

命令模式

RAh [Φ_1, \dots, Φ_n] [/GIVENangles]

[/LIMIT [: MArgin | ATtained] [:COmbine]] [/AREA [: [unit] [intervals]]

[/STOP[: condition]] [/HOLD] [/NOWARN] [/NOTAB] [/NOPRINT] [/NOTlight]

[/GRAPH: NONE | [ONLY] [FIT] [NOAREA] [NOCRT] [NOGM] [CLEAN[:set]]]

[/SIZE: max [,min]] [/FREEbd] [/FIRSTMAX] [/FSM | /TRUEFSM | /EXTRAFSM]

[/GMRA] [/GM:WPL | SLOPE | LESSER | RA | BLEND | MODU] [/RAMACRO[:name]]

Computes righting arms at one or more heel angles using the current weight, center of gravity, tank loading, damage condition, ground points, wave condition and heeling/trimming moments.

基于当前的重量，重心，舱室装载状况，破损状况，搁坐点，波浪情况以及横倾/纵倾力矩，计算一个或多个倾斜角度下的复原力臂。

参数说明

Φ_1, \dots, Φ_n

List of heel angles in degrees, relative to the present heel angle. Up to 360° range, monotonically increasing or decreasing. If not present, default ANGLES are used.

相对于当前横倾角度下的横倾角度列表至 360° 单向递增或递减。如果不定义，则使用默认的 ANGLES。

/GIVENANGLES

Uses given angle list verbatim instead of extending or interpolating any additional angles.

逐字使用给定的角度列表，而不是扩展或插值任何其他角度。

/LIMIT [: MARGIN | ATTAINED] [: COMBINE]

Evaluates against the current stability criterion; see the LIMIT command for details. Limit evaluations are displayed relative to the LIMIT value if the default MARGIN subparameter is present, or as actual values if ATTAINED is present. If the COMBINE subparameter is used, then the limit pair for the special-case area limit specification (interpreted limit value) is combined into a one-line display rather than being shown separately.

根据当前稳性衡准求值；更多详细信息请参考 LIMIT 命令。如果出现默认 MARGIN 子参数，则显示关于 LIMIT 数值的限定计算；如果出现 ATTAINED 参数，则显示关于实际数值的限定计算。如果使用 COMBINE 子参数，则特殊区域限定说明（限制值）的限制条件将会整合为一行显示，而不是分开显示。

/AREA

Includes area under the righting arm curve. Requires $|\Phi_i - \Phi_{i-1}| \leq 10^\circ$

包含复原力臂曲线下面的面积。要求 $|\Phi_i - \Phi_{i-1}| \leq 10^\circ$

/AREA: [unit] [intervals]

The optional keyword `unit` must be `DEGrees` or `RADians` to determine the angle unit used in the areas under the righting arm curve. The `intervals` parameter produces an additional area analysis for certain specified intervals. It takes the form of ordinal pairs separated by a hyphen; eg. 4-6 for the 4th through the 6th of the given angles. (Spaces are not allowed within an ordinal pair, but may be used to separate pairs.) Up to 10 intervals may be specified. The following may be substituted for either of the numbers in the ordinal pair: `RA`, `RA00`, `MAX`, `FLd` or `CRT`. `RA` and `RA00` designates the angle where the righting arm goes to zero; `MAX` designates the angle of maximum righting arm; `FLD` and `CRT` are synonymous and designate the angle where the lowest downflooding point becomes immersed. `Unit` may be combined with the `intervals` list.

可选参数 `unit` 的单位必须为度或弧度。这将决定复原力臂曲线下面积的角度单位。`Intervals` 参数会对指定区间进行额外的面积解析。`intervals` 采用成对数值中间用横杠连接的格式，如 4-6，表示给定角度的第 4 个到底 6 个角度区间。（一对数之间不允许有空格存在，但对与对之间可以使用空格分隔）。最多可以定义 10 个区间。每对数中的任意数值可用以下字符替代：`RA`，`RA00`，`Max`，`FLd` 或 `CRT`。`RA` 和 `RA00` 表示复原力臂为 0 时的角度。`MAX` 表示复原力臂最大时的角度。`FLD` 和 `CRT` 同义，表示最低进水点浸没时的角度。`Unit` 可根据 `intervals` 列表来进行选取。

