Cargo Loss Prevention

A Formula for Success in the Domestic & International Markets

Proven Loss Prevention Model & Process
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“...it's late because of a dock strike...”
“...I can assure you, your order is on the water...”
"...your shipment is waiting to be released..."
“...we sent it by ground...”
...sure, we can do drop shipments...
Cargo Shipping

Puzzle

or

Process?
Cargo Shipping

Success Formula

Product Susceptibility + Transit Environments + Understanding the Total Transit + Packaging Adequacy = Loss Free Shipment
Cargo Shipping

- Product Susceptibility
- Transit Environments
- Understanding the Total Transit
- Packaging Adequacy
Product Susceptibility

- Understanding the components of the product
- Understanding how the components work and are engineered
- Determine where the product can be damaged
- Some exposures: vibration, moisture damage, crushing, dropping, theft, infestation, temperature extremes
Transit Environments

- **Domestic Transit**
  - Train, Truck, Air, Barge

- **Overseas Transit**
  - Vessel, Air

- **Destination Transit**
  - Train, Truck, Air, Ox Cart
Transit Environments

Critical Components

• **Carrier Selection:** adequate cargo protection, modern equipment, experience handling similar cargoes, clean stowage

• **Forwarder Selection:** knowledgeable about ports and services, country import requirements
Understanding the Total Transit

- Carriers
- Shipping Terms
- Weather Conditions
- Importation Country Requirements
- Anticipated Time of Total Transit
- Contract Provisions
We Know:

- How the product can be damaged
- The total transit, and entry requirements
- The contract terms for carriage and sale of the product
- Method of transportation including stowage requirements
Packaging Adequacy

Thought Process

• Minimize Loss From the Theft Group
• Minimize Physical Damage
• Minimize Environmental Damage
Final Check List

Preparing the Cargo

• Pack for the toughest leg of the journey
• Understand where the cargo is most susceptible to damage
• Understand that the exterior package may need to support cargo more dense because of transit schedule
• Protect from Theft, Handling and Stowage, Water damages
• Understand the entire transit exposures
Final Check List

Plan The Stow

• Observe Weight Limitations
• Avoid Mixing Incompatible Cargo
• Observe Hazardous Materials / Dangerous Goods Regulations
• Have all Cargo and Materials Ready Before Stowage Begins
• Plan for ease of Unloading
• Understand Cosmetic Damage Exposures
Loss Free Shipment

Success Formula

• Product Susceptibility + Transit Environments + Understanding the Total Transit + Packaging Adequacy =

Loss Free Shipment
Marine Transportation of Irregular Cargo

Case Study: Trans-ocean tow of a large floating dry dock

Chris Law
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A Division of Starr Indemnity & Liability Company
Marine Transportation of Irregular Cargo

**Define The Project:**

By definition, “irregular cargo” implies a cargo type that does not fit into the box of “standard” marine transportation and as a result often requires an increased level of loss control input and management.

To start this process it is vital to define and understand the project which generally revolves around the 4-in-1 question:

- What needs to go where, when and how?

And while sometimes the immediate answers can be a little daunting.....

- What? The large, heavy, awkward to handle and expensive parts
- Where? Very, very far and/or to remote and inaccessible location/s
- When? Yesterday. But tomorrow at a push
- How? We are working on that........

Involvement at that stage is ok as it allows a level of input and control.
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The 4-in-1: What, where, when, how?

- What? Delivery of a 950 foot long new-build steel floating dry dock (FDD), 55,000 long ton lift, as a 576’ mid body section with the 187’ bow and stern sections stowed and secured
- Where? Trans Pacific: Far East to San Diego, California (via Hawaii)
- When? October to December 2016
- How? Open ocean tow, approximately 6,500 NM @ 5 knots, 60 days
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**Identify The Hazards:**

Primarily associated with the route

- Weather and sea state; Western Pacific “typhoon alley” in typhoon season, followed by several thousand nautical miles of open Pacific Ocean
- Distance from assistance, safe harbor/shelter
- Slow speed can’t outrun storms

*I.e. is a large FDD strong and stable enough for the rigors of open ocean transit?*
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**Strength analysis:**

Conventional ship longitudinal strength analysis comprises of stress and strain calculations associated with longitudinal bending moments, hogging and sagging, and shear forces.

These bending moments develop as a result of load distribution (cargo, ballast, deadweight and vessel lightweight) and buoyancy distribution (waves and hull form), and themselves depend on the intended vessel design purpose and Classification notation (area of operation and statistical wave characteristics).
**Strength analysis:**

But even this analysis does not prevent all hull failures....

