

## 命令模式

DAMSTAB [(divlist)] /SDIC | /SDIHC | /SDIHR | /SDI194C[SP] | /SDI194P[SP] | /SDI216C[SP] | /SDI216P[SP] | /SDI412P[SP] | /SDItype [/L:l1,l2] [/B:b1[,b2]] [/N:n1,n2] [/STOP[AT][:n]] [/DLL:draftloadline] [/LIMITHEEL:angle] [/WRITE:runfile] [/SIDE:Port | Starboard] [/DIVLENGTH] [/H:hmax] [/MACRO:name] [/NOREQ] [/QUICK] [/ALLPEN] [/AUTOFLOOD]

Measures stability with damage following the specified method, calculating a Subdivision Index for the present loading condition (requires the AF module).

根据指定方法计算破损稳性；计算当前装载工况的分舱指数（需要 AF 模块）。

## 参数说明

(divlist)

A list of divisions (i.e. subdivisions or compartments) to be considered in the damage stability analysis. If absent, all divisions are used.(See the DIVISIONS command).

破损稳性计算中需要考虑的分舱（即 subdivisions 或 compartments）。如果空缺，则考虑所有分舱（参看命令 DIVISIONS）。

/SDIC

Uses the method recommended by the International Maritime Organization (IMO) for cargo ships. Required in order to calculate probabilistic damage stability following SOLAS Regulation 25 for cargo vessels.

使用 IMO 中推荐的货船计算方法。即根据 SOLAS 公约 Regulation 25 计算货船概率破舱稳性。

/SDIHC or /SDIHR

Uses the method implementing revised SOLAS regulations for probabilistic damage calculations applying to Conventional (/SDIHC) and RO-RO (/SDIHR) vessels respectively. Required in order to use the methods from the IMO-sponsored research project "Harder" as published in SLF 45/3/3 and SLF 45/3/5. Of the two methods of calculating the "s" factor, only the "traditional GZ-based formulation" is currently implemented.

根据修订版 SOLAS 公约中的计算方法计算，计算方法分别适用于普通船(/SDIHC)和滚装船(/SDIHR)。即根据 IMO 发起的发行在 SLF 45/3/3 和 SLF 45/3/5 的研究项目"Harder"中的方法计算。在两种计算方法中，"s"因数的计算目前只使用“传统 GZ 公式法”。

/SDI194C[SP] or /SDI194P[SP]

Uses the method implementing the SOLAS amendment MSC.194(80) for cargo (/SDI194C) and passenger (/SDI194P) vessels. Only the final survivability is implemented. It is recommended that survivability be computed by a /MACRO parameter macro. Optional "SP" suffix indicates a special purpose ship.

根据 SOLAS 修订案 MSC.194(80)中的计算方法计算，分别适用于货船(/SDI194C)，客船(/SDI194P)。只有最终残存稳性会被执行计算。建议残存稳性使用宏参数/MACRO 进行计算。可选后缀"SP"表示特殊功能船。

/SDI216C[SP] or /SDI216P[SP]

Same as /SDI194 variants but referencing the MSC.216(82) regulation, which is equivalent for the purposes of these calculations.

是/SDI194 的另一种形式，但是参考的是 MSC.216(82)，它们的计算目的相同。

#### /SDI421P[SP]

Same as /SDI216P except that Required index R is calculated according to MSC.421(98), also known as the SOLAS 2020 Amendment. Note: The alternate Sfinal formula for RO-RO ships is only available in the DAMSTAB2 wizard.

除了所需的指数 R 是根据 SOLAS 2020 修改通报/ MSC.421(98) 计算以外，其他规定与 /SDI216P 相同。注意：对于 RO-RO 滚装船的替代 s 的计算，请采用 DAMSTAB2 向导。

#### /SDIP (synonym: /SDIP: Simplified)

Uses the method implementing the IMO resolution A.265 (VIII) simplified for RO-RO passenger vessels, calculating a Subdivision Index for the present loading condition.

