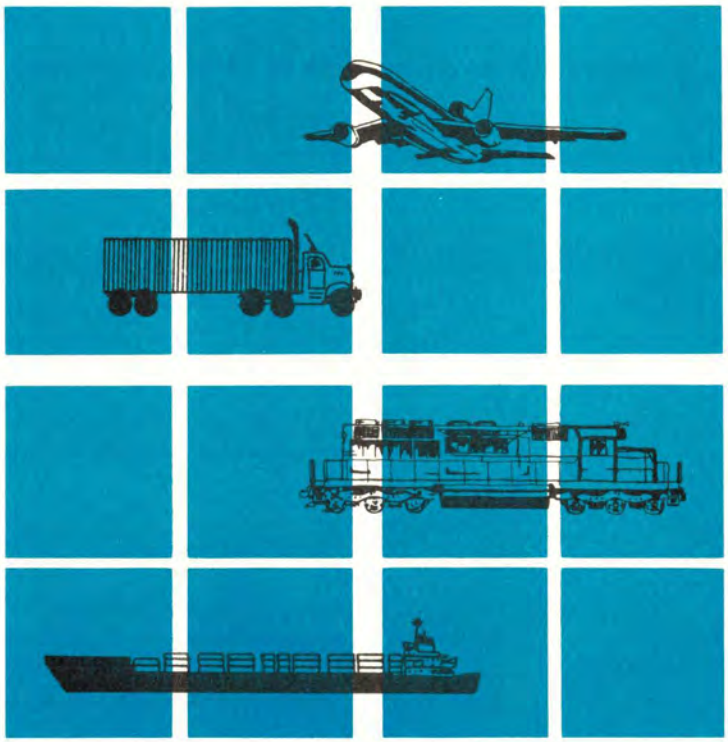
MISSOURI INTERMODAL FREIGHT HUB OPPORTUNITIES



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MISSOURI INTERMODAL FREIGHT HUB OPPORTUNITIES

Prepared for:

Missouri Highway and Transportation Department

by

Reebie Associates

Stifel, Nicolaus & Company, Inc.

Airport Consulting Group, Inc.

November, 1993

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MISSOURI HIGHWAY & TRANSPORTATION DEPARTMENT

INTERMODAL FREIGHT HUB OPPORTUNITIES

CURRENT SITUATION: INTERMODAL & MISSOURI

Intermodal transportation, described as the new hope for improved efficiency, reliability and cost savings since the 1950s, is still making headlines in the 1990s as the bright prospect for the future in transportation of containerizable freight. And, indeed, real cost savings and service improvements have been seen in the past several years -- especially with the large scale movement towards double-stack container service by rail, coupled with pickup and delivery by truck.

A number of recent studies have shown that major U.S. shippers are receiving and recognizing benefits from the economics and service characteristics of intermodal transport. Moreover, the trend is distinctly toward intermodal and away from all-highway on large volume shipments of 500 miles or more. Even motor carriers, such as Schneider, J.B. Hunt, and an increasing number of others, are solidifying partnerships with major railroads in order to utilize more extensively the efficiencies of rail movement for long hauls.

Intermodal market share is growing and will likely continue to grow for years to come -- especially in the long haul markets with greatest traffic density. Much of this growth in the past decade has been the result of handling international freight containers between ports and inland points. Now this expansion in the use of containers is making inroads into the domestic markets. Figure 1 offers a view of the growth trend in rail intermodal carloadings from 3.1 million in 1980 to 6.7 million in 1992 -- an increase of 116% over the period, somewhat over 6.6% per year.

"Intermodal transportation" can have different meanings for different audiences. In The Intermodal Surface Transportation Efficiency Act (ISTEA) "intermodal planning reflects a focus on connectivity between modes as a means of facilitating linked tripmaking."[1]

Within intermodal planning, multimodal planning "reflects consideration of more than one mode to serve transportation needs." These definitions include many possibilities, both physically and in distribution context, for the movement of goods.

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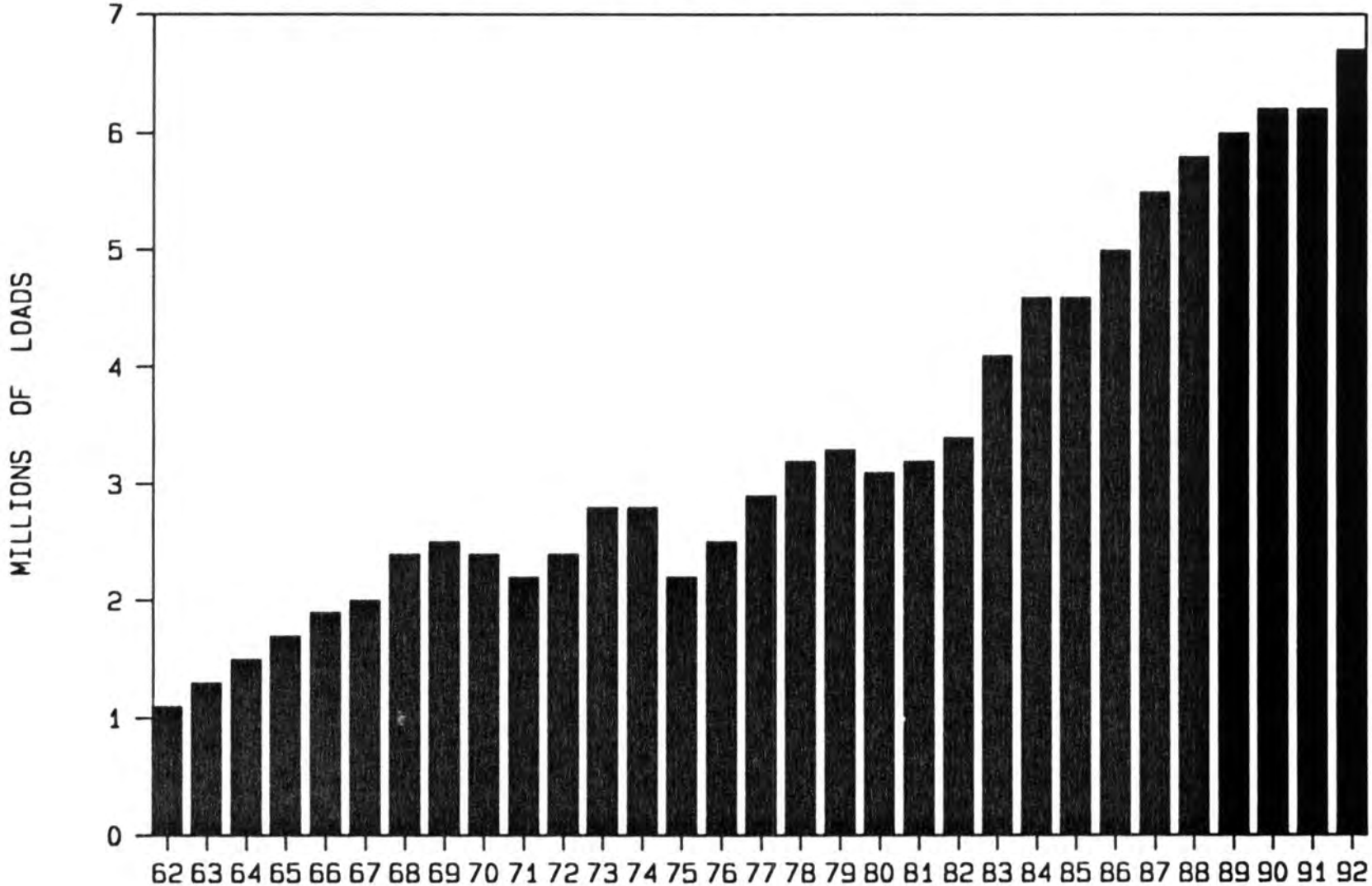
[1] Federal Register, LVIII, No. 39, March 2, 1993, 12085. "...multimodal planning reflects consideration of more than one mode to serve transportation needs in a given area and is included within the meaning of intermodal. Intermodal planning reflects a focus on connectivity between modes as a means of facilitating linked tripmaking. It emphasizes connections, choices, coordination and cooperation".

INTERMODAL LOADINGS 1962 - 1992



SOURCE: ASSOCIATION OF AMERICAN RAILROADS (AAR), RAILROAD FACTS

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Popularly in freight transportation circles, intermodal includes: ocean containers moving from shipboard to rail or highway for subsequent movement; rail/highway combinations of trailers and containers in conventional, double-stack container (or other) service; air cargo containers moving from plane to truck for delivery; and more.

This study has focused upon domestic movements of freight (although international containers are included in the analysis) via rail, highway and air. The primary emphasis has been placed on rail/highway combinations with the prospect of a "hub center" or major new terminal in Missouri. Consequently, the types of freight included in the study are merchandise type or "containerizable" commodities; for the most part, manufactured goods.

The effort was undertaken to determine if, by planning now, Missouri could benefit its own economy and that of surrounding states by implementing a new intermodal cargo hub. That is, one which could more effectively serve a broad area of the Midwest. Benefits could eventually take the form of:

- employment opportunities (direct and indirect);
- reduced traffic congestion on highways;
- improvements or at least a reduction in harmful effects on the environment--air quality, noise and other pollution;
- more efficient energy usage; and
- better and more cost-effective service for the industrial shipping/receiving public.

Air cargo has also been studied as a prospect for air/truck combinations making the modal shift at a Missouri based hub -- with pickup and delivery capability to a wider range of markets.

The State of Missouri continues to possess a natural asset in its central location in the nation, with good-to-excellent access to numerous surrounding states and significant market areas via interstate highway. In addition, the traditional gateway areas of both St. Louis and Kansas City are points where eastern and western railroads' main lines converge; and where they interchange long haul freight.

With the emphasis on greater efficiency, lower costs and improved service perpetually facing the freight transportation industry, the objectives of this study are both timely and important. If a new intermodal cargo hub were to be established, the benefits could reach far beyond Missouri's own economy to carriers, shippers and receivers of freight throughout the U.S., and abroad. In addition, there are public benefits such as reduced congestion on highways, reduced energy consumption and a cleaner environment.

Brief Historical Perspective

Intermodal, in terms of rail/highway long haul movement within the United States, began to take hold in the 1950s and by the 1960s had gained a significant portion of the intercity, containerizable traffic.

From the late 1960s to the mid 1970s, however, rail/highway intermodal loadings leveled off. The Federal Railroad Administration's National Intermodal Network Feasibility Study, completed in the mid 1970s, pointed out that future growth of intermodal activity depended on the development of more reliable, lower cost operations. Such seemingly countervailing demands, the study went on to suggest, could best be met by expanding the use of solid intermodal trains operating on a network of 120 dedicated terminals. The recommendation was in contrast to the then prevailing orientation of mixing intermodal cars into longer, less frequent mixed manifest trains serving some 1,400 ramp points.

In the latter portion of the 1970s intermodal traffic began another sharp rise. Large, volume oriented terminals with mechanical unloading devices took over throughout the U.S., while smaller ramp points were closed or became merely locations on paper for rate making purposes only. Dedicated intermodal trains had become more commonplace.

Another shot in the arm for intermodal traffic occurred with rate deregulation in 1981. With this change railroads and shipper agents vigorously pursued traffic opportunities. The intermodal business was on a roll. Traffic increases persisted even during economic downswings.

In 1979 boxcar traffic was 18% of the railroads' total carloadings. In virtually every year since that time this car's share of market dropped to the point where it was approximately seven and a half percent by 1990. The evidence supports the contention that much of the intermodal traffic was a shift from boxcar to Trailer-on-Flat-Car (TOFC)/Container-on-Flat-Car (COFC).[2]

Double-stack container cars made their debut in the early 1980s. But, it was not until the mid 80's that the economies of these operations were linked with large container ships calling on selected ports. Since right-of-way clearance considerations associated with these higher double-stack loads could be more readily addressed in the west, the import/export traffic with the Pacific Rim countries paved the way for such dedicated trains to link up west coast port cities with key midwestern markets.

Then, by the late 1980s the shift towards double-stack container service broadened to include domestic U.S. freight as well. This trend gained a significant market penetration into shipments of "merchandise" type freight; i.e., products that could be put into a "dry van" type container and that needed to be moved expeditiously for distances of 700 miles or more.

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[2] Reebie Associates, Effects of the Boxcar Exemption prepared for Interstate Commerce Commission (Greenwich, CT: Reebie Associates, 1988), pp. 15, 51. TOFC/COFC piggyback are all part of intermodal. The terms, TOFC and piggyback describe rail/highway intermodal transportation. Piggyback refers to the highway transportation of trailers that can be transferred to rail cars for part of their move. Trailer-on-Flat-Car or TOFC are other terms for piggyback. They are used interchangeably in this report.

In addition to the rail carriers themselves, there have been a variety of forces which have had a role in shaping the intermodal network and equipment design. In the early years of piggyback, rail carriers made numerous attempts to develop intermodal relationships with motor carriers. The most successful and persistent of these was with UPS.

For close to three decades shipper agents and brokers, or 3rd parties as they are more often classified, have functioned as major intermodal marketers. In the 1980s the international traffic of steamship carriers in combination with the third parties assumed an important role in shaping physical aspects of the operation. Then, within the past three years a new, stronger commitment has been formed with a few truckload and long haul LTL carriers. If these relationships grow as anticipated, they will have a major impact on the evolution of tomorrow's intermodal network.

According to at least some intermodalists, the next major trend will see the further inclusion of non-dry van types of equipment and the freight they contain. Technologies such as intermodal tank "containers" are the equivalent of railroad or highway tanks. Similarly, flat containers are aggressively pursuing commodities carried on flat bed truck. Also refrigerated containers are emerging on the domestic traffic scene.

The economics and service characteristics of intermodal rail/highway transportation are discussed in greater detail later in the report.

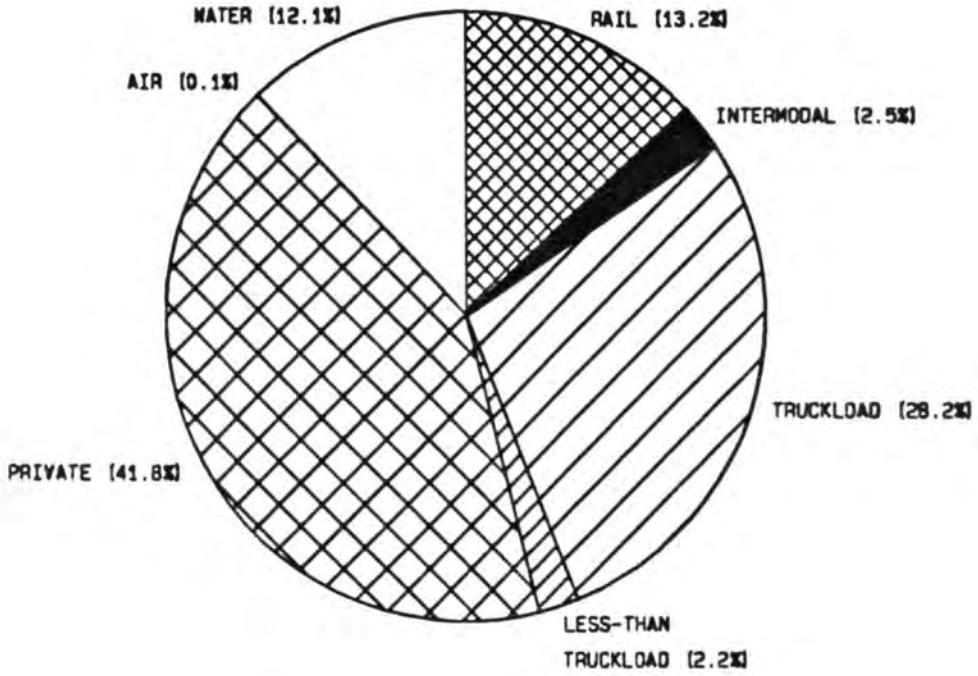
Current Status of Intermodal

U.S. rail/highway intermodal traffic continues to grow in volume. In 1992, it reached a level of more than 6.7 million trailers/containers or more than 97 million tons. As shown in the prior Figure 1, the growth of intermodal carloadings has remained steady even through the current economic recession.

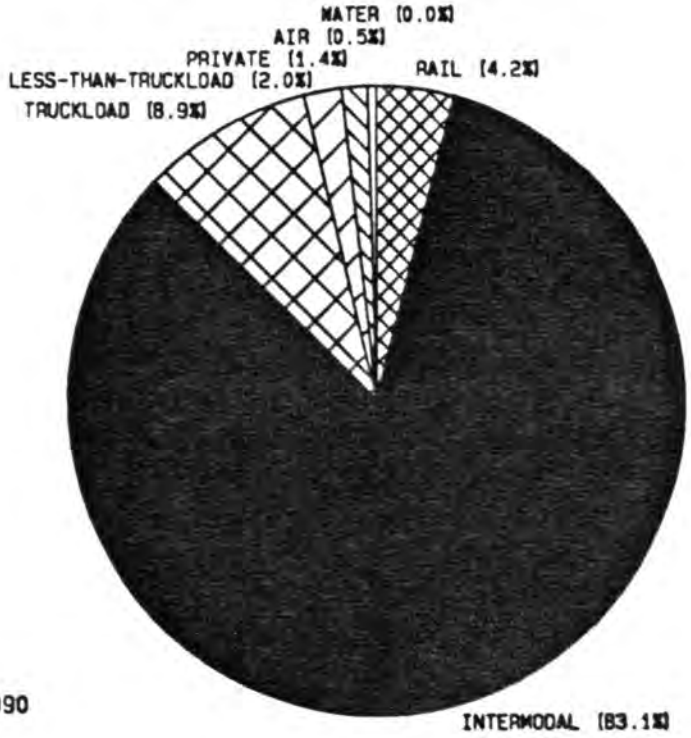
On occasion some individuals describe rail/highway intermodal as a very small portion, some 2% to 3% of the total freight moving in America, as seen in Figure 2, -- U.S. vs. Intermodal Corridor. While this is true in an overall sense, it is not relevant for most discussions. The truly relevant potential for intermodal does not include bulk items such as coal, ore, gravel and wet cement, which represent a large share of the national "total" tonnage. Neither does it include local and short haul freight movements -- by far the most common. It is in specific long haul traffic corridors and containerizable commodities where dry van intermodal has relevance; and where its successes are measurable. In certain corridors, such as Los Angeles to/from Chicago, intermodal surface transportation has reached levels of over 80% market share for the available, relevant freight.

U.S. vs INTERMODAL CORRIDOR

U.S. MANUFACTURED FREIGHT BY MODE
(in annual tons)



LOS ANGELES TO CHICAGO



Source: TRANSEARCH, 1990

MAJOR U.S. INTERMODAL MARKETS

As shown in Figure 3 -- Top U.S. Intermodal Hubs -- the leading market areas for inbound surface intermodal traffic are the huge hub area of Chicago and the largest U.S. container ports such as Los Angeles, Seattle, Houston and New York. And yet, both Kansas City and St. Louis are among the top twelve U.S. markets.[3] Competing with the two Missouri market areas are Memphis and Chicago, which is the number one U.S. area in intermodal volume by far. Figure 4 -- Intermodal Volume Trends 1986-1990 -- gives a relative view of the volume of intermodal activity at these established hub areas over a recent five-year period.

While intermodal activity has grown significantly over the five year period in most of the market areas shown, St. Louis has been flat or slightly negative in terms of growth (+2.3% outbound; and -3.3% inbound). Kansas City and Memphis both have gained rapidly and by 1990 equaled or surpassed the level of intermodal activity at St. Louis -- a volume of approximately 6 million tons or 400,000 units (trailers or containers) per year. New Orleans has grown even faster and advanced to a level about 15% greater; but it is in a position to serve the role of a major container port in the South.

Because the volumes and potential economic impact are so varied, and because of the differing nature of air cargo operations from rail/highway, the study was segmented to include these opportunities separately. Greater emphasis was placed on the rail/highway opportunities.

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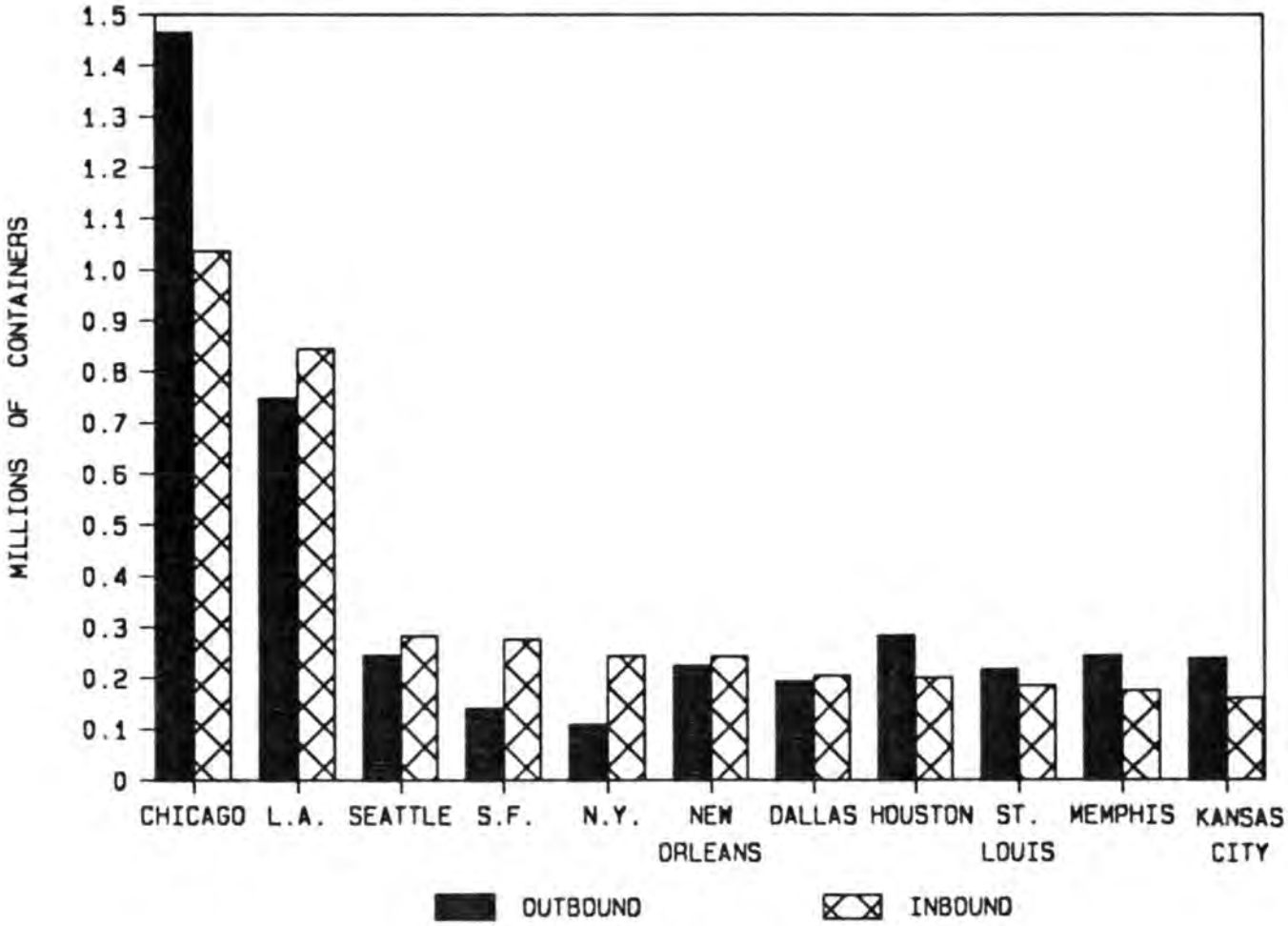
[3] This study utilizes the geographic and economic concept of Business Economic Areas (BEA) developed at the U.S. Department of Commerce for purposes of economic analysis and projection. The following definition is quoted from page 2 of Area Economic Projections 1990: "Each BEA area consists of an urban center and the surrounding counties in which economic activity is focused, directly or indirectly, on the activity of the center. Each area combines place of residence and place of work of the labor force as nearly as possible so that there is a minimum of commuting across the boundaries." There are 181 markets in the 48 states. Missouri is a cosmopolitan set of seven BEAs, with portions extending into contiguous states: Arkansas, Mississippi, Tennessee, Illinois, Iowa, Kansas and Oklahoma.

