program files directory.
GHS 可通过 Windows“快捷方式”来启动。在桌面快捷方式 GHS.EXE 默认位于 GHS 主程序文件夹中。GHS 主程序文件夹不能作为工作文件夹，因此，需确认将“启动路径”设置在工作文件夹中，保存项目的数据文件。**工作文件夹不能设置在 GHS 主程序文件夹中，也不能设置在 windows 系统文件的子文件夹中。**

It is important that you understand the significance of having a separate working folder for each project. Not only does it help to keep your files organized, it also avoids having to specify paths with your file names.
每个项目有各自独立的工作文件夹尤其重要，这不仅有利于项目文件保持组织有序，也有利于指定读取路径。

The GHS Main Screen GHS 主界面

The various elements found on the GHS main screen are shown below.
GHS 主界面上工具栏如下所示：

Window bar – program name and Project name if defined (otherwise Geometry File name).
窗口栏-程序名称和已定义的项目名称（或者模型文件名称）

Menu bar – pull-down menus
菜单栏 - 下拉菜单

Title bar – GHS Version, Title as defined in Geometry File, Project name.
标题栏 -GHS 版本、模型文件已定义的标题、项目名称。

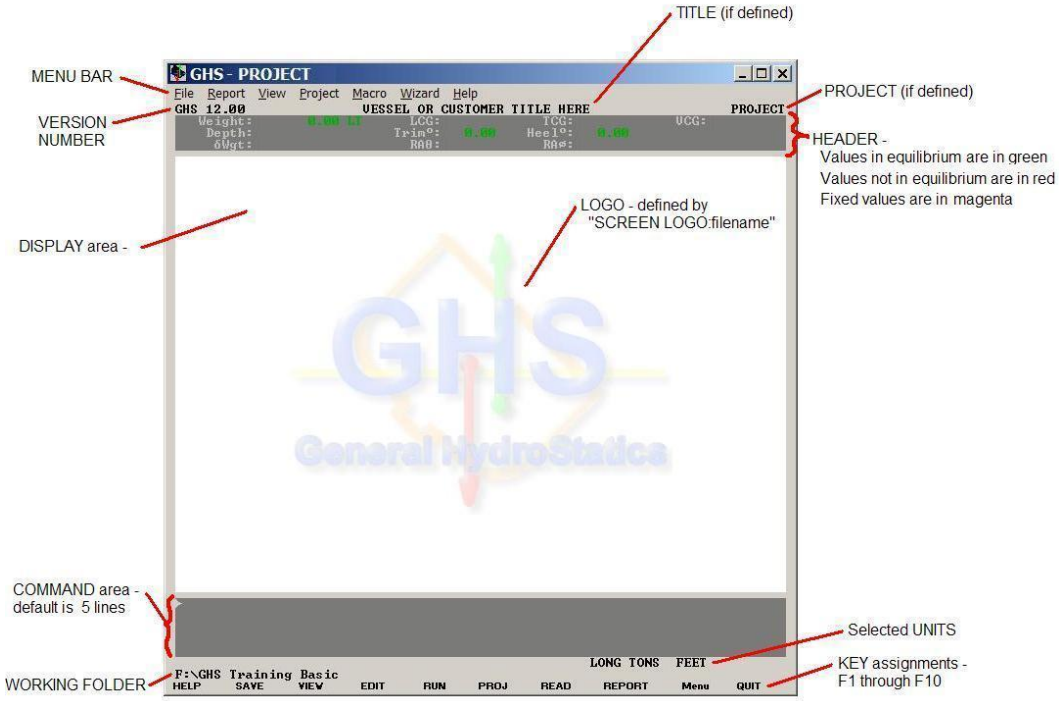
Header with data box showing (this data box can be turned off using the View menu).
数据框显示标头（该数据框可以由界面菜单关闭）。

Logo – screen background shows the GHS logo (can be changed via the View menu).
标识 - 屏幕背景显示 GHS 标识（可以通过界面菜单更改）。

Display/Command Area – configurable via the View menu.
显示/命令区 - 通过界面菜单设置。

Status bar – shows the working folder, report file, units setting.
状态栏 - 显示工作文件夹、报告文件、单位设置。

Function Keys (footer buttons) – Configurable via the KEY command.
功能键（页脚按钮） - 通过 KEY 命令设置。



Pull-Down Menus 下拉菜单

At the top of the GHS screen are several pull-down menus. Almost all of the activities that you access through these menus are also available through commands. In fact, when you make a selection from a menu, the equivalent command appears on the screen – the menu mechanism actually generates and runs the command. That means you can place any of those commands in your run files to produce the same action that you would get through the menu.

GHS 界面上方有几个下拉菜单。几乎所有通过菜单访问的功能都可由命令来实现。实际上，在菜单中进行选择时，相对应的命令就会出现在界面上-菜单的原理就是生成并运行命令。也就是说可将菜单生成的命令置于运行文件中，能产生同样的效果。

If there is a dialog box active, such as the “GHS Executive” (discussed below), you will have to close it before you can access the pull-down menus.

如果出现一个动态对话框，如“GHS Executive”（见下文），只有关闭对话框后，才能继续访问下拉菜单。

The menu that you will find most useful is Help, which provides quick access to nearly all of the GHS User's Manual. It is organized by command name, making it easy to look up the description and parameters of a given command.There is also a global search, allowing you to search the entire manual for any word. Help opens a separate window that stays open until you deliberately close it even after closing the GHS session. Right click anywhere in a Help window to bring up the index.

最实用的菜单是 Help（帮助）菜单，能够快速访问几乎所有 GHS 用户手册的内容。帮助菜单由命令组成，可方便快捷查找命令的描述和参数。另外菜单设有全局搜索，便于搜索整个手册的任何单词。帮助菜单会打开一个单独的窗口并保持打开状态，甚至关闭 GHS 界面后，还是需要单独将其关闭。在 Help（帮助）窗口任意位置右击，即刻弹出索引。

Printer Setup 打印机设置

GHS will use your Windows default printer unless you direct it to use another one. You will notice there is a separate Report menu where all of the report functions, including printing, are grouped together (rather than being in the File menu as you might expect). If you want to change the printer that GHS will be using, use Setup Printer at the bottom of the Report menu.

GHS 使用 Windows 默认打印机，除非另外设置。可以看到界面有独立的 Report（报告）菜单，所有的报告功能（包括打印）都集中在一起（不同于 File 菜单）。如需更改打印机，在 Report（报告）菜单下方 Setup Printer(设置打印机)设置。

Text Editor Setup 文本编辑器设置

In the File menu there is a Setup Paths selection, and under it the Editor Program selection allows you to specify any text editor for editing your run files. Notepad is the default editor, and it is quite adequate. We recommend that you do not use a full-featured editor, since GHS only recognizes basic ASCII text.

在 File（文件）菜单中有 Setup Paths（设置路径）选项，选项中有 Editor Program（编辑程序）选项指定文本编辑器用于编写运行文件。文本格式是默认编辑器，使用方便。建议不要使用全功能编辑器，因为 GHS 只能识别基本的 ASCII 文本。

The User Library Folder 用户库文件夹

As you become more familiar with the power of the GHS command language, you may want to have some of your Run Files easily available to you regardless of which working folder you are using. Such files would be general-purpose Run Files that you would reference in other Run Files. In this case they would be called Library Files and would use the file-name extension .LF; however, the command structure and everything else about the file is the same as any other Run File. A User Library folder can be established in which GHS will automatically look for your Library Files when needed.

当更熟悉 GHS 命令语言后，设想无论在哪个工作文件下工作，都可以方便的调用一些 Run Files（运行文件），这就是公用 Run Files（运行文件）。公用运行文件可以被其它运行文件调用。这样的文件称之为 Library Files（库文件），扩展名为.LF。但这类文件的命令结构和其他方面都和 Run Files（运行文件）是一样的。建立 User Library（用户库）文件夹，在需要时 GHS 可以自动寻找 User Library（用户库）文件夹。

Under the File menu, Setup Paths, you will find the User Library function which allows you to establish the location of your User Library folder.

在 File（文件）菜单下，Setup Paths（设置路径），有 User Library（用户库）功能，建立 User Library（用户库）文件夹位置。

The Executive Dialog Box 执行对话框

Normally (exceptions discussed below) there will appear at program start-up a GHS Executive dialog box positioned at the bottom of the GHS main screen. (This is also known as the Executive Wizard.) This is a handy helper for managing files, and it has a built-in Help system that can be used by anyone who is new to the program (or has forgotten what was learned in training). Any time the menus are active, the Executive

can be quickly brought up since it is the first item in the Wizard menu. It can also be brought up via the command, RUN EXECUTIVE.WIZ.

通常情况下（个例在下面讨论）GHS 启动时会在主界面下方出现一个 Executive（执行）对话框（也称为 Executive Wizard(执行向导)）。这是个便捷的文件管理助手，内置 Help（帮助）系统，用于帮助初学者（或者易忘记培训内容的学员）。这个菜单在任何时候都可以起作用，都可以迅速调出 Executive（执行）对话框，因为它是向导菜单中的第一项，还可以通过运行命令 EXECUTIVE.WIZ 调用。

The automatic appearing of the Executive at program start-up can be turned off and on by the Executive itself. Press the Executive's Help button and at the top of the Executive Help screen are buttons for turning the automatic appearing on and off.

程序启动时自动开启 Executive（执行）对话框，该对话框可在其内部关闭和开启。点击执行对话框的 Help（帮助）选项，在界面顶部设有执行对话框自动开启和关闭的选项。

Automatic Start-up Run Files 自动启动运行文件

There are two special Run File names that GHS looks for at program start-up: GHS.LF and GHS.SAV. GHS looks in the working folder, the user library folder and the GHS program directory for these Run Files. If both GHS.SAV and GHS.LF exist, GHS.SAV runs before GHS.LF. Note that if either of these special start-up files exist, the Executive dialog will not appear unless the RUN EXECUTIVE.WIZ command appears in the start-up file.

GHS 在程序启动时会查找两个特殊 Run Files（运行文件），GHS.LF 和 GHS.SAV。GHS 在工作文件夹、用户库文件夹和 GHS 程序目录中查找这些运行文件。如果两个 GHS.SAV 和 GHS.LF 存在，GHS.SAV 在 GHS 之前运行。如果。请注意，如果存在这些特殊启动文件中的任何一个，则除非运行执行，否则不会显示“执行”对话框。WIZ 命令出现在启动文件中：

GHS.LF - This auto-run file could be used to customize the user interface as well as set printer options. It could also set any of the screen options from the View menu. Of course, this file does not have to exist at all; for most users, the defaults are fine and GHS.LF is not needed.

GHS.LF - 此自动运行文件可用于自定义用户界面以及设置打印机选项。它还可以从“视图”菜单中设置任何屏幕选项。当然，这个文件根本不必须存在;对于大多数用户，默认值是好的和 GHS.LF 是不必要的。

GHS.SAV - GHS.SAV is the default filename for the SAVE command. SAVE writes an “environment” file that can be used to restore the state of the program. While it would be quite reasonable to have a GHS.SAV file in a working directory, inadvertantly storing a GHS.SAV file in the User Library or the program directory can lead to confusing behavior and should be avoided.

GHS.SAV 是 SAVE 命令的默认文件名。SAVE 写入可用于还原程序状态的“环境”文件。虽然拥有 GHS 是相当合理.SAV 文件在工作目录中，无意中存储了 GHS。用户库或程序目录中的 SAV 文件可能会导致混淆行为，应避免使用。。

Direct Command Entry 直接命令入口

Exit the Executive Wizard dialog if it is present, and you will see somewhere on the screen a blinking cursor. This is the command prompt for typing a command directly. For example, you could type, QUIT to close GHS.
如出现 Executive Wizard（执行向导），选择退出，这时屏幕上出现闪烁的光标。这就是直接键入命令的命令提示符。例如，键入 QUIT 关闭 GHS 对话框。

In most cases the command name can be abbreviated. The minimum abbreviation is indicated in the User's Manual by underlining. A quicker way to find out the minimum abbreviation is in the Help menu where it is capitalized.
在大多数情况下，命令名称可以缩写。在用户手册中用下划线表示最简写的命令。查找最简写的命令最快捷的方式就是通过 Help（帮助）菜单，命令用大写字母表示。

The Structure of Commands 命令结构

Commands follow certain formatting rules. All commands start with the command name, which, as mentioned earlier, usually can be abbreviated.
命令遵循统一的格式规则。所有命令都以命令名称开始，如前所述，命令通常可以简写。

After the command name there are usually parameters that help to define what you want to happen when the command is executed by the program. Separators can be spaces or commas. In many cases you can also separate the command name from the first parameter with an equals (”=”) sign, and sometimes that looks better.
在命令名称之后通常是参数，用于定义通过程序执行的命令。参数分隔符可用空格或者逗号表示。在许多情况下，还可以用等号（“=”）将命令名称和第一个参数分隔开，有时这样会看起来更好。

Each command has its own syntax, which is shown in detail in the User's Manual. But there are certain syntax conventions that are followed throughout the program. More will be presented on this later. For now it is sufficient to understand that there will always be:
每个命令都有它自己的语法，在用户手册中有详细阐述。但程序中有通用的语法规则，详情见下文。目前所需充分了解的规则如下：

- A command name (possibly abbreviated);
- 命令名称（可缩写）;

- Zero, one or more parameters following the name (usually).
- 可以没有、一个或多个参数跟随命令（通常情况）

Regarding the parameters:
关于参数：

- The order of the parameters is often significant.
- 参数的顺序通常非常重要

- Certain parameters must be enclosed in parentheses, if they appear at all;

- 某些参数出现时，必须用括号括起来

- Some parameters must be enclosed in quotation marks;
- 某些参数必须用引号括起来

- Some parameters must begin with a slash (“/”).
- 某些参数必须以斜杠（“/”）为起始

The case used in commands and parameters does not matter; it can be either upper or lower case or a mixture of upper and lower.
在命令和参数中字母大小写并不重要，可以是大写、小写或者混合。

Changing the Working Folder 更改工作文件夹

The path to the current working folder is shown on the left side of the status bar at the bottom of the GHS window. To switch to a different working folder, use the File menu and its first selection, Change directory:
当前工作文件夹的路径显示在 GHS 窗口底部状态栏的左侧。若要切换到不同的工作文件夹，选择 File（文件）菜单中第一个选项来更改目录：

Setting the Project Name 设置项目名称

The command “PROJECT name” defines a short (8 characters maximum) name that appears at the top right corner of the GHS screen, and in a similar location on every page of the reports. It also forms default file names. Once the project name is defined you can enter the direct command, “EDIT”, or simply “ED”, and the text editor will come up ready to create or edit the Run File named accordingly. For example,
命令“PROJECT+名称”定义简写的项目名称（名称最多 8 个字符），名称显示在 GHS 界面右上角，也同样显示在报告文件页的相似位置。项目名称默认形成了文件名。当定义项目名称完成后，可以直接输入命令“EDIT”或者简写“ED”，调出文本编辑器，用于创建和编写相应 Run File（运行文件）。例如：

```
PROJ DAY1
ED
```

Now you are ready to edit the file DAY1.RF in the current working folder.
现在，可以在当前工作文件夹编辑该文件 DAY1.RF。

The Project Folder System 项目文件夹系统

If you pull down the Project menu you will see that there is a complete facility for managing project folders and sub folders. If you do not already have an established structure for your projects, you might want to consider using this system. It is optional, and is explained in the manual under the PROJECT command. For lack of time it will not be covered in this course.
当下拉 Project（项目）菜单时，会出现一个完整的项目管理文件和子文件系统。如果还未构建项目系统，可以参考使用本项目系统。此系统是可选的，并在手册中有 PROJECT（项目）命令的详细介绍。由于时间问题，本教程未详细阐述。

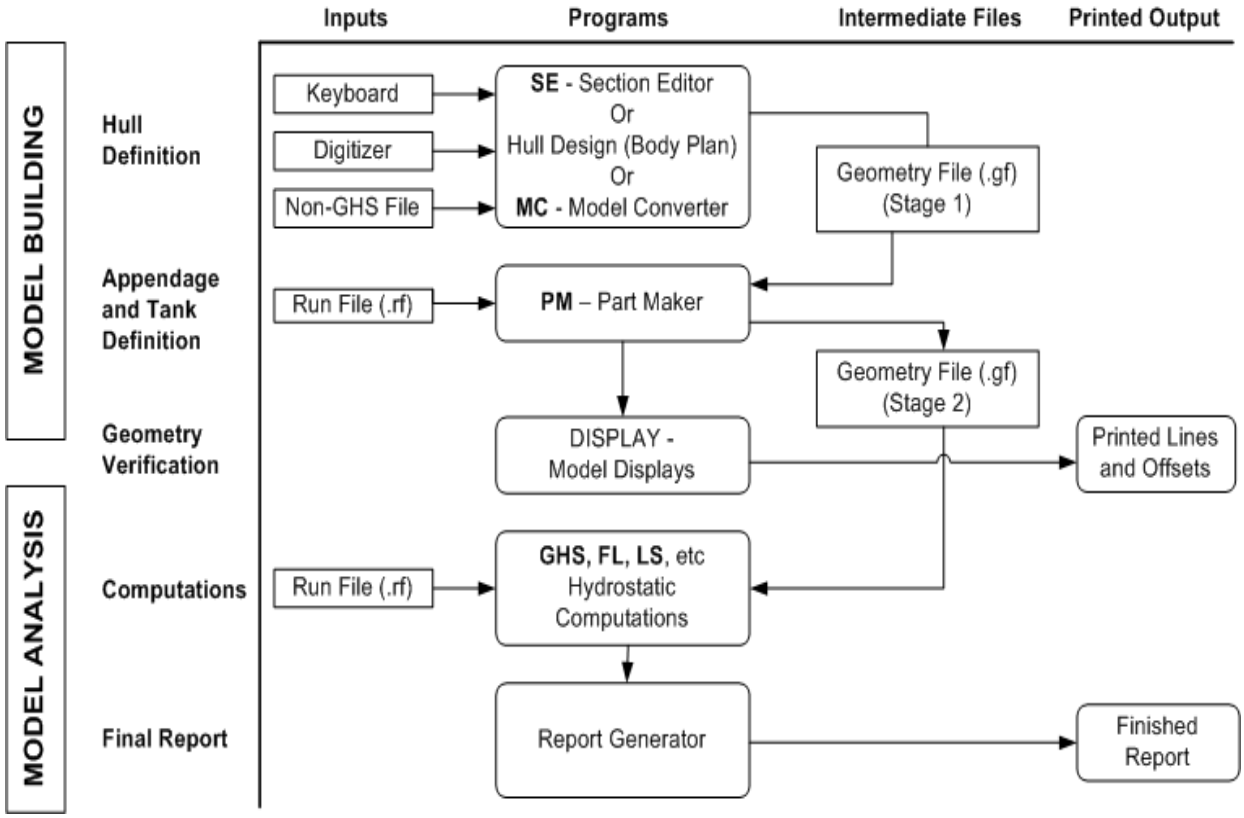
The Phases of a Project 项目运行过程

The chart below depicts the steps involved in producing a report, how the variousdivisions in the software relate to these steps, and which files are involved. It is worth studying this chart. It will help you keep your bearings as you navigate through the process from starting to build geometry to producing the final report.

下图描绘了生成报告的步骤，软件各部分如何参与这些步骤，涉及到的文件。这张表格非常值得研究学习，它可以帮助把握引导方向，从开始建模到生成最终报告。

Note the two main phases: 1) Model Building; and 2) Analysis using the model. Model Building here refers to the process of creating the Geometry File. In one sense, as noted earlier, this is not the complete model, since light-ship weight, and other non-liquid weights are also essential to the overall model. But we do not include them in the Model-Building phase since they are provided in the Run File during the Analysis phase.

要注意两个主要阶段：1）建立模型 2）模型分析研究。建立模型指创建 Geometry File（模型文件）的过程。如前所述的，从某种意义上来说这不是一个完整的模型，是因为空船重量以及其他非液体重量也是整个模型文件必不可少的部分。但是这些未包含在建立模型阶段，而在分析研究阶段的 Run File（运行文件）中提供。



Geometry Organization: Understanding the Model 组织构架：了解模型

Whether creating a GHS geometry file by importing an existing file or building one from scratch, an understanding of the model hierarchy is required. The essentials of the GHS geometry data structure are shown below in outline form (it is fully described in an appendix of the GHS manual).Note that there are three levels in the hierarchy.

创建模型文件无论是导入现有文件还是新建模型，都需对模型的体系有所了解。GHS 模型数据构架简介如下所示（详细介绍见 GHS 用户手册附件）。模型体系分为三个层级。

At the highest level are the Parts. Each Part has an unique name and belongs to one of three classes:
最高层是 Parts（部件）。每个 Parts（部件）名称唯一且从属于三大类型之一：

- Displacer Parts, providing the upward or buoyant forces;
- Displacer Parts（浮体部件），提供向上的力或浮力；

- Tank Parts, providing downward forces;
- Tank Parts（舱室部件），提供向下的力；

- Sail parts contributing only to wind heeling moments and not to buoyancy or weight.
- Sail parts（上建部件），仅影响风倾力矩，不影响浮力或重量。

Additional attributes of Parts are as shown below in the outline.
Parts（部件）的附加特性，概括如下。

Part 部件

Name (optional description) 名称（描述可选）

Class 类型

Substance 实体

Reference Point 参考点

Sounding-tube Definition (optional for tanks only) 测深管定义（只有舱室可以写这个）

Component 组件

Name 名称

Side 方位

Effectiveness or Permeability factor (adding vs. deducting)
渗透率因数（增加或是减少）

Shape factor (optional for sail or displacer parts only)
形状因数（只用于上建或者浮体可选项）

Translation Vector 平移矢量

Margins (optional) 梁拱（可选）

Shape 形状

Name 名称

Shell thickness (optional) 外板厚度（可选）

Section 横剖面

Longitudinal coordinate and number of points
纵向坐标和点的序号

Point 点

Transverse coordinate 横向坐标

Vertical coordinate 垂向坐标

Longitudinal line code (optional)
纵向线规则（可选）

At the next level are the Components. Components belong to Parts. In other words, each Part is the collection of its Components. Since each Component belongs to only one Part, Component names need be unique only within the Part. Therefore, when you refer to a particular Component, it is helpful to mention the Part to which it belongs. A complete Component reference is written as, Part\Component. Notice the back slash between the Part name and the Component name.

Parts（部件）的下一层级为 Components（组件），Components（组件）属于 Parts（部件）。换句话说，每一个 Parts（部件）是其 Components（组件）的集合。由于每个 Components（组件）属于一个 Parts（部件），Components（组件）名称只需在该 Parts（部件）内唯一。因此，当特指某一 Components（组件）时，最好注明它所属的 Parts（部件）。完整的 Components（组件）参数：Parts（部件）\ Components（组件）。请注意 Parts（部件）名称和 Components（组件）名称之间的反斜杠。

At the lowest level in the hierarchy are the Shapes. This is where the bulk of the data resides. The Shape is a 3-D solid model represented by sections, where each section (or “station”) is a closed 2-D curve represented by a series of points. The lines between points are straight; therefore curves need to be represented using enough points to make the errors in the linear approximations negligible. Likewise the “area curves” derived from the sections are considered to be linear between the sections; so the sections need to be spaced closely enough that the errors due to the linear approximations are negligible here as well. You can experiment with point and section spacings, observing the slight differences in results. In most cases 25 – 35 sections gives acceptable accuracy. Typically there is little if anything gained by using more than about 40 sections. GHS enforces a maximum station spacing of 1/20 of the overall length.

Shapes（形状）是最低的层级，主要数据都包含在内。Shapes（形状）是由横剖面形成的 3-D 实体模型，每个横剖面（站线）都是由用点表示的封闭 2-D 曲线组成。点之间由直线连接，因此曲线需要充足的点描绘，来减少线性误差。同样地，“面积曲线”也是由横剖面之间的直线连接，横剖面之间的间隔需足够紧密，来减少线性误差。在大多数情况下，25 – 35 的距离下的精度是可接受的，通常很少有模型用超过 40 的距离。 GHS 允许的最大的站间距为总长度的 1/20。

Interpreting Shapes 形状说明

Note what the Component does: It gives a particular interpretation to the points that comprise the Shape. It also sets their final location on the vessel. By this we mean, the final curve you get from the points in a section will depend on the Side and Vector attributes of the Component.

Components（组件）是什么：给出一个特殊的解释就是 Components（组件）是由 Shape（形状）构成的。Components（组件）设定其在船上最终位置。实际上，从横剖面得出的最终曲线取决于 Components（组件）方位和矢量属性。

If the Side is Starboard, the points remain unchanged. The last point connects to the first, making a closed curve. If the Side is Port, the points are seen in their mirror image, i.e. the transverse coordinates are negated, and the order is reversed. If the Side is Centerline, the points are taken first to last, then again from last to first with the transverse coordinates negated. Thus, the same Shape can serve both port and starboard Components, and only half of a Centerline Component needs to be given.

如果 Side（方位）在右舷，则点保持不变。最后一点连接第一个点形成封闭曲线。如果 Side（方位）在左舷，则镜像这些点，即横向坐标为负，且顺序颠倒。如果 Side（方位）在中心线，则第一个点连接到最后一点，然后反向从最后一个连接到第一个点，且横向坐标为负。 这样，同样的 Shapes（形状）都可以用于左舷和右舷的 Components（组件），并且只需要给定中心对称的一半 Components（组件）。

The Purpose of the Hierarchy 层级的作用

If you want to experience the full power of model building in GHS and avoid a lot of trouble and confusion, then take the time to understand the Part-Component-Shape hierarchy. There are good reasons for this structure.

如想体验 GHS 建模全部功能，但又想避免问题和困难，那就得花时间去理解 Parts（部件）- Components（组件）- Shapes（形状）之间的层级结构，这种层级结构相当合理。

When you finally produce a report, showing vessel loading conditions, the report will list the Parts only. This is a great feature because it allows you to build up a complex hull or tank/compartment using many Components, yet the report will show only the summation of all Components belonging to the Part. So the purpose in having Components within Parts is to make the construction of the model easier without having unnecessary detail in the final report.

当生成最终报告，显示船舶装载工况，报告只列出 Parts（部件）。这是一个非常强大的功能，可以用多个 Components（组件）建立复杂的船体、液舱和舱室，但在报告中只显示所有 Components（组件）综合组成的 Parts（部件）。所以在 Parts（部件）中建立 Components（组件）模型时更加简便，无需考虑不必要的项出现在报告中。

Then why have an additional level for Shapes? Because you can use a Shape in more than one place! How is that possible if two objects are not to be occupying the same space? What makes it possible is the translation Vector at the Component level. Each Component “points to”, or we might say it is “used by”, one and only one Shape. But a Shape can be used by any number of Components since a Component can “vector” the Shape to a position that is suitable to its own purposes. The most common use of this is where symmetrical port and starboard Tank Parts have Components that share the same Shape. In this case the translation Vector is not even needed since the Component can also use the Shape as its mirror image simply by designating its Side as Port or Starboard, as noted above.

为什么给 Shapes（形状）额外一个层级呢？因为同一个 Shapes（形状）可以用在多个地方！怎样使两个物体不占用同一个空间呢？在 Components（组件）层级，平移矢量使之成为可能。每个 Components（组件）“指向”或者“受用于”有且唯一的 Shapes

（形状）。但是 Shapes（形状）可以用于多个 Components（组件），Components（组件）可以平移 Shapes（形状）到想要的目标位置。最常见的用途就是 Tank Parts（舱室部件）的 Components（组件）左右舷对称共享同一 Shapes（形状）。此例中，由于 Components（组件）只需镜像 Shapes（形状）指定其 Side（方位）为左舷或者右舷，无需使用上述平移矢量。

It is worth reading the User's Manual section entitled Understanding the Model in the GHS System Overview. There you will find a diagram that shows the Components of two tanks sharing the same Shape.

用户手册 GHS 系统概述章节中理解模型那部分值得一读。其中有一个图例显示两个舱室 Components（组件）共享同一 Shapes（形状）。

The Vessel Coordinate System 船用坐标系统

The ship model uses a 3-D Cartesian coordinate system, but rather than refer to the axes as X, Y and Z, we call them L, T and V (Longitudinal, Transverse and Vertical), and they always appear in that order. The sense of these axes is positive aft, positive to starboard, and positive upward. We can also denote the longitudinal by means of a letter suffix. For example, “-10.0” would be 10.0 units of length forward of the origin; but it could also be denoted as “10.0f”. Likewise, “10.0” could be written as “10.0a”. Similarly, in the transverse direction, “p” and “s” suffixes can be used. Especially in reports, the f/a and p/s suffixes are used so that the reader does not need to remember the GHS sign convention.

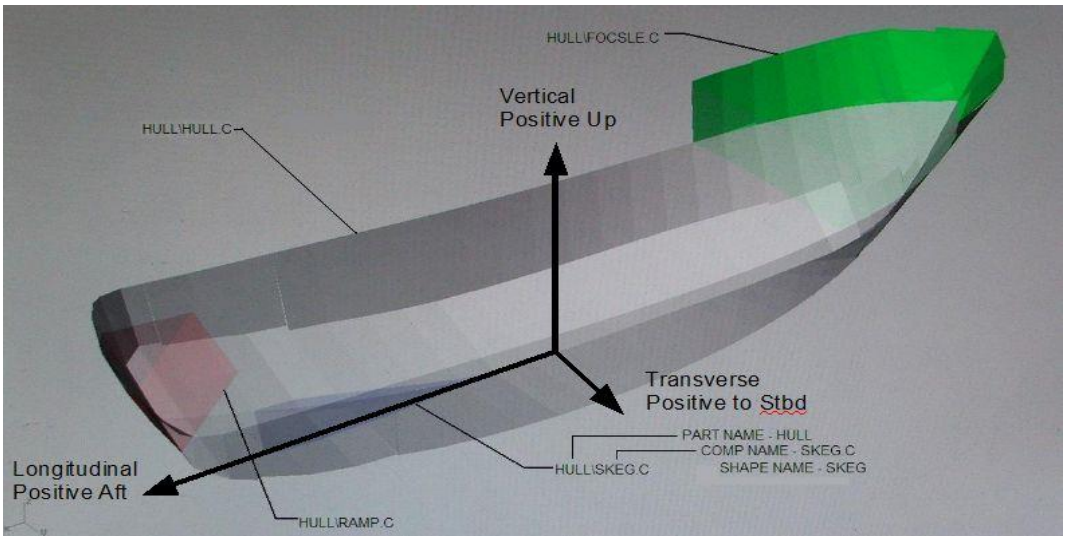
船模型用 3-D 直角坐标系统，但是坐标轴向不叫 X，Y 和 Z，而称之为 L，T 和 V（纵向，横向和垂向），L，T 和 V 按顺序排列。轴向定义是向尾为正、向右为正和向上为正。还可以用符号表示纵向轴向。例如：-10.0”指距原点向首 10.0 单位长，但它也可以写成“10.0f”，同样地，“10.0”可以写为“10.0a”。类似的，在横向轴向可用“p”和“s”后缀表示。特别是在报告中，f/a 和 p/s 后缀的应用，使读者无需记住 GHS 的轴向规定。

The origin of the coordinate system (i.e. the point 0,0,0) is usually located near the keel, in the plane of transverse symmetry and at one of the perpendiculars. In other words, it is usually located the same as on the original lines plan or hull model. The base plane, by definition, runs through the origin, as does the center plane. But this is only terminology, and you are free to locate the origin anywhere you choose. Remember that ultimately the model may be used in an on-board GLM, where the shipboard personnel will expect that locations refer to an origin they are familiar with.

坐标系原点（即点 0,0,0）通常位于船靠近船底部、横向对称中心且在垂线上。换而言之，原点坐标通常与型线图或船舶模型原点相一致。定义的基准面如同中纵剖面一样经过原点。但这只是学术说法，当然可以在任意位置设置原点坐标。但最终模型可能用于船上的 GLM，船上人员更愿意看到模型原点坐标在他们所熟悉的位置。

The origin appears as a blue crosshair in Section Editor, Display and the vessel graphic when it is displayed in the background of the GHS main screen.

当在 GHS 主界面显示时，原点坐标在 Section Editor（横剖面编辑器）、Display（显示界面）和船图像上显示为蓝色十字。



Waterplane Coordinates 水线面坐标

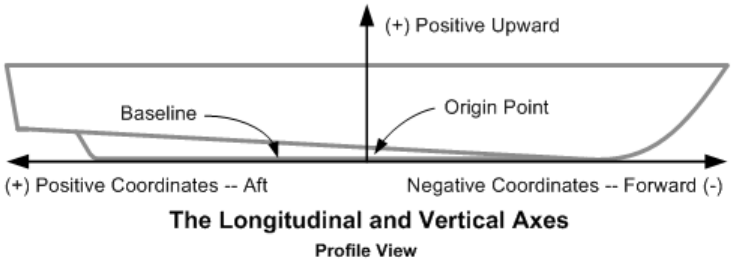
The following illustration emphasizes that the vessel coordinate system is attached to the ship. Centers of gravity and centers of buoyancy are always with respect to the ship coordinate system. However the direction of buoyant and weight forces is perpendicular to the waterplane, which is, only parallel to the baseplane when the ship is upright.

下图例突出标示船坐标系。重心和浮心都是相对于坐标系的位置。但浮力和重力的方向都是垂直于水线面的，只有当船舶正浮时水线面才平行于基准面。

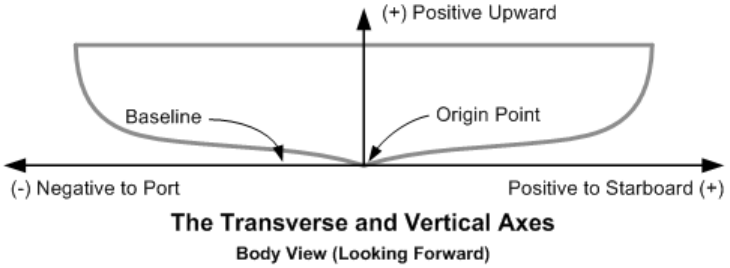
At equilibrium, the CB (center of buoyancy) and the CG (center of gravity) are on a line perpendicular to the waterplane. If heel or trim are present, this line will not be vertical in the vessel coordinate system. Therefore you can expect to see a difference in the longitudinal and transverse coordinates of the CB and the CG even at equilibrium. This is illustrated in the bottom diagram.

