

Schmidt-Cramer



# Refrigerated Transportation by Motor Common Carriers

A MANAGEMENT INQUIRY

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# Contents

	<i>Page</i>
<b>Chapter One—Nature and Purpose of the Study</b> .....	4
<b>Chapter Two—Trends In Refrigerated Motor Transportation</b> .....	5
Economic Developments .....	5
Technological Developments .....	6
Agricultural Exemption .....	8
Specialized Motor Carriers .....	9
Transportation Patterns and Changes for Specific Products .....	9
<b>Chapter Three—Characteristics of Selected Midwestern Motor Common Carriers of Refrigerated Products</b> .....	11
Organization and Administration .....	11
Size of Business .....	13
Financial Situation and Operating Performance .....	15
Operating Methods and Control .....	19
Current Performance Reports .....	21
Other Characteristics .....	23
<b>Chapter Four—Problems of the Study Carriers</b> .....	24
Stated Carrier Problem Areas .....	24
Observed Carrier Problem Areas .....	24
<b>Chapter Five—Summary and Implications</b> .....	27
<b>Appendix A</b> .....	29
<b>Appendix B</b> .....	30
<b>Appendix C</b> .....	30
<b>Appendix D</b> .....	31

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## CHAPTER 1

# Nature and Purpose of the Study

The youthful trucking industry had fewer than 100 thousand vehicles 50 years ago. It registered 13.3 million trucks of all types in 1964. By capitalizing on speed and completeness and flexibility of service, this industry has become so important that it is an indispensable part of our modern food marketing system. As the shipping requirements of numerous commodities become more specific, the motor carrier industry is entering a new era of specialization to satisfy these demands and to increase profits.

One significant group of commodities that requires a special transportation service is perishable foods.<sup>1</sup> About 60 percent (by weight) of all the food Americans eat in a year requires some refrigeration along the route from the farm to the household refrigerator. Controlled temperature transportation has made higher levels of nutrition possible by providing consumers more usable nutrients per dollar. Preventing or reducing spoilage, decay, defrost, and off-condition promote this end.

Although the motor common carrier is not the only type of transport agency selling refrigerated service, it is perhaps the least understood. This lack of understanding is indicated by the limited information available on the organizational structure, business practices, and special services of refrigerated motor carriers. Little is known about the problems of refrigerated motor carriers and of the opportunities open for educational work by Extension marketing personnel.

This study analyzes the use of refrigerated transportation by 15 Midwest motor common carriers and the carriers' problems that tend to interfere with business efficiency. The study method used is a firm-by-firm analysis of carriers. By applying this method to transportation agencies, we hope to

1. Achieve a better understanding of refrigerated products transportation for the benefit of carrier managers and their customers, and
2. Provide suggestions for Extension programming in agricultural transportation.

The study is designed to answer questions of fundamental importance to motor transportation and business planning: What is the relative importance of refrigerated products transportation and of the motor common carriers who serve this part of the food industry? What factors can be expected to influence motor transportation's future? What are the prospects for Midwestern-based motor carriers of refrigerated products?

The survey was limited to common carriers with headquarters located in the Midwest. The area comprises three ICC geographical and statistical reporting regions: (1) Northwestern region—Minnesota, North Dakota, South Dakota, Wisconsin; (2) Midwestern region—Iowa, Kansas, Nebraska, Missouri; and (3) Southwestern region—Arkansas, Texas, Louisiana, Oklahoma.

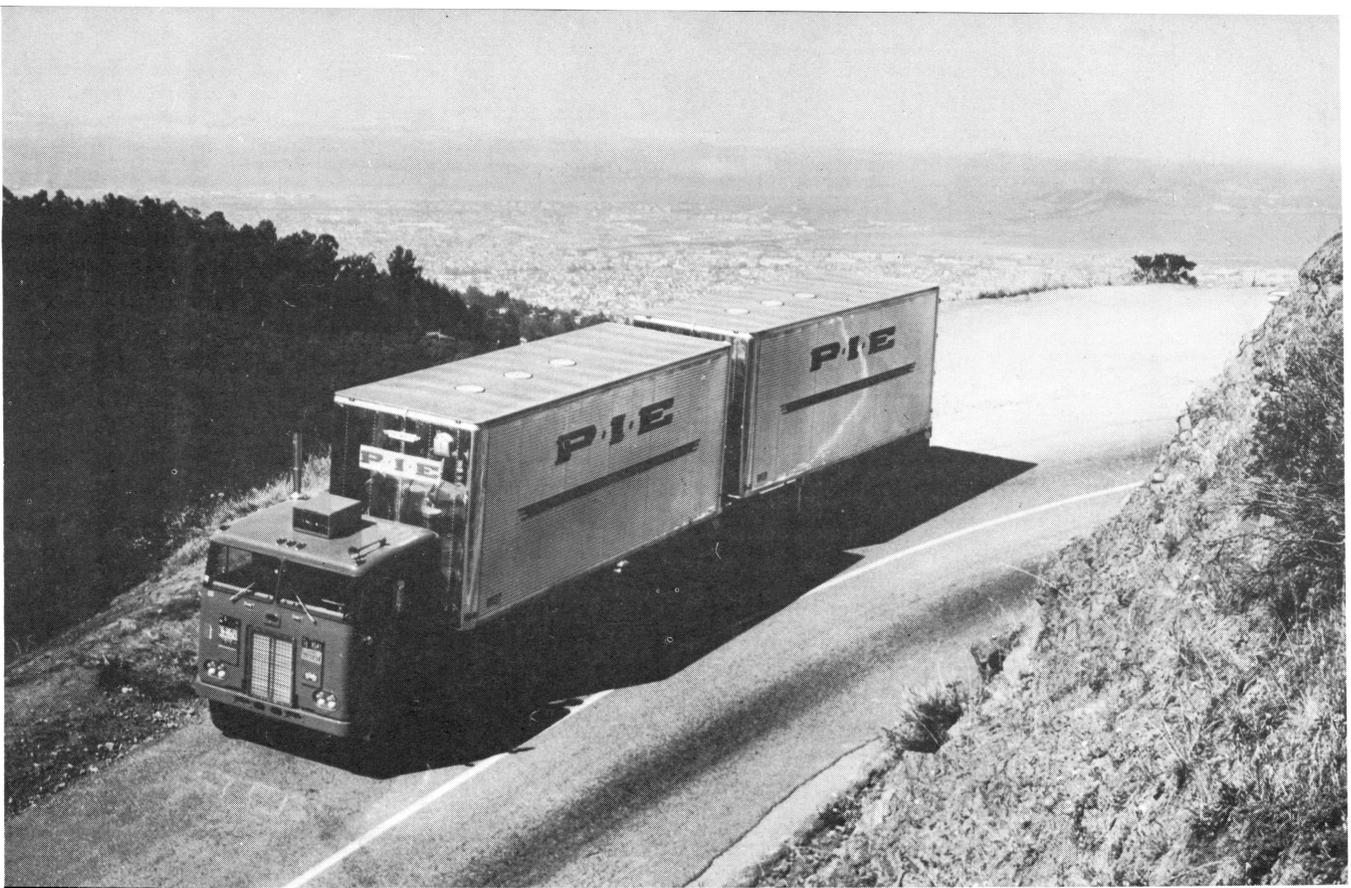
Carriers were selected by the following criteria:

- Firms that were Class I motor common carriers (those with annual revenues of \$1 million or more).
- Firms regularly engaged in intercity transportation of refrigerated solid products.
- Firms with their general offices located in the Midwest.

From a list of 70 Midwest carriers, eight specialized refrigerated carriers and seven general freight carriers were selected, representing eight states. (This distinction was important for analysis purposes because specialized motor common carriers serving the perishable foods industry have unique characteristics.) Personal interviews were conducted with key management personnel who were familiar with the overall company philosophy, organization, and procedures for the perishable food operations.

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1. "Perishable freight" usually refers to any commodity susceptible to decay or deterioration which may be protected by refrigerating, ventilating, or heating. Although a wide range of non-food items may be considered perishable, e.g., livestock, drugs, etc., this study concerns food products requiring temperature control.



(Photo by Pacific Intermountain Express)

## CHAPTER 2

# Trends in Refrigerated Motor Transportation

### ECONOMIC DEVELOPMENTS

The function of transportation is to carry a surplus of goods from one point to fill a demand for these goods at a distant point. At the destination point, the goods must sell for enough to pay for the cost of transportation. Thus, transportation is not purchased for its own sake; instead, it has two aims—to make or to add to a profit and to satisfy a user.

Obviously, a shift in the demand for a commodity will produce a shift in the need for transportation for that commodity. Although the per capita consumption of food decreased 9 percent from 1942 to 1962 (Table 1), wide fluctuations have occurred among the various food classes.

Consumption of potatoes, cereal products, and eggs has declined. Expansion in frozen food consumption has largely absorbed the decline of fresh fruits and vegetables. Meat, poultry, and fish consumption trends expanded about 17 percent from 1950 to 1962. The consumer demand for refrigerated commodities is likely to increase due to population growth, higher incomes, and a greater preference for meat, frozen foods, and other relatively high value food products.

The cost of transporting food products in the United States by rail and truck has increased from about \$2.5 billion in 1949 to \$4.3 billion in 1963. Transportation costs have absorbed 10 to 12 percent of the total food marketing bill almost every year since 1929. Adequate informa-

TABLE 1--PER CAPITA CONSUMPTION OF FOOD ON A RETAIL WEIGHT EQUIVALENT BASIS, U. S.

Commodity	1942		1952		1962	
	Pounds	Percent of Total	Pounds	Percent of Total	Pounds	Percent of Total
Meat, poultry and fish	166.9	10.6	179.9	12.1	198.1	13.9
Eggs	38.1	2.4	49.2	3.3	41.0	2.9
Dairy Products, including Butter	409.0	26.0	412.0	27.7	375.0	26.4
Fats and Oils, excluding Butter	32.6	2.1	38.7	2.6	41.5	2.9
Fruits:						
Fresh	129.3	8.2	109.4	7.3	82.1	5.8
Processed	31.5	2.0	45.2	3.0	51.3	3.6
Melons	31.4	2.0	30.2	2.0	25.0	1.8
Vegetables:						
Fresh	199.5	12.7	161.8	10.9	144.8	10.2
Canned	39.5	2.5	40.8	2.7	44.4	3.1
Frozen	1.1	.1	4.9	.3	7.7	.5
Potatoes & Sweet Potatoes	142.3	9.1	105.9	7.1	108.8	7.7
Beans, Peas, Nuts & Soya Products	22.5	1.4	17.2	1.2	16.6	1.2
Flour & Cereal Products	201.0	12.8	162.0	10.9	144.0	10.1
Sugar & Sweeteners	102.8	6.6	108.4	7.3	109.8	7.7
Coffee, Tea & Cocoa	15.1	1.0	17.3	1.2	15.5	1.1
Other	7.4	.5	7.1	.4	16.4	1.1
TOTAL	1,570.0	100.0	1,490.0	100.0	1,422.0	100.0

Source: U. S. Food Consumption, 1909-63, Economic Research Service, U. S. Department of Agriculture, Statistical Bulletin No. 364, June, 1965, pp. 18-19.

tion representing the total movement of perishable commodities has been unavailable because exempt for-hire and private fleet operators are not required to file economic information with the ICC.

Transportation costs have been directly related to three factors: total tonnages moved, length of haul, and freight rates. Farm output has expanded steadily, which means that total tonnage moved has increased. Truck transportation has become the major mode of carriage for much of this production; especially for the traffic moving short to intermediate distances. As specialized production areas become more clearly defined, the evidence points toward greater distances separating the production and the large population centers.