TOP U.S. INTERMODAL HUBS, 1990



Source: TRANSEARCH, 1990

TOP U.S. INTERMODAL MARKETS

In Annual Tons by BEA Market Area Base Year: 1990

INBOUND

	BEA	MARKET AREA	INTERMODAL TONS	ESTIMATED CONTAINERS*
1	83	CHICAGO IL	15,408,496	1,040,288
2	180	LOS ANGELES CA	12,561,677	848,088
3	171	SEATTLE WA	4,220,782	284,962
4	176	SAN FRANCISCO CA	4,127,362	278,654
5	12	NEW YORK NY	3,645,973	246,154
6	113	NEW ORLEANS LA	3,621,000	244,468
7	125	DALLAS TX	3,051,966	206,050
8	122	HOUSTON TX	3,010,863	203,275
9	107	ST LOUIS MO	2,779,420	187,650
10	55	MEMPHIS TN	2,627,500	177,393
11	43	MIAMI FL	2,584,085	174,462
12	105	KANSAS CITY MO	2,418,920	163,311
		TOTAL U.S.	91,933,372	6,206,782

OUTBOUND

	BEA	MARKET AREA	INTERMODAL TONS	ESTIMATED CONTAINERS*
1	83	CHICAGO IL	21,705,299	1,465,410
2	180	LOS ANGELES CA	11,084,229	748,340
3	122	HOUSTON TX	4,205,082	283,902
4	171	SEATTLE WA	3,614,483	244,028
5	55	MEMPHIS TN	3,608,583	243,630
6	105	KANSAS CITY MO	3,529,808	238,311
7	113	NEW ORLEANS LA	3,323,523	224,384
8	107	ST LOUIS MO	3,223,723	217,646
9	125	DALLAS TX	2,874,995	194,102
10	41	JACKSONVILLE FL	2,502,092	168,926
11	172	PORTLAND OR	2,432,392	164,220
12	176	SAN FRANCISCO CA	2,093,867	141,365
		TOTAL U.S.	91,933,372	6,206,782

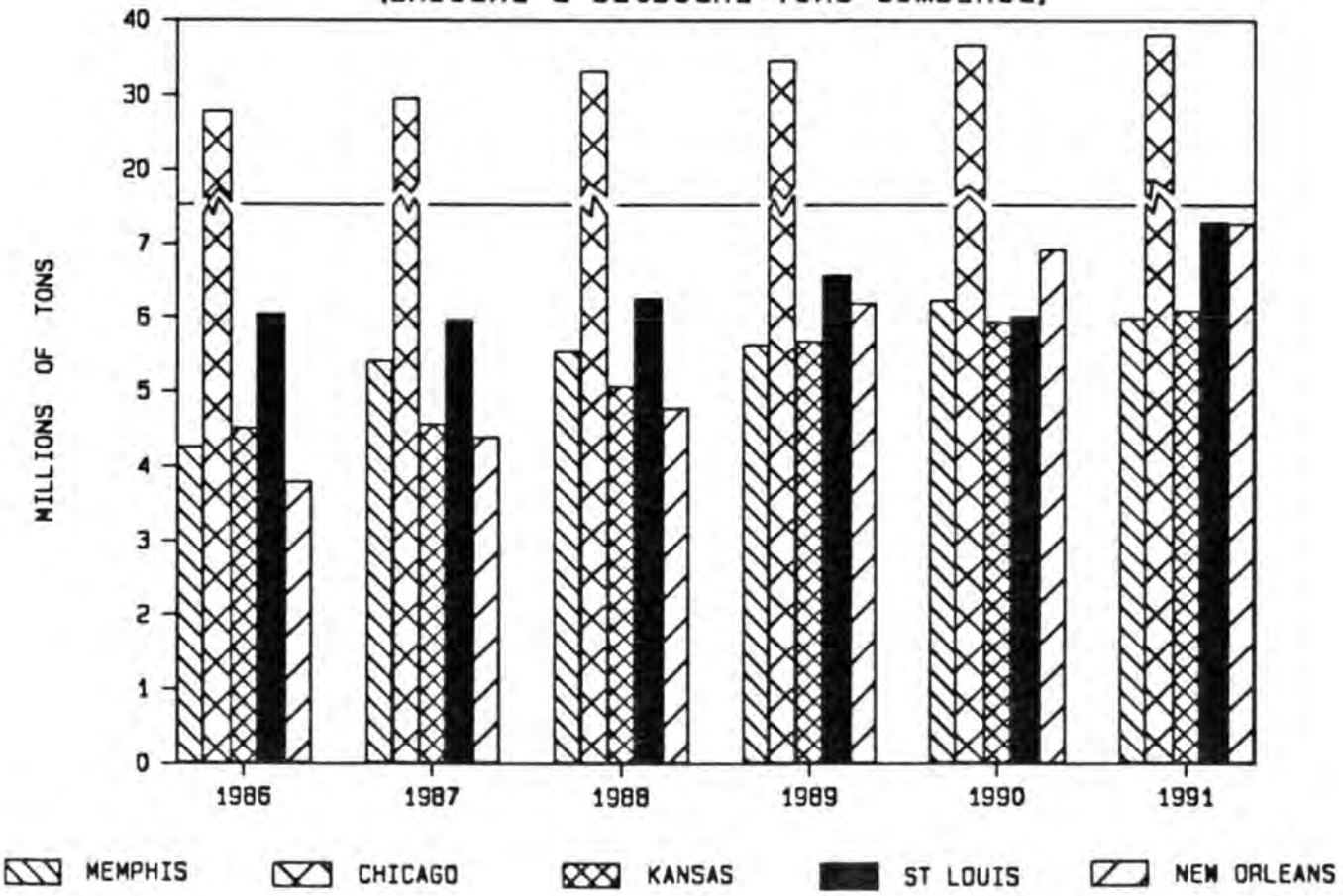
* Number of containers based upon total intermodal tons in TRANSEARCH divided by number of intermodal units (trailers and containers) in AAR's "Annual Summary of Revenue Freight Traffic Statistics"... i.e., 14.8 tons per load.

Source: TRANSEARCH Freight Traffic Flow Data

INTERMODAL VOLUME TRENDS 1986-1991

KEY MIDWESTERN STATES

(Inbound & Outbound Tons Combined)



AIR CARGO ISSUES

Locating Air Cargo Hubs

Location of cargo hubs is based on a number of factors which characterize existing successful air freight hub locations. Among the most fundamental of these criteria are the following:

a) The center of gravity for freight volume, in order to minimize air linehaul activity (often measured on a ton-mile basis);

b) Weather, or general climatic conditions, because having favorable takeoff and landing conditions is crucial to service reliability;

c) Ground markets in same-night feeder radius (often estimated at 300 miles), so that a carrier can give air-equivalent service at ground costs.

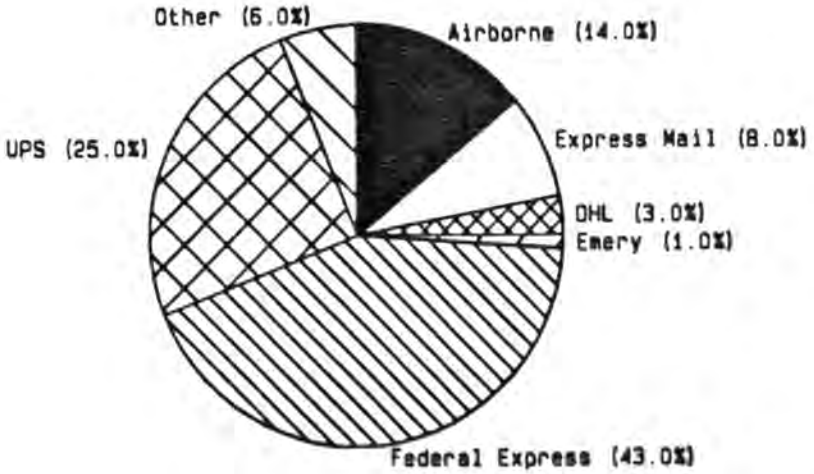
A number of the existing hubs serving the midwest are in Ohio, Kentucky and Indiana. Federal Express is the furthest west at Memphis and the weather is a positive factor there. Currently no similar hubs are in downstate Illinois, nor in Missouri which may lead observers to suspect that the economics do not favor these areas (i.e., to the west of existing hubs).

Carriers do use regional subsorts to bleed off some freight traffic from the hub. However, most of these are in the dense coastal areas. In Missouri, any subsort would probably be fed on the ground because of the favorable distances and highway access to large, concentrated market areas.

Federal Express Chairman, Fred Smith, has stated that, "the future of air cargo is on the ground." This is further evidenced by UPS' entry and current success in the market; and also is one of the main reasons Roadway Services, a traditional leader in the motor carrier (less-than-truckload) field, recently made a decision to get into the air freight arena.

U.S. DOMESTIC AIR CARGO

SHIPMENT SHARES, 1991



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As compared to the analysis elsewhere in this study, i.e., concerning rail/highway intermodal freight, the air freight business has some fundamental differences. Indeed, it is a very different subculture with different types of individuals and organizations involved in making decisions and shaping the future of the industry.

Economic factors have different impacts, too, on the air freight side. For example, part of the conclusions for the rail/highway portion of this study state that Missouri (particularly St. Louis, and to some extent Kansas City) is "where east meets west" in the railroad industry. There is no such traditional natural boundary in the air cargo field. There is little or no interchanging of traffic between carriers. Therefore, an air carrier can locate its hub in a preferred site, without as much concern for collaboration with other carriers as a railroad would have to consider. Thus, the economics for air freight do not have to include factors for natural geographic meeting and crossing points, etc. If the weather is good, and space and suitable facilities are available, and traffic volumes are concentrated to form an attractive opportunity, then an air freight carrier can select on these bases.

Potential for Expansion

The framework for expanding air carriers' existing systems in Missouri locations is in place. The principal all-cargo aircraft types currently flying into Kansas City and St. Louis are Boeing 727s and Douglas DC8s. Larger aircraft types such as Boeing 747 and Douglas MD11 freighters are in use on the denser traffic lanes, and are available to provide lift should the demand and economics suggest the use of larger aircraft. These larger aircraft are used by UPS and Federal Express. However, the DC8s are capable of holding up to 18 cargo pallets and 100,000 pounds.

The probability of an all-cargo operator establishing a new cargo hub at Kansas City or St. Louis appears to be remote. Both cities function as spokes off the main domestic hub. St. Louis is already a hub for TWA's domestic and overseas passenger flights to certain cities in Europe but their service is not available to the Pacific rim countries, the larger potential growth area for freight. Moreover, TWA, due to financial pressures, has been in a defensive posture during the past several years.

KCI Airport at Kansas City has felt the lack of any major carrier's hub operation there since Braniff Airlines ceased operations a number of years ago. Two prior studies during the past 18 months have examined the potential for expanding air service at Kansas City.[4] Conclusions in both studies were cautious at best, or pessimistic at worst.

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[4] "Kansas City International Airport: Air Cargo Opportunities for the 1990s and Beyond" by Global Aviation Associates, Ltd., Washington, DC, February, 1993.

"Analysis of Domestic Air Service and an Air Service Marketing Plan" by Leeper, Cambridge & Campbell, Inc., Alexandria, VA, May, 1992.

The airline industry, generally, is suffering under huge financial challenges. U.S. air carriers lost more than $10 billion over the past three years; and overseas carriers lost approximately $4.5 billion during the same period. Airlines are facing the need for major replacement and upgrading of equipment. For example, as environmental protection movements continue to grow, there is greater pressure on air carriers to shift to "noise suppressed" engines; i.e., Stage-3 aircraft. Those who do not have capital resources to make such changes are in danger of non-survival.

The limiting factors for a new hub or mini-hub are the size, density and traffic mix of the potential service area that will allow late afternoon pickup for outbound express items and next morning delivery of inbound items. The movement of heavy items is much less critical in terms of delivery times but a good mix of express and/or small packages is vital to ensure a profitable business. It is important that all customer needs be identified and reviewed regularly by those planning and operating air cargo service.

Current Status of Air Cargo

In order to understand the issues surrounding air cargo in Missouri, one must begin by determining the current level of activity -- particularly in St. Louis and Kansas City, where the largest airports in the state are operated. This will lead to some comprehension of the roles these facilities play currently in the regional distribution system.

One of the better measurements of air cargo activity is the U.S. Department of Transportation's annual air cargo entitlements. They are based on the landed weight of all-cargo aircraft at each qualifying airport. In fiscal year 1992, the federal DOT apportioned $50 million among 85 airports. The relationships among the airports receiving the top entitlements and the two major Missouri airports is shown in the following table:

APPORTIONMENT OF U.S. DOT ENTITLEMENTS

Rank	Airport	Amount of Entitlement	Pct of Total
1.	Anchorage Int'l	$4,000,000	8.00%
2.	O'Hare Int'l (Chicago)	$3,818,607	7.64%
3.	Memphis Int'l	$3,386,866	6.77%
4.	Dayton Int'l	$2,958,940	5.92%
5.	Staniford Field (Louisville)	$2,924,724	5.85%
6.	J.F.Kennedy Int'l (New York)	$2,448,835	4.90%
29.	Lambert Int'l (St. Louis)	$ 390,189	0.78%
41.	Kansas City Int'l	$ 231,154	0.48%

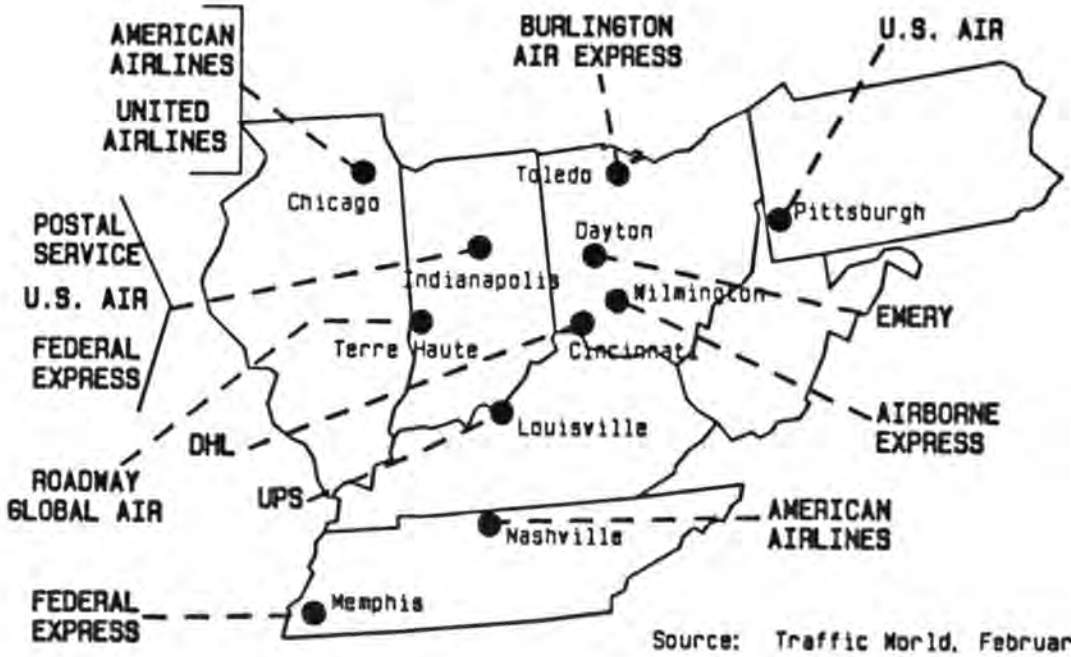
The principal USA-wide air carriers serving both Missouri airports with all-cargo aircraft include Federal Express, United Parcel Service, Airborne Express, Burlington Air Express and Emery Worldwide. In most instances, the air service is supported by a road feeder service (RFS) which operates on cargo airline type schedules. These, in turn, connect with late-night flight departures and early morning flight arrivals.

These air carriers' main domestic hubs are located in Memphis, TN (Fedex); Louisville, KY (UPS); Wilmington, OH (Airborne); Toledo, OH (Burlington); and Dayton, OH (Emery). Other hub carriers are DHL Airways (Cincinnati, OH) and Zantop Int'l (Detroit, MI). Most of Zantop's domestic routes recently have been taken over by American Int'l Airways. Domestic air freight forwarders long have relied on Zantop to deliver their domestic shipments.

The map below shows the concentration of air cargo hubs in the midwest region as currently operated.

CURRENT AIR CARGO HUBS

in MidWest Region



Source: Traffic World, February 3, 1992

The all-cargo operators carry over ninety percent of all U.S. domestic air cargo. St. Louis and Kansas City airports mainly serve as distribution and collection centers for each carrier's local client list. The air operations are necessary in order for the carriers to provide an expedited delivery service: from express packages to heavy freight, such as emergency automobile assembly line items from Detroit, Germany or Japan.

MIDWEST AIR FREIGHT TONNAGES
To/From Five Airport 'Hub' Areas

General. The 'hub' data shown in the tables below have been extracted from the TRANSEARCH data base of 183 U.S. Business Economic Areas (BEAs). The airport hubs include: Chicago; Kansas City; Memphis; New Orleans and St. Louis. For practical purposes of the report, data for Chicago, Memphis and New Orleans is shown for comparison. Each table presents directional flows of traffic for each market area, both inbound and outbound.

Evaluation of BEA air tonnages. The air freight tonnage figures taken from the data base for the directional flow of traffic to/from Kansas City and St. Louis are shown below:

1. To/From All 183 U.S. (BEA) Market Areas (in tons):

Airport Hub	Inbound	Outbound	Total	Per Cent
Kansas City	20,252	3,827	24,079	39.3%
St. Louis	24,591	12,664	37,255	60.7%
Total	44,843	16,491	61,334	100.0%

2. BEA Market Areas Generating Over 1,000 Tons Per Annum

Airport Hub	Inbound (BEAs)	Outbound (BEAs)	Total (BEAs)	Per Cent
Kansas City	16,377 (4)	1,619(1)	17,996 (5)	36.9%
St. Louis	22,173 (8)	8,642(3)	30,815(11)	63.1%
Total	38,550(12)	10,261(4)	48,811(16)	100.0%

Overall comparison of the Five Hub airports. The tonnage figures for Chicago, Kansas City, Memphis, New Orleans and St. Louis, are shown with directional flow patterns. Again, these are to/from market areas generating greater than 1,000 tons per year (Note: Figures in parentheses (BEAs) refer to the number of markets or trading partners amounting to 1,000 or more tons per year, in relation to hub area at left).

Airport Hub	Inbound (BEAs)	Outbound (BEAs)	Total (BEAs)	Per Cent
Chicago	65,284(15)	92,800(22)	158,084(37)	67.6%
St. Louis	22,173(8)	8,642(3)	30,815(11)	13.2%
New Orleans	18,550(5)	2,690(1)	21,190(6)	9.1%
Kansas City	16,377(4)	1,619(1)	17,996(5)	7.7%
Memphis	8,269(3)	5,542(3)	13,811(3)	2.4%
Total	122,334(32)	111,293(30)	233,627(62)	100.0%

The Chicago figures reflect a directional bias in favor of outbound traffic, whereas there is a definite directional traffic flow in favor of inbound tonnage for the other airports.

Integrated vs. Non-integrated Air Carriers

Integrated carriers dominate the U.S. domestic market, with greater than 90% market share on a shipment basis (if you include Express Mail, which is linehauled by Emery).

Air freight customers ship via air for the sake of high speed and reliability. Integrated carriers are all cargo, so they can guarantee aircraft capacity and offer pickup and delivery operations which are dedicated and designed to the purpose. Federal Express achieves better than 98% on time by 10:30 a.m. next day, and this is probably the best on-time record for an aggressive schedule anywhere in transportation.

Non-integrated carriers, generally described, are passenger airlines, or companies who use passenger airlines' cargo space for linehaul. This means the schedules and capacity are driven by passenger demand. It also means air freight gets bumped out of the aircraft's belly if it's needed for bags, and it means the flight gets cancelled if there aren't enough people flying. One of the reasons for air freight forwarders' existence is their ability/opportunity to arbitrage between the airlines, looking for the best schedules and making up for the bumps in order to give good service. They also arrange or have competitive pickup and delivery service.

Although specific data is not available, it is believed that most of the integrated air freight carriers use ground feeders into their hubs to/from St. Louis, though probably to a lesser extent to/from Kansas City. In other words, they don't even use the airport in these cities today in a significant number of cases.

International Air Cargo

International air freight is a different story: there is less of it, it's heavier, and the passenger carriers have a big role. This is due, at least in part, to the expense (distance costs money) and the sheer geographic breadth of the market. This means individual routes can end up being considerably thin for volume, particularly two way volume. Also, it is both interesting and relevant to note that the dominant U.S. integrated carriers (Federal Express and United Parcel Service) have not achieved profitable business segments internationally. There are numerous reasons, but the effect is that the passenger carriers still hold sway on the international scene.

Passenger carrier presence means that passenger patterns drive the system. No carrier will set up an international hub for cargo reasons, nor will they introduce direct service that is not justified by passenger demand. (There are all-cargo international flights run by passenger carriers like Lufthansa, but they are limited to the densest lanes). This means a Missouri location would have to make an argument for a change in passenger service in order to derive the freight benefit on the side.

According to information obtained from Global Air, Kansas City does not have much in the way of international direct service presently. St. Louis has some with TWA, but the big question here is the draw radius. Information gathered in this study did not include

analyzing drayage or feeder costs into Kansas City versus alternative airports with as good or better schedules and choices. Interviews with industry contacts indicated that avoiding O'Hare (Chicago) made good sense, but the question remains as to how much business can really be diverted. What lane would be offered? How much better would the schedule be (if it existed)? and what would the comparative costs look like? Air shippers are price sensitive (hence the proliferation of "Day Two" and "deferred" services). Their uniqueness lies in the fact that their total economics allow them to trade time for transportation expense.