根据 IMO 公约中的 A.265 (VIII) 计算方法计算，适用于滚装客船，用于计算当前装载工况的分舱指数。

#### /SDIPi (synonym: /SDIP: i)

Uses the method implementing the IMO resolution A.265 (VII) for passenger vessels at draft i (i = 1, 2 or 3).

根据 IMO 公约中的 A.265 (VII) 计算方法计算，适用于客船，其中吃水为 i (i = 1, 2 or 3)。

#### /SDIPT (synonym: /SDIP: Total)

Accumulates and reports the total subdivision index using the results from previous DAMSTAB commands with /SDIP: 1, /SDIP: 2 and /SDIP: 3.

利用之前执行的命令 DAMSTAB，及参数 /SDIP: 1, /SDIP: 2 and /SDIP: 3 的计算结果，汇总报告总分舱指数。

#### /L: l1,l2

Specifies the terminal points of the Subdivision Length. If absent, the extreme ends of the model are used.

定义分舱长度的终点。如果不定义，则使用模型首尾端作为终点。

#### /B: b1 [,b2] (synonym: /B1: b1[/B2: b2])

Specifies the Subdivision Breadth; if absent, the greatest breadth of the model is used. For /SDIP methods only, a second value may be included to specify the regulation's B2 breadth.

定义分舱宽度；如果不定义，则使用模型最大宽度。仅适用于参数 /SDIP，也可定义第二个数值来适用于规范中 B2 的宽度。

#### /N: n1, n2 (synonym: /N1: n1/N2: n2)

Specifies numbers of passengers and crew. Only available for /SDI194, /SDI216, and /SDIP methods.

定义乘客和船员数量。仅适用于参数 /SDI194, /SDI216, 和 /SDIP。

**/STOP[AT]: n**

Forces the Subdivision Index computations to stop after n-division flooding or (if no "AT") after reaching the Required value and completing the present level of division aggregation.

在 n 个相邻分舱同时进水或（如果没有"AT"）达到所需 R 值时，且完成当前分舱计算之后，强制分舱指数计算停止。

**/DLL: draftloadline**

Provides the height at which the breadth - at the center of the division - is to be measured for the purpose of determining whether a space is to be included as a wing. If absent, maximum breadth at the center of the division is used.

定义量取分舱中心宽度值时所取的高度，该宽度值将决定是否划分某处空间为边舱。如果不定义，则使用分舱中心处的最大宽度。

**/LIMITHEEL: angle**

Modifies the SDIC survivability criterion by limiting the end of the range of stability to the given angle. It also limits the range over which area is taken in the SDIP version. It does not affect the range in which the maximum righting arm is recognized.

修改 SDIC 残存稳性衡准，使得回复力臂考察范围到指定角度。这同样会限制从 SDIP 中得到回复力臂面积积分的范围。但它并不会影响最大回复力臂的考察范围。

**/WRITE: runfile**

While performing the SDI process, also writes a run file of the given name which contains commands to flood tanks for each combination of divisions in the damage stability analysis followed by a command to execute a user-written "RA" macro after each case.

当执行 SDI 程序时，同时也保存一个指定名称的运行文件，该运行文件包含了破损稳性计算中每种分舱组合浸水的命令；同时每种破损下都执行一次用户定义宏"RA"。

**/SIDE: Port | Starboard**

Specifies the side of damage. If not specified, the default is the side having the most tanks as listed in DIVISION commands (or starboard if both sides are equal).

指定哪一舷破损。如果不指定，默认为命令 DIVISION 中列出的拥有舱室较多的一舷（如果两舷舱室数量一样，取右舷）。

**/DIVLENGTH**

Causes inner compartments to be examined only within the division length when deciding whether the bottom is low enough to be flooded.

在分舱长度范围内检验内部舱室，用于判断双层底是否足够低到能被浸水。

**/H: hmax**

Specifies the "maximum possible vertical extent of damage above the baseline". If absent, it is computed as a function of the Subdivision Length according to the appropriate IMO rule. Not available for /SDIP methods.

定义“基线以上垂向破损的最大高度”。如果不定义，则按照相应 IMO 规范中基于分舱长度的函数来计算。不适用于/SDIP。

**/MACRO: name**

Uses the named macro to calculate probability of survival. Not available for /SDIP methods.

