Risks associated with the carriage of yachts as deck cargo

A paper for the IUMI Loss Prevention Committee

Rod Johnson FNI MIIMS
Marine Risk Management Director
Mick Barrass MNI
Marine Risk Management Consultant

March 2018

CONTENTS

Executive Summary

This report, prepared for the IUMI Loss Prevention Committee meeting in March 2018, describes the particular risks and issues attached to the transportation of yachts as deck cargo.

Yachts are transported around the world by sea on a regular basis. There are three principal methods employed; carriage on deck, carriage below deck or in ISO containers, or carriage on road trailers driven on to roro ferries.

This report focusses on yachts carried as deck cargo, and in particular where the cargo is lifted on board. Some specialised ships use a floating dock concept to float the cargo on and off. This technique offers several advantages in that the potentially hazardous lifting operation is precluded and the construction of the ship affords the deck cargo additional shelter from the effects of wind and sea. However, floating dock ships still have to lash the yachts to the deck prior to a sea passage and have common risks and issues with conventional ships in this regard.

The report concludes that;

1. Although theoretically well regulated and planned, the complex relationships between the actors involved undermines the concept of a single prudent uninsured and introduces multiple pathways for negligent behaviour to remain uncontrolled or even undetected.

2. Yachts are difficult to lash safely as they are large, voluminous, irregularly shaped and the strong points provided for mooring are unsuitable for lashing.

3. The cost of properly lashing yachts is avoided by the assumption that insurance will mitigate the losses caused by the lack of effective control and unwillingness by the industry to provide securing systems that are inherently safe on the grounds of cost.

4. The patterns of loss for risk carriers is a series of attritional “damaged on deck” type losses that occasionally spike into a large loss caused by the cargo going overboard. The pattern of attritional loss should indicate to underwriters with a high degree of certainty the likelihood of a large loss and the proper premium to charge. These accounts are inherently volatile.

Roderick Johnson FNI MIIMS
Marine Risk Management Director, RSA Global Risk Solutions

Captain Michael Barrass MNI
Marine Risk Management Consultant, RSA Global Risk Solutions

London, March 2018

Yachts as deck cargo

Yachts, both sail and power, are routinely transported around the world on board ship. These voyages are for a number of reasons and apply to both yachts in solely private use and those offered out for commercial charter. These reasons are typically;

- Positioning, where an owner wants to use the boat in different cruising areas around the world to take advantage of the seasons.
- Sale and purchase, particularly of rare or high value craft.
- Sales and marketing events at a distance from the place of manufacture.
- The provision of production boats to dealerships in other global regions.
- Racing on the international circuit.

Yachts are typically carried on deck because of their size. Smaller yachts can be carried more easily either under deck or, if size permits, in ISO containers.

Transportation is either arranged by the carrier, often a specialist company offering an end to end service to clients, or by transportation brokers who sub contract each element of the voyage.

The contracts of carriage vary but in some cases the carrier's liability is limited and very low, with the yacht owner being asked to carry the bulk of the risk of loss or damage and to either hire or provide cradles, dunnage, chocks and lashings.

Carriers will then take out cargo cover to indemnify them against individual claims for loss or damage. There are no reliable figures to illustrate the size of the trade in terms of volume or value. RSA estimate that losses in this sector may be as high as $100 million annually although the true scale of loss may be obscured by the latency of some of the damages caused.

The principle pathway to loss is during the lifting operation[1], followed by heavy weather damage and damage caused by bad lashing technique.

Lashing systems and issues

All cargo, including containerised cargo, must be properly and safely lashed to resist the motions of the ship on passage. Failing to lash cargo will result in cargo loss or damage and in the case of heavy cargo may threaten the safety of the ship, either by causing hull damage or by shifting, which undermines the reserves of stability.

The governing documentation on board is the Cargo Securing Manual, a statutory document mandated by the International Maritime Organisation[2]. This document is ship specific and describes the requirements on board for lashing points, lashing systems and their use. Chapter 3 of the Manual specifically addresses the stowage and securing of non standard cargo.

