11 Air Cargo

Introduction Historical Overview Air Cargo Today The Future The Market for Air Freight Types of Air Freight Rates Special Air Freight Services Factors Affecting Air Freight Rates

Chapter Checklist • You Should Be Able To:

- Distinguish between air-express, air freight, and air mail services
- Discuss the role of the Railway Express Agency in the early development of air-express service in the United States
- Describe the concept of overnight air express as established by Federal Express
- Describe the role of air freight forwarders in the air freight business
- Explain why the arrival of jumbo jets in the early 1970s proved to be both a boon and a bane for the cargo business
- Define the three types of air cargo carriers and give examples of each
- Compare and contrast the role of air cargo today and in the future with the carriage of passengers and other modes of transportation
- Discuss the market for air freight in relation to the type of commodity carried and demand and distribution problems

- List some of the special air freight services provided by the carriers
- Discuss several types of air freight rates and factors affecting them

INTRODUCTION

Carrying cargo has been far more important than carrying passengers for almost every mode of transportation ever used by humankind. This was true of beasts of burden, waterborne carriers, and wheeled vehicles, including railroads. The only exception so far has been aircraft. Many people believe that aircraft will always be primarily passenger carriers. Others believe that aircraft will be carrying more cargo than passengers as the 21st century progresses. But there is no doubt that cargo volume has been increasing more rapidly than passenger volume for the past two decades.

HISTORICAL OVERVIEW

Air cargo got its start on May 28, 1910, when Glenn Curtiss flew a sack of mail from Albany to New York City for the Post Office Department, covering the 150 miles in two-and-a-half hours. Or you could say it all started on November 10, 1910, when the Wright Company flew 65 miles from Dayton to Columbus, Ohio, with five bolts of silk cloth strapped into the passenger seat of the plane for a department store that wanted to sell strips of the cloth as mementos of "the first air shipment."

These were interesting events, but they did not mark the start of any regular air cargo service. Actually, there are three separate elements of air cargo services—air mail, air express, and air freight—and therefore three histories to trace. Air mail is self-explanatory, but "air express," as originally used, included what we now call "air freight," a term that did not come into use until the first all-cargo aircraft were introduced. Today, **air express** refers to small packages that usually have a higher priority of carriage than air freight. Until the mid-1970s, air express was also distinguished from air freight by the fact that it was a cooperative effort among airlines, using a separate ground operator, the Railway Express Agency (REA). The REA accepted shipments from customers and distributed them over the available routes of the associated carriers so as to give the customer the most expeditious service.

Air freight, on the other hand, has always been marketed independently by airlines in competition with one another. In recent years, the lines of distinction between air express and air freight have become less clear. In 1989, Federal Express, the pioneer of overnight small-package air service and now the largest carrier in that business, acquired Flying Tiger, the world's largest all-freight carrier. In 2004, FedEx flew 14.58 million scheduled freight tonne-kilometres. The weight limit on express shipments was removed, causing some industry analysts to conclude that the boundaries between freight and express are blurring and may soon disappear.

Air mail service, the first of the air cargo services, was an important factor in the formation of air transportation in the United States (see Chapter 2). The first air mail service, which its founders hoped would be permanent, started with an experimental service between Washington, D.C., and New York. During the three-month test, the Post Office Department moved 193,021 pounds of mail, collected \$159,700 from the sale of its 24-cent air mail stamp, and showed a profit of \$19,103. This experiment marked the real beginning of air mail service, because it convinced the Post Office Department that air service was feasible.

For the next nine years, the Post Office Department completely controlled air mail service—even the operation of the airplanes—using both Army Air Corps and civilian

pilots. In 1925, Congress ordered the government out of the business of flying the mail and established procedures for contracting with private operators. By 1927, the government had ceased aircraft operations for mail services completely. Air mail began to grow more rapidly after the Post Office Department turned operations over to private contractors. It is difficult to overemphasize the importance of air mail to the early aircraft operators. The first commercial aircraft were built primarily to transport mail, and mail was the principal revenue source for the operators for many years. Air mail was responsible for the beginnings of the U.S. airline system as we know it today. Mail continued to be the dominant revenue source for the airlines until the arrival of the DC-3 in 1935. This craft could carry 21 passengers across the country in 15 hours, but more important, it was the first aircraft that could be operated profitably on passenger revenues alone. The introduction of the DC-3 began to shift the focus away from air mail and toward passenger operations. Although air mail would continue to be a significant revenue source to the airlines, it would gradually slip in relative importance. Today, mail accounts for less than 3 percent of the airlines' revenues.

Air Express

Whereas mail had its greatest impact on air transportation in the early days of the industry, air express has only recently begun to fulfill its promise. Air express service was inaugurated at Hadley Field near New Brunswick, New Jersey, on September 1, 1927, by National Air Transport, a predecessor of United Airlines, created specifically for the purpose of carrying air express, and by the REA. Three other carriers joined the effort to provide a comprehensive express service: Colonial Airlines, Boeing Air Transport, and Western Air Express.

The carriers affiliated with the REA tried to persuade other air carriers to join them in this enterprise, but American, Eastern, TWA, and several others were concerned over the choice of the REA as the ground operator. They were afraid that the REA's rail operations would be in conflict with the air service and preferred a more neutral operator. These airlines decided instead to organize General Air Express. Established in August 1932, General Air Express claimed to provide "the largest and most complete air express service in the world," serving 125 cities directly by air and offering connections to Canada, Mexico, the West Indies, and Central and South America. But the REA's head start was too much for General Air Express to overcome; General Air Express folded at the close of 1935, and the REA became the sole express agent for the U.S. air carrier industry.

Even with the REA acting as coordinator for all the carriers, air express was a small part of the airlines' income. When the mail contracts were canceled in 1933, United Airlines was earning almost 60 percent of its revenues from the carriage of mail and 40 percent from passengers. Its express business accounted for only a little over 1 percent of the gross—some \$133,000 a year.

