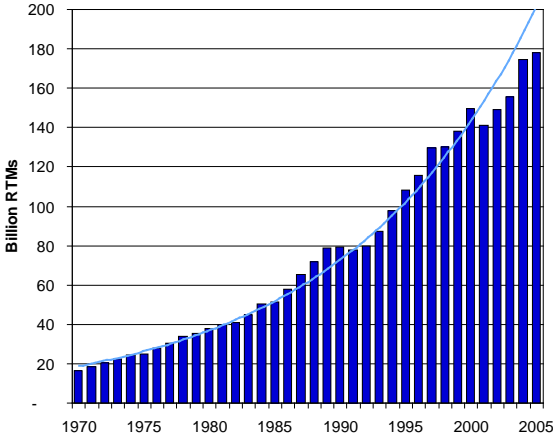


1 DEMAND FOR INTERNATIONAL AIRFREIGHT

Stages of growth

The international airfreight business has gone through a number of phases in the last half century while continuing to grow at over nine percent per year in terms of revenue ton-kms⁸ (Figure 1-1, IPCC 1999). The total air cargo traffic carried on scheduled flights, as reported by the International Civil Aviation Organization (ICAO), experienced a sharp build-up in the decade following World War II. Traffic doubled due to the introduction of propeller aircraft capable of long haul, nonstop domestic and international service. Another surge occurred beginning in 1958 with the introduction of jet passenger aircraft, offering belly cargo capacity that greatly increased available lift while allowing passenger airlines to increase their participation in airfreight. This was followed with the introduction of jet freighters (B-707F, DC-8F) in 1963, and the wide-body aircraft in the 1970s. The latter increased not only capacity, but also efficiency supporting a rapid increase in international airfreight. The wide-bodied airfreighters also caused a substantial increase in market share for scheduled all-cargo services between East Asia and North America/Europe. However, this share subsequently declined in the late 1970s and early 1980s as a significant portion of the scheduled freighter services was replaced by charter services able to achieve higher load factors and greater flexibility by operating outside the restrictions of bilateral agreements. This led to a merger of scheduled and chartered air freighter operations with both combination carriers,⁹ such as Lufthansa, and all cargo airlines, such as Cargolux, using the same fleet to provide both scheduled and charter flights.¹⁰ At the same time, the air courier services began their rapid expansion in the United States and Europe. During this same period, the market share of cargo carried on passenger aircraft increased from its traditional 30–40 percent to slightly over 50 percent by the 1990s. This was accomplished through more flexible and competitive pricing in order to take advantage of the cargo capacity in their wide-bodied aircraft.

Figure 1-1. Air cargo traffic, 1975-2005



Source: Boeing

During the 1990s the air courier services expanded into the larger developing economies and extended their activities to include road and air services for both parcels and freight. While the overall growth of airfreight slowed in the 1990s the growth in domestic traffic in larger developing countries began to accelerate. National carriers in developing countries expanded their freight services by feeding cargo consolidated from their domestic networks to the international carriers. This was

⁸ Throughout this report, tons mean metric tons.

⁹ The air cargo industry has three primary types of carriers; combination carriers (passenger airlines that use a portion of their “belly-hold” capacity to carry cargo and may also operate separate air cargo fleets), conventional all-cargo carriers operating both scheduled and charter services, and integrated (express) carriers operating their own fleet of aircraft and delivery vehicles providing overnight, door-to-door service.

¹⁰ The integrator DHL also has a significant charter operation based in Panama to increase utilization of its fleet.

followed by the introduction of express services, which provided both air and ground courier services. These integrated carriers have established a dominant position in domestic shipments of time-sensitive goods. They also developed relationships with the international courier services and in some cases were absorbed by them. During this period, the larger passenger airlines introduced road freight services (RFS) that allowed them to use trucking services to extend their area of service and thus emulate integrated services, but they still lost market share falling back to about 40 percent.¹¹ At the same time, sea-air shipments, which were first introduced in the 1970s, finally grew into a major business for Dubai and Miami. In recent years, new carriers have entered the scheduled airfreight business, in particular those in the Gulf States.

