Air Cargo: Impacts of Adapting to Deregulation

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In November 1977, legislation was enacted to dismantle nearly all economic regulation of the air cargo industry. The resulting deregulation has had important impacts on the air cargo industry. Rates are almost certainly lower than they would have been under continued regulation, and the range of rate and service offerings has expanded. Service patterns have changed as major passenger airlines have withdrawn their freighters from service and begun to rely on belly cargo. Passenger route networks have been restructured in response to increased competition in passenger markets. Faced with changing rates and service patterns, shippers have placed increased reliance on freight forwarders. Some of the larger freight forwarders have responded to new freedoms and opportunities by acquiring and operating their own cargo aircraft, developing hub-and-spoke route networks, and entering the rapidly growing package express market. All-cargo carriers have been hurt by the combination of downward pressure on rates caused by unused belly cargo capacity and the new aircraft operations of the larger freight forwarders. Both all-cargo carriers and package express carriers face increased competition for second-day service from belly cargo in passenger aircraft, particularly because recent consolidations of passenger airlines have resulted in more comprehensive route networks served by a single carrier.

Congress deregulated the air cargo industry in November 1977, a year before the more highly publicized deregulation of the passenger airline industry. Passenger airline travel and air cargo are closely linked; more than 40 percent of both domestic and international air cargo is carried in the belly compartments of passenger aircraft. The air cargo industry has changed significantly since 1977, in large part because of deregulation's removal of constraints on competition but also because of other changes in the economic environment including passenger airline and motor carrier deregulation. Changes in the air cargo industry as it adapts to deregulation, some of the causes of these changes, and implications for future development of the industry are examined.

BACKGROUND

In a sense, the air cargo industry dates back to the 18th century; in 1783 air transport, in the form of a balloon, was used to carry mail across the English Channel. In another sense, the industry dates "only" to 1910, 7 years after the Wright brothers' first flight, when an airplane was used to carry a 60-lb bolt of silk from Dayton to Columbus, Ohio (for $71.20/lb) (1, p. 98). The modern air cargo industry, however, began after World War II when surplus transport aircraft and military pilots returning to civilian life coupled with a lack of regulatory restrictions made entry into the air cargo industry both inexpensive and easy. However, the combination of undercapitalization, limited managerial skills, highly variable profit potential in previously untested markets, and overcapacity of hundreds of new operations led to many bankruptcies (2).

Spurred by bankruptcies and other problems in the fledgling industry, the Civil Aeronautics Board (CAB) in 1947 adopted regulations for entry, routes, and rates for air cargo operations that were similar to the regulations that had been established for passenger airlines in 1938. Predictably, the period between 1947 and 1956 was one of consolidation through merger and bankruptcy. After 1956, no new all-cargo airlines were certified although, unlike passenger airlines, the lack of new entrants was less the result of restrictive CAB policy than the absence of applicants (2).

In November 1977, legislation was enacted to dismantle nearly all of the air cargo economic regulation that had emerged during the 1940s. As had been the case with passenger airlines, the CAB had controlled which companies could carry air cargo, the routes each company could serve, and the rates charged for such service. Air cargo regulations also drew a sharp distinction between direct air carriers and freight forwarders. Freight forwarders, for example, were not permitted to own or operate aircraft, although after 1948 they were allowed to charter air transportation. Moreover, the regulations usually limited the geographic area within which surface transportation could be provided by air carriers and freight forwarders to within 25 mi of the airport that served as the origin or termination of the air portion of the trip. Surface carriers were generally prohibited from participating in air transportation (3).

There were, of course, some important exceptions to these regulations. For example, one large air freight forwarder, United Parcel Service, had obtained extensive trucking authority from the Interstate Commerce Commission (ICC). Also, similar to the commuter airline exemption in passenger service, many of the regulations did not apply to air carriers offering cargo service in small aircraft with payloads of less than 7,500 lb (3).

Despite steady growth from the mid-1960s to the early 1970s, evidence began to emerge that economic regulation was hindering the industry's performance. Some markets experienced a shortage of prime-time evening cargo capacity, and...
others had extremely low load factors in the bellies of passenger aircraft. In still other instances, restrictions on operating authority hindered efficient equipment use by preventing carriers from carrying freight on intermediate segments of their routes (2). Restrictions on surface operations by direct air carriers and air freight forwarders hampered development of integrated surface and air transportation services.

