USER MANUAL
Tug-Barge Combination

RAPID RESPONSE DAMAGE ASSESSMENT

March 2019

ABS

Contents

Revision History

Date of Revision	Detail of Revision	Approved
September 25, 2019	Added Copyright reference to front page.	RH
	Added note on Page 4 about changes to vessels principal characteristics.	RH

If you need Emergency Stability and Strength Analyses, call RRDA now at +1-(281)-872-6161 and email the most recent loading computer output to rrda@eagle.org.

- All pages of the output should be sent.
- State the voyage number
- State date and time of the condition.
- Note fuel burn and any other significant revisions to the condition.

Note regarding changes to the principal characteristics of the vessel.

Any changes made to the vessel that revises lightship, hydrostatic particulars or hull strength, must be communicated to rrda@eagle.org for consideration. Examples of this are a tanker conversion to FPSO and an added mid-body section to a container ship. Other conversions apply.

SECTION

1

RRDA Program

1.1 General Information

RRDA maintains a website for access to the latest RRDA User Manual and other related documents. The page is found at the following link:

https://ww2.eagle.org/en/Products-and-Services/rapid-response.html

RRDA complies with the following regulations and industry guidelines:

- MARPOL Regulation 1/37(4), as circulated by resolution mepc.117(52), all oil tankers of 5,000 tonnes deadweight or more shall have prompt access to computerized shore-based damage stability and residual structural strength calculation programs.
- MARPOL 73/78 Annex I, Regulation 37 requires a shipboard oil pollution emergency plan (SOPEP) for all tankers of 150 gross tons or more and all other vessels of 400 gross tons or more.
- US Coast Guard requirements of OPA 90 in 33 CFR 155.240 for oil tankers and offshore oil barges, in which owners are required to have "prearranged, prompt access to computerized shore-based damage stability and residual structural strength calculations."
- The ISM Code, Section 8, requires the company to establish procedures to respond to potential emergency shipboard situations, including the use of drills and exercises to prepare for emergencies.
- OCIMF Guidelines on Capabilities of Emergency Response Providers.
- IACS Rec. No. 145 Recommendation for the Operation of Shore-Based Emergency Response Services.

The ABS Rapid Response Damage Assessment (RRDA) Program is administered from ABS headquarters in Spring, Texas. USA. The facility provides rapid response damage assessment support during an emergency incident affecting an enrolled vessel's stability and hull strength.

RRDA maintains an agreement with the vessel owner, to provide this service and vessel-specific data for the tank barge. In some cases, the associated tug is also modelled. Related data is stored electronically at ABS. This data is provided for responding to an emergency on board and RRDA should be considered an extension of the vessel's own shoreside emergency response team capability.

RRDA is activated when the Master or other owner-authorized person calls the RRDA 24-hour emergency number and requests assistance with a vessel emergency incident.

The time required for RRDA to provide accurate analyses for any given scenario affecting stability and strength is dependent on:

1. Receipt of the vessel load condition and damage reports
2. The complexity of the problem

The RRDA Program does not cover salvage engineering, class surveys, or surveys in connection with repairs, damages, conversions, compliance with outstanding recommendations, extensions, lay-up or reactivation, modifications/alterations, riding ship, change of flag or new installations.

When requested by a flag Administration, ABS is obliged to provide details of its evaluations and files. When a vessel is classed or issued with a Load Line by ABS, the ABS Classification department will be advised that the RRDA team is evaluating damage on an ABS-classed or Load Line-only vessel. The ABS RRDA team will review the most recent available survey status for the vessel and will communicate response activity to the ABS Classification department for consideration. However, a survey by the class surveyor continues to be a requirement for subsequent evaluation of damage and repairs or when a Certificate of Fitness to Proceed[1] is to be issued.

ABS does not act as a principal in the matter of salvage or repairs. ABS can only act in an advisory capacity, leaving it always to the client to accept or reject such recommendations as ABS may make. ABS has no authority to order or contract for repairs, salvage or other matters.

1.2 Instructions for Validating Enrollment Status

This instruction applies to vessels that are ABS classed only.
(Vessel that are not classed with ABS, will be provided an RRDA Certificate valid for 12 months)

This instruction is intended to ensure that Masters, vessel managers and other parties (Port State Control Officers, Vetting Inspectors, etc.), can easily validate whether a vessel is enrolled in the ABS RRDA Program.
There are two means to confirm if a ship is enrolled in RRDA.

1. Examination of the ABS Class Certificate.
   The vessel is enrolled in the RRDA program if the Class Certificate shows “RRDA” in the Additional Notations.
   For example:

   ADDITIONAL NOTATIONS
   RRDA, BWE, CRC(I), TCM, GRAB [20]

2. The Class Record
   Details provided in the ABS Record are available via the internet and provide reference to the RRDA notation as follows:
   https://ww2.eagle.org/ > Rules and Resources >ABS Record, Online Database >Search the Database >Enter vessel name or other search criteria >Scroll to Additional Notations.
   For example:

[1] Class authorization for the ship to transit, issued after recommendations made by the attending surveyor have be completed.