The percentage of cargo moving by air is negligible in terms of weight but significant in terms of value. For the U.S. international trade, nearly 30 percent by value is shipped by air, up from 16 percent in 1980. The percentage is higher for exports (about 35 percent) than for imports (about 24 percent).

As for the future, there remains considerable potential for growth in domestic movements in the larger developing countries as their markets become more time sensitive. Currently domestic traffic accounts for only one-quarter of the total airfreight (measured in revenue ton-km) and most of this is concentrated in North America and Europe.

Deregulation

The growth in air cargo has been assisted by two major initiatives to deregulate the market. The first occurred in the United States with the passage of the 1978 Airline Deregulation Act. Prior to that, entry to air cargo operations was limited to airlines that had offered prior service. The Act allowed any citizen seeking to operate an all-cargo airline to file an application for a section 418 certificate. Within one year of passage, major passenger airlines such as Delta, Continental, and Allegheny (now USAIR) submitted applications along with the major airfreight forwarders Emery and Airborne. Existing cargo airlines such as Flying Tiger and Seaboard used the law to expand their networks. This act also allowed a small express package service, Federal Express, which was using small commuter jets, to acquire larger aircraft, B-727s, B-737s, and DC-10s and to expand its network. Eventually there would be over 100 carriers obtaining section 418 certificates. Because of the high startup costs, most of these were established airlines. However, some were airfreight forwarders who would lease aircraft to serve markets where the belly capacity of passenger airlines was insufficient.

Markets outside the United States were slower to open their markets for either passengers or cargo. For most countries, the passenger market has only been opened during the last ten years with the introduction of low-cost operators, although the origins of this effort date back to the 1970s when People Express and Laker Airways attempted to open the U.S. and transatlantic markets. The opening of the air cargo market has been slower, in part because of limited demand—particularly in developing countries where demand has been adequately met with belly cargo of national carriers or through charter services.

The second major deregulation has been the move towards “open-skies” agreements. The basis for commercial air traffic between countries was established in the 1944 Chicago Convention (Annex A). This was predicated on utilizing bilateral agreements to permit flights between countries and through those countries to third countries. These agreements limited the number of flights, the size of aircraft

¹¹ IATA figures for 1999 indicate a market share of 42 percent for scheduled passenger services, 9 percent for pure charter operations and 49 percent for integrated all-cargo carriers.

and the participating airlines. The “open-skies” agreements are intended to eliminate these restrictions but within the context of bilateral agreements. While the introduction of this regime remains contentious for passenger services, there has been less resistance for cargo services. The agreements allow scheduled air cargo airlines to establish services to major markets with relative ease (charter flights are generally not restricted under the Chicago Convention), thereby allowing countries to expand into new markets especially for exports that are high value or time sensitive. These agreements are typically bilateral but there are a growing number of increasingly multilateral agreements, such as that between Singapore, Thailand and Brunei, as well as the APEC agreement involving eight states. There are also some unilateral agreements as in the case of India, Lebanon, Philippines and Kenya, which provide full liberalization for air cargo with or without reciprocity. Since 1992, there have been over a hundred bilateral agreements signed (about 2/3 involving the United States)., Sixty percent of those provide full freedoms including 7th freedoms (cabotage). The “open skies” agreement being negotiated between the United States and the EU will permit EU airlines to carry cargo between the United States and all third (non-EU) countries, as well as allow U.S. and EU airlines to enter into cooperative arrangements, including codesharing, franchising, and leasing. Even where there are no formal agreements, a large number (in excess of 120) of codesharing agreements exist that include air cargo, and effectively grant foreign partner airlines the same rights as domestic airlines.

