Section I

GENERAL PROVISIONS ON THE ORGANIZATION OF CARRIAGE OF GOODS

Topic 2. Organization of transportation of certain categories. Means of cargo operations

1. Definition of cargo and cargo types
2. Container Services
3. Cargo shipping
4. Means of cargo operations

1. Definition of cargo and cargo types

One of the main service areas of logistics service suppliers is constituted of Cargo transport services. In this context, Cargo transport can be considered as a logistic act in principle. In a more specific context, Cargo transport is a type of shipment service and is in the group of subsidiary services intended for the shipment sector.

The word “cargo” is used with the meaning of “freight, haul” as lexical meaning. When this meaning is taken as a basis, Cargo transport can be defined as the activities related to delivery of any freight from a place to another place. In the international literature, the term “cargo transport” is used as transport of any freight regardless of its weight, dimensions and content; however, in our country freights with weights under a certain weight are called “cargo”. On the other hand, the activity being called cargo transport in our country is called “parcel delivery” in the international literature in terms of its content. In other words, parcel delivery services constituting a sub-section of cargo transport services in the literature, is called Cargo transport services by the operators (Cargo transport firms) in our country.

Regular Cargo is sent by mainly corporate (commercial) customers, while special Cargo is sent by mainly individual (non-commercial) customers. Similarly, Cargo transport is divided into two groups as well. The firs group represents the both types of Cargos mentioned above, while the second group covers only regular Cargo transport (Gould, 1970, s.345).

In Golden Dictionary, the term “Cargo” is defined as “freight, haul”. In Columbia Encyclopedia, ‘aviation’ is referred for the definition of this term. In the mentioned Encyclopedia, ‘aviation’ is defined as the operations related to the activities in relation with air vehicles; and is discussed in three groups as military, general and airway transport (Columbia Encyclopedia, 2006. The word “aviation” is defined as “aviation” (in the known meaning) in Golden Dictionary. When these definitions made in the general sources are combined, the main meaning of Cargo is a freight being transported by airway. In the dictionary of the Turkish Language Society, the word “Cargo” came to our language from English is defined as “aircraft or vessel transporting freight”; material, freight being transported by vehicles such as aircraft, vessel etc.; company transporting freight or post from any place to another place; and the freight or post being transported by that company (tdk.gov.tr 2006). When these definitions are considered, it is seen that the word “cargo” is defined in different forms such as transport vehicle, firm or freight. A more detailed definition regarding Cargo can be made as follows: Cargo is the name of objects and goods such as files, packages, parcels cases etc. placed into a packet or container, weights of which are not much than 100 kg in a one piece, being transported from a place to another place in a certain time.

This definition does not include all kinds of objects and goods into the scope of Cargo; and clarifies the freights that can be considered as Cargo in terms of weight and type. It would be suitable to take this definition as a basis by reason of the fact that it is concordant with the meaning used in our country. As for Cargo transport, it covers the activities related to delivery of cargo in the general meaning. Cargo transport covers transportation of both commercial (corporate) and non-commercial (individual) Cargos. More specifically, Cargo transport can be defined as transportation of objects and goods in a certain time, on an inner-city, inter-city or international basis.

In the Land Transport Law No 4925;

Cargo is defined as goods in a small dimensioned parcel, case and packet placed into a package, weight of which is not much than 100 kg in a one piece

Cargo operator is defined as a person, who has the right of use an independent workplace; who provides the services such as loading, unloading, storing, stowing,

transfer and delivery to consignee and carries out or have carried out transport work under his/her supervision and control with intent to receive the Cargo and deliver it to the consignee in a short time; and who undertakes the responsibility arising from such activities;

Logistics and Cargo are often confused with each other. In the term “logistics”, the purpose of which is to present a product to customer with an acceptable price at a proper point and time, without detriment to its quality, the term Cargo is defined as the service of receiving a product, weights of which are not much than 100 kg, from a point and delivering it to another point. In this context, Cargo seems a transport part in logistics. If we carefully pay attention, it is seen that in the definition of the word Cargo a weight not much than 100 kg in a one piece and small dimension are deemed as condition. Accordingly, transport of heavy materials with large volume such as coal and mine, and goods heavier than 100 kg and goods with large volume are not included in the coverage of the word Cargo. Besides, there are something in common between Cargo and Courier in parcel and package transportation.

Courier :

This word represents the whole process of receiving and delivering to consignee the valuable/invaluable documents not related to communication, or unmonopolized gift goods and samples in small dimensions with a weight and volume can be transported by a person on foot or by a motorcycle. However, it covers the transport of all kinds of printed documents and packages, transportation of which is legally banned in the implementation in the market.

Cargo firms generally desire to transport “a piece of object such as a large parcel, case or packet” which has a weight and/or volume cannot be transported by a person on foot or by a motorcycle; while courier firms generally desire to transport numerous parcels and packets with small dimension and weight, within the boundaries of the city, on foot or by a motorcycle. Similarly, Cargo firms desire international or inter-city transport, while courier firms generally desire to inner-city transportation.

In Cargo transport services, there are some terms used related to the presentation form and content of the service. These terms and their meanings are listed below.

- Working Area: It is the boundaries of the residential areas, where the determined addresses are available, at which the Cargo transport firm's branch and agent carry out the activities of receiving and delivering Cargo. It defines the responsibility areas of all branches, where they carry out the activities of receiving and delivering Cargo.
- Transferred Cargo: It means the cargos, deliveries of which couldn't be made within the day due to any reasons such as unavailability of the consignee at the address, wrong address or refusal by the consignee; and then which have been remained at the branch for being delivered by the next day.
- Storehouse Receipt for Taking Delivery: It is an official document bearing the banderole of the Ministry of Finance that renders possible to healthily provide the service of receiving the cargo from the address and to enable it to be accepted at the customer's address. It is issued in 3 original copies. Information on the storehouse receipt is completely filled up during the acceptance of the cargo at the customer's address, and one original copy of it is submitted to the customer. The other two copies are delivered to the unit for issuing an invoice. After issuing the invoice, one copy of it as attached to the invoice is sent to the delivery center and the other one is filed in the unit.
- Receiving Notice: It is the act of demand of the customers requesting to have Cargo transport service, intended for having their cargos received from the address upon their calling made to the branch of the Cargo firm.
- Receiving from Address: It is the act of receiving the cargo of the customer who gave a receiving notice.
- Departure Branch/Agent: It is the point, at which the cargo is received from the consignor customer, and from where it is transferred to the transshipment center for the delivery to the consignee customer.
- Arrival Branch/Agent: It is the branch/agent, where the cargo is delivered to the consignee customer.
- Aggregated Transport Waybill: It is the official liability document, on which Cargo invoice number and the number of cargo written on that invoice are recorded in

order to render possible to transfer the cargo by cargo transport vehicles from branch to transshipment center, from transshipment center to other transshipment center, from other transshipment center to branch.

- Incoming Cargo: It is a cargo directed towards the arrival branch by the transshipment center, in order to be delivered to the consignee customer.
- Consignment Code: They are the cargos received from the consigner customer, with intent to be delivered to their consignees.
- Consignment Code: Issue number of the invoice drawn up for the cargo to be delivered is called consignment code. It is also legibly written on the barcode label stuck on the parcel or packet. It is used for tracking the cargo in the automation program as well.
- Advice Note: It is an informative note left at the consignee customer's address in case of default in delivery of the cargo due to unavailability of the consignee at the address visited in order to deliver the cargo. Invoice details and the branch of delivery must be stated in the note and the consignee must be requested to contact the branch.
- Decimeter: It s the value obtained by multiplying the width, length and height of the packets, parcels or cases in centimeter (cm) and then dividing them by 3000. In calculations of international consignments, the decimeter value is obtained by multiplying the width, length and height in centimeter (cm) and then dividing them by 6000.
- Cargo with Phonecall Notice: It is a cargo, for which the consignor customer calls the firm and sates that he/she wants the branch to receive his/her cargo and that he/she wants the consignee to be informed of the delivery in order to enable him/her to receive the cargo from the delivery branch. Cargos requested to be received by the consignees at the delivery branch upon a Phonecall notice are kept there for three days at most. Cargos not received within that period are returned to the consigner.
- File: It is a document with a weight between 0-250 g (or a weight not much than 500gr). Such documents do not contain cash money, check or any valuable documents.

- Cargo delivery document (Document of Ratification from the Consignee): It is an invoice copy, on which identity information of the consignee is written, his/her stamp and signature are placed during delivery of the cargo to the consignee customer.
- Minutes: It is a document required to be issued in case of damage on the cargo or incompleteness or loss in its content.
- Claim Petition of Customer: It is a petition from the customer, containing the information indicating that he/she submits and accepts the condition.
- Consent Letter of Customer: It is a document, by which the customer assigns the Cargo firm as his/her representative, for receiving the cost of the cargo from the insurance company for any reason.
- Plastic Seal: It is the seal bearing its serial number, locked on the door of the transport vehicle in order to ensure the security of the cargos in the vehicle during the transport.
- Mini Packet: It is a cargo with a weight between 251-999 g, being carried in a manifest bag.
- Lock Bag: It is a transport bag, in which goods such as files and mini packets can be transported; which can be securely delivered to it consignee and can be protected against alteration of the special serial number placed on it, if it is closed by the consignor by use of its special adhesive available on it.
- Certificate of Authority: It is a document indicating that the cargo can be received by another person and/or organization in the name and behalf of him/her. Any person or organization has to submit a certificate of authority, when they attend the branch for delivery of the cargos sent to the branch with a receiving notice or phonecall notice.
- Vehicle Voyage Chart: It is a form required to be available in the vehicle, on which time and kilometer data of the vehicle entrances and departures at the transshipment center and Branch/Agent are written,.
- Indebtment: It is the process of sending a cargo arrived wrongfully, to the Branch/Agent active in the area covering the consignor’s address.