`/STOP [:condition]`

Stops the righting arm sequence before Φ_n if condition is met. Condition may be `RA`, `RA00`, `MAX`, `FLd`, `CRT`, Φ_{max} or any combination. `RA` and `RA00` stops when the righting arm vanishes. `MAX` stops at the first maximum righting arm angle. `FLD` or `CRT` stops when the worst (lowest) downflooding Critical Point immerses (or just Point num if specified). Φ_{max} stops at the lesser of the specified absolute heel angle or highest in the angles list. (These stops may be overridden by the requirements of the stability criterion when `/LIMIT` is present.) If no condition is included and `/LIM` is present, the righting arm sequence stops when all of the requirements of the stability criterion are met.

在计算到达 Φ_n 之前，当 `condition` 条件满足时，停止复原力臂顺序计算。`condition` 可以是 `RA`，`RA00`，`MAX`，`FLd`，`CRT`， Φ_{max} 或其任意组合。`RA` 和 `RA00` 表示当复原力臂消失时停止。`MAX` 表示到达第一个最大的复原力臂角度时停止。`FLD` 或 `CRT` 表示当最坏（最低）进水点（或者是制定的浸水点）浸没时停止。 Φ_{max} 表示到达指定的绝对横倾角度或设定的角度最大值（二者取小者）时停止。（当出现 `/LIMIT` 参数时，这些停止条件会被稳性衡准中的要求覆盖）。如果不定义 `condition` 且定义了 `/LIM` 参数，当所有稳性衡准要求满足时，复原力臂顺序停止。

`/HOLD`

Causes the final-heel condition to be sustained after the command is finished. (Normally, the initial condition is restored.)

命令运行完毕后，保持最后的倾斜状态。（通常会重建初始浮态。）

`/NOWARN`

Omits the warnings and notes following the righting arm table printout.

忽略复原力臂输出列表后面的警告和说明信息。

`/NOTAB`

Omits all printout except the stability criterion evaluation produced by the /LIM parameter, including graph plots only if /GRAPH is present.

只打印输出根据/LIM 参数进行的稳性衡准计算，仅当存在 /GRAPH 时才包括图形图。

/NOPRINT

Prevents all output but still causes the LIMMARG system variable (see VARIABLES) to be set to the worst limit margin, as well as setting any LIMATTn variables to attained values.

停止所有输出，但是仍然会把系统变量 LIMMARG（参看 VARIABLES）设置成最小余量，同时把所有 LIMATTn 变量设置为所得值。

/NOTIGHT

Completely ignores Weathertight Critical Points as if they were Nonflooding.

完全忽略的浸水点，就好像它们是水密的一样。

/GRAPH: NONE

Inhibits the generation of graph plots for the present RA command.

阻止当前 RA 命令的曲线图生成。

/GRAPH: [ONLY] [FIT] [NOAREA] [NOCRT] [NOGM] [CLEAN[:set]]

Omits the indicated portions of the graph by including one or more of these subparameters:

图表显示时，忽略以下一个或多个指定子参数：

ONLY - Omits all output except the graph;

ONLY - 省略除图形之外的所有输出；

FIT - Omits the page break before the graph if it fits in the current page;

FIT - 省略图表前的分页符（如果它适合当前页面）；

NOAREA - Omits the area portion;

NOAREA - 省略面积部分；

NOCRT - Omits the Critical Point Height portion;

NOCRT - 省略临界点高度部分；

NOGM - Omits the GM line;

NOGM - 省略 GM 曲线；

CLEAN - Omits horizontal and vertical guide hairs according to optional summed set of: 1=MAX0; 2=30 & 40 degree; 4=area; 8=EQU0; 16=EQU; 32=TFLD; 64=FLD; 128=DI (default=127 if set is omitted or exceeds 255).

CLEAN - 根据以下代码，忽略水平和垂向导向：1=MAX0; 2=30 & 40 degree; 4=area; 8=EQU0; 16=EQU; 32=TFLD; 64=FLD; 128=DI（如果未输入或代码超过 255，则默认=127）

/SIZE: max [,min]

Scales the righting arm portion of the graph so the top is at least max and optionally the bottom is at most min. Assuming this range is large enough to include any expected righting arm value, this provides uniform scaling for easy comparison of a series of RA plots, graphing the full heel angle range even when /STOP (except ϕ_{max}) is present. If /SIZE:* is given, then sizes from the last RA plot are reused.

