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Annex I

Economic factors impacting the dismantling market

I. The macro-economics of ship demolition.

The ship demolition market is chiefly determined by trends in several factors: the market for sea freight, the scrap recycling market and the increasing age of ships sold for dismantling.

The determinant point is that, with the exception of a few relatively limited cases, (notice to evacuate a wreck for example) nobody is compelled by any international standard to send a ship to demolition. It is true that it is prohibited to scuttle ships in most seas, as it is to abandon ship, but the recurrence of such practices is proof that these are only theoretical prohibitions.

Under these conditions, it can only be ascertained that the decision to demolish a ship is taken solely if it complies with a balanced economic process. If the interests of ship owners in sending their ships to demolition are either reduced or become non-existent, a process is gradually introduced *ipso facto* giving priority to the continued navigation of increasingly obsolete vessels.

The consequence is an increased risk of ship abandoning or unauthorized scuttling. This can be deduced from statistics insofar as total losses subsequent to real events at sea are estimated at 300 per year, and only 313 ships were dismantled in 2006. On the basis of desired demolition figures of 1500 ships per year, it appears that 900 ships are either kept at sea despite their old age, or are scuttled or are abandoned on beaches or in unidentified ports.

Sluggish ship demolition is synonymous with risks for navigational safety and protection of the marine environment.

II. Decisional processes leading to scrapping of a ship

The decision by a ship owner whether or not to send a merchant ship to demolition is governed by several parameters:

- even if purchase prices of ships to be dismantled are high, the owner may be reluctant to part with a ship engaged in commerce for which freight prices are attractive;
- if purchase prices are low, the immediate feasibility of the operation is uncertain and its profitability is poor.

Several typical processes can be outlined between the time a ship is withdrawn from active commercial operation and the start of its dismantling.

With the exception of a few particular cases, merchant ships pass through several operating phases:

- Newbuilds are generally built at the request of the persons ordering a ship or can be purchased on plan or in dry-dock at the shipyard, when they are optimised for a specific trade;
- A ship then gradually moves away from the optimum level of the trade for which it was purchased. Its profitability decreases either through an increase in maintenance costs, or through its obsolescence or through shrinking of its initial market segment;

- Its operator will then seek to dispose of the ship, either for the above reasons or simply to make an exceptional profit by taking advantage of favourable market conditions;
- The ship's new operator, especially if the ship has been bought under good conditions, will draw renewed profitability from the vessel for a certain period, after which time this new operator will find himself in the same position as the previous operator.

Most ships therefore experience two, three, four and sometimes more mutations both in ownership and in commerce throughout their useful working life. These changes are frequently associated with changes in flag State, classification society, public liability insurer, etc.

Generally, at the end of this process, the ultimate owner is no longer a leading shipowner. The end owner may be less sensitive to its image and difficult to identify since it trades on secondary haulage markets (regional coasting trade for example).

The time comes when, despite conditions of accommodating registration, restriction of operations to trade sectors for which State inspections are less strict, and the limited sensitivity of shippers to safety issues, the profitability of the ship is definitely compromised for the following reasons:

- Exponential maintenance or upgrading costs;
- "Non-insurability" of the ship;
- Ill-suitability to any type of trade.

The residual value of the ship no longer exceeds its resale value on ship demolition markets. However, several choices still remain open for the ship operator:

1. Continued navigation « whatever the cost » despite deteriorated safety conditions;
2. Abandonment on a beach or at the far end of a port, after taking necessary precautions so that the actual owner cannot be traced;
3. Organising its scuttling, whether authorized or not;
4. Laying up the ship on a site which may or may not be adapted, while awaiting better days either for its sale to a breaker's yard or for its resumed operations;
5. Sale for demolition.

Solutions 1 to 3, fraudulent par essence, do not fall under an economic approach but reflect a criminal attitude. Solutions 4 and 5 warrant greater attention.

In fact, in most cases the ultimate operator does not itself carry out the operations for sale to a dismantler. These are outsourced to an intermediary (« cash-buyer »).