- Transferred Cargo: It means the cargos, deliveries of which couldn't be made within the day of their arrivals to the arrival branch due to any reasons (such as default of the consignee in receiving its consignment with Phonecall notice, unavailability of the consignee at the address); which are required to be received from the Branch/Agent by its consignee within maximum 6 days.
- Minutes for Determining the Condition of the Cargo: It is a document intended for determining the content, issued under the supervision of the customer upon his/her request, in case there is no damage on the cargo.
- Damage Assessment Minutes: it is a document issued for damage assessment in case of any damage (torn, burst, crushing or wetting) on the cargo or its package.
- Line Vehicle: It is an vehicle transporting the cargos to their destinations.
- Parcel Pocket: It is a transparent pocket used for placing invoice onto the parcel.
- Contracted/Subscriber Customer: He/she is a customer; with whom the coverage and conditions of the cargo transport service is determined by mutual signatures.
- Commitment Letter: It is a document willingly given by the customer, who wants to send a certain type of cargo subjected to special conditions determined by the cargo company.
- Receiving at Address: It means receiving and delivery of the cargo at the customer's address upon submission of storehouse receipt. At different times of the day, customers can demand their cargos to be received from their addresses, by making a telephone call to the Agent / Directorate of Contact Office.
- **Delivery at Address :**

It means delivery of the cargos at the customer's address upon the demand of its consignor at the departure center. They are called "cargos to be delivered to the address".

Cargos are delivered to their consignees after identification process performed during delivery, in order to ensure the cargos to be securely delivered to the right

person; and in order to be able to officially authenticate the person, to whom the cargo has been delivered, in case of any disagreement. Besides, clear identification is a legal obligation. In the announcements regarding this issue published in the 31.12.1997 dated official gazette, private finance institutions, finance leasing companies as well as Cargo companies are included in the obligators required to submit identity evidence, and such identification is made by ID card, driving license or passport.

- Insurance: Cargos not included in the list of cargos to be transported under special conditions are under the company's guarantee as from the time, at which they are received, to the time of delivery to their consignees; and they are transported in the coverage of insurance. Customers, who want to send a cargo subject to certain conditions determined by the Cargo company, fill up voluntarily a form of commitment letter indicating that they send the cargo voluntarily; and upon that, they don't make any claim in case any damage or loss occur in their consignments in anyway.
- Delivery Reporting: Cargo firms enter the recipient information into the Cargo automation system, after delivery of the cargos that they received from the customers. By entering the Storehouse Receipt through the website, consignors can see who has taken the delivery of their cargos.
- Invoices: Cargos are invoiced at the departure branch. For the consignments, payments of which are made in cash, invoice is issued when the consigner gives the cargo to the branch. For the consignments received at the address, invoice is issued after delivery of the cargo to the branch, and then the invoice is sent to the customer. For the consignments, payment of which is made by consignee, collection is made at the delivery of the cargo to its consignee.
- Cargo with Phonecall Notice: It is a cargo, for which the consignor customer calls the firm and sates that he/she wants the branch to receive his/her cargo and that he/she wants the consignee to be informed of the delivery in order to enable him/her to receive the cargo from the delivery branch. Cargos requested to be received by the consignees at the delivery branch upon a Phonecall notice are kept there for three days at most. Cargos not received within that period are returned to the consigner.

Big bag (FIBC), baled, palletized, and bundled cargo loading and unloading services to ships that are suitable for transporting general cargo. Every effort is must be made to ensure that the loading and unloading of all goods that qualify as “general cargo” take place efficiently, effectively, and damage-free in accordance with cargo handling standards.

Goods that qualify as “general cargo” are moved into enclosed warehouses within the temporary storage area according to their particulars so as to protect them against weathering etc.

Items of general cargo that are to be loaded aboard vessels will be brought alongside by the port if they were previously surrendered to the port to be warehoused. If they were not so surrendered, it is the responsibility of the owner to bring them alongside the ship.

When goods are unloaded from a vessel, the port takes delivery of them from the vessel’s captain. If the goods are to be placed in a warehouse, they will be surrendered to their owner when they leave the warehouse. If they are to be surrendered alongside, they will be turned over to the owner when they are aboard the vehicle.

2. Container Services

Container is a transportation equipment for shipping cargo via various means of transport. Containers are durable enough for repeated use and can be stacked. Containers are divided into medium-duty (three- and five-tonne), which conform to former Soviet Union standards and are still used for shipments in Russia and the CIS, and ISO (20- and 40-foot) containers, which are used for Russian and international shipments. The universal standard unit TEU (twenty-foot equivalent unit) was introduced to measure transport flow volumes.

Container block-train means a train consisting of flatcars loaded with containers belonging to the carrier or to third parties. A train’s length and speed both comply with relevant legislation. A train is put together at its starting station and travels to its destination station without being divided en route and without any further re-consignment of the containers.

Containerisable cargo is defined as a type of cargo fit for transportation by container, or cargo for which containers are the best or only possible means of transportation.

Containerisation – the use of containers for cargo transportation, supply and storage. The process of containerisation deals with the containerisation level or containerisation ratio which for a particular type of goods this means the volume of goods transported in containers as a percentage of the total volume of such goods transported; for a region or mode of transportation (e.g. by rail) it means a ratio of cargo tonnage actually transported in containers to the total tonnage of transported cargo which could be potentially transported in containers (containerisable cargo).

Container terminal is a place equipped for the trans-shipment and storage of containers. A container terminal typically includes one or more container yards. Rail-based container terminals are equipped with spur tracks for loading and unloading containers to/from railroad platforms (cars).

The box (container) is what makes the world go round.

The driver of intermodal transportation has undoubtedly been the **container**, which permits easy handling between modal systems. While intermodalism could take place without the container, it would be very inefficient and costly. At start, a distinction is necessary between containerization and the container.

Container. A large standard size metal box into which cargo is packed for shipment aboard specially configured transport modes. It is designed to be moved with common handling equipment enabling high-speed intermodal transfers in economically large units between ships, railcars, truck chassis, and barges using a minimum of labor. The container, therefore, serves as the load unit rather than the cargo contained therein. The reference size is the 20 foot box of 20 feet long, 8'6" feet high and 8 feet wide, or 1 **Twenty-foot Equivalent Unit** (TEU). Since the great majority of containers are now forty foot long, the term **Forty-foot Equivalent Unit** (FEU) is also used, but less commonly. "Hi cube" containers are also common and they are one feet higher (9'6") than the standard.

Containerization. Refers to the increasing and generalized use of the container as a support for freight transportation. It involves processes where the intermodal container is increasingly used because it either substitutes cargo from other conveyances, is adopted as a mode supporting freight distribution or is able to diffuse spatially as a growing number of transport systems are able to handle containers.

The development of intermodal transportation and containerization are mutually inclusive, self strengthening and rely of a set of driving forces linked with technology, infrastructures and management. One of the initial issue concerned the different sizes and dimensions of containers used by shipping lines, which were a source of much confusion in compiling container shipping statistics. A lift could involve different volumes since different box sizes were involved. As a result, the term TEU (Twenty foot Equivalent Unit) was first used by Richard F. Gibney in 1969, who worked for the Shipbuilding & Shipping Record, as a comparative measure. Since then, the TEU remains the standard measure for containerized traffic.The usage of containers shows the complementarity between freight transportation modes by offering a higher fluidity to movements and a standardization of loads. The container has substantially contributed to the adoption and diffusion of intermodal transportation which has led to **profound mutations in the transport sector**. Through reduction of handling time, labor costs, and packing costs, container transportation allows considerable improvement in the efficiency of transportation. Thus, the relevance of containers is not what they are - simple boxes - but what they enable; intermodalism. Globalization could not have taken its current form without containerization. Containers are either made of steel (the most common for maritime containers) or aluminum (particularly for domestic) and their structure confers flexibility and hardiness. Another factor behind the diffusion of the container is that an agreement about its base dimensions and latching system was reached through the International Standards Organization (ISO) within 10 years of its introduction. From this standard, a wide variety of container sizes and specifications have been put in use. The most prevalent container size is however the 40 foot box, which in its 2,400 cubic feet which carry on average 22 tons of cargo. However, transporting cargo in a 20 foot container is usually 20% cheaper than

transporting cargo in a 40 foot container. Irrespective of the size a 20 foot container requires the same amount of intermodal movements even if it takes about half the space during transport and at terminals. There are five main types of containers:

- **Standard container**. Container designed to carry a wide variety general cargo. They are often labeled as dry containers because they carry dry goods either in break bulk (most common) or bulk (less common) form. Cargo is loaded and unloaded through a double door which marks the "back side" of the container.
- **Tank container**. Container designed to carry liquids (chemicals or foodstuff). It is composed of a tank surrounded by a structure making it the same size than a standard 20 foot containers, including its four latching points.
- **Open top container**. A container with an open roof and designed to carry cargo that is too large to be loaded through standard container doors, such as machinery. The container is loaded from the top with a tarpaulin used to cover its contents.
- **Flat container**. Container having an open roof and sides designed to carry heavy and oversized cargo. The cargo transported is left exposed to outdoor conditions.
- **Refrigerated container**. Also known as a reefer. Container designed to carry temperature controlled cargo, often around or below freezing point. It is insulated and equipped with refrigeration plant maintaining the temperature constant.

