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"Mega-ships state of art: are ports able to take the challenge?"

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(slide 1 – Titolo)

The ongoing progress of building and navigation techniques has allowed to cut transport time and costs.

In particular, starting from the second half of the XX century, two phenomena have especially affected the evolution of maritime transport: we will now analyze them by referring to the so called phenomenon of "giant or gigantic ships".

Today's meeting is focused on giant ships, a very important phenomenon especially because of its huge, inevitable repercussions on port infrastructure, logistics and cargo-related value added services.

This phenomenon is closely tied to specific, increasingly specialized ship types, apt to fulfill business operations requirements.

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Oil tankers and bulk carriers were the first type of ships to grow disproportionately in size, from as early as in the fifties.

The sharply increasing demand for hydrocarbons and coal, and the distance between producing and industrial countries somehow forced shipping companies to adopt economies of scale in order to lower their transport costs.

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One figure for all: maritime traffic of dry and liquid bulk (oil, minerals, coal, wheat etc.) rose from 744 million tons in 1962 up to over 2.4 billion tons in 1979.

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Over the same period, the world fleet of oil tankers and bulk carriers increased from 78 to 465 million tons. In 2011, the maritime traffic of oil, minerals and corn amounted to 6.4 billion tons whereas the world fleet exceeded one billion tons in terms of deadweight (1.040 million dwt).

OIL TANKERS

Giant size in the field of oil tankers reached a record level during the seventies, between the two oil shock crises of 1973 and 1979: in those years, political instability in the Middle East led to avoid strategic routes with an ensuing sharp increase of oil prices. In 1970, the first, large supertanker (229,000 DWT) flying the Italian flag ("Caterina M.") was officially launched.

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The need to avoid 'hot areas' around the Suez Canal by circumnavigating Africa caused regular 13-day trips (crossing the Suez Canal) to take as long as 45 days.

This is why some shipping companies decided to invest in the construction of large sized oil tankers (above 500,000 dwt)).

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The largest ship ever built was an oil tanker; its name was Knock Nevis and was launched in 1971; it was 458 meter long, 69 meter wide, with a 24.6 meter draft and a deadweight of 564,763.00 tons. It could carry approximately 4.1 million barrels of crude oil (in Italy, in 2011, the average daily consumption was about 1.7 million barrels).

Once the crisis was over, that investment proved to be fatal to many owners. The drop of crude oil prices along with the impossibility for fully laden supertankers to cross the Suez Canal pushed those large units out of the market; some of them were transformed into storage units (for instance, Agip Firenze of SNAM, then Shipping Company of ENI Group) or were literally shortened (for instance, Agip Marche of SNAM, then Shipping Company of ENI Group, which was shortened by 63 meters by removing the central portion of the hull). **(slide 7)**

It is important to underline that in the evolution of cargo ships, the possibility to cross the crucial hubs over the world big routes determined a proliferation of previously unknown types.

These days, bulkers are classified by size. **(Slide 8)**

- **ULCC** (Ultra Large Crude Carrier) – vessels with a carrying capacity of over 320,000 tons;
- **VLCC** (Very Large Crude Carrier) - oil tankers with a deadweight of over 200,000 tons;
- **SUEZMAX** - oil tankers with a 120,000-200,000 deadweight; they can cross the Suez Canal;

- **AFRAMAX** - (American Freight Rate Assessment) oil tankers with a deadweight of 80,000-120,000;
- **PANAMAX** – ships with a deadweight of 60,000-79,000 and ea maximum width of 32.2 meters; they can cross the Panama Canal
- **HANDYMAX** – ships with a deadweight of 40,000-59,000 tons.
- **HANDYSIZE** – ships with a deadweight of 10,000-39,000 tons.

Evolution of the bulker fleet (number of ships in 1992 – 2012) **(Slide 9)**

	1992	1997	2002	2007	2012
VLCC	437	434	421	483	578
SUEXZMAX	261	270	267	341	444
AFRAMAX	447	491	545	698	909
PANAMAX	202	200	214	307	408
SMALL	1.725	1.757	1.937	2.398	3.303

When speaking of giant ships, it is necessary to distinguish between oil tankers and the so called petroleum product tankers; these latter carry finished products from refineries to consumer markets and are generally smaller than tankers.

World

An analysis of data on the deadweight of oil tankers in 2001-2011 shows that the average deadweight has grown by about 8% **(Slide 10),** with a high of 18% for Suezmax and 17% for Aframax.

