

VOLUME 1

GENERAL

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1.1 Introduction

SEAKING is a program package for naval architecture calculations. It consists of different modules built on the number of common subroutines. New programs can be added based on the data produced by the programs and subroutines in the package. The package can be used with the hull form definition contained in the package or linked to any other hull form definition system by adding an interface program.

Following qualities are characteristic for the package:

- **Simple and flexible input**
The data sheets are commented in detail to simplify the preparation of the data. Flexible input means that for preliminary project calculations, very few data are required compared to the detail data necessary for the final calculations. The free format input system eliminates some of the typical typing errors and simplifies the use of the program.
- **Complete or shortened output (printout)**
Output is complete and can therefore be submitted directly to the authorities for approval and also for use on board of the ship. Shortened printouts for preliminary calculations are also available.

Input files are formed with help of the tables found on data sheets. Each table describes type and order of data required for that specific calculation. Besides tables, data sheets contain comments on data which should provide sufficient advice for the normal use of the program. This User's Guide is intended to give more complete and detailed explanation.

User's Guide consists of six volumes which are:

- | | |
|-----------------|--|
| Volume 1 | General |
| Volume 2 | Hulldefinition |
| Volume 3 | Various geometric calculations based on hull form <ul style="list-style-type: none">• Hydrostatic calculation• Intact stability• Floodable length• Launching calculation• Tonnage calculation according to 1969 Convention• Bon-Jean data |
| Volume 4 | Different calculations of compartment capacities and geometric properties for different levels of filling. |
| Volume 5 | Damage stability calculations <ul style="list-style-type: none">• Ordinary damage stability• Passenger ship damage stability• Damage stability in real time |
| Volume 6 | Loading conditions |

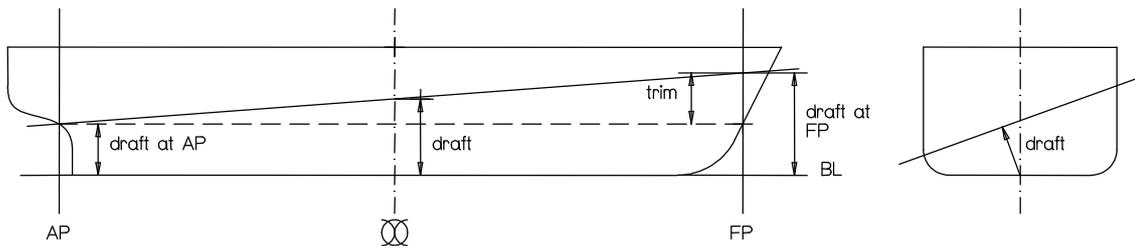
1.2 General comments

Draft

Draft always refers to midship section. This means:

- $\text{draft} = 0.5 * (\text{draft}_{\text{AP}} + \text{draft}_{\text{FP}})$
- $\text{trim} = \text{draft}_{\text{FP}} - \text{draft}_{\text{AP}}$
- $\text{draft}_{\text{AP}} = \text{draft} - 0.5 * \text{trim}$
- $\text{draft}_{\text{FP}} = \text{draft} + 0.5 * \text{trim}$
- trim by head is positive.

Definition of draft in heeled position



Units

The program places no restriction in the choice of units. The same units must however be used consistently in the calculation for one and the same ship. However, the format for input and output imposes some restrictions. That is, if input data are given in mm, the calculated volumes will also be printed in mm^3 which would, for a normal ship, give more figures than the format allows.

Some data sheets provide a possibility to enter conversion factor (or factors). In that case, input data are multiplied with this factor immediately after they are read by program. For example, data sheet 1 includes that possibility. If that conversion factor is given as =3.048, input data stated in feet will be converted to meters and also printed in meters. After this conversion to meters, all subsequent data for the following programs should also be given in meters.

The most usual units are meters or feet for length and metric tonnes of 1000 kg or English tonnes of 1016 kg for weight. The following values for density in salt and fresh water (i.e. sw and fw) are normally used.

Length	Weight	sw	fw
m	Ton of 1000 kg	1.025	1.0
m	Ton of 1016 kg	1.00886	0.98425
ft	Ton of 1000 kg	0.029025	0.028317
ft	Ton of 1016 kg	0.028568	0.027871

1.3 Free format system

The input data for the SEAKING package are given in a free format system as described hereafter. The quickest introduction to the system would probably be through the following examples as follows:

Example 1

2/4 7 24/0.85 0.6 0.95/3.2 3*4

is equivalent to the following typing:

```
2
4 7 24
0.85 0.6 0.95
3.2 4 4 4
```

Explanation: Instead of typing a new line “/” can be typed and the next dataset then follows in the same line. The multiplication sign “*” means that the number which follows should be repeated a stated number of times.

Example 2

```
5 3 3*7.4//7/114 C
8 4 2 9///3 C
4 C
5 6 C
7 2*-5
```

is equivalent to the following typing:

```
5 3 7.4 7.4 7.4
blank line
7
114 8 4 2 9
blank line
blank line
3 4 5 6 7 -5 -5
```

Explanation: Sign “C” means that the remaining part of the dataset is typed on the next line.

1.4 Definitions

Dataset is a logical group of input data, usually stated on one line on the data sheet.

A line on the screen is the physical unit of input for the computer.

There are three alternatives for typing:

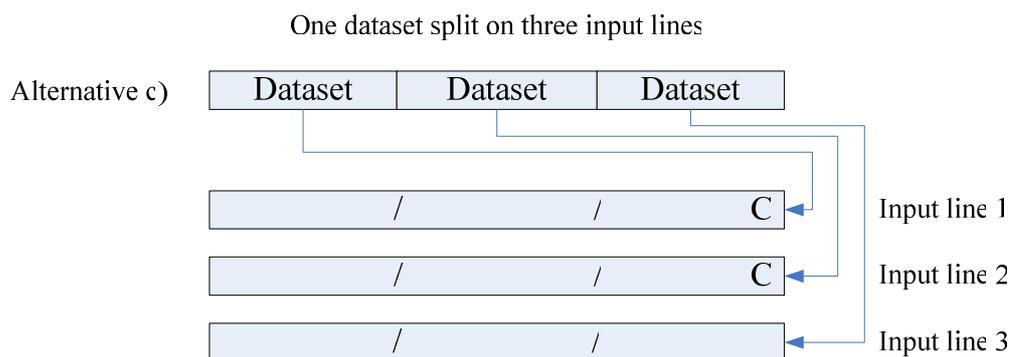
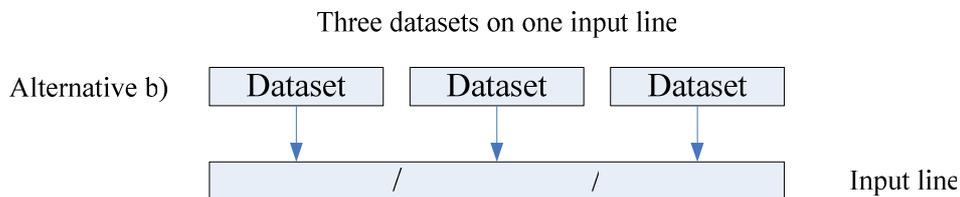
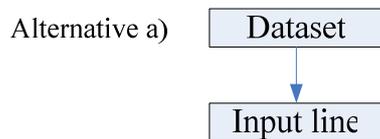
- Alt (a) - one dataset typed on one line
- Alt (b) - several datasets typed on one line
- Alt (c) - one dataset typed on more than one line

Alternative (a) is the most straightforward.