A significant share of international containers are either owned by shipping lines that tend to use them has a tool to help fill up their ships or by leasing companies using containerized assets for revenue generation. In the United States, a large amount of domestic containers of 53 foot are also used. Doublestacking of containers on railways (COFC: Containers On Flat Cars) has doubled the capacity of trains to haul freight with minimal cost increases, thereby improving the competitive position of the railways with regards to trucking for long-haul shipments. While it is true that the maritime container has become the work horse of international trade, other types of containers are found in certain modes, most notably in the **airline industry**. High labor costs and the slowness of loading planes, that require a very rapid turnaround, made the industry very receptive to the concept of a loading unit of standard dimensions designed to fit the specific shape of the bellyhold. The maritime container was too heavy and did not fit the rounded

configuration of a plane's fuselage, and thus a box specific to the needs of the airlines was required. The major breakthrough came with the introduction of wide-bodied aircraft in the late 1970s. Lightweight aluminum boxes, called unit load devices, could be filled with passenger's baggage or parcels and freight, and loaded into the holds of the planes using tracking that requires little human assistance. Containerization represents a revolution in the freight transport industry, facilitating both economies of scale and improvements in handling speed and throughput, with containerized traffic has surged since the 1990s. This underlines the adoption of the container as a privileged mean to ship products on international and national markets, particularly for non bulk commodities where the container accounts for more than 90% of all movements. Containerization leans on growth factors mainly related to globalization, substitution from break bulk and more recently the setting of intermediate transshipment hubs. Although containerization initially superimposed itself over existing transportation systems, as it became a dominant mean of freight transportation it created its own unique system of exclusive modes and terminals.Globalization and containerization as closely interrelated. According to UNCTAD, between 1970 and 1990 trade facilitation measures accounted for 45% of the growth in global trade while membership to global trade organization such as GATT/WTO accounted for another 285%. The container accounted for an **additional 790%**, exceeding all the other trade growth factors put together. The diffusion and adaptation of transport modes to containerization is an ongoing process which will eventually reach a level of saturation. Containers have thus become the most important component for rail and maritime intermodal transportation. The challenge remains about the choice of modes in an intermodal transport chain as well as minimizing the costs and delays related to moving containers between modes. 4. Advantages and Challenges of Containerization Among the numerous advantages related to the success of containers in international and hinterland transport, it is possible to note the following:

- **Standard transport product**. A container can be manipulated anywhere in the world as its dimensions are an ISO standard. Indeed, transfer infrastructures allow all elements (vehicles) of a transport chain to handle it with relative ease.

Standardization is a prevalent benefit of containerization as it conveys a ubiquity to access the distribution system and reduces the risks of capital investment in modes and terminals. The rapid diffusion of containerization was facilitated by the fact that its initiator, Malcolm McLean, purposely did not patent his invention. Consequently, all segments of the industry, competitors alike, had access to the standard. It necessitated the construction of specialized ships and of lifting equipment, but in several instances existing transport modes can be converted to container transportation.

- **Flexibility of usage**. A container can transport a wide variety of goods ranging from raw materials (coal, wheat), manufactured goods, and cars to frozen products. There are specialized containers for transporting liquids (oil and chemical products) and perishable food items in refrigerated containers (called "reefers" which now account for 50% of all refrigerated cargo being transported). About 2.3 million TEUs of reefers were being used by 2013. Discarded containers are often used as storage, housing, office and retail structures.
- **Management**. The container, as an indivisible unit, carries a unique identification number and a size type code enabling transport management not in terms of loads, but in terms of unit. This identification number is also used to insure that it is carried by an authorized agent of the cargo owner and is verified at terminal gates. Computerized management enables to reduce waiting times considerably and to know the location of containers (or batches of containers) at any time. It enables to assign containers according to the priority, the destination and the available transport capacities. Transport companies book slots in maritime or railway convoys that they use to distribute containers under their responsibility. As such, the container has become a production, transport and distribution unit.
- **Economies of scale**. Relatively to bulk, container transportation reduces transport costs considerably, about 20 times less. While before containerization maritime transport costs could account between 5 and 10% of the retail price, this share has been reduced to about 1.5%, depending on the goods being transported. The main factors behind costs reductions reside in the speed and flexibility incurred by containerization. Similar to other transportation modes, container shipping is benefiting

from economies of scale with the usage of larger containerships. The 6,000 TEUs landmark was surpassed in 1996 with the Regina Maersk and in 2006 the Emma Maersk surpassed the 12,000 TEU landmark. By 2013, ships of more than 18,000 TEU became available. A 5,000 TEU containership has operating costs per container 50% lower than a 2,500 TEU vessel. Moving from 4,000 TEU to 12,000 TEU reduces operating costs per container by a factor of 20%, which is very significant considering the additional volume involved. System-wide the outcome has been costs reductions of about 35% by the use of containerization.

- **Speed**. Transshipment operations are minimal and rapid, which increase the utilization level of the modal assets and port productivity. A modern container ship has a monthly capacity of 3 to 6 times more than a conventional cargo ship. This is notably attributable to gains in transshipment time as a crane can handle roughly 30 movements (loading or unloading) per hour. Port turnaround times have thus been reduced from an average of 3 weeks in the 1960s to less than 24 hours, since it is uncommon for a ship to be fully loaded or unloaded along regular container shipping routes. It takes on average between 10 and 20 hours to unload 1,000 TEUs compared to between 70 and 100 hours for a similar quantity of bulk freight. With larger containerships, more cranes can be allocated to transshipment; 3 to 4 cranes can service a 5,000 TEU containership, while ships of 10,000 TEU can be serviced by 5 to 6 cranes. This implies that larger ship sizes do not have much differences in loading or unloading time, but this requires more yard equipment. A regular freighter can spend between half and two-third of its useful life in ports. With less time in ports, containerships can spend more time at sea. Since a ship generates revenue while at sea, containerships are more profitable. Further, containerships are on average 35% faster than regular freighter ships (19 knots versus 14 knots). Put all together, it is estimated that containerization has reduced travel time for freight by a factor of 80%.
- **Warehousing**. The container limits damage risks for the goods it carries because it is resistant to shocks and weather conditions. The packaging of goods it contains is therefore simpler, less expensive and can occupy less volume. This reduces insurance costs since cargo is less prone to be damaged during transport. Besides,

containers fit together permitting stacking on ships, trains (doublestacking) and on the ground. It is possible to superimpose three loaded and six empty containers on the ground. The **container is consequently its own warehouse**.

- **Security**. The contents of the container are anonymous to outsiders as it can only be opened at the origin, at customs and at the destination. Thefts, especially those of valuable commodities, are therefore considerably reduced, which results in lower insurance premiums. Theft was a serious issue at ports before containerization as longshoremen had direct access to the cargo they were handling.

In spite of numerous advantages in the usage of containers, some challenges are also evident:

- **Site constraints**. Containerization implies a large consumption of terminal space. To fully load or unload a containership of 5,000 TEU a minimum of 12 hectares of stacking space is required. Conventional port areas are often not adequate for the location of container transshipment infrastructures, particularly because of draft issues as well as required space for terminal operations. Many container vessels require a draft of at least 14 meters (45 feet) and the later generation of larger ships require at least 15 meters (50 feet). A similar challenge applies to container rail terminals; many being relocated at the periphery of metropolitan areas. Consequently, major container handling facilities have new location criteria where suitable sites are only found at the periphery.
- **Infrastructure costs**. Container handling infrastructures, such as gantry cranes, yard equipment, road and rail access, represent important investments for port authorities and load centers. For instance, the costs of a modern container crane (portainer) are in the range of 4 to 10 million USD depending on the size. Several developing countries as well as smaller ports face the challenge of finding capital for these infrastructure investments.
- **Stacking**. The arrangement of containers, both at terminals and on modes (containerships and double-stack trains) is a complex problem. At the time of loading, it becomes imperative to make sure that containers that must be taken out first are not

below the pile. Further, containerships must be loaded in a way to avoid any restacking along its numerous port calls where containers are loaded and unloaded.

- **Thefts and losses**. While many theft issues have been addressed because of the freight anonymity a container confers, it remains an issue for movements outside terminals where the contents of the container can be assessed based upon its final destination. The World Shipping Council estimated that on average 546 containers are lost at sea each year under normal operating conditions and 1679 containers if events such as ship collisions and sinking are included. Rough weather is the major cause of container losses, but improper container stacking also plays a role (distribution of heavy containers). Yet, the loss rate remains very low since 5 to 6 million containers are being transported at any given time.

- **Empty travel**. Maritime shippers need containers to maintain their operations along the port networks they service. The same number of containers brought into a market must thus eventually be relocated, regardless if they are full or empty. On average containers will spend about 56% of their 10 to 15 years lifespan idle or being repositioned empty, which is not generating any income but convey a cost that is part of the shipping rates. Either full or empty, a container takes the same amount of space on the ship or in a storage yard and takes the same amount of time to be transshipped. Due to a divergence between production and consumption, it is uncommon to see an equilibrium in the distribution of containers. About 2.5 million TEUs of empty containers are stored in yards and depots around the world, underlining the issue of the movement and accumulation of empty containers. They represent about 20% of the global container port throughput and of the volume carried by maritime shipping lines. Most container trade is imbalanced, and thus containers "accumulate" in some places and must be shipped back to locations where there have deficits (mostly locations having a strong export function). This is particularly the case for American container shipping. As a result, shipping lines waste substantial amounts of time and money in repositioning empty containers.

- **Illicit trade**. By its confidential character, the container is a common instrument used in the illicit trade of counterfeit goods, drugs and weapons. Concerns

have also been raised about containers being used for terrorism. These fears have given rise to an increasing number of regulations aimed at counteracting illegal use of containers. In 2003, following US inspection requirements the International Maritime Organization (IMO) introduced regulations regarding the security of port sites and the vetting of workers in the shipping industry. The US, itself established a 24 hour rule, requiring all shipments destined for the US to receive clearance from US authorities 24 hours prior to the departure of the vessel. In 2008, the US Congress passed a regulation requiring all US-bound containers to be electronically scanned at the foreign port of loading, prior to departure. Needless to say, these measures incur additional costs and delays that many in the industry oppose.

