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Cascading Failures:

Small Shifts and the Unforeseen Consequences

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Case Study:

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Drill Barge (DB) Dry Transportation



Cargo:

- Drill Barge (DB)
- 6 Cargo Barges
- Offshore drilling support assets
- Fleet has been safely transported in the past
- Established operator with global project experience

Transportation Vessel:

- Semi-Submersible Heavy Lift Vessel (SSHLV)
- Purpose-built for transporting large and complex structures
- Operated by a leading global Transportation Contractor
- Proven track record in complex offshore construction and transportation projects





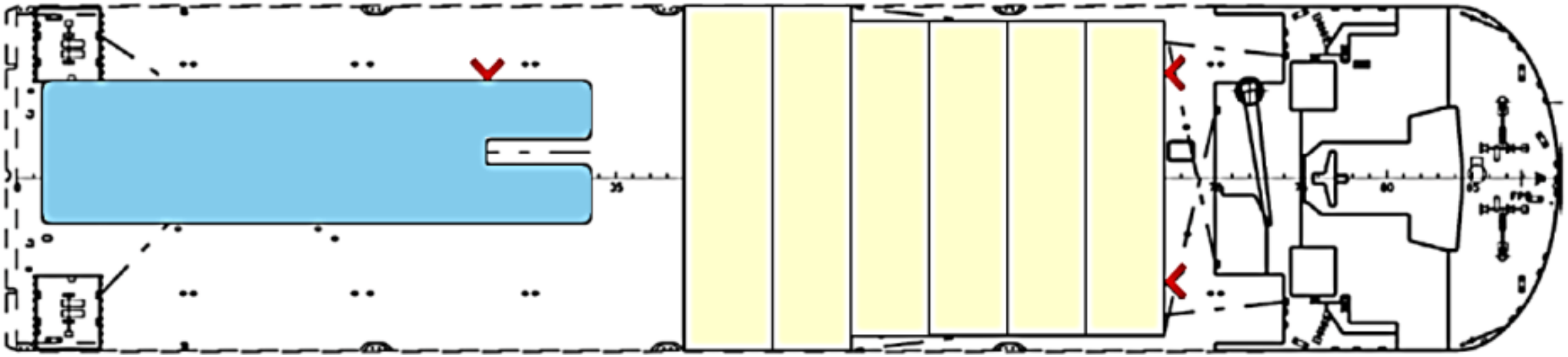
Dry Transportation

- **Route:** Louisiana, USA to Bonny, Nigeria
- **Voyage Duration:** 22 days at 12 knots
- **Approximate Distance:** 6,300 nautical miles
- Transatlantic crossing through Gulf of Mexico and Atlantic Ocean

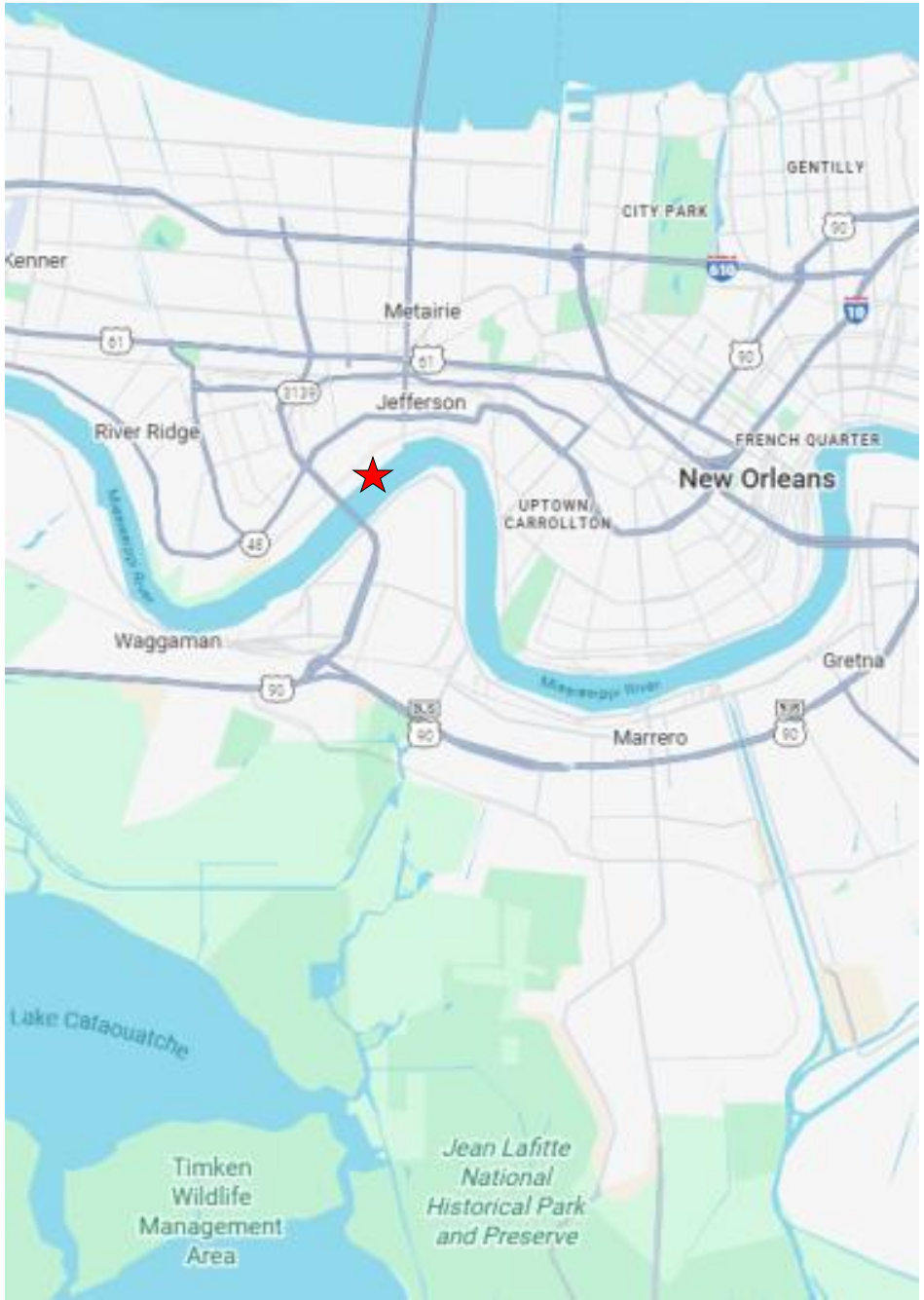
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Cargo Arrangement