Alternative (b) is useful for saving lines.

A slash "/" between each dataset typed on the same line is necessary to indicate the end of a dataset. The last dataset on the line should not be followed by a "/" as the end of the line indicates end of dataset.

Alternative (c) has to be used when complete dataset cannot be contained on one line. A "C" has to be typed to indicate that the dataset continues on the next line. The last line for the dataset shall of course not contain any "C".



Dataset containing text

In some cases numerical information and text are stated on the same line in the input data sheet, (for example compt no and the name of the compartment on data sheet 7). The numerical information is always stated first, followed by text. The text has to start with a letter and not a figure because all information before the first letter is treated as numerical and all information after the first letter is treated as text. As a text can contain "C" as well as "/" the use of these symbols as described above cannot be used for such datasets. Therefore, this type of dataset has always to be typed on one separate line.

Comment lines

Any line starting with a "\$" sign in the first position is neglected by the program. This option gives user the possibility to make his own comments in the inputfile. Another possibility is to create a standard textfile giving heading for all required input.

Summary of the free format system

- Symbol "/" indicates that one more dataset is typed on the same line. Symbol "C" indicates that dataset continues on the next line.
- Decimal point doesn't have to be typed if there are no decimals.
- Statement of type n*A means that number A (real or integer) has to be repeated n (integer) times. There shouldn't be any space before or after the *.
- Dataset containing text must be typed on one separate line. Also, "C" and "/" are not allowed in the sense of item 1. above.
- Zeroes at the end of a dataset can be omitted if they are not necessary to indicate a correct number of numbers.
 - Where "one blank line" is called for on the data sheets to end a group of datasets, a separate blank line should preferably be used.

Comments on the data sheets

The layout of the data sheets is designed with regard to the free format system described above. Only data written in boxes are typed. One line is normally one dataset. Exception to this rule is data sheet 1a where one section is one dataset and on data sheet 6 where one table (including table number) is one dataset. Bolded, underlined numbers represent number of the datasets. If any error in the input occurs, program prints out the number of wrong dataset along with the error message. This simplifies tracing of the input error. Also, this way, input data out of sequence are easily found.

In many cases tables on the data sheets don't have enough space for the maximum number of data allowed, for instance dataset 3 on sheet 1. There is a space for only 15 frame numbers while up to 39 numbers are allowed. In such a case, if all the numbers of one dataset cannot be typed in one line, they are continued on more lines using the "C" option as described previously.

Since the free format system also counts the number of numbers read, zeroes at the end of the dataset have to be typed whenever it is necessary to fill the correct number of numbers. For example, if the y coordinate for the last point in a table on data sheet 6 is 0, this zero has to be typed. If the correct number of numbers is not necessary (where the data sheet says "normally blank"), zeroes don't have to be typed. On several places on the data sheets "one blank line" is called for. These lines serve to end the group of datasets. It is recommended in such cases to insert the blank line rather than to use the slash "/". In some cases, the program uses blank lines when an error occurs. Program skips all the data until the next blank line and continues reading from there (this technique is used on data sheet 7 for compartments). Skipped data can be verified, corrected and reread.

Program DISPL

When the user is in doubt whether some calculation has been performed, this program is run to display the calculation saved on the disc. No input data are needed.

1.5 Error messages

This program is written in Fortran 1V. The following error messages may appear:

Page	Error in program
1-8	Common errors
1-8, 1-9	HULL74
1-9, 1-10	STHYD
1-10	HYDB
1-11	HYDR
1-12	STABB
1-12, 1-13	STABR
1-13	STAB8
1-13	HYDFL
1-13, 1-14	SUBD
1-14	LAUNCH
1-14	HVOL
1-14, 1-15	TONN
1-15	BONJ
1-15, 1-16, 1-17	VOL1
1-18	VOL2
1-18	CVOL
1-19	VOLLC
1-19	SOUND
1-19, 1-20	GRAIN1
1-19, 1-20	GRAIN2
1-20, 1-21, 1-22	DAM1
1-22	DAM2
1-22	DAM3
1-23	DAM4
1-20, 1-21, 1-22	DAM1P
1-22	DAM2P
1-22	DAM3P
1-23	DAM4P
1-20, 1-21, 1-22	DAM1R
1-22	DAM2R
1-22	DAM3R
	Subroutines
1-23, 1-24, 1-25	FRAM78
1-25	DRTRC
1-25	VOLSUB
1-26	LOADSUB
1-26	FRDAT

Common error message

Message: "Wrong ship number on data sheet x"

The *ship number* on each data sheet must be the same as on data sheet 1.

Free format reading

This program is used through the whole SEAKING package for reading data in free format. The "free format system" is described in the User's Guide, Volume 1. Error message refers to input no, bolded, underlined number found on the left side of each data group on data sheets.

Message: "Illegal character in input no ii"

A character not allowed in a numerical input is found. Check the input.

Message: "Error in multiplier in input no ii"

The multiplier "*" is not used correctly.

Message: "Number of numbers wrong in input no ii"

Compare input data with the data sheet; number of numbers in input does not agree with the data sheet.

Program HULL74

Message: "Too many data in hull form"

Message: "Too many data in hull form decrease number of values with at least ii"

Number of data on data sheets 1 - 4 exceeds 6000. Decrease the number of data on data sheets 1 - 4.

Message: "Error in i-values in ship contour on CL"

The column for *part no* in sheet 1 has to be 1, 2 or 3. One of these numbers is missing or wrong.

Message: "Error in input number 5, type must be =1 or 2"

In program HULL74, check if *type* =1 or 2.

Message: "Error in data for midship"

Check data for midship section, *type* =1.

Message: "Append wrong or out of sequence"

Check appendage data and the last data preceding the appendage.

Message: "Data sheet 1 or 2 out of sequence"

Check that *camber* is given for the deck.

Check that all the decks are given before the knuckle lines.

Message: "Data sheet 2, 'line no' out of sequence"

Check that *camber number* is stated for each deck point and that all the knuckle lines are after the decks.