Yet, the advantages of containerization have far outweighed its drawbacks, transforming the global freight transport system and along with it the global economy. 5. Intermodal Transport Costs There is a relationship between transport costs, distance and modal choice that has for long been observed. It enables to understand why road transport is usually used for short distances (from 500 to 750 km), railway transport for average distances and maritime transport for long distances (about 750 km). Variations of modal choice according to the geographical setting are observed but these figures tend to show a growth of the range of trucking. However, intermodalism offers the opportunity to combine modes and find a less costly alternative than an unimodal solution. It is also linked with a higher average value of the cargo being carried since intermodal transportation is linked with more complex and sophisticated commodity chains. As a result, the efficiency of contemporary transport systems rests as much on their **capacity to route freight** than on their **capacity to transship it**, but each of these functions have a cost that must be reduced. The intermodal transportation cost implies the consideration of several types of transportation costs for the routing of freight from its origin to its destination, which involves a variety of shipment, transshipment and warehousing activities. It considers a **logistic** according to which are organized transport chains where production and consumption systems are linked to transport systems. Numerous technical improvements, such as river / sea shipping and better rail/road integration, have been established to reduce interchange costs, but containerization

remains the most significant achievement so far. The concept of economies of scale applies particularly well to container shipping. However, container shipping is also affected by diseconomies involving maritime and inland transport systems as well as transshipment. While maritime container shipping companies have been pressing for larger ships, transshipment and inland distribution systems have tried to cope with increased quantities of containers. Thus, in spite of a significant reduction in maritime transport costs, land transport costs remain significant. Between half and two-third of total transport costs for a TEU is accounted by land transport. Public policy is also playing a role through concerns over the dominant position of road transport in modal competition and the resultant concerns over congestion, safety and environmental degradation. In Europe, policies have been introduced to induce a shift of freight and passengers from the roads to modes that are environmentally more efficient. Intermodal transport is seen as a solution that could work in certain situations. In Switzerland, for example, laws stipulate that all freight crossing through the country must be placed on the railways in order to try to reduce air pollution in alpine valleys. The European Union is trying to promote intermodal alternatives by subsidizing rail, and shipping infrastructure and increasing road user costs. Since intermodal transportation is mostly the outcome of private initiatives seeking to capture market opportunities it remains to be seen to what extent public strategies can be reconciled with a global intermodal transport system which is flexible and footloose. While economies of scale enabled to reduce the unit costs of maritime, inland intermodal transportation costs account to about 50% of the total costs if terminal costs are included. With the deregulation and privatization trends that began in the 1980's, containerization, which was already well established in the maritime sector, could **spread inland**. The shipping lines were among the first to exploit the intermodal opportunities that deregulation permitted. They could offer door-to-door rates to customers by integrating rail services and local truck pick up and delivery in a seamless network. To achieve this they leased trains, managed rail terminals, and in some cases purchased trucking firms. In this way they could serve customers across the country by offering door-to-door service from suppliers located around the world. The move inland also led to some significant developments, most

notably the double-stacking of containers on rail cars. This produced **important competitive advantages** for intermodal rail transport and favored the development of inland terminals. It also required various forms of transloading between maritime and domestic container units.

Container turnaround - the number of containers handled upon arrival and departure at a port or station over a certain period of time.

Container loading/unloading services

"Loading" consists of moving full or empty containers from a pier, the terminal area, CFS, or a truck onto a vessel that has arrived and is docked at Port Akdeniz. "Unloading" consists of moving full or empty containers from a vessel directly onto a truck and taking them to the terminal area or CFS station.

Container shifting services

"Onboard shifting" consists of moving a full or empty container from one location aboard a vessel to another on the same vessel. "Vessel/alongside/vessel shifting" consists of unloading a container from a vessel onto the dock alongside and loading it back onto the same vessel again at another time.

Lashing/unlashing services

"Lashing" consists of securing a container loaded aboard a vessel in place in line with the captain's wishes by means of bars, bridges, or rods. "Unlashing" consists of the removal of such stabilizing restraints. Although twistlock disengagement may be regarded as a form of unlashing, a separate charge may be made for this service at the port administration's option.

Opening/closing container vessel cargo hatch covers

Cargo hatch covers on container vessels will be opened, removed to the dock, and later removed from the dock and closed again by the port in the absence of any other agreement and provided that the covers are properly fitted for this service. A fee is charged for each cargo hatch cover.

Loading containers onto vehicles and unloading them from vehicles

In container loading/unloading services involving vehicles and ferries or ro-ro ships, loading/unloading services in which port terminal transport vehicles are used will

be treated as normal loading /unloading services (which is to say as if a crane had been employed). Container loading/unloading services involving vessels and vehicles other than the port's own will be subject to charges at the normal rates specified for vehicle loadings and unloadings.

Container packing/unpacking

At the request of owners or of customs authorities, containers arriving at the port may be transferred to the CFS station and unpacked and the contents will be turned over to their owners or placed in storage. "Container packing" services consist of the opposite: goods taken into the warehouse area for exportation will be packed into containers after which their doors will be closed.

Once a container has been packed and sealed, it becomes the responsibility of its owner or his agent. No container that is unsealed will be accepted by the port for filling or packing and the port incurs no responsibility whatsoever on account of such actions.

The equipment and labor required for packing/unpacking containers at the port will be provided by the port and their costs will be treated part of the overall packing/unpacking charge. In other words, no separate charge will be made for equipment used in packing/unpacking containers unless otherwise stipulated.

Container contents lashing services may be provided by the port at the port's option. The lashing materials must normally be supplied by the owner. If the materials are to be supplied by the port, the person making the request will be required to pay for them. The port does not issue any certificates for container contents lashing.

Containers for which loading/unloading services have been requested will be packed/unpacked in accordance with standard rules and regulations. The port will not be responsible for any damage that is incurred by loaded/unloaded goods that have been palletized, crated, packed, or lashed etc in non-standard ways.

The port is under no obligation to fulfill packing/unpacking service requests in situations that it deems to be unsuitable.

Container interior scavenging

Agents will be responsible for the cleanliness of containers that are to be packed in the port area and of containers that arrive empty at the port. At the agent's request the interiors of containers will be scavenged (swept out) against payment of a charge.

All containers that are unpacked within the port area must be properly scavenged and the agent will be billed for the cost of this service.

Container repair

Containers that arrive in port in damaged condition will be repaired by the port against payment of charges to be specified by the port and insofar as circumstances allow. The port is under no obligation to certify compliance with international rules in the case of such repairs. The port will not allow outside parties to repair damaged containers within the port area. Damaged containers may only be repaired by others if they are removed from the port area first.

Electricity for reefers

The port will supply electricity against a charge for containers that require it both inside and outside the port area. The port maintains a supply of electricity sufficient to meet such needs and it is obliged to provide such electricity when requested by the owner of the goods or container.

Transit containers

Containers which arrive by ship and are transferred from Port Antalya to another port or to a warehouse of a recipient that is subject to the transshipment regime as prescribed in the Customs Code and whose papers indicate that they are intended for transshipment are referred to as "transit containers".

The agent concerned must notify port authorities of all transit containers that are to arrive or leave by ship before the containers are actually unloaded into the port area. Only containers for which such notification has been provided will qualify for transshipment rate charges, which will be based entirely on the information contained in their manifests and/or bills of lading.

Containers loaded with hazardous materials

Cargoes that qualify as “hazardous materials” or “dangerous goods” will be admitted to the port area only with the written approval of the harbormaster and appropriate public authorities and by the port’s consent.

No containers with any IMDG Class 1 (explosives) or IMDG Class 7 (radioactive materials) contents will be admitted to or retained or stored within the port area; nor may they be unloaded from vessels; nor will they be handled in any way by the port, including but not limited to placing them under tackle prior to loading aboard ship.

The port is authorized to require owners to supply all documentation that will assist in correctly classifying hazardous materials.

Containers with dangerous goods in them are segregated in reserved areas. For this reason, incoming containers whose contents are classified as “hazardous” will be sent directly to such areas and measures will be taken by the port as may be necessary to ensure this.

3. Cargo shipping

A **cargo ship** or **freighter** is any sort of ship or vessel that carries cargo, goods, and materials from one port to another. Thousands of cargo carriers ply the world's seas and oceans each year, handling the bulk of international trade. Cargo ships are usually specially designed for the task, often being equipped with cranes and other mechanisms to load and unload, and come in all sizes. Today, they are almost always built by welded steel, and with some exceptions generally have a life expectancy of 25 to 30 years before being scrapped

Cargo ships/freighters can be divided into five groups, according to the type of cargo they carry. These groups are:

1. General cargo vessels
2. Tankers
3. Dry bulk carriers
4. Multi-purpose vessels
5. Reefer ships

General cargo vessels carry packaged items like chemicals, foods, furniture, machinery, motor- and military vehicles, footwear, garments, etc.

Tankers carry petroleum products or other liquid cargo.

A tanker (or **tank ship** or **tankship**) is a merchant vessel designed to transport liquids or gases in bulk. Major types of tankship include the oil tanker, the chemical tanker, and gas carrier. In the United States Navy and Military Sealift Command, any type of tanker used to refuel other ships is called an *oiler*.

Tankers can range in size of capacity from several hundred tons, which includes vessels for servicing small harbours and coastal settlements, to several hundred thousand tons, for long-range haulage. Besides ocean- or seagoing tankers there are also specialized inland-waterway tankers which operate on rivers and canals with an average cargo capacity up to some thousand tons. A wide range of products are carried by tankers, including:

- hydrocarbon products such as oil, liquefied petroleum gas (LPG), and liquefied natural gas (LNG)
- chemicals, such as ammonia, chlorine, and styrene monomer
- fresh water
- wine
- molasses

Tankers are a relatively new concept, dating from the later years of the 19th century. Before this, technology had simply not supported the idea of carrying bulk liquids. The market was also not geared towards transporting or selling cargo in bulk, therefore most ships carried a wide range of different products in different holds and traded outside fixed routes. Liquids were usually loaded in casks—hence the term "tonnage", which refers to the volume of the holds in terms of how many tuns or casks of wine could be carried. Even potable water, vital for the survival of the crew, was stowed in casks. Carrying bulk liquids in earlier ships posed several problems:

- The holds: on timber ships the holds were not sufficiently water, oil or air-tight to prevent a liquid cargo from spoiling or leaking. The development of iron and steel hulls solved this problem.
- Loading and discharging: Bulk liquids must be pumped - the development of efficient pumps and piping systems was vital to the development of the tanker. Steam

engines were developed as prime-movers for early pumping systems. Dedicated cargo handling facilities were now required ashore too - as was a market for receiving a product in that quantity. Casks could be unloaded using ordinary cranes, and the awkward nature of the casks meant that the volume of liquid was always relatively small - therefore keeping the market more stable.

