INTRODUCTION: ROLE OF AIR CARGO IN LANDLOCKED COUNTRIES

Potential market

The demand for airfreight is limited by cost which is typically 4–5 times that of road transport and 12–16 times that of sea transport. The commodities shipped by air are those that have high value per unit density and/or are very time-sensitive. The latter include documents, production samples, perishable agricultural and seafood products, electronic consumer goods, pharmaceuticals and fashion garments. They also include emergency shipments of spare parts and some inputs to meet just-in-time production.

Landlocked developing countries have had limited demand for airfreight exports because the majority of the enterprises are SMEs which produce relatively small volume shipments of low value goods. Since airfreight rates range from $1.50-$4.50 per kilogram, the value of air cargo typically exceeds $4.00 per kilogram. The principal exports shipped by air from developing countries are cut flowers, fresh fruits and vegetables, and electronic parts. Imports shipped by air include a range of high value consumer goods. However, without a significant outbound flow, the inbound airfreight rates are higher, thus reducing the types of goods transported by air.

Airfreight can be used to obtain competitive advantage. For example, producers will agree to shorter order times assuming that those shipments that experience a delay in production or cargo clearance can be shipped by air. Similarly, manufacturers of garments, electronics and other goods will compete for larger orders by shipping the large initial order using ocean freight and then using airfreight to replenish inventories if demand is greater than expected.

Airfreight can also be used as part of a strategy for diversification. Manufacturers use airfreight to introduce products with shorter shelf life or to serve more distant markets with the same shelf life. Airfreight can also be used when diversifying into new markets to provide reliable delivery of smaller volumes. Once the market has been established and volumes increase, the manufacturer can reconstruct supply chains based on less costly transport. Manufacturers moving up the value chain in terms of product quality will use airfreight to reduce the order cycle especially for smaller, customized orders. These strategies are of particular importance for landlocked countries that have unreliable land transport options or lengthy and uncertain clearance procedures at their borders and foreign gateways. Where exports require cold chains, airfreight can present the only viable means for guaranteeing continuity.

2 Airfreight = $3.50 per kg for 15,000 kilometers, Road = $0.80 per kilometer for 15 tons, Sea = $3,500 for 15 tons for 15,000 kilometers.

3 Most fish are shipped frozen and therefore transported by sea, but shellfish and fresh fish move by air.

4 These are sometimes shipped by air but since most exports have relatively long shelf lives, they do not require rapid shipment.
Airfreight plays a critical role in the shipment of product samples. While this does not represent a major source of air cargo, it is critical for manufacturers who export manufacturing products. The exchange of trade documents is increasingly done electronically, but there is still a need to send patterns, designs, and technical drawings by air to smaller enterprises that lack the ability to reproduce these from electronic files. More importantly, there is a need to exchange various types of samples between manufacturers and potential buyers. In the case of contract manufacturing, this includes the initial prototype sent for the buyer’s approval so that the order can go ahead followed by a head of production run, which must be approved prior to starting full production. Samples may also be provided for testing and/or promotion campaigns. Finally, samples shipped when there are changes in design for follow-on orders. Since each of these samples represents a sequential step in the order cycle, it is important that they be handled quickly to minimize the time required to complete the order.

**Types of service**

Most landlocked developing countries have relatively limited air transport services because of their size and level of economic activity. The domestic air network is usually a hub and spoke arrangement with the airport nearest the capital city acting as both the domestic hub and the international gateway. On the trunk routes, passenger aircraft are primarily narrow bodied with limited cargo capacity. On other domestic routes, smaller aircraft with little or no cargo capacity are used. For international traffic, the national carriers serve relatively few international routes. Cargo is carried on passenger aircraft but these are frequently wide-body. National airlines also offer interline arrangements with international carriers, but the destinations are still limited, often overlapping routes already served by the national carriers. There is very little use of airfreighters other than occasional charters. However, in some of the larger developing countries air courier services have been introduced using cargo aircraft. The international air cargo shipped on passenger aircraft often goes to the nearest transshipment hub where it is transferred to the hold of another passenger aircraft or to a scheduled airfreighter.

