Chapter 2

AN OVERVIEW OF THE AIR CARGO SYSTEM

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INTRODUCTION

Since the beginning of air transportation, air cargo has grown largely as an auxiliary to passenger service. As late as 1978, more than one-half of scheduled air cargo moved in the bellies of passenger aircraft. In the last decade, however, domestic all-cargo carriers (those airlines that carry only goods, not people) have begun to increase their share of the market, Cargo accounts for 11 percent of the total revenues of U.S. commercial air carriers. In 1980, scheduled air cargo generated over $3 billion in revenues. [1]

[1] *'Air Cargo Statistics, U.S. Scheduled Airlines, Total industry,* 1980 (Washington, D. C.: Air Transport Association of America, 1981), p. 4.

In the period following World War II and through the 1960's, the introduction of new technology—long-haul propeller and then jet aircraft—had a great effect on the air cargo industry. In recent years, Government deregulation has come to have a major impact. Although the long-term effect of deregulation is still unclear, it already has enabled such innovations as intermodal cargo service (by Flying Tiger). While the air cargo industry as a whole showed operating profits only during the 1960's, combination (passenger/cargo) carriers flying international routes have generally made a profit and innovators such as Federal Express have been extremely profitable.

AIR CARGO INDUSTRY STRUCTURE

The world's air cargo delivery system is comprised of two networks. The first is essentially the same as the passenger network. In this system passengers are carried above and cargo is carried below in the belly of the aircraft, utilizing space not needed by baggage or mail—hence the name "belly cargo. " **These** flights are routed and scheduled for the convenience of the passengers. While the passenger airlines are generally willing to sell this otherwise unused space, they have not always wanted to bother with the ground operations of pickup and delivery and loading the belly containers, so a class of indirect carriers—called "forwarders''—has fulfilled this function. Until the Air Cargo Deregulation Act of 1977 these forwarders could not operate their own aircraft, although one large forwarder, Emery, organized a fleet of leased aircraft totally dedicated to its service.

A second network utilizes aircraft that carry just cargo. These dedicated cargo aircraft, sometimes referred to as freighters, or all-cargo aircraft, come in all sizes from small, propeller-driven aircraft to giant Boeing 747s configured to carry only cargo. The network over which all-cargo aircraft operate is less extensive than the passenger network, but has over the years carried a growing proportion of total air cargo. These aircraft generally fly at night and are scheduled for the convenience of shippers.

All-cargo *aircraft* are flown by both all-cargo carriers and some combination carriers. As the name suggests, all-cargo carriers fly all-cargo aircraft exclusively. Federal Express, the small package delivery service, and Flying Tiger are examples of all-cargo carriers. Combination carriers transport both passengers and freight.

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Some, such as Pan American and Northwest, own all-cargo aircraft while others such as Continental, TWA, and most commuter airlines carry only belly cargo.

Approximately 20 percent of air cargo ton-miles is carried by all-cargo carriers, with the rest flown by combination carriers. The combination carriers in turn transport about half their