Message: "Error in camberdata line no ii"

Check *camber* data for the line no stated.

Message: "Error in input no 12 type ii, in this case type must be =ii ii"

Check first card on data sheet 4, *type* must be =1,2 or 3.

Message: "Too many y coord on data sheet 4 for frame no xx"

This warning indicates that more y coordinates are given than number of waterlines stated. The program omits the last y coordinates and continues.

Message: "Missing y coord on sheet 4 for frame xx"

This warning indicates that there are less y coordinates than number of waterlines stated. The program continues with the missing y coord equal to the last given y coord.

Message: "Wrong line sheet 3" and followed with the line in question.

Check data sheet 3 and check if data sheet 2 and data sheet 3 are followed with one blank card.

Message: "Any errors in lines xx xx data sheet 2"

Check corresponding lines and the surrounding lines on sheet 2. For example: Error in deck number or in knuckle line number; x coordinate not increasing for the given deck or knuckle line.

Message: "Error in frame dx for given frame xx or next on data sheet 4"

X coordinate on data sheet 4 are not increasing between the **frame no** xx and the following frame.

Message: "No result saved because of serious error in input data for hull"

The hull form is not saved on disk because serious errors occurred in input data.

Message: "Number of hulldata =iii max number =nnn"

A message showing how much space is available for additional hull input.

Program STHYD

Message: "Wrong shipno data sheet sth"

Check **ship number** or the data set.

Message: "Error, i in dataset 16 on sheet sth must be between 1-4"

See data sheet sth, **i** indicates which type of calculation to be done.

Message: "Calculation for stability
 hydrostatic data
 floodable length curves
 tonnage (moulded volume)

made before is replaced by following new calculation"

Warning, the calculation has already been done.

Message: "Error too many WLS*trims, data sheet sth"

Number of WLS*trims is limited as stated in data sheet sth.

Message: "Error too many WLS stated on sheet sth"

Number of WLS for hydrostatic data is limited as stated in data sheet sth.

Message: "A reduced no of WLS and trims are allowed for asymmetric ships, see data sheet sth"

For hydrostatics calculation of asymmetric ships, number of WLS and trims is further reduced, see data sheet sth.

Message: "Error only one part may be calculated for floodable length curves"

Only one number has to be stated in line B and C for floodable length curves.

Message: "Error, too many angles data sheet sth"

Number of heeling angles on data sheet sth is limited to 15. Normally 6-10 heeling angles are sufficient.

Message: "Too many sections data sheet sth"

The number of sections exceeds the limit of 200.

Message: "Error, the set of angles is changed from the previous calculation, restart from hull form"
 After the angles of heel have been changed in the stability calculation, there is a possibility that some previous calculation is still based on the first set of angles. To avoid any possible mistake, restart from the hull form.

Message: "Error, no appendices are described"
 In this case there is no reference to hull form (dataset 18 - 21 are left blank) and no appendices given. Check input data.

Message: "Only appendices are calculated"
 Warning. No reference is made to hull form (dataset 18 - 21 are left blank) and therefore only the stated appendices are calculated.

Message: "No of sections sheet sth wrong"
 Check the input data on sheet sth data set 20 and the sequence.

Message: "Error in frame no given on sheet sth"
 This error occurs if the x coordinate connected to the given *frame number* and *dx* in the input is not increasing.

Message: "Appendices excluded for calculation of floodable length curves"
 This message says that although appendices are described they are not included in the calculation for floodable length curves.

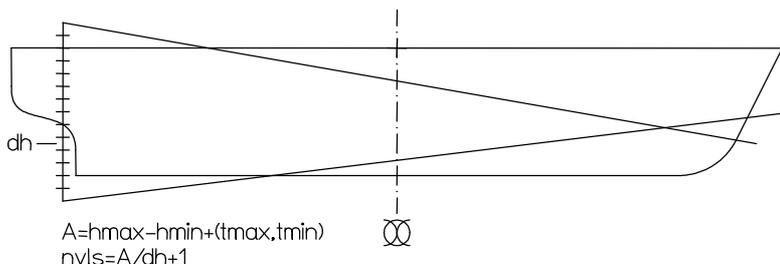
Message: "Wave length must be greater than PI x wave-height"
 Error, it is not possible to calculate the actual wave height if the wavelength is less than π * wave height. See also the error messages in subroutine group FRAM78.

Program HYDB

Message: "STHYD not properly run"
 Check if STHYD is correctly executed before this calculation is done.

Message: "Program HYDB is already calculated"
 Error, a new run is made but HYDB is already calculated for this range. The result is already saved for this calculation. If a new calculation is wanted, restart from STHYD.

Message: "In subroutine FRDAT ii WLS to be calculated while main program allows only jj WLS"
 In order to be able to calculate the frame area for trimmed positions, the total number of WLS has to be $NVLS=A/dh$. The message is given if number of WLS exceeds 300. Decrease the number of WLS or increase hmin - hmax range.



Program HYDR

Message: "DHR must be greater than 0, calculation omitted"

In input no 44, data sheet hydr, *dhr* must be stated greater than 0.

Message: "Warning, following text contains more than 40 characters xxxx text xxxx"

Max 40 characters are allowed in input 46. The program continues with 40 characters.

Message: "Hydrostatic data cannot be printed because not calculated"

The results cannot be printed because program STHYD and /or HYDB were not executed or they were abnormally ended.

Message: "Required trim outside range of calculated trims"

Requested trim on data sheet hydr must be inside the calculation range of the trim tmin - tmax on sheet sth.

Message: "hmin on data sheet sth too large"

Requested draft on sheet hydr is below calculated range hmin - hmax on data sheet sth. See comment below.

Message: "hmax on data sheet sth too small"

Requested draft on data sheet hydr is above calculated range hmin - hmax on data sheet sth.

Comment

To avoid the messages above choose the interval hmin - hmax on data sheet sth a little outside the requested interval for the hydrostatic data on data sheet hydr because the requested interval can refer to the baseline as well to the underside keel. Data sheet sth refers always to the baseline.

Warning

The results from codes 14, 15, 16, 18, 20, 26, 28, 31, 35, 36, 37 might be wrong when using the add-parameter"

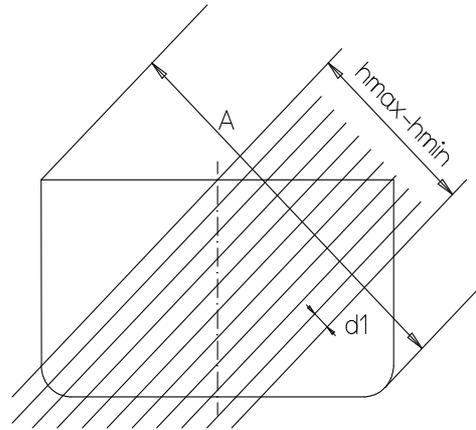
When using the add-parameter two hull forms are calculated separately at two different occasions. This means that those codes might be wrong.