The latter pays cash for the ship (on the basis of standard contracts and most often through *ad hoc* bank financing) and will decide:

- whether or not the ship can remain laid-up for some time;
- whether or not it can be reallocated to merchant navigation;
- whether or not it should change flag;
- or finally whether or not it should be disposed of by dismantling.

Therefore, there is most often no direct contact between the ship's last operator and the company which carries out the actual dismantling operations.

The cash-buyer's margin is ensured by fine-tuned management and timing of sale and resale conditions, in relation to the ship market, the freight market and the scrap market.

The intention to scrap a ship, in its usual meaning based on considering the ship as waste in the light of some legislation, therefore remains uncertain up until an advanced stage of the transfer process.

Mostly it is only becomes clear once the ship has been sent into the territorial waters of the State in which the dismantling site is located.

III. The freight market.

With respect to ship demolition, the freight market has an opposite effect to that of the scrap market.

In the last four years it has reached unprecedented heights lasting over long time periods, which have not been seen for half a century. The freight market is bolstered by world growth, especially the growth of newly industrialized countries. On this account even old ships continue to navigate, and high freight rates allow repairs which would not usually be considered worthwhile. These old vessels can therefore be kept afloat, overcoming the lack of the immediate availability of new ships due to the saturated workload of ship-building yards.

The corollary to this situation is a scarcity of ships to be recycled, and hence an increase in their price.

From an economic viewpoint, ship demolition finds itself in the following situation:

- Either freight prices are high and the raw materials for ship breaking become scarce and expensive, which is only partly offset by the concomitant increase in scrap sale prices;
- Or these raw materials become overabundant, but this situation generally points to a sluggish world economy which in turn affects scrap prices.

Freight prices began to rise in January 2001, when the "Baltic Dry Index" (mean shipping rates for bulk ore, coal, metals, grain) stood at 1500 points, reaching 6000 points in 2004 before collapsing by 70% in eight months owing to the sudden 71,5% upsurge in iron ore prices, which brought down Chinese freight demand. After a stabilisation phase of Chinese industry, imports and therefore freight rates again moved upwards culminating at the end of December 2006 at 4318 points.

Shipowners realised that the upturn was sustainable and accelerated the placing of orders with shipyards, in particular for "Capesize" iron ore carriers of 120 000 deadweight tonnes (these vessels have to go around Africa, their size preventing them from taking the Suez Canal) whose number increased from 752 (118 MT) in 2005 to 830 (130 MT) in 2006. Shipyards have 225 "Capesize" iron ore carriers on order to deliver between now and 2010, but for as long as this additional transport capacity is not available on the market, and for as long as the increase in maritime traffic continues, the temptation will not diminish for shipowners to keep their ocean-going vessels in navigation for as long as possible.

IV. Effect of scrap prices on dismantling.

Scrap is a raw material for which prices are balanced by world conditions. The tightening of environmental legislation and high energy costs also prompt the increased operation of iron ore deposits and the use of this ore in steel production. The world's soaring steel production, increasing between 2000 and 2006 from 1 billion to 1.2 billion tonnes has entailed the use of scrap to feed electric furnaces, the percentage of this scrap representing a relatively constant rate of 42% of the raw materials used to

produce steel. This 20% increase in 7 years of scrap destined for consumption by the steel industry has evidently been transposed into prices, which moved up from \$100 to nearly \$250.

The statistics of the FEDEREC trade federation show stability of prices within the €80-100 range up until 2002, followed by a rapid rise in prices due to growth of the world economy headed by China and the United States.

The trend in world prices is chiefly due to lack of anticipation by steel producers of the massive imports of steel and scrap by China from the year 2000 onwards, the immediately prior period having been characterized by steel overproduction. This slow response time was aggravated by the levying of export taxes by countries such as Russia and the Ukraine, concerned about the gradual depletion of metal stocks chiefly of military origin inherited from the ex-USSR and non-renewable due to the current poor performance of industry. Scrap production was partly able to follow demand due to the operation of new deposits in countries such as South Korea, and more particularly due to the fall in shipping costs of bulk scrap (€15/tonne) and therefore in container costs (empty containers returning to Asia). This drop in shipping costs helps exports of European countries which are close to overproduction owing to their reserves of motor vehicles and electric household appliances.