It has been impossible to analyze freight rate trends for motor carriers handling important agricultural products because rates are negotiable for exempt items such as fresh fruits and vegetables, fluid milk, livestock, and grains. Railroad freight rate indexes have been developed by the United States Department of Agriculture for some agricultural commodities. In 1962 the combined average

rail freight rate index for farm commodities was 95 and represented a decline of six points from the peak levels of 1957 and 1958.<sup>2</sup> Rate indexes for fresh meats and fruits and vegetables declined 20 points and six points respectively since the 1957-59 base period. In many instances motor rates have followed rail trends in about the same proportion.

Motor carrier costs may be separated into out-of-pocket and constant expenses. Joint costs are also incurred due to the round-trip operation of equipment. Fixed costs represent a low proportion of motor carrier costs because the highway investments are provided from public funds. The motor carrier plant can be expanded and contracted rather easily to adjust to fluctuating business conditions since over-the-road trucking operations are conducted in small production units.

The level and behavior of carrier costs depend largely upon the size and distance of shipment. Because large

2. *Marketing and Transportation Situation*, Economic Research Service, U.S. Department of Agriculture, November, 1963, p. 13.

shipments incur less terminal costs per ton, the larger the shipment the lower the cost per ton. Economies of long haul involve primarily a spreading of the fixed terminal costs over a greater number of miles. Specialized refrigerated carriers commonly conduct a truckload operation, so terminal facilities are limited and terminal expenses of a shipment are relatively low per ton. General freight carriers may handle a number of small shipments which require terminal activities. This increases expenses per unit. To a degree, the low ton mile cost of long-distance trucking reflects economies of long-haul.

### TECHNOLOGICAL DEVELOPMENTS

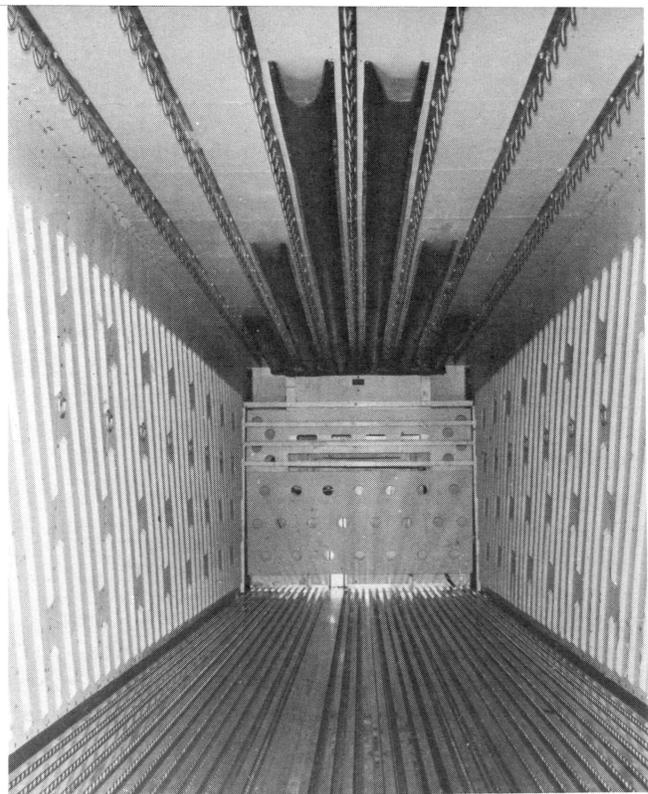
Today's high cubic capacity trailers, dependable refrigeration systems, and effective insulation materials permit heavy loading of freight and maintenance of quality in transit. Though these technical accomplishments are remarkable, the industry still seeks better equipment performance at lower cost. Perishable freight claims paid by rail carriers for damages and product deterioration of produce have been estimated at \$11 million. More than \$30 million annual shrinkage loss has been reported on fresh meats. Motor carrier claims for perishable freight have not been analyzed, but it is clear that loss and waste in the transportation of foodstuffs are compelling incentives for equipment improvements.

The major function of a mobile refrigerating unit is to remove BTU's of heat. Heat build-up occurs in the product itself through normal respiration. Other sources of heat are solar radiation, conduction through insulated walls of the trailer or container, vehicle velocity, road heat radiation, vehicle engine exhaust, tire heat, and warm air infiltration around doors.

With the advent of the frozen food industry, water ice was simply inadequate as a method of refrigeration. The 30 percent water ice and salt mixture was an improvement but the large amounts of ice necessary to protect the product severely reduced the over-all cubic capacity remaining for freight. Dry ice was introduced, but its cost stood in the way of rapid and continuing acceptance. Many shippers of perishables found it necessary to own or lease equipment in order to have ready access to transportation facilities.

Since the end of World War II, mechanical refrigeration systems have reached a high degree of sophistication. This refrigerating method employs a compressor that is driven by an independently powered gasoline, diesel, or LPG engine. The compressor is connected to an evaporator consisting of refrigerated plates, finned pipe coils, or a blower-type unit cooler located within the trailer. Electrical heating elements may be used which not only stimulate periodic defrosting but automatically protect the lading against excessively low temperatures.

Chemical refrigeration systems employing either liquid



Refrigerated trailer fitted with meat rails. Note air ducts and extruded floor. (Consolidated Freightways photo)

nitrogen or carbon dioxide have been introduced recently by several manufacturers. The system consists of a thermostatic activating mechanism that releases the refrigerant inside the van. Because of its very low boiling point, the liquid turns to gas when exposed to air. The gas expands in volume and absorbs heat almost instantaneously. Cryogenic refrigerants are expendable, and supply facilities are being established at key truckstops throughout the U.S.

Technical improvements in design of insulated trailers have been directed toward vehicle units of higher cubic capacity, using light-weight aluminum, and employing superior insulation. In 1946 units as long as 28 feet accounted for 74 percent of the van trailers ordered by fleet operators. By 1966, the one category of semi-trailer size, 38 to 40 feet, accounted for 82 percent of the U.S. production. Trailer upgrading has been stimulated by modernized state laws permitting vans of larger capacity. Insulation efficiency has been improved through the use of plastic formulations which almost eliminate the danger of gradually increasing heat transmittance. Aluminum extruded flooring specially designed to facilitate air circulation, cleaning, and loading has become generally accepted by refrigerated truckers.

According to the Truck Trailer Manufacturers Association, the total number of refrigerated, insulated, or semi-insulated trailers produced from 1954 to 1963 was about 60,000. Total trailer production was 655,000; so about 9 percent of the 10-year trailer production was of the type considered usable in refrigerated transport.

The Census of Transportation revealed 165,000 active refrigerated trucks and trailers were licensed in the U.S. in 1963. This was 1.3 percent of the 12.7 million motor trucks licensed. A large number of vehicles were trucks 16 feet or less in length, which reflected the short haul or

local delivery operations of wholesalers and food retailers. At the time of the survey, 16 percent of the refrigerated units were licensed by the for-hire trucking industry and 84 percent were used by the other private businesses.

In order to estimate the amount of refrigeration required, four factors need to be considered: (1) the temperature of the product loaded, (2) the expected ambient temperature, (3) the number of square feet on the outside surface of the van to be refrigerated, and (4) the thickness and coefficient of heat transmittance of the insulation material.

A rating system covering truck bodies and refrigerated trailers has been developed by the USDA, the National Bureau of Standards, and industry leaders which measures the heat gain of each trailer in terms of BTU's per hour under rigid control conditions. The Air Conditioning and Refrigeration Institute has also announced a BTU capacity rating method for engine-driven refrigerating units. These programs will enable the fleet operator to more accurately match the refrigerating unit and the insulated trailer against the heat gain caused by construction and design limitations, and the job to be done.

Containerization has been another promising development in physical equipment to reduce the necessary rehandling of cargo and to effect equipment interchange economically and expeditiously. A railroad innovation, trailer-on-flat-car (TOFC) transportation of refrigerated commodities, has been regarded as the forerunner of a mature containerization system. Cooperating arrangements have been initiated by certain railroads and motor carriers to meet the demands of those shippers who want the flexibility of motor trucks and the lower long-distance rates of railroads.

Direct federal participation in highway financing has had a dynamic influence on the expansion and improvement of motor carrier service. The Interstate Highway System, for example, reduces running time and vehicle maintenance and makes for a safe fleet operation. An important characteristic of a highway is the amount of weight it can bear, both at each point and over a given length, without incurring excessive maintenance expense. Other factors being equal, the greater weight means more road capacity and a lower cost of operation. The federal government has been researching the practicality of higher maximum limits on federal highways. The lower state limitations, however, pose searching questions in terms of optimum truck transport efficiency since, presumably, state regulations would become effective at every interchange of the Interstate Highway System.

Pricing the services of highways to joint users has been regarded as the primary problem of highway finance. Closely related problems are those of measurement and equitable allocation of the common costs between trucks and private automobiles.

## AGRICULTURAL EXEMPTION

Both common and contract carriers operating in interstate commerce are subject to economic and safety regulations, whereas private carriers and exempt for-hire carriers are subject to the regulations pertaining to safety. Approximately 33,000 for-hire carriers are exempt from economic regulation because of the commodity carried or the territory served. This means the ICC has no control over entry into the business, routes traveled, and rates charged.

A long list of agricultural products may be transported at any rate by any carrier. The Motor Carrier Act of 1935 recognized the fact that regular service by regulated carriers would not always satisfy the special requirements of agriculture. The exempt trucker usually can provide maximum flexibility of service because he can move from the farm or wharf in any direction to any market.

Over the years motor carriers, the Commission, and the courts became enmeshed in numerous proceedings of commodity interpretations which resulted in a gradual judicial liberalizing of the list of exempt agricultural commodities. In order to prevent more commodities moving into the exempt category, the Transportation Act of 1958 returned previously exempt items such as frozen fruits, berries, and vegetables to the regulated category. Since 1958 there has been little change in the character of the exempt list of commodities.<sup>3</sup>

In the USDA rate and cost studies of exempt for-hire carriers, rates were found to be lower than common carrier rates for approximately similar service. At the same time, exempt carrier rates produced revenues that covered average exempt carrier costs. Finally, exempt truck rates tended to be relatively stable but did vary in response to the supply of and demand for trucks at particular times and places.

Because exempt carriers do not file annual reports to the I.C.C., the number of firms and vehicles involved in transporting perishables are unknown. Furthermore, the extent of private carriage can only be estimated. The estimated number of carriers and vehicles subject to ICC safety regulations is shown in Table 2. Exempt trucking companies represented 24 percent of all interstate carriers in 1963, and 10.5 percent of all vehicles. In 1960 this type of carrier accounted for 28 percent of all carriers and 12 percent of all vehicles.

Exempt motor carriers have become important haulers of cattle, hogs, sheep and lambs, dressed poultry, butter, and to a lesser extent, fresh fruits and vegetables. Because of the intense rate competition among the large number of exempt carriers, the impact on regulated for-hire transportation has been considerable.

3. "Administrative Ruling No. 110." Washington: Interstate Commerce Commission, Bureau of Motor Carriers, September 26, 1958.

TABLE 2--ESTIMATED NUMBERS OF INTERSTATE MOTOR CARRIERS AND VEHICLES  
SUBJECT TO ICC SAFETY REGULATION

Type of Carrier	Number of Carriers		Number of Vehicles	
	1960	: 1963	1960	: 1963
Authorized for-hire	18,788	18,587	837,462	923,725
Private	76,548	82,152	678,091	771,864
Exempt for hire (203 [b])	37,515	33,609	199,003	200,040
Other*	--	7,006	--	12,450
<b>Total</b>	<b>132,851</b>	<b>141,354</b>	<b>1,714,556</b>	<b>1,908,079</b>

\*Migrant workers and carriers from foreign countries that travel in and out of the United States.

Source: ICC Annual Reports, 74th, 77th.