Nature of air cargo

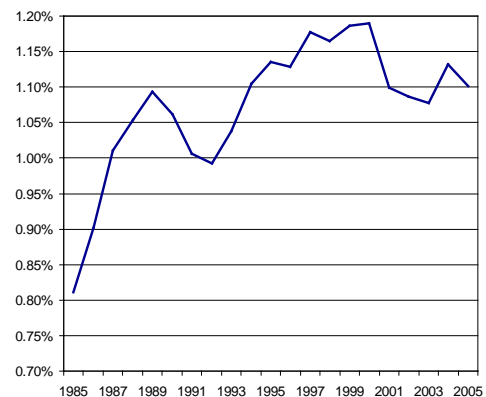
The growth in airfreight over the last five decades has led to a diversification in the types of services and also the markets that are served. Most goods carried by air are high-value low-density cargoes, or time-sensitive goods such as perishables. The share (by value) of international freight traffic transported by air has increased. ICAO estimated airfreight accounts for about 40 percent of international exports by value, but the percentage based on weight remains close to one percent (Figure 1-2).

The basic commodity groups transported by air are:

- capital and transport equipment,
- computers, telecommunications equipment and other technology products,
- apparel and textiles,
- perishables and refrigerated goods,
- intermediate goods for distributed manufacturing, and
- other consumer products.

The proportion of traffic on the major trade routes accounted for by these commodity groups (as measured in FTK -freight ton-kilometers) is shown in Figure 1-3, based on estimates for the year 2005. Intermediate goods are important for the manufacturing and re-export trade in Asia. The trade in perishables reflects rising consumer demand for cut flowers, exotic fresh seafood, and counter-seasonal vegetables. The projected growth in traffic for these categories (as shown in Table 1-1), anticipates that globalization of production will continue increasing the share of capital equipment and intermediate goods. This would be followed by steady growth in shipments of electronics and perishables, but a decline in the share of apparel. The latter

Figure 1-2. Market share of air freight

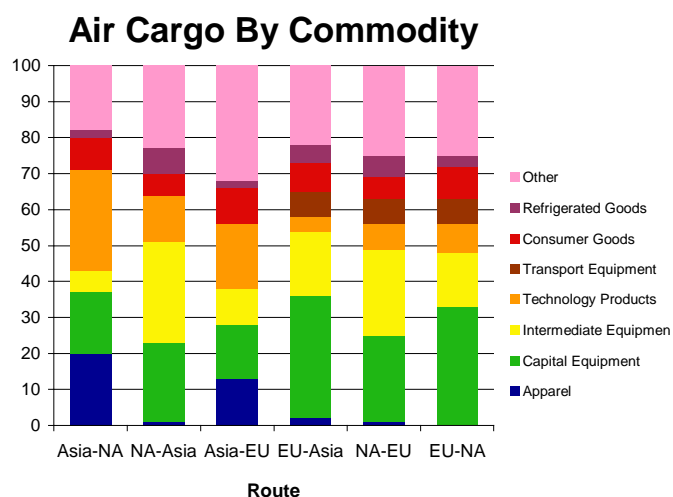


Source: Boeing

reflects continuing improvements in supply chain management leading to a gradual shift of lower value, time-sensitive products to ocean transport.

Air cargo can be characterized according to the types of services required. There are currently four such categories: emergency freight, high-value freight, perishables and routine freight. Emergency freight includes time-critical shipments of spare parts and business and financial documents (where these cannot be transmitted electronically). High-value freight includes gold, jewelry, currency, artworks, electronic components and luxury vehicles. These utilize airfreight for security as well as speed. Perishables include fresh seafood, fruits and vegetables, pharmaceuticals and cut flowers. Airfreight provides most of the value added and usually accounts for a majority of the delivered price. Routine freight is the residual from which new categories are emerging. Among these are the rapid replenishment shipments, which are used to limit the amount of inventory when demand is volatile, for example in the markets for fashion garments or apparel with short seasons. It also applies to a portion of the just-in-time manufacturing process in which a short lead-time is combined with a flexible production line. Related to this are the missed shipment cargoes. These are cargoes that would normally use a slower, less costly mode of transport but because of delays in production or other problems have to be rushed to meet agreed delivery dates. Normally, this would have been included in the category of emergency freight, but use of these shipments has become a strategic decision wherein producers accept tight delivery schedules for competitive reasons but use slower transport with the understanding that a significant portion of shipments will become “rush shipments”. There are also a number of emerging market niches that currently fall into one of the categories mentioned above but have the potential to become separate categories of airfreight. One example is shipments associated with Internet B2C (business to consumer) in which electronic retailers offer rapid delivery for impatient customers. While this has largely been limited to domestic shipments, there is every indication that this will become a small but important niche in global trade. Two other examples are military and relief supplies shipped to areas in conflict and project cargo, for example special equipment and machinery for specific construction or fabrication activities.