Air express did not become the important revenue source the carriers hoped it would. While airline managements concentrated on winning passengers away from the railroads, the REA and the airline cargo staffs struggled with air express, often at odds over who should control the product and how revenues should be shared. On November 12, 1975, the REA declared bankruptcy. In place of the coordinated joint effort, each carrier introduced its individual air-express service, foregoing the nationwide coverage they were able to provide with the REA.

Overnight Air Express

On April 17, 1973, Frederick W. Smith began his Federal Express operations at 13 airports. Smith's concept was to provide a door-to-door overnight service for small packages. The key new element was the overnight feature. Up till then, air-express service relied almost entirely on passenger flights that operated during daylight hours. Packages tendered after the close of business generally sat at the origin airport until the next morning and were not delivered until the second day. By flying dedicated aircraft, FedEx was able to fly at night and deliver packages the next business day.

Operationally, Fred Smith revolutionized the air industry by introducing the huband-spoke system, routing all packages and aircraft through a hub in Memphis. A large portion of FedEx's work force was made up of college students who performed the sorting and loading functions at Memphis each night.

In 1975, its third year of operation, FedEx was grossing \$173 million in revenues but still losing money. What helped turn FedEx profitable was the demise of the REA. By then, Smith's company was big enough to enable it to pick up the pieces from the REA, his fleet having grown to 30 Falcon 20 minifreighters, each with a capacity of 350 to 400 packages.

And so the banner was passed from the passenger carriers to FedEx. And FedEx has carried it very high indeed. From an average of fewer than 500 packages handled per night in 1973, FedEx has grown at a phenomenal rate, to garner half of the express traffic in the United States and become a significant factor in international service.

Air Freight

If we accept the original definition of air freight as traffic carried in all-cargo aircraft, then the birth of air freight operations would date back to 1931 when Transcontinental and Western Air began overnight air freight service between New York and Kansas City. It used "specially constructed freight planes cruising over 100 miles per hour." The planes were unscheduled; they departed in the evening whenever a full cargo load became available. They made six intermediate stops—in Philadelphia, Harrisburg, Pittsburgh, Columbus, Indianapolis, and St. Louis. Customers could ship between any two of the points served for the same "astonishingly low price" of \$11 per 100 pounds. As part of the promotion for "the first air freight service," TWA introduced a new shipping document, the air freight waybill, and offered a souvenir copy to any customer who requested one.

The first regularly scheduled all-cargo service was started by United Airlines in 1940 between New York and Chicago. The flight left New York at 11:30 P.M. and arrived in Chicago at 3:40 A.M.

Air freight received a big boost at the end of World War II with two landmark decisions by the Civil Aeronautics Board (CAB). The first, in April 1948, legitimized **air freight forwarders** as middlemen between shippers and airlines, giving them the right to consolidate individual shipments and tender them to the airlines at the carriers' volume rates. Although opposed by most of the air carriers, the official recognition of the forwarder added a new dimension to air freight, greatly increasing marketing and sales efforts and stimulating new traffic.

The second CAB decision gave operating rights to three all-cargo carriers: Slick, U.S. Airlines, and Flying Tiger. The last-named airline had been formed by Bob Prescott in 1945 under the name National Skyway Freight Corporation. But it soon came to be known by

its slogan, "The Line of the Flying Tigers," because it was equipped with surplus military transports, flown by pilots who had served with Prescott under General Chennault, defending the Burma Road. It was the first of the three all-cargo carriers to be certificated, on September 21, 1949.

The halcyon days of air freight began in the 1960s. In October 1962, American Airlines ordered its first 707 freighters, and United followed suit in 1964 by ordering 727-QCs (for "quick change"). These planes had removable passenger seats so that they could be flown in the daytime as passenger aircraft and at night as freighters. By 1969, American was operating a fleet of 39 of the 707 freighters; United had 15 DC-8 freighters plus 30 QCs; and TWA was flying 12 of the 707s and 8 QCs. Even with all this dedicated lift, however, cargo still accounted for only 10 percent of the revenues for these carriers.

The Arrival of Jumbo Jets

In January 1970, the Boeing 747 jumbo jets began operating as passenger liners. They proved to be both a boon and a bane for the cargo business. They were a boon because as all-cargo aircraft they provided the capacity to carry containers as big as $8 \times 8 \times 40$ feet and to lift over 100 tons per trip. In November 1971, Boeing finished construction of the first 747 freighter. Delivered to Lufthansa on March 9, 1972, it was put into service on the Frankfurt–New York route. On February 21, 1974, Sabena World Airways marked another important first in the jumbo-jet era by introducing the 747 combi in scheduled service—an aircraft that divided the main deck so that $8 \times 8 \times 10$ foot cargo containers could be carried aft of the passenger compartment.

The jumbo jets were also a bane, however, because the bellies of passenger aircraft could accommodate most of the air cargo tonnage available, and—by virtue of the byproduct nature of the space—at considerably less cost than dedicated freighter aircraft. The combination of expanded belly capacity and lower air freight rates permitted under the CAB's liberalized pricing policies following deregulation in 1978 proved to be the death knell for freighter operations by the U.S. passenger airlines. TWA operated its last freighter in December 1978, and in subsequent years, American, United, and Pan Am all got out of the business. Today, Northwest is the only one of the originally certificated combination carriers to operate freighter aircraft. Flying Tiger, acquired by Federal Express in 1989, was the only surviving all-cargo carrier from those originally approved by the CAB in 1948.

After most U.S. certificated carriers phased out their operation of freighters, the promotion of air cargo devolved upon the freight forwarders, who had been the airlines' best customers. Some of the largest forwarders, such as Emery, Burlington Air Express, and Airborne, later began to fly their own aircraft to provide the cargo lift they needed, at the times of day they needed it, and became major cargo carriers in their own right.

Foreign-flag carriers, which continue to operate cargo services with dedicated freighters and combi aircraft, have been far more aggressive than U.S. carriers in promoting air cargo.