### SPECIALIZED MOTOR CARRIERS

The ICC has adopted a classification system to identify carriers and to facilitate the process of regulation. The Commission identifies all trucklines by type of carrier, route service, and commodity class transported (one of 17). Except for motor carriers of general freight, each carrier commodity classification defines the somewhat specialized services requiring a particular type of equipment or special facilities for loading or unloading.

The motor carrier industry has demonstrated its ability to adapt organization, equipment, and services to the changing marketing and distribution patterns of the food industry. Refrigerated solids products carriers emerged after World War II in response to the growing need for flexible and dependable refrigerated service. Many general commodity carriers were unwilling or unable to provide continuous and scheduled service, partly because of the perishable nature of the commodities and the special handling requirements. Typically the commodities had to be hauled long distances which could involve interlining with other carriers. Specialized equipment, trained personnel, and available single-line service were important factors conducive to the growth of specialized refrigerated motor transportation. Specialized refrigerated carriers established point-to-point charges that applied to specific commodities, and were lower than class rates commonly leveled by many general commodity carriers. These commodity rates were justified on the basis of reduced costs of regularly handling a large volume of any one commodity between certain points.

The number of Class I common and contract carriers (those earning \$1 million or more), classified as refrigerated solids carriers, increased from 55 firms in 1958 to 78 by 1963. The total tonnage hauled was slightly over 3 million tons in 1958, and it steadily increased to 5.6 million

tons by 1963.<sup>4</sup> The average tons hauled per carrier expanded 24 percent in the five-year period. Tonnage indexes by commodity classes (1957-59 = 100) revealed a 58 percent increase of refrigerated tonnage in 1963 compared to the base period.<sup>5</sup> General freight carriers expanded tonnage 23 percent in 1963 from the base period.

### TRANSPORTATION PATTERNS AND CHANGES FOR SPECIFIC PRODUCTS

A total of \$185 million was received in 1962 by Class I motor carriers for transporting 31 perishable commodity classes (Table 3). This was 9 percent of the total freight revenue received. From 1958 to 1962 the largest regulated truck lines increased their revenue from perishable traffic 37 percent, an annual growth rate of 9.3 percent. At the same time the total regulated motor carrier movement of all commodities advanced 34 percent.

Larger trailers and lower rates offered shippers for heavier loads caused a slight rise in the average load per trailer of most perishable commodities. In 1962 the average for 31 perishable commodities was 15.35 tons per trailer, an increase of 0.2 ton per trailer over the 1958 loading.<sup>6</sup> The total truckloading of 8.9 million tons of 1962 perishable freight was handled with 7,600 fewer truckloads than if the loading had continued at the 1958 average of 15.15 tons per trailer.

Based upon ICC Freight Commodity Statistics, the Class I regulated motor carries handled in some part of the movement 36 percent of the 1962 production of 4.5 million tons of frozen foods, and the railroads handled

4. *Intercity Truck Tonnage* (Washington: American Trucking Associations, Inc., 1958 to 1963).

5. *American Trucking Trends* (Washington: American Trucking Associations, Inc., 1964), p. 19.

6. See Appendix A.

TABLE 3--REGULATED CLASS I MOTOR CARRIER REVENUE FROM 31 SELECTED CLASSES OF PERISHABLE COMMODITIES<sup>1</sup>, 1958-1962

Commodity Group or Classes	Gross Freight Revenue		Percentage Increase From 1958 to 1962
	1962	1958	Percent
	Thous. Dollars	Thous. Dollars	
Products of Agriculture			
Total	\$ 69,569	\$ 47,349	47
18 selected classes	38,283	20,219	89
Animals and Animal Products			
Total	113,995	92,182	24
4 meat & poultry classes	78,185	63,397	24
5 other product classes	19,481	17,711	10
Manufacturers & Miscellaneous			
Total	1,792,056	1,340,015	34
4 selected classes	48,859	33,208	47
Grand Total	2,048,706	1,526,536	34
31 Perishable Classes	184,808	134,535	37
Revenue from 31 Perishable Classes as a Percentage of the Total Regulated Motor Carrier Movement	9.0%	8.8%	

<sup>1</sup>See Appendix A for complete list of the 31 commodity classes.

Source: Motor Carrier Freight Commodity Statistics, ICC, 1959 and 1963.

34 percent.<sup>7</sup>

Tonnage wise, the most important perishable commodity hauled by the regulated motor carriers has been fresh meat and packinghouse products. Truck shipments totaled 182,000 truckloads and 2.5 million tons in 1962 out of a total of 14.5 million tons of meat produced. Thus about 18 percent of the total red meat production was handled by regulated Class I motor carriers. The Class I railroads hauled about 26 percent. From 1958 to 1962, while total red meat production expanded 13 percent, motor and rail tonnage increased about 11 percent and 8 percent, respectively.

In 1962 Midwestern Class I motor carriers originated 30 percent of the 8.86 million tons of perishable commodities, and 33 percent of the \$185 million perishable revenue received by all regulated Class I motor carriers. From 1958 to 1962 the Class I regulated motor carriers in the U.S. increased perishable tonnage 16 percent, but the Midwest carriers expanded tonnage 42 percent. The carrier revenues derived from perishable commodities increased 37 percent in the U.S., but for the Midwestern

carriers it increased 61 percent.<sup>8</sup> Reasons for the growth by Midwest trucklines in perishable commodities traffic include: The relative expansion by Midwestern specialized common carriers of refrigerated products; heavier loadings of trailers; longer hauls; and service advantages to large Midwest shippers through nearby motor carrier location.

In 1962 the large regulated Midwest motor carriers accounted for 49 percent of the total Class I motor carrier meat tonnage originated and 42 percent of the total freight revenue. In 1958 meat tonnage originated by these Midwest carriers was 3 percent less and freight revenue was 9 percent less.

The Midwest area carriers loaded out 14,800 fewer truckloads of refrigerated commodities in 1962 than in 1958 due to heavier loading per trailer. The average weight per trailer in 1962 was 15.45 tons compared with 14.23 tons in 1958.

7. See Appendix B.

8. See Appendix C.

## CHAPTER 3

# Characteristics of Selected Midwestern Motor Common Carriers of Refrigerated Products

Characteristics of the 15 Midwest motor common carriers are described in this section to develop a profile of carrier organization structure, size of business, methods of refrigerated transport operation, and management controls. Specialized and non-specialized carriers will be the terms used to refer to the eight specialized refrigerated commodities carriers and to the seven general commodity carriers who operated refrigerator equipment.

### ORGANIZATION AND ADMINISTRATION

The typical pattern of organizational development was one in which the owner, family, or partners drove trucks. As the business expanded and additional personnel were necessary, a relatively simple organization was devised—one that could be managed and controlled by members of the family or very close friends.

The non-specialized carriers had been in operation for a longer period of time than the specialized firms. Six of the seven non-specialized companies had begun operations before 1941, while the eight specialized refrigerated carriers started after 1945. All of the companies were incorporated, with voting shares of common stock closely held by a few stockholders of record. The companies did not issue shares of common stock to the public.

### Company Objectives

If a motor carrier organization is to be well-adapted to the future as well as the current operation, then it must bear some relationship to long-term objectives. The universal company objective was to make a profit which was directly related to the survival of the firm. Numerous intermediate goals were mentioned which should be reflected in the organization pattern of the business.

The non-specialized carriers had goals related to overall company growth and to improved customer service. The executives, however, had divergent views about refrigerated operations. In most cases these carriers de-

pendent upon perishables as return haul freight to balance their operation. Only two firms mentioned future expansion of service and earnings from perishable commodities in their list of important goals. The other five executives indicated that they had reached their peak on truckload refrigerated traffic, had decided to gradually de-emphasize this phase of the business, or had no specific goals at all.

Specialized refrigerated carriers stressed expansion of firm size and diversification of services as important goals. The most frequently mentioned goals were: (1) to expand operating territory through purchase of additional authority, (2) to emphasize sales and marketing, (3) to increase the LTL (less-than-truckload) phase of the business, and (4) to increase revenue by concentration and coordination of present traffic patterns.

### Organization Pattern

Foremost for effective management is the development of a sound organization structure. Additional knowledge about prior company objectives can be acquired by studying the arrangements or grouping of activities to be performed. Activities were classified in this study by customers, by territories served, by products transported, and by functions.

*1. Customers.* By arranging carrier activities by type of customer, sales efforts may be improved through specialization of knowledge concerning rates, handling characteristics, and available services. Presumably, each salesman would confine his attention to customers of certain commodity groups.

The usual practice of the seven non-specialized carriers was for the solicitors to generate revenue freight from a heterogeneous group of customers. Only two companies separated refrigerated sales efforts from general freight sales. The total of 89 solicitors on the 1960 company payrolls increased to 124 persons engaged in sales activities (not including supervisors) by 1963. In all cases



A modern truck dispatching facility. Cards on system boards allow dispatchers to know the location of all equipment operated by the firm. (American Trucking Associations photo)

company officers contacted selected customers on a personal basis to maintain good public relationships.

The eight specialized carriers reported 13 full-time solicitors and sales supervisory personnel in 1960 and 21 in 1963. Terminal or area managers divided their time between sales and operations functions so it was impossible to measure accurately the total time devoted to either activity. The companies were quite selective in the type of customers contacted because of the specialized nature of their transportation service. Generally, operations-oriented personnel of the carrier company were in regular telephone contact with traffic managers and/or brokers in the respective service areas and booked return hauls or otherwise solicited refrigerated freight as a part of their normal day's work. Company officers served as salesmen in addition to the normal sales staff. Commission agents were utilized to some extent by four of the eight specialized carriers.

**2. Territory Served.** Motor common carriers are legally franchised to conduct business within prescribed geographic areas, or from specific points or places to other points or places. The highway routes may or may not be specified. Certificates of public convenience and necessity explicitly identify the type of commodities which may be legally transported; at times products may be very specifically classified. Because of the wide geographic scope of operations in long-haul motor transportation, many

carriers find decentralized management of operations feasible and necessary. Terminal areas are designated where one person is responsible for local operations, traffic, and sales. As carriers expand in size, divisionalization occurs where numerous terminal areas are grouped into a larger administrative unit.

The seven non-specialized carriers were authorized to offer pickup and delivery service in a total of 16 states in 1960 and 1963. One city which all carriers served directly on their own line was Chicago.

Each non-specialized carrier was decentralized by terminal areas with a terminal manager responsible for refrigerated operations and sales in his territory. Terminal managers reported directly to the general manager in two instances; to a vice president of operations, and to a vice president of sales in three cases; to a manager of refrigerated operations and to a director of sales in one company; and to a zone manager in another. In the latter case, the zone manager reported to a vice president of marketing and to a vice president, special divisions.

In 1963 three of the eight specialized refrigerated carriers were permitted to transport specified commodities in every state except Alaska and Hawaii; six companies were certified by the ICC in 24 states. This does not mean that refrigerated service was provided to all parts of the respective states. The certificates authorized service from specific places in one or more states to other specified places.

The specialized carriers adapted their organizational structure to fit the sprawling nature of the territory served. In most instances, terminals or branch offices were located 1,000 miles or more from the general office. The vast geographic territory was divided into administrative divisions by five carriers. These divisions served the purpose of decentralization much the same as terminal areas served the non-specialized carriers. Area managers were generally responsible for both operations and sales activities. The crucial traffic and scheduling activities were closely controlled and directed by a central dispatching officer at the general office. Division and/or terminal managers reported to an operations manager and to a sales manager in four instances; to a vice president of operations and to a vice president of sales in two cases; and to a general manager in two instances.

**3. Products transported.** Sometimes motor carriers are organized into specialized subsidiaries or autonomous divisions depending upon the product characteristics and the service requirements. Authority and responsibility of management by product areas can be considered as a special type of decentralization.