The initial legislative proposals for regulatory reform of the air cargo industry were included in efforts aimed primarily at reducing regulation of passenger operations. In the congressional hearings and debate, almost all attention was focused on the passenger provisions with modest support for and only minor objections to air cargo reform. As the debate over passenger deregulation grew heated, the cargo provisions were removed and grafted onto a bill already in conference (H.R. 6010) that contained a series of miscellaneous aviation measures. That bill emerged from conference, was passed by both houses, and was signed by the president on November 9, 1977, almost a year before passenger airline deregulation was enacted. The principal features of the new law (P.L. 95-163) opened entry into the industry after a brief transition period; freed the industry from price controls with the usual caveat that prices could not be discriminatory, preferential, prejudicial, or predatory; and removed the major barriers to the development of integrated surface and air transportation services (3).

**POSTDEREGULATION TRENDS IN AIR CARGO**

Assessing the impacts of air cargo deregulation is complicated by the dramatic fuel price increases that followed the Iranian revolution in 1979 and by the severe economic recessions in 1980 and 1981–1982. Passenger airline deregulation in 1978 also influenced the cargo industry as airlines adjusted passenger operations, and associated belly cargo capacity, to a more competitive environment. Moreover, motor carriers, the primary competition for many segments of the domestic air cargo market, were substantially deregulated in 1980 with resulting shifts in both the patterns of motor carrier service and the rates charged for such service (4). As a result of all of these influences, the air cargo industry and indeed most other segments of the transportation industry are still in transition to a more competitive environment. Although it may be too soon to determine the eventual impacts of deregulation on the air cargo industry, several important trends have begun to emerge.

**Rise of Package Express**

Overnight service for letters, documents, and other small packages existed before deregulation, but much of its recent growth can be attributed to removal of regulatory restrictions. Federal Express, the largest provider of such package express service, started operations in 1973 using small jet aircraft with cargo capacities that were less than the CAB’s 7,500-lb limit and thus exempt from CAB entry, route, and rate restrictions. The exemption from entry and route restrictions allowed Federal Express to build a hub-and-spoke route system. Without deregulation, however, Federal’s growth might have been hampered had they been unable to take advantage of the operating economies of larger aircraft as their package volumes grew. Indeed, by the end of 1985, Federal Express no longer operated any of the small-sized jets with which it had started; its fleet of aircraft had grown to include 11 DC-10s, 18 B-727-200s, and 35 B-727-100s (5).

Deregulation has also permitted new methods of operating by other companies offering package express service. Companies such as Emery, Purolator, and Airborne started as freight forwarders and, under regulation, were prohibited from operating their own aircraft. As discussed in more detail later, each of these carriers developed a hub-and-spoke route system after deregulation to avoid being forced to rely on a patchwork of offerings by other carriers. Each operates fleets similar to Federal’s. Purolator, for example, uses B-727-100s and DC-9s (6), and Emery uses primarily B-727-100s and DC-8s (7).

The package express segment of the air cargo industry has received widespread attention in the years since deregulation. One reason, of course, is the extensive public media campaign launched first by Federal Express and then by others to promote overnight delivery services. A second reason is the tremendous growth of such services. Figure 1 shows a comparison of the annual operating revenues of three package express companies (Emery, Federal Express, and Purolator) with the combined cargo operating revenues of all scheduled airlines providing cargo services including both the all-cargo carriers such as Flying Tigers and the cargo operations of predominantly passenger airlines such as American, Northwest, and United. As can be seen in the figure, package express revenues were far below cargo revenues of the scheduled airlines in 1978 but by 1985 had surpassed them by 30 percent. Although Federal Express’s compound growth rate during the period was a spectacular 43.7 percent per year, both Emery (11.7 percent per year) and Purolator (18.3 percent per year) also grew much faster than the scheduled airlines combined cargo revenue growth rate of 4.4 percent per year. Such robust growth and high public profile have tended to divert attention from the other segments of the air cargo industry and the important trends emerging there.