....although inclusion of this example in no way implies or suggests cause....
Strength analysis:

But in strength terms, a floating dry dock is not a conventional vessel. Operational design is calm (still water) harbor conditions with the load case for most onerous longitudinal strength analysis being a vessel equal to the FDD maximum lift capacity distributed over the shortest deck length. Also note, FDDs are not designed specifically for open ocean towing, and wide, open ended, 3 sided boxes are not inherently rigid structures (*Note as of 2017 ABS rules for steel FDDs include consideration of "Environmental Safety Factors" associated with open ocean towing).
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**Strength analysis:**

So how do you analyze the strength of an FDD under conditions of open ocean tow? An FEA (Finite Element Analysis) study was completed for the anticipated load condition and for the most severe historical significant wave height for the route; BUT it is important to note the FEA outputs are only as good as the inputs:

**FEA Inputs:**
- Mesh size and fixity
- FDD particulars
- FDD structural arrangement
- Load condition
- Sea states and direction

**FEA Outputs:**
- Worst case – quartering seas, “racking”
- Local stress hotspots
- Structural modifications
Stability analysis:

Stability was modeled for a variety of conditions to include two compartment damage in the anticipated load condition; again it is important to note the model outputs are only as good as the inputs:

**Model Inputs:**
- FDD particulars
- FDD watertight subdivision arrangement
- Tank volumes
- Load condition
- Dynamic wind heel
- Hs wave profile

**Model Outputs:**
- Intact and damage stability criteria met
- Longitudinal strength criteria met
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Motion Study:

• 6 degrees of vessel motion
• Different accelerations at different locations
• Acceleration applied to object mass determines the required restraining force
• Permits design of adequate sea fastenings

To ensure adequate securing of:
• Bow and stern sections
• Pontoon deck apron
• Vehicle access ramps
• Keel blocks
• 50 ton SWL Wing Wall Cranes
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**Green water load analysis:**

- To ensure adequate strength of the transverse internal bulkhead which is now the FDD’s effective bow (remember the FDD actual bow and stern sections have been removed and stowed; the mid body is being towed)
- To design “breakwaters” with sufficient sea fastening restraint at the bow and stern for protection against shipping excessive green water:
  - Prevent unwanted additional loads on bow/stern section, vehicle ramp and apron sea fastenings
  - Preventing any possibility of water from entrapment of water deck
Limiting Sea State and Wind Speed (really important!):

Determining that the FDD is strong and stable enough, and sea fastenings are designed to be strong enough loads associated with the long term statistical wave heights on the route does not define safe limiting sea state and wind speed criteria for the tow:

- $H_s$ (significant wave height) is the statistical average of the $1/3$ of the highest waves – there will be higher, steeper waves and there is the possibility of rogue waves
- The sustained wind speeds associated with an 8.5m (28’) height wave in a “fully developed” sea state are approximately 41-47 knots, Strong Gale Force. Depending on fetch, winds associated with this wave height could be much stronger.

It makes sense to introduce a margin of safety with reduced recommended limiting sea state and wind speed, which in this case were 5m $H_s$ and winds 30 knots or less. Why?

- Keeps actual motions, stresses and green water loads below engineering calculations
- Limits for both prevent exposure to one of the two extremes independently e.g. short fetch
- While not absolutely binding, they define quantified reasonable limits for the towing vessel (and Captain) for the basis of route planning
- Are not so onerous that the FDD will never leave the dock
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**Towing vessel selection:**

- Bollard pull calculation – the required towing power to overcome the FDD hydrodynamic and aerodynamic resistance under the anticipated towing conditions. Typically calculated for two conditions:
  - Design tow speed in reasonable sea conditions
  - Hove-to in heavy weather
  - De-rate actual tug BP to 75% MCR for margin
- Fuel consumption, range calculation, reserves and bunkering
- Towing gear main and second tow line, winch, brake capacities and tension monitoring
- Desktop review: Class survey and certification status, ISM audits, PSC inspection records

**Towing pad eye strength analysis and tow gear design arrangement:**

- To ensure the towing fixtures and adjoining hull structure have sufficient strength, including a margin for the anticipated loads under tow.
- Towing gear arrangement – tow wire, bridle, shackles and connection gear SWLs and emergency tow wire arrangements

**Refuel/Bunkering Plan:**

- Insufficient fuel to make the voyage required a plan to refuel/take bunkers; approx. 24 hour process
- Procedure for release/handover of tow wire to a standby vessel
- Selection of a suitable standby tug
- Identify suitable locations and determine safe limiting sea state and wind criteria
**Voyage Plan or Towing Method Statement (really really important!):**

A single narrative document which lays out the Point A to Point B tow plan and all information pertinent to its safe execution, and which is reviewed and agreed to by ALL PARTIES!!

