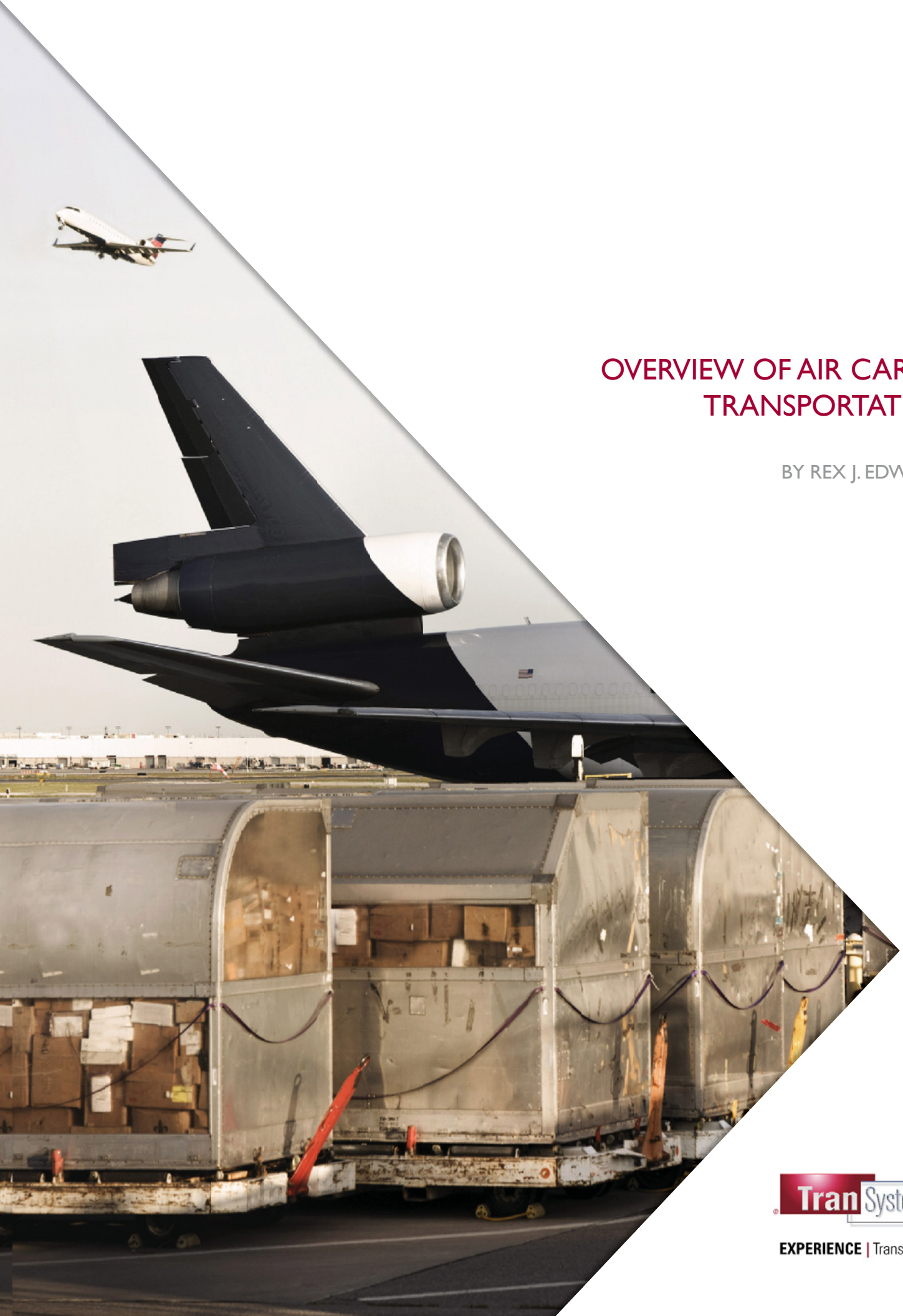

OVERVIEW OF AIR CARGO TRANSPORTATION

BY REX J. EDWARDS

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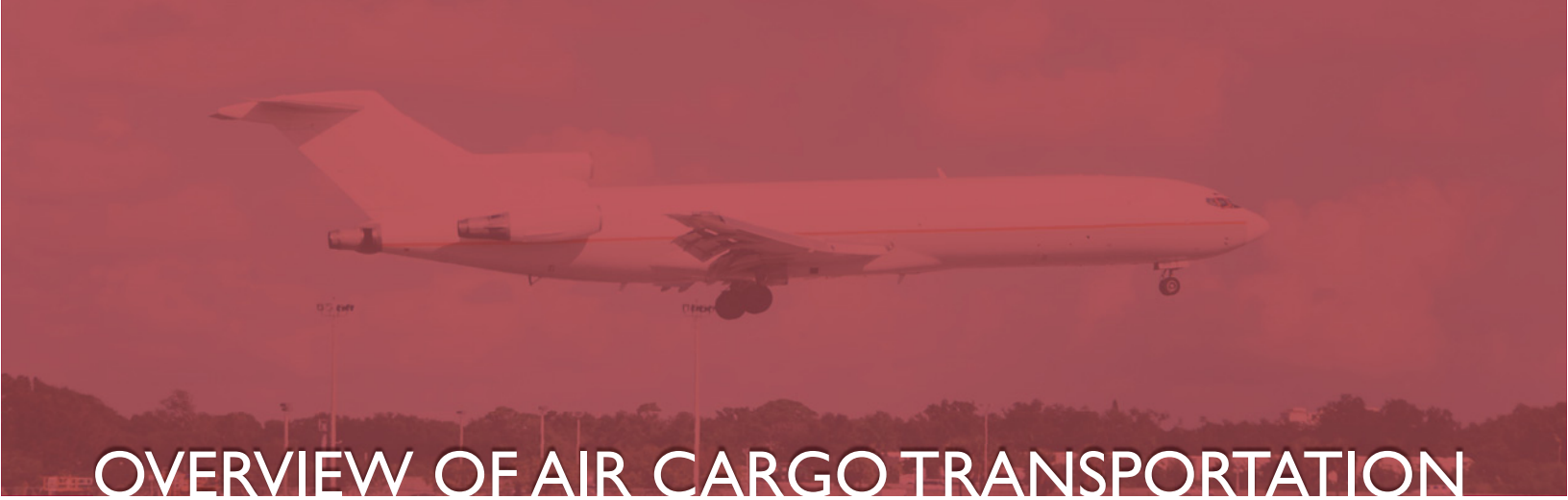


OVERVIEW OF AIR CARGO TRANSPORTATION

MARKET BACKGROUND

AIR CARGO BACKGROUND

The transportation of freight and mail by air represents a vital element of regional trade and distribution networks. In recent years, increased demand for fast and time-definite transportation by manufacturers, merchants and consumers has combined with the development of advanced air services to greatly increase the importance of air transport. Air transport is the fastest, most reliable option for shipping commodities between markets, although typically at a higher cost relative to surface transportation (ocean, rail and truck). Accordingly, air cargo shipments are relatively small, light, and of high value. Examples of the types of goods that tend to travel by air include pharmaceuticals, electronics, auto parts, fashions, and high-value perishables. While relatively insignificant in terms of weight volumes, air transport is responsible for more than 40% of the world's trade value. Despite the effects of recession and terrorist attacks, world air cargo traffic averaged 6% annual growth from 1993 to 2003, and both Boeing and Airbus project similar growth over the next twenty years at about 1% more per year than air passenger traffic.