The general concept of lashing is to connect the cargo to the ship with a system of lashings capable of resisting the forces imposed on the cargo by the movement of the ship and in a manner that does not damage the cargo or the ship.

Yachts are difficult to stow and lash. This is because of their irregular shape, large size, high enclosed volume and fragility. This presents the carrier with some challenges.

[1] Some yachts are carried on board floating dock type ships where no lift on is required. Some yachts are driven onto the deck of ro or ships on their road trailers. However, most yachts are lifted on board either from road trailers of from alongside.

[2] SOLAS Regulation VI/5 and VII/5 and MSC.1/Circ 1353 Rev 1

The first challenge is to sit the yacht on deck in an upright position. The yacht must be upright to prevent machinery damage by the displacement of lubricant from machinery, and to minimise the loading imparted on the mast step and rigging by the weight of the mast by keeping the mast vertical. This can only be done by some form of cradle or chocking, known as Jenga chocks after the famous parlour game.

Many yacht transporters provide universal cradles and chocks which are maintained in a good condition. The chocks support the yacht in an upright condition and to some extent, with the use of wooden dunnage, resist the lateral movement of the yacht across or along the deck imparted by vessel motion. They exert point loads on the hull when tensioned by lashings and so they must be very carefully positioned if these point loads are not to damage the hull.

The second challenge is to secure the cargo in a way that adequately resists the motions imparted upon the yacht by the movement of the ship. The securing arrangements need, in aggregate, to be sufficiently strong in all six degrees of freedom without placing extraordinary loads on the cargo itself.

All of the yacht transporters provide a variety of lashing systems capable of being specifically tensioned and which have varying degrees of elasticity.[3]

When considering "sufficient strength", a safety margin is built into each particular type of lashing to provide for fortuitous loadings. As such the total strength of the lashing system should, when safety margins are applied, be able to resist the motions of the ship expressed as a fraction of the total mass, with the resistance in each direction of movement having a different proportion.[4]

The third challenge is the manner in which the lashings are attached to the yacht, given that yachts are not designed with lashing points of sufficient number or strength to enable their securing on deck. This is the weak link in the chain because the obvious places to attach lashing to the yacht are the mooring cleats. However, these cleats are not designed to take lashing loads and can only perform in a narrow range of effectiveness. The loads imparted by lashings on these mooring points can be excessive and cause damage to the yacht.

Only one carrier used proprietary software to accurately calculate lashing strength and the frictional restraining forces offered by hull stands placed on dunnage but otherwise unsecured. Many carriers rely on guesswork.

Lifting operations

In many cases yachts are lifted onto the deck of the carrying vessel, usually using the ship's own cranes.

Yachts are not intended or designed to be lifted, but this can be achieved without consequence if the following considerations are taken into account.

Firstly, the centre of gravity must be established and fixed. Establishing the vertical and longitudinal centre of gravity can be derived from drawings or manufacturers recommendations and these positions can be fixed by ensuring that fuel and water is removed or minimised. Additionally, stores and inventory must be secured and stowed and any effect upon the design centres of gravity is accounted for.

[3] The elasticity of a lashing enables it to absorb and release energy imparted by the motions of the ship on the cargo. This can be useful where the object being lashed is not completely rigid.

[4] The IMO publication "Code of Practice for Cargo Stowage and Securing" is the industry reference on the subject of lashing system total strength and apportionment.

Establishing the position of the centre of gravity in all three axes will assist with the identification of lifting points to ensure a controlled and level suspension.

Secondly, the gross weight of the yacht must be established. It is conventional to lift a yacht from at least four suspension points. Accordingly, the downward force experienced at each suspension point must be understood (this is not always gross weight/4) and an agreed safety factor applied, typically 50%.

Thirdly, the direction of lift at each suspension point must be vertical, requiring the use of frames or spreaders because any deflection from the vertical towards the lift point will exert a compressive force on the yacht hull at deck level, a load that the designers never contemplated the hull to have to bear.

