The Ageing International Bulk Fleet: Implications for Australia

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Abstract:

The loss of six bulk ships carrying Australian exports off the Australian coast in recent years prompted a government enquiry, "Ships of Shame Report" The report stated that the problem was essentially one of substandard ships and/ or substandard owners Since Australia relies heavily on shipping for the export of so much of our raw materials Australian exporters cannot be complacent about their role Prescriptive measures can be taken to identify problems before they occur so that these tragedies can be avoided

To improve our balance of payments position exporters can play an active role in the choice of ships used to transport their cargoes by taking control of and being responsible for the transport by selling CIF Controlling the ship not only adds value to Australian product it also reduces the risk that substandard ships will be used

Although there are moves for greater regulation by port/state legislation the solution to the problem of an ageing international bulk fleet lies with commercial pressure Exporters who control the ships not only control the trade but can apply far more effective and more timely pressure on owners than relying on regulation to control substandard shipping

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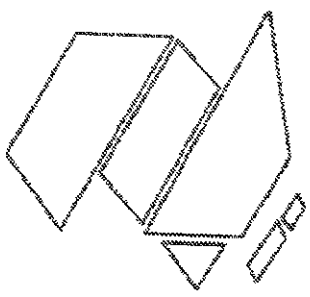

THE AGEING INTERNATIONAL BULK FLEET:
Implications for Australia

Australia depends almost exclusively on shipping to move its exports and imports. In terms of tonnes/kilometre this is the fifth largest shipping task in the world (AMSA, 1991). To fulfil its trade commitments, 11 000 ships visit Australian ports per annum. Unfortunately most of these ships are owned or controlled by overseas interests.

Organising delivery of Australian exports, particularly mining and agricultural products is often seen as just an option by the exporter, rather than an integral part of the export marketing process. Exporters of bulk products should, whenever commercially feasible, control delivery of their goods into their export markets. *He who controls the ships, controls the trade.*

This is an elementary marketing concept. People without a perception of the practices and problems of international trade, and shipping in particular, find it difficult to believe that so much of our bulk mining product is sold at the wharf. The exporter of bulk product too often seems to consider that his marketing function is finished once the product is loaded aboard ship.

Small mining or bulk commodity companies negotiating export orders with large industrial combines overseas may feel that taking responsibly for shipping is too difficult a job. The alternative of selling FOB however must be considered the **soft** option. Australian firms who export large quantities of our natural resources without maximising the return to the owner are, in fact, selling Australian resources for much less than they are worth to the customer.

From a national perspective, selling FOB is significantly reducing the amount of foreign exchange which can be earned from exports of our resources. There is much discussion about the need to create an "export culture" in Australia. There have been some remarkable achievements from the R&D efforts of companies like CRA in processing iron ore so that Australian ore is the preferred product for many steel mills. In a base commodity such as ore, this product differentiation is a notable commercial triumph in the fiercely competitive international markets. The mining community is naturally export aware but there is still more that can be done to increase our export earnings by adding value to exports through controlling the freight.

So the thrust of the argument is, if at all possible, Australian exporters should sell CIF. This means taking responsibility for, and bearing the cost of, arranging the transport to the customer. Of course, the price will reflect this added freight component. Control of the freight adds another service which enhances the value of the product while offering the potential for increasing the profit.

Exporters such as BHP often own or have long term charters on ships. In fact BHP Transport is a major international transport operator with a turnover exceeding $1 billion in its own right, thus adding value to raw material exports. Smaller exporters would need to charter a ship for a specific shipment (spot charter) or over a period (time charter) for a number of shipments.

There are difficulties in chartering ships. There are additional risks involved, but there are also significant benefits. At the most basic, controlling the export of shipments of goods to the market adds considerable value to the selling price. For example the freight on a tonne of coal can significantly increase its selling price and the cash flow through the company. Given a selling price of (say) $US40 FOB and a spot freight rate from NSW to Japan of $US7.50, the selling price becomes $US47.50, adding value to the export of a base commodity.

If an exporter has a long term contract to deliver coal or iron ore or alumina or any of the bulk products the contract includes delivery, a competent ship broker can negotiate contracts of affreightment to deliver cargo over the term of the contract. That contract, essentially a delivery agreement, can specify a freight level in dollar terms or, in terms of a hire rate per day (a time charter) which will probably be a discount to the current or spot market.