Trade professionals in this sector estimate that the world price of scrap should stabilize over the coming years to around a pivot price of \$250, but nonetheless with a very slight upward trend.

The chief importers of scrap are Turkey (12 Mt), China (10 Mt), la Belgium (8 Mt), South Korea (7 Mt), Spain (6.4 Mt), Germany (5 Mt), Italy (5 Mt), United States (4 Mt) and France (3 Mt).

After the macro-economic analysis of the scrap market, consideration must be given to the situation of scrap derived from ship breaking, which used to represent nearly 3% of the total but is currently only in the region of 1 % due to the shortage of ships to be dismantled.

In the main Asian dismantling countries, the metal recovered from ships is chiefly used for re-rolling and for the manufacture of long products (corner irons, concrete reinforcement rods for example). Also the recycling of recovered equipment provides an important source of profit, particularly in India and Bangladesh.

The advantage of recycled steel is both economical and environmental: direct steel treatment by re-rolling leads to energy savings of at least 40% since it avoids the use of scrap as "secondary raw material ", in the same way as the use of production off-cuts for example. Since steelmaking factories (Turkey, China and India) are located in the immediate vicinity of dismantling sites, transport costs prove to be particularly low and exhaust emissions by trucks limited to a maximum.

The swift return on investment, the low level of invested capital and limited machine requirements account for the attraction of the dismantling industry for semi-industrialised or developing countries, being an employment factor for an abundant labour force.

As a consequence, a dismantling site will not hesitate to pay between 200 and 250 dollars per tonne for a ship if it is seeking raw material for steelworks (as is the case in China and Turkey), \$375 if the site is also seeking to recover recyclable equipment (Pakistan), \$425 if the objective is especially to recover the equipment (India), and \$475-490 if it has no local iron ore resources and little foreign currency to purchase scrap imported from Europe (Bangladesh).

V. The increasing age of ships sold for dismantling.

V.1. The geographical factor:

It is commonly recognized that most (but not all) maritime operators of industrialised countries phase out their ships when they reach 15 years of age to draw advantage from a modern fleet better corresponding to the fluctuating needs of the freight market. A "follow-on" effect even exists whereby owners are all led to selling off vessels which, without being obsolete, nonetheless appear to be less adapted to configurations of the freight to be shipped or which are too fuel intensive.

Additionally, changes in international legislation play a definite role in prompting anticipation of the laid down time limits, the most known example being oil tankers drawing near to their 25 year deadline and which, under rule 13-G of the MARPOL Convention, are bound to be equipped with a double hull. Rather than risk the ship not passing its special 25-year inspection, ship owners have the choice between selling the tanker to a second-ranking operator, scrapping it, converting the vessel to a double-hulled vessel (a decision which is currently feasible having regard to high freight prices), using the vessel as floating storage capacity or withdrawing it from service while waiting to see whether maintained freight prices warrant the cost of conversion or whether it would be better to take advantage of high scrap prices for ships dismantled in Southern Asia.

Finally, some countries like Algeria have legislation requiring all kinds of ships to be sold when they are 15 years old.

These rational criteria are not systematically adopted however by shipowners. If reference is made to 2006 geographical statistics for disposal by dismantling, it is found that the industrialized countries, after having sold the majority of their vessels at the age of around 15 years in the past, sometimes have a propensity to maintain part of a fleet up until a very old age. Flags of convenience evidently account for a preponderant share (60.9%) of scrapped ships, followed by developing countries (27.4%) and finally OECD countries (11.8%). The congruent OECD share is coherent with the indications given in the previous paragraph, but what is less coherent is the high mean age of 34.4 years.

In first place comes the United States of America with an average age of 42.8 years. The oldest dismantled ship in 2006, the *JOSEPH H. FRANTZ*, was a coastal trader on the Great Lakes and was 81 years old.

Within the European Union, the average is 33.9 years with Cyprus in particular (32.7 years) and the Greek fleet (34.7 years) which in 2006 scrapped many of its old inter-island ferries which were detrimental to its tourist image. On the other hand a State such as Malta, whose situation is very close to the two first countries, has already undertaken to rejuvenate its fleet (28.6 years). There is therefore a two-tiered maritime Europe, the tax advantages in some States prompting the introductions of a young fleet, whereas other member States are handicapped by the maintaining of some time-expired ships for domestic or proximity service links.