As the volume of airfreight grows, there is a natural progression from passenger aircraft to chartered cargo planes of increasing size, and finally to scheduled cargo services. The principal difficulty with using passenger aircraft is the availability of capacity since priority is given to passengers and their baggage. For narrow-body aircraft with a high load factor, the available capacity will typically be less than two tons. Although load factor may vary from flight to flight, shippers usually have a fixed shipment schedule that is planned based on the minimum available. In developing countries tourism often generates substantial freight capacity, but this capacity is available only during the tourist season.5

The use of chartered aircraft provides the shipper with more reliable capacity, but the freight rates are higher, especially for smaller cargo aircraft or where it is not possible to maintain a high load factor in both directions (using either a round-trip or triangular route). Capacity may also be a problem during peak seasons when all exporters compete for the available fleet. Most international scheduled air cargo services operate on east-west routes and serve airports that are major generators of air cargo. They avoid airports that already have a significant amount of wide-body passenger aircraft traffic. They maintain high load factors throughout the year by using a mix of aircraft sizes and reallocating their fleet to different sectors periodically to maintain high load factors.

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5 For countries with year-round tourism, such as Kenya, this is not a problem.
In order to meet the demands of shippers exporting small volumes or cargoes of median value, a number of hybrid services have been developed. The first relies on consolidators, who combine shipments in order to generate sufficient volume to obtain reasonable freight rates. The consolidated shipments are then flown to the nearest major transshipment hub where they are re-consolidated for their final destinations.

The second involves freight forwarders who arrange for road transport from the cargo origin to the nearest hub airport. This involves a one-day, or at most two-day, trip and includes a border crossing if the hub airport is in a neighboring country. This type of road-air services is increasingly being provided as part of an airline RFS service (road freight service) in which the goods are transported by truck under the airway master bill.

The third involves a combination of air and sea freight. An air-sea combination can be used where there are convenient flights to a hub airport that has a major seaport nearby, for example Singapore or Dubai. Exports move from the point of production to the gateway port using air transport. This arrangement is used when exports have missed their shipment date and need to be loaded on a specific cargo vessel or when land transport to the gateway port in another country is costly, unreliable, or involves a difficult border crossing. The sea-air combination is used for cargo that requires a delivery time that is less than the ocean transit time but more than the transit time by air. The advantage is that it offers a lower freight rate than the air shipment rate. For landlocked countries, this intermodal movement would be combined with an initial movement by road.

**Cargo airports**

There are few airports that only handle cargo, or for which a majority of their traffic is cargo. These are primarily hubs for integrators such as FedEx and DHL. All but a few of the major hubs were originally built for passenger traffic and continue to handle significant passenger volumes. The few pure cargo airports are mostly converted commercial or military airports.

The principal cargo-handling activities taking place on the airport are receiving and delivery of cargo by the airlines, building cargo palettes, X-ray scanning of outbound cargo, clearing import and export cargoes, and loading and unloading of aircraft. Consolidation and short-term storage of cargo is generally performed on-airport by the airlines or cargo-handling agents or off-airport by forwarders. Recently, there has been an effort to consolidate these activities on the airport through the development of larger cargo terminals or cargo villages with multiple warehouses.

Airlines select an airport for major cargo operations based on the potential traffic. Little consideration is given to the physical characteristics of the airport other than length of the runway and approach control. The landside facilities are less important because they can be adapted to meet the traffic. Most landlocked developing countries have gateway airports that are relatively simple in configuration with small warehouses. Options for improving the cargo facilities are often limited by the amount of space available on the airport. However, as passenger traffic increases, many of these airports are moved to new, larger sites allowing for development of modern cargo facilities. Even if they remain in the same location, it is possible to introduce new, multi-storey facilities with open cargo handling areas on the ground floor and office space for officials, airlines and forwarders, as well as storage for equipment on the other floors.

Since the advantage of using airfreight is much shorter transit times, it is important that cargo moves quickly through an airport. The time required for cargo operations depends on four factors, customs clearance procedures, cargo inspection procedures, the efficiency of cargo handlers and the layout of
storage facilities. For imports, the customs procedures are critical. The clearance requires both the airway master bill, which is sent at the time the flight departs, and the customs declaration, which is filed by the brokers after the cargo had been shipped. In some countries, the customs authority at the airport uses the same procedures and systems as at other international gateways with the results that inbound cargo can take up to day to be cleared. In others, the procedures are adapted to the requirements of air cargo with all transactions being conducted electronically and cargo cleared within one or two hours on a 24/7 basis. This allows for cargo to be cleared within a few hours of the aircrafts arrival.

