

As an aid to assess the stability of a vessel loaded with bulk or grain in bulk, LOCOPIAS can be equipped with a dedicated grain/bulk loading module.

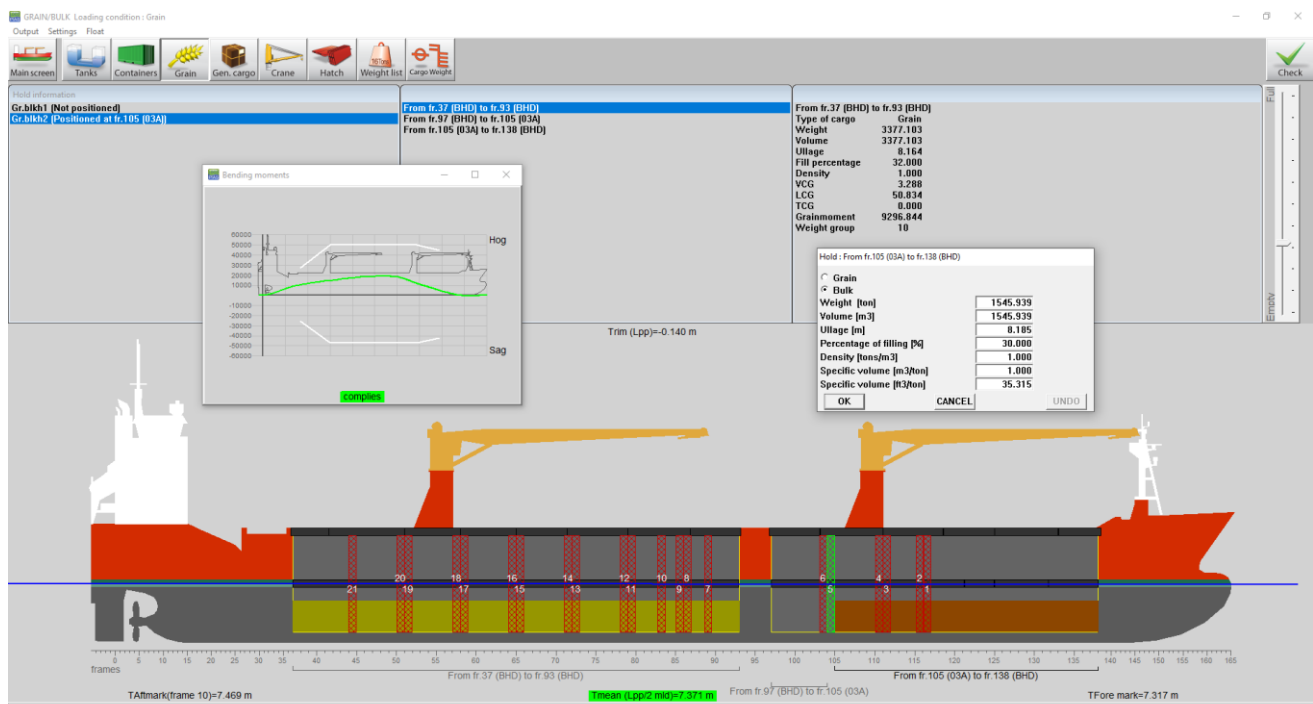
This module performs the following functions:

- Selection and positioning of moveable grain bulkheads, or tweendeck panels;
- Selection of grain holds, and filling of those holds by volume, weight, ullage or percentage;
- After the filling of the holds, the LCG, VCG and heeling moments (in case of grain) of the cargo are determined automatically;
- Verification of compliance against the relevant grain stability criteria;
- At any desired moment, stability or strength particulars can be evaluated and verified against the relevant criteria.

For grain loading the stowage and stability parameters are in accordance with the IMO *International Code for the Safe Carriage of Grain in Bulk (International Grain Code)*

The LOCOPIAS grain module can be applied for vessels with:

- Single holds or multiple holds;
- Relocatable grain bulkheads;
- Relocatable tween decks;
- Combinations of relocatable bulkheads and tween decks



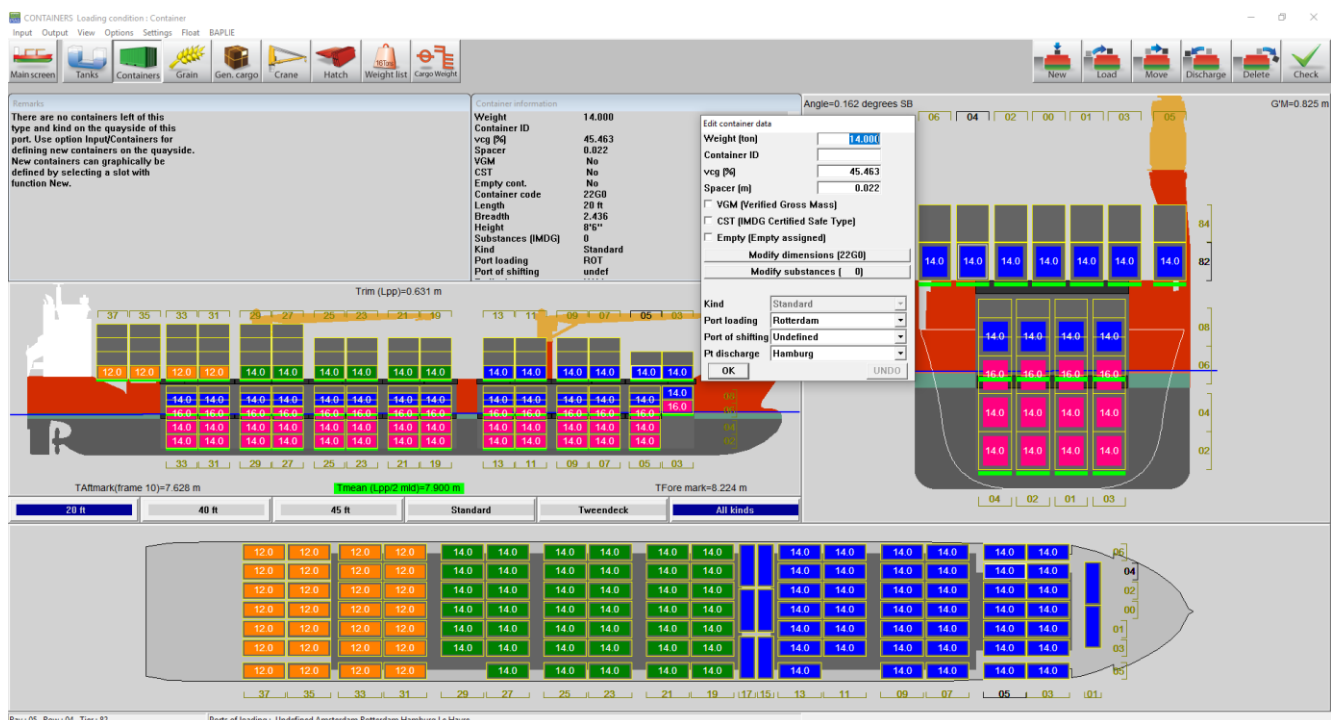
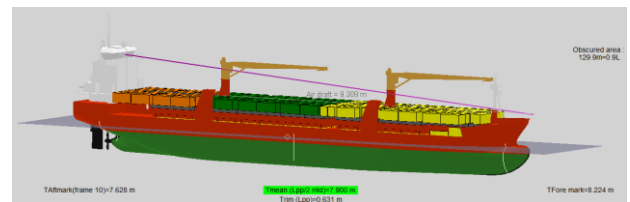
For container vessels LOCOPIAS can be equipped with a dedicated container module

This module is essential for vessels with a significant container capacity. It allows for the interactive positioning of containers of any size, and contains numerous loading options, amongst which electronic data exchange.