Types of Carriers

The air cargo industry includes three types of carriers: integrated carriers, passenger airlines, and conventional all-cargo carriers. **Integrated carriers**, also called express carriers, operate door-to-door freight transportation networks that include all-cargo

aircraft, delivery vehicles, sorting hubs, and advanced information systems. These carriers operate their own aircraft to ensure adequate capacity and service reliability, although they also use the belly cargo space of passenger aircraft to supplement their own capacity and to provide international service. The U.S. express carriers include FedEx, United Parcel Service (UPS), Airborne Express, DHL Airways, Emery Worldwide, and Burlington Air Express.

A second major type of cargo carrier is the **combination carrier**, which carries passengers and cargo. These carriers primarily offer point-to-point service on a wholesale basis, relying on freight forwarders for pickup and delivery, sales to shippers, and customer service. Because the passenger plane belly space that represents much of their cargo capacity is a co-product of passenger service, combination carrier cargo services have a low marginal cost and thus usually offer much lower prices than express carriers. Although virtually all passenger airlines handle some cargo, the importance of the cargo business varies substantially from airline to airline. Many large Asian and European carriers, including Korean Air, Cathay Pacific Airways, Lufthansa, and Air France, operate fleets of freighter aircraft to supplement their belly cargo capacity. Cargo accounts for a large share of total revenue for most major non-U.S. air carriers, but it plays a much less prominent role for many other airlines, including most major U.S. passenger airlines.

The third type of cargo carrier is the **all-cargo airline**, which operates a variety of cargo services. Some, including Gemini Air Cargo, and Polar Air Cargo, provide point-to-point service for air freight forwarders, either as common carriers or under guaranteed-space agreements. Others, like Atlas Air and Air Transport International, primarily operate aircraft on a contract basis for other airlines. Two of the conventional carriers, Atlas and Polar, specialize in international 747 freighter service and are among the fastest growing cargo carriers in the world. It should be noted, Atlas Air and Polar Air Cargo are owned by Atlas Air Worldwide Holdings.

AIR CARGO TODAY

Air cargo traffic continues to grow at a healthy rate, but it has not yet achieved the status envisioned by the air cargo pioneers of the 1930s and 1940s. They fully expected that air cargo would in time be the most important revenue source for the airlines. After all, every known form of transportation had earned more money from the carriage of freight than of people. Thus, the only real question for the airlines was how soon air freight would overtake passenger revenues. Most experts thought it would happen within 5 years, or 10 at most.

So what has happened? Why is it that the time frame for the ascendancy of air cargo keeps being pushed into the future? And why do many experts suspect that air cargo may never be the top money-maker?

A fundamental reason for air cargo's inability to surpass passenger revenues is that air is a premium-cost transportation mode compared to any surface system. It costs far more to operate an airplane than to run a truck, ship, or railroad car. Thus, there has to be a compelling reason for customers to use air services. Computer companies regularly ship by air, for example, because the added cost of air transportation is more than offset by getting the product to market and into service earlier. Shippers of perishables—such as fresh fruits, flowers, and fish—use air transport because they have no other way to reach their worldwide markets. But shippers of most commodities find surface delivery times acceptable and therefore choose the lower transportation costs associated with surface modes.

Another reason freight lags behind passenger traffic is that aircraft being produced today, and on which air cargo has relied in the past, have been designed primarily for the carriage of passengers and are not particularly well suited for freight. Nor are we likely to see, any time soon, the research and development funds needed to produce a vehicle better suited to the carriage of cargo.

The unprofitable operations of freighter aircraft through the years also took a toll on air cargo's reputation. The fact that freighters lost money somehow translated to the belief among senior management of the leading U.S. carriers that air cargo was an unprofitable business—certainly not a valid conclusion when you look at the profits that are made by the carriage of cargo in combination aircraft. In any event, the perception that cargo was a loser has convinced many passenger airline managements not to invest their scarce capital in any more freighter aircraft.

Although air cargo has failed to achieve the preeminent position that was expected of it, and in spite of the limitations imposed by the marketplace and the design of aircraft, air cargo is alive and well. More and more companies are using air cargo services as they experience the inventory reduction benefits that air transportation can provide.

Air cargo has grown very rapidly over the past 25 years, as shown in Table 11-1. Freight and express ton-miles have tripled while revenues have increased more than sixfold during this period. Although cargo accounts for only 5 to 10 percent of total revenues for most of the combination carriers in the United States, it is a considerably more important revenue source for many of the foreign-flag carriers, which continue to operate jumbo freighters and combi aircraft on international routes. Some of them—such as Lufthansa, Japan Airlines, and Air France—earn as much as one-third to one-half of their gross revenues from cargo on some routes.

The four largest markets—the North Atlantic, transpacific, Europe–Far East, and U.S. domestic—account for nearly three-quarters of air cargo shipments, with traffic divided almost equally among them. In recent years, international traffic has grown more quickly than U.S. domestic business.

The composition of the U.S. domestic market changed dramatically during this time, as the integrated all-cargo carriers captured virtually all of the growth and became the industry leaders. Today, the express carriers hold a two-thirds market share and earn over 80 percent of domestic air freight revenues.

TABLE 11-1Freight and Express Ton-Miles and Revenues for U.S. Air Carrier
Scheduled Services, 1975–2004^a

Year	Ton-Miles (thousands)	Revenues (thousands)
1975	4,795,308	\$ 1,309,779
1980	5,741,567	2,431,926
1985	6,030,543	2,680,715
1990	10,546,329	5,431,627
1995	14,568,416	8,480,085
2000	21,143,000	11,993,000
2004	27,978,000	14,911,000

Source: Air Transport Association (ATA) annual reports.

^aIncludes international and domestic operations.

The integrated carriers have successfully followed the strategy of offering superior service at a premium price. By providing time-definite, guaranteed door-to-door service supported by real-time shipment tracking service, they are able to generate a yield of about \$2.00 to \$2.50 per pound for domestic shipments. Their leading competitors, the combination carriers, supply airport-to-airport service primarily on a space-available basis, usually provide no service guarantees, offer little or no tracking capability, and typically earn \$0.30 to \$0.40 per pound for domestic freight.