在平衡时，CB（浮心）和 CG（重心）在同一直线上且垂直于水线面。当有横倾或纵倾时，这条直线将不垂直于船舶坐标系。因此，可见 CB（浮心）和 CG（重心）的纵向和横向坐标位置都不同，如下图所示：

Coordinate System Diagrams 坐标系示意图

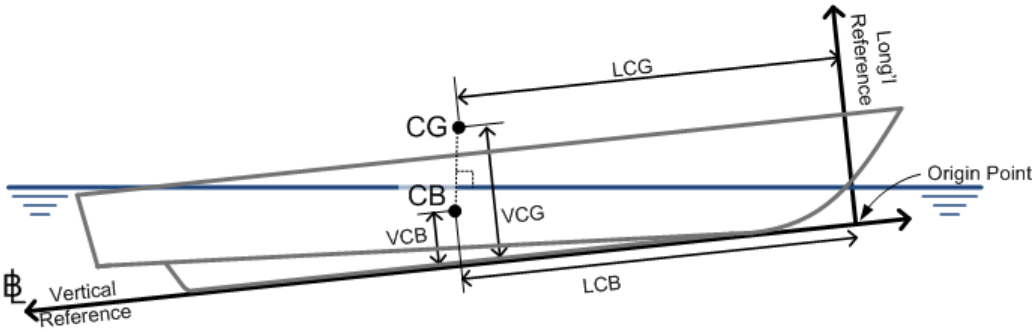


The Longitudinal and Vertical Axes
Profile View



The Transverse and Vertical Axes
Body View (Looking Forward)

Note: All dimensions relative to ships coordinates
Excessive trim shown for clarity



Model Building: Creating the Geometry 建模：创建模型

The tools essential to the process of creating and modifying geometry are:
创建和修改模型过程中的主要工具有：

Part Maker (ENTER PM command) 部件生成（键入 PM 命令）

Part Maker is typically used for building tanks, appendages, and superstructure into Geometry Files that have an existing hull Part. It can be used to create hulls, but if the hull is of ship-shape form, Model Converter or Section Editor would be a better choice. Other hulls that consist primarily of cylinders and rectangular shapes can be created quite efficiently using Part Maker alone.

Part Maker（部件生成）主要用于在已有船体 Part（部件）的 Geometry Files（模型文件）中建立液舱、附体和上层建筑。Part Maker（部件生成）可用于创建船体，但如果船体为船型，那么用 Model Converter（模型转换）和 Section Editor（横剖面编辑器）更为适合。其他圆形或者长方体船型可用 Part Maker（部件生成）建模，非常便捷。

Components of Parts (typically tanks and superstructure) are created by specifying simple boundaries and then trimmed to the required shapes by fitting to existing Components. For example, if given the end bulkheads, the inboard bulkhead, the top, and the bottom boundaries, a wing tank can be easily fitted to the hull.

Parts（部件）中的 Components（组件）（通常指舱室和上层建筑）是通过简单的边界线创建，然后根据需要进行剪切形状并加入已有的 Components（组件）中。例如：当给定前后舱壁、内舱壁、顶部边界、底部边界时，边舱可通过剪切船体轻松得到。

We will get into the details of actually using of Part Maker later.

我们后面将详细介绍实际使用 Part Maker（部件生成）。

Model Converter (MC command or IMPORT and EXPORT commands)

模型转换器（MC 命令或导入和导出命令）

Model Converter is used to import and, in some cases, to export the following files, which are listed here under the file name extensions that Model Converter recognizes.

Model Converter（模型转换器）用于导入文件，在有些情况下也用于导出如下格式文件，这些列出的文件扩展名可由 Model Converter（模型转换器）识别。

GF - GHS geometry file.

GF - GHS 模型文件。

DXF - Drawing eXchange File, commonly available from CAD programs.

DXF - Drawing eXchange File，一般可从 CAD 程序中得到。

IDF - IMSA (International Marine Software Associates) data file for exchange of geometry definitions between marine software products.

IDF - IMSA（International Marine Software Associates）和此软件产品之间转换模型定义文件。

SHC - Ship Hull Characteristics Program data file. Contains a hull description. If bulkhead offsets are included, a Part Maker Run file can be written to create the compartments thus described. Conversion from GF to SHP is not available.

SHC - Ship Hull Characteristics Program 软件数据文件。包含船体描述，当有舱壁位置距离数据时，可用部件生成编写建立船体描述。由 GF 转换到 SHP 不可用。

OFE - Offset Editor file format used by some hull design software.

OFE - Offset Editor 文件格式用于某些船体设计软件。

SHP, HUL, CMP, CMA - Herbert Engineering Corp. file format. Hull geometry and tank geometry information may be found in separate files. Model Converter will read certain of these files and write the result to a GF file. Conversion from GF to HEC is not available.

SHP，HUL，CMP，CMA - Herbert Engineering Corp.文件格式。船体模型和舱室模型在各自独立文件中。Model Converter（模型转换）可读取这些文件并生成 GF 文件。由 GF 转换到 HEC 不可用。

EAG - A simple hull definition file originating from the PIAS software.
EAG - 由 PIAS 软件编写的简单船体定义文件。

Model Converter FIXUP Mode (FIXUP command) 模型转换器修正模式（修正命令）

In this mode, Model Converter provides a rich set of operations that you can perform on your Geometry Files. For example, you can have it change, add or delete sections, define deck edge, specify margin or specify shell thickness. When directed to do so, it can also delete all tanks, delete all parts except tanks and reorder the sequence of tanks.
在这种模式下，Model Converter（模型转换）提供了丰富的操作模式，用于建立 Geometry Files（模型文件）。例如：用于修改、添加或删除横剖面、定义甲板边线、定义梁拱或定义板厚。如果愿意去做，还可以删除所有舱室，删除除舱室以外所有舱室并重新排列舱室顺序。

Some of these operations are also available in Section Editor and Part Maker. Model Converter is especially useful as a command in a Run File, which leads to a greater degree of automation in your work.
其中的一些操作也可用于 Section Editor（横剖面编辑器）和 Part Maker.（部件生成）模块。Model Converter（模型转换）在模型文件中是一个特别有用的常用命令，在工作中实现更大程度的自动化。

We will learn more about Model Converter later.
我们将在后面学习了解更多 Model Converter（模型转换）的内容。

Section Editor (SE command) 横剖面编辑器（SE 命令）

Section Editor can be used to edit Components and Shapes. You can add, delete or move sections and points. Filling between sections by interpolation is also possible. Deck edge definitions (used for deck-immersion criteria and margin line assignments) can be added and edited. SE can also be used to create hull Parts from a table of offsets or by digitizing body plans using digitizing tablets.
Section Editor（横剖面编辑器）可用于编辑 Components（组件）和 Shapes（形状）。可用于添加、删除或者移动剖面和点。剖面之间用用插值法填充。可添加和编辑甲板边线（用于甲板浸没规范和甲板梁拱）。SE 还可以通过型值表或型线图来建立船体 Parts（部件）。

For viewing the geometry without an editing capability, it can be used in DISPLAY mode (DISPLAY command).
可用 DISPLAY（显示）模式（显示命令），查看模型而不进行编辑。

Starting Section Editor 启动横剖面编辑

If a Geometry File is in main memory, the same file is automatically read by SE when started. If no geometry file was in memory, you can use the Read command while in SE. In order to become familiar with Section Editor, do the following:

当 Geometry File（模型文件）在主程序中，那么在启动时 SE 将自动读取文件；当主程序中没有 Geometry File（模型文件）时，在 SE 中可用 Read 命令读读取文件。为熟悉 Section Editor（横剖面编辑器），请执行如下操作：

1) With the command prompt is showing in the GHS main program, first make sure there is no Geometry File currently in memory (use the CLEAR command if necessary);

1） 在 GHS 主程序中显示命令提示符，首先确保程序没有 Geometry File（模型文件）（如有必要用 CLEAR 命令清除）;

2) Type, READ FV.GF,which will read the fishing vessel model that comes with GHS;

2） 键入 RREAD FV.GF，读取 GHS 附带的渔船模型;

3) Give the command SE to bring up Section Editor.

3） 输入命令 SE 来开启 Section Editor（横剖面编辑器）。

Now you should be looking at the Section Editor's main screen showing profile and plan views of this simple fishing vessel model. Here are some things to explore: Use the Tab, Shift-Tab, and Enter to display different views of the geometry. Tab will cycle through the profile/plan – isonometric – body views. The Enter key toggles between the profile/plan mode and the iso/body mode. Shift-Tab will toggle between the profile and plan views or the iso and body views. To go from Part to Part, press the Page Up and Page Down keys. It cycles back to the first part after the last part. To go from Component to Component within the same Part, use the Up-arrow and Down-arrow keys.

现在，可以在 Section Editor（横剖面编辑器）界面看到这个简单的渔船模型侧视图和俯视图。这里可以研究一下：使用 Tab 键、Shift-Tab 键和 Enter 键来显示模型不同的视图。Tab 键用于在侧视/俯视-包络线视图-主视图之间循环切换。Enter 键用于侧视/俯视和主视图/包络线图之间切换。Shift-Tab 键用于侧视和俯视之间、包络线视图和主视图之间切换。Part（部件）和 Part（部件）之间用 Page up 和 Page Down 切换，切换循环从第一个 Part（部件）至最后一个 Part（部件）。Part（部件）中 Component（组件）和 Component（组件）之间用上箭头和下箭头键切换。

Note that on the left side of the screen there is a vertical array of Function Key reminders. Pressing F1 (on the keyboard, not the screen) will bring up the complete Section Editor usage information. Go to the end of it and you will find a handy alphabetical list of the SE commands. These commands are also summarized on pages 36-37.

注意到在界面左侧垂直排列了一排功能键。按 F1 键（按键盘，而不是屏幕）出现完整的 Section Editor（横剖面编辑器）使用说明。在说明最后部分按字母顺序排列了 SE 命令集。这些命令的总结在 36-37.

Commands in SE all begin with different letters of the alphabet. When you type the first letter of a command, the rest of the command word appears automatically. This action is unique to Section Editor and its derivative, DISPLAY.

SE 的所有命令都以字母表的不同字母开头。当键入一个命令的第一个字母时，命令的其余部分会自动出现。这功能在 Section Editor （横剖面编辑器）中是独一无二的，其衍生功能 DISPLAY（显示）中也同样适用。

A Section Editor Exercise 横剖面编辑器练习

As an exercise, try to create the geometry model shown below using Section Editor. The finished Geometry File will have two Parts: a Hull-class Part and a Sail-class Part (in this case the Sail Part is actually a sail).

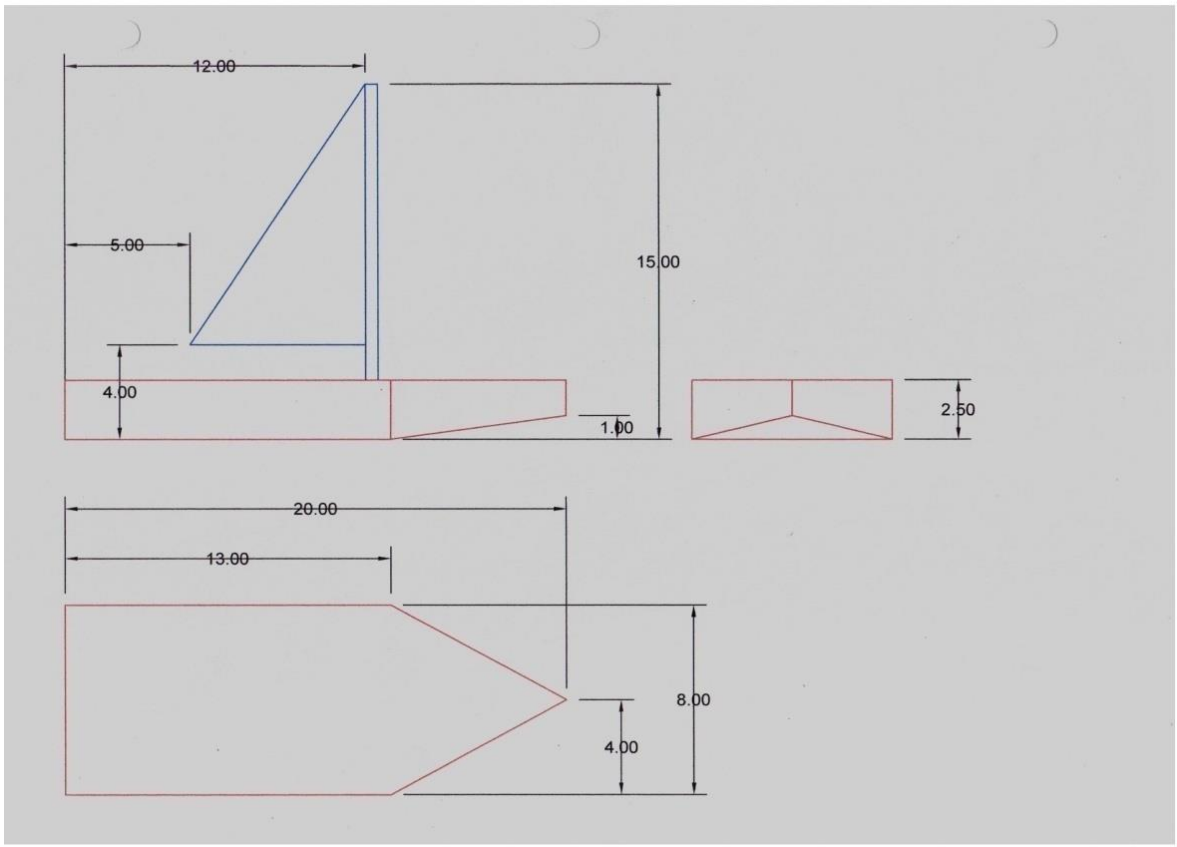
练习，尝试用 Section Editor（横剖面编辑器）创建如下模型文件。完工版的 Geometry File（模型文件）有两个 Parts（部件）：Hull-class Part（船体部件）和 Sail-class Part（上层建筑部件）（本例中 Sail Part（上层建筑部件）实际上就是帆）

If you are now in Section Editor and there is some geometry showing, give the command Read clear to get ready to create the new model.

如果现在在 Section Editor（横剖面编辑器）中，显示有模型存在，键入命令 Read clear 清除模型，准备创建新模型。

When there is no geometry in Section Editor, it goes directly to the body-view screen so that you can begin entering points immediately. You can declare the name of the Part and Component now or you can do it later. Let's do it now. We will be naming the hull Part “HULL” and its single Component will be “HULL.C” (the “.C” meaning it will be a Centerline component so that we will only need to create the starboard half to get the complete symmetrical hull).

当 Section Editor（横剖面编辑器）中没有模型时，将直接进入主视图界面，这样就可以立即开始输入点。在现在就可命名 Part（部件）和 Component（组件），或稍后再命名。现在，命名船体 Part（部件）为“HULL.C”（这里“C”表示中心对称组件，这样就只需创建右半部分，就可以的到完整对称的船体模型）。



Enter Name hull\hull.cto provide this information. Actually “HULL\HULL.C” is the default, and you only needed to press N then the Enter key. Notice these names appearing at the top of the screen. You will also notice that the Shape has been named automatically as HULL.

输入名称“hull\hull.c”提供信息。实际上“HULL\HULL.C”是默认定义船体名称，然后只需键入 N，并回车。会注意到这些名字出现在界面的顶部，还会发现 Shape（形状）已经自动命名为 HULL。

About Names of Parts, Components and Shapes 部件、组件和形状的命名

Part and Component names look about the same. Both are limited to 14 characters and must have no embedded spaces. Component names carry a Side designation by means of the suffix (“.S”, “.P” or .C”). Tank Part names generally carry a side designation in the same way, but other Part names do not (Hull-class and Sail-class parts do not have this side suffix). Although the side suffix is available on Tank Part names, it is the Components that actually determine how each Shape is interpreted, and whether it goes on the port or starboard side, as explained previously.

Part （部件）和 Component（组件）名称看起来都差不多。两者都是限定 14 个字符，且不含空格。Component（组件）名称带有 Side（方位）符号，用后缀符号（“S”，“P”或 C“）表示。Tank Part（舱室部件）通常以同样的方式命名，但是其他 Part（部件）则不是（Hull-class 和 Sail-class 部件没有方位符号）。根据先前说明的，虽然 Tank Part（舱室部件）有方位符号，但实际上是 Components 决定了每个 Shape（形状）的特性和左右舷的方位。

Shape names are limited to eight characters and obviously do not need side designations since that information is provided at the Component level. Most of the time you will not be concerned with Shape names since the system will assign them automatically. When you refer to a particular Shape, you can always do it through a Component, since all Shapes are referenced by at least one Component.

Shape（形状）名字字符限定为 8 个字符，当然它并不需要指定方位信息，因为这些信息会在 Component（组件）层级中提供。大多数情况下不用考虑 Shape（形状）的命名，因为系统可以自动命名。当需要特别指定时，可通过 Component（组件）完成，因为所有的 Shapes（形状）都指向至少一个 Component（组件）。

About Units in Section Editor 横剖面编辑的单位

Section Editor allows you to work in any convenient units and even to switch between units. The Units command will change the displayed units. Use the arrow keys to scroll through the options. You can also enter units different from the displayed units by including the appropriate forms of the numbers. To see what those forms are, simply try different display units and note how the coordinates are shown.

Section Editor（横剖面编辑器）允许使用任何便捷的单位进行工作，甚至是单位之间相互切换。Units（单位）命令可改变界面显示的单位，使用箭头键选择单位可选项。还可以输入与界面单位不一致的数，只要数字形式恰当。如要查看单位形式，可简单尝试显示不同的单位，并注意坐标系如何显示。

Entering Offsets with Section Editor 横剖面编辑器中输入型值

Now we're ready to enter points for the first section – or shall we call it a station?The terms are interchangeable in this context. A prompt to enter the longitudinal location of the first station appears automatically. This is the Station@ command, which you can give any time you want to add a new station. Decide where you want the origin to be, then enter the station's location relative to the origin. Stations can be entered in any order. To delete a station, hit Ctr-F4. You can always go back and edit a station if necessary.

现在，已准备输入第一个剖面或者“站”的点，这两个术语是可互换的。这里会自动出现输入第一站纵向位置的提示。Station@命令可以在任何时间添加新的站线。确定原点位置，然后输入相对于原点位置的站线位置，站线顺序可以是任意的。若要删除一个站线，点击 F4。根据需要随时都可以返回并编辑站线。

After you give the section location, start entering its points. The Insert command will automatically appear, waiting for you to enter the transverse and vertical coordinates of the first point. A comma or a space can be used as a delimiter between these two numbers. Let the first point be at the centerline, on the bottom of the hull. So the first number will be zero, followed by the height above baseline. Assuming you are making a station in the full-beam portion of the vessel, the offsets would be,

在定义剖面位置之后，开始输入剖面的点。INSERT（输入）命令会自动出现，等待输入第一点的横向和垂向坐标。两组数之间分隔符可用逗号或者空格。设置第一点在船体底部中心线处，则第一个数字是 0 和其距基线高度。假设定义船横剖面站线，其型值如下：

```
Point 1: 0.0, 0.0
Point 2: 4.0, 0.0
Point 3: 4.0, 2.5
Point 4: 0.0, 2.5
```

Points always proceed in the counterclockwise direction. Normally you start at the keel and go around and up to the deck edge. Since we are dealing with a centerline Component, you can stop at the deck edge. The other side is implied.

通常点按照逆时针方向旋转进行。一般的从底部开始旋转直至甲板边线。因为设置的是中心线 Component（组件），所以点在甲板边线终止，默认镜像另外一舷。

What about the top of the section from the deck edge to the centerline? It, too, is implied. Since all sections are closed curves by definition, there is no such thing as an “open” top.

那么在剖面中甲板边线到中心线的顶部怎么处理呢？没错，也是默认相连的。由于所有的剖面都定义为封闭曲线，所以不会存在“开放”的顶部。

For this simple hull, you need only three points per station. At the stem you can use small transverse offsets slightly greater than zero for the second and third points.

对于这个简单的船体，每站只需三个点。尾部用横向偏移略微大于 0 的值作为第二点和第三点。

If a point is entered incorrectly, move to that point using the F5 and F6 keys to bring the cursor to the point. Then press F2 to switch from Insert mode to Replace mode, then retype or edit the numbers to the correct values. Alternatively, pressing K puts it in Key

Editing Mode where the arrow keys can be used to move the point to the correct location. Pressing K again or F2 will return to insert mode.

如果一个点输入错误，可用 F5 和 F6 键移动光标到该点。然后按 F2 键，从插入模式转换为替换模式，然后重新输入或编辑正确的值。另外，可按 K 键进入 Key Editing Mode（关键编辑模式），用箭头键将点移到正确位置。再按 K 键或者 F2 返回插入模式。

Another way to insert and edit points is by means of the right mouse button. It will insert after the current point or replace the current point with coordinates derived from the present mouse pointer. The left mouse button can be used to select points.

另一种插入和编辑点的方法就是鼠标右击。根据鼠标位置，在当前点之后插入，或替代当前点坐标。鼠标左键可用于选择点。

Since the Insert mode will always have your new point inserted after the current point, how do we insert a point before the first point? Go to the first point, then while in Insert mode press F5 and it will say “pre insert”, which means the point you now enter will be inserted before the first point (now becoming the first point.)

由于插入模式总是将新的点插入当前点之后，但如何将点插在当前点之前呢？找到第一点，然后进入插入模式按 F5 键，会显示“Pre insert（在前面插入）”，这表示插入的点将在第一点之前（现在变成了第一点）。

To delete the current point, hit F4.

要删除当前点，按 F4 键。

Saving Your Work: Writing the Geometry File 保存工作：编写模型文件

Writing your work to a Geometry File is done using the Write command. For example, Write EX1.GF will write your current model to a Geometry File named EX1.GF. You can also scroll through the “.GF” files in the working directory using the arrow keys. If an existing file is selected, it is overwritten without warning. It is easy and prudent to save your work often using the Write command.

用 Write 命令将工作内容写入 Geometry File（模型文件）。例如：Write EX1.GF 把当前模型写入名为 EX1.GF 的 Geometry File（模型文件）。也可用方向键在工作目录中选择“GF”文件，当选择完一个文件后，将覆盖此文件但没有提示。用 Write 命令经常保存文件是简单且明智的做法。

The Arc Command Arc 命令

Shall we add a bilge radius? The Arc command makes it easy. On any station, go to the point at the intersection of the bottom and side, then give the command Arc radius 1.0 and the original point becomes an arc.

是否可以添加半径圆弧？Arc 命令可以轻松实现。在站线底部和侧面的交叉点，输入命令 Arc radius 1.0,，则原来的点变成一个圆弧。

How Many Stations? 有多少站？

There is no need to enter more than three stations in this simple exercise: one at each end and one at the knuckle will be sufficient.

这个简单练习输入不超过三个站：两个站线在首尾两端，一个站线在中间节点处就足够了。

GHS requires station spacing no greater than 1/20 of the overall model length. Section Editor will write a geometry file even if the station spacing is too large, in which case, a “Station spacing too great” error will appear when trying to read the file into GHS main memory. If this happens, you can immediately give the main-program's FILL command and it will send the Geometry File through Model Converter FIXUP to fill-in the missing stations.

GHS 要求站之间的距离不超过整个模型长度的 1/20。Section Editor（横剖面编辑器）编辑时即使站间距过大也会写入模型文件中。此时，当 GHS 主程序读取模型时会出现“Station sapcing too great”的报错。如果发生此情况，可立即在主程序中输入 FILL 命令，将 Geometry File（模型文件）发给 Model Converter FIXUP（模型修复），填充修复缺少的站线。

But we can easily generate the missing stations with the Fill command in SE before we leave. Note that this filling operation, whether done by SE or MC, uses nonlinear interpolation. It will detect obvious abrupt changes in the original and use linear interpolation in such cases. However, it is not a bad idea to put closely-spaced stations at any discontinuity before Filling. In the case at hand, the Fill operation should respect the knuckle and give reasonable results from just the three original stations.

但在离开之前，可以用 SE 的 Fill 命令生成缺少的站，这相当简单。无论在 SE 还是 MC 中进行填补操作都采用非线性插补法。当程序发现在原始站线中有明显的突变的情况时，会使用线性法填补。但不管怎样，在填充之前，把不连续的站线设置成紧凑排列的是个不错的主意。在本例中，Fill 操作应遵循节点，根据三个原始站线给出合理的结果。

Making the Sail 建立上层建筑

To complete the model in this exercise, Enter the Name command again and instead of accepting the default prompt HULL\, enter

为完成本练习中的模型，再次输入 Name 命令，这次不再接受默认提示名 HULL\，而是输入：

```
Name sail:rig\sail.c
```

The “SAIL:” prefix tells SE that it is to be a Sail-class Part. It will come back asking “Want to create part RIG?”. This is to guard against accidentally starting a new Part when you only wanted to switch to an existing Part. In this case we do want to start a new Part, so the answer is “Yes”.

前缀“SAIL”指示 SE 这是 Sail-class Part（上层建筑部件）。程序会反馈“Want to creat part RIG（建立 RIG 部件）？”当只是想切换到一个现有的部件时，为了防止意外启动一个新的 Part（部件）。这里我们想新建一个 Part（部件），那么回答就是“YES”。

The rest is similar to what we did to make the hull. Give it some slight transverse offset, not simply zero. For example,

其余操作和创建船体模型类似。输入一个略微大于 0 的横向偏移的点。例如：

```
Point 1:0.0,4.0
```

```
Point 2:0.01, 4.0
Point 3:0.01, 15.0
Point 4:0.00, 15.0
```

For the last aft-most point out at the cLEw, still use three points and make the third point slightly higher than the second rather than having two points at the same location.
类似之前尾部的设置，仍然使用三个点，并且使第三点略高于第二点，而不是两点在同一位置。

Two stations are sufficient (but you will still have to Fill).
两站就足够（但还需 Fill 填充）

If you want to make the mast as an additional Component, create the second Component, again with the Name command:
如果想创建桅杆作为另外个 Component（组件），再建立第二个 Component（组件）并使用 Name 命令：

```
Name rig\mast.c
```

Tab to the Body view if you are not there already and go ahead with the first station on the mast. Note that the SAIL.C component is still showing since it is within the same Part. If you want to have only one Component showing, press Ctr-P. Two stations will suffice for the mast, and no filling is necessary since the spacing is already close enough.
如不在包络线视图，按 Tab 键切换到包络线视图，建立桅杆的第一站。由于在同一个 Part（部件）内，SAIL.C 组件仍然在这里显示。如果想只显示单独一个 Component（组件），按 Ctr-P 键。桅杆用两站就足够了，因为间隔已经足够紧密，没有必要进行填充。

Supposing you accidentally made the mast Component such that it overlaps the sail Component, and you want to move the sail aft a bit. You may remember the mention of Component Vectors previously, and you will have noticed that the Section Editor screen shows the Vector of the current Component. You can change this vector through the Edit command. First, make sure you are looking at the Component whose vector you want to change, using theUp/Down arrow keys if necessary. In this case, while highlighting the RIG\SAIL.C, enter the command,
假如在建立桅杆 Component（组件）时，不小心与帆 Component（组件）重叠了，想要将帆向尾移动一点。可能还记得之前提及的 Component Vectors（组件矢量）在 Section Editor（横剖面编辑器）界面显示当前 Component（组件）的矢量。可通过 Edit 命令更改位置矢量。首先，确认此 Component（组件）与改变矢量相对位置，用向上/向下键选择。本例中，找到 RIG \ SAIL.C，输入命令：

```
Edit vector 0.5, 0, 0
```

This will shift the sail 0.5 units aft of where it was originally.
帆与原位置相比向船尾移动了 0.5 个单位。

Other SE Commands 其他 SE 命令

To quit Section Editor and go back to the main program, use the Quit command (or press the Escape key) which will bring up a prompt to confirm quitting.
退出 Section Editor（横剖面编辑器）并返回到主程序，用 Quit 命令（或者按 Esc 键），退出时弹出确认退出的提示。

Other interesting SE commands include:
其它值得关注的 SE 命令包括：

- Ctrl + U： Undo
- Ctrl + R: Redo
- Delete Component; the Part is also deleted if it has only one Component.
- Delete Component，如果这个 Part（部件）只有一个 Component（组件），那么 Part（部件）也会被删除。
- Edit changes Component parameters Effectiveness, Margin, and Vector.
- Edit 命令修改 Component（组件）参数的有效性，梁拱和矢量。
- Location relocates a station, optionally moving neighboring stations to Lengthen or Shorten the shape.
- Location 移动站线，选择性的移动邻近的站线来延伸或缩减形状。
- Title adds a title to be saved with the geometry file.
- Title 添加一个标题保存在模型文件中。
- Xlate toggles translate mode. In this mode, moving a point moves the entire station.
- Xlate toggles translate mode。在这种模式下，移动一个点可移动整个站线。

A list of Viewing and Editing commands for Section Editor are provided below for Reference. The Viewing commands also work in Display.
Section Editor（横剖面编辑器）中 Viewing 和 Editing 命令列表如下仅供参考。Viewing 命令也适用于 Display（显示）。

Section Editor / Display 横剖面编辑器/显示 **Viewing Commands Viewing 命令**

Change view 更改视向:

TAB	cycles through view: plan/profile → isometric → body → plan/profile
TAB 键	循环显示：平面图/侧视图→包络线视图→主视图→平面图/侧视图
SHIFT + TAB	toggles view: profile ↔ plan OR body ↔ isometric
SHIFT+TAB 键	切换视向：侧视图↔平面图或主体 ↔包络线视图
ENTER	toggle views: plan/profile ↔ isometric
ENTER 键	切换视向：平面图/侧视图↔包络线视图
ALT +← ↑ → ↓	rotates model in isometric view
ALT +← ↑ → ↓	在包络线视图旋转模型

Viewing Options 视图选项:

CTRL + B	toggle background color black ↔ white
CTRL + B 键	切换背景颜色为黑色↔白色
CTRL + K	toggle deck edge (and centerline) display on & off
CTRL + K 键	切换甲板边线（和中心线）显示&不显示
CTRL + L	toggle single station ↔ all stations (in single station mode, F7 & F8 display adjacent stations)
CTRL + L 键	切换单个站线 ↔全部站线 (在单个站线的模式，显示相邻 F7 & F8 键的站线
CTRL + O	toggle component/shape information on ↔ off
CTRL + O 键	切换组件/形状信息开↔关
CTRL + P	part toggle: entire part ↔ single component
CTRL + P 键	切换部件：整个部件↔单个组件

Zoom 放大缩小功能:

CTRL + F9	centers cursor on selected point
CTRL + F9 键	将光标中心移到选择点
F9	restore normal view, entire part fills screen
F9 键	键恢复常规显示，完整 part（部件）充满屏幕
F10	zoom in 放大
Z – ZOOM	zoom by a sets the zoom factor; default is 1.0 which doesn't change the scale, but does center the cursor on selected point
Z – ZOOM	根据缩放系数缩放，默认值为 1.0 即为不缩放，但是会使光标中心移到选择点

Change selected part 更改选择的部件:

PAGE DOWN selects next part
PAGE DOWN 键选择下一个部件

PAGE UP selects previous part
PAGE UP 键 选择上一个部件

SPACE cycles through parts
SPACE 键 循环显示部件

Change selected component 更改选择的组件:

↓ (down arrow) selects next component in present part
↓ (向下箭头) 在现有的部件中选择下一个组件

↑ (up arrow) selects previous component in present part
↓ (向上箭头) 在现有的部件中选择上一个组件

Change selected station 更改选择的站线:

F7 move to next station (aft) in shape
F7 键 移动到形状中的下一个站线（向尾方向）

F8 move to previous station (forward) in shape
F8 键 移动到形状中的上一个站线（向首方向）

CTRL + F7 move to last station is shape
CTRL + F7 键 移动到形状中的最后一个站线

CTRL + F8 move to first station in shape
CTRL + F8 键 移动到形状中的第一个站线

Change selected point 更改选择的点:

F5 move to prior point on station
F5 键 移动到该站线前一个点

F6 move to next point on station
F6 键 移动到该站线后一个点

CTRL + F5 move to first point on station
CTRL + F5 键 移动到该站线第一个点

CTRL + F6 move to last point on station
CTRL + F6 键移动到该站线最后一个点

See following page for SE/Editing Commands
在下页中浏览 SE/Editing 命令

Section Editor Only 仅在横剖面编辑器 **Editing Commands Editing 命令**

Note: Section Editor uses only the first letter of a command. Once the first letter is typed, the command becomes active. Additional letters typed are perceived by the program as input to the command.

注意：Section Editor（横剖面编辑器）使用命令的第一个字母做为命令。一旦键入第一个字母，就激活命令。程序把另外键入的字母看作是输入到该命令中去的。

See HELP SE-REF for more details about Section Editor commands and functions.

Section Editor（横剖面编辑器）的命令和功能的更多细节请参阅 HELP SE-REF。

Input Mode Keys 输入模式按键

F2	edit mode toggle: insert ↔ replace (move)
F2 键	编辑切换模式：插入↔代替（移动）
CTRL + F2	toggle key edit mode ↔ insert/replace mode (see K command below)
CTRL + F2 键	切换修改模式键↔插入/代替模式（参见下述 K 命令）

Commands for editing geometry 编辑模型的命令:

A – Arc	converts present point to an arc of specified radius
A – Arc	转化当前点为指定半径的圆弧
F3	duplicate present point
F3 键	复制当前点
F4	delete present point
F4 键	删除当前点
CTRL + F4	delete present station
CTRL + F4 键	删除当前的站线
D – Delete	delete component; if only one component, deletes the part also
D – Delete	删除组件；如果只有一个组件，则部件将一并删除
E – Edit	edit the component vector, effectiveness factor, or margin
E – Edit	修改组件矢量、有效因数或是梁拱
F – Fill	interpolate stations on the present shape to fill gaps larger than given interval
F – Fill	在当前形状中插入站线，填充过大的间隔。
K – Keyedit	toggle keyedit mode enabling arrow keys to nudge selected point
K – Keyedit	切换键入模式用方向键移动已选择点
	- ARROW keys (← ↑ → ↓) nudge point by 0.010

- 箭头键 (← ↑ → ↓) 以 0.010 的单位移动点

- CTRL + ARROW moves larger increments (0.100)
- CTRL + ARROW 键以 0.100 的单位移动点。

L – Location	move present station; can be used lengthen or shorten vessel
L – Location	移动现有的站线，可以用来延长或是缩短船长
N – Name	select, create new, or rename a part/component
N – Name	选择、创建新的或是重命名一个部件/组件
S – Station	new station, copy present station, or interpolate new station
S – Station	新建站线，复制现有的站线或是插入新站线
X – Xlate	toggles translate mode, moving a single point moves entire station
X – Xlate	切换转化模式，移动一个单独的点即可移动整个站线
CTRL + D	construct deck edge
CTRL + D 键	创建甲板边线
CTRL + Z	deconstruct deck edge
CTRL + Z 键	拆除甲板边线

Other commands 其他命令:

F1	help window
F1 键	帮助窗口
Q – Quit	to exit section editor, will prompt to save changes.
Q – Quit	退出 section editor（横剖面编辑器），将提示保存更改
R – Read	read a geometry file, if already read in GHS, will be read automatically
R – Read	读取模型文件，如果已经在 GHS 中读过，模型文件将会被自动读取
T – Title	to add a title to the geometry file
T – Title	为模型文件增加标题
U – Units	to set units for input and display
U – Units	为输入和显示设定单位
W – Write	saves the current geometry to a file
W – Write	将现有的模型保存为文件

Model Converter: Importing and Exporting Geometry 模型转换器：输入和输出模型

Model Converter is used when you import or export geometry data. The IMPORT and EXPORT commands are most useful for these operations, and when you use these commands you are actually using Model Converter indirectly.