Some highlights of this module are:

- The module is founded upon a 3-D representation of container distribution. It allows the user to show any desired combination of rows, bays and tiers, and to work in a sequence and orientation selected by the user;
- Suitable for all kinds of containers. The module has no restrictions at all with regard to the container type (20', 30', 40', 45', 48', 52' or every other length, with random breadth and height of each container) or loading combination. (Refrigerated containers are also supported);
- Drawings and lists of container loading details, either sorted by bay, row or tier;
- At any desired moment, stability or strength particulars can be evaluated and verified against the relevant criteria

- Alarm on exceeding maximum stack load;
- Only consistent container loading is accepted. For instance, containers can only be placed where/if the slots underneath are also occupied;
- Database management functions for import and export of container data and loading conditions;
- Integrates seamlessly with LOCOPIAS *line of sight* module;
- Container cargo positioned above deck is automatically included in the calculation of the windcontour of the vessel.
- Optional IMDG module assists in the loading of dangerous cargo by real time validation against the IMDG requirements.



Dedicated LOCOPIAS module for loading and distribution of general cargo.

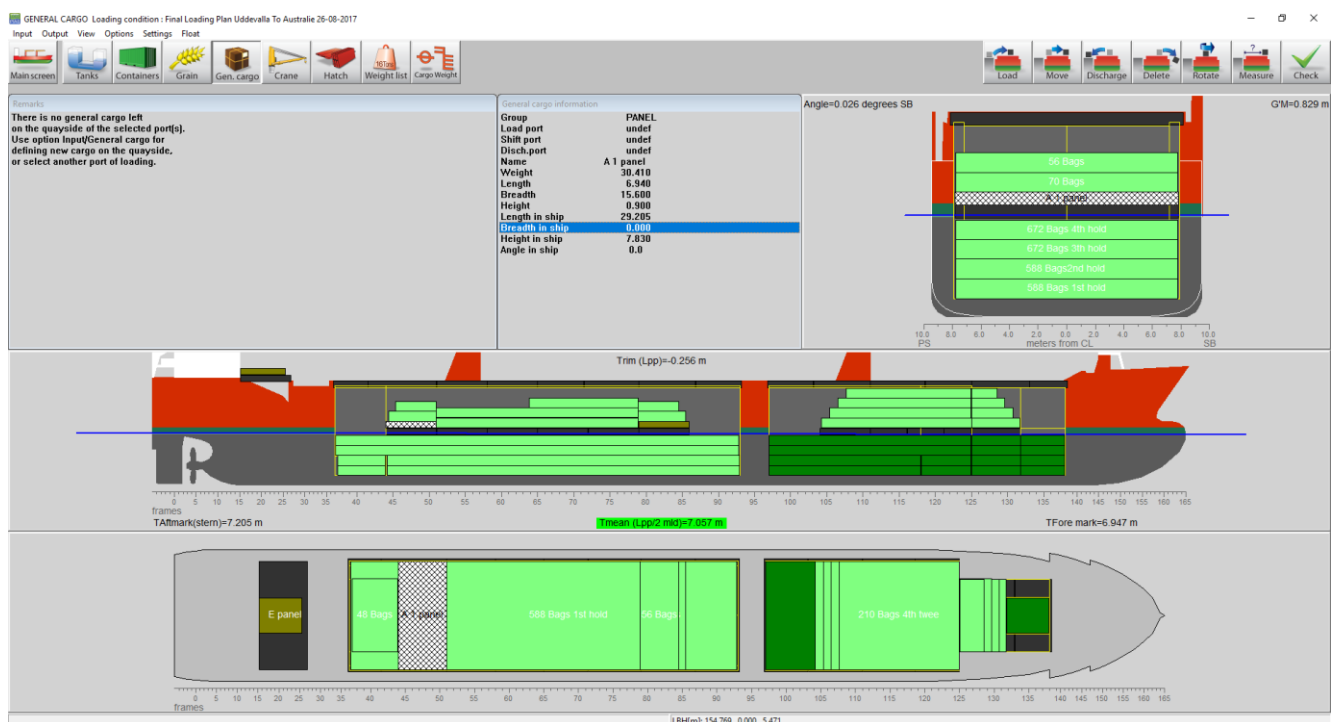
The general cargo module is intended for project cargo. The weight and centres of gravity of the general cargo are incorporated in the loading condition, and thus included in the calculation of stability, strength etc.

This module is an add-on for LOCOPIAS and is applicable for ships with general cargo capability.

- At any desired moment, stability or strength particulars can be evaluated and verified against the relevant criteria;

Some highlights of this module are:

- Cargo can be placed on any position in the vessel;
- Cargo holds and compartments used for storage are visible in all views of the vessel;
- Project cargo positioned above deck is automatically included in the calculation of the windcontour of the vessel;
- Project cargo of any dimension can be defined (LxBxH);
- Cargo can be rotated;
- A list of all cargo or a graphical cargo stowage plan on any desired horizontal section can be printed;