The combination carriers appear to have little chance of reversing the trends of the past 25 years and capturing a larger share of the domestic freight market. By offering a consistently high level of service, the integrated carriers have raised the expectations of freight shippers. The passenger airline freight product has changed little over the past 25 years, and the gap between the level of service they can support and the level demanded by the market is widening. Recent changes designed to improve the profitability of passenger service, including grounding wide-body aircraft and scheduling faster turn times, further limit cargo opportunities for combination carriers. In addition, the integrated carriers have developed a variety of lower-cost second-day and deferred service options through increased use of trucking. These services options reduce the combination carriers' price advantage while preserving shipment tracking and other integrated carrier service advantages.

The most important competitive response by U.S. combination carriers is the trend toward contracting out airport cargo services. This may increase airline cargo profitability by reducing labor costs, but it will not help the combination carriers regain market share and may cause a further drop in share if it lowers their service quality.

If current trends continue as expected, the volume of domestic traffic handled by the integrated carriers will continue to grow rapidly. This will have important implications for U.S. airports. Because almost all integrated carrier domestic traffic moves in all-cargo aircraft, the number of all-cargo operations will rise. This will increase the demand for cargo aircraft parking positions, particularly at spoke airports, where many cargo aircraft remain parked from early morning until late evening. Integrated carriers have more flexibility in locating cargo warehouses than do combination carriers, which need access to passenger aircraft, so the demand for on-airport cargo warehouse space will grow less rapidly than the demand for cargo aircraft parking. Parts of the airport that do not have good access to passenger terminals and are not well suited for combination carrier freight warehouses may be suitable for integrated carrier facilities. The noise impacts from cargo may also increase, because most integrated carrier flights are operated at night, although the shift to quieter Stage 3 aircraft will offset the increase in the number of cargo operations in many cases.

The growth in U.S. airport freighter activity primarily reflects the development of integrated carrier flight routings. Most of the airports with the greatest activity and growth are the integrated carrier hub/gateway airports: Memphis, Indianapolis, Anchorage, Oakland, Newark, and Dallas–Fort Worth for FedEx; Louisville, Anchorage, Newark, Dallas–Fort Worth, Philadelphia, and Ontario for UPS; Dayton for Emery Worldwide; and Toledo for Burlington Air Express. Because the integrated carriers have established major facilities, cargo usually receives sufficient attention at these airports. Where cargo may not always receive enough attention, and where the increase in freighter activity makes it an important issue, is at the large airports that are not integrated carrier hubs, such as Atlanta, Chicago, Denver, Honolulu, Phoenix, and Boston.

THE FUTURE

Although air mail was the first of the air cargo products, it now accounts for less than 7 percent of the revenues for cargo carried by the world's airlines. Mail growth has been steady but slow, advancing at an average of about 4 percent a year but eclipsed by the faster growth in express and freight. Mail will probably continue to grow at a leisurely pace, aided on the one hand by the expansion of international commerce and beset on the other hand by the rapid growth of fax services and small-package carriers. The real potential for air cargo growth lies with air express and air freight. According to Boeing, it is expected that world air cargo will grow at a rate of 6.2 percent per year during the next 20 years. The North American market will grow at about 5 percent per year.

Two primary factors influence freight growth: economic conditions and rate levels. The outlook for both is positive for cargo. Moderate economic growth is expected to continue into the future, with only a minor slowdown in the short term. Cargo rates should also remain low as several factors serve to keep the lid on prices.

A large number of new aircraft have been introduced in recent years. This new capacity will help keep prices down. Labor costs for the world airlines should continue to move downward due to better utilization of the labor force and to continued industry consolidation.

In addition, the formation of an integrated European economic community should result in increasing traffic to Europe from all areas of the world. The European market will consist of some 330 million people, exceeding by half the size of the United States. Furthermore, to the extent that trade barriers are removed, customs procedures simplified, and carriers given more flexible operating rights, air cargo traffic growth will be stimulated.

FedEx and UPS, the two major U.S. express operators, are expanding their international services so that they can offer worldwide distribution. But they face some formidable competition from well-established international operators, notably DHL and TNT, both of which provide global service. The competition promises to keep the small-package express market lively for a while.

The globalization of the world economy—the production of parts and the assembly of products half a world away from where they will be placed in service—will also provide a major stimulus to air freight. Rather than rely on ocean transportation, which can take as much as two or three weeks, shippers can transport the goods by air within a couple of days. For products with a short shelf life—be they magazines or fashion goods or fresh fish—air freight is the only real choice shippers have, and they are realizing it more and more.

All in all, the future of air cargo should well exceed its past. Air cargo revenues may not overtake passenger revenues in the next 5 to 10 years, but the gap between them will undoubtedly be narrowed. The blend of additional capacity (air cargo people simply can't accept unused capacity), the continued explosion of traffic in the competitive express package market, and the customers' interest in quick and reliable delivery will fuel air cargo's accelerated growth.

As demand for air cargo increases, there will be a need for specialized aircraft. Currently, there is a lack of cargo-specific aircraft throughout the global fleet. Most airplanes used to transport air cargo are converted passenger aircraft. In most cases, those aircraft are old, costly to operate, and at the end of their life span. As these aircraft retire, aircraft manufacturers are realizing the need to produce aircraft that are geared toward air cargo transport.

Airbus Industrie has announced the production of a very large aircraft (VLA) called the Airbus A380. The passenger version of the A380 launched flight trials in 2006 and the freighter version will launch in 2008. Federal Express will be the primary launch customer for the freighter version. For the first time in aviation history, a passenger aircraft and a freighter aircraft will be launched almost simultaneously. The freighter version will be called the A380-800F and will operate as a high-capacity, long-range aircraft. The gross payload will total more than 330,000 pounds and will operate on routes approximately 6,000 nautical miles in length.