Model Converter（模型转换器）用于导入和导出模型文件。对这些操作来说 IMPORT 和 EXPORT 命令是最实用的命令。当使用这些命令时，实际上等于间接的用了 Model Converter（模型转换器）。

The DXF drawing file is one source of geometry data that the IMPORT command recognizes. For example, if you have a CAD drawing and can export the hull sections as a DXF, you can then import the data from the DXF into a GHS Geometry File.

DXF 图形文件是 IMPORT 命令可识别的模型数据源之一。例如：当有一张 CAD 图纸，并转化为船体横剖面的 DXF 格式文件，就可以把 DXF 文件导入 GHS Geometry File（模型文件）。

It is recommended that the data in the DXF be in the form of a 3D drawing. Model Converter will also handle 2D drawings, but it becomes more complicated since section locations have to be communicated explicitly. Model Converter offers you several ways to do this, such as using layer numbers or names to represent the longitudinal location of the section on that layer.

建议 DXF 中数据是用 3D 形式的。Model Converter（模型转换器）也可以处理 2D 图形，但由于站线位置需连接紧密，这使得工作将变得非常复杂。Model Converter（模型转换器）还提供了几种处理方法，如用图层或名称来表示该站线在图层中的纵向位置。

Since the DXF file fundamentally represents a drawing, there is no guarantee that a coherent model can be extracted from it. For example, there is nothing to prevent the DXF from having lines that are coincident. Model Converter must piece together line segments, polylines and arcs from the DXF in order to make a 3D solid model suitable for the GHS Geometry File. The DXF file format does not require that these drawing elements be in any particular order, even if it is a 3D drawing.

由于 DXF 文件基本功能是表示图形，不能保证模型提取后的连贯性。例如：没有方法防止 DXF 文件中的线重合。Model Converter（模型转换器）必须把 DXF 文件的分线段、多段线和圆弧按顺序转化成适用于 GHS Geometry File（模型文件）的 3D 实体模型。但在 DXF 格式中，即使是 3D 模型，都不会要求图形元素按特定顺序排列。

A Model Converter Exercise 模型转化练习

For this exercise we will generate suitable DXF files the easy way: simply by using the EXPORT command. We will export two components from the FV.GF model as two separate DXFs, then import them back into a singe Geometry File. If you have a CAD program on your computer you can look at the DXFs that we will be generating.

在本练习中，生成适当的 DXF 文件，方法简单：只需用 EXPORT 命令。从 FV.GF 模型中导出两个组件作为两个独立 DXF 文件，然后返回导入 Geometry File（模型文件）。如果在电脑上有 CAD 软件，那么可以查看生成的 DXF 文件。

This is a good time to use a Run File. We will place the EXPORT and IMPORT commands in a Run File named MKHULL.RF. At the GHS main program prompt, enter the command “PROJECT MKHULL”. Then enter the command “EDIT”. This should

bring up the Run File editor ready to create or edit MKHULL.RF. The first thing to put on this file is that PROJECT command again. This will save some time if you come back to this file later, since it will define the project name itself when your run it.

现在可以使用 Run File（运行文件）。在 MKHULL.RF Run File（运行文件）中写入 EXPORT 和 IMPORT 命令。在 GHS 主程序提示符界面，输入命令“PROJECT MKHULL”，然后输入命令“EDIT”。调出 Run File（运行文件）编辑器，准备创建或者编辑 MKHULL.RF。对于这个文件做的第一件事就是再次写入 PROJECT 命令，为以后再次回到这个文件节省时间。因为当你运行时，它会自行定义项目的名称。

Next we will use the READ command to read FV.GF into main program memory. Then type in the EXPORT command as shown below.

下一步，用 READ 命令读取 FV.GF 到主程序中。然后输入如下所示的 EXPORT 命令：

```
PROJECT MKHULL
READ FV.GF
EXPORT (HULL\HULL.C) HULL.DXF /3D:XYZ
```

You can now close the editor, saving the file first, and when you get back to the GHS main program command prompt, enter the command “RUN”. Since the project name is MKHULL, it will run MKHULL.RF. Unless you include the /NOWAIT parameter, there will be an informational MC window that you will need to close before it will continue.

现在，保存该文件，退出编辑器，回到 GHS 主程序命令提示符界面，输入命令“RUN”。因为项目名称是 MKHULL，那么会运行 MKHULL.RF。除非在命令中包含参数/ NOWAIT，否则在程序继续运行前需要关闭 MC 信息窗口。

The result of this run is the file HULL.DXF, and you will find it in the working folder. If you are familiar with the DXF format, you might like to have a look at it. Since DXF files are text files, you can view it as text using the VIEW command: “VIEW HULL.DXF”. Much more useful would be to look at the DXF through a drawing program that reads or imports DXFs. If you have one on your computer you might want to take a look at this drawing that Model Converter has created.

此次运行结果为 HULL.DXF 文件，可在工作文件夹下找到该文件。如果熟悉 DXF 格式文件，可以打开查看一下。由于 DXF 文件是文本文件，可以类似查看文本用 VIEW 命令查看“VIEW HULL.DXF”文件。查看 DXF 文件更实用的的方法是通过图形软件读取或者导入 DXF 查看文件。如果有一台计算机，那么就可以查看由 Model Converter（模型转换器）创建的图形文件。

As you may have guessed, the parameter “/3D:XYZ” has something to do with the way the drawing is laid out. It tells Model Converter to make a 3D drawing and to make the drawing's X,Y and Z axes correspond to the L, T and V axis of the GHS model.

正如所猜测的，“/3D：XYZ”参数与图形文件的布局有关。Model Converter（模型转换器）创建 3D 图形文件，并让图形文件的 X，Y 和 Z 轴对应到 GHS 模型中的 L，T 和 V 轴。

Now let's complete the exercise by doing the following.

现在，通过执行以下操作，完成练习。

First, add a second EXPORT command to your run file, this one exporting the Component HULL\FOCSLE.C to the file FOCSLE.DXF.
首先，在运行文件中添加第二个 EXPORT 命令，这个命令输出 Component（组件）HULL\FOCSLE.C 到文件 FOCSLE.DXF.

Next put the command “CLEAR”. This will clear the geometry from main program memory so that we can be sure that what we see next will actually be what was imported.
下一步，输入命令“CLEAR”。清除主程序模型文件，这样确保接下来看到是导入的模型。

Follow this with an IMPORT command to take the drawing data from HULL.DXF and place it on the Geometry File FV1.GF. Now the command needs to be more explicit. The EXPORT command needed only to state the name of the file to receive the output, implying that the currently-read Geometry File would be the source. Now we must specify both the input, or source, and the output file. The command would be,
接下来用 IMPORT 命令导入图形文件 HULL.DXF，放在模型文件 FV1.GF 中。现在命令需更加详细。EXPORT 命令只需指定文件名，接收输出文件，也就是说当前已读的 Geometry File（模型文件）是源文件。现在需定义输入文件/源文件和输出文件，命令如下：

```
IMPORT HULL.DXF (HULL\HULL.C) FV1.GF /3D:XYZ/NOFILL
```

Here are some things to observe: 1) The reason we need to specify the Part and Component names is that the DXF does not carry this information; 2) the /3D parameter must match that in the EXPORT command exactly (i.e. it must accurately indicate the form in which the drawing portrays the 3D model); and 3) the /NOFILL parameter tells Model Converter to not bother with filling-in extra stations since we know that it already had enough.
可以注意到以下几点：1）之所以需要指定 Part（部件）和 Component（组件）名称，是因为 DXF 不包含这些信息；2）3D 模型参数必须和 EXPORT 模型完全匹配（即必须精确指出图形文件中的 3D 模型格式）；3）当站线足够时，/ NOFILL 参数表示 Model Converter（模型转换器）无需插入额外站线。

Finally, add the second IMPORT command.
最后，添加第二个 IMPORT 命令。

Of course, if the drawing had contained other elements, they could be similarly imported as additional Components of the hull, as Sail-class Parts and even as tank Parts (but in most cases Part Maker is the best way to put tanks into the model).
当然，如果图形文件包含其他元素，它们同样也可以导入其他船体的 Component（组件）、Sail-class Parts（上层建筑）、甚至是 Tank Parts（舱室部件）（但在大部分情况下 Part Maker（部件生成）是模型建舱室的最佳方法）。

After importing the geometry, you will want to mark the deck edge. Section Editor and Part Maker can do that as well, but we will show how you can use Model Converter through the FIXUP command to accomplish this as well. The command to mark the deck edge on HULL.C would be,

在导入模型文件之后，想要生成甲板边线。可用 Section Editor（横剖面编辑器）和 Part Maker（部件生成）完成，但这里将演示如何用 Model Converter（模型转换器）中 FIXUP 命令完成。在 HULL.C 中生成甲板边线的命令是：

```
FIXUP FV1.GF (HULL\HULL.C) /DECKEDGE
```

Your completed run file could look something like the following, but without the SHELL command, which is shown here to demonstrate what you could do if you had Rhino or some other CAD program on your computer and wanted to automate the step of examining a DXF before importing it.

完整的运行文件如下所示，但不包含 SHELL 命令。这里将演示如果电脑配备有 Rhino 或其他 CAD 软件时可以如何去做，以及如何自动导入前检查 DXF 文件的步骤。

```
PROJ MKHULL
READ FV.GF
EXPORT (HULL\HULL.C) HULL.DXF /3D:XYZ /NOWAIT
SHELL OPEN HULL.DXF /SPAWN
EXPORT (HULL\FOCSLE.C) FOCSLE.DXF /3D:XYZ /NOWAIT
CLEAR
IMPORT HULL.DXF (HULL\HULL.C) FV1.GF /3D:XYZ /NOFILL
IMPORT FOCSLE.DXF (HULL\FOCSLE.C) FV1.GF /3D:XYZ /NOFILL
FIXUP FV1.GF (HULL\HULL.C) /DECKEDGE /NOFILL
FIXUP FV1.GF (HULL\FOCSLE.C) /DECKEDGE /NOFILL
DISPLAY
```

Deck Edge Considerations 甲板边线修正

If you bring up DISPLAY or SE, and you have marked the deck edge on both HULL.C and FOCSLE.C, you will notice brown lines in the iso view, showing where Model Converter put the deck edge. Now here is a problem: Does this represent reality? In this case the answer would be “no”, since the FOCSLE.C Component is a watertight structure that covers the main deck forward. We would like to remove the deck-edge marks from HULL.C where it is covered by FOCSLE.C. It is not difficult to do this using Section Editor. If you move the point marker to the point at the deck edge, you will see “DK” following the point's coordinates. Simply deleting the “DK” removes the deck edge mark on that station. You could do this for all of the stations on HULL.C that are in way of FOCSLE.C. But you can also do it with the FIXUP command. By adding a range of locations to the /DECKEDGE parameter we can specify the length over which the deck edge is to be marked:

当调用 DISPLAY 或 SE，在 HULL.C 和 FOCSLE.C 上都已标记了甲板边线，在包络线视图可看见有棕色的线，显示 Model Converter（模型转换器）设定的甲板边线。问题：这条线是否表示真实甲板边线呢？在这种情况下，答案是“不”，由于 FOCSLE.C Component（组件）是覆盖在船首甲板的水密结构。应删除 HULL.C 上被 FOCSLE.C 覆盖的甲板边线，用 Section Editor（横剖面编辑器）来说这很简单。当把标记点移动到甲板边线上，可以在点坐标系中看到“DK”。只需简单删除“DK”，移除标识点站线的甲

板边线，通过此方法，可以删除所有 HULL.C 被 FOCSLE.C 覆盖甲板边线。但也可以用 FIXUP 命令来操作，通过为/ DECKEDGE 参数定义长度范围来定义甲板边线的长度范围：

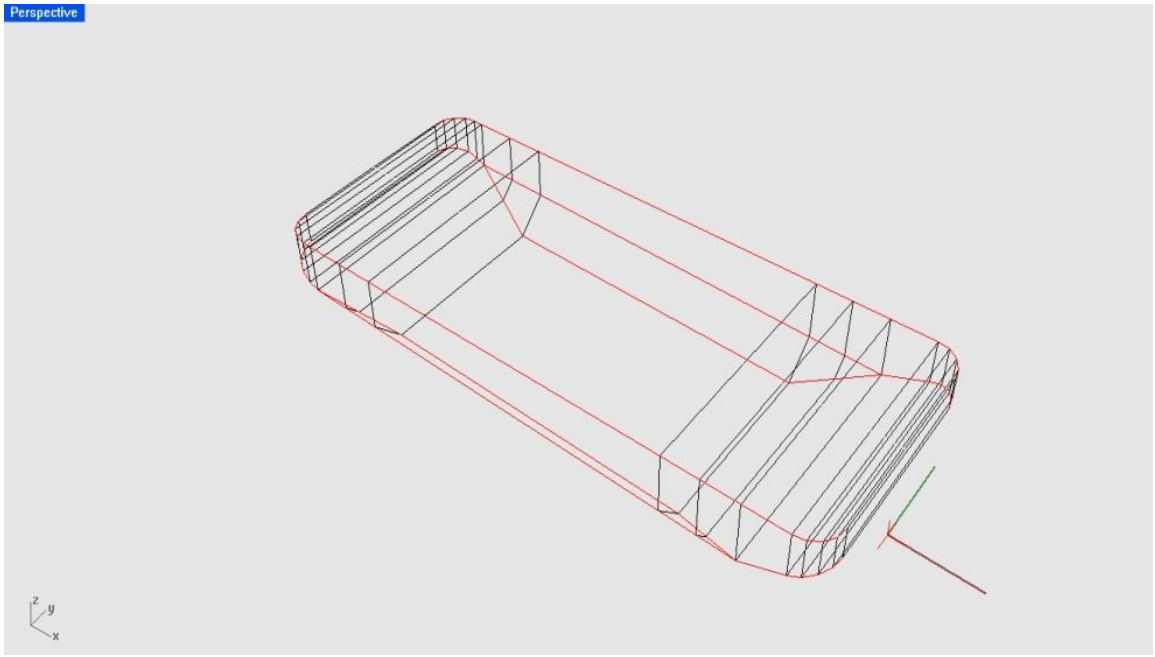
```
FIXUP FV1.GF (HULL\HULL.C) /DECKEDGE:-23.2, 41/NOFILL
```

Another Model Converter Exercise 其他模型转换练习

Convert BARGE.DXF into a GF file. We will use the resulting Geometry File later for the Part Maker Exercise. In this case BARGE.DXF happens to be a 3D drawing with axis assignments such that we need the parameter /3D:XYZ. Here are the commands to put on your run file MKBARGE.RF:

将 BARGE.DXF 文件转换成 GF 文件，此后生成的 Geometry File（模型文件）将用于 Part Maker（部件生成）练习。本例中，BARGE.DXF 的 3D 模型自带坐标轴定义，正如我们所需要的参数/3D:XYZ。运行文件 MKBARGE.RF 命令如下：

```
PROJECT MKBARGE
IMPORT BARGE.DXFBARGE.GF /NEWGF /3D:XYZ
DISPLAY
```



The second part of this exercise is to add parameters to the IMPORT command line to orient station 0 at the head log with the hull positioned aft (to the left as viewed in profile/plan). The /SCALE parameter on the IMPORT command will be useful for this. You can use a negative scale factor to reverse the longitudinal coordinates.

练习的第二部分，为 IMPORT 命令行添加参数，把首部的 0 号站线定义为船艉（如上图所示）。IMPORT 命令中的/SCALE 参数在这里非常适用。可以用负比例因子来转换纵向坐标轴。

Getting Into Part Maker 进入部件生成

To enter the Part Maker environment, the command is “ENTER PM”, which you can issue either from the GHS command prompt or from a Run File, but not from the Executive dialog.
用命令“ENTER PM”进入 Part Maker（部件生成）工作环境。此命令可由 GHS 命令提示符界面或者 Run File（运行文件）输入，但是不能从 Executive（执行）对话框得到。

The basic layout of any session begins with ENTER PM and ends with QUIT PM. All of the commands between these two will be processed by Part Maker. You can include your Part Maker command sequence in any Run File.
命令的基本布局由 ENTER PM 开始，以 QUIT PM 结束。所有这两个中间的命令都由 Part Maker（部件生成）处理。可将 Part Maker（部件生成）的命令集定义在 Run File（运行文件）中。

The Part Maker command that creates geometry is the CREATE command. This is a multi-line command; i.e. it always takes more than one line of text. The first line starts with CREATE and the last line is a single forward slash.
Part Maker（部件生成）创建模型命令是 CREATE 命令。这是一个 multi-line 命令，即多行文本。第一行以 CREATE 开始，最后一行是一个正斜杠。

The lines between the CREATE and the terminating slash look like additional commands, but since they are within the multi-line command we call them Statements. They are essentially parameters that define what is to be created. Here is an example of a simple Part Maker run to create a double bottom tank on the starboard side with its top at 2.5 ABL and extending from the centerline to the shell:
CREATE 和终止符号正斜杠之间的行是其他命令，但由于它们在多行命令中，所以我们称它们为 Statements（语句）。它们是定义创建模型的基本参数。这有一个简单创建一个右舷双层底舱室的例子，其舱室顶部为 2.5 ABL，从中心线延伸到外板：

```
ENTER PM
READ OLDSHIP.GF
CREATE TANK1.S
  ENDS 12.34f, 4.56a
  TOP 2.5
  FIT HULL\HULL.C
/
WRITE NEWSHIP.GF
QUIT PM
```

It is assumed that the hull geometry, at least, was already present in the GHS main memory, causing the file that it came from to be read into PM by the ENTER process.
假定船体模型已在 GHS 主程序中，通过 ENTER 操作，将其读入 PM 中。

This example generates not only the new Part, TANK1.S, it also generates the first Component within the new Part. Since we did not specify the Component name, it becomes the same as the Part name. The Component's Side, of course, is starboard. It

also creates the Shape to carry the actual offsets, most of which were derived from the hull in order to give it the proper shape where it is bounded by HULL.C.

本例不仅生成了新的 Part（部件）TANK1.S，还生成这个新 Part（部件）中第一个 Component（组件）。由于未定义 Component（组件）的名称，所以它和 Part（部件）名称一样。Component's Side（组件的位置）位于右舷。还按照实际尺寸创建 Shape（形状），为了和 HULL.C 的边界相匹配，其中部分形状是从船体剪切得出的。

It is was not necessary to declare the Class in this example because class TANK is the default.

因为 Tank 类型是默认的，本例无需声明 Class（类型）。

There is a Part Maker tutorial at, www.ghsport.com/support/tutor/pmtut and you may also find it included in your GHS Help system: From the Help menu select “Web Help” then “GHSport on disk” then select “Customer Support” then “Tutorials” and finally “Part Maker Tutorial”.

在 www.ghsport.com/support/tutor/pmtut 有 Part Maker（部件生成）的教程，也可在 GHS 帮助找到此教程：从帮助菜单中依次选择“Web Help”—“GHSport on disk”—“Customer Support”—“Tutorials”—“Part Maker Tutorial”。

Under the Help menu you will find PM, which is the summary reference document for Part Maker. At the end of that document is an alphabetical list of the Part Maker commands and statements. The Help entry PM-TM explains in detail about making tanks, and PM-AM similarly covers appendage making with Part Maker.

在帮助菜单中可以找到 PM，这是 Part Maker（部件生成）的参考文件摘要。在该文件的末尾处是 Part Maker（部件生成）按字母排序的命令和语句。帮助菜单中 PM-TM 详细阐述了如何创建舱室，PM-AM 同样包括在 Part Maker（部件生成）中如何创建附体。

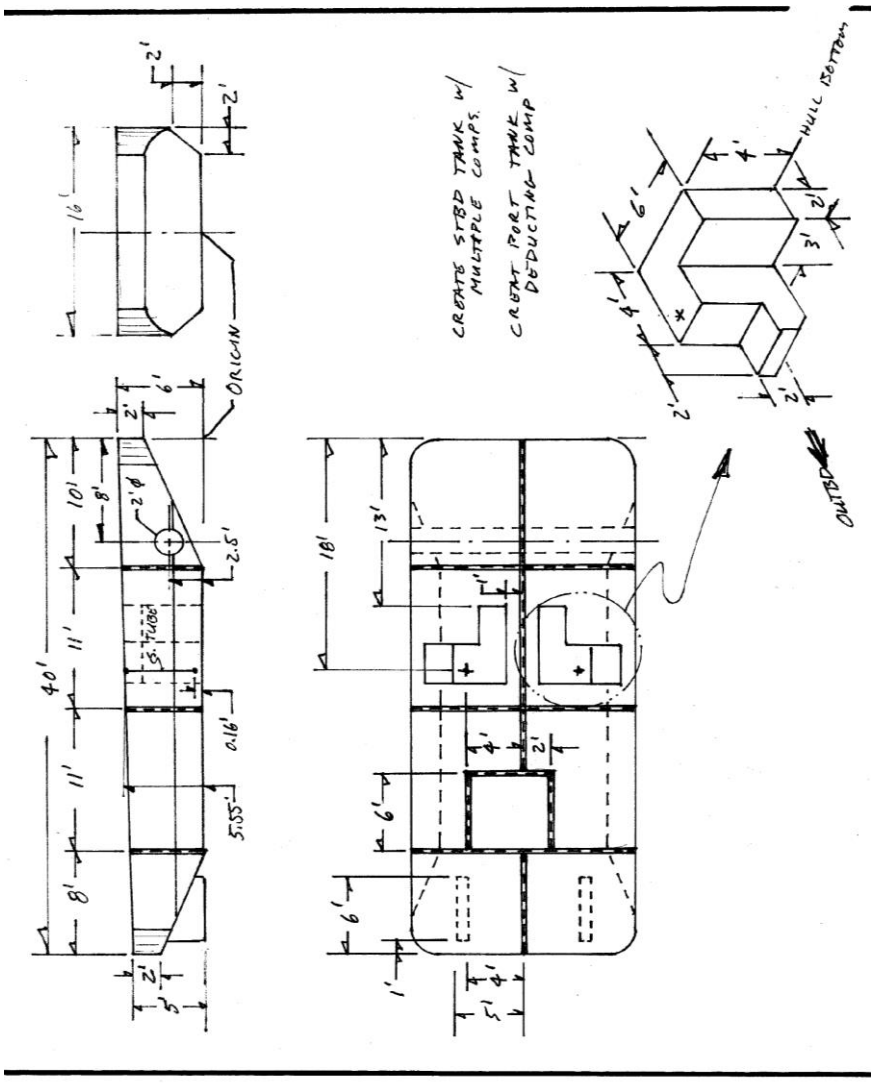
A Part Maker Exercise 部件生成练习

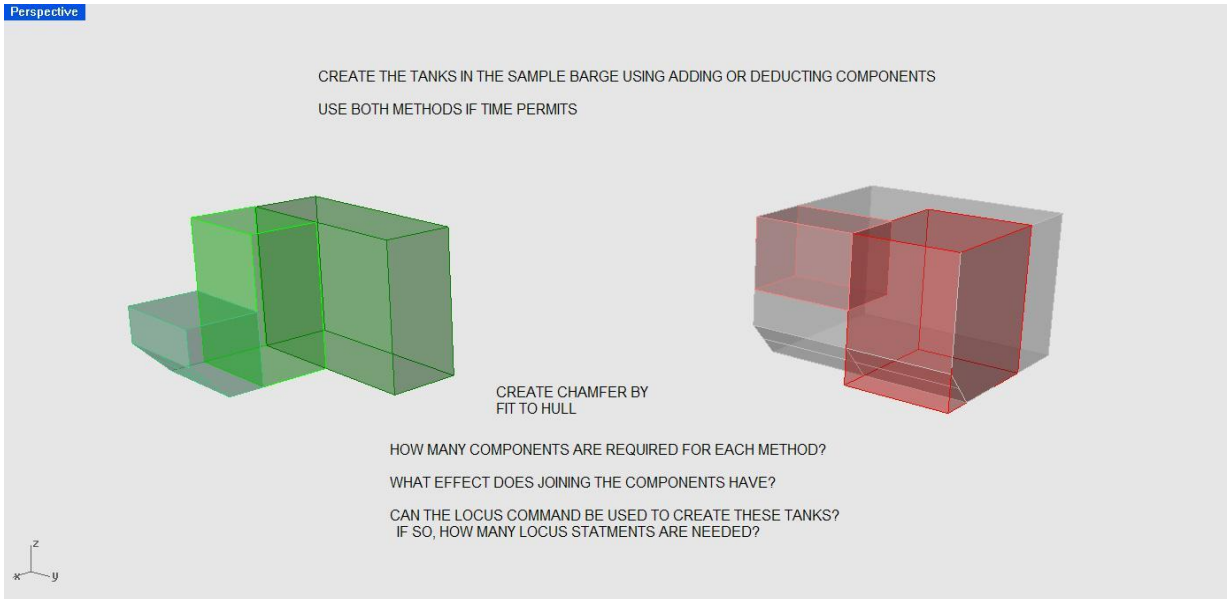
Using the barge hull created in the second Model Converter Exercise above, add the hull Components THRUSTER and SKEGS and also the compartments and independent tanks shown in the drawing below. Here is a start for the Run File.

用上述第二个 Model Converter（模型转换器）练习中创建的驳船船体，添加船体 Component（组件）THRUSTER、SKEGS 以及如下图所示的组件和独立舱室。开始运行如下 Run File（运行文件）。

```
PROJECT MKTANK
READ BARGE.GF
ENTER PM
ECHO ON
UNITS F
TITLE 40X16X6 BARGE
COMM HULL CREATED BY MODEL CONVERTER FROM BARGE.DXF
COMM TANKS ADDED PER TANK DWG

CREATE HULL\TUNNEL.P
 DEDUCT
 CYL 8, 0, 2.5 8, 8, 2.5,2.0
```

```
 FIT HULL
/
CREATE HULL\SKEG.C
 ENDS 34, 39
 TOP 4
 BOT 0
 IN 4
 OUT 5
 FIT HULL
/

`CREATE REMAINING TANKS PER SKETCH

UNITS M
WRITE BARGE.GF1
DISPLAY
QUIT PM
```





Generating Reports 生成报告

In order to generate a report, you need to open a report file to receive information. The “REPORT filename” command is used for this. From the time GHS receives the REPORT command to open a file until the time it gets a “REPORT OFF” command to close the report file, you will be capturing a record of anything displayable that issues from your commands. At any time while a report is open, the command “PRINT PREVIEW” or "REPORT /PREVIEW" will bring up a window allowing you to see the report as it would look if it were printed.

为了生成报告，需打开报告文件来接收信息。“REPORT filename”命令用于接收文件。从 GHS 收到 REPORT 命令打开文件开始，到接收“REPORT OFF”命令关闭文件期间，将收录命令中所有可显示的记录。在报告打开的时候，“PRINT PREVIEW”命令或“REPORT /PREVIEW”可以打开窗口界面，预览报告是否已打印。

The preferred and default file name extension for report files is “.PF”. Through the Report menu you can View (text only) and Preview (text and graphics) report files.

首选和默认文件的报告文件扩展名是“PF”。通过 Report 菜单，可以查看报告（只限文本格式）和 Preview（预览）（文本和图形）报告文件。

The Basic Run File Structure for Reports 报告基本运行文件结构

So far we have made Run Files that are oriented toward creating geometry. From this point on, we will be using the geometry that was created previously, and our Run Files will be structured accordingly.

目前为止，已经创建了用于建模的 Run File（运行文件）。从这时候开始，将使用先前创建的模型，编写相应 Run File（运行文件）的结构。

Here is the basic pattern for any Run File that reads existing geometry and performs calculations based on it:

下面是 Run File（运行文件）读取已有模型和执行计算的基本格式：

```
PROJECT name
READ filename.GF
REPORT repname.PF
. . .
REPORT /PREVIEW
REPORT OFF
```

The purpose of the "REPORT /PREVIEW" command, as noted earlier, is to allow you to see the report without printing it. You can always print it later through the Report menu.
命令“REPORT /PREVIEW”的作用，正如前面所提到的，无需打印就可查看报告。可以稍后通过 Report 菜单打印。

Annotating Run Files 运行文件注释

It is helpful to have notes in your Run Files – information that will be ignored by GHS when it processes the commands from the file. The left apostrophe (above the Tab key on most keyboards) is ignored, as well as anything after it on the same line.
在 Run File 中添加注释是非常有帮助的，当 GHS 处理文件命令时可以忽略这些注释信息。左撇号（键盘 Tab 键上方）表示忽略，同时也忽略符号之后同一行的信息。

Printing Out the Geometry 打印输出模型

To get a hard copy of the geometry, use the “DISPLAY PRINT” command:
为取得模型文件硬拷贝，可用“DISPLAY PRINT”命令：

```
READ FV.GF
REPORT FVDISPLAY.PF`Opens the report file
DISPLAY PRINT /NOOFF
REPORT /PREVIEW
REPORT OFF`Closes the report file
```

The /NOOFF parameter causes it to omit listings of the offsets. There are many other parameters available as well, which you can read about in the User's manual or through Help DISPLAY.
/NOOFF 参数可忽略尺寸列表。还有很多其他参数可用，可以阅读用户手册或者使用 DISPLAY 帮助。

For example, 例如：

```
DISPLAY PRINT /PREVIEW
```

Gives you the on-screen preview of the geometry hard-copy report even when there is no report file open.
此命令可以在即使没有报告文件打开的情况下，屏幕上也能预览到模型文件硬拷贝。

Caution: If you simply give the command,
注意：如果只给出如下命令：

```
DISPLAY PRINT
```

without a report file being open and without the /PREVIEW, the report will be sent to the printer immediately, which can consume a great amount of paper.
没有打开报告文件且不带/PREVIEW，那么报告将会立即发送到打印机，这样会耗费大量的打印纸。

This printout can serve as documentation of a particular Geometry File.
这种打印的输出可作为 Geometry File（模型文件）特征说明文件。

Annotating Reports 报告注释

You can place text and graphics in your report by means of the NOTE command. This command has a special abbreviation: the back slash ("\"). For example,
可通过 NOTE 命令将文本和图形放在报告中。这个命令有个特殊的缩写：反斜杠（“\”）。例如：

```
\Case 3 - Arrival
```

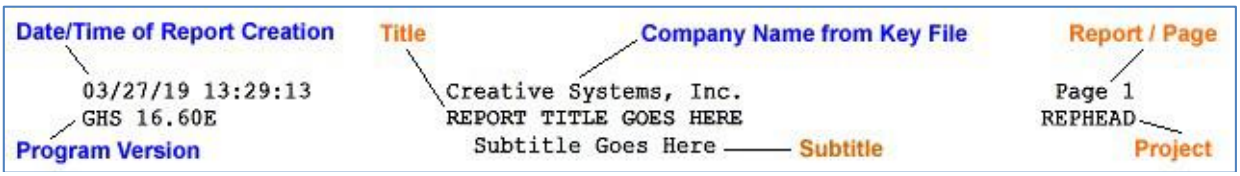
This places the text "Case 3 - Arrival" on the current line of the report file starting at the left margin. To have it centered horizontally in the line, put another back slash at the end:
命令将文本“Case 3 - Arrival”放置在报告当前行左边起始位置。若要该文本居中，则在结尾再输入一个反斜杠：

```
\Case 3 - Arrival\
```

An advantage ofusing the back slash rather than NOTE is that it preserves the case (NOTE capitalizes everything).
使用反斜杠而不用 NOTE 命令的优点是，它保留文本的原有状态（NOTE 将文本转变为大写）。

There are many other features of the NOTE command, including its ability to place a graphic image in the report. Look in HELP NOTE for all the details.
NOTE 命令有很多其他功能，包括在报告中放置图形文件。详情参看 NOTE 帮助文件。

The report header contains some information such as the Title and Subtitle that provide useful information. The image below indicates the various parts of the report header. Labels in red are GHS commands that can modify the header object. Labels in blue generally can't be customized except for the company name. To update the company name, please contact Creative Systems, Inc.
报表页眉包含一些信息，例如标题和副标题，这些信息提供了有用的信息。下图显示了报表标题的各个部分。红色标签是可以修改标头对象的 GHS 命令。除公司名称外，蓝色标签通常无法自定义。要更新公司名称，请联系 Creative Systems Inc.。



The subtitle is especially useful for identifying the condition or stability criterion for the report reader.
副标题对于装载工况或稳性衡准报告特别有用。

The MESSAGE Command 消息命令

This command has many uses. The most basic one is to place a message on the screen. For example,
这个命令有许多用途。最基本的用途是在屏幕上显示一个消息。例如：

```
ME Hello GHS
```

Try this and you will find “HELLO GHS” on the screen. Note that everything became capitalized. To prevent the capitalization, start your message with a quotation mark (no need to put one at the end):
尝试输入该命令，然后在屏幕上显示“HELLO GHS”。注意到所有字母都大写了，为了防止转化为大写形式，可在输入信息的起始位置输入引号（末尾不需要），如下：

```
ME "Hello GHS
```

System Variables 系统变量

Certain information internal to the program is accessible to you without having to take it from reports. The means of accessing this information is the System Variable. For example, there is a System Variable named PROJECT. You get whatever information is currently held under the name of a System Variable by enclosing the name in braces, sometimes called “curly brackets”. For example,
程序内部的某些信息可以不通过报告直接访问，访问这些信息的途径就是 System Variable（系统变量）。例如，SystemVariable（系统变量）名 PROJECT。通过大括号括起当前 SystemVariable（系统变量）名称来调用想要的信息，有时大括号也称之为“curly brackets”例如：

```
PROJ RIVERQ
ME “The project name is {PROJECT}
```

Compared to report output, this is a more intimate way of communicating with the program. It may not be obvious now, but eventually you will find it quite useful.
相比较于报告输出，这是与程序沟通更直接的方式。现在效果可能不明显，但是以后会非常受用。

Two Kinds of Calculations 两种计算方式

There are two kinds of calculations: Those that do not require a particular condition or load, and those that are based on one particular condition.

有两种计算方式：一种不要求指定工况或者装载，另一种是基于特定工况。

The calculations that are independent of any particular load condition typically result in a table and graph of some vessel characteristic as a function of displacement or load. This includes curves of form, hydrostatic properties, cross curves of stability, maximum VCG curves and tank characteristics curves. In a slightly different category, but of the same kind, are those that are entirely independent of any waterplane: Component skin area and tonnage.

与装载工况无关的计算的方式，通常会计算与排水量或者装载相关的船体特征表格数据或者图表。船体特征包括船体型线、静水力特征、稳性横交曲线、最大 VCG 曲线和舱容曲线。还有在类别上稍有不同但本质上一样的，且与水线面无关的特征，例如：Component（组件）型表面积和吨位。

Those calculations that are based on a specific condition include the status report of particular hydrostatic properties, righting-arm curves, maximum VCG in a particular condition, longitudinal strength curves and floodable length curves.

基于特定工况的计算的方式，报告包括：静水力特征、回复力臂曲线、特定工况下最大 VCG、总纵强度曲线以及可浸长度曲线。

Parts and Components in the Calculations 计算中的部件和组件

As mentioned earlier, one reason for the hierarchy of Parts and Components is to simplify the presentation in reports. Similarly, nearly all of the commands in the GHS main program deal with whole Parts. For the most part, the user need not be aware of the Components within the Parts.