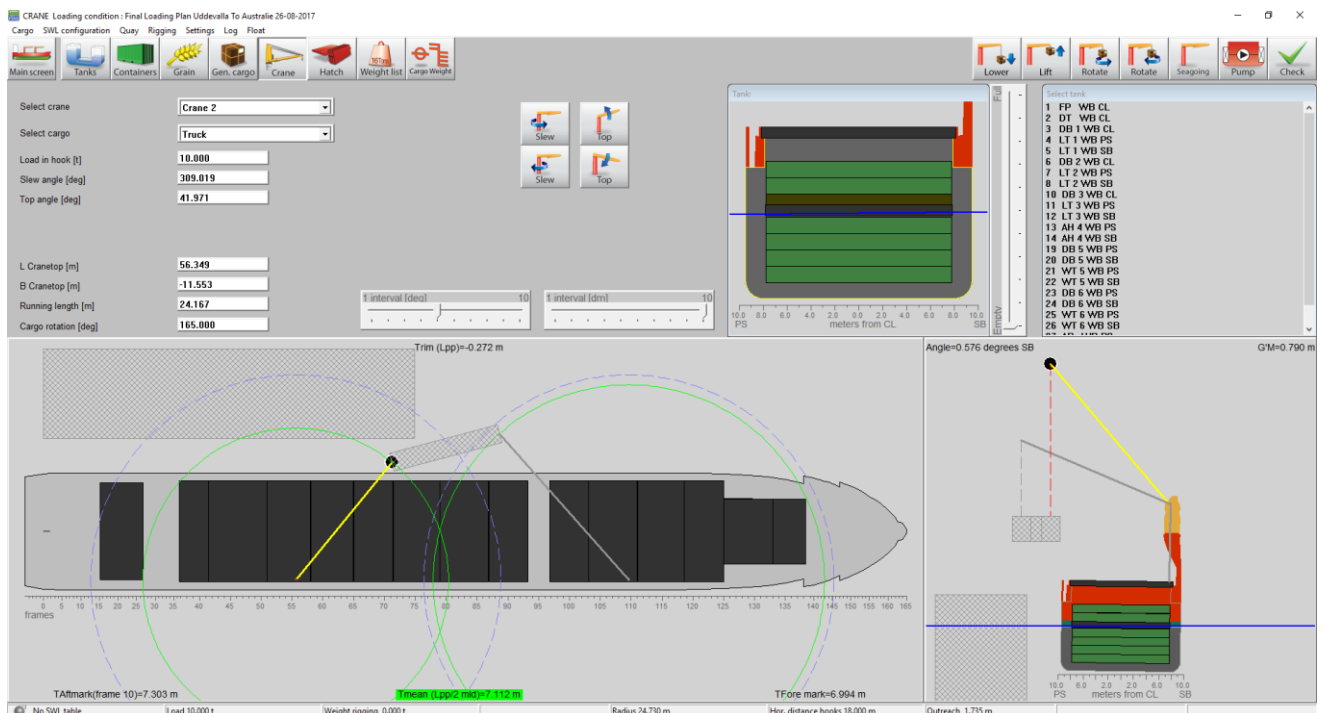


For geared vessels

The cranes module is intended for the loading of cargo with one or two (coupled) cranes. The weight and centres of gravity of the cranes and their loads are incorporated in the loading condition and loading scenarios can be created and stored.

Some highlights of this module are:

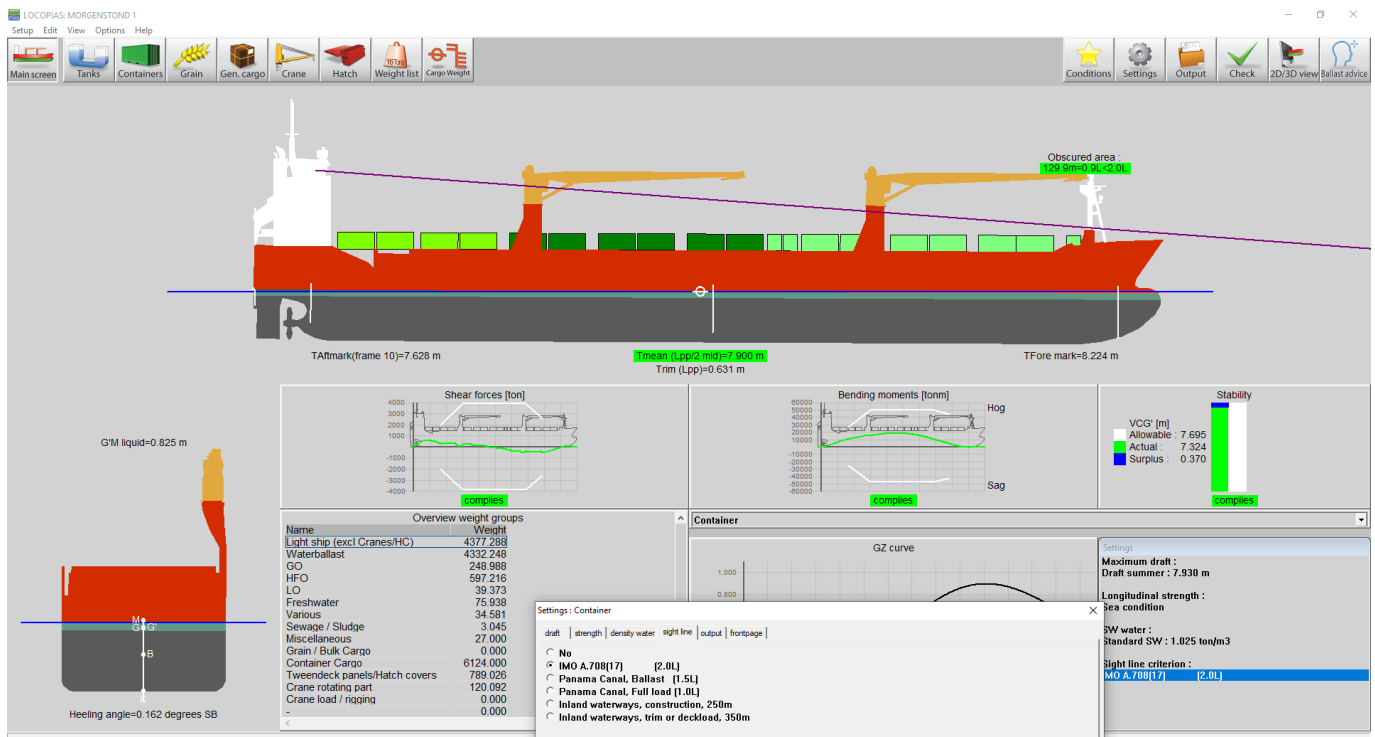
- Supports dual crane operations, also with coupled cranes;
- Supports tank counter ballasting, either by filling ballast tanks with seawater, or by pumping between two tanks.
- Instant verification of heel, trim, stability or longitudinal strength.
- Supports crawler cranes.
- Records all simulated actions (for re-assessment or replay);
- Including the effects of heeling and trim on the exact location of the hanging loads;



For all vessels, but in particular for vessels with possible deck loads (containers, general cargo).

IMO regulations stipulate criteria for the line of sight. In order to assess whether a vessel complies with these rules, LOCOPIAS is equipped with a dedicated add-on, with the following features:

- Integrated with other LOCOPIAS modules for general cargo and containers;
- Effects of fixed obstructions, such as cranes or constructions on deck, are accounted for;
- Including the effect of trim;
- Also with criteria for line of sight in Panama Canal.