THE MARKET FOR AIR FREIGHT

A review of the major commodities shipped by air, according to data supplied on an annual basis by the Air Transport Association, gives a good idea of the major markets for air cargo. These commodities include the following:

Auto parts and accessories	Chemicals, elements, and compounds	
Machinery and parts	Machines for electronic data storage and	
Printed matter	processing	
Electronic/electric equipment	Metal products	
and parts, including appliances	Photographic equipment, parts,	
Fashion apparel	and film	
Footwear	Cut flowers and nursery stock	
Tools and hardware	Plastic materials and articles	
CDs, tapes, televisions, radios, and	Medicines, pharmaceuticals, and drugs	
recorders	Instruments – controlling, measuring,	
Computers and software	medical, and optical	
Fruits and vegetables	Food preparations and miscellaneous	
Sporting goods, toys, and games	bakery products	
Live animals	Other e-commerce products	

Shipping commodities by air is the most desirable form of distribution when one or more of the following characteristics is present:

- 1. When the commodity is:
 - a. Perishable
 - b. Subject to quick obsolescence
 - c. Required on short notice
 - d. Valuable relative to weight
 - e. Expensive to handle or store
- 2. When the demand is:
 - a. Unpredictable
 - b. Infrequent
 - c. In excess of local supply
 - d. Seasonal

- 3. When the distribution problems include:
 - a. Risk of pilferage, breakage, or deterioration
 - b. High insurance costs for long in-transit periods
 - c. Heavy or expensive packaging required for surface transportation
 - d. Need for special handling or care
 - e. Warehousing or stocks in excess of what would be needed if air freight were used

For commodities that are perishable, subject to quick obsolescence, or required on short notice, the speed of air transportation becomes advantageous. Timing is important for products such as recordings, fashion apparel, and novelty items. When the market is seasonal or when demand fluctuates for any reason, air freight allows an immediate response without the penalty of costly fixed overhead—being out of stock or overstocked. A manufacturer that offers a wide selection of styles, sizes, colors, or accessories in a product line and whose market covers a wide geographic area is usually faced with the dilemma of carrying costly inventory and obsolescence or long delays in filling orders. Air freight can eliminate the cost of carrying inventory. Customers can select freely from the entire line of products and they can be assured of delivery from a central warehouse as quickly as from a local warehouse.

Air freight is premium service. It projects an image of premium product and company progressiveness. The retailer who advertises "flown in from..." and the salesperson who assures the client that "we'll fly it in from our main office" understand the value of such an image. The various modes of transport represent great differences in quality. Air freight can add a new competitive edge to the marketing effort. Superior service adds value to any product and generates a quality image for the shipper.

Air freight can stimulate growth in existing markets, and it allows firms to enter new markets without making a commitment to large, fixed investments in warehousing and inventories. Test markets supplied overnight by air allow adjustment to market response as readily as to the demands of a local market.

The risk of pilferage, breakage, or deterioration is minimized through the use of air transportation because of the lack of en route handling and exposure of goods to long periods under minimum security. Insurance charges tend to be substantially lower for air freight than for surface freight, because there is less risk by air and because the transit time is shorter. Insurance represents a considerable expenditure for many companies.

Packaging for air freight is usually of minimal cost. Because air transport reduces the risk of jolts and shocks, cardboard cartons usually will suffice, whereas heavy wooden crates may be required for surface transportation. Ground handling is done on a more individual basis than is the case for most other modes of transportation. Risk of exposure to the elements is slight, and for commodities for which containerization is used, there may be no need to package at all.

The total costs associated with carrying inventory are high; it includes the cost of capital tied up in warehouse facilities and in stock, insurance, and taxes. In addition, stocked items may become obsolete, and the cost of labor and multiple handlings is a major consideration. With each handling, loss and damage is a factor. Air freight can often bring about drastic reductions in the cost of carrying inventory. Businesses that use regional warehousing supplied by surface transportation can reduce safety stocks and perhaps eliminate some warehouses. Even when air freight costs more than surface freight, the tradeoff in reduced

costs has made it profitable for many businesses to substitute overnight distribution by air from a central warehouse.

TYPES OF AIR FREIGHT RATES

General Commodity Rate

The air freight rate structure is similar to the passenger fare structure in that there is a normal or basic price applicable to all commodities in all markets. This is called the **general commodity rate.** General commodity shipments are rated by weight. (Dimensional weight is used if the shipment is of very low density; this will be discussed shortly.) As the weight of a shipment increases, the per-pound rate decreases, as Figure 11-1 illustrates. There is generally a minimum charge, depending on the city-pairs between which the shipment takes place.

Dimensional weight is computed by finding the cubic measurement of a shipment (length × width × height) and charging the rate for 1 pound for each 194 cubic inches. There are exceptions. For example, cut flowers and nursery stock being transported to domestic cities take a charge of 1 pound for each 250 cubic inches. In this way, if a cargo compartment were filled with, say, 20 pounds of Styrofoam cups, the charge would be based on a weight that represented a minimum density in relation to the space occupied.

Specific Commodity Rate

Specific commodity rates are established for unusually high-volume shipping of certain products between certain cities, such as fish from Anchorage, Alaska, to certain points in the continental United States; recording tapes, athletic goods, and musical instruments from Denver to San Francisco; and flowers, decorative greens, furs, fruits, and vegetables between Seattle–Tacoma and Minneapolis–St. Paul. In most cases, the specific commodity



FIGURE 11-1 General commodity rates vary by weight of the shipment. The greater the weight, the lower the rate (hypothetical example).

rate is lower than the general commodity rate to reflect the benefit to the carrier of regular high-volume shipments.

Exception Rate

Exception rates are higher than the usual air freight rates and apply to certain types of shipments that require special handling. For example, live animals and uncrated furniture take exception rates. A dog travels at 110 percent of the applicable general commodity rate on interstate routes within the continental United States. In some cases, an exception rate does not apply on certain routes.

Joint Rate

For domestic shipments transported on two or more airlines between origin and destination, a published rate, called a **joint rate**, often applies. The joint rate is usually the same as the rate for direct service. Where a joint rate is published, the shipper has the advantage of availability of a number of different routings at the same rate. This is especially advantageous if direct service is limited.