缩放图表中复原力臂曲线部分，使得其顶点在最大处，（可选）底部在最小处。如果这个范围足够大来包含所有预期复原力臂值，这将会提供一个统一的比例来便于比较一系列的复原力臂曲线，即使出现/STOP（ ϕ_{max} 除外）参数也会生成整个横倾角度范围内的曲线。如果输入/SIZE:*，则使用上一次复原力臂曲线所使用的比例。

/FREEBD

Causes minimum freeboard to be shown at each heel angle (requires deck edge marking in the Geometry File). However, if flood points are present, the heights of flood points are shown in preference to freeboards, and only the angle of deck-edge immersion is noted.

显示每一横倾角度下的最小干舷（要求在 GF 模型文件中定义限界线）。然而，如果出现进水点，进水点的高度会优先干舷显示，并且只会说明甲板边界浸没时的角度。

/FIRSTMAX

Makes MAX in the LIMIT command refer to the angle at the first-encountered maximum RA.

使得 LIMIT 命令中的 MAX 为第一个最大复原力臂的角度。

/FSM

Causes the Formal free surface moment to be used (temporarily elevating the center of gravity) instead of allowing the contents of slack tanks to shift in response to heel and trim. See the FSM command.

使用形式自由液面矩（暂时提高重心位置），不允许半载舱的液体因浮态变化而变化。请查看 FSM 命令。

/TRUEFSM

Like /FSM but forces the true free surface moment to be used even if it differs from the formal FSM.

类似/FSM，但强制使用实际自由液面矩，即使和形式自由液面矩不同。

/EXTRAFSM

Allows the shifting of tank contents and in addition elevates the center of gravity such that the initial GM is the same as results from using the formal FSM in calculating GM.

允许舱室液体流动，并且额外升高重心位置，从而使初稳性高和使用形式自由液面矩计算而来的 GM 结果相符。

/GMRA

Causes the lesser of the righting arm and waterplane derived values to be used for calculating GM. Normally the waterplane is used (unless the axis angle is not zero), but in some cases where the waterplane changes abruptly the righting arm at a small

heel increment is a better basis for the GM calculation. (GM is only needed when referenced in a LIMIT command.)

使用复原力臂或者水线面导来值（取小者）计算 GM 值。一般情况下使用水线面（除非坐标轴角度不为 0）。但是当某些情况下，水线面突然变化时，使用小幅度范围内倾斜增长的复原力臂来计算 GM 更好。（只有当涉及在 LIMIT 命令之中时，才会需要 GM）

/GM: WPL | SLOPE | LESSER | RA | BLEND | MODU

Provides additional options for the method by which GM is calculated:

计算 GM 值的额外几种选项：

WPL - GM is derived from the waterplane (normal default for zero axis);

WPL - 基于水线面计算 GM 值。（通常默认 axis=0）

SLOPE - GM is taken from the slope of the RA curve (normal default for zero axis);

SLOPE -复原力臂曲线斜率得到的 GM 值。（默认 axis=0）

LESSER - GM is taken as the lesser of the waterplane and RA-slope values;

LESSER -取用水线面或复原力臂曲线斜率得到的较小值为 GM 值。

RA - same as LESSER and /GMRA (this is the default when MB is active);

RA -类似 LESSER 与/GMRA（当 MB 被激活时，默认使用这种方法）。

BLEND - blends the waterplane- and RA-derived GMs;

BLEND -融合水线面和复原力臂方法得到的 GM 值。

MODU - GM is derived using the same method as the GMMODU system variable.

MODU -使用和 GMMODU 系统变量相同的方法计算 GM 值。

/RAMACRO [:name]

Causes execution of the named macro ("RAMACRO" by default) to obtain effective heel righting arm values. This macro is responsible for defining the output real variable RAH_RA to equal the righting arm in current length units based on the current heel (see example below).