International service does have some latitude. It tends to be good where the passenger flights are frequent and the density is good (like New York-London), but it gets away with being slower and less reliable elsewhere because: a) the alternative is a container ship; and b) customs delays slow down delivery anyway.

Passenger presence also means freight forwarders, and they play a big role in the international market. They derive justification for existence from the arbitrage function, to work pickup and delivery in distant places, and to handle customs.

Potential for Specialized Roles

Since the basic structure of Missouri's two major airports is in place, niche cargo opportunities presented by each airport should be explored more fully. This can take one or a combination of many forms, including the following:

- Mixing (break bulk) Center - inbound full containerloads are stripped and re-assembled for further shipment in smaller, mixed lot sizes.

- Fabrication Operations - various parts inbound from many areas are used in local assembly to finished goods for outbound.

- Forward Distribution Center - staging area for major, steadily consumed product (such as perishable fruits) is moved from the traditional growing area (e.g., California's Central Valley) to a Missouri location for cold storage, sales and shipment to a "next day delivery" buyers' market.

- Parts Bank - parts flown in from many origins, inventoried at Missouri hub location and made available to specialized industry, such as automotive or appliance.

- Free Trade Zone - expansion of concept already in place for central distribution of high valued items; with advantage in import/export duty status.

In any of the above scenarios, or others which may be explored, it is important that backhaul opportunities are matched to what would otherwise be classified as one way traffic. For example, potential air cargo operators will need to identify current areas of strength in Missouri

localities, such as the promotion of the livestock export business via Kansas City International Airport. The livestock exporting business at Kansas City, however, needs the availability of return loads to develop into an economically viable system.

Planning for any of these niche-type roles must involve not only proponents but potentially active participants in the system. Attempts to establish all-cargo airports and subsequently attract participants and customers have been characteristically futile. This is evidenced, for example, at Huntsville, AL, Front Range Airport in Denver and Alliance Field in Ft. Worth.

Opportunities for "Link Up" with Carriers

Although the following discussion is speculative in nature, it still may be valuable in terms of depicting a type of organization to approach, and some of the required information for promoting a Missouri location(s) as an air freight hub.

Roadway Services, a $3.6 billion (1992 reported revenues) transportation and logistics holding company in Akron, OH is parent of Roadway Express Inc. one of the nation's largest trucking companies, and Roadway Package System Inc. (RPS), which specializes in the small package market, as well as several regional motor carriers. Roadway plans to open a new air freight service under the name of "Roadway Global Air" in the fall of 1993.

Roadway Services, Inc. has indicated publicly that its new Roadway Global Air (RGA) will focus on packages weighing more than 25 pounds and will provide next-day, second day and deferred service. The market for heavy air freight is highly competitive but Roadway expects to invest $100 million in the business to finance capital costs and losses. The company has been engaged in researching and planning the new operation for the past year.

Given the many financial problems of many air cargo operators it is doubtful that Roadway views the new air freight operation as a profitable venture at this time. However, it does position Roadway to offer more comprehensive services to its customers in combination with RPS and in competition with UPS.

Roadway will contract for its own dedicated leased airlift and initially will operate its own air freight hub in Terre Haute, Indiana. The company has signed one year leases for nine stage-2 aircraft, including four Boeing 727s, two DC-9s, and three turboprops. It expects to operate 38 air logistics centers, or leased terminals domestically and 12 leased terminals in Europe. It may operate as a forwarder on international routes in similar manner to include 150 terminals in three years.

The predominant flow of domestic air freight is inbound to Missouri in support of the major industries located around Kansas City and St. Louis. Major origin points include Atlanta, Detroit, Los Angeles and Seattle.

Direction	Airport Kansas City	Airport St. Louis	Total
Inbound	16,377 tons	22,173 tons	38,550 tons
Outbound	1,619 tons	8,642 tons	10,261 tons
Totals	17,996 tons	30,815 tons	48,811 tons

Spokesmen for Missouri's interest in air freight expansion will need to provide even more specific information on aircraft handling and loading equipment at prospective airports and the availability of potential ground service and cargo handling companies.

While Roadway Global Air appears as an interesting example of a new opportunity in a start-up operation of a new carrier, it also may be that the planning already done at RGA does not include a major role for Missouri areas. In short, it may be too late to get on the RGA bandwagon. On the other hand, if one views a series of events in perspective there could be future opportunity with another carrier.

For example, Yellow Freight System remains as one of the three largest L-T-L (less than truckload) carriers in the U.S. with terminals throughout the nation. The other two have recently entered the air freight package business: Consolidated Freightways via a purchase of Emery Air Freight; and Roadway Express, as mentioned above, through a startup of the new Roadway Global Air.

Moreover, Yellow Freight's president, Reid Armstrong, has been quoted in recent interviews and public speeches as seeking changes in direction for the company and "opening up new product areas" for its customers. Further, Yellow Freight has its headquarters in the Kansas City area. Perhaps it would be timely and welcome for Missouri (MHTD) to take the initiative in opening up discussions with Yellow Freight's senior management on the subject of expansion into the air freight business.

Steps To Be Taken

Although the probability of establishing a new cargo hub at any Missouri airport appears remote at this time, provision should be made in each major Missouri airport's FAA Master Plan for this possibility. The needs of air cargo operators are much different from those of the passenger airlines. It is advisable to set aside a section of the airport for future cargo development. Airport road access, connecting with the federal interstate system, and capable of accommodating maximum vehicle lengths and widths (102"), also is important. Discussion with the major express carriers to solicit their views on this point is vital.

Since the major express and heavy freight carriers are already servicing both Missouri airports it is likely that the current facilities are adequate for today's volumes, which are geared mainly to inbound traffic. Priority should be given to developing outbound air traffic,

preferably to those areas where current inbound loads originate. The replacement of, or modification to current premises and facilities by more functional cargo processing systems are outside the scope of this report but should be addressed elsewhere.

Both of Missouri's major airports fall within the jurisdiction of the District Director, U.S. Customs Service, St. Louis, MO. The rapid processing of overseas shipments is essential to developing local import clearance. TWA is "live" in St. Louis with the U.S. Custom Service Air Automated Manifest System, known as Air AMS. The availability of electronic import clearance processing of both express letters/mail and packages over 25 pounds with U.S. Customs by importers has become increasingly important. Thus, contact and discussions with the U.S. Customs Service are essential in the planning process.

Conclusion re: Air Freight Opportunities

Air cargo is a very small fraction (less than one-thousandth) of the total volume of containerizable, or merchandise-type freight moving in midwestern market areas and traffic lanes today. Yet it has a unique place due to its general profile of high-valued, time-sensitive commodities involved, including small parcels.

While it has been cited that commercial air carriers have been through a prolonged period of difficulty, financially and otherwise, opportunities may still exist for growth and expansion. These are not generally apparent or easy to find, however, given the competitiveness of the industry -- especially since the effects of deregulation have been undergone.

As in the case of rail/highway intermodal opportunities, it is the economics and critical volumes of relevant freight which determine the feasibility of various scenarios. Several studies have borne negative conclusions concerning air freight in Kansas City. While this current study did not uncover any strong evidence to refute those findings, there still may be opportunities of a more specialized nature.

In conclusion, given the observations and understandings cited above:

1. Current integrated carriers have no apparent cause to relocate their hubs. And further, those carriers who have established or expanded hubs recently have chosen more eastern locations, such as Ohio, Kentucky and Indiana.

2. Collaboration with a new integrated carrier (e.g., Roadway Global Air or Yellow Freight, etc.) is speculation, and still there would be no compelling reason to think the economics would favor a hub further west than the other carriers. Nonetheless, a link-up with a specific carrier such as one of these, may be the best way to initiate expansion of a Missouri site.

3. International offers more promise, but:

   a. freight is a side benefit to passenger;

   b. O'Hare may be congested, but it has better schedules than anyplace else off the coasts;

   c. what is left, then, is to find or determine a specialized role, or niche strategy.

4. Niche opportunities need to be explored further, since there does not appear to be a role in general air freight favoring a Missouri location. Probably, these opportunities would have to serve needs of a special industry (such as automotive or perishable foods). Or, they might be aligned with a special combination of a particular company/group and a particular area; such as a large electronics manufacturer in Joplin or a major parts distributor in St. Louis, etc. Contact with specific air carriers or distribution companies within a target industry should provide the focus of further exploration.

RAIL INTERMODAL HUBS

Rail carriers have undergone an evolutionary process in the geographic concentration of intermodal services offered in terms of terminal and hub locations and therefore in terms of routes.[5] As stated above, there were no fewer than 1,400 intermodal terminals operated in the early 1970s. Currently the number has been streamlined to around 200. From both a service and cost standpoint serving outlaying, small TOFC ramps was not viable. Large terminals were needed to support the superior service of dedicated intermodal trains and be able to justify the use of mechanical lifting devices -- either gantry cranes or side lift transfer units -- to handle containers.

Still, there is a concentration of intermodal terminals around each major metropolitan area. Most are operated by the railroads, themselves; but some are run by contractors and even by (or exclusively for) a single railroad customer. Certainly, the region around Missouri is dotted with intermodal terminals serving many rail carriers -- and clusters appear around the traditional gateway points of Chicago, Kansas City, St. Louis and Memphis. Figure 6 provides a view of current intermodal terminal locations in the region.

Terminals serving double-stack container trains are typically among the most up-to-date and most efficient facilities. A network exists of double-stack container train routes and terminals across the country. It involves virtually all major rail carriers and connects major U.S. port areas with major inland market areas. A picture of this double-stack network appears in Figure 7. The type of service varies, however, by railroad and by corridor as will be discussed below.

Exploiting the inherent efficiencies of double-stack container operations has been a critical topic with most railroads. It is true, however, that some have been selected or won a role for themselves as a containerized intermodal carrier; while others have not felt compelled to do so.

Economies of scale and density apply in intermodal operations. The decided lower costs of trains carrying very large volumes of containers dovetails into the advantages of large, regional intermodal hub terminals. Typically, the greater the "throughput" of trailers and/or containers the lower the cost per unit.

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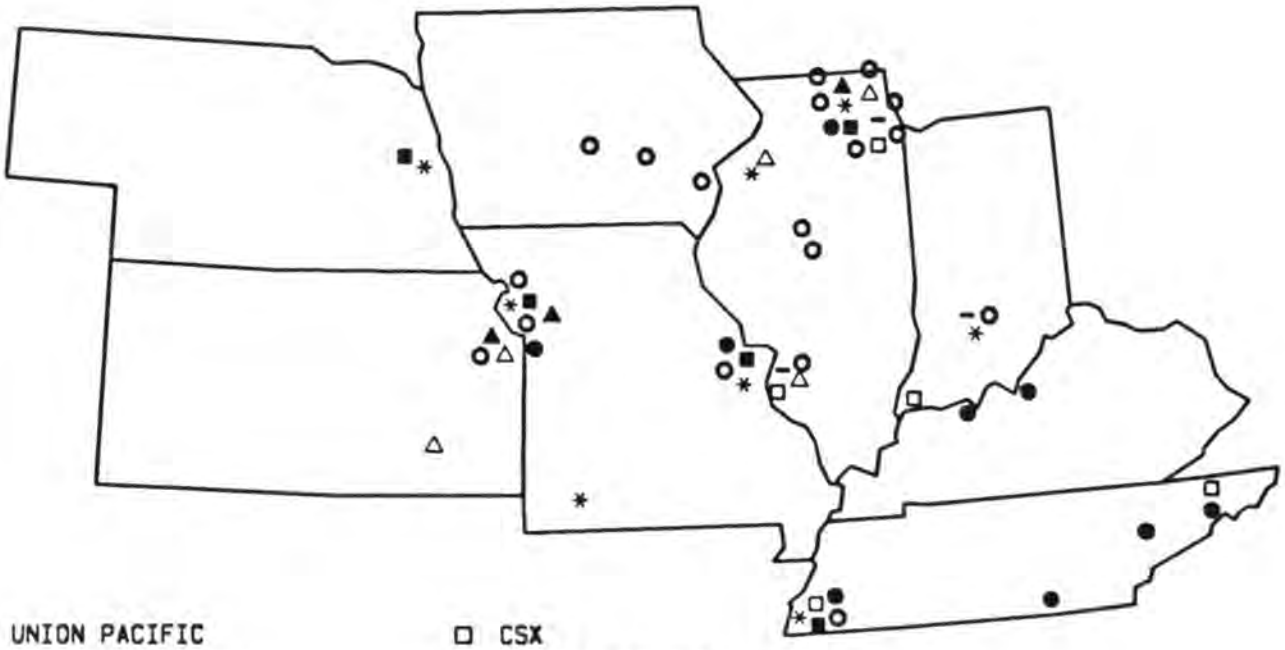
[5] A hub is a large transfer point. In this report hub is used to denote an intermodal facility developed as a regional center which is an interface between rail and truck transportation operations that not only serves the local market in its natural hinterland but would act as a transfer or interchange point between rail moves. A ramp is on an incline and is a place to load or unload freight cars semitrailers from flat cars. The term "terminal" is used in this intermodal context as a large facility where trailer and containers are interchanged between a railroad and a motor carrier or drayman.

MAJOR RAIL/INTERMODAL TERMINALS

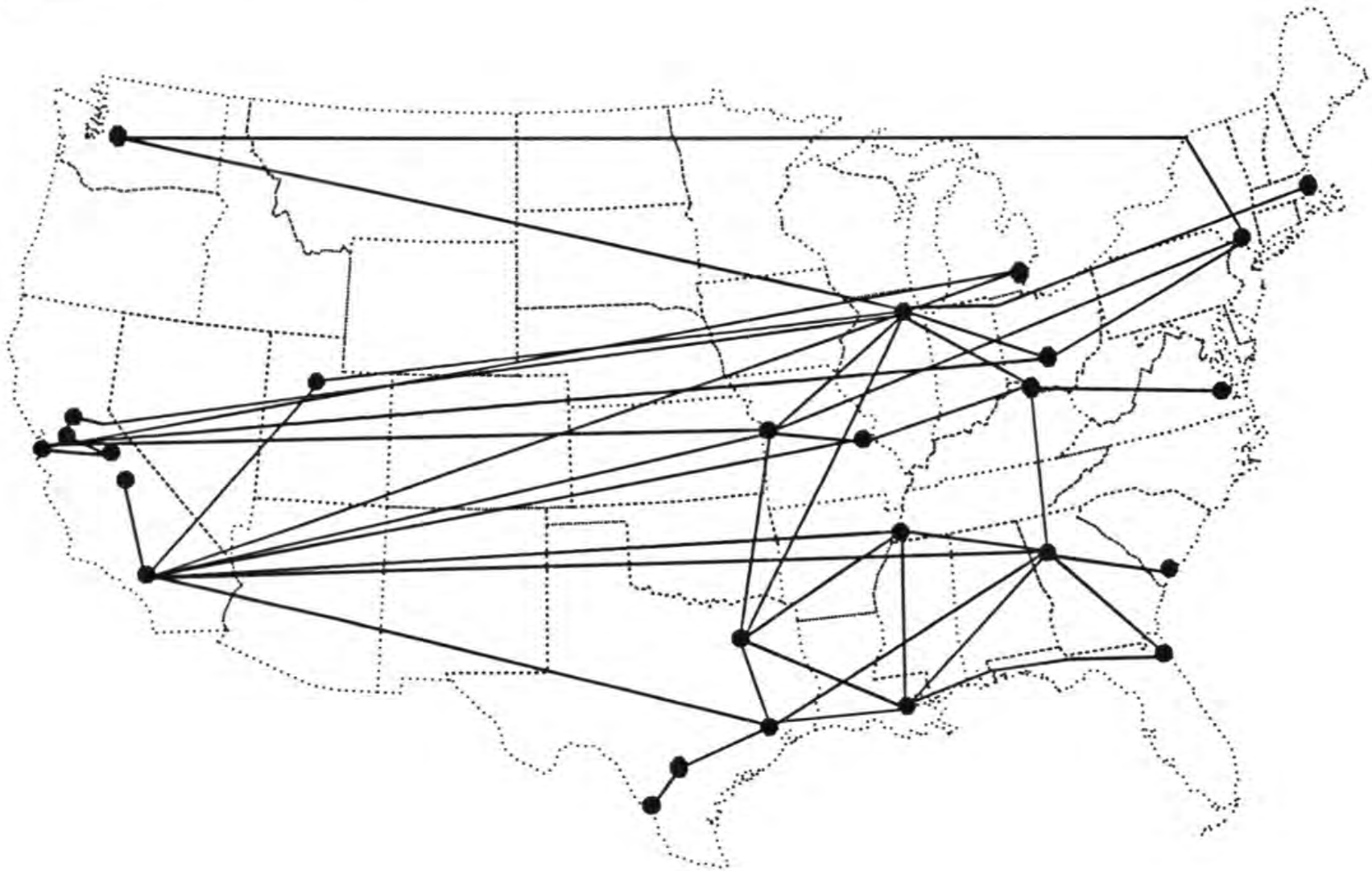
(WITHIN TRUCK DELIVERY RANGE OF MISSOURI)



■ UNION PACIFIC
▲ SOUTHERN PACIFIC
△ SANTA FE
✳ BURLINGTON NORTHERN
□ CSX
● NORFOLK SOUTHERN
– CONRAIL
○ OTHER

Source: K-III Information Company. The Official Railway Guide, North American Edition

CURRENT HUB CENTERS AND DOUBLE-STACK CONTAINER LANES



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Economies of scale, of course, are true up to a point for both the train and the terminal. In the case of the terminal an extremely large facility can result in excessive interval travel from gate to track side to storage. There is a point when the economic advantages level off or decline. Of equal or even greater importance in this business is that service may erode.

The highly flexible truck operations set the service standard in moving manufactured and merchandise freight. There is a very real trade off, therefore, between large hubs and smaller, closer to customer operations. Not only must the costs of transfer and drayage to/from the hub be considered, when comparing against the all-highway competitors; but also service implications play an important part in modal decisions. For example, the intermodal operation must be as good as or better than the over-the-road trucker in on-time delivery, consistency, absence of loss & damage, loading/unloading assistance and so on.

Beyond carrier considerations there are social considerations associated with very large intermodal operations. Intermodal may reduce trucks in the highway traffic stream and thus aid in improving air quality. The fact, however, that large volumes are concentrated around a terminal may also have an adverse effect; i.e., to exacerbate local traffic congestion.

Moreover, very large operations also carry the risk that problems in one phase or point of the operation will have a major broad impact. Train failure or terminal shut down can interrupt the flow of commerce. It may be precarious to have a large region of the country dependent on a single transportation hub for much of its goods distribution.

DEFINING THE INTERMODAL HUB

For the purpose of the surface intermodal portion of this study, the main focus has been placed upon the feasibility of an intermodal hub which would be state-of-the-art in terms of its operation. Such a facility would have to accommodate the equipment and train operations support by the participating carriers and the various intermodal marketing groups -- shipper agents, steamship companies and motor carriers. The following are some of the key options:

- Double-stack "Unit train" - has a single origin and destination point, with wider pickup/delivery area surrounding each. The train configuration is all double-stack container cars, ideally with no empty slots. It has no intermediate stop-offs. When the train reaches its destination, it is unloaded, reloaded and returns to origin; i.e., a continuous back-and-forth loop. Once cars reach destination, some may be unloaded for local and hinterland delivery; others may move to interline rail connection.

- Expedited "double-stack" container train - is actually a combination of conventional container cars and even TOFC (trailers); but with a block of double-stack cars attached. It has an expedited schedule as a dedicated intermodal train (no non-intermodal cars). It serves a single origin and destination, but makes a limited number of stops en route. The operation includes local delivery at destination, plus interline connection.

- Conventional intermodal train - carries both TOFC and COFC cars, mix of trailers and containers. It may be a dedicated intermodal train, but in practice can also have auto rack cars or other types of expedited traffic attached to same train. It makes a schedule of stops for setting off blocks of intermodal cars and pick up other blocks. It, too, includes local delivery at destination, plus interline.

- Other types - other possibilities exist. They range from mixed train service (slower, many stops, variety of car types) to other technologies such as RoadRailer trains -- which typically are a part of high service operations often meeting needs in shorter haul markets or somewhat smaller, specialized markets.

In a number of cases during the course of the study, it was revealed that in current practice double-stack cars often are combined with conventional cars in intermodal trains -- but these trains are referred to as double-stack trains. That is, a block of stack cars (usually a stack car is a set of five articulated platforms -- each of which holds two containers) is attached to the rear of a train containing conventional TOFC/COFC cars and a mix of trailers and containers. These operate with intermediate stops. Moreover, both Kansas City and St. Louis terminals are served in this fashion; and both are intermediate points.

At present the double stack container technology has received the greatest attention and has achieved the greatest success in terms of units handled. It, therefore, becomes the baseline of this analysis.

HUBS VS. SUPER-HUBS

The traditional view of rail/highway intermodal transport is a prototype from which many variations are carried out in real world practice. To allow for a range of alternatives, the study has divided its focus into two perspectives - a high and a low estimate - in terms of the nature, size and scope of the hub, itself.

The lower end, or conservative approach, envisions a rail/highway intermodal hub. It would be operated by or for one or more railroads; with truck drayage provided by a core group of motor carriers. The facility would also be a connecting point for through service between interlining rail carriers.

It would have sufficient work space, storage space and equipment to allow for a designed level of throughput in the form of stack containers. It would have or be near modern, efficient and expeditious steel rail connections to other rail terminals and facilities. They would also have clear, direct access to the interstate highway system. It would be able to handle all conventional TOFC/COFC equipment as a secondary capability. The facility would include gates, fencing, lighting and security items to represent a first-rate facility.

The upper end concept, or "super-hub" would contain all of the above, plus additional facilities. These include distribution center(s), warehousing, refrigeration service and storage, U.S.D.A. and U.S. Customs inspection stations, a full service truck stop, motel and tractor and trailer repair shops and leasing facilities. Which, of course, are in addition to the "natural" support facilities - food, loading, fuel to name a few. The super-hub might become a magnet for greater participation on the part of several rail carriers and a larger number of truckers -- and so would need to allow for accommodating them all.

Obviously, the super-hub would involve greater requirements in terms of land, capital expenditures, etc.; but also could create more employment and result in a greater amount of other economic activity and benefits for the area.

IDENTIFICATION OF POTENTIAL MARKET AREAS IN MISSOURI

There are a number of areas within the State of Missouri that can be considered for a potential intermodal cargo hub. The study team gave impartial consideration to five general areas:

- Cape Girardeau
- Columbia/Jefferson City
- Joplin/Springfield
- Kansas City
- St. Louis

Other areas, such as St. Joseph and Hannibal, were contemplated, but the study team felt that the five areas listed above represent a sufficiently good cross-section of Missouri locations. That is, large and small, borders and interior, east and west, north and south, urban and rural portions of the State are all included in the basic list. If Cape Girardeau and/or Joplin proved to be the most attractive candidate areas, then further assessment of Hannibal or St. Joseph would have been warranted -- but this was not the case.