Additional Notations
RRDA, BWE, CRC(I), TCM, GRAB [20]

1.3 Types of Analyses for Response

Using the RRDA HECSALV™ model for the barge, the following useful analyses can be made:

1. Ground reaction and force to free with allowance for tide
2. Deadweight to be lightered or shifted to refloat
3. Effect on stability due to flooding, grounding, wind heeling, cargo loss or shifting, liquefaction (bulk carriers)
4. Oil outflow
5. Bending and shear stresses caused by pinnacle loads with the ship aground
6. Hull girder strength with wave loading
7. Local strength in the damaged area
8. Evaluation of the plans for offloading, ballasting or cargo transfer
9. Other calculations as appropriate for the vessel's condition

1.4 Drills

Knowledge about the RRDA program may be improved with regular drill activity. Drills correctly align mutual expectations and promote a more efficient level of response should an actual incident occur.

Vessel managers usually exercise their response capability annually and invite RRDA to participate at the appropriate level. Drills may connect RRDA and the vessel directly but it is more usual that RRDA communicates with the manager's DPA/response team ashore, who relay related information to and from the vessel. This relieves the Master of the need to duplicate calls and ensures all parties are using the most current information. (This is most relevant in an actual response)

RRDA's capacity for response may be tested at any time and to the extent the vessel manager deems appropriate. Generally though, provision of drill activity is contingent on the following:-

1. Notification is given to RRDA by email (rrda@eagle.org), with at least one week notice.
2. Any charges to be incurred by the vessel manager are agreed in advance.
3. RRDA may decline a proposed drill time if the drill activity is in conflict with other scheduled drill activities previously agreed to by RRDA.
4. RRDA may cease drill activities if RRDA is activated for an actual incident.

The extent that RRDA is involved in a drill can vary depending on the operator's requirement. Variations are:-

1. Live drill role play. RRDA is activated and provides analyses reports and recommendations according to the scenario and information provided by the operator. This tests RRDA's capacity to respond.
2. Pre-drill analyses. RRDA contributes to a drill scenario developed by the operator, providing accurate input data with respect to how the vessel will react to a grounding or

collision or other serious event. This is done in advance and allows the operator to script a scenario and use RRDA's reports to inject accurate results. For the operator, this validates that RRDA has an effective model of the vessel and that accurate analyses can be completed and reports generated.

3. Post-drill reporting. RRDA is requested to provide analyses reports after a drill is completed, using data provided by the operator. This will validate that RRDA has an effective model of the vessel and can provide analyses of the conditions communicated by the operator.
4. Communication drill. Vessel or management office calls RRDA's emergency number for a communication drill. This validates the number is correct and that RRDA can be activated. This is done by speaking with RRDA staff directly or, if after normal office hours, by speaking with an RRDA call center operator.

All drill activity is logged with RRDA.

1.5 Training

RRDA offers short training sessions that can be delivered remotely via the Web or by office visit. Contact rrda@eagle.org for details.

SECTION

2

Communications

2.1 Activating/Notifying RRDA Team

To activate the ABS RRDA team, the client is to establish verbal communication using the phone numbers provided below. RRDA is most commonly contacted by the Designated Person Ashore (DPA) but may also be contacted directly by the vessel Master.

MOST IMPORTANT - Do not attempt to initiate an RRDA response using email only.

24-hour Emergency Numbers
Primary: +1- 281-872-6161
Alternate: +1- 281-820-8697

For Consideration.

1. Do not wait to collect all information before calling. Initiate contact with RRDA immediately and provide additional information when it is available.
2. Always establish verbal communication with RRDA first. RRDA email is monitored during normal office hours only so email communications received after normal office hours will probably not connect to RRDA personnel within the time needed for an effective emergency response.

2.2 Time to Respond.

The RRDA team will respond immediately for calls received during office hours. After office hours and during weekends or holidays, your call will be taken by a call center representative who will then alert RRDA and relay message details. That process is expected to take about 30 minutes. It may be less. An RRDA Team Leader will call you back using the contact details given, and when it is confirmed that the RRDA team is required, the Team Lead and other staff will immediately travel to the RRDA facility. It is expected that RRDA will be in attendance at the office within two (2) hours after the initial call is made. It may be less.

2.3 Office Hours

The normal office hours are as listed below. During these normal office hours, a member of the ABS RRDA team can be expected to answer the incoming call directly. If personnel are temporarily unavailable, the line will automatically transfer to a call center operator who will take note of critical details and then relay that information to RRDA personnel directly.

Monday through Friday 7:30 a.m. to 4:30 p.m. (0730 to 1630) – Central US Time

Note:
Non-emergency inquiries relating to RRDA are welcomed by phone or email. Such inquiries should be made by email (rrda@eagle.org) or using the ABS main number (+1-281-877-6000).

2.4 After Office Hours

After office hours and during holidays, any emergency call directed to RRDA using the +1 281 872 6161 and the +1 281-820-8697 numbers, will be answered by the ABS RRDA call center. The caller will be asked for a contact name, vessel name and IMO number, call back number and nature of the incident. The call center operator will then connect directly with RRDA personnel to initiate the RRDA response and you will be called by the RRDA Team Leader directly thereafter.