运行命名的宏（默认为"RAMACRO"），从而得到有效倾斜复原力臂值。此宏用于定义输出实变量 RAH_RA，使之等于基于当前倾斜状态下的当前长度单位的复原力臂值（请看以下例子）。

Operation

操作

The righting arms are computed and tabulated in the order in which the angles are given. If the heel angles Φ_1, \dots, Φ_n are not provided as parameters, a default list of angles is used. See the ANGLES command for establishing the default angles. Extra angles are inserted where the righting arm is zero and, if possible, where it is maximum. With the /LIM parameter, extra angles are also inserted where required by the LIMITS.

复原力臂值根据给定的角度顺序进行计算列表。如果不指定倾斜角度 ϕ_1, \dots, ϕ_n , 则使用默认的角度列表。如何建立默认角度, 请查看 ANGLES 命令。在复原力臂值为 0 或最大处会插入额外的角度。连同/LIM 参数, 也会在 LIMITs 要求的地方插入额外的角度。

If the ROLL angle is referenced in a LIMIT, the angles list must include a zero.

如果在 LIMIT 中涉及了 ROLL 角度, 那么角度列表必须包含 0 度。

The direction of heel may be redefined by the AXIS command.

倾斜方向可以使用 AXIS 命令重新定义。

If the trim has been fixed via the FIX command, it remains constant during the righting arm computations; otherwise, equilibrium in trim (zero trim moment) is maintained at each heel angle.

如果通过 FIX 命令, 锁定了纵倾, 在计算复原力臂的过程中纵倾会保持不变。否则, 纵倾平衡 (纵倾力矩为 0) 保持在每一横倾角中。

If heeling and/or trimming moments have been defined (see the HMMT and TMMT commands), the righting arms shown are the residual righting arms, after the heeling and trimming moments have been subtracted. In order to get an area under the residual righting arm curve starting at the equilibrium heel, issue a SOLVE command before the RA command.

如果已经定义了横倾或纵倾力矩 (请看 HMMT 和 TMMT 命令), 显示的是剩余复原力臂, 即: 扣除了横倾和纵倾力矩的影响。为得到剩余复原力臂曲线下从平衡倾斜角度开始的面积, 在 RA 命令前, 先运行 SOLVE 命令。

The /AREA parameter causes the area under the righting arm curve to be computed and displayed as an additional column in the output table. Its units are normally determined by whether English or metric units are currently being used. In metric, the default units are meter-radians; in English, foot-degrees. However, the default angle unit may be overridden by specifying DEGRess or RADians after the /AREA parameter.

/AREA 参数会计算并显示复原力臂下的面积, 并在输出表格中作为额外单独一列。其单位通常为当前使用的英制或公制单位。若公制单位, 默认单位为米-弧度。若英制单位, 默认单位为英尺-度。然而, 默认角度单位可在 /AREA 参数之后通过 DEGRess 或 RADians 重新定义。

The area at the first heel angle ϕ_1 is assigned the value of zero. Areas beyond the first interval are computed using 2nd degree integration and require that the angles be given at intervals not exceeding 10° . Rapidly changing righting arm curves may require that intervals smaller than 10° be used between angles (the command will stop with an error message if this is the case).

在第一个横倾角度 ϕ_1 的面积指定为 0。超过第一区间的面积将结合第二角度进行计算, 并且要求指定间隔角度不超过 10° 。快速改变复原力臂曲线要求角度间隔区间小于 10° (这种情况下, 命令会停止运行并且报错)

If any Flooding Critical Points have been defined, the height of the lowest one (above the water, wave included) is shown at each heel angle; note that if /LIM is used, then flooding point heights are only shown for angles in the same direction as heel changes.

In addition, if the height of the lowest point goes from positive to negative (or vice versa), the angle at which the immersion occurs is inserted in the sequence of righting arms. Weathertight Critical Points are only considered at the angle of equilibrium. Nonflooding Critical Points are ignored.