- Free Surface Effect: a large body of liquid carried aboard a ship will impact on the ship's stability, particularly when the liquid is flowing around the hold or tank in response to the ship's movements. The effect was negligible in casks, but could cause capsizing if the tank extended the width of the ship; a problem solved by extensive subdivision of the tanks.

Tankers were first used by the oil industry to transfer refined fuel in bulk from refineries to customers. This would then be stored in large tanks ashore, and subdivided for delivery to individual locations. The use of tankers caught on because other liquids were also cheaper to transport in bulk, store in dedicated terminals, then subdivide. Even the Guinness brewery used tankers to transport the stout across the Irish Sea.

Different products require different handling and transport, with specialised variants such as "chemical tankers", "oil tankers", and "LNG carriers" developed to handle dangerous chemicals, oil and oil-derived products, and liquefied natural gas respectively. These broad variants may be further differentiated with respect to ability to carry only a single product or simultaneously transport mixed cargoes such as several different chemicals or refined petroleum products.[1] Among oil tankers, supertankers are designed for transporting oil around the Horn of Africa from the Middle East. The supertanker Seawise Giant, scrapped in 2010, was 458 meters (1,503 ft) in length and 69 meters (226 ft) wide. Supertankers are one of the three preferred methods for transporting large quantities of oil, along with pipeline transport and rail.

Despite being highly regulated, tankers have been involved in environmental disasters resulting from oil spills. See *Amoco Cadiz*, *Braer*, *Erika*, *Exxon Valdez*, *Prestige oil spill* and *Torrey Canyon* for examples of coastal accidents.

Many modern tankers are designed for a specific cargo and a specific route. Draft is typically limited by the depth of water in loading and unloading harbors; and may be

limited by the depth of straits along the preferred shipping route. Cargoes with high vapor pressure at ambient temperatures may require pressurized tanks or vapor recovery systems. Tank heaters may be required to maintain heavy crude oil, residual fuel, asphalt, wax, or molasses in a fluid state for offloading.

Tanker capacity Tankers used for liquid fuels are classified according to their capacity.

In 1954, Shell Oil developed the average freight rate assessment (AFRA) system which classifies tankers of different sizes. To make it an independent instrument, Shell consulted the *London Tanker Brokers' Panel (LTBP)*. At first, they divided the groups as *General Purpose* for tankers under 25,000 tons deadweight (DWT); *Medium Range* for ships between 25,000 and 45,000 DWT and *Large Range* for the then-enormous ships that were larger than 45,000 DWT. The ships became larger during the 1970s, and the list was extended, where the tons are long tons

- 10,000–24,999 DWT: General Purpose tanker
- 25,000–54,999 DWT: Medium Range tanker
- 55,000–79,999 DWT: Large Range 1 (LR1)
- 80,000–159,999 DWT: Large Range 2 (LR2)
- 160,000–319,999 DWT: Very Large Crude Carrier (VLCC)
- 320,000–549,999 DWT: Ultra Large Crude Carrier (ULCC)

Largest fleets Greece, Japan, and the United States are the top three owners of tankers (including those owned but registered to other nations), with 733, 394, and 311 vessels respectively. These three nations account for 1,438 vessels or over 36% of the world's fleet.

Builders Asian companies dominate the construction of tankers. Of the world's 4,024 tankers, 2,822 or over 70% were built in South Korea, Japan or China

Dry bulk carriers carry coal, grain, ore and other similar products in loose form.

A **bulk carrier, bulk freighter,** or **bulker** is a merchant ship specially designed to transport unpackaged bulk cargo, such as grains, coal, ore, and cement in its cargo holds. Since the first specialized bulk carrier was built in 1852, economic forces have fuelled the development of these ships, causing them to grow in size and sophistication.

Today's bulkers are specially designed to maximize capacity, safety, efficiency, and durability.

Today, bulkers make up 15% - 17% of the world's merchant fleets and range in size from single-hold mini-bulkers to mammoth ore ships able to carry 400,000 metric tons of deadweight (DWT). A number of specialized designs exist: some can unload their own cargo, some depend on port facilities for unloading, and some even package the cargo as it is loaded. Over half of all bulkers have Greek, Japanese, or Chinese owners and more than a quarter are registered in Panama. South Korea is the largest single builder of bulkers, and 82% of these ships were built in Asia.

A bulk carrier's crew participates in the loading and unloading of cargo, navigating the ship, and keeping its machinery and equipment properly maintained. Loading and unloading the cargo is difficult, dangerous, and can take up to 120 hours on larger ships. Crews can range in size from three people on the smallest ships to over 30 on the largest.

Bulk cargo can be very dense, corrosive, or abrasive. This can present safety problems: cargo shifting, spontaneous combustion, and cargo saturation can threaten a ship. The use of ships that are old and have corrosion problems has been linked to a spate of bulker sinkings in the 1990s, as have the bulker's large hatchways, important for efficient cargo handling. New international regulations have since been introduced to improve ship design and inspection, and to streamline the process of abandoning ship.

There are various ways to define the term bulk carrier. As of 1999, the International Convention for the Safety of Life at Sea defines a bulk carrier as "a ship constructed with a single deck, top side tanks and hopper side tanks in cargo spaces and intended to primarily carry dry cargo in bulk; an ore carrier; or a combination carrier." However, most classification societies use a broader definition where a bulker is any ship that carries dry unpackaged goods. Multipurpose cargo ships can carry bulk cargo, but can also carry other cargoes and are not specifically designed for bulk carriage. The term "dry bulk carrier" is used to distinguish bulkers from bulk liquid carriers such as oil, chemical, or liquefied petroleum gas carriers. Very small bulkers are almost

indistinguishable from general cargo ships, and they are often classified based more on the ship's use than its design.

A number of abbreviations are used to describe bulkers. "OBO" describes a bulker which carries a combination of ore, bulk, and oil, and "O/O" is used for combination oil and ore carriers. The terms "VLOC," "VLBC," "ULOC," and "ULBC" for very large and ultra large ore and bulk carriers were adapted from the supertanker designations very large crude carrier and ultra large crude carrier.

History

Before specialized bulk carriers existed, shippers had two methods to move bulk goods by ship. In the first method, longshoremen loaded the cargo into sacks, stacked the sacks onto pallets, and put the pallets into the cargo hold with a crane. The second method required the shipper to charter an entire ship and spend time and money to build plywood bins into the holds. Then, to guide the cargo through the small hatches, wooden feeders and shifting boards had to be constructed. These methods were slow and labor-intensive. As with the container ship, the problem of efficient loading and unloading has driven the evolution of the bulk carrier.

Specialized bulk carriers began to appear as steam-powered ships became more popular. The first steam ship recognized as a bulk carrier was the British coal carrier SS *John Bowes* in 1852. She featured a metal hull, a steam engine, and a ballasting system which used seawater instead of sandbags. These features helped her succeed in the competitive British coal market. The first self-unloader was the lake freighter *Hennepin* in 1902 on the Great Lakes. This greatly decreased the unloading time of bulkers by using conveyor belt to move the cargo. The first bulkers with diesel propulsion began to appear in 1911.

Before World War II, the international shipping demand for bulk products was low—about 25 million tons for metal ores —and most of this trade was coastal. However, on the Great Lakes, bulkers hauled vast amounts of ore from the northern mines to the steel mills. In 1929, 73 million tons of iron ore was transported on the Lakes, and an almost equal amount of coal, limestone, and other products were also moved. Two defining characteristics of bulkers were already emerging: the double

bottom, which was adopted in 1890, and the triangular structure of the ballast tanks, which was introduced in 1905. After World War II, an international bulk trade began to develop among industrialized nations, particularly between the European countries, the United States and Japan. Due to the economics of this trade, ocean bulkers became larger and more specialized. In this period, Great Lakes freighters increased in size, to maximize economies of scale, and self-unloaders became more common to cut turnaround time. The thousand-footers of the Great Lakes fleets, built in the 1970s, were among the longest ships afloat and in 1979, a record 214 million ton of bulk cargo were moved on the Great Lakes.

Categories

Bulkers are segregated into six major size categories: small, handysize, handymax, panamax, capesize, and very large. Very large bulk and ore carriers fall into the capesize category but are often considered separately.

Mini-bulkers are prevalent in the category of small vessels with a capacity of under 10,000 DWT. Mini-bulkers carry from 500 to 2,500 tons, have a single hold, and are designed for river transport. They are often built to be able to pass under bridges and have small crews of three to eight people.

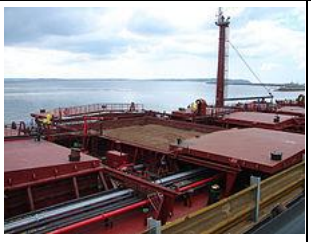
Handysize and Handymax ships are general purpose in nature. These two segments represent 71% of all bulk carriers over 10,000 DWT and also have the highest rate of growth. This is partly due to new regulations coming into effect which put greater constraints on the building of larger vessels. Handymax ships are typically 150–200 m in length and 52,000 – 58,000 DWT with five cargo holds and four cranes. These ships are also general purpose in nature.

The size of a Panamax vessel is limited by the Panama canal's lock chambers, which can accommodate ships with a beam of up to 32.31 m, a length overall of up to 294.13 m, and a draft of up to 12.04 m.

Capesize ships are too large to traverse the Panama canal and must round Cape Horn to travel between the Pacific and Atlantic oceans. Earlier, capesize ships could not traverse the Suez and needed to go around the Cape of Good Hope. Recent deepening of the Suez canal to 66 ft (20 m) permits most capesize ships to pass through it.

Capesize bulkers are specialized: 93% of their cargo is iron ore and coal. Some ships on the Great Lakes Waterway exceed Panamax dimensions but they are limited to use on the Great Lakes as they cannot pass through the smaller St. Lawrence Seaway to the ocean. Very large ore carriers and very large bulk carriers are a subset of the capesize category reserved for vessels over 200,000 DWT. Carriers of this size are almost always designed to carry iron ore.