2.5 Action After Voice Notification

After the initial phone contacts have been established and you know RRDA is activated, an email confirmation of the vessel status should be sent to RRDA.

FOR INFORMATION THAT RRDA NEEDS - GOTO Section 4.

Email: rrda@eagle.org
Fax: +1-(281)-877-5964

SECTION

3

Information Sharing

3.1 Information Requirements

Emergency incidents are not prescriptive. In an emergency, phone conversations and email exchanges with RRDA will develop the mutual communications and information requirement that is relevant to the incident. Priority will be discussed with respect to the incident and what information is most important for RRDA to receive. Effort will always be made to ensure that information requested from the vessel is important and relevant to the requirement. Early and transparent sharing of information is key.

INFORMATION THAT RRDA NEEDS - GOTO Section 4.

3.2 Load Condition Before the Incident.

MOST IMPORTANT!

The vessel's loaded condition has to be provided to RRDA; without it, analysis results will not be reliable.

The load condition should be sent to RRDA as output from your loading computer with corrections offered as appropriate for bunkers or other significant changes like ballast. If your system includes CARGOMAX software (a brand of loading computer), the exported load-case (.LC) file should be sent to RRDA. If the loading computer is other than CARGOMAX, a full .pdf of the output is preferred.

3.2.1 Departure Load Condition

You are encouraged to routinely send RRDA the departure load condition report so that it can be used by RRDA in an emergency. This will do away with the need for the condition to be sent by the vessel or manager during an emergency incident but, to ensure that no error occurs, the Voyage Number and departure port with date must be clearly identified on the report.

3.3 Collision/Damage/Flooding (Not a Grounding Event)

The goal of RRDA are to identify the resulting damaged state, to maintain stability, monitor hull stress and to consider limiting pollution. The main focus of a significant collision event is the prevention or reduction of oil outflow from cargo and fuel oil tanks which can result from local or global structural losses.

FOR INFORMATION THAT RRDA NEEDS GO TO Section 4.

3.3.1 Comments and Considerations

a. Uncontrolled ingress should be prevented or otherwise managed to the extent possible. This is particularly true for machinery spaces which have to remain operational for the tug and barge to function. Even so, there are circumstances, as with flooding of a ballast tank for example, that seawater ingress may not cause a higher measure of vulnerability to failure and depending on design and loads, might actually reduce global or local stress about the damage.
b. The above comment notwithstanding, unless it is clear that pumps are incapable of bettering the ingress rate, the default condition should be to keep pumping. At least until adequate assessment has been made and alternate recommendations have been considered.
c. The rate of seawater ingress will decrease as water depth in the space increases because the pressure differential reduces as balance occurs. Therefore, initially, the pumping capacity to discharge a flooded space may not be adequate to prevent flooding but the same capacity might prevent the space from becoming fully flooded as the ingress rate slows. This may be of no concern or advantage for tank spaces that can be allowed to flood completely but, managing ingress to the lowest possible height in machinery spaces will be critical and this could provide a measure of advantage that makes the difference. Also, depending on pump type, pump efficiency may increase as the water level in a space adds pressure at the pumps inlet.
d. For spaces well outside the parallel mid-body and with significant flare in the hull shape such as an aft engine room, internal volume changes considerably with height above the tank top. Therefore, for a steady ingress flow rate, there will be a decrease in the rate at which water depth in the space rises as flooding progresses. Use this to be aware that you should not estimate the time it will take to flood the compartment, on the rate at which the water level rises initially, unless the space is wall-sided.

3.3.2 Useful questions and things to consider

i. Was this a T-bone or side-swiping contact?
ii. What is the other vessel name and IMO number? (RRDA will do a quick search of the Web to source a photograph of the ship)
iii. Other vessel draft at the bow. This information is useful when considering location and extent of damage. For example, damage sustained from contacting a cruise ship with an enormous bulbous bow and extensive bow flare is expected to be different to that of a more ordinary shaped bulk carrier.
iv. Did your vessel take a list? How much? Why? Is the vessel still settling?
v. Is oil being lost from the cargo tank? At about what rate? Take ullages.
vi. Is the damaged ballast tank taking water or not? Take soundings.
If the tank is dry, damage may be isolated to above the waterline. It is critical that damage isolated above the waterline remains above the waterline. If, for whatever reason, the barge is listing to that side, the condition should be checked and options weighed.
vii. If cargo is being lost from the cargo tank and isn't going overboard, it is probably being captured by the ballast tank. If so, asymmetric loading is occurring as the

cargo moves into the ballast tank, particularly as it rises out of the bottom into the side (as in a J-Tank). This will increase the list and may begin to submerge the hull opening and that will cause flooding of the ballast tank and initiate moving oil cargo to the sea as the cargo is displaced by seawater and flows out.

viii. Is there an obvious pollution event originating from the barge? If yes, the ballast tank is probably already full of seawater with cargo oil on the surface.

ix. Is there an unexpected water/cargo interface inside the cargo tank that was not there previously?