Fourthly, the weight of the yacht between pairs of suspension points is typically spread around the hull by the use of a lifting band. These lifting bands must be positioned properly, typically following the lines of a bulkhead moulding and in a manner that does not compress bilge keels, propeller shafts or other underwater fittings.

Finally, the gross weight of the yacht, slings and spreaders must be within the safe working load of the crane at the planned outreach required. All of the factors listed above should feature in a lifting plan prepared prior to the lift.

Any shortcomings in the lifting arrangements will be quickly and ruthlessly exploited by gravity and the strength limitations of the yacht hull, usually with catastrophic consequences.

Risk and liability transfer

There are a number of actors in the transport of yachts as deck cargo. These are;

- The owner, who may be a private client or a business entity, either or which may be represented by an agent.
- The shipper, who may be a yacht transport company with control over every stage of the voyage or a yacht transport broker who places the business with others on behalf of the owner.
- The carrier, who may be the shipowner or a charterer.
- The stevedores, who may be retained by the transport company, or transport broker, or provided by the port.
- The surveyor or supercargo, either contracted by the transport company or broker, or directly employed.

Each of these actors is in a contractual relationship which should, if effective, set out the various obligations that each party owes the other(s).

Each of the actors is able to take out insurance to indemnify them against a loss including those caused by their own negligence.

The standard terms for the carriage of deck cargo do not adequately guard against the actions of a Master who is unwilling to deviate to avoid heavy weather, and once in such weather is disinclined to sufficiently reduce speed.

The complexity of the relationships between the actors, especially in the context of a desire for repeat business, inevitably means that risk control is diffuse and the concept of the prudent uninsured becomes lost in the complexity.

Yacht transport as experienced

There is no central repository of global losses for this type of business, so a typical account involving a market leader has been analysed over a three year period and reliable inferences can be drawn from this.

Figure 1 shows the scale of loss in dollar terms, categorised into three broad types of causation. These are;

- Damaged on deck, which covers damage to the yacht caused by poor lashing, or contamination, or contact with other cargo.
- Lifting damage, covering damage caused by the yacht being dropped or swung into something because of poor lift planning.
- Loss overboard, caused by a combination of heavy weather aggravated by the inadequacies of the lashing system in use.

Figure 2 shows the same pattern of loss by frequency.[5]