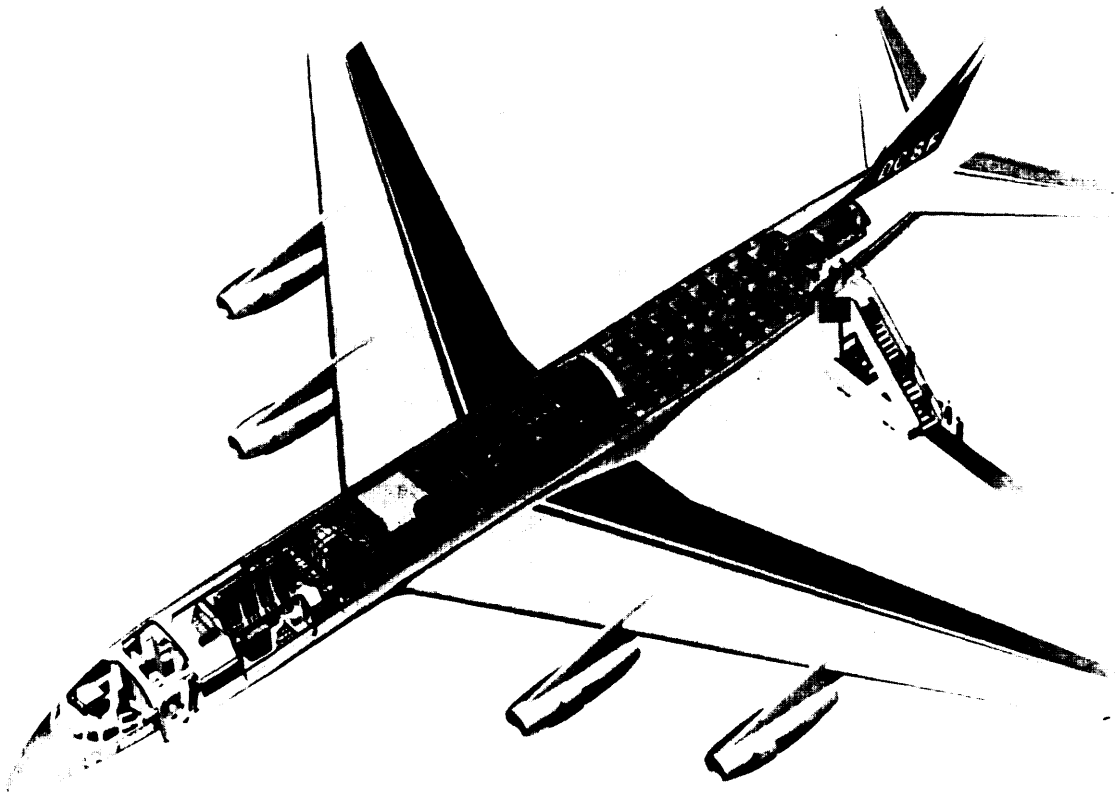


Photo credit McDonnell Douglas

Cutaway layouts of a DC-8F combination cargo and passenger aircraft

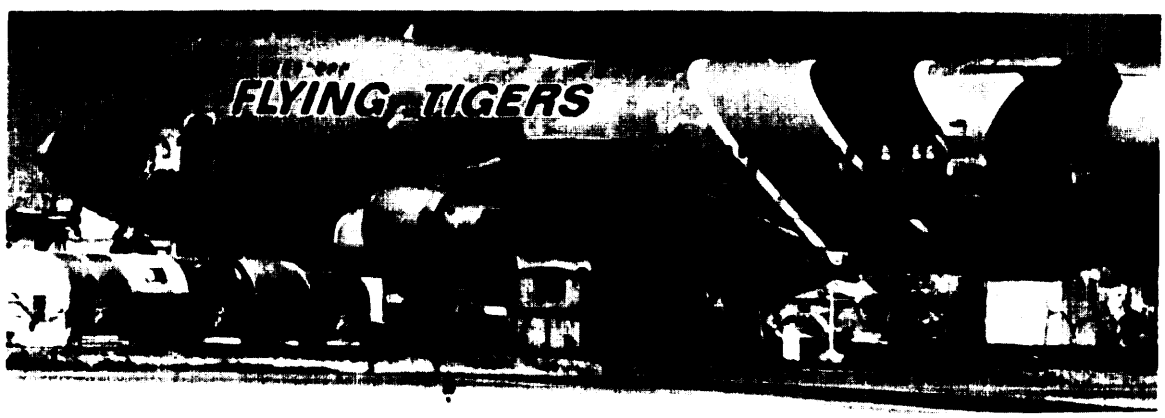


Photo credit Flying Tiger Lines

All cargo aircraft

cargo in the bellies of passenger aircraft and the other half in their own all-cargo aircraft. Load factors are much higher for all-cargo aircraft: in 1978, only 28 percent of available belly cargo space was used, while for all-cargo aircraft the figure was 64 percent.[2]

The air cargo market is not homogeneous, and the differences have resulted in specialization among various carriers. Federal Express, Emery Express (part of Emery Air Freight), Purolator Courier, and others have concentrated on the express or premium-package-delivery market, which is a special segment of the air cargo market. This specialization came about in part because the individual pieces are small, thereby enabling hub operations to be less mechanized than that required for the bulky containers common to general freight. In addition, while the cost per package is moderate, the package is small, so the net result is high revenue per pound. Higher unit revenue makes it possible to cover the higher costs inherent in the use of the small business jets and the small-shipment ground pickup and delivery system typically used to provide this service.

The express package market is the fastest growing segment of air cargo. Federal Express, with over half of the market, reported 67-percent growth from 1978 to 1979,[3] The express business has grown to the point where small jets are often too small, and express carriers are using the freedom granted with deregulation to acquire 727s, 737s, and even DC-1 OS.