正如前面提到的，Parts（部件）和 Components（组件）之间设置层级的一个原因是为了在报告中简单化显示。类似的，几乎所有在 GHS 主程序中的命令都是处理 Parts（部件）。在大多数情况下，用户无需关注 Parts（部件）中的 Components（组件）。

The exception to this is the COMPONENT command. This is the only command that produces reports based on individual Components. There are three uses for this. One is to get component properties: coefficients of form, curves of form, wetted surface and skin surface area. The second use is setting those component parameters that are adjustable: permeability/effectiveness and shape factor. The third use is delving into the Component level to investigate how individual Components contribute to the properties of Parts. This can be carried even further, down to the section level, examining section properties and sectional-area curves.

唯一的例外是 COMPONENT 命令，这是唯一一个单独基于 Components（组件）报告的命令。它有三种用途，一个是获取组件的属性：船型系数、船体型线、湿表面积及表面积，第二个用途是设定组件可调节参数：渗透率/有效性和形状因子，第三个用途是深入研究 Component（组件）级，探索单独 Component（组件）对于 Part（部件）的影响。这可以进一步进行至剖面层级，检查剖面特性和剖面积曲线。

Reference Points of Parts 部件参考点

One of the attributes of a Part is its Reference Point. Each Part has a Reference Point attached to it, which can be set and reset at any time. This point is used for various purposes. Usually it marks some special point on the Part. However, the initial default setting of Reference Points on all Parts is (0,0,0); i.e. the same as the origin of the

coordinate system. Any Reference Point can be set to any location by means of a statement in Part Maker at the time the Part is created, and that setting is kept in the Geometry File. Reference points can also be changed at any time in the main program by means of the REFPT command. For example, to change the reference point of a Part named HULL, the command would be,

部件的其中一个属性就是 Reference Point（参考点）。每个 Part（部件）都附有一个相应的 Reference Point（参考点），Reference Point（参考点）可以在任何时候设置或者重新设置。这个点有很多不同的作用，通常用它标记 Part（部件）上某些特殊的点。所有 Part（部件）的 Reference Point（参考点）初始默认设置为（0,0,0），与坐标系的原点相同。在创建 Prat（部件时），Reference Point（参考点）可以在 Part Maker（部件生成）中设置，参考点设置将保存在 Geometry File（模型文件）中。Reference Point（参考点）可随时在主程序中通过 REFPT 命令更改。例：更改 HULL Part（部件）的参考点，命令如下：

```
REFPT (HULL)= l, t, v
```

Remember the discussion about system variables? (These are certain values internal to the program that are accessible to the user.) One of them is the height, relative to a waterplane, of the Reference Point of the given Part. This is accessed through the HEIGHT system variable. For example,

还记得关于系统变量的讨论么？程序内的某些定值可以被用户访问。在 Part（部件）中设置的 Reference Point（参考点）相对于水线面高度就是其中之一。通过系统变量 HEIGHT 访问提取。例如：

```
PART = HULL
MESSAGE"Height of HULL Ref Point is {HEIGHT}
```

Notice that we had to establish HULL as the Current Part by means of the PART command so that the program would know which Part we were interested in.

请注意，必须用 PART 命令将 HULL 设为当前 Part（部件），这样程序才能识别我们所用的 Parts。

The Current Parts List 当前部件列表

In many occasions you will need to address a certain Part or a certain collection of Parts. One way to do this is to make use of the Current Parts list. As we saw in the previous section, the PARTS command does this.

在许多时候，需要指定一个 Part（部件）或者 Part（部件）的集合。能做到这一点的方法就是使用当前 Part（部件）列表。正如上一节所见，用 PARTS 命令执行操作。

Note that the Current Parts list shows up at the bottom of the screen – at least it shows as much of it as will fit in the space available. (The list itself is not truncated; only the display of it may be incomplete.)

请注意，Current Part（当前部件）列表显示至屏幕的底部-在可用空间尽量多的显示列表。（列表本身不会被截断，可能会显示不完整）

Some commands act on certain Parts. Generally there are two ways to tell the program which parts you want it to act upon. One is simply to provide the name or names of the

Parts right in the command that will be acting on them. This is always the first parameter of the command and in most cases is enclosed in parentheses. If a Current Parts list exists, the parenthetical list can be omitted, and the Current Parts list will be used instead. (If neither exists, the command will issue an error message.) An exception to this rule is the COMPONENT command, where it goes ahead with all Parts in the model; but the COMPONENT command is exceptional in several ways, as we shall see.

命令作用于某特定 Parts（部件）。一般的来说，有两种途径指定程序需要作用的 Parts（部件）。一种是简单的在命令右侧定义将要执行 Parts（部件）的名称，Parts（部件）名称通常是命令的第一个参数，在大多数情况下 Parts（部件）名称用括号括括起来。如若 Current Part（当前部件）列表已存在，那么可以省略插入部件，并且 Current Part（当前部件）列表将顶替使用（如果不存在，那么命令将会报错）。其中有个例外的命令是 COMPONENT 命令，此命令是在模型 Parts（部件）中执行的；但是，COMPONENT 的命令在几个方面很特殊，如下：

To set a Current Parts list of tanks the command is, TANKS = list (the trailing asterisk can be used on the tank names in list). To set the list to all tanks the command would be,

设置舱室 Current Parts（当前部件）列表的命令是：TANKS = list（后缀星号可以代替舱室名称用在列表中）。设置所有舱室的命令如下：

```
TANKS = *
```

To turn off the Current parts list; i.e. to make it empty, the command is,

如若关闭 Current Parts（当前部件）列表；即清空列表，命令如下,

```
TANKS OFF
```

Similarly the PARTS command can be used. One difference is that TANKS will only accept the names of tank Parts. Another difference is that PARTS is smart when you give it the name HULL and there is no Part by that name. Instead of issuing an error, it defers instead to the first hull-class Part in the model. This is useful when you want to know the height above water of a certain part, as was demonstrated in the previous section.

同样的，PARTS 命令也可以使用。其中一个区别就是 TANKS 只接受舱室 Parts（部件）名称。还一个区别就是，Part 命令是非常智能的，当定义名称为 HULL，但没有 Parts（部件）用这个名字时，程序不会发生报错，而是用模型中第一个船体类型的 Part（部件）替代使用。如先前章节提到的，当想知道某 Part（部件）的水面高度时，这个命令是很有用的。

Heel Angles and Trim Angles 横倾角和纵倾角

The Heel angle is best visualized looking at a body plan, keeping the body plan upright and rotating the waterplane. Where the waterplane cuts a section in the body plan, you have a line; and the angle that line makes with the base line is the Heel angle. The sense is positive or “starboard” if the Heel angle is at a positive rotation from the baseline in the counterclockwise direction. Heel angles can range between 180 degrees to port and 180 degrees to starboard. The HEEL command sets the Heel angle. For example, HEEL=10 sets the Heel at 10 degrees to starboard.

观察横倾角最直观的视图是主视图，保持主视图垂直且绕水线面旋转。水线面在主视图中相交形成一条线；这条线和基准线的夹角就是横倾角。当横倾角在基准线逆时针方向正旋转时，横倾角值为正或者“s”（右舷）。横倾角范围从左倾 180 到右倾 180 度。用 HEEL 命令设置横倾的角度。例如：HEEL=10 表示右倾 10 度。

The Trim angle is best visualized on the same body plan.The lines cutting the sections are parallel to one another and the more trim you have, the greater the distance between them. From any two sections you can calculate the Trim angle by taking the arc tangent of the distance between the water lines divided by the distance between those two sections. The sense is positive for “aft trim” when the water line on the section further aft is above the other. Trim angles can range between 90 degrees forward to 90 degrees aft. The TRIM command sets the trim angle. For example, “TRIM=2.0” sets two degrees aft trim without affecting the Heel angle.

观察纵倾角最直观的视图也是主视图。切割剖面的线是相互平行的，并且纵倾角越大，它们之间的距离越大。可以通过任意两个剖面计算纵倾，反正切函数计算两个水线面距离除以剖面距离的值。尾部剖面水线高于其他剖面时的尾倾为正。横倾角范围从首倾 90 度到尾倾 90 度。TRIM 命令用于设置纵倾角。例：TRIM=2.0 表示尾倾 2 度，纵倾角度不会影响横倾的角度。

Origin Depth vs. Draft 原点水深 vs 吃水

The waterplane is specified and reported primarily by means of three parameters: Trim angle, Heel angle and origin depth. The origin depth is the distance between the waterplane and the coordinate system's origin (0,0,0). This distance is taken perpendicular to the waterplane, and it is positive when the origin is under water, negative if the origin is above the waterplane.

水线面主要由三个参数定义和显示：纵倾、横倾和原点水深。原点水深指水线面到坐标系原点（0，0，0）的距离。取距水线面的垂直距离，当原点坐标在水面以下时值为正，在水面之上值为负。

Draft is not the same as the origin depth for three reasons:1) Draft is always measured perpendicular to the base plane of the ship's coordinate system, while origin depth is measured on a line that is perpendicular to the waterplane; 2) Draft requires additional qualification, viz. the location along the length of the vessel at which the draft is taken (draft at the FP, draft at the AP, LCF draft, etc); and 3) Draft can reference some line other than the base line (keel draft, for example).

吃水和原点水深不一样的原因有三个：1）吃水测量垂直于船坐标系基线，而原点吃水测量垂直于水线面的直线；2）吃水需额外限定条件，即沿船长吃水的位置（首吃水 FP，尾吃水 AP，漂心 LCF 吃水等）；3）吃水可以参考除基线以外的线（例如船底吃水）。

A certain form of the DRAFT command is used to change the draft reference line. For example,

DRAFT 命令某些形式可以用来改变吃水的参考线。例如：

```
DRAFT "Keel" = -0.04 @ 50f,-1.04 @ 50a
```

defines a sloping "draft line" that is below the base line.After this command has been issued, all drafts in the reports will be referenced to this "Keel" draft line, and all draft inputs will assume this line as well. To revert to baseline drafts, the command is simply,

命令定义了一个低于基线的斜“吃水线”。在这个命令起作用后，所有在报告中的吃水参考这一“Keel（底部）”吃水线。同样的，所有输入值也参考此吃水线。如要还原基线吃水，则命令如下:

```
DRAFT BASELINE
```

When the ship is upright or nearly so, draft is often used because it relates to markings on the hull of the actual ship.As the inclination becomes greater, draft becomes less useful. At 90 degrees heel, draft is undefined. GHS will allow draft to be used only at inclination angles less than 45 degrees. Origin depth is always usable regardless of the inclination.

当船正浮或者接近正浮时，经常采用吃水，因为它涉及到实际船舶的船体标记。随着倾斜度变大，吃水作用减少。当横倾 90 度时，吃水无意义。GHS 只允许在倾斜 45° 之内定义吃水。无论倾斜如何原点水深都是可用的。

We will defer the discussion about how to set drafts until we get to setting up specific load conditions.

推迟讨论怎样设置吃水，讲述定义装载工况时再详细说明。

FP, AP and LBP 首吃水、尾吃水和垂线间长

GHS does not derive the locations of the perpendiculars automatically from the geometry. If you want it to acknowledge these locations, you must declare them explicitly be means of the LBP command. In the simplest form of the LBP command, you can simply specify the length between perpendiculars. This is useful for enabling the representation of trim as a distance instead of an angle. Or you can give the FP and AP locations using the command in the form,

GHS 不可以从模型上自动得到首尾垂线位置。如想确认这些位置，则需用 LBP 命令声明。用最简短的 LBP 命令，定义垂线间长。垂线间长在用长度代替角度表示纵倾时非常实用。或者定义首尾垂线用命令定义 FP 和 AP 位置。

LBP = L_{fp}, L_{ap}

where the L values are longitudinal locations in the ship's coordinate system.

其中 L 值是船的坐标系统中的纵向位置。

Trim Angle vs. Trim Distance 纵倾角和纵倾距离

Although trim is fundamentally an angle, it is often more convenient to represent it as the difference between forward and aft drafts. However, this is not a precise definition unless the ship is at zero heel. Exactly how does GHS represent trim as a distance? It simply takes the tangent of the Trim angle and multiplies it by the LBP.

虽然本质上纵倾是一个角度，但它经常用首尾吃水差表示更为方便。然而，这样做并不精确，除非船舶横倾为 0。那么 GHS 将如何将纵倾表示为距离呢？它只需简单的根据纵倾角三角正切函数乘以 LBP 即可。

After the LBP has been defined, the reports will show trim as distance and also mention the LBP length so that there is no question about the length. If FP and AP have both been defined, some of the reports will show drafts at both points rather than trim. In that

case, the trim distance will not be exactly the same as the difference in those drafts unless the heel angle is zero. This follows from the definition of Trim given above: Trim is based on the heeled waterplane while draft is to the ship's baseline.

LBP 定义之后，将显示纵倾的距离，以及 LBP 的长度，所以用长度表示没有问题。当 FP 和 AP 都被定义时，报告将显示这两个点的吃水，而不显示纵倾。在这种情况下，除非横倾为 0，纵倾距离和这两个位置的吃水差不一定完全一致。由以上定义的纵倾可知：纵倾基于横倾水线面定义，而吃水基于基准线。

What about trim input? When trim is involved in any command, GHS expects it to be an angle unless a slash appears along with the given number. For example, if you say “TRIM=1.5a” it takes this to mean 1.5 degrees of trim aft. But if you say “TRIM=1.5a/150.” it assumes this to be a ratio of distances, and computes the trim angle as its arctangent, or 0.573 degrees. If you have defined the LBP, and want to base your trim input on that, you can use the slash with nothing following it; for example, “TRIM=1.5a/”.

如何输入纵倾呢？当命令涉及纵倾时，GHS 用一个角度值设定纵倾，或者在纵倾距离后加斜杠和长度设定。例如，“TRIM=1.5A”指艉倾 1.5°，“TRIM=1.5a/150.”指距离的纵倾比值。正切计算角度，0.573°。当已定义 LBP 时，并在此基础上定义纵倾时，可用斜线不附带数字即可。例如：“TRIM=1.5a/”。

Curves of Form 船体型线图

Curves of form are form coefficients plotted against a range of drafts or waterplane levels. Since the coefficients of form are intended to compare form characteristics of hulls, or possibly other fair-body objects, they are available only for individual Components. Hence, in a Hull Part that includes appendages as separate Components, it would be a main fair-body Component (usually HULL.C, but not necessarily so) that would be a good candidate for curves of form.

船体型线图描绘了各吃水或者水线面下船体形状系数。由于船体型线旨在比较船体或者其他浮体的形状特征，所以只有单独 Component（组件）有船体型线图。因此，在船体 Part（部件）包括单独 Component（组件）附体中，对于船体型线而言，主体 Component（组件）（通常是 HULL.C，但也不全是）是个很好的选择。

The command to get curves of form is,

船体型线命令，

COMPONENT HULL\HULL.C/FORM/DEPTH: d_1,d_2, … d_n

where the d values are Reference Point depths of the Part's Reference Point, not the coordinate system's origin (though, of course, a Reference Point can be at the origin). Why use Reference Point depths rather than origin depths or drafts? Drafts are not used since they are not always well defined (as discussed above). Origin depths are not used because curves of form are not limited to hull Parts. Even tank Components can have their curves of form, in which case it is the “waterplane” within the tank, not the vessel's draft that is relevant.

其中，d 值是 Part（部件）参考点的相对参考深度，而不是坐标系原点（参考点当然也可以是原点）。为什么用参考点深度而不是原点水深或者吃水呢？由于吃水的不确定性，（如上所述）而不使用吃水；由于船型系数不在船体 Part（部件）范围内而不使用原点

水深。当把舱室内部看做“水线”（不是船舶吃水），每个舱室都有各自的船型系数曲线。

Curves of form are available at any trim and heel angle.
在任何纵倾和横倾下都可有船体型线。

The first parameter in the COMPONENT command is actually optional. The default is to repeat the calculations for each Component of each Part in the entire model. However, if one or more Current Parts have been defined by means of the PARTS or TANKS command, these reports are limited to them.
COMPONENT 命令的第一个参数实际上是可选的。默认选项是重复计算当前模型每个 Part（部件）中的每个 Component（组件）。当然，当 PARTS 或 TANKS 命令指定当前 Parts（部件），那么报告根据当前 Parts（部件）输出结果。

Curves of Hydrostatic Properties 静水力特征曲线

Here we deal with the properties of the entire vessel at a series of waterplane levels. All Parts that are subject to the waterplane are included, even flooded tanks, and any Wave that may have been specified is taken into account. Tank TYPES and the WAVE command will be discussed in more detail later.
在这里，先论述整船在各水线面高度上的特性。所有与水线面相关的 Parts（部件）都包括在内、甚至是浸水舱以及已定义的波浪。舱室类型和 WAVE 命令将在后面更详细地讨论。

There are two sorts of hydrostatic properties. One is “pure” hydrostatic properties that have nothing to do with the center of gravity. These are available through the HS command, where origin depth is the independent variable. For example,
有两种静水力特性。一种是与重心无关的“纯”静水力特性，这种静水力可通过 HS 命令设置，其中原点水深为自变量。例如：

```
HS 2 2.1 ... 8 `Hydrostatics from 2 to 8 feet, 0.1 increments.
```

The other sort of hydrostatic properties recognizes the effect of the CG and therefore is able to include moments to trim. The command for this is GHS and the independent parameter is displacement weight or draft. In the GHS command, draft is assumed to be at the the LCF, by default, but any other draft location can be specified. For example,
另一种静水力特性和 CG 相关，因此可以设置纵倾力矩。得出这个静水力的命令是 GHS 命令，参数设置为排水量重量或者吃水。在 GHS 命令中，默认吃水位置在 LCF 位置，但也可以定义在其他位置。例如：

```
GHS DRAFT @ 0 = 2 2.1 ... 8
```

while, 但是，

```
GHS 2 2.1 ... 8
```

will assume the drafts are to be at the LCF. If there is no trim it makes no difference where the drafts are taken. If there is trim, the location of the LCF generally depends on

the draft, which means that the program must do some extra work to set the LCF draft to a given value (but it does so very quickly).

这里假定吃水位置在 LCF 位置。如果没有纵倾，那么无论吃水位置在哪，LCF 位置都没有区别；如有有纵倾，那么 LCF 位置通常由吃水决定，也就意味着程序必须做一些附加工作来设置 LCF 位置吃水值（但是这非常快捷）。

An Exercise in Curves of Hydrostatic Properties 静水力特征曲线练习

Write a run file to compute curves of hydrostatic properties including graphs using the FV.GF model.

编写运行文件用 FV.GF 模型计算静水力特征曲线和图表。

```
CLEAR
READ FV.GF
REPORT HSTATICS.PF
...
REPORT /PREVIEW
```

More About Station Spacing 关于站距

In order to get nice, smooth curves of hydrostatic properties, you may have to add more stations to your hull geometry model near the ends, especially when there is little or no deadrise in the station curves – such as you would have in the rakes of a barge. The reason for this has to do with the waterplane properties that depend on the plane that is obtained by cutting through the stations. At the ends of this plane there can be a severe lack of definition, particularly when its ends fall between stations. If the station bottoms are V-shaped, the waterplane endings will be fine, and this problem is usually insignificant. But where the stations are broad on their bottoms, the waterplane endings will also be wide and blunt, and their exact shapes will be difficult to get by cutting through the existing stations. GHS makes an attempt to extrapolate properties for such poorly-defined waterplane endings, but the results are not as accurate as they would be from closer station spacings.

为了得到精确、光顺的静水力特征曲线，可能需要在模型首尾两端之间增加站线，特别是当船体没有或者很少有舭部升高时- 例如一艘尾部倾斜线型的驳船。增加站线的原因与水线面特征有关，水线面是由平面和站线相交得出的，但平面在端点缺乏精确定义，尤其是水线面在两站线之间倾斜。如果站线底部是 V 字形的，那么水线面端点易处理，这样的话问题不大；但如果站线底部宽大，水线面端点宽而钝，那么水线面形状难以通过已知站线相交得到精确结果，GHS 会根据这些已定义的不精确的水线面端点推算水线面特征，计算结果不如紧密型的站线精确。

If you get your curves of hydrostatic properties at closely-spaced drafts, this effect will be more apparent, and it may take a large number of additional stations at the ends of the hull to yield smooth curves. The displacement-related curves are not affected by this to any significant degree. It is only the waterplane-related curves such as KM, Weight to Immerse and Moment to Trim that are subject to this problem.

当用间隔紧密的吃水得到的静水力曲线时，其受到的影响会更加明显，需要在船体首尾两端增加大量站线使之产生光顺平滑的曲线。这不会明显影响与排水量有关的曲线，只对水线面相关的曲线有关，例如 KM、浸没重量以及纵倾力矩。

These extra stations that might be added in order to smooth the curves of hydrostatic properties will have no significant effect on the displacement or the stability calculations. With the possible exception of GM, stability information does not depend on waterplane calculations. When free surface moments are used (GHS does not normally use FSM in its treatment of free surface, as will be explained later) the tank "waterplanes" are also significant. Generally, if the hull is producing smooth curves of waterplane properties, the tank FSMs will also be sufficiently accurate if the tanks have been FIT to the hull during their creation in Part Maker.

为了光顺静水力特性曲线而增加的站线对排水量及稳性计算没有影响。除 GM 以外，稳性信息不根据水线面计算。当使用自由液面力矩（GHS 通常不会用 FSM 处理自由液面，这将在下文解释）时，也会影响舱室水线面。通常地，当船体生成光顺的水线面特性曲线时，在 Part Maker（部件生成）中用 FIT 命令创建的舱室，它的自由液面力矩也将是精确的。

Either Model Converter or Section Editor can be used to conveniently insert additional stations into a hull model by interpolation. In most cases the interpolation yields acceptable results. But you should always inspect the new stations in Section Editor and make any necessary corrections. Since extra stations require extra calculation time, it is not productive to have more stations than necessary. Closely-spaced stations in the mid body contribute little to accuracy but may add significantly to the run time.

无论是 Model Converter （模型转换器）还是 Section Editor（横剖面编辑器）都可以通过插入方式，方便地在模型中增加更多的站线。在大多数情况下增加站线后的结果是合理的。但在 Section Editor（横剖面编辑器）中需要经常检查新的站线，有必要时进行修正。由于额外的站线需要更多的计算时间，因此不需要增加不必要的站线。过分紧密型站线在船平行中体中对精确性的意义不大，反而会增加运行时间。

Choosing your Drafts 选择吃水

Another irregularity in the plots of the curves of hydrostatic properties occurs when there is an abrupt change in the waterplane at some draft. Since the curves are plotted using non-linear interpolation, this can result in "overshooting" at the draft where an abrupt change occurs. It may be necessary to select closely-spaced drafts on both sides of the transition in order to force the curves to change their direction abruptly.

当水线面在某吃水发生突变时，描绘的静水力曲线会不规则。由于描绘曲线用没有用线性插值，所以当在某吃水出现突变时，结果可能出现“凸点”。在吃水突变的两侧选择紧密间隔吃水，用来强行改变曲线方向，这点非常有必要。

Cross Curves of Stability 稳性横交曲线

In case you need cross curves, they are available (there should be little need for them in the modern world). The command is CC and, like the GHS command, the independent parameter is either displacement or draft. For example,

如若需要稳性横交曲线，这也是可以得到的（现代不怎么需要横交曲线）。该命令是 CC，类似 GHS 命令，设定的参数是排水量或者吃水。例如：

```
CC 2.0 2.5 ... 8.0 /MARK:DECK
```

computes the righting arms for the range of drafts specified and includes a line at deck immersion. Another example:

计算已定义吃水范围的回复力臂，包括甲板浸没线。另外一个例子：

```
CC DISPL:50 100 ... 300 /MARK:FLOOD
```

computes the righting arms for the given range of displacements, including a line at downflooding.
计算给定排水量范围的回复力臂，包括浸水的线。

Cross curves can be run with fixed or variable trim and with the assumed VCG at any value. If you want to fix the trim, the command is FIX TRIM; and to restore free trim the command is VARY TRIM.
可在纵倾锁定或者释放条件和假定任意 VCG 的条件下运行横交曲线命令。若锁定纵倾，命令是 FIX TRIM；若还原纵倾，命令是 VARY TRIM。

Macros 宏

A macro is simply one or more commands that have been stored under a certain name so they can be conveniently executed by giving that name. It is easy to define a new macro. For example,
宏是命名某名称用于存储一个或多个简单命令的地方。可通过调用该名称执行命令。所以定义一个宏非常简单。例如：

```
MACRO ST
 STATUS WEIGHT, DISPLACEMENT, FREEBD
/
```

Now we can execute that rather lengthy STATUS command simply by saying, “EXECUTE ST”, or even more simply by
这样，就可以执行一个复杂的 STATUS 命令，而只需简单输入“EXECUTE ST”，或更简单的“.ST”

```
.ST
```

where the dot is the short way of saying “EXECUTE “.
其中，点是“EXECUTE”的缩写。

Note that the MACRO command is a multi-line command, where all of the lines between the word MACRO and the final slash are stored under the name that appears on the first line. No processing of these lines takes place until the macro is executed.
MACRO 命令多行命令，其中所有命令行都存在单词 MACRO 和最后斜杠之间。只有执行宏时，这些命令才会被调用。

You might be tempted to ask whether this doesn't violate the rule about sequential processing that we learned early in the course. The answer is, “no”; commands are always processed in the order in which they are presented to the command processor. The Macro command is processed, like any other command, when it comes up in the sequence. It does its thing, which is simply to store its body in the program's memory. The Macro command doesn't care what is in those lines. Later, when the command to execute the macro is encountered, the lines from the body of the macro are retrieved

from memory and fed to the processor one by one in sequence. If you remember that everything is done sequentially, you will have no trouble getting into macros with parameters, macros executing other macros,macros defining macros and macro loops; and you will begin to utilize the full power of macros to organize and shorten your Run Files, and, most importantly, to automate your work.

你或许会疑问，这是否违反了先前课程学习到关于顺序处理的规则，答案是 No。命令还是按照顺序在处理器中执行。Macro 命令与其他命令一样，按照顺序执行。Macro 命令将命令主体存储在程序中。Macro 命令不关注主体命令行的内容。当执行命令执行时，将从存储器中调用宏命令主体并按照顺序反馈给处理器。只要牢记命令都是按照顺序执行的，那么在输入宏参数、宏执行其他宏、宏定义宏以及宏循环时都不会存在问题；可以开始利用宏命令所有的功能去编写和精简运行文件，最重要的是，宏使得工作自动化。

An important feature that is provided with macros is the ability to modify the commands within the macro at the time the macro is executed. There are several ways of doing this -- using variables and macro redefinitions -- but the primary method is through macro parameters. Here is an example.

宏的重要功能之一，在执行宏命令的同时，可以修改宏的命令。有这样几种方法—变量和宏重新定义—但是主要方法还是通过宏参数实现。例如：

```
MACRO T
 TRIM=%1/
 GHS 3.0, 3.5, ...,9.0
/
.T 1f
.T 0
.T 1a
```

The “%1” is called a “dummy parameter”, since it simply reserves the place where the real parameter will be substituted when the macro is executed. In this example the macro “T” is executed three times. In the first execution the TRIM command becomes “TRIM=1f/”. In other words, it sets the trim to 1.0/LBP forward.

其中“%1”指“伪参数”，因为它仅仅是存储位置，当宏执行时，真正的参数将会替代其位置。本例中宏“T”执行了三次。第一次执行时，TRIM 命令变为“TRIM=1f/”。换而言之，就是设置首倾 1.0/LBP。

Up to nine different dummy parameters can be used; i.e. %1, %2, etc.

可使用多达九个不同的伪参数，%1, %2 等。

Nested Run Files 嵌套运行文件

Another way to encapsulate a series of commands to be used later is to have them reside on a separate Run File. At some point in your master Run File you would use the RUN command to run the separate file. The command processor then begins taking commands from that file until it comes to its end or encounters the END command. Then it may or may not revert to the next command in your master Run File, depending on the form of the Run command.

另一种嵌套一系列命令的方法，就是将命令保存在独立的运行文件中。在主运行文件需要时，用 RUN 命令运行这个独立文件。然后命令处理器调用这个文件中的命令直至结束或 END 命令。这之后是否返回主运行文件的下一个命令，取决于 RUN 命令的形式。

For example, if you have, within your Run File, the commands,
例如：如果在运行文件中含有命令，

```
RUN MORE.RF
MESSAGE "Back from More and continuing.
```

it will process the commands from MORE.RF but will not return to process the Message command. The way to make it return and keep going is to include the parameter /CALL with the RUN command. For example,
程序会先处理 MORE.RF 中的命令，但不会返回处理 Message 命令。用带有参数/ CALL 的 RUN 命令返回并继续运行。例如，

```
RUN MORE.RF /CALL
MESSAGE "Back from More and continuing.
```

will return and continue, processing the Message command.
程序将返回并继续处理 Message 命令。

If you develop a general-purpose Run File, the place to put it would be in your User Library folder so that it becomes easily accessible from any working folder.
如果编写一个公共的运行文件，那么可将此文件放在 User Library（用户库）位置，这样就可以方便地从工作文件夹中获取。

A word of caution: Nested Run files are not easy to manage and can become confusing. They should be used only when there is a good reason.
要注意的是：嵌套的运行文件不便于管理，容易混淆。故只在非常必要时使用。

The WRITE Command 编写命令

There are several forms of the WRITE command. We encountered one of them when we were dealing with geometry: Both Section Editor and Part Maker have WRITE commands that write Geometry Files. In the context of the main program, the WRITE command writes various forms of Run Files. These are files that you can use later by issuing the RUN command. For example,
WRITE 命令有好几种格式。在处理模型时会用到其中一种：Section Editor（横剖面编辑器）和 Part Maker（部件生成）都可能用 WRITE 命令写入 Geometry Files（模型文件）。在主程序中，WRITE 命令可写入各种运行文件，之后可用 RUN 命令运行这些文件。例如：

```
WRITE (SAVE) ABC.DAT
```

will write a file named ABC.DAT that contains all the commands necessary to restore the state of the program to its current state. In other words, it has the READ command to bring in the geometry, commands like HEEL and TRIM to restore the warteplane, etc.

The file name extension .DAT was used in this case to distinguish it from ordinary Run Files. This is merely a convention and not a requirement.(It could have been named “ABC.RF”.)
这里编写了一个名为 ABC.DAT 的文件，包含了将程序中所有必要的命令，将文件还原到当前状态。换句话说，它用 READ 命令将信息输入模型，诸如用 HEEL 和 TRIM 命令还原水线面，等等。在这种情况下使用文件扩展名.DAT，将文件与普通文件区别开。不过这只是一个约定，而不是要求。（也可以命名为“ABC.RF”）。

Then when you want to restore everything to the way it was at the point when you did the WRITE command, simply issue the command,
这样，当想要还原已用 WRITE 命令定义的内容时，只需用如下命令：

```
RUN ABC.DAT
```

There are other, more specialized, files that the WRITE command will generate, as we shall see later.
还有其他 WRITE 命令生成的更专业化文件，我们将在后面看到。

Stability Criteria: Introduction to the Limit Command 稳性衡准：介绍限定条件命令

GHS provides for stability criteria through the LIMIT command. Various properties of the righting-arm curve are addressed; viz: area, area ratios, minimum angles, etc. The Limit command does not reference any particular stability criterion; rather, you write Limit commands using parameters that, in your judgment, represent the requirements of a given criterion. Several of these limits can be in effect simultaneously, thereby addressing each aspect of the criterion. However it is usually not possible to represent more than one stability criterion simultaneously with the same set of Limit commands. For example, you would treat ordinary energy stability separately from weather stability.
GHS 通过 LIMIT 命令设置稳性衡准。定义各种回复力臂特性，即：面积、面积比、最小角等。Limit 命令不涉及具体某一个稳性衡准，而是用编写的 Limit 命令参数判断是否满足已知衡准要求。多个 limit 可以同时一起作用，从而满足了各衡准要求。然而，通常不可能用相同一个 Limit 来表示多个稳性衡准。例如，把一般稳性衡准和气象衡准分开设置。

You will want to become very familiar with the Limit command in all or most of its forms. The User's Manual is the best source for this information, which is also available through the Help LIMIT. At the end of the Limit documentation you will find some examples.
如想更加全面了解 Limit 命令，可以参看用户手册，这是最佳途径。当然还有 Help（帮助）菜单中的 Limit，在 Limit 文件的末尾，有一些例子可以作参考

Limit commands will be covered in more detail when we get to righting arm curves and specific conditions. For our immediate purposes, here are two sets of Limit commands representing two different stability criteria:
在回复力臂曲线和具体工况章节中将更详细讲述 Limit 命令。就简单了解而言，这有两组表示不同稳性衡准的 Limit 命令供参考。

```
UNITS LT
LIMIT(1) AREA FROM 0 TO 30 > 10.3
```

```
LIMIT(2) AREA FROM 0 TO 40 OR FLD > 16.9
LIMIT(3) AREA FROM 30 TO 40 OR FLD > 5.6
LIMIT(1) GM UPRIGHT > 0.49
LIMIT(2) RA AT 30 OR MAX > 0.66
LIMIT(3) ANGLE AT MAX > 25
```

Critical Points 关键点

GHS gives you the ability to mark any point on the vessel, inside or out, with points that are of interest with respect to their distance from the waterplane. The most common use for these points is marking places on the vessel where some significant downflooding would occur if the point were to become submerged even briefly. Therefore when you define a critical point, it is assumed to be a downflooding point (we call it a Flood or FLD point) -- unless you specify otherwise.

GHS 可在船上内部或外部任何地方标记一个点，此点用于表示距水线面距离。最普遍的用法就是当船舶发生破损进水时，判断这些点是否已被浸没。因此，当定义一个关键点时，除非特殊定义，一般默认为进水点（称之为 Flood 或者 FLD 点）。

The CRTPT command defines critical points. Each Critical Point has a number, which is enclosed in parentheses. For example,

CRTPT 命令用于定义关键点。每个关键点都有用括弧括起来的编号。例如：

```
CRTPT(1) "Engine room vent" 22.85f, 5.50, 16.5
```

This defines Critical Point #1. If there was already a Critical Point definition in the #1 slot, it is replaced with this new one. In addition to the number, you must supply a brief description in quotation marks.

此命令定义了关键点#1。如果之前已定义了关键点#1，此定义将会覆盖原有的关键点。除了需加入数字以外，还需在引号内加入简短的描述。

A related form of the Critical Point is used to mark weathertight points: places where downflooding would be significant if the point were permanently submerged. These we call TIGHT points. For example,

有一种关键点型式是用于表示风雨密点：当这个点被永久浸没时，则该处发生进水。这种点称之为 Tight 点。例如：

```
CRTPT(3) "Main hatch side” 8.0f, 5.3, 14.5 /TIGHT
```

In some of the LIMIT commands above, you will notice the FLD keyword appears. This means that the program is to check for any critical points that become submerged, and to give no credit for stability beyond that heel angle. In other words, the criterion expects there to be sufficient energy in the righting moment curve prior to the immersing of any downflooding point. If there happens to be a TIGHT point that is submerged as the vessel sits at equilibrium, the stability is considered to be failing in that case also.