- The tow route, waypoints with distances and durations and locations of possible safe harbors/ports of refuge
- The FDD particulars, load condition and departure drafts/markings
- The main and emergency tow gear arrangements with protocols for hook-up, deployment, release and retrieval
- Departure and arrival protocols; weather, tide and draft restriction windows, use of assist tugs and pilots, regulatory and port authority notifications (dead ship tow arrival)
- Sea state and wind speed limiting criteria
- Weather forecasting advance period, frequency and routing
- Progress reporting, twice daily, agreed content and distribution
- Monitoring of the tow line tension and condition, of the FDD stability and of stowed equipment
- Chain of command for go, no-go decision making with 24/7 points of contact
- Emergency contingencies for loss of tow wire, loss of stability, loss of power
- Refueling (bunkering) method statement detailing standby tow vessel, release/handover of tow wire, handover location options, limiting sea state and wind criteria, hand back to main tow
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**Preparation for and actual departure:**

Pre Departure Meeting involving:
- Harbor authorities
- Tow vessel Captain
- Assist vessel Captains
- MWS
- Owner’s rep
- Builder’s rep
- Lines handler foreman

Checklist of preparations:
- Loaded drafts / high visibility marks
- Watertightness
- Sea fastenings
- Towing Gear
- Departure tides, drafts and weather
- Route weather forecast
- Vessel traffic
- Navigation warnings/notices
- Towing vessel vetted/provisioned/fueled
- Issue Clearance to Depart Certificate
- Lines away!
The Voyage:

Departed October 2, 2016 after a delay to monitor the forecast track, intensity and sea states associated with Typhoon Chaba:

Relative positions of the FDD and Typhoon Chaba on October 4, 2016 (winds 110 knots, wave height 9m or 29.5 feet)
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The Voyage:

Once underway:
- Monitor the conditions, modify the route accordingly – theory versus reality
- Monitor the tow (stability/draft marks, cargo), and report twice daily; failure to do so may result in shore side anxiety!!
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The Voyage:

Refueling/Bunkers Honolulu, November 13 – 14, 2016 (plan submitted to and approved by USCG Sector Honolulu prior to departure):
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**The Voyage:**

Arrival San Diego Harbor, December 8, 2016 after 60 days and 7,081 NM at sea (dead ship arrival plan submitted to and approved by USCG Sector San Diego prior to departure Honolulu):
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Post Arrival:

- Arrival condition survey (joint parties)
- Final assembly, testing and commissioning trials
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**Post Arrival:**

FDD “Pride of California” open for business....
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Conclusions:

• Define the project to answer the “what, where, when and how”
• Identify the hazards and analyze the associated risks
• Manage the risks through detailed planning, engineering analysis, incorporation of safety margins and contingencies, AND production of a VOYAGE PLAN!!
• Execute the plan, monitor the tow and weather forecasts and adapt accordingly

And finally, take a deep breath and get a decent nights sleep, as you never know what the next “irregular cargo” project may entail……

Thanks for your attention!

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November 23, 2003 – Moving the British Airways Concorde from JFK to the Intrepid Sea Air Space Museum.
PROJECT MANAGEMENT FROM ORIGIN TO FINAL DESTINATION:

1. Planning.
2. Lifting/Shifting.
3. Site Preparation.
4. Transportation.
7. Transfers.
The Challenge:

Risk Engineering was contacted on Dec 23rd, 2016 by Houston based underwriting team about a unique risk that needed immediate assistance. Customer had purchased a large amount of used (Oil/Natural Gas) Capital Equipment in Columbus, MS, and wanted to transport it via barge(s) to New Orleans, LA. **Value: $36,000,000.00**

This was the first time this customer had ever done such a project, so they immediately proceeded to farm out all their logistics to the subcontractor who offered....the lowest bid, then went shopping for insurance.

Any of this sound familiar?
Mark Cote
Director - Global Marine
NJ & Associates, Inc.
Loading of the barges was scheduled to begin on Dec 27th.

Columbus, MS is located in the center of the state, 3 drive hours from the coast, and accessible to the ocean only by navigation through the narrow 190+ mile Tombigbee River system to Mobile, AL., followed by navigating the coastal route to New Orleans, LA.
Complications of assignment:

**Timing** – We were notified of the assignment two days before Christmas, with loading to commence 2 days after Christmas. (Tough to get people on the phone)

**Location** – There were no qualified Project Cargo Surveyors located in Columbus, MS. (It’s 150 miles from the ocean). Closest associate was in Mobile and/or New Orleans.