Program STABB

Message: "STHYD not properly run"

Check if STHYD is correctly executed before his calculation is done.

Message: "Too small distance between calculated WL.
Give either fewer WLS or a larger hmin - hmax range"
The distance $d1$ between calculated WLS $= (h_{max} - h_{min}) / (nvl - 1)$. See data sheet sth. To enable the calculation of frame area of heeled and trimmed WL it is necessary to calculate all waterlines from the bottom to the top of the frame. The number of waterlines is $A/d1 + 2$. The above message is given if the number of waterlines exceeds 250. To avoid this, the distance $d1$ has to be increased, which can be done either be decreasing the number of waterlines (nvl) or increasing ($h_{min} - h_{max}$) in the input.



Message: "Stability data for new part added to record ii jj"

It is a facility in the program to add stability data for a number of hull forms.

Message: "Stability for even keel cannot be printed because not inside calculated range"

If *prin2* is left blank on data sheet sth, calculation data is printed for even keel and zero angle of heel. If, however, zero trim is not inside the interval $t_{min} - t_{max}$ this cannot be done.

Program STABR

Message: "STHYD not properly run"

Check if STHYD is correctly executed before this calculation is done.

Message: "Error, text in input no 48 too long, max 40 characters"

Check no of characters in the printed text, see also data sheet stb1.

Message: "More than 100 GRAIN-VCG values requested in datagroup 49"

For criteria type 10 max 100 VCG values can be used. Check input data on sheet stb1. Change the number of VCG values either by decreasing the range VCG1-VCG2 or increasing ΔVCG .

Message: "Wrong number of numbers in input 49"

Check criteria data on data sheet stb1.

Message: "No special points are given in input"

This is only a message.

Message: "More than 20 result trim on data sheet stb3"

On the data sheet stb3 the number of trims is limited to 20.

Message: "More than ii values states for wind pressure"

Max number of wind pressure are limited, see data sheet stb2.

Message: "More than ii limiting points stated for wind area"

Number of limiting points is limited, see data sheet stb2.

Message: "Input data for special condition in error"

Message: "Input-special condition line no ii in error, the condition is omitted in the calculation."
Check input no **56** (data sheet stb3), for instance $1 \leq alt \leq 3$ and if ρ_{SW} is stated either in input no **52** or on each line in input no **56**.

Message: "Too many result displacements requested on sheet stb3."
This message appears if number of displacements* number of angles exceeds 1000.

Message: "Errors in input data for prog STABR, execution terminated
This message follows one or several errors in input and the program stops.
See also the error messages in subroutine DRTRC and LOADSUB.
After the error messages, from DRTRC follows:
Displ=xxx Draft=xxx Trim=xxx Angle=xxx
If DRTRC has failed for more than 100 cases, the calculation stops with the following **message:**
"Further calculation cancelled".

Program STAB8

Message: "DRAFT-TRIM out of calculation interval"
This message appears if calculation is out of range in STABR.

Message: "Warning difference between required and calculated value for criteria no ii
required value xxx
calculated value yyy"
This message occurs when the difference between required and obtained values differ. The reason could be in very flat GZ-curve where exact maxpoint is difficult to find.

Message: "Error in code number for dataset 54"
Check print codes on data sheet stb3.

Message: "No criteria stated in input, no printout for = ii"
One **print code** is stated, which refer to data calculated from criteria.

Message: "No points stated in input for flooding-calc"
Self explaining.

Message: "Outside calculation range of angle of heel in subroutine STABV"
Criteria on data sheet stb1 are specified for angle(s) outside the calculation range of heeling angles.

Program HYDFL

Message: "STHYD not properly run"
Check if STHYD is correctly executed before this calculation is done.

Message: "Program HYDFL is already calculated"
Error, a new run is made but HYDFL is already calculated for this range and the result is already saved.
If a new calculation is wanted, it should be restarted from STHYD.

Program SUBD

Message: "Wrong no of numbers in data 71 xxx xxx xxx xxx"
Check input **71** on data sheet floodl.

Message: "Too many perm in inputdata"
The number of permeability on sheet floodl is limited to 10.

Message: "Perm not stated in decreasing order"
Permeability have to be given in decreasing order as stated in data sheet floodl.

Message: "Too many cond"
The number of conditions on sheet floodl is limited to 10.

Program LAUNCH

Message: "Launching calculation cannot be made because hydr data not calculated"
Calculation cannot be performed because the program STHYD and/or HYDB are not executed or ended abnormally.

Message: "More than 10 forces stated"
Number of *dragging forces* is limited to 10.

Message: "Force no ii contains more than 10 changes"
Maximum no of changes for one *dragging force* =10.

Message: "Calculation omitted because of error in inputdata"
If errors are found in input data no calculation is performed.

Message: "The ship has not stopped after ii steps and trav =xx"
If number of steps exceeds 1000 in the speed calculation the calculation is stopped.
See also messages in subroutine DRTRC.

Program HVOL

Message: "STHYD not properly run"
Check if STHYD is correctly executed before this calculated is done.

Message: "Program HVOL is already calculated"
Error, a new run is made but HVOL is already calculated for this range and the result is already saved. If a new calculation is wanted, it should be restarted from STHYD.

Program TONN

Message: "Error in I-value data sheet tonn2"
Check input no 81 on data sheet tonn2. $1 \leq i \leq 3$.

Message: "Error in NC on data sheet tonn2"
Check input no 81 data sheet tonn2 no of cards.

Message: "Error in stated type on sheet tonn2"
Check input no 82 on data sheet tonn2. $1 \leq type \leq 4$.

Message: "Neg diam stated for elem no ii"
Check stated diameters for element printed in the error message in input no 82 data sheet tonn2.

Message: "Neg area stated for elem no ii"
Check stated areas for element printed in the error message in input no 82 data sheet tonn2.

Message: "B and/or H neg value"
Check B and H values for *type* =4 in input no 82.

Message: "item no ii sequence no jj is omitted"
All errors are followed with this message.

Message: "Outside range of the table appendix 2".

Program BONJ

Message: "N. B. shellplate is included in the result"
Warning, if the hull form is described including shellplate (i.e. shellplate < 0), the shellplate is not subtracted from the contour.

Message: "Error in data 42, ID=ii"
Check input no 42 data sheet 12. $1 \leq id \leq 3$.
See also messages in subroutine FRAME.

Program VOL1

Message: "End reading room data, total calc sect =xx"
The last compartment is to be followed with at least one extra blank line. When this line is read, the program stops reading and gives this message.

Message: "All tables are deleted"
This messages appears if *delt* =1 on data sheet 6. After this message it's impossible to refer to any earlier bulkhead tables.