Priority Reserved Air Freight

Priority reserved air freight is designed to serve shippers of heavy or bulky freight who need the advantage of reserved space on a specific flight. For example, if an oil-drilling company has stopped production because it needs some drill bits, space can be reserved on the next flight. Knowing exactly when the drill bits will arrive, the drilling company can plan accordingly. Because special handling is required for this type of service, the rate is higher than the normal general commodity and specific commodity rates.

Speed Package Service

Speed package service is a small-package fast-delivery service, airport to airport, with certain carriers on their own systems. Packages are accepted at the airport passenger terminal, at the passenger baggage check-in position, or at the air freight office. They are delivered to the baggage claim area at destination. Speed package service is handled like passenger baggage, but because there is no accompanying passenger, the sender must make arrangements for someone to pick up the package on arrival.

Speed package service is designed for situations in which even a few hours are important. For example, critically needed small machinery parts often are shipped by this method. There is generally a flat rate based on distance between city-pairs for any speed package service shipment.

Container Rate

Container rates are low rates charged by the carriers to shippers using containers to ship air cargo. There are many types of containers designed for air freight, suitable for shipping quantities from 400 pounds to 5 tons. Some types are owned by the airline and made available to the shipper on request. Other types are purchased by shippers for regular use

or rented from various sources (see Figures 11-2 and 11-3). There are many advantages to containerizing air freight shipments:

- 1. Transportation charges are lower when a shipper has a large enough shipment to fill, or nearly fill, the container used. This is true even when the airline supplies the container.
- 2. Packaging costs can be reduced, because the container provides protection against handling mishaps.
- 3. Shippers can seal containers to prevent pilferage.
- 4. Shipments arrive as one complete unit; there are no delayed or missing parts.
- 5. Counting and checking the pieces of the shipment at destination is simplified.
- 6. Transportation costs for high-density freight shipments in containers often are lower than for surface transportation.

Shippers can use carrier-owned containers, for which they are generally charged a flat fee that includes both the use of the container and the transportation of its contents. Sometimes, the weight of the contents allowed at the flat fee is a specified maximum. An *excess pound rate* is applied to weight that exceeds the amount allowed at the flat rate. (The weight of the container is not considered in these calculations.) In many cases, there are different rates for day and night. Airlines can also provide one or more containers for the shipper that has many items going to the same city and charge the shipper less for the total shipment while reducing packaging costs and providing the benefits of decreased handling and protection from weather. Carriers have specially built containers for heavy items, such as machinery parts.

Shippers often purchase their own containers or else rent them. These containers also qualify for special rates that are lower than the general commodity rate. Most shipperowned containers are small enough to be moved through factory assembly lines. Thus, goods can be loaded and the container sealed at the plant. An airline normally will charge a container rate to a shipper that can stack its boxes on a pallet and secure them with a cargo net, provided that the overall dimensions do not exceed the dimensions for the type of container on which the rate is based.

SPECIAL AIR FREIGHT SERVICES

Assembly Service

Airlines will consolidate packages from a shipper, or group of shippers, and base the transportation charge on the total weight of all the pieces, which allows a price break on heavy shipments. When numerous shipments are sent to the same address, the use of assembly service can result in real savings to the shipper. The assembly time can begin at 12:01 A.M. and end the following day at 12:00 midnight. During the 24-hour period,

AIR TRANSPORTATION

IYPE: A1 Dom. /SAB-UAB Inti.	TYPE: LD6 Dom. /AWC-AWF Intl.	
Int. Capacity: 393 Cu. Ft.	Int. Capacity: 316 Cu. Ft.	
Max Gross Weight: 13 300 Lbs	Max Gross Weight: 5 680 Lbs	
Cube Displacement: 425 Cu. Ft.	Cube Displacement: 339 Cu. Ft.	
TYPE: A2,A3 Dom. /AAA-SAA Intl.	TYPE: LD7,LD9 Dom. /AAP-AAR Intl.]
Int. Capacity: 440 Cu. Ft.	Int. Capacity: 355 Cu. Ft.	
Ext. Dimensions: 88x125x87 In.	Ext. Dimensions: 125x88x64 In.	
Max. Gross Weight: 12,500 Lbs.	Max. Gross Weight: 13,300 Lbs.	
Cube Displacement. 475 Cd. Ft.	Cube Displacement. 401 Cu. Ft.	
TYPE: FTC Dom. /=	TYPE: LD8 Dom. /ALE Intl.]
Int. Capacity: 151 Cu. Ft.	Int. Capacity: 253 Cu. Ft.	A
Ext. Dimensions: 81x60.4x62.75 In.	Ext. Dimensions: 196x60.4x60 In.	
Max. Gross Weight: 4,500 Lbs.	Max. Gross Weight: 5,400 Lbs.	
Cube Displacement: 174.5 Cu. Ft.	Cube Displacement: 280 Cu. Ft.	
TYPE: LD2 Dom. /APA Intl.	TYPE: LD10 Dom. /AWR-AWS Intl.	
Int. Capacity: 120 Cu. Ft.	Int. Capacity: 246 Cu. Ft.	
Ext. Dimensions: 47x60.4x64 In.	Ext. Dimensions: 125x60.4x64 In.	\leftarrow
Max. Gross Weight: 2,700 Lbs.	Max. Gross Weight: 5,680 Lbs.	
Cube Displacement: 134 Cu. Ft.	Cube Displacement: 257 Cu. Ft.	
TYPE: LD3 Dom. /AVE-AKE Intl.	TYPE: LDW Dom. /=	
Int. Capacity: 150 Cu. Ft.	Int. Capacity: 70 Cu. Ft.	\sim
Ext. Dimensions: 79x60.4x64 In.	Ext. Dimensions: 98x42.2x41.6 In.	$\langle \rangle$
Max. Gross Weight: 3,500 Lbs.	Max. Gross Weight: 1,700 Lbs.	X
Cube Displacement: 166 Cu. Ft.	Cube Displacement: 76 Cu. Ft.	-
TYPE: LD4 Dom. /DLP-DLF Intl.	TYPE: M1 Dom. /ARA Intl.]
Int. Capacity: 193 Cu. Ft.	Int. Capacity: 572 Cu. Ft.	
Ext. Dimensions: 96x60.4x64 In.	Ext. Dimensions: 125x96x96 In.	\leftarrow
Max. Gross Weight: 5,400 Lbs.	Max. Gross Weight: 15,000 Lbs.	
Cube Displacement: 215 Cu. Ft.	Cube Displacement: 666 Cu. Ft.	
TYPE: LD5, LD11 Dom. /AWB-AWD Intl.	TYPE: M2 Dom. /ASE-ASG Intl.	
Int. Capacity: 265 Cu. Ft.	Int. Capacity: 1,077 Cu. Ft.	
Ext. Dimensions: 125x60x64 In.	Ext. Dimensions: 240x96x96 In.	
Max. Gross Weight: 7,000 Lbs.	Max. Gross Weight: 25,000 Lbs.	
Cube Displacement: 265 Cu. Ft.	Cube Displacement: 1,286 Cu. Ft.	
	L	