Two non-specialized carriers conducted refrigerated operations apart from the rest of the business. The major reasons cited for this product separation were: (1) to maintain closer control over the shipment in transit, and (2) to more effectively service the specialized handling demands of shippers. Five of the non-specialized carriers said integrated general freight operations and refrigerated transportation services were not compatible and desirable. The lack of properly trained personnel and the difficulty of maintaining appropriate refrigerator equipment were cited as the major underlying reasons. Several executives pointed out that LTL refrigerated traffic and the platforming of perishables at their present terminals would greatly complicate present operating methods.

The entire organization structure of specialized carriers was closely related to refrigerated traffic. A further refinement of company organization by product classes was not made, although most of the firms hauled frozen as well as light refrigerated commodities. Five specialized carrier executives believed refrigerated activities should be separated from general commodity operations for optimum efficiency.

**4. Functions.** The jobs and responsibilities of carrier management personnel are generally similar regardless of the size of the firm. The larger the organization, the greater the division of duties and responsibilities, but even the smallest carrier performs the same functions on a smaller scale. The assignment of authority and responsibility for each aspect of administration and operation is important but flexibility is essential for rapid adjustment

to changes in business conditions, competition, or government policies.

The extent of departmentalization was dependent upon the size of business, the nature of traffic handled, and other operational procedures. One non-specialized carrier had a written organization chart. The other executives expressed general satisfaction with an unwritten but clearly understood division of activities. Administrative responsibility and authority were universally delegated to specific individuals for operations, sales, and accounting. Traffic, safety, and maintenance were additional functions supervised by specific administrative officers in four of the seven companies.

In general, the delegation of duties by the specialized carriers was informal and performance was closely controlled by one or a few key employees. One large specialized carrier had a written, up-to-date organization chart, and two firms were in the process of updating old ones. Four of the eight carriers expressed dissatisfaction with their present organization and said improvements were needed. Five specialized carriers combined both the sales and operations functions under one individual. The accounting function was departmentalized by six firms. Safety, traffic, and maintenance were separate functions frequently administered by a supervisor.

### Subsidiary Companies

Truck lines usually own or control one or more subsidiary companies, directly or indirectly. Nineteen separate corporations had been formed on or before 1963 by the seven non-specialized carriers. Eleven of these were of the real estate type. Seven of the eight specialized carriers had formed subsidiaries. Equipment rental or leasing companies were the most prevalent type.

### SIZE OF BUSINESS

Although there are a growing number of large carriers, the motor carrier industry is predominately small firms. In 1963 there were 1,175 Class I carriers (those earning a million dollars or more) and 14,443 Class II and Class III carriers (annual revenues of less than a million dollars).

Since the carriers used in this study were Class I, the information relating to the typical size of business overstates the average size for all trucking companies.

Table 4 shows the 15 carriers grossed almost \$100 million in revenue in 1963, an increase of almost 40 percent over 1960 receipts. The range in revenue of the non-specialized carriers was from \$3,817,000 to \$12,090,000 in 1963. The gross receipts of the specialized carriers ranged from \$1,904,000 to \$8,748,000.

In revenues the average non-specialized carrier was

TABLE 4--SELECTED BUSINESS COMPARISONS, SPECIALIZED AND NON-SPECIALIZED CARRIERS, 1960 and 1963

	Eight Specialized			Seven Non-Specialized		
	1960	1963	Incr. %	1960	1963	Incr.
Revenue (Million Dollars)	\$ 31.6	\$ 45.6	44	\$ 39.3	\$ 53.7	34
Tonnage (Thous. Tons)	1,078	1,531	42	1,857	2,253	21
Ton-miles <sup>1</sup> (Millions)	1,127	1,483	32	701	842	20
Assets (Thous. Dollars)	\$7,886	\$13,338	69	\$12,708	\$18,212	43
AVERAGE PER FIRM						
	1960	1963	Incr.	1960	1963	Incr.
Operating Revenue (Million Dollars)	\$ 3.9	\$ 5.6	\$ 1.7	\$ 5.6	\$ 7.5	\$ 1.9
Tonnage (Thous. Tons)	135	191	56	265	322	57
Ton-Miles <sup>1</sup> (Millions)	161	212	51	100	120	20
Assets (Thous. Dollars)	\$ 986	\$ 1,667	\$681	\$ 1,815	\$ 2,595	\$780

<sup>1</sup>The data of one specialized carrier was excluded due to error in reporting.

larger than the average specialized carrier, but the rate of growth since 1960 was 44 percent for the specialized and 34 percent for the non-specialized firms. Both types of carriers acquired extensive operating rights during the past few years; in fact, 12 of the 15 firms expanded their system through acquisition and/or merger.

The total intercity freight tonnage was 3,784,000 tons in 1963, an increase of 30 percent from 1960. Specialized carriers collectively transported over 1.5 million tons of perishables in 1963, up 42 percent since 1960.

Refrigerated traffic data for the non-specialized carriers were not normally separated and reported by commodity groups. However, these executives estimated that approximately 15 percent of their 1963 total freight tonnage was refrigerated commodities, or 343,500 tons.

The average refrigerated carrier increased its traffic by 56,000 tons from 1960 to 1963, while the average non-specialized carrier expanded 57,000 tons. However, the actual volume of freight moved by the average specialized carrier was significantly less when compared to the non-specialized firm.

The ton-mile is a commonly used unit for measuring business activity, representing weight times the distance traveled. In 1963 a total of 2.3 billion ton-miles of intercity freight was reported by 14 carriers included in the study—an increase of 27 percent from 1960. Total ton-miles were substantially greater by the specialized carriers than by the non-specialized carriers. Although tonnage was less, the specialized carriers evidently traveled longer distances than non-specialized firms.

The average of 212 million ton-miles per specialized carrier in 1963 was 51 million greater than in 1960, while the average non-specialized carrier increased ton-

miles by only 20 million.

The total number of miles operated by all vehicles in 1963 was 62 million for the seven non-specialized carriers, and 96 million for the seven specialized truck lines. The typical length of haul for a ton of freight was 351 miles for the non-specialized carriers. For the specialized firms a ton of refrigerated cargo traveled on the average 1,345 miles. Since 1960 the average distance has declined 31 miles for the specialized and three miles per ton for the non-specialized carriers.

Total assets of the 15 operating carrier companies (Table 4) were \$31.5 million in 1963—an increase of 53 percent from 1960. The non-specialized carriers had significantly larger assets per firm than did the specialized carriers. Starting from a lower base, the specialized carriers increased total assets 69 percent from 1960, or about 23 percent per year. The non-specialized carriers expanded assets 43 percent, or 14.3 percent per year.

Trucks, tractors, and semi-trailers comprise a very large group of assets of motor carriers. The number of power units owned by the carrier, rented with drivers, and rented without drivers is reported each year to the ICC; however, only the semi-trailers owned by carriers are reported. This means the total number of units operated must be approximated because many carriers lease trailers.

The 15 carrier executives estimated 1,632 refrigerated trailers were normally operated in 1963 (Table 5). They planned a net addition of 165 units for 1964—a 10 percent increase in one year.

The eight specialized carriers operated about 1,057 "reefers" in 1963, or 65 percent of the total refrigerated units. The range was from 59 to 213 units. The average

TABLE 5--REFRIGERATED TRAILERS OPERATED BY SPECIALIZED AND NON-SPECIALIZED CARRIERS, 1963, AND PROJECTIONS TO 1964

Equipment Type	Eight Specialized			Seven Non-Specialized		
	1963	Planned 1964	Incr.	1963	Planned 1964	Incr.
	(Number of Units)			(Number of Units)		
Refrigerated Trailers						
Total Owned	564	608	44	397	426	29
Total Rented	493	585	92	178	178	0
Total Operated	1,057	1,193	136	575	604	29
Average Number Operated	132	149	--	82	86	--

number of trailers operated was 132. Carriers owned about 53 percent of all trailers.

The seven non-specialized carriers operated approximately 575 refrigerated trailers in 1963. The range was 12 to 291 units and the average number per carrier was 82. About 70 percent of the refrigerated trailers were company-owned. The percentage of refrigerated trailers to total trailers was in the neighborhood of 25 percent.

The firms represented in the study operated a total of 1909 power units in 1963. The seven non-specialized carriers owned about 50 percent of 906 units operated, and the eight specialized carriers owned 25 percent of 1,003. Typically, the average firm operated about 115 power units.

Straight trucks, a very important part of the general freight business, were generally not used in refrigerated service. In 1963 a total of 364 were owned by non-specialized carriers. Only one specialized carrier owned refrigerated straight trucks.

Employment is frequently used to indicate the size of a business enterprise. Motor carriers generally employ workers on both an hourly and daily basis. Additionally, carriers sometimes contract on a permanent and/or one trip lease with individuals who may own operating equipment. These individuals are typically paid a percentage of the freight revenue to cover wages, expenses, and the use of their own equipment. Many specialized carriers and some general freight carriers use owner-operators or contractors to augment the transportation function. Thus, employment data frequently understate the true nature and size of such motor carrier operations.

In 1963 the 3,500 employees on the non-specialized carriers payroll greatly exceeded those on the specialized carriers payroll. In 1963 a total of 3,130 hourly and 371

daily personnel of the eight non-specialized carriers were paid total wages and salaries of \$26.5 million. Personnel requirements expanded 18 percent in the three year period and total wages and salaries increased 37 percent.

The specialized carriers employed 1,082 people in 1963, an increase of 26 percent from 1960. Total compensation to these workers exceeded \$7.7 million, up 47 percent from 1960. The rate of employment growth and compensation was greater for the specialized carriers than for the non-specialized lines.

The transportation function of numerous specialized carriers was performed by owner-operators under the exclusive use and control of the carrier company. In effect, the carriers purchased transportation service. Typically, the payment was for equipment with drivers. In 1963 almost \$21.5 million was paid to owner-operators by the eight specialized carriers and \$3 million by five non-specialized carriers. Over the years refrigerated carriers have expanded this method of obtaining transportation. Regular company drivers were generally used in refrigerated transport by the non-specialized companies, although one carrier reported using owner-operators to a large extent.

#### FINANCIAL SITUATION AND OPERATING PERFORMANCE

Since these carriers are regulated by the ICC they are required to file an annual report with the Commission based upon a uniform system of accounting. The ICC figures are not consolidated which differs from the audited statement familiar to bankers. Many carriers have a subsidiary that owns revenue equipment, so lease payments will be high in the operating company and depreciation will be correspondingly lower.

Ratios must be used with discretion since a ratio that

TABLE 6--COMPOSITE BALANCE SHEETS BY EIGHT SPECIALIZED CARRIERS, 1960 and 1963

	1960		1963		Incr. (Decr.)	
	Amount	Percent	Amount	Percent	Amount	Percent
(In Thousands of Dollars and Percentage of Total)						
<b>ASSETS</b>						
Cash	703	9	618	5	(85)	(12)
Accounts Receivable	1,937	24	3,355	25	1,418	73
Other	366	5	1,053	8	687	188
<b>CURRENT ASSETS</b>	<b>3,006</b>	<b>38</b>	<b>5,026</b>	<b>38</b>	<b>2,020</b>	<b>67</b>
Operating Property	3,880	49	6,103	46	2,223	57
Other	1,000	13	2,209	16	1,209	12
<b>TOTAL ASSETS</b>	<b>7,886</b>	<b>100</b>	<b>13,338</b>	<b>100</b>	<b>5,452</b>	<b>69</b>
<b>LIABILITIES &amp; OWNERS' EQUITY</b>						
Accounts Payable	893	11	1,716	13	823	92
Other	611	8	1,021	8	410	67
Equip. Debt - 1 year	1,050	13	1,680	12	630	60
<b>CURRENT LIABILITIES</b>	<b>2,554</b>	<b>32</b>	<b>4,417</b>	<b>33</b>	<b>1,863</b>	<b>73</b>
Equip. Debt - after 1 year	2,059	26	3,407	26	1,348	65
Other Term Debt	355	5	849	6	494	139
<b>TOTAL LIABILITIES</b>	<b>4,968</b>	<b>63</b>	<b>8,673</b>	<b>65</b>	<b>3,705</b>	<b>75</b>
<b>OWNERS' EQUITY</b>						
Capital Stock	953	12	1,060	8	107	11
Surplus	1,965	25	3,605	27	1,640	83
<b>TOTAL LIABILITIES &amp; OWNERS' EQUITY</b>	<b>7,886</b>	<b>100</b>	<b>13,338</b>	<b>100</b>	<b>5,452</b>	<b>69</b>

appears good for one company may be misleading for another. This same analogy holds when comparing ratios of specialized and non-specialized types of motor carriers; however, they are helpful as guidelines in assessment of the over-all financial position and several are presented in Appendix D.