The use of this method places the exporter effectively in control of the delivery of the product to the customer's wharf. The selling price and delivery terms are then a matter of commercial negotiation between the buyer and the seller, the point being that the selling price is the landed CIF price of the goods. In the case of the coal export discussed above for instance, the exporter is negotiating a sale which enhances the selling price for the raw product and gives two opportunities for profit, one in the normal price structure for FOB, and the other in terms of the contract of affreightment.

There is no doubt that some bulk exporters are involved in negotiating freight rates and time charters ever day. However the fact that much of Australian mineral and commodities are sold FOB indicates that not all exporters are prepared to consider arranging and controlling the freight on their product. Others may be unaware of the importance to this country of adding as much value as possible to our raw material exports, if only for the benefit of enhancing this country's balance of payments.

Controlling shipping also helps to avoid the situation which has been occurring in Newcastle over the past few months where a number of ships lie at anchor off the port awaiting cargoes. The demurrage on those ships is to the exporters' account since most ships are on charter to the buyer. It is in the buyer's interest, in the short term, to leave the ships at anchor outside Newcastle since the demurrage paid by the seller is at least partly offsetting the daily charter cost paid by the buyer. Where the exporter controls his own shipping he can minimise costs in the event of protracted delays by simply not chartering a ship.

The CSR case a few years ago demonstrates the tremendous advantages to the exporter who sells CIF. A long term contract was signed by the buyer for sugar, just before the world price for sugar collapsed. The buyer wanted to renegotiate the contract at more favourable terms and refused to take delivery of the sugar. By selling CIF, CSR controlled the transport and the ships continued to arrive at the buyer's port. The negotiations continued and more ships arrived. In this case the buyers were responsible for the demurrage. The result was that the buyers had to accept the sugar to avoid an escalating demurrage bill. If the contract had been negotiated on FOB terms the buyer would simply not send the ships and the Australian export would have been left to stockpile...not very good for a negotiating position. **Thus *he who controls the ships, controls the trade*.**

In addition to the benefits to the exporter in controlling his own shipping and freight there are a number of flow-on benefits to the community

Added Skills

Consider a specialised shipping group either as part of the marketing department, or as a stand alone service to management. While only a relatively small team, the chartering function requires a high level of skill and training and as such adds considerable value to the exporting company and to the community, as well as making a profit. It can be treated as a profit centre in its own right. The chartering manager can work through the broking community to ensure that the company can achieve the most economical shipping service.

A Broker Community

Years ago there was a thriving ship broking community in Australia however there are still companies who will act on behalf of exporters to charter ships although the number of firms has been greatly reduced. Controlling freight means that a broker will be working for the Australian exporter instead of the importer - obviously far more attractive from the company's and Australia's point of view than the reverse.

INSURANCE

CIF contracts mean that the exporter takes responsibility for insuring the product to delivery. The international shipping insurance market is vast and specialised but there are some Australian insurance companies in this field. Unfortunately, with so much of Australian product sold FOB, the insurance task and employment and premiums benefit overseas companies much more than would be the case if Australian companies controlled the shipping. The more Australians control cargoes through CIF contracts the greater the contribution made to Australian insurance companies. We have been exporting marine insurance jobs for the last 20 years. To contribute to the drive for increasing export awareness there needs to be a campaign to promote control of shipping for exports of bulk commodities. Ships chartered here can be insured through the international insurance markets in Australia.

How to Identify and avoid a sub-standard chartered ship

Having decided to charter, how can exporters ensure that the ship is not going to fall apart or sink with Australian cargo on board?

Advancements in shipbuilding technology over the last three decades have led to bulk carriers becoming larger and larger in an attempt to reap economies of scale. The foundering of ships of this size carrying thousands of tonnes of cargo has in some cases aroused public outcry particularly when there has been detrimental effects on the environment such as the recent losses of the "*Exxon Valdez*" on the pristine Alaskan coastline, the "*Braer*" in the outer Hebrides and to a lesser extent the "*Kirki*" off the coast of Western Australia. However less publicised has been the losses of bulk carriers which have disappeared after loading Australian cargo. "The Ships of Shame Report" (Parliament of Australia, 1992) attempted to determine common factors present. However it should be clearly understood that the analysis covered only the ships that sank. There are many other similar ships still loading in Australian ports that have not sunk - yet. The report did not give frequency measures or any other indicators of the probability of a particular type of ship sinking.

