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OBJECTIVES

Editorial Policy. The objective of The Journal of Transportation Management is to report and disseminate new information and new techniques to improve and advance the management of transportation. Articles in The Journal of Transportation Management are of interest to both transportation practitioners and academics. As such, they report topics relevant to the practice of transportation as a profession, to professionals.

Articles relating to carrier management, modal and intermodal transportation of goods and people in both the domestic and international areas are accepted. Topics from allied areas such as public policy, logistics, purchasing and distribution are also acceptable if they are specifically related to the objective stated above. Because articles are to have a real-world orientation, those which are theoretical in content with no application for practitioners are inappropriate for The Journal of Transportation Management.

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PREFACE

After years of planning and preparation, Delta Nu Alpha Transportation Fraternity has published the Journal of Transportation Management. The Journal's focus is on transportation and transportation related subjects with a practitioner oriented flavor.

There are too many people to thank individually. However, we offer a special thanks to those members of DNA who have supported our belief that this Journal is an important educational tool for both the practitioner and academician. Your encouragement and your financial support is appreciated. DNA's elected officers, who had the foresight and patience to bring this project to fruition, must also be recognized.

We firmly believe that education in our industry can be accomplished in a variety of methods such as seminars, workshops, conferences, and newsletters. Delta Nu Alpha Transportation Fraternity is proving yet another important method to meet our educational objectives - The Journal of Transportation Management.

David J. Bloomberg, Ph.D.
Jerry R. Foster, Ph.D.

Co-Editors,
Journal of Transportation Management

LINER SHIPPING AND THE U.S. INTERNATIONAL TRADES

by
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INTRODUCTION

Over the past few years liner shipping has undergone a number of changes which have been particularly important in the U.S. international trades. These changes have affected shipping lines, shippers, consignees, and intermediaries, who have had to modify the way in which they operate in order to be successful. This article will discuss some of the more important changes that have taken place, the impact that they have had on the industry, and what this means for shipping lines and their customers.¹

The international liner industry serving the U.S. consists of two types of shipping lines - conference lines and independents, with both regulated economically by the Federal Maritime Commission (FMC). Conference lines belong to voluntary organizations, whose members jointly agree on the rates to be charged and the services to be provided by member lines, and may include the determination of sailing schedules and ports of call.² A number of these Conferences are found in the U.S. trades and are given anti-trust immunity to make these joint decisions regarding rates and service. Conferences in the U.S. trades are required to be "open," which means that any line wishing to join cannot be arbitrarily denied membership. Independent lines operate outside the conference system making management decisions on an individual basis and frequently competing against the conference lines.

Among the recent and continuing changes that have affected the international liner industry in the U.S. trades are:

- * implementation of the Shipping Act of 1984³;
- * passage of the Omnibus Trade and Competitiveness Act of 1988⁴;
- * increased development and sophistication of intermodal services;
- * evolution of round-the-world services;
- * overcapacity on many U.S. international trade routes.

These changes represent both problems and opportunities for both shipping lines and their customers. Those who adapt to these changes will be successful. The following sections highlight the most prominent features of these changes and the impacts that they have had on the U.S. international liner trades.

RECENT U.S. SHIPPING LEGISLATION

Shipping Act of 1984

The Shipping Act of 1984 has resulted in a number of major changes in U.S. international liner shipping. This legislation took a somewhat different direction than did most other contemporary legislation that dealt with economic regulation of transportation. While nearly all other legislation of the last decade resulted in some form of deregulation, the Shipping Act of 1984 seemed to increase liner shipping's exemption from anti-trust considerations.⁵ At the same time, however, the power of shippers in relation to liner conference operators was also increased.

Since the Shipping Act of 1984 is quite comprehensive, only the most relevant provisions will be dealt with here.⁶ These are:

- * A clear authority for conferences and their shipping line members to offer intermodal rates and services;
- * The right for individual conference members to take independent action on 10-days' notice on any rate or service action required to be filed in a tariff;
- * Service contracts with specific rate schedules and service guarantees may be negotiated in which a shipper commits a minimum amount of cargo over a specified period of time, with independent action on service contracts only available to conference member lines when the conference permits;
- * Carriers or conferences are prohibited from refusing to deal with shipper associations.

The above provisions created a number of changes in the relationships between shipping lines and their customers. The first three provisions listed above resulted in much more flexibility in the negotiation of rate and service changes on the part of the liner conferences and their individual member lines serving the United States.

The provision of the Act which permitted conferences and their members to offer intermodal service has been quite important, because there had been legal questions about conference authority in this area. Prior to 1984, shipping line conferences were hesitant to establish intermodal services for fear of violating U.S. antitrust law. As a result of the Shipping Act's intermodal provisions, the number of intermodal services have increased dramatically, as discussed below. In order to preserve the prevailing environment of domestic transportation regulation, however, the Act specified that overland rates and terms of service by rail or highway were required to be individually negotiated between a shipping line and an overland carrier.

The use of service contracts between shippers and conferences/individual shipping lines has become an important result of the Shipping Act. A service contract provides a vehicle for negotiating transportation arrangements such as rates, terms of service, and shipper commitment of cargo between the two respective parties. Generally, shippers with large volumes of cargo and/or regularly scheduled shipment needs are in the best position to negotiate these contacts with shipping lines. In some cases, service contracts are possibly dominating scheduled liner services such as in the Japan to U.S. trades, where it is estimated that more than 80 percent of liner cargo moves under service contracts.⁷

The Act's inclusion of independent action on tariff rates by individual conference lines has also provided a method for increasing the degree of competition in the U.S. international liner trades. Under these provisions, any conference line can establish their own rate separate from one filed in a conference's tariff on 10-days' notice. This situation will often lead to individual shipping lines filing rates under independent action that are below the conference's tariff. This can lead to lower transportation costs for those shippers whose cargo moves under independent action rates. The use of independent action has grown over the last couple of years. As an example, in April, 1988, the liner members of the Asia North America Eastbound Rate Agreement took over 2,400 independent actions, more than in all of 1987.⁸

Decisions by the FMC within the last year, however, are beginning to place limits on individual liner flexibility for determining rates and services under the Act.⁹ The FMC has banned the use of changes to service contract rates based on verbal quotes a shipper may have received, known in the industry as "Crazy Eddies."¹⁰ Instead, the only justification for modification to a service contract rate is the publication elsewhere of a rate in a tariff or other service contract below the existing contract rate. An additional pricing constraint on shipping lines under consideration by the FMC is to

bar rate changes from a published tariff after cargo is in transit, known as pocket rates, in order to prevent undermining of filed tariff rates.

Another decision by the FMC allows conferences to ban independent action by their members on loyalty contracts whereby a lower rate may be available to a shipper who makes a specific minimum cargo commitment. Previously, mandatory independent action was available to individual conference lines on loyalty contracts. Mandatory independent action still exists on normal rate or service items filed in a conference's tariff which are available to all shippers. The above actions and decisions, if fully implemented, will probably result in increased rates paid by some shippers who are using conference lines for their liner shipping needs.

Omnibus Trade and Competitiveness Act of 1988

This recent international trade bill deals not only with general trade issues but also specifically with discrimination by foreign governments against U.S. liner operators. With regard to shipping, the intent of the legislation is to increase the power of the FMC to deal with unfair conditions affecting U.S. flag shipping.¹¹ The legislation changes the regulation of liner shipping in areas such as the inclusion of intermodal activities as subject to investigation and remedy, a wider range of penalties available to the FMC, a shortening in the length of an investigation of alleged discrimination, and subpoena power for the FMC to obtain critical information.¹²

As a result of the powers given to it by the 1988 Act, the FMC has proposed new sanctions against foreign lines (in addition to those previously available) to include:

- * limits on sailings or volume or type of cargo carried to U.S. ports;

- * suspension of agreements relating to preferential terminal arrangements;
- * space chartering, or pooling of cargo or revenues in intermodal service;
- * fines of up to \$1 million per voyage;
- * requests to the U.S. Customs Service and/or Coast Guard to deny vessel clearance or entry.¹³

The proposed sanctions, which may be adopted in their entirety or modified before final implementation, will potentially give the FMC much greater power to control unfair shipping practices.

CURRENT LINER SERVICE DEVELOPMENTS

Intermodalism

Intermodal liner services have continued to grow over the last few years, not only in the U.S. international trades but on other liner service routes as well.¹⁴ Intermodal service in the U.S. international trades today consists of three basic forms as follows:

- * microbridge, in which overland transportation between an interior point and a port is coordinated with ocean transportation;
- * minibridge, in which a segment of an all-water ocean transportation movement is replaced by an overland movement to/from an intermediate port;
- * landbridge, in which coordinated land transportation is substituted for a mid-portion of an all-water ocean transportation movement.¹⁵

In order to develop an efficient and effective intermodal service, a number of key elements must be in place. A shipping line must have coordinated services with carriers in one or more land-based modes of transportation. In the U.S., intermodal ocean service is available in coordination with both rail and highway carriers to/from many interior points. The ocean carrier must possess an adequate pool of equipment in the form of containers, chassis, container cranes, and container-handling equipment. A smooth flow with minimal delays must be accomplished in vessel discharge and loading as well as in cargo flow in the terminal area. Finally, a computerized control system is critical in the functioning of the intermodal system to ensure a high level of service.

Today, many shipping lines in the U.S. international liner trades offer intermodal service. Although pioneered by carriers such as American President Lines (APL) and Sea-Land Services (Sea-Land), a number of foreign lines also offer similar types of service. As an example, APL provides an intermodal service which includes a computerized information system that includes single transaction capability and integrated rail and highway transportation with a network of over 130 terminals throughout North America.¹⁶ Sea-Land also offers a highly developed intermodal system which includes overland rail and trucking services to much of the continental United States.¹⁷

A key component of intermodal liner service in the U.S. trades is the development of intermodal rail, and to some extent, trucking services. Rail service, known as container on flat car (COFC), is used for longer distance overland movements while trucking is generally used for shorter distance movements. In some cases, the intermodal rail service is operated by a shipping line with the actual line-haul rail service provided by contract between the shipping line and a rail carrier. In other cases a railroad may provide the service which is available to any shipping line that wishes to use the service. The railcars used in the service can be owned by either the shipping line or the railroad.

One of the most recent developments in intermodal rail service is the use of double-stack trains where the containers are carried two high. These services result in lower transportation costs because more containers can be carried with a reduction in the weight of the rail cars and only a small increase in the number of engines and rail crew size. The growth of these services has been rapid (see Table 1); thirty weekly eastbound double-stack services in 1986 increased to ninety-six in 1987. The weekly TEU capacity was over 38,000 in 1987, up from 18,000 in 1986.¹⁸ It has been estimated that in 1987 double-stack cars accounted for approximately thirty-five percent of all container miles carried by rail, up from virtually zero in 1983.¹⁹

The two largest double-stack lines for both frequency and capacity were American President Lines and Sea-Land. Nearly every other double-stack service was operated by a foreign-flag line or other type of carrier. The origins and destinations for these services are found in Table 2. Los Angeles, Seattle, and Long Beach are the principal eastbound ports on the U.S. west coast for double-stack service and the first two show the largest growth between 1986 and 1987. The principal destinations are Chicago and New York, both with large growth between the two years. In nearly every case, the double-stack trains serving New York also provide service to Chicago.

As intermodalism has grown, the nature of the service provided has also changed. The size of containers has been growing with lengths increasing from forty feet to forty-five and then to forty-eight feet. Container heights have increased from 8.0 feet to 8.5 and 9.5 feet. Most recently, containers of fifty-three feet in length have been introduced by APL. Some of the new containers introduced by APL and others have been initially intended for domestic service only. Thus, the intermodal liner services are no longer confined to just international transportation but are also extending the overland portion of the transportation movement to also include the domestic market.

TABLE 1
EASTBOUND DOUBLE - STACK TRAINS FROM
U.S. WEST COAST BY CARRIER

Carrier	1987		1986	
	Weekly Frequency	TEU Capacity	Weekly Frequency	TEU Capacity
American President Lines	17	8,830	8	3,480
Sea-Land	8	3,920	7	2,800
K Line	4	1,240	1	400
Maersk	2	1,120	1	560
NYK	5	1,060	1	400
OOCL	2	660	1	360
MOL	1	480	1	400
Evergreen	2	400	---	---
Hanjin	1	400	---	---
HJCL	1	400	---	---
YS Line	2	260	---	---
J Line	2	200	---	---
NOL	1	200	---	---
U.S. Lines	---	---	2	700
VO-MTO's ^a	<u>48</u>	<u>19,000</u>	<u>8</u>	<u>9,110</u>
Totals	96	38,170	30	18,210

^aVessel operating multimodal transport operators

Sources: Adapted from Review Of Maritime Transport 1987 and 1986.

TABLE 2
EASTBOUND DOUBLE - STACK TRAINS BY ORIGIN
AND DESTINATION

<u>West Coast Origin</u>	1987 ^a		1986 ^a	
	<u>Weekly Frequency</u>	<u>TEU Capacity</u>	<u>Weekly Frequency</u>	<u>TEU Capacity</u>
Long Beach	9	3,700	6	2,300
Los Angeles	22	8,600	7	2,800
Oakland	1	560	1	400
Portland	1	300	---	---
Seattle	9	3,320	2	1,080
 <u>Destination^b</u>				
Chicago	35	14,150	17	7,000
Cincinnati	2	560	1	200
Columbus	5	1,360	1	400
Memphis	7	2,480	1	400
New York	2	7,780	8	3,500
Houston/Dallas	7	2,020	2	760
New Orleans	1	460	2	760
Atlanta	8	3,900	2	700

^aVessel operating multimodal transport operators (VO-MTO's) not included.

^bMany stack trains operate to more than one destination; frequencies and capacities cannot be summed.

Sources: Adapted from Review Of Maritime Transport 1987 and 1986.

In order to tie an intermodal and international transportation system together, many shipping companies have implemented sophisticated computer systems for management and control. As with intermodalism itself, APL and Sea-Land have been the innovators for these computerized systems with Eagle Data Access and Sea-Trac, respectively. These computer systems, and others like them, provide for shipper/consignee access to electronic booking and tracking of intermodal cargo, vessel schedules, container equipment access, and vessel space status as well as computer generation of required documentation,²⁰ all of which benefits a line's customers. More recently, Sea-Land has developed a system known as Sea-Pay in which the freight billing and payment are handled electronically.²¹

Round-the-World Liner Service

A fairly recent development is the reimplementation of round-the-world (RTW) liner service, in which vessels sail in only one direction rather than on a route serving one geographic region. Only a limited number of ports are served with cargo from outlying areas brought to the load center ports by either feeder vessels or overland carriers. Overland transportation may be an intermodal service or a more traditional non-integrated service. Although a recent development, RTW service existed previously in the more traditional liner trades. For example, APL had such service up until the late 1970's, although that service did not match the current services since it handled primarily break-bulk cargoes.

The innovators in the new RTW services were Evergreen Shipping of Taiwan and U.S. Lines of the United States.²² Both services started in 1984 and were gradually brought up to a sailing schedule of weekly service from the selected load center ports. Evergreen started and continues to operate their service in both eastbound and westbound directions between the Far East, North America, Europe, the Mediterranean, and the Mideast. U.S. Lines'

service was only in an eastbound direction covering the same basic service areas as Evergreen. In late 1986, U.S. Lines filed for bankruptcy and the vessels of the RTW service were sold.

More recently, other lines such as Senator Line have started RTW service while Evergreen has expanded its service. In most cases these services use large vessels with limited numbers of ports of call. RTW services have generally required large, regular volumes of cargo in order to be profitable, given the high levels of vessel, operating, and start-up costs. Since these services may not provide as high a level of service as those of intermodal carriers, the rates a RTW liner service can charge are often lower than those for intermodal service.²³ The success that Evergreen in RTW service can partially be explained by the fact that they offer intermodal service in conjunction with the RTW service. The number of lines offering RTW service continues to be much more limited than those offering intermodal services, indicating that there may not be a high level of shipper demand for this service.

Vessel Size

Containerization in the liner trades led to the development of new vessel designs in order to take advantage of the new transportation technology. The initial vessels, however, were often small and in many cases converted from existing vessels not designed for containerization, thus creating inefficient container ships. More recently, however, container vessels have increased in technological sophistication to better use the technology of containerization as well as the more recent intermodal liner services. The increased sophistication has put pressure on shipping lines to reduce operating costs which has led to an escalation of container ship sizes.²⁴

Newer containerships are now routinely above 2,500 TEU (twenty-foot equivalent length containers) capacity with lengths of 800-900 feet and more. As of mid-1988, nearly forty percent of the world container fleet was of more than 2,500 TEU capacity, while ninety-two percent of the capacity to be added by mid-1990 is of this size.²⁵ Container vessels on order or placed in service since the beginning of 1987 or currently out for bid will add approximately 397,000 TEU to the world fleet.²⁶ Characteristics of some recent or projected containerships are found in Table 3. Of particular note is the APL C-10 class vessel with a beam of over 129 feet. This design represents a break with tradition since these vessels cannot transit the Panama Canal where the maximum beam is 106 feet. All other existing vessels listed in the table are able to fit through the Panama Canal although many of them do not actually transit the canal.

The increasing vessel sizes place a number of constraints on containerized liner service systems. Additional investments are required to acquire new and larger vessels and containers, improve and enlarge port facilities, purchase new container cranes and other handling equipment, and improve the sea/overland transportation interface. The large vessel sizes create more inflexibility in how these container vessels are used. The number of trade routes where these vessels can call are limited by available cargo volumes and length of route. Additionally, many ports cannot be used due to channel, pier, and container crane constraints. The new APL ships described earlier are not only confined to the Pacific but are able to call at only eight ports throughout their area of service.²⁷ As a result, increased reliance must be placed on feeder services to the load center ports, either via smaller containerships or overland modes. These feeder services are an important consideration in the functioning of intermodal and round-the-world liner services previously described.

Overcapacity

The escalating sizes of vessels, particularly for containerships discussed in the previous section, have helped to create an oversupply of shipping service in the liner trades. In the world general cargo and unitized fleets, which include container, break-bulk, and other types of vessels, the overcapacity in deadweight was on the order of six percent.²⁸ This represented a decline for the general cargo fleet and the same level for the unitized fleet when compared with the early to mid 1970's. Since a relatively large percentage of break-bulk and containerized cargoes are of low density, deadweight may not be a good measure for evaluating overcapacity.

A previous paper reported estimates of containership overcapacity in the Trans-Pacific and Trans-Atlantic container trades, with overall load factors for TEU of seventy-six and seventy percent respectively in 1986, representing declines from 1983 figures.²⁹ A more recent report estimates that the load factors in both trades are nearly the same or worse in the 1986-87 time period, being approximately seventy percent for both trades, as found in Table 4.³⁰ The Europe/Far East container trades are estimated to have a higher load factor of about eighty-three percent. This data indicates that not only is the overcapacity problem persisting but it is somewhat growing worse, at least for the U.S. containerized liner trades.

The worsening overcapacity problem in the U.S. liner trades creates a number of difficulties for shipping lines. One of these is increased competition among the lines in these trades, even when conferences are found on a particular trade route. Since conferences in the U.S. liner trades are required to be open, a shipping line can withdraw from the conference if constrained too much knowing that it can easily rejoin the conference if it desires. As a result, downward pressure is often exerted on the rates by independent liner operators and the threat of conference members to become independents.