如果定义了进水临界点，则显示在每一横倾角度下的最低临界点高度（高于水面，考虑浪高）。如果使用/LIM 参数，则只显示与横倾变化同一方向的角度进水点高度。另外，如果最低点的高度从正值变为负值（反之亦然），在复原力臂顺序中会插入浸没时的角度。风雨密临界点只在平衡角时考虑。忽略非进水临界点。

The /LIMIT parameter causes an evaluation according to the stability criterion defined with LIMIT commands. If areas under the righting arm curve are involved in the criterion, the area column is automatically included. The angle unit of area is the same as that specified when the limits were defined (unless overridden with a different unit by the /AREA parameter).

/LIMIT 参数会根据用 LIMIT 命令定义的稳性衡准进行计算。如果复原力臂下的面积涉及到衡准之中，输出中会自动包含面积列。面积的角度单位和在 LIMIT 中定义的相同（除非使用/AREA 参数重新定义了单位）。

Attained limit values are stored in user variables LIMATTn where n is the limit number. Since these are user variables they must have been declared (see the VARIABLE command) prior to executing the RA command.

得到的限制值储存在用户变量 LIMATTn 中，n 为限制序号。因为这些是用户变量，所以在运行 RA 命令前，必须提前定义（查看 VARIABLE 命令）。

After the RA command has been executed, the depth, heel and trim are restored to the values they had before the command was issued unless the /HOLD parameter is present.

在 RA 命令运行完毕后，深度（吃水）、横倾和纵倾会恢复到 RA 命令运行之前的状态，除非出现/HOLD 参数。

Applying Free Surface Moment

施加自由液面矩

The /FSM and /TRUEFSM parameters cause the tank loads to be temporarily counted as fixed weight and the free surface moment (formal or true) to be applied to raising the center of gravity. If neither of these parameters is given, center-of-gravity shifts due to the current tank loads are used.

/FSM 和/TRUEFSM 参数使舱容装载暂时被视为固定重量，同时其自由液面矩（形式的或实际的）用来升高重心。如果这两个参数都不定义，将使用当前舱室装载重心的移动进行计算。

The /EXTRAFSM parameter causes a combination of tank-center shifting and raised CG to be used. The CG is raised by an amount representing the difference between the formal and true FSM values (assuming that the formal FSM is larger). This allows an extra margin of safety to be used while keeping the basic realism of the CG shifts.

/EXTRAFSM 参数同时包含舱容重心移动和重心位置升高。重心升高值表示为形式自由液面距与实际自由液面距的差（如果形式自由液面距更大的话）。这为实际情况下重心移动提供了额外的安全余量。

When applying FSM, the center of gravity is always elevated in the direction perpendicular to the waterplane. The heel and trim angles at which this takes place are normally at the angle of equilibrium. A STATUS WEIGHT /FSM command preceding the RA command will show the derivation of the FSM and how it is applied to elevate the CG. The heel and trim angles used in this STATUS report are automatically transmitted to the subsequent RA command so that it will use the same angles when it elevates the CG. Therefore, a SOLVE should normally precede the STATUS in order to use the equilibrium angles.

当施加 FSM 时，重心始终会在垂直于水线面的方向上升高，这通常会发生在横倾和纵倾的平衡角处。在 RA 命令之前的 STATUS WEIGHT /FSM 命令，会显示 FSM 的来源及其对重心的影响。在 STATUS 报告中显示的横倾和纵倾角度会自动传送到随后的 RA 命令之中，这样在重心升高时会使用相同横倾和纵倾角。因此，SOLVE 命令通常应该在 STATUS 命令之前使用，从而使用平衡状态的角度。

Another approach is to use SOLVE /FSM which solves for equilibrium with normal tank free surface CG shifting disabled, replaced by CG elevation perpendicular to the waterplane at zero heel and trim (or to the current waterplane if already in equilibrium).

另一种方法是使用 SOLVE /FSM 命令，求解出不考虑舱室自由液面重心移动情况下的平衡状态，用正浮状态下，垂直于水线面的重心升高值来替代（如果已经处于平衡状态，则垂直于当前水线面）。

By contrast, STATUS WEIGHT /FSM locks in the current heel and trim (rather than zero heel and trim) to be used by RA /FSM for CG elevation - which is why the equilibrium found by RA /FSM can differ from the SOLVE /FSM equilibrium in such cases.