Other characteristics of air express are different from general air freight. Contrary to the observation that air cargo is only competitive at long distances, some of these shipments, especially those on commuter passenger flights, can be on the order of 100 or so miles. In this situation air is competitive with ground modes because of the high frequency and convenience of service; the commuter carriers can easily and cheaply offer no-wait movement of goods. The commuters also sometimes offer special pickup and delivery service, as do the specialized express package carriers.

[2] *Air Cargo Statistics, U S Scheduled Airlines Total Industry, 1978 (Washington, D, C,:* Air Transport Association of America, 1979), chart D.

[3] Federal Express Corp., Development of Operation Engineering Section, telephone interview, Feb. 5, 1980.

THE IMPACT OF LONG-HAUL AIRCRAFT

Total world scheduled air cargo traffic, as reported by International Civil Aviation Organization, experienced a sharp build-up in 1947 to 1951 and a growth of 100 percent in the decade of the 1950's.[4]

This 1950's growth coincided with the advent of propeller aircraft capable of long-haul, nonstop domestic and international service. Another surge began in 1958 with the introduction of jet aircraft for passenger operations; their belly capacity was such as to provide an enormous increase in available lift capacity. However, air cargo traffic and revenues most clearly began to respond when jet freighters (B-707F and DC-8F) entered service in 1963.

Turbine-powered aircraft have dominated the commercial U.S. all-cargo system since 1967, pacing the development of the present system. The introduction of the stretched DC-8-63F in 1968 further spurred the growth of all-cargo traffic, particularly in international operations. The DC-8-63F carried over 40 percent of total scheduled U.S. all-cargo traffic by 1974, and then started to lose ground to the B-747F. By 1978, the 747F carried 57 percent of total U.S. all-cargo traffic and 81 percent of U.S. international all-cargo traffic. [5]

[4] *ICA0 Bulletin,* May 1969, table 9, p. 28 and diagram 1, p. 19. ICAO "cargo" does not include mail.

[5] *Operating Results From Scheduled All-Cargo Service for the* 12 Months *Ended June* 30, 1978 (Washington, D. C.: U.S. Civil Aeronautics Board, October 1978), table 4.

COSTS AND PROFITS OF U.S. ALL= CARGO OPERATIONS

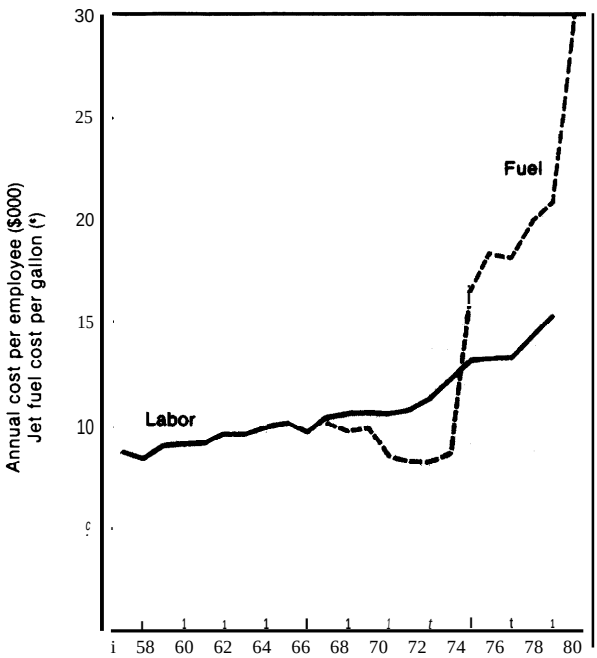
costs

During the 1962-66 period, unit operating costs sharply declined. This coincided with the introduction of turbine-powered all-cargo aircraft (B707Fs and DC-8FS) in 1963 and with a major increase in all-cargo volume and growth rates. Overall U.S. all-cargo aircraft traffic growth rates reached over 55 percent in 1965, with the all-cargo traffic of combination carriers increasing 134 percent. [G]

After 1973, as shown in figure 1, fuel costs nearly quadrupled. Labor costs also increased during the 1970's, but not as rapidly as did fuel costs. Fuel and labor were roughly equal components of total operating costs in 1979; but continued price increases now make fuel the largest single cost element.