使用已命名宏来计算残存概率。不适用于/SDIP。

**/NOREQ**

Omits any consideration of the Required index, instead continuing processing until flooding has progressed to the point where no increment in the attained index is being made, or the number of divisions specified in the /STOP parameter have been processed. Not available for /SDIP methods.

忽略任何指数 R，一直运行直到浸水达到指数 A 不再有任何增长为止，或者到达参数/STOP 中定义的分舱破损数量。不适用于/SDIP。

**/QUICK**

Bypasses searching for minimum Survival probability due to lesser vertical extents of damage. Not available for /SDIP methods.

计算残存概率时，不考虑因较小的垂向破损而导致的更低的残存概率。不适用于/SDIP。

**/ALLPEN**

Causes all penetration distances to be considered in multiple-division flooding.

在多舱浸水情况中，考虑所有破损深度。

**/AUTOFLOOD**

Disables any special flooding assignment given in the DIVISION subparameters li and Uj.

禁止命令 DIVISION 中子参数 li 和 Uj 所定义的特殊浸水设置。

## Operation

### 操作

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#### Subdivision Index Calculation

##### 分舱指数计算

This method for computing a measure of probable damage survivability automatically takes into account the vessel's stability when various compartments and combinations of compartments are damaged. It assigns probabilities to the extents of damage as well as to the survivability when so damaged. The products of these probabilities are summed over the various possible combinations of flooding which could occur from a single breach of the hull. The result is called the "Attained Subdivision Index".

一种在各个舱室以及舱室组合破损时，考虑船舶的稳性，自动计算其概率破损残存性的计算方法。这会根据破损范围计算破损概率，当严重受损时，也会计算残存概率。根据单个缺口使得的船舶

破损后导致的可能进水的各种组合，计算两个概率的乘积和。计算结果称为“达到的分舱指数 A”。

Before the DAMSTAB command is given, the program needs to know exactly what combinations of tanks and compartments are to be considered divisions. (It does not assume that each tank and compartment is an independent division.) This information must be supplied by means of the DIVISIONS command.

在使用命令 DAMSTAB 之前，系统需要确切的知道各个舱室以及舱室组合的分组情况。（不会假定每个舱室为一个独立分组）。这些信息需要由命令 DIVISIONS 进行定义。

After all of the divisions have been defined, the Subdivision Indices in the present loading condition may be obtained. DAMSTAB computes and displays the probability of damage and probability of survival for each case of damage, then sums the results, giving the Attained Subdivision Index. Note that this index applies only to the present loading condition. If additional conditions are to be considered, the DAMSTAB command must be run again for each condition.

在所有分组都已经定义之后，就可以得到当前装载工况下的分舱指数了。命令 DAMSTAB 会计算每种状况下的破损概率和残存概率，计算概率之和即为达到的分舱指数 A。注意这个指数只针对当前装载工况。如果需要考虑其他装载工况，需要重新运行命令 DAMSTAB。

Both horizontal and vertical longitudinal bulkheads are considered when their presence has been indicated by the /HBHD and /WING parameters, respectively, in the DIVISION command. The /WING distance is taken inboard from the local side shell to establish the offset relative to the centerplane, and any tank whose boundry extends outboard of that offset is considered to be flooded when that level of penetration is being considered.

当在命令 DIVISION 中通过参数 /HBHD 和 /WING 指定了舱壁时，垂向和横向破损深度将分别在计算中进行考虑。/WING 的距离为在相关中心平面上，从位置所在的船外板起到所定义的偏移量。当考虑指定高度的破损时，任何边界超过该偏移量的舱室都将被认为是浸水的。

Lesser extents of vertical damage which might lead to a lower survivability value are evaluated by successively eliminating lower tanks in the division. This search for "Smin" can be bypassed by including the /QUICK parameter.

更小范围的垂向破损可能会导致残存性更小，程序通过逐步减少分组中低位舱室来进行评估计算。使用参数 /QUICK 可以忽略这种找寻 "Smin" 的方式。

In the /SDIC and /SDIP: Simplified versions a minimum Required Index is shown which is a function of vessel size. The average Attained Index for two drafts, taken according to the IMO rule, is to be compared to this Required Index.