- Drill tower / derrick lowered and secured on deck
- Single guidepost for the DB
- DB to be stowed aft between stability caissons
- Two guideposts forward for the six associated barges
- Six barges to be stowed on forward portion of HLV deck




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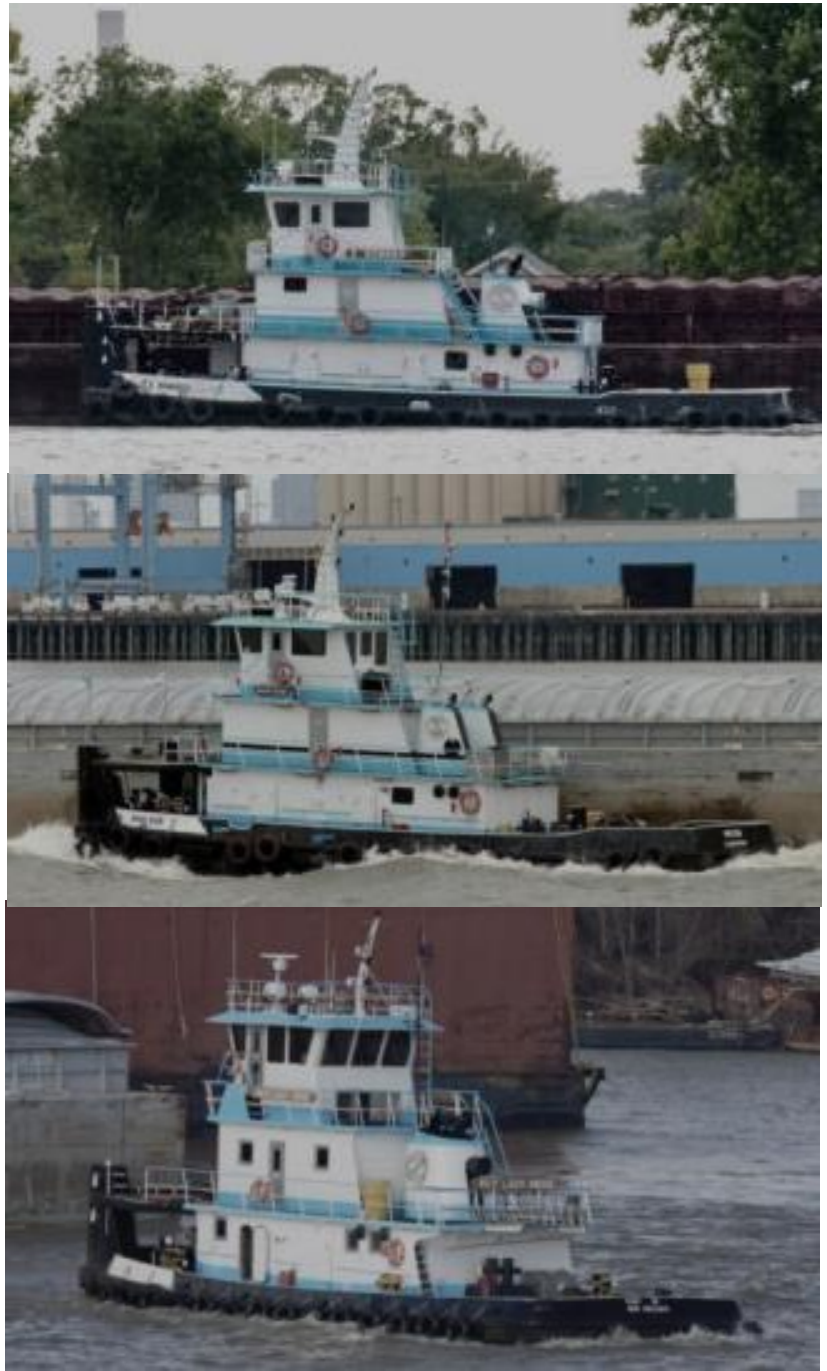


Loading Location

- Mississippi River, Jefferson, Louisiana
- Just upstream of the Huey P. Long Bridge
- Proximity to bridge adds navigational complexity
- Active river traffic zone
- Open river loading location with minimal shelter
- River current add complexity and risk
- All because towing 7 vessels to a more suitable location would be costly