#### Financial Situation — — Specialized Carriers

Specialized refrigerated carriers increased total assets almost 70 percent in three years. Operating revenue expanded 44 percent during this period. Net income as a percentage of sales inched upward in 1963 to 1.9.

The composition of assets, liabilities, and owners' equity has experienced significant changes (Table 6). About 38 percent of the total assets of specialized carriers have been held in the form of current assets. Accounts receivable represented the major item of current assets. Other current assets (pre-payments and inventories) have increased noticeably while the cash position has declined. The marked expansion of business generally places a heavy demand upon carriers for cash. These growing pains may have placed an extraordinary burden upon the firms for financial resources. On the other hand, motor carriers have substantial amounts of cash flowing through their businesses. This somewhat tempers the need for sizeable cash balances.

A noticeable change has occurred in accounts receivable. The absolute dollar amount increased \$1,418,000, or 73 percent. The ratio of revenue to accounts receivable,

which provides an indication of the carrier's effectiveness in collecting receivables, declined from 16.3 in 1960 to 13.6 in 1963. Receivables should turn over rapidly since motor carriers are legally required to collect bills within 14 days after the freight moves. The accounts receivable include trade accounts, interline and agents' accounts, plus miscellaneous receivables. Although interline and the miscellaneous amounts may not normally be collected this rapidly, the collection period appeared excessive. Based on 254 working days, the number of days that revenue was in accounts receivable increased from 16 days in 1960 to 19 days in 1963. It should be noted that these data were year-end figures only, and upon further analysis it may be found this relationship was due to an unusually large volume of sales near the end of the year or to a temporary increase in the proportion of credit to cash transactions.

Operating property was 46 percent of total assets, of which revenue equipment comprised the largest amount. As mentioned previously, these companies lease from "out-siders" or affiliated companies. Therefore, more assets were at their disposal than reflected on the balance sheet. Furthermore, the value of operating rights, rental of land and buildings, good will, employee loyalty, the advantages of a trained and experienced organization, and location advantages are not reflected in the accounting records.

About one-third of total liabilities and owners' equity were current liabilities and equipment debt due in one year. In this analysis debt due in one year was included

in current liabilities which follows customary accounting procedures. Earned surplus, or retained earnings, advanced 83 percent in three years, and accounted for 27 percent of total liabilities and owners' equity in 1963. In actual dollars, total owners' equity increased almost \$1,750,000 but the over-all capital position weakened relative to total liabilities and owners' equity.

Equipment purchases appeared to be largely financed through borrowed capital rather than owners' equity. The total debt ratio increased from .63 to .68 in three years. Conversely, the owners' equity ratio decreased from .37 in 1960 to .32 in 1963. It would seem that an owners' equity ratio of .45 to .50 would be a reasonable goal upon which carriers might set their sights.

From the lender's viewpoint the debt to worth ratio has been very important. It measures the total debt per dollar of owners' equity and thus reflects the borrowing capacity of the firms. In 1960 this ratio was 1.70, and 1.86 in 1963. Cognizant of the expanding capital needs of growing concerns, financial institutions have been supporting the specialized carriers to a large extent.

The current ratio, which represents the ability of carriers to pay liabilities promptly when due, remained stable at about 1.14. This indicates current assets were slightly in excess of current liabilities and debt obligations due in one year.

#### Financial Situation — — Non-Specialized Carriers

The seven non-specialized carriers, Table 7, increased their total assets 43 percent in three years, but the rate of

growth was not as pronounced when compared to the 69 percent increase of the specialized group. Operating revenue of non-specialized carriers increased 34 percent during this period. Net income before taxes as a percentage of revenue was 2.1 percent in 1960 and 2.2 percent in 1963.

The total assets of non-specialized carriers increased almost \$5.5 million. Current assets represented 50 percent of this expansion. The current ratio was .9 in 1963, up slightly from .8 in 1960. A partial reason for the relatively low current ratio may be the sizeable short term equipment obligations of these firms as compared to the specialized carriers.

At the present time the seven non-specialized truck lines have slightly over 40 percent of their total assets in operating equipment. Some shifting took place from equipment ownership to other long-term investments, and possibly to leasing of equipment. This latter possibility is further reinforced by observing the relative declines in equipment debt, both short term and long term.

Although operating property was financed largely through borrowed capital, the non-specialized carriers had a larger percentage of liabilities covered by owners' funds than specialized companies. The total debt ratio for the non-specialized firms remained stable at .57. The owners' equity ratio was, therefore, .43 which indicated more favorable protection to creditors than the .32 for specialized carriers. These comparisons of ratios should be viewed with the over-all make-up of the debt in mind and the

TABLE 7--COMPOSITE BALANCE SHEETS BY SEVEN NON-SPECIALIZED CARRIERS, 1960 and 1963

	1960		1963		Incr. (Decr.)	
	Amount	Percent	Amount	Percent	Amount	Percent
(In Thousands of Dollars and Percentage of Total)						
<b>ASSETS</b>						
Cash	871	7	2,087	12	1,216	140
Accounts Receivable	2,270	18	3,834	21	1,564	69
Other	921	7	914	5	(7)	(0.7)
<b>CURRENT ASSETS</b>	<b>4,062</b>	<b>32</b>	<b>6,835</b>	<b>38</b>	<b>2,773</b>	<b>68</b>
Operating Property	6,660	52	7,815	43	1,155	17
Other	1,986	16	3,512	19	1,526	77
<b>TOTAL ASSETS</b>	<b>12,708</b>	<b>100</b>	<b>18,162</b>	<b>100</b>	<b>5,454</b>	<b>43</b>
<b>LIABILITIES &amp; OWNERS' EQUITY</b>						
Accounts Payable	1,742	14	3,276	18	1,534	88
Other	1,783	14	2,998	16	1,215	68
Equipment Debt - 1 year	1,542	12	1,286	7	(256)	(17)
<b>CURRENT LIABILITIES</b>	<b>5,067</b>	<b>40</b>	<b>7,560</b>	<b>41</b>	<b>2,493</b>	<b>49</b>
Equipment Debt - over 1 year	2,171	17	2,688	15	517	49
Other Term Debt	53	--	133	1	80	150
<b>TOTAL LIABILITIES</b>	<b>7,291</b>	<b>57</b>	<b>10,381</b>	<b>57</b>	<b>3,090</b>	<b>42</b>
<b>OWNERS' EQUITY</b>						
Capital	1,687	13	1,473	8	(214)	(13)
Surplus	3,730	30	6,308	35	2,578	69
<b>TOTAL LIABILITIES &amp; OWNERS' EQUITY</b>	<b>12,708</b>	<b>100</b>	<b>18,162</b>	<b>100</b>	<b>5,454</b>	<b>43</b>

stage of development of the carriers in the study. It is conceivable that the younger, more rapidly expanding, and relatively smaller specialized carriers may not have accumulated the financial resources in the form of equity simply because they have had fewer years in actual operation.

The total debt per dollar of owners' equity in 1960 was 1.35, and in 1963 it was 1.33. As revealed earlier, a relatively smaller proportion of total debt is in the form of long-term obligations which suggests that non-specialized carriers have become more active in leasing operating property. Three of the seven carriers reported less total depreciation expense in 1963 than they reported in 1960.

#### Operating Performance — — Specialized Carriers

The 1963 pre-tax net income for the eight study carriers was \$1.3 million, a 65 percent increase from 1960 (Table 8). Operating performance appeared satisfactory as net operating revenues increased 97 percent in three years. The 1963 return on investment was 18.3 percent; in 1960 it was 16.9.

The combined operating ratio was 96.1, which was an improvement over the 1960 level of 97.1. However, because of the leasing of equipment and the use of subsidiaries for certain aspects of the business, this ratio may have lost some of its meaning. Interest and income taxes

are not included in the calculation of this ratio. After taking these factors into account, the average net income per firm advanced to \$107,000 from \$62,000 in 1960.

Transportation expense accounted for nearly 75 percent of the total operating revenue. Among the important categories of transportation expense are purchased transportation, fuel for equipment, and compensation of company drivers and helpers. Terminal expenses increased 68 percent and traffic expenses 86 percent in three years. Interest payments were up 402 percent. Maintenance, depreciation, and administrative expenses did not advance as rapidly as total expenses.

#### Operating Performance — — Non-Specialized Carriers

The seven non-specialized carriers reported pre-tax net income in 1963 of \$1.1 million, a 38 percent increase from 1960 (Table 9). Operating revenues increased to \$52.8 million, or 34 percent above the 1960 level. Operating expenses also advanced 34 percent. Before income taxes, the 1963 return on investment was 14.7, compared to 15.3 in 1960.

The combined operating ratio in 1963 was 97.3, which was almost equal to the 97.2 reported in 1960. After taking both interest and income taxes into account, the average net income per carrier declined from \$93,000 to \$79,000 in 1963. It appears that some firms need to

TABLE 8--EIGHT SPECIALIZED MOTOR COMMON CARRIERS INCOME STATEMENT FOR YEARS ENDING DEC. 31, 1960 and 1963

	1960		1963		Increase (Decrease)	
	Amount	Percent	Amount	Percent	Amount	Percent
(In Thousands of Dollars and Percentage of Total)						
<b>Revenue:</b>						
Operating Revenue	31,662	100	45,610	100	13,948	44
<b>Expenses:</b>						
Maintenance	1,487	4.7	1,971	4.3	484	33
Transportation	23,493	74.1	33,631	73.7	10,138	43
Terminal	475	1.5	797	1.8	322	68
Traffic	407	1.2	757	1.7	350	86
Insurance and Safety	1,273	4.0	1,769	3.9	496	39
Administrative	1,833	5.9	2,340	5.1	507	28
Depreciation	1,005	3.2	1,366	3.0	361	36
Taxes and Licenses	776	2.5	1,182	2.6	406	52
Total Expenses	30,749	97.1	43,813	96.1	13,064	43
Net Operating Revenue	913	2.9	1,798	3.9	885	97
Deduction from Income						
Interest, etc.	87	.3	437	.9	350	402
Net Income before Income Tax	826	2.6	1,361	3.0	535	65
Less: Income Taxes	333	1.1	504	1.1	171	51
Net Income	493	1.5	857	1.9	364	74

exercise closer control over operating expenses in order to improve profit margins.

The expense categories which increased relative to the total were taxes, terminal, and insurance expenditures. Those on the relative decline were depreciation and maintenance expenses. Transportation expense accounted for 46 percent of total operating revenue in both periods.

#### OPERATING METHODS AND CONTROL

Fourteen of the 15 companies said the most important refrigerated tonnage was meat and packinghouse products; one firm hauled primarily frozen foods. In 1963 approximately 1,022,000 tons of fresh meat and packinghouse products were transported by 14 carriers. This traffic represented 63,180 trailer loads at an average weight of 16.17 tons per trailer. Frozen foods, candy, dairy products, produce, and dressed poultry were also mentioned as important refrigerated traffic.