Message: "All comp are deleted"
This message appears if *delc* =1 on data sheet 6. After this message it's impossible to refer to any earlier given compartments in any calculation.

Message: "All comp-sections are deleted"
This message appears if *dels* =1 on data sheet 6. After this message the following programs can not use or refer to the sections of earlier defined compartments.
Therefore, programs CVOL, SOUND, and VOLLC have to be run before these sections are deleted.

Message: "Table no ii altered"
This message is printed when a new table is stated with the same no as previously described table, which is now replaced.

Message: "Comp no ii altered"
The same as for the tables above.

Message: "Table no ii must be gt 10 and le 10000"
Check table no. $10 < no < 10000$

Message: "Table no ii has not as odd number of numbers"
This message means that input number 31 should always consist of odd number of numbers (table no + n-lines of $(y+z)=1+2*n$). All coordinates must be stated, zeroes can not be replaced with blanks.

Message: "More than 30 lines for table ii"
Maximum number of lines allowed for each table is 30.

Message: "Number of table-data exceeds 2000"
Check input, number of data for the tables is limited to 2000.

Message: "Number of tables exceeds 200"
Check input, more than 200 tables are not allowed.

Message: "Table ii is therefore omitted"
The above stated error-messages are followed by this message.

Message: "Tables above are stored on disk and need not be read at eventual rerunning"
In the next execution of VOL1 only new or corrected tables need to be run.

Message: "No compt are read"
Check input for compartments, there are probably too many blank lines somewhere or all compartments are wrong.

Message: "No of compts exceeds 200"
Number of compartments in the program is limited to 200.

Message: "Error type=i for comp no jj"
Type of data sheet 7 must be between 1 and 6.

Message: "Error, no of added compts must be less than 8 compt jj"
Maximum 7 compartments can be included or excluded.

Message: "Number of numbers wrong in input no 33"
Check number of input data for input no 33 for the type in question.

Message: "Blank line out of sequence"
In definition of compartments on data sheet 7, a bank line is out of sequence.

Message: "The aft end forward the fore end"
The longitudinal coordinates must be increasing (described from aft to fore end) for each part. In this case the fore end of the part is described before the aft end.

Message: "Bulkh does not extend enough longitudinally"
Check the data sheet 7:3, **frame no** for tables must be outside or equal to **frame no** for compartment.

Message: "Error in deck no"
Deck no is not stated or negative.

Message: "Error in number of cuts"
Check input data (**no of cuts** =0).

Message: "Number of cuts not odd - one cut is added see comp ii"
Number of cuts in data sheet 7 column 6, which has to be calculated, has to be odd because the Simpson's first rule is used. If that number is even, the program adds one more cut automatically.

Message: "Error in perm"
Check the input data (**perm** > 1.0).

Message: "Number of numbers wrong in input no 35"
Check input no 35 for actual type of compartment.

Message: "Compt no ii bulkh no jj missed or incorrect"
Check description of longitudinal bulkheads, program cannot find the printed bulkhead.

Message: "Compt no xx table no yy is not a bulkhead"
Number of the bulkhead table referred to in the compartment definition is not defined as a bulkhead table.

Message: "Compt no ii tables j1 j2 are of different types"
The interpolation between differently described types of compartments is not possible. Check the input data.

Message: "Compt no ii interp between table xx and yy no of points in these tables do not agree"
As the description of procedure for bulkhead interpolation on data sheet 6 requires, two bulkhead tables must have the same number of points.

Message: "Compt no ii tables j1 and j2 must have the same sign and the input SB/P must be the same for both tables".
For elliptic sections the tables must agree in description. Check input data, data sheet 6:3.

Message: "Compt no ii for tables j1 and j2 YMAX must either be given for both tables or left blank for both tables"
See data sheet 6:3, the description for both tables has to be done the same way.

Message: "Mixed types of tables for compt no ii"
One table without connection with hull form *type* =1 cannot be mixed with a table connected to hull form, see User's Guide.

Message: "Compt. type 4 or 5 is to be followed by a blank card"
This message is printed only if errors are found in input. It is only necessary with a blank card but recommended when checking the input data.

Message: "Error compt no ii the input SB/P is wrong"
The input *SB/P* must be between 0 and 2.

Message: "Error compt no ii R1 must be greater than R3"
It is not possible to have radius *R3* greater than *R1*. Check input data sheet 7:6.

Message: "Error compt no ii P1 must be aft or portside and P2 fore or starboard"
The description of a cylinder must go from aft to fore or from portside to starboard.

Message: "Error, the centreline for the compt no ii must be in either longitudinal or transverse direction"
Check input in data sheet 7:6.

Message: "Error, the transverse compt no ii must have equal endpoints"
Check input in data sheet 7:6.

Message: "No input data for comp no ii"
The compartment stated above is referred to by a reflected or moved compt., but program can not find the wanted compt. This compartment must be defined before referring to it.

Message: "Compt no ii is therefore omitted"
Program shows this message after the diagnostic error message, when the program is unable to finish the calculation of this compartment. The program continues with the next compartment. The omitted compartments have to run again after correction.

Program VOL2

Message: "Error in comp ii section jj first and last point on SB and P contour must coincide"

If two bulkhead tables are not connected to the hull form, the first and the last point in both tables must coincide.

Message: "More than 20 intersections between contour and bulkhead"

No of intersections between stated bulkhead table and the compartment contour exceeds 20, which is not allowed. Probably an error in input.

Message: "The bulkhead was moved temporarily by (DY=YY, DZ=ZZZ) to get proper intersections for compt ii and section jj"

Depending on computer accuracy and rounding off, problem might occur when calculating an intersection. This is solved by moving the bulkhead slightly.

Message: "The bulkhead was moved 10 times (in total by DY=YYY, DZ=ZZZ), but still it was impossible to get proper intersections. Advice: check input data!"

See the comment above, however, in this case the problem was not solved. Check input and the contour.

Message: "Error in comp ii section jj. Comp is omitted"

Message: "The mothercomp ii is not calc in VOL2 and therefore comp no jj is omitted"

If a moved reflected compartment refers to a compartment (mothercomp) that is not calculated, no calculation can be performed.

See also the error message in subroutine FRAM78.

Program CVOL

Message: "No input data for comp no xx"

The compartment to be calculated is not defined or has not been run properly by the program VOL1 and VOL2.

Message: "Serious error, saved compts cannot be found"

Check execution sequence and that all steps terminated normally.

Message: "Error in compt data, compt height is grt than 400000"

The height of the comp exceeds 400000 units. There are two possibilities:

1. Input error
2. Used units are too small

Message: "Distw data sheet 7a too small"

The allocated space for the table giving volumes and centres of gravity is limited to 100 levels.