在先前 LIMIT 命令中，可以注意到出现了关键字 FLD，这就说明程序在校核关键点是否被浸没，且规定稳性的横倾角不超过该浸没点。换句话说，规范要求在进水点浸没之前回复力臂有足够的剩余稳性。假如 TIGHT 点在船舶静平衡后仍处于浸没状态，那么稳性在此工况中浸没。

Curves of Maximum VCG 最大重心高度曲线

The MAXVCG command produces these curves, and the independent parameter is draft or displacement weight, just like we saw in the GHS and CC commands. In addition, the MAXVCG command will take a list of trims or LCG values so that you can get a family of curves, where each curve represents the highest VCG that meets the current Limits at each given initial trim or LCG.

MAXVCG 命令可生成最大 VCG 曲线，类似于 GHS 和 CC 命令，需吃水或者排水量作为参数。此外，MAXVCG 命令可以在带有纵倾或者 LCG 值时进行计算，得出一系列曲线，其中每一条曲线表示在各初始纵倾或 LCG 时满足 Limits 的最大 VCG。

There must have been one or more Limit commands issued to establish a stability criterion before the MAXVCG command is issued. The process which GHS uses to find maximum VCG values involves generating righting-arm curves and evaluating their characteristics according to the Limits in effect. The VCG is experimentally elevated until it reaches the point where one of the Limits is exceeded.

在运行 MAXVCG 命令之前，必须先定义一个或多个 Limit 命令的稳性衡准。在 Limit 中 GHS 计算最大 VCG 的过程中，会涉及生成回复力臂曲线和并根据 Limit（限定条件）校核特征值。计算时，VCG 逐渐升高，直至特征值超过其中某个 Limit（限定条件）。

The report that is generated shows the result of evaluating each of the Limits at the maximum VCG. These are shown as margins relative to the Limit value. If everything goes well, at least one of the margins will be zero and the others positive. The Limit with the zero margin is the one that limited the VCG at that displacement.

生成的报告显示在最大 VCG 时评估每个 Limit（限定条件）的结果，显示相对于 Limit（限定条件）值的裕度。如果计算结果精确，那么其中至少有一组数据裕度为 0，其余为正值。裕度为 0 的 Limit（限定条件）就是当前排水量下最大 VCG 的极限值。

If the program finds that no matter how low it makes the VCG, one or more of the Limits are still negative, it will not show a maximum VCG result in that case. (The most common cause of this is early downflooding, since the angle of downflooding normally does not increase much when the VCG is lowered.) How low does it attempt to bring the VCG? No lower that the initial VCG setting. This is called the Floor VCG. You can use the VCG command to set the floor before you issue the MAXVCG command. For example, VCG=5.0. If you take the trouble to specify a floor value that is not so low as to be unreasonable, it will speed the MAXVCG process.

在程序计算时，如果出现无论 VCG 值多低，其中一个或多个 Limits 值的裕度仍然为负，那么此工况不会显示最大 VCG 值。这种情况最常见的原因是过早发生进水，因为降低 VCG 值对于增加进水角度并无明显影响。那么最低 VCG 会是多少呢？这取决于初始 VCG 的设定。初始 VCG 称之为 Floor VCG，用 VCG 命令在运行 MAXVCG 命令之前设置这个基准 VCG 数。例如：VCG=5.0。如果你可以不嫌麻烦，设置合理的 VCG 较低值，可以加速 MAXVCG 命令的运行。

There are cases where it is impossible to satisfy all of the Limits while having one limit be zero. This is caused by discontinuities in the Limit values as a function of VCG. For example, there are cases where it is impossible to find a VCG that gives a certain value to the area up to the maximum RA, because the the RA curve is flat on the top or has

two equal peaks and one gives an area value greater than required and the other gives a lesser value.

在某些情况下，当某个 Limit 条件值为 0 时，不是所有 Limit 都能满足条件。原因类似 VCG 功能，由于 Limit 值不连续。例如，在有些工况中，根据到最大 RA 曲线下面积值计算，却找不到 VCG。这是由于 RA 曲线峰值顶部平坦或者有两个相等的峰值，并且提供的面积值大于要求值，而其他提供的面积值小于这个值。

The MAXVCG command assumes that the vessel has port/starboard symmetry with respect to its center of gravity. If any tank loads or other weight declarations exist from prior commands, they will be ignored. The parameters of the command specify what displacements are to be used; therefore light ship and existing loads are irrelevant.

MAXVCG 命令假定船舶关于重心位置左右对称。如果已经有舱室装载或其他重量存在，执行命令前，将忽略这些装载。命令参数用指定排水量；因此 MAXVCG 命令与空船重量和其他装载无关。

All that is needed in order to generate maximum VCG curves with damage is to have used the TYPE command to set one or more tanks to the FLOODED type. Of course a stability criterion appropriate to damage stability should have been established with the Limit commands.

求解破舱稳性最大 VCG 曲线时需使用 TYPE 命令，设置一个或者多个舱室为 FLOODED 舱室。当然，计算时需用 Limit 命令事先定义破舱稳性衡准。

Vessels that carry a significant portion of their cargo as liquids are not suitable subjects for maximum VCG curves with damage, because the theory behind maximum VCG breaks down when a given initial condition is changed by the damage differently for different loads. If damaged tanks are initially loaded, the runoff will change the displacement and TCG of the vessel. For this reason, it is becoming more common for everyday onboard stability calculations to go back to first principles rather than using maximum VCG curves. They are evaluating each loading condition by running the RA curves, even including checking a large number of damage cases. GHS is doing this in some of its onboard installations and does it fast enough even with very complex vessel models. Since this is now possible, there is little reason to continue to use maximum VCG curves. Like cross curves, curves of max VCG are being made obsolete by fast computers.

当船舶装载类似液体的货物时，不适用于求解最大 VCG 曲线的方法。当工况由于装载不同破损不同而改变初始装载状态时，与支持最大 VCG 的理论相违背。当破损的舱室初始有装载，这个因素将改变船舶排水量和 TCG。出于这个原因，根据每日船上装载计算稳性作为首选变得愈加普遍，逐渐替代了最大 VCG 曲线的方法。这种方法通过运行稳性曲线校核每个装载工况，甚至还包括校核大量的破损工况。GHS 通过装载仪处理这些问题，即使是非常复杂的船只模型也可以运行非常快速。出于这些原因，没有必要继续使用最大 VCG 曲线方法。如同稳性横交曲线，最大 VCG 曲线对于装载计算机来说也在变得过时。

Other parameters called for by the stability criterion will need to have been specified also. These might include heeling moments and Roll specification when dealing with weather criteria. These will be covered later.

稳性衡准调用的其他参数需要在计算之前定义。类似在处理气象衡准时的横倾力矩、横摇角参数。这些将在稍后介绍。

A MAXVCG Exercise 最大重心高度练习

Calculate Maximum VCG Curves using FV.GF for displacements from 50 to 250 long tons by 50 LT increments and for a range of LCG values from 5.0f to 1.0a. Use the first set of Limit commands shown above. Your run file would look something like the following.

用 FV.GF 模型计算，排水量计算范围从 50LT 到 250LT，间隔为 50LT；LCG 范围从 5.0f 到 1.0a。用上述第一套 Limit 命令。运行文件如下：

```
PROJ MAXVCG1READ FV.GF
REPORT
CRTPT(2) "Focsle door" 23f, 8.0, 14.0
UNITS LT
LIMIT(1) AREA FROM 0 TO 30 > 10.3
LIMIT(2) AREA FROM 0 TO 40 OR FLD > 16.9
LIMIT(3) AREA FROM 30 TO 40 OR FLD > 5.6
MAXVCG DISPL: 50100 ... 250 /LCG: 5.0f4.0f ... 1.0a
REPORT /PREVIEW
REPORT OFF
```

The “Focsle door” critical point was added as another flood point in order to demonstrate the effect of earlier flooding.This will become significant when we do composite max VCG curves in the next exercise.

“Focsle door”关键点作为进水点，用于校核早期进水的影响。在接下来的合成最大 VCG 曲线练习中，关键点设置非常重要。

Composite Maximum VCG Curves 合成最大 VCG 曲线

Often you will need to produce a set of max VCG curves that reflects the results of more than one stability criterion.In other words, you want the maximum VCG at any point to be the lowest of the maximum VCGs found under two or more criteria or for several damage cases.The way this is accomplished is to repeat both the set of Limits and the MAXVCG command for each criterion.If you are finding the composite max VCG curve for a series of damage scenarios, you would not need to change the Limits, but you would be changing the flooding zone.

经常需要生成一系列的最大 VCG 曲线用于反映多个稳性衡准的结果。换句话说，最大 VCG 值在任何时候是两个或以上稳性衡准或破舱工况中最低值。需要计算出多个稳性衡准或者多个破损工况下，任意吃水下最低的最大 VCG 值。通过重设置 Limit 限定条件和 MAXVCG 命令求解每个衡准。如需计算破舱稳性的最大 VCG，则无需改变 Limit 限定条件，改变不同浸水区域工况。

There is one more thing: The second MAXVCG command and all those that follow it, if there are more than two, must include the /COMPOSITE parameter. In all other respects the MAXVCG commands must be identical. Sounds like a good place to use a macro!

另外：第二个 MAXVCG 命令和它后面所对应内容，如果有两个以上的，必须写入参数 /COMPOSITE。在 MAXVCG 命令其他方面必须相同。这里非常适合使用宏。

Oh yes; there is another thing: When doing composites at more than one initial trim, use the /LCG option rather than giving trims directly. The reason for this requirement is that the internal organization of the maximum VCG data uses LCG and displacement. Trim depends on the VCG itself, while LCG does not.
还有就是：当有不止一个初始纵倾时，用/LCG 参数而不是直接定义纵倾角度。这样做的原因是 GHS 内部是基于 LCG 和排水量计算最大 VCG 的。纵倾根据 VCG 值计算，而不根据 LCG。

A Exercise in Composite Max VCG 合成最大 VCG 练习

For the same range as above, create composite Maximum VCG curves based on the two criteria shown above.The plan of this Run File would be,
和上一个练习相同计算范围，创建合成两个衡准的最大 VCG 曲线。运行文件构架如下：

```
Project
Read
Define critical point #2
Report
Criterion #1
Maxvcg
Criterion #2
Maxvcg /COMPOSITE
WRITE (MAXVCG) MAXVCG.DAT
Preview
Report off
```

This is only a plan for the run file, not actual commands – except the WRITE command, which can appear exactly as it is written. What it does is write a special Run File that contains all of the maximum VCG information that was being held within the program at that point. This will save you from having to rerun the original MAXVCG calculations when you want to make use of these particular max VCG curves.
这只是一个运行文件构架，不是真正的命令，除了 WRITE 命令可以真正运行。WRITE 命令将保存一个包含所有最大 VCG 信息的特殊运行文件。这样做可以节约调用这些最大 VCG 曲线而重新运行 MAXVCG 的计算时间。

When you get this exercise up and running you will notice that it appears that the second MAXVCG report is independent of the first one. Each one is reporting the results of the particular criterion it is dealing with. However, there remains in the program's memory a record of the composite maximum VCG data. This is the data that the WRITE command put out.
当进行练习并运行时，可注意到第二个 MAXVCG 报告与第一个报告是相互分开独立的。每个报告都显示各自衡准计算结果。但是，合成的最大 VCG 数据已经被程序记录。这就是 WRITE 命令将要输出的数据。

MAXVCG LOOKUP 调用最大许用重心高度

After the MAXVCGcommand completes, the information that appeared in the tabular report is held in the main program's memory, as we have said. One way to utilize this information is to use the MAXVCG command in LOOKUP mode. In this mode it does not actually compute or generate any new max VCG information. It merely goes to the information stored in its memory.

如之前所述，完成 MAXVCG 命令后，报告列表中的信息已保存在程序中。如要调用这些信息，用 MAXVCG 命令 LOOKUP 模式。在这种模式下，它实际上并没有计算或生成新的最大 VCG，而是在程序记录中提取信息。

If the MAXVCG command issued in LOOKUP mode has all the same parameters as the one that originally generated the information, its job is easy, since it will be simply retrieving information at the same points. But if different drafts or displacements appear in the LOOKUP mode, it will be doing interpolations within the stored data.

如果在 MAXVCG 命令 LOOKUP 模式中生成的初始值都相同，提取相同点的数据非常简便。当 LOOKUP 模式中吃水或者排水量值不同，那么可以用线性插值提取。

A MAXVCG LOOKUP Exercise 调用最大重心高度练习

Perhaps you really wanted your composite maximum VCG curves to be at constant trim, not constant LCG. This can be done in LOOKUP mode -- since the MAXVCG /LOOKUP command parameters do not have to match those used originally.

可能你想要合成的最大 VCG 曲线的纵倾固定，而不是 LCG 固定。LOOKUP 模式可以实现，因为 MAXVCG/LOOKUP 命令参数形式和程序原始构架并不一样。

For this exercise, write a new run file that picks up your MAXVCG.DAT file and produces a separate report of the composite curves where each curve is at a certain trim value. Of course if the parameters you supply with this MAXVCG command cause it to look outside of the data previously computed, it will return nothing and the curve will be incomplete.

本练习中，编写一个新运行文件调用 MAXVCG.DAT 文件并生成合成曲线的单独报告，其中每个曲线都带有固定的纵倾。当然，如果超出了提供的的 MAXVCG 命令参数范围，将不会返回得值和显示曲线。

Your run file should look something like this:

运行文件如下所示：

```
PROJ MAXGCG3
READ FV.GF
REPORT
RUN MAXVCG.DAT /CALL
UNITS MT
MAXVCG DISPL: 50 100 ... 250 /TRIM: 0.5f 0 .5 1 /LOOKUP
REPORT /PREVIEW
REPORT OFF
```

Specific Conditions: Setting Up a Waterplane 特殊条件：设置水线面

Earlier we discussed the HEEL and TRIM commands, which provide for the waterplane's attitude or inclination. The third waterplane parameter is the origin depth, which was also introduced at that time. You can set the origin depth directly using the DEPTH command; for example, DEPTH=5.0 changes the origin depth without affecting the trim and heel angles. If you define a waterplane in this manner, be sure that your TRIM command comes before the DEPTH command.

前面讨论了 HEEL 和 TRIM 命令，这些命令提供水线面状态和倾斜角度，同时还介绍了第三个水线面参数-原点水深。可以用 DEPTH 命令直接设置原点水深，例如：DEPTH=5.0 改变原点水深，但不影响纵倾和横倾角度。如果采用这种方式定义一个水线面时，需确保 TRIM 命令在 DEPTH 命令之前定义。

Here's why. When you change the trim by any significant amount, the position (but not the trim or heel) of the waterplane becomes undefined. GHS deliberately makes the origin depth undefined as a result of changing the trim. Changing the trim alone would rotate the waterplane, keeping the origin depth constant (which is what happens when you change the heel angle). If the origin happened to be located near midship, this might be an acceptable result, since the draft at one end would increase while the draft at the other end would decrease. But if the origin were near one end of the vessel, the draft at the other end would show nearly all the change.

原因是，当纵倾改变时，水线面位置（非纵倾和横倾）变得不明确。GHS 设定当纵倾改变时原点水深变得不明确。仅改变纵倾时，水线面也会随之旋转，但原点水深保持不变（当横倾改变时，原点水深不变）。当原点设置在接近船中位置时，结果可能较为合理，因为一端吃水增加的同时另一端吃水减少；当原点设置在首尾端点时，另一端吃水完全改变。

Of course there are other ways that the program might have been designed, but causing the origin depth to go undefined avoids unnecessary complexity. In many cases you will want to keep the displacement constant, which is easily done with the SOLVE command as will be explained shortly.

当然，程序也设计了其他方法，但是设置原点吃水变得不明确的做法避免了更复杂的局面。大部分情况下，还是希望保持排水量恒定，这用 SOLVE 命令可以很容易地完成，SOVLE 命令之后将会介绍。

If the vessel is upright or nearly so, you can use the DRAFT command. For example, DRAFT =5.0 sets the origin depth such that the draft at the LCF is 5.0. DRAFT @ 0 = 5.0 sets the origin depth such that the draft at the origin is 5.0. Another useful form of the DRAFT command sets origin depth and trim simultaneously. For example,

当船正浮时，可以用 DRAFT 命令。例如：DRAFT=5.0 设置原点吃水，即 LCF 吃水为 5.0。DRAFT@0=5.0 设置原点吃水，即原点吃水为 5.0。还有一种 DRAFT 命令形式就是同时设置原点吃水和纵倾，例如：

```
DRAFT = 5.0 @ FP, 5.5 @ AP
```

sets both origin depth and trim such that the drafts at the FP and AP are as given. Of course this requires that the LBP command has defined the FP and AP locations. Literal locations can be used also. If a DRAFT command similar to the example above is given with more than two locations, it can define a nonlinear waterplane, which we can use to

represent hog or sag. In that case GHS fits a parabola through the given drafts and reports the results, showing any deviations from the parabola.
这个命令设置 FP 和 AP 位置吃水，定义了原点水深和纵倾。当然，这么做的前提是 LBP 命令已定义了 FP 和 AP 位置。还可以使用文字类的位置（FP 和 AP）。当 DRAFT 命令如上所述定义两个以上位置吃水，可以定义一个非线性的吃水，通常用来表示中拱或中垂。在这种情况下，GHS 通过给定的吃水拟合一条抛物线并生成报告，显示抛物线的偏心距。

The draft at any location is always considered to be the average of port and starboard draft. In other words, it is the draft that you would find in the centerplane if you had a draft sensor at that point. Since the draft measurement is taken with respect to the current heel angle, if the vessel is inclined, be sure to set heel before draft.
在任意一处的吃水都看做是左舷和右舷的平均吃水。换句话说，如果船中心点有个吃水传感器，那么你可以发现平均吃水就是这一点的吃水。由于吃水测量是相对于当前的横倾角度进行的，如果舱室倾斜，请务必在吃水前设置横倾角。

Draft Surveys 测量吃水

Deadweight surveys, inclining surveys and salvage surveys all depend on being able to model a waterplane that accurately represents the survey condition. Heel angle is straightforward. If the heel is not great, the multi-point drafts could be used to establish both the trim and the origin depth. Of course, freeboards would have to be converted to drafts before they could be used.
空船测量、倾斜测量和打捞测量都依赖于能够准确地反映测量情况的水线面模型。横倾角是直接计算的。当横倾角不大时，多点吃水可以表示纵倾和原点吃水。当然，干舷在调用之前需转换为吃水。

If the heel angle is large, such as in a salvage situation, it might be more convenient to set the trim as an angle and set the origin depth indirectly through the HEIGHT command. The HEIGHT command references a particular critical point. You would set up a critical point at some convenient point, then take a plumb-line measurement to the water surface from there. This would be the “height” of that point above the waterplane. The command to reference critical point 21 where the height is 5.43 would be,
当横倾角较大时，例如在打捞工况下，通过 HEIGHT 命令设置纵倾角和原点水深较为方便。HEIGHT 命令参考的是关键点的位置。在适当的位置设置关键点，便于测量水面距离。即测量水线面到该点的高度。距离关键点 21 号 5.43 米，设置如下：

```
HEIGHT (21) = 5.43
```

Tank Loads 舱室装载

In order to make use of your tank geometry, tanks can be loaded up to specified levels. The LOAD command is used for this. For example,
为了利用舱室模型，舱室可以装载到指定的量。用 LOAD 命令定义，例如：

```
LOAD (tankname) = 0.98
```

sets the surface in the tank such that the volume is at 98% of the tank's capacity. There are many other ways to specify tank loads: via soundings and ullages, for example.

这里设置舱室液面至 98%舱容。还有其他方式定义舱室装载：通过测深值和测空值，例如：

The surface attitude in a loaded tank automatically follows the heel and trim angles of the external waterplane, so that the center of gravity is recalculated each time the inclination changes. This is how GHS represents free surface. It is something like a “moment of transference” method. We call it simply CG shifts in tanks, and it gives similar results.

舱室装载后的液面和外部水线面纵倾横倾保持一致，从而需根据倾斜角变化实时重新计算重心。GHS 中是如何表示自由液面呢？用类似于“力矩移动”的原理。我们将其称为舱室 CG 移动，它得出了类似的结果。

As in the TYPE command presented earlier, tankname in the LOAD command can be a list of tanks, and the asterisk “wildcard” can appear at the end of any of those names.

如之前 TYPE 命令介绍的，LOAD 命令中也可以是一个舱室名列表，在舱室名末尾用“*”号表示舱室名列表。

Coefficients of Form, Wetted Surface and Sectional Area Curves 船型系数、湿面积和横剖面面积曲线

These calculations all apply to single Components and therefore come under the COMPONENT command. They differ from the COMPONENT commands covered earlier in that they are based on current waterplanes. If the Component belongs to a Hull- or Sail-class part, or a tank in flooded mode, its waterplane is the external waterplane of the vessel. If the Component belongs to an intact tank, its waterplane is the surface of the liquid in the tank.

这些计算都适用于单个 Component（组件），用 COMPONENT 命令表示。与之前 COMPONENT 命令不同，此处 Component（组件）都是基于当前水线面。当组件属于船体、上建或者破损舱室的 Component（组件）时，计算基于船体外部水线面；当组件属于完整的（未破损）舱室时，指舱室内部液体表面。

```
COMP /FORM
```

produces coefficients of form for Parts in the Current Part list, or if the Current Part list is empty, it does it for all Components of all Parts including tanks.

此命令生成当前 Part（部件）的列表，或者如果当前 Part（部件）列表是空的，会把所有舱室 Part（部件）的 Component（组件）都列出来。

```
COMP HULL\HULL.C /FORM
```

produces the coefficients of form for the HULL\HULL.C component.

生成 HULL\HULL.C 组件的船型系数。

```
COMP (HULL\HULL.C) /SECTIONS
```

produces station section properties.

生成横剖面参数。

```
COMP (HULL\HULL.C) /WETTED
```

is like /FORM with wetted surface area included.
与/FORM 类似，列出湿表面积。

Free Surface and Free Surface Moments 自由液面和自由液面惯性矩

A misconception we encounter frequently is that free surface is described by its free surface moment (FSM). This is only partially true. Free surface is the surfaces of liquids in tanks, which causes the centers of gravity in such tanks to shift depending on the heel and trim of the ship. FSM indicates how much the center of gravity will shift with a small change of heel or trim at a particular heel and trim. FSM is like GM: it gives you the initial slope but does not tell you anything about what happens at greater angles.
经常有误解：用自由液面惯性矩（FSM）描述自由液面，通常来讲，这只有部分正确。自由液面指舱室液面表面，舱室液体重心随着纵倾横倾移动。FSM（自由液面惯性矩）指在指定纵倾横倾下改变纵倾或横倾后舱室液面重心移动的量。FSM(自由液面惯性矩)类似 GM 值：只反映初始的斜率，不反应大倾角时的数据。

GHS always takes free surface into account (unless you deliberately shut it off by explicitly freezing tank contents, in which case you no longer have free surface). Normally it does so by constantly recalculating the locations of the CGs in the tanks whenever the ship's heel or trim changes. As mentioned before, this is sometimes called the “moments of transference” method. We call it simply CG shifts, and that is why we consider tank weights to be variable and non-liquid weights to be “Fixed”.
通常 GHS 会始终考虑自由液面影响（除非冻结自由液面影响）。船舶在改变横倾或者纵倾时，通常 GHS 会不断地重新计算舱室液 CGs（重心）。正如前面提到的，称这个为“力矩移动”，我们简单称为 CG（重心）移动。这也是为什么把舱室液体重量认为是可变的，非液体的重量是“Fixed”的。

The phrase "free surface correction" often appears in stability regulations. Even when actual CG shifts are allowed, it is described as a "correction based on the actual moment of transfer". This language implies that there is something deficient that needs to be corrected. It views the calculation of a righting arm as a process that must include a "correction" in order to produce a realistic result. But this is not true. GHS has always, starting with version 1.00, produced realistic righting arms without applying any corrections. The term "moment of transfer" implies an alternative to "free surface moment". Technically GHS does not use "moment of transfer", though the results are the same – if the moment of transfer is done rigorously and in all directions, not simply transversely.
在稳性计算中可能经常出现“自由液面修正”。即使允许实际 CG（重心）移动，但还是会有“correction based on the actual moment of transfer（实际力矩移动修正）”的描述，这句话表明有不足之处需要修正。它认为在稳性回复力臂计算中必须进行修正，才能得到切合实际的结果。但事实并非如此，自 GHS1.00 版本开始，生成实际的回复力臂不会进行修正。“力矩移动”就是指“自由液面惯性矩”。在技术层面来讲，尽管得出结果一样，但严格来讲，移动力矩的是指各个方向上的力矩，不单单是横向力矩，所以 GHS 不使用“力矩移动”。

A different subject is GM. The calculation of GM from the waterplanes does not involve any CG shifts, and it is incorrect to talk about “moment of transference” in that context. More about GM later.

GM 是与自由液面不同，根据水线面计算得出的 GM 值和 CG 移动无关，这里涉及“力矩移动”都不适用于 GM。更多 GM 说明将在后面介绍。

If that were the end of this subject, FSM would not seem too difficult to apply. But there is more, and it is like opening the proverbial “can of worms”. Things get messy when you try to force artificial methods on reality. But that's what the regulations do in many cases.

如果问题就此结束，那么 FSM（自由液面修正）也不难理解。但还有很多情况，使得问题变得复杂。当人为强行去改变，那么情况会变得更糟糕。所以，这就是规范存在的原因了。

The first issue is how the FSM is derived. There are many options as listed below, consult the relevant regulations:

第一个问题是如何得出的 FSM（自由液面惯性矩）。下面列出了许多选项，请参阅相关规定：

1) true FSM at the equilibrium angle;
1） 在静平衡时实际 FSM；

2) true FSM from zero heel and equilibrium trim;
2） 无横倾但纵倾平衡时的实际 FSM；

3) true FSM from zero heel and zero trim;
3） 无纵倾无横倾的实际 FSM；

4) true FSM for tanks that are not nearly full, and zero for those that are;
4） 真正的 FSM 适用于未接近满载的舱室，而对于空舱或满舱为零；

5) some reduced FSM value when the load is below a certain near-empty level and true FSM above that;
5） 当装载低于某个接近空的水平时，FSM 值会降低一些，而真正的 FSM 高于该水平；

6) maximum FSM at some heel and trim for some or all tanks;
6） 某些横倾和纵倾处的最大 FSM，对于部分或所有舱室；

7) maximum FSM regardless of the current load, or zero for empty or pressed tanks;
7） 无论当前装载如何，最大 FSM，但空罐或满舱为零；

8) true FSM subject to a floor value;
8） 实际自由液面受最低值限制；

9) true FSMs subject to a floor values for each type of substance in certain tanks;
9） 某类型舱室实际自由液面受最低值限制；

10) any of the above subject to an overall floor FSM?
10） 所有舱室 FSM 取最低值？

GHS allows you to use any of these methods. The FSMMT and FSMFLOOR commands apply. The FSMMT command allows you to assign two FSM methods to each tank. Each method is active for a range of loads defined by two preset boundaries. This allows, if necessary, a method for nearly-empty, nearly-full and any load in between. the FSMFLOOR command provides for assigning the floor values to certain tanks as well as an overall floor value.

GHS 允许你选择任意一种方法，用 FSMMT 和 FSMFLOOR 命令执行：FSMMT 命令可以设置每个舱室有两种 FSM 计算方法；每种方法对于由两个预设边界定义的一系列装载都处于活动状态。如有必要，这允许使用一种接近空、接近满和介于两者之间的任何装载的方法。FSMFLOOR 命令可以设置某舱室自由液面惯性矩的最低值，并保持这个值。

There is some reason behind all of these options, though only one of them has to do with being more realistic. The others are about: a) conforming to old methods that date back to the days of slow or expensive computing methods; or b) trying to build in an extra safety margin that recognizes the development of additional free surface relative to the current condition. Ironically there are cases (deep tanks) where the CG shift method gives a more pessimistic stability result than some of the FSM methods.

所有这些选项都是有原因的，但只有其中一个更为接近实际。其它则是关于：a）按照老方法费时费力的进行计算；b）在当前装载工况下由于自由液面影响而预留安全裕度。但有些工况可能出乎预料，CG 移动方法得出的结果比 FSM 方法得出的结论更加不理想。

One of the FSM "methods" that you can assign to any tank is MAX. The command,

其中有个 FSM 方法就是设置舱室自由液面最大 MAX。命令是：

```
FSMMT (FO*) = MAX
```

finds the loads in the named tanks where the FSM is maximum, and assigns those FSMs to the tanks as "fixed" values. It does this at the current heel and trim angles. An important side effect is that it leaves the tanks loaded where it found the maximum FSMs. Therefore, it is best to do the FSM assignments before setting the load condition.

在当前纵倾和横倾下，设置该名称系列舱室的 FSM（自由液面惯性矩）最大，并保持最大 FSM 值不变。这样做的负面影响就是舱室会按照最大 FSM(自由液面惯性矩)装载。因此，在做装载工况之前，先进行 FSM（自由液面惯性矩）的定义。

When the Content of a tank is changed from one substance to another and where the densities are different, the FSM also changes in proportion even if it is a "fixed" assigned value.

当舱室装载物改变时，密度也将改变时，无论是否锁定 FSM（自由液面惯性矩）值，FSM（自由液面惯性矩）也会随之改变。

About GM 关于 GM

The traditional way to calculate GM is from the waterplane moment of inertia, which, together with displaced volume yields BM and applying that to the CB we get the metacenter location and hence can arrive an GM. All this depends on the vessel being at equilibrium; otherwise we have to assume a CG location that would put it in equilibrium.

按照传统的方式，GM 值一般由水线面惯性矩进行计算，其结合排水体积得出的 BM 和 CB 得出 GM 值。这些值都是船在静平衡下计算得到的；否则，必须假定一个 CG(重心)，保持平衡。

When slack liquid loads are present in tanks, the metacenter is affected, which affects the GM. However the traditional approach to this is to leave the metacenter alone and "correct" the VCG using the FSM. Obviously this is technically incorrect since the CG does not change as a result of the free surface: You could freeze the tanks and have the same CG, yet the GM would increase.

当液体舱室未满舱，就会影响稳性高，进而影响 GM 值。但是，按照传统做法是不修正稳性高，而是用自由液面惯性矩修正 VCG。显然，这种做法是错误的，因为 CG（重心）不会随着自由液面而改变：你可以冻结舱室和使用相同的 CG（重心），增大 GM 值。

Therefore, GHS always puts the free surface effect in the BM, where it belongs, rather than leaving it out of the BM and making a VCG "correction". Either way yields the same GM, but the BM from GHS will not agree with the BM from a method that "corrects" the VCG.

因此，GHS 对 BM 值进行自由液面修正，而不是对 VCG 进行修正。尽管有时 GM 值相等，但是由 GHS 得出的 BM 和经修正 VCG 之后得出的 BM 值并不相同。

GM can also be calculated from the the RA curve, since GM equals the slope of the RA curve. GHS gives you this option, and it has the advantage of being less sensitive to waterplane discontinuities. This GM option appears as optional parameters on the GHS, SOLVE and RA commands.

GM 也可以由 RA 曲线计算得到，因为 GM 值等于 RA 曲线的斜率。用 RA 曲线求解 GM 值时，对于水线面是否连续的要求不高。这个 GM 选项在 GHS、SOLVE 和 RA 的命令中做为可选参数出现。

Hydrostatic Properties for the Current Condition 装载工况的静水力特征

Several commands produce reports of hydrostatic properties in the current condition. It need not be a realistic "solved" condition. The only requirement is that the waterplane be defined. Here are the commands and a brief description of what you can expect to get from them.

有几个命令生成当前工况的静水力特征，此工况不必是求解之后的工况，唯一的要求便是水线面已定义。下面将简单介绍命令及命令能够生成何种结果。

HS – This is the "pure hydrostatics" report that is entirely independent of the CG.

HS –独立于 CG（重心）的“纯静水力”报告。

GHS – This is similar to the HS report, but it takes the CG into consideration and shows GML and GMT. If the CG is not on the BM line it assumes a CG position that puts it on the BM line without changing the VCG. The optional /GMRA parameter causes it to get the GM from the righting-arm curve, but only when it is in equilibrium.

GHS –类似于 HS 报告，但会把 CG（重心）考虑进去，得出相应 GMT 和 GML 值。如果 CG 与 BM 不共线，那么会在不改变 VCG 的情况下假定一个 CG，与 BM 共线。可以通过可选参数/ GMRA 从回复力臂曲线得出 GM 值，但只限于静平衡状态。

STATUS – This command has many options and is frequently used. The recommended form is STATUS GHS, which presents all the information that you would get from using both STATUS and GHS, but in a more compact form since nothing is duplicated. The rightmost column in the standard STATUS report shows Reference Point heights, which you may not need, and in that case you can eliminate it by including the /NOREF parameter. Alternatively you can get FSM in that column by including the /FSM parameter.

STATUS –命令有很多选项，在 GHS 中使用频率很高。推荐使用 STATUS GHS 命令形式，这个命令可以显示 STATUS 和 GHS 命令所有信息，这种形式简单且无赘述。标准 STATUS 报告最右边行是 Reference Point（参考点）高度，这个值可能用不到，可以用 /NOREF 参数隐藏此列。当然也可以用参数/FSM，显示 FSM（自由液面惯性矩）值来代替此列。

There are 19 different categories of information that you can get from the STATUS command. If you want a certain mixture of them, it is usually better to specify them all in one STATUS command since the report will be more compact than if you give separate STATUS commands. When multiple status reports are specified, the order in which they are reported is fixed regardless of the order of the parameters.

STATUS 命令可以显示 19 种不同类别的信息。如果你想要它们的特定组合，通常最好在一个 STATUS 命令中指定它们，因为报告会比你给出单独的 STATUS 命令更紧凑。指定多个状态报告时，无论参数的顺序如何，报告它们的顺序都是固定的。

LOAD (tanklist) STATUS TANKS – This produces a report that is similar to the presentation in the Tanks screen of the Load Editor. It omits centers of gravity, but includes Part descriptions, which are absent form STATUS reports. With petroleum loads you can get gross and net volumes depending on temperature.

LOAD (tanklist) STATUS TANKS-生成的报告类似于 Load Editor（装载编辑器）界面的舱室装载。此报告省略了重心信息，但加入了 Part（部件）的描述，通常 STATUS 报告中不存在此描述。在装载石油时，可根据温度的得出舱室装载的总容积和净容积。

LOAD STATUS FIXED – This report is similar to the presentation in the Weights screen of the Load Editor.

LOAD STATUS FIXED-生成的报告类似 Load Editor（装载编辑器）界面固体重量信息。

DISPLAY (tanklist) STATUS – This is the Condition Graphics report, which is a graphical representation of the current status and is very effective when used immediately after the STATUS command. In most cases you will want all tanks that have any loads in them, or that are flooded, to be shown, and so the command would be,

DISPLAY (tanklist) STATUS-此命令生成 Condition Graphics（图像信息）文件，用图形表示当前装载，在 STATUS 命令后快速显示图形。大多数情况下，希望选择显示所有舱室装载和破损状态，命令如下：

```
DISPLAY (*) STATUS
```

By default you get plan and profile views. There are many other options that you can read about in Help CG.