[6] *Trends in* Scheduled *A1l-Cargo Service,* 6th ed. (Washington, D. C,: U.S. Civil Aeronautics Board), table 10A, p. 31.

Figure I.— Labor and Fuel Prices for U.S. Trunks
(1967 dollars)



SOURCES: **U.S. Civil Aeronautics Board, Handbook of** *Airline* **Statistics (Washington, D.C., 1973) part VII, table 16;** *Handbook of Airline Statistics Supplement, 1974-7978,* **part VII, table 16, Air Transport Association,** *Air Cost index* **(Washington, D C., 1980), p 7.**

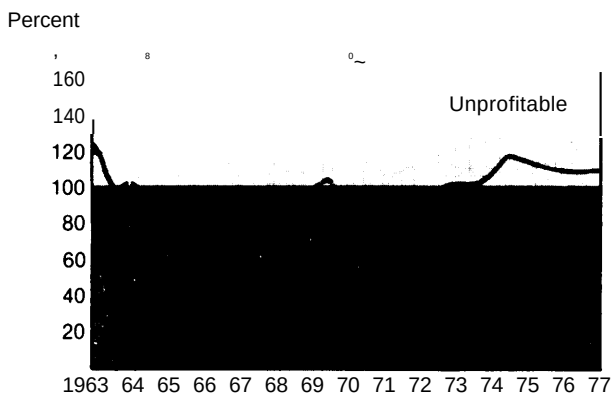
Profits

International air cargo has a greater speed differential over the ocean shipping industry than domestic air cargo has over the domestic trucking industry. This comparative advantage has helped international air cargo operations to show a better operating and profit performance.

As shown in figure 2, the international operations of both combination carriers and all-cargo carriers, produced an operating profit—an excess of revenues over expenses—for a sustained period of time. By contrast, figure 3 shows that in the domestic market combination carriers showed profits for only one brief period (1966-67). The all-cargo carriers did little better: they were profitable in 1966-67 and again in 1972-73. Although they were in a loss position when the data ended (1977), the losses were narrowing.

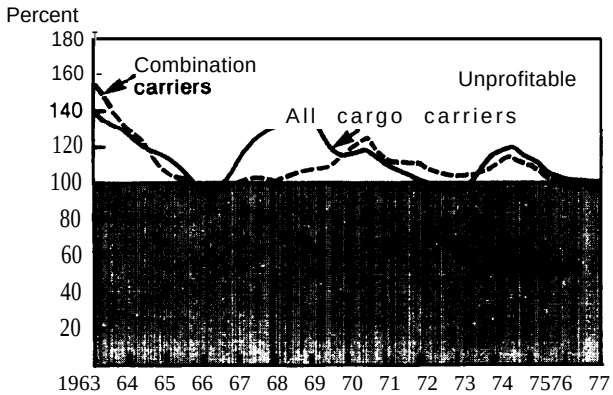
This lackluster performance has caused many all-cargo carriers to drop out or be absorbed by other carriers. Several combination carriers, most recently TWA, have discontinued all-cargo service. Those remaining in the business have done so for a variety of reasons. Combination carriers flying international routes have generally been able to show a profit and the prevailing

Figure 2.—Operating Ratio (operating expense as a percent of operating revenue) Scheduled All-Cargo Service by Carrier Group (international)



SOURCE U S Civil Aeronautics Board, *Trends in Scheduled A// Cargo Service* **6th ed (Washington, D C Government Printing Off Ice, 1977) table 3A, p 8**

Figure 3.—Operating Ratio (operating expense as a percent of operating revenue) Scheduled All-Cargo Service by Carrier (domestic)



SOURCE U S Civil Aeronautics Board *Trends in Scheduled All-Cargo Service,* 6th ed. (Washington D C Government Printing Off Ice, 1977), table 3A, p 8

view is that the prospects for future growth and profitability are good. In the case of all-cargo carriers, Flying Tiger is convinced that the potential for growth is strong in the domestic market and deregulation of both air cargo and trucking opens up the prospect of forging a highly profitable intermodal cargo service.

Federal Express has demonstrated that it is not impossible to reap huge profits from air cargo. Their revenues have grown from $17 million in *1974* to $415 million in 1980. Since the company turned a profit in its third year of operation (1976) earnings have multiplied at the annual rate of **76** percent.