TABLE 3
SELECTED CHARACTERISTICS OF LARGE CONTAINERSHIPS

Characteristic	Sea-land	APL		Evergreen	
	Atlantic ^a	C-9	C-10	G-Class	New
Length, ft.	950	860	903	750	N/A
Beam, ft.	106	106	129.2	105.6	N/A
Draft, ft.	29.5	35	41	32	N/A
Speed, knots	19.1	25	24.2	19.5	N/A
Capacity, TEU ^b	3,400	2,500	4,300	2,728	4,000

^aFormer New York class vessels of U.S. Lines; vessel TEU capacity downsized from 4,482.

^bTEU = twenty-foot equivalent units.

Sources: Marine Engineering/Log, Containerisation International, American Shipper.

This inability to implement or sustain rate increases is exactly what has often happened in the U.S. liner trades.³¹ Liner shipping rates of the U.S. Atlantic/Northern Europe Conference declined approximately fourteen percent between 1984 and 1986. The twenty-five percent decline of liner freight rates to parts of Europe between 1985 and 1987, including both U.S. and non-U.S. trades, is a further indication of this downward rate pressure. Liner rates in the eastbound Trans-Pacific trades are estimated to have declined by

ten percent or more during 1988. As a result, a number of conferences and shipping lines have found it difficult to increase operating revenues, even in the face of escalating operating costs and the need to purchase additional vessels and equipment to remain competitive.

Another issue facing shipping lines due to overcapacity is the use of rebates, where a shipping line makes payments to customers who use their liner service. This effectively reduces the transportation rate charged below that filed in the legal tariff. Although rebating is a common practice in the world liner trades, Federal law prohibits such actions by shipping lines in the U.S. international liner trades. Previous enforcement action was undertaken by the FMC in the Trans-Atlantic trades and similar action is now underway in the

TABLE 4
SELECTED CHARACTERISTICS OF LARGE CONTAINERSHIPS

<u>Trade Route</u>	<u>Estimated Annual Cargo TEU, mm's</u>	<u>Estimated Annual Capacity TEU, mm's</u>	<u>Load Factor (Percent)</u>
Trans-Pacific	4.4	6.3	70%
Trans-Atlantic	2.8	4.0	70%
Europe/Far East	2.0	2.4	83%

Sources: Adapted from Review of Maritime Transport 1987.

Trans-Pacific trades.³² One line was recently fined \$2.5 million and further enforcement action is expected. Liner firms find it difficult to resist using rebates to encourage cargo bookings given the current overcapacity, but the rebates are illegal nonetheless.

The current overcapacity has thus created financial difficulties for some shipping lines, both foreign and U.S.³³ As an example, U.S. Lines had to declare Chapter 11 bankruptcy in late 1986 because of difficulties with its RTW service and will apparently not recover from this situation. Not only were the 11 rates too low and vessel capacity too large, but U.S. Lines was not carrying enough high rated cargo. Lykes Line and Hapag-Lloyd also withdrew from the Trans-Pacific trades while Showa Line of Japan withdrew in early 1988 from nearly all liner trades including the Trans-Pacific. Financial difficulties are also being experienced on other trade routes due to the overcapacity problem.

ANALYSIS

The environment for liner shipping in the U.S. international trades today is one that potentially creates both problems and opportunities for all concerned. Whether a firm is a shipping line, shipper, consignee, or intermediary, its operations have been affected. The reaction to the current environment and the anticipation of the future environment will help to determine a firm's success or failure. The following sections examine the impacts on and reactions of shipping lines and their customers.

Shipping Line Effects

The effects of the environment on liner shipping are numerous. The Shipping Act of 1984 determines to some extent the nature and scope of these effects. The three principal components of intermodal authority, mandatory independent action, and service contracts

discussed earlier have resulted in changes in the industry that have, in some cases, worsened the effects of the current overcapacity problem. Mandatory independent action and service contracts, in particular, have been used by individual shipping lines to lower the rates charged for international liner transportation. As a result, shipping line profitability has eroded for many lines since lower rates don't always result in increased total revenue and/or profitability.

A number of surveys and meetings evaluating the Shipping Act have taken place since its implementation nearly five years ago.³⁴ These have found major disagreements between how shipping lines view the Act as compared to shippers (covered below). Shipping lines appear to have the most concerns about the mandatory independent action for conferences required by the Act, which has generally led to a depressed level of rates. Shipping lines have also expressed reservations about service contracts, which have often resulted in lower rates than might otherwise have been obtained.

Shipping lines, however, have positive views about other portions of the Act as well. Principal among these are the streamlined process to implement new rates and services, increased anti-trust immunity, and the ability to offer intermodal rates and services. This last view is reinforced by the large growth in intermodal services since the passage of the Act in 1984. Overall, the overcapacity that exists in the liner trades accounts to some degree for the carrier dissatisfaction. In a market with a better balance between supply and demand, there would be much less pressure to lower rates through independent action or service contracts.

The liner conferences and individual lines in the U.S. trades have instituted actions to address the overcapacity issue and its impacts. Although overcapacity affects most liner trades in the world, it appears to be more acute in the U.S. trades because of the size of the gap between supply of capacity and cargo available. One way in which this situation can be addressed is for liner conferences

to rationalize (reduce) service among their members in order to decrease total capacity. For example, conference and independent shipping lines in the trans-Pacific trades have recently agreed to cut eastbound container capacity.³⁵ The result of this rationalization may be the increase of shipping rates in both directions on the trans-Pacific trades and reduced numbers of independent actions by individual lines.

Another strategy to cope with overcapacity has been to form joint services through what are known as space charters. These services use the ships of one or more lines, with space on each vessel allocated to two or more shipping lines, even though the vessel may be operated by a single liner firm. A space charter agreement allows two or more lines to participate on a liner route without each line having to operate its own vessels, thus easing the overcapacity situation. Space charters have been concluded, among others, by Sea-Land with Nedlloyd and Trans Freight Lines and Atlantic Container Line with Wilhelmsen and Hapag-Lloyd in the trans-Atlantic trades, and Barber Blue Sea with Norwegian Specialized Auto Carriers in the trans-Pacific trades.³⁶ Another possibility is the merger of shipping lines in order to create a more efficient carrier, such as the proposed merger of Lykes with Farrell Lines.³⁷

The continued evolution of liner service appears to be toward a greater offering of intermodal service, as opposed to more traditional liner service or RTW service. Although RTW service has expanded somewhat, the bankruptcy of U.S. Lines removed a major competitor from this market. Evergreen has enjoyed success in this segment of international liner shipping but few other lines have implemented similar services. Traditional liner services, which handle break-bulk or general cargo, are still quite viable in the less developed U.S. international trades such as those with much of Africa. The liner trades between industrialized nations will probably be dominated even more by container and intermodal shipping in the years to come.

Intermodal service, as discussed previously, has grown dramatically. Part of this is undoubtedly due to the freedom granted by the Shipping Act of 1984 for conferences to offer such service. These services have expanded to include multiple overland modes, the stack-trains described earlier, domestic transportation service, and well-developed computer information systems to support intermodalism and are now marketed as a value-added service.³⁸ The stack-train services, through their expansion to domestic transportation, are apparently beginning to replace the trailer on flat car (TOFC) intermodal services offered by U.S. railroads. More and more shipping lines are expanding the scope of intermodal service they can directly offer, as is found with APL and Evergreen. Sea-Land has taken this one step further since, through their ownership by CSX, they are often able to offer a complete intermodal movement for which CSX has complete responsibility.

Shipping Line Customer Effects

As with the shipping lines, shippers have also been dramatically affected by the Shipping Act of 1984. In the case of shippers, the effects of the Act have, for the most part, been quite positive.³⁹ While shipping lines find independent action and service contracts a barrier to achieving financial success, just the opposite is true of shippers primarily because rate reductions through both means have been quite prevalent in recent years. Not all shippers have necessarily benefited as a result of service contracts and independent action, since some are not large enough to enjoy the deepest rate reductions.

There have been a number of specific benefits enjoyed by shippers in addition to the reduced transportation costs resulting from reduced rate levels. Among these benefits are increased intermodal services, faster transit times, more sailings, and greater choices between the origin/destination gateways used.⁴⁰ Many of these benefits have resulted from the increased intermodal services

since these services must emphasize speed, frequency, reliability, and geographic scope of coverage in order to attract shipper cargo. Thus, there have been a range of benefits to shippers as a result of the Shipping Act.

The overcapacity in international liner shipping today has generally benefitted shippers who use these services. Overcapacity, with the resulting pressure to decrease rates, has allowed shippers the opportunity to negotiate favorable shipping rates. This has been done through service contracts or through conference rate levels and independent action on the part of individual shipping lines. Concurrently, shipping lines have had to be responsive to the full range of needs of shippers, thus enabling many shippers to receive higher levels of service. The lower levels of rates have created some uncertainties with regard to the availability of particular shipping services when a line drops a particular service.⁴¹

The range of liner service available to shippers today is much greater than it was only a few years ago. Shippers can now choose among traditional break-bulk, containerized, RTW, and intermodal services. In order to make these choices, however, a shipper needs to better understand the transportation decision environment. Thus, to make a good decision about what carrier and service to use, the shipper may have to make a total cost analysis of the transportation alternatives. For a high value or perishable cargo, a reliable intermodal service can potentially offer the lowest total logistics cost,⁴² even though the transportation cost may be higher than other liner alternatives. A shipper of lower value non-perishable goods, however, might be better to choose a more traditional, containerized, or RTW liner service offering lower transportation and total logistics cost.

Although an intermodal service may offer a higher level of service, it does have some potential drawbacks for a shipper. One of these is that the shipper will no longer have control over the selection of individual overland carriers. The intermodal shipping

line will, in most cases, have already selected the inland carriers to use for its intermodal service. The heavy reliance on rail transportation could lead to increased loss and damage when compared with the use of a highway carrier for overland transportation. These considerations will often be outweighed by the advantages to intermodal shipping.

Other types of liner service also have potential drawbacks as well. The non-intermodal services require a shipper to make a wider range of transportation decisions regarding type of service to use, which carriers to select, how to ensure efficient cargo transfer from one carrier to another, and what routes to use. Additionally, the amount of documentation will generally be much greater for the non-intermodal services. For shippers who are not well versed in international transportation, intermodal service offers a way to ship cargo internationally without having to necessarily acquire the expertise in-house. Thus, intermodal liner service can be advantageous to not only shippers of high value cargo but to others as well.

CONCLUSIONS

The dynamic environment both within and outside liner shipping in the U.S. international trades has caused many changes. Regulatory changes have created an environment of greater competition in liner shipping. The Shipping Act of 1984 with its provisions for intermodal service, independent action, and service contracts, created stronger competition. Recent rulings or pending actions by the FMC may, however, reduce carrier pricing flexibility with resulting rate increases. The outcome of a formal review of the Act will take place during 1989, and the implementation of any subsequent recommendations cannot be determined at the present time. Likewise, the actual role of the Omnibus Trade and Competitiveness Act of 1988 in liner shipping has yet to be fully determined.

In spite of the uncertainties, the current overcapacity in the industry will probably continue to exert downward pressure on rates. The increasing vessel and fleet sizes will continue to contribute to this overcapacity. Current efforts in the industry to rationalize liner service through space charters, mergers, and capacity restrictions should relieve some of the pressure. The capacity reductions in the industry will probably not be sufficient to alleviate the situation in the near term. As a result, rate increases may be difficult to sustain and practices such as below tariff rates and rebating may be difficult to completely eliminate in the U.S. international trades.

The competitive environment has also witnessed a growth in the types of international liner service available. Intermodalism has grown rapidly and can be expected to continue to expand, although the growth rate will slow at some point in the future. RTW services appear to have stabilized in size and market impact and can be expected to remain stable without major environmental changes. Containerized shipping, be it via intermodal, RTW, or traditional liner service will continue to dominate the trades with developed nations. Traditional break-bulk liner services appear to be confined primarily to the trades with less-developed nations where the overland transportation infrastructure is more rudimentary.

The current difficulties with the level of rates and the wide range of liner services available has created a real need for more efficient and effective management. Shipping lines require management that is able to cope with an environment of overcapacity and reduced rate levels. Management must also be in a position to make effective decisions regarding the competing needs to reduce overcapacity yet at the same time purchase new vessels and equipment to maintain a competitive edge. This tradeoff is especially critical for intermodal lines, where the current technological lead on competition may not last very long.

Likewise, shippers, consignees, and intermediaries require effective management. Although lower rates are generally an advantage to shipping line customers, decisions are still required in a number of areas. The wide range of services available and the potential flexibility in rates means that a firm must do a careful analysis to determine the best shipping alternative. This analysis must not only include the ocean transportation cost incurred but also other transportation and logistics costs. Thus, the changing environment is a challenge to both shipping lines and their customers.

ENDNOTES

¹Fredrick M. Collison, "Recent Developments in International Liner Shipping," Journal of Transportation Management: 1986 Proceedings Issue, 1987, pp. 22-34.

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³P.L. 98-137.

⁴H.R. 4848.

⁵As a counterpoint, the Staggers Rail Act of 1980 and the Motor Carrier Act of 1980 increased the exposure of carriers to anti-trust law, rather than reducing it as the Shipping Act of 1984 did.

⁶For a comprehensive description of the provisions of the Shipping Act of 1984, from which the following summary is drawn, see Stanley O. Sher and John A. DeVierno, "Maritime Reform: The Players Are the Same But the Rules Have Changed," American Shipper, April 1984, pp. 11-22.

⁷Elizabeth Canna, "Dilemma of Service Contract & Common Carriage," American Shipper, July 1988, p. 12.

⁸Bruce Vail, "IAs Threaten ANERA," American Shipper, July 1988, p. 16.

⁹The recent decisions and proposed action of the FMC can be found in Tony Beargie, "FMC Meets Crazy Eddie Half Way," American Shipper, December 1988, p. 7; Tony Beargie, "Compromise Is Reached On Pocket Rates Issue," American Shipper, December 1988, p. 27; Tony Beargie, "Shippers Lose IA On Loyalty Contracts," American Shipper, December 1988, 28.

¹⁰A "Crazy Eddie" is named after the salesman you sometimes see in advertisements who guarantees to "meet the price charged by any other competitor," whether the price makes sense or not.

¹¹Francis J. Invancie, "Recent Legislation Has Broadened the Powers of the FMC," Pacific Shipper, January 23, 1989, p. 16.

¹²Peter J. Finnerty, "What's in the Trade Act?" American Shipper, October 1988, p. 24.

¹³Tony Beargie, "Five New Sanctions For FMC Arsenal," American Shipper, December 1988, p. 11.

¹⁴Intermodalism can be defined as the coordinated transportation movement of cargo by two or more modes of transportation in which one carrier generally arranges the entire movement, one set of shipping documents are required, and the administrative task of the shipper/consignee is simplified.

¹⁵For more detailed definitions of these terms, see John J. Coyle, Edward J. Bardi, and Joseph L. Cavinato, Transportation, 2nd. ed., St. Paul, MN: West Publishing Company, 1986, pp. 218-220.

¹⁶A description of APL's intermodal service can be found in, among others, Richard Knee, "APC Value Added Package," American Shipper, August 1987, pp. 50-51; Richard Knee, "APL to More on Land-Side," American Shipper, June 1986, p. 55; Richard Knee, "APL Buys Three Domestic Firms," American Shipper, May 1985, pp. 25-26; "APL Launches Intermodal Unit," The Journal of Commerce, February 13, 1985, p. 2A; Mark Magnier, "Challenge Match: APL's Doublestack Linertrain," American Shipper, September 1984, pp. 18+.

¹⁷See, for example, Ian Middleton, "Analysis: Sea-Land," Seatrade Business Review, November/December, 1988, pp. 19-21, and Francis E. Phillips, "CSX/Sea-Land Intermodal Rolls Out," Containerisation International, July 1988, pp. 48-49.

¹⁸United Nations Conference on Trade and Development Secretariat, Review of Maritime Transport 1987, New York: United Nations, 1988, pp. 53-53, and Review of Maritime Transport 1986, New York: United Nations, 1987, p. 51.

¹⁹Bruce Johnson, "Stack Car/Road Rail Test," American Shipper, June 1988, p. 48.

²⁰Elizabeth Canna, "On-Line Tracking & Booking," American Shipper, November 1988, pp. 40, 42.

²¹Elizabeth Canna, "Sea-Land Breaks Ground With Electronic Payments," American Shipper, November 1988, p. 52.

²²For a more detailed description of these two services, see Reference 1, pp. 22-24.

²³As an example, because the transit times of RTW service may be longer and less reliable due to the use of only a few load center ports, feeder vessels rather than overland transportation in some cases, and the difficulty in coordinating vessels schedules, the rates for these services may have to be lower than competing intermodal services.

²⁴For a discussion of some of these issues, see "Ocean Liner Technologies of the Future," Transportation Quarterly, Vol. 42, No. 4 (October 1988), pp. 625-637.

²⁵"Top 20 Lines on Course for Larger Share of World Fleet," Containerisation International, October 1988, p. 35.

²⁶David F. White, "Nedlloyd Ship Plan Stirs Fears," The Journal of Commerce, February 6, 1989, p. 10B.

²⁷These ports are Yokohama, Los Angeles, Oakland, Kobe, Hong Kong, Kaohsiung, Seattle, and Singapore, with the last two not presently ports of call, as reported in "C-10's Enhance APC's Pacific Presence," Containerisation International, June 1988, pp. 37-38, and Elizabeth Canna, "The Next American Presidents," American Shipper, May 1988, p. 14.

²⁸Review of Maritime Transport 1987, p. 28.

²⁹Reference 1, p. 29.

³⁰Reference 28, p. 29.

³¹See, for example, "Pacific Talks," Containerisation International, December 1988, p. 8; Reference 28, pp. 44, 46; Leo J. Donovan, "Will U.S. Ports Be the Stepchild of the 1984 Shipping Act," Pacific Shipper, October 26, 1987, p. 18.

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³⁴The analysis here is drawn primarily from Tony Beargie, "No Quick Fix of Shipping Act Seen for '89," American Shipper, December 1988, pp. 66-69; Erik S. McMahon, "Another Report Card on the Shipping Act of 1984, With Focus on Conferences," Pacific Shipper, October 24, 1988, pp. 29-30; Tony Beargie, "Shippers Evenly Divided," American Shipper, August 1987, pp. 35-38.

³⁵See, for example Richard Knee, "Look for Changes in Pacific," American Shipper, March 1989, pp. 6-7; Mark Magnier, "Anera Lines Optimistic on Rate Hike," The Journal of Commerce, February 2, 1989, pp. 1B, 3B; Richard Knee, "Pacific Capacity Reduction Plan," American Shipper, January 1989, pp. 16, 18.

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³⁷Gloria Joseph, "Money, People, Ports Key Issues in Lykes-Farrell Combination," The Journal of Commerce, February 16, 1989, pp. 1A, 10A.