在参数 /SDIC: Simplified 和 /SDIP: Simplified 中：简体版会根据船舶尺寸计算并显示要求的分舱指数 R。根据 IMO 规范，两个吃水下达到的分舱指数 A 的平均值，要与指数 R 进行对比。

The /SDIP version does not consider horizontal bulkheads; only the /WING parameter in the DIVISION command applies. The search for Smin is not performed. It calculates the Attained Index only using the VCG of the present condition. The intent is that the Attained Index at the highest operating VCG be divided by the Attained Index at a

lower VCG where the "s" values are equal to 1.0. The ratio (A/Amax) is considered to be the significant measure of damage survivability.

/SDIP 参数不会考虑水平舱壁；只考虑 DIVISION 命令中的/WING 参数。同时不找寻 Smin。它只会根据当前工况的 VCG 计算指数 A。目的是得到(A/Amax)的比值，（其中 Amax 为"s"值等于 1.0 时的重心高度所计算的指数 A，A 为最大操作的重心高度所计算的指数 A）。该比值是衡量破损残存性的重要指标。

In order to support the A265 6.d.iii probabilistic damage provision for special treatment of multiple-division damage cases "prior to equilization", the /SDIP version checks for heel exceeding 20 degrees or downflooding when damage flooding does not include tanks marked with "+", and assigns S=0 in such cases, ignoring the minimum GM requirement and allowing it to continue in those special cases.

为了满足条款 A265 6.d.iii 中对“平衡之前”多种分舱组合破损的特殊处理的要求，/SDIP 将考虑不包含标记"+"的舱室的破损，检查横倾是否超过 20 度或有进水点浸没，如果是则设置 S=0，这些情况下，忽略最小 GM 的要求并允许继续在此特殊工况下进行计算。

Any tank/compartment having its contents description set to CRITICAL forces the survival probability to zero when flooded.

任何舱容描述为 CRITICAL 的舱室浸水时，残存概率都将为 0。

### Variables for Probability of Survival Macro

**残存概率宏变量。**

When /MACRO is specified to calculate probability of survival, variables are used for input to and output from the macro. These variables must be defined in advance by the user and have names as follows.

当宏/MACRO 被用来计算残存概率时，将使用变量在宏中输入或输出。这些变量必须事先被用户定义，其命名规则如下：

#### Input string variable:

输入字符串变量：

DAMSTAB\_TANKS - contains list of tanks flooded;

DAMSTAB\_TANKS – 包含浸水舱室列表；

DAMSTAB\_PROG - contains list of progressive flooding tanks;

DAMSTAB\_PROG – 包含连贯浸水舱室列表；

DAMSTAB\_INBD, DAMSTAB\_UPPER - if present, these variables should be set to the inboard and upper layer numbers before executing the macro;

DAMSTAB\_INBD, DAMSTAB\_UPPER – 如果出现，这些变量代表运行这个宏所考虑的破损由舷外向内，由下向上的层数；

DAMSTAB\_DIV - if present, this variable should be set to the list of division numbers currently involved before executing the macro.

DAMSTAB\_DIV – 如果出现，该变量代表运行这个宏所考虑的分舱列表。

Output real variables:

输出实变量:

DAMSTAB\_PS - probability of survival;

DAMSTAB\_PS – 残存概率；

DAMSTAB\_MAXRA - maximum RA in current units;

DAMSTAB\_MAXRA – 当前单位下的最大回复力臂；

DAMSTAB\_RANGE - range of stability in degrees;

DAMSTAB\_RANGE – 稳性范围，单位为：角度；

DAMSTAB\_STATUS - if present and set to a positive number this variable causes the report to show the equilibrium in the condition established by the macro rather than the fully-flooded equilibrium.

DAMSTAB\_STATUS – 如果出现且设定为正值，则该变量使报告显示宏指定的平衡状态，而不是完全进水的平衡状态。

## Display Output

### 显示输出

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#### SDIC (Subdivision Index for Cargo Vessels, SOLAS Reg. 25)

#### SDIC (货船分舱指数, SOLAS Reg. 25)

A table is presented where each line represents the result of damaging a certain division or combination of divisions.