AIR CARGO DEREGULATION

Prior to the passage of the Air Cargo Deregulation Act of 1977 (Public Law 95-163), the Civil Aeronautics Board (CAB) was responsible for the economic regulation of commercial airlines including both the all-cargo and combination carriers. (Commuter carriers operating aircraft with payload under 7,500 lb and airlines operating solely within the borders of one State were exempt from regulation). CAB granted each carrier a "certificate of public convenience and necessity" which specified the points which could be served. CAB was also responsible for setting rates.

The domestic all-cargo industry was in poor financial health in the early to mid-l970's. A series of congressional hearings on air cargo held in *1976* highlighted the precarious state of the industry. [7] Only two certificated all-cargo carriers were operating domestic services, and both had experienced financial difficulties, During the 1970-1976 period, Western, Continental, Delta, and Eastern terminated all-cargo service. American and United reduced prime-time (overnight) air freight service and discontinued freighter operations to a number of cities. In the late 1960's, approximately 50 U.S. cities were receiving domestic all-cargo service. By **1977,** that figure had been cut almost in half. There was a movement away from scheduled service as shippers increasingly turned to contract (charter) carriage or to other modes. [8]

It has been argued that the regulatory system frustrated the growth of the air cargo industry not only by restricting the routes but also by keeping many rates below costs. Carriers claim that prior to deregulation air freight rates had been too low to support the level of prime-time freighter operations which the market demanded. The Domestic Freight Investigation completed by CAB shortly before cargo deregulation concluded that regulated freight rates were fully 42 percent below those justified by estimates of long-run costs during 1976.[9]

On November 9, 1977, President Carter signed Public Law 95-163 deregulating air cargo

[7] See U.S. Congress, House Committee on Public Works and Transpiration, *Reform of the Economic Regulation of Air Carriers,* hearings before the Subcommittee on Aviation, 94th Cong., 1st sess., serial No. 94-55, 1976.

[8] Domestic Air Cargo Deregulatio *A Preliminary Review* (Washington, 13. C.: U.S. Department of Transportation, Office of the Secretary, 1979), p. 7.

[9] *Domestic Air Freight Rates Investigation* order No. 77-8-62, (Washington, D. C.: U.S. Civil Aeronautics Board, 1976), p. 42.

rates and for 1 year limiting free entry into new markets to "grandfathers," that is carriers who had offered all-cargo service in the past (whether certificated or not). This authority was extended by subsequent act to include supplemental (charter) carriers in March 1978.

Rights under the new authority are granted under section 418 of the Federal Aviation Act. Seventy-four carriers received "section 418 certificates. " Most of these were small contract carriers. Trunk airlines receiving certificates included American, Braniff, Pan American, TWA, Northwest, and United.

Industry Response

During the first year under deregulation, Pan American was the only trunk carrier to begin new services. TWA discontinued its all-cargo operations, and there was little activity from other CAB certificated carriers. Six supplemental carriers received section 418 certificates, but only two (Evergreen and Zantop) began new service.

As expected, the all-cargo carriers, Airlift, Flying Tiger, and Seaboard, took advantage of the new route freedom. Flying Tiger has been especially aggressive in expanding the network of cities it serves. In addition, it has acquired both Seaboard and several regional trucking firms.

Federal Express, a commuter airline originally organized to carry express packages and documents in small business jets, has also expanded its route structure since deregulation. For Federal Express, deregulation meant the right to operate larger aircraft. It took advantage of this new freedom by purchasing *B-727s*, B-737s, and DC-1 OS.

In November 1978, 1 year after the passage of the deregulation bill, entry to air cargo operations was no longer confined to airlines which had offered prior service. "Any citizen of the United States" interested in operating an all-cargo airline was allowed to file an application for a section 418 certificate.

By the middle of September 1979, several additional carriers received section 418 certificates under these new open-entry rules. These included Delta, Continental, and Allegheny (now USAIR), together with such major air freight forwarders as Emery and Airborne. Currently over 100 carriers hold section *418* certificates.