An estimated 789,000 tons, or about 50 percent of 1,530,000 total tons hauled by specialized carriers were meat and meat products. The length of haul ranged from 325 to 2,500 miles, the median being 1,800 miles. The meat shipments were primarily truckloads (10,000 pounds or more).

The non-specialized carriers also ranked meat and meat products first in refrigerated traffic. An estimated 233,000 tons, or 10 percent of the 2,253,000 total tons of

freight hauled, were meat and packinghouse products. Since total carrier traffic averaged about 15 percent refrigerated commodities, the meat transportation portion represented 66 percent of their perishable tonnages. The average length of haul ranged from 320 to 640 miles, the median: 500 miles. Almost all shipments were truck-loads.

Primarily, refrigerated traffic enabled non-specialized carriers to help balance their operations and to correct the effects of irregular freight movements at different seasons of the year. Each carrier had authority to serve the metropolitan area in and around Chicago with refrigerated products providing profitable backhaul freight. It was quite common for "reefers" to be loaded with non-refrigerated freight outbound from Chicago to points served by the respective carrier.

The specialized carriers depended upon refrigerated freight almost exclusively. Based in the Midwest, these carriers held irregular route authority to almost all corners of the country. Seven of the eight specialized carriers were headquartered within a very short distance of a major meat packing plant, although this might have been coincidental. A balanced refrigerated operation required expert knowledge of the seasonal production and consumption characteristics of agriculture. These companies often relied upon exempt fruits and vegetables as backhaul traffic from Pacific and Gulf points to Midwestern destinations.

TABLE 9--SEVEN NON-SPECIALIZED MOTOR COMMON CARRIERS INCOME STATEMENT FOR YEARS ENDING DEC. 31, 1960 and 1963

	1960		1963		Increase (Decrease)	
	Amount	Percent	Amount	Percent	Amount	Percent
	(In Thousands of Dollars and Percentage of Total)					
<b>Revenue:</b>						
Operating Revenue	39,292	100.0	52,776	100.0	13,484	34
<b>Expenses:</b>						
Maintenance	4,163	10.6	5,325	10.1	1,162	28
Transportation	18,407	46.8	25,540	46.5	6,133	33
Terminal	6,512	16.6	9,477	18.0	2,965	46
Traffic	1,462	3.7	1,964	3.7	502	34
Insurance and Safety	1,527	3.9	2,138	4.0	611	40
Administrative	2,266	5.8	3,007	5.7	741	33
Depreciation	1,752	4.5	1,944	3.7	192	11
Taxes and Licenses	2,098	5.3	2,948	5.6	850	41
Total Expenses	38,187	97.2	51,343	97.3	13,156	34
Net Operating Revenue	1,109	2.8	1,431	2.7	322	29
Deductions from Income						
Interest, etc.	280	.7	284	.5	4	1
Net Income before Income Tax	829	2.1	1,147	2.2	318	38
Less: Income Taxes	177	.5	591	1.1	414	234
Net Income	652	1.6	556	1.1	(96)	(15)



Loading lamb carcasses in a refrigerated truck trailer. (Consolidated Freightways photo)

### Pre-shipment Methods

The typical practice of non-specialized carriers was to deliver a city tractor and an empty refrigerated trailer to the packer's plant upon request and pickup another loaded trailer or return to the terminal empty. The line-haul power unit was not usually used for this function. Drivers rarely assisted with the loading of suspended meat. Under certain situations they did help to load other commodities. The Packinghouse Workers' Union and/or company policies usually dictated the loading practices. The refrigerated commodities seldom received a platform handling at the origin terminals.

Packers typically placed orders for equipment well in advance of the scheduled day of loading which allowed carriers operating from distant dispatch points to schedule specific equipment for specific loads. The line-haul drivers normally remained with their equipment until loading was completed.

Sometimes line-haul equipment was used to make several pickups to efficiently utilize van capacity. This practice was followed by both types of carriers but seldom on meat hauls. The carrier tariffs typically provided for a limited number of combinations of split pickups and deliveries.

Palletized loads represented a very minor part of the total refrigerated traffic, although four non-specialized companies and seven of the eight specialized carriers accepted loads in this way. Important obstacles to the use of pallets were returning the empty pallets, and damage to the trail-

ers from the prongs of the fork lift. Containers were tried by several non-specialized carriers with limited success.

Temperature control in transit was considered to be the essential element in refrigerated motor transportation. Sometimes certain shipments were delayed due to equipment failure, but if the product deteriorated the carriers were faced with very sizeable claims. Owner-operators were typically responsible for line-haul performance and ultimately held accountable for claims due to negligence.

Although rigid and regular safety inspection of equipment is required by the ICC, qualified maintenance personnel checked and serviced all units prior to assignment. All trailers were steam-cleaned to remove dirt and odors. Drivers were required to inspect their rigs too, and report in writing any questionable mechanical situations. The equipment inspection report forms were then signed by drivers and submitted to the maintenance supervisor.

Refrigeration units were serviced by trained personnel and units were almost always started and the trailers pre-cooled to the carrying temperature of the load. Most of the meat shippers required pre-cooled trailers at least from May through September. This procedure assured the carrier that the unit was operating properly and enhanced the ability of the carrier to hold the desired in-transit temperature.

Some shippers do not allow carrier personnel to take product temperature readings. If the carrier wanted such readings, the product control department of the firm would normally provide them. One shipper said, "Our

product control department is charged with the responsibility of maintaining continuous product checks on out-bound movement. These product checks are a matter of record and product temperature taken must fall within an allowable range as set forth in written temperature specifications. The temperature at which we require the trailer to be maintained is made a matter of record on each bill of lading.”

When drivers were permitted to take temperature readings as loading progressed, a record was made on the bill of lading, or on a simple temperature chart, or on a perishable freight log. Several executives said shippers were sometimes reluctant to initial the results of product readings, and occasionally high-level discussions were necessary to alleviate conflicts. Nine of fifteen carriers said they almost always received meat at acceptable temperatures, ranging from 32° to 38° F. The other companies said numerous loads were tendered at temperatures exceeding these levels. The original bill of lading and the shipping order must be signed by the carrier’s representative which means the carrier accepts responsibility for the maintenance of the product in transit.

A few meat packers seal all trailers, without exception. The driver cannot request a final billing, invoices, and bills of lading until the seal personnel have cleared the truck for departure. However, sealing of trailers has not been a universally adopted practice by all shippers of refrigerated products when using truck service.

### Shipment Methods

Almost every carrier required drivers to physically check the mechanical refrigerating units at regular intervals in transit. The control method usually consisted of a perishable load report form to be completed which provided space for thermostat setting, temperature reading, defrost time, and other remarks. Four non-specialized carriers required drivers to check the unit about every three hours. The special perishable load report form accompanied each load and served as a running record of equipment and personnel performance. One carrier required a copy to be sent to the payroll department which induced driver compliance.

The very long hauls of the specialized carriers necessitated close attention to equipment and driver performance. Owner-operators were required to inspect the load at all fuel stops, and sign a form at checkpoints enroute. Several carriers required all drivers to call central dispatch daily or pay a fine and receive demerits from the safety department. One carrier used automatic recording thermometers on all trailers; several employed a private checking service which also took temperature readings; and another metered the fuel supply in an attempt to control performance of drivers. Several carriers instructed drivers to take product temperatures several times a day and break shipper seals if necessary.

### Post-Shipment Methods

At destination the operating procedures ranged from normal consignee signature on a delivery receipt to insistence that the consignee take product temperature readings, record them on the delivery receipt, and then sign it. The signed delivery receipt insured an adequate record for delivery, and for use in connection with any possible future freight claim. Product temperatures were frequently taken at public warehouses; however, many consignees did not take temperatures unless a questionable load was delivered.

Drivers usually assisted in unloading perishable freight (to the tailgate), although four non-specialized carriers said sometimes the shipper unloaded. Several specialized truck lines hired local helpers at certain destinations to assist drivers in unloading. Specific provisions for split deliveries and all extra charges were provided in regional tariff publications and/or individual company tariffs. Usually no more than four “splits” were authorized and the importance of this practice varied among the companies.

### CURRENT PERFORMANCE REPORTS

Motor common carriers are required to submit numerous records and reports to federal and state regulatory commissions, tax agencies and financial institutions. In addition to corporate financial statements, management control data utilized by carrier managers included actual performance records of employees and of functional operating units.

Performance is measured in various ways depending upon the specific area involved. Quantitative measures of accomplishments, costs incurred, and results achieved serve as a written record for reference in planning, budgeting, and controlling of business resources.

This study found that records and reports were becoming the basis for more of the management decisions. Managers were seeking better methods to measure performance of equipment and personnel. Research and informal educational programs are needed to help carrier managers plan, assemble, analyze, and interpret company performance reports.

Table 10 summarizes some commonly used performance reports. The illustrations are designed to embrace the corporate freight operations, which for the non-specialized carriers represented both refrigerated and non-refrigerated activities. It would be coincidental if managers required all of the reports.

As mentioned previously, owner-operators were often held accountable for in-transit performance and were reim-

TABLE 10--CURRENT PERFORMANCE REPORTS PREPARED FOR MANAGERS OF MOTOR  
COMMON CARRIERS

Frequency and Title of Report	Information Needed	Use in Controlling Operations
<u>DAILY</u>		
1. Dispatch	1. Name of shippers; destination; weight; revenue, year-to-date, and forecast to budgeted revenue goals.	1. To appraise and correct imbalances of fleet operation. Guide to meeting revenue goals for a given time period by terminal and/or company-wide.
2. Equipment and Drivers	2. Where each unit is located and where it will be next week.  Number of units that turned around (i. e. unloaded and were reloaded the same day.)  Number of loads lost and why.  Number of delayed loads in transit and shipper or consignee involved.	2. Guide to optimum utilization of equipment. A meaningful check on business trends, and equipment needs. To locate and correct causes of poor customer relations and maintain accounts through close control over loads in transit. To correct scheduled service deficiencies.
3. Cash Recap	3. Total amounts of receivables, checks written, held, bank transfers, and payables.	3. Forces the accounting department to bill loads promptly and keep up to date. To protect cash, locate and correct causes for cash shortages.
4. Personnel	4. Complete itinerary of operators prior to each trip.  Number of freight bills cut and processed.  Number of pickups and deliveries made.  Number of solicitations made and responses.	4. Complements equipment and dispatch records. To check and increase productivity of workers, and judge business conditions.
5. Low Revenue	5. Negotiated rates on every exempt load.	5. To locate and correct causes for low revenue loads (especially on back hauls.)
<u>WEEKLY</u>		
1. Sales	1. Expenses, number of calls made, responses.	1. To judge relative company growth and sales performance. To correct excessive sales expenditures.
2. Terminal	2. Number of outbound loadings, tonnage, bills processed, on-time deliveries, and number of deliveries late.	2. To evaluate production of terminals and to correct causes for business declines in each area.
3. Payroll	3. Number, hours, overtime, and wages of drivers, dockmen, and clerical personnel. Total reimbursement for purchased transporations.	3. To locate and correct causes for labor inefficiencies and to appraise labor requirements.
4. Claim Analysis	4. Paid claims by commodity (over \$25). Reasons for potential claims.	4. To locate and correct causes for loss and damage of freight before consequences become more serious.
<u>MONTHLY</u>		
1. Equipment	1. Complete revenue and cost breakdown for each company owned tractor-trailer. Number of empty miles, revenue per vehicle mile, and profit per mile for entire fleet.	1. Basis for determining and increasing profits for each unit in the company fleet, and to judge reimbursement levels for owner-operators.