显示一个表格，每一行显示一种破损情况的结果。

The leftmost column displays the numbers of the divisions which are damaged. Divisions are numbered according to the assignments given by the DIVISIONS command. "Inboard" and "Upper" portions of the division are indicated if such bulkheads have been indicated with the DIVISION command. The next column is labeled "P" and represents a probability of damage for the division(s).

最左边一列显示破损的区域编号。区域编号由命令 DIVISIONS 中进行定义。如果命令 DIVISION 中定义了横向和垂向舱壁，则会对应显示 "Inboard" 和 "Upper"。下一列标记为 "P"，显示区域的破损概率。

Following this is a column labeled "S" or "Smin" which represents the probability of survival when the division(s) are damaged. "Smin" indicates that the search for minimum S has been performed. The next column, "P\*S\*V" is the product of P multiplied by S times the V factor for any horizontal bulkhead which may be present; and following it is "A", the Attained index so far which is a running summation of the P\*S\*V values.

继续下一列标记为"S" 或者"Smin", 显示区域破损后的残存率。"Smin"表示进行了最小 S 值的求解。再下一列, "P\*S\*V"为三个因子的乘积, 表示可能出现的水平舱壁; 后一列为"A", 表示 P\*S\*V 值的累积和。

On the righthand side are five columns showing the most important characteristics of each damage case. "Depth, Trim and Heel" (the latter two being in degrees) represent the waterplane in the damaged equilibrium condition. "Range" is the range of stability beyond equilibrium. "MaxRA" is the greatest righting arm in this range.

右手边的 5 列显示了每种破损工况中最重要的参数。“Depth, Trim 和 Heel”（后两项为角度单位）显示了破损平衡状态的水线面。“Range”表示平衡后的稳性范围。“MaxRA”表示该范围内的最大回复力臂。

When /MACRO is present, a note is included indicating that probability of survival comes via a user-supplied macro.

当使用宏/MACRO 时, 会显示一条注释, 表示残存概率是通过用户自定义宏进行计算。

Whenever there are cases of user-assigned flooding that cause deferred flooding relative to when it would naturally occur according to the geometry, an addendum lists such cases along with the amount of the discrepancy.

当用户定义的浸水工况推迟了根据计算模型正常情况下的浸水工况时, 会生成附录显示这些破损工况和其差异。

### **SDI194 (Subdivision Index for Cargo and Passenger Vessels, MSC 194)**

#### **SDI194 (货船和客船的分舱指数, MSC 194)**

Similar to the SDIC method with some differences, especially in the calculation of the "s" value. The passenger version involves heeling moments and intermediate stages of flooding which require more ship-specific data than can be passed through the parameters of this command. Therefore the /MACRO feature must be used to implement the survival probability calculations. A "wizard" run file (DAMSTAB2) is available which supplies the macro and automatically performs all of the required calculations for both the cargo and passenger version.

和 SDIC 计算方法类似, 不同之处主要是"s"值的计算方法。客船要求考虑横倾力矩和中间进水阶段, 这比该命令参数需要更多的船舶数据。因此必须使用宏/MACRO 来计算残存率。可使用名为 "DAMSTAB2"的计算向导“wizard”, 它提供宏并且为货船和客船自动执行所有所需计算。

### **SDIP (Subdivision Index for RO-RO Passenger Vessels -- Simplified Version)**

#### **SDIP (滚装客船的分舱指数 – 简化版)**

A table is presented similar to the one for the /SDIC version. In this case the formulation of probability of damage includes an "a" and a "p" factor, both of which are shown. The "s" column shows probability of survival and the "A" column is the running total of the Attained Index. The contribution to the Attained Index can be seen by subtraction of two successive values in the "A" column. The righthand side omits the Depth column and includes an Area column since area under the righting arm curve is involved in the "s" value. This version does not go beyond two-division flooding.