默认情况下会显示平面图和侧视图，还可以显示更多视图，请查看 CG 帮助菜单。

Deadweight 载重量

There are two ways to get a deadweight report through the STATUS command.
通过 STATUS 命令有两种方法计算载重量。

The STATUS DW report includes a Deadweight Status line showing the difference between total displacement and total light ship. It always includes the displacement at the current waterplane.
STATUS DW 报告包含总排水量和空船重量之差，报告还包含当前水线面排水量。

The STATUS /DEADWEIGHT report shows Deadweight Loaded, which is simply the sum of added weight items and tank loads above light ship. You can get this report without the displacement information:
STATUS /DEADWEIGHT 报告显示 Deadweight Loaded（装载载重量），这个重量就是除空船重量之外的装载重量和舱室装载重量之和。当然，在报告输出时可以省略排水量信息，命令如下：

```
STATUS WEIGHT /DEADWEIGHT
```

More on the Structure of Commands 深入介绍命令结构

As we get into writing more extensive run files, it will be helpful to revisit the topic of command structure and to carry it farther. Let's look at two examples:
在编写复杂的运行文件之前，重新解读命令构架并深入了解是非常有帮助的。请看如下两个例子：

```
ADD "Crew and effects”,12.34,45.0f, 0.0, 15.5
LOAD (FO*) STATUS /ULLAGE /VOLUME:BB
```

The primary parameters appear immediately after the command name, and sometimes their order is important. If the first parameter is optional, it is enclosed in parentheses to make sure that the program has no trouble determining whether or not it is present.
主参数紧跟着命令名称之后出现，有时参数顺序是非常重要的。当第一个参数是可选的，那么将此参数用括号括起来，便于程序确认此参数。

After the primary parameters there may be “slash” parameters that are almost always optional and have no particular order requirement.
主参数之后的参数是比较松散的，因为这些参数是可选的且没有特殊的顺序要求。

A parameter might have one or more sub-parameters. In the example above, BB is a sub-parameter.
有的参数可能有一个或多个子参数。在上面的例子中，BB 是子参数。

As you can see in the above examples, parameters are often numbers. Sometimes they are strings of characters enclosed in quotation marks. And sometimes they are keywords.
可以在上述例子中看到的，参数通常是数字，但有时也是用引号括起来的字符串，有时是关键字。

When a command line ends in either a comma or a semicolon, it is considered to be incomplete and the next line is appended to it. For example,
当命令行结尾出现逗号或者分号时，那么这个命令行的下一行继续执行此命令。例如：

```
ADD "Deck cargo”,0.23 @ 20f,
                 0.67 @ 10f,
                 0.67 @ 8f,
                 0.0, 17.5
```

This is considered to be all one command. You can do the opposite also: More than one command can go on one line when you separate the commands with the “vertical bar” character “|”. For an example, see the next section.
上述命令都包含在一个命令中。当然也可以用“竖线“表示，用符号“|”。见下章节样例。

Light Ship Weight 空船重量

If you know the light ship weight and its center of gravity, use the WEIGHT command to enter this information:
如果知道空船重量和重心，那么用 WEIGHT 命令输入此信息：

```
DELETE ALL WEIGHTS
WEIGHT = weight, lcg, tcg, vcg
```

The reason for the DELETE ALL WEIGHTS is to make sure you do not have any added fixed weights in effect. Normally you would give the WEIGHT command before any ADD commands (see the next section), so the DELETE command here would not be necessary. You see, the WEIGHT command actually sets the total Fixed Weight including all ADDed weights that might be present. It does that by setting the Light Ship weight to the difference.
用 DELETE ALL WEIGHTS 命令是为了确保没有固定重量项的影响。通常定义时 WEIGHT 命令应在 ADD 命令（见下章节）之前，所以这里就无需执行 DELETE 命令。实际上 WEIGHT 命令实际上就是设置总 Fixed Weight（固体重量），其中也包含可能出现的 ADDed（装载）重量，这样设置的 Lightship 重量会有不同。

Another way to get a light ship weight is to derive it from a given waterplane: Set up the waterplane, then solve for the required light ship at that waterplane. Here is an example/exercise:
得出空船重量的另一种方式是根据给定水线面：设置水线面，求解该水线面下的空船重量。例如：

```
HEEL=0 | TRIM=1a | DRAFT=5.5
VCG=6.5
SOLVE WEIGHT, LCG, TCG
STATUS
```

After setting up the waterplane we specified the VCG, then solved for the displacement weight, LCG and TCG to make the weights equal the buoyancy and the centers be in alignment perpendicular to the waterplane. It does that by changing the Light Ship weight, preserving all other weights that may be present.

设置水线面之后定义 VCG，然后求解排水量，LCG 和 TCG，使得重量等于浮力，重心垂直于水线面。用这种方法改变 Lightship 重量，显示所有其他重量。

If you try this with a nonzero trim as in the example above, you will find that the LCG does not exactly equal the LCB. Why is that?

如果在上述例子中加入纵倾值，那么 LCG 就不等于 LCB，原因是什么？

Adding Other Fixed Weights 增加其他固体重量

The ADD command is used to add either point loads or distributed fixed weights. An example is in the section above on the structure of commands. You can change an ADDed weight by repeating the command with the same description. Also the weight of an ADDed weight item can be adjusted relative to the declared /MAX value with the LOAD command. These weight items can be deleted with the DELETE WEIGHT command.

用 ADD 命令增加点载或者均匀分布的固体重量，在上面命令构架章节中有个例子可以参考。可通过 ADDed 相同描述重量来修改重量。还可以用 Load 命令调用已声明/MAX 值的 ADDed 重量百分比重量。通常这些重量都可以用 DELETE WEIGHT 命令删除。

Finding Equilibrium 求解平衡

Suppose you have your light ship and then you change the load configuration. Now you want to see how the draft, trim and heel have responded and to get some hydrostatic properties. Simply issue the SOLVE command without parameters, then use any of thecommands discussed above under Hydrostatic Properties.

假设已定义空船重量，需更改装载状态。为了反映出吃水、纵倾和横倾是如何变化的和得出静水力报告。输入不带参数的 SOLVE 命令，然后用反映 Hydrostatic Properties（静水力）特性的命令显示结果。

Load Editor and LEw 装载编辑器和编辑器窗口

The LOAD command addresses the loading of tanks (or produces a report of tank loads as we saw with the LOAD STATUS command). Instead of LOAD (tanklist) = value, you can say LOAD (tanklist) EDIT, in which case you bring up a spreadsheet-like interactive tool called the Load Editor or LE.

LOAD 命令用于装载舱室（LOAD STATUS 命令可生成舱室装载报告）。这里不用 LOAD(舱室名)=值的命令格式，用 LOAD（舱室名）EDIT 命令格式，生成类似 LOAD EDIT(装载编辑器)和 LE 编辑表格。

There are two versionsof the Load Editor: LE and LEw. LEw is the more advanced version and gives you “loads” of options. If LEw is installed on your computer, that is what you get with the LOAD EDIT command. If not, you get the “bare bones” version that is still fully capable of editing loads, both in tanks and your added weights.

有两种 Load Editor（装载编辑器）方式：LE 和 Lew。其中 LEw 是高配版本提供装载选项，如果计算机已安装 LEw，可以用 LOAD EDIT 命令调用。如果未安装，生成低配版装载编辑器，满足舱室和增加重量基本功能。

Inclining 倾斜试验

Setting up for an inclining calculation is much like the setup we did for the light ship solving earlier. Of course in that case we somehow knew the VCG. In the inclining calculation we're trying to find the VCG as well as light ship weight and the other components of its CG. However, setting up the waterplane, setting any tank loads and other loads (such as inclining weights that are aboard and not to be included in light ship) is all the same. No doubt the DRAFT command will be more elaborate – more like what we saw earlier when the DRAFT command was first introduced: listing several drafts taken at different locations, and expecting it to result in some deflection.

设置倾斜试验计算类似前面求解空船重量设置。当然，需前提预估 VCG。在倾斜试验计算中，求解 VCG 和空船重量和重心。设置水线面、舱室装载和其他装载（例如压重块）。毫无疑问，DRAFT（吃水）命令需要更加详细-像先前第一次提到的 DRAFT 命令：列出各个位置的吃水，得出平均吃水。

Having done all that, the final step is to use the GMTMMT command, which takes as a parameter the GM moment. This is the slope of the righting moment curve that you derive during the inclining experiment.

完成以上步骤后，最后一步是设置 GMTMMT 命令，类似于参数 GM 的力矩，这就是在倾斜试验中得出的回复力臂的斜率。

The easy way to do the inclining calculations is to use the Incline wizard. You will find it in the Light Ship category within the Wizard menu.

倾斜试验计算最简便的方式是用 Incline wizard（倾斜向导）。在 Wizard（向导）菜单 Light Ship 类别里面。

About Wizards 关于向导

Several “wizards” are provided with GHS. They are software extensions that make use of GHS to perform specific tasks. If you have used or attempted to use wizards in other software environments, you will find that GHS wizards are a little different. Rather than leading you through a linear sequence of steps, the GHS wizards present an interface that helps you establish the parameters of your problem, then goes ahead and generates the solution, complete with a report in many cases. Also, GHS wizards usually save your inputs so that you never have to redo things that you are not changing. Some of the more elaborate wizards write run files and launch separate sessions of GHS.

GHS 提供了“wizard（向导）”模块。利用 GHS 的软件拓展模块执行特殊任务。如果用过其他软件的向导，那么会发现 GHS 向导还是有区别的。不同于流水线式的操作模式，GHS 向导提供了操作界面，在界面里输入问题的参数，运行计算，生成解决方案，完成报告。还有，GHS 向导通常可以保存输入值，不用重复输入不需要改变项，节约时间。某些更为复杂的向导可以编写运行文件，启动 GHS 独立窗口。

All wizards are designed to be self-explanatory. All necessary documentation is built in, or at least that is the intention. There are no manuals or separate documents for wizards.
所有向导设计得一目了然，所有必要文件都已内置，或者有相应提示。向导没有操作手册或者单独声明文件。

If you open a wizard file in a text viewer, you will see that it is actually a Run File. Some wizards use coded files that are not viewable because the programming in them is complex and we do not want to have to support versions that users have modified. However, you are free to write your own wizards for your own use or even to share with others. All that is needed is some experience using macros, variables and templates (see the TEMPLATE command).
当用文本格式打开向导文件，可以发现向导其实是 Run File（运行文件）。某些向导文件是编码文件而且不能打开，是因为程序太过复杂而不支持用户更改文件。但是，用户可以自编向导文件供自己使用，甚至可以与他人分享。所有这些都需要在 macro（宏）编辑、变量和程序自带变量（见 TEMPLATE 命令）有一定经验。

Some of the wizards that are distributed with GHS are updated frequently, and they may require the latest versions of GHS. At www.ghsport.com/support/downloads.htm you will find links to the latest wizards for downloading them.
某些 GHS 向导更新较为频繁，更新之后的向导需相应版本的 GHS。在 www.ghsport.com/support/downloads.htm 有最新的向导下载链接。

Most wizards involve more than one Run File. There may be one or more library Run Files as well as the ".WIZx" file. In any case, when you get the file package, copy all files into your GHS program folder.
大部分向导包含数个 Run Files（运行文件），包含数个 library Run Files（库文件）以及".WIZx"文件。还有，当得到更新向导文件时，需把所有文件复制到 GHS 文件夹中。

User Variables and the SET Command 用户变量和设置命令

User variables are similar to system variables. But rather than providing information from inside the GHS program, they hold information that you put there by means of the SET command. This doesn't sound useful until you see what the SET command can do. With it you can perform arithmetic calculations. There are trig functions and many other handy functions that you can use to prepare parameters for other commands.
用户变量类似于系统变量。但不同的是，用户变量不在 GHS 系统中，而是通过 SET 命令用户自定义变量。在没有用 SET 命令定义之前，自变量不起作用，只有定义之后才能调用计算。通过变量，三角函数和其他函数可以作为其他命令的参数。

More on Limits and Stability Criteria 深入研究限定条件和稳性衡准

GHS does not provide preset stability criterion options. However, using the LIMIT command, you can define a stability criterion to be considered when performing an analysis. The proper set of Limit commands will address known regulations. But there are possible variations and interpretations of the regulations that are left up to the user's discretion.

GHS 没有预设的稳性衡准的选项。但可以用 LIMIT 命令，在稳性分析时定义稳性衡准。现有的 Limit 命令适应已有的规范。对于规范的更新和变化，GHS 也为用户编写衡准预留了一定的空间。

Basically, the Limits are about the righting-arm curve, the heeling arm curve and the residual righting arm curve, which is the difference between the first two curves. They apply to various aspects of these curves, establishing metrics that relate to stability and safety. There are several types of Limits, and each type is designed to examine a certain quantity such as area or range of heel angles. In most cases it is intervals between significant heel angles that are of interest. The GHS keywords for some of the significant angles are:

本质上，Limit（限定条件）与回复力臂曲线、横倾力臂曲线和剩余回复力臂曲线相关，其中剩余回复力臂曲线与另外两条曲线不同。Limit（限定条件）运用于曲线的各个方面，创建涉及稳性和安全的指标。有几种 Limits（限定条件）型式，每种型式设计用于校核某一特性，例如回复力臂面积和横倾范围角。在大部分情况下，Limit（限定条件）设置角度重要横倾角的间隔角度，这些重要横倾角用关键字表示，如下：

EQU – angle of stable equilibrium;
EQU – 稳性平衡角；

RA0 – angle of the "second intercept" or unstable equilibrium;
RA0 - 稳性消失角；

FLD – angle of downflooding;
FLD - 进水角；

MAX – angle at maximum righting arm;
MAX – 最大复原力臂角

ROLL – angle after rolling to windward;
ROLL – 横摇角；

DI – angle of deck immersion.
DI – 甲板浸没角；

For the complete list, see Help Limit.
完整列表参见 Help Limit（Limit 帮助菜单）

The types of Limits are,
Limits 的种类有：

- Angle limits – these apply directly to significant angle ranges or values.
- Angle limits –定义角的范围角或者值；

- Area and Area Ratio – these require some minimum area or ratio of areas.
- Area and Area Ratio – 回复力臂最小面积或者面积比；

• Arm, Arm Ratio and Arm Rise limits – these look at righting arm levels at certain angles.

• Arm, Arm Ratio and Arm Rise limits – 校核在某横倾角时回复力臂曲线值；

• Gm limits – these require minimum GM values.

• Gm limits –最小 GM 值

The RAH Command 计算回复力臂命令

This command produces the righting-arm curve in a particular load condition. It is essential to almost all stability work. If you acceptthe defaults and simply issue the RA command with no parameters, you will get a reasonable result. But if you have established a stability criterion with Limit commands, you will need to include the /LIM parameter:

此命令生成特定装载工况下的回复力臂曲线，这对稳性校核来讲是必不可少的。如果你接受默认设置，简单设置为不带参数的 RA 命令，那么你可以得到一个合理的结果。但是，如果已经用 Limit 命令建立了稳性衡准，那么在用 RA 命令时需要加入/LIM 参数：

```
RA /LIM
```

There are two ways to specify the range of angles that the RA command will use. One way is to list the angles on the command itself:

有两种方法来指定 RA 的命令的使用角度范围。一个是用命令本身设置角度：

```
RA 0, 5, ..., 60
```

A better way is to manipulate the ANGLES list. This list is held in the program's memory, and is what the RA process uses when you do not give angles with the command. Initially this list is 0, 5, ..., 60. Changing it involves the ANGLES command. For example,

还一个更好的方法是用 ANGLE 列表。此列表保存在程序中。当命令未给定角度时，使用 RA 命令时会调用这些角度。初始值列表 0,5… 60。可用 ANGLES 命令更改角度值。例如：

```
ANGLES = 0, 2, ..., 10, 15, ..., 90
```

establishes the angles at 2-degree increments up to 10 degrees, then 5-degree increments to 90 degrees.

上述命令设置角度 0-10 度时每 2 度间隔，10-90 度时每 5 度间隔。

If you want the heel angles to progress to port instead of to the starboard side, use negative angles. If you want the direction to go in whichever direction the vessel is heeling initially, the commands would be,

如果设置横倾角向左舷计算来替代向右舷，可以用负值角度。如想根据船初始横倾设置任意方向，命令如下：

```
SOLVE
ANGLES *
```

This looks at the present heel angle and reverses the direction of the existing angles list if necessary in order to make it go in that same direction.
这个命令可以检查当前横倾角，为保持已有的横倾角和计算横倾角方向保持一致，有必要时可以扭转计算横倾角方向。

It is important to know that RA normally starts the curve at the present heel angle. In other words, the angles, whether given directly with the command or through the ANGLES list, are relative to the heel angle at the time the RA command is issued. This is useful if you want to start the curve at equilibrium:
重要的是要知道，RA 曲线通常从当前横倾角开始计算。换句话说，无论提供计算横倾范围是 RA 命令自带还是根据 ANGLES 列表，RA 命令计算的横倾角都是根据当前横倾角度开始计算的。

```
SOLVE | ANGLES *
RA
```

But if you want to start at zero heel, use a HEEL command before RA:
但如果想从零横倾开始，那么在 RA 前需用 HEEL 命令定义：

```
SOLVE | ANGLES *
HEEL=0
RA
```

Normally the RA process performs CG shifts in slack tanks, which is the most realistic way to represent the free surface effect. If you need to have it apply Free Surface Moments instead, there are some FSM options:
通常情况下，RA 命令过程中执行舱室装载的 CG 移动，这是表示舱室自由液面影响最切合实际的做法。如果用 Free Surface Moments（自由液面惯性矩）来替代 CG 移动，那么以下有几种 FSM 的选项：

- /FSM causes it to use the formal FSM (i.e. whatever FSM methods have been assigned to the tanks);
- / FSM 用传统的 FSM（自由液面惯性矩）（即：不管舱室是如何用 FSM 定义）;
- /TRUEFSM forces it to calculate true FSM for each tank regardless of the method assignments;
- /TRUEFSM 强制舱室根据实际自由液面进行计算，忽略先前舱室 FSM 的定义方法；
- /EXTRAFSM allows the shifting of tank contents and in addition elevates the center of gravity such that the initial GM is the same as would result from using the formal FSM.
- /EXTRAFSM 允许舱室装载移动和额外的升高重心高度，这样做的话计算 GM 时，初始 GM 和用传统 FSM 的方法得出的 GM 相同。

When FSM is being applied, the report header preceding the RA table shows the FSM application – showing exactly how the CG was changed. In the CG-shift mode, this is not necessary, and only the Fixed-weight CG is shown in the header since the total CG is variable.

当应用 FSM 时，在报告标头 RA 表之前显示 FSM 信息，显示究竟 CG 是怎样改变的。在 CG 移动的模式中，这就没有必要显示了，只有 Fixed-weight（固体重量）CG 显示在标头，因为总的 CG 是可变的。

If GM is involved in the Limits, the waterplane-derived GM will be used unless a GM parameter appears. There are several possibilities here for which Help RA is the best reference.

如果 Limits（限定条件）涉及 GM，那么将使用根据水线面生成的 GM，除非出现一个 GM 参数。这里有几种可能的情况，最好参考 RA Help 帮助菜单。

Several options are available for the graphs. The default option is to get the full set of graphs, plotting righting arms or moments, area or energy, and flood point heights. Normally the graphs include score lines at significant angles. These can be turned off with /GRAPH:CLEAN, which is appropriate if the Limits are not of the sort that address those angles.

图形有几个选项可选。默认选项是描绘整套图表、回复力臂和力矩、回复力臂面积、稳性能力和进水点高度。通常情况下，图形会为重要角度划线，可以通过 GRAPH:CLEAN 关闭。如果 Limit（限定条件）和这些角度无关，那么可以适当关闭这些角度。

With Limits in effect, there is a choice as to how the Limit evaluations are to be shown. Normally the margins are shown, as they are in the MAXVCG report. The /LIM:ATTAINED parameter will cause the attained values to be shown. When the special-case area limit that requires two sequential limits is present (see Help LIMITS) the /LIM:ATTAINED:COMBINE parameter will result in the best presentation.

在 Limit（限定条件）作用下，有一个选项可以选择如何显示 Limit（限定条件）计算结果。通常显示的是裕度，如同 MAXVCG 报告中的裕度值。参数/LIM:ATTAINED 作用是显示得出的计算值。当在特殊情况下，回复力臂面积的限定要求两个次序排列的限定条件同时作用（见 LIMITS HELP 帮助菜单），则参数/LIM:ATTAINED:COMBINE 可得出最佳显示结果。

There are many additional features of the RA command, all of which are well-documented in Help RAH.

RA 命令有很多附加功能，都可以参考 RAH Help 帮助菜单。

Heeling Moments 横倾力矩

GHS provides for heeling moments with the HMMT command. You can give a fixed value or function, or have the heeling moment be derived from wind pressure, turning or tank CG shifts.

GHS 用 HMMT 命令设置横倾力矩，可定义横倾力矩为固定值，或者根据风压、扭矩或者舱室 CG 移动计算横倾力矩。

A heeling moment report is available from the HMMT REPORT command. It includes all of the sources that go to make up the current heeling moment.

HMMT REPORT 命令生成横倾力矩报告，报告显示所有产生横倾力矩的项。

Wind Heeling 风倾

In order to get heeling moments from wind pressure, the WIND command must precede the HMMT command. Wind pressure can be given as a constant, as a profile depending on height above the water, or as a speed in knots referenced to 10 meters above the water with a standard profile implied.

为了根据风压计算横倾力矩，WIND 命令必须在 HMMT 命令之前定义。风压可以是一个始终不变的定值，也可以根据水线面以上侧面积计算，还可以根据水线面以上 10m 的风速进行计算。

In order to produce an adequate heeling moment from wind pressure, the geometric model must include all elements of the superstructure and rig that are significant contributors to the wind heeling moment.

为了根据风压生成所有横倾力矩，模型文件必须包含所有上层建筑和井架等对风倾力矩产生较大影响的所有的项。

Two methods of extracting effective lateral plane areas for wind heeling are available: 1) the traditional lateral plane projection where the area is the summation of the lateral projection of all above-water components of all hull- and sail-class Parts; 2) the Band method where areas are accumulated in horizontal bands starting at the waterplane and going up to the highest element of the model.

有两种获取有效侧面面积的方法计算风倾力矩：1）传统的侧向投影面积，面积包括所有水线面以上船体和上层建筑的部件；2）Band 方法，从水线面以上条状分布风压面积，直至模型最高点。

The lateral plane method ignores lateral overlaps of Components. Therefore it tends to yield unrealistically large lateral areas if the calculation is done at other than zero heel. However a wind heeling moment based on the lateral plane at zero heel is an accepted method and is prescribed in some regulations.

侧向投影方法忽略了侧向投影面的遮蔽。因此，在横倾不为零时，往往得出不符合实际的较大值。但在零横倾状态时，风倾力矩根据侧向投影面积计算是合理的方法，在一些规范中也用这个方法计算风倾力矩。

The Band method is able to recognize overlaps in the lateral projections and produce heeling moments that are more realistic at any heel angle. However it requires much more calculating time and will significantly slow the righting-arm calculations when it is in effect.

Band 方法能够识别侧向面积的遮蔽，在带有横倾角时生成的横倾力矩也更为真实合理。但此方法花费的计算时间较长，且当风倾力矩作用于回复力臂时会显著减慢计算时间。

The command "HMMT WIND" causes the heeling moment to be based on the specified wind pressure and lateral area. By default you get the lateral plane method. The optional parameter for the Band method is "/BAND:w" where w, if present, specifies the "width" of the bands (which of course are more like heights). The smaller the w value the slower the calculations will be, and if too small it will run very slowly with no significant improvement in accuracy.

“HMMT WIND”命令根据已定义风压和侧向投影面积产生横倾力矩。这里默认采用侧向投影面积计算方法。当然也有可选项 Band（遮蔽）方法，“/ BAND：w”。其中 w 定义

遮蔽“宽度”（当然这更像高度）。w 值越小计算速度越慢，如果 w 值太小，那么运行速度会非常慢，这显然对精确性也没有太大意义。

A table and plot of wind pressure or speed as a function of height above the waterplane is available from the WIND REPORT command.

WIND REPORT（风压报告）命令生成水线面以上的风压和风速图表。

Severe Wind and Rolling Calculations 强风和横摇角计算

When wind and waves are on the beam, the ship will need to have enough righting energy available to absorb the kinetic energy during a rebound from a severe roll upwind of its steady-wind induced heel. GHS provides a mechanism for conveniently arriving at the windward heel angle so that these energies can be compared in the righting arm curve.

当风和浪都作用在船横向方向，船舶需要有足够的回复力臂能量抵御逆风向的横摇角和风作用的横倾。GHS 提供了一种计算方法，专门用于这种风浪引起的横摇角，并在回复力臂曲线中进行校核。

With a heeling moment in effect, the equilibrium heel angle can be found simply by issuing the SOLVE command (without parameters). Now if the magnitude of the initial roll is known, the upwind heel angle can be set simply by giving the command,

在横倾力矩作用下，可以简单用 SLOVE（求解）命令（不带任何参数）求解平衡角。如果已知横摇角，风倾横倾角可以通过以下简单的命令来设置：

```
HEEL = *-r, where ris the roll angle.
```

A more convenient way of specifying the roll angle is provided by the ROLL command. For example,

定义横摇角更简便的方法就是用 ROLL 命令。例如：

```
ROLL = 20
HEEL *-ROLL
```

does essentially the same thing, except that it conveniently moves the heelangle in the direction opposite to the initial heel angle. Further, if the value of the Roll is not fixed, but is to be calculated from the present condition according to the IMO rolling formula, then the ROLL command can be given once in the form,

本质上，这些命令表达意思相同，命令只是把横倾角倾斜方向设置与初始倾斜角方向相反。另外，由于 Roll（横摇角）值不固定，而是需要根据 IMO 规范横摇角公式对当前工况重新计算，ROLL 命令可以用于此计算。

```
ROLL IMO
```

and the actual roll value will be recalculated at the time it is used.

实际横摇值将根据不同时间段的工况重新计算。

A typical sequence of commands to check the energy available to resist an IMO roll would be:

典型校核抵御 IMO 横摇角力矩的命令是：

```
ROLL IMO
UNIT MT
WIND (PRESSURE) 0.0514    `in current units (wt/length^2)
HMMT WIND /CONST
SOLVE
HEEL *-ROLL
RA /AREA
```

If an increase in the heeling moment (due to a gust of wind) occurs at the rolled angle, it can be modeled by using a /GUST parameter on the HMMT command. The issuance of the HEEL=*-ROLL command then automatically causes the heeling moment to be multiplied by the gust factor from then on -- until another HMMT command is issued. For example,

当在横摇角状态下增加横倾力矩（由于一阵风），可用 HMMT 命令参数/GUST 定义。HEEL=*-ROLL 命令可以自动计入阵风的影响，直至另外的 HMMT 命令定义风。例如：

```
...
HMMT WIND /CONST /GUST: 1.5
SOLVE
HEEL *-ROLL`<- The gust factor takes effect after this.
RA /AREA
```

When using the MAXVCG process, the roll angle and gust factor are automatically applied in the proper sequence. Thus,

在使用 MAXVCG 过程中，横摇角和阵风因数按照正确的顺序自动运行。那么，

```
ROLL IMO
WIND 53.4
HMMT WIND /CONST /GUST: 1.5
SOLVE MAXVCG
```

is all that is necessary.

所有命令都是必要的。

Further, the MAXVCG command automatically recalculates the wind moments at each new draft when they are based on the lateral plane. Hence,

此外，MAXVCG 命令自动重新计算每个新的吃水下的风倾力矩，此力矩根据侧向投影面积计算。因此，

```
ROLL IMO
HMMT WIND /CONST /GUST: 1.5
MAXVCG ...
```

produces maximum VCG curves for a stability criterion involving the ROLL angle.

这个命令根据稳性规范计算最大 VCG，其中包含了 ROLL(横摇角)影响。

If the ROLL keyword appears in the Limits, it actually refers to the heel angle arrived at by *-ROLL. For example,
当关键字 ROLL 命令出现在 Limits（限定条件中），那么实际上指的是横倾角到达*-ROLL。例如：

```
LIMIT RESIDUAL RATIO FROM ROLL TO ABS 50 OR RA0 > 1
LIMIT RESIDUAL RATIO FROM ROLL TO FLD OR RA0 > 1
```

expresses the area comparison portion of the IMO criterion for severe wind and rolling.
表示 IMO 稳性气象衡准的风压与横摇面积比。

If the PRE angle keyword appears in the Limits, it refer to the heel angle which was current immediately prior to *-ROLL. For example,
当关键字 PRE 角度出现在 Limits（限定条件中），那么实际上指的是刚刚到达*-ROLL 前的横倾角。例如：

```
LIMIT ANGLE FROM PRE TO ABS 16 OR 80%DI0 > 0
```

When you want to run the righting-arm curve either to port or starboard, depending on the vessel's initial (non-wind) list, things get a little more complicated. The MAXVCG process handles this automatically; but when you are doing an individual righting-arm curve you have to make sure that certain commands are in the correct order. The procedure is as follows.
根据船舶初始横倾（没有风），选择向左舷还是右舷运行回复力臂曲线，事情看起来有点复杂。MAXVCG 在求解过程中可以自动作出选择。但是，当单独运行回复力臂曲线时，需要保证命令计算方向正确。过程如下：

1. With the heeling moment off, solve for the equilibrium heel angle.
1. 关闭横倾力矩，解出平衡横倾角

2. Set the ANGLES direction accordingly.
2. 设置相应的ANGLES（角度）方向

3. Set the heeling moment.
3. 设置横倾力矩

4. Set the HMMT direction according to the heel angle.
4. 根据横倾角设置HMMT方向

5. Solve for the equilibrium heel (with steady wind).
5. 解出平衡横倾（包括风倾）

6. Apply the roll.
6. 加载横摇角

7. Do the RA /LIM command.

7. 运行RA/ LIM命令

Here is an example.
举例如下：

```
HMMT OFF
    SOLVE
    ANGLES *
    HMMT WIND/CONST/GUST:1.5 /TRIMALLOW
    HMMT *
    SOLVE
    HEEL=*-ROLL
    RA /LIM
```

More about FSM 深入探讨 FSM（自由液面惯性矩）

The only way to prevent GHS from recalculating the centers of gravity in tanks is to Freeze the tanks' contents: TYPE(*) FROZEN. However, you can have it temporarily suspend the CG shifting during righting-arm curve calculations by including the /FSM parameter with the RA command. That causes it to temporarily freeze the tanks and to compensate by elevating the overall center of gravity according to a free surface moment.
阻止 GHS 重复计算舱室重心的唯一方法是 Freeze（冻结）舱室，TYPE(*) FROZEN。也可以在 RA/FSM 命令参数下，在生成回复力臂曲线时暂时性冻结 CG 移动。这样就能暂时性的冻结舱室，根据自由液面力矩修正船舶重心高度。

After we have decided what the total FSM number is in a given load condition, the next thing is to decide when to freeze the tanks: 1) at zero heel and trim; 2) at zero heel and equilibrium trim; 3) at equilibrium with the CG elevated; 4) at normal equilibrium; 5) at equilibrium before or after wind heeling? Communicating your choice here is intended to be a natural result of your preparation before the RA command.
在装载工况中计入 FSM（自由液面惯性矩）后，接下来要做的就是决定在何时冻结舱室：1）在没有纵倾和横倾；2）在没有横倾，但有纵倾角；3）在平衡状态，CG 升高；4）在平衡状态；5）在风倾作用之前或之后的平衡状态？为了得出较为正确的结果，在执行 RA 命令前做好选择 FSM 方式的准备工作。

Finally, we have to decide in which direction to move the CG. If it is elevated at some angle other than equilibrium it will change the angle of equilibrium. Should it be elevated at the same heel and trim at which the tanks are frozen? This can make a substantial difference in the stability results. Generally if you do your equilibrium solving using the form,
最后，选择 CG 移动的方向。如果选择非平衡角方向，CG 升高会影响平衡角角度。那么在舱室冻结时，CG 方向和纵倾横倾方向相同吗？这个问题对于稳性计算结果影响很大。一般来说，当在求解平衡角时，用如下命令，

```
SOLVE /FSM:UPRIGHT
```

things will work out in a reasonable way with the CG elevation being done at zero heel.
这样在零横倾下程序将选择合理的方式升高 CG。

If you want to use FSM rather then CG shifts in a Severe Wind and Rolling calculation, it gets a little more complicated than what was shown in the previous section. There are some choices to make about when and how to apply the FSM. Here is the recommended sequence:
如想在气象衡准计算中引入 FSM（自由液面惯性矩）而不是 CG 升高，那么计算就比前面讲述的更加复杂。关于选择何时和怎样运用 FSM（自由液面惯性矩），建议命令顺序如下：

```
ROLL IMO /FSM
HMMT OFF
SOLVE /FSM:UPRIGHT
ANGLES *
HMMT WIND ...
HMMT *
SOLVE /FSM:UPRIGHT
HEEL *-ROLL
RA /LIM /FSM
```

An Intact Stability Exercise 完整稳性练习

Find out whether FV.GF complies with these intact criteria (described more fully on the following pages):
校核 FV.GF 是否满足如下完整稳性要求（后续将更全面描述）：

- 46 CFR 170.173, Paragraph B (Vessels of Unusual Proportion and Form)
- 46 CFR 170. 173, Paragraph B（非常规船舶规范）

- 46 CFR 170.170(GM Weather Criterion)
- 46 CFR 170.170（GM 天气衡准）

- IMO Severe Wind and Roll
- IMO 气象衡准

Assume the following 假定如下:

Light Ship 空船重量:

```
156.0 Long Tons at 0.56f, 0, 10.56
```

Downflooding points 进水点:

```
(1) "ER VENTS"           22.8f, 7.0s, 15.0 /SYM
(2) "PORT CABIN DOOR"    10.0f, 9.0p, 14.0 /TIGHT
```

```
(3) "STBD CABIN DOOR"          5.0a, 9.0s, 14.0 /TIGHT
```

Load sequence:（装载状态）

Fixed loads 固体重量舱室装载:

Departure 离港:

```
Crew&effects  2.0, 25f, 0, 25.0
Stores        12.0, 14f, 0, 15.0
Net on deck   5.0, 20a, 0, 13.0
```

Tank loads 箱的装载:
(changes only) （更改而已）

```
WT1*0.95
WT2*0.95
WT3*0.95
FODAY*0.95
LUBE.S0.95
HYDR.P0.95
FW* 0.98
HOLD* 0.0
```

Arrival at fishing grounds 到达渔场:

```
Stores 8.0, 14f, 0, 15.0
```

```
WT1*0.05
LUBE.S0.66
HYDR.P0.66
FW* 0.66
```

Departing fishing grounds – good catch 驶离渔场—货物装载:

```
Stores 4.0, 14f, 0, 15.0
```

```
WT2*0.05
LUBE.S0.33
HYDR.P0.33
FW* 0.33
HOLD* 1.0
```

Depart fishing grounds – no catch 驶离渔场未装货货舱空:

holds empty

Arrival – good catch 达港—货物装载:

```
Stores 0.2, 14f, 0, 15.0
```

```
WT3*0.05
LUBE.S0.10
HYDR.P0.10
FW* 0.10
HOLD* 1.0
```

Arrival – no catch 到港未装货货舱空:

holds empty

Intact Stability Exercise specification, continued 完整稳性练习，续:

- The CFR 170.173 criterion requires several Limit commands. See the highlighted portion of the regulation text. Reference HELP LIMIT for the Limit commands. This criterion is easily addressed with a simple RA /LIM starting from upright heel.