x. When the extent of the hull opening is known to extend about the waterline, consider inducing a list that raises the hull breach out of the water completely. This will prevent any continued loss due to displacement of the cargo by seawater. This is a subject for careful appraisal and should be tabled early in order that RRDA can analyze the condition and support the decision process. (See note below)

xi. When the extent of the hull opening is known to be below the waterline, consider inducing an increased list on the same side as the damage so that the hull/cargo tank breach is forced further below the surface. This will have the effect of trapping an increased amount of oil in the tank above the damage. Again, this is a subject for careful appraisal and should be tabled early in order that RRDA can analyze the condition and support the decision process. (See note below)

xii. When the bow of another vessel contacts heavily, causing significant structural damage about the deck stringer plate and shear strake, it is likely that the cargo tank boundary will be breached with cargo loss into the ballast tank and possibly also to the sea. In this case, immediate consideration should be made to reducing the cargo level until it is below the damage. This can be done in either or both of these ways. (See note below)

   a. List the barge to increase freeboard on the damaged side. This will increase the cargo tank ullage adjacent to the damaged tank boundary.
   b. Transfer cargo from the damaged tank to available volume, preferably on the opposite side of the barge.

Note - Though valid for all tankers, these actions relate most significantly when the vessel has a large beam. This is because of the relatively large amount of freeboard change that occurs per degree of list, when compared to smaller vessels.

The best action to take under collision related circumstances may not be clear because of difficulties assessing damage and the measure of success will depend largely on how well the tank boundary damage location is identified relative to the waterline.

3.3.3 Notes relating to oil outflow.

a. Oil outflow from damaged tanks depends on the induced movement of oil out of the tank, either because it’s height in the tank creates a head pressure compared to sea level or (and) it is displaced out of the tank by ingress of seawater with a higher specific gravity than the oil.

b. Double hull technology is known to reduce the likelihood of pollution from ships in collision or after a grounding. The structural arrangement requires the ship’s structure to be subjected to a higher measure of impact energy in order for the cargo tank boundary to fail. The cargo tank boundary will fail if subject to sufficiently high local loads and when that occurs, the failure may be limited to plate tears about adjacent welds and structure, resulting in slow rates of oil transfer into the adjacent ballast tank. Alternatively, energy absorbed by a very high inertia event may well drive a large opening directly into the tank boundary with potential for very rapid loss of tank content directly into the sea and no opportunity for the crew to influence change.

c. When considering transfer of cargo internally. If seawater ingress into the cargo tank is rapid, normal tank suction arrangements will be covered by seawater preventing suction on the oil. Therefore, if oil is to be transferred out of a damaged tank successfully, pumping must be commenced without delay. The effectiveness of the transfer will depend on water ingress rate versus pumping capacity. Never assume that the pump has suction on oil. Check.
d. If cargo loss occurs at slower rates with a reasonable amount of time available, careful consideration will provide opportunity to weigh options and implement changes that can reduce the final quantity of cargo lost to the sea. Developing a robust recommendation depends on what you do and do not know.

3.4 Grounding

INFORMATION THAT RRDA NEEDS GO TO Section 4.

Vessels are normally robust structurally and often capable of recovering well from the conditions presented by grounding. The RRDA team's first goal in a grounding situation is to accurately determine the ground reaction. This lends to determining if the barge can be refloated without lightering or the extent to which lightering arrangements must be planned. Reported flooding and the effect of tide will be considered, as well as whether there is internal capacity to change load distribution by transferring cargo, fuel or changing ballast. Consideration for the measure of stress in the hull will be made based on bottom contact details provided to RRDA or/and as provided in the divers report.

Groundings range from soft/low impact bottom contact with no damage to fully stranded conditions and total loss. The severity of the grounding event depends on vessel velocity and inertia as the barge takes the bottom, hull shape, how much vertical reaction is developed, sea bottom characteristics, buoyancy loss due to breaches in the hull, tidal details and subsequent exposure to the environment. For obvious reasons, an exposed and isolated rocky shoreline in higher latitudes during the winter with contact made at High Water spring tides, introduces much higher risk to the vessel than a low impact grounding onto a muddy bottom in a river environment. Fortunately, most groundings tend to occur in the restricted maneuvering environment of port approach channels and fairways, which limits exposure and provides improved access to tugs and other resources.

3.4.1 Comments and Considerations on Grounding

a. Own propulsion (Upper seawater cooling intakes should be used where possible)
In the stress and urgency of a grounding situation, there is a likely optimism that the vessel can be moved using its own propulsion. Generally though, the amount of thrust generated by the propeller, especially when running astern, is relatively small compared to ground reactions likely to develop and little or no change is expected. There are exceptions. If the barge is grounded on a hard isolated pinnacle and has

deeper water about the stern, immediate action to trim by the stern, if available, may well allow the vessel to come off. Another example is a low reaction event with no loss of buoyancy and with the advantage of favorable tide. Even so, unless adequate heading and position control can be achieved immediately after refloat, influences of wind, current and propeller induced side forces will increase the likelihood of subsequent grounding, including damage about the stern. A proper measure of tug capacity is highly recommended any time a vessel is refloated.