Their findings suggest pitfalls to avoid in order to minimise the risks of chartered vessels foundering. Of course if the exporter chooses to sell FOB this problem is avoided. However there is no control over the ship and its too late to remonstrate with the buyer for using substandard ships if the cargo is lost. It is Australian exporters that bear the brunt of the publicity.

The enquiry found that although a ship age was a major concern, the problems were often more complex and exhibited multicolinerarity. In a world where the shipping industry is facing the eighth recession since 1945 (Sanderson,1993), commercial pressure on ship operators has meant that ageing tonnage has not been replaced and maintenance, training and loading practices are often inadequate adding to the ageing factor.

AGE

The average age of the 47 ships covered by the report at the time of the accident was 18.02 years. In fact the ages of the ships that sank from apparent structural failure ranged from 24 to 9 years. This compares with the average age of the world fleet of about 12 years (Lloyd's Statistical Tables, 1992). (See figure 1)

Age is relevant in itself because of the fatigue generated by both loading and unloading operations and ocean voyages. It is compounded by poor maintenance.

SHIP MAINTENANCE

Lack of maintenance in this sense is the deterioration of structural members (eg bulkheads, frames, tanktops etc) leading to a weakening of the ship's hull. Damage to structural members can occur during loading and discharging operations or during a voyage and, if not rectified, can lead to formation of weak spots and corrosion. Good maintenance also implies that regular inspections of the ship are made and any problems identified and dealt with promptly.

An inspection could reveal a small crack in the steel work. The reason for the crack could be analysed and proper repairs undertaken. If the inspection had not taken place that crack could have increased and corrosion started. Certainly the reason for the crack would not have been established. If it appears likely that it may be a design fault then ideally the authorities should be notified so that the ships of a similar class can be checked and preventative measures taken.

SHIP MANAGEMENT

Good maintenance is a sign of good management but do not be deceived by a fresh coat of paint. Remember the *Kirki*!

Good management covers many areas but in relation to the suitability of the ship for charter covers proper manning, certification, insurance and inspection by authorities. Certainly there are some signs of poor management including **frequent** or **recent** changes in ownership, registry, name or classification society.

The exporter should lay down the parameters of the type of ship to be chartered. These can be based on relatively simple criteria such as age limits etc. Depending on the volume of business these criteria can become more sophisticated. In the future the task is likely to be made easier by such devices as a "white list" being discussed in the USA (Slater, 1993)

THE LOAD OPERATION

A poor loading programme can be detrimental to the ship.

A ship will flex during loading- for instance if the middle holds are loaded first the ship will "sag" in the middle and if the ends are loaded first the ship will "hog" Now more exact and assessable measures of stresses are used, Shear Force, SF, Bending Moments, BM. If the ship flexes excessively then this obviously is not good practice.

If a single hold is fully loaded and the adjacent holds empty, then there will be a **shear force stress** at the bulkheads between the holds. Unless the ship has a disposition of ballast or has been particularly strengthened then this situation should be avoided. (Some ships are permitted to load in alternate holds only, specifically for iron ore. Most large ships have the ability to load water ballast in certain holds. In both cases the holds would be specially strengthened).

Alternate hold loading for heavy cargoes has two obvious benefits. Firstly by alternate hold loading there is a doubling of the amount of cargo in each hold which effectively raises the centre of gravity of the ship and cargo. The ship will be more comfortable and will suffer less damage in heavy weather. Secondly, at the discharge port this practice increases productivity. The grab is more effective and there are only half the number of holds to clean up. This will increase the overall tonnes per hour discharged.

So what is good loading practice?

There is sophisticated software which assesses SF and BM on a PC allowing for preplanning of cargo stowage.