Another surprise brought by these statistics is the fact that fleets with flags of convenience are not as old as could be feared, having an average age of 29.4 years. Liberia has the least old fleet (26.4 years), followed by the Dominican Republic (27.6 years), Saint Vincent (28 years), Panama (29.7 years) and the Bahamas with 31.6 years. Several explanations can be put forward: for European vessels carrying flags of convenience, trade image requires the use of ships that are not too obsolescent, since in the event of an accident it is possible to trace the real owner. For second-ranking shipowning companies, the explanation is probably the lack of ship maintenance, the increasing difficulty in passing periodic inspections and henceforth stricter controls conducted by port authorities.

The last category is highly ill-assorted and includes a majority of ships from developing countries having an average age of 32.9 years, the extreme case being North Korea (35 years) whereas China (32.8 years) and Saudi Arabia (30 years) lie in a mean position. The youngest fleets are those of Singapore (28 years), which is high for an industrialised country but can be attributed to regional links with China, Taiwan and A.S.E.A.N. nations, and India with 26.7 years.

V.2. Types of ships dismantled:

The teaching drawn from the table below is relatively simple: the average age of dismantled ships is on the increase, moving up from 27.1 years in 1995 to 31.6 years in 2006. Bulk carriers, subjected to high mechanical stresses are the youngest to be sold for breaking, followed by container carriers (given freight prices there have been practically no demolitions since 2005), oil tankers (chiefly due to a MARPOL effect), cargo ships (the small vessels are demolished but larger vessels remain at sea owing to the demand for inter-ocean freight transport) and finally passenger ships. The high average age of passenger ships (38.3 years) has a twofold cause: cruise ships, carefully constructed have the advantage of undergoing few mechanical stresses insofar as the great majority of cruises take place in more or less closed seas, such as the Mediterranean or the Caribbean, and ferries navigate mostly in inner seas. Having regard to the high number of accidents in recent years in Saudi Arabia, in Egypt, Indonesia and the Philippines, it is logical to assume that on and after 2007 there will be a large wave of ferry dismantling, a substantial increase already having been observed in the second half of 2006.

Age of Dismantled Ships

Year	Oil tankers	Bulk carriers	Cargo carriers	Container carriers	Passenger ships	Total (all vessels)
1995	26.1	24.5	25.8	24	26.8	26.1
1996	26	24.3	27.8	26.2	33.5	26.7
1997	28.2	25.3	26.9	22.8	34.7	26.9
1998	28.2	25.2	26.7	25.5	32.8	26.5
1999	26.2	25	26.7	24.8	35.1	26.1
2000	32.8	19	27.3	10.1	15	27
2001	28	26.7	27.4	26.9	35.9	27.7
2002	28.3	26.6	28.2	26	37.7	28
2003	29.3	26.5	29.3	25.5	33.6	29.1
2004	29.5	27.3	32.9	30.5	37.6	31.7
2005	31.5	28.1	31.9	30.6	36.7	31.9
2006	30.2	28.1	32.6	29.6	38.3	31.6

Source: ISL

The age of ships sent to breakers' yards therefore reached a peak in 2005 with an average of 31.9 years, when the fleet of dismantled ships reached its lowest level: 187 vessels representing 5.9 million deadweight tonnes (Mdw) compared with 620 ships and 30.2 Mdw in 1999. The "V-shaped" dismantling curve fortunately started to reverse in 2006 with 313 vessels and 7.1 dwt, but the age at which ships are sent for breaking remains high at 31.6 years.