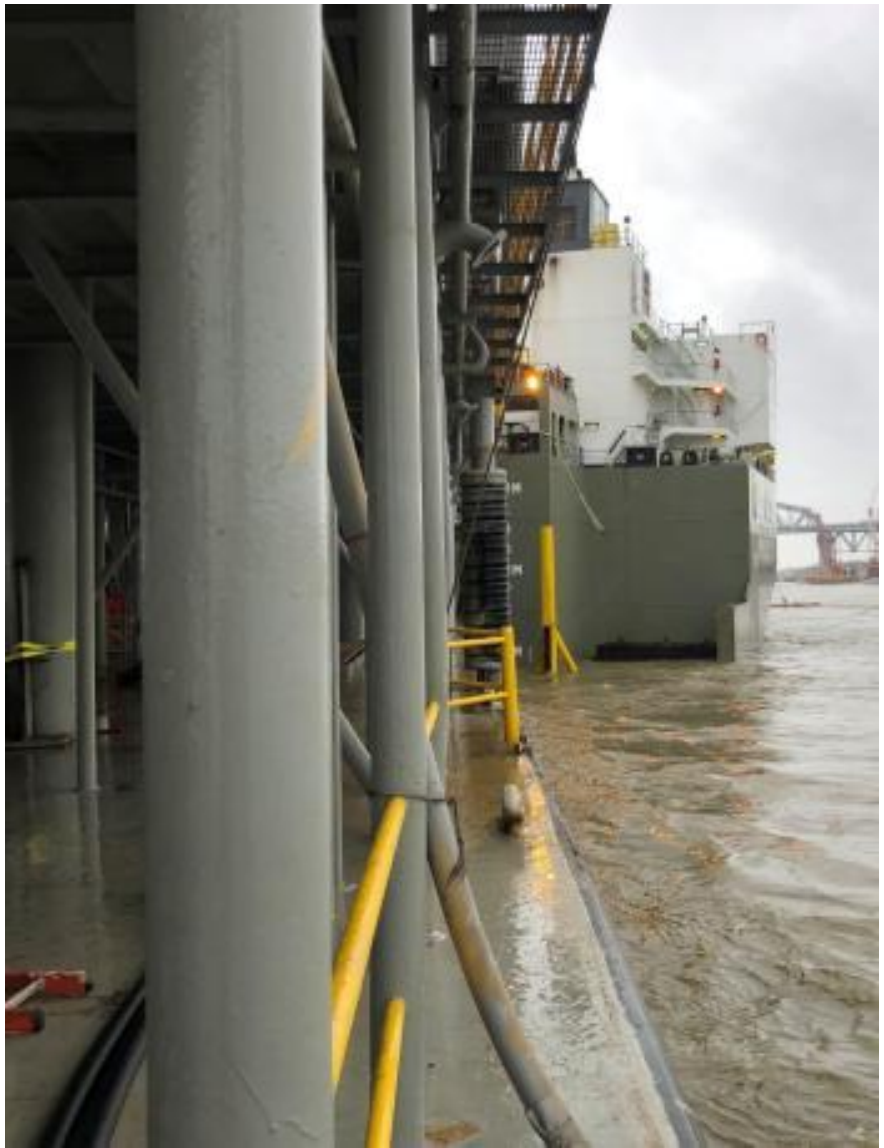
Time For Decidin’

- Current at site measured more than 4 knots
- Three small Intercoastal Tugs arrive onsite
- MWS and the loadmaster express concerns over current conditions and maneuverability
- Local tug captains acknowledged the challenge but note they’ve *“Worked in worse”*
- After some discussion, MWS issues the CoA
- Loading immediately commences following issuance of the MWS approval




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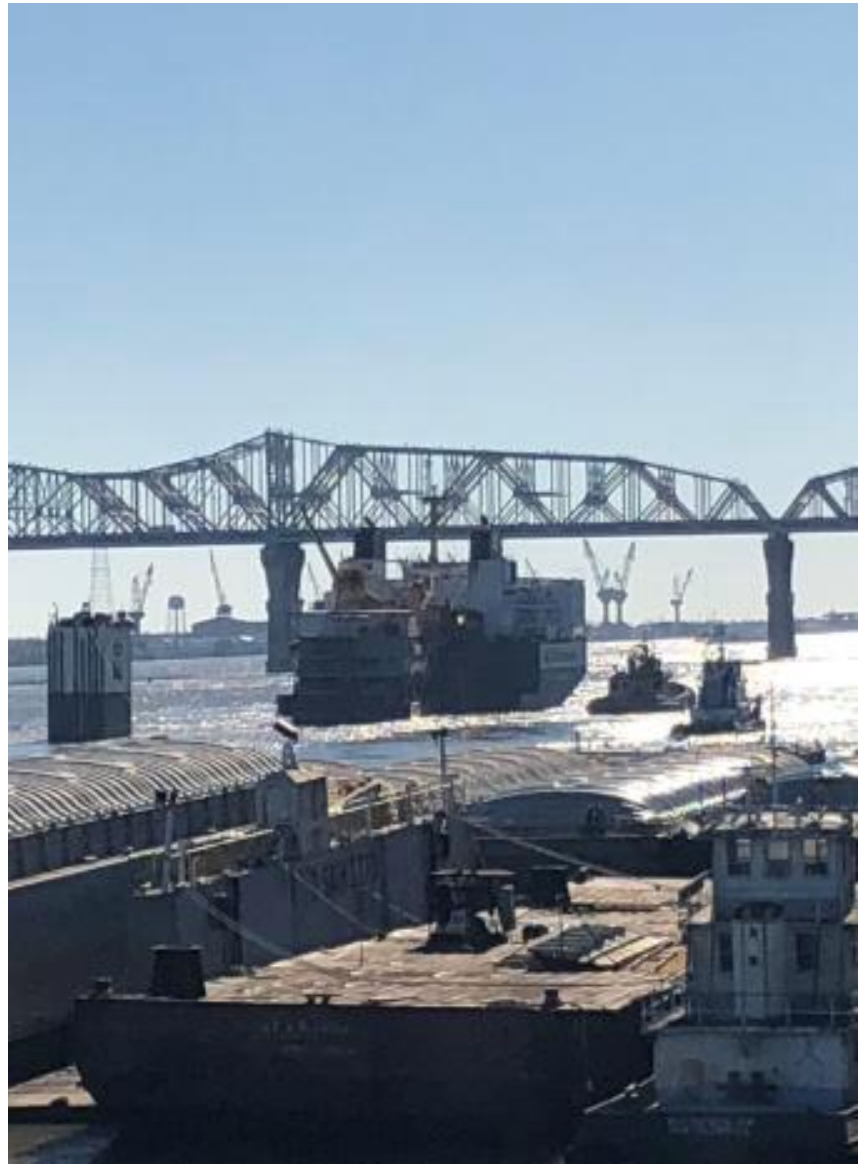
Challenging Maneuvers