相比之下，STATUS WEIGHT /FSM 锁定了当前状态下的横倾及纵倾角（而不是正浮状态），使其用于 RA /FSM，使得重心升高，这也就是为什么通过 RA /FSM 求得的平衡状态不同于使用 SOLVE /FSM 求得的平衡状态。

In summary, three approaches can be used:

总结，有三种方法可以使用：

1) FSM adjustment applied perpendicular to zero heel and trim:

1) 通过垂直正浮状态的方法修正自由液面矩：

SOLVE /FSM:UPRIGHT

RA /FSM

To include a STATUS report, the following equivalent method can be used instead:

为了得到包含 STATUS 的报告，可以使用以下的等效方法替代：

HEEL=0 | TRIM=0

SOLVE DRAFT

STATUS WEIGHT /FSM `required` 必须

SOLVE /FSM

RA /FSM

2) FSM adjustment applied perpendicular to true equilibrium heel and trim:

2) 通过垂直当前实际平衡状态的方法修正自由液面矩:

SOLVE

STATUS WEIGHT /FSM `optional` 可选

RA /FSM

3) FSM adjustment applied perpendicular to FSM equilibrium heel and trim:

3) 通过垂直自由液面矩平衡状态下的横倾和纵倾的方法修正自由液面:

SOLVE /FSM

STATUS WEIGHT /FSM `required`

RA /FSM

In each case, the HEEL=0 command may be inserted before the RA command without changing the outcome of limits based on the equilibrium angle.

每种情况下，HEEL=0 命令可以插在 RA 命令之前，而不会改变基于平衡角度的限制结果。

Display Output

显示输出

The first three columns show the depth, trim and heel respectively – the order in which these variables invariably appear. Origin depth is used rather than draft, since it is well-defined at any heel and trim. Heel, though not in the first column, is the independent variable.

前三列总是按顺序分别显示深度，纵倾和横倾。显示的是原点吃水深度而不是平均吃水，因为在任何浮态下原点的位置都是容易识别的。横倾虽然不显示在第一列，它仍然是一个独立变量。

The displacement is shown to verify that constant displacement is being maintained within tolerance. (In the case of a spilling tank, such as an open hopper, displacement varies as the contents spill.)

显示排水量的大小，用来核对排水量是否保持在允许误差范围之内。(如果出现了一个泄漏舱室，例如一个开口加料斗，由于溢出舱容，排水量会有所不同)

Both heel and trim righting arms are reported in order to verify whether there is equilibrium in trim.

同时显示横倾和纵倾复原力臂的大小，从而核查是否达到纵倾平衡。

Righting arms are shown as starboard if the heel progresses to starboard; port if the heel progresses to port.

若船舶向右倾斜，那么显示右舷复原力臂；若向左倾斜，那么显示左舷复原力臂。

The physical quantities involved are actually the moments (displacement x righting arm), but righting arms, being smaller numbers and less sensitive to vessel size, are easier to work with. Likewise the area under the righting arm curve represents accumulated righting energy (area x displacement x .0175). If the AREA intervals were specified, energy is shown in addition to the areas. This is particularly useful when the displacement varies due to spilling cargo.

尽管本质的物理量是复原力矩在发生作用（排水量 x 复原力臂），但是复原力臂在数值上较小，并且对船舶尺寸不是那么敏感，因此常用复原力臂作为讨论常量。同样又如，复原力臂曲线下的面积表示累积的复原能量（面积 x 排水量 x 0.0175）。当设定了面积步长，除了显示面积之外，还会额外显示复原能量。当因舱室泄漏而导致的排水量变化时，这将非常有用。

In cases where displacement varies with heel (such as a spilling tank), righting moment and righting energy curves are displayed instead of the righting arm and righting area curves. The reason is that if displacement is not constant, the righting arms alone do not give the complete assessment of the vessel's stability.

当因为倾斜导致排水量变化时（例如舱室泄漏），则显示复原力矩和复原能量曲线而不显示复原力臂和复原面积曲线。因为当排水量变化时，单独的复原力臂不能够对船舶的稳性做全面的评估。

If free surface is involved, a note at the end of the printable output states how it was handled. Likewise, the manner in which heeling and trimming arms (if any) were derived is noted on the printout.