**Barges** - Four barges - tandem towed (two at a time/two movements).

**Cargo Height** on Barge: 50’

**Navigation** – The Tombigbee River is very narrow in locations, with a large number of hairpin turns, locks, and 10 bridges to travel under.

**Weather** – There was a cold front stalled over much of the Columbus, MS geography – cold, moist northern air mixed with warm southern earth = heavy fog.
Ten Bridges/Rail Crossings

NORFOLK SOUTHERN RAILWAY BRIDGE

- Elevation of Low Steel: 466.0'
- Vertical Clearance at Normal Pool: 52.0'
- Vertical Clearance at 1% Duration Flood: 46.5'
- Horizontal Clearance: 280.0'
MISSISSIPPI
LEFT DESCENDING
BANK

2

CHANNEL SPAN

MISSISSIPPI
RIGHT DESCENDING
BANK

BURLINGTON NORTHERN SANTA FE RAILROAD BRIDGE

Elevation of Low Steel 242.0'
Vertical Clearance at Normal Pool 52.0'
Vertical Clearance at 1% Duration Flood 41.8'
Horizontal Clearance 300.0'
• We were able to send our Mobile, AL based surveyor to Columbus, MS on December 24\textsuperscript{th} to review the transportation plan with the client. Loading was agreed to start on Dec 27\textsuperscript{th}.

• Risk Engineering requested that NDT (Non-Destructive Testing) be conducted on the Module bracing system that would be used to support the various towers that were to be placed on the 2\textsuperscript{nd} group of barges.
December 27th, (Day of first scheduled loading) - Surveyors arrived on site, and the following items became known:

- Two of the tug boat captains did not have the proper license to navigate the Tombigbee River (aka: River Endorsement).

- **NDT Testing of the module crib system showed a 100% failure rate on 80 weld-joints.**

- The barges were not the right class that should have been used for the cargo in question. The customer had entrusted the barge selection to their logistics provider – who had never actually moved this type of equipment, nor in this type of narrow river & multiple bridge(s) condition.
• It was expected that the barges to be used would have been larger - and flatter - thus preventing the need for ballasting. The Tombigbee River has numerous bridges along the 190+ route to Mobile. The barges that were present would need to be ballasted to reduce their height while going under the numerous bridges located on the Tombigbee River. (50’ under normal river conditions).

• Ballasting of the barges would not normally be of concern if the entire trip were on the river - but the tow also included 150+ miles of coastal/open ocean tow. Waves, wind, and foul weather could easily swamp wrong type of barge and cause vessel capsize.
Risk Engineering immediately placed the entire movement at Port Risk and froze any possible loading of cargo until the above problems were solved.

Solutions:

• Another two tug captains with proper licensing were found.

• The 2\textsuperscript{nd} barges crib system was dismantled and all joints were to be re-welded & re-tested before being allowed to leave port. This would cause a 2 week delay in departure.

• The ballast solution was to use WATER as ballast (instead of sand/gravel fill normally used by this particular river barge company). This would allow the barges to reduce their profile enough to clear all river bridges, but could then be pumped out while departing the Mobile, AL waterways, allowing for higher gunwale
The first barges departed Columbus on Jan 2\textsuperscript{nd}, 2017. The journey down-river was complicated by heavy fog, but the barges eventually made it to Mobile, AL, where they pumped necessary ballast out and steamed toward New Orleans. The barges were placed in a lock system waiting area approx. 60 miles east from final destination, until the 2\textsuperscript{nd} group of barges could catch up. It was decided this would allow for a single offloading date.

The second group of barges departed 12 days late, but only after all welds were re-tested and ALL passed. Like the first barges, the travel down the Tombigbee River was slowed due to heavy fog. It finally reached Mobile, AL., pumped ballast, and made its way to the New Orleans Locks.

On Jan 20\textsuperscript{th}, the first barges were released from the locks and towed toward New Orleans. They arrived that same evening and were successfully offloaded on Jan 21\textsuperscript{th}.

On Jan 23\textsuperscript{rd}, the second barges arrived at the New Orleans locks, piloted through, and towed to off-loading area. They were offloaded successfully by the morning of Jan 24\textsuperscript{th}. 
• Had Risk Engineering not been involved, there was a VERY high chance of the cargo movement having incurred a CAT loss due to one of the possible scenarios:

• Navigational error by an unlicensed pilot on a narrow and foggy river.

• Failure of the module braces once frame stress was experienced in open ocean, possibly resulting in total loss of cargo on 2\textsuperscript{nd} barge group.