FIGURE 11-2 Containers provided by airlines. These containers are owned by the airlines and are certified as an integral part of the aircraft. These units are available from the carrier for shipper use. The specifications may vary slightly by owner; this information is provided as a guide only. (Source: Air Transport Association of America, Air Cargo from A to Z [Washington, D.C.: Air Transport Association, 1988].)



FIGURE 11-3 Containers offered by shippers. These containers are shipper owned and are available from many commercial sources and from the airlines. Most carriers offer container incentive rates when used. Specifications may vary slightly; this information is provided as a guide only. (Source: Air Transport Association of America, Air Cargo from A to Z [Washington, D.C.: Air Transport Association, 1988].)

a shipper that asks for assembly service can dispatch any number of packages to the carrier's air freight office and the airline will assemble the parts until the shipment is complete or the assembly time has expired (see Figure 11-4).

Distribution Service

Another service provided by airlines that fly air cargo is accepting one shipment from a shipper and, at destination, separating it into its parts and distributing them to different customers. The advantages are the same as those for assembly service in that a shipper with many customers in the same city can take advantage of the rate break for heavy shipments. However, carriers generally do not provide assembly and distribution service on the same shipment. A variation of this service is for the carrier to deliver a shipment to the main post office at the destination city, where the shipment is sorted by zip code. Rather than ship thousands of items from the home office, large retailers and wholesalers who mail catalogs, magazines, and so forth frequently use this service because of the substantial savings involved.



FIGURE 11-4 Assembly service charge by total shipment weight over a 24hour period (hypothetical case).

Pickup and Delivery Service

Air freight pickup and delivery service is performed by independent local truckers under contract to act as the carrier's local agent. They are governed by Air Cargo, Incorporated (ACI), an organization owned jointly by the major airlines whose major function is to negotiate contracts with local truckers. ACI truckers generally make two regular pickup and delivery runs daily within a 25-mile radius of the airport. Rates for services performed at ship docks or outside the 25-mile radius are generally higher.

Other Specialized Services

Airlines provide a number of other specialized air freight services, including armed guards for shipments of highly valuable goods, such as furs, precious gems, watches, jewelry, negotiable securities, bills of exchange, bonds, and currency. Generally, such items are not accepted by the carrier until three hours before the scheduled departure time of the flight on which they are to be transported, nor can they be held for more than three hours after arrival at the destination. Because many of these items are small, carriers generally require that a minimum-size container be used. For example, coins must be shipped in a 1,500-cubic-inch container.

Shipments of human remains are arranged for by a mortuary and are consigned to another mortuary at the destination city. The shipping mortuary must provide a death certificate and burial certificate to accompany the shipment. Commodities called *restricted articles* range from those that are accepted without limitation but that must have an identifying label (magnetized materials, for example) to such things as poison gas, which cannot be made safe enough for commercial air transportation under any circumstances. Most restricted articles are materials that can be shipped safely when packaged according to DOT specifications for hazardous materials and that are limited in terms of allowable quantities per container and per aircraft. All restricted-article shipments must be conspicuously labeled by the shipper, using authorized labels, so that all airlines participating in the routing can observe special loading arrangements and advise flight crews of any potentially hazardous materials on board. Accurate labeling is also essential so that the carrier can deal appropriately with leakage or spillage of materials that are hazardous to humans and animals, to aircraft structure, or in combination with other materials being shipped in the same cargo compartment. Most restricted-article shipments require a shipper's certificate.

Many products have various degrees of hazard, depending on their components. Aerosol products, for example, may be classified as an inflammable gas or as poison or may have no restrictions, depending on both the contents and the propelling agent used. Paint is another product classified in various ways, depending on its composition.

Some airlines accept certain restricted articles not accepted by other airlines. Some restricted articles may be carried on all-cargo aircraft but not on the passenger-carrying aircraft of any carrier. And, again, some highly dangerous materials cannot be made safe enough to carry on commercial air carriers under any circumstances.

The Air Cargo Guide

The *Air Cargo Guide* (2000 Clearwater Drive, Oak Brook, IL 60521) is a basic reference publication for shipping freight by air. It contains current domestic and international cargo flight schedules, including pure-cargo, wide-body, and combination passenger-cargo flights. Each monthly issue also contains information on air carriers' specialized services, labeling requirements, airline and aircraft decodings, air carrier and freight forwarders, cargo charters, U.S. and Canadian city directory small-package services, interline air freight agreements, aircraft loading charts, and a great deal more information regarding air cargo services. (See the Web Sites list at the end of this chapter for additional information.)