General types

General Bulk Carrier Types	
Illustration	**Description**
	**Geared bulk carriers** are typically in the handysize to handymax size range although there are a small number of geared panamax vessels, like all bulkers they feature a series of holds covered by prominent hatch covers. They have cranes, derricks or conveyors that allow them to load or discharge cargo in ports without shore-based equipment. This gives geared bulkers flexibility in the cargoes they can carry and the routes they can travel. (Photo: A typical geared handysize bulk carrier.)
	**Combined carriers** are designed to transport both liquid and dry bulk cargoes. If both are carried simultaneously, they are segregated in separate holds and tanks. Combined carriers require special design and are expensive. They were prevalent in the 1970s, but their numbers have dwindled since 1990. (Photo: The oil pipeline and dry bulk hold aboard the *Maya*.)
	**Gearless carriers** are bulkers without cranes or conveyors. These ships depend on shore-based equipment at their ports of call for loading and discharging. They range across all sizes, the larger bulk carriers (VLOCs) can only dock at the largest ports, some of these are designed with a single port-to-port trade in mind. The use of gearless bulkers avoids the costs of installing, operating, and maintaining cranes. (Photo:*Berge Athen*, a 225,000 ton gearless bulker.)
	**Self-dischargers** are bulkers with conveyor belts, or with the use of an excavator that is fitted on a traverse running over the vessel's entire hatch, and that is able to move sideways as well. This allows them to discharge their cargo quickly and efficiently. (Photo: The *John B. Aird* a self-discharging lake freighter.)
	**Lakers** are the bulkers prominent on the Great Lakes, often identifiable by having a forward house that helps in transiting locks. Operating in fresh water, these ships suffer much less corrosion damage and have a much longer lifespan than saltwater ships. As of 2005, there were 98 lakers of 10,000 DWT or over. (Photo: *Edward L. Ryerson*, a Great Lakes bulker.)

BIBO or **"Bulk In, Bags Out"** bulkers are equipped to bag cargo as it is unloaded. The *CHL Innovator*, shown in the photo, is a BIBO bulker. In one hour, this ship can unload 300 tons of bulk sugar and package it into 50 kg sacks

Fleet characteristics

The world's bulk transport has reached immense proportions: in 2005, 1.7 billion metric tons of coal, iron ore, grain, bauxite, and phosphate was transported by ship. Today, the world's bulker fleet includes 6,225 ships of over 10,000 DWT, and represent 40% of all ships in terms of tonnage and 39.4% in terms of vessels. Including smaller ships, bulkers have a total combined capacity of almost 346 million DWT. Combined carriers are a very small portion of the fleet, representing less than 3% of this capacity. The lake freighters of the Great Lakes, with 98 ships of 3.2 million total DWT, despite forming a small fraction of the total fleet by tonnage and only operating 10 months a year, carried a tenth of the world's bulk cargo because of the short trip distance and fast turnarounds.

As of 2005, the average bulker was just over 13 years old. About 41% of all bulkers were less than ten years old, 33% were over twenty years old, and the remaining 26% were between ten and twenty years of age. All of the 98 bulkers registered in the Great Lakes trade are over 20 years old and the oldest still sailing in 2009 was 106 years old.

Flag states

As of 2005, the United States Maritime Administration counted 6,225 bulkers of 10,000 DWT or greater worldwide.[More bulkers are registered in Panama, with 1,703 ships, than any four other flag states combined. In terms of the number of bulk carriers registered, the top five flag states also include Hong Kong with 492 ships, Malta (435), Cyprus (373), and China (371). Panama also dominates bulker registration in terms of deadweight tonnage. Positions two through five are held by Hong Kong, Greece, Malta, and Cyprus.

Largest fleets

Greece, Japan, and China are the top three owners of bulk carriers, with 1,326, 1,041, and 979 vessels respectively. These three nations account for over 53% of the world's fleet.

Several companies have large private bulker fleets. The multinational company Gearbulk Holding Ltd. has over 70 bulkers. The Fednav Group in Canada operates a fleet of over 80 bulkers, including two designed to work in Arctic ice. Croatia's Atlantska Plovidba d.d. has a fleet of 14 bulkers. The H. Vogemann Group in Hamburg, Germany operates a fleet of 19 bulkers. Portline in Portugal, owns 10 bulkers. Dampskibsselskabet Torm in Denmark and Elcano in Spain also own notable bulker fleets. Other companies specialize in mini-bulker operations: England's Stephenson Clarke Shipping Limited owns a fleet of eight mini-bulkers and five small Handysize bulkers, and Cornships Management and Agency Inc. in Turkey owns a fleet of seven mini-bulkers.

Builders Asian companies dominate the construction of bulk carriers. Of the world's 6,225 bulkers, almost 62% were built in Japan by shipyards such as Oshima Shipbuilding and Sanoyas Hishino Meisho. South Korea, with notable shipyards Daewoo and Hyundai Heavy Industries, ranked second among builders, with 643 ships. The People's Republic of China, with large shipyards such as Dalian, Chengxi, and Shanghai Waigaoqiao, ranked third, with 509 ships. Taiwan, with shipyards such as China Shipbuilding Corporation, ranked fourth, accounting for 129 ships. Shipyards in these top four countries built over 82% of the bulkers afloat.

Freight charges Several factors affect the cost to move a bulk cargo by ship. The bulk freight market is very volatile, and it fluctuates, along with the type of cargo, the ship's size, and the route traveled all affect the final price. Moving a capesize load of coal from South America to Europe cost anywhere from $15 to $25 per ton in 2005. Hauling a panamax-sized load of aggregate materials from the Gulf of Mexico to Japan that year could cost as little as $40 per ton to as much as $70 per ton.

Some shippers choose instead to charter a ship, paying a daily rate instead of a set price per ton. In 2005, the average daily rate for a Handymax ship varied between

$18,000 – $30,000. A Panamax ship could be chartered for $20,000 – $50,000 per day, and a Capesize for $40,000 – $70,000 per day.

Ship breaking

Generally, ships are removed from the fleet go through a process known as ship breaking or scrapping. Ship-owners and buyers negotiate scrap prices based on factors such as the ship's empty weight (called light ton displacement or LDT) and prices in the scrap metal market. In 1998, almost 700 ships were scrapped in places like Alang, India and Chittagong, Bangladesh. This is often done by 'beaching' the ship on open sand, then cutting it apart by hand with gas torches, a dangerous operation that results in injuries and fatalities, as well as exposure to toxic materials such as asbestos, lead, and various chemicals. Half a million deadweight tons of worth of bulk carriers were scrapped in 2004, accounting for 4.7% of the year's scrapping. That year, bulkers fetched particularly high scrap prices, between $340 and $350 per LDT

Multi-purpose vessels, as the name suggests, carry different classes of cargo – e.g. liquid and general cargo – at the same time.

A Reefer (or Refrigerated) ship is specifically designed and used for shipping perishable commodities which require temperature-controlled, mostly fruits, meat, fish, vegetables, dairy products and other foodstuffs.

Specialized types of cargo vessels include container ships and bulk carriers (technically tankers of all sizes are cargo ships, although they are routinely thought of as a separate category). Cargo ships fall into two further categories that reflect the services they offer to industry: liner and tramp services. Those on a fixed published schedule and fixed tariff rates are cargo liners. Tramp ships do not have fixed schedules. Users charter them to haul loads. Generally, the smaller shipping companies and private individuals operate tramp ships. Cargo liners run on fixed schedules published by the shipping companies. Each trip a liner takes is called a voyage. Liners mostly carry general cargo. However, some cargo liners may carry passengers also. A cargo liner that carries 12 or more passengers is called a combination or passenger-cum-cargo line.

Definitions

The words *cargo* and *freight* have become interchangeable in casual usage. Technically, "cargo" refers to the goods carried aboard the ship for hire, while "freight" refers to the compensation the ship or charterer receives for carrying the cargo.

Generally, the modern ocean shipping business is divided into two classes:

1. Liner business: typically (but not exclusively) container vessels (wherein "general cargo" is carried in 20 or 40-foot containers), operating as "common carriers", calling a regularly published schedule of ports. A common carrier refers to a regulated service where any member of the public may book cargo for shipment, according to long-established and internationally agreed rules.

2. Tramp-tanker business: generally this is private business arranged between the shipper and receiver and facilitated by the vessel owners or operators, who offer their vessels for hire to carry bulk (dry or liquid) or break bulk (cargoes with individually handled pieces) to any suitable port(s) in the world, according to a specifically drawn contract, called a charter party.

Larger cargo ships are generally operated by shipping lines: companies that specialize in the handling of cargo in general. Smaller vessels, such as coasters, are often owned by their operators.

Vessel prefixes

A category designation appears before the vessel's name. A few examples of prefixes for naval ships are "USS" (United States Ship), "HMS" (Her/His Majesty's Ship), "HMCS" (Her/His majesty's Canadian Ship) and "HTMS" (His Thai Majesty's Ship), while a few examples for prefixes for merchant ships are "RMS" (Royal Mail Ship, usually a passenger liner), "MV" (Motor Vessel, powered by diesel), "MT" (Motor Tanker, powered vessel carrying liquids only) "FV" Fishing Vessel and "SS" (Screw Streamer, driven by propellers or screws, often understood to stand for Steamship). "TS", sometimes found in first position before a merchant ship's prefix, denotes that it is a *T*urbine *S*teamer. (For further discussion, see Ship prefixes.)

Famous cargo ships

Famous cargo ships include the Liberty ships of World War II, partly based on a British design. Liberty ship sections were prefabricated in locations across the United

States and then assembled by shipbuilders in an average of six weeks, with the record being just over four days. These ships allowed the Allies to replace sunken cargo vessels at a rate greater than the Kriegsmarine's U-boats could sink them, and contributed significantly to the war effort, the delivery of supplies, and eventual victory over the Axis powers.