Further, many of the key statistical data are available on a "Business Economic Area" basis. Four of the five chosen areas are BEA centers -- and the rest of Missouri counties fall into one or another of the four. Cape Girardeau was the exception (normally included as part of the St. Louis BEA) and greater effort was required to separate out freight movement activity and other economic statistics. This was warranted so as to give fair consideration to a more remote, less populated, but (in some terms) strategically located market area.

Early in the study effort agreement was made on the criteria for assessment of each area. These <u>feasibility guidelines</u> included four major concerns and two secondary ones. These are as follows:

Primary:

Interstate Highway Access

Rail Main Line Access & Routes (not as important for air cargo considerations)

Local Economic Base
Proximity to Major Hinterland* Points

Secondary:
Land Availability
Labor Force Availability

* Hinterland - Markets within a 550 mile radius of a market center.

Land Availability

The reason that Land and Labor Force were considered secondary was that other conditions -- mainly market size, cost and service -- must be met first. Then, land and labor become critical factors. In other words, if land were the first criteria, then White Sands, New Mexico or Pt. Barrow, Alaska would become excellent candidates for an intermodal hub. Both have plenty of inexpensive land available but relatively little demand for freight service.

Springfield or Cape Girardeau may be viable candidate areas if either had enough local commerce to justify stack train volumes and operations. Further, if key hinterland markets can be reached more economically from these points than to/from the larger economic areas of St. Louis or Kansas City, then the prospects become even stronger. At this point land availability would become an important criterion for assessment.

Labor Force Availability

Because of its mobility, labor is a somewhat different topic. Especially in times of recession there is evidence that qualified workers and managers will emigrate to fill available positions. Also, there is a reason to believe that if the local market economy is sufficient to support stack train transportation, then it probably possesses a large and flexible skilled labor force as well.

Currently, in Missouri the top ten employers include McDonnell-Douglas, TWA, Chrysler and Ford. These four, all categorized in the transportation equipment manufacturing sector, represent more than 75,000 jobs. While this is quite different from operating an intermodal cargo hub, it is one indication of an established, large skilled labor force. Unfortunately, many of the jobs in these four companies presently are in jeopardy due to the ongoing stagnation and economic shifts.

Information on the base labor force and unemployment level for the Missouri portion of each of the study areas are shown on the next page. These figures represent the potential labor pool within the state; i.e., some of whom might be employed to work in an intermodal hub facility:

LABOR FORCE IN MISSOURI STUDY AREAS

Study Area	Base Labor Force*	Unemployment Number*	Level Rate
Kansas City	702,615	38,313	5.5%
Columbia	261,041	12,598	4.8%
St. Louis	1,405,514	79,841	5.7%
Cape Girardeau	33,135	2,871	8.7%
Joplin/Springfield	246,695	16,494	6.7%

* (Figures in thousands) Source: Missouri Division of Employment Security, Research & Analysis Section, June, 1993.

Interstate Highway Access

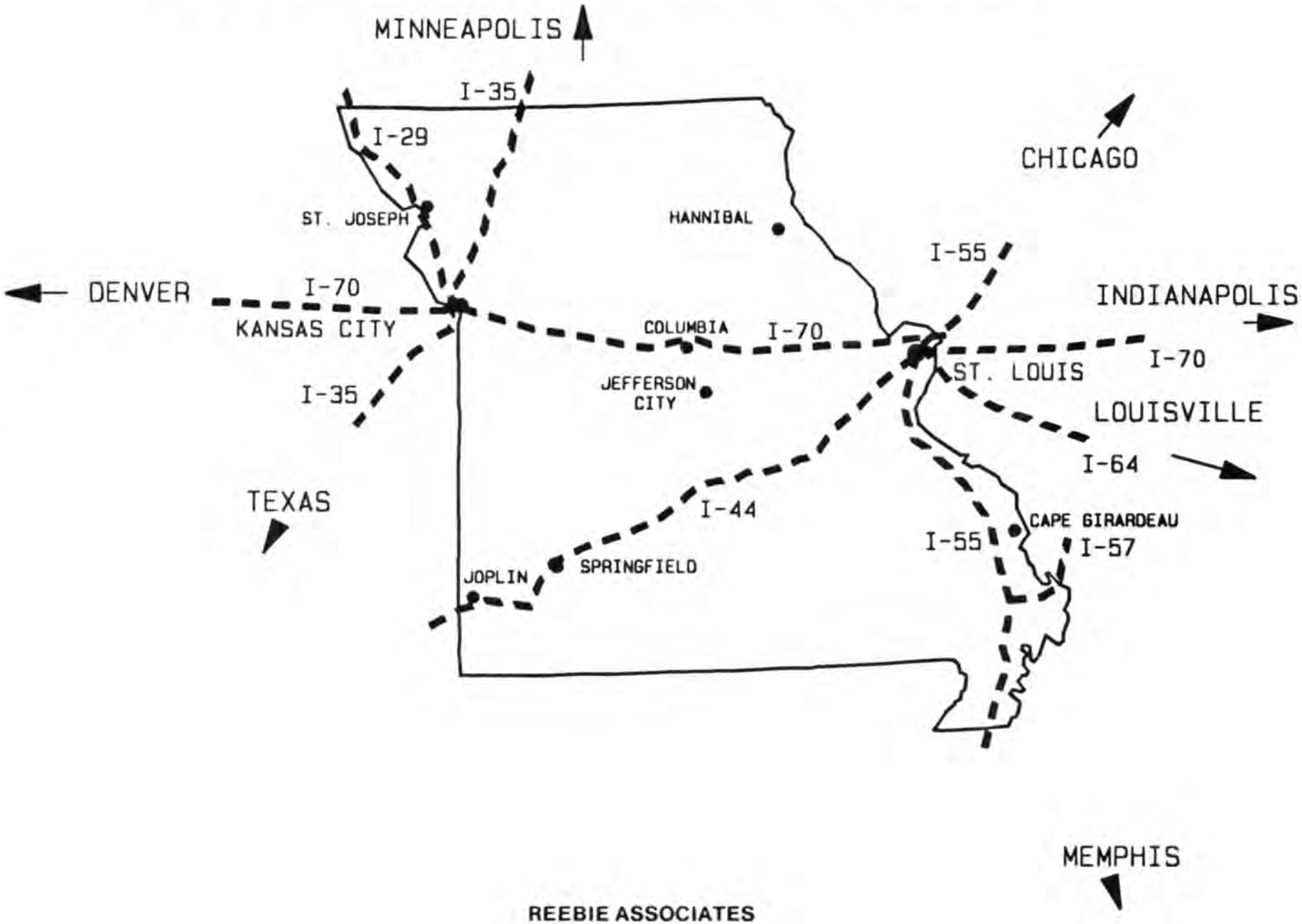
As for interstate highway access, Missouri has an excellent system already in place. A glance at the interstate map shows that both Kansas City and St. Louis are points of convergence of major routes to/from all directions. The other areas are served by one major interstate route, connecting to others. Figure 8 gives a picture of the interstate routes serving Missouri.

Rail Main Line Access & Routes

Rail route structures also favor Missouri. Again, both Kansas City and St. Louis have evolved (long ago) as connecting points for major rail carriers -- both east-west and north-south. As Figure 9 shows, all four major western railroads (Santa Fe, Burlington Northern, Southern Pacific and Union Pacific) have main line routes crossing Missouri and connecting it with important markets elsewhere. All of these carriers serve both Kansas City and St. Louis -- with direct lines operated by the latter three, and Santa Fe operating in conjunction with the Gateway Western Railroad. One of the three large eastern railroads, Norfolk Southern, also crosses Missouri and connects both Kansas City and St. Louis with eastern and southeastern markets. The other two eastern carriers, Conrail and CSX, connect at East St. Louis. Kansas City Southern serves the Kansas City and Joplin/Springfield areas with a north-south route to/from the Gulf Coast.

Interviews conducted during the study with railroad intermodal managers and planners confirm that main line access is a critical concern in locating an intermodal hub. Rail carriers have concluded that to maintain service and price competitiveness with motor carriers, switching must be held to a minimum and use of branch and secondary lines eliminated.

MAJOR HIGHWAY ACCESS AND ROUTES



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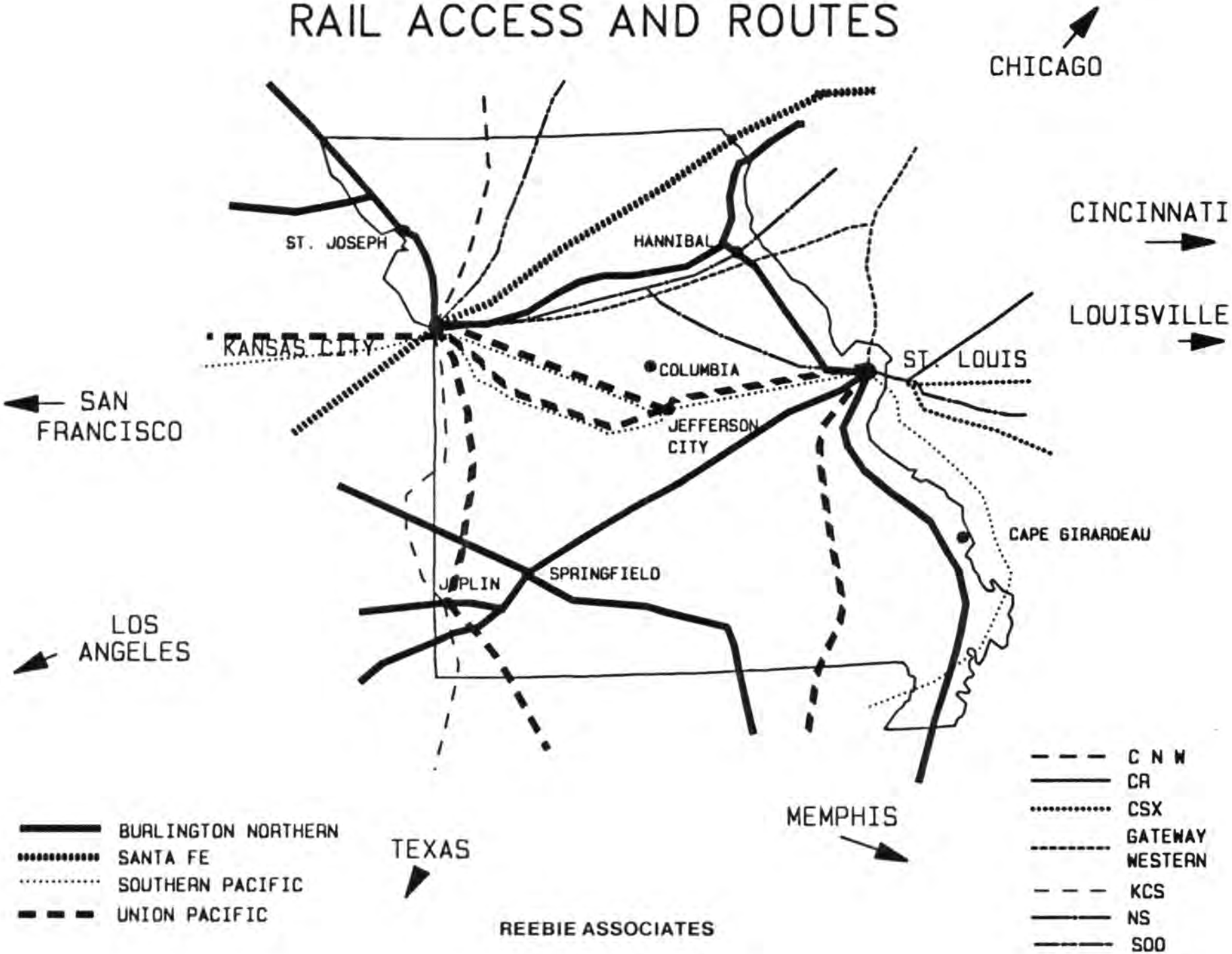
RAIL ACCESS AND ROUTES



REEBIE ASSOCIATES

Airport & Cargo Handling Facilities

An air cargo hub for non-integrated carriers, or overseas carriers, is dependent upon passenger operations. Thus, the only existing Missouri facilities of sufficient size, capacity and density are at the major airports of KCI, Kansas City and Lambert International, St. Louis. There is a disparity in viewing these two locations: first, Kansas City is much further to the west and therefore further from existing hubs of the integrated air carriers; second, KCI has a great amount of expansion space and is underutilized presently, while Lambert is pushing at the seams with the difficult challenge of finding more space for expansion.

Other areas in Missouri could conceivably be attractive to integrated air carriers such as UPS, Federal Express, DHL, Airborne, etc. But although there are areas in Missouri with good highway access to key markets, the chances still appear to be remote. They would have to be developed as new facilities, with significantly expanded capacity and space. Moreover, the present concentration of air cargo hubs is further to the east, in Ohio, Kentucky and Indiana. This is due to the proximity of these areas to major manufacturing and business centers which they serve. Generally, air carriers will not establish an active presence at an airport unless there is a critical mass of industry surrounding the location.

Local Economic Base

Missouri's concentration of population, employment and industrial activity is greatest, of course, in St. Louis and Kansas City. But a more precise quantified evaluation is important: first, to give a fair assessment to all areas as candidates for an intermodal hub; and second, because there are so many alternative forms which the hub might take that public and private planners may well need to reassess the areas numerous times before final decisions are made and any implementation is begun.

In Figure 10, which follows, the five study areas of Missouri are shown side by side in terms of population and manufacturing. A review of the figures reveals not only that St. Louis is the largest but it is approximately eight times larger than the Cape Girardeau area.[6] In addition, the charts show that Kansas City is twice as big as Springfield/Joplin in population and about three times larger in terms of annual freight tons shipped/received; but only about 45% bigger in manufacturing employment.

Many observations can be made from Figure 10. The most important concern in this study, however, has been the level of economic activity needed to support intermodal stack train service. As will be shown in more detail in the following section, this criteria leaves Kansas City and St. Louis as the only truly viable candidate areas.

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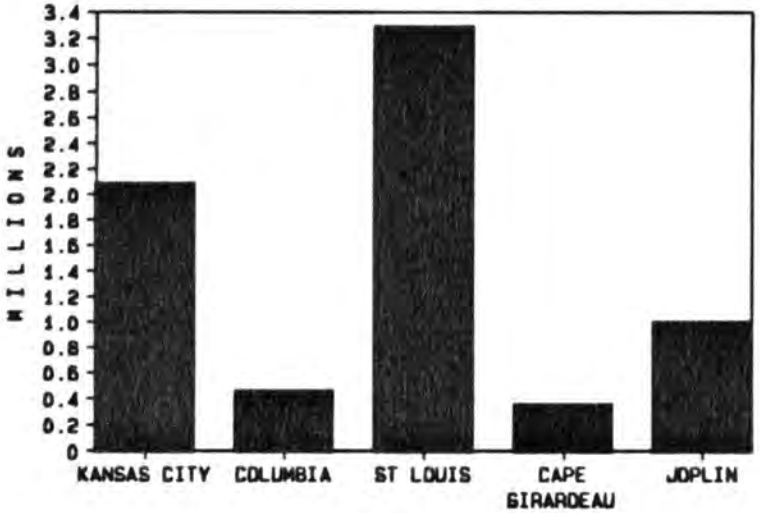
[6] Comparisons were made using the Business Economic Area (BEA) geographic definitions. For Cape Girardeau, which is not in the BEA listings, 18 counties were grouped together -- and most of these were extracted from the St. Louis BEA. For a listing of the counties in each area, see Appendix-A.

COMPARATIVE ECONOMIC SIZE

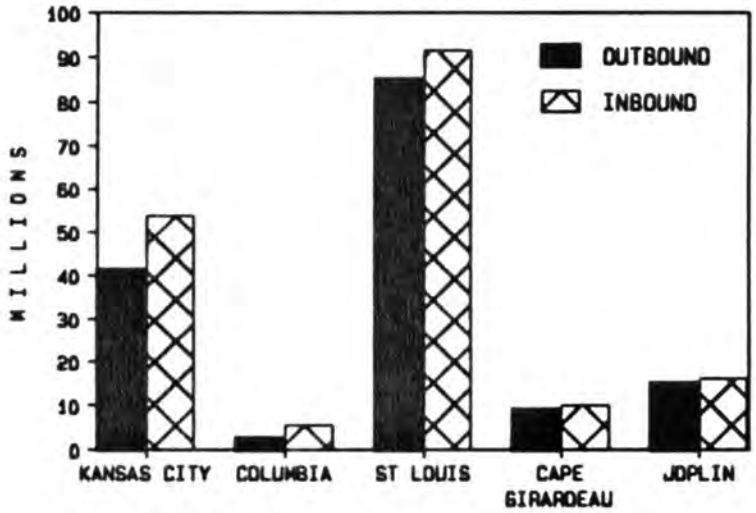
POTENTIAL MISSOURI INTERMODAL HUB AREAS

1990

POPULATION

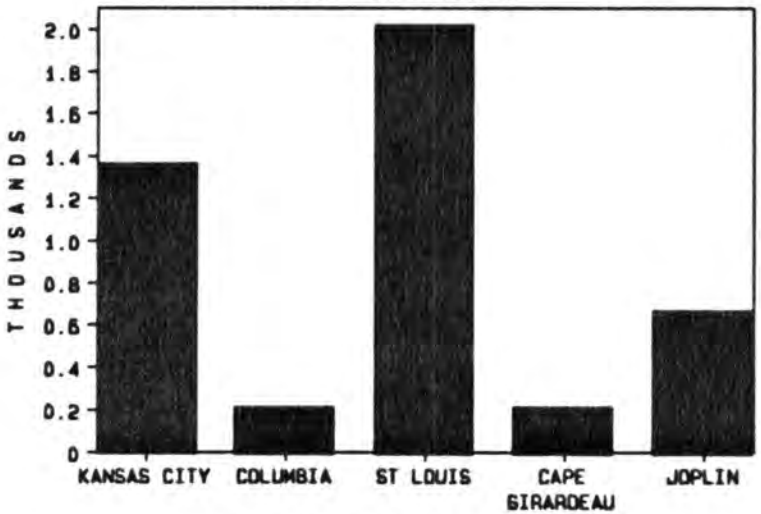


TONS SHIPPED



MANUFACTURING COMPANIES

(20 + EMPLOYEES)



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Proximity to Major Hinterland Points

The key geographic reality is the positions of Kansas City and St. Louis on the western and eastern edges of Missouri. This presents an advantage to St. Louis on two essential issues. First, there are far more numerous and larger market areas within a one-day truck delivery reach (550 miles) from St. Louis than from Kansas City. This is demonstrated in Figure 11, which outlines the reasonable delivery zones from these prospective hub areas; and in the summary table on the following page. Second, the long haul/containerizable freight traffic densities are greatest between West Coast points (Los Angeles, S.F./Oakland and Seattle) and Missouri. This means that economies of intermodal stack trains are greater with the longer haul to St. Louis, as well as the greater delivery opportunity mentioned above.

Does all this reasoning mean that Kansas City is not a viable alternative? Not necessarily; although it appears that St. Louis has several stronger advantages. As noted earlier, if a new Missouri intermodal hub is to be established it will take the cooperation and involvement of rail carriers and major shipper agents such as The Hub Group or Alliance Shippers, and carriers from other modes like American President Lines, J.B. Hunt or Schneider, to name a few. For institutional reasons it is conceivable that an impasse may occur at one general location; and thus attention will turn to an alternative.

Are the other candidate areas viable for further consideration? Probably not. It is inadvisable to shut the door completely on future possibilities, but there are several strong arguments against establishing a new intermodal hub in the areas of Columbia, Springfield/Joplin or Cape Girardeau:

- Insufficient local traffic base to support most effective intermodal stack-train service;

- Further distance to densely populated hinterland markets;

- Lack of main line rail access to some or all rail carriers;

- Greater distance to a variety of major interstate highway connections; i.e., more expensive drayage.

The following is a rated summary of the criteria which was useful in reviewing potential areas within Missouri. The chart on the next page can be used to isolate each criteria and each candidate area to reevaluate and measure comparative rankings again, if desired.

FEASIBLE HINTERLAND AREA
FOR OVERNIGHT OR NEXT DAY DELIVERY BY TRUCK
KANSAS CITY and ST. LOUIS

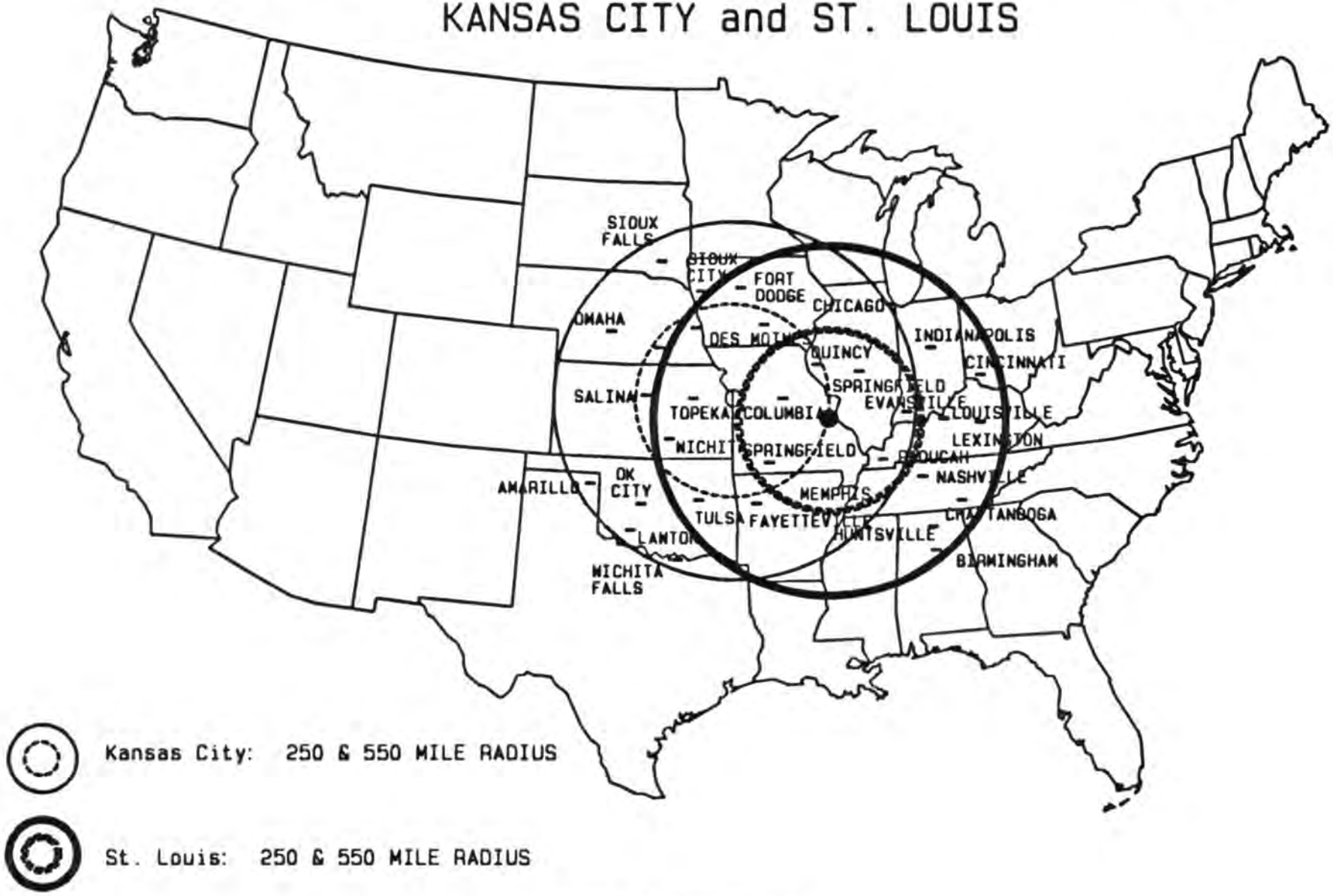

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Table 2

MISSOURI INTERMODAL HUB: RATING POTENTIAL AREAS
PRELIMINARY ASSESSMENT OF SUITABILITY

	Kansas City	Columbia	St. Louis	Cape Girardeau	Spgfld-Joplin
Primary Criteria: (1-10) 10=Most Favorable					
• Interstate Hwy Access	10	6	10	7	7
• Rail Main Line Access	8	4	8	3	3
• Airport/Cargo Facilities	8	2	7	2	4
• Local Economic Base	6	2	8	2	3
• Proximity to Major Mkts.	5	6	9	8	6
Secondary Criteria: (1-5) 5=Most Favorable					
• Labor Force Availability	5	3	5	4	4
• Land Availability	5	5	3	5	5
Total Points	47	28	50	31	32

For a more specific evaluation of each area's potential, current volumes of intermodal and potential intermodal traffic were reviewed. These were long haul, containerizable commodities moving in market-to-market (BEA-BEA) corridors. See Figure 12 -- Market Share (Hinterland) Size Comparisons by Population and Long Haul Freight Movement.