For exports, the documents are filed at the time cargo arrives at the airport, and the inspection is done at the same time so that cargo can be loaded within a few hours of arrival. Prior to the introduction of X-ray scanners, a 24-hour cooling period added a day to the transit time, but this has been eliminated. However, most of the scanners are for baggage and small packages requiring that the cargo be unloaded from the truck in loose form and scanned before being built into palettes. At the larger airports with significant cargo traffic, full palette scanners are being introduced which allow shippers to build their palettes off-airport and to load them on the aircraft within a few hours.

The selection of the cargo handlers at the airport is important not only to ensure efficient and secure handling of the cargo but also to allow the airlines to compete with one another. Where cargo volumes are relatively small, an exclusive contract is used and the contractor must provide appropriate equipment for unloading the different types of aircraft. In many developing countries, the national carrier is given this monopoly. This creates a problem where the carrier is an inefficient state enterprise. It also introduces opportunities for discriminatory behavior in the handling of competitors’ cargo. In other airports, a private contractor is granted this monopoly but with performance regulated through productivity incentives. Since the possibility for discriminatory behavior remains, it is important to introduce competition as soon as there is sufficient cargo or alternatively allow the carriers to handle their own cargo if they wish to.

The storage facilities at smaller and older airports are often relatively primitive. This has minimal impact on cargo storage since most cargo does not stay in the airport. The exports are usually time-sensitive and the imports are high value, fast moving goods. The facilities do affect the handling of the cargo. Modern warehouses have loading docks to speed truck turn-around and minimize vertical movements of cargo. There are also separate facilities for exports and imports. The former have large areas for scanning, inspection, building palettes and gathering the cargo for specific flights. The latter have offices and inspection areas to facilitate customs clearance procedures and to allow for segregation of cargo into truckloads. For perishable cargos, these warehouses have temperature-controlled rooms for maintaining the cold chain between the truck and the aircraft. These warehouses also provide some bonded storage for high value cargo. Where there is sufficient traffic and space, the airlines or larger forwarders will be willing to invest in these facilities. Where there is a lack of space or each airline handles a relatively small amount of freight, it is the airport that has to invest in a multi-user facility. In both cases, the airport must finance the construction of the complementary taxiways and the aircraft parking area.

Where these four elements; customs procedures, inspection equipment, cargo handling services, and warehousing, are integrated into an efficient operation, then most cargo will pass through the airport within a few hours. This not only minimizes dwell time but also substantially reduces the space required to handle a specific volume.
Cost considerations

The principal difficulty for landlocked and other developing countries is to generate sufficient traffic to attract airfreight services that are both frequent and offer competitive rates. The liberalization of the market by permitting free competition, "open skies", for air cargo services can be an important step but may not be sufficient if most cargo is transported as small shipments in passenger aircraft. Liberalization of passenger services to include fifth freedoms has been a greater challenge, especially in countries with a national carrier and limited passenger volumes. Another important liberalization is expanding the role of consolidators, especially the large integrators such as UPS, and the international forwarders specializing in air cargo such as Kelly Logistics, as well as local forwarders with international connections.

As a result of the dramatic increase in price, fuel now accounts for over half of the annual cost for operating an aircraft. The proportion is similar for cargo and passenger aircraft. 6 Because fuel consumption is roughly proportional to the aircraft weight and the distance flown, the marginal cost for carrying cargo is computed based on weight and destination. 7 In the case of belly cargo, the cargo space is offered on an "as available" basis since priority is given to passengers and their luggage. Therefore the rate is usually set based to marginal cost and then adjusted based on the level of service. For charter services, the rates are usually higher reflecting the cost for incremental distance flown including the empty legs as well as the balance between demand and available capacity.