For the most part, air cargo moves on a multi-modal door-to-door basis involving a combination of air transport, ground transport and transfer/handling activities. Air carriers provide the air transport segment of air shipments, and may also provide ground handling or pickup/delivery services. Air carriers are primarily categorized as either "direct airport-to-airport" carriers who are mostly responsible for the air portion of the trip, or "integrated" carriers who maintain single entity responsibility for shipments on a door-to-door basis (including most if not all of the functions of the cargo service providers listed below). Unlike other modes, passenger services account for a significant amount of cargo capacity, particularly for mail and international traffic. While handling cargo, these services are geared towards passenger markets.

Other key participants in the air cargo service market include:

- **airports** provide facilities and support services to air carriers and air cargo shippers, both at origin/destination points and intermediate hub or gateway transfer points.

In 2003, the Boeing Company estimated that mail traffic accounted for 4% of world airline cargo traffic with freight accounting for 96%. Express services accounted for 11% of international traffic in 2003,

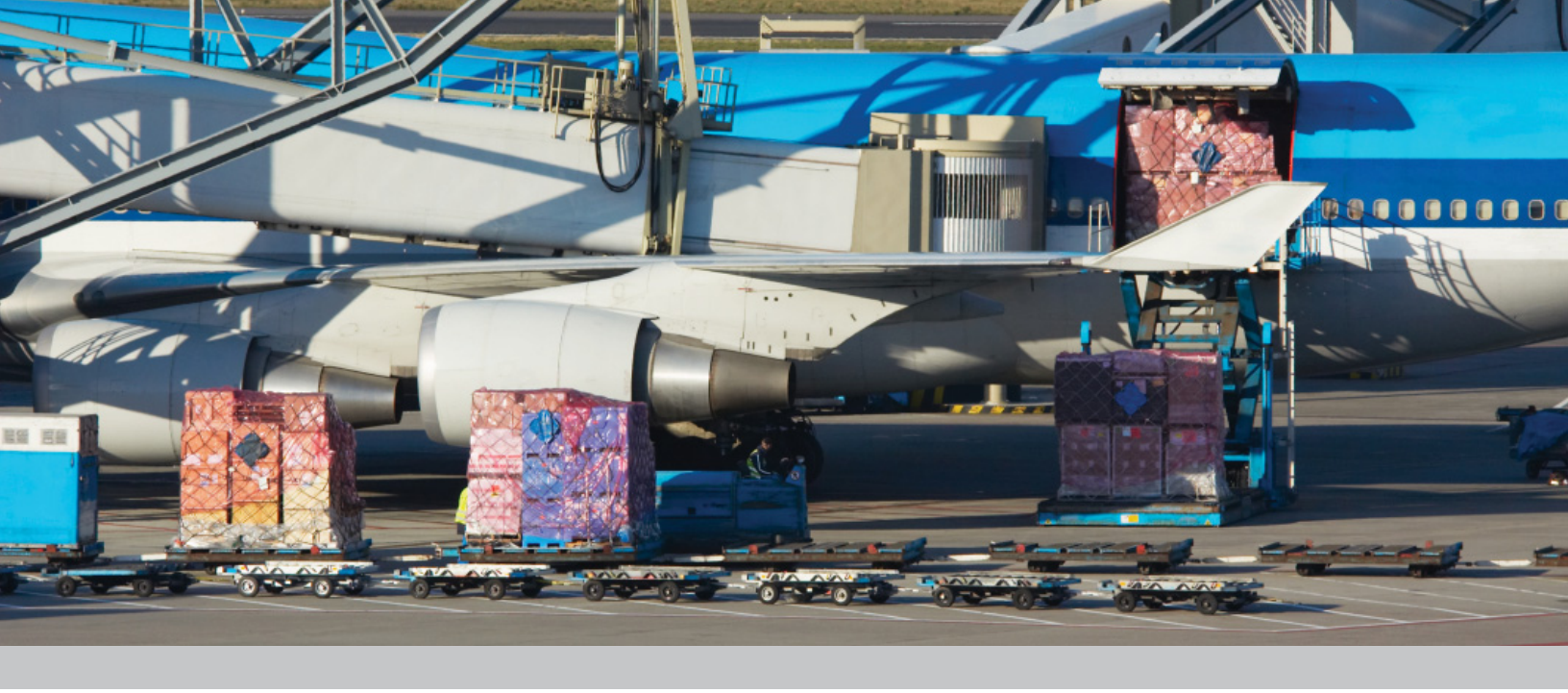
- **freight forwarders and customs brokers** provide ground and other handling services that connect shipments to airport-to-airport services as an agent for the shipper or consignee.
- **trucking firms** transfer shipments to/from both the origin and destination airports, often combining a local pickup or delivery with a linehaul transfer between a gateway and local airport.
- **specialized services** may be provided independently of forwarders/brokers and integrated carriers including warehousing and airport ground handlers. An increasingly important type of service provider is the third-party logistics (3PL) or distribution firm that may provide little or no direct transportation, but rather acts as the shippers' or consignees' agent in handling overall distribution systems.

The air cargo service ("supply") sector is designed to accommodate the need for fast and reliable transportation by shippers and consignees ranging from delivery of an online gift purchase to a household, to the transport of donor organs to hospitals, and to managed distribution of manufacturing components and finished product between suppliers, factories and retail outlets.

The use of air services is determined by a shipper or consignee in consideration of trade-offs between service and price relative to the type of shipment. Air cargo demand markets are characterized by:

- **origin/destination** – most air shipments do not originate or terminate at an airport, but are determined by industrial and demographic location patterns. The origin and destination of a shipment determine the range and cost of routing and service options available.
- **commodity** – commodity type affects both the desirability of, and requirements for, air shipment. Key characteristics include size, perishability, value, weight, and physical dimensions.
- **desired transit time** – for the most part, the level of air cargo service desired is determined by the shipment's physical characteristics, although other conditions may dictate use of air services (e.g., emergency need for a low-value part).
- **shipment size** – for the most part, air shipments are small and typically must be consolidated into pallets or containers for handling to and from the aircraft. Larger sized shipments may require special handling or aircraft types, but they can also move at a lower cost.
- **shipment volume** – while air cargo services are available in some form for almost all conceivable origin-destinations, the volume of traffic for a particular origin or destination dictates the variety and scope of services available.

While there are thousands of distinct commodities that move in trade markets, air cargo traffic can be categorized as follows:



- **Mail** – shipments collected and distributed through national postal systems and shipped to foreign points via airline contracts including intra-government mail (e.g. diplomatic pouches, military mail).
- **Express Freight** – air shipment of envelopes and small packages via the express services of integrated carriers.
- **General Freight** – air shipment of mostly larger commodities and packages using more traditional airport-to-airport services (including those provided by integrated carriers). This is also known as "heavy freight."