如果包含自由液面，在打印输出的底部会说明自由液面是如何处理的。同样的，横倾和纵倾复原力臂是如何得到的也会在打印输出中说明。

The limit evaluation can be shown in one of two ways: 1) MARGIN shows the excess (or shortfall if negative) relative to the LIMIT value as a percentage (except for angle limits where it is shown as degrees); or 2) ATTAINED shows the actual value for each criterion followed by a "P" if the condition passes or an "F" if the condition fails. If the parameter is not included, Margin is assumed.

稳性横准的评估有两种方式显示：1) MARGIN 以百分比（如果是角度限制，则用度表示）的形式显示超过 LIMIT 数值的余量（若不足则用负数表示）。或 2) ATTAINED 显示每个衡准的实际数值，如果满足衡准要求，则用"P"表示，如果不满足衡准要求，则用"F"表示。如果不包含任何参数，则默认使用 Margin。

Plots may include the righting- and heeling-arm plots, area plots, and flood/tight-point heights. A vertical line at the angle of deck immersion may also be shown. On the righting-arm plot the GM line may be shown either at the equilibrium heel angle or at zero heel if the absolute righting arm curve passes through zero heel and the GM UPRIGHT limit is present. The GM line may be omitted by using /GRAPH:NOGM; it will be omitted automatically if equilibrium is not covered in the list of angles or if GM UPRIGHT is one of the limits and the absolute righting-arm curve does not pass through the origin.

Plots 会包含复原力臂、横倾力臂图表，面积图表和进水点/密性点高度。在甲板浸没的角度位置会显示一条垂线。在复原力臂图表中，GM 线要么显示在倾斜角平衡处；要么显示在 0 横倾处（如果绝对复原力臂曲线经过的 0 横倾处，并且出现 GM UPRIGHT 限制）。若使用 /GRAPH:NOGM 参数，会省略显示 GM 曲线。如果平衡状态不包含在角度列表中，或者如果 GM UPRIGHT 是其中一个限制条件，且绝对复原力臂曲线不经过原点，会自动省略显示 GM 曲线。

Nondisplay Output

无显示输出

The righting arm output is preceded by the current values of the fixed weight and center of gravity. Normally, transverse GM is also included.

复原力臂的输出优先于当前固定重量和重心。通常还会包含横向 GM 值。

A table is then defined which consists of the following entries at each heel angle:

随后定义的表格包含了每个横倾角度下的各个参数，由以下参数的组成：

1. Depth, trim, heel, displacement weight, righting arm in trim, righting arm in heel (gross arms, not residuals);
1. 吃水深度，纵倾，横倾，排水量，纵向复原力臂，横向复原力臂（总力臂，而非剩余力臂）。
2. Residual area under the righting arm curve if the /AREA parameter or an area limit was present (unless /GRAPH:NOAREA appeared);
2. 如果出现 /AREA 参数或出现面积限制，则显示复原力臂下剩余面积（除非出现 /GRAPH:NOAREA）。
3. Overturning arms in trim and heel if trim/heel moments are defined;
3. 如果定义了纵倾/横倾力矩，则显示纵向/横向倾覆力臂。
4. Critical point height and number if any critical points are defined.
4. 如果定义了临界点，则显示临界点的高度和编号。

All angles of heel are represented, including those which are automatically inserted during the execution of RA.

显示所有的横倾角度，包括在计算复原力臂时自动插入的角度。

The same units as in the display output are used.

单位与显示输出中的保持一致。

Examples

样例

Heeling to starboard with area integration:

右倾角度下的复原力臂并显示曲线下面积：

RA 0 10s ... 60s /AREA

Heeling to starboard with stability evaluation:

右倾角度下的复原力臂并计算稳性:

RA 0 5 ... 60 /LIMIT

Heeling to port, stopping when the righting arm becomes zero or the heel progression reaches 60° whichever occurs first:

左倾角度下的复原力臂，当复原力臂为 0 或达到左倾 60 度（二者首先发生者）停止:

RA 0 5p 10p 20p ... 60p /STOP: RA

Applying a user-specified FSM to the VCG and heeling according to the default list of angles defined by the ANGLES command. Includes the area integration column and stops early if either the righting arm goes negative or a critical point immerses:

根据 ANGLES 命令中定义的默认角度列表，为垂向重心及横倾施加一个用户自定义的自由液面矩。要求包含自由液面影响下的复原力臂曲线下的面积，并且当复原力臂为负值或临界点浸没时停止:

FSMFLOOR = 123.4

FSM (*) = 0

RA /FSM /AREA /STOP: RA,CRT

Finding equilibrium heel due to the given heeling moment, then running a righting arm curve, with area, to the second intercept:

给定横倾力矩值，找到对应的平衡横倾角。生成复原力臂曲线及曲线下面积，至第二个交点:

HMMT = 1205

SOLVE

RA 0 7.5 ... 30 40 ... 90 /AREA /STOP: RA

Area and energy in the intervals 0-30° 0-40° 30°-40° 0-Φflood, 30°-Φflood:

显示区间 0-30° 0-40° 30°-40° 0-Φflood, 30°-Φflood 下的面积和能量:

RA 0 5 10 20 ... 80 /AREA: 1-5, 1-6, 5-6, 1-FLD, 5-FLD

A wind heel and rolling study:

风作用下的倾斜与摇摆:

HMMT = 500

`Initial wind heeling moment.

HMMT = 500

`初始风倾力矩

SOLVE

`Find equilibrium.

SOLVE

`求解

RA 0 14p /HOLD

`Roll to port 14°

RA 0 14p /HOLD

`倾斜至左倾 14 度

HMMT = 750	`Increase the wind by 50%.
HMMT = 750	`风倾力矩增大 50%
RA 0 10 ... 70 /AREA /STOP: 50	`Stop at 50° starboard heel.
RA 0 10 ... 70 /AREA /STOP: 50	`右倾 50 度时，停止
Damage stability:	
破损稳性:	
ANGLES 0 2.5 ... 15	`Establish a set of heel angles.
ANGLES 0 2.5 ... 15	`定义一组横倾角度
TANK(ENGRM*) FLOODED	`Damage the engine room & all its tanks.
TANK(ENGRM*) FLOODED	`所有名称以 ENGRM 开头的舱室破损
SOLVE	`Find equilibrium in the damaged condition.
SOLVE	`求解破损状况
STATUS	`Document the condition.
STATUS	`显示破损状况
ANGLES *	`Reverse angle direction if listing to port.
ANGLES *	`左倾时，反向倾斜角度方向
RA	`Check stability.
RA	`稳性校核
Water on deck:	
甲板积水:	
TANK(DECKWELL)	`The deck-to-coaming-top modeled as a tank.
TANK(DECKWELL)	`甲板表面至拦水扁铁高度空间，视为一个舱室
TYPE SPILLING	`Declare it to be a spilling type.
TYPE SPILLING	`定义其为泄漏形式
REFPT = 55, 14.5, 17.25	`Set spill pt. in vicinity of discharge.
REFPT = 55, 14.5, 17.25	`设定进水点坐标
LOAD = 1.0	`Put a load of green water aboard.
LOAD = 1.0	`装载大量绿水上船
STATUS	`For the record.
STATUS	`记录当前状态
RA 0 10 ... 40	`The water spills as she rolls.
RA 0 10 ... 40	`船舶摇晃时进水

Reaction to dropping a crane load:

吊钩货物突然失去时的反作用力:

```

ADD "Load at end of boom" 100, 60a, 55s, 65
SOLVE                                `Equilibrium with the load.
SOLVE                                `求解吊物下的浮态
STATUS
DELETE "Load at end"                 `Drop it.
DELETE "Load at end"                 `卸载吊物
RA 0 2p ... 20p /AREA                `Rolling back at the unloaded displacement.
RA 0 2p ... 20p /AREA                `回到未吊物状态下的排水量
    
```

Using a macro to calculate average righting arm in waves:

使用宏命令计算波浪下的平均复原力臂:

```

MACRO RAH_RA
  WAVE 0, 100 /NOPRINT
  SOLVE TRIM
  VARIABLE RAH_RA={RAH}
  WAVE 180, 100 /NOPRINT
  SOLVE TRIM
  SET RAH_RA={RAH_RA} PLUS {RAH} DIV 2
  WAVE OFF /NOPRINT
/
RA /LIM /RAMACRO:RAH_RA
    
```