IDENTIFICATION OF HINTERLAND MARKETS

From this point the study concentrates on Kansas City and St. Louis as remaining viable candidate areas for a new intermodal cargo hub. These two areas have already carved out a significant role in intermodal activity (see Figure 4). But, they also face formidable competition from other gateway hub* areas serving the Midwest: principally, Chicago, Memphis and to a lesser extent New Orleans.

In order to sort the region into some logical patterns of association, highway mileages were used to categorize hinterland markets as akin to one or another of the hub areas mentioned above.

For example, Memphis recently gained status as the chosen container hub for a joint venture between Union Pacific (UP) and American President Lines (APL).[7] As this venture develops, then it will not matter to APL that Louisville is closer in highway miles to St. Louis than to Memphis. The container line will still serve Louisville from the Memphis hub, having

[7] "APL, SP, Santa Fe Boost Intermodal Services from California," Traffic World, February 22, 1993, p. 41.

MARKET SPHERE (HINTERLAND) SIZE COMPARISON BY POPULATION & LONG HAUL FREIGHT MOVEMENT

Base Year: 1990

Area	U.S. Population (millions)	Percent of U.S. Pop	Long Distance Freight Movements* (millions of tons) outbound	inbound
Kansas City + 550 miles	51.3	20.53%	103.0	95.5
Columbia + 550 miles	58.9	23.58%	121.7	98.6
St. Louis + 550 miles	76.2	30.50%	132.0	108.4
Cape Girardeau + 550 miles	60.7	24.29%	123.8	102.3
Springfield + 550 miles	51.2	20.49%	103.4	90.3

* Millions of tons, annually, of containerizable type freight moving 700 miles or greater distances. Includes all U.S. market areas.

Source: TRANSEARCH.

"placed its stake" there. This matter may have been determined by initiative or careful economic study; but the fact remains that once the hub is in place its stakeholders will attempt to utilize it so as to optimize its effectiveness and profitability.

Missouri, too, faces the same opportunities. That is, it must first develop a clear understanding of the underlying economics of an intermodal hub -- based in part on the intermodal traffic potential. And then its supporters must utilize initiative, creativity and effective marketing to gain needed participation and eventual success in this field.

For the sake of establishing a first level of analysis the intermodal hub areas are shown separately with their hinterlands at two distances: first, short range (up to 250 miles); and then medium range (250 to 550 miles). Based upon discussions with motor carriers, rail intermodal operators and the MHTD staff's rail specialists, the distance of 550 miles was selected as the maximum for one-day delivery by truck.

Figures 13 through 17 display five hub areas with their prospective hinterlands attached in these two tiers. Further, these exhibits break the analysis into two more segments: all hinterland markets reachable (550 miles or less); and "favorable" hinterland markets, i.e., those which are within the delivery range and also a shorter distance by highway than from any of the other gateway hub areas. Thus a conservative, as well as a more expanded look at traffic potential may be attempted for a given hub area when compiling the traffic volume statistics.

As shown in Figures 13 through 17, Chicago is closer to a greater number of market areas than are the other key gateway cities. The exact location of a hub in a metropolitan area, of course, can have a distinct impact in actual truck miles to plants or warehouses served in a hinterland area. In this study no allowance has been made for actual carrier routings and locations. Instead, the economic centroid of BEAs has been adopted along with map mileages for highway or railroads.

While the highway distance from the hub to served markets is important, these need to be added to an assessment of rail cost and service for moving freight into and out of the hub area. Since the analysis is considering the prospects for hub locations and does not address specific carrier involvement, rail mileage has been used as a surrogate. There are, however, two additional issues.

For most markets there are several applicable rail distances. In these analysis a map mileage table has been used. Typically, these numbers are close to those of the carrier with the shortest actual operations. With clearance considerations when operating trains with double stack cars, however, the practical distances might vary.

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* Gateway hub - Freight interchange point between two regions. This is because the cost of pickup and delivery by truck is determined in large part by the mileage. In real world operations, however, it must be recognized that additional factors, institutional, traditional and others, have an effect on how and where intermodal freight is handled.

HINTERLAND AREA OF INTERMODAL HUBS

CHICAGO

SHORT-RANGE (within 250 miles)

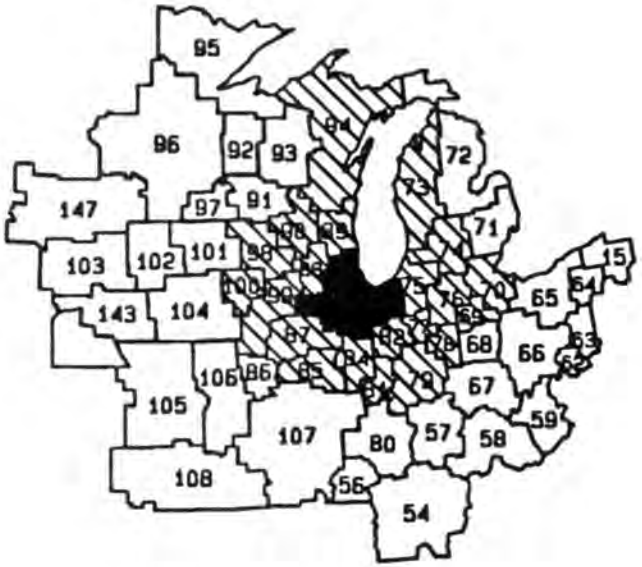
HUB:

BEA	CHICAGO	MILES
69	LIMA OH	222
70	TOLEDO OH	232
73	GRAND RAPIDS	172
74	LANSING MI	212
75	SOUTH BEND IN	85
76	FORT WAYNE IN	159
77	KOKOMO IN	150
78	ANDERSON IN	192
79	INDIANAPOLIS	177
81	TERRE HAUTE IN	179
82	LAFAYETTE IN	117
84	CHAMPAIGN IL	133
85	SPRINGFIELD IL	193
87	PEORIA IL	153
88	ROCKFORD IL	84
89	MILWAUKEE WI	86
90	MADISON WI	138
94	GREEN BAY WI	194
98	DUBUQUE IA	176
99	DAVENPORT IA	163
100	CEDAR RAPIDS	220

MEDIUM-RANGE (250-550 miles)

HUB:

BEA	CHICAGO	MILES
15	ERIE PA	432
54	NASHVILLE TN	466
56	PADUCAH KY	366
57	LOUISVILLE KY	286
58	LEXINGTON KY	344
59	HUNTINGTON WV	432
62	PARKERSBURG WV	422
63	WHEELING WV	428
64	YOUNGSTOWN OH	394
65	CLEVELAND OH	348
66	COLUMBUS OH	357
67	CINCINNATI OH	287
68	DAYTON OH	273
71	DETROIT MI	266
72	SAGINAW MI	283
80	EVANSVILLE IN	292
86	QUINCY IL	285
91	LA CROSSE WI	269
92	EAU CLAIRE WI	304
93	WAUSAU WI	271
95	DULUTH MN	458
96	MPLS-ST. PAUL	410
97	ROCHESTER MN	335
101	WATERLOO IA	266
102	FORT DODGE IA	377
103	SIOUX CITY IA	495
104	DES MOINES IA	328
105	KANSAS CITY MO	542
106	COLUMBIA MO	380
107	ST LOUIS MO	285
108	SPRINGFLD MO	494
143	OMAHA NE	461
142	LINCOLN NE	516
147	SIOUX FALLS SD	548



HUB CENTER

<250 MILES

>250 <500 MILES

HINTERLAND AREA OF INTERMODAL HUBS

MEMPHIS

SHORT-RANGE (within 250 miles)

HUB:

BEA	MEMPHIS	MILES
49	BIRMINGHAM AL	249
50	HUNTSVILLE AL	216
54	NASHVILLE TN	210
56	PADUCAH KY	168
111	LITTLE ROCK AR	137
112	JACKSON MS	213

MEDIUM-RANGE (250-550 miles)

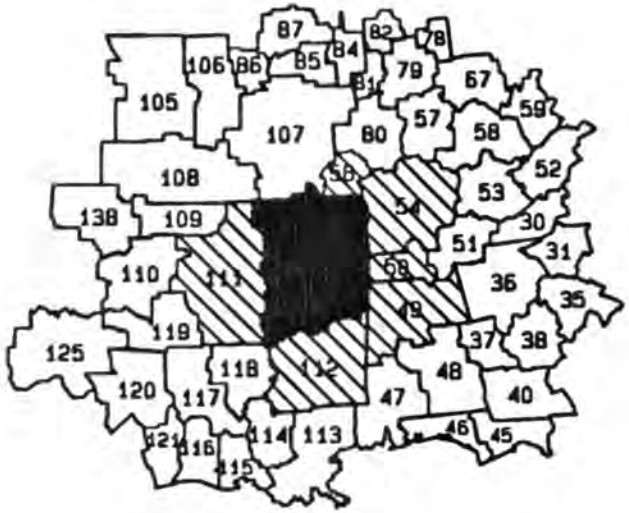
HUB:

BEA	MEMPHIS	MILES
30	ASHEVILLE NC	488
31	GREENVILLE SC	503
35	AUGUSTA GA	517
36	ATLANTA GA	369
37	COLUMBUS GA	394
38	MACON GA	412
40	ALBANY GA	482
45	TALLAHASSEE FL	540
46	PENSACOLA FL	419
47	MOBILE AL	362
48	MONTGOMERY AL	338
51	CHATTANOOGA TN	309
52	JOHNSON CITY	482
53	KNOXVILLE TN	384
57	LOUISVILLE KY	378

MEDIUM-RANGE (250-550 miles) (continued)

HUB:

BEA	MEMPHIS	MILES
58	LEXINGTON KY	408
59	HUNTINGTON WV	532
67	CINCINNATI OH	479
78	ANDERSON IN	473
79	INDIANAPOLIS	474
80	EVANSVILLE IN	271
81	TERRE HAUTE IN	370
82	LAFAYETTE IN	454
84	CHAMPAIGN IL	396
85	SPRINGFIELD IL	363
86	QUINCY IL	401
87	PEORIA IL	436
105	KANSAS CITY MO	482
106	COLUMBIA MO	364
107	ST LOUIS MO	283
108	SPRINGFIELD MO	280
109	FAYETTEVILLE	304
110	FORT SMITH AR	283
113	NEW ORLEANS	387
114	BATON ROUGE	361
115	LAFAYETTE LA	415
116	LAKE CHARLES	438
117	SHREVEPORT LA	323
118	MONROE LA	251
119	TEXARKANA TX	277
120	TYLER TX	392
121	BEAUMONT TX	492
125	DALLAS TX	452
138	TULSA OK	399



HUB CENTER

<250 MILES

>250 <500 MILES

HINTERLAND AREA OF INTERMODAL HUBS

KANSAS CITY

SHORT-RANGE (within 250 miles)

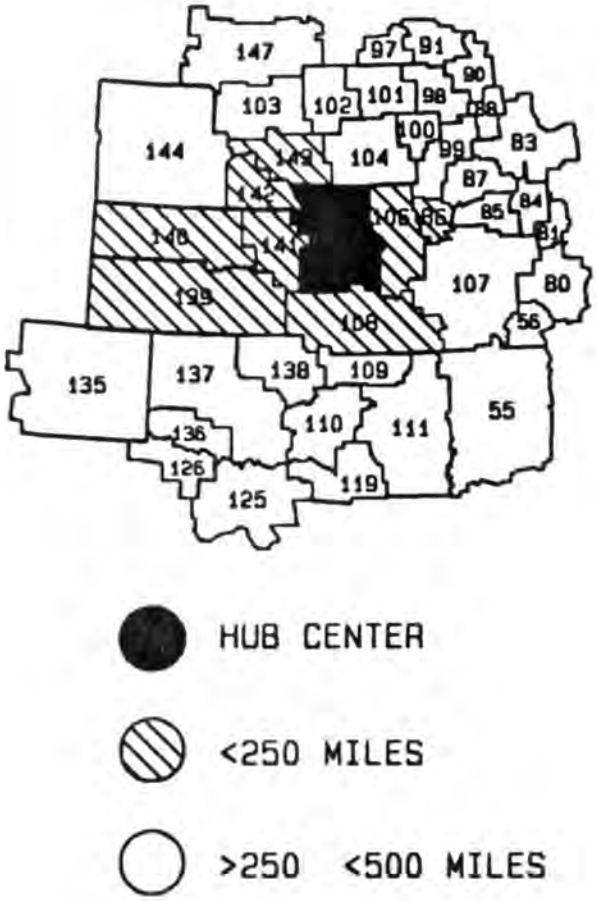
HUB:

BEA	KANSAS CITY	MILES
86	QUINCY IL	222
104	DES MOINES IA	191
106	COLUMBIA MO	134
108	SPRINGFIELD MO	156
139	WICHITA KS	190
140	SALINA KS	184
141	TOPEKA KS	70
142	LINCOLN NE	192
143	OMAHA NE	184

MEDIUM-RANGE (250-550 miles)

HUB:

BEA	KANSAS CITY	MILES
55	MEMPHIS TN	482
56	PADUCAH KY	421
80	EVANSVILLE IN	424
81	TERRE HAUTE IN	414
83	CHICAGO IL	542
84	CHAMPAIGN IL	388
85	SPRINGFIELD IL	308
87	PEORIA IL	351
88	ROCKFORD IL	450
90	MADISON WI	469
91	LA CROSSE WI	436
96	MPLS-ST. PAUL	443
97	ROCHESTER MN	398
98	DUBUQUE IA	375
99	DAVENPORT IA	314
100	CEDAR RAPIDS	295
101	WATERLOO IA	306
102	FORT DODGE IA	277
103	SIOUX CITY IA	280
107	ST LOUIS MO	256
109	FAYETTEVILLE	266
110	FORT SMITH AR	290
111	LITTLE ROCK AR	423
119	TEXARKANA TX	469
125	DALLAS TX	486
126	WICHITA FALLS	484
135	AMARILLO TX	540
136	LAWTON OK	432
137	OKLAHOMA CITY	345
138	TULSA OK	251
144	GRAND ISLAND	289
147	SIOUX FALLS SD	364



HINTERLAND AREA OF INTERMODAL HUBS

ST. LOUIS

SHORT-RANGE (within 250 miles)

HUB:

BEA	ST. LOUIS	MILES
56	PADUCAH KY	167
79	INDIANAPOLIS IN	246
80	EVANSVILLE IN	167
81	TERRE HAUTE IN	188
82	LAFAYETTE IN	247
84	CHAMPAIGN IL	161
85	SPRINGFIELD IL	105
86	QUINCY IL	136
87	PEORIA IL	168
99	DAVENPORT IA	236
106	COLUMBIA MO	129
108	SPRINGFIELD MO	214

MEDIUM-RANGE (250-550 miles)

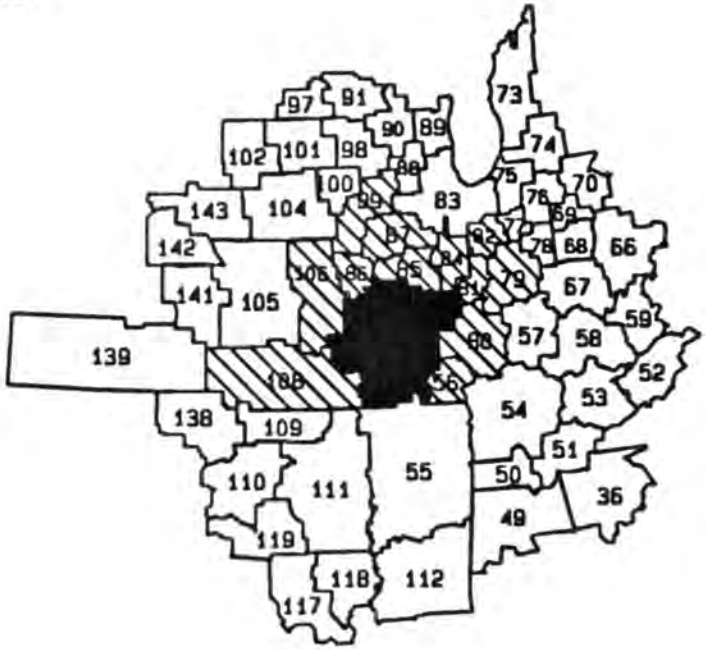
HUB:

BEA	ST. LOUIS	MILES
36	ATLANTA GA	526
49	BIRMINGHAM AL	512
50	HUNTSVILLE AL	406
51	CHATTANOOGA TN	416
52	JOHNSON CITY	557
53	KNOXVILLE TN	471
54	NASHVILLE TN	321
55	MEMPHIS TN	283
57	LOUISVILLE KY	258
58	LEXINGTON KY	332
59	HUNTINGTON WV	456
66	COLUMBUS OH	422

MEDIUM-RANGE (250-550 miles) (continued)

HUB

BEA	ST. LOUIS	MILES
67	CINCINNATI OH	354
68	DAYTON OH	339
69	LIMA OH	384
70	TOLEDO OH	459
73	GRAND RAPIDS	427
74	LANSING MI	467
75	SOUTH BEND IN	548
76	FORT WAYNE IN	359
77	KOKOMO IN	287
78	ANDERSON IN	274
83	CHICAGO IL	289
88	ROCKFORD IL	285
89	MILWAUKEE WI	376
90	MADISON WI	348
91	LA CROSSE WI	432
97	ROCHESTER MN	464
98	DUBUQUE IA	304
100	CEDAR RAPIDS	286
101	WATERLOO IA	337
102	FORT DODGE IA	393
104	DES MOINES IA	370
105	KANSAS CITY MO	256
109	FAYETTEVILLE	321
110	FORT SMITH AR	383
111	LITTLE ROCK AR	351
112	JACKSON MS	497
117	SHREVEPORT LA	546
118	MONROE LA	513
119	TEXARKANA TX	520
138	TULSA OK	420
139	WICHITA KS	462
141	TOPEKA KS	327
142	LINCOLN NE	444
143	OMAHA NE	436



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HINTERLAND AREA OF INTERMODAL HUBS

NEW ORLEANS

SHORT-RANGE (within 250 miles)

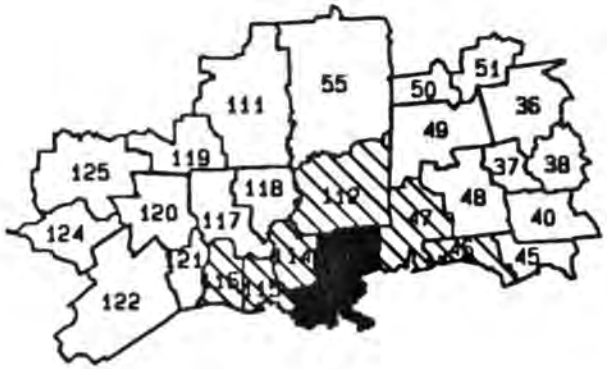
HUB:

BEA	NEW ORLEANS	MILES
46	PENSACOLA FL	200
47	MOBILE AL	143
112	JACKSON MS	180
114	BATON ROUGE LA	80
115	LAFAYETTE LA	134
116	LAKE CHARLES	205

MEDIUM-RANGE (250-550 miles)

HUB:

BEA	NEW ORLEANS	MILES
36	ATLANTA GA	471
37	COLUMBUS GA	396
38	MACON GA	491
40	ALBANY GA	412
45	TALLAHASSEE FL	382
46	PENSACOLA FL	200
48	MONTGOMERY AL	308
49	BIRMINGHAM AL	346
50	HUNTSVILLE AL	436
51	CHATTANOOGA TN	481
55	MEMPHIS TN	387
111	LITTLE ROCK A	417
117	SHREVEPORT LA	315
118	MONROE LA	258
119	TEXARKANA TX	386
120	TYLER TX	407
121	BEAUMONT TX	263
122	HOUSTON TX	352
124	AUSTIN TX	506
125	DALLAS TX	497



HUB CENTER

<250 MILES

>250 <500 MILES

Figure 17

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A comparison of the total rail and truck distances, in and of themselves, is not adequate. A rail mile is different than a truck mile, in terms of cost. In the case of a container stack train the incremental cost per mile is approximately $.30 while it is approximately $.90, three times higher, for the over-the-road trucker. Thus an advantage accrues with an estimated ratio of 3:1 to an intermodal service with shorter mileage. In other words, if St. Louis is 180 miles shorter by rail from Los Angeles than is Chicago, the St. Louis based service could "buy" 60 extra miles via truck and still be competitive with the Chicago hub. In the case of Peoria, then, the highway distance from a Chicago hub is 15 miles shorter than from St. Louis, but this can be offset by the shorter rail distance for traffic between Los Angeles and St. Louis as compared to Chicago.