- **7:25 AM:** Over the next hour, tugs wrestle with conditions, struggling to bring the DB into position
- The DB surges unexpectedly, making contact with the STBD stability caisson of the SSHLV
- SSHLV connects to DB, allowing tugs to disconnect
- DB crew attempted to tie off to the guidepost
- The line snaps immediately, narrowly missing nearby personnel

Structural Damage and Flooding

- **8:27 AM:** SSHLV Superintendent abandons the operation; tugs reconnect to the drill barge
- Over the next hour and a half, the DB repeatedly makes contact with the stability caissons of the SSHLV
- **10:00 AM:** DB collides with guidepost, swings to strike the STBD stability caisson of the SSHLV
- **10:20 AM:** Guidepost is knocked overboard, DB begins taking on water and develops a STBD list



Drifting Unit and Emergency Response

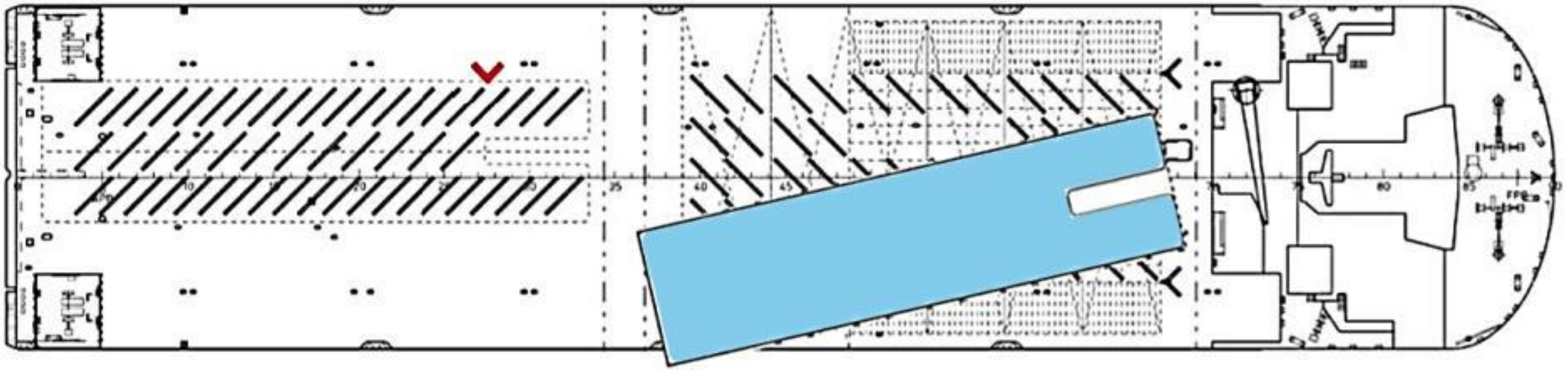


- **10:27 AM:** Tug Towmaster requests SSHLV to release the DB so tugs can regain control
- Tug 1, pulled by the drill barge, cuts its towline
- Tug 2 and Tug 3 release their towlines
- DB is drifting
- SSHLV sounds general alarm
- DB collides with the FWD guidepost
- SSHLV de-ballasts to catch the DB


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“Current” Cargo Arrangement

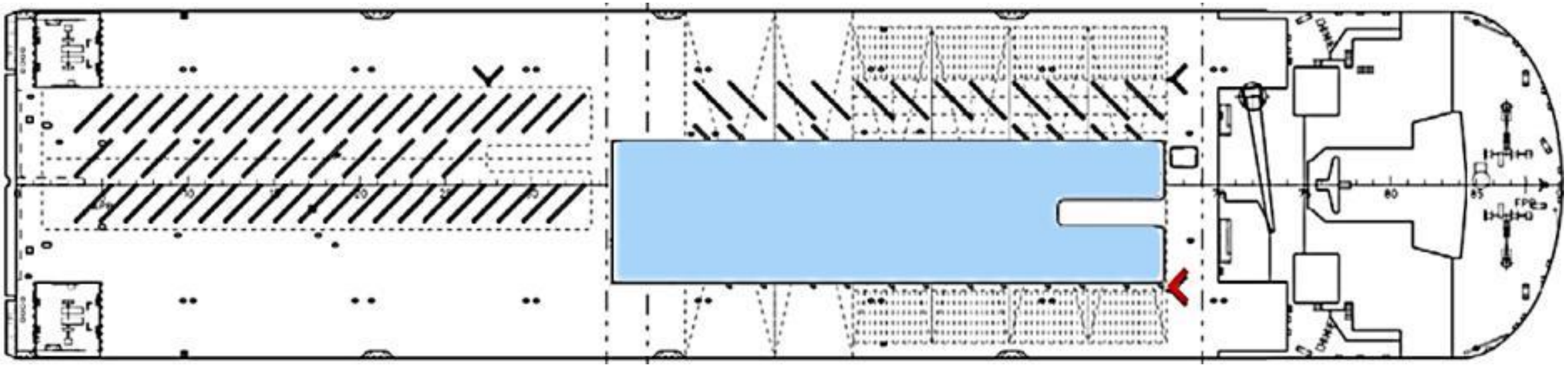
- DB is damaged and the watertight integrity is compromised
- The single aft guidepost, intended to position the barge, has been toppled
- Stability caissons on the SSHLV bear the scars of repeated impacts
- One of the forward guideposts catches the barge
- The SSHLV captain’s quick thinking prevented a potentially catastrophic loss





Recovery and Damage Assessment

- **Five days later:** The drill barge is re-floated and repositioned
- Conditions are significantly improved
- The loading is completed without further incident
- Adjuster boards the SSHLV to assess the extent of damage





Now For Plan B

- A drydock will be required to repair extensive structural damage to the DB
- No suitable drydock available in the Gulf of Mexico
- Plan to transport the unit to a drydock in Nigeria for repairs
- Ultimately minimizing further costs and delay

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HUMAN RIGHTS WATCH

Nigeria: Widespread Violence Ushers in President's New Term






6
5
4
3
2





Why Did This Happen?