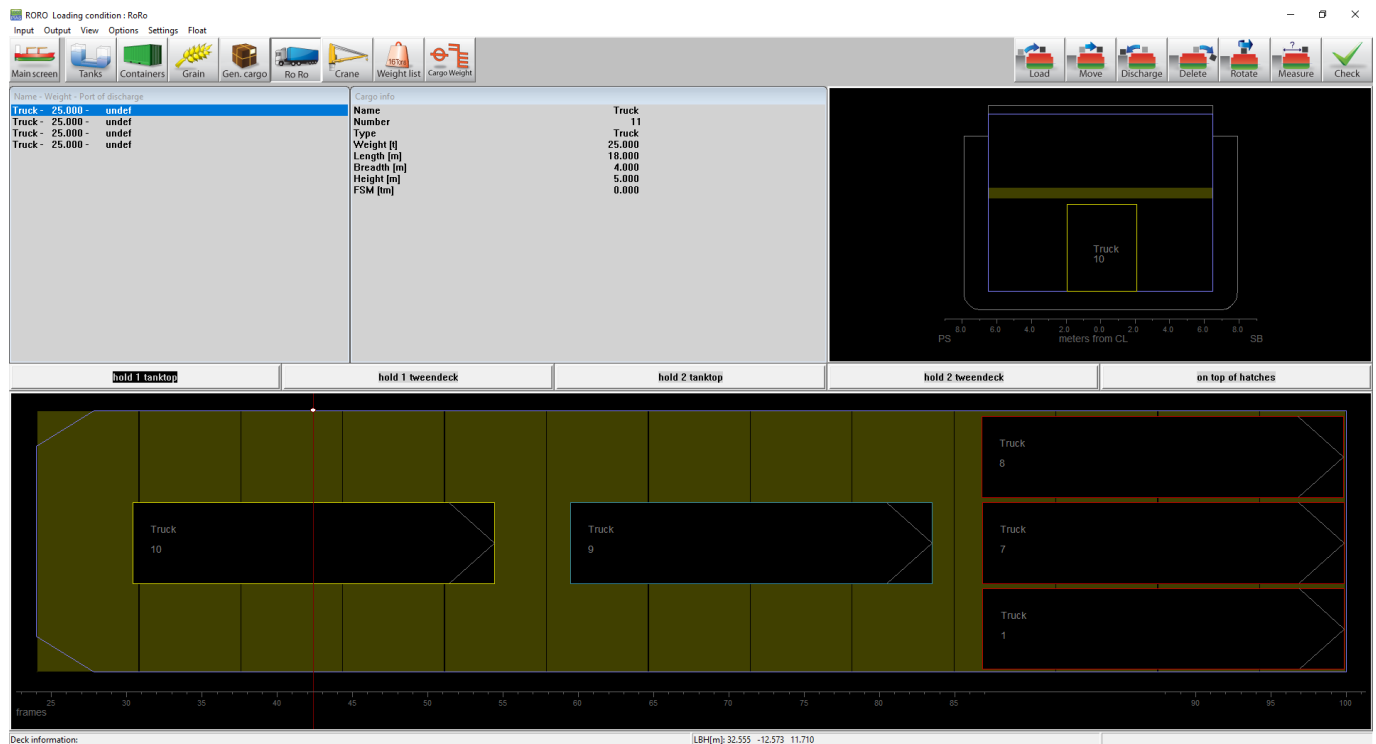


For ships with RoRo capacity

The RoRo module is intended for rolling cargo. RoRo cargo can be positioned on all defined RoRo decks. The weight and centres of gravity of the RoRo cargo are incorporated in the loading condition. RoRo cargo stowage plans and loading lists can be printed. This module is an add-on for LOCOPIAS and is applicable for vessels with RoRo capacity.

Some highlights of this module are:

- Collision checking with other (positioned) cargo, deck outline and other defined deck obstructions;
- Integrated (user maintainable) database for storage of frequent occurring cargo items. Records all intended actions (for re-assessment or replay);
- Cargo can be rotated;
- Check of available deck height and maximum deckload.
- Output of stowage plan and lists of RoRo



Calculation of actual tank contents including effects of list and trim

To be able to determine an accurate determination of the volume and weight of the tank content, LOCOPIAS can be equipped with a special tank reading module. This module has the following characteristics:

- The user can enter sounding, league, pressure, volume, weight, percentage of filling or temperature. The software determines all corresponding properties instantaneously.
- The tank geometry (rather than a pre-calculated table) is used to calculate the volume for each tank for the actual trim and heel. There is no need for additional correction tables.
- Interfaces for many tank measurement systems are available, so at each moment an exact overview of liquid content can be available, without further data entry.
- For vessels which carry petroleum products, a variety of temperature-volume correction tables is available: 54A, 54B, 54C, 55. Corrections can also be set manually. Moreover, a change in tank volume (caused by the deflection of steel under temperature fluctuations) is compensated for.
- Each collection of tank weights can serve as a basis for new loading conditions.

Choose the conversion table to be used

- ☒ No temperature correction
- ☐ Correction factor per degree
- ☐ Volume Correction Factor
- ☐ ASTM Table 54 A (crude oil)
- ☐ ASTM Table 54 B (products)
- ☐ ASTM Table 54 C (general)
- ☐ ASTM Table 55
- ☐ Mynas (bitumes)
- ☐ ASTM Table 54 A (crude oil + glass hydrometer correction)
- ☐ ASTM Table 54 B (products + glass hydrometer correction)
- ☐ ASTM Table 23 A (crude oil on basis of relative density)
- ☐ ASTM Table 23 B (products on basis of relative density)
- ☐ ASTM Table 5 A (crude oil, on basis of API density)
- ☐ ASTM Table 5 B (products, on basis of API density)

OK
SARC
PIAS
UNDO

PIAS: Sounding

Setup Help Quit

Product, temperature and density

Tank name	Cargo tank 1	fr.142-160 PS
Include this tank in ullage report		No
Product (substance)		
Conversion table	No temperature correction	
Datalink		0.000
Temperature		15.000
Volume (not corrected for expansion)		0.000
Density at 15 degrees Celcius (in air)		1.0000
Density at 15 degrees Celcius (in vacuum)		1.0011
Correction factor per degree Celcius		-
Volume Correction Factor		1.00000
Temperature Expansion factor		1.00000
Density at 15.000 degrees		1.0000
Residue On Bottom (ROB)		0.0000
Density x Temperature Expansion Factor		1.0000
Weight		0.000

W-O DEVOCEAN

OK

For ships with open deck pipe storage capacity

The pipe module is intended for vessels with open pipes as deck cargo. (f.e. offshore supply vessels). This module determines the weight of the combined pipe cargo, as well as the trapped water. The resulting weights and centers of gravity are incorporated in the loading condition.

PIPESTACK DATA
Setup Help Quit Layout holds

	Fill in the data for each pipe hold							
Name of pipestack	1 (single)	2 (single)	3 (single)	4 (single)	5 (single)	4-5 (double)	6 (single)	7 (single)
Thickness of dunnage [m] :	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
Thickness PS guidance wood [m] :	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
Thickness SB guidance wood [m] :	0.100	0.100	0.100	0.100	0.100	0.000	0.100	0.100
Pipe outside diameter [m] :	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500
Straightness tolerance factor [-] :	1.030	1.030	1.030	1.030	1.030	1.030	1.030	1.030
Joint weight [Ton] :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Stack weight [Ton] :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of joints [-] :	0	0	0	0	0	0	0	0
Required number of tiers [-] :	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mid highest full tier, (comp. max stach height) [m] :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Top highest tier, (comp. max stack height) [-] :	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Vertical Center of Gravity [-] :	30.330	30.330	30.330	30.330	30.330	30.330	30.330	30.330
Longitudinal center of gravity [m] :	208.750	194.250	179.750	159.250	143.750	151.500	125.513	83.013
Length of stack [m] :	12.900	12.900	12.900	12.900	12.900	25.800	12.900	12.900
PS boundary of stack (steel) [m] :	-37.909	-37.909	-37.909	-37.909	-37.909	-37.909	-39.028	-44.278
PS boundary of stack (wood) [m] :	-37.809	-37.809	-37.809	-37.809	-37.809	-37.809	-38.928	-44.178
SB boundary of stack (steel) [m] :	-11.908	-11.908	-11.908	-11.908	-11.908	-11.908	-12.506	-17.756
SB boundary of stack (wood) [m] :	-12.008	-12.008	-12.008	-12.008	-12.008	-11.908	-12.606	-17.856
Bottom of dunnage [m above base] :	30.030	30.030	30.030	30.030	30.030	30.030	30.030	30.030
Max Stack height [m above base] :	36.864	36.864	36.864	36.864	36.864	36.864	36.864	36.864
PS boundary of stack above wingtank (steel) [m] :	-39.856	-39.856	-39.856	-39.856	-39.856	-39.856	-40.975	-46.225
PS boundary of stack above wingtank (wood) [m] :	-39.766	-39.766	-39.766	-39.766	-39.766	-39.766	-40.885	-46.135
SB boundary of stack above wingtank (steel) [m] :	-13.855	-13.855	-13.855	-13.855	-13.855	-13.855	-14.453	-19.703
SB boundary of stack above wingtank (wood) [m] :	-13.945	-13.945	-13.945	-13.945	-13.945	-13.855	-14.543	-19.793

LOCOPIAS

Hatch module

For ships with tween deck hatches

The module keeps track of the use of those hatches, while their weights and centers of gravity are incorporated in the loading condition. Hatch module is intended for vessels with multiple tweendeck hatches, which may possibly also be used as (parts of) grain bulkheads.