2. Quota	2. Revenue and expenses and per cent to quota.	2. Basis to judge attainment of forecasted budgets, and to correct causes of profit deficiencies before serious consequences.
3. Customer Analysis	3. Revenue earned for the month, previous month and past year for each major account.	3. To appraise and enhance customer relations and save profitable accounts.
4. Safety	4. Number of accidents, violations, demerits, training programs conducted.	4. To locate and correct driver incompetence. To reduce loss of life and property.
5. Claims	5. Number of claims paid, filed, declined and transmitted.	5. To identify and eliminate the causes of negligence. To facilitate the rapid settlement of bona fide claims and promote customer good will.
6. Income Statement	6. A company-wide consolidation of operating revenues earned, costs of goods and services consumed and net income during the period.	6. To report the amount of net income compare it with prior periods, and with the budget. To explain the way in which income was earned over the period.
7. Balance	7. The nature and amount of properties acquired and on hand. The manner in which assets are momentarily financed.	7. To assess the financial condition of the firm at a given date. To show the owner's claims against the values reported as assets.

bursed on a percentage of freight revenue. This financial arrangement encouraged expedited delivery and careful attention to temperature control. Several carriers paid a bonus to operators who delivered their loads on time, hence accurate records were essential for routine and continuous business transactions.

Specialized carriers were especially sensitive to the operating and maintenance costs per mile incurred by owner-operators in relation to revenue per mile. If the reimbursement percentage to drivers was insufficient to cover these costs plus a reasonable return to owned equipment, then owner-operators would cancel the contract. But, the carriers sacrificed revenue if the percentage was set too high.

The non-specialized carriers which considered perishable freight as primarily a backhaul operation, generally required reports that reflected the over-all fleet operation. They rarely separated refrigerated traffic costs and/or revenues. Production reports of terminals and solicitors were universally required. Several of the companies which used data processing equipment were experiencing difficulty in deciding the appropriate kind and optimum number of reports. Other managers expressed the need for more effective and timely information and viewed data processing equipment as a means to this end.

#### OTHER CHARACTERISTICS

Eleven companies said undue waiting time at destinations required them to hold shipments which retarded equipment and personnel performance and added to overall costs. Several firms assessed consignees a detention

charge (a tariff provision) for extraordinary delays, although the payments were sometimes difficult to collect.

The range of carrier claims was estimated by 13 executives from .005 percent to 1.5 percent per \$100 revenue. Two carriers had no idea what the figure was for their company. Four specialized carriers said claims were charged back to the drivers or owner-operators.

Carriers reported that driver training programs usually consisted of having prospective drivers participate on a number of selected runs with experienced and loyal drivers. This process of close observation and supervision seemed to be a reasonably effective way of selecting responsible operators. The safety personnel worked continuously toward the goal of increasing the company safety record and the operations personnel persistently stressed temperature checks and emergency procedures in case of equipment failure. It was difficult for specialized carriers to hold driver meetings because the personnel were almost always enroute.

The managers said coordinated motor-rail transportation operations were almost non-existent. Some interchange of refrigerated trailers was arranged through connecting motor common carriers. Palletized perishable cargo and insulated containers accounted for a minor part of the total refrigerated volume.

The most active or potentially active refrigerated transport competition was the specialized refrigerated motor common carrier. The specialized carrier managers, recognizing that piggyback is primarily a substitute for long-haul trucking, also mentioned all-railroad TOFC (trailer-on-flat-car) as important competition. Private carriage, principally a substitute for shorter haul trucking, was also a recognized concern of the non-specialized carriers.

## CHAPTER 4

# Problems of the Study Carriers

This chapter identifies important carrier problems that impede business efficiency. Areas of primary concern, as stated by experienced carrier executives, are contained in the first section. Impressions of carrier problems, based on the interviews, are incorporated in the second part.

### STATED CARRIER PROBLEM AREAS

During the interviews the managers mentioned numerous company problems. Subsequently, the statements were compiled into a list of 16 categories, alphabetized, and then mailed to each respondent. The managers were requested to examine the categories and to rank the six most important areas. Table 11 shows the ratings made by respondents of the two carrier groups.

Waiting time (or undue delays at destination to unload) was mentioned by 11 of 15 carriers. Although unloading practices are being improved gradually, these carriers indicated the need for more rapid and efficient unloading procedures. Non-specialized carriers were especially critical of excessive delays, and specialized refrigerated truck lines were also dissatisfied. Restrictive unloading practices and the lack of adequate unloading facilities were stated as significant factors contributing to increased carrier costs and reduced productivity of drivers and equipment.

Another problem area was the increased competition from illegal forms and arrangements of transportation. Seven managers of the specialized group and two non-specialized carrier executives said illegal truck operators acquired substantial traffic from the regulated trucking companies. Although progress has been made by the ICC to restrain illegal operations, the specialized group said the problem needs clarification, the penalties are too meager, and the procedural steps involved in identifying and punishing violators are too lengthy.

The control and prevention of claims was a common problem area. Non-specialized carriers were more likely to be concerned about claims than the specialized group. The specialized carriers charging claims to the owner-operators said the technique has been reasonably effective.

Fewer claims may be expected by trained and experienced personnel who handle a limited number of commodities. However, claims made upon a transportation agency on perishable shipments tended to be very costly because losses usually involved the entire load.

Driver selection, training, and dependability were rated equally with backhaul deficiencies and ineffective middle management development. These problem areas were of particular importance to the specialized group because their operations extended over a vast geographic territory, drivers were enroute for extended time periods, and traffic patterns were not nearly so well routinized as those of the non-specialized companies. Furthermore, the rapid business expansion of the specialized group has probably been associated with greater responsibilities of the existing management and the need for additional competencies.

Problem categories that ranked low or not at all were: company organization, research, long-range planning, and finance. The managers indicated that production-type problems would require more attention in the future if operating costs continued to increase relative to freight revenues. However, as personnel acquire business knowledge and experience, it appears that many operational problems could be considered and decided routinely. The ratings may also reflect the production orientation, values, and experiences of the respondents.

### OBSERVED CARRIER PROBLEM AREAS

In order to attain the objective of improved business efficiency, the administrative officers were increasingly dependent upon the availability of highly trained, imaginative personnel. Moreover, the leadership qualities exhibited by the top executives were equally important. Each executive recognized that his company faced a myriad of challenges, many of them crucial.

The firms were multi-million-dollar businesses and the managers appeared concerned about how to maintain and perpetuate business efficiency. Preoccupation with the

TABLE 11--PROBLEM AREAS OF SPECIALIZED AND NON-SPECIALIZED  
MOTOR COMMON CARRIERS

Problem Category	: Eight Specialized	: Seven Non-Specialized
	Number of times cited and ranking	
BACKHAUL . . . lack of quality and quantity	: 1, 1, 2, 3	: 1, 2, 3, 4
CLAIMS . . . need for control and prevention	: 1, 3, 4	: 3, 6, 6, 6, 6, 6,
COMPANY ORGANIZATION . . . reconsider structure and delegation of authority and responsibility	: 4	:
COMPETITION . . . from all legal forms, and other modes	: 1, 4, 6	: 2, 3
COMPETITION . . . pressures from illegal forms and arrangements	: 1, 2, 2, 3, 4, 5, 6	: 1, 3
DRIVERS . . . inadequate selection, training, dependability	: 1, 1, 2, 3, 4, 5, 5	: 1
EQUIPMENT . . . lack of uniform standards and design specifications	: 5, 5	: 3
FINANCING . . . cash needs and long term capital	:	: 1
LABOR RELATIONS . . . employer-union conflicts	: 2, 6	: 3, 6, 6
LTL . . . inefficient operations and sales performance	: 5	: 4, 5, 5, 5
LONG RANGE PLANNING . . . lack of attention to future markets, authority and personnel needs	: 5	: 4
MANAGEMENT . . . ineffective middle management selection, development and training	: 2, 2, 3, 3, 6, 6	: 1, 5
	Number of times cited and ranking	
RESEARCH . . . lack of economic facts and help	:	: 5
REGULATIONS . . . unnecessary and complex state and federal laws and legislation	: 1, 4, 4, 5	: 4, 5, 5
SHIPPER-CONSIGNEE RELATIONS . . . lack of communication and understanding	: 3, 6	: 1, 2, 2, 4, 4
WAITING TIME . . . undue delays at destination to unload	: 2, 3, 4, 6, 6	: 1, 2, 2, 2, 3, 4

details of routine business operations and regulation appeared to have diverted the attention of most managers from marketing strategies, long-range planning and analysis of the socio-economic changes affecting the business. There was a need for most companies to re-evaluate and clarify corporate objectives and the organizational structure.

It also appeared that most companies tended to make decisions about the profitability of refrigerated cargo, customers, and markets with insufficient facts. The firms were legally bound to serve the public but determining sales emphasis remained a carrier prerogative. Market surveys and continuous records of refrigerated shipments in

terms of revenue and tonnage by active and potential customers are recommended as guides to expanded sales efforts.

In recent years, *refrigerated piggyback* transport has developed rapidly and this method may become formidable competition to many long distance motor carriers. On the other hand, less than truckload (LTL) refrigerated service has been generally unavailable or unsatisfactory. The majority of carriers in the study had not evaluated the demand for LTL refrigerated service. It appears that the specialized carriers need to re-examine the changing economic forces in long-haul transportation as well as the market potential of scheduled LTL refrigerated service.



Loaded highway trailer being lifted to a railroad flatcar for a piggyback run. (Chicago & Eastern Illinois Railroad photo)

Finally, financial support for managerial and economic research and education in motor transport is limited. The channels of communication are not developed between the refrigerated trucking industry and most universities. Managerial and economic problems are, in many companies, the most troublesome and important areas

facing truckline administrators. So it is necessary that communication be established and competencies of university agricultural economics research and Extension personnel be directed to solving the problems of refrigerated transportation if this country is to achieve the best possible food distribution system.



Transfer of perishable lading from refrigerated highway transport to jet airliner exemplifies growth of intermodal transport. (Brady Motorfrate photo)

## CHAPTER 5

# Summary and Implications

The regulated motor carrier movement of refrigerated agricultural commodities is a large and changing process. In 1962, a total of 31 perishable commodity classes accounted for \$185 million, or 9 percent of the \$2 billion total revenues received by all Class I regulated motor carriers. From 1958 to 1962, large regulated truck lines increased their revenues from refrigerated traffic by 37 percent and their perishable tonnage by 16 percent.

The large Midwestern-based regulated trucking companies have expanded their share of the refrigerated traffic market in recent years. These firms, based in 12 states, originated 30 percent of the 8.8 million tons of perishables that moved by Class I carriers in 1962. They also accounted for 33 percent of the \$185 million perishable freight revenue. From 1958 to 1962, Midwestern carriers increased their tonnage of refrigerated commodities by 42 percent and revenue by 61 percent. Almost half of the 2.7 million tons of meat and poultry products hauled by Class I motor carriers in 1962 was originated by Midwestern truck lines.

One structural change in motor transportation occurring since the end of World War II has been the rapid growth and development in specialized refrigerated motor transport. Capitalizing on lower commodity rates and single-line service covering a vast territory, specialized carriers have provided some shippers an important competitive advantage. In 1958, 55 Class I specialized motor carriers hauled three million tons of refrigerated solid products. In 1963, 78 Class I refrigerated solid products carriers transported more than 5.3 million tons.

At least 60 percent of the food consumed in this country requires temperature control in the distribution process. Per capita consumption has increased in many important perishable goods including meats and frozen foods. This means a large and growing market potential exists for the regulated motor carrier industry. The technological advancements in trailer design, refrigeration systems, and insulation now permit heavier loadings and more effective product quality control in transit. Trailer upgrading has been further stimulated by higher minimum state size and weight laws. However, the organizational characteristics, business practices and emerging

trends of intercity refrigerated trucklines are not well understood by students of agricultural business and marketing.