The approach described above has been used to develop the hinterlands for St. Louis and Kansas City hubs as compared to Chicago and Memphis hubs.

It is instructive, however, to look at the real world operations of major truckload carriers. Many of these operators have main terminals in Chicago, Memphis and/or Kansas City, but only secondary terminals in St. Louis. Conversations with the truckers revealed that this is because St. Louis is "too close" to warrant a main terminal, as it would overlap their own operation in one of the other surrounding places.

It is almost ironic that St. Louis has suffered in economic development because it is "too centrally" located. This issue is not a knock-out factor, but is important enough to bear careful attention during the planning process. That is, St. Louis may have real potential for intermodal double-stack rail service when viewed on its own; but the fact is there are real competing areas all around it -- and carriers or other stakeholders may prefer to place their hub operations in several positions to the north, south and west of St. Louis rather than centering an entire operation there.

On the other hand, a case can be made for centralizing operations in a single hub terminal at St. Louis which can serve a wider area for pickup and delivery if the economics are favorable. A Kansas City based operation would not be in a position to supplant Memphis or Chicago in terms of reaching markets to the east; but it could do so as far as serving hinterland markets to the west and southwest.

The answer to the hinterland question is determined in part by the local economic base of each hub area. That is, if the local activity is great enough to attract a primary intermodal terminal, then service to a reasonable hinterland region will follow.

What is the impact, then, in terms of traffic volume of these hinterland markets? In the next section of the report, "Traffic Volume Requirements for Stack Trains", the potential intermodal volume of the various hub areas, potential divertibility of traffic and future projections are described.

DOUBLE STACK CONTAINER TRAIN POTENTIAL

Using TRANSEARCH[8] data base of U.S. freight volumes and patterns, the potential for double stack train service[9] was measured. These data revealed the amount of containerizable freight flowing between major market areas (700 miles or greater length of haul). Four Missouri market areas (BEAs) were included, as were the rival hub areas of Chicago and Memphis.

International containerized shipments are included, but merged together with domestic freight. Shipments now carried via rail/highway intermodal were included as well as commodities which could be carried in intermodal service, but are presently moving via rail carload, or over-the-road truckload. Air cargo was shown separately; and domestic waterborne cargo was excluded in this analysis.

Separate estimates were developed concerning the size of operation needed to support double-stack container service. These, then, were compared to market prospects for container traffic.

Traffic Volume Requirements for Stack-Trains

From interviews with rail planners, different minimum stack train sizes are used as a standard by different railroads, but the minimum range is from 10 to 16 car-sets per train currently. Each car has five sections and carries 10 containers. Thus, minimum train size ranges from 100 to 160 containers. For analytical purposes, the study team used 120 containers, or 12 car-sets as a "threshold" minimum train size.

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[8] TRANSEARCH is a freight traffic flow data base prepared and maintained by Reebie Associates which gives annual volumes of movements by commodity, by mode of transport for origin and destination areas throughout the U.S.

[9] The volume requirements for a double stack train service have been used because of the surging popularity of this form of intermodal operation and because it requires the largest volume to support it. If volumes necessary to warrant a dedicated stack train were not available then an option would be to consider the prospects for another form of rail/truck operations with smaller traffic requirements.

The process of reducing intermodal volume requirements, of course, could continue into different operational configurations -- say, a more conventional TOFC/COFC, Roadrailer, Iron Highway, to name a few -- or for specialized market segments -- automobile parts or canned goods distribution, for example. If, on the other hand, there is evidence that the larger volume stack train operation is viable, then other more specialized options and markets could be added to the intermodal hub center.

How does that level translate into tons?

The average lading weight used in this study is 16.8 tons per van or container. This was adopted from a combination of feedback from over-the-road truckers whose freight might be diverted to an intermodal service and rail industry statistics. In addition some weight was given to the expectation that steady growth in transAtlantic container trade will cause the average weight per container to increase.

Thus, the minimum amount of freight needed to support a stack train service would be 2,016 tons per train. If one train per week is envisioned, then 105,000 tons per year of freight would be needed in a specific traffic lane; in each direction, in order to attain a balanced system (critical for intermodal profitability).

The market volumes required for stack train service must be sufficient to account for the fact that only portions of the business will be handled by the intermodal service and that there are variations in shipment patterns. Not all traffic would opt for the intermodal service. Special service requirements for at least a portion of the traffic, such as multiple stop-offs or pickups, preclude this. To assume each same volume for each day is unreasonable. Seasonality as well as day of week variations must be accounted for in the assessment.

Experience in the trucking industry reveals a reasonable estimate of freight availability by day of the week, and shows that Friday is the day for the largest volume with Monday and Tuesday representing the least. Thus, for the study the following percentages have been used:

Day of Week:	Monday	Tuesday	Wednesday	Thursday	Friday
Pct. of Total:	17%	17%	20%	22%	24%

The AAR "Weekly Railroad Traffic Statistics" for intermodal units originated were reviewed for several prior years for both trailers and containers. While the maximum variation between average and the lowest loading numbers was 39 percent, a factor of 20 percent has been used in the analysis to reflect a more typical range and dampen the impact of cyclical variation.

It need only be mentioned that with greater service frequency intermodal operators can attain greater market share. In the main, freight shippers are not likely to wait more than a single day for intermodal train service, since all-highway truck service can depart for destination at any time. The probability of waiting is greater at the end of the week, due to the lack of weekend delivery slots at destination.

It was estimated that 60 percent of the containerized traffic could be diverted to a prospective stack train once it is fully operational and effectively marketed -- assuming a service of 4 or more trains per week in each direction. If only 1 to 2 trains per week are run, the market share dropped to 22 percent.

Figure 18 displays a summary of the calculations used to determine the required volume for stack container trains to achieve economic and operational viability.

Thus, if stack train service were available only once per week, with departure on Friday, then the "available market" in that corridor would be 37.2% of the week's production (the entire 24% designated as Friday output, plus 60% of Thursday's). Of this portion (37.2%) the intermodal service's market share could be estimated at 60% or 22% of the total relevant freight for the entire week.

The analysis described above, however, can be replaced or supplanted in numerous ways if more specific arrangements are made between carrier and major shipper(s). For example, if container shipline "X" arranges with rail carrier "Y" to transfer 150 to 200 containers each Monday at the Port of "Z" for movement to Kansas City, then the volume to justify the service is already virtually achieved. And any additional traffic attracted to the intermodal service represents greater contribution towards profitability for railroad "Y."

Missouri Hub Areas' Potential Intermodal Volume

When paired with specific major long haul markets, which Missouri market areas or potential hub areas have enough relevant freight volume to support a stack train as described above? The answer was derived from the TRANSEARCH data base (1990 base year) of intercity freight volumes. A summary of the findings, as follows, may be seen in Figure 19:

Kansas City --------- none to/from the East; and two
to/from the West (L.A.)

Columbia ---------- none.

St. Louis ---------- four to/from the East (NY/NJ);
plus four to/from the West (L.A.)

Joplin/Springfield --- one-half: outbound to Denver there is enough to support a once per week trainload (barely); but in the reverse direction it is far below an adequacy level.

Impact of Adding "Hinterland" Volume

After adding specific freight potential from these hinterland markets, what are the specific origin/destination markets which could reasonably support a Kansas City or St. Louis stack train service? The following is a summary of the traffic levels by hub area.

STACK TRAIN VOLUME REQUIREMENTS

==========

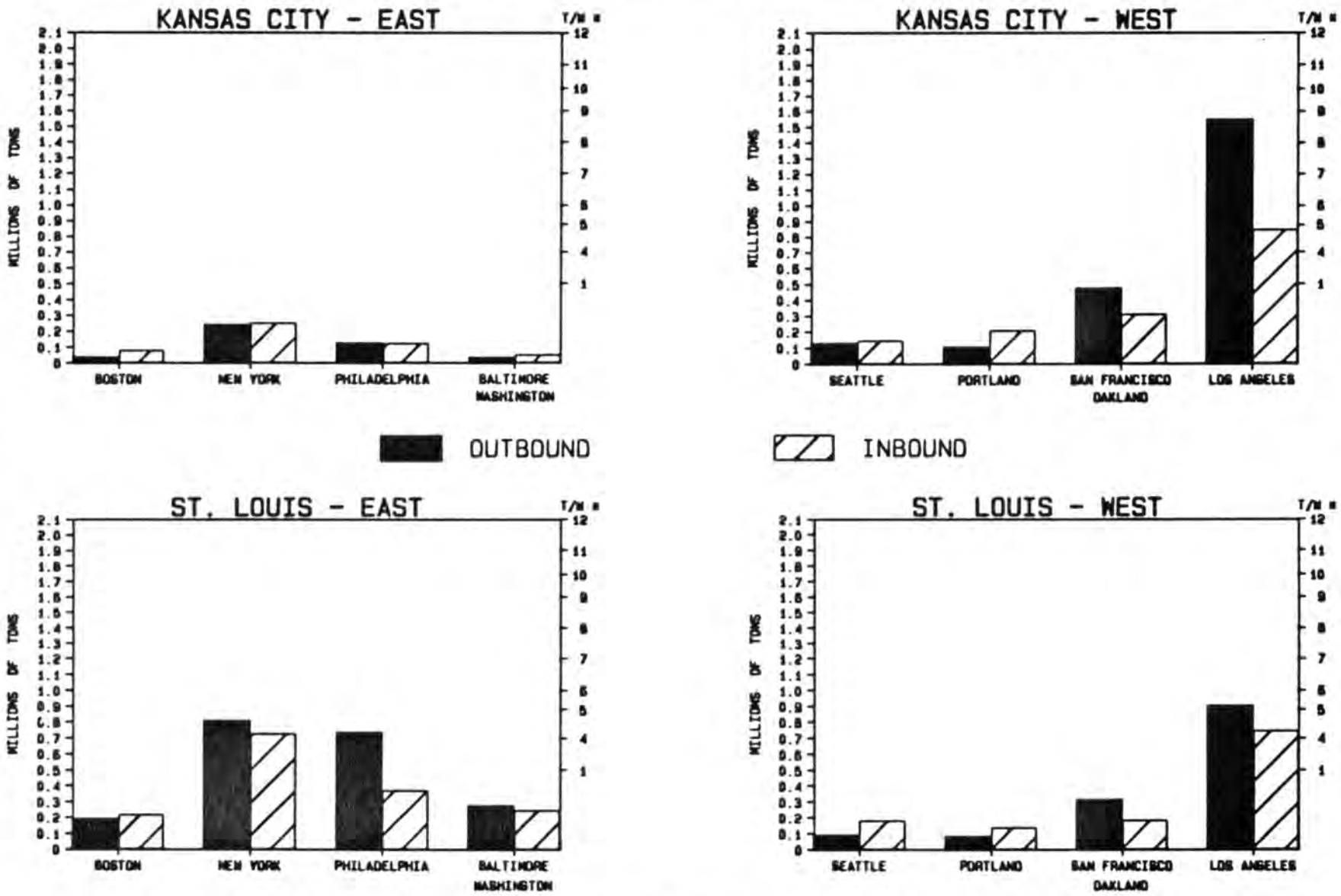
Minimum: 12 car sets = 120 containers per train
x 16.8 tons per container (avg.)

2,016 tons (cargo) per stack train
x 52 weeks per year

104,832 tons (cargo) per year...@ 1 train/week

Number of Trains per week	Annual Tons Required	Market Penetration Factor	Adjustment Factor For Seasonality & Peaking	Minimum Annual Tons Needed in Lane
1	105,000	0.22	.20	572,728
2	210,000	0.22	.20	1,145,454
3	315,000	0.33	.20	1,145,454
4	420,000	0.60	.20	840,000
5	525,000	0.60	.20	1,050,000
6	630,000	0.60	.20	1,260,000
7	735,000	0.60	.20	1,470,000
8	840,000	0.60	.20	1,680,000
9	945,000	0.60	.20	1,890,000
10	1,050,000	0.60	.20	2,100,000
11	1,155,000	0.60	.20	2,310,000
12	1,260,000	0.60	.20	2,520,000

CONTAINERIZABLE TRAFFIC POTENTIAL (1990)



* NOTE: T/W = Number of double stack trains per week that could be supported in each traffic lane, given the total volume of containerizable freight.

Source: TRANSEARCH

Kansas City:

to/from the West:	Los Angeles	EB	825,000 tons (5 trains/wk)
		WB	1,550,000 tons (9 trains/wk)
	San Frn/Oak	EB	280,000 tons (0.5 trains/wk)
		WB	475,000 tons (1.2 trains/wk)
	Seattle	EB	140,000 tons (0.2 trains/wk)
		WB	125,000 tons (0.2 trains/wk)
to/from the East:	NY/Newark	EB	250,000 tons (0.5 trains/wk)
		WB	265,000 tons (0.5 trains/wk)

St. Louis:

to/from the West:	Los Angeles	EB	760,000 tons (4 trains/wk)
		WB	910,000 tons (5 trains/wk)
	San Frn/Oak	EB	190,000 tons (0.4 trains/wk)
		WB	320,000 tons (0.6 trains/wk)
to/from the East:	NY/Newark	EB	850,000 tons (5 trains/wk)
		WB	780,000 tons (4 trains/wk)
	Philadelphia	EB	740,000 tons (4 trains/wk)
		WB	165,000 tons (0.7 trains/wk)

The following is a list of the reasons traffic could be diverted to a Kansas City or St. Louis intermodal hub?

- Cost advantage
- Service advantage (faster delivery, transit time)
- Avoid congestion delays
- Environmental concerns vs. alternative sites
- Institutional arrangements
- Fit into discreet distribution system:
  - Distribution Hub for Major Customer(s)
  - Parts Bank
  - Mixing
  - Forward Distribution Center
  - Fabrication
  - Free Trade Zone

Future Projections of Volume

The TRANSEARCH data was put through a forecasting procedure to allow for the inclusion of future growth in potential intermodal traffic. The process is based on information supplied by the WEFA, Inc. The forecast has been disaggregated to reflect anticipated modal shifts during the period. In this case the base year 1990 TRANSEARCH data was forecast to project traffic volumes to the year 2000.

What is the impact of the forecast traffic data, in terms of potential, for a Missouri hub center? Overall, the TRANSEARCH forecast shows an increase of approximately 25% in relevant or containerizable freight for Missouri's intermodal partners; i.e., major markets at least 700 miles away. Figure 20, when compared to Figure 19, shows the relative growth by individual traffic lane. Again, this represents total relevant freight available.

The effect of the increase does not appear to open up any new traffic lanes as attractive as those already discussed in terms of stack train potential. It does, on the other hand, strengthen the potential for the lanes already reviewed: Kansas City and/or St. Louis to/from New York, Philadelphia, Los Angeles, San Francisco and Seattle. Two other areas, Portland, OR and Baltimore/Washington appear to come close, but will not generate enough volumes on their own to support a stack train intermodal service of the type described in the study.

COMPETITIVE ECONOMICS

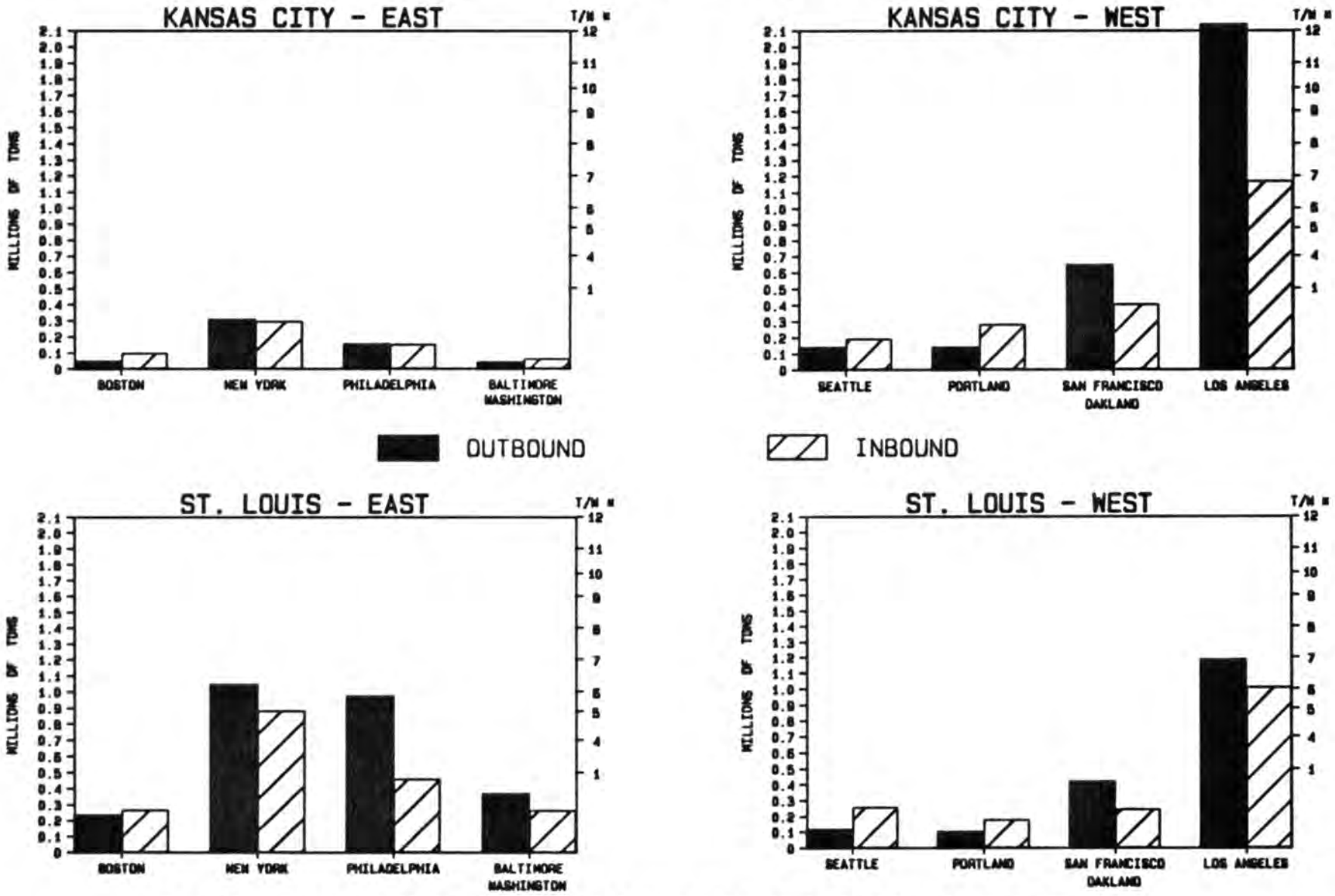
Having identified several key traffic lanes where enough potential exists for double-stack container intermodal service, the analysis must subsequently assess the divertibility of that traffic. One of the most significant factors in the decision to divert is the cost of transporting the containers to/from a Missouri intermodal hub.

Freight shippers generally will consider diverting to a new transportation option on the basis of rates and/or service differentials; as well as other, institutional factors. While costs are not always reflected in the carriers' rates, his costs are an indication of long term competitiveness and an ability to sustain rates which can attract traffic.

Using Reebie Associates' Carrier CostLine computerized models, the study team assessed the costs of moving containers or trailers via rail/highway as well as truck modes. Rail/highway was further broken down to compare a double-stack "unit train" type of operations with more conventional intermodal trains.

The results revealed that there are significant savings, indeed, with the intermodal double-stack train scenario. Moreover, the amount of these savings would allow for penetration to the hinterland market areas. In other words, movement by stack train to a Missouri hub terminal is sufficiently less expensive per unit that the additional charges for extended pickup and delivery via truck will still produce a significant net savings.

CONTAINERIZABLE TRAFFIC POTENTIAL (2000)



* NOTE: T/W = Number of double stack trains per week that could be supported in each traffic lane, given the total volume of containerizable freight.

Source: TRANSEARCH

Figure 20

More specifically, Figure 21 shows the relationship of the alternative modes' costs at varying lengths of haul. Predictably, the over-the-road truck is less expensive than conventional intermodal in the short haul -- 500 miles; but intermodal reaches a crossover point at 1,000 miles and is increasingly more economical beyond that point. At 2,000 miles conventional intermodal service is less costly than truck by as much as $534[10]. This would allow for an additional 27% or $333 to be added to the line haul costs -- for extended pickup and/or delivery-- and still come out more than 10% less than the trucker.

For different rail carriers the line haul cost differs, and therefore, the economic advantage changes. The eastern railroads do not have any hauls of 2,000 miles; but for a 1,000 mile haul both Conrail and Norfolk Southern would have to contend with costs which are higher than those of the trucker (i.e., using the conventional intermodal scenario). These eastern carriers could still figure as part of an interline move with a connecting railroad on a longer haul, and then possibly amass an overall advantage versus the motor carrier.

The cost of a "unit train" type of double-stack line haul is significantly less than both of the other alternatives; that is, assuming a very tight and efficient operation. These alternatives are: a) the over-the-road motor carrier; and b) a more conventional rail "mixed" intermodal operation with perhaps additional stop-offs and pick-ups at other terminals en route, and without fully dedicated equipment and crews, etc.

Even at 500 miles the unit train option has a cost advantage of approximately 20% over the trucker. This is in comparison with the most efficient of six rail carriers used in the cost analyses, employing 1992 figures.

At 2,000 miles costs for this efficient intermodal option are in the area of 45% less than those of the long haul motor carrier. Figure 21 represents the cost of a single container or highway trailer at varying lengths of haul, and compares the three modal alternatives described above. Thus, if a trucker's fully allocated costs for a 2,000 mile haul are $2,100 (assuming $1.05/mile) and an efficient rail double-stack operation is around $1,100; the difference of $1,000 can be allocated to reach a wider pickup and delivery zone for the rail/highway scenario. (Note: a cost element of $132.00 was built into the analysis for the intermodal option, as representative of a local pickup and delivery expense).