Situation hatches
Copy Cut Paste Enter

Hatch	Position	Weight	LCG	TCG	VCG
A2-01-panel	H pos.06	30.410	92.532	0.000	7.369
A1-02-panel	H pos.07	30.410	85.552	0.000	7.369
A2-03-panel	H pos.08	30.410	74.559	0.000	7.369
A1-04-panel	H pos.09	30.410	67.579	0.000	7.369
A2-05-panel	H pos.10	30.410	60.599	0.000	7.369
A1-06-panel	H pos.11	30.410	53.619	0.000	7.369
A2-07-panel	H pos.12	30.410	46.639	0.000	7.369
A1-08-panel	H pos.13	30.410	39.659	0.000	7.369
A2-09-panel	H pos.14	30.410	32.679	0.000	7.369
A1-10-panel	H pos.15	30.410	25.701	0.000	7.369
B-02-panel	H pos.04	24.062	103.663	0.000	7.369
B-01-panel	H pos.05	24.258	98.569	0.000	7.369
C-panel	H pos.03	17.494	108.086	0.000	7.369
D-panel	H pos.02	20.254	113.345	0.000	7.369
E-panel	H pos.01	10.258	119.820	0.000	7.369
H1/1	H1/1 closed	20.900	120.619	0.000	13.870
H1/2	H1/2 closed	26.000	113.957	0.000	13.870
H1/3	H1/3 closed	26.800			
H1/4	H1/4 closed	28.900			
H1/5	H1/5 closed	30.200			
H1/6	H1/6 closed	26.200			
H2/1	H2/1 closed	26.200			
H2/2	H2/2 closed	30.300			
H2/3	H2/3 closed	28.500			
H2/4	H2/4 closed	25.800			
H2/5	H2/5 closed	29.400			
H2/6	H2/6 closed	26.800			
H2/7	H2/7 closed	34.700			
H2/8	H2/8 closed	28.000			

Select position
Ashore/Grainbulkhead
H pos.02
Sh-01-no.05
Sh-02-no.01
Sh-03-no.01
OK
UNDO

LOCOPIAS

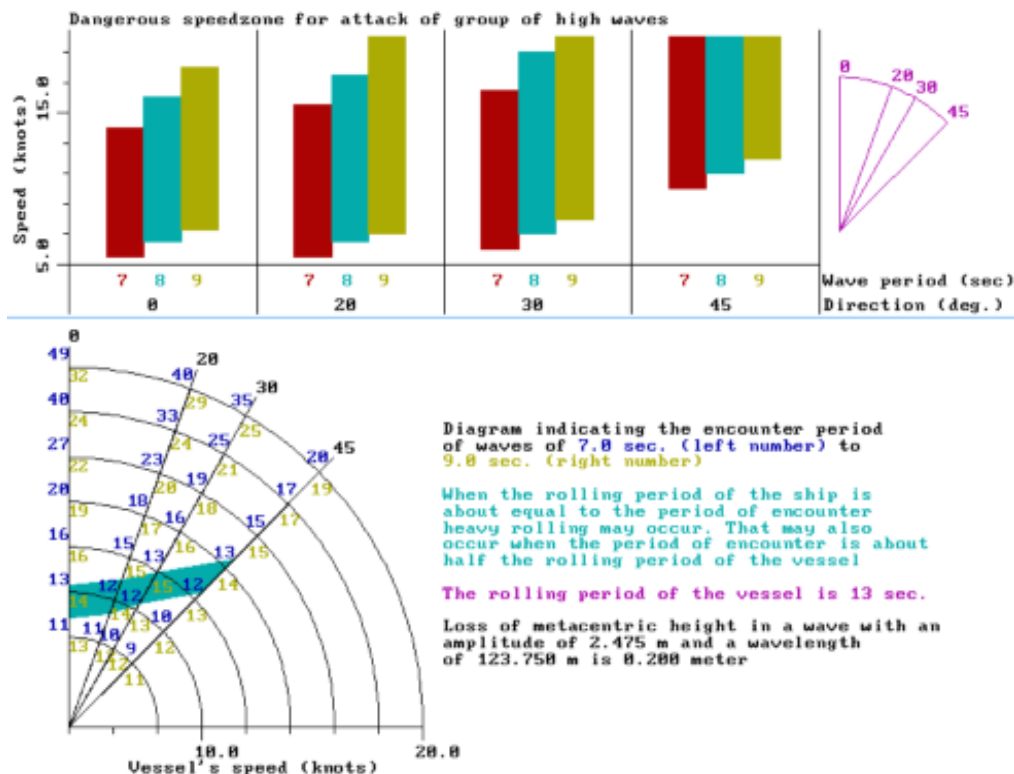
Assessment of quartering and following seas

High quartering and following seas may inflict immediate danger to a vessel.

Those dangers can be categorized as follows:

- Surfriding: when the speed of the vessel approximates the speed of the waves, the vessel will be accelerated by those waves, thus reducing the rudder function. This effect may cause broaching;
- Loss of stability on a wave crest: for a vessel with V-shaped cross sections the waterline breadths at the vessel's ends is reduced in the wave troughs, which reduces G'M, and may even lead to negative G'M values;
- Synchronal rolling or resonance;
- Asynchronal rolling or resonance.
- In order to be able to assess those dangers, LOCOPIAS can be equipped with a specialistic function, which is based on the method of IMO paper SLF 39/3/3. This LOCOPIAS function presents a graph, which indicates all possible dangers instantaneously. It contains three elements:
 - A bar chart, indicating the dangerous speed zone for surf riding;
 - A polar diagram, which indicates dangerous resonance zones for different courses and speeds. In this diagram the areas with possible synchronous or asynchronous resonance (resulting from the actual loading condition) are indicated in red;
 - An indication of the loss of stability, by showing the loss of metacentric height on a wave crest with a height of 2% of the length between perpendiculars.

LOCOPIAS produces a graph, of which an example is presented below, which can help the crew to determine a possible change of course or speed.