Generally speaking, the incidence of vessels with a deadweight above 80,000 tons out of the entire fleet of oil tankers decreased by 4% **(Slide 11) over** the period. Hence, there seems to be at least a slowdown of giant sizes in this segment.

However, an analysis of the new vessel orderbook shows that 81% of new orders is accounted for by vessels above 80,000 dwt; it is even more interesting to note that ULCCs under construction represent, in terms of tonnage, 145% of the present fleet of ultra large vessels. Even VLCCs on order account for a significant share of the present fleet of very large ships, equal to 24%.

Italy

As to the Italian flag, 75% of the fleet of oil tankers in terms of tonnage consists of **(Slide 12) ships** between 80,000 and 120,000 in dwt (Aframax) and 18% between 10,000 and 40,000 dwt (Handysize). Things are not going to change in the next future, since the Italian order book is characterized by a modest increase of Aframax and by nearly twice as many orders for Handysize.

BULK CARRIERS

As to bulk carriers, there exist different types of tonnage: **(Slide 13)**

- **CAPESIZE** – vessels with a deadweight above 80,000 tons: they cannot cross either the Panama Canal or the Suez Canal
- **PANAMAX** – ships with a deadweight of 60,000-79,000; they can cross the Panama Canal
- **SUPRAMAX** – deadweight of 50,000-59,999;
- **HANDYMAX** – ships with a deadweight of 40,000-49,000 tons.
- **HANDYSIZE** – ships with a deadweight of 10,000-39,000 tons.

Evolution of the bulk carrier fleet (number of vessels in 1992 – 2012) **(Slide 14)**

	1992	1997	2007	2012
CAPESIZE	473	535	715	1.366
PANAMAX	828	1.075	1.397	2.028
HANDYMAX	447	1.097	1.498	2.478
HANDYSIZE	202	2.762	2.745	3.028

World

An analysis of data on the deadweight of bulk carriers in 2000-2011 shows that on average it grew by about 30% **(Slide 15) , with** a high of 70% for Capesize and 57% for Supramax.

In general terms, the incidence of vessels with a deadweight above 80,000 tons out of the global fleet of bulk carriers rose from 22% in 2000 to 50% in 2011. **(Slide 16)**

This trend is confirmed by the new order book; in terms of tonnage, 59% of orders are accounted for by Capesize vessels with an average dwt of about 154,000. The popularity of large size vessels is further confirmed by the fact that new orders for Capesize represent over 30% of the present fleet of this type of bulk carriers, with an average tonnage slightly smaller than the present one (118.000 dwt).

While Handymax (or Supramax) were nearly non existent in the late eighties/early nineties, they now seem to be the class preferred by ship owners. Being self-unloading, these ships have actually conquered India, Indonesia and other regions where port facilities are nearly absent or quite limited.

Italy

Under the Italian flag, 61% of the fleet of bulk carriers (in terms of tonnage) consists **(Slide 17)** of ships with 80,000-120,000 dwt (Capesize class) and an average tonnage of 110.000 dwt; 22% of vessels with 60,000-80,000 dwt (Panamax) and an average tonnage of 75.000 dwt. This picture is unlikely to change in the next future, since the Italian order book includes 5 Capesize for a total of about 500,000dwt.

PANAMA CANAL AND SUEZ CANAL

(Slide 18)

As previously mentioned, the possibility to cross the two large Suez and Panama Canals is key when discussing about giant ships.

As you can see from the table, any route other than the Suez Canal (even more so for the Panama Canal) entails a considerably longer trip and much higher operational costs.

(Slide 19)

ROTTA	MARE SUEZ (gg)	MARE CBS (gg)	MN SUEZ	MN CBS	COSTO BUNKER SUEZ	COSTO BUNKER CBS	TOT. COSTI SUEZ $	TOT. COSTI CBS $	DIFFERENZA COSTI TOTALI $
Ras Tanura -Rotterdam	17,9	31,0	6.436	11.169	260.265	443.010	838.765	968.010	-129.245
Tokyo - Rotterdam	31,1	40,3	11.192	14.507	445.805	741.401	1.222.305	1.405.901	-183.596
Singapore - New York	28,1	34,4	10.133	12.380	365.885	543.072	1.097.385	1.119.072	-21.688
Colombo - New York	23,9	30,9	8.600	11.131	267.605	440.225	936.105	963.725	-27.620

The above table clearly shows that any alternative route to the Suez Canal has a major impact on the cost of journey for products travelling to the European market rather than those travelling to the U.S. market.