4. Means of cargo operations

The goods-related services consist of loading, unloading, shifting, and limbo operations of goods for vessels alongside any dock or pier, tied to any buoy, stern-docked on the breakwater, or riding on anchor within the borders of the port area.

Loading/unloading services

Loading and unloading services consist of taking goods from docks, storage, or vehicles or vessels and placing them alongside the vessel, loading them aboard the vessel, stowing them away in the hold or on deck, etc. In the case of dry or liquid bulk cargoes, they consist of services provided using mechanical means and equipment (pneumatic loaders, conveyers, pipelines, etc) owned by the port or, when authorized, by the owner.

Shifting services

Shifting services consist of moving goods from one location aboard a ship to another on the same ship without the goods being removed from the ship onto land.

Limbo services

Limbo services consist of moving goods from the hold or deck of one ship to a hold or deck on another ship that has come alongside the first. The movement of goods between two ships that requires the intervention of a third craft whether owned by the port or by someone else does not fall within the scope of “limbo services”.

Terminal services

Terminal services consist of:

- Unloading goods from vehicles that brought them into the terminal to be loaded aboard vessels, moving them, stacking them, and carrying them alongside the vessel onto which they are to be loaded;

- Moving goods that have been unloaded from a ship to the terminal area, stacking them, and loading them aboard vehicles.

Manipulation services

Manipulation services consist of:

- Storing chemicals according to the documents and analyses that indicate their properties;
- Having rented covers and tarpaulins put in place by the port at the owner's request;
- Having dry bulk goods packaged by the port or, with the port's permission, by the owner;
- Allowing goods that have been accepted into the terminal area to be assembled/disassembled by the owner with the port's permission.

Storage services

Storage services are deemed to have commenced as of the day on which:

- The first item contained in a bill of lading for goods arriving by ship is unloaded onto any vessel or vehicle or is placed in the terminal;
- Unloading resumes from a vessel that returns to a dock after having been suspended because the vessel being unloaded had to be removed from the dock for any reason whatsoever;
- A vehicle carrying goods to the terminal enters the terminal.

Storage services are deemed to have ended as of the day on which the goods are surrendered to a recipient.

Acceptance of goods into storage areas

Livestock and bulk goods

Livestock and bulk goods may be accepted for storage if there are suitable terminal areas or storage space for them.

Worthless and perishable goods

Under tackle services (only) are provided only on condition that service charges be paid in advance in the case of:

- Goods whose value is deemed to be unlikely to cover the cost of their storage and handling etc
- All perishable goods.

Goods whose storage requires special equipment etc

Goods such as cold-chain goods whose storage requires special equipment and facilities are accepted in storage only if the port has the means and facilities for dealing with them and on condition of payment of the charges prescribed for them in the rates schedule.

Contraband and abandoned goods

No contraband or abandoned goods will be admitted to the regular storage areas. They will only be admitted to designated contraband/abandoned goods warehouses belonging to customs authorities or leased to customs authorities by the port. If goods accepted for storage subsequently become subject to action as contraband, they will still be liable for storage fees up to the date on which they are removed to contraband storage.

Hazardous materials

Cargoes that qualify as “hazardous materials” or “dangerous goods” will be admitted to the port area only with the written approval of the harbormaster and appropriate public authorities and after the port has determined the charges that are to be made and given its consent accordingly.

The port is authorized to require owners to supply all documentation that will assist in correctly identifying hazardous materials.

Air Cargo Operations

Cargo handling is performed at thousands of airports all over the world by hundreds of companies, big and small. This poses a high potential risk for deviations in quality of handling. IATA actively drives the development of ground handling operations standards, best-practice processes and procedures and promotes global consistency and harmonization.

IATA works to drive efficiency in all areas of cargo operations. The integration of those efficiencies into operations plays an increasingly critical role for today's air freight industry.

With a plan aligned to Cargo Committee's priorities, working with the Ground Handling Council and other sub-groups, the IATA Cargo Handling Consultative Council (ICHC) brings together cargo handlers and airlines involved in cargo operations. Its objective is to develop best-practice processes and procedures to address all aspects of cargo acceptance and handling.

ULDs and airmail

IATA is aware of the importance of a safe, proper and effective management, use and control of Load Devices (ULDs). Over USD 300 millions are spent each year on repairing damaged ULDs, a result of poor industry awareness and training. ULDs are also the most frequent cause of damage to aircraft on the ground, according to IATA's Ground Damage Database (GDDB).

Air mail is also an essential part of IATA's scope for cargo operations. Through the Air Mail Board (AMB), IATA works in close collaboration with the Universal Postal Union (UPU) to guarantee an efficient supply chain for the delivery of e-commerce goods as well as your regular mail.

Dwell times in the air cargo supply chain

It is obvious to all stakeholders that the transportation time from the shipper to the consignee needs to be reduced. ICHC investigates this issue and started to perform various measurements to assess those areas where processes could be improved. IATA will later share its views with the Global Air Cargo Advisory Group (GACAG) members.

Nearly all airports handle both cargo and passengers. There are relatively few pure cargo airports. For cargo operations, the airports can be categorized as hub and feeder airports, especially for international operations where the hub-and-spoke system continues to be the dominant operating model for scheduled flights, both passenger and cargo. Larger aircraft are used on long-haul international routes, while smaller aircraft serve domestic origins and destinations. This system allows shipments between

origin/destination pairs that could not support direct, point-to-point, service. It also provides for more frequent services from the hubs to the various international origins and destinations.

The hub airport is generally located in or near a major population center to have a significant amount of inbound and outbound baseload cargo. It provides a transshipment node not only for interlining between domestic and international carriers but also for connections between an airline's domestic and international services. A larger hub airport may also act as regional gateway, for example:

The hub and spoke system can also be intermodal providing a connection for sea-air services or for sea-road services. The latter involve RFS (road freight services) connections in which an international air movement is combined with a domestic road movement between the hub and feeder airport. The road transport segment is treated as a scheduled air shipment. The cargo is transported under an airway bill and customs clearance is performed at the feeder airport's warehouse. This arrangement allows an airfreight carrier to sell services to airports where it does not actually land. The latter can allow nearby airports to act as hubs for different carriers, as is the case with Dubai and Abu Dhabi or Beijing and Tianjin.

Most of the major hub airports serve either a large integrator or the dominant national carriers as shown in Table 3-1. However, some of the hub airports serve a broad mix of services, for example New York's JFK (Table 3-2). Governments can help airports to achieve the status by improving airport performance through investment in infrastructure and transfer of operations to private operators. Freight forwarders can promote the use of an airport for international • Hong Kong, which provides European and North American carriers with air and land access to China, as well as air access to other Asian destinations, • Dubai, which provides connections between European and Asian services, also acts as a regional distribution center for Africa and the Middle East. • Miami, Florida and Tocumen airport in Panama, which serve Latin American carriers connecting with North American and European carriers.

However, the choice of hub airports remains the purview of the airlines, which choose hub airports in order to optimize their networks. Furthermore, multinational carriers do not have any local obligations beyond adhering to regulatory requirements.

The national hubs are usually airports that serve the capital or other major markets and act as a gateway to/from smaller markets within that country. The selection of national hub airports is often determined by government, especially where the national carrier is controlled by the government and required to provide essential air services to outlying markets that are not profitable. The national carrier either provides international services or interlines with a foreign carrier. In rare cases, this relationship can lead to the development of a regional hub but only where there is already a substantial and effective operation. For example, San Salvador evolved from a hub for the national carrier TACA to a regional hub once TACA established itself as Central America's regional carrier by acquiring the former national airlines of Costa Rica, Honduras, Guatemala and Nicaragua. As a regional hub, San Salvador provides shippers and travelers with direct flights to markets that would otherwise have only been served through interlining.

In recent years, the growth of large integrators has led to the development of airports in which cargo is the primary business. Since a certain scale of operations is required to justify the investment in an all-cargo airport (see discussion at end of chapter), there are relatively few of them and nearly all are located in the United States and Europe. These include FedEx regional hubs in Ft. Worth, Texas (Alliance Airport) and Columbus, Ohio (Rickenbacker), DHL's U.S. hubs in Riverside, California and Wilmington, Ohio and its UK hub at East Midlands. One of the few all-cargo airports in developing countries is Viracopos Airport in Brazil. There has been talk of setting up a facility in Johore in Malaysia but the profitability remains in question, especially given the proximity to Changi Airport in Singapore.

More common are airports in which there is some passenger traffic, but the cargo operations of the integrators are the major activity. Examples in the United States include the FedEx hub in Memphis, Tennessee, and Indianapolis, Indiana, the BAX Global hub in Toledo, Ohio and UPS' hubs in Louisville, Kentucky and Ontario,

California. In Europe, there is the TNT hub in Liege in Belgium (see Box 3-1), and the DHL hub in Leipzig, Germany, as well as the Cargolux hub in Luxembourg Airport. There are no such hubs in Latin America, as the integrators prefer to operate out of Miami. There is, however, a major cargo operation in Bogotá, Colombia. In the Middle East, there are DHL hubs in Bahrain and Dubai. The latter also serves as the hub for FedEx, Emirates and most of the cargo airlines serving the region. In East Asia, FedEx and UPS have operated hubs at Subic and Clarke in the Philippines, but have since shifted their operations to China, Guangzhou and Shanghai Pudong, respectively.20 20 There initial attraction had been their location on the main trade route to Southern China and Southeast Asia combined with very low charges and a liberal regulatory policy, but they lost this business when China liberalized its regulations.

Liege Airport is located within the triangle of Europe's major cargo airports—Paris, Frankfurt and Amsterdam. It was a military installation until 1990 when the Walloon government decided to concentrate cargo flights in Liege airport. A new airport company was established as a joint venture between Wallonia's regional airport company and airports authority for Paris. Five years after becoming a commercial venture, Israel Cargo Airlines (CAL) started using Liege, which now serves as its European hub for shipments of flowers, fruit and vegetables. The airport received a major boost when TNT established its regional hub there in 1997.