LOCOPIAS

Maximum allowable anchor chain forces

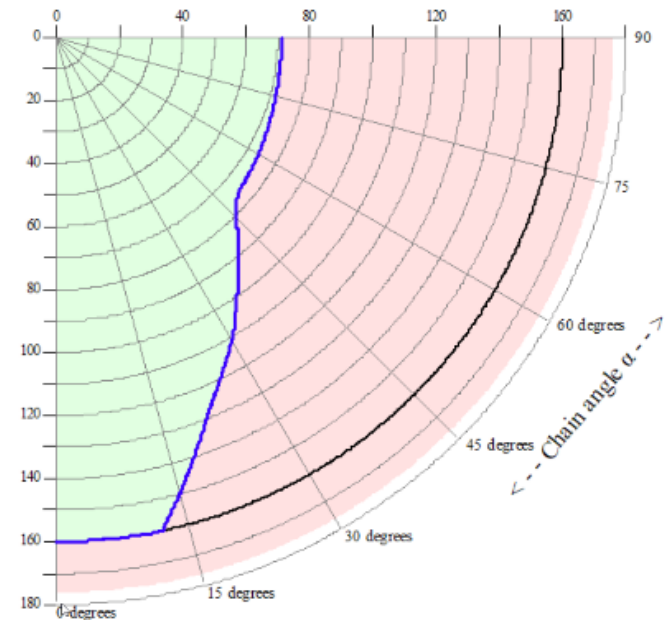
Diagram indicating the maximum allowable anchor chain forces during anchor handling, according to NMD-2007 and BV-2014

In June 2007 the Norwegian Maritime Directorate (NMD) released the Guidelines for immediate measures on supply ships and tugs that are used for anchor handling, where additional stability criteria for vessels engaged in anchor-handling are presented. Under effect of the anchor chain force, the heeling angle is limited to:

- The angle equivalent to a GZ-value equal to 50% of GZ-max.
- That which results in water aft on working deck when the deck is calculated as flat.
- 15 degrees.

The 2014 BV rules contain similar criteria, albeit with different output format requirements. Both sets are included in LOCOPIAS.

In order to assess the compliance of a particular loading with these criteria, for each loading condition a polar diagram can be plotted, as an extension to the calculation of intact stability, which contains the maximum allowable anchor chain force, as a function of the anchor chain angle.



Calculation of loaded or discharged cargo weight

This module can be used on every cargo vessel. It calculates the weight of the loaded or discharged cargo after the input of the drafts or freeboards before and after the cargo handling. It takes into account the differences of ballast water and consumables.

At the right the output of this module is shown. In this case the weight of the loaded containers is 3086.703 tons.

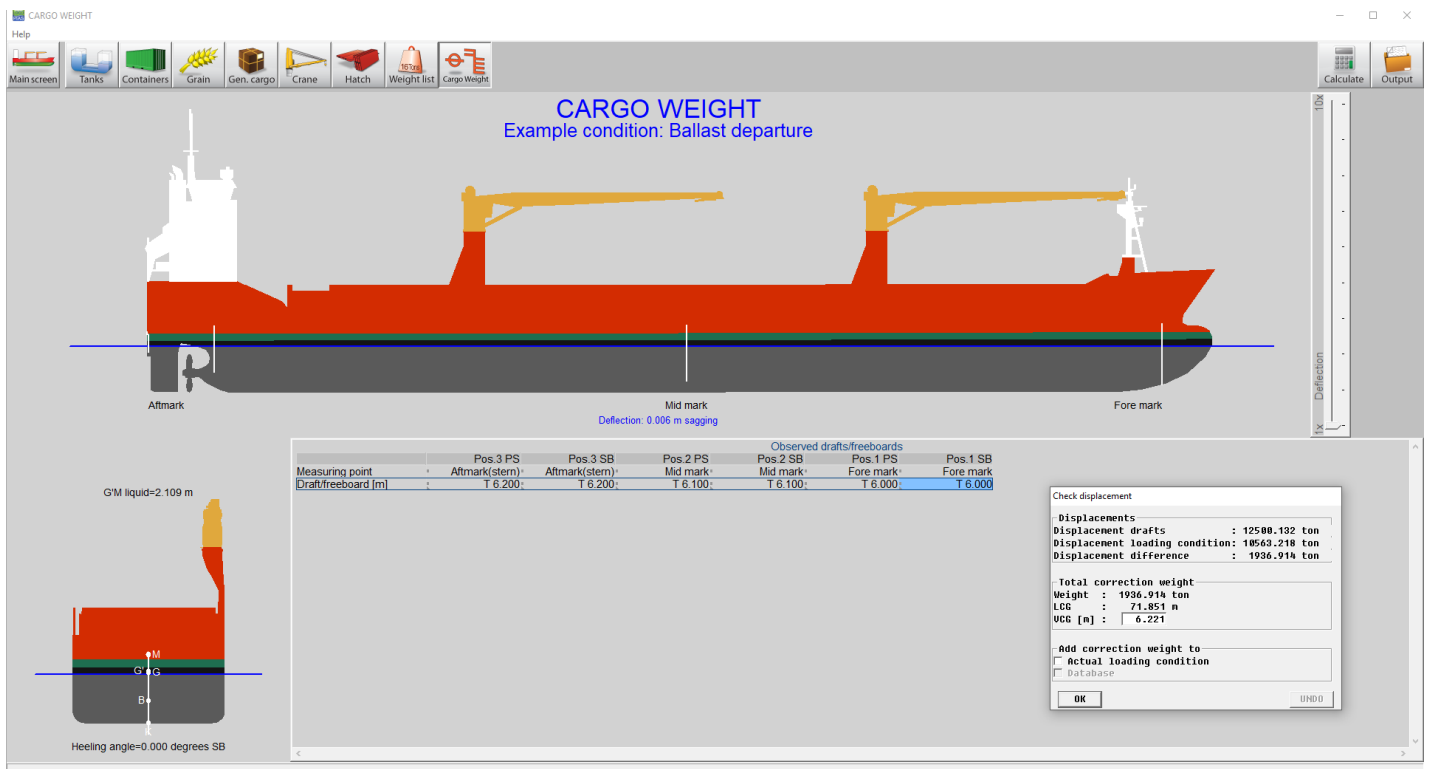
Below is the main screen of the user-interface. Standard the draft marks are used, but you can also define a reference point yourself.



Draft survey report

16-08-2010 14:36

	Initial			Final		
Observed drafts [m]	Aft	Mid	Fore	Aft	Mid	Fore
Starboard	2.900	2.800	2.750	5.570	5.500	5.470
Portside	2.900	2.800	2.750	5.570	5.500	5.470
Mean	2.900	2.800	2.750	5.570	5.500	5.470
Hydrostatics						
Draft mean of means [m]		2.793			5.491	
Trim on Lpp [m]		-0.148			-0.098	
Angle [degrees]		0.000			0.000	
Deflection [m]		-0.021			-0.017	
Specific weight water [ton/m3]		1.025			1.025	
Actual displacement [ton]		4000.179			8377.359	
Deductables [ton]						
Ballast water		677.769			1968.246	
HFO		479.459			479.459	
Fuel Oil		70.450			70.450	
Fresh Water		52.831			52.831	
Miscellaneous		36.634			36.634	
Cargo		0.000			0.000	
Tweendeck hatches		207.239			207.239	
Grain bulkheads		66.000			66.000	
Crew / prov / stores		15.000			15.000	
Other		0.000			0.000	
Total deductables		1605.380			2895.858	
NET Displacement [ton]		2394.798			5481.501	
Empty ship		2380.041			2380.041	
Constant/cargo on board [ton]		14.757			3101.460	
Total loaded [ton]					3086.703	