**Profile of the Domestic Air Cargo Industry**

Although high revenues are earned carrying package express, such cargo constitutes a relatively small portion of total air cargo ton miles. In 1985 package express combined with mail...
carried for the U.S. Postal Service made up about 30 percent of domestic revenue ton miles and heavy freight accounted for the remaining 70 percent. These figures should be considered only approximate because of incomplete or missing data in some cargo operators’ reports to the U.S. Department of Transportation.

Air cargo is transported by three types of carriers: by passenger airlines, as belly cargo; by freighters (all-cargo aircraft) providing scheduled service; and by nonscheduled freighters. Figure 2 shows the proportion of revenue ton miles (RTMs) in 1985 for each type of carrier in both domestic and international service. In domestic service, belly cargo (43.1 percent) and scheduled freighter service (41.6 percent) each account about the same number of RTMs, and nonscheduled freighter service accounts for the remainder (15.3 percent). The proportions are quite similar in international service; the only difference is that scheduled freighter service is slightly more important and belly cargo slightly less.

![Air cargo by type of carrier, 1985](image)

**FIGURE 2** Air cargo by type of carrier, 1985 (from U.S. Department of Transportation Industry Cargo Summary, 1985).

The international market for U.S. carriers is only about one-half the size (53 percent) of the domestic market. Although the international market grew at only about 3 percent per year between 1979 and 1985, the domestic market grew more rapidly at about 5 percent per year. Air cargo deregulation, of course, applied only to cargo carried within the United States; international air cargo movements continue to be governed by bilateral agreements among countries. Air cargo traffic may actually have grown more rapidly than the RTM figures indicate. Technological improvements have reduced the weight of some air cargo packaging thereby increasing the proportion of cargo tons that is actually cargo (8).

Changing Role of Freight Forwarders

In, as one freight forwarder executive put it, the “warm, protected days of regulation,” air freight forwarders had a well-defined albeit limited role in the air cargo industry (9, p. 31). Their principal functions were to pick up and deliver shipments within a 25-mi radius of the airport, to consolidate small shipments into larger shipments thereby taking advantage of lower rates, and to market air cargo services within their geographic area. Although forwarders could charter cargo aircraft, they were not permitted to provide their own lift by owning and operating aircraft. Surface transport beyond a 25-

A combined result of air cargo deregulation in 1977 and motor carrier regulatory reform in 1980, the distinctions among the participants in freight transportation have become much less sharp. One pronounced trend has been for some of the larger air freight forwarders to operate their own cargo aircraft. For example, former freight forwarders such as Airborne, Emery, Purolator, and United Parcel Service now have their own cargo fleets. Some of these forwarders acquired their own lift capability in response to deterioration of scheduled freighter service, particularly as trunk passenger airlines withdrew from freighter cargo service.

An emerging pattern for forwarders with their own lift is to operate aircraft in hub-and-spoke route networks similar to those of passenger airlines such as Eastern and Delta in Atlanta, United in Chicago and Denver, American in Chicago and Dallas/Fort Worth or, in the package express market, Federal Express with its hub in Memphis (10). For example, Airborne operates a hub at a former Air Force base in Wilmington, Ohio; Purolator operates a hub in Indianapolis; Emery has a hub in Dayton; and United Parcel Service has established a hub in Louisville. For air cargo operators, and particularly operators offering package express service, such hubs offer advantages similar to those for passenger airlines. Specifically, with a hub-and-spoke network, more city pairs and lower traffic density markets can be served economically with the same fleet than could be served if only single-plane direct service were offered (11).

Hubs were difficult to establish with the route restrictions of CAB regulation. Thus, as with passenger airlines, full development of hub-and-spoke systems has only been possible with deregulation’s route freedoms. Thus far, only the larger forwarders have developed such systems; the small forwarders still rely on the belly cargo capacity of scheduled passenger airlines, virtually all of whom now operate hub-and-spoke route networks, and the scheduled freighter capacity of the cargo carriers.

The passenger airlines’ hub-and-spoke development may well have made it easier for forwarders to provide service via a single airline to a broader range of communities. Although the typical timing of passenger flights may offer greater potential for second-day air service than for overnight delivery, the possibility of mixing passenger service with overnight freight service should not be overlooked. Eastern Airlines, for example, established late night “Moonlight Special” mixed passenger and cargo flights in 1985 in cooperation with CF Airfreight, a subsidiary of Consolidated Freightways, Inc. (12, p. 4). The flights provide an overnight heavy-freight delivery system and also offer price-sensitive passengers quite low fares. This service contributed to a 39 percent increase in Eastern Airlines’ cargo revenues in 1985 over 1984.