Figure 1-3. Air cargo by commodity



Source: Merge Global in Air Cargo World

Table 1-1. Projected share of growth in airfreight 2005-2010 (% of additional FTK)

Capital Equipment	19.8%
Transportation Equipment	4.5%
Computers	11.2%
Telecommunications Equipment	6.1%
Technology Products	2.9%
Intermediate Materials	15.1%
Perishables	7.3%
Apparel	8.1%
Textiles	6.0%
Consumer Products	6.9%

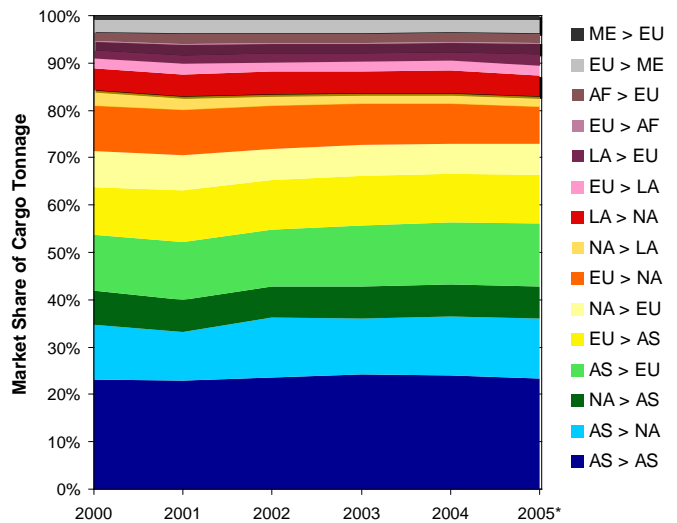
Source: MGI Global Freight Model

Market concentration

Air cargo is reported by airports in terms of weight handled, whereas airlines report the amount in freight ton-kilometers. Both are geographically concentrated, as is the underlying economic activity. Not surprisingly, most of the trade involves movements between North America, the EU and Asia, primarily China. Routes with origins or destinations in Asia account for 70 percent of the total volume of air cargo (Figure 1-4). Movements between Asia and both, the United States and Europe, account for 41 percent of total airfreight (Figure 1-5). In addition, the domestic movements in the United States account for about 13 percent and the shipments between the United States and Europe account for 10 percent. These percentages are likely to change as domestic shipments in North America stagnate (Table 1-2) and Asia continues to experience rapid growth, especially for routes serving China (Table 1-3). About 20 percent of the total volume is transported within Asia. Although important in terms of quantity of air cargo, this represents a relatively small portion of the freight traffic since such movements involve relatively short distances.