In 2003, the Boeing Company estimated that mail traffic accounted for 4% of world airline cargo traffic (measured in revenue tonne-kilometres for domestic and international markets combined) with freight accounting for 96%. Express services accounted for 11% of international traffic in 2003, up from 4.1% in 1992, indicating the continued expansion of the integrated carriers' world networks. In contrast, US express carriers account for 60% of the US domestic market.

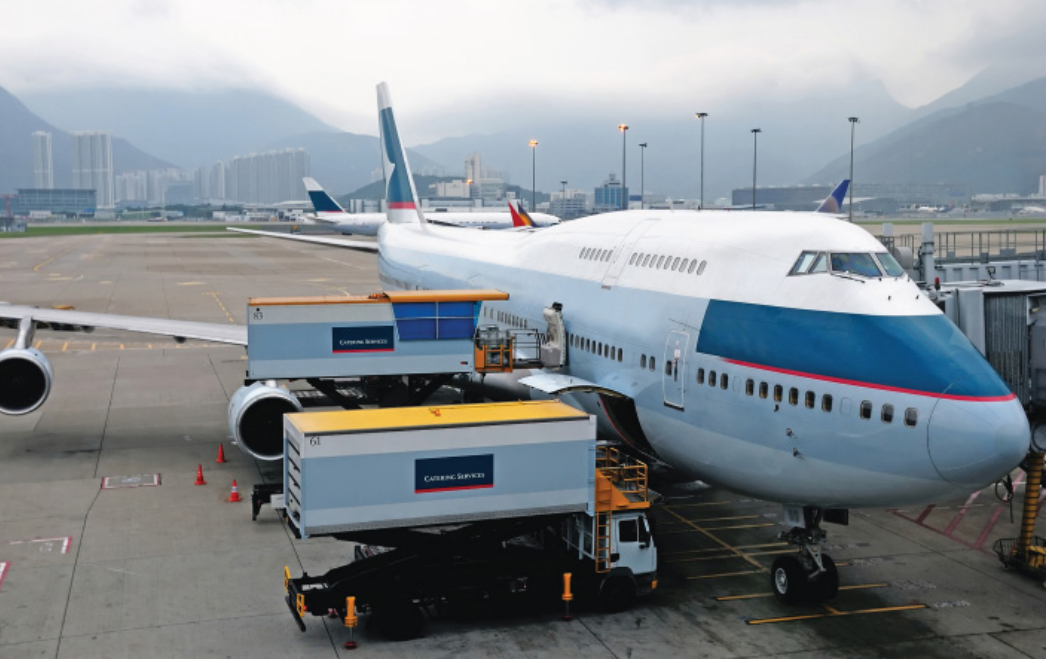
The dominance of the integrated carriers in the U.S. domestic market results in a significant distinction between the domestic and international service sectors. The integrated carriers provide direct air service between their hubs and most U.S. airports, based on the need to meet overnight express schedules. The remaining domestic traffic moves on passenger flights (as determined by passenger flow patterns) and all-cargo flights on high volume cargo routes. While the integrated carriers collect and distribute international traffic via their U.S. and worldwide networks, international air traffic is more highly dependent on both widebody passenger and freighter flights with the latter geared towards connecting hub networks in the U.S., Asia, Europe and other world regions. The result is that most domestic air cargo is handled via local airports, while international traffic tends to gravitate to major gateways with some increasing diversion to emerging secondary gateways.

The interaction between air cargo demand and supply patterns results in the flow of air commodities via various routings, service types and carriers. Traffic patterns reflect the underlying demand for shipping between various geographic regions, the type of commodities involved, and the way individual providers tailor their services to meet demand.

REGIONAL MARKETS

Regional economies are highly dependent on air cargo to support industrial and consumer activity. Local manufacturers ship in supplies, components and emergency parts, while shipping out finished products to domestic and international markets. Wholesale, retail and distribution firms use air services to provide the most efficient delivery to their customers, while consumers increasingly use direct air shipment to shop worldwide for products once limited to local store inventories.

The local air cargo infrastructure is critical to attracting and retaining high tech and similar industrial activity that is increasingly dependent on air transport to compete in speed-dependent manufacturing and distribution markets.



A region's airports are critical connectors to worldwide air distribution networks and their efficiency and capabilities are essential to attracting and maintaining economic development.

The service market (or "hinterland") for an air cargo airport can extend 500 miles and even further for the top international gateways (e.g., LAX) that have a high share of available cargo flights to overseas points. Except for the major gateways and integrated hub airports, the typical regional airport serves a local metropolitan market and regional market defined by the location, size and capabilities of competing gateways. Optimally, an air shipper would prefer to directly deliver an outbound shipment to the airplane and have the consignee pick it up at the flight's destination airport. In reality, most air shipments require some ground transport and some transfer at an intermediate hub or gateway airport. Shippers seek to minimize ground linkages, but any cost and time savings using a local airport must be compared to cost and service advantages at the major gateways, particularly the breadth of direct air services typically not available at a "secondary" gateway.

The integrated carriers dominate the handling of domestic air cargo shipments and therefore the catchment area served by an airport is determined by local delivery zones for these carriers. For almost every zip-code in the U.S., each of the integrated carriers have standard routing patterns for overnight traffic included a designated airport for transfer to and from hub flights. The size and scope for any particular airport's catchment area is primarily based on the location of other service airports relative to drive times during rush hour periods with adjustments based on shipment volumes and the optimization of truck usage (e.g., traffic may be routed to a more distant service airport to better use pickup/delivery trucks).

U.S. international air trade is dominated by a few large gateway airports that draw cargo from large regional markets via both truck and air connecting services. The primary gateways are dominant within regions defined by the location of the other primary gateways (extending up to one day's truck drive away or about 500 miles), but also attracts cargo from regions dominated by other gateways based on its coastal orientation. Smaller gateways with limited international cargo service that are located within a primary gateway's dominant area will still attract cargo from up to 500 miles but will draw most of its traffic from a more constrained "primary" area as defined by same day pickup/delivery time by truck (typically 50 to 100 miles from the airport, depending on the location of other gateways). A secondary region is further defined as the area within the larger catchment area where the local airport would be the closest international gateway.

A market hinterland can be broken into the following three sub-regions. The Primary market region represents the area where an airport is the most easily accessed airport using local pickup and delivery trucks (within 50-75 miles). The Secondary market area is a region within which an airport can compete with the primary international gateways for some traffic based on the ability to offer same day pickup and delivery for cargoes. The Tertiary market area is within a reasonable truck haul of an airport, but the particular services would have to have a superior advantage in price or service to divert traffic from closer airports or dominant gateways. While not measured in the statistics, market hinterlands can extend across the Canadian and Mexican borders, particularly for a specialized service or a shipper with a large regional distribution area.