Another factor which has to be taken into consideration is the disparity within each category of vessels, which can be analysed from the following table:

**Dismantling
(in million dwt)**

Year	Tankers under 70,000 t	Tankers under 120,000 t	Tankers over 120,000 t	Tankers Total	Bulk carriers under 60,000 t	Bulk carriers under 80,000 t	Bulk carriers over 80,000t	Bulk carriers Total	Other	Grand total
1995	0.9	0.5	9.2	10.6	0.6	0.4	1.3	2.3	2.2	15.1
1996	1	0.6	5.2	6.8	2.3	2.5	3.3	8.1	2.6	17.5
1997	0.3	0.7	2.4	3.4	2.8	1.5	3.2	7.5	4.8	15.7
1998	0.5	0.7	5.8	7	3.9	3.3	4.4	11.6	4.3	22.9
1999	0.6	2.6	13.2	16.4	2.6	2.5	3.8	8.9	4.8	30.1
2000	2	1.7	9.7	13.4	2.3	0.7	1	4	3.7	21.1
2001	1.2	1.9	12	15.1	3.4	1.8	1.8	7	4.8	26.9
2002	2.5	1.8	13.5	17.8	3.3	1.5	1	5.8	5.1	28.7
2003	3.5	3.5	10.8	17.8	2.4	0.5	0.6	3.5	3.5	24.8
2004	2.8	2.6	2.8	8.2	0.6	0.1	0.1	0.8	1.5	10.5
2005	1.9	1.5	0.4	3.8	0.6	0.2	0.2	1.1	1	5.9
2006	1.7	1	0	2.7	1.4	0.9	0.4	3.7	0.7	7.1

Sources ISL, Platou & Allied.

- Tankers:

At the start of the period under analysis, the vessels that are more particularly scrapped are vessels weighing over 200 000 tonnes: 7.8 Mt in 1995, compared with 1.4 Mt for 120/200 000 t vessels, 0.5 Mt for the 70/120 000 range and 0.9 Mt for 10/70 000 t vessels.

The situation is henceforth reversed, and the high transocean freight rates are keeping large tankers at sea such as « Suezmax », « VLCC » and « ULCC », whereas the « Minitankers », « Products », « Panamax » and « Aframax » are being scrapped.

It is therefore in the interests of owners to dispose of their small and medium-sized tankers: « Minitankers » (under 10 000 t), « Products » (10 000 t to 60 000 t), « Panamax » (60 000 to 80 000 t) and « Aframax » (80 000 to 120 000 t). The result is a reduction in recyclable metal for shipyards.

- Bulk carriers and cargo vessels:

The situation is similar to the situation of tankers:

* In 1995 demolition particularly concerned Capesize vessels (+ 80 000 t) whereas the Minibulks, Handys, Handymax and Panama were kept in activity.

* On and after the turnaround of the freight market in 2004, the situation was reversed with large capacity bulk carriers continuing to navigate (e.g. to carry iron ore and soy from Brazil to China), while the gradual increase in purchase prices by Asian shipyards prompted the accelerated dismantling of the smallest units, especially the Handys (10/40 000 t), which are rather too large for local coast trading and too costly in terms of fuel and port fees for transoceanic navigation.

The size of a ship therefore influences the decision to dismantle. Historically a Handymax is only sold for breaking when freight prices for modern units (old ships must offer a rebate of 20-25%) fall to \$10 000 per day. For a Panamax, the limit is \$11 500 per day.

VI. Market prospects

Currently 7500 vessels, including small and medium-sized ships represent nearly 40 million dwt. Their age lies in the range of 28.1 years (for bulk carriers) to 38.2 years (for passenger vessels) and they are therefore virtual candidates for demolition in the coming years:

- Oil and gas tankers: 12.3 Mt
- Bulk carriers: 16 Mt
- Cargo vessels: 9.2 Mt
- Container carriers: 1 Mt.

VI.1. Oil tankers:

Various programmes to phase out single hulled tankers have been introduced in recent years and their application is determinant in estimating the quantities of vessels which are to be dismantled over the coming years.

The strengthening of oil tanker freight prices has led to an increase in the number of VLCCs who have passed their fourth special visit; there is therefore reason to believe that some of these vessels could now survive until their 25th anniversary. By way of comparison with the mid-80s, when markets were suffering from severe overcapacities, numerous shipowners had preferred to scrap their ships rather than bear the costs entailed for the third special inspection.

At the present time since vessels reaching 25 years of age must, pursuant to rule 13-G of the MARPOL Convention, be equipped with double hulls, there is a possibility that the special 25-year inspection will play a major role in decisions by owners to scrap tanker vessels.