³⁸See, for example, Richard Knee, "Value-Added Service Is Paying Off," American Shipper, May 1988, p.11, and Elizabeth Canna, "Value Added Spells Relief," American Shipper, January 1988, pp. 34-36.

³⁹Reference 34.

⁴⁰"The US Shipping Act of 1984: Measuring Shipper Benefits," Containerisation International, September 1988, pp. 37-43.

⁴¹As an example of this type of problem, shippers who used U.S. Lines RTW service received only short notice of the service suspension and some consignees whose cargo was already on the ships did not receive their shipments for some period of time after the service stopped operating.

⁴²Total logistics cost includes basic cost elements such as transportation, inventory maintenance, and ordering; this type of analysis attempts to minimize the total cost, rather than the cost of any individual element. For more information, see Donald J. Bowersox, David J. Closs, and Omar Keith Helferich, Logistical Management, 3rd. ed., New York: Macmillan Publishing Company, 1986, pp. 268-273.

THE TIME DIMENSION IN RAILROAD OPERATING SCHEDULES:
FACT OF SEMANTIC SMOG

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INTRODUCTION

The transportation service provided by a railroad can be viewed in terms of the model shown in Figure 1.

Figure 1

Railroad Service Model

<u>Economy</u>		<u>Level of Service</u>
		Speed
		Reliability
	Railroad	Loss & Damage
	Traffic	Equipment
<u>Competition</u>	Carried	Information
Highway		
Water		<u>Rates/Prices</u>
Pipe		

Of these components, the level of service warrants closer examination as the literature contains little information about how railroads operate to attain a given level of service.

Railroads have, historically, been criticized by many scholars for their inattentiveness to service (Wyckoff 1976, Gellman 1986). Many recent articles have surveyed a plethora of shippers to determine railroads responsiveness in meeting and dependent upon the audience being questioned. Certainly, members of CURE (Consumers United for Rail Equity) have expressed dissatisfaction with the service/price option bundle (right half of Figure 1) provided by railroads (Grimm and Smith 1986, 1987). Other shippers, often contracting for their transportation purchase, have been very satisfied with performance of rail service (Rhea and Schrock 1987).

The purpose of this article is not, however, to add to the number of articles exploring shippers' attitudes and perceptions. Rather, this explanatory effort is to provide a taxonomy of railroads operating factors which can assist traffic and railroad managers in their efforts to improve railroad service (Murphy 1988, Baghi 1987, Bookbinder 1987, Urba 1978). This article expands previous research concerning shippers' needs, but from the perspective of how railroads actually fulfill their service obligations (Williamson 1985, Lieb and Miller 1988, Ditmeyer 1987). The focal issue, from a railroad perspective, is a comparative assessment of how two Class I railroads provide service to their customers by type of train.

The paper is organized as follows: The next section discusses railroad operating characteristics of two railroads, one eastern and one western. Comparisons of operating data are presented, followed by a discussion of potential impacts. The final section provides some tentative conclusions and areas for future research.

RAILROAD OPERATING SERVICE FACTORS

When providing service to shippers in a competitive environment, railroads offer a bundle of services (Figure 1): sufficient equipment, information, claims adjustments, adherence to schedules, and speed of service. It is the latter aspect which has received little attention from scholars. Most studies assume speed is important, but typically analyze it on the basis of line haul miles per hour. In fact, speed is a function of several factors. These include line haul speed, arrival and departure times, amount of time spent in a terminal, and cutoff and availability times. Any of these elements can dramatically alter the line haul speed and, therefore, the ability of a railroad to fulfill shipper demands.

Simplistically, railroad sales personnel solicit business from shippers by offering the rail service at a specified price for a given schedule (Murphy 1988). Thus, the shipper is told that the shipment must be made available at a specified time and will be delivered at some future date and time for the quoted rate. Shippers, consignees and consignors, then plan their "Production schedules" based upon this quotation. Assuming prices remain competitive, the shipper will continue to utilize the rail carrier as long as the service performance level continues to be reliable.

Historically, railroads have not maintained high reliability levels and have experienced decline in market share (Association of American Railroads 1986). In part, this has been a result of the changes occurring in production requirements of shippers. For example, inventories have become increasingly expensive and shippers have opted for faster transit times and mode to control inventory costs. The next section explores how two railroads operated their trains to fulfill the dynamic movement requirements.

TAXONOMY AND OPERATIONAL PROVISION OF SERVICE

Two Class I railroads were selected for this study. These two roads, one eastern and one western, account for approximately thirty percent of rail traffic in the United States, as measured by ton miles, freight revenue, or miles of track.

Train briefs, published operating schedules, were analyzed to ascertain how the time dimension (door-to-door time) is actually performed. The train brief data does not permit an examination of adherence to the published schedule, thus the variance cannot be addressed.

The taxonomy of the speed variable (time dimension) is comprised of several elements from an operational perspective (Figure 2). Each of these elements contribute to the amount of time it takes to move a shipment door-to-door and, ultimately, determine whether or not the railroad can remain competitive.

While the distance, miles, reflects the geographical distance, other elements dictate the time lost in transit. Cutoff times for intermodal traffic represent the initial carrier contact with the physical shipment. From the perspective of the shipper, it represents the point for the door-to-door clock to start. The cutoff time can inhibit or promote customer service. For example, an early time (1500) means that the shipper must have the shipment at the intermodal hub no later than this time in order to be placed aboard the appropriate train. Such a cutoff time, in theory, may result in "idle time" for the workforce of the shipper if the normal workday is from 8:00 a.m. to 5:00 p.m.

Once the shipment is received, the railroad has a limited amount of time to load the traffic aboard the intermodal car and/or switch the car into the train. The amount of time will vary, but will contribute to the total transit time in any event.

Figure 2

Operating Elements Inherent in Speed

Element	Definition
Miles	miles between origin and destination
Cutoff	time shipment must be tendered at origin
Departure	scheduled departure time
Speed	miles per hour, line haul
Arrival	scheduled arrival time
Availability	scheduled time intermodal traffic made available at destination
Day	number of days in transit (from day shipment tendered to day of delivery)
Terminal	time, in hours, spent in terminals between origin and destination
Hours	scheduled duration of one haul trip, in hours
Door-to-Door	total trip time, cutoff to availability

Following the departure of the train, the line haul speed is governed by the speed of the train and the number of terminals through which the train passes. Typically, trains operating shorter distances will incur less terminal delays than longer trains. Longer trains incur delays due to mandatory inspections, crew changes, refueling, and/or awaiting the arrival of interline traffic or scheduling meets with other trains.

Upon arrival, the cars are again switched or spotted to the intermodal terminal where the trailers or containers are made available for delivery to the consignee. The total trip time from cutoff to availability constitutes the door-to-door time so critical to the shipper. This total time will vary between intermodal, priority, and general freight trains.

It is hypothesized that intermodal trains will operate at greater speeds and incur fast door-to-door times than other types of trains (priority and general). This should occur as intermodal traffic is of higher value and more time-sensitive than other traffic. According to the Association of American Railroads, intermodal traffic averages \$50-\$60 per ton while other traffic is considerably less (Association of American Railroads 1986).

Priority trains, while carrying time sensitive commodities, should exhibit slower transit times and greater terminal delays as these commodities are not as highly valued as intermodal traffic.

General freight trains should, comparatively, reveal the greatest transit times and greatest variance in departure times as they haul the least time-sensitive commodities. While not a part of this analysis, it can be speculated that these trains also would carry freight with the lowest comparative rates.

OPERATING CHARACTERISTICS OF SPEED

The operational elements of the time dimension are shown in Figure 3 for the two railroads by type of train.

As shown in Figure 3, the intermodal trains for both railroads are scheduled to operate at faster speeds. This would suggest that the railroads are attempting to fulfill the needs of shippers for his higher-valued freight. Similarly, the speed of the priority trains is greater than the general trains.

Figure 3

Operating Elements for Daily Scheduled Trains, By Type

Elements	Western Railroad			Eastern Railroad		
	IM	Prior	Gen	IM	Prior	Gen
No. of Trains	44	33	32	41	29	34
Ave. Miles	988	1141	417	715	584	329
Ave. Speed	31.4	24.2	18.0	28.0	18.9	16.9
Ave. Trip Hours	32.7	49.9	24.8	26.7	33.5	19.8
Days	2.6	3.2	1.9	2.2	2.4	1.9
Terminal	3.6	10.2	5.5	2.4	8.5	5.3
Cutoff to Dptr.	2.2	NA	NA	2.3	NA	NA
Arrival to Avail	3.2	NA	NA	3.8	NA	NA

Note: IM - Intermodal; Prior - Priority; Gen - General

The average miles per trip for the western road reflects the longer geographical distances to be traversed when compared to the eastern road. The data also indicates that priority trains are dominated by long hauls while both intermodal and general trains operate in short route corridors. The longer trip miles of the western road also are reflected in the longer terminal times as it incurs more inspections, refueling stops, and crew changes.

The days to receipt, departure to arrival days, appear as anticipated. A third day delivery for the western road reflects the longer average distances. Similarly, priority and general trains incur greater terminal times. Priority trains must await connecting traffic from interlining roads or connections from other trains on the same road. General trains handle non-priority freight and tend to incur more switching delays. These trains also travel shorter distances which is indicative of more local operations.

The additional data provided by the train briefs for intermodal trains permits greater insight into management attitudes for service. Quite naturally, these "hot shot" trains spend, comparatively, little time in terminals. Of the time, most is devoted to crew changes.

A more interesting statistic concerns the cutoff to departure times for the intermodal trains. Both railroads have added an average of two hours to tier schedules in order to handle the shippers' trailers or containers. For critical freight, this would appear to be an inordinate amount of time given the comparatively higher freight rates and cargo values.

Equally disturbing is the amount of time taken to make TOFC/COFC traffic available once it has arrived at the destination. Both roads need an average of over three hours to provide the consignees with their traffic.

When the time taken on both ends of the trip (cutoff to departure and arrival to availability) are taken in to consideration, both roads exhibit a deterioration in service.

The door-to-door time provides some insight into the relative decline in market share to the trucking industry. So much time is lost in terminal delays that shippers may feel trucks offer faster service for the highly valued commodities. (See Figure 4)

While speed and transit times are important, the authors also feel that the actual times that trains arrived and departed might be critical for the three types of trains. Arrivals and departures for both railroads were grouped by the time of day as shown in Figures 5 and 6.

Figure 4

Comparison of Line Hauls to Door-to-Door*
Hours and Speed

	Road #1	Road #2
Average line haul trip hours	32.7	26.7
Average door-to-door trip hours	38.4	34.4
Average line haul speed	31.4	28.0
Average door-to-door speed	26.3	21.3

*Door-to-door calculated by adding the differences between cutoff and departure times, arrival and availability times to total line haul trip hours

Figure 5

Arrivals by Time of Day

Time	Type of Train		
	Intermodal	Priority	General
2400-0559	23	18	10
0600-1159	32	8	18
1200-1759	14	20	20
1800-2359	16	16	18

Figure 6

Departures by Time of Day

Time	Type of Train		
	Intermodal	Priority	General
2400-0559	19	14	15
0600-1159	11	15	12
1200-1759	12	13	11
1800-2359	43	20	28

With the exception of arrivals, where the time of arrival does exhibit some dependency on the type of train (Chi2 $p < .01$), departure for the types of trains appears to be somewhat random. This would suggest that railroads are, in fact, not scheduling operations for shipper convenience, but rather for their own operating convenience.

In assessing cutoff and availability time for intermodal trains by time of day, it would appear that railroads are less sensitive to shipper needs with respect to cutoff times than they are for availability times. As shown in Figure 7, more than 50 percent of the intermodal trains were made available before noon. This would suggest that the roads are attempting to adhere to shipper production schedules.

Figure 7

Combined Availability and Arrival Schedules by Time of Day

Time	Availability	Arrivals
2400-0559	10	23
0600-1159	33	32
1200-1759	23	14
1800-2359	14	16
Total	80*	85

*availability times not reported for five trains

Figure 8

Combined Cutoff and Departure Schedules by Time of Day

Time	Availability	Arrivals
2400-0559	12	19
0600-1159	15	11
1200-1759	14	12
1800-2359	38	43
Total	79*	85

*cutoff times not reported for six trains

An assessment of cutoff and departure times for both roads, Figure 8, suggests railroads provide detrimental schedules for shippers.

Assuming a working day of 8:00 a.m. - 5:00 p.m. for the shipper, the data indicates that shipments would have to have been received the previous working day or carried over until the next working day in order to meet the cutoff time for 12 trains. Twenty-nine trains, only 36.7 percent, have cutoff times during "normal working hours" and 23 trains, only 27.1 percent, depart during this time. This suggests that rail schedules are not coordinated with shipper production schedules. Such scheduling may impose burdens on the shipper as the work force of the shipper is structured in a manner that overtime may be incurred in order to meet rail schedules.

IMPACTS AND CONCLUSIONS

This article has been an exploratory effort to comprehend, from a railroad operating perspective, how two railroads provide service to shippers. Many recent articles, surveying shippers, have contended that service is exceeding cost as a prime consideration for modal and carrier selection and this study was conducted to learn how railroads schedule their operations to meet these service demands.

Two Class I railroads were studied, utilizing operating data contained in their train briefs. The train briefs represent the schedules that railroads plan to offer the shipping public for agreed upon prices.

The time dimension associated with these schedules is comprised of several elements, but from the perspective of a shipper, can be represented in terms of door-to-door time. Thus, the shipper is concerned not only about line haul speed, but also about the amount of time delayed in terminals and the delays encountered in arrivals and departures.

The data suggests that shippers are at the mercy of railroad schedules for movements of their products. Arrival and departure times appear to be somewhat random and not coordinated with "normal" working schedules of the industries served. In addition, considerable time is lost during transit as well as origin and destination terminals. This would indicate that railroad management must begin to improve adaptation of rail schedules to the production requirements of their customers.

At a time when shippers are vitally concerned about escalating inventory costs and rapidly changing markets, it appears that railroads maintain an inordinate amount of slack in schedule performance. If railroads are to recapture market share, they must be better able to offer operating schedules which truly reflect the needs of the shipper.

This exploratory effort represents only two Class I railroads and additional research is needed to study operating schedules of all railroads. An official railroad schedule guide is necessary in order to provide the shipping public with more realistic performance evaluations.

Railroads can benefit from this research by comprehending the pricing differentials that may be available with varying service options. Obviously, not all commodities require the same time dimension and it may be possible to segment further operating performance by customer and commodity.

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THE TRUCK DRIVER SHORTAGE: AN OVERVIEW AND SOME RECOMMENDATIONS

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INTRODUCTION

The driver shortage is now a well established and well recognized fact in the motor carrier industry. The American Trucking Association, its member organizations, and virtually every trucking firm in the United States now must deal with the problems related to this shortage. And, unfortunately, many of the industry's standard practices actually worsen this already bad situation.

The effects of the driver shortage have not been uniform throughout the industry. For some firms, particularly the small, specialized carriers, the shortage has effectively limited the growth of their business; due to a lack of qualified drivers, many of these firms have been unable to take advantage of opportunities that might otherwise be available to them. For other firms, such as the large, unionized LTL carriers, the driver shortage has created regional recruiting problems. While they may retain their current drivers because of union seniority rules, in many areas the LTL's are having difficulty attracting new drivers. For still other firms, especially the large, TL carriers, the shortage has meant runaway turnover, with annual rates often exceeding 150 percent.

In this paper, we discuss some of the sources of this problem and examine recent research that may point toward a possible solution of the driver shortage. Demographic, industry, and firm-specific factors relating to the problem are treated in the sections that follow.

DEMOGRAPHIC FACTORS

The change in the demographic make-up of the U.S. workforce has been a major contributor to the current driver shortage. Moreover, current demographic trends indicate that tomorrow's driver shortage will be far more severe than that of today. This will occur for two reasons. First, the number of potentially qualified workers in the labor market is dwindling. Simply put, while the educational level of the American workforce is the highest it has ever been, the reading and comprehension level of these workers may be the lowest they have ever been. The number of applicants who fail the "dress rehearsals" of the new commercial driver's license tests supports this statement. For instance, 57% of those taking the California commercial drivers test fail to achieve a passing grade.¹

Second, the makeup of the workforce has shifted away from the traditional truck driver labor pool, the 25-45 year-old white male. The people who will be driving trucks for the next twenty years have already been born. The forecast of the maximum number of people who might be available in the workforce can, therefore, be fairly accurate.

Tomorrow's Driver

While the U.S. population will continue to increase in size, its growth rate will be far slower than in the past. Also, tomorrow's population, in terms of color, sex, and age, will bear little resemblance to that of today. According to the Hudson Institute's report, Workforce 2000:

The population and workforce will grow more slowly than any time since the 1930's;

Population growth will level off at an annual rate of 0.7 percent by the year 2000;

The labor force that grew by 2.9% for the 1970's will expand by 1% annually in the 1990's;

More minorities and women will enter the workforce.²

This slower growth in population makes the last point particularly relevant. It now appears that by 1991, 70% of the new entrants to the job market will be minorities or women³; specifically, 29% of all new workers will be Hispanic and 17% will be black.⁴ If these projections prove accurate, by the year 2000 over 47% of the workforce will be female, 12% will be black, and 10% will be Hispanic. The significance of these changes can best be appreciated when it is noted that in 1979, 42% of the workforce was female, 10% was black, and 5% was Hispanic.⁵ The significance of these changes can best be appreciated when it is noted that a 5 percentage point increase in the proportion of female in the workforce represents a 5 percentage point change in the proportion of males. In other words, a 10% swing.

The methods for managing this workforce must change as its demographic composition changes. It is quite likely that many, if not most, of yesterday's and today's managerial techniques will not have a place in the future. After all, it is going to be a "new ball game," and these old ways may simply not work. For that matter, they may not be working very well now, as the next section suggests.

INDUSTRY FACTORS

Several of our introductory points need some expansion. For small TL and LTL carriers, particularly those in special commodities, the lack of qualified drivers has limited growth for many years. The vice-president of personnel for one of the three largest liquid bulk carriers has stated that in the near future, a driver with DOT certification for hazardous materials and explosives will be like a free-agent baseball player--able to go wherever he or she wants and able to name the price.

Recent interviews with the top managers of 23 liquid bulk and explosives haulers perhaps best illustrate just how widespread the effects of this driver shortage are. Everyone of these managers described incidents where their firms passed up concrete growth opportunities because of a lack of qualified drivers. Additionally, they also provided examples of customers who had tried to form their own private fleets in order to improve service. Yet the customers' efforts were frustrated by the same factors that limited the carriers: high turnover and a lack of qualified drivers.