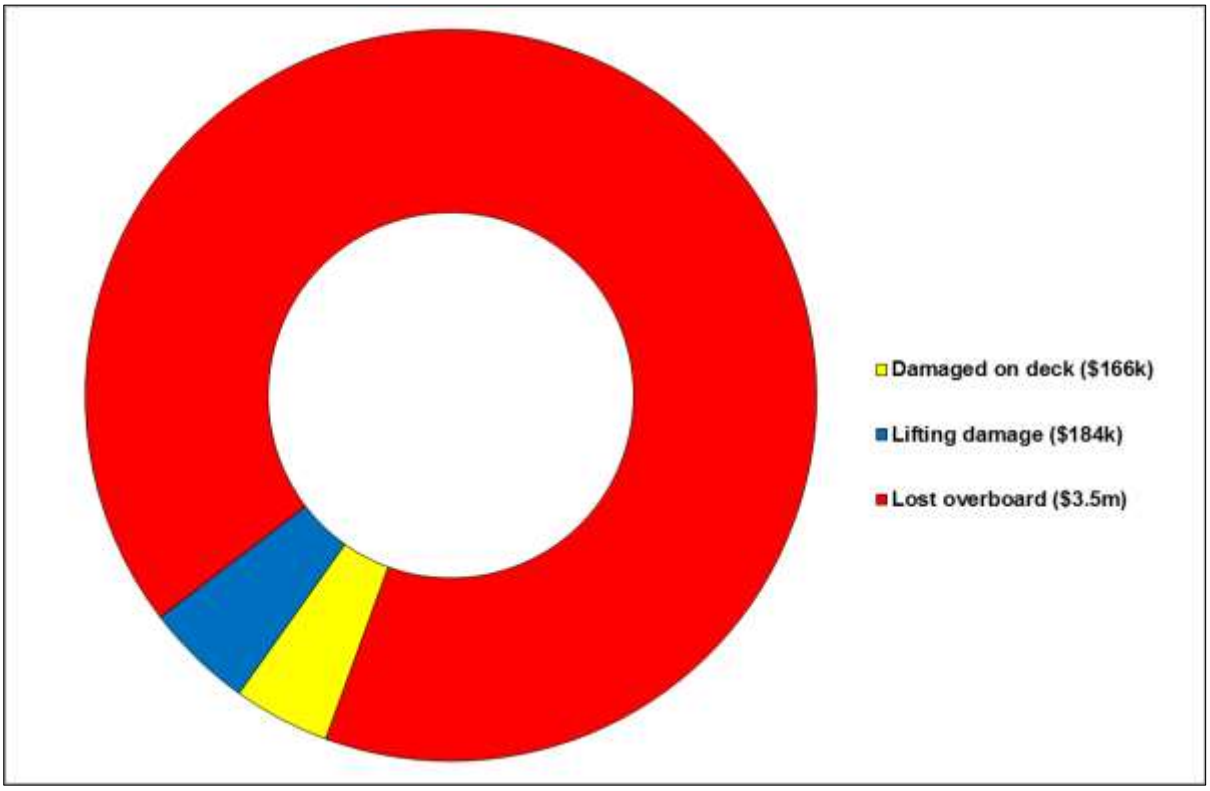

Figure 1 - Claims experience by quantum

[5] Note that the claims experience contains one occurrence of inherent vice at a cost of $20,000 which is not shown in the graphs.