For shorter distances, air freight rates per kilometer are higher basis because a greater portion of the trip is spent both on the ground and more of the time in the air is spent climbing and descending, which has a higher rate of fuel consumption. For this reason, it is often preferable to use road transport on the leg between the domestic source or destination and the transshipment hub. If the hub is in another country, this requires transport under a transit document with minimum time and cost for crossing at the border.

Marketing and supply chain considerations

As already suggested, airfreight can be incorporated into a general marketing strategy for greater product value, product diversification and access to new markets. This requires constructing multiple supply chains not only for different products but also for the same product shipped to different markets. It involves using airfreight in different combinations with road and sea transport. Since it is costly, airfreight must be used selectively. This implies not only a careful analysis of the value chains for various product-market combinations but also a continuing effort to improve supply chains and adjust the use of airfreight in order to increase the value of delivered goods. Kenya’s success in using airfreight to increase product value and maintain competitive advantage is a good example of such an effort.

The challenge in using airfreight effectively is to ensure that all components of the supply chain are performing efficiently. The airlines, especially the national airlines, can contribute to this effort. All cargo airlines are equipped to expedite cargo handling, but passenger airlines generally treat the

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6 Passenger aircraft are used more intensively, but their fixed costs for labor are much higher, so the proportion of fuel costs per revenue kilometer is similar.
7 Because most cargo is low density, the rate is sometimes computed in freight tons, that is based on weight or volume whichever is greater. One metric ton is equated with 6 cubic meters, alternatively one kilograms and 60 square centimeters.
cargo as an afterthought. For example, Colombia was able to develop its flower trade only after the national carrier recognized the importance of this cargo and improved its quality of service.

Airfreight is often used to compensate for delays elsewhere in the supply chain, in particular the supply of inputs. As these delays are eliminated through better management, there are opportunities to reduce costs by substituting ocean freight for airfreight. This has been the trend for exports of fresh fruits and vegetables. Precise schedule of the movement from farm to shelf have been complemented by techniques for extending shelf life to extend the range over which goods can be shipped by air while at the same time allowing air freight to be used to extend the market area for these goods.

**Future role of airfreight in landlocked countries**

At a time this report was prepared, the air cargo industry was entering a very difficult period due to a dramatic increase in fuel prices. In the short run, this is expected to result in slower growth or possible downturn in the air cargo traffic. Over the longer run, it is anticipated that traffic will continue to grow but airfreight will be integrated into multimodal supply chains that provide a better balance between cost and time. Airfreight will continue to be an essential mode of transport for extremely time-sensitive goods and for expansion into more distant markets as globalization continues. It will play a crucial role in developing exports for developing countries in general, and landlocked countries in particular. Perishables, especially fresh fruits and vegetables and chilled seafood, will continue to require shipments by air although an increasing proportion will use ocean freight as new sources are developed closer to the major markets. Airfreight will be used to open new markets by providing fast and reliable service for initial deliveries of products. It can also be used to ship the small volumes required during the initial market entry period. Airfreight will continue to support production activities, especially the exchange of samples and delivery of critical spare parts and high-value inputs. Airfreight will increase in importance in supporting reverse logistics, including repair and warranty work, for electronics and other high-end consumer goods.

The area in which the use of air cargo is expected to decline is its use as a mechanism for minimizing inventories and supporting just-in-time production. For these activities, the increasing cost of airport transport will offset the benefits from minimizing inventories in the supply chain. It is important for potential exporters to have access to airfreight services and to manage their supply chains to provide a competitive balance between cost, speed, and reliability of shipments.

In order to facilitate the use of air cargo, landlocked countries will need to improve operations at their airports and to liberalize access for foreign airlines. It is unlikely that scheduled air cargo operators will have significant operations in landlocked countries unless and until those countries become major suppliers. Instead, most air cargo will move by as belly cargo on passenger airlines, with some complementary use of chartered air freighters during periods of peak shipment. Therefore, it is necessary to provide greater access for foreign passenger airlines.

The following chapters discuss the international air cargo industry in greater detail; examining the current demand in Chapter 1, nature of air freight services in Chapter 2, cargo handling operations in Chapter 3, and cost elements in Chapter 4. Chapter 5 presents some case studies of air freight being used to develop export activities in developing countries.