AIR CARGO INFRASTRUCTURE

The physical elements of an air cargo system support the transport and handling activities of door-to-door "air" cargo shipments. A typical inbound shipment involves the following elements to reach final origin/destination:

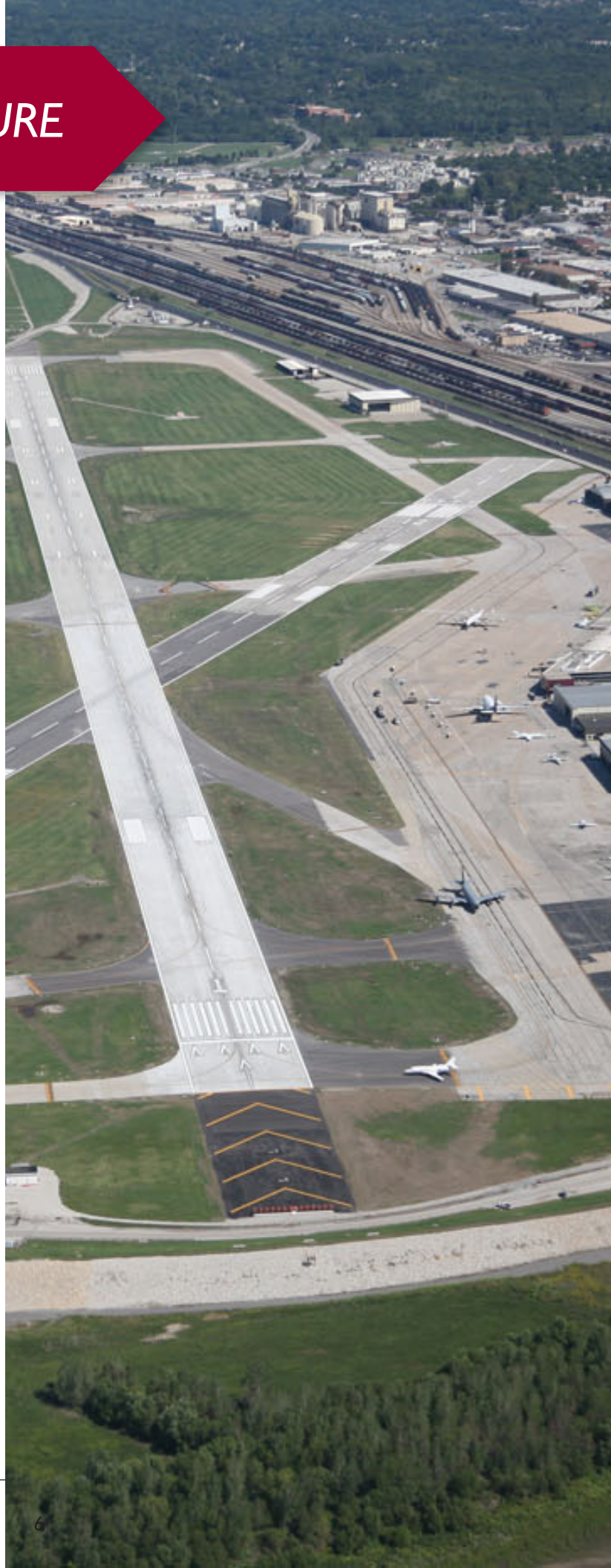
AIRSPACE AND AIRFIELD

An airport's ability to handle cargo-carrying flight activity under varying weather and congestion conditions is determined by airfield and airspace capacity and efficiency. Runway length and number determine both the number of flights and types of aircraft that can be handled with the availability of more than one primary runway a key advantage in averting major delays due to shutdowns. Associated taxiways and the layout and location of cargo facilities and parking areas also affect capacity. An airport flight handling capacity is also affected by the efficiency and capacity of the local air traffic control system inclusive of local airspace. Airports are also obviously affected by regional, national and international airspace issues. Airspace and airfield capacity is shared between passenger and cargo activity for most airports.

AIRCRAFT HANDLING AND CARGO TRANSFER EQUIPMENT

Air cargo is handled to and from the aircraft using loading equipment that transfers pallets, containers, and even loose shipments to ground transfer equipment. Passenger aircraft are typically handled directly at the passenger transfer point which may require a longer on-airport transfer to reach the cargo area. Freighter aircraft are parked close to the cargo terminals in the designated cargo area. The handling of non-integrated aircraft is typically conducted by a third party operator, particularly in smaller airports where an airline may have just a few cargo flights per day.

Smaller freighter and passenger aircraft don't require any specialized equipment, while large freighters generally use a special loading device (e.g., front loaders). The relatively low usage of special loading devices at small gateways often is a competitive disadvantage relative to the major gateways.



ON-AIRPORT AND OFF-AIRPORT CARGO TERMINALS

Most air cargo shipments move in a palletized or containerized form, but the small average shipment requires "building" and "breaking down" unit load devices for transfer to and from the aircraft. These types of activities are typically conducted in airport terminals, although large forwarders and some integrated carriers use off-airport sites.

In addition to cargo handling facilities, airports also have facilities where Customs and other inspection activities can be conducted.

Most of the forwarders and custom brokers have off-airport sites where final distribution (or initial acceptance) of shipments are conducted, often in concert with ocean and truck traffic. Because most of these operators handled multiple modes, these facilities may be located some distance from the airport at a centralized location. Most of the large air forwarders are located in local office parks where rental costs are less than on-airport facilities.

AIRPORT ACCESS

As noted above, most air cargo is transferred by truck between airport and off-airport facilities. Most of the general air traffic uses smaller trucks that shuttle traffic back and forth to the airport prior to flight departure or after flight arrival. Integrated carriers that sort local traffic on-airport may operate larger equipment, while off-airport sorts may transfer cargo using tugs. Airports that attract cargo from a large hinterland may also have direct airport-to-airport long distance

trucks. Large shippers may operate their own equipment or use regional or local trucking firms.

In any case, the ability to efficiently transfer cargo between the airport and either local or long-distance points is essential to the overall efficiency of air cargo services. At the high rates charged for air cargo (relative to other modes), shippers expect the fastest and most reliable transit times possible, and any advantage of a direct flight can easily be dissipated by ground delays having nothing to do with the airport.

The critical elements of the ground access system are:

- **Airport Gate** – Being a secure area, all ground equipment transferring air cargo must use a airport gate.
- **Local Roads** – While air cargo may travel long distances by road, most general air cargo (i.e., non-integrated) involves a short-haul transfer between the airport and a local facility, typically moving under a tight schedule. While these local truck transfers do not generate significant traffic relative to passenger-related traffic and non-airport local traffic, congestion caused by those other uses may have a significant impact on the efficiency of air cargo services. For example, increased rush-hour congestion may require an off-airport forwarder to cutoff shipments earlier to make a flight. An earlier local cutoff will translate into earlier departures from origin areas, possibly adding a day to the ultimate delivery time and making a service non-competitive.[1] The efficiency of local road access also determines the range where manufacturers and other cargo shippers can locate and still be "close" to the airport. Local road congestion can severely affect the ability to attract and retain air-dependent industries that require such access.
- **Highway Access** – The importance of local access also pertains to the longer-distance access necessary to connect the airport with final origins and destinations. Air cargo service is regarded as a door-to-door product, as best exemplified by the integrated carriers. The size of regional market hinterlands available for specific cargo services depends on the time and cost efficiency of truck transfer to various points, particularly quick access to interstate highways.