The ship should be provided with a loading book which gives sample loading programmes and detailed instructions. This should allow the ship to draw up a loading sequence sheet which avoids undue stress in the ship, while minimising the number of loader moves. If the loading facility staff are responsible they will follow this programme and in fact will check the programme to ensure that it is reasonable. The following simple rules would be sensible. (See figures 2 and 3)

Check the amount in each hold - Divide the amount of cargo to be loaded by the number of holds. Apart from the end holds this should be fairly consistent.

Check the order of loading - The first few runs, with each loading head, should be spaced out to lessen the stress and the trim angle and should consist of about half the full hold amount. Later the holds can be loaded to the full amount in one go.

Both end holds and a centre hold should be left half full to allow adjustment of the trim and to allow for loading to marks. This may sound complicated but with the aid of software - the task is straight forward. Following these simple rules will ensure that the ship is loaded correctly and that the cargo has every chance of being delivered in good condition. Records of the loading sequence and amounts should be retained especially if dispute developed later between the ship and the terminal as to how the ship was loaded.

CAUSES OF BULK CARRIER LOSSES AND SOLUTIONS

Drawing on the Ships of Shame Report, the main causes of the 47 losses covered in a twenty month period during 1989 to 91 were in order of predominance

Structural failure	39
Human error	6
Other	2

Human error

As shown by such incidents as the *Braer* grounding in Scotland no amount of regulations covering the construction of ships will prevent all accidents. There has to be serious doubts about the management of a ship, which had problems with its machinery, electing to pass through a narrow passage in bad weather conditions. If these are shown to be the facts following the inquiry, then this incident is a classic example of human error.

There are many other reported examples of human error including the fact that ships are often manned by inexperienced crew who are carrying forged certificates. Crews are often drawn from different nationalities who cannot communicate with the ship's officers or between themselves. Lack of training, lack of communication compounds to destroy effective ship management in a crisis. In a crisis people *panic in their own language*.

Human error will never be eliminated as long as there are humans but there should be strategies available to prevent gross examples such as the *Braer*. These strategies are being developed by the international community primarily through the International Maritime Organisation (IMO). The Port/State Control proposals are a classic example of international co-operation whereby any ship may be inspected at any port in the world and in appropriate circumstances detained until deficiencies rectified. These inspections will look at the qualifications of the master and crew and the manning levels of the ship. It will also cover the survey certificates for the ship both statutory and classification. Finally the inspection will ensure that the navigation and safety equipment and machinery are in a fit state of repair.

All these strategies are aimed at making the management of both the shipping company and the ship itself (the master) more responsible. This in turn should help to prevent many of the circumstances where human error occurs.

How does this help the charterer? As previously mentioned it is possible that a "white list" will be developed where a ship meeting certain criteria will be deemed to be a suitable ship for charter. In time if the system is successful there will be substantial pressure on ship owners to ensure their ships are in a suitable condition and maintained in that condition so that they can secure charters. Large scale charterers should investigate the establishment of an inspection service, the results of which they should be prepared to **share** even if on a fee basis. On an official level, the Australian Government has offered neighbouring countries in Asia-Pacific region access to safety records of ships that visit Australia that have been inspected by the Australian Maritime Safety Authority, AMSA. (Dodd 1993)

Structural Failure

In discussing maintenance above, the importance of inspections and fault rectification was stressed. However this is a reactive procedure. It assumes that if a fault cannot be identified then everything is all right. However a ship is a complex arrangement of steel work. The ship moves and flexes in a seaway, during ballasting and cargo operations which suggests that stresses and strains are continually being applied to various structural members and metal fatigue could occur. Similarly there could be a design fault in a ship which manifests itself, in failure, at a relatively early stage. There have been incidences reported in recent years of ships which exhibited cracks ***even on their maiden voyages***.

Whilst proper loading and ballasting procedures and proper handling at sea will help to avoid problems there are proactive strategies to avoid structural failure.

As discussed earlier great stress can be placed on a ship during loading and unloading functions (demonstrated by the SF and BM) while the ship is in port in a protected still water environment. When the bulk carrier is at sea it has to contend with a hostile environment. Waves can cause quite marked stress on the hull of the ship, particularly the bow slamming action which cause **shock waves** on the ship's structure.