b. Anchors

Consideration should be made to the deployment of anchors in order to arrest movement onto the lee shore or obstruction. Clearing anchors from the hawse in a controlled condition is preferred and then either walking the chain or letting-go, depending on the water depth close-in and whether the seafloor is rising gently of shelving rapidly.

c. Drafts. Your initial report to RRDA should include a best estimate of the drafts aground *and the time that the drafts were taken*. RRDA's analyses result is contingent on the accuracy of drafts and the change that occurred when grounded. It is fully acknowledge that drafts may not be easy to obtain and with wave action on the hull, confidence in the accuracy of draft readings may not be high. Even so, the data is critical. Best efforts are needed to establish a baseline and tuning for improvement can always be done as the situation settles, as daylight comes and as support arrives.

- An attending boat or tug is probably the best way to acquire good drafts and soundings about the hull.
- If boats are not available, depending on conditions and equipment on board, the drafts may best be determined by observing the freeboard or height from the waterline to the deck or another feature such as a gunwale top. In this case, the location of each reading has to be carefully notated, preferably by frame number but other notable feature or structure on the deck will also be good, so that the hull depth dimension for the barge at these locations can be found by the RRDA team using their model, the general arrangement or other plans.

d. Ground definition. An accurate ground definition must be provided when possible. When known, the shape of the contact area can be applied to the model by the RRDA team. This allows for a more detailed assessment of how the barge will react to changes in loads. It is also important in determining a more complete assessment for hull stresses that may be greatly influenced by bottom support and is essential for planning and monitoring purposes.

- Contact area can also be reported by sounding around the barge using a lead line or other device. Use the form provided in this manual for reporting values. Sketches are greatly encouraged. Measuring the distance from the deck edge for example, to the bottom, will be fine provided the list (in degrees) is also noted and can be allowed for by RRDA.
- Divers may be used for reporting the contact area. Divers are essential for determining the location of single or multi pinnacle contact areas.
- Use an attending pilot boat, tug or FRC to obtain soundings about the ship.
- Be aware that softer bottom materials like mud and clay tend to mound and rise against the bow and will create what appear to be odd or doubtful depth readings. Trust what you have and report same.

- Be aware that sand may be moved about the hull by strong currents with resulting changes in the sounding due to scouring and deposit.

e. Damage. Structural bottom damage frequently occurs during grounding. This can be local buckling causing hull plate cracks and tearing, having little effect on longitudinal strength. Alternatively, it can be as gross deformation over large areas of the bottom with impact to the inner bottom structure and internal bulkheads. Identifying the extent of damage under these circumstances will undoubtedly be hindered due to limited or zero access. Voids and tank spaces may be flooded and inaccessible and other internals may be covered with cargo. Tank and void space soundings will indicate where the hull is breached but not the extent to which longitudinal strength is lost.

f. Divers. Diver support though very useful, also has significant access limitations under these circumstances. Reports can detail only the damage observed and visible. Underwater visibility may be poor, currents about the ship can be high and in some cases, the hull can be moving making work in proximity of the hull especially dangerous.

g. What if? Consideration must be made to the potential for conditions on board deteriorating, specifically with respect to the integrity of ship systems that are intact and operational initially but which fail later. Piping as an example. It may be that cargo oil could have been transferred away from the damaged area early on but later, with subsequent buckling loads on the lower structure, piping becomes disabled and ceases any opportunity for transfer or lightering, which then can require special effort by salvors to remove and has the potential to become a pollution event.

h. Engine failure and a Lee Shore. The case of a barge loosing propulsion whilst being set down onto a lee shore can be dire, particularly when a high sea state and rocky shoreline complicate the situation. Under such circumstances, the Master will likely attempt to arrest the barge using anchor(s).
When weighing options, consideration may be made to determine if the barge can be ballasted to increase draft so that it takes the ground in deeper water and further from the shore than it would otherwise. This of course is contingent on loading and ballast capacity and varies with vessel design and load plan. Ideally, the resulting condition would allow the barge to be refloated after removing ballast and with suitable additional tug support in attendance.