In the above example, the trucker can -- and undoubtedly will -- compete aggressively for the business, rather than lose it. He or she may use pricing which is below full costs, and even below long run variable costs; but over the long term the intermodal operator has a significant advantage. The intermodal operator may use this advantage effectively; say, going 550 miles beyond the intermodal hub at a cost of $1.20 per mile. Thus, he or she would be able to compete with a long haul motor carrier for the line haul; add $660 for extended hinterland delivery (or origin pickup, or a combination of both); and still enjoy an advantage

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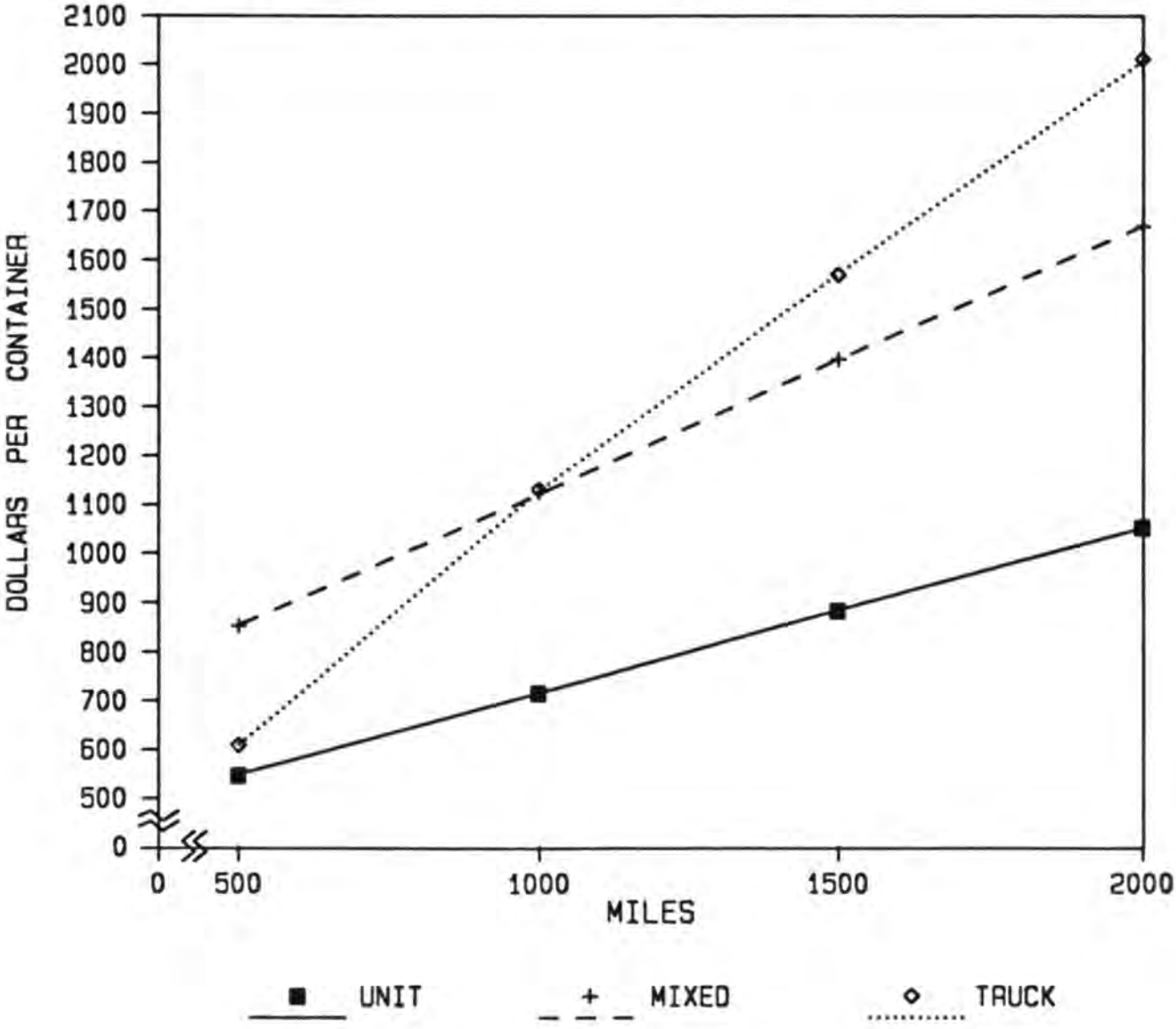
[10] This figure was calculated based on statistics for an individual railroad as reported to the Interstate Commerce Commission (ICC) versus an efficient "lower quartile" over-the-road trucker.

COST COMPARISON FOR RAIL AND TRUCK

(UNIT TRAIN vs. MIXED TRAIN vs. TRUCK)



of $240 or 12% under the trucker's costs. This, in turn, should be sufficient to allow for pricing to divert a significant amount of freight to the intermodal service, assuming the service aspects are as good or better than the truckers'.

In short, the assumed hinterland in the earlier part of the analysis -- of 550 miles beyond the Missouri hub -- appears to be feasible on an economic basis.

Economics in Specific Traffic Lanes

As shown in the prior section on "Double Stack Container Train Potential" there are a limited number of key traffic lanes which hold sufficient potential for a competitive intermodal service to/from Missouri points.

These attractive freight corridors were evaluated using Reebie Associates' Carrier CostLine models to compare all highway costs with intermodal rail/highway. A brief review of the assumptions is as follows:

Conventional Intermodal Train

- 6-car block of intermodal cars on "mixed" train;
- 60 containers per shipment;
- one additional stop-off en route to destination;
- empty return factors: cars 6.7%; containers 48.0%;
- cargo payload: 16.8 tons per container;
- local pickup & delivery provided by railroad (Plan 2.0) with allocation of $132 per shipment;
- terminal charges (lift on/off) as reported by carriers.

When assessing the conventional intermodal option, the only market-partner in the east with sufficient traffic volume, New York/New Jersey metro area, did not come out favorably when compared to an all highway alternative. This is partly due to the fact that New York to St. Louis is less than 1,000 miles and New York to Kansas City is only slightly more than 1,000 miles. That is, the economic advantages of conventional-type intermodal do not begin to appear strong enough to counter the trucker at that length of haul.

For western market-partners, both the opportunities and the advantages appear greater. Using a conventional intermodal approach, various carriers show a cost advantage of approximately 20% to 25% over the trucker.

Turning to an analysis of all highway versus a truly dedicated intermodal "unit train" of double stack container cars, the assumptions were somewhat different:

Double Stack Container "Unit" Train

- 16-car (10 platforms per car) dedicated train;
- 160 containers per shipment;
- no stop-offs en route to destination (except crew changes and fueling);
- empty return factors: cars 1.9%; containers 15.0%;
- cargo payload: 16.8 tons per container;
- local pickup & delivery provided by railroad (Plan 2.0) with allocation of $137 per shipment;
- terminal charges (lift on/off) as reported;
- tare weight of cars adjusted.

Comparisons of the dedicated "unit train" type of intermodal service versus the truck show a sharply more pronounced advantage for intermodal. Again, the East Coast to/from Missouri route is less attractive than the West Coast routes. In this scenario, however, the route between New York and St. Louis (with option of interline connection to/from Kansas City) does show a positive advantage over the long-haul trucker; albeit a small one. The intermodal savings of 12% at St. Louis and/or 19% at Kansas City do not allow for much leverage in diverting traffic, or exploiting long-term economic superiority regarding an extended hinterland around either hub area. The analysis suggests that the cost advantage could be enough to capture some intermodal containers for the local base markets in either case.

For West Coast market areas of Los Angeles, San Francisco/Oakland and Seattle the advantages are more clear and promising. Again, with variations according to individual rail carrier, the intermodal cost advantage appears to be approximately 40% or greater in each case. As is explained in the following section of the report, this amount is sufficient to provide for an extended drayage, at least at the Missouri hub end, of the full 550 miles.

Highway Drayage Beyond the Intermodal Hub

Again, using Reebie Associates' Carrier CostLine model for truckload shipments, a series of analyses were conducted regarding the cost of truck delivery (or pickup) beyond the Missouri intermodal hub. Both Kansas City and St. Louis were used in the analyses and partnered with hinterland markets ranging from 100 to 550 miles away.

For the sake of analysis the assumptions included a 48-foot container with the same cargo weight, 16.8 tons, used in the rail cost assessments. Also, an efficient operation with 8% to 12% empty return factor was envisioned.

The cost per mile varies by the length of haul and ranges from $140 to $630 depending on the actual mileage. Thus estimates of the cost of drayage to hinterlands may be made using a scale or table derived from the cost analyses. For example, the cost of drayage from Kansas City to Springfield, MO, a distance of 156 miles, would be $206 (or $1.32/mile); while a similar dray from Kansas City to Texarkana, TX, a 469-mile run, would be $568 (or

$1.21/mile). As noted in the previous section, some of the rail intermodal cost advantages exceed these levels, and so could be applied to justify attempts at penetrating markets such as Springfield or Texarkana via a Missouri hub.

Figure 22 shows the estimated dollar savings for intermodal routes along with the extended market range they suggest.

A cautionary note should be entered at this point. That is, the hinterland area of an intermodal hub -- correctly outlined --is not a "circle," but rather an "ellipse" shape. This is because the competitive factor, the trucker, can go direct from any origin to any destination point via interstate highways. But the intermodal option must involve transferring from the train to the highway at a fixed terminal location, and then proceeding via highway to ultimate destination. If the ultimate destination, however, involves "backtracking" in the direction of the origin, then the intermodal advantage diminishes because the trucker can get there more directly.

To illustrate with an example, as shown in Figure 23, an intermodal operation from Los Angeles to St. Louis could conceivably be quite competitive for shipments going from Oxnard to Louisville. This, of course, involves drayage by highway on each end of the haul. The intermodal operation is significantly <u>less</u> competitive for a San Bernadino to Topeka shipment via St. Louis, because in this case a counter-directional drayage is incurred at each end. Even though Topeka and Louisville are approximately the same distance from St. Louis, the economic advantages of intermodal are far greater to Louisville for shipments to/from the West Coast. The opposite would be true for shipments to/from the East Coast. Thus the feasible hinterland, in economic terms, is represented by a series of ellipses corresponding to the distant markets involved and centering on the hub, itself.

PHYSICAL REQUIREMENTS

In an earlier section on "Hubs vs. Super-Hubs" a brief description was given of a proposed intermodal cargo hub facility under two different assumed levels and/or scopes of activity. The first is a rail/highway intermodal terminal located near a main line of one or more railroads so as to provide for interline service, as well as transfer of containers (and/or trailers) for pickup and delivery in the local area and an extended hinterland.

The second alternative is a "super hub" which is similar to the first, but goes far beyond in size and extent of activities performed. This larger concept envisions the intermodal terminal plus distribution and warehousing operations. Further, it could contain: motor carriers' driver showers and sleeping accommodations; dispatch office; break bulk operations; truck and trailer/container repair; truck wash and leasing facilities; a full service truck stop; U.S.D.A. and U.S. Customs inspection stations; and more.

Why would a Missouri intermodal hub want to extend beyond the traditional concept of the terminal? One reason is the demand for distribution and warehousing services continues to exist and is growing. Putting all of them together in a "super hub" could make for a high

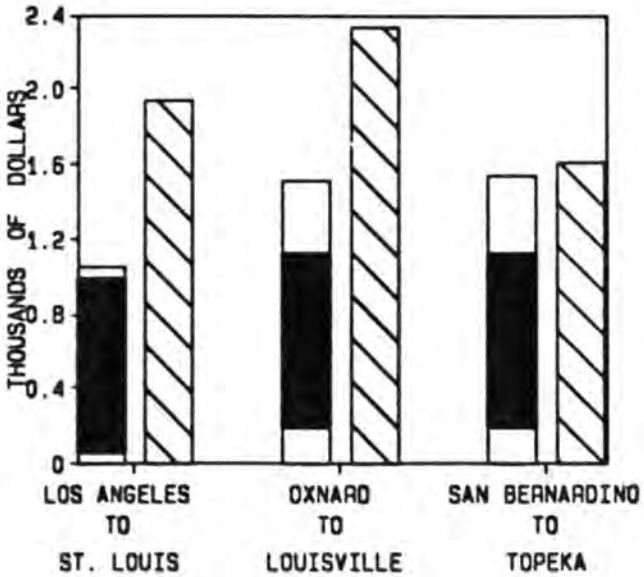
INTERMODAL COST ADVANTAGES VERSUS ALL-HIGHWAY IN SPECIFIC CORRIDORS

Intermodal Advantage (dollars per container)				Estimated Extension of Hinterland (miles from hub)			
Conventional "Mixed Train" Intermodal							
----------to/from St. Louis----------							
New York	L.A.	S.F.	Seattle	New York	L.A.	S.F.	Seattle
-169	509	743	502	0	425	550	420
----------to/from Kansas City----------							
New York	L.A.	S.F.	Seattle	New York	L.A.	S.F.	Seattle
-526	454	643	407	0	390	550	270
Dedicated Double-Stack Container "Unit Train"							
----------to/from St. Louis----------							
New York	L.A.	S.F.	Seattle	New York	L.A.	S.F.	Seattle
121	950	1,212	915	30	550	550	550
----------to/from Kansas City----------							
New York	L.A.	S.F.	Seattle	New York	L.A.	S.F.	Seattle
248	846	1,212	770	65	550	550	550

DIRECTIONAL EFFECT ON FEASIBLE HINTERLAND

EXAMPLE: Los Angeles, CA to St. Louis, MO
Oxnard, CA to Louisville, KY
San Bernardino, CA to Topeka, KS

COSTS

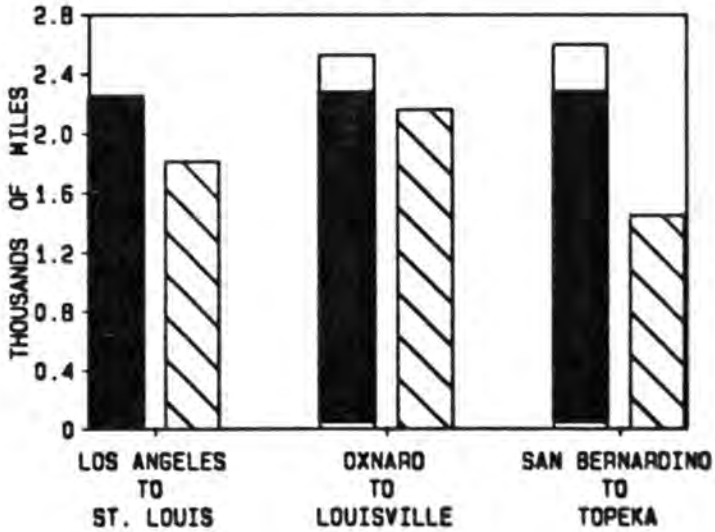


Rail portion

Highway drayage portion

All highway

MILEAGES



volume facility and therefore offer cost efficiencies based upon economies of scale. Second, there is a relationship between most of the activities; and thus, many customers could take advantage of "one stop shopping" for a number of services. Others would be able to select the single service relevant to their needs without any problems; but would also receive the benefits of the economies of the larger, presumably more efficient super hub.

Third, but not least, the super hub concept tends to spread the downside risk of underutilization. That is, if estimates of activity are not attained in actual operations, then the economies cannot be realized. But with numerous types of activities being conducted at the facility, there is a greater chance that if one facet is an underachiever, another will be an overachiever and possibly need to expand further than expected.

Estimated Throughput Volume

Beginning with the first, more conservative concept of the intermodal hub, the size of the facility must be determined by the volume of containers which are expected to be handled through the terminal. This includes "run through" train service; transfer of containers and/or trailers for local and regional pickup and delivery; and (realistically but not ideally) rubber wheel interchange.

This sizing cannot properly be estimated using the average throughput, or annual totals. Rather, it must take into account the actual or anticipated daily activity at the "peak" levels. Allowance must also be made, of course, for expansion and growth.

The earlier discussion on double stack container potential focused in on a select number of key lanes with sufficient current and forecast volume. Lanes discussed were confined to Kansas City and St. Louis in relation to the three largest West Coast port areas of Los Angeles, San Francisco/Oakland and Seattle. If an intermodal hub were to be established -- either a completely new facility, or renovation of an existing one -- to serve these markets, then a projected base level of activity could be established in accordance with the freight flow opportunities already discussed.

It is also true that once this baseline becomes attractive enough to justify establishment of a new hub terminal, the same facility could also serve more conventional intermodal needs; i.e., trains which serve other traffic lanes and pickup/setout blocks of intermodal cars to/from other areas. This, in turn, makes it challenging to estimate the expanded throughput, because the amount of this ancillary activity is dependent on which rail carrier (or combination of carriers) serves the intermodal hub.

For example, if a Missouri intermodal hub were to be served by Railroad A it would have a significantly different volume of activity, potentially, than if served by Railroad B. This is because "A" is a different combination of market areas from "B". Also routings to/from Missouri locations may be quite different for "A" vs. "B"; and direct vs. interline service could be a factor, too.

The numerous combinations of markets served by various carriers can be quantified, in terms of intermodal traffic potential; but that is a task beyond the intended scope of this study. For the sake of estimating the feasibility of a Missouri intermodal hub, the analysis may be based upon the volumes associated with the major coastal market areas mentioned earlier, and the respective rail carriers who serve them and Missouri.

Referring to the earlier section, which quantified intermodal traffic potential, it was shown that there may be sufficient volume in year-2000 to/from Los Angeles to sustain six trains per week to St. Louis or Kansas City. Further, the analysis indicated that there may be volume to support one additional train per week from the San Francisco/Oakland area to St. Louis or Kansas City. While the traffic potential in the opposite direction (westbound) is greater still, we will use a conservative estimate based on the underbalanced direction, assuming that a two-directional balance is a necessary part of the economic requirements for the scenario.

Turning to the eastern markets, the analysis showed a potential for New York/Newark container trains, perhaps four per week, westbound to St. Louis. While this traffic did not appear divertible from an all-highway mode based upon the competitive economics analysis, there is still potential here. Opportunity may lie in the ability to offer interline, long distance intermodal rail service -- e.g., from New York to Los Angeles --with a block of cars set off at St. Louis or Kansas City for regional delivery, and conversely picked up by a returning train for the shipments to the northeast. Thus, the estimate of throughput potential may include this traffic, as well.

With the assumptions as discussed above, the potential for the conventional type Missouri intermodal hub can be calculated using the following assumptions and factors:

- 7 trains/week to and from the West Coast; or 160 containers per day inbound, plus 160 outbound -- with a six day per week operation; goes up to 320 containers on two heaviest days of week;

- 4 trains/week picking up and setting off blocks to/from East Coast; or 80 containers on a given day inbound "deramped", plus 80 outbound "ramped"; with additional 80 in each direction passing through on interline connections; adds 160 containers handled on heavy days.

- total of 2,880 containers per week handled (on average); or 150,000 per year at terminal; 800 containers per day handled on heavy days (trains from both east and west).

- additional peaking factor during busiest seasons, etc., of 20%; raises total on heaviest days to 960 containers per day handled.

- growth factor for possible expansion of operations beyond year-2000, of 33%; allows for additional whole trains handled at terminal (10/week west; 6/week east); 1,280 containers on heaviest volume days; 220,000 per year.

Physical Requirements of the Intermodal Hub:

Based upon these throughput estimates, the size of the terminal and its facilities and equipment have been estimated using several sources of information. These include: conversations with (and specific quantified estimates from) current intermodal operators and terminal planners; research on existing facilities and their size, scope and costs of operation; prior studies conducted by Reebie Associates relating to intermodal terminal facilities and their physical requirements. The investigation produced the following specifications for the hypothetical intermodal hub as described:

- Overall Size: 100 acres.
- Working Track: 4 tracks; 9,000 feet (at longest point); 90-feet space between tracks - allows for double parking of trailers/containers alongside track, plus crane.
- Storage Track: 2 tracks; 4,000 feet each.
- Parking Space: 75 acres (trailers + containers + chassis).
- Transfer Units: 4 Gantry cranes (or 7 side loaders).
- Yard Tractors: 10 (hostlers).
- Other Equipment: 1 fire truck; 2 security patrol cars; 1 light repair van.
- Gate: 4 lanes (with lighting, radio communication and automated data entry).
- Buildings:
  1. Terminal office (admin., security, dispatching) 12,000 square feet; with 3-story control tower.
  2. Trailer/Container and chassis repair shop; with truck wash; 40,000 square feet, 2-story height (but single floor with 18-foot ceiling).
  3. Driver lounge; with showers; 4,000 square feet, single story.
- Fencing: 8,400 linear feet; 10-feet high.
- Lighting: 474 stanchions in total; 300 in work area; 150 in parking areas; 8 at office and driver lounge area; 6 at repair shop; 10 at gate and entryway.

The cost of building and equipping this facility would be in the range of $60 to $80 million. It represents a modern, first-class intermodal terminal which is competitive with similar single carrier facilities being built at present or on the drawing board at offices of major intermodal carriers.

Scoping the "Super-Hub":

For the sake of simplifying the discussion, as well as for consistency, the analysis here assumes all of the descriptive factors mentioned above for the conventional intermodal hub. The following discussion, then, centers on what additional facilities and expenses would be required to establish a larger-scale "super hub."

The super-hub concept can take on multitudinous forms. The objective here is to put forth a sample concept to establish a benchmark of size, cost and scope of operation. The super-hub might conceivably involve active service by additional rail carriers besides the original two-carrier partnership outlined above. This, in turn, might require additional work track space and connections to main lines; plus additional storage and parking space.

Further facilities here would accommodate distribution operations, trucker repair/leasing, inspection stations, truckstop and motel. The following list is an indication of size requirements:

- Overall Size: 196 acres (96 additional vs. above).
- Working Track: 4 additional tracks (20 acres).
- Storage Track: 3 additional tracks; 4,000 feet each; acres.
- Parking Space: 45 more acres.
- Transfer Units: 3 more Gantry cranes (or 5 side loaders).
- Yard Tractors: 6 additional (hostlers).
- Other Equipment: 1 additional fire truck; 1 security patrol car; 1 more light repair van.
- Gate: 2 additional lanes.
- Buildings:
    1. Terminal office (admin., security, dispatching) add 8,000 square feet.
    2. Container repair shop; same size, but add shifts.

3. Distribution center(s): 2 buildings of 160,000 square feet each; with 100 truck docks in each building; and each with 2 acres of parking.

4. Inspection station: shared building -- U.S.D.A. on one side; and U.S. Customs Bureau on the other. Total of 10,000 square feet; plus overhead portico for trucks during inspection (8 lanes, 150-feet long) - 1 acre.

5. Truck stop: restaurant, fueling, light service, telephone lounge, convenience shop; parking for 100 cars, plus 60 trucks. Building - 20,000 square feet; parking/access - 3 acres.

6. Motel: 100 rooms - 18,000 square feet; parking shared with truck stop, plus additional 1 acre.

- Fencing: 3,400 additional linear feet (11,800 total).

- Lighting: add 180 stanchions; 100 more in terminal work area; 50 more in terminal parking areas; 2 at office and driver lounge area; 10 for inspection building; 12 for truckstop; 6 for motel.

This description provides an initial idea of what a super-hub might look like, and what it might involve in terms of facilities and scope of operation. An estimated cost of putting this super-hub into place would be in the range of $115 to $125 million.

FINANCING OPTIONS

In order to finance the intermodal cargo hub facility the State can consider either public or private financing options. The primary advantage of public financing is the ability to issue tax-exempt debt which translates into a lower cost of financing. However, in order to qualify for a public issue the State or some other public entity must retain ownership interest in the facility. There are a number of legal tests with respect to use and ownership that the project would have to pass in order for the financing to be tax-exempt. When the State is ready to proceed with the project, a competent bond counsel should be engaged to analyze these issues and recommend structuring alternatives.

Private financing would most likely be accomplished through carriers or distributors who owned or used a substantial portion of the facility. The use by a private developer would limit the availability of tax-exempt debt; however, a private developer could probably pull together a financing package based upon commitments from users of the facility. A likely scenario could include both public and private financing sources.