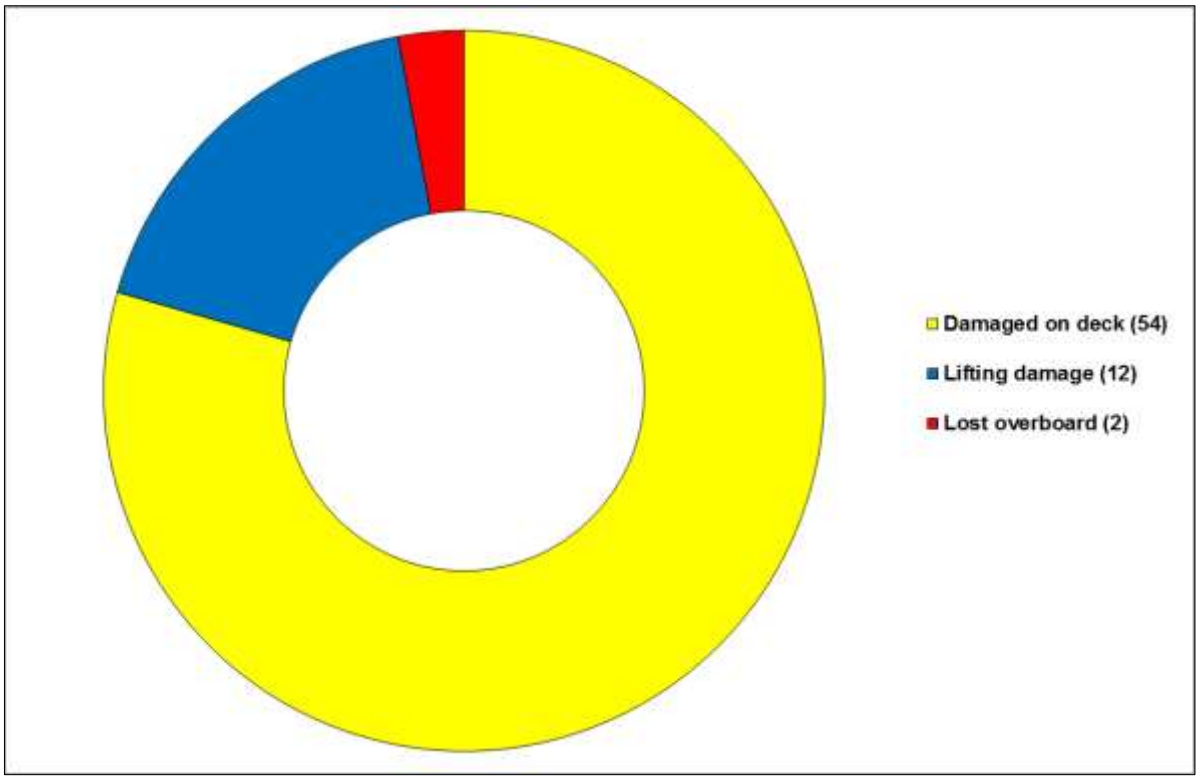

Figure 2 - Claims experience by type

The graphs demonstrate that large losses are a low frequency/high consequence proposition, with the potential to distort the performance of an account to the extent that it may become unviable. The loss of a vessel overboard is the logical conclusion of the combined effects of deficiencies in lashing systems and operational control. As will be described in detail below, both of these adverse effects are inherent within the business of yacht transport.

Lashing systems – the gap between planning and execution

As described above, lashing systems and techniques for the securing of non specialised cargo are well documented and understood. It follows that a reasonably competent person, with access to good quality equipment, should be able to securely lash a yacht without causing damage.

The weak point in the system is the reliance upon the mooring cleats fitted to yachts. Stevedores are attracted to these cleats because of their utility. However, these cleats are designed to withstand loads within +/- 15° of the horizontal, and within =/- 30° of the major axis of the cleat. They cannot withstand rotational loads and the global load limit is low, typically 5 tonnes on a mid sized yacht. It should be borne in mind that mooring cleats are not marked with a safe working load and, to a prudent stevedore, represent an unquantifiable risk.

The problem of mooring cleat strength is further confused by the lack of a unified set of construction rules. Yachts less than 24 metres in *overall* length are built to the Recreational Craft Directive, and mooring cleat strength and design is determined by ISO 15084:2003 (en). Yachts with a *waterline length* of over 24 metres have their mooring arrangements specified by Classification society rules and ISO 13713:2012 (en). Yachts in the so called “grey area” between 24 metres overall and waterline length are technically ungoverned but in practice to save cost yacht manufacturers extrapolate the Recreational Craft Directive standards. Larger yachts of between 24 and 28 metres overall (a very popular size) are therefore large, heavy and underequipped in this regard. The issue is aggravated by the design problems associated with the ability of fibre reinforced plastic to withstand point loads.

This can lead to the lashing system becoming the primary source of damage on deck. Below are some examples of the most salient issues that represent the gap between the comprehensive procedures offered by most carriers and the reality of their execution.

Figure 3 - typical yacht mooring cleat

Figure 3 illustrates a typical mooring cleat. It is made of marine grade cast stainless steel and in this case is specifically aligned to allow for a stern line or a spring to be safely made fast. The cleat is bolted through the deck, typically 20mm of FRP and backed up onto a 25mm plywood plate, which is intended to spread the load over a wider area and prevent radial stress cracking around the base of the cleat.

Figure 4 below shows an extreme case when multiple and heavily loaded lashings are taken up to a deck fitting which is not designed or certified to withstand these loads.

Figure 5 shows a similar lashing error, and in this case it is likely that the lashings will abrade and damage the hull of the yacht on passage. Additionally, the pairing of chain lashings to one sling in this way means that should one of the chains come loose, the whole lashing is loosened and weakened by a factor of 12.

Figure 6 illustrates what happens when a fitting not intended to take any load at all is seized upon by incompetent stevedores as a lashing point based solely on appearances.