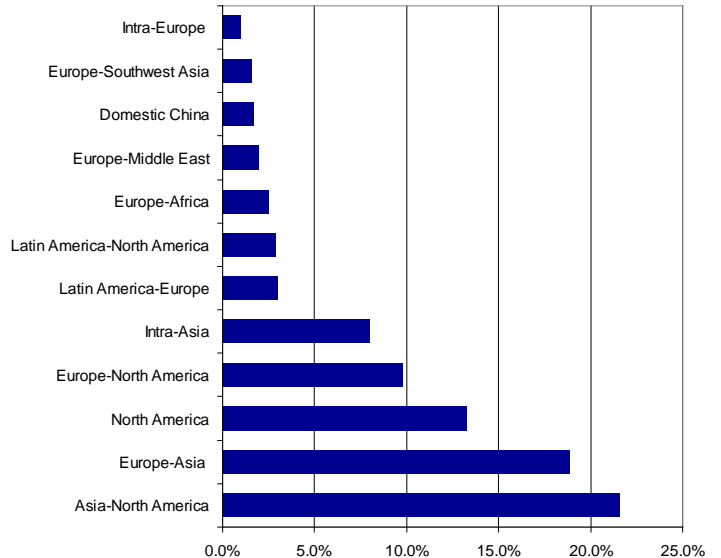
North America continues to account for the largest share of cargo handled in its airports (Figure 1-6), however, this share has been declining.¹² Also, it includes a large amount of domestic cargo. If only international trade is considered, then Asia has more air cargo than North America. Of the fifteen largest air cargo airports in the world, six are located in the United States and six in Asia. However, four of the top six are in Asia and this does not include Beijing, which, with a growth rate of about 30 percent is expected to rise quickly from its #20 rating in 2006. The Middle East, Africa and Latin America account for only about 11 percent of air cargo but there has been continuing growth in market share over the last decade.

Figure 1-4. Air cargo by route



Source: MergeGlobal

Figure 1-5. Air freight market share by route



Source: Boeing

¹² This number is also inflated by the large proportion of cargo that is transshipped at hub airports where they are counted both as arriving cargo and departing cargo.

Table 1-2. Average growth: value of U.S. air cargo (%)

Annual %	Total	Exports	Imports
1970–1975	20.5	20.0	21.2
1975–1980	25.2	24.8	25.8
1980–1985	6.9	2.6	12.9
1985–1990	14.2	16.1	12.1
1990–1995	12.0	10.4	13.9
1995–2000	10.8	9.4	12.1

Source: U.S. Department of Transportation

Developing countries traffic

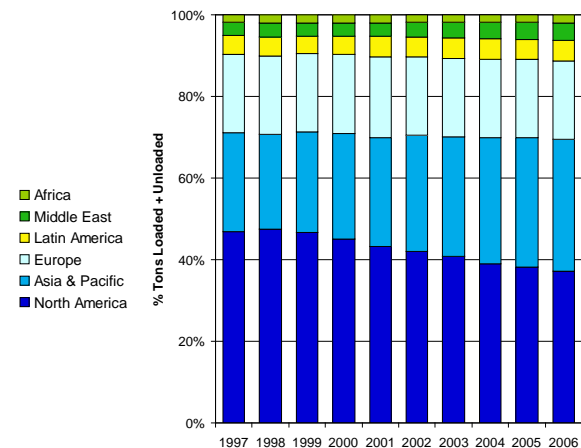
There are a number of factors limiting the volume of airfreight in developing countries. The principal constraint is the lack of balanced loads. Industrialized regions such as China’s east coast are more likely to have significant volumes of two-way activity with inbound shipments of inputs for production helping to balance outbound loads comprised at least partially of finished products from those same inputs. For countries that do not have significant industrial production, the lack of consumer demand limits the potential for inbound air cargo to balance the outbound loads. International carriers attempt to mitigate the negative effects of directional imbalances by scheduling multiple stops to build volumes, rather than applying a strict round-trip routing. Because LDC’s are often major producers of perishable cargo (particularly off-season fruits and vegetables), seasonality is an important factor in limiting year-round scheduled service. High shipping rates (costs) also result from a variety of additional operational risks. Other factors affecting demand for air transport include network factors, such as the role of airports as a domestic hub with linkages to local airports and as a gateway with linkages to international hub airports.