类似于/SDIC，这里也会生成一个表格。破损概率会包含并显示"a"和"p"因数。"s"列显示残存概率，"A"列为指数 A 累积和。每行破损所贡献的 A 值可由两行连续指数 A 的差值得到。右手边忽略了 Depth 列，但包含了 Area 列，这是由于计算"s"值需要回复力臂曲线下的面积。这种方法不考虑两组以上进水的情况。

### SDIP: n (Subdivision Index for Passenger Vessels)

#### SDIP: n (客船分舱指数)

This requires three conditions which must be run with three separate DAMSTAB commands where a digit appended to /SDIP indicates the draft number. Thus DAMSTAB /SDIP1 deals with the condition whose draft is designated d1 in the IMO literature, etc. In order to get the final totals, a fourth DAMSTAB command must be issued using the /SDIPT. Here the parameters /N1 and /N2 may be included to specify the numbers of passengers and crew. For example, DAMSTAB /N1:1000, N2:100 /SDIPT

计算要求有三种装载工况，需分别使用命令 DAMSTAB。每种装载工况都需要在/SDIP 中指定吃水编号。DAMSTAB /SDIP1 根据吃水编号对应到 IMO 所规定的 d1 等工况中。为了得到最终总结报告，必须使用参数/SDIPT 运行第四次 DAMSTAB 命令。这里可能需要使用参数/N1 和/N2 来定义乘客和船员数量。例如，DAMSTAB /N1:1000, N2:100 /SDIPT。

The N1 and N2 values should be given with each DAMSTAB /SDIPn command as well as with DAMSTAB /SDIPT (they may differ). If the /B1 or /B2 parameters are given, they must be the same on each of the DAMSTAB /SDIPn commands.

每个命令 DAMSTAB /SDIPn 或 DAMSTAB /SDIPT 中必须分别定义 N1 和 N2 的值。如果定义参数/B1 或/B2，那么必须在每个命令 DAMSTAB /SDIPn 中保持一致。

### Nondisplay Output:

#### 非显示输出

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Details of the DAMSTAB process showing the names of individual tanks as they are flooded as well as intermediate values used in the calculations can be obtained through the "Trace" output. (See the MESSAGE command about enabling trace output.) These intermediate results may be helpful in verifying the displayed results. Caution! The amount of trace output may become very large if many divisions are involved.

显示 DAMSTAB 命令的详情计算过程，包含浸水时各个进水舱室的名称，同时可以通过追踪文件"Trace"得到中间进水数据。（参看命令 MESSAGE，查看追踪输出。）这些中间结果可以用来核对报告的结果。注意：如果包含很多区域，追踪输出的结果会非常大。

### Examples

#### 样例

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Defining divisions and finding the Attained Index for a cargo vessel at one draft:

定义分组，并且求货船在某一吃水下的 A 指数：

```
DIVISION(1) FORPK.C
```

```

...
DIVISION(7) AFTPK.C
DIVISIONS
TRIM 0
HEEL 0
DRAFT 35.0
VCG 37.5
SOLVE WEIGHT, LCG, TCG
DAMSTAB /L: 0.0, 234.5 /SDIC

```

[Finding the Attained Index for a passenger vessel \(A.265 VII method\):](#)

求客船 A 指数(A.265 VII 方法):

```

MACRO DS
DAMSTAB /N: 1000, 100 /SDIP: %1
/
.COND1
.DS 1
.COND2
.DS 2
.COND3
.DS 3
.DS T

```

[Using a macro to calculate probability of survival \(MSC 194\(80\) method\):](#)

使用宏计算残存概率(MSC 194(80) 方法):

```

VARIABLE (STR) DAMSTAB_TANKS
VARIABLE DAMSTAB_PS, DAMSTAB_RANGE, DAMSTAB_MAXRA
MACRO PROBSURV
.Sfinal
SET DAMSTAB_PS={S}, DAMSTAB_RANGE={R}, DAMSTAB_MAXRA={MA}
.Smom
SET DAMSTAB_PS={DAMSTAB_PS} TIMES {S}
.Sinter
IF {S}<{DAMSTAB_PS} THEN SET DAMSTAB_PS={S}
/
DAMSTAB /SDI194P /MACRO:PROBSURV

```