The intermodal cargo hub facility could be viewed as being analogous to a public airport. The State might own the common use areas such as loading, unloading and transfer areas which would be generally available to any carrier/distributor who made appropriate arrangements to use the facilities. The participating carriers/distributors would enter into use agreements granting the right to use the common areas. The use agreements would be long-term and would provide for the payment of regular fees, as well as, certain miscellaneous fees. In the case of the super-hub the State could lease certain space to providers of the additional services such as repair and concessions. The individual carrier/distributor would finance the construction of any parts of the facility to be specifically used by them.

Tax-Exempt Financing

The use, ownership structure, and location of the project determine whether tax-exempt debt can also be issued. The tax code provides various exclusions from taxation, including among others, "the governmental use" exemption which clearly requires the State to receive the profit or the loss resulting from the operation of the facility. Any type of management contract with an outside non-public entity would need to meet very specific criteria including being short-term in nature and that the payment of fees could not be based upon the profitability of the facility. There may also be some tests regarding general availability to the public. This criteria often limits the interest of developers. There is also a specific exemption for "exempt facilities" which include airports, docks and wharves. This facility might be structured to qualify as a dock facility; however dock facilities are generally considered to be part of a water based facility. To take advantage of this exemption it might be useful to consider combining

the intermodal cargo hub facility with a barge facility or to locate the intermodal cargo hub facility at or adjacent to a public port. An added benefit of qualifying under the "exempt facilities" exemption is that restrictions on the participation of private parties are not as great as the "governmental use" exemption; therefore, a private developer might be more interested in participating and the link to the State and its resources diminished. There are also additional requirements associated with issuing "exempt facilities" bonds, including complying with public notice/hearing requirements and receiving State allocation (which is limited) to issue tax-exempt debt.

Current legislation is being reviewed to provide for the establishment of enterprise zones. Facilities located in enterprise zones would also receive more favorable treatment.

Tax-exempt financing for a project such as the intermodal cargo hub facility is usually structured as revenue bonds or as a lease-purchase financing. Each of these options is discussed below.

Revenue Bonds

Revenue bonds are bonds which are secured by the stream of revenues from the project. A revenue bond provides lower interest rates than the alternate lease-purchase structure, but a trade-off to consider is that revenue bonds require a vote by referendum with an approval ratio of 4/7 of the votes. A lease-purchase bond does not require a referendum.

Revenue bonds would be secured solely by a pledge of the revenues derived from the operation of facility. Since the bonds are secured by revenue rather than unlimited taxes, special financing covenants are incorporated into the documents. The most significant provision affecting cost is a requirement to maintain a level of debt coverage. Debt coverage refers to the level of revenues which must be continually maintained for debt payment above and beyond debt requirements. For example, if 125% debt coverage is required to market the bonds, the facility must generate one dollar and twenty-five cents in revenues for every one dollar of payment of debt. Debt coverage is necessary since revenues can be affected by a governing body's willingness to increase future rates. Without periodic rate increases, income tends to decline over time due to escalating operating costs.

As additional security for bondholders and in order to market revenue bonds, it is also necessary to fund a debt service reserve account. The debt service reserve account is a fund which is set aside for payment of debt in the event other revenues are not available. This account is generally funded in an amount ranging from 10% of the principal amount of the bond issue to as much as one year's maximum annual debt service. The account may be funded with proceeds from the sale of the bonds. It is sometimes possible to replace a reserve account with a surety bond or letter of credit.

Since revenues from the intermodal cargo hub facility would be dependent upon the delivery of services, the ability to make a debt service payment is conditioned upon the delivery of service. For this reason, revenue bond documents establish a priority for the use of revenues. The first priority is to use revenues in a manner which will assure full and ongoing operation and maintenance of the facility. Provision for debt payment is subordinate to funding the operation and maintenance of the utility. The covenants providing for operation and maintenance of the facility, funding of depreciation and reserve accounts, and user rate covenants are included in the bond documents and are considered to be a part of the payment of the debt. Therefore, user charges established for operation and maintenance or to comply with the other funding requirements of the revenue bond documents are exempt from the provisions of the Hancock Amendment. As a result, fees can be increased without a public vote. For this reason, revenue bonds offer considerable opportunities for revenue enhancement and future financial flexibility.

Lease-Purchase Financing

There are two methods of financing a lease-purchase transaction. Lease-purchase is commonly used as a financing vehicle where there are sufficient revenues available to pay debt service on a project. A lease-purchase financing does not require a vote. The first method of lease-purchase financing involves the issuance of certificates of participation. Each certificate holder owns a beneficial interest in the lease. Certificate holders, in the aggregate, essentially constitute the lessor. The second method of financing is through the sale of bonds secured by a lease. This method requires that the property or equipment be purchased by a not-for-profit corporation or governmental agency. The not-for-profit corporation or governmental agency issues bonds secured by the lease and serves as lessor of the property. The market generally prefers the second alternative. Lease purchase financing presents some difficult marketing considerations and, consequently, a higher financing cost than revenue bonds.

The terms of the financing are set forth in a lease-purchase agreement. For federal income tax purposes, this agreement is deemed to be a conditional sale agreement, with the result that the interest component of the "rental" payments made by the governmental entity are generally exempt from federal income taxes under the Internal Revenue Code of 1986.

Under the lease-purchase agreement, the State would make payments in an amount sufficient to cover debt service. In addition, the State would have full responsibility for the operation and maintenance of the leased facilities and the costs associated therewith. The rental payments would be contingent on the State making annual appropriations to the lessor. In the event rental payments are not made, the State would no longer have the use of the leased facilities.

Some of the factors which would affect marketability and rating of lease-backed bonds are the following:

- Credit worthiness of the State;
- Essentiality of the leased property; and
- Security features of the lease.

The rating assigned to the debt obligation is at least one rating grade lower than the lessee would receive on its general obligation debt, except in cases where added security exists from credit enhancement. After a review of the credit quality of the lessee, the rating agencies review the likelihood of nonappropriation. The major variable in this analysis is a determination as to the importance of the leased property in providing essential services for the lessee. Finally, the rating agencies review the structural aspects of the lease. The structural aspects include, among others, the term of the bond issue, the process for annual appropriations, any substitution clauses, and the security interest in the property.

As a first step to lease-purchase financing, the State would create a not-for-profit corporation. This, in turn, requires satisfying several criteria including the following:

- the corporation must engage in activities that are essentially public in nature;
- the corporation may not be organized for profit;
- the corporation's income must not inure to any private person;
- the State must have a beneficial interest in the corporation while the obligations remain outstanding; and
- the State must approve the formation of the corporation and the specific obligations issued by the corporation.

The not-for-profit corporation would acquire, through purchase or construction, the facilities that are to be leased to the State. Bonds would be issued by the not-for-profit corporation for the purpose of acquiring assets or to construct or improve the intermodal cargo hub facilities. The facilities constructed or assets acquired by the corporation would be leased to the State through a one year lease subject to automatic yearly renewal. The debt would be secured by rental payments made by the State. Revenues for such payment would be derived through the general purpose revenues of the State rather than through a specific tax levy or revenue pledge. Upon the retirement of the Bonds, the corporation would convey the assets or facilities back to the State.

Industrial Development Bonds

The exemption for industrial development bonds has expired, but may be renewed sometime in the near future. This exemption provided the ability for small manufacturers to borrow money on a tax-exempt basis through qualified public entities. The tax-exempt bonds are repaid solely from the proceeds of the small manufacturer's business. The users of intermodal cargo hub probably would not have qualified for this financing as the IRS code provisions were previously stated; however, future provisions may make this an option.

Taxable Financing

Taxable financing would probably be initiated through a private developer or through the State's efforts to locate dedicated users for the project who would in turn develop the project. An example of this second alternative is the pending joint venture between Union Pacific and American President Lines to locate a hub in Memphis. As with the tax-exempt financing options, the credit quality and the ability to attract financing will depend upon the ability to get long-term user agreements in place in order to guarantee a certain level of revenue at the facility. This taxable financing would most likely come from banks who extend credit to the users or from the sale of debentures of primary users. A bank credit facility is more likely in the case where various carriers/distributors sign long-term users agreements because a single entity is not primarily responsible for repayment. Debentures may be an option where a major carrier/distributor develops the hub, as may be the case in Memphis.

Given the limitations of the availability of tax-exempt financing, it may be necessary to issue a portion of the bonds using the same structure as described in the tax-exempt financing section, but instead as taxable bonds.

Tax Credits

The State has a program which provides tax credits for projects which enhance economic development in the area. This program is administered through the Missouri Economic Development, Export and Infrastructure Board. The Board has three funds into which contributions can be made by companies seeking investment tax credits. In exchange for the contribution, the Board may award an amount equal to half of the contribution as a tax credit. These credits are carefully awarded and limited in size. The intermodal cargo hub facility certainly could be argued to provide economic enhancement to the area; however, tax credits would not be a significant financial resource for the project.

Grants

From time to time federal moneys are available for significant transportation projects, as the Missouri Highway and Transportation Department is well aware. To the extent available, grants should be pursued. In particular, monies allocated under provisions of the recent Intermodal Surface Transportation Efficiency Act (ISTEA) may be available for such a project; and this should be explored thoroughly if and when a more detailed plan is adopted.

Conclusion

There are a variety of financing options available to the State that will need to be seriously investigated should the project go forward. Though tax-exempt debt is clearly the most economical it is only available if the State is willing to maintain an active role in the project.

The preferred scenario may be to have the active parties, i.e., the railroads, motor carriers, steamship containerlines and/or others, finance the intermodal cargo hub facility privately. The State would then receive taxes as well as public benefits (increased employment, improved air quality, reduced traffic congestion on highways, lower freight transportation costs and better service); while the intermodal operators and owners would retain the profits.

Even if this were to be achieved, the State of Missouri (possibly in conjunction with the State of Illinois) might need to take an active role in improving the East-West rail interchange connections(s). According to comments by railroad managers this is a critical issue, and could become the driving factor in the potential success or location of a new intermodal cargo hub.

OTHER CONSIDERATIONS

The subject of intermodal feasibility is a complex one. A multitude of factors have potential impact on the question, and any given combination of these could influence the ultimate feasibility. The study team conducted analyses of traffic volumes and economic costs and operating scenarios, which indicated an affirmative potential for locating an intermodal hub in either the St. Louis or Kansas City areas. These conclusions, however, can be swayed significantly by institutional factors; for example, new technology, new legislation or regulation, or predetermined relationships or investments in other areas which might preclude interest in a Missouri hub facility.

A specific example may be seen in the enormous size and market influence of United Parcel Service and its shipments. If UPS could be enticed to locate a regional hub in Missouri, this alone would be sufficient to justify a significant investment and would offer very high probability of success. However, the prospect is moot because UPS has already begun implementation of a regional hub in Willow Grove, IL (suburban Chicago) in conjunction with the Santa Fe Railway. This project, said to be in excess of $100 million, indicates that "the die is cast" as far as UPS is concerned; and thus Missouri proponents must look elsewhere for a similar organization to sell on the concept of a regional intermodal hub in Missouri. Some of these candidates may be containership lines or other domestic package delivery services.

Highway Competition

Other institutional factors can influence the economic picture. For instance, expanded use of truck doubles and triples (or even longer combination vehicles), often termed LCVs, could have a pronounced impact on intermodal economics; as could the advent of "smart highway" or dedicated truck lanes. That is, the over-the-road trucker would become more intensely competitive even in long haul corridors. This, in turn, might diminish the size of intermodal hubs, since the truckers can deliver loads more directly to consignees in all directions without as much need for a central "batching" location.

Motor carriers will continue to possess a key advantage in their ability to deliver smaller lot sizes for those customers whose inventories require this. They are also more flexible and responsive to short-term or seasonal ups and downs than are rail operators. The focus of this study - intermodalism - addresses these issues by combining the larger scale, long-haul efficiencies of rail movement with the smaller, more flexible truck pickup and delivery capability. But this can be accomplished through a variety of approaches.

Labor Force

On the other hand, another institutional factor, a labor issue, revolves around the well publicized driver shortage in the trucking industry. With closer examination, the problem is not simply a shortage of qualified drivers; but rather is compounded by the increasing demand

among drivers for a lifestyle which includes being home with a family on a regular basis. In other words, there are fewer drivers who are willing to go on long haul assignments repeatedly, due to the personal demands of being away from home for extended periods--or not knowing where he/she will be next week or next month. In conversations with managers from major long haul motor carriers, the study team has been told that this is one of the main reasons for the movement of truckers toward intermodal rail/highway arrangements recently.

Technology

There is an on-going debate on intermodal technology and the optimal train size to maximize economic advantages. This, in turn is drawn into an age-old question of railroad economics: namely, the trade-off(s) between operating efficiency and marketing/service attractiveness. Institutionally speaking, some railroads prefer to run shorter, more frequent trains to appeal to customers needs and availability of their freight; while others lean heavily toward maximizing train length for greater economies and efficiency, thus limiting the service to fewer, less frequent departures.

Rail Carriers

Another issue that needs to be recognized is the number of rail carriers who serve Missouri, and the number of them who might potentially participate in a new intermodal hub facility. Much of the traffic analysis portion of the study developed a picture of the total relevant freight available for an intermodal service. It also took into account a possible percentage or market share which could be gained by an effective intermodal service to/from a Missouri hub. But the total available traffic may be viewed in different ways by different carriers.

For example, Union Pacific, Southern Pacific and Santa Fe all serve the California to Missouri corridor, generally speaking. If one of these were to become an active proponent of a St. Louis intermodal hub, the other two would not simply abdicate their interests; but rather, might aggressively compete to gain more of that same traffic for regional service via a Chicago or Memphis hub facility. This means that further analysis is somewhat "fluid"; or will require numerous examinations under varying scenarios, to approach a more detailed plan. This issue can be resolved in innovative ways. Where demand is limited in a specific lane to only enough traffic for a single carrier, a common or shared operation is possible.

With a common or shared terminal the overriding question will revolve around how priorities are arranged and how decisions are made to handle traffic from one carrier versus another. These questions are addressed continually in passenger airline "hub terminals" and with considerable success. Rail/highway intermodal operators, however, are skeptical or at least sensitive to this issue.

Another institutional factor, already acknowledged in the analysis, is the natural east-west rail connections which occur in both the St. Louis and Kansas City areas. There are certain traditional preferences among the carriers in terms of traffic hubs; some favor Kansas City, some St. Louis and others Chicago. Some might view Missouri locations as unfavorable, but these institutional attitudes can only be dissolved through demonstrating the impact of revenues, costs and service to customers.

Interline Freight

Interline or "overhead" traffic is that which is not originating or terminating in the hub location, but rather "passing through" and connecting from the lines of one rail carrier to another. It may be originating in a market area on the east coast and destined for the west coast. The interline freight issue is raised here because in the view of a majority of rail carriers it is an essential factor in supporting an intermodal hub.

This interline traffic is not just secondary, but in fact foremost in the minds of railroads' senior management. Indeed, interline traffic was included in this study within the assessment of "Train Potential". To recognize the fact is important; and to quantify the market potential is necessary; but to move toward capturing an advantage in this area may require substantial investment and physical improvements in rail connections.

Rail Carrier Management's Views

In the course of the study interviews were conducted with individual contacts in the intermodal field, mostly senior management personnel from railroads which serve Missouri. Also, the interview list included senior managers from a major containership line, and an intermodal equipment supplier, as well as a "third party" or intermodal consolidator.

The companies included in the survey were:

- American President Lines
- Atchison, Topeka and Santa Fe Railway
- Burlington Northern Railroad
- Consolidated Rail Corporation
- CSX Transportation
- Gateway Western Railroad
- Hub City Terminals
- Illinois Central Railroad
- Kansas City Southern Lines
- Norfolk Southern
- RoadRailer Corporation
- Southern Pacific Lines
- Union Pacific Railroad

More than one individual was interviewed from most of the companies. A mix of perspectives was attained from individuals whose backgrounds are in marketing, site selection, operations planning, strategic planning and senior management.

As an overview the level of interest in pursuing the feasibility of a Missouri intermodal hub was mixed. There were at least five individuals whose interest was categorized as "high"; another six who showed "medium" interest; and six others whose interest was "low." There were indications of at least some active interest among these officials after discussing the implications of a Missouri intermodal cargo hub facility. A number of these individuals indicated a desire to discuss the concept further and to be kept informed of progress and plans.

CONCLUSION

After studying the overall traffic potential, and penetrating into economic analyses of specific traffic corridors, some initial conclusions can be made regarding the potential for a Missouri Intermodal Cargo Hub. In brief, the answer is an affirmative one. There is sufficient potential to support a hub for rail/highway intermodal service -- especially of the dedicated, double-stack container train type, with an extended hinterland for pickup and delivery by highway.

The analysis indicate sufficient volume of relevant types of freight, moving to/from key long distance markets. The challenge lies in identifying how this traffic is handled currently, what relationships are already in place, and how Missouri might position itself to attract or divert a sizeable portion of this cargo to a new intermodal hub.

Where does the potential exist? In St. Louis, and to a lesser extent in Kansas City; mainly relating to West Coast market partners -- particularly Los Angeles. The current traffic levels indicate sufficient volume for such an intermodal service. Moreover, forecasts of traffic in the year 2000 show greater opportunities due to growth in this area. And with this growth would come increased opportunities for stack-train volumes in a greater number of geographic areas to/from Missouri. Further, the economic analyses confirm that a service from the West Coast to a Missouri intermodal hub could serve an extended hinterland of up to 550 miles (to the east and southeast) and still be competitive with the alternative of over-the-road trucking.

How can this potential be realized? It appears that an intermodal hub could be justified both on the basis of serving the local market area and extended hinterland, as well as for longer distance containerized freight which would be interchanged between eastern and western railroads at the hub area. This reflects the "hub" concept as used in the passenger airline business where an airline's hub is used to bring together flights from many points and mix the connections at a single location -- as well as serving a sizeable local market at the same spot.

The rail/highway participants in intermodal transport (railroads, containership lines, etc.) are actively seeking ways to alleviate the congestion problems which exist at the nation's major interchange hub of Chicago. This presents an opportunity for Missouri (either St. Louis or Kansas City) to step in and win over market share if a superior offering can be made in terms of run-through interline facilities for east-west connections. Existing facilities and infrastructure may not be adequate to win this advantage, and so physical improvements in the form of new right of way or double-decking bridges may be needed, for example between St. Louis and East St. Louis.

If a preferred location is chosen at this point, it would be St. Louis. The reasons are numerous, and include the following four categories:

1. A larger, established local market exists at St. Louis. This is an advantage over the alternative areas of Columbia, Cape Girardeau and Joplin/Springfield; and is

at least 25 percent larger than Kansas City, in terms of both inbound and outbound intermodal freight volume (containerizable freight moving distances of 700 miles or more).

2. A larger, more commercially active hinterland area surrounds St. Louis. Within a 550 mile radius of downtown St. Louis there is a population of 76.2 million (mostly to the east) which is almost 50% greater than that of Kansas City at 51.3 million. In industrial manufacturing employment, and freight originated and terminated, too, St. Louis leads Kansas City by a significant margin of 25% or more (see Figure 12).

3. A greater number of railroads meet in the St. Louis area. Although Kansas City is a rail hub, too; it is at St. Louis that the greatest potential for east-west interconnections could be made. For example, Conrail connects at St. Louis (or Chicago) with western rail carriers, but not at Kansas City. It could be argued that Norfolk Southern connects from the east at Kansas City; but Norfolk Southern's eastern markets do not offer the traffic densities of Conrail's eastern markets such as New York and Philadelphia.

4. Rail carriers' terminal facilities at St. Louis (many on the Illinois side of the Mississippi River) need more space and more central location. The time appears right for extensive change. Intermodal operators need better facilities and better location, i.e. closer to the center of the market area to reduce required drayage distances and costs.

5. Better economics can be realized when the rail portion of the intermodal haul is greater. This would favor St. Louis, since the most attractive intermodal markets are on the West Coast and St. Louis is a further rail distance from any West Coast point than is Kansas City. Moreover, the railroads' traditional objective is to gain a maximum haul length. For eastern carriers the geographic fact is that most of them go only as far as St. Louis; and further, the economics don't favor connecting to a Kansas City hub because it is too short of a distance to be decidedly competitive versus the long haul trucker.

Is Kansas City out of contention? Certainly not, but the emergence of a workable implementation plan will depend upon the interest and involvement of the rail carriers and other players in the intermodal arena. For example, if a particular railroad takes up the idea with enthusiasm, then Kansas City could become a viable site for a new intermodal hub. The traffic volume exists in sufficient proportion and is growing. There are cost advantages to Kansas City and a number of hinterland market areas to/from the West Coast and East Coast markets. And there are two other factors which favor Kansas City:

1. It is possible that St. Louis is "too close" to the greater hinterland to its east and southeast. That is, in vying with the competing hub areas of Chicago and Memphis, St. Louis, according to some perspectives, is caught in the middle. Memphis is closer to the southeastern markets and Chicago is closer to the midwestern and eastern markets.

This is borne out when viewing the terminal structure of several major motor carriers. These companies have major terminals in place at Kansas City, Chicago and Memphis; but only secondary or satellite terminals at St. Louis. The reason is that each hub serves a different hinterland, but St. Louis' hinterland is mostly an overlap of either Memphis' or Chicago's. Thus, Kansas City --given the understanding that it's local market is smaller and its natural hinterland more sparse-- could grow as an intermodal hub area without as much direct competition from the other hub areas.

2. As experienced intermodal operators point out, Kansas City has a great amount of warehousing and distribution activity; i.e., types of freight which fit naturally into intermodal scenarios. St. Louis, on the other hand, is generally viewed as a center of bulk type cargo such as grain and chemicals.

Recommendations

Considering all the arguments set forth above, the study team still feels that St. Louis should be the first choice for further consideration as a new intermodal cargo hub. It is our recommendation that MHTD continue a vigorous effort to identify key participants and proponents for establishment of new rail/highway intermodal hub.

Next Steps

In terms of going further from this point to develop the concept of a Missouri intermodal hub, there are a number of tasks to be done. The next steps for the State and MHTD to explore include the following:

- the active interest of key parties (railroads, drayage motor carriers, containership lines, third parties, etc.) in giving serious consideration to such a project;
- identification and examination of specific possible sites for an intermodal hub in St. Louis, and perhaps Kansas City;
- further development of the specific investment requirements for an intermodal hub and the alternative methods of financing such a venture;
- identification of an individual or team of individuals who are willing to act as spokesmen to promote the concept and win support from the many participants who may become involved in the intermodal cargo hub, its development, implementation and ongoing operations.
- a risk analysis of the investment costs associated with the many benefits of an intermodal hub versus the possible eroding effect of a domestic LCV network on traffic prospects in future years;

- a study of organizational alternatives for the development, control, and operation of such a facility, particularly in the light of the prospects of it having competing tenants;

- a more detailed assessment of a reasonable evolution scenario of the hub's development -- beginning with the markets where substantial volumes of containerized traffic exist and prospects are greatest, to the inclusion of other smaller market pairs -- of a phased development plan.

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