Table 1-3. Projected rates of growth by route 2005–2025 (%)

Domestic China	10.8
Intra-Asia	8.6
Asia-North America	7.1
Europe-Asia	6.9
Europe-Southwest Asia	6.2
World	6.1
Latin America - N. America	5.6
Latin America - Europe	5.6
Europe-North America	5.4
Europe - Africa	5.3
Intra-Europe	5.0
Europe-Middle East	4.3
North America	3.8

Source: Boeing World Air Cargo Forecasts

Figure 1-6. Airport cargo traffic



Source: Airports Council International

Asia continues to be the dominant market for air cargo in the developing world, as shown in Figure 1-7. Most of this is concentrated in East Asia (Figure 1-8) where the major exporters are located. The principal growth has been in shipments of intermediate goods to China and manufactured goods from China. This has led to a shift from using external hubs to establishing hubs in Beijing and Shanghai. This was made possible by the U.S./China Bilateral Agreement in July 2004 which allowed U.S. carriers to establish cargo hubs in China with no limitations on the 3rd, 4th, 5th and 7th freedom

rights, as well as more freedom to enter marketing and change of gauge¹³ agreements with domestic carriers.

A significant portion of the air traffic is intra-Asian trade primarily of manufactured goods and intermediate products (Table 1-4). This is driven by the dispersion of production processes complemented by trade in intermediate goods on a just-in-time basis. Capital equipment and intermediate materials represent about 1/3 of airfreight within the region. China accounts for about half of the regional trade.

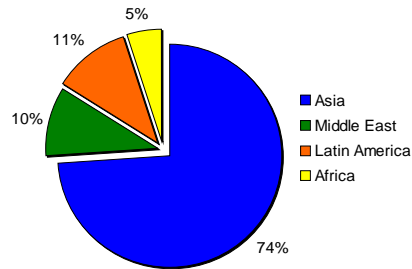
In Southeast Asia, the growth in air cargo in recent years has been slow but steady, reflecting the growth in economic activity. Singapore has managed to maintain a sizeable market share through efforts to maintain Changi as the regional hub supplemented with the development of a cargo village. Thailand’s air cargo volumes are expected to experience faster growth with the opening of Suvarnabhumi airport, which will strengthen the role of Bangkok as an air hub, and encourage Thai International to establish an air freighter operation.¹⁴

South Asia has been slow to develop air cargo in part due to slower economic development and limited transport infrastructure. Recent acceleration in exports combined with an effort to modernize the airport sector will create new opportunities for air cargo. However, so far, the only segment that provides efficient and reliable service is air courier services, which has been growing rapidly. Despite these efforts, the countries in South Asia continue to be served from the regional hubs in the United Arab Emirates and Southeast Asia.

The largest quantity of intercontinental shipments is between Europe and Asia. Westbound flows accounted for about 1/6 of total intercontinental flows. About half of these are apparel, computers and capital equipment. For eastbound shipments

Figure 1-7. Distribution of cargo in developing regions

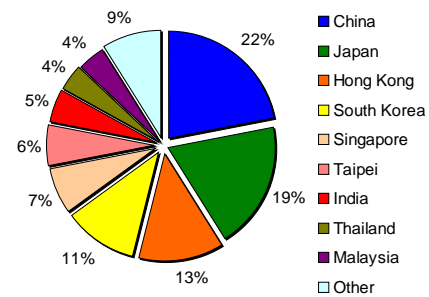
Tons loaded+unloaded at major airport



Source: Airports Council International

Figure 1-8. Distribution of cargo in Asia

Tons loaded+unloaded at major airport



Source: Airports Council International

Table 1-4. Commodities: Intra-Asian air cargo (%)

From To	Intra Asia
Capital Equipment	17
Transport Equip.	15
Refrigerated Foods	10
Computers	18
Apparel, Textiles	8
Other	32

Source: Merge Global

¹³ Change-of-Gauge refers to an air transportation service operated under a single flight number but involving a change of aircraft en route.

¹⁴ An earlier decision to do so has been delayed due to difficult conditions in the airfreight business

about half are capital equipment and intermediate materials, but there is also a growing trade in high-value consumer products, especially cosmetics and leather products,

The second largest volume of intercontinental air shipments is between Asia and North America. The exports to North America have a similar composition and this trade is expected to continue experiencing strong growth. The shipments from North America are much smaller. About half of this is intermediate materials and capital equipment used in the production of goods for export to the United States.