The shortage of drivers most clearly affects the LTL carriers in high cost areas such as New York and California. In one its regions, a large unionized LTL carrier spent \$200,000 on help-wanted ads in 1988 but was able to recruit only two drivers. The large unionized carriers have not been immune to the labor shortage even in low cost areas such as Mississippi. For example, a firm with over \$500 million in annual revenues spent five months trying (unsuccessfully) to fill a \$12.00 an hour city driver job in Jackson, Mississippi, even though the average wage in the area is a rather low \$4.51 an hour.⁶

Perhaps the most dramatic effects of the driver shortage can be found in the TL sector of the motor carrier industry. A recent survey of personnel and safety managers in member firms of the Interstate Truckload Carriers Conference of the ATA, found that almost 26% of the responding firms had turnover rates in excess of 76% annually. Schneider Transport, one of the most highly regarded firms in the industry, reported an annual turnover rate of 100%, despite a number of highly innovative programs designed to retain drivers.⁷ All told, approximately 10% of the fleet belonging to the Interstate Truckload Carriers Conference is idle due to a lack of drivers.⁸

Fairly traditional industry practices are actually increasing the already acute shortage of drivers. Consider the way companies normally recruit new drivers. The motor carrier industry makes extensive use of magazine/trade journal advertising in recruiting.

For example, recent issues of The Owner Operator Directory have devoted more than 80% of paid advertising space to carriers' pleas for more drivers. One issue of this publication actually had ads from 98 different carriers. But most of the people who read these journals already work in the industry. This means that firms, in effect, are raiding each others' drivers. Since drivers will need expensive inducements to change jobs, carriers are involved in bidding wars for their services. But these inducements increase turnover. The supply of drivers stays the same, but the demand increases. Bottom line, then, is that payroll costs must increase.

Similarly, a few carriers have attempted to develop a larger pool of drivers. Some firms have now opened or reopened their in-house driving schools, while others have developed client relationships with commercial driving schools and community colleges. But these programs will contribute only a small number of drivers for the long run. Furthermore, as long as firms continue "stealing drivers" from one another, these new "graduates" are unlikely to significantly ease the driver shortage.

When these practices are considered in light of the demographic changes discussed earlier in this paper, it becomes critical for the industry to totally redirect its driver-recruitment strategy. Recruitment efforts must be targeted toward new audiences, e.g. Hispanic, black, women, older people. The "good old boy" in a baseball cap with a Hank Williams, Jr. song playing in the background, must not be the star of tomorrow's recruitment literature. Neither will he be the driver of tomorrow.

Obviously featuring minorities in recruitment advertisements will not solve the driver shortage. But they are a start, and a good one, at that.

FACTORS FOR THE INDIVIDUAL FIRM

Bottom line: the driver shortage is a personnel problem. This means that the controllable factors include supervisory practices, recruiting practices, compensation policies, training programs, and all other activities that affect the way the company deals directly and indirectly with its drivers. In the motor carrier industry, many of these personnel practices seem to be founded on false assumptions, outdated information, and at times, contempt for the employee.

A number of myths about drivers seem to have perpetuated themselves among managers and supervisors--that drivers are inherently unreliable as a 'breed'; that they are surly and motivated solely by money; that they have no loyalty to or concern for the company; and so on ad nauseum. This is very similar to the philosophy expressed in an 1899 Army Officers' Manual: Enlisted men are basically stupid, but crafty and bear close watching. Such attitudes tend to be founded on slim evidence (at best) and on experience with a few drivers.

Probably the most damaging result of these myths is the seemingly widespread belief that nothing can be done about many of the problems with drivers because, well, that is just the way drivers are. It is very easy simply to blame someone's "nature" for any problems that exist. However, it is not the way to solve these problems.

Research into drivers' attitudes toward their jobs and companies does not support any of these well-worn myths. Consider the belief that drivers are chronic malcontents. A 1988 study of job satisfaction among drivers did not support this. This survey found that on average, truck drivers were as satisfied with their jobs as were any other type of employee. Note the emphasis on the word "job." Drivers are satisfied with such aspects of their job as the feeling of accomplishment it brings them, the freedom to use their own judgement at work, and the opportunity to do different things from time to time.

Drivers are very dissatisfied, however, with the factors external to their jobs. For example, drivers are very unhappy with the way their supervisors handle them, with the way company policies are implemented, with the lack of praise they receive, and with the compensation received for the amount of work done. (This last point should not be overly emphasized. Complaining about pay is a common "smoke screen" for dissatisfaction with other parts of the job. Turnover is not a consequence, solely, of low pay.) When compared with other groups, drivers are particularly dissatisfied with these external factors.

What is the critical lesson in these results? Drivers are dissatisfied with the very things over which management can exercise the most control. The overall control of dispatch, the relationship between the drivers and the dispatcher, the respect (or lack thereof) shown drivers by all levels of management, supervisory practices, and unrealistic promises made during recruitment, can all be improved dramatically in many firms. Perhaps the following example of such poor practices most succinctly illustrates the problems in this area:

A driver from a central state developed problems with the electrical system on his truck while dropping off a load in California. His dispatcher had him constantly recharging the battery in an attempt to bring the truck back to the company's central maintenance facility. After driving for two hours without lights in the dark, the driver threatened to abandon the truck if repairs were not made on the road. The repairs were finally authorized, but the driver, who had an outstanding record, left both the firm and the industry.

In this instance, the dispatcher cost the company a very scarce, expensive resource--the driver--in an effort to save a few dollars on maintenance.

Was it worth it? That is, was it cheaper to lose and replace (if lucky!) a driver in order to save on repair costs? In answering this question, consider the fact that the cost of replacing a driver is assumed to be around \$5,000. Also, keep in mind that this figure probably is quite low, especially when the potential damage costs of a new, "inexperienced driver" as opposed to a long-time "pro" are considered. Could a fully loaded rig be replaced for \$5,000? Would \$5,000 settle a personal injury lawsuit brought by a motorist injured by the new driver? Now answer the question: was it worth it?

SUMMARY

The motor carrier industry is experiencing a crisis that can fundamentally and perhaps permanently retard its growth. Yet there are a number of proactive, relatively inexpensive steps the industry can take in response to this problem. New, targeted help-wanted advertisements, innovative programs for in-house driver training, and revised, enlightened managerial techniques, are ways to begin combatting this problem.

A key question, however, is will firms be willing to make the kinds of financial and managerial commitments required for these new practices? But perhaps more basic than even this, is the question of whether management is willing to expend the energy required to reorient the firms? Will the industry continue "as is," and watch profit margins and market shares continue to decline? In some ways, this is the "life and death" question facing motor carriers. The answer not only will affect this industry, but also will exert a significant impact on the total U.S. economy.

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AIRLINE MERGER POLICY AND ENTRY BARRIERS: A LESSON FROM THE PAST

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INTRODUCTION

Many criticisms have been voiced about the U.S. Department of Transportation's oversight of the airline merger authority under Section 408 of the Federal Aviation Act. The Department of Transportation inherited this function from the Civil Aeronautics Board on the occasion of that agency's sunset on December 31, 1984. On January 1, 1989, Section 408 of the Federal Aviation Act was sunset. Airline mergers are now governed by the general antitrust laws of the United States as administered by the U.S. Department of Justice.

This paper is designed to give an inside look at each of the mergers approved during the DOT era as well as the basis upon which the decisions were made. Since review of barriers to entry was of critical importance in the DOT review process, a primary focus of this paper will be on barriers to entry. Since this paper will touch upon acquisitions as well as mergers, I will use the term "merger" to refer to both types of transactions.

This document will respond to criticisms voiced in the past as well as review the important market by market analyses undertaken by staff and decisionmakers. All too often critics have been quick to judge the DOT period of merger review by the "numbers" of cases approved, revised, or disapproved. Responsible reviews of the decisions should be made after an analysis of the specific circum-

stances surrounding each case. Only when there is a clear and informed understanding of past merger decisions can there be a sound basis for the continued development of airline merger policy.

This paper will also briefly address two other developments that some may argue should play a greater role in entry barrier analysis in the airline industry -- airline owned computer reservations systems or "CRSs" and special arrangements, referred to as code-sharing agreements, between large carriers and selected smaller feeder carriers. These developments may also have relevance to the discussion on exclusionary conduct which follows.

AIRLINE MERGER POLICY AND ENTRY BARRIERS

The CAB's and Department's review of airline mergers has been governed by Section 408 of the Federal Aviation Act of 1958.¹ Section 408 (b) establishes the standard for review that is to be applied. Before deregulation, Section 408 (b) conferred on the CAB broad discretion to approve or disapprove airline mergers under a "public interest" test. Maintenance of competition was not always the CAB's highest priority in applying this test. When Congress enacted the Airline Deregulation Act of 1978,² it amended Section 408 to reflect its decision that the airline industry should be governed by the forces of the marketplace, not by federal economic regulations. Although Congress retained the public interest test, it added a specific competitive test.³ Section 408 required the Department to approve a merger 1) that will not result in a monopoly or further an attempted monopoly and that will not likely lessen competition substantially in any region of the United States and 2) that is not inconsistent with the public interest. Section 408 requires the Department to disapprove a merger that does not meet these standards, unless DOT found that it met significant transportation needs and conveniences of the public that cannot be met through any reasonably available alternative transaction that would be

materially less anti-competitive.⁴ Parties challenging a transaction bore the burden of proving its anti-competitive effects.⁵

The competitive test of Section 408 was very similar to that of Section 7 of the Clayton Act. For the record, the CAB and DOT have never approved an anti-competitive merger under the transportation needs and conveniences test. The Department, therefore, applied standards established under Section 7 in their review of airline mergers. Under Section 7, review of a merger must consist of a "functional analysis" which includes a consideration of an industry's structure, history and future, according to the Brown Shoe and General Dynamics decisions and their progeny.⁶

In reviewing mergers, the CAB and DOT attempted to determine whether the merger would provide carriers market power enabling them to charge fares above, or reduce service below, competitive levels. This is also the central inquiry in Clayton Act cases in other industries. However, the method of analysis for other industries frequently may differ from that employed for the airline industry. Most Clayton Act cases involve industries where new entry is unlikely. The courts therefore assume that a significant increase in market shares or concentration statistics substantial lessening of competition unless the proponents of a merger can show otherwise. In contrast, both the CAB and the Department have found that high concentration statistics are not themselves reliable indicators of market power in the airline industry, especially concentration statistics in individual city-pair markets. This position was based on the belief that in the absence of constraints on entry, carriers can enter individual city-pair markets relatively easily. Before deregulation proved to be one of the biggest constraints on entry. Once this barrier was removed, the threat of potential entry could discipline the service of carriers actually in a market. This belief in turn was not based solely on theoretical musing, but on the CAB's real-world observations in some of its earliest decisions such as the National Acquisition and the Texas International-Continental Cases that

"Airline markets are nearly always concentrated by traditional antitrust standards, yet most are competitive in performance."⁷ Therefore, in the CAB merger cases cited (among others), and in concentrated on the Department's own merger decisions, such as the Southwest-Muse and Northwest-Republic cases, both agencies concentrated on determining whether any entry barriers that would justify inferring a loss of competition from a substantial increase in concentration existed in the specific markets at issue.⁸ And since the agencies drew no presumptions from concentration statistics, they looked to merger opponents to demonstrate the existence of entry barriers or otherwise to show anti-competitive effects. The Department discussed this issue at some length in the Northwest-Republic case.⁹

One of the most significant developments in airline operations in a deregulated environment has been the establishment of hub-and-spoke route networks. In hub-and-spoke networks, airlines serve many routes emanating from a common hub. By combining local traffic flying between the hub and each spoke end-point with traffic flying between different end-points, airlines lower their per passenger costs of operating any specific flight segment. Hub and spoke operations permit airlines to serve smaller local markets that could not sustain service with local traffic alone. In addition, airlines compete vigorously with each other for passengers moving between the same pairs of spoke end-points by offering single-plane or connecting service over alternate hubs. The growth of hub and spoke operations have clearly benefited many airline customers. However, it has also generated controversy in airline merger cases.

Since one of the CAB's earliest merger decisions under the Deregulation Act, opponents, including the Justice Department in some cases, have contended that the efficiencies of hubbing are so substantial that control of feed or "hub dominance" is an entry barrier in hub city-pair markets. The CAB never seriously doubted that access to feed was a relative efficiency factor that could reduce a hubbing carrier's per passenger costs. However, the CAB also

found, based on the evidence before it, that other factors -- such as lower operating costs, strong local traffic demand, reliance on one-stop or connecting service to compete with non-stop service, or feed from their own hubs -- would permit carriers to enter successfully hub city-pair markets served by a carrier with hub dominance. Therefore, the CAB consistently concluded that the benefits of feed were not so large as to preclude the threat of competition from disciplining a carrier with hub dominance. Again, the CAB's conclusion was based on hard evidence from the real world. In each case, the Board had before it examples of carriers actually serving hub city-pair markets that they should not have been serving if hub dominance really were a barrier to entry. The National Acquisition and Continental-Western merger cases are good examples.¹⁰

The hub dominance issue was hotly contested in DOT merger cases as well, especially those involving combinations of carriers that had hubbing operations in the same city, such as the Northwest-Republic (Minneapolis/St. Paul and Detroit) and TWA-Ozark (St. Louis) cases.¹¹ The Justice Department opposed each of these mergers. In approving them, the Department determined that the record did not support the Justice Department's contention that competitors could not use other advantages, such as those outlined above, to match the benefits of hub - dominance and enter the hub carrier's markets. Again, the Department had evidence of carriers actually operating where they should not have been if hub dominance really impeded entry.¹²

Some observers have made much of the fact the Justice Department and Department of Transportation took such diametrically opposed positions on these mergers. I think these observers have read more into these differences than they fairly should. Out of twenty-odd major merger decisions by the Department, the TWA-Ozark and Northwest-Republic transactions were the only two that the Department approved when the Justice Department urged outright disapproval.¹³ The Justice Department reached its position in part because it relied on the traditional antitrust notion that

increased concentration implies loss of competition and in part because it believed that one-stop or connecting service was not competitive with non-stop service. DOT did not find that the record supported either contention. At the risk of oversimplifying, DOT found its expertise in the airline industry, supported by the records in the cases, to be a more reliable than the Justice Department's general antitrust expertise.

The hub dominance issue arose again in the USAir-Piedmont case, even though there were no overlapping hubs.¹⁴ The Justice Department did not challenge the merger, but another carrier, the America West Airlines did. The carrier submitted evidence on the correlation of fare levels in individual city-pair markets to a dominant carrier's share of enplanements at the end points of the city-pairs. It claimed that this statistical analysis showed that hub dominance provided market power to allow the dominant carrier to raise fares. In addition, its experts claimed that various business practices that arose in the deregulated environment -- such as frequent flyer programs, CRSs, override commissions for travel agents and sophisticated discount fare capacity control programs -- might give such large advantage to hubbing airline as to be barriers to entry in hub city-pair markets. I believe that they may have been following a lead suggested by Professor Mike Levine in his article in the Yale Journal on Regulation.¹⁵

The Department carefully reviewed these contentions and the record in the case. It found that the statistical analysis was flawed and therefore could not be relied on to demonstrate that hub dominance conferred market power. With respect to Professor Levine's article, I think he has raised some interesting theoretical and analytical questions which probably deserve consideration in the review of any future airline mergers. However, the Department makes its merger decision based on the characteristics of the airlines and the markets in the particular case before it. In the USAir-Piedmont case, the Department found that any competitive advantages that the business practices gave to USAir or Piedmont were not

so large as to make the practices entry barriers in the markets affected by the USAir-Piedmont transaction. I don't think anyone would seriously argue that the ability of a carrier like American to offer frequent flyers free travel to numerous European and Caribbean destinations also allows it to compete effectively against USAir's frequent-flyer program, even in cities like Syracuse where USAir enjoys a strong presence. Some of these business practices may even facilitate entry or expansion.

Limitations on airport access are the other potential entry barrier that the CAB and DOT have most frequently considered in merger cases. These limitations may take two forms: (1) the lack of terminal or other ground facilities to accommodate increased service; and (2) regulatory ceilings on the number of flights permitted to operate at an airport. Federal restrictions on the number of operations at four airports ("slots") -- Lagueardia and John F. Kennedy International airports in New York, Chicago O'Hare and Washington National -- are the most well known of the latter category, but some airports have succeeded in imposing their own limits as well.

Limitations on terminal facilities have been most frequently cited by merger opponents as entry barriers in cases where hub dominance was also a central issue, such as the Continental-Western, Northwest-Republic, and TWA-Ozark cases. In each of these cases opponents argued that a potential entrant needed the ability to establish its own hub at the affected city in order to exercise effective competitive discipline over the merging carrier's hub operation and that there were insufficient ground facilities to permit a new hub. Generally speaking, the agencies have agreed that the affected airports did not have adequate facilities to permit immediate entry on a hub scale. However, the agencies found that there were adequate facilities to permit entry on a lesser scale. As the earlier discussion of hub dominance suggests, the agencies also found the threat of entry on less than a hub scale to be sufficient to provide effective competitive discipline. Therefore, the agencies have not

found limitations on airport ground facilities to be entry barriers.¹⁶ In the TWA-Ozark case, one carrier, Southwest Airlines, did have access to sufficient ground facilities to support a hubbing operation.

When the Department considered whether slots are an entry barrier it usually focused on the New York and Washington slot-controlled airports. Each of these airports serves a metropolitan area that also receives substantial air service through at least one airport that is not under slot restrictions. With one exception, the records before the Department showed that services at the airports without slot constraints were part of the same market as services at the slot-constrained airports. Therefore, existing or potential service at the unrestricted airports provided competitive discipline for services at the slot constrained airports. The Department accordingly found that slots were not an entry barrier requiring disapproval of the mergers. The USAir-Piedmont case is an example.

The exception which proves the rule, the Texas Air-Eastern case, involved unique circumstances. The merger involved the combination of the two competitors in the Northeast Corridor air shuttle markets (Washington National-Laguardia and Laguardia-Boston). The Department found that these markets were airport specific and that a competitor would have to provide hourly service to compete effectively in the markets. The Department found that in these circumstances slots were an entry barrier and it refused to approve the acquisition until the applicants gave up enough slots to Pan American to mount a competitive shuttle operation.¹⁷ In this case, the Department agreed with the Justice Department that there were competitive problems that needed to be fixed before the transaction could be approved.

Before turning away from mergers I would like to address two points recently raised by critics of past merger policy. First, they suggest that the relative stability in market shares of merging carriers at their hubs indicates that their hub dominance has insulated them

from competition. Second, they suggest that recent trends toward fare increases may be manifestations of a loss of competition in the industry. To infer a lessening of competition in the airline industry from either phenomenon requires a leap of faith that isn't justified.

Concerning market shares, as even the Justice Department acknowledges, immediate new entry is not required, and should not be expected, in order to exert competitive discipline on incumbents in an airline market. Three hubs affected by DOT approved mergers, Minneapolis St. Paul, Detroit and St. Louis has each seen entry by new carriers and expansion by incumbents other than the merging carriers. As to fares, the downward movement in fares for much of the last two years coincided with dramatic decreases in the price of aviation fuel, which is the second largest component of airline operating expenses. In recent months, aviation fuel prices have stabilized or started to rise. In addition, many airlines have made commitments for, or started to take delivery on, large orders for new aircraft. These aircraft must be paid for. Thus, the recent upward trend in fares reflect no more than a change in airline cost structures

Turning to CRSs, the affiliations of the five U.S. travel agent CRSs with airlines has been a subject of controversy ever since the CAB first examined the issue. In its CRS rulemaking,¹⁸ the CAB found that CRS operators used their CRSs to increase their share of sales by agents subscribing to their CRS services at the expense of their airline competitors. This phenomenon is referred to as the generation of incremental revenues. The CAB found that by generating incremental revenues, CRS operators could reduce their own unit costs of providing airline service while raising the costs of their airline competitors. The CAB also found that airline economics and distribution practices required airlines to be listed in any CRS that had gained significant penetration in the travel agent industry. Therefore, the CAB found that CRSs were analogous to essential facilities under the antitrust laws.