1 - Air cargo shippers optimally seek to ship out at the end of business day and time a start-of-the-day arrival at destination. Relatively short delays that affect that window can be significant in terms of routing and even modal decisions.

Key Factors Affecting Future Expansion And Efficiency Of Air Cargo System

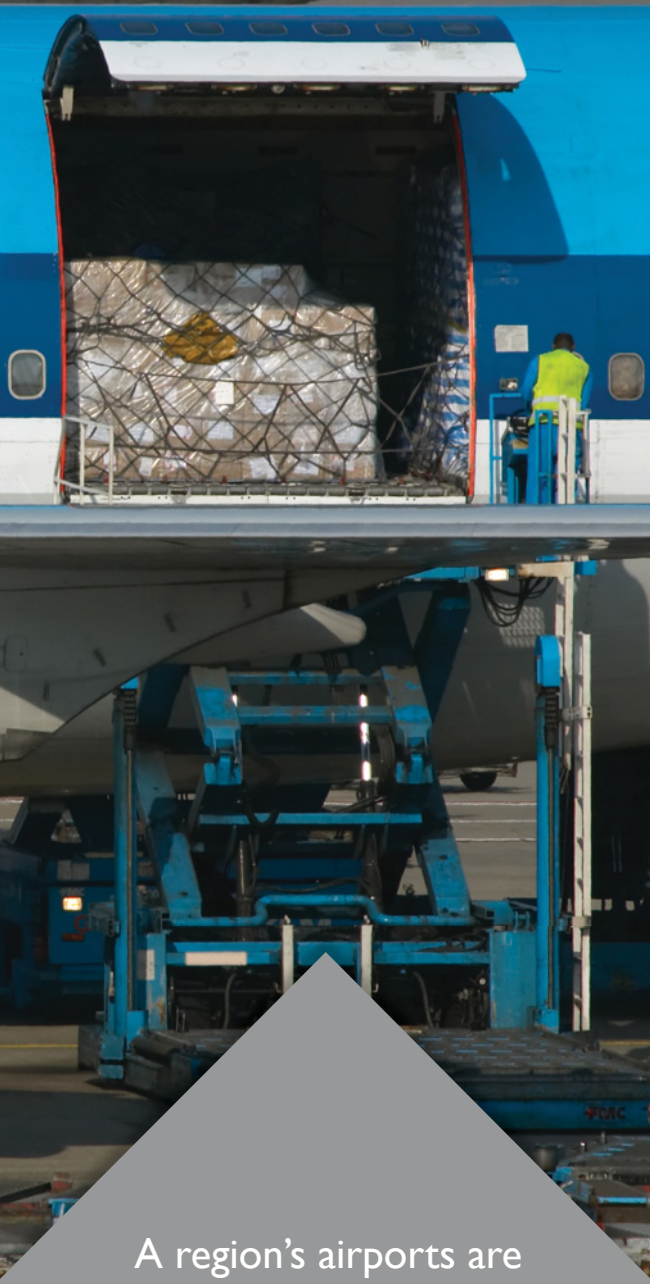
LOCAL AND REGIONAL DEMAND

General demand market factors that affect regional traffic levels by mode including population and employment changes, shifts in the local industrial profile or that of trade partners. Due to the interaction of industrial location/growth patterns and the efficiency of trade and transportation systems, each mode will be affected different by general demand shifts.

Like other modes, future air cargo traffic growth depends on general economic trends. Population growth determines the level of consumer products shipped by air, as will relative income growth as many luxury items or discretionary shipments (e.g., overnight lobsters from Maine or high fashion items) tend to be shipped by air. To the extent there is general growth in the demand for products produced in the area, air shipments should rise somewhat similar to other modal shipments by local industries.

In regard to air cargo, an important demand consideration relative to future airport growth is the growth or re-location patterns of air-dependent industries and how that may be affected by current location patterns rather than the future trade and transport environment in the region. While consumer-based shipments by air vary in type similar to surface modes (e.g., air-shipped products available on-line are comparable to what can be found at Target or Wal-mart), the industrial-based shipments tend to be concentrated in certain industries and commodity types, particularly for a local or regional economy.

Air cargo shippers optimally seek to ship out at the end of business day and time a start-of-the-day arrival at destination. Relatively short delays that affect that window can be significant in terms of routing and even modal decisions.



A region's airports are critical connectors to worldwide air distribution networks and their efficiency and capabilities are essential to attracting and maintaining economic development.

Industries make location and expansion decisions based on a variety of factors including labor and other costs and availability of skilled labor and space. Accordingly, future growth in particular air cargo movements will vary significantly based on other factors that drive those decisions. The rise or fall of existing or future high tech and other "air-dependent" industries will greatly determine air traffic volumes at an airport, particularly as the location of these time-sensitive shippers drive the service sector. As described above, air transport accounts for a high share of U.S. overseas trade value and an increase or decrease in the efficiency of local air cargo systems could have a significant effect on local production and employment.

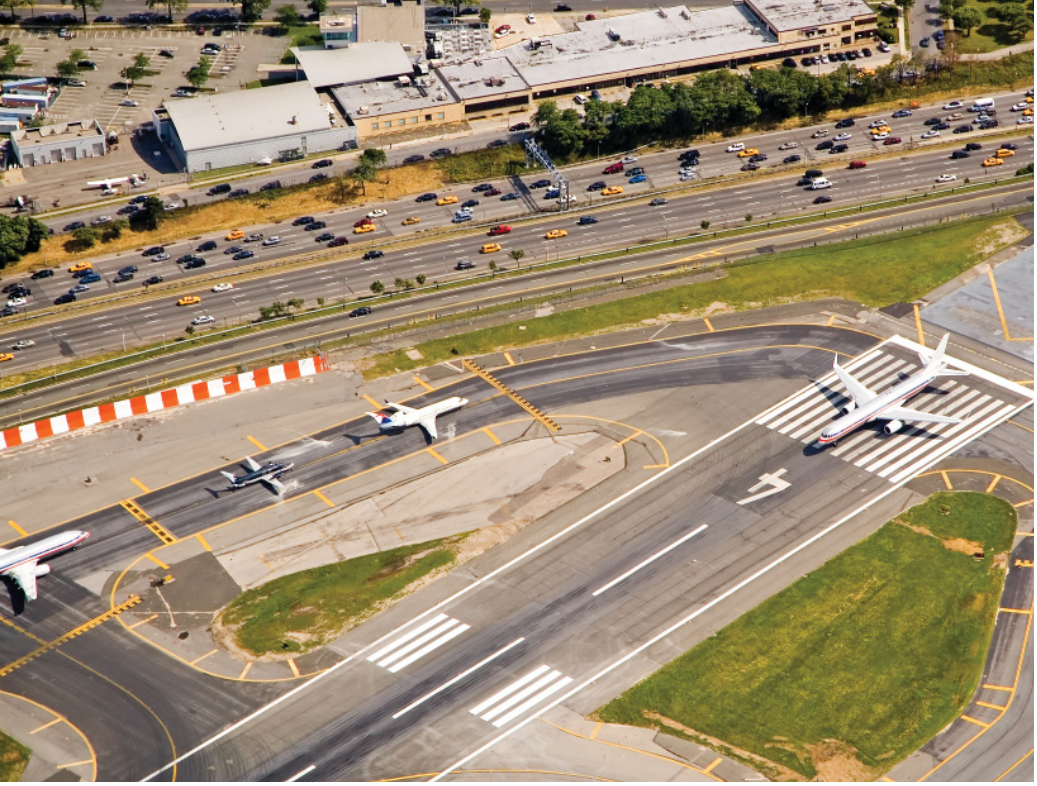
A similar set of factors affect the markets that local and regional shippers ship to or from. Any growth or shift in the overseas markets that trade with a particular regional market will affect future air cargo growth, again mostly unrelated to the air cargo system. As with local industries, the air-related markets overseas may be highly concentrated in certain sectors and subject to large pattern shifts (e.g., the rise and fall of circuit manufacturing in general and the constant shift of facilities between countries).