In addition to the amendment to the MARPOL Convention, numerous charterers in particular the oil companies have been showing greater severity since the early 90s in their « vetting »¹ system. For some types of cargo, only modern units are able to meet the criteria laid down by end users and maritime authorities. Vessels which fail the approval of oil companies cannot expect to obtain market freight prices and later become candidates for demolition. Since the early 90s, inspections by port States have also been reinforced in an attempt to eliminate sub-standard vessels. Other initiatives could also cause difficulties for the regular use of old, ill-maintained ships. In addition to the age limits laid down by the Oil Protection Act (OPA) and the MARPOL Convention, several countries have passed regulations laying

¹ Vetting: ship inspection procedure set up by shippers, mainly the oil companies.

down age limits for vessels navigating in their territorial waters. With respect to tankers these countries are the following: Japan, Korea, India, Libya, Nigeria, China and Syria. Some vessels which have exceeded the 15-year age limit set by most of these States are nevertheless accepted if they are well known to charterers and/or the port authorities. Therefore unless these age limits are required by an increasing number of countries, this criterion alone hardly seems likely to accelerate the pace of sales to scrapyards. It is the combination of the factors mentioned which may be able to promote a certain increase in ship demolition activities. This increase could be further accentuated through the passing of new legislation requiring heed of other criteria relating to ship design, equipment or operation.

The European Commission (DG Transport) currently puts forward the following figures for the phasing out of tanker vessels over the coming years:

- 2007: 107
- 2008: 146
- 2009: 129
- 2010: 784
- 2011-2014: 30-43

These figures do not indicate the number of vessels actually intended for demolition. Numerous tanker « hulls » are effectively reconverted rather than destroyed. A certain number therefore are reconverted into FSUs² in oil producing areas, others are converted into FSOs³ and FPSOs⁴. The development of deep sea oil production has the corollary of an estimated need of 130 units of FSU and FPSO type over the coming five years. Purchases of VLCCs and ULCCs for their conversion into these types of structures are currently undergoing a new surge.

The forecast figures of the European Commission for the years 2004, 2005 and 2006 were 139, 25 and 57 respectively. BIMCO also forecast a «larger concentration of dismantling operations over the period 2004-2007 ». These forecasts proved to be little accurate, since effective phasing-out figures were much lower.

Figures are particularly difficult to predict and even a demolition peak of tanker vessels in 2010 is subject to caution.

VI.2. Gas tankers:

The increasing tightening of standards and quality constraints, associated with age limits, should weigh in favour of the dismantling of gas tankers over the coming years.

The gas tanker fleet is globally fairly old, despite numerous additions to fleets in recent years.

More especially, new gas production plans (Qatar, Egypt, Russia) require cubage units that are far higher than the largest existing units.

If the emerging « tramping » market is unable to use the units driven into obsolescence by new requirements of the gas tanker market, the removal of these vessels from fleets could gather pace.

² FSU: floating storage unit

³ FSO: floating storage and offloading unit

⁴ FPSO: floating production storage and offloading unit

VI.3. Bulk carriers:

As indicated above, the average age of bulk carriers sent to breakers' yards is 28.1 years.

As at January 1st 2006, 790 bulk carriers representing more than 16 Mdwat had reached or exceeded this age. They are therefore candidates for demolition in the short or medium term.

VI.4. Cargo vessels:

The average age of cargo vessels sold to demolition yards totals 32.6 years.

Under these conditions, 3 400 ships (10.6 Mdwat), i.e. 10% of the cargo fleet, could be dismantled over the longer term.

VI.5. Container carriers:

It is interesting to compare the profile of the fleet in terms of age with deliveries of new vessels: since container carriers are generally scrapped at the age of 29.6 years, it can be estimated that the number of vessels which could be demolished before 31 December 2007 is 333 for 350 000 TEU (Twenty Equivalent Units), and for the year 2008 at 43 for 46 000 TEU, but this is merely a theoretical calculation since in 2005 and 2006 practically no container carriers were dismantled aside from accident-damaged vessels.

The potential for demolition increases with every passing month, and it can be expected that numerous vessels will be scrapped simultaneously when freight prices take a downturn.