Based on its findings, the CAB adopted regulations that reduced CRS Operators' ability to generate incremental revenues with their systems.¹⁹ The rules also required the operators to give access to their CRSs to other airlines on non-discriminatory terms and at non-discriminatory prices.²⁰

The CRS rulemaking has proven to be far from the last word on CRSs. A number of airlines have filed private antitrust actions against the airline affiliates of the largest CRSs, American and United.²¹ A key issue in those cases is whether CRSs should be classified as essential facilities.

As I noted earlier, the opponent of the USAir-Piedmont merger argued that CRSs might be an entry barrier. The Department rejected this argument in part because neither USAir nor Piedmont at that time owned a CRS. Since the Department's decision, USAir has agreed to join a group of four foreign airlines to purchase a fifty-percent interest in United's CRS.²²

The Department very recently issued its study of the CRS industry. The Department's study is probably the most comprehensive -- it is certainly the longest -- since the CAB's rulemaking. Nevertheless, I do not believe that the study itself can answer all questions about the current effects of airline-CRS affiliation in entry barrier analysis for airline mergers. Among other things, the study suggests that CRSs continue to generate some incremental revenues for their airline affiliates, but precise determination of the amounts and causes of incremental revenues was not possible. CRSs also earn substantial fee payments from airlines that are listed in their displays. It would not, however, be fair to infer from these findings alone that CRSs benefit their airline affiliates so much that competitive discipline in the airline industry has been materially eroded. Even if CRSs do create some advantages for their airline affiliates, they also provide other carriers with convenient, quick and reliable access to the nationwide distribution network represented by travel

agents. To the extent that CRS participation allows carriers to avoid using other more costly distribution methods, CRSs may enhance competition.²³

Code-sharing agreements also have been the subject of much discussion lately. Code-sharing agreements are arrangements in which a commuter carrier's flights are listed in schedules and CRSs under the airline designator code of a large jet operator. The large airline usually enters into these agreements to provide additional feed support from smaller communities to its hubs. In addition to sharing codes, the commuter services will often be marketed under a trade name closely aligned with the name of the jet carrier, for example American Eagle or United Express. Connecting flights between the parties to code-sharing agreements receive the same priority as true single-carrier connections in CRS schedule displays. In addition, the jet operators offer joint fare arrangements to their code-sharing partners that are more favorable than those they offer to other commuters.

Although they have been part of the industry since the 1960's they had not generated much controversy until the 1980's when they began to proliferate. You need only look at the comments on code-sharing in two rulemaking dockets, CAB Dockets 42199 and 41686 to appreciate the intensity of this controversy.²⁴ Independent commuters have claimed that they cannot effectively compete against code-sharing commuters because of the benefits of improved CRS listings and the special joint fare arrangements. When the Department completed its study of code-sharing in early 1986²⁵ the evidence available to it did not support these contentions. The data relied on at that time suggested that independent commuters continued to play a substantial role in serving smaller communities and that they were effectively competing head-to-head against code-sharing commuters in many markets. However, later data suggested that the benefits of code-sharing may place independent commuters at a disadvantage, and that independents are declining as a force in the market.²⁶

Although code-sharing arrangements may increase the costs or risks of entry by independent commuters, I believe it is fair to consider them as much entry tools as entry barriers. Increasingly, jet operators are including code-sharing arrangements as part of their program for establishing new hubs. United arranged for initiation of United Express service at American Eagle service when it opened its Raleigh-Durham and Nashville hubs. The Department has found in a number of merger decisions, including the Northwest-Republic and Alaska Airlines- Horizon cases,²⁷ that participation in a code-sharing arrangement may facilitate a commuter carrier's entry or expansion into markets around a hub.

CONCLUSION

The sponsors have reminded me that the purpose of this symposium is to suggest lessons that general antitrust practitioners might draw from the experiences of deregulated industries. Let me close by suggesting at least one lesson to be gleaned from both the CAB's and Department's experiences with airline mergers. It is critically important for the decision-maker passing judgement on a merger to thoroughly understand the nature of the industry and markets, and the characteristics of competition and the competitors, and affected by a proposed merger before applying the competitive standards of the Clayton Act. Presumptions or even conclusions that have been drawn about the nature of competition for some industries or markets may not be readily transferable to others. As antitrust practitioners, you can best contribute to sound antitrust policy by assuring that the decision-maker is presented with the information that will permit the thorough understanding necessary for well-reasoned and reasonable decisions.

REFERENCES

¹49 U.S.C. Sec. 1378.

²P.L. 95-504, 92 Stat. 1705 (1978).

³The Conference Report to the Deregulation Act, in explaining the changes to Section 408, stated clearly that, "The foundation of the new airline legislation is that it is in the public interest to allow the airline industry to be governed by the forces of the marketplace." H.R. Rep. 95-1779 95th cong., 2d sess. at 73 (October 12, 1978).

⁴Section 408 also empowered the Department to impose such condition in its approval as are considered just and reasonable.

⁵Effective January 1989, Section 408 was terminated and airline mergers will be governed by the antitrust laws. 49 U.S.C. Sec. 1551(a)(6).

⁶Brown Shoe v. United States, 370 U.S. 294 (1962); United States v. General Dynamics, 415 U.S. 486 (1974).

⁷Texas International/Pan American-National Acquisition Case ("National Acquisition") Orders 79-12-163/164/165 at 12 (October 24, 1979). Texas International-Continental Acquisition Case, Order 81-10-66 at 4 (August 14, 1981).

⁸Southwest Airlines-Muse Acquisition Show Cause Proceeding ("Southwest-Muse") Order 85-5-28 at 6-7 (May 3, 1985); NWA-Republic Acquisition Case (Northwest-Republic'), Order 86-7-81 at 6-7 (July 31, 1986).

⁹Northwest-Republic, *supra*, Order 86-7-81 at 5-8.

¹⁰National Acquisition, supra, Order, 79-12-163/164-165 at 19; Continental-Western, supra, Order 81-6-1/2 at 11.

¹¹Northwest-Republic, supra, Order 86-7-81 at 12, 13; TWA-Ozark Acquisition Case ("TWA-Ozark"), Order 86-9-29 (September 12, 1986).

¹²E.g., TWA-Ozark, supra, Order 86-9-29 at 7-8.

¹³In one case, the Southwest-Muse acquisition, the Justice Department did not support our competitive analysis, but it nevertheless agreed that the acquisition should be approved. Southwest-Muse, supra, Order 85-6-79 (June 24, 1979). In another case, when United Air Lines purchased Pan American's transpacific international operations, the two agencies differed only on the narrow question of the need for further consideration of the issue of requiring United (which already operated to Tokyo from Seattle) to give up some of its Trans-Pacific route authority. The Justice Department would have required United to give up the authority at the time we approved the transaction. We determined that the matter deserved further consideration before any action was taken. Pacific Division Transfer Case, Order 85-11-6 (October 31, 1985).

¹⁴USAir-Piedmont Acquisition Case, Order 87-10-58 (October 30, 1987); appeal dismissed for lack of standing sub. nom. America West Airlines, Inc. v. Department of Transportation, No. 87-1639 (D.C. Cir. February 19, 1988).

¹⁵M. Levine, "Airline Competition in Deregulated Markets: Theory, Firm Strategy, and Public Policy", 4 Yale Journal on Regulation. 393 (Spring 1987).

¹⁶Continental-Western, supra, Order 81-6-112 at 13-14; Northwest-Republic, supra, Order 86-7-81 (July 31, 19 at 13,14-15; TWA-Ozark, supra, Order 86-9-29 at 9-10.

¹⁷Texas Air-Eastern Acquisition Case, Order 86-7-21 (July 9, 1986).

¹⁸Notice of Proposed Rulemaking EDR-466C, 49 Fed. Reg. 11644 (March 27, 1984); Final Rule, ER-1385, 49 Fed. Reg. 32562 (August 15, 1984) aff'd United Air Lines, Inc. v. CAB, 766 F. 2d 1107 (7th Cir. 1985)

¹⁹14 C.F.R. S 255.4 (regulation display of flight information in CRSs).

²⁰14 C.F.R. SS 255.5, 255.7 (regulation the provision of CRS services to other airlines).

²¹USAir, Inc. v. American Airlines, CV. No. 84-8918 ER; Continental Air Lines, Inc. v. American Airlines, Inc., CV 86-0696 ER. (C.D. CA).

²²Application of United Air Lines, Inc., Covia Corporation, et al., Department of Transportation Docket 45616.

²³This issue is discussed in the USAir-Piedmont decision, Order 87-10-58 at 17-18

²⁴See also EDR-470, 49 Fed. Reg. 9430 (March 13, 1984); ER 1377, 49 Fed. Reg. 12677 (March 30, 1984), PSDR-85, 49 Fed. Reg. 43709 (October 31, 1984); Amdt. No. 399-80, 50 Fed. Reg. 38508 (September 23, 1985).

²⁵D. Pickrell, C. Oster, A Study of the Regional Airline Industry, The Impact of Marketing Alliances, Department of Transportation Staff Study (May 1986)

²⁶C. Oster, "The Competitive Effects of Marketing Alliances: An Update", (November, 1986).

²⁷Northwest-Republic, supra, Order 86-7-81 at 19; Alaska Airlines-Horizon Air Acquisition Case, Order 86-12-61 at 7 (December 23, 1986).

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THE IMPACT OF AIRLINE SIZE UPON EFFICIENCY AND PROFITABILITY

by
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INTRODUCTION

With the enactment of the Airline Deregulation Act of 1978, deregulation of the nation's airlines officially began in 1979.¹ Deregulation of the airlines was accompanied by a series of setbacks: fuel prices more than doubled between 1978 and 1981, and the surge in costs, coupled with the 1981-1982 recession, inflicted huge losses on the industry. The 1981 air-traffic controller strike and the aftermath of firing of more than 11,000 air-traffic controllers sharply restricted the number of flights at the large U.S. airports. Airlines stretched out or cancelled plane orders and even grounded part of their fleets.² Also adding to the chaos was the entrance of new airlines such as Peoples Express.³

Following the 1978 banner year of \$1.365 billion in operating profits, the U.S. airline industry lost nearly \$1.4 billion from 1980 through 1982.⁴ Profits reached \$310 million in 1983, about \$2.1 billion in 1984, around \$1.4 billion in 1985, \$1.3 in 1986, and a record \$2.46 billion in 1987.^{5, 6, 7, 8}

The overall airline recovery since 1983 is attributed to a number of factors. Among them, fuel prices which account for one quarter of an airline's operating expenses, have remained more stable. Many airlines have received concessions from their labor forces. Tough cost cutting measures have been implemented. The wiser use of new routes has been a contributor, and a strong economy

during this period has also had a very positive effect on the airlines.⁹ This recovery follows on the heels of a post-deregulation transition which saw competitive forces challenge the market dominance of established carriers.

Even with the good profits of recent years for air carriers as a group, certain individual airlines such as Eastern have not shared in the gains. Also on the negative side, statistics show that 21 of 36 airlines certified before deregulation are no longer operating, 84 of all new entrant airlines since deregulation no longer exist. These changes have resulted from merger, liquidation, and decertification.^{10, 11, 12, 13, 14}

The effect of size or scale on economic performance is a key aspect of the economies of business enterprise and industrial organization. The trend with the passage of time for companies to become larger through mergers as well as growth makes it of particular interest to obtain objective measures of the economies or diseconomies and other effects of increasing scale.

The key question to be answered in this paper is whether size has been associated with improved efficiency and profitability. This paper attempts to analyze efficiency and profitability difference of U.S. airlines according to firm size within a segment of the U.S. airline industry. This is a topic of current importance because of the great structural changes, particularly mergers, that have occurred in the airline industry since deregulation and the implications for future optimum airline size that would best serve the public interest and the nation's need for a dependable and efficient airline industry.

AIRLINE TRENDS

An examination of several airline operating characteristics is an appropriate beginning for the analysis. Table 1 shows relevant airline operating statistics from 1978 through 1988.^{15, 16, 17}

Graphically, it can be seen in Figure 1 and Figure 2 that both revenue-passenger miles and available seat miles have each risen around 60 percent since the slump of 1981. The trend for both since 1981 has been a relatively smooth upward movement. Due to the nature of the airline industry, high fixed costs made marginal revenue/additional revenue contribution an important aspect of operating income. Thus, advantage of increasing demand by the traveling public.

In Figure 3, the load factor which is a result of available seat miles being divided by revenue-passenger miles, has been erratic over the time period. After climbing to a high of 63% in 1979, just when deregulation was to take effect, it fell sharply in 1980 to 59%. Since 1981, although the individual years have been inconsistent, the trend has been upward. A post-deregulation higher level of 62.7% was reached in 1988.

The operating ratio, the amount of operating revenue used for operating expenses, has varied considerably since 1978. It has ranged from a low of 97% in pre-deregulation 1978 to a high of 102% in 1982. Since 1982 the airlines have succeeded in returning the ratio to a more profitable level. Figure 4 shows the ratio.

From Figure 5, operating income dropped drastically after 1978 to a deficit of minus \$733,435,000 in 1982. This drop was probably due to a combination of factors ranging from price competition on competing routes among the carriers in a deregulated environment to the economic climate. After 1982, operating income returned to profitable levels. In 1987, the carriers as a whole realized their highest operating income on record.

In addition to collective airline operating statistics, individual airline operating characteristics such as market share, merger trends, and the interface between these two elements are germane to this analysis. Market shares of enplanements for all of the major U.S. airlines from 1978 through 1987 are shown in Table 2.¹⁸

TABLE 1

AIRLINE INDUSTRY OPERATING STATISTICS 1978-1988

YEAR	REVENUE PASSENGER MILES (000)	AVAILABLE SEAT MILES (000)	LOAD FACTOR %	OPERATING REVENUE (000)	OPERATING EXPENSES (000)	OPERATING RATIO	OPERATING INCOME (000)
1978	226,781,368	368,750,530	61.50%	22,883,955	21,519,092	0.940	1,364,863
1979	262,023,375	416,126,429	63.00%	27,226,665	27,026,610	0.993	200,055
1980	255,192,114	432,535,103	59.00%	36,662,555	33,949,421	1.007	(221,615)
1981	248,887,801	424,897,230	58.60%	36,662,555	37,117,325	1.012	(454,770)
1982	259,643,870	440,119,206	59.00%	36,407,635	37,141,070	1.020	(733,435)
1983	281,829,148	464,537,979	60.70%	38,953,672	38,643,262	0.992	310,410
1984	304,458,727	514,010,029	59.20%	43,825,047	41,673,536	0.951	2,151,511
1985	336,403,021	547,788,432	61.40%	46,664,414	45,238,150	0.969	1,426,264
1986	366,283,158	606,847,601	60.40%	50,524,933	49,201,832	0.974	1,323,101
1987	404,307,784	648,414,398	62.40%	57,020,400	54,561,111	0.957	2,459,289
1988	411,628,429	656,866,299	62.70%	N/A	N/A	N/A	N/A