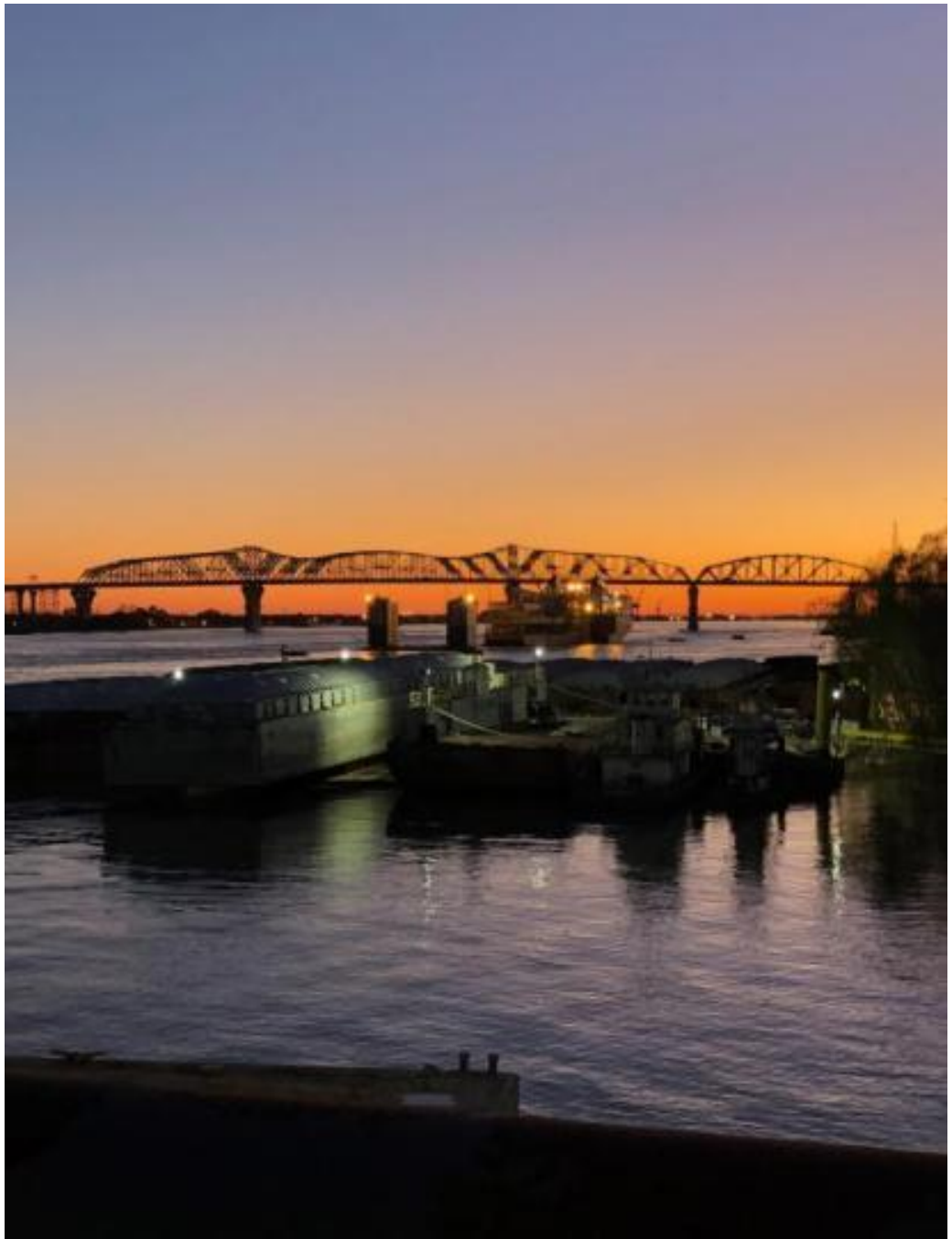
Cargo Securing Manual:

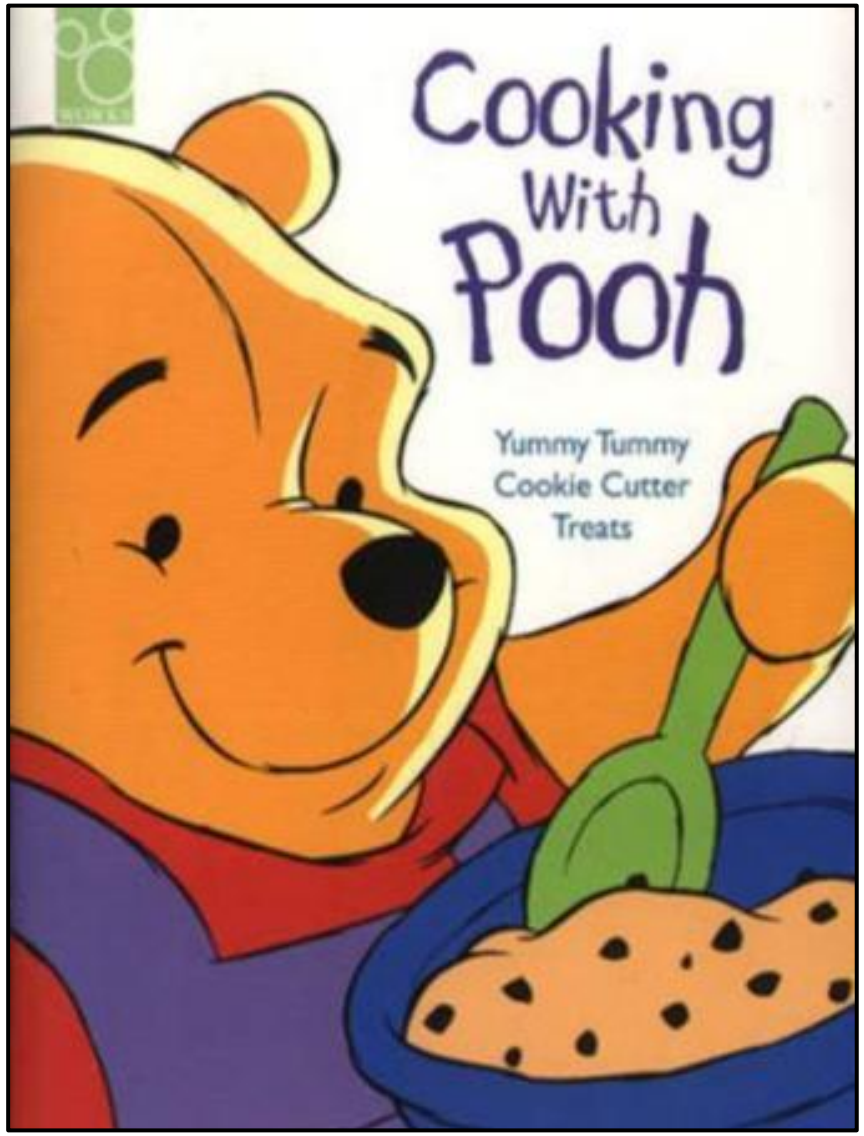
- “This document is used as a guideline for the voyage, loading, and discharge operation.”
- “For the loading operation, favourable weather conditions are required.
- “Maximum current speed 0.5 knots”

Actual current:

4.0 knots, 800% over the limit

“…worked in worse”




Cooking
With
Pooh
Yummy Tummy
Cookie Cutter
Treats



Case Study:

FPS Dry Transportation

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Cargo:

- Four Column Semi-Submersible Floating Production Unit (FPU)
- New Construction
- Never been transported
- Established Designer
- Established Operator

Transportation Vessel:

- Semi-Submersible Heavy Lift Vessel (SSHLV)
- Converted tanker for transporting large and complex structures
- Operated by a globally recognized Transportation Contractor
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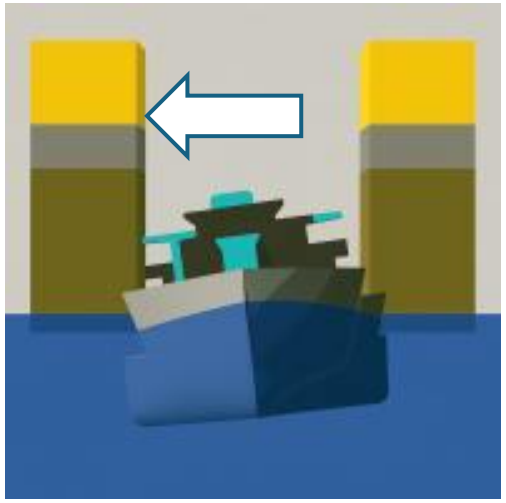
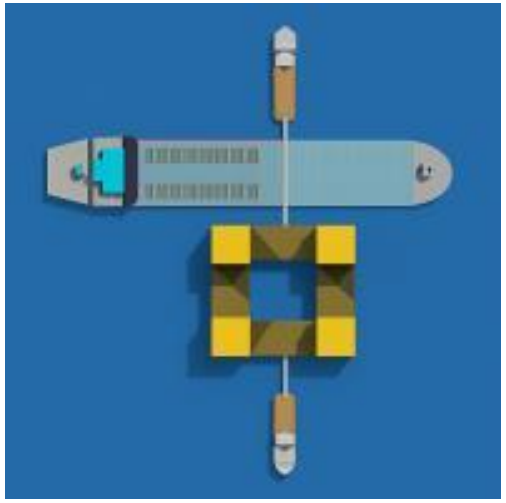
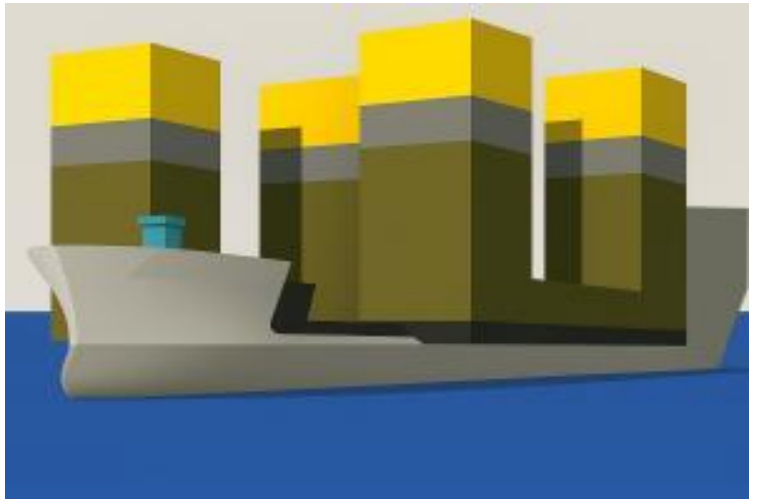
Dry Transportation