For Latin America, the major air cargo trade is with North America. Most southbound shipments are intermediate goods and spare parts for manufacturing activities, predominantly in Brazil and Mexico. The final products are then re-exported to North America. There are also shipments of electronics, optical equipment, medical devices, aerospace equipment and pharmaceuticals from the United States. Northbound shipments from South and Central America and the Caribbean consist of fresh food and horticultural products, followed by apparel and capital equipment. The first two account for about 61 percent of the traffic (Table 1-5) but growth has slowed due to stagnant demand for cut flowers. There are also shipments of manufactured products including apparel, footwear, transportation equipment, and electronics. Brazil and Colombia are the major sources of air cargo with the former exporting footwear and other manufactures and the latter primarily cut flowers. The northbound traffic has been growing at twice the rate of the southbound cargo and is expected to continue doing so.

Latin American trade with Europe has expanded with increased westbound shipments of intermediate materials, capital equipment and transportation equipment to support manufacturing in the major markets (Brazil and Mexico) financed through European investments. About half the eastbound air cargo are food products. The eastbound trade also includes manufactured goods but most of this production is sent to North America and other Latin American countries.

Three countries, Brazil, Colombia and Mexico account for almost $\frac{3}{4}$ of the air cargo handled in Latin America (Figure 1-9). Brazil, the biggest exporter, has seven of Latin America's top twenty airports. The others have only a single national airport in the top twenty. Despite the quantity of cargo, neither Varig, Brazil's national carrier, or TAMPA, Colombia's all-cargo carrier, have been profitable. On the other hand, LanChile operating out of its hub in Santiago is one of Latin America's best-run carriers.

Table 1-5. Commodities: Latin American air cargo (%)

From To	NA LA	LA NA	EU LA	LA EU
Capital Equipment	53	7	25	9
Intermediate Goods	8		27	11
Transport Equipment	7	4	13	8
Refrigerated Goods		53		41
Primary Foods		8		8
Computers	9			
Teleph, Tech Prod.	4			
Apparel, Textiles		9		
Consumer Goods			8	
Other	19	19	27	23

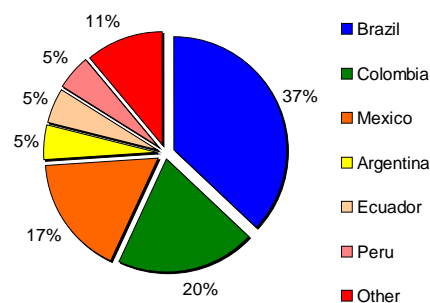
Note: NA (North America), LA (Latin America), EU (European Union)

Source: Merge Global

The final products are then re-exported

Figure 1-9. Distribution of cargo in Latin America

Tons loaded+unloaded at major airport



Source: Airports Council International

Growth of air cargo in Mexico’s airports has been constrained by competition from road transport serving the United States and federal regulations that encouraged concentration of shipments in Mexico City airport. In Central America, Panama and Costa Rica have the largest air cargo volumes. The former acts as a regional hub for DHL, while the latter exports perishables.

Europe is the primary destination for African air cargo accounting for about 2/3 of the total. The African exports are counter-seasonal cut flowers and other perishables to Europe, but with relatively little return cargo. More than half of the shipments are cut flowers and other refrigerated goods (Table 1-6). Netherlands is a major recipient and Kenya a major exporter of cut flowers. Manufactured goods are shipped primarily from South Africa, which accounts for almost 1/3 of the northbound air cargo. The southbound trade, which has been the fastest growing, is primarily capital equipment, intermediate products and transport equipment. Together, these account for over half the shipments (Table 1-6).