i. Tank damage and cargo loss to the sea. If bottom structure is heavily set in because of pinnacle loads or extreme ground reactions over an increased area of the bottom, it is possible that the cargo tank boundary about that area will be sufficiently impacted to fail allowing cargo to flow into the ballast tank under the influence of head pressure in the cargo tank. This is a complex situation with the results depending on many variables but the big question is, will the ship loose cargo to the sea? The assumption in this case is that the ballast tank has rapidly flooded to hydrostatic balance. Let us also consider the cargo tank to be full. A worst case scenario. In this case, a net positive pressure in the tank causes cargo to flow into the ballast tank and then work within the upper structure of the ballast tank eventually flowing into the side volume between cargo tank and ship side. As this occurs, sea water will be displaced by the cargo and flow out to the sea through the openings in the bottom plate. (Assumes these openings to not be plugged by mud or clay) This exchange of ballast water for cargo inside the ballast tank will continue until hydrostatic balance occurs between the sea, the ballast tank and the cargo tank. If balance occurs before the water/oil interface contacts bottom hull plate openings, no pollution will occur at that time. If, on the other hand, there is still a net positive head pressure in the cargo tank at that time, oil will begin passing out of the hull openings to the sea. IMPORTANT SIDE NOTE. With cargo in the ballast tank and no pollution, it is highly important to consider tide because hydrostatic balance between the sea and ballast and cargo tanks will cause flow in and out of the breached tank as sea level against the barge changes. What was an adequate water cushion inside the ballast tank at high water, can steadily diminish and disappear altogether with low tide thereby allowing oil into the sea. RRDA can analyze this condition and estimate the potential for oil outflow. On a positive note, oil cargo can be pumped from the cargo tank using cargo pumps because in this condition, no seawater has passed into the cargo tank. Therefore, by removing cargo from the cargo tank, either to available volume elsewhere on the ship of by STS transfer, seawater will flow into the ship, the height of the water cushion will increase and pollution can be prevented.

j. Ballasting down. If lightering is required to refloat, ballasting the barge to ensure it remains hard aground may be recommended. This allows for the lightering to be completed with no chance that the barge will unexpectedly move and create an unsafe condition. In this way, after the lightering is completed and all associated equipment and personnel are cleared away, the barge can be deballasted and refloated at an agreed most suitable time.
k. Stability. Like dry-docking, when ground reaction occurs, there is a virtual rise of the center of gravity that reduces stability and influences heel, perhaps significantly when stranded on a pinnacle with falling tide. Vulnerability to excessive heel and possible deck edge immersion will be mitigated if the contact area with the bottom increases laterally and the ship becomes supported by the sea floor thereby preventing further heel.
l. Refloating. Before the barge is allowed to refloat, particularly when flooding and structural damage are identified, RRDA will analyze the refloat condition to ensure the vessel has sufficient stability and strength margin.
m. Loss of Buoyancy. When a significant measure of buoyancy is lost due to hull breaches, with flooding in several spaces, salvors may deem it necessary to induce buoyancy using low pressure compressed air inside the damaged spaces. This forces sea water back out of the hull, reduces ground reaction and improves the afloat condition. With the ship afloat, temporary patches can be applied and the vessel dewatered to the extent needed to meet the requirements of the recovery plan.
n. Unaccountable list after refloating. The drafts, list and trim will be determined by RRDA prior to the refloat, with results based on the reported loads. If there is good confidence regarding weight distribution (loads) on board and extent of flooding, but the ship refloats with a “mystery list”, consideration should be made to the possible taking-on of heavy sea floor material into damaged spaces. The extent to which such unintended loading affect list (and trim), depends on the heeling moment and the measure of initial stability.

3.5 Lightering

Lightering the barge may be required for refloating after a grounding event or to mitigate risks associated with hull stresses, stability and pollution. It is the vessel or salvor that will develop the plan for lightering and RRDA may assist in the plan development by providing supporting analyses that considers the effects of damage and the vessels condition.

3.6 Moving a Damaged Ship

Authorization for a damaged barge to be moved is contingent on reviews by flag, the Classification Society, Coastal State and Port Authority. Other stakeholders also contribute to the process of recovery. Decisions made will relate to the original voyage plan and whether that plan must be revised to mitigate the risks associated with the vessel’s condition. Many of these considerations remain outside of RRDA’s scope; however, when damage has been sustained to a barge that affects hull strength and stability, RRDA will continue to provide analyses that determines the margin of strength and stability for the proposed transit route. This work relies on review of accurate damage assessment reports that are usually provided by the attending class surveyor.

SECTION

4

Useful Forms

The following forms and illustrations are intended to be used for efficiently communicating important information to RRDA. The expectation is that these can be quickly completed by hand and copied to .pdf for emailing to rrda@eagle.org.

Initial Incident Report

Vessel Name			
IMO Number			
Type of Ship			
Incident Type			
Voyage No.			
Last Departure Port		Dep. Date	
Destination			
Average Daily Fuel Burn			
Current Position			
Managing Company			
Preferred Contact Name			
Preferred Telephone			
Preferred Email			
CC. Email(s)?			

Last Departure Condition has been sent to rrda@eagle.org? (Most important)	YES	NO	
Correction for bunkers and consumables has been made?	YES	NO	N/A
Departure Conditions are sent routinely on this ship and RRDA has the condition?	YES	NO	N/A
Detailed stowage information has been sent to rrda@eagle.org?	YES	NO	N/A

ENTER COMMENTS RELATING TO THE ABOVE OR OTHER USEFUL INFORMATION HERE:

Follow-up Incident Report

Ref. Date and Time	(Local/GMT)		
Vessel Name			
Position	Latitude	Longitude	
Nature of Incident			
Contributing Information	Hull spaces are breached	Y N	(write note below)
	Pollution to the sea	Y N	(write note below)
	Hull structure is known to be damaged	Y N	(write note below)
	Has cargo moved internally or been lost	Y N	(write note below)
	Density of water body	kg/m3	
	Ballast system is operational	Y - @ about m3/hr. N	
	Cargo pumps operational	Y - @ about m3/hr. N	
	Tug's own bilge system is operational (Tug damage)	Y - @ about m3/hr. N	
	Propulsion is available	Y N	
	Steering is available	Y N	
	Anchors are available	Y N	
	Swell height (m) and period (sec)		
	Wind speed (knots) and direction		
	Photos of damage or associated subject	Y N	