FIGURE 1
YEAR VS. REVENUE PASSENGER MILES
1978-1988

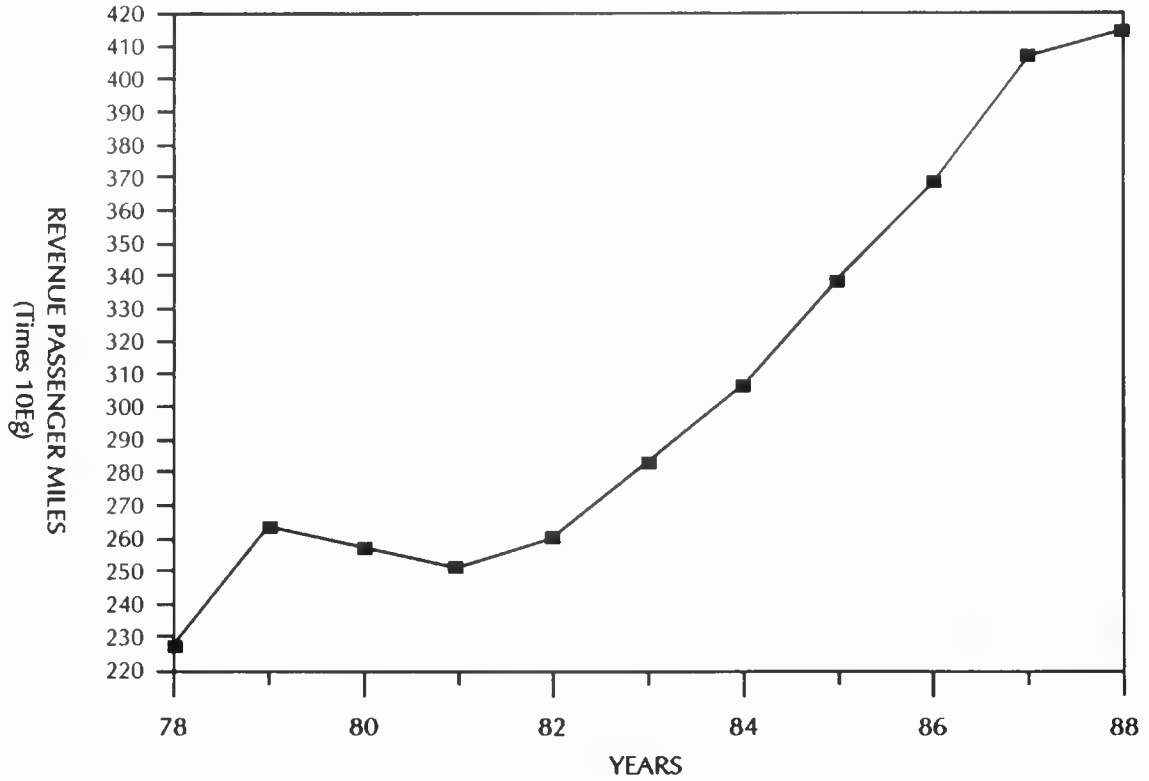


FIGURE 2
YEAR VS. AVAILABLE SEAT MILES
1978-1988

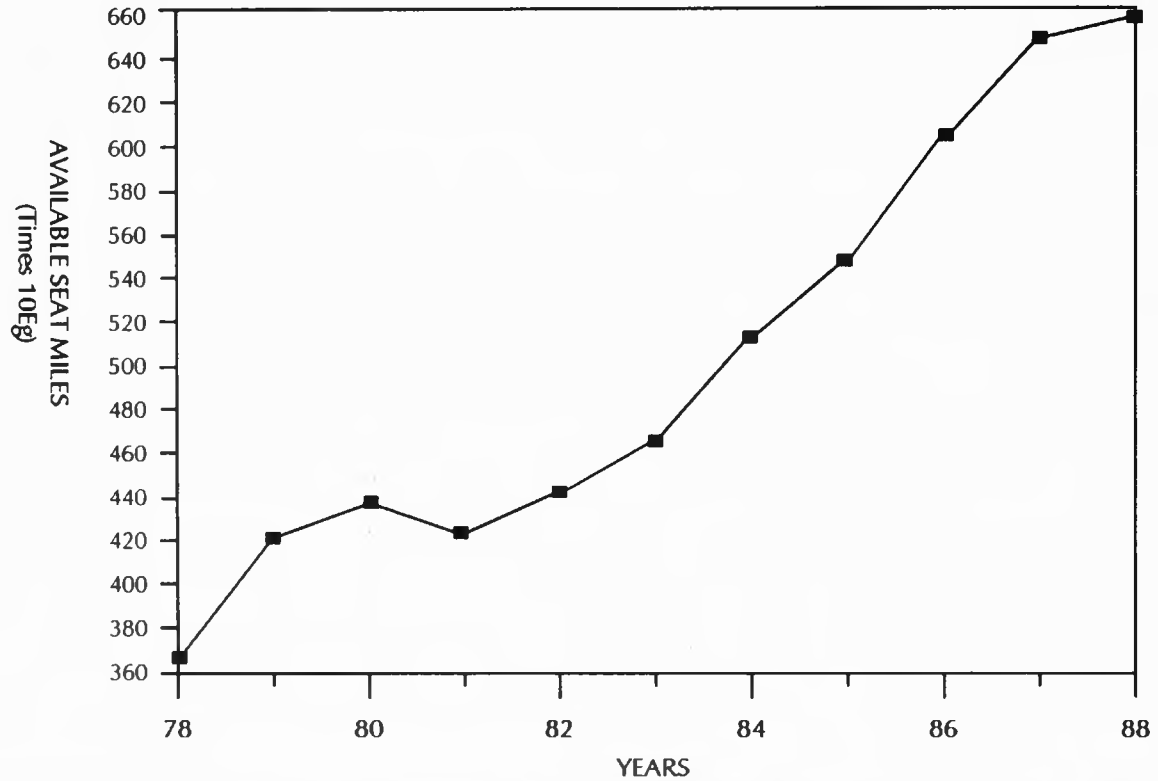


FIGURE 3
YEAR VS. LOAD FACTOR (%)
1978-1988

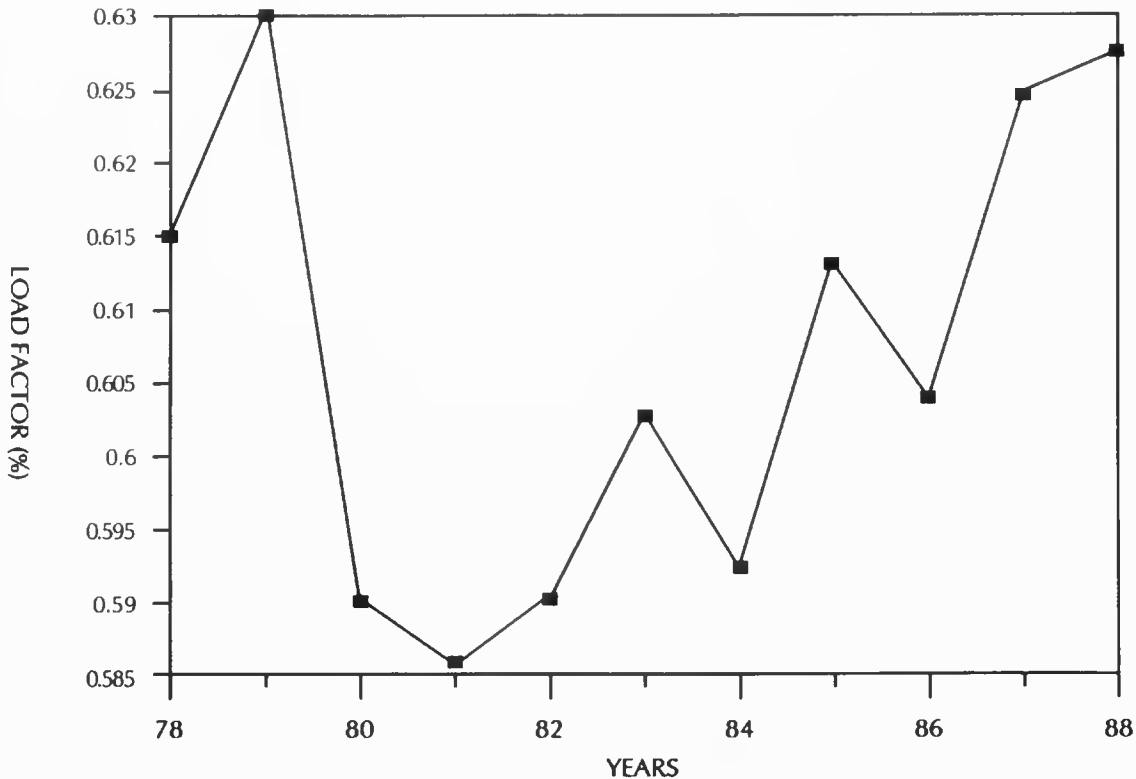


FIGURE 4
YEAR VS. OPERATING RATIO
1978-1987

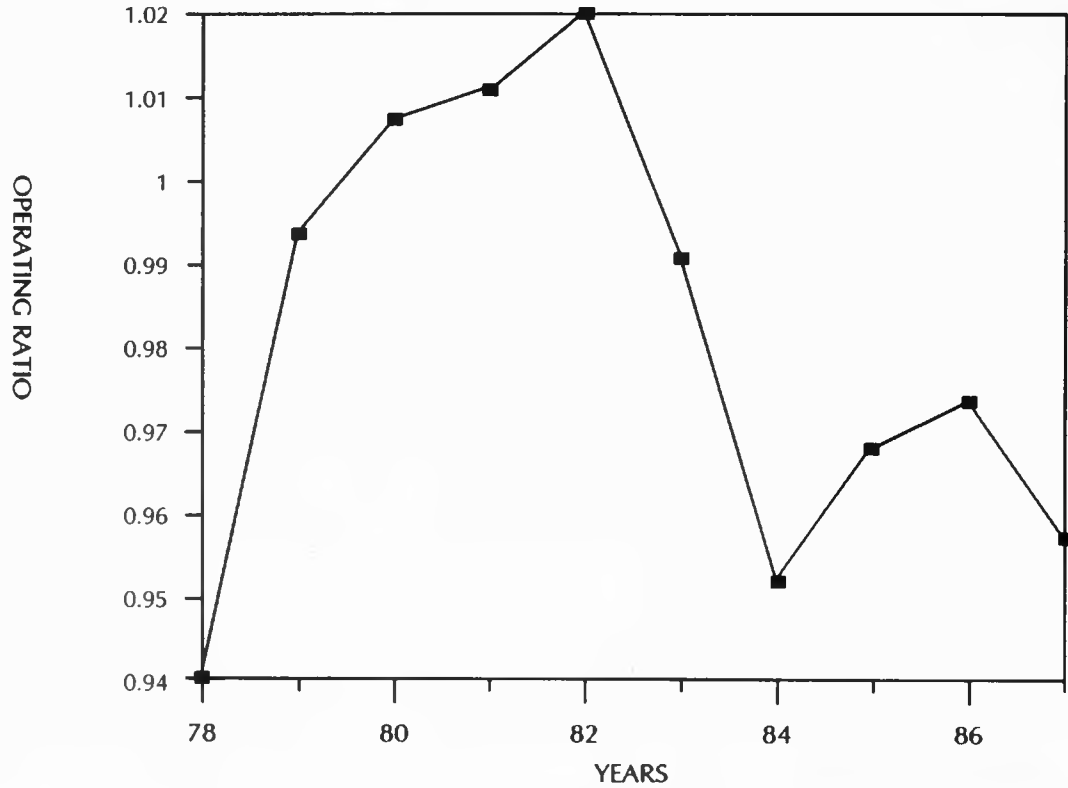


FIGURE 5
YEAR VS. OPERATING INCOME
1978-1987

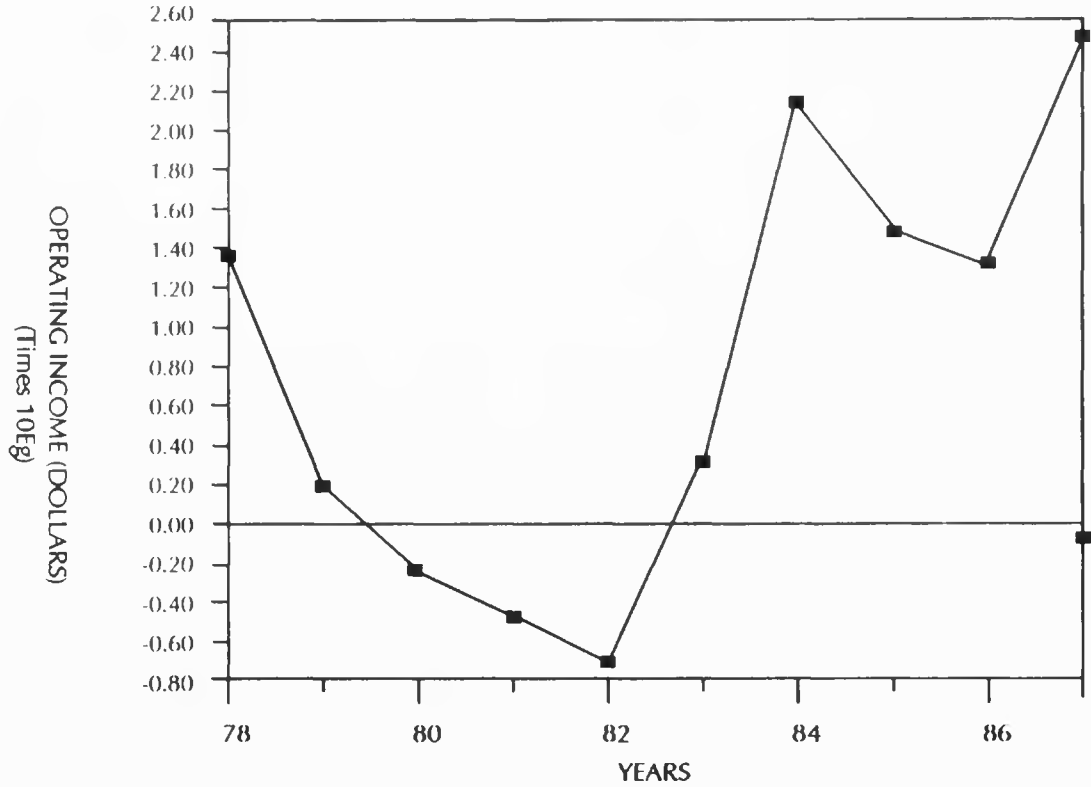


TABLE 2

U.S. AIRLINES PERCENT MARKET SHARE OF ENPLANEMENTS 1978-1987

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
United	14.95	11.38	11.27	10.03	11.84	12.57	12.82	10.87	12.96	13.21
American	10.20	9.98	9.00	9.10	9.99	10.43	10.67	11.56	11.83	11.63
Eastern	13.91	13.75	13.77	13.22	12.66	12.99	11.91	11.70	10.84	11.60
Delta	13.32	12.96	13.44	12.89	12.16	12.22	11.68	11.15	13.67	13.46
Piedmont	1.66	1.76	1.99	2.60	3.07	3.69	4.46	5.06	5.85	5.77
U.S. Air	4.72	4.62	4.95	4.89	5.29	5.36	5.33	5.40	5.57	5.44
Northwest	3.42	3.74	4.01	4.13	4.10	4.22	4.13	4.09	5.24	9.29
Continental	3.40	3.18	2.83	3.11	3.63	3.40	3.48	4.52	5.23	9.56
Transworld	7.25	7.26	7.10	6.67	6.30	6.19	5.78	3.84	6.14	5.62
Republic	---	1.82	4.14	6.21	6.51	6.30	4.75	4.80	3.77	---
People Express	---	---	---	0.30	1.02	2.23	3.07	4.14	3.38	---
Southwest	---	1.70	2.58	2.85	3.26	3.58	3.77	3.70	3.33	2.83
Pan Am	3.19	2.88	5.30	5.62	4.43	4.69	4.05	3.65	3.20	3.19
Western	4.09	3.85	3.44	3.41	3.61	3.73	3.33	3.39	---	---
Pacific										
Southwest	---	2.76	2.09	2.26	2.56	2.69	2.45	2.53	2.73	2.66

TABLE 2 CONTINUED

U.S. AIRLINES PERCENT MARKET SHARE OF ENPLANEMENTS 1978-1987

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
American West	---	---	---	---	---	0.10	0.75	1.44	1.83	2.39
Air Cal	0.92	0.92	1.03	1.29	1.23	1.18	1.25	1.25	1.29	1.31
Frontier	2.10	2.10	2.10	2.33	2.11	2.10	2.20	1.92	1.18	---
Ozark	1.69	1.30	1.26	1.54	1.66	1.61	1.55	1.56	1.06	---
Hawaiian	1.39	1.22	1.16	1.08	1.14	0.86	0.94	0.94	1.06	1.15
Aloha	1.02	0.96	0.94	0.97	0.98	0.72	0.74	0.70	0.73	0.78
Braniff	4.25	4.62	4.23	3.87	1.41	---	---	---	---	---
National	2.57	2.12	---	---	---	---	---	---	---	---
Hughes Airwest	2.30	1.62	1.31	---	---	---	---	---	---	---
North Central	2.48	1.26	---	---	---	---	---	---	---	---
Southern	1.51	0.71	---	---	---	---	---	---	---	---
Texas Intl.	1.47	1.49	1.51	1.38	1.19	---	---	---	---	---

Source: Air Transport World, Jan. 1, 1988, p. 11.

It is clear that most of the large carriers already operating before 1978, lost traffic share after deregulation, especially during the initial years of deregulation. United Airlines has to yet regain the share enjoyed before deregulations. American's share was below 1978 levels until 1985. The 1985-1986 increase was due partly to the strikes at United and TWA in those years. But the fact remains that it did not surpass its 1978 share level until 1985, six years after deregulation. Eastern has seen a fairly steady erosion of its market share since 1978. In addition to the problems encountered by all airlines in the deregulated environment, Eastern has encountered a multitude of other problems, not the least being labor and its interface with non-union sister Continental. Delta has also experienced a steady decline of market share since deregulation. Only because of the merger with Western does Delta's share show a significant increase beginning with 1986. Piedmont and U.S. Air are two smaller carriers that have been able to gain market share during this era of deregulation. Northwest Airlines was able to increase market share during the initial years of deregulation even before it merged with Republic. Much of this increase was due to its international operations, where deregulation did not apply. In fact, during the period from 1979 to 1985 its domestic traffic actually declined. Continental's share has increased since deregulation; a significant share was gained at the expense of Eastern. TWA even after the merger with Ozark in 1986 has continued to show an erosion in market share. Pan American merged with National in January 1980. Following their merger, their combined traffic share has declined in every subsequent year. For the airlines formed since deregulation the results have been mixed. Peoples Express was merged into Texas Air. American West has steadily increased its share since inception. The case is similar for Air Cal.

Market share can also be viewed from the perspective of individual airports. Before deregulation, C.A.B. studies showed that the ideal competitive balance at major airports was three carriers with full flight schedules. Today, however, more than half of the flights in an increasing number of cities are provided by a single car-

rier. For example, Northwest controls over 80% of the gates at Minneapolis; U.S. Air has more than an 80% share at Pittsburgh; Piedmont 80% at Charlotte; and United and Continental share most of the gates at Denver.

Market share whether from the perspective of air carrier Enplanement or individual airport gate dominance has been significantly impacted by the wave of airline mergers since deregulation. Between May 1985 and December 1987 alone, twenty-four acquisitions and mergers involving U.S. airlines operating jet aircraft in scheduled passenger service occurred. Among the more significant mergers or acquisitions during this period were American and Air California; Delta and Western; Eastern, Continental, Peoples Express, Frontier, New York Air, and Butt; Northwest and Republic; Trans World and Ozark. Seven major carriers are all that remain today of the eleven trunk carriers that existed in 1978. These seven carriers account for over 86% of the total market share of all U.S. airlines.¹⁹

METHODOLOGY

The study examined 13 domestic airlines.^{20, 21, 22, 23, 24, 25, 26} All of the majors were included except pan Am and Continental. Alaskan and Hawaiian airlines were also included in the data. The years 1978 through 1987 were analyzed. Because deregulation took effect in 1979, 1978 was chosen as a starting point for a pre-deregulation comparison with the deregulated years since.

In an attempt to obtain a measure of firm size, three different representations were used: total assets, available seat miles, and number of employees. It was hoped that if a significant relationship was masked by a weakness in one indicator of size, analysis of one or more of the other standard would lead to more meaningful results. Profitability in this study was measured by operating income which is the operating revenue less operating expenses. Efficiency

was measured by the operating ratio. The operating ratio is the proportion of operating revenues consumed by operating expenses. This is a good statistic for a firm's relative performance on the question of cost versus revenue. It is generally thought to be one of the best indicators of operating efficiency.

Correlation and regression analysis of firm size in relation to various profitability measures were the prime analytical tools used. The major question examined in this paper is quite simple. As the size of an airline increases, does operating efficiency increase or decrease and does profitability increase or decrease more than proportionately with adjustments in airline size?

FINDINGS OF THE ANALYSIS

Results of the correlation analysis of the 13 airlines examined from 1978 through 1987 are presented in Table 3. Looking at the airline profitability in terms of operating income and the influence size has on this profitability, the three representative measures of airline size generally tended to follow the same pattern. When total assets are used as predictor of operating income, significant correlations are found for the pre-deregulation year of 1978 and for the years of 1984-1987. For the years 1979-1983 correlations are very weak or nonexistent. Figure 6 shows the regression of this relationship for 1987.

The relationship of available seat miles to operating income produces mixed results over the years. Available seat miles provides predictability of operating income for 1978, 1984, 1985, and 1987. No significant correlations were found for the intervening years. Figure 7 reflects this relationship for 1987.

Using number of employees to predict operating income was not conclusive. The years 1978, 1984 and 1985 showed good relationships. In 1987 some relationship existed, but the other years were very weak. Figure 8 shows the weak relationship in 1987.

TABLE 3
CORRELATION COEFFICIENTS (R²) 13 INDIVIDUAL AIRLINES

	Operating Income									
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total Assets	75.5 S.	7.4 N.S.	22.6 N.S.	4.1 N.S.	28.2 N.S.	5.5 N.S.	80.5 S.	70.2 S.	35.9 S.	61.3 S.
Available Seat Miles	76.7 S.	2.2 N.S.	22.6 N.S.	2.2 N.S.	32.5 N.S.	32.5 N.S.	2.3 N.S.	52.9 S.	13.6 S.	40.3 S.
Employees	73.1 S.	3.2 N.S.	9.5 N.S.	1.1 N.S.	25.4 N.S.	0 N.S.	71.1 S.	52.7 S.	14.8 N.S.	37.0 S.

S = The correlation is statistically significant.

N.S. = The correlation is not statistically significant.