Figure 4 - excessive use of inappropriate fixture

Figure 5 - excessive use of fixture and a source of damage to gel coat

Figure 6 - consequences of using inappropriate fixtures, before and after

Most lashing plans rely upon the use of deck fittings which are unfit for the purpose. Damage to the yacht is an inevitable consequence. The authors believe that this kind of damage is underreported for two reasons; firstly the damage caused by overloading may not be immediately visible, and secondly the thoroughness of the survey at discharge is often poor, bordering on the expedient.

In figure 7 below the logical consequences of this behaviour are graphically illustrated. The image shows a lashing attached to a cleat completely detached from a yacht that washed overboard. In this particular incident two yachts were lost from the same ship when the Master proceeded into forecast bad weather at excessive speed. Subsequent enquiries revealed reluctance on the part of the shipper to engage with the carrier, or seek redress. This is a good example of how the many actors involved appear to value their relationships with each other over bad outcomes for underwriters and yacht owners. This may explain why retained surveyors appear unwilling to be more assertive during loading and discharge when poor practice is observed.

Figure 7 - the inevitable consequences

Lifting - the gap between planning and execution

As described above, lifting operations require careful planning to ensure that yachts are properly suspended by equipment that is strong enough and includes a margin of safety, and that the yacht is lifted in a controlled manner at a controlled attitude.

Any lack of control at either the planning or execution stage can result in failure. These failures fall into three broad categories.

Firstly, the lifting gear is compromised by poor design or inspection, and fails allowing the yacht to fall. Figure 8 is a before and after compilation illustrating gear failure. The yacht in question fell approximately 3 metres onto the deck and was very badly damaged as a result. It is worth noting that damage like this is never fully repairable.

Figure 8 - gear failure causes yacht to fall

Secondly, the bands passed around the hull to support the yacht are improperly positioned or secured so that they slip out of position whilst the yacht is suspended. In Figure 9, an accident of this type resulted in the yacht entering the water at an acute angle and capsizing.

Figure 9 - consequences of lifting band slippage

Finally, the failure to use proper spreaders to ensure that suspension points are vertical can result in force being applied to the vulnerable deck/hull joint in a manner that effectively crushes the hull. As with dropping, repairs made after crushing are very seldom of a permanent and fully restorative nature.

Figure 10 - failing to use spreaders resulting in crush damage

Conclusions for underwriters

The issues described above come together in practical terms to present underwriters with the following issues to consider.

The Broker presentation is likely to focus on the operation as planned, which will be thorough and appear to provide multiple assurances such as compliance standards, certification of lifting equipment and the use of supercargoes and surveyors to provide the correct supervision of lifting, stowing and lashing for both load and discharge.

The operation as experienced is likely to be a little different. Depending upon the nature of the operation, there will be a variety of actors linked in complex contractual relationships. No single entity will have total control and there will be considerable commercial pressure to expedite loading and discharge at the expense of caution and thoroughness. Underwriters should expect that this type of operation will not produce a single prudent uninsured, but a list of actors each of whom will be seeking either to subrogate or transfer liability for their negligence.

The contractual terms for the carriage of cargo on deck do not provide much by way of defence against the Master who fails to avoid, or proceeds too fast in bad weather. This will quickly exploit any weaknesses in the lashing system because the motions of the ship will quickly become extreme.

Lifting and lashing yachts is complex and considerable diligence and expertise is required. Damage caused by lifting or lashing may not be immediately visible or detectable and so there may be some latency to claims advanced by any one of the parties involved.

Lashing yachts is not possible without specialised and often bespoke equipment to safely transfer the load from the lashings to the yacht. This is hardly ever provided and stevedores persist in using whatever strongpoint (which may not be very strong) that comes to hand. The consequences described above inappropriately rely on insurance to remedy the losses which should instead be mitigated by the provision of the correct equipment. The equipment usually provided, particularly in terms of chocks and cradles, is only suitable to position the yacht on deck.

The pattern of loss is typically pyramidal, with a large number of smaller, damage on deck type losses periodically producing a large loss typified by the loss of an expensive yacht overboard. In the absence of such losses in the claims experience underwriters should guard against charging too small a premium because such a loss will happen; it is in the nature of the trade.