Five-seven percent of world maritime traffic currently travels through the Panama Canal, for a total of about 40 ships/day (approx. 14,000 ships/year). As to the Suez Canal, maritime traffic accounts for 16% of the world total traffic.

Given the increasing size of vessels (especially containerships) and the exponential growth of traffic, both canals (Suez and Panama), built in 1868 and 1914, respectively, seem to be currently inadequate to the needs of international trade.

To meet the need of such larger ships, the depth of the Suez Canal was increased up to 24 meters in 2010; in this way, even supertankers with a gross deadweight of 240,000 tons can cross it.

As to the Panama Canal, its present lockage and maximum depth of 14 meters do not allow the last generation ships to travel through it, i.e. +3,000 passenger cruise liners and 5,000-12,500 TEU containerships. It is for this reason that a project to significantly improve dredging and construct a new lockage system was approved: by 2014, transit will double as larger vessels can cross the Canal.

DREDGING AND PORT INFRASTRUCTURE

Alike the two Canals, ports as non dynamic facilities (huge costs and long time for any upgrade activity) represent an evident limit to the size increase of ships.

First, the sea bottom. Large ships have a draft as deep as 20 meters, as shown in the table.

(Slide 20)

PANAMAX	12,04m
SUPER POST-PANAMAX	14/15m
SUEZ-MAX	16,1m
MALACCA-MAX	20m
VLCC	20m

Not many ports can receive these giants.

(Slide 21)

Port depth:

NORTHERN EUROPE		MEDITERRANEAN		ITALY	
AMBURGO	16,7m	PIREO	16,5m	GIOIA TAURO	16m
ROTTERDAM	16,6m	ALGECIRAS	16m	GENOVA	15m
ANVERSA	15,5m	VALENCIA	16m	CAGLIARI	14m
SOUTHAMP	15 m	BARCELLONA	16m	TARANTO	14m

A comparison of the two tables shows that few commercial ports in Italy can receive large ships, unlike Northern European and Mediterranean ports. The only Italian port provided with facilities suitable for large ships is the port of Gioia Tauro.

Another limitation is the possible adjustment of the port terminal infrastructure to the size of these giants of the sea: docks over 300 meter long, cranes with arms extending beyond 50 meters to handle up to 500 containers/hour, as well as spaces available to receive as much as 13,000 containers.

As to dry and liquid bulk, this factor becomes remarkably less important.

In particular, oil tankers do not moor at a quay; they dock by oil platforms extending up to 2,000 meters off the coast, i.e. floating platforms, where the sea bottom depth is not a problem.

On the other hand, there exist other issues; for example, such infrastructure is quite vulnerable to adverse sea weather, with an implicit higher maintenance cost.

As far as bulk carriers are concerned, although they load and upload cargo by the dock, it is not a matter of tonnage but of number. Indeed, when a large number of units need to be catered to, dedicated facilities may get congested, with inevitable cost and time repercussions.

CONCLUSIONS

While until the seventies, giant ships almost exclusively included oil tankers and bulk carriers, in the last two decades this phenomenon has remarkably slowed down whereas containerships, cruise liners and ferry boats have kept growing in size.

Undoubtedly, such phenomenon is not and will not be risk-free; indeed, the evolution of oil tankers showed the limits of giant ships as early as in the seventies, and more limitations became evident over time. As a matter of fact, problems have emerged with respect to both vessels and ports (depth of sea bottom and port infrastructure).

For instance, insurance may be quite problematic for both large cruise ships and other vessels. The risk level is extremely high: take, for example, ships carrying 4,000-5,000 passengers or 13,000-15,0000 containers. Many are questioning whether insurance and reinsurance companies are prepared to cover the cost of a possible claim.

In addition, the maneuverability of these giants is quite limited with respect to regular ships, especially during port operations. Some have even suggested to equip them with a second engine system. However, this would probably throw them out of the market, given the unsustainable management costs.

Moreover, one should consider the latest market developments. With the beginning of the crisis in 2008 and a timid recovery in 2010, charter figures are negative again, especially in the field of dry bulk, crude oil and oil products, due to an excess storage supply.

Large ships are severely limited given their operational rigidity; to be cost-effective, they must travel when fully laden, the only way to avoid management criticalities.

In conclusion, while the phenomenon of giant ships presents numerous positive aspects, not least an undoubtedly good environmental performance per unit of cargo carried, clear limits exist as well. These must be carefully evaluated not only by those investing in the construction of these giants of the sea but, more specifically, also by those who need to design the logistics infrastructure development of ports and, even more so, of the national transport system.