General industrial demand patterns relate to the production and consumption of commodities and products, but the rising importance of logistics in both manufacturing and final product distribution has created "intermediate demand" for air and other cargo transportation. Particularly for high tech and high value products, the distribution process (including distribution of components to manufacturing sites) has become increasingly as important as the production process. The trend towards regional distribution centers to service large geographical areas has created new air cargo for some airports (e.g., LAX) based not on local demand, but the efficiency of transferring cargo to satisfy other regions' demands.

AIR CARGO SERVICE MARKET

The structure of the air cargo service market is similar to passenger airline markets in some respects, but differs in the greater integration of ground services and the requirements for specialized services by third parties such as forwarders and customs brokers. The international air cargo business contains the following types of service providers:

- air carriers/airlines
- airports and associated public agencies
- freight forwarders and customs brokers
- ground trucking firms (linehaul and local pickup/delivery)
- warehouse operators and airport ground handlers
- multi-function and logistics/distribution firms



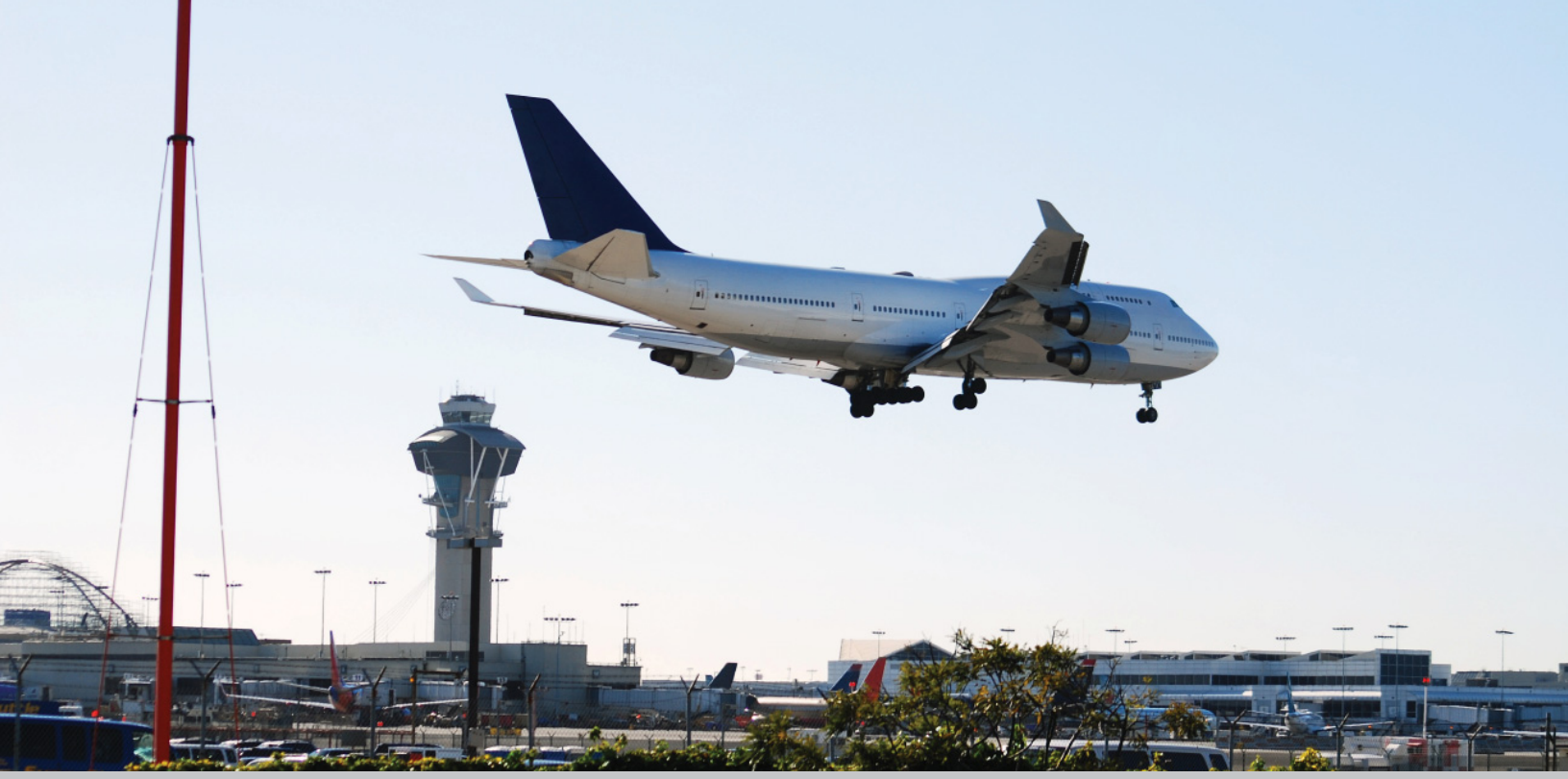
Air carriers provide the air transport segment of international air shipments, and may also provide ground handling or pickup/delivery services. Air carriers are primarily categorized as either "direct airport-to-airport" carriers who are mostly responsible for the air portion of the trip, or "integrated" carriers who maintain single entity responsibility for shipments on a door-to-door basis. The airport-to-airport carriers include scheduled passenger ("combination") airlines carrying freight in their belly-holds (e.g., British Airways, Lufthansa, Delta), scheduled all-cargo operators of freighters (such as Polar, Cargolux), and charter freighter operators. A final category of all-cargo airline are "wet-lease") or ACMI (Aircraft, Crew, Maintenance and Insurance) operators that operate freighter aircraft for other airlines. The impact of an OAA on the airport-to-airport cargo carriers would be comparable to that of passenger airlines with the primary differences based on the one-way pattern of cargo flows and the relatively small share of cargo activity that is handled by all-cargo freighter operators.[2]

The most significant innovation in air cargo services in recent years has been the development of transportation carriers that integrate air and ground services into a door-to-door transportation product. There are four large, international integrated (express) carriers (UPS, FedEx, DHL and TNT) whose overall approach is to control the entire shipment from pickup at the shipper's dock/office to delivery at the consignee's facility or general distribution point ("door-to-door"). These carriers utilise their ground and air networks to collect and distribute international traffic, linking domestic transport with international freighter flights at their primary hubs or regional gateway hubs. The integrated carriers have diverted a substantial share of cargo traffic from traditional all-cargo airlines and have created a distinct service sector based on high reliability and service levels. The design and capabilities of these carriers' networks are highly dependent on the availability and flexibility of traffic and other operating rights, so the OAA will have a more drastic impact on this sector albeit one that is distributed over their networks rather than on a market-to-market basis.