Message: "Perm for next compt gt 1, perm =xxx"

Self-explanatory. The program continues with the given permeability.

Message: "Wrong perm given both on datash 7 and 7a calc made for the prod of these perms for comp ii"

As stated in data sheet 7a, *permeability* must be given either on data sheet 7 or 7a.

See also the error messages in subroutine FRDAT and VOLSUB.

Program VOLLC

Message: "Stability must be calculated first"

Before executing the program VOLLC the user should have run the programs STHYD and STABB. See the flowchart of the complete system.

Message: "Perm greater than 1 in compartment xx"

Self-explanatory. The program continues the calculation with the given *permeability*.

Message: "Volume greater than 3000000"

The volume of the compartment exceeds 3000000 units. There are two possibilities.

1. Input error
 2. Used units are too small. For example mm³.
- See also the error messages in subroutine FRDAT and VOLSUB.

Program SOUND

Message: "No input data for comp no xx"

The program to be calculated is not defined or has not been run properly by the program VOL1 and VOL2.

Message: "Serious error, saved compts cannot be found"

Check the execution sequence and that all steps are terminated normally.

Message: "Error, comp ii no of point on pipe exceeds 15"

For describing the sounding pipe or defining the ullage table max allowed no of points is 15.

Message: "Error in dataset 43"

See dataset **43**, data sheet 7b. At least 3 multipliers should be stated.

Message: "No of text lines ii exceeds max no =12"

No of text lines is limited to 12 for "Heading text for the sounding-ullage-tables".

Message: "Because of error in input data calc is omitted"

Because of input errors the program is not able to finish the calculations and the message is printed.

Message: "Permeability greater than 1"

Self-explanatory. The program continues with the given *permeability*.

Message: "Wrong perm given both on data sheet 7 and 7b calc made for the prod of these perms for comp ii"

As stated in data sheet 7b, *permeability* must be given either on data sheet 7 or 7b.

Message: "Negative volume compartment xx"

Warning. The calculated volume is negative. The reason can be that a negative described part is bigger than a corresponding positive part at any level.

See also the error messages in subroutine VOLSUB.

Program GRAIN and GRAINL

Message: "No input for comp no xx"

The compartment to be calculated is not defined or has not been run properly by the program VOL1 and VOL2.

Message: "Perm gt 1 in compartment xx"

Self-explanatory. The program continues the calculation with the given *permeability*.

Message: "Error in grain compartment geometry specification

comp no =ii section no =jj ullage =xx

coordinates of compartments in error are

y z
yy zz
yy zz
yy zz
yy zz

Check the description if actual compartment.

Message: "Too small value on dist. in input"

The distance between the different levels is such that number of levels exceeds the maximum of 200.

See also the error message in subroutine FRDAT and VOLSUB.

Program DAM1

Message: "Stability calculation must be done first"

Programs STHYD, STABB and VOLLC must be run before any damage calculation can be made.

Message: "Warning, more than 25 textlines"

No of text lines is limited to 25, see data sheet Dm1, dataset 17.

Message: "Error number of input not correct in datagroup 61 or 62

xxx xxx xxx xxx xxx"

Check the printed data with dataset 61 and 62 on data sheet Dm2.

Message: "Error, cond ii refers to cond jj which is not found"

On data sheet Dm2 dataset 62 variable m is stated. The actual condition refers to condition *m* (for including liquids), but this is not found. This means that either condition *m* is not calculated or that it is a typing error.

Message: "Too many compts with liquid cargo in load cond ii"

Check number of compts with liquid cargo data sheet Dm2. That also means compts included from other conditions. Max number of compts =30.

Message: "Room with liquid no xxx is not calculated"

The compartment is not defined or it has not been run properly by the program VOL1, VOL2 and VOLLC.

Message: "Error for load no ii compt no jj is calc only to SB/PS side"

This message appears if the compartment is not calculated in the direction in which the heeling calculation is requested.

Message: "Percent or fraction for fluid cargo wrong, compt no ii"

See data sheet Dm2 dataset 64.

If *fraction* stated $-1 \leq \textit{fraction} \leq 0$

If *%filling* stated $0 \leq \textit{\%filling} \leq 100$

Message: "Warning for compt no xx diff in calc of volume from weight and perc fill is greater than 5 percent"

This difference in volume might depend on input errors or that expected compt volume and the volume calc by SEAKING do not agree.

Message: "Too much liquid given on data sheet Dm2 for comp xx"

This message is given if the volume given on data sheet Dm2 is larger than the total volume calculated in programs VOL1, VOL2 and VOLLC. The density of the liquid is modified in such a way that the volume of the liquid corresponds to the total volume of the compartment; this is followed with the

message:

"The density for this comp is altered to xx"

Message: "Error in condition no ii"

This message follows error message stated earlier and the condition is omitted.

Message: "Error too many load cond stated"

No of loading conditions stated in dataset 71, on data sheet Dm3, is limited to 20.

Message: "Error damage case xx too many damaged compts stated"

No of damaged compts given on data sheet Dm3 dataset 72 is limited to 15.

Message: "Error, Mix =ii must be =0-3"

Error, the *mix* factor must be between 0 and 3. See data sheet Dm3.

Message: "No of flood stages not stated"

The *flooding stage* factor must be given either on data sheet Dm1, input no 12 or data sheet Dm3, input no 74, check input.

Message: "No of flood stages exceeds 11"

Check *no of flooding stages*, the total *no of flooding stages* is limited to 11.

Message: "Damaged room xx is not calculated"

The compartment is not defined or has not been run by the programs VOL1, VOL2 and VOLLC.

Message: "Damaged room ii not VOLLC-calc"

The compartment is not calculated by the program VOLLC.

Message: "Error, in dam case xx, SB/P =ii but compt jj is only calculated to SB/PS"

Requirement for the heeling in damage case and the calculated direction for the compt do not agree.

Check *SB/P* in data set 71 sheet Dm3 and check also heeling directions for the compt wanted (VOLLC).

Message: "Error in code datagroup 76 xx xx xx xx"

Only a few codes are allowed. Check the printed line with the description of data set 76.

Message: "Error, it is not allowed to refer to the same type more than once xx xx xx xx"

When using *codes* 1 and 2 dataset 76 it is not allowed to refer to the same type of points more than once.

Check stated input with the printed line.

Message: "Error type ii must be between 1 and jj"

The *type* of points is limited to 10.

Message: "Comp ii stated for progressive flooding must be given as damaged"
All compts stated for progressive flooding must be given also in dataset 72.

Message: "Error, this code is only valid for the passenger version xx xx xx xx"
Check the printed input because the stated code can only be used when running the passenger version.

Message: "Error in damage case no xx"
Message when errors are found in a damage case. No further calc is made for this case.
See also error messages in subroutine DRTRC.