- **Route:** Singapore to Ingleside, Texas
- **Voyage Duration:** 45 days at 12 knots
- **Approximate Distance:** 12,700 nautical miles
- Rounding the Cape of Good Hope

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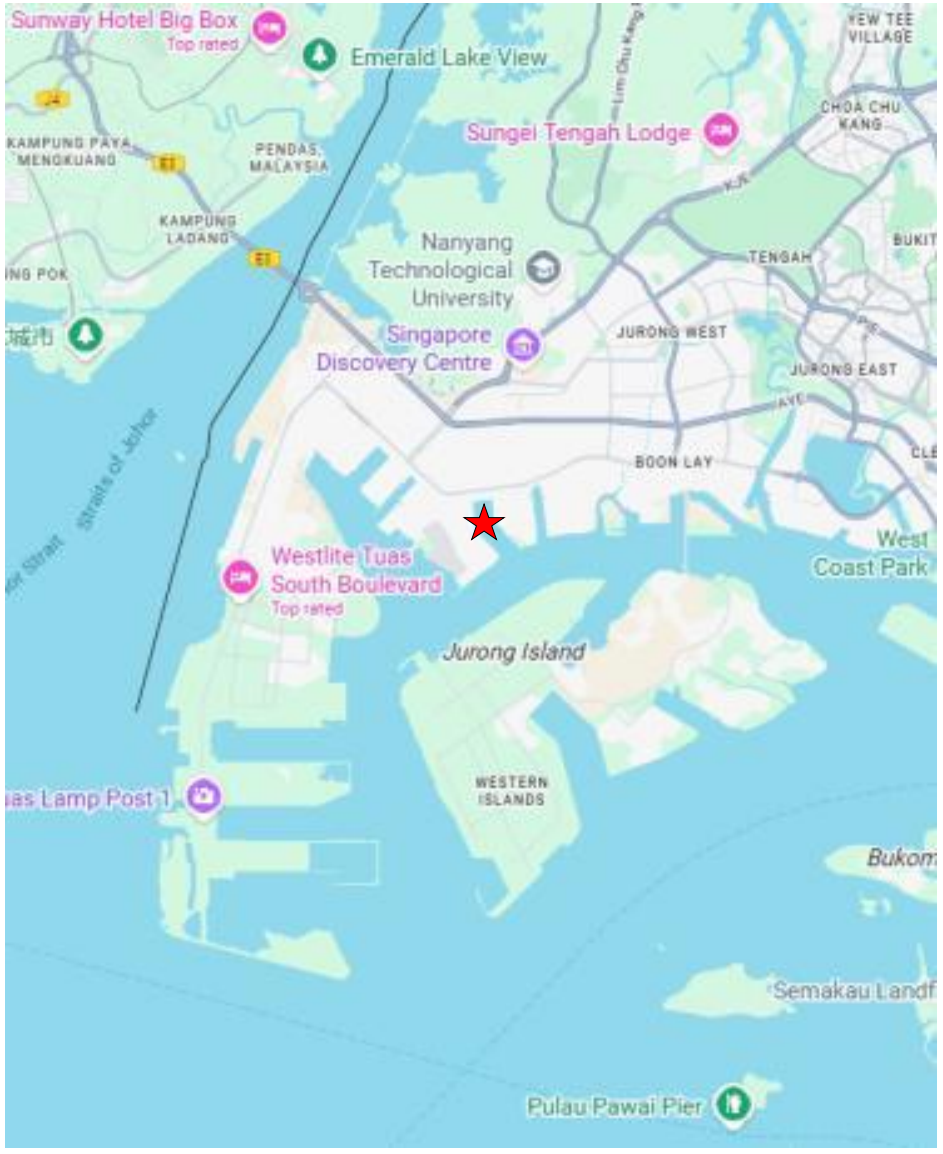
Cargo Arrangement

- FPU transversely loaded via 2m deep skid beams
- Once in place, the FPU is temporarily seafastened to shift offshore to deeper water
- Cut free temporary seafastenings on starboard side
- Detailed ballast plan to produce STBD list for STBD discharge by two tugs
- Repositioned on transportation cribbing, seafastened, safely depart for GoM


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Loading Location



- Dyna-Mac Facility
- Singapore
- Multiple dry docks “one-stop” large-vessel repair
- Multiple ships being repaired, upgraded or converted at any given time
- Active traffic zone
- Outside of the facility there is potential for significant tidal currents

Operation Commences

- **4:00 PM:** Over several hours the FPU hull is transversely loaded and positioned on 2m skids on the deck of the heavy lift vessel at the yard.
- Temporary seafastenings are added for shifting the hull on the following morning,
- **7:00 AM:** The following morning the vessel shifts to the deep hole to perform the float aft operation.
- Everyone but the loadmaster is onboard.
- Temporary seafastenings are removed from the STBD side of the cargo for the controlled float aft operation.
- **7:50 AM:** Ballasting operations commence.
- Shortly after, the Loadmaster arrives onboard.




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- **8:30 AM:** During initial ballasting, the vessel develops a port list of approximately 2° to 3°.
- **9:05 AM:** The Ballasting Engineer adjusts the ballasting operation to correct the port list.
- **9:19 AM:** The vessel suddenly lists again, increasing to about 4° to 5° to port.
- **9:23 AM:** Loud juddering erupts as the FPU hull suffers an uncontrolled launches from the port side.