  CFR170.173 规范需要满足几个 Limit（限定条件），见规范高亮部分。Limit（限定条件）参看 HELP LIMIT(帮助菜单)。这个规范可以简单用 RA/LIM 命令，从正浮开始计算。

- The CFR 170.170 weather criterion appears to have been formulated as a simplification of a criterion that limits the angle of wind heeling by requiring a minimum GM. There is a discussion of this in the GHS User Bulletin WEATHER. HTM, which is on ghsport.com. A way to address the criterion is presented there, but it does not meet the "letter of the law". Therefore it is recommended that the C170170 macro library be used. Here are the steps (after setting up the load condition):

  CFR170.170 天气衡准，要求 GM 最小时，风倾作用下的角度需满足通过规范公式计算角度。在 www.ghsport.com 网站上有关于 GHS User Bulletin WEATHER.HTM 的讨论。定义该规范的衡准如下，但它不符合“官方正式”条文，所以 GHS 推荐使用 C170170 数据库中的宏。步骤如下（在转载工况定义完成之后）：

```
RUN C170170.LIB /CALL
SET P=0.005
.170_170
```

For all three criteria,
对于所有这三个衡准来说，

- Calculations to be performed using CG shifts.
- 使用 CG 的升高方式进行计算。

- Report to include subtitles, Status with GM & Critical Point heights and righting arm data with evaluation of each stability criterion with graphs.
- 报告中包含副标题、GM 值和关键点高度信息以及各稳性衡准的回复力臂图表。

- Use P=0.005 for the purpose of 170.170.
- 使用 P =0.005 的目的是为了计算 170.170 衡准。

- Do not include Reference Point data in output.
- 输出数据无需包含参考点信息。

- Questions:
- 问题：

1. Do the results indicate the vessel meets all three criteria?
1. 结果表明该船满足所有这三个稳性衡准吗？

2. Do you suspect any error with input information?
2. 对输入数据是否存有疑问？

§ 170.173 Criterion for vessels of unusual proportion and form. 非常规船舶衡准 170.173

(a) If required by the Coast Guard Marine Safety Center or the ABS, each mechanically powered vessel less than 328 feet (100 meters) LLL, other than a tugboat or towboat, must be shown by design calculations to comply with—

(a) 根据ABS或Coast Guard Marine Safety Center要求，对于小于 328 英尺（100m）水线间长（除拖船和顶推船除外）的有动力船舶，需满足如下要求：

(1) Paragraph (b) or (c) of this section if the maximum righting arm occurs atan angle of heel less than or equal to 30 degrees; or

(1) 段落 (b)或 (c)，最大复原力臂发生角小于或等于 30 度;

(2) Paragraph (b) of this section if the maximum righting arm occurs at an angle of heel greater than 30 degrees.

(2) 段落 (b)，最大复原力臂发生角大于 30 度。

(b) Each vessel must have—

(b) 所有船舶需满足：

(1) An initial metacentric height (GM) of at least 0.49 feet (0.15 meters);

(1) 初稳性高度（GM）应不小于 0.49 feet（0.15m）; .

(2) A righting arm (GZ) of at least 0.66 feet (0.20 meters) at an angle of heel equal to or greater than 30 degrees;

(2) 横倾角大于或等于 30 度时回复力臂值（GZ）应不小于 0.66 feet（0.2m）；

(3) A maximum righting arm that occurs at an angle of heel not less than 25 degrees;

(3) 最大回复力臂发生角不小于 25 度；

(4) An area under each righting arm curve of at least 10.3 foot-degrees (3.15 meter-degrees) up to an angle of heel of 30 degrees;

(4) 平衡角至 30 度之间回复力臂面积应不小于foot-degrees (3.15 meter-degrees)；

(5) An area under each righting arm curve of at least 16.9 foot-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less; and

(5) 平衡角至横倾角 40 度或者进水角，取小者之间的回复力臂面积应不小于 16.9 foot-degrees (5.15 meter-degrees)。

(6) An area under each righting arm curve between the angles of 30 degrees and 40 degrees, or between 30 degrees and the downflooding angle if this angle is less than 40 degrees, of not less than 5.6 foot-degrees (1.72 meter-degrees).

(6) 在横倾角 30 度到 40 度之间或 30 度至进水角（如果进水角小于 40 度）之间回复力臂曲线下面积应不小于 5.6 foot-degrees (1.72 meter-degrees)。

(c) Each vessel must have—

(c) 所有船舶需满足：

(1) An initial metacentric height (GM) of at least 0.49 feet (0.15 meters);

(1) 初稳性高度应不小于 0.49 feet (0.15 meters);

(2) A maximum righting arm that occurs at an angle of heel not less than 15 degrees;An area under each righting armcurve of at least 16.9 foot-degrees (5.15 meter-degrees) up to an angle of heel of 40 degrees or the downflooding angle, whichever is less;

(2) 最大回复力臂所对应的横倾角应不小于 15 度；平衡角至横倾角 40 度或者进水角（取小者）应不小于 16.9 foot-degrees (5.15 meter-degrees)。

(4) An area under each righting arm curve between the angles of 30 degrees and 40 degrees, or between 30 degrees and the downflooding angle if this angle is less than 40 degrees, of not less than 5.6 foot-degrees (1.72 meter-degrees); and

(4) 在横倾角 30 度与 40 度之间或者 30 度与进水角（如果进水角小于 40 度）之间的回复力臂曲线下的面积应不小于 5.6 foot-degrees (1.72 meter-degrees)；

(5) An area under each righting arm curve up to the angle of maximum righting arm of not less than the area determined by the following equation:

(5) 平衡角与最大回复力臂之间回复力臂面积不小于如下公式面积：

A=10.3+0.187 (30 - Y) foot-degrees

A=3.15+0.057 (30 - Y) meter-degrees

where—其中：

A=area in foot-degrees (meter-degrees).

A=面积，单位foot-degrees (meter-degrees)

Y=angle of maximum righting arm, degrees.

Y=最大回复力臂对应横倾角度，单位degrees

46 CFR 170.170 Weather Criterion 46CFR 170.170 天气衡准

§ 170.170 Calculations required.
§ 170.170 计算要求

(a) Each vessel must be shown be design calculations to have a metacentric height (GM) that is equal to or greater than the following in each condition of loading and operation:
(a) 所有船舶需计算显示初稳性高值（GM），且各装载工况下GM需大于等于如下值：

GM > PAH / (W tan(T))

Where – 其中：

P=0.005+(L/14,200)^{2}tons/ft^{2}or 0.055+(L/1309)^{2}metric tons/m^2. . . for ocean service, Great Lakes winter service, or service on exposed waters.
P=0.005+(L/14,200)^{2}tons/ft^{2}or 0.055+(L/1309)^{2}t/m^2. . .针对远洋航区、五大湖冬季航区及无遮蔽水域航区。

P=0.0033+(L/14,200)^{2}tons/ft^{2}or 0.036+(L/1309)^{2}t/m^2. . . for Great Lakes summer service, or service on partially protected waters.
P=0.0033+(L/14,200)^{2}tons/ft^{2}or 0.036+(L/1309)^{2}t/m^2. . .针对五大湖夏季航区及部分遮蔽水域航区。

P=0.0025+(L/14,200)^{2}tons/ft^{2}or 0.028+(L/1309)^{2}t/m^2. . . for service on protected waters.
P=0.0025+(L/14,200)^{2}tons/ft^{2}or 0.028+(L/1309)^{2}t/m^2. . .针对遮蔽航区

L=LBP in feet (meters).
L=LBP以英尺(米)为单位。

A=projected lateral area in square feet (square meters) of the portion of the vessel and deck cargo above the waterline.
A =船及甲板货水线面以上侧向投影面积，单位平方英尺（平方米）。

H=the vertical distance in feet (meters) from the center of A to the center of the underwater lateral area or approximately to the one-half draft point.
H=从A中心至水线面以下面积中心或者二分之一吃水附近垂向距离，单位英尺（米）。

W=displacement in long (metric) tons.
W=排水量，单位长吨（公吨）。

T=either:
T=以下两者之一：

(1) the lesser of either 14 degrees heel or the angle of heel in degrees at which one half the freeboard to the deck edge in immersed; or
(1) 横倾角小于 14 度或者干舷至甲板浸没边缘二分之一处角度

(2) for a sailing vessel, T = the lesser of either 14 degrees or the angle of heel in degrees to the deck edge.

(2) 对于帆船来讲，T =横倾角小于 14 度或者横倾至甲板边缘浸没角度。

The deck edge is to be taken as the intersection of the sideshell and the uppermost continuous deck below which the sideshell is weathertight.

甲板边缘应取舷侧外板和最上部连续甲板相交处。

(b) If approved by the Coast Guard Marine Safety Center or the ABS, a larger value of T may be used for a vessel with a discontinuous weather deck or abnormal sheer.

(b) 若经Coast Guard Marine Safety Center或ABS认可，非连续露天甲板或者超常规船舶可取较大T值。

(c) When doing the calculations required by paragraph (a) of this section for sailing vessel or auxiliary sailing vessel, the vessel must be assumed –

(c) 对于计算需满足段落（a）中章节要求的帆船或者辅助帆船，应做以下假定:

(1) To be under bare poles; or

(1) 不张帆；或

(2) If the vessel has no auxiliary propulsion, to have storm sales set and trimmed flat.

(2) 如果船舶无辅助推进装置，应配置有抵御风暴和调节平衡装置。

(d) The criterion specified in this section is generally limited in application to flush deck, mechanically powered vessels of ordinary proportions and form that carry cargo below the main deck. On other types of vessels, the Coast Guard Marine Safety Center or the ABS requires calculations in addition to those in paragraph (a) of this section. On a mechanically powered vessel under 328 feet (100 meters) in length, other than a tugboat or a towboat, the requirements of §170.173 are applied

(d) 在本节规定的衡准通常适用于全通甲板、常规动力及货物装载在主甲板以下的船舶。对于其他船舶，Coast Guard Marine Safety Center和ABS要求进行本节段落（a）中的额外计算。对于在 328 英尺（100 米）以下有动力船，除拖船和顶推船，应满足§170.173 要求。

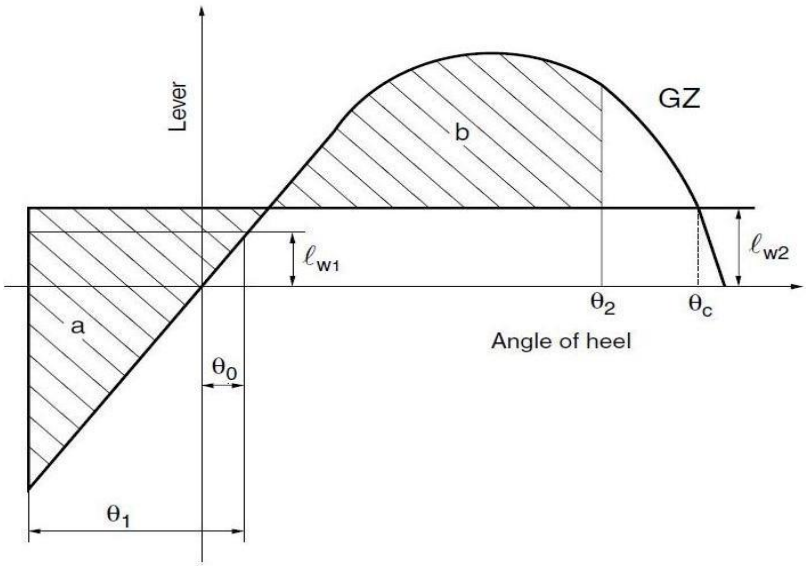
Severe wind and rolling criterion (weather criterion) 气象衡准

3.2.1 Assumptions
3.2.1 假定

The ability of a ship to withstand the combined effects of beam wind and rolling is to be demonstrated for each standard condition of loading, with reference to Fig 1 as follows:
船舶在各装载工况下经受侧向横风和横摇角共同作用下的回复能力，参考图 1，如下所示：

- the ship is subjected to a steady wind pressure acting perpendicular to the ship's centreline which results in a steady wind heeling lever (w1);
- 船舶始终受恒定风压垂直作用于船舶中心，产生恒定风倾力臂（w1）；
- from the resultant angle of equilibrium (θ0), the ship is assumed to roll owing to wave action to an angle of roll (θ1) to windward;
- 从由上述风压产生的平衡角（θ0），假定船舶迎浪产生迎风向的横摇角度为（θ1）；
- the ship is then subjected to a gust wind pressure which results in a gust wind heeling lever (w2);
- 船舶受到阵风风压产生阵风风倾力臂（w2）；
- free surface effects, as described in [4], are to be accounted for in the standard conditions of loading as set out in Ch 3, App 2, [1.2].
- 自由液面惯性矩影响，如[4]描述，自由液面在Ch 3, App 2, [1.2]有详细说明。

Figure 1 : Severe wind and rolling气象衡准



3.2.2 Criteria
3.2.2 衡准

Under the assumptions of [3.2.1], the following criteria are to be complied with:
在[3.2.1]的假设下，需满足以下衡准：

- the area "b" is to be equal to or greater than area "a", where:
- 面积“b”大于等于面积“a”，其中：

a: Area above the GZ curve and below w2, between θR and the intersection of w2 with the GZ curve
a：GZ曲线之上与w2 之下，从角度θR至w2 与GZ曲线交点处的所围面积。

b : Area above the heeling lever w2 and below the GZ curve, between the intersection of w2 with the GZ curve and θ2.
b：风倾力臂w2 之上与GZ曲线之下，从w2 与GZ曲线交点处至θ2 所围面积。

- the angle of heel under action of steady wind (θ0) is to be limited to 16° or 80% of the angle of deck edge immersion, whichever is less.
- 在恒定风压作用下产生的角度(θ0)小于的等于 16° 或者甲板浸没 80%角度处，取小者。

3.2.3 Heeling levers
3.2.3 横倾力臂

The wind heeling levers w1 and w2, in m, referred to in [3.2.2], are constant values at all angles of inclination and are to be calculated as follows:
风倾侧杆w1 和w2，以m为单位，参考[3.2.2]，是倾斜的所有角度的恒定值，计算如下：
参考[3.2.2]，风倾力臂w1 和w2，单位m，在计算倾斜角度下风压恒定，计算方法如下：

$$\ell_{W1} = \frac{PAZ}{1000g\Delta}$$

and 和

$$\ell_{W2} = 1{,}5\,\ell_{W1}$$

where: 其中：

P : 504 N/m2 for unrestricted navigation notation. The value of P used for ships with restricted navigation notation may be reduced subject to the approval of the Society;
P : 504 N/m2 用于无限航区。P值在主管机关的批准下根据航区情况适当减小；

A : Projected lateral area in m2, of the portion of the ship and deck cargo above the waterline;
A : 船体和甲板货水线以上侧向投影面积，单位m2。

Z : Vertical distance in m, from the centre of A to the centre of the underwater lateral area orapproximately to a point at one half the draught;
Z : 从A中心至水线面以下面积中心或者二分之一吃水处的垂直距离，单位m。

Δ : Displacement in t;
Δ : 排水量，单位t；

g = 9,81 m/s2.

3.2.4 Angles of heel
3.2.4 横倾角

For the purpose of calculating the criteria of [3.2.2], the angles in Fig 1 are defined as follows:
为了计算[3.2.2]中衡准，图 1 中的角度定义如下：

θ0: Angle of heel, in degrees, under action of steady wind
θ0: 恒定风压下横倾角，单位度

θ1: Angle of roll, in degress, to windward due to wave action, calculated as follows:
θ1: 在风浪作用下产生的横摇角，单位度。计算公式如下：

$$\theta_1 = 109kX_1X_2\sqrt{rs}$$

θ2: Angle of downflooding (θf) in degrees, or 50° or θc , whichever is less
θ2: 进水角（θf），50 度或者θc，取小者，单位度。

θf: Angle of heel in degrees, at which openings in the hull, superstructures or deckhouses whichcannot be closed weathertight immerse. In applying this criterion, small openings throughwhich progressive flooding cannot take place need not be considered as open;
θf: 船体、上层建筑及甲板室开口不能被关闭且被浸没的横倾角度，单位为度。能产生累积进水的较小的开口不应视作开口；

θc: Angle in degrees, of second intercept between wind heeling lever w2 and GZ curves
θc: 风倾力臂与GZ曲线的第二交点处的横倾角，单位为度。

θR = θ0 - θ1

X1: Coefficient defined in Tab 1
X1: 系数定义如表 1；

X2: Coefficient defined in Tab 2
X2: 系数定义如表 2；

k: Coefficient equal to:
k: 折减系数：

k = 1,0 for a round-bilged ship having no bilge or bar keels
k = 1,0（船底部未设舭龙骨或减摇装置）

k = 0,7 for a ship having sharp bilge
k = 0,7（船底部尖锐）

For a ship having no bilge keels, a bar keel or both, k is defined in Tab 3.
对于设有舭龙骨或减摇装置或者两者都有，K值定义如表 3。

r = 0.73 +/-0.6 (OG)/T1

OG: Distance in m, between the centre of gravity and the waterline (positive if centre of gravity is above the waterline, negative if it is below)
OG: 重心至水线面距离（重心在水线面之上为正，之下为负），单位为m。

T1: Mean moulded draught in m, of the ship
T1: 船舶平均型吃水，单位m。

s: Factor defined in Tab 4.
s: 定义如表 4 因数。

Note 1: The angle of roll θ1 for ships with anti-rolling devices is to be determined without taking into account the operations of these devices.
注 1：配置防横摇装置的船舶横摇角θ1 不是由其装置操作所决定的。

Note 2: The angle of roll θ1 may be obtained, in lieu of the above formula, from model tests or full scale measurements.
注 2：横摇角θ1 可由上述公式、模型试验或者现场测量决定。

The rolling period TR, in s, is calculated as follows:
横摇周期TR，单位s，计算公式如下：

where: 其中：

The symbols in the tables and formula for the rolling periodare defined as follows:
表中的符号和公式用于定义横摇周期如下：

LW : Length in m, of the ship at the waterline
LW : 水线间长，单位m；

T1 : Mean moulded draught in m, of the ship
T1 : 船舶平均型吃水，单位m。

AK : Total overall area in m2 of bilge keels, or area of the lateral projection of the bar keel, or sum of these areas, or area of the lateral projection of any hull appendages generating added mass during ship roll
AK : 船底舭龙骨总面积，或者减摇龙龙骨侧向投影面积，或者两者兼有面积相加，或者横摇时产生附加质量的船体附体侧向投影面积，单位m2

GM : Metacentric height in m, corrected for free surface effect.
GM：自由液面修正后的初稳性高，单位m。

4 Effects of free surfaces of liquids intanks

4 舱室液体自由液面影响

4.1 General

4.1 概述

4.1.1 For all loading conditions, the initial metacentric height and the righting lever curve are to be corrected forthe effect of free surfaces of liquids in tanks.

4.1.1 所有转载工况下，初稳性高及其回复力臂曲线都需经舱室液体自由液面修正。

(A.749(18) 3.3 - SLF 41/18)

4.2 Consideration of free surface effects

4.2 自由液面影响考虑因素

4.2.1 Free surface effects are to be considered whenever the filling level in a tank is less than 98% of full condition. Free surface effects need not be considered where a tank is nominally full, i.e. filling level is 98% or above. Free surface effects for small tanks may be ignored under the condition in [4.9.1].

4.2.1 当舱室液体装载小于 98%满舱状态时需计入自由液面影响。当舱室装载满载，即装载 98%或者以上时不计入自由液面影响。在如[4.9.1]工况下，可以忽略小舱室自由液面影响。

4.2.2 For ships having cargo tanks with a breadth greater than 60% of the ship’s maximum beam, the free surfaceeffects when the tanks are filled at 98% or above may not be neglected.

4.2.2 对于货舱舱室宽度大于 60%船宽时，舱室装载 98%或以上时，自由液面可能不可以忽略不计。

4.3 Categories of tanks

4.3 舱室类型

4.3.1 Tanks which are taken into consideration when determining the free surface correction may be one of two categories:

4.3.1 舱室考虑自由液面修正时，符合以下两种类型之一：

- Tanks with fixed filling level (e.g. liquid cargo, water ballast). The free surface correction is to be defined for theactual filling level to be used in each tank.
- 舱室装载固定（如：液货，压载水）。自由液面按照实际自由液面修正。

- Tanks with variable filling level (e.g. consumable liquids such as fuel oil, diesel oil, and fresh water, and also liquidcargo and water ballast during liquid transfer operations). Except as permitted in [4.5.1] and [4.6.1], the freesurface correction is to be the maximum value attainable among the filling limits envisaged for each tank, consistentwith any operating instructions.
- 舱室装载可变（消耗品，如燃油、柴油、淡水，以及可变液货和压载水）。除[4.5.1]和[4.6.1]规定的，各舱室自由液面修正值取最大值，与操作手册保持一致。

4.4 Consumable liquids

4.4 消耗品液体

4.4.1 In calculating the free surfaces effect in tanks containingconsumable liquids, it is to be assumed that for eachtype of liquid at least one transverse pair or a single centreline tank has a free surface and the tank or combinationof tanks taken into account are to be those where the effect of free surface is the greatest.

4.4.1 在计算消耗品液体自由液面时，对每一种液体应假定至少有一对横向液舱或一个中心线上液舱具有最大自由液面，而需考虑的一个液舱或者舱组应为自由液面影响最大者。

4.5 Water ballast tanks

4.5 压载舱

4.5.1 Where water ballast tanks, including anti-rolling tanks and anti-heeling tanks, are to be filled or discharged during the course of a voyage, the free surfaces effect is to be calculated to take account of the most onerous transitory stage relating to such operations.

4.5.1 当压载舱（包括抗横摇和抗横倾舱室）在航行中装载或泄放压载水时，自由液面按照此过程中最大值修正。

4.6 Liquid transfer operations

4.6 调载液体操作

4.6.1 For ships engaged in liquid transfer operations, the free surface corrections at any stage of the liquid transferoperations may be determined in accordance with the filling level in each tank at the stage of the transfer operation.

4.6.1 对于涉及液体调载操作的舱室，自由液面根据各舱室调载过程中装载液体进行修正。

4.7 GM0 and GZ curve corrections

4.7 GM0 和GZ曲线修正

4.7.1 The corrections to the initial metacentric height and to the righting lever curve are to be addressed separately as indicated in [4.7.2] and [4.7.3].

4.7.1 初稳性高和回复力臂曲线修正在章节[4.7.2]和[4.7.3]分别介绍。

4.7.2 In determining the correction to the initial metacentric height, the transverse moments of inertia of the tanks are to be calculated at 0 degrees angle of heel according to the categories indicated in [4.3.1].

4.7.2 在确定初稳性高的修正时，其横向惯性力矩安装横倾为 0 计算，参照[4.3.1]舱室类型。

4.7.3 The righting lever curve may be corrected by any of the following methods:

4.7.3 回复力臂曲线可以通过以下任意方法进行修正：

- Correction based on the actual moment of fluid transfer for each angle of heel calculated; corrections may becalculated according to the categories indicated in [4.3.1]
- 在各个横倾角下根据自由液面实际移动进行修正；修正值计算参考[4.3.1]自由液面类型。

- Correction based on the moment of inertia, calculated at 0 degrees angle of heel, modified at each angle ofheel calculated; corrections may be calculated according to the categories indicated in [4.3.1]
- 根据惯性矩对各个横倾角下的值修正，修正值取横倾为 0 度时的值；修正值计算参考[4.3.1]自由液面类型。

- Correction based on the summation of Mfs values for all tanks taken into consideration, as specified in [4.8.1].
- 根据所有舱室的自由液面惯性矩总和进行修正，如[4.8.1]定义。

4.7.4 Whichever method is selected for correcting the righting lever curve, only that method is to be presented in the ship's trim and stability booklet. However, where an alternative method is described for use in manually calculated loading conditions, an explanation of the differences which may be found in the results, as well as an example correction for each alternative, are to be included.

4.7.4 无论选择何种方法修正回复力臂曲线，船舶稳性报告中只出现修正方法。但如果选择手动计算装载工况修正值时，报告中将显示相关解释，以及每个方案的修正样例。

4.10 Remainder of liquid

4.10 剩余液体

4.10.1 The usual remainder of liquids in the empty tanks need not be taken into account in calculating the corrections, providing the total of such residual liquids does not constitute a significant free surface effect. (A.749(18) ch 5)

4.10.1 通常空舱中的剩余液体不计入自由液面修正，这些残余液体对自由液面没有影响。

Longitudinal Strength 总纵强度

Prerequisite to any Longitudinal Strength calculation is establishing a longitudinal weight distribution for light ship and any other fixed weights aboard that extend over a significant length. Weights from tank loads are distributed automatically. Both the WEIGHT and the ADD commands will take multiple weight density curves in lieu of point weights.

在计算总纵强度之前，需确定空船重量沿船长的分布以及固定装载长度方向的分布。舱室装载的重量可以自动进行分布。WEIGHT 和 ADD 命令都可以定义多种重量分布密度曲线代替点重量分布。

Getting a light-ship distributed weight curve to exactly match the known total light ship weight and LCG is made easier by a feature where GHS scales its magnitudes and shifts its locations to match the known values. For example,

通过 GHS 将重量分段分布和移动重量位置来匹配已知重量，得出的空船重量分布完全匹配总空船重量和 LCG 将变得更加容易。例如：

```
WEIGHT  6.0 @97.57f,
       14.0 @85.05f,
       19.6 @85.04f,
       22.8 @ 5.03f,
       20.0 @ 5.03f,
       21.2 @ 2.90a;
        5.5 @ 12.0f,
        3.3 @ 0.0
WEIGHT 2981.257, 48.419f, 0.000, 6.503
```

The first WEIGHT command establishes the light ship weight distribution, giving weights in tons/meter at several locations. Note that there are actually two curves; the second being separated from the first by a semicolon. The program automatically combines the two curves.

第一个 WEIGHT 命令建立了空船重量分布，在不同位置加载重量密度，单位吨/米。要注意的是这里实际上有两条曲线；第二点与第一点分离，但程序会自动连接这两条曲线。

Each curve is a series of weight density numbers @ their corresponding locations. Note that the curve goes from point-to-point. It is not a series of weight blocks. It is a series of weight density points. If you need to input an existing weight curve that is in the form of blocks, you will have to use two points for each block where the density values are the block weights divided by the block lengths.

每一条曲线都是重量密度数值@相应位置。注意到有些曲线是从点到点，这个就不是一系列重量块，而是重量密度点。假如想输入一组已知的重量块重量曲线，那么每个重量块需要两个点定义，重量密度为重量除以重量分布长度。

The locations in the example above are shown going from forward to aft. It is not necessary that the points be given in that order, since the program sorts them into order of ascending locations (fwd to aft). Discontinuities are best represented by two weight densities at nearly the same location. If two points on the same curve are at the same location, it is important that the one belonging to the forward segment come before the one belonging to the aft segment. A good practice is to always give the point locations in ascending order.

在上面的例子中，分布长度从船首到船尾。实际上不必按上面例子顺序排列点，因为程序运行时是按照其位置排列顺序（从首到尾）。不连续的两个点最好用两个几乎在相同位置的重量密度表示。如果两个点在同一条曲线同一个位置时，靠首部点需定义在靠尾部点之前。所以，最好的方式就是始终按顺序排列点。

The second WEIGHT command also sets the light ship weight and CG, but it does not discard the distribution that has already been defined; rather it scales and shifts it as necessary so that it has the required total weight and LCG. The same thing can be done with SOLVE WEIGHT. For example, if you have drafts in a known load condition, you can set up that condition, enter the light-ship weight curve, then give the command

"SOLVE WEIGHT, LCG" and it will scale and shift the existing light ship distribution as necessary.

第二个 WEIGHT(重量)命令也设置了空船重量和重心，但没有删除已定义的重量分布，而是根据需要调整达到总的重量和 LCG。同样的，SOLVE WEIGHT（求解重量）命令也可以匹配重量和 LCG。例：已知装载工况吃水，设置装载工况，输入空船重量曲线，执行命令“SOLVE WEIGHT, LCG”，程序会根据需要通过和调整和移动已存在的空船重量分布。

The example above is very simple with only two curves. In real life distributed weight curves are usually much more detailed, often involving several curves and many more points.

上述只是关于两条曲线非常简单的例子。在实际情况中，重量分布曲线一般会非常详细，常常除了包含曲线的同时还有非常多的点。

If you need to go beyond bending moments and get stress and/or deflection, you will need to provide section modulus and/or section moments of inertia as well. For this you would use the SMOD command. Single values or curves can be specified. Section moments of inertia can be given as well, either in place of section modulus (SMOD=I/) or in a ratio (SMOD=I/c) where section modulus is given as the moment of inertia divided by the distance from neutral axis. Section moduli for both keel and deck stress can be given. See HELP SMOD for details. If deflection is being calculated, and there is no wave present, the resulting waterplane with deflection remains after the LS calculation is complete. However any change you make in the waterplane after that will remove the deflection.

如需得出总纵弯矩、剪力以及中垂/中拱，需提供剖面模数或者剖面转动惯量。SMOD 命令可以用于此功能，可以定义单个剖面模数也可以是曲线。还可以定义剖面转动惯量，用于替代剖面模数(SMOD=I/)或者剖面模数比值(SMOD=I/c)，其中剖面模数等于转动惯量除以轴向距离。可以给定船底板和甲板的剖面模数，详情参考 HELP SMOD（帮助菜单）。当计入中垂/中拱时，且无波浪状态，LS（总纵强度）计算完成后，得出的水线面数据包括中垂/中拱。但之后如过改变任何水线面参数，将自动删除中垂/中拱。

You can provide shear and bending moment limits by means of the LSLIM command. The limits themselves and also how the results compare to the limits will be shown in the reports.

可通过 LSLIM 命令定义许用弯矩和剪力，在报告中显示许用值及实际值与许用值比较的结果。

If a wave profile is to be included in the LS calculation, issue the WAVE command also. Remember that a Condition Graphic at this point (after a SOLVE) will help to verify that the wave has been set up as expected.

如在 LS（总纵强度）计算中定义波形，用 WAVE 命令。请记住，Condition Graphic（工况图像）在求解之后可帮助校核波浪是否已经如预期的起作用。

After providing this information, simply issue the LS command to get a table of the LS results including shear, bending moment and optionally deflection. There are some options about what is to be included in the table. One of the options is to show the results only at specified frame locations. A special Frame File provides frame names

and locations. See the HELP LS for more information about the options and about preparing the Frame File.

在提供此信息后，只需执行 LS（总纵强度）命令得出 LS（总纵强度）表格，包括剪力、弯矩和可选项中垂/中拱。表中可以包含一些备选项，其中有个选项是结果按照肋位显示，定义肋位需特殊 Frame File（肋位文件），提供肋位名称和位置。详细介绍参看 HELP LS（LS 帮助菜单）。

An LS Exercise 总纵强度练习

Make a Run File to produce a longitudinal strength curve using TANKER.GF and the weight curves shown above, tank loads and a wave. Include the SMOD command and get deflection. If you want to use the Load Editor to set up your tank loads, you can do it in two phases with two Run Files arranged as shown below. The first run sets up the load condition, saves it to the file LS1.DAT. The second run picks up LS1.DAT, establishes wave and generates the report.

创建一个 Run File（运行文件），用 TANKER.GF 模型和重量曲线、舱室装载及波浪生成总纵强度曲线。加入 SMOD 命令，生成中垂/中拱。当用 Load Editor（装载编辑器）设置舱室装载时，可分为两步，如下两个 Run File（运行文件）。第一个运行文件设置装载工况，并保存到文件 LS1.DAT 中。第二个文件读取 LS1.DAT 文件，建立波浪并生成报告。

```
PROJECT LS1
READ TANKER.GF
WEIGHT ...
SMOD 4000/
LOAD (*) EDIT
SAVELS1.DAT
END

PROJECT LS2
RUN LS1.DAT /CALL
REPORT
\\\LS with Waves\
WAVE 0, 100
SOLVE
DISPLAY (*) STATUS PROFILE:OUTBOARD, PROFILE
LS
REPORT /PREVIEW
REPORT OFF
END
```

Waves 波浪

GHS allows you to specify a wave profile that gets superimposed on the waterplane. This is used primarily for longitudinal strength calculations, but the wave profile will be recognized in all other calculations as long as it is there. The WAVE command is used to establish the wave. The three primary wave parameters are Phase, Length and Amplitude. By default, the Length is the same as the LBP and the Amplitude is 1/20 of the length. But the Phase must always be specified. If you think of a periodic wave being based on angles running from 0 to 360 degrees, Phase is the angle of the crest relative to the origin. Suppose the origin is at the mid section and the wave length is LBP. Then when the peak of the wave is midship the Phase is zero (WAVE=0), and when peaks are at the end perpendiculars the phase is 180 degrees (WAVE=180). If the LBP is not defined, or you want some other wave length, a second parameter must be included giving the Length to be used. Pull down the Help menu and look at the WAVE command document to see all of its available parameters.

GHS 可以定义一个波浪叠加在水线面上。波浪主要用于总纵强度计算，只要波存在，那么计算时就会考虑波浪的影响。用 WAVE 命令定义波浪。波浪三要素：相位、波长和振幅。在默认情况下，波长与 LBP 长度相当，振幅为 1/20 波长，但相位需要自行定义。假定一个 0 到 360°角度的周期波，相位为波峰至原点的角度。假设原点在船中，波长为 LBP。然后把波峰定义在船中，相位为 0（WAVE=0）（当波峰在尾垂线时，相位为 180°（WAVE=180））。若未定义 LBP，且定义其他长度为波长，在定义波长时需要第二参数。下拉 Help（帮助）菜单，找到 WAVE 命令，查看 WAVE 命令所有参数。

To turn off a wave and revert to the flat waterplane, the command is WAVE OFF.

要关闭波浪，还原到水平面状态，命令是 WAVE OFF。

Floodable Lengths 可浸长度

After setting up a condition, the FL command will produce a series of floodabe-length curves at various values of assumed permeabilities.A list of tentative bulkhead locations can be given on the same command line by means of the /BHD parameter. Here is an example, where the /NC parameter specifies how many adjacent compartments are to be included when the "tepees" are drawn.