Liege is the 8th largest cargo airport in Europe handling about a half million tons. The cargo has grown steadily over the last decade despite a downturn in 2006.

The airport has a single 8,800 ft runway. It has 32,000 m² of warehousing, including a terminal for perishables, and seven B-747 freighter docks. It also has an 84-hectare cargo village with a 4-hectare transshipment yard for road and rail. More than 50 companies run cargo flights into the airport, including Emirates, Kalitta and Iceland Air, which flies fresh fish into Liege. China Southern Airlines has a code-sharing arrangement with TNT Airways, the airport's largest freight operator.

Another mechanism used to promote air cargo activities is the designation of an airport as a "tech stop." Initially, aircraft landing at the airport may refuel, make crew changes and possibly receive catering services but do not transfer cargo. The airlines

select tech stops based on their position along the major air routes. Airports can compete for this business by offering attractive charges for fueling and provisions, attractive crew accommodations or aircraft maintenance facilities, but these are secondary considerations. In some instances, tech stops have evolved into hub operations as a result of strong growth in economic activity. The airports in the United Arab Emirates were initially tech-stops for flights between the Indian subcontinent and Europe, as well as between Southeast Asia and Europe. They evolved into regional distribution hubs as a result of the rapid economic development over the last 20 years. The situation in Anchorage is different. While it has relatively little economic activity, it was able to graduate from a tech stop to a transshipment point for flights between Asia and North America and between Asia and Europe over the North Pole. On the other hand, Dakar in Senegal remains a tech stop for flights between Southern Africa and North America while Almaty, Kazakhstan provides a similar service on connecting parts of Asia with Europe.

Other factors that affect the attractiveness of an airport for air cargo operations include the regulatory environments for international flights, the charges levied by the airport operators and national civil aviation authorities, the costs for cargo handling services, ability to contract third-party services, and airfield resources. While the latter is important, air freight carriers can adapt marginal or even inadequate facilities by changing equipment, that is using less than optimal gauge aircraft where runways are too short and employing refrigerated containers at airports lacking refrigerated warehouses. The airport charges are important, but most airports set their aeronautical fees through comparison with other airports in the area. The costs for cargo handling remain a critical factor and depend on the level of competition permitted for on-airport services. Indeed, the ability of Subic Airport to convince FedEx to set up a hub there was based primarily on extremely attractive charges for the cargo handling facilities along with the autonomy to perform its own ground handling.

Cargo handling operations

Cargo handling operations at airports involve the preparation of cargo shipments, the loading and unloading of the aircraft, and the transfer of cargo between the storage

facilities and land transport. For outbound cargo, the preparation includes consolidation of cargo, building up of the air cargo pallets and containers, inspection and documentation. For inbound cargo, the preparation includes customs and other regulatory procedures, as well as deconsolidation. For transshipment cargo, the operation is generally limited to unloading, reconsolidating, and reloading the cargo but can be as simple as a direct transfer between aircraft (sometimes known as tail-to-tail transfer).

Although air cargo ideally remains in the airport for a relatively short time, it is necessary to provide storage facilities. Bonded facilities are required for imports and international transshipment cargo. For perishable cargoes, it is necessary to provide cold rooms. For outbound cargo, it is necessary to provide X-ray scanners to inspect the cargo. Since most air cargo is low density, most of the cargo is stored on racks, preferably in large open warehouses with high ceilings (more than eight meters). The storage areas must be equipped with loading docks on the landside to allow for rapid movement of goods to and from trucks. Most airports also provide offices near the warehouses for the airlines and forwarders to receive/deliver cargo and prepare shipping documents, and for customs to clear import and export cargo.

A major issue in the layout of airports is the extent to which cargo-handling activities take place on the airport versus outside the airport boundaries. The airlines receive and dispatch cargo on the airport. Inspection is generally done on the airport including scanning, which generally implies that the palettes are built up on the airport. Beyond that, exporters, importers and forwarders generally prefer to locate their activities outside the airport to avoid space limitations and reduce operating costs. Where possible, they also prefer to build their own pallets and ULD containers prior to delivery to airlines, especially where they have to maintain a cool/cold chain for temperature-sensitive perishables. However, this requires that pallets/containers be accepted “as is” without having to be broken down for inspection and then rebuilt. In order to do this, the airlines and security officials must certify the forwarder’s warehouse as well as the forwarder or shipper. Alternatively, if there is sufficient cargo volume, more expensive full pallet scanners can be introduced.

On-airport cargo terminals are usually multi-tenant. These may be common-user spaces managed by an authorized cargo handler, but, as traffic levels increase, carriers and integrators often want to have their own space. Initially this may be space rented on a long-term basis but eventually they need their own facilities. Similarly, forwarders/customs agents may occupy a designated storage area or merely place their customers' consignments in a common area. In order to accommodate different carriers and consolidators, various airports have established cargo villages. These are sites with multiple cargo terminals. They usually evolve from the existing warehouse facilities, but in some cases are constructed on a new site. The village is designed to allow better coordination of operations and improved traffic flow. It also allows for provision of a common office building to simplify the interaction between the carriers, forwarders and shippers. An alternative is to construct a larger, multi-story warehouse and lease space to the various parties. In the case of Dubai, both strategies have been applied with the introduction of a Mega Cargo Terminal within the Cargo village.

Different warehouse technologies are introduced as the volume increases (Table 3-3). The larger warehouses usually have more sophisticated equipment and layouts with the result that the throughput per square meter is also higher. These tend to be operated by integrators or third party consolidators who have sufficient volumes to justify the higher capital expenditure. The large integrators introduce automation because of their need to manage international supply chain, for example the DHL hub at Tocumen. Other parties that have sufficient cargo volumes to justify modern warehousing are national carriers and designated ground handlers with exclusive rights to provide on-airport cargo services. However, these groups are often inefficient monopolists not interested in making long-term investments to improve efficiency.

The area required for storage depends on the typical dwell time and stacking density. The large warehouses achieve higher throughput by better planning of storage and greater use of the available space. Although air cargo is low density, the dwell time is very short. Much of the cargo is cleared in a few hours. That which is not, rarely remains more than two days so that 75–100 turns per year is not unreasonable. With high stacks and narrow aisles, it is possible to achieve throughputs well in excess of 17

tons per year for a single integrator. With multiple tenants the number would be significantly lower.

The requirement for refrigerated space depends not only on the type of commodities shipped but the arrangement with shippers. Flower exporters are particularly intensive users of refrigerated space but usually locate their primary cargo handling and storage facilities off-airport. The flowers are transported to the airport just prior to loading the aircraft. This requires that there be no significant delays for security inspections and delays in aircraft movements. In Bogotá and Quito, there are refrigerated terminals on the airport but they operate independently of other cargo terminals. Nairobi has a pair of on-airport refrigerated storage facilities operated by the ground-handling subsidiary of Kenya Airways, as well as a stand-alone cold storage operated by DHL on the airport and Swissport off the airport. These are highly automated. Possibly the most advanced cold storage is the Dubai Flower Center, a multi-storey facility located next to the Dubai Cargo Village. It is designed for the storage and processing of flowers imported primarily from Africa for both the local market and for distribution to the region. The initial phase on this center is designed for an annual throughout of up to 180,000 tons of flowers

The airport determines who can provide ground handling, both ramp and warehouse services. National carriers are often given exclusive rights to provide these services, especially in smaller airports. Other carriers or cargo handlers are usually reluctant to become involved unless they have substantial traffic to justify the investment and/or are allowed to offer the service to other carriers who would provide sufficient volume.

Alternatively, the government may give a third party exclusive right to provide these services. These are usually domestic companies but there is a growing number of international operators (Table 3-4). The latter provide not only special skills but also business connections with carriers and forwarders. They offer carriers a standard level of quality, but must organize themselves according to the regulatory environment in which they operate. For example, Menzies has expanded into Africa with ground-handling and cargo operations in Cotonou, Benin; Bangui, Central African Republic;

Malabo, Equatorial Guinea; Accra, Ghana; Bissau, Guinea Bissau; Niamey, Niger; and Dakar, Senegal. These use partnerships in which independent handlers join the Menzies network, adopting its service standards and IT solutions. Swissport Cargo, which has eight operations in Africa and twenty in Latin America, utilizes joint ventures in which it holds a majority stake in Brazil, Philippines, South Africa, Kenya, Tanzania, and minority stakes in Algeria, Dominica, Peru and Honduras.

The development of on-airport cargo facilities can be undertaken by the airport operator or cargo handlers as part of providing services.

The challenge is to cultivate adequate competition to ensure efficient services. For small volumes, it is often left to the airport operators to provide the facilities and to assign responsibility for their operation to the national carrier and other tenants. For larger volumes, it is beneficial to have forwarders, carriers and/or third parties who invest in structures – either for their own exclusive use or to market their use to others. The use of contracted services and concessions can be an effective method for ensuring efficient and low-cost cargo handling services. However, the extent of competition depends on the volume of traffic and the area available on the airport. Modern airports tend to be much larger than their predecessors and include space for developing significant cargo operations. In some cases, this includes provision for areas to be used for distribution centers and processing of the goods, but the extent to which this is an efficient use of airport property depends on the airport's total land holdings.

Customs has an important role in the use of an airport for import cargo and more particularly for transshipment cargo. Because of the high value and time sensitivity of air cargo, it is important to minimize the time required for clearance of import cargo and to simplify the procedure involved in cargo transshipped through the airport. Many countries have developed a dual track for clearing goods. Expedited services are provided for express package services allowing them to meet tight delivery schedules, while large shipments are cleared more slowly. Most major airports in developing countries can clear cargo in a few hours to one day. While this is quite rapid relative to cargo shipped on other modes, anything over six hours must be considered inefficient and a reasonable target would be two hours. This is possible because of the level of

computerization of airfreight documentation, which allows submission of the IGM (Inward General Manifest) at the time of departure from the previous airport. Slow clearance times are usually associated with the failure of customs and shippers to adopt modern information and communications technology. These systems are also important for tracking shipments and for ensuring efficient use of warehousing space.