Damage, Flooding, and Drifting

- **9:23 AM:** All four mooring ropes instantly part.
- **9:30 AM:** Two moored vessels in the vicinity quickly recovered their anchors and maneuvered out of the way to avoid collision with the FPU hull.
- **10:03 AM:** Tugboats arrived on site, connected to the hull, and relocated the FPU hull back to the Dyna-Mac yard for initial damage inspection.
- Within 30 minutes, two assets were seriously damaged, and several other vessels narrowly escaped.
- Personnel involved in the operation were lucky to be alive.





Aftermath

- Heavy lift vessel halted all operations to assess the damage
- The damage sustained during the incident had impacted the FPU hull’s seaworthiness.
- Three ballast tanks were compromised.
- Two were flooded to the waterline.
- The third contained approximately 12" of water.
- Several other tanks showed significant damage to web frames.
- Multiple anodes were torn from the hull and required reinstatement.



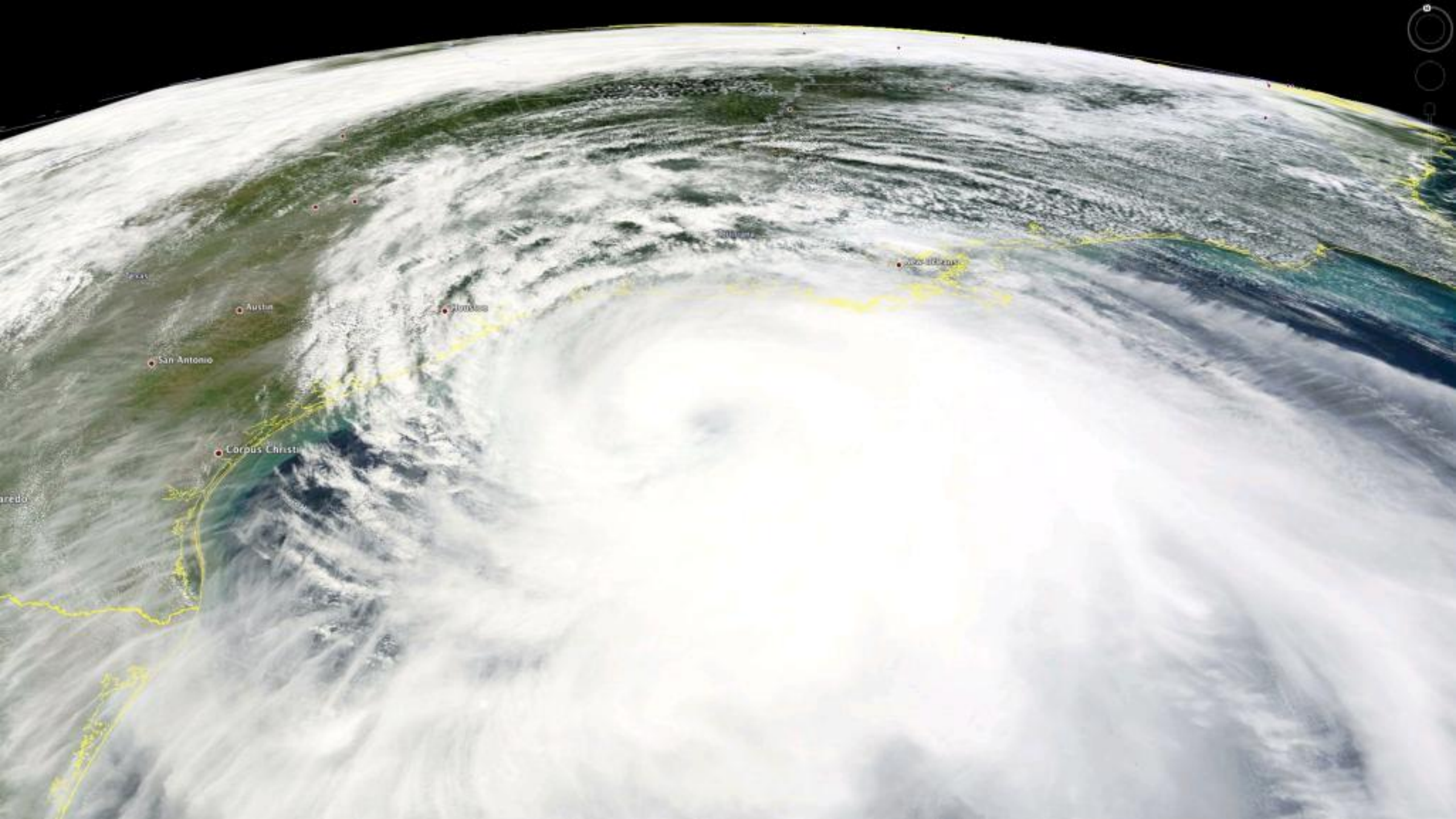


Now For Plan B

- The hull would have to be redirected to a dry dock in Port Arthur, Texas for repairs.
- The United States Port Authorities required a pre-condition repair before arrival.
- An additional dry dock in Galveston, Texas was nominated to restore watertight integrity prior to wet tow to Port Arthur.

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Austin
San Antonio
Corpus Christi


45
Galveston
146
6
Texas City



Now For Plan C

- The SSHLV new plan is to redirect to Trinidad for patchwork repairs.
- Upon completion, it will sail directly to the drydock in Port Arthur.
- After final repairs, the FPU can be wet-towed to the Kiewit Facility in Ingleside.
- However, the vessel's mid-Atlantic blackouts are never firmly addressed.

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FIRST
SAFETH
FIRST





NEWS

Titan-1 Capsized & Lost En-Route to UK North Sea

KS Energy Services Ltd.

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The Board of Directors of KS Energy Services Limited regrets to announce the loss of its jackup liftboat Titan-1 en-route from Pascagoula (Miss, USA) to Liverpool (UK), loaded aboard the semisubmersible heavy lift vessel M/V Ancora.

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Globally active, locally present.