Program DAM2

Message: "Error, if progressive flooding is used KG must be given, dam case xx load cond ii"
If calculation of progressive flooding is requested, KG must be given for the requested loading condition.

Message: "Attempt no ii to find final floating pos DR, TR =xx yy"

In order to find the final floating position, the program does an iteration, which consists of filling the water in to the outer water level, calculate the new draft-trim position, fill the water in again and so on. The iteration proceeds until the difference between two iteration steps is smaller than a fixed value. If this iteration exceeds 45 steps, the message above is written for the steps between 45 and 50.

Hereafter the program terminates with the following comment:

"Draft, trim-diff after 50 attempts for dam no: ii, load no jj, angle =xx"

See also the error messages in subroutine DRTRC.

Program DAM3

Message: "Error type-no for points must not exceed ii"
Types of points are limited to 10. Check data sheet Dm4.

Message: "Error data sheet Dm5, too many criteria items"
Check total no of criteria data, max no is equal to 300.

Message: "Error, criteria set ii not defined on sheet Dm5"
One damage case refers to a criteria set that is not defined. Check damage cases sheet Dm3 and sheet Dm5.

Message: "Error, the point number for excl/incl points of type ii are wrong for damage case jj"
The point numbers for excl/incl according to data sheet Dm3 do not correspond to point numbers on data sheet Dm4.

Message: "Dam no ii load no jj is not complete calc due to outside range for stab calc or that the ship is sinking"
In calculation of a floating position, the ship left the draft-trim range, defined on data sheet sth, for at least one angle of heel. If the ship is sinking this is expected. It is recommended that the range for draft and trim on data sheet sth is so wide, that if calculation leaves this range, the damage case becomes unacceptable.

Message: "The ship is sinking (outside calc range)"
It is not possible to calculate a GZ curve if successful calculation is made for less than 3 angles hence no further evaluation is made.

Message: "Heeling to PS/SB for following stage"

This is a warning. The ship is heeling in the opposite direction in this flooding stage than requested in the calculation.

Message: "Warning, for the following flooding stages the ship is heeling to PS/SB, flooding stages i1 i2 i3"

See the comment above. If the criteria evaluation is requested, the following warning is also printed:
"In this case criteria evaluation is not correct"

Program DAM4

Message: "Error no of load/dam-cases must be gt than 1 and le than total no of load/dam-cases"

Probably no of cases or too many cases are stated in data set **102** or **103** on data sheet Dm6. Check input.

Message: "Error following load/dam-case stated in input is not calc =xx"

One of the cases stated in data set **102** or **103** is not calculated or saved. Check input.

Message: "Error, stated code ii is not allowed"

Check *print codes* in data set **104**, data sheet Dm6.

Message: "Because of errors in input execution terminated"

Errors have occurred in input and therefore the execution does not continue.

Subroutine group FRAM78

Subroutine frame (parabolas)

Message: "The CL contour not given for frame xxx, the section is omitted in calculation"

The centreline contour on data sheet 1 must be given at least for the part of the ship that is calculated. The section is omitted, see comment.

Message: "Deck no xxx not given for frame xxx. The section is omitted in calc"

Deck number is not defined for this frame and x coordinate on data sheet 2. The section is omitted, see comment.

Comment

The calculation is continued after this message with the section calculated as a zero section. This means that the accuracy of the results has to be checked.

Message: "Frame contour from CL for frame no xx is not of the same type"

In this case the bottom part of the frames are described from CL data sheet 1 input no **5** in program HULL74, and the frame aft resp. forward the calc frame are not of the same type. This means that only the CL is interpolated from the description not the bottom part.

Message: "Interpolation for frame no xx is made for ii points from frame contour described from CL"

In this case the bottom part of the frames is described from CL data sheet 1 input no **5** in program HULL74, and the frame aft resp. forward the calc frame are not described with the same number of points. Therefore the interpolation is made only for the number of points stated in the message.

The following warning with reading appears for sections where one or more points are omitted:

Message: "Warning! These points are not used for frame =fff (x =xxx)

YK ZK LTYP LNR REASON"

where YK and ZK are y and z coordinates of the point

LTYP - type of point
LTYP =1, 2, 3 1,2 and 3 intersection with CL
LTYP =10, 12 deck points
 10 normal deck corner
 12 all WLS below this deck corner are omitted to the next knuckle
LTYP =20, 21, 22 knuckle points
 20 normal knuckle
 21 knuckle treated as WL
 22 corresponds to 12
LTYP =30 normal WL

LNR - line number
 For decks and knuckles the same number as stated in input.
 For waterlines the sequential number +100.
 For centreline point sequential number +1000.

REASON

“Waterline below knuckle type 2”¹⁾
 As data sheet 2 states, all WLS below a deck or knuckle type 2 are omitted to the next knuckle.

“Below centreline point”²⁾
 A knuckle is described below the centreline and is therefore omitted.

“Above deckpoint”²⁾
 A knuckle is described above referred deck and is therefore omitted.

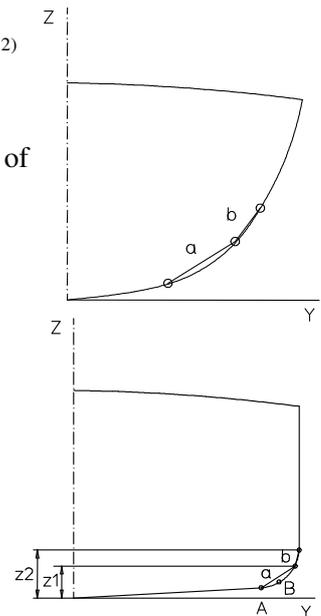
“Too close to nearest point”²⁾
 One point is omitted if it is too close to another point.

“Same y coordinate”¹⁾
 If more than two succeeding points have the same y coordinate, all points between are omitted.

“Bad space for interpolation frame xxx, Z =xxx, xxx, xxx Y =xxx, xxx, xxx”²⁾
 The message prints three sequential points between, which there is no possibility to interpolate the curve. This depends on the spacing between the points. An acceptable spacing is $1/3 \leq a/b \leq 3$. Straight lines are used instead of a curve.

“Bad spacing between the bottom and first WLS for frame xxx the parabola gives decreasing z coordinate”²⁾
 This corresponds to the same case as above but for the first three points. Two things have to be taken care of.

1. If the frame is very near to the straight line between A and B, give B as a knuckle line instead of A.
2. It is recommended to give the first waterline a level lower than half of the distance to the second waterline. Depending on the hull form, $z1/z2$ could be between 0.3 and 0.4.



“For section at X =xxx, interpolation between camber xxx and camber xxx not possible”
 As shown on the sketches on the data sheet 3, it is possible to give different camber forms and interpolate between these. It is a requirement that the number of defining points in both cambers is the same.