TABLE 3 CONTINUED
CORRELATION COEFFICIENTS (R²) 13 INDIVIDUAL AIRLINES

	Operating Ratio									
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Total Assets	31.4 S.	10.3 N.S.	0 N.S.	0.1 N.S.	0.1 N.S.	0.9 N.S.	12.4 N.S.	0 N.S.	2.3 N.S.	2.1 N.S.
Available Seat Miles	29.3 S.	1.7 N.S.	.1 N.S.	0 N.S.	0.2 N.S.	0 N.S.	10.1 N.S.	0.4 N.S.	0.1 N.S.	0 N.S.
Employees	28.6 S.	6.9 N.S.	0.4 N.S.	1.3 N.S.	0.1 N.S.	0 N.S.	6.7 N.S.	3.5 N.S.	12.2 N.S.	0 N.S.

S = The correlation is statistically significant.

N.S. = The correlation is not statistically significant.

FIGURE 6
TOTAL ASSETS VS. OPERATING INCOME
1987

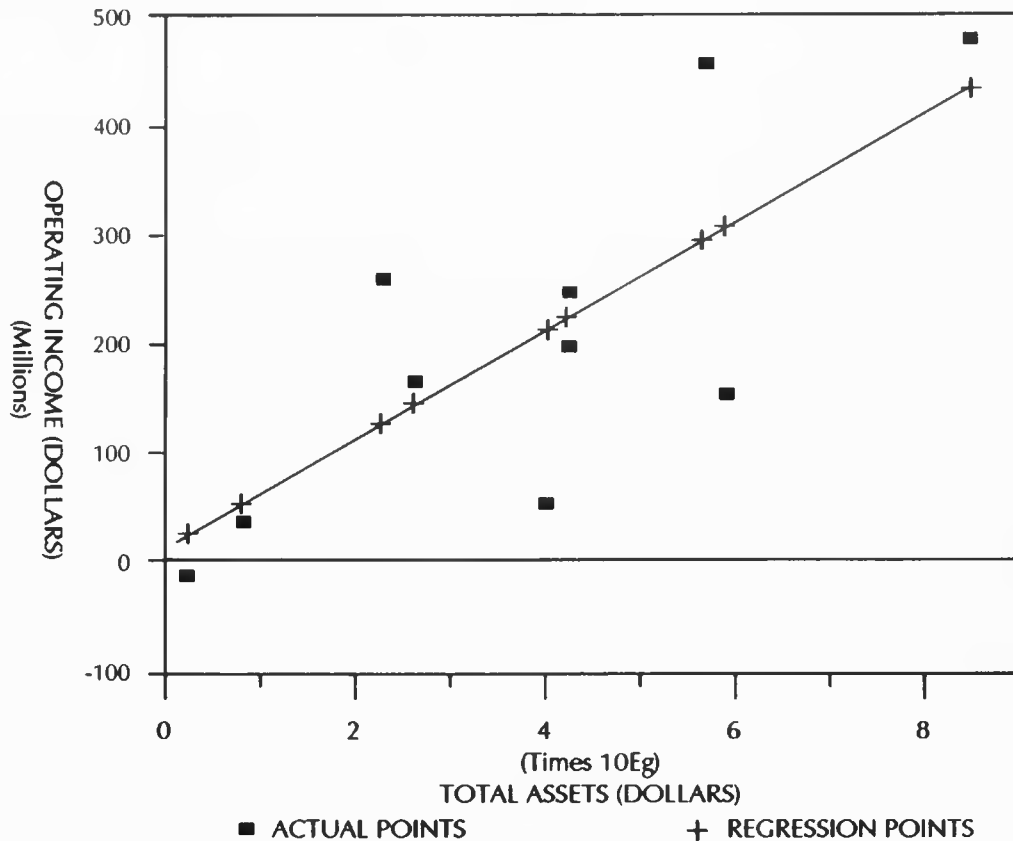
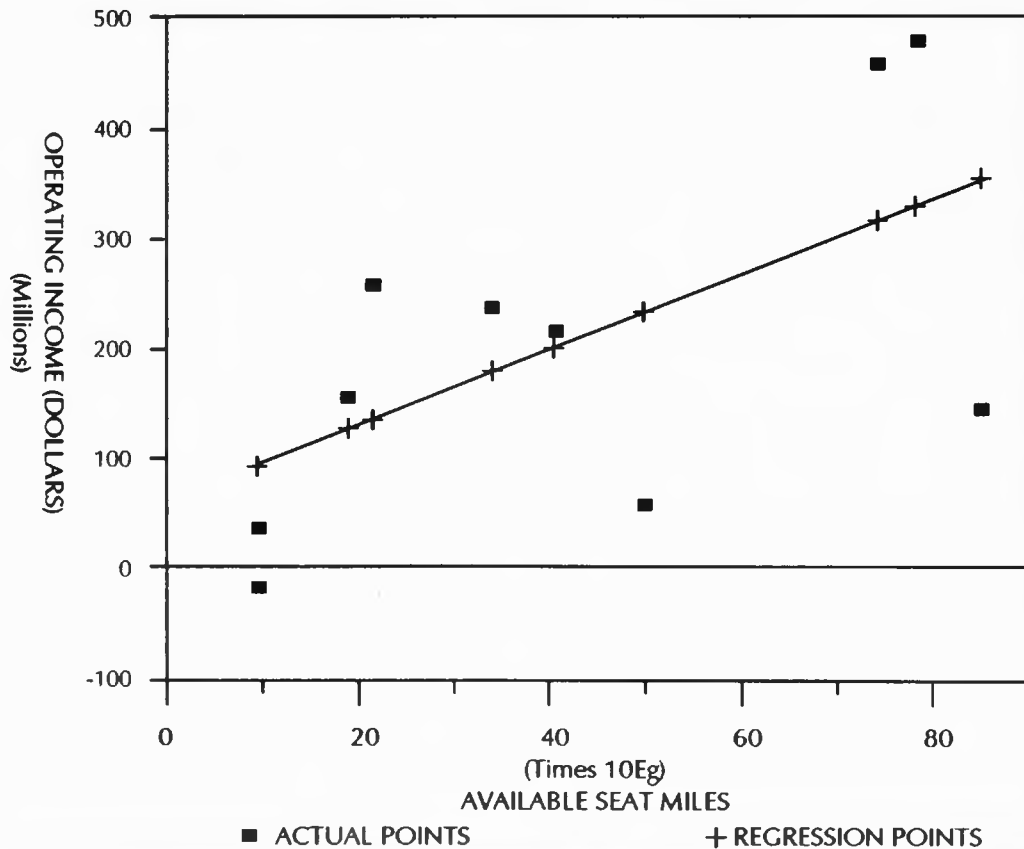


FIGURE 7
AVAILABLE SEAT MILES VS. OPERATING INCOME
1987



Generally, the lower the operating ratio, the better the chance for operating efficiency. When using the three representations of firm size to predict efficiency in operations as indicated by the operating ratio, virtually none of the measures, total assets, available seat miles, or number of employees, indicated any significant relationships for any of the years except 1978. In 1978 a somewhat weak relationship between the three size measures and operating ratio was found. Figure 9 shows an example of the "scatter" of available seat miles for 1987

Some general observations concerning the individual airlines in recent years, namely 1985, 1986 and 1987, should be noted. The largest airline in terms of assets, American, has consistently shown the highest operating income during this period. The airline with the smallest assets, Hawaiian, has had the lowest or next to lowest operating income during the period. The airlines with the highest available seat miles during these years have not had the highest operating income, but the airlines with the fewest available seat miles have generally had the lowest operating income. The airlines with the largest number of employees have not had the highest operating income, but the airlines with the fewest number of employees have had the lowest operating income.

As far as the relationship of size to operating ratio is concerned during 1985, 1986 and 1987, American airlines with the most assets in 1985 had one of the lowest operating ratios, but that subsequently rose in 1986 and 1987. It might also be noted that in 1987 the airline with the smallest assets had the highest operating ratio. The airline with the highest number of available seat miles in 1985, United, also had the highest operating ratio of 1.06. In 1987, the airline with the lowest available seat miles, Hawaiian, had the highest operating ratio. In 1985, the airline with the largest number of employees had the highest operating ratio. In 1987 the airline with the fewest number of employees, Hawaiian, had the highest operating ratio.

In an attempt to gain additional insight, the 13 airlines were broken down into two groups for comparison in 1985 and again into two groups in 1987, as shown in Table 4. For the 1985 grouping, airlines with less than \$4 billion in assets were grouped together and those with assets in excess of \$2 billion were grouped together. The 1987 groupings were based on airlines with assets in excess of \$4 billion and those with less than \$4 billion in assets. The year 1986 was excluded for comparison because of the numerous consolidations that occurred during the year.

For 1985 both size categories showed significant relationships between "the three measures of size; total assets, available seat miles, and employees; and operating income. A dichotomy appears when the size measures are correlated with the efficiency measure of operating ratio. The smaller sized carriers showed a significant correlation between size measures and the operation ratio, but the largest airlines reflected no relationship.

The differences become even more visible when a 1987 comparison is made. Generally, these two groupings are cases where the larger carriers have become larger in 1987, primarily as a result of mergers such as Delta and Western, and the smaller carriers have shrunk in number. But the smaller carriers continue to show a significant correlation between the of size and operating income. However, the larger carriers do not even show how a relationship between size and operating income as they did in 1985. As in 1985 when it comes to a comparison between the two groups for size measure and the relationship to operating ratio, the small carriers have a positive relationship while the larger carriers have little or none.

When the above groupings were compared on a basis of averages, significant differences were even more apparent. According to the computed Figures in Table 5, the smaller sized carriers were more profitable in relation to their size measure than the larger carriers in 1985. The small airlines had operating income equal to

FIGURE 8
NUMBER OF EMPLOYEES VS. OPERATING INCOME
1987

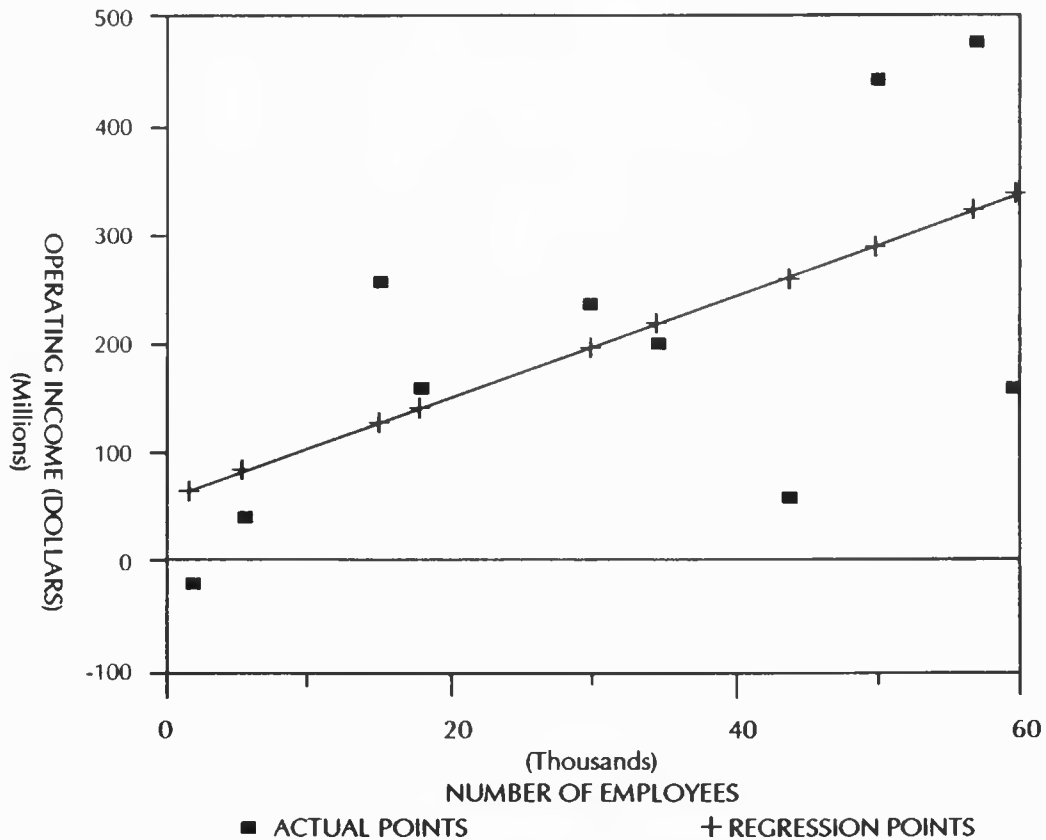


FIGURE 9
AVAILABLE SEAT MILES VS. OPERATING RATIO
1987

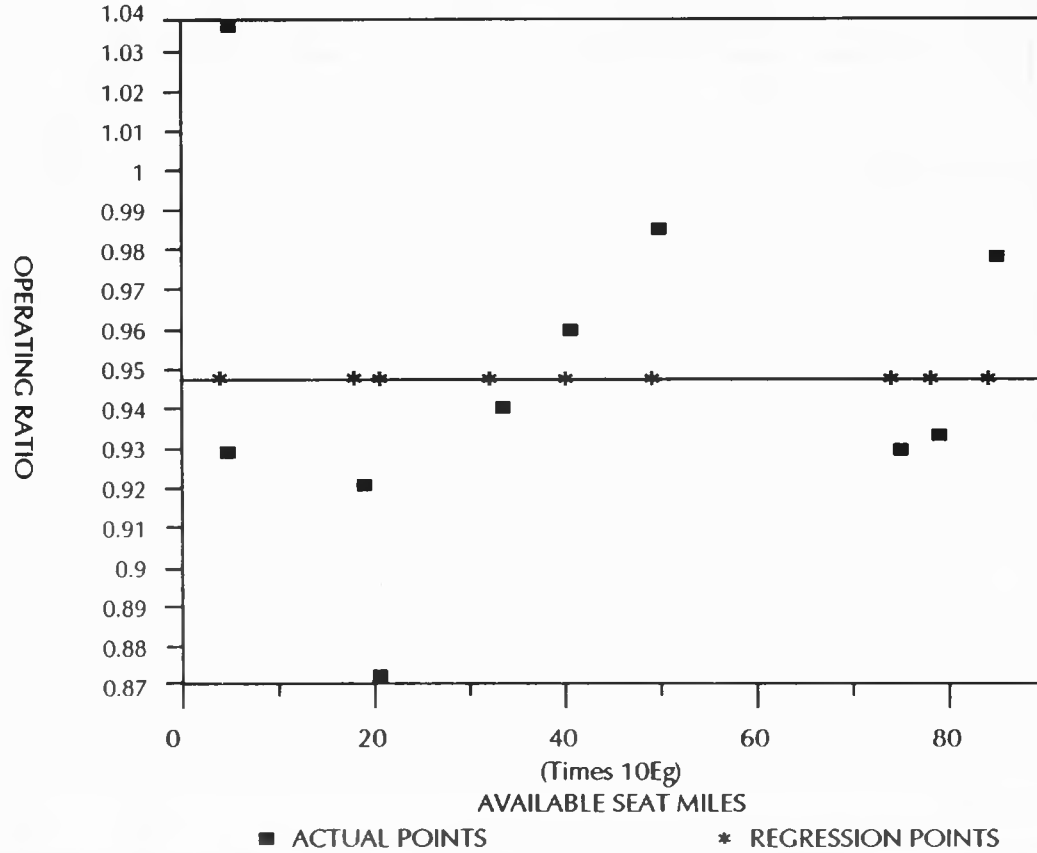


TABLE 4

CORRELATION COEFFICIENTS (R²) 13 INDIVIDUAL AIRLINES - GROUPED

	1985			
	Operating Income		Operating Ratio	
	Group I	Group II	Group I	Group II
Total Assets	78.6 S.	86.6 S.	72.9 S.	5.1 N.S.
Available Seat Miles	69.3 S.	53.2 S.	51.4 S.	0 N.S.
Employees	90.4 S.	48.6 S.	76.0 S.	0 N.S.

Group I: Assets less than \$2 Billion--Alaskan, Hawaiian, U.S. Air, Piedmont, Republic, Western, Ozark.

Group II: Assets more than \$2 Billion--Eastern, TWA, Northwest, Delta, United, American.

TABLE 4 CONTINUED

CORRELATION COEFFICIENTS (R²) 13 INDIVIDUAL AIRLINES - GROUPED

	1987			
	Operating Income		Operating Ratio	
	Group III	Group IV	Group III	Group IV
Total Assets	79.5 S.	9.5 N.S.	64.3 S.	20.2 N.S.
Available Seat Miles	90 S.	17.5 N.S.	57.1 S.	0 N.S.
Employees	78.8 S.	9.5 N.S.	56.7 S.	0 N.S.

Group III: Assets less than \$4 Billion--Alaskan, Hawaiian, U.S. Air, Piedmont.

Group IV: Assets more than \$4 Billion--Eastern, TWA, Northwest, Delta, United, American.

TABLE 5

COMPARATIVE OPERATING INCOME RATIOS OF STUDY GROUP

	<u>1985</u>	
	Group I	Group II
Average Operating Income	\$52,991,00	\$213,102,660
Average Assets	\$926,578,420	\$4,060,905,500
Average Available Seat Miles	11,520,540,000	47,785,756,000
Average Number of Employees	8,336	35,174
	<u>1987</u>	
	Group III	Group IV
Average Operating Income	\$111,019,500	\$260,515,830
Average Assets	\$1,412,606,500	\$5,454,687,300
Average Available Seat Miles	12,371,715,000	61,168,176,600
Average Number of Employees	10,071	46,970
	<u>1985</u>	
	Group I	Group II
Operating Income as % of Total Assets	5.7%	5.2%
Available Seat Miles Per \$1 of Operating Income Generated	217,405	224,238
Operating Income Generated Per Employee	\$6,356.89	\$6,059.20
	<u>1987</u>	
	Group III	Group IV
Operating Income as % of Total Assets	7.85%	4.85%
Available Miles Per \$1 of Operating Income Generated	111,437	234,797
Operating Income Generated Per Employee	\$11,025	\$5,540

5.7% of their total assets compared to 5.2% for the larger carriers. The smaller carriers had available 217,405 seat miles for every dollar of operating income generated while the larger carriers made available 224,238 seat miles for every dollar of operating income derived. The smaller carriers did a little better than larger ones when operating income generated per employee was compared; \$6356.89 for smaller carriers vs. \$6,059,20 for the larger airlines.

After significant growth of some large carriers in 1986 via mergers and consolidations, the 1987 comparison gap for the two groups widens even more. Smaller carriers show a 7.85% figure for operating income as a percent of total assets while the larger carriers drop to 4.8%. The available seat miles per \$1 of operating income generated drops to 111,437 for smaller carriers while it rises to 234,797 for the larger airlines. Operating income generated per employee reflects an ever widening difference; up to \$11,025 for smaller airlines and down to \$5,546 for larger carriers.

SUMMARY AND CONCLUSIONS

Since the enactment of the Airline Deregulation Act of 1978, the road to profitability for the airlines, both large and small, has been a rough one. In recent years it seems to have smoothed out for most of the carriers but with a strong economy as has been experienced during recent years, it remains to be seen how the carriers will fare once the economy takes on a downward trend. The fact remains that up through 1987 the trend is positive for revenue passenger miles, load factor, operating revenues, and operating income. And the desired trend of down for the operating ratio seems to be in place.