设定工况后，用 FL 命令可在各种假定渗透率下生成一系列可浸长度曲线。还可以用此命令增加/BHD 参数模拟舱壁位置。如下例，其中/NC 参数定义相邻组件的数量。

```
PROJECT FL1
READ TANKER.GF
REPORT
DRAFT 5
VCG 6
SOLVE WEIGHT, LCG
FL 0.7,0.8, 0.9 /BHD:85f,70f,60f,40f,25f,10f,0 /NC:2
REPORT /PREVIEW
REPORT OFF
END
```

Report Options 报告选项

The following Run File illustrates some of the options available for reports.
下面的 Run File（运行文件）介绍用于生成报告的可选项。

```
project reports
read fv.gf
draft 5 | vcg 7 | solve weight, lcg
add "crew&effects" 0.5, -25,0,25
add "stores" 1, -14,0,15
add "net on deck" 2 20 0 13
load (wt*,fo*,lu*,fw*) 0.95
print configure /nofoot
`print        configure/font:courier        /foot:footfoot.txt
/logo:minilogo.bmp
`report /nofoot
`report /nographs
`report /box:classic
`report /box:bw
report /box:color
report `/p:0
`report /p:45
solve
status
page
ra
report /preview /thick:4 /count
report off
```

As you know by now, REPORT filename opens an output file for the reports using the specified file name. If no name is given, the project name is used with the .PF extension. The REPORT command also has other modes and options in which it can:

正如现在所知道的，REPORT（报告）文件可打开指定名称的输出文件名。如果没有名称，那么会自动命名为项目名称加.PF 后缀名。REPORT 命令也有其他模式和可选项：

- append to an existing file,
- 附加到现有文件；

- preview an opened file,
- 预览打开的文件；

- close the report file with or without printing it.
- 关闭报告时选择打印或不打印文件。

Parameters that you can use when opening a report allow you to control:
可以在打开报告时用参数选择：

- whether graphs are to be included,
- 是否包括图表，

- page numbering,
- 页码，

- lines per page (useful for paper other than 11” long),
- 每页的行（常规纸张，非 11 英寸长纸张），

- whether to use footers.
- 是否使用页脚。

Three levels of visual enhancements are also available:
三种优化的报告形式选项：

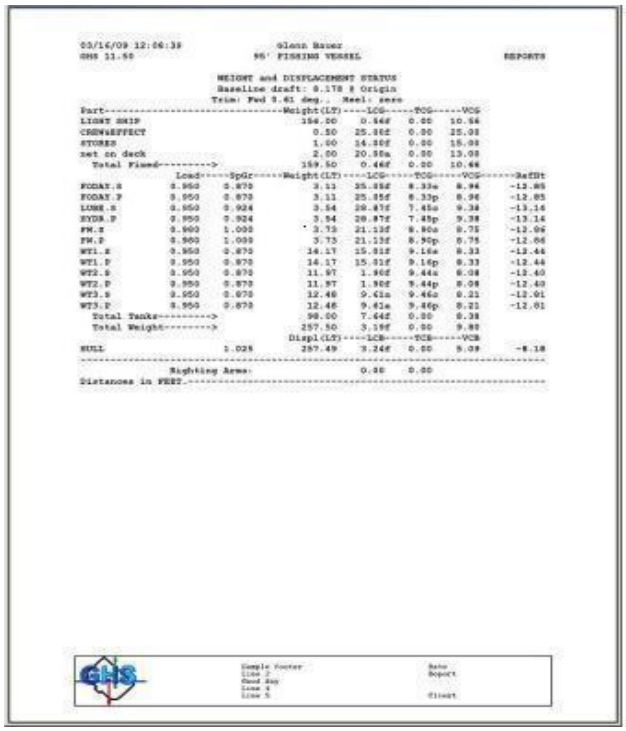
/BOX – boxes are drawn around tables,
/BOX- 用图框装裱报告；

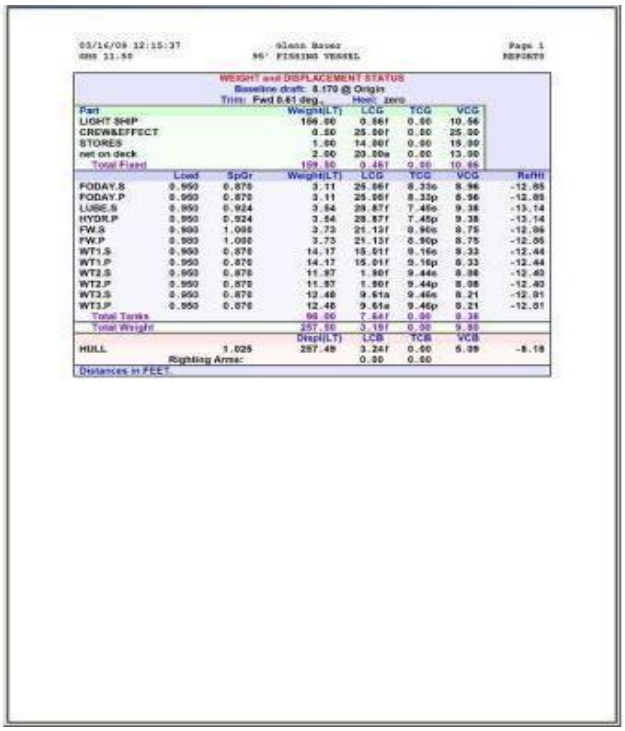
/BOX: BW – enhanced "fancy" boxes and fonts,
/BOX: BW-优化字体和图框；

/BOX: COLOR – adds background colors in tables.
/BOX: COLOR-表格增添背景色。

Some of the features you might want to include in your reports must be specified in the printer setup, which can be done either through the Report pull-down menu or through the PRINT command. You can select a font, footer, logo, thickness of graphs, shading, left margin and more.
报告中如果想要添加某些功能，需要在打印选项中设置。打印可通过 Report（报告）下拉菜单或者 PRINT（打印）命令设置，可以设置字体、页脚、标识、图形尺寸、阴影、剩余裕度等。

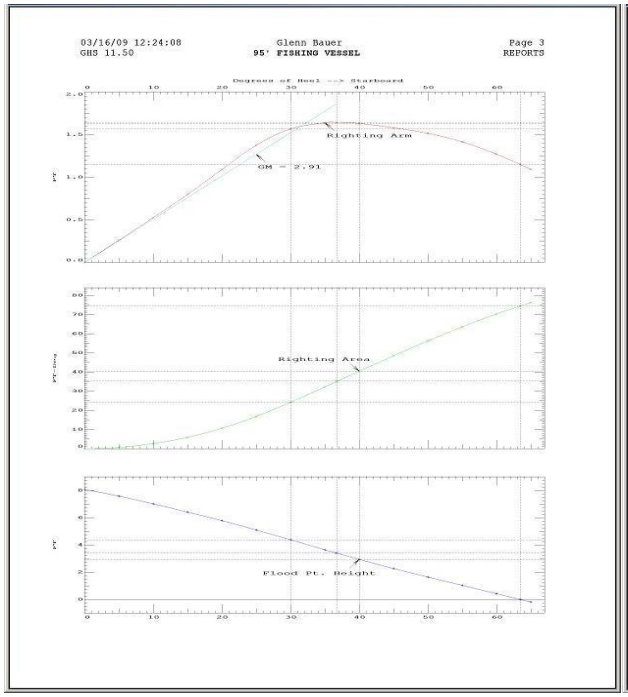
You can email report files by means of PRINT /EMAIL. The recipient will need to have GHS or the free GHS Public Print Utility available from the Downloads link at
可以通过 PRINT /EMAIL 的方式发送报告电子邮件。收件人应有 GHS 程序或有从 GHS 官网 www.ghsport.com/support 下载免费的 GHS Public Print Utility（GHS 公共打印）程序。

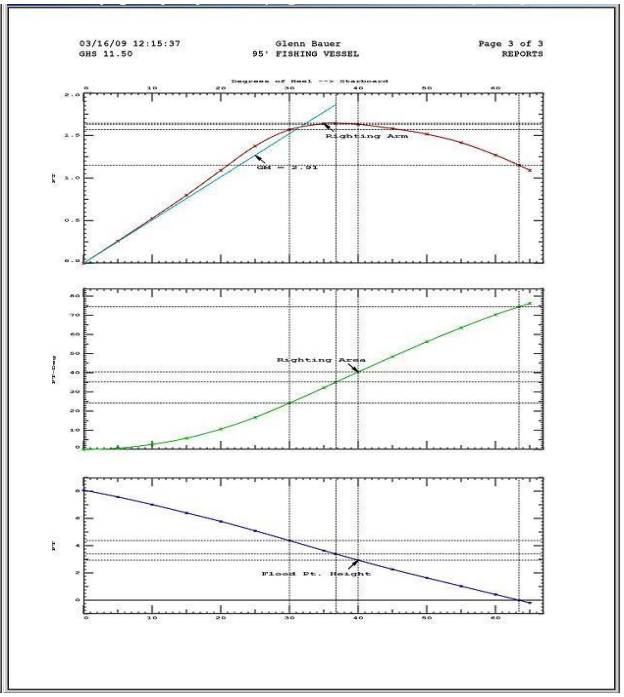




Output without page numbers and footer with logo. With page numbers and boxed in color.

报告输出无页码和页脚，但有 logo；报告输出有页码和彩色图框。





Special Message Commands 特殊信息命令

Certain special messages are recognized by the program and cause it to display information about your computer, operating system and program settings:
程序可以辨识电脑某些特殊信息，显示电脑、操作系统和程序设置等信息。

```
ME PATH `paths to certain folders used by GHS
```
ME PATH ` GHS 使用文件路径；

```
ME EXPIRE `expiration time of limited or roaming licenses
```
ME EXPIRE `许可文件有效期；

Other special Message commands provide for changing certain program settings:
其他改变某些程序设置的特殊信息命令如下：

```
ME DATEFORMAT Year-Month-Day `sets date formatting
```
ME DATEFORMAT Year-Month-Day `设置日期格式；

```
ME ERRBEEP ON/OFF `turns beep on errors on or off
```
ME ERRBEEP ON/OFF `打开或关闭报错提示音；

```
ME REPFONT `enhances NOTE font in fancy reports
```
ME REPFONT ` NOTE（注释）字体加粗；

```
ME REPFONT OFF `turns off enhanced NOTE font
```
ME REPFONT OFF `关闭 NOTE（注释）字体加粗；

See Help MESSAGE for all of the special messages.
参考 Help MESSAGE(帮助菜单)了解更多特殊信息。

You can switch Message output that would normally go to the screen to go to a text file instead:
可转换输出信息，通常将屏幕信息转换到文本文件，命令如下：

```
ME (REPORT) filespec
```

opens the file to receive the message output. Of course you would not use this if filespec is already open. The /APPEND parameter is available for adding to an existing file.
打开文件接收信息输出。当然可以不采用已打开的文件。用参数/APPEND 添加文件到当前文件夹中。

```
ME (REPORT) OFF
```

closes the file.

关闭文件

User-generated reports and plots are also controlled through Message commands. This is covered in one of the Advanced Training sessions.

用户生成报告和图表也可由 Message（信息）命令控制。在 Advanced Training（高级培训）章节中有具体描述。

Tank Characteristics 舱室特征

The TC command produces tank tables and plots suitable for design work or inclusion in a T&S book. There are several options for what is to be included in the tables. The default option gives tables like this:

TC 命令在适用于设计工作或者 T&S 报告中生成舱容表和图形。其中包括几种选项，供选择表格输出项。默认表格如下：

TANK CHARACTERISTICS
No Trim, No Heel
Tank: HOLD1.C, Contents: SALT WATER at 1.025 Specific Gravity
FORWARD HOLD

		Weight	Center of Gravity					FSM
Ref Ht	Load	LONG TONS	LCG	TCG	VCG	GML	GMT	Ft-LT
-4.73	.100	8.57	9.57f	0.00	4.29	65.0	16.8	144.1
-5.60	.200	17.13	9.57f	0.00	4.73	32.5	8.4	144.1
-6.48	.300	25.70	9.57f	0.00	5.16	21.7	5.6	144.1
-7.35	.400	34.26	9.57f	0.00	5.60	16.2	4.2	144.1
-8.23	.500	42.83	9.57f	0.00	6.04	13.0	3.4	144.1
-9.11	.600	51.40	9.57f	0.00	6.48	10.8	2.8	144.1
-9.98	.700	59.96	9.57f	0.00	6.92	9.3	2.4	144.1
-10.86	.800	68.53	9.57f	0.00	7.35	8.1	2.1	144.1
-11.73	.900	77.09	9.57f	0.00	7.79	7.2	1.9	144.1
	1.000	85.66	9.65f	0.00	8.23			

-Distances in FEET.-
HOLD1.C Reference Point: Long.= 0.00 Trans.= 0.00 Vert.= 0.00

Output includes Reference Point height, load fraction, contents, weight, CG and free surface information. Other display options are possible, such as tank volumes and sounding/ullages. See Help TC for the full range of options.

输出值包括 Reference Point（参考点）高度、装载百分比、舱室液体、重量、CG（重心）和自由液面信息。其他可以显示的选项有，如舱容和测深/测高表。详情参考 Help TC（帮助菜单）。

Tank Characteristics Exercise 舱室特性练习

Starting with the Run File listed below, add statements to produce additional tank characteristics reports for:

运行如下 Run File（运行文件），添加其他命令语句生成舱室其他特性报告：

DB0.S and DB1.S giving volume in gallons and no surface information;

DB0.S 和 DB1.S 舱室定义输出舱容，单位为加仑，且无自由液面信息;

WT1.S and WT2.S using tank soundings and no load fractions.

WT1.S 和 WT2.S 舱室输出舱室测深，但没有装载百分比。

```
PROJECT TC1
READ FV.GF
REPORT
TC (HOLD1.C) .1 .2 ... 1 /NOREF /VOLUME:GA
TC (WT2.S) SO:0 .25 ... 12 /NOREF
REPORT /PREVIEW
REPORT OFF
```

Tank Sounding Tables 舱室测深表

The TS command produces several formats of detailed tank soundings tables that are designed for everyday shipboard use. Included are the following.
用 TS 命令生成船上每天都会用到的舱室测深表，表格形式如下：

1 - Volume vs Sounding arranged four columns per row (default);
1 - 体积与测深，每行（默认）分四列;

2 - Volume vs Sounding & Ullage in Ft & Inches or M. & Decimeters;
2 –体积与测深&测高值，单位英尺&英寸，或米&分米;

3 - Volume, Cu.Ft/M., Center & Moments vs Sounding;
3 - 体积，立方英尺/米，重心&自由液面惯性矩与测深;

4 - Volume, Cu.Ft/M., Center, Trim Corr. & Transverse Moment vs Sounding;
4 - 体积，立方英尺/米，重心，纵倾修正值&自由液面惯性矩与测深;

5 - Cu.Ft/M., Volume & Weight vs Sounding & Ullage;
5 - 立方英尺/米，体积&重量与测深＆测高;

6 - Volume, Cu.Ft/M., Weight, Center & FSM vs Sounding.
6 - 体积，立方英尺/米，重量，重心&自由液面惯性矩与测深。

A report file must be open, since these reports have no screen-only counterparts.
必须要打开报告文件才能查看结果，因为报告在界面没有副本。

Example: 例如：

```
PROJECT TSOUND
READ FV.GF
REPORT
TS (WT1.S) /FORMAT:1
REPORT /PREVIEW
REPORT OFF
```

Flooding Tanks 舱室浸水

Tanks can be intact or flooded. When flooded they become negative displacers since they are considered to be open to the sea. In other words they see the same waterplane that the hull sees, but instead of making a positive contribution to displacement they subtract from it.
舱室可以是完整的或者浸水状态。当浸水时，舱室被认为是与海相联通，舱室不提供浮力。换句话说，舱室水面和海面平齐时，舱室不贡献排水量，而是扣除排水量。

The command to switch a tank from Intact type to Flooded type is the TYPE command.Initially all tanks are intact. To make a particular tank flooded, the command is,
将舱室从完整状态切换为浸水状态用 TYPE 命令，最初所有的舱室都是完整的。定义一个舱室浸水，命令如下：

```
TYPE (tankname) = FLOOD
```

then to restore it to the intact type,
然后还原舱室为完整状态。

```
TYPE (tankname) = INTACT
```

In both cases tankname can be a list of tanks separated by spaces or commas, and each member of the list can end with an asterisk to match all tanks whose names have a common beginning.This is especially useful when you want to make sure all tanks get restored to intact:
在这两种情况下 tankname 可以是用空格或逗号分隔的舱室列表，其中列表每个舱室名都可以已星号结尾，用于命名相同前缀名的舱室。在确保所有舱室还原为完整状态时，这个命令非常实用，如下：

```
TYPE (*) = INTACT
```

Damage Stability 破舱稳性

All of the commands and methods used for intact stability apply to damage stability as well. The only difference is that one or more tanks/compartments will have TYPE = FLOODED. This is the only tank type that is used in regular damage stability work. TYPE = DAMAGED is reserved for special simulations since it requires a specific point of damage.
所有用于完整稳性的命令和方法也同样适用于破舱稳性。唯一的区别就是其中有一个或者几个舱室/部件 TYPE=FLOODED(破损进水)。在常规破舱稳性中，这是唯一必须要有的舱室类型。TYPE=DAMAGED(破损)用于特殊模拟指定的舱室破损。

A Damage Stability Exercise 破舱稳性练习

For the loading used in the intact stability exercise, determine if the fishing vessel meets the following criterion:
用在完整稳性练习中的装载工况，确定渔船是否满足以下工况。

- Angle at equilibrium less than 7 degrees
- 平衡角小于 7 度；

- No deck immersion (Can the margin line be immersed? DI vs DI0)
- 无甲板浸没（甲板边线可浸没?DI 与 DI0）

- Righting energy to the lesser of 30 degree or flood is greater than 10 ft-deg.
- 平衡至横倾角 30 度，或者进水角(取小者)之间回复力臂面积大于等于 10 英尺-度。

Check these two damage cases:
检查这两个破损工况：

- Engine room, starboard LUBE and starboard FODAY tanks flooded.
- 机舱，滑油舱右和日用燃油舱右进水。

- Starboard WT2 and DB1 tanks flooded.
- WT2S 和 DB1 舱室进水。

Tonnage Calculations 吨位计算

A report that is useful for International Tonnage is available through the COMPONENT command:
通过 COMPONENT 命令计算吨位计算书。

```
COMPONENT /TONNAGE
```

Skin Areas 表面积

Skin Area of any component is now available (beginning with GHS version 12.28) through COMPONENT /SKIN. This calculation was previously available in the optional SA module, and is now included in the main program. Skin areas are useful for estimating hull materials, plating weight and CG, and areas for painting.
自 GHS 12.28 版本后，可通过 COMPONENT /SKIN 命令计算每个部件的表面积。在这之前这个计算是在 SA 模块选项中的，现在可以在主程序中运行。表面积可用于估算船体材料、涂料重量及重心和涂装面积。

Important Wizards 重要向导

Some areas of GHS application are best done with wizards because the sophistication of the Run Files required is beyond what most users would have the time or desire to develop.
在某些方面最好使用 GHS 应用程序向导，因为这些 Run Files(运行文件)的复杂性往往要求大多数用户花费相当大时间和精力。

There are two classes of wizards. Major wizards are complete application programs for specific purposes. Other wizards can be integrated with your Run Files. Typically they involve library files having the same name as the wizard with the .LIB extension, that

are used by the wizard and are also usable directly in your Run File. To get information about using such a library file directly, execute the LIBINFO macro. For example,

GHS 有两种类型的向导。大部分向导用于完成程序的特殊功能，还有一些向导与 Run Files（运行文件）相结合运用。通常向导与数据库相关，有相同的后缀名.LIB，向导可以读取这些文件，而且 Run Files（运行文件）也可以直接读取相应文件。为熟悉类似数据库文件，执行宏 LIBINFO，例如：

```
RUN FLDINTER.LIB
.FI.LIBINFO
```

RIG Wizard 平台计算的向导

This is a major wizard essential for MODUs and any other vessels where least stability is not necessarily in the transverse direction or where trim becomes large when heeling transversely. The RIG wizard finds the weakest or critical axis and produces composite maximum VCG curves including intact and damage. It can import wind heeling moment files to take advantage of wind-tunnel tests, or it will derive wind heeling moments from the geometry in any direction and as a function of heel. This is a flexible and powerful wizard with years of real-world experience. It produces complete reports and is easy to use. Condition Graphics is highly recommended but not essential.

这是主要用于评估 MODU 的向导，还可以用于其他最苛刻稳性轴不在横向方向或者发生横倾时发生剧烈纵倾的船舶。RIG 向导用于寻找最危险轴或关键轴向，生成包含完整稳性及破舱稳性的最大 VCG 综合性曲线。向导可以导入风洞试验数据，或者根据模型所在轴向和横倾计算风倾力矩。向导使用灵活，功能强大，根据多年事实经验总结完成的。可生成完整的稳性报告，且易于操作。使用向导时，强烈建议使用 Condition Graphics（图形文件）功能。

DAMSTAB2 Wizard 概率破舱向导

The new probabilistic damage regulations are so complex that this major wizard is virtually essential. It greatly simplifies the task of defining subdivisions and takes over every aspect of setting up and producing damage stability. It applies to cargo and passenger ships. It required the Advanced Features module. Condition Graphics and Load Editor are highly recommended.

最新概率破舱法则非常复杂，所以概率破舱向导显得非常有必要。向导大大简化了分舱，及分舱的设置和破舱稳性计算。向导适用于散货船和客船，且要求 GHS 配置 Advanced Features（高级）模块。强烈推荐用户在向导中配置 Condition Graphics（图形）和 Load Editor（装载编辑器）模块。

GLM_MAKER 装载仪设置器

All GLM configurations are done by means of this wizard. It offers every option that has ever appeared in any GLM, and makes configuring and testing GHS Load Monitor systems easy. Condition Graphics and Load Editor with windows (LEw) are required. If longitudinal strength is involved, the LS module is also required. If a GLM utilizes Multi-Body operations the MB module is required. If it involves complex cranes, the Crane module is required.

所有 GLM（装载仪）构架都是由此向导完成。此向导提供了 GLM（装载仪）中所有的选项，便于 GHS Load Monitor（GLM 缩写）系统的构建和调试。向导需配置 Condition Graphics（图形）和 Load Editor（装载编辑器）及 LEw（窗口）模块。如需校核总纵强度，那么需配置 LS（总纵强度）模块。如 GLM（装载仪）涉及 Multi-Body（多体）操作，需配置 MB（多体）模块。如涉及大型起重机，则需配置 Crane（起重机）模块。

CRANE Wizard 起重机向导

Complex crane modeling, including capacity tables and extensive graphics are managed with this wizard. Load Editor with windows and the Crane module are required.

向导能处理大型起重机的建模功能，其中包括起重负荷表和起重机图形。需配置带有窗口的 Load Editor（装载编辑器）和 Crane（起重机）模块。

FLDINTER Library and WizardFLDINTER（内部破损）数据库和向导

This library provides the essential macro for intermediate stages of flooding including blending densities of cargo and sea water. Unlike the major wizards above, it is designed to be embedded in the User's Run file. No optional modules are required.

这个数据库提供了计算中间进水阶段的宏命令，其中包括货物和海水混合的阶段。和上述主要向导不同，此向导设计用于嵌入 User's Run file（用户运行文件）中。向导无需配置其他模块。

C170170 and C171050 Libraries and Wizards　USCG 稳性衡准数据库和向导

These libraries address GM criteria that are not well suited to the usual criteria represented by Limit commands. They provide for the evaluation of load conditions and will also produce maximum VCG curves. They can be utilized through their wizards or by using libraries directly. No optional modules are required.

这个数据库用于表示 GM 稳性衡准，无法用 Limit（限定条件）命令设置这条衡准。用此向导评估装载工况稳性和生成最大 VCG 曲线。还可以通过其他向导或者数据库直接使用。此向导无需配置其他模块。

WOD – Water on Deck Wizard and Library　WOD(甲板积水)向导和库

New regulations for assessing the effect of water on decks of RO-RO and ferry vessels are addressed in the WOD library and wizard. No optional modules are required.

新的规范要求考虑 RO-RO（滚装）和渡轮甲板积水的影响，WOD 数据库和向导提供此计算。此向导无需配置其他模块。

Topics for Advanced Training 拓展练习

Tank Groups and transfers within a groupAdvanced Tank Types: Damage, Spilling, Bubble, WDF, Flooded Plus, DeckWater on deck criteriaWater on deck wizard and WOD library

Tank Groups（舱组）和调载的 Advanced Tank（高级舱室）舱组类型：Damage, Spilling, Bubble, WDF, Flooded Plus, DeckWater 向导及数据库。(所有舱室类型参考 HELP 菜单 TYPE)

LEw
Weight categories 重量种类
GLM_MAKER 装载仪构架

Axis: heeling in all directions 轴向: 所有方向轴横倾
Rig stability 平台稳性
Rig wizard 平台向导

Progressive flooding 累积进水
Intermediate stages of flooding 中间浸水阶段
FLDINTER wizard libraryFLDINTER（内部浸水）向导数据库
Probabilistic damage 概率破舱
DAMSTAB2 wizard 概率破舱向导

Oil outflow 溢油

Grain shift 谷物移动
Maximum heeling moments 最大横倾力矩
MaxHMMT wizard and libraryMaxHMMT（最大横倾力矩）向导和数据库

Crane operations 起重机操作
Crane wizard 起重机向导
Crane criteria 起重机衡准

Ground reactions 搁浅反作用
Launching 下水
Dry docking 干船坞

Multi-Body 多体
Salvage procedures 打捞作业

Submarine stability 半潜下潜稳性

Advanced command language 高级命令语言
Templates 模板
Making wizards 设置向导
User tables 用户表格
User graphs 用户图形

Hopper spilling with mud lag 挖泥船加料斗

EXERCISE RUN FILES　运行文件练习

Importing the Barge Hull from a DXF
从 DXF 文件中导入驳船船体

```
PROJ MKBARGE
IMPORT BARGE.DXFBARGE.GF /NEWGF /3D:XYZ /SCALE:-1,1,1
DISPLAY
```

Making the Barge Appendages and Tanks
生成驳船 Appendages（附体）和 Tanks（舱室分舱）

```
PROJECT MKTANK
READ BARGE.GF
ENTER PM
ECHO ON
UNITS F
TITLE 40X16X6 BARGE
COMM HULL CREATED BY MODEL CONVERTER FROM BARGE.DXF
COMM TANKS ADDED PER TANK DWG

CREATE HULL\TUNNEL.C
 DEDUCT
 CYL(12) 8, 0, 2.5   8, 8, 2.5,  2.0
 FIT HULL
/
CREATE HULL\SKEG.C
 ENDS 34, 39
 TOP 4
 BOT 0
 IN 4
 OUT 5
 FIT HULL
/

`CREATE REMAINING TANKS PER SKETCH

CREATE TANK.S\C1.S
 ENDS 13, 16
 IN 1
 OUT 3
 TOP 4
 FIT HULL
COMP
 LOCUS @ 16 = 1,-1,  7,-1, 7,2,  5,2,  5,4, 1,4
 LOCUS @ 19 = 1,-1,  7,-1, 7,2,  5,2,  5,4, 1,4
 FIT HULL
 JOIN C1.S
/
```

```
CREATE TANK.P\C1.P
 ENDS 13, 19
 IN 1
 OUT 7
 TOP 4
 FIT HULL
DEDUCT C2.P
 ENDS 13, 16
 IN 3
 OUT 7
 TOP 4
 BOT 0
 SPACING 1
DEDUCT C3.P
 ENDS 16, 19
 IN 5
 OUT 7
 TOP 4
 BOT 2
 SPACING 1
/

CREATE VOID1.S
 ENDS 0, 10
 FIT HULL
/
CREATE VOID1.P
 OPP VOID1.S
/
CREATE VOID2.S
 ENDS 10, 21
 FIT HULL
DEDUCT
 SHAPE TANK.S\C1.S
/
CREATE VOID2.P
 ENDS 10, 21
 FIT HULL
DEDUCT
 SHAPE TANK.P\C1.P
COMP
 SHAPE TANK.P\C2.P
COMP
 SHAPE TANK.P\C3.P
/
CREATE VOID3.S
 ENDS 21, 26
 FIT HULL
```

```
COMP
 ENDS 26, 32
 INB 2
 FIT HULL
 JOIN VOID3.S
/
CREATE VOID3.P
 ENDS 21, 26
 FIT HULL
COMP
 ENDS 26, 32
 INB 4
 FIT HULL
 JOIN VOID3.P
/
CREATE VOID4.S
 ENDS 32, 40
 FIT HULL
/
CREATE VOID4.P
 OPP VOID4.S
/
CREATE WELL.P
 ENDS 26, 32
 INB -2
 OUT 4
 FIT HULL
/

UNITS M
WRITE BARGE.GF1
DISPLAY
TANKS
ECHO OFF
MESSAGE Except for VOID3, P&S volumes should match.
WAIT
QUIT PM
```

Composite Max VCG
MaxVCG 计算

```
PROJ MAXVCG2
READ FV.GF
REPORT

CRTPT (2) "Focsle door" 23f, 8.0, 14.0

UNITS LT
LIMIT(1) AREA FROM 0 TO 30 > 10.3
```

```
LIMIT(2) AREA FROM 0 TO 40 OR FLD > 16.9
LIMIT(3) AREA FROM 30 TO 40 OR FLD > 5.6

MACRO MV
 MAXVCG DISPL: 50  100 ... 250 /LCG: 5.0f 4.0f ... 1.0a %1
/
.MV

LIMIT(1) GM UPRIGHT > 0.49
LIMIT(2) RA AT 30 OR MAX > 0.66
LIMIT(3) ANGLE AT MAX > 25

.MV /COMPOSITE

WRITE (MAXVCG) MAXVCG.DAT

.MV /LOOKUP

REPORT /PREVIEW
REPORT OFF
END
```

Load Condition Setup Library
设置装载工况数据库

```
`File FVSTAB.LF
`FV Stability Load Condition Setup Library
READ FV.GF
UNITS LT
WEIGHT 156.0, 0.56f, 0, 10.56
CRTPT (1) "ER VENTS"            22.8f, 7.0s, 15.0 /SYM
CRTPT (2) "PORT CABIN DOOR"   10.0f, 9.0p, 14.0 /TIGHT
CRTPT (3) "STBD CABIN DOOR"    5.0a, 9.0s, 14.0 /TIGHT

MACRO COND1
 SUBTITLE
 \Departure\
 UNITS LT
 ADD "Crew&effects"  2.0, 25f, 0, 25.0 /NOWARN
 ADD "Stores"      12.0, 14f, 0, 15.0  /NOWARN /MAX:12.0
 ADD "Net on deck"   5.0, 20a, 0, 13.0 /NOWARN
 LOAD (*) 0 /QUIET
 LOAD (WT*,FODAY*,LUBE*,HYDR*) 0.95
 LOAD (FW*) 0.98
 LOAD (HOLD*) 0.0
/
MACRO COND2
```

```
 .COND1
 SUBTITLE
 \Arrival at fishing grounds\
 LOAD "Stores" 0.66
 LOAD (WT1*) 0.05
 LOAD (LUBE*,HYDR*,FW*) 0.66
/
MACRO COND3
 .COND2
 SUBTITLE
 \Departing fishing grounds - good catch\
 LOAD "Stores" 0.33
 LOAD (WT2*) 0.05
 LOAD (LUBE*,HYDR*,FW*) 0.33
 LOAD (HOLD*) 1.0
/
MACRO COND4
 .COND3
 SUBTITLE
 \Depart fishing grounds - no catch\
 LOAD (HOLD*) 0
/
MACRO COND5
 .COND3
 SUBTITLE
 \Arrival - good catch\
 LOAD "Stores" 0.017
 LOAD (WT3*) 0.05
 LOAD (LUBE*,HYDR*,FW*) 0.10
/
MACRO COND6
 .COND5
 SUBTITLE
 \Arrival - no catch\
 LOAD (HOLD*) 0
/
MACRO CONDS `%1 - condition number, %2 - command to execute
 .COND%1
 PAGE
 %2
/
MACRO SHOW
 SOLVE
 STATUS GHS
 DISPLAY (*) STATUS PROFILE, PLAN
/
MACRO DOCRIT
 LIMITS OFF
 HMMT OFF
```

```
 .CRIT%1
 IF "%2"<>"" THEN .ALLCONDS .CALC ELSE PAGE | .CALC
/
MACRO ALLCONDS
 .CONDS (6,1) 1, "%1"
/
MACRO BYCRIT
.ALLCONDS .SHOW
.DOCRIT ({NCRITS},1) 1, ALL
/
MACRO BYCOND
.ALLCONDS ".SHOW | .DOCRIT ({NCRITS},1) 1"
/
END
```

Intact Stability with Three Criteria
设置完整稳性，三个稳性衡准

```
PROJECT INSTAB1
RUN FVSTAB.LF /CALL
REPORT /BOX:BW
\\\\\\\Training Class Exercise\
\\Intact Stability\

VARIABLE NCRITS=3

MACRO CRIT1
 LIMIT TITLE 170.173
 UNITS LT
 LIMIT GM UPRIGHT > 0.49
 LIMIT RA AT ABS 30 OR MAX > 0.66
 LIMIT ABS ANGLE AT MAX > 25
 LIMIT AREA FROM ABS 0 TO ABS 30 > 10.3
 LIMIT AREA FROM ABS 0 TO ABS 40 OR FLD > 16.9
 LIMIT AREA FROM  ABS 30 TO ABS 40 OR FLD > 5.6
 MACRO CALC
  SOLVE
  ANGLES *
  HEEL 0
  RA /LIM:ATT
 //
/
RUN C170170.LIB /CALL
MACRO CRIT2
 UNITS LT
 SET P=0.005
 MACRO CALC
```

```
 .170_170
 //
/
MACRO CRIT3
 WIND 53.5
 ROLL IMO
 LIMIT TITLE IMO SWR
 LIMIT RES RATIO FROM ROLL TO ABS 50 OR FLD > 1
 LIMIT ABS ANGLE AT PRE < 16
 LIMIT ANGLE FROM PRE TO 80%DI0 > 0
 MACRO CALC
  HMMT OFF
  SOLVE
  ANGLES *
  HMMT WIND /CONST /GUST:1.5 /TRIMALLOW
  HMMT *
  SOLVE
  HEEL *-ROLL
  RA /LIM:ATT /GRAPH:CLEAN
 //
/
`.BYCRIT `All conditions for each criterion
.BYCOND `All criteria for each condition

REPORT /PREVIEW
REPORT OFF
END
```

Damage Stability

破舱稳性

```
PROJECT DASTAB1
RUN FVSTAB.LF /CALL
REPORT /BOX:BW
\\\\\\\Training Class Exercise\
\\Damage Stability\

VARIABLE NCRITS=1

MACRO CRIT1
 LIMIT TITLE DAMAGE STABILITY
 UNITS LT
 LIMIT ABS ANGLE AT EQU < 7
 LIMIT ANGLE FROM EQU TO DI > 0
 LIMIT AREA FROM EQU TO ABS 30 OR FLD > 10.0
 MACRO CALC
  SOLVE
  ANGLES *
```

```
  HEEL 0
  RA /LIM:ATT
 //
/

MACRO DODAM
 TYPE (*) INTACT /QUIET
 TYPE (%1) FLOOD
 `.BYCRIT `All conditions for each criterion
 .BYCOND `All criteria for each condition
/

.DODAM "ENGRM.C,LUBE.S,FODAY.S"
.DODAM "WT2.S,DB1.S"

REPORT /PREVIEW
REPORT OFF
END
```