• Possible flooding & sinking of barges caused by excessive ballasting to clear bridges was originally not scheduled to offloaded in Mobile, AL (Original ballast was going to be sand/aggregate, and would have taken too much time and $$$).

• What was supposed to be only a 12 day exposure to Insurer became a full Month exposure – BUT while the number of days exposure doubled, the actual RISK of loss was greatly diminished by establishing risk engineering controls.

• Success is also contributed to the constant, daily communication between Marine Field Personnel, Risk Engineering, and Underwriters nervously awaiting daily reports. Decision making had to be made daily, and trust between the parties made this complicated job that much easier.
**USS Sequoia** is a former United States presidential yacht used from Herbert Hoover to Jimmy Carter, who had it sold in 1977. The ship was decommissioned under Roosevelt and lost its "USS" status at that time, but by popular convention is still often used.

*Sequoia* was designated a National Historic Landmark in 1987. The yacht is 104 feet (32 m) long, with a wooden hull, and was designed by John Trumpy, a well-known shipbuilder. It includes a presidential stateroom, guest bedrooms, a galley and dining room, and was at one time retrofitted with an elevator for Franklin D. Roosevelt. Lyndon Johnson had it removed and replaced with a liquor bar).

Notable events aboard *Sequoia* include:

- Herbert Hoover sailed her to Florida
- Dwight Eisenhower lent her to Queen Elizabeth II during her state visit to the US
- John F. Kennedy held strategy meetings during the Cuban Missile Crisis, and had his last birthday party on the yacht. (He also used the yacht for romantic getaways with Marilyn Monroe)
- Richard M. Nixon negotiated the SALT I arms treaty with Leonid Brezhnev and Anatoly Dobrynin, and later made the decision to resign the presidency
- Gerald Ford conducted Cabinet meetings
- Ronald Reagan met all 50 state governors at the gangplank
- George H. W. Bush met with Chinese premier Li Peng
(The above photo is a classic representation of a wooden vessel that has “hogged”. Her bow and stern have hogged (sagged) down and her midships have pushed up so that her sheer line is nearly flat.)
M/Y Sequoia on the Railway at Chesapeake Boat Works
Blocking is not on bulk heads

The transom needs support blocks here!

HULL AND BOTTOM:
The keel can be seen leaning to port.

Steel support on keel and major crack in keel.
Can’t use a crane and sling
Can’t Float on/Float off. Sequoia won’t float, and marina is too shallow for float vessel.
Challenges:

• Vessel is currently stored in remote location in Deltaville, VA.

• Extremely narrow pathway to river – very limited space for crane or barge crane. 147 GT.

• At the time it was placed on current rail system, vessel was capable of floating. Now – not the case.

• Wood rot to hull and frame is significant. Use of sling would most likely cause structural collapse.
TRANSPORT OF IRREGULAR CARGO – INTERACTION OF UNDERWRITER AND RISK ENGINEER

Aspen Insurance

Steven Weiss, CPCU, AMIM, NAMS-CMS
Senior Vice President - Marine

Aspen Insurance Holdings Limited
WHY DO UNDERWRITERS INVOLVE SURVEYORS

• Any Thoughts?
  - Is it full employment for surveyors week?
  - Lazy Underwriting – don’t want to take responsibility

• Or is it maybe:
  - 4 eyes are better then 2?
  - Unique Characteristics
  - Specialty knowledge
How do markets underwrite project risk?

- Physical Damage rate is generally as per market, or slightly higher
- DSU premium based on “Rate on Line” methodology
- Potential downside is HUGE
- Must count on proactive loss prevention, and knowledgeable claims handling
WHEN SHOULD THE SURVEYOR BE INVOLVED

Surveyors are key to the success of a project, acting as Underwriters’ eyes and ears from the planning stage through execution:

• When should the Surveyor be involved?

• What is the role of the Surveyor?

• Factors in Company/Surveyor selection
  - In-house - role
  - External – role
WHEN IS THE TIME TO INVOLVE THE SURVEYOR

Pre-Bind:
• To assist the Underwriter in the analysis of the risk from a logistics and complexity standpoint
• Agree Critical Items
• Agree estimated costs for surveys
• Review logistics package

Post-Bind
• Kickoff meeting
• Set up survey parameters
• Assign Surveyors
• Accomplish the actual surveys
KEYS TO PROJECT SUCCESS

Project Knowledge – three legged stool
• Underwriting
• Claims
• Risk Engineering

Specialized Risk Analysis

Coordinated Involvement (project lifecycle)
• Client
• Broker
• Underwriter/Risk Engineer and Claims
THANK YOU