Deregulation has also enabled freight forwarders to integrate surface and air transportation more smoothly by allowing forwarders more freedom to operate surface transport. Forwarders are no longer restricted to a 25-mi radius around an airport and many have obtained both intrastate and interstate trucking
authority. These forwarders can now provide either surface or air transport depending on which best suits a shipper's particular needs. Although interstate trucking authority has not been difficult to get in the wake of the Motor Carrier Act of 1980, granting intrastate authority is still the domain of state regulatory commissions. Some states have liberalized intrastate motor carrier entry along the lines of federal deregulation, but others have remained quite restrictive so that some forwarders have been unable to obtain the intrastate authority they need to develop fully integrated service.

Air freight forwarders may also be assuming a larger role in shipping, although data to assess their role are limited. In 1978, however, Air Transport Association airlines received 43.6 percent of shipments from forwarders whereas by 1982 the figure had risen to almost 50 percent (13). If forwarders are indeed assuming a larger role, cargo experience would again parallel passenger airline experience and probably for much the same reasons. For passenger airlines, travel agents now sell a substantially greater portion of tickets than before deregulation (10, 14). When airline fares were the same for all carriers in a market and service patterns were held relatively stable by CAB regulation, a travel agent had relatively little to offer; a passenger could simply book a flight with the airline directly with little fear of missing an opportunity for a more convenient flight or a lower fare. With the often bewildering array of fare and service combinations and the frequently shifting patterns of passenger airline service, travel agents can now provide extremely valuable service in finding the best fare and flight alternative for a traveler's needs. Similarly, in air cargo the entry, rate, and route freedoms ushered in by deregulation have increased the range of cargo transportation alternatives on which a freight forwarder can draw and therefore the value of a skillful freight forwarder's ability to keep abreast of changing alternatives and find the rate and service best suited to a particular shipper's needs.

Passenger Airlines and Air Cargo

Most of the passenger airlines that operated freighter aircraft before cargo deregulation have sold their freighters and confined their cargo operations to the belly compartments of their passenger aircraft. Some of the narrow-body freighters such as B-707s and the smaller DC-8s either became uneconomic to operate in the face of rapidly rising fuel costs in 1979–1980 or could not meet the new noise standards without expensive retrofits (15). The wide-body freighters, although still potentially profitable, often did not fit into the passenger airlines' longer-term strategies, particularly in light of the substantial unused cargo capacity in the bellies of passenger aircraft. American Airlines, for example, had been a pioneer in cargo transport but sold its last B-747 freighter to United Parcel Service at the end of 1984 (16).

As the Eastern Airlines Moonlight Express example illustrates, some passenger airlines are turning their attention to using more of their belly cargo capacity. A wide-body aircraft such as a DC-10, an L-1011, or an A300 has about 52,000 lb of belly cargo capacity and a B-747 can have between 72,000 and 120,000 lb depending on the specific model (5, 17, p. 7). Even a modest amount of cargo can have an important impact on the profitability of a flight.

Consider, for example, a DC-10-10 operating with a 65 percent passenger load factor and a break-even load factor of 60 percent—both fairly typical values for 1985 domestic operations of the more profitable major airlines. Under these assumptions and using the average passenger yield for United Airlines for 1985 (10.6 cents per revenue passenger mile), the profit from the flight comes from the revenue from the last 13 passengers (18). The same amount of revenue could be earned by adding only 6,720 lb of cargo, assuming an average cargo yield for United of 40.1 cents per revenue ton mile. Although carrying cargo adds some costs to a flight, the marginal costs of handling additional cargo, once a carrier is prepared to handle any, are not likely to be large.