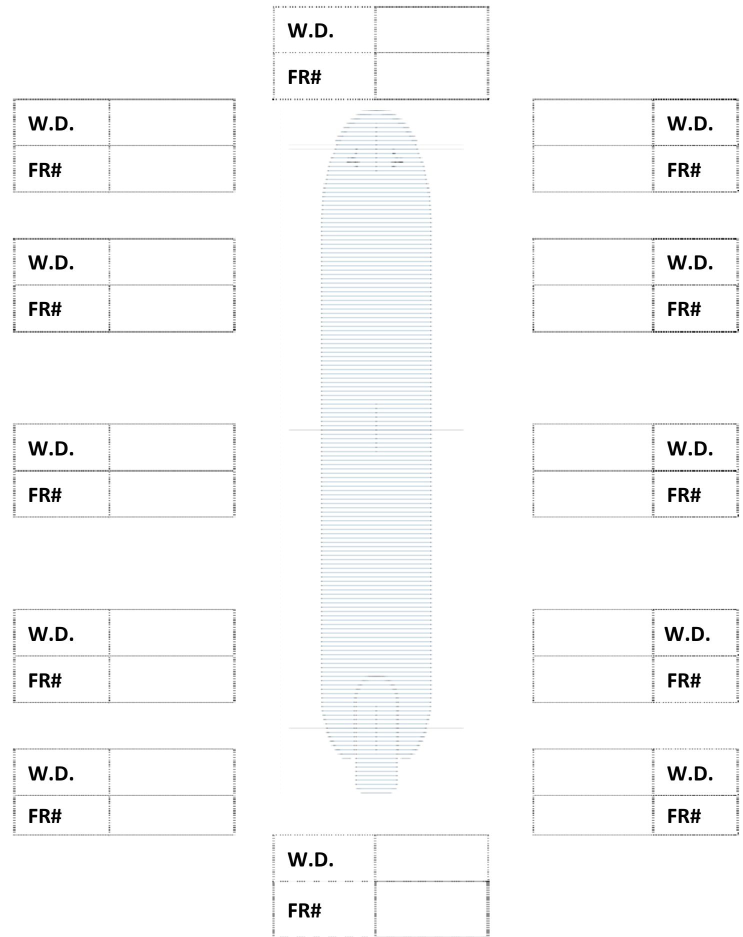
Vessel is Afloat	Under keel clearance	(m or ft)	
	Heel/list (°)	P or S	
	Max. roll angle (°) and period (sec)		
	Approx. steady heading		
	Seas breaking on deck	Y N	
	Main deck openings secure	Y N	(write note below)
	Deck edge immersed	Y N	
	Other vessel I.D. (if collision) Name and ship type		

Vessel is Aground	Time of grounding (very important)	(Local/GMT)
	Accurate drafts (very important)	Notate to vessel sketch below
	Time drafts taken (very important)	Notate to vessel sketch below
	Tides: times and range	If requested by RRDA
	Heel	Y N (Add note below)
	Heading	
	Where is bottom contact	Notate to vessel sketch below
	Soundings (WD) about the ship	Notate to vessel sketch below
	Type of seafloor material	
	Diver's underwater survey of contact area and damage report	Y N (write note below)

ENTER COMMENTS RELATING TO THE ABOVE OR OTHER USEFUL INFORMATION HERE:

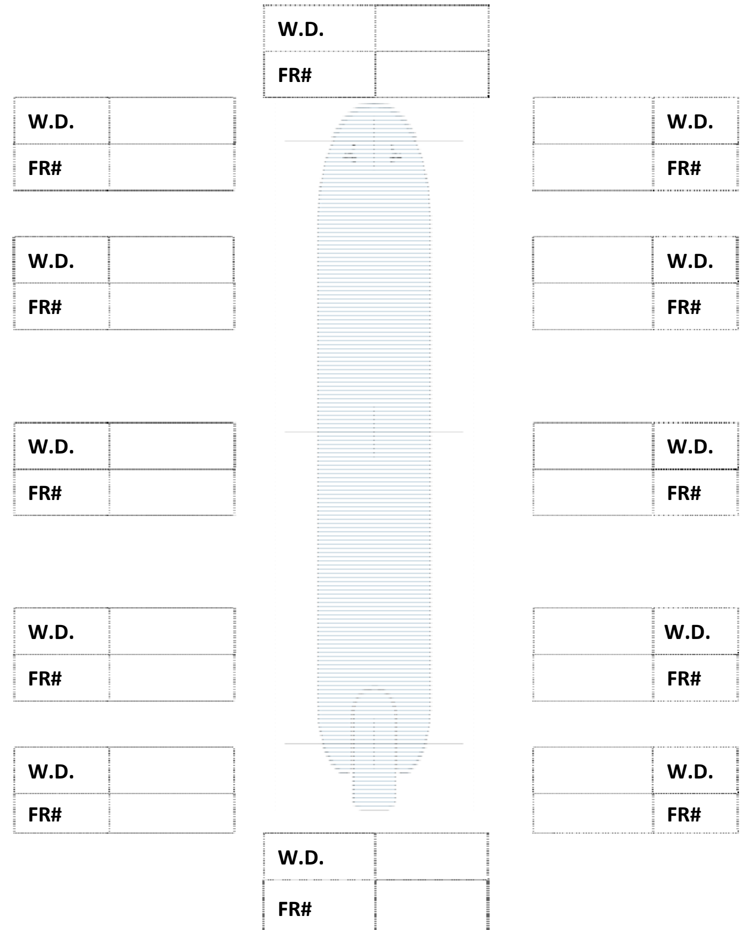
Additional Details About a Grounding Incident