The non-airline participants in the air cargo service market include airports that provide facilities and support services to air carriers and air cargo shippers, some of which operate as the express hubs (e.g., Memphis or Brussels) in support of an integrated carrier's network. Other firms provide service for or manage international cargo shipments in support of the airline or the shipper/consignee including:

- **freight forwarders** provide ground and other handling services that connect shipments to airport-to-airport services as an agent for the shipper or consignee.
- **customs brokers** are primarily responsible for marshalling inbound shipments through local customs and inspection requirements.
- **trucking firms** assist in the transportation between airport and origin/destination when not handled by the airline or forwarders.
- **specialized services** including warehousing, airport **ground handlers**, and **third-party logistics** (3PL) or distribution firms.

2 - Any OAA impacts on passenger services will also affect the belly capacity available in OAA markets. These impacts are considered as a by-product of the passenger changes as cargo operations has a limited impact on passenger flight scheduling and fleet planning.



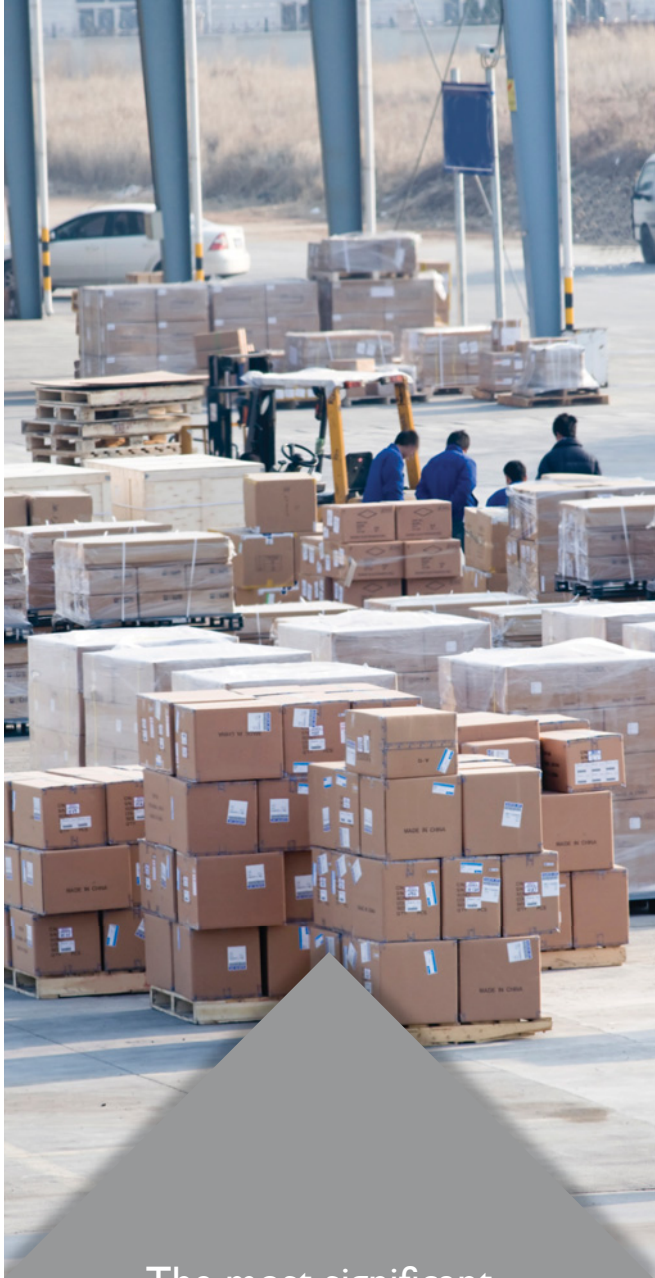
The relevance of these service providers to this analysis is primarily that (1) they typically play a more active role in the cargo transportation process than anyone comparable in the passenger market (e.g., forwarder managing an air shipment vs. travel agent providing limited ticketing services) and (2) their functions are often part of the integrated carrier networks and should be considered as part of a single service rather than merely an air transit.

While air cargo services share some characteristics with air passenger markets (and in the case of combination carriers function within a single airline), air cargo patterns have unique elements that are relevant to understanding the potential impact of the proposed OAA including:

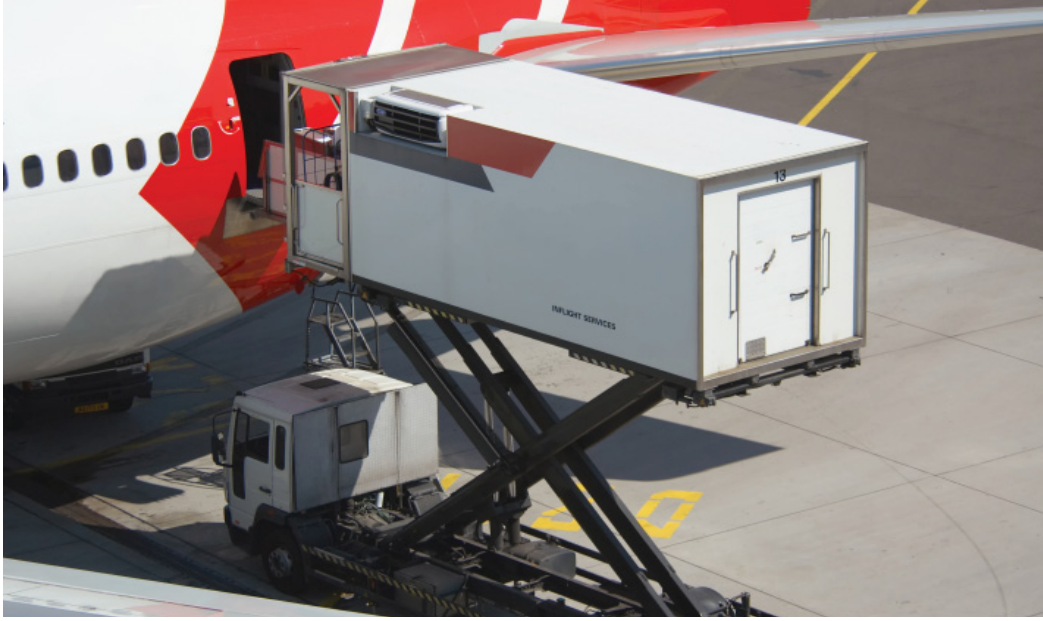
- Air cargo flows are almost entirely one-way and can produce great imbalances leading to unused capacity and disproportionate freight rates in one direction. This affects the utility of expanded service rights as does the fact that air cargo origin/destination patterns can shift drastically on short time periods and may not directly follow general industrial patterns (i.e., small economic markets may be large cargo markets). In particular, the lack of cargo service rights on particular routes may have no impact if the market is relatively small and can be handled using passenger capacity.
- There is great variance in the level of service provided by air cargo companies ranging from overnight (or even faster) guaranteed door-to-door delivery (from integrated carriers) to deferred space-available transfer between airports (by all-cargo or passenger airlines). The importance of expanded OAA rights depends on how they affect the level (and cost) of service with the greatest impacts to be expected for the higher service providers.
- While passenger carriers focus on transporting people from airport-to-airport via a single mode, transportation of cargo is generally a door-to-door process involving multiple modes that are typically managed by the transportation company rather than the "user" (i.e., shipper or consignee). OAA impacts can not be considered solely in terms of the air segment, but must also consider ground elements.
- While air passenger services directly affect international travel and tourism markets (as well as passenger-based trade), the cost, efficiency and availability of air cargo services has its greatest impact on international merchandise trade and consequently regional economic development. With increasing dependence on air transport, manufacturing firms require efficient links to both source materials and final consumer markets and should be considered the sector that is most affected by the OAA.