The potential for such belly cargo is largely untapped. For example, the average United Airlines jet passenger aircraft flight carried only 2,250 lb of cargo in 1985. Part of the reason, of course, is that many passenger flights are at times of the day that are poorly suited for some air cargo needs. To be useful for overnight service, flights must be late in the evening or at night. However, virtually any passenger flight would be suitable for second-day air cargo service, and some freight forwarders report a growing awareness among shippers that second-day service is often adequate for their needs, particularly when it can be offered at a lower price. For example, although Federal Express has focused its marketing on more lucrative overnight service, by 1985 18 percent of its volume was second-day service, an increase from 11 percent in 1983 (5). UPS also ships a substantial volume of second-day air freight, although UPS does not report a breakdown of cargo volume among different categories of service.

During much of the regulated period, rate floors hindered the ability of passenger airlines to price belly cargo capacity low enough to make second-day service a widely attractive alternative. Since passenger deregulation, most management attention has been focused on developing route networks and reducing cost structures to survive in the intensely competitive passenger markets. Such competition, however, may well be the driving force behind airline managers' increased attention to underused belly cargo capacity. As suggested previously, a relatively small addition to the cargo load can make a significant contribution to the profit of a flight thus providing an important competitive edge. Moreover, as the Eastern Moonlight Express example illustrates, some passenger airlines are exploring innovative ways of mixing passenger and cargo operations.

Cargo Rates

The wide and changing variety of rate and service combinations limits the analysis of the effects of deregulation on cargo rates to an examination of changes in aggregate rate levels as measured by total revenues divided by total ton miles (yields). Figure 3 shows a comparison of an index of average domestic passenger yield with an index of average freight and package express yield for the period 1979 to 1985. During this period, both types of service were subject to many of the same types of cost pressures including fuel price increases, interest expense during a period of record-high rates, recession-dampened demand, and so forth. As the figure indicates, cargo rates have lagged far behind passenger rates since 1979; while passenger
yield increased 34.5 percent, cargo yield increased only 20.6 percent.

Both average cargo and passenger yields have been affected by a changing mix of traffic during the period. An increasing percentage of passenger traffic has traveled at low-yield discount fares since 1979 so that standard fares have risen faster than the yield index suggests. Conversely, in cargo markets, high-yield package express service has grown faster than heavy freight so that a measure of standardized rates has probably increased less than the combined yield index. Thus, if indices of standardized rates had been used instead of yields, the gap shown in the figure would probably be even wider.

Experience before deregulation was markedly different from that after 1979. Between 1972 and 1978, before the effects of either cargo or passenger deregulation, domestic freight yields grew at an average annual rate of 8.5 percent, far greater than the average annual growth rate for domestic coach passenger yields of 4.8 percent (19). Thus before deregulation cargo rates were growing faster than passenger rates, but after deregulation cargo rates grew more slowly and actually declined in real terms when the effects of rising factor costs were taken into account. For example, between 1978 and 1982 passenger yields increased 45 percent (in nominal terms) and cargo yields increased 34 percent, but at the same time the consumer price index increased 59 percent and the CAB index of airline input costs increased 87 percent (20). There appears to be little doubt, therefore, that cargo deregulation has led to lower cargo rates in much the same way that passenger airline deregulation has reduced average passenger fares (10).

Some of the downward pressure on cargo rates may well have come from pricing response to excess belly capacity in passenger aircraft. United Airlines, for example, had a lower freight yield in 1985 than in 1979, but its passenger yield increased 42.8 percent during the same period. Similarly, both American Airlines and Northwest had declining freight yields between 1980 and 1984.

The average yields for belly cargo are substantially below the average domestic yield for Flying Tigers, by far the largest all-cargo carrier. Flying Tigers offers different service characteristics and has different underlying costs. All-cargo service is better suited to providing overnight service, and freighter aircraft have far fewer size and commodity constraints on the cargo they can carry, which means that belly cargo cannot compete for a portion of an all-cargo airline’s business.

In the case of Flying Tigers, there are also some important underlying cost differences. In much the same manner as those of the passenger airlines, Flying Tigers’ costs, particularly labor costs, had reached high levels under regulatory protection; for example, Flying Tigers’ average annual wage for members of flight crews was $115,000 in 1986 (21). In late 1986, Flying Tigers sought a 25 percent wage cut and work rule changes in contract negotiations with its pilots in an attempt to become cost competitive and avoid having eventually to withdraw from the air cargo business (22).