Vessel Name:			
Date:			
1. Drafts - Aground			
Units	Meters	Feet	
Time	-hrs.	Local	UTC
--	Forward	Amidships	Aft
Port			
Starboard			
List or Heel		Degrees	P S
2. Approximate Area of Ground Contact			
Outline the approx. contact area on the hull outline.			
3. Provide water depths (W.D.)			
Water depth values to the extent needed.			
Measured by a boat or tug?			
Measured from ship's deck?			
4. Vessel Heading			
			-Degrees (T)



Additional Details About a Grounding Incident

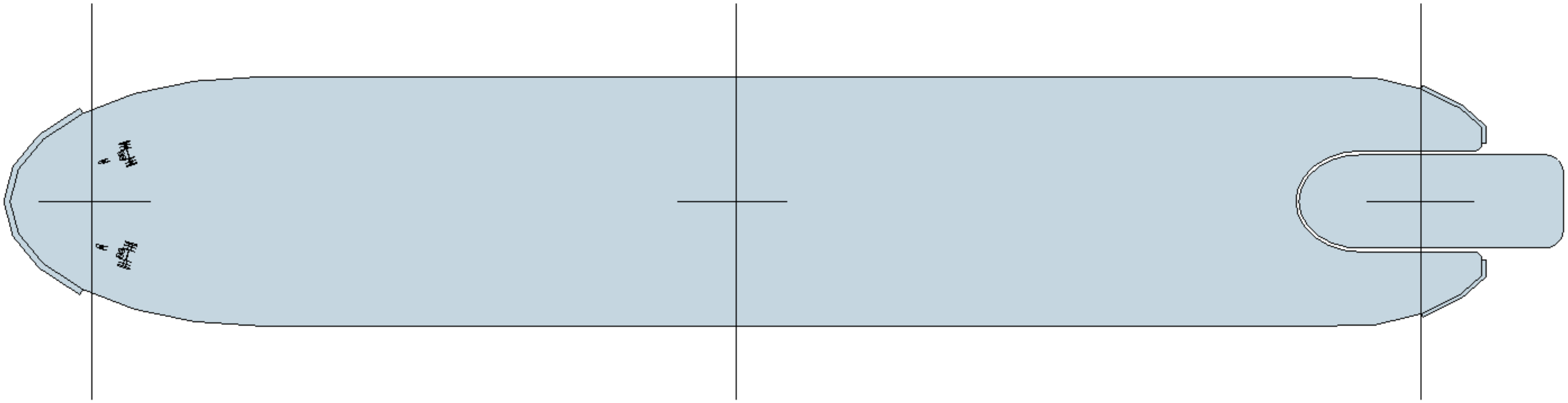
Vessel Name:			
Date:			
5. Drafts - Aground			
Units	Meters	Feet	
Time	-hrs.	Local	UTC
--	Forward	Amidships	Aft
Port			
Starboard			
List or Heel		Degrees	P S
6. Approximate Area of Ground Contact			
Outline the approx. contact area on the hull outline.			
7. Provide water depths (W.D.)			
Water depth values to the extent needed.			
Measured by a boat or tug?			
Measured from ship's deck?			
8. Vessel Heading			
-Degrees (T)			



Handy Sketch for Any Incident

VESSEL NAME: **DATE and TIME:** **UTC/LOCAL**

USE THIS DIAGRAM TO ILLUSTRATE ANY ADDITIONAL PERTINENT INFORMATION LIKE GROUND CONTACT AREA, PINNICLES, AREA DAMAGED, BUCKLING or CRACKS, HULL BREACH, WATER DEPTHS, FREEBOARDS, DRAFTS, OBSTRUCTIONS, ETC.



VESSEL NAME: **DATE AND TIME:** **UTC/LOCAL**

USE THIS DIAGRAM TO ILLUSTRATE ANY ADDITIONAL PERTINENT INFORMATION LIKE GROUND CONTACT AREA, PINNICLES, AREA DAMAGED, BUCKLING or CRACKS, HULL BREACH, WATER DEPTHS, FREEBOARDS, DRAFTS, OBSTRUCTIONS, ETC.