Airline market shares have taken significant turns since deregulation. Most of the larger carriers operating before deregulation lost significant emplacement market share in the initial years after

deregulation. Many of these carriers have not yet regained the level they enjoyed before deregulation. Market share as far as gate control is concerned has increased for most of these larger carriers.

Mergers and acquisitions since deregulation had a significant impact on the airline industry structure. Seven major carriers exist today in place of the eleven trunk carriers operating in 1978. Many reasons can be cited for the recent wave of mergers - ranging from competitive reasons to the need to obtain additional aircraft. Whatever the reason, this consolidation of large carriers into even larger carriers has had a significant impact on carrier profitability and operating efficiency.

The major question asked in this paper is quite simple. As an air carrier becomes larger, does it become more efficient, does it become more profitable and do these increases occur more than proportionally? Operating income was used as the profitability measure. Operating ratio was the measure of efficiency. Total assets, available seat miles, and number of employees were utilized as indicators of airline size.

The analysis of profitability and efficiency according to the three size measures of the 13 U.S. airlines studies revealed some interesting facts, but no simple answers. When examining the profitability factor of operating income, all three size measures indicated a significant correlation for 1978 and recent years. For the years 1979 through 1983, the three measures confirmed no correlation. The reason for the sharp differences could be due to a number of factors. Factors such as the initial chaos caused by deregulation, the economy, statistical fluke, and others cannot be discounted. Based on this data, the three measures of firm size are not reliable predictors of a firm's operating efficiency. The fact that there is little or no correlation seems to indicate that firms of all sizes can operate efficiently or inefficiently. Larger firms do not necessarily have an advantage.

When the 13 carriers were broken down into two groups based on size for 1985 and 1987, the differences between large and small carriers became more apparent. In 1985 both size categories showed significant correlation between size and operating profitability, but only the smaller sized carriers showed a significant relation between size and operating efficiency. For 1987 the large carriers failed to show any relationship between size and either operating profitability or operating efficiency.

Examining differences between the two groups based on averages confirmed the correlations. For 1985 the smaller carriers fared better than larger carriers in terms of profitability and efficiency. In 1987 the gap was even wider between the two group sizes, showing that the smaller carriers were both more profitable and efficient based on all three measures of size.

It would appear from this analysis that the question of larger airlines being more profitable and efficient is answered by a no. No statistical evidence of constant returns to scale, much less economies of scale exists. The correlation numbers generated for the larger airlines are generally statistically insignificant.

Analysis of the data indicated that the larger firms had more assets in relation to operating income than the smaller firms. That the assets are proportionately above the small carriers when operating profits are considered may imply that asset creation is being financed by heavy borrowing. The bulge in assets coupled with a higher operating ratio could also indicate that facilities are not being effectively utilized. The larger carriers could possibly handle new business with relatively little additional investment. That is to say, as they grow larger, they are becoming less efficient.

By whatever means carriers grow, internal expansion, acquisition, or merger, a number of major adjustments are inherent. The expansion is usually financed through increased debt which increases interest expense. In the case of acquisition/merger there are

expenses of rationalizing the combined fleet, consolidating maintenance activities, merging reservation systems, combining management, and dealing with union contracts. The additional non-operating expenses often cause total costs to go up more than total revenues after intensive expansion, merger, or consolidation. All of these adjustments take time and resources. It remains to be seen if these "costs" will be rationalized in the long term.

The trend of airline consolidation forming larger and fewer carriers should not come as a total surprise. The airlines are fulfilling earlier predictions that only a handful of major carriers together with some healthy regional and commuter airlines would ultimately survive in the competitive intensity of a deregulated industry.

Airline industry officials have contended that competition will be preserved even at airports controlled by a single carrier because of the ample freedom for new airlines to enter the business. In such an environment, they say, any airline that charges monopoly prices will invite invasions of other carriers. But the major carriers are getting better at using their vast resources, such as computerized reservation systems, expansive flight schedules, and marketing resources to dominate smaller competitors. The price of entry is going up! Carriers are probably building barriers that competitors won't be able to penetrate. They are trying to achieve the market dominance that will give them better control of prices.

It would appear from this analysis that larger airlines are less efficient and profitable in proportion to their size than the smaller carriers. Because of the small sample in this analysis, further study is needed on this issue to arrive at any definitive answers. Answers are needed because of the important consequences for the future structure of the airline industry and the resulting impact on fares and service to the public if deregulation continues in its present form.

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BOOK REVIEWS

THE MANAGEMENT OF BUSINESS LOGISTICS, 4th Edition,
by John J. Coyle, Edward J. Bardi, and C. John Langley, Jr.,
(St. Paul: West Publishing Company, 1988). Pp. xxi, 631.
\$36.50. ISBN 0-314-65263-9.

Maintaining a current working knowledge of logistics is an ongoing challenge for both the practitioner and academician. Globalization of American business, changes in government regulations, advancing technology, new directions in both strategic and operational management techniques, and the search for differential advantage all combine to make logistics one of the most dynamic disciplines in business today. The 4th edition of Management of Business Logistics meets this challenge or change by presenting an expanded discipline in a practical, readable, current, and comprehensive introductory textbook.

The fourth edition is almost 90 pages longer than the previous edition and contains 17 chapters (2 more than previously) divided into four parts. Part I (Chapter 1-4) provides the conceptual background around which the activities of logistics revolve. The authors retain their link-node approach to logistics as a framework for the solving of temporal and spatial problems. Chapters 1 & 2 provide an overview of the logistics discipline along with the role of logistics in the firm. An appendix has been added to Chapter 2 covering the basic concepts of distribution channels. Such an addition is appropriate in light of the continuing trend toward integration of marketing and logistics. Chapter 3 discusses the establishment of Customer service in achieving buyer satisfaction while Chapter 4 examines the supply side of logistics and materials management.

Part II (Chapters 5-8) examines the functions which take place at the nodes of a logistics system. The nature of inventory management and specific inventory decisions are covered in Chapters 6 & 7. Improvements have been made in the discussion of both MRP and JIT while an appendix dealing with special applications of EOQ remains for those wishing a little more depth. Warehousing decisions are covered in Chapter 8 including a new section on third party warehousing. Materials handling and packaging, discussed in Chapter 9 could be improved with a more expanded coverage of unitization. Part III (Chapters 9-11) examines the transportation (link) element of logistics. Chapters 9 and 10 present an overview of transportation modes and traffic management, including rates and documentation. Much of the information from a separate chapter on rates and tariffs in the third edition has been incorporated into the chapter on traffic management. Chapter 11 is a new chapter entitled "Strategic Transportation Decisions". While some of the material contained in this chapter is not new (e.g. private carriage), there is a good coverage of important general transportation strategies (e.g. reducing the number of carriers to build volume).

Part IV covers the broader decision areas of logistics. Chapter 12 is a new chapter which provides an expanded coverage of international logistics including intermediaries, terms of sale and documentation. Chapter 13 provides an introduction to the role of logistics in making location decisions. The other new Chapter (14) introduces logistics information systems and contains a good discussion of innovative information techniques (e.g. expert systems). Chapter 15 and 16 examine logistics organizational structures and strategic logistic planning. The text ends with the obligatory Chapter (17) on future directions for logistics. Features retained from the third addition include On-the-Line application examples (all new), end of chapter questions, topic summaries within each chapter, short cases for each chapter (about one half new), comprehensive cases (all new), a bibliography following each part, a comprehensive table of contents, and a glossary of terms. The short cases lend themselves to some discussion but not to any formal case analysis.

The four comprehensive cases do not deliver a promised opportunity to "view the entire logistics system". Perhaps one or two longer, more integrative cases would be more appropriate. An instructors manual is available which contains chapter objectives, outlines, and answers to end of chapter questions along with examination questions and additional cases. Finally, there is a bibliography of logistics topics and a list of logistics information sources. As is true with most "support" materials found for principles of logistics texts, while adequate, it does little to help the instructor enhance the presentation of the subject. For example, the case noted for all four comprehensive cases are less than two pages long.

Introductory text books can always be criticized for their lack of depth on any particular topic. For example, this text might be improved with a discussion of forecasting and "partnerships" or strategic alliances in logistics. However, the value of these texts lies in their ability to provide an appreciation for the important role played by a particular discipline (e.g. logistics) in the success of a firm. From this perspective The Management of Business Logistics succeeds in providing a well written overview for business students in general and a good starting point for those wishing to pursue a career in logistics.

Skip Sherwood
Professor of Logistics
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TRAFFIC MANAGEMENT: PLANNING, OPERATIONS, AND CONTROL; by John E. Tyworth, Joseph L. Cavinato, and C. John Langley, Jr. (Addison-Wesley Publishing Company, 1987); pp. xiii, 514. \$41.55. ISBN 0-201-06504-5.

Here at last is a textbook treatment that brings the traffic manager out of the cloistered world of rates, tariffs, and legal jargon and places him/her in the modern corporate setting as a manager planning, organizing and controlling major logistics functions from a total cost perspective. Such a treatment is long overdue.

This is the first book of its kind to organize an examination and analysis of traffic management around the broader conceptual framework of the three basic functions of management: planning, organizing, and controlling. Recognizing the legitimacy and the importance of the traffic/transportation function and its management in the modern industrial setting, this treatment seems to be quite deserved and long overdue. Accordingly, the subject matter content is logically divided into three basic parts, roughly corresponding to these three key management functions. Moreover, this conceptual approach lends itself quite well to the task of presenting traffic management as a challenge to management creativity within the dynamics of the current environment as opposed to traditional traffic management as the conduct of a set of highly routinized, legalistic duties in a more static environment. These authors have successfully accomplished this task.

In the past, the relatively few books devoted to the subject of industrial traffic management have stemmed largely from the perceived demand for a compendium of information on procedure and practice in traffic management which could serve as a handbook for practicing traffic managers. Consequently, these books were directed principally toward that purpose and tended to be merely improvisations when an attempt was made to accomplish the instructional objectives of a course in traffic management as a part of a college curriculum in transportation and distribution studies. From

this standpoint, the Tyworth, Cavinato, and Langley book comes almost as a "breath of fresh air" to those seeking an effective instructional tool for the more academic approach to traffic management as well as to nonacademic professionals who wish to more accurately perceive the modern traffic management function in the integrative systems perspective.

Another plus for those academicians looking for a better teaching tool for courses in traffic management is the fact that the authors have provided a comprehensive instructor's manual containing subject matter outlines, examination questions with answers, and a packet of transparency masters for classroom visual presentation of key concepts and relationships. This obviously has resulted in a more effective teaching instrument. The most important qualification here, perhaps, is the fact that the depth of the treatment is pitched at a relatively elementary level for some college classroom use. This, no doubt, reflects the intent of the authors to give the book greater versatility and acceptability across a wider range of curriculum designs in transportation and distribution studies and need not be construed as a weakness. Those using the book in curricula with greater depth of transportation and logistics offerings may wish to upgrade the course content with supplementary materials.

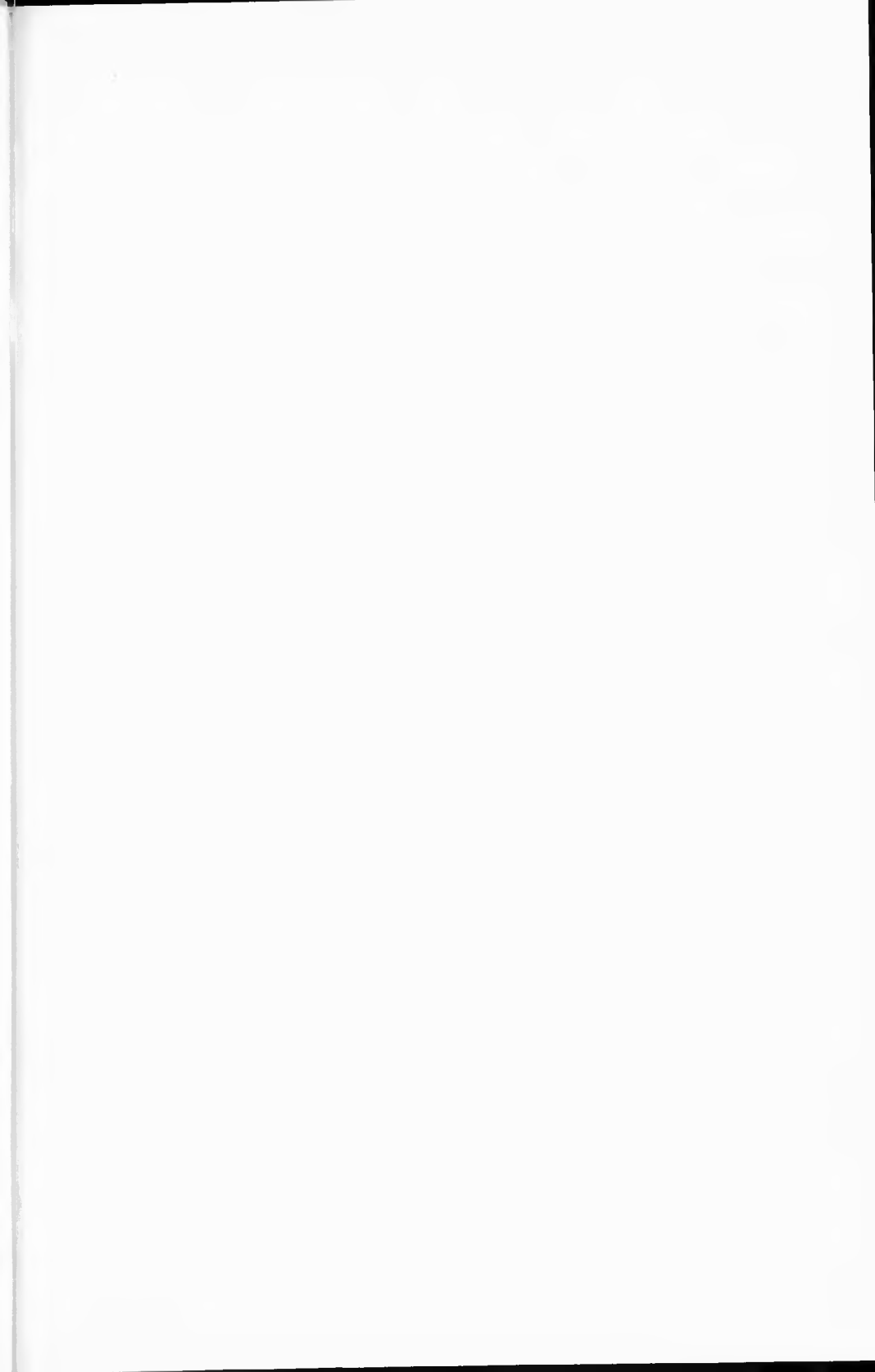
Significantly, this book gives far better balance in meeting the dual objectives of the student and the practitioner than previous books and is far more reflective of the appropriate concerns and the relevant approach to traffic management in the current environment. In Part One, the authors pay due tribute to the legacy of traditional traffic management by placing into proper perspective the continuing significance of the remaining vestiges of such institutional elements as legal and regulatory parameters and tariff pricing systems. At the same time, this section opens a new vista by setting into juxtaposition with the traditional the modern corporate role of the traffic manager as it has evolved in the much more dynamic environment following regulatory reform.

In Part Two one finds the real "meat" of this work as the authors present the management tasks of planning and organizing the shipping firm's operations directed toward accomplishment of effective and timely shipment. Not only are the traditional areas of importance in traffic operations such as liability, claims management, accessorial services, and terms of sale adequately dealt with, but appropriate and timely attention is given to contract negotiation and costing, shipment planning, fleet management, and international shipping in keeping with the changed shipping environment.

Part Three with only two chapters dealing with management control considerations is, perhaps, the weakest section of this book. In regard to the subject matter presented here, though timely and relevant enough, the scope and depth, nonetheless, hardly fulfills the purpose that the book's auspicious layout might claim. The information and electronic data transmission revolution with the resulting opportunities and potential for facilitating the control function in traffic management would seem to warrant broader, more comprehensive treatment of this section.

Perhaps, the major distinction of this treatment, as compared with the previous works in the area, is that the authors have succeeded in portraying the traffic responsibilities in the modern firm as comprising functions to be managed--not merely an array of duties to be performed. Thus, if there were nothing more to recommend it, the fact that this book has succeeded, through accurate portrayal of the traffic management function in the modern logistics system context, in deservedly elevating the traffic management function to its proper status in today's corporate setting is sufficient credit to the effort and intent of the authors. This should serve to enhance the attractiveness of traffic management as a career objective for students of transportation and distribution.

James W. Adams
Associate Professor of Transportation
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HIGHLIGHTS OF FUTURE ARTICLES

Claims Prevention
New Traffic Manager
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SPECIAL ISSUE

A special issue of the Journal of Transportation Management devoted to Air Cargo will be published in 1991. This future publication is being made possible as a result of a grant from Federal Express Corporation. Please contact the editors or publisher for additional information.

FUTURE EVENTS AND ACTIVITIES

Delta Nu Alpha's 50th Anniversary will be celebrated in Philadelphia on September 12-15, 1990 at the Fourth Annual Combined Education Conference co-sponsored with the American Society of Transportation and Logistics.

The 9th Annual Operation Stimulus will be held in Denver, Colorado on February 2, 1990. Contact the Denver Transportation Club, Delta Nu Alpha or The American Society of Transportation and Logistics for additional information.



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Dear DNA Friend:

Enclosed is your copy of the JOURNAL OF TRANSPORTATION MANAGEMENT. It is always exciting when you send out Volume I - Number 1! The second issue has returned from typesetting and is in the process of being proofed at this point. You can expect to receive it by the middle of April.

Also enclosed is a copy of the Call for Papers which was recently distributed to the academic community regarding a special upcoming issue that will be devoted to air cargo. As you can see, this anticipated publication is made possible as a result of a specific grant from Federal Express.

Please pass along the subscription form in the event any of your associates are interested in suscribing to the publication. Back issues may be purchased for \$25 each.

Co-Editors David Bloomberg and Jerry Foster as well as the Board of Directors will be interested in your comments and suggestions. Best regards.

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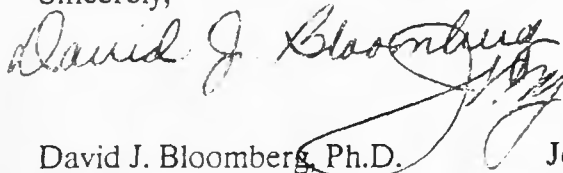
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CALL FOR AIR CARGO RESEARCH ARTICLES

As a result of a research grant provided by Federal Express Corporation to the Delta Nu Alpha Foundation, a special issue of the *Journal of Transportation Management* devoted entirely to the air cargo industry will be published and distributed in March of 1991. Anyone interested in submitting an article regarding air cargo should send it either to Dr. David J. Bloomberg or Dr. Jerry R. Foster (addresses listed below) no later than September 1, 1990.

Because of limited publishing space in *JTM*, expected interest in this particular topic, and acceptance on a first-come, first serve basis, early submission is suggested. If there are any question regarding submission dates, writing style, or other matters, please contact either Editor as soon as possible.

Sincerely,



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