In addition to competition from passenger airlines, another source of downward pressure on air cargo rates has probably been falling motor carrier rates after enactment of the Motor Carrier Act of 1980. By offering competing service, motor carriers constrain air cargo rates for short and medium hauls and for nonovernight service. Lessened motor carrier regulation has stimulated a wider array of innovative motor carrier services, including some that are often competitive with air cargo for door-to-door elapsed transport time.

CONCLUSIONS AND PROSPECTS FOR THE FUTURE

Deregulation has almost certainly resulted in lower air cargo rates than would have prevailed under continued regulation and has expanded the range of rate and service offerings to shippers. Major passenger airlines have withdrawn their freighters from service in favor of reliance on belly cargo and have restructured their passenger route networks into hub-and-spoke systems in response to passenger deregulation. Faced with changing rate and service patterns, shippers have placed increased reliance on freight forwarders to seek out and provide the rate and service combinations that best suit their needs.

Freight forwarders, in turn, have been freed from many of the regulatory constraints under which they had historically operated. Some of the larger freight forwarders have responded to new freedoms and opportunities by acquiring and operating their own cargo aircraft, developing hub-and-spoke networks, and entering the rapidly growing package express market. Others have engaged in more aggressive marketing of traditional freight services, extended surface operations beyond their previous 25-mi limit, and provided more closely integrated surface and air operations.

The prederegulation all-cargo carriers have been hurt by the combination of the downward pressure on rates, caused in part by excess capacity in belly cargo, and the new aircraft operations of the larger freight forwarders. As was the case with passenger airlines, regulation, by basing rates on average industry costs, dampened incentives for careful cost control and gave these carriers a legacy of high costs primarily attributable to high wage rates (23). The result for many all-cargo carriers has been a string of annual financial losses as they struggle to reduce costs.

If the future looks grim for those all-cargo carriers that cannot reduce costs substantially, it may be brighter for freight forwarders and belly cargo in passenger airlines. Although the preferred timing of passenger flights may not be well suited for overnight shipments, most flights are well suited for second-day air cargo service. Moreover, the postderegulation growth of large hub-and-spoke networks allows many more city pairs...
to be served without the added complication of interline transfers. As the airline industry completes its transition to a deregulated environment, these route networks can be expected to stabilize thereby making it easier for a passenger carrier to provide predictable cargo capacity.

Intense competition in passenger service can be expected to keep pressure on the airlines to use the belly of the aircraft to make greater contributions to a flight's revenue. Increased emphasis on using belly cargo capacity could mean added business for freight forwarders, particularly those associated with Air Cargo, Inc., which have traditionally handled the pickup and delivery portion of passenger airlines' air cargo business.

Conversely, some passenger airlines may follow a variant of Eastern's example and develop exclusive arrangements with motor carriers to handle surface pickup and delivery of air cargo shipments. The Air Cargo, Inc., freight forwarders are free to "feed" their cargo to the major passenger airlines that best suits the shipper's needs in much the same manner that independent commuter airlines are free to feed passengers to the major carrier that best suits the traveler's needs. The importance of feed traffic to the profitability of passenger operations has led the major airlines to develop marketing alliances with commuters in an attempt to capture more of that feed (16). The same competitive pressures and the same potential for additional cargo to enhance profitability could lead the airlines to develop similar arrangements with motor carriers to capture more cargo feed. The airlines could establish such exclusive arrangements with freight forwarders or look to motor carriers who already have national or nearly national distribution networks in place. Motor carriers specializing in less-than-truckload shipments would appear to be particularly attractive candidates because such alliances could offer a shipper either air or surface transport depending on the specific need.

Such service—perhaps focused primarily on second-day service at reduced rates—could become an increasingly important feature of the distribution systems of manufacturers of high value-to-weight ratio goods. For such goods, which appear to be a growing part of the U.S. economy, air cargo distribution might make it possible to maintain fewer regional warehouses with attendant cost savings without decreasing service to customers.

In sum, air cargo deregulation has resulted in reduced rates and increased service options for most shippers and an expanded role for freight forwarders in helping shippers find and select the options that best suit their needs. The combination of competitive pressures in passenger airline service and under-utilized belly cargo capacity will almost certainly lead passenger airlines to increase their emphasis on cargo operations. The transition to a more competitive environment has not been without turmoil, nor is that transition yet over, but the indication to date is that the new competitive environment will better serve the needs of most shippers.

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