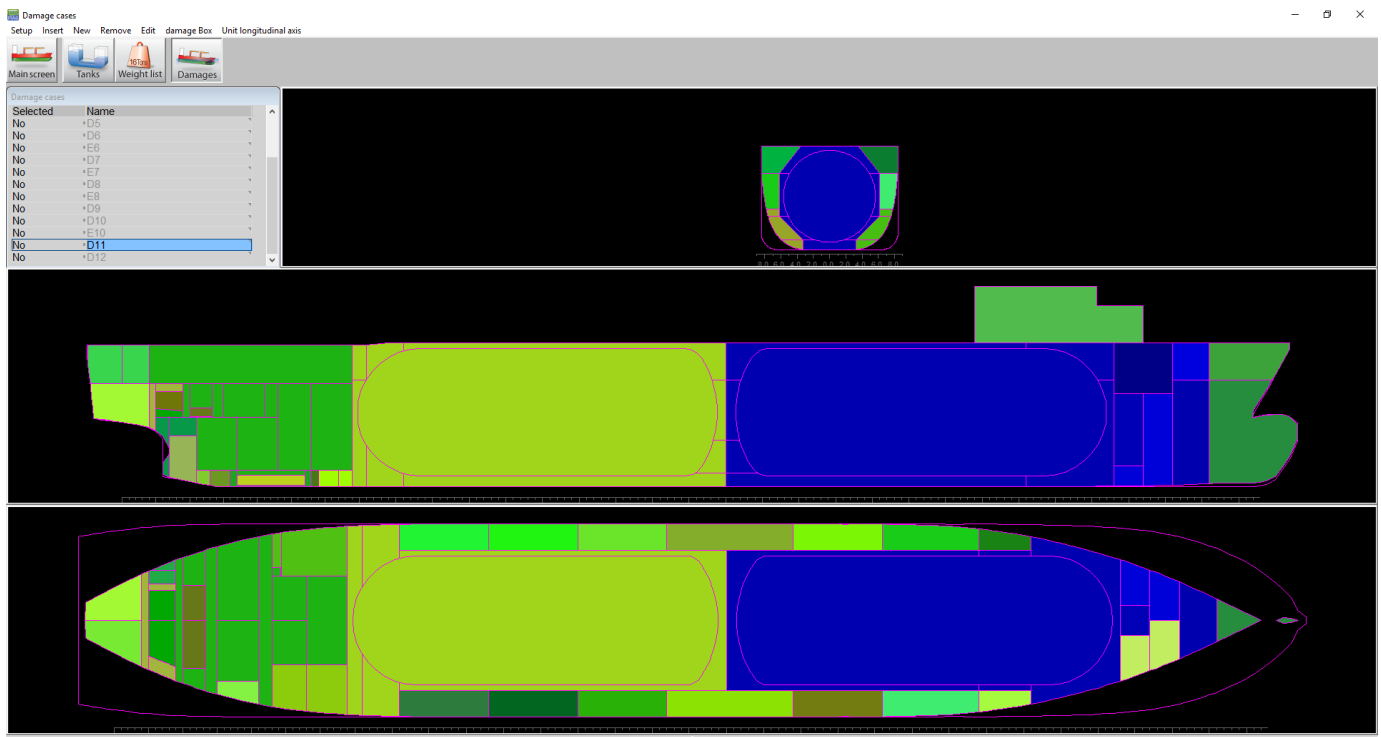
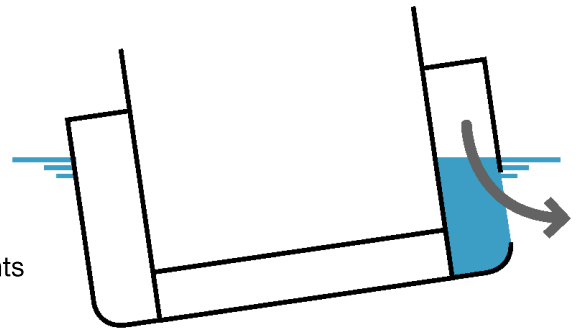
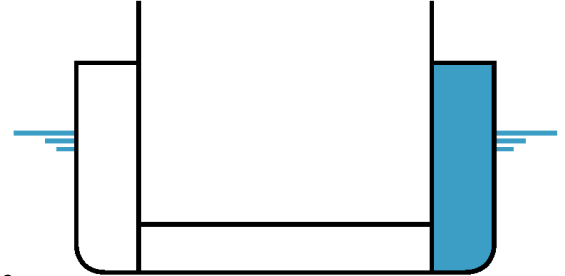
Direct Damages calculations

This module calculates whether the relevant mandatory damage cases comply with the stability requirements in damaged condition. This module calculates the end stage of flooding as well as the intermediate stages of flooding, even when unequal stages of flooding occur.

The effect of free surfaces in tanks is accounted for by calculating the actual shift of centre of gravity of the liquid in the tanks. The use of this “direct-calculation-method” allows for a more accurate calculation of the vessel stability without the need to “overcorrect” the vessel’s stability with a free-surface moment correction. These large overcorrections mainly occur when tank are almost full or almost empty.

LOCOPIAS takes in account the potential outflow of liquid from a damaged tank. This in order to account for the actual effect of a specific damage case. The effects on stability of an empty or full tank being damaged are noticeably different.

LOCOPIAS also allows for assessment of an actual damage case. The Damages module allows the user to specify which compartments are damaged, after which LOCOPIAS will calculate the actual stability condition of the vessel.



Calculation of stability when the vessel is grounded

The Grounding module calculates the vessel's stability in case of grounding. Based on a variety of input parameters, LOCOPIAS determines whether the vessel actually is grounded (based on a specific loading condition).