FACTORS AFFECTING AIR FREIGHT RATES

Costs of the Service

A basic consideration in rate making is that the rates should cover the costs of service and yield a reasonable profit. In air transportation, where air freight is carried in the cargo compartments of passenger aircraft as well as in all-cargo aircraft, the costs that must be covered generally are the same as those of an all-cargo aircraft operation. This approach is usually followed for two reasons: (1) the allocation of costs in a combination aircraft is difficult, and (2) the maximum development of an air cargo industry requires the operation of all-cargo aircraft whose costs must be met. As was pointed out earlier in the chapter, freight rates have considerably less profit potential than passenger fares because the advantages of air over surface modes of transportation are less apparent.

Volume of Traffic

Numerous pricing considerations affect rates. One of these is the volume of new traffic a carrier can achieve at any particular rate. Volume is significant, because traffic potential is a key factor in determining the maximum net revenue that can be derived from any commodity. Thus, the rate structure contains reduced rates for larger shipments.

Directionality

Whereas most passenger travel is round-trip, freight traffic is all one-way. Historically, domestic air freight has tended to move in larger volumes in a westbound direction than eastbound, and in larger southbound than northbound volumes within the eastern United States. Consequently, rates have been set at lower levels in the off-direction as a means of filling up space to equalize the flow of traffic and put aircraft to more efficient use.

Characteristics of the Traffic

Air carriers also consider the transportation characteristics of the commodity as an important element in the rate-making process. The major transportation characteristics are the density of the commodity (the relationship of weight to measurement), the size (weight or volume) per average piece, and the average weight of the shipment (whether 10, 20, 40, 100, 1,000, or 10,000 pounds makes up one shipment at one time).

In cargo aircraft, utilization of available space and available lifting capacity must be optimized. The density of the load must be related to the capability of the aircraft in determining freight rates. A cargo aircraft fully loaded with a particular commodity should produce sufficient revenue to cover the full cost of operation and earn a profit. For example, suppose that an all-cargo aircraft has a practical volume capacity of about 7,700 cubic feet and a lifting capability of almost 92,000 pounds. The optimum density for traffic is therefore:

$$\frac{92,000}{7,700}$$
 = About 12 lb per cubic foot.

When individual shipments are loaded on an aircraft, unavoidable losses in the utilization of space occur due to the irregular shapes of the shipments. These are called *stacking losses*. To achieve the optimum density, the average density of shipments tendered to our example aircraft must be greater than 12 pounds per cubic foot to compensate for stacking losses. If the loaded density of the commodity is 12 pounds or more, the revenue-producing load will be 92,000 pounds in this aircraft. Basically, the total cost of the operation plus the profit margin, divided by the pounds of the commodity on board, will give the approximate air freight rate for that commodity.

The character of the commodity also includes whether it is dangerous, hazardous, perishable, or susceptible to damage or pilferage; what packing and packaging is needed; whether it is easily loaded and stowed aboard aircraft; and whether it will readily ensure safe transportation with ordinary care in handling. When unitized or containerized shipments are involved, the importance of some of these rate-making factors may be reduced.

Value of the Service

Value of service is frequently an important factor in establishing a specific commodity rate. In theory, a specific commodity rate should allow the commodity to move in a volume that yields the maximum revenue in excess of the added costs of carrying the commodity. Taking revenue dilution into consideration, the principal factors that reflect value of service include the speed and reliability of air freight service, the value of the commodity, and the profit margin of the consignor or consignee. The consignor, usually the shipper, is the party that designates the person to whom goods are to be sent. The consignee is the person named as the receiver of a shipment—one to whom a shipment is consigned.

Market demands, possible obsolescence of stock, cost of inventory, the necessary lead time in placing orders for surface shipments, and the possibility of reduction of warehouse expenses are all factors that may influence the shipper's acceptance of a rate level for an air shipment.

Competition

Competition is, of course, also a major factor in determining air freight rates. Where capacity exceeds demand, there is considerable pressure to lower rates. Rate reduction can be introduced by the least successful competitor to improve its market share or possibly by the principal carrier to generate new traffic.

Competition from other modes of transportation, especially trucks and railroads, may help determine the rate that can be charged on any commodity. The competitive impact of shipping via other routes, shipping via nonscheduled air carriage, or using shipperowned vehicles also may be pertinent.

KEY TERMS

air express	general commodity rate	
air freight	specific commodity rate	
air mail	exception rate	
air freight forwarder	joint rate	
integrated carrier	priority reserved air freight	
combination carrier	speed package service	
all-cargo airline	container rate	

REVIEW QUESTIONS

- 1. What is the difference between *air express, air freight,* and *air mail service*? Why was the early air mail service so important in establishing the U.S. airline system? Discuss the role of the Railway Express Agency and General Air Express in developing early air express service.
- 2. Describe the basic concept of Federal Express. Why has this company revolutionized the air express business? Explain the role of the air freight forwarder in the air cargo business. Why did the arrival of the jumbo jet prove to be both a boon and a bane for the air cargo business?

- 3. Distinguish between *integrated carriers, combination carriers,* and *all-cargo airlines,* and give examples of each. Why have the integrated carriers gained a significant market share in recent years? What effect has this had on airport planning?
- 4. Do you think that air cargo revenue will ever exceed passenger revenue? Why or why not? Discuss several factors that will influence air cargo growth in the future.
- 5. List five major commodities shipped by air. Why do you think they are shipped by air versus surface modes of transportation? Distinguish between *general commodity rates* and *specific commodity rates*. What are *exception rates*? What is *priority reserved air freight? Speed package service*? Describe several advantages of containerization. What are some of the special air freight services provided by air carriers?
- 6. List and briefly describe six factors affecting air freight rates. An aircraft may "gross out" before it "spaces out," and vice versa. How is this related to air cargo? What are *stacking losses*? How does directionality affect air freight rates?

WEB SITES

http://www.ata.org http://www.ups.com http://www.fedex.com http://www.polaraircargo.com http://www.aircargoworld.com http://www.aircargoworld.com http://www.tiaca.org http://www.cargofacts.com http://www.atlasair.com http://www.atlasair.com http://www.faa.gov http://www.aci-na.org http://www.bts.gov http://www.dot.gov

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CHAPTER 11 • AIR CARGO

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