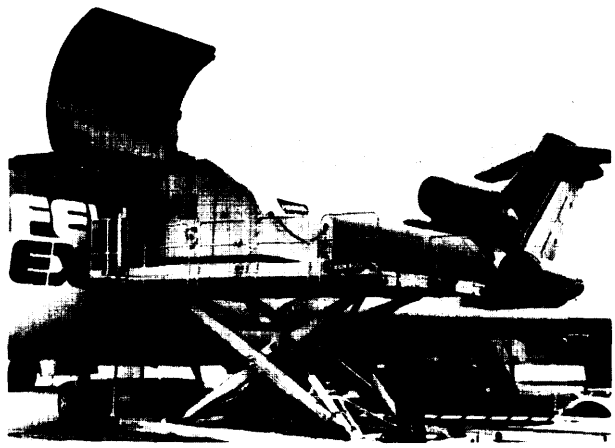


Photo credit Federal Express

There has been no rush of total newcomers to the air freight industry. Because of high startup costs, most of those entering or expanding air cargo service have been established carriers. Several air freight forwarders are furnishing their own cargo service in markets where belly capacity is inadequate. Often they lease aircraft and pilots—an arrangement called a wet lease. The major air freight markets remain dominated by the same carriers as before deregulation, The new entrants are primarily operating in local commuter-type markets.

Impact on Rates and Service

Although some early proponents of cargo deregulation had predicted that rates would drop, there has been an increase in air freight rate levels and premium rates charged for commodities requiring special handling. The Shippers National Freight Claim Council, Inc., has testified that the real increases in rates published between January 1978 and January 1979 range up to 89 percent on minimum charges, 21 percent on 100-lb rates, and 76 percent on 5,000-lb rates.[10] CAB reports, however, that air cargo rates

[10]Shippers National Freight Claim Council, testimony of William J. Angello, Executive Director / General Counsel before the Subcommittee on Aviation, House Committee on Public Works and Transportation, July 25, 1979.

began to increase in the 2 years preceding deregulation and that some carriers have boosted their rates more than others (see table 1).

The rates for some commodities and some markets have increased more than others. Rates for live animals have increased from 110 to *200* percent of general commodity rates. Many carriers have increased priority rates from **130** to **150** percent of the general commodity rates. Rates in short-haul markets have increased more than in long-haul markets. Short-haul markets have long been unprofitable, while the denser long-haul markets are more compatible with freighter aircraft economics.

Published rates, however, do not tell the whole story. Air freight rate levels and premium rates have increased, but carriers have been offering discounted rates—usually for large shipments and particularly on selected daylight flights which are less popular with shippers than "prime-time" (overnight) flights. There have also been some rate cuts in the small package sector as some of the larger carriers attempt to compete with Federal Express in the rapidly growing small package business.

Although CAB has yet to issue a new set of rules governing ratemaking on international routes, it has notified domestic carriers that it does not favor their participation in the International Air Transport Association ratemaking proceedings. Substantial excess cargo capacity over the North Atlantic has led to a rate war, and CAB apparently is not going to intervene.

Some shippers have claimed that air cargo service has been reduced since passage of the Air Cargo Deregulation Act. It is likely, however, that the Airline Deregulation Act of 1978 (Public Law 95-504) at least initially had more effect on cutbacks in belly capacity than did the cargo deregulation act. Immediately following airline deregulation, there was an increase in passengers—and therefore passenger baggage—with a resulting decrease in belly space available for cargo. In 1980, passenger load factors fell, thus freeing up additional belly space. Some of the larger air freight forwarders have begun to work more with charter and commuter carriers which will serve those areas abandoned by trunk airlines. CAB officials of the previous administration admitted that some small communities lost air freight capacity when airlines discontinued combination service. They did not see this as a problem, however, saying that the type of aircraft used in such service typically did not carry much freight and also pointing out that it is rapidly being replaced by truck service owned or leased by air cargo carriers to funnel shipments to nearest air freight traffic hubs.

Table 1 .—General Air Freight Rate Increases for Selected Carriers 1975-80

	Carriers operating freighters			Carriers with no freighter operations		
Effective dates	AA	FT	UA	CO	DL	TWA
Jan. 1975	10%	80/0	70/o	—	—	80/0
July/Aug. 1975	10	9	7	7%	60/0	9
Feb. 1976	10	10	8	—	—	9
April 1976	—	—	—	—	6	–
Oct. 1976	10	10	8	—	—	8
Dec. 1976	—	—	—	8	6	1
July 1977	9	9	9	—	—	8
Sept. /Oct. 1977	–	–	–	8	8	–
Nov. 9, 1977	Al	R	CARGO	D	E	R EG U LAT 10 N
Mar./April 1978	10	8	9	–	10	9
Nov. 1978	—	—	—	11	—	—
Jan./Feb. 1979	9	8	9	–	5	–
May 1979	–	5	—	–	—	–
June 1979.	5	7	—	–	—	—
Aug,lSept. 1979	7	–	12	–	—	8
oct. 1979	–	4	–	10	15	–
Nov./Dee. 1979.	5	5	5	—	—	5
Jan./Feb. l98O	—	5	5	10	–	–
Mar./April l98O	10	5	2	–	10	12
June/July 1980.	10	10	10	10	—	10
Sept. /Oct. 1980	10	7	7	–	–	–