“Section at $X = xxx$, H given in camber so neg. hatch xxx units”.

The deck corner D on data sheet 2 and the height H on data sheet 3 are defined in such values that the hatch does not exist or in fact is negative.

“Interpolated point for section fr no =xx y=yy z=zz the point is corrected to $y = B/2 = BB$ ”

This message says that the breadth at the stated point is bigger than the max. breadth stated on data sheet 1. The program continues with the breadth corrected to max. breadth.

1) This message is printed only if requested (print=1)

2) This message can be omitted if print =-2

Subroutine DRTRC

Message: “The condition is outside calc. range for stability”

Message: “The condition is outside calc. range stated on sheet 1”

Message: “Below lowest calculated draft”

Message: “Above highest calculated draft”

Message: “Below lowest calculated trim”

Message: “Above highest calculated trim”

This message appears when position of the ship is outside the range of min and max draft and trim defined in data sheet sth. It is important to notice that the ship can be inside the range in unheeled position and outside the range when heeling. The sketch explains the definition of calculation range at an angle of heel on data sheet sth. Also when heeling, the ship gets a trimmed position which has to be predicted by defining the calculation range with trim.

Message: “Iter of draft trim does not converg”

Iteration that is not converging can be caused by different reasons, which cannot be explained generally. Check the input carefully.

Message: “DRPJ =0 not possible to calc the ship-equilibrium or probably outside calc range for stability/stated on sheet 1”

Message: “WL outside ship or in a discontinuous part”

WLS are probably outside the ship because the difference between displacements is zero. Check the input carefully.

Subroutine group VOLSUB

The following error messages are printed only for compartments, which refer to the other compartments.

Message: “Error, compt no ii refer to compt no jj which is not calc”

All referred compts must be calculated before the actual compt is calculated. Check the messages from compt ii or jj at execution of VOL1 and VOL2. At rerunning both compt ii and jj must be included.

Sometimes this message is followed with:

Message: “Program VOL2 is not executed correctly”

This means that compt jj is in error. See the comment before.

Message: “Error, compt no ii refers to compt no jj which refers to another compt”

It is not allowed to refer to compts, which refer to other compts.

Subroutine group LOADSUB

The following error messages are printed when reading compartments containing fluid cargo.

Message: "Too many compts with liquid cargo in load cond ii"

Check in main program how many compts are allowed.

Message: "Room with liquid no ii is not calculated"

Compt must be correctly calculated by VOL1 - VOL2 - VOLLC before running actual program.

Message: "Error for load no ii compt no ii is calc only to SB/PS"

The heeling direction of the condition and compartment do not agree. For example, if condition requires heeling to portside, the VOLLC calculation for that compt has also to be done to portside.

Message: "Percent or fraction for fluid cargo wrong, compt no ii"

Check that the *percentage of filling* is between 0 and 100%.

Message: "Warning for compt no ii

diff in calc of volume from weight and perc fill is greater than 5 percent"

If all *weight*, *density* and *%filling* are stated, the volume of the cargo can be obtained in two ways and if the difference is too big this warning is printed. Check volume of compt and the actual input.

Message: "Too much liquid given on data sheet 9 for comp xx"

This message is given if the volume given on data sheet 9 is larger than the total volume calculated in the programs VOL1, VOL2 and VOLLC. The density of the liquid is modified in such a way that the volume of the liquid corresponds to the total volume of the compartment.

This message is followed with:

Message: "The density for this comp is altered to xx" after which the program continues.

Subroutine FRDAT

Message: "In subroutine FRDAT iii WLS to be calc main program allows only jjj WLS"

Check max number of WLS in the main program.

1.6 Execution sequence

Hull form description

- HULL74 data sheet 1-4

Hydrostatic tables

- STHYD data sheet sth
- HYDB
- HYDR data sheet hydr

Intact stability

- STHYD data sheet sth
- STABB
- VOL1 data sheets 6-7
- VOL2
- VOLLC for input see "Capacity calculations"
- VOL1, VOL2, VOLLC are executed only if STABR requests data sheet lcond
- STABR data sheets stb1, stb2, stb3 and lcond
- STAB8

Bon Jean data

- BONJ data sheet bonj

Launching calculation

- STHYD data sheet sth
- HYDB
- LAUNCH data sheet launch

Floodable length curves

- STHYD data sheet sth
- HYDFL
- SUBD data sheet floodl

Compartment definition

- VOL1 data sheets 6, 7
- VOL2

Capacity calculations

- CVOL data sheet cvol (calculation for 0-trim 0-heel)
- SOUND data sheet sound
- VOLLC this program stores on disc volumes and c.o.g. of compartments to be used by other programs. Input file has only one line: *i1 0 0 i2*
 - i1* =0 print volume and c.o.g. for various levels and angles of heel (one page per tank)
 - i1* =2 print volume and c.o.g. for full tank only (one line per tank)
 - i2* =0 calculate to SB only
 - i2* =1 calculate to SB and PS

Grain calculation

- GRAIN1 data sheets grain1, grain1a, grain2
- GRAIN2 two blank lines

Tonnage calculation

- STHYD data sheet sth (omitted if volume of hull is known)
- HVOL
- VOL1 data sheets 6, 7 (omitted if volume of cargo spaces is known)
- VOL2
- CVOL data sheet cvol
- TONN data sheet tonn1, tonn2

Damage stability

- STHYD data sheet sth
- STABB
- VOL1 data sheets 6, 7
- VOL2
- VOLLC for input see "Capacity calculations"
- DAM1 data sheets Dm1-Dm3
- DAM2
- DAM3 data sheets Dm4-Dm5
- DAM4 data sheet Dm6

Damage stability (passenger equivalent)

- STHYD data sheet sth
- STABB
- VOL1 data sheets 6, 7
- VOL2
- VOLLC for input see "Capacity calculations"
- DAM1P data sheets 8p, 9p, 10p
- DAM2P
- DAM3P data sheets Dam3p
- DAM4P data sheet Dam4p

Damage stability in real time

- STHYD data sheet sth
- STABB
- VOL1 data sheets 6, 7
- VOL2
- VOLLC for input see "Capacity calculations" (note, however, $i2 = 1$ i.e. normally $3*0 1$)
- DAM1R data sheets 8, 9, 10r
- DAM2R
- DAM3R one blank line (this may be replaced by printcode, see program description)

Loading conditions

- STHYD data sheet sth
- HYDB
- VOL1 data sheets 6-7
- VOL2
- CVOL data sheet cvol (save =1)
- STHYD data sheet sth
- STABB
- VOLLC for input see "Capacity calculations"
- PREPC data sheets cond1-cond7
- COND data sheet cond
- COFINC data sheet cond10 followed by data sheets cond1-cond14 in free sequence