In 1964, 15 Midwestern Class I motor common carriers were studied in an attempt to better understand how transport agencies conduct and control refrigerated commodities transportation. Eight carriers were specialized refrigerated products carriers, and seven were general commodities carriers who operated at least 12 refrigerated trailers.

Following personal interviews with each firm, a comparative analysis of specialized and non-specialized carriers included: objectives, organization, size of business, financial situation, business methods, competition, and problems.

The non-specialized group had been organized a longer period of time, owned more assets, earned larger revenues, and transported more total tonnage than the specialized group. Perishable commodities accounted for an estimated 15 percent of non-specialized carrier tonnage. The truckload refrigerated service commonly involved meat products. Refrigerated shipments were transported an average distance of 350 miles over regular routes, and the cargo helped to correct the effects of uneven carrier traffic patterns. Although opportunities appear to exist for continued development of refrigerated traffic, most carriers did not plan to expand beyond present levels of output.

The activities of non-specialized companies were organized by terminals and functional departments. The carriers have not always followed the desirable procedure of centralized refrigerated dispatching with close supervision by a limited number of management personnel. Consolidated terminal production reports precluded the analysis of particular refrigerated shipments. Market analysis of active and potential customers would provide a means of optimizing business decisions.

The specialized group, though more recent in development, has shown a remarkable growth from 1960 to 1963. The nature and organization of long distance trucking, coupled with a growth in shipper's demand for specialized services, have contributed to this expansion. Furthermore, the carriers planned to expand terminal fa-

cilities, sales personnel and refrigerated equipment. The specialized group provided truckload service primarily to the Midwest meatpacking industry. The outbound refrigerated shipments were transported an average distance of 1,345 miles over irregular routes. Low revenue exempt perishable commodities were often handled on the return haul because of commodity restrictions in carrier operating certificates.

The specialized companies were organized by type of customers and by functional departments. A continuous program of research and education appeared needed to assist the executives to develop standards of performance and to improve the control of drivers and equipment. Automatic temperature recorders on trailers would provide factual information for management control purposes but the innovation was not commonly used.

The most competitive form of refrigerated transportation was the specialized motor common carrier. All-rail piggyback appears to be a substitute to some long-distance refrigerated carriers. Private carriers of refrigerated products represented competition to some non-specialized trucklines.

Managerial and economic problems were found to be the most troublesome and important areas facing truckline administrators. The priority problems were: excessive delays at destination to unload resulting in reduced turn around and increased costs; increased competition from illegal trucking forms and arrangements; lack of an effective claims prevention program; inadequate driver selection and training; lack of desirable revenue freight on the backhaul; and ineffective middle management development and training. It was also observed that most companies needed to clarify corporate objectives, expand research and long-range planning efforts, and analyze less-than-truck-load refrigerated service.

The Extension transportation specialist has an opportunity to extend management and economic research results to this industry. It appears that carrier executives would welcome economic information that could be used for market analysis. The managers would appreciate additional knowledge in the planning process, and in particular, ways to improve management efficiency.

Applied research is needed to determine the true causes, extent of, and alternative solutions to waiting time. A greater understanding and cooperative working relationship with shippers and carriers is recommended. The Extension specialist will find a receptive audience among the refrigerated carriers as channels of communication are developed.

Carrier management is looking for guidance in devising better ways to control perishable operations. Many of these entrepreneurs now have or plan to rent electronic data processing equipment. The Extension specialist may be able to help managers to maximize the equipment's usefulness.

Some non-specialized carriers could increase the utilization of equipment and company profit through a thorough reconsideration of perishable freight. However, they may need information on fitting this specialized program into the over-all company operation.

Finally, carrier managers would appreciate unbiased, technical information on the merits and limitations of refrigerating systems, improved loading methods, more effective and practical in-transit temperature control, claim prevention techniques, and more rapid settlement procedures involving multiple carriers and/or modes. Many of these critical issues can best be approached through informal educational programs of the Cooperative Extension Service.

# APPENDIX A

## SUMMARY OF TRUCKLOAD PERISHABLE FREIGHT TRAFFIC FOR 1962, COMPARED WITH SIMILAR TRAFFIC FOR 1958

ICC Code	Commodity	1962			1958			Incr. (Decr.) in Avg. Tons per Trailer	Saving in Truck-loading, 1962 Compared with 1958*
		Truck-loads per Orig.	Tons Orig.	Tons per Trailer	Truck-loads per Orig.	Tons Orig.	Tons per Trailer		
		Thous.	Thous. Tons		Thous.	Thous. Tons			
49	Apples, fresh	3.7	67	18.1	2.2	36	16.2	1.95	- 449
51	Bananas	12.3	175	14.2	4.3	47	10.9	3.35	-3,778
53	Berries, fresh	.4	7	18.0	.4	5	12.3	5.71	- 169
55	Cantaloups & Melons, NOS	2.0	37	18.1	.9	15	16.6	1.51	- 186
57	Grapes, fresh	3.2	67	21.1	1.1	20	18.5	2.66	- 457
59	Citrus fruits, NOS	1.6	26	16.2	9.3	222	23.8	(-7.59)	+ 523
61	Oranges & Grapefruit	9.9	171	17.2	4.8	76	15.7	1.47	- 932
63	Peaches, fresh	10.7	215	20.1	7.3	145	19.8	.37	- 202
65	Pears, fresh	2.1	43	20.4	4.1	81	20.0	.37	- 38
69	Fruits, fresh, NOS	5.0	76	15.1	3.2	47	15.0	.17	- 58
73	Fruits & Berries, NOS, frozen	7.8	132	17.0	5.6	69	12.3	4.67	-2,938
77	Cabbage	.7	12	16.5	.5	7	13.5	3.03	- 168
79	Celery	1.8	28	15.6	.8	12	14.2	1.37	- 173
81	Lettuce	7.4	122	16.6	21.6	422	19.6	(-2.98)	+1,126
85	Potatoes, other than sweet	12.0	221	18.4	8.6	151	17.6	.81	- 552
87	Tomatoes	13.7	303	22.1	13.1	270	20.7	1.42	- 942
89	Vegetables, fresh, NOS	15.4	232	15.1	11.3	134	11.8	3.25	-4,231
95	Vegetables, frozen	18.1	276	15.3	29.3	546	18.7	(-3.39)	+3,302
215	Meats, fresh, NOS	138.4	1,929	13.9	120.2	1,640	13.6	.29	-2,965
217	Meats, cured-smoked	21.4	297	13.9	20.1	269	13.4	.49	- 782
219	Packinghouse products, NOS	22.2	306	13.8	27.2	379	14.0	(- .14)	+ 222
225	Poultry, dressed and frozen	16.7	228	13.6	17.1	209	12.2	1.47	-2,015
221	Margarine, NOS	10.8	169	15.6	12.8	179	14.0	1.66	-1,285
227	Eggs	3.6	51	14.2	3.8	48	12.7	1.44	- 411
229	Butter	9.9	171	17.2	10.3	160	15.6	1.61	-1,032
231	Cheese	14.6	219	15.0	21.4	311	14.5	.44	- 444
233	Dairy Prods., NOS	67.5	1,151	17.1	33.7	578	17.1	(- .06)	+ 250
243	Seafood, NOS	11.3	201	17.7	6.1	77	12.5	5.26	-4,769
749	Liquors, malt	17.9	309	17.3	21.1	394	18.7	(-1.37)	+1,312
761	Candy & confectionary	44.6	632	14.2	40.7	568	14.0	.22	- 715
765	Food products, NOS frozen	70.4	986	14.0	41.4	523	12.6	1.37	-7,625
TOTAL (31 commodities)		577.2	8,860	15.4	504.3	7,638	15.2	.20	-7,626

\*To arrive at saving in truckloading, tons 1962 were ÷ average tons per trailer 1958. The difference between quotient representing truckloads and the 1958 truckload = (+) or (-). (-) = saving in truckloads.

Source: Freight Commodity Statistics, ICC, 1959, 1963.

## APPENDIX B

### PRODUCTION OF MEAT AND COMMERCIAL FROZEN FOODS AND MOVEMENTS BY REGULATED CLASS I MOTOR CARRIERS AND RAILROADS\*, 1958-1962

Year	FROZEN FOODS <sup>1</sup>					MEATS <sup>2</sup>				
	Prod.	Motor	Percent of Prod.	Rail	Percent of Prod.	Prod.	Motor	Percent of Prod.	Rail	Percent of Prod.
	Thous. Tons	Thous. Tons	Percent	Thous. Tons	Percent	Thous. Tons	Thous. Tons	Percent	Thous. Tons	Percent
1962	4,557	1,621	36	1,536	34	14,481	2,533	18	3,746	26
1961	4,251	1,427	34	1,348	32	14,293	2,588	18	3,667	26
1960	3,987	1,407	35	1,230	31	14,104	2,630	19	3,639	26
1959	3,283	1,217	37	1,060	32	13,660	2,581	19	3,752	28
1958	2,514	1,347	54	917	37	12,829	2,288	18	3,477	27
5-year Total	18,591	7,082	38	6,091	33	69,366	12,618	18	18,291	26
5-year Average	3,718	1,404		1,218		13,873	2,524		3,658	

\*ICC Commodity classes for frozen foods were: 73, 95, 225 and 765. Meat classes were: 215, 217, 219.

<sup>1</sup>Output includes: fruits, vegetables, poultry, meats, seafoods, prepared foods, and concentrates.

<sup>2</sup>Output includes: beef, pork, lamb, and veal, based on carcass-weight equivalent.

Source: Quick Frozen Foods; Livestock and Meat Statistics, Statistical Bulletin No. 333, U.S.D.A.; and Freight Commodity Statistics, ICC.

## APPENDIX C

### MIDWESTERN TRUCKLOAD PERISHABLE FREIGHT TRAFFIC ORIGINATED AND FREIGHT REVENUE BY CLASS I MOTOR CARRIERS OF PROPERTY, 1958, 1962<sup>1</sup>

Commodity Classes	Region	1962		1958		Change in Tonnage 1958-62	Change in Revenue 1958-62
		Tonnage	Gross Freight	Tonnage	Gross Freight		
		Orig.	Revenue	Orig.	Revenue		
		Thous. Tons	Thous. Dollars	Thous. Tons	Thous. Dollars	Percent	Percent
<u>Products of Agr.</u>							
18 selected classes	U.S.	2,210	38,283	2,305	20,219	-4	89
	Midwest	527	15,701	185	5,060	183	210
<u>Animals and Products</u>							
4 meat & poultry classes	U.S.	2,760	78,185	2,496	63,397	11	24
	Midwest	1,340	32,543	1,135	23,427	18	39
5 other selected classes	U.S.	1,762	19,481	1,276	17,711	38	10
	Midwest	485	5,185	328	4,339	48	20
<u>4 Miscellaneous Classes</u>							
	U.S.	2,128	48,859	1,561	33,208	26	47
	Midwest	293	8,002	208	5,299	41	51
<u>Total</u>							
31 classes	U.S.	8,860	185,808	7,638	134,535	16	37
	Midwest	2,645	61,431	1,857	38,126	42	61

<sup>1</sup>See Appendix B for complete list of 31 perishable commodities used in the analysis.

Source: Motor Carrier Freight Commodity Statistics, ICC, 1959 and 1963.

## APPENDIX D

### COMPARISON OF FINANCIAL AND OPERATING RATIOS SPECIALIZED AND NON-SPECIALIZED CARRIERS INCLUDED IN STUDY, 1960 AND 1963

	:	Eight Specialized		:	Seven Non-Specialized	
	:	1960	1963	:	1960	1963
Operating Ratio (Operating Expenses/Operating Revenues