The air cargo service sector responds to underlying demand patterns in the context of available technology, air system capacity, the market structure of industry participants, and other factors such as route restrictions. Some of the service factors that will influence future growth include the follwoing:

- Unlike other modes, air cargo flight capacity is significantly affected by passenger demand and service patterns, particularly in the international market. In simple terms, passenger flights are scheduled to satisfy traveller demand, creating some excess belly capacity that is sold based on market conditions determined by both the total availability of passenger lift and the availability of all-cargo services. Future shifts and growth in passenger service will drive cargo routing patterns, as will fleet changes that may reduce cargo capacity (e.g., reduction in wide-body Transcon flights) or increase it (e.g., Airbus A380).
- The most important development in worldwide air cargo transportation has been the evolution of the integrated carriers from small package overnight delivery companies serving a single region to multi-modal value-added transportation companies operating worldwide networks. As mentioned above, the emergence of the U.S. integrated carriers resulted in a significant decline in the need for general all-cargo freighters for the U.S. domestic market, and a similar effect could be seen in U.S. international markets. The future changes to the integrated carriers participation in air cargo and related markets will greatly affect routing patterns, particularly for their hub and gateway airports.
- General all-cargo freighter service typically provides flight capacity on routes where passenger flights can not satisfy demand either in terms of capacity or capabilities (e.g., oversized shipments). In fact, many passenger airlines operate their own freighters for just that purpose. While limited in the U.S. domestic market, non-integrated freighters continue to have a strong role in the international market, but the future will depend on both the passenger and integrated carrier sectors. While traditionally operated on an airport-to-airport basis, it is possible that the general all-cargo airline may assume some of the traits of "integrated" services and develop full-scale distribution networks that can compete with the integrated carriers.
- The pattern of air cargo routings is affected by the range and payload characteristics of both passenger and freighter aircraft and future fleet trends will affect future patterns. For example, many U.S.-Asia freighter flights are required to make a technical stop in Alaska, increasing traffic and flight activity at Anchorage and West Coast airports not requiring



The most significant innovation in air cargo services in recent years has been the development of transportation carriers that integrate air and ground services into a door-to-door transportation product.



a tech stop. Most international freighters are wide bodies leading to more concentration in the large gateways that can both handle the aircraft and feed enough cargo to fill it. Two trends for future aircraft will have counteracting effects on air cargo. The introduction of the Airbus 380 freighter and passenger aircraft (including both FedEx and UPS) will limit the markets that can handle the aircraft or support its enormous capacity, probably to the advantage of the top gateways or hubs. On the hand, the introduction of longer range middle-sized aircraft into international markets may increase the use of less congested secondary gateways whose markets are suited to their capacity.

- A related factor is the level of future fuel prices that will not only affect operating costs, but also drive many fleet decisions. Fuel price increases disproportionately affect air relative to other modes increasing rates and causing mode shifts. This is partially the reason for the recent shift of U.S. express shipments from air transport to LTL ground networks (often operated by the integrated carriers). High consuming aircraft may not be efficient to operate, thereby reducing (or shifting) capacity.
- Air cargo routing patterns are not driven entirely by cost and time factors, but also depend on structural factors for the airline and forwarder industries. The concentration of air cargo at just a few international gateways is partially caused by airlines wanting to use common airports for their passenger and freighter flights and by airline partnerships. Most forwarders operate under "gateway" systems whereby local offices have incentives to route their freight to a limited number of airports where the local office can consolidate and negotiate low rates. Forwarders have a major influence on routing decisions, particularly when shippers do not fully understand the air cargo market. While having some economies of scale advantages, this system shifts routing decisions from shippers and local forwarders to corporate offices, often to the detriment of emerging international airports.
- International regulation has also affected cargo routing, with many U.S. markets controlled by bilateral agreements that limit carrier entry and routes. This has also tended to concentrate services at a limited number of gateways, both in strict terms and in terms of making it more difficult to choose a secondary gateway with valuable route authority. The trend towards "Open Skies" agreements that would eliminate these limits may reduce this as a factor. One possible long-term possibility is that the elimination of all route restrictions could allow foreign carriers to serve U.S. domestic and international markets not involving their home market. This may increase the attractiveness of secondary gateways.
- Increased post-9/11 security has affected the air cargo market significantly including the restriction of cargo handling on passenger flights, and cost impacts from increased screening and security review. In the future, increased cargo screening could decrease the competitiveness of air vs. other modes, both in terms of cost and time. Security changes could also affect air routing patterns. A requirement to use specialized screening equipment would tend to further concentrate traffic at a few airports that can afford to efficiently operate that equipment. On the other hand, the ability to conduct security activities at less congested secondary gateways might be an advantage.
- On the environmental side, the key issues are noise and emissions. The direct effect of local noise concerns over integrated cargo flights was discussed above, but noise and emissions restrictions could affect the cost of operating all-cargo fleets, many of which are heavily populated with the older aircraft targeted by the regulations.

FUTURE OPPORTUNITIES AND CHALLENGES

In simple terms, future traffic levels for a particular airport will depend on:

- Growth and shifts in local and regional demand
- Attraction and expansion of throughput and transfer activity
- Changes to the size and scope of the service market hinterland relative to competing gateway airports
- Attraction and expansion of direct air and related services relative to shifts in underlying structure
- Airport infrastructure capacity and capabilities relative to changing requirements.

These factors can be interrelated. For example, the size of the local origin/destination market will determine whether airlines choose to serve it with direct flights or via truck service to larger markets. On the other hand, the attraction, retention and expansion of air-dependent industries depend on the available air services compared to other industrial locations. Pure transfer activity (e.g., hub sorting) may be attracted to large O/D markets based on economies of scale or may go to smaller less congested airports. Finally, the ability to handle air cargo traffic depends on having adequate and suitable infrastructure, the development of which depends on attracting sufficient air services to cover costs and may be driven by factors unrelated to the airport (e.g., local roads).