Standing on the deck of a bulk carrier, say the size of the *Iron Pacific* (315.02 metres) it is possible to see the deck flexing. The longer the vessel the more the wave action will cause these flexing motions and the greater the stresses on the hull as the ship twists and turns. A rough or confused sea state for a stressed ship can then become the "straw that broke the camel's back".

The need for constant monitoring on bulk carriers and very large crude carriers has been highlighted in recent years by a number of unexplained losses of these types of vessels. During the many investigations it has become clear that catastrophic hull failure has been the main cause, and as a result Lloyd's Register has introduced a new "Notation" which has been awarded to ships which are fitted with stress monitoring systems. Lloyds contracted out much of the research necessary to develop and test the standards adopted for Stress Monitoring systems. There are now 15 of these stress monitoring systems in place on a number of the more reputably owned and operated ships.

The first three stress monitoring systems were designed to a specification prepared by BP Shipping Ltd. who have now fitted them to six ships, as part of a long term study of stress in VLCCs. This design was used as the basis for a standard system which would meet the requirements of Lloyd's Register "SEA(R) Notation. There are seven systems fitted on bulk carriers operated by P&O Bulk Shipping Ltd, and Voyage Data Recorder on a container ship was upgraded to display hull stress.

BHP recently announced that its research department was investigating stress monitoring systems for its fleet. It has been reported that some of the ALSOC owners are looking at stress monitoring for their large gas carriers.

Hull stress systems have been improved over the past four years as operational experience is gained, with refinements to both hardware and software being implemented, particular attention being given to the transducers.

There are three types of transducers fitted:

1	strain gauges	measures stresses -twists and turns
2	accelerometers	measures vertical motion
3	pressure transducers	measures bow slam - shock waves.

These stress monitoring systems have been developed to the point where they can record in **real time** the various stresses and forces acting on the hull of the ship. Gauges placed strategically around the hull of the ship collect stress data and transmit it to a set of computers (PCs) on the ship's bridge giving the Master a continuous reading of the condition of his ship's hull.

When the ship runs into heavy weather, the data displayed on the monitoring system can indicate **how corrective action is affecting the hull**. A deviation of a few degrees from the ship's course can significantly reduce slamming, for instance. Alternatively slowing the ship slightly but maintaining course can minimise stress more effectively. In some cases it has been demonstrated and proven on the stress monitoring system that increasing speed will reduce stress. All the stress data is recorded during a voyage, along with weather, sea state and other environmental information. A pattern of stress on the hull during a voyage can be retained for later analysis.

More important, however, is the continuous real time reporting to the ship's officers of the stresses on the hull in adverse weather and the **instant feed** back on the effect on hull stress of measures to reduce stress. The stress monitoring system truly offers the modern crew the means to monitor and manage the stress on the ship's hull during normal operations. The latest version of this monitoring system can be used to **predict metal fatigue** and hence the time to correct or at least monitor structural failure of steel structures on the ship.

In summary it is essential that exporters of raw materials and bulk commodities should control their cargoes to the customer's wharf wherever possible. There are significant benefits to the company and to the community in controlling your cargoes - *"he who controls the ship controls the trade"*.

Controlling the ship entails extra risk, of course, but in a time when great efforts are being expended in lifting the community's awareness of Australia's now desperate need to export and to earn more foreign exchange, there is a means, within the grasp of the mineral, mining and bulk commodity companies, to increase export revenue by taking control of their own cargoes

There has been much publicity given to substandard ships and the losses at sea of apparently well founded ships carrying Australian cargoes. Those exporters who do charter can minimise the risk of hiring these substandard ships by instituting a few precautionary constraints on the type of ship and by ensuring that a ship with a dubious history is not employed. Age although a major determinant cannot be considered in isolation "Behind every substandard ship lies a substandard operator" (Parliament of Australia,1992 p.ix). Meanwhile reputable owners have, for years, been tackling the problem of monitoring stress on ships with the long term aim of increasing safety and extending the working life of their ships.

Although commercial pressures on ship operators in part contributed to substandard vessels it will be commercial pressure on insurance and classification societies that will force ship operators to correct this problem If classification societies encourage the extension of hull stress monitoring to all bulk carriers as a preventive measure and insurance companies only insure ships with proven records then this will ensure that the recent record of ship and crew losses will not continue

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