Carrier codes. AA American CO Continental
FT Flying Tiger DL Delta
UA United TW TWA

[a]TwA terminated freighter operations m 1978

NOTE. These percentages represent in some cases simple "across. the-board" Increases by the amount Indicated, and in others a weighted average of Increases of varying amounts for different categories of rates (i e , changes in the rate structure Itself)

SOURCE. Civil Aeronautics Board

THE PRESENT STATE OF THE INDUSTRY

It is not possible to put together a complete picture of the present state of the cargo industry. Following deregulation, CAB reduced, and in some cases, eliminated reporting requirements, leaving both the Government and the public with no way to monitor the performance of the industry, The Air Freight Forwarders Association has requested that CAB reestablish some "minimal" reporting requirements for forwarders and airlines that would at least provide data on where freight is moving and where traffic is developing. There is concern as well that this lack of data may permit organizations and individuals to use fragmentary information to support their particular positions.

CAB testified before the House Subcommittee on Aviation in July 1979 that the all-cargo carriers increased their total revenue ton-miles of shipments by approximately 26 percent during 1978 compared to an Ii-percent growth during 1977. Flying Tiger increased its domestic revenue ton-miles over 33 percent, but a large part of this increase was due to a reclassification of some Alaska traffic (enroute between the United States and Japan) as domestic.

Commuter airlines increased their total cargo tonnage by 48 percent during 1978, compared to 12 percent in 1977. ' [11] In this category, Federal Express has expanded its total shipments by *67* percent in 1979 as compared to 38 percent in 1978, and 15 percent in **1977.2**

Total freight revenue ton-miles of the trunk combination carriers increased only 1.1 percent in 1978 compared to 7.0 percent in 1977. All-cargo traffic of the trunk carriers increased 2.0 percent in 1978.13 Data from the Air Transport Association show that freight revenues for the scheduled carriers increased 14.5 percent in 1980, but traffic (ton-miles) decreased 1.7 percent, [14] reflecting both the rate increases and the impact of the recession.

[11] U.S. Civil Aeronautics Board, testimony before the Subcommittee on Aviation, House Committee on Public Works and Transportation, July 25, 1979, p. 37.

[12] Fecleral Express Corp., Development of Operation Engineering Section, telephone interview., Feb. 5, 1980.

[13] *Aviation Daily Dec.* 5, 1979.

[14] *4A It Cargo Statistics 1980* (Washington, D.C Air Transport Association, June 1981).

FORECASTED INDUSTRY GROWTH

Available forecasts of long-term air cargo growth vary from about 8 to 11 percent for both U.S. domestic and U.S. international traffic. Total free world growth was estimated by one forecaster at 12 percent, and by another to be between 7 and 9 percent. All estimates were made before the sharp increase in fuel prices that occurred in late 1979. While air cargo market forecasts in the past have tended to be overoptimistic, it should be noted that in 1972 few expected the phenomenal rate of growth that subsequently occurred in the express package delivery business.

MAJOR CONCERNS OF CARGO CARRIERS

The major concerns of the air cargo industry today are similar to the concerns of the air passenger industry. Fuel costs, though having recently stabilized, still play a major role in determining which markets to enter or exit.

Another concern is that airport space is becoming increasingly tight, especially for cargo carries. As will be discussed in chapter 4, the construction of major new airports appears unlikely in the near future, but some alternatives

are available for making better use of existing facilities.

Also, carriers will have to bring their fleets into compliance with Federal Aviation Administration noise standards under new noise legislation. Communities are continuing to exert pressures against aircraft noise, resulting in increased attempts to reduce noise impacts by imposing operating restrictions on carriers. Night curfews are still not common in the United States, but if adopted they could severely impact cargo operations.

Another industry concern relates to actions of some foreign government policies to protect their national airline from U.S. competition. Some industry spokesmen state that a concerted U.S. Government effort is needed to ensure that U.S. carriers are treated fairly overseas.

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