The air cargo is less concentrated than in Latin America. Three countries, Kenya, South Africa, and Egypt handle about half the air cargo (Figure 1-10). Africa has only three airports with significant cargo operations, Johannesburg, Nairobi and Lagos.¹⁵ Johannesburg benefits from a strong local economy and a distance that makes air transport compulsory for most perishables exports to Europe. Nairobi has a relatively strong domestic demand for imports shipped by air as well as exports of cut flowers. It has leveraged this scale to become one of Africa’s gateways. Nigeria benefits from the demand associated with its oil industry and other natural resources as well as relatively higher consumer demand. Cargo carriers have demonstrated an interest in serving this market despite problems with infrastructure and corruption. Other countries with significant potential for agricultural exports by air, for example Uganda and Ghana, have difficulties with landside access and transport services, especially cold chains.

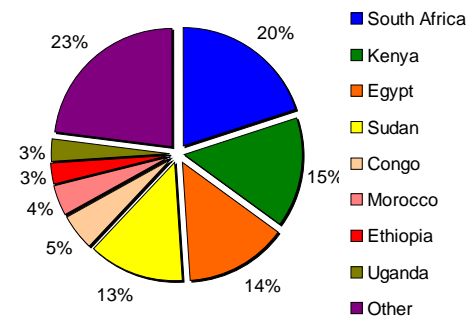
South African Airways (SAA), Kenya Airways and Ethiopian Airways provide high quality air cargo services, often in collaboration with major international operators. However, most of the international gateways continue to rely on the traditional European carriers that operated during the colonial period.

Table 1-6. Commodities: African air cargo (%)

From	EU	Africa
To	Africa	EU
Capital Equipment	22	11
Intermediate Goods	21	7
Transport Equip.	13	
Refrigerated Goods		50
Primary Foods		6
Computers	7	
Consumer Goods	6	
Other	31	26

Source: Merge Global

Figure 1-10. Distribution of cargo in Africa
Tons loaded+unloaded at major airport



Source: Airports Council International

¹⁵ A fourth, Khartoum in the Sudan, had well in excess of 100,000 metric tons of air cargo but much of this is attributable to relief supplies flown under contract by commercial carriers and charter operators.

Europe accounts for more than half of the air shipments to the Middle East. The principal destinations are United Arab Emirates and Israel. Over half of the air cargo imports are capital equipment and intermediate materials for manufacturing, in particular equipment and spare parts for the petroleum industry, and transport equipment (Table 1-7). Other Middle East countries are increasing their imports as part of efforts to diversify their economies and improve their infrastructure. Westbound shipments to Europe include perishables, capital equipment and intermediate materials originating primarily in Israel. The amount shipped by other countries in the region is small but expected to experience significant growth as a result of diversification efforts.

Over half the air cargo handled in the Middle East moves through the United Arab Emirates reflecting its expanding demand for industrial products and consumer goods as well as its growing role as a transshipment hub for the region. Saudi Arabia, Bahrain and Israel together handle about a third of the air cargo (Figure 1-11). Bahrain acts as a transshipment hub primarily for DHL. Saudi Arabia has a large amount of imported goods for its petroleum industry and for domestic consumption. Israel is primarily an exporter of high value goods and perishables but also imports intermediate goods.

The largest airport is Dubai, which is among the top 20 cargo airports in the world. Its capacity is now being expanded through development of the Jebel Ali airport.

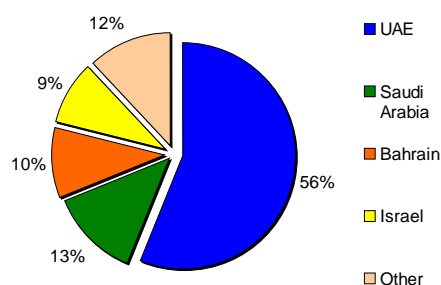
Table 1-7. Commodities: Middle East air cargo (%)

From	EU	Middle East
To	Middle East	EU
Capital Equipment	26	13
Intermediate Goods	23	14
Transport Equip.	6	
Refrigerated Foods		22
Primary Foods	7	
Consumer Goods	5	10
Other	33	41

Source: Merge Global

Figure 1-11. Distribution of cargo in Middle East

Tons loaded+unloaded at major airport



Source: Airports Council International