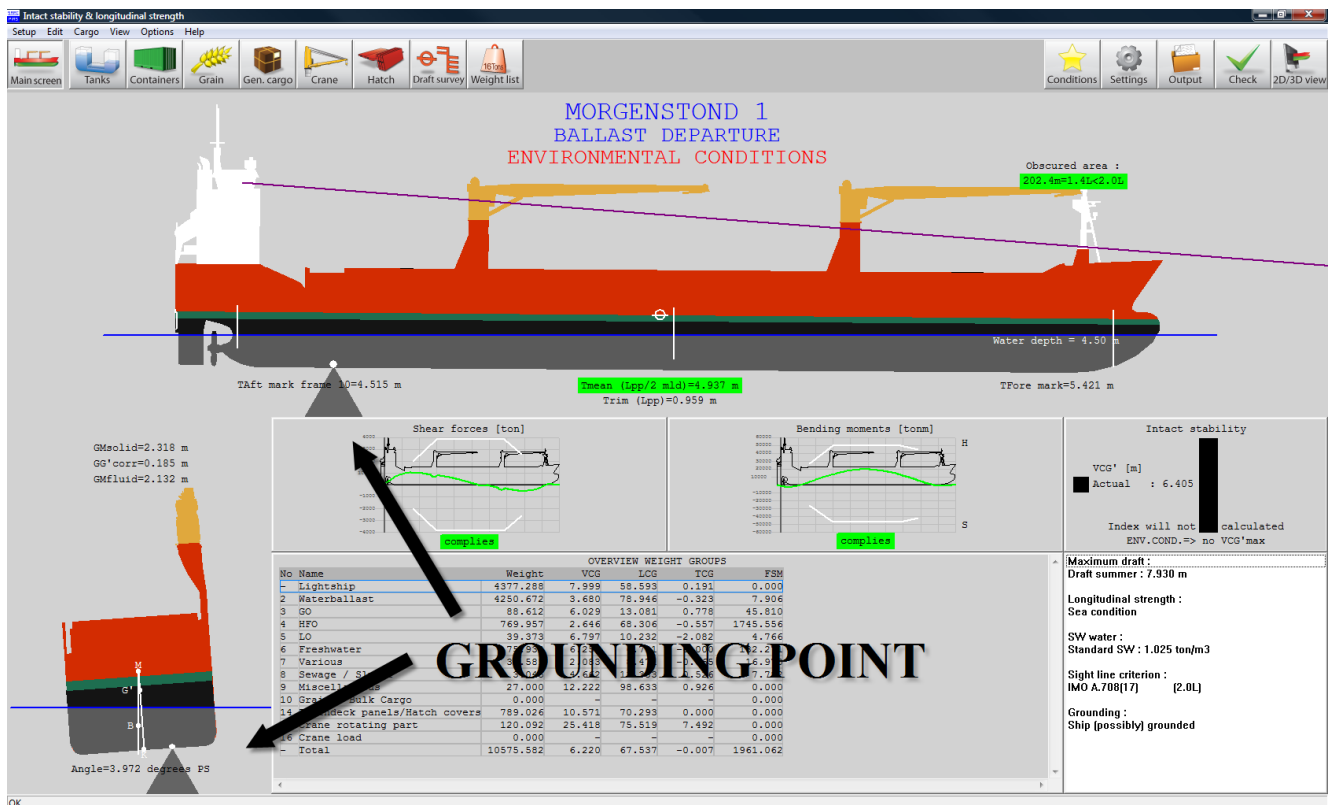
Subsequently the reaction force of this grounding point on the vessel is calculated. The resulting trim and heel are calculated based on this reaction force. Using these figures, in combination with the hydrostatic particulars of the vessel, the actual stability, longitudinal strength and damaged stability are assessed while taken in account the resulting grounding force.

The resulting grounding force is modeled as a point.

grounding

☒ With grounding

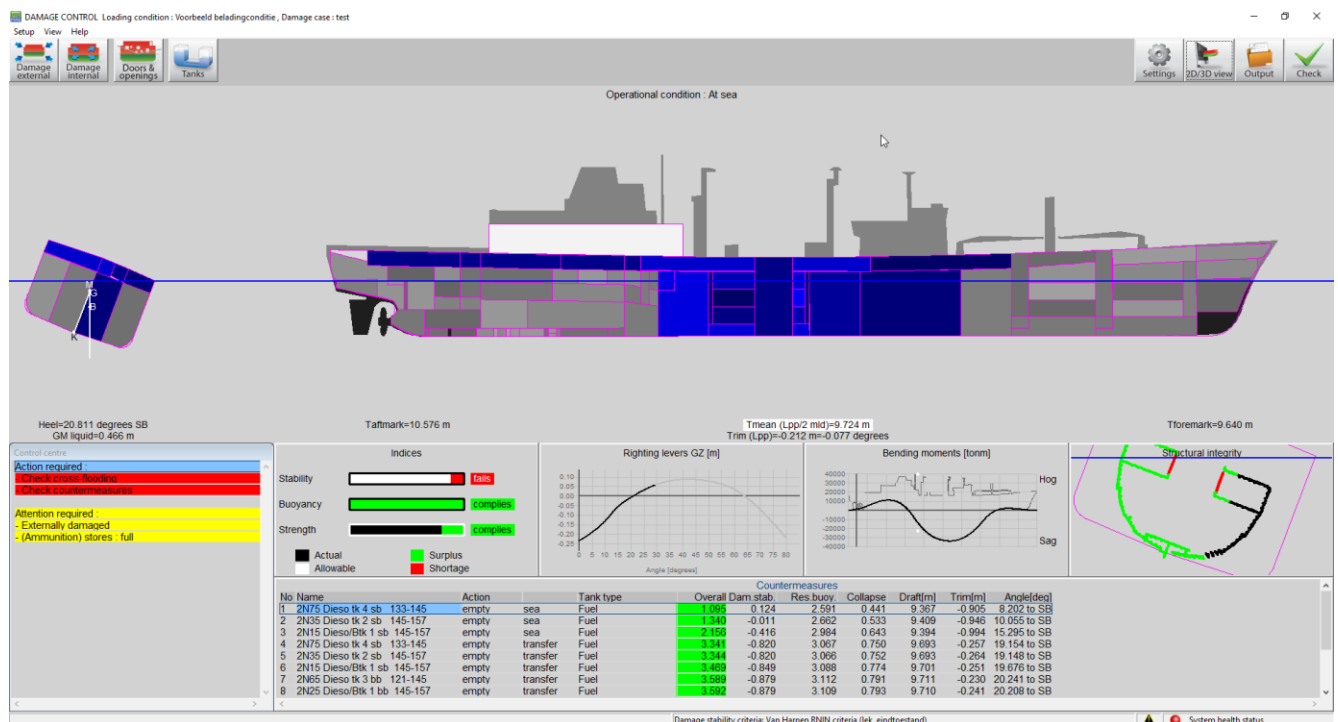
Water depth [m]	4.500
Longitudinal position where ship is grounded [m]	20.000
Transverse position where ship is grounded [m]	3.100
Vertical position where ship is grounded [m]	0.100



As an aid to assess the stability of a vessel in damaged condition, LOCOPIAS can be equipped with a dedicated Damage Control module.

This module performs the following functions:

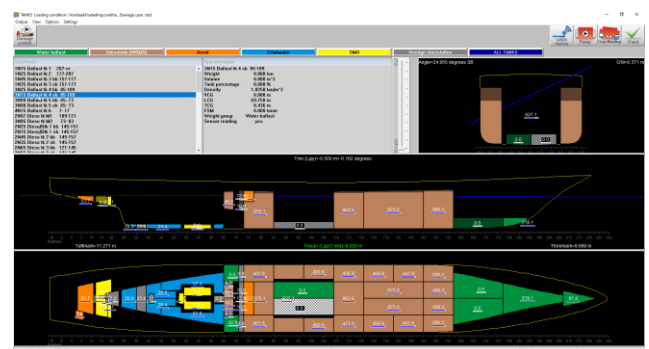
- This module calculates whether an actual damage case complies with the stability requirements. It calculates the final stage of flooding as well as the intermediate stages of flooding, even when unequal stages of flooding occur.
- It gives an overview of the damaged condition of the ship and the main stability particulars.
- It can also calculate the effects of internal damages, caused by a broken pipe or by fire fighting.
- It directly shows the effects of filling/emptying tanks in damaged condition.
- It generates and sorts countermeasures for improving the situation of the vessel.
- It gives advice which actions are required for checking the damaged situation.



Main screen Damage Control module of the Zuiderkruis of the Dutch navy.



Option for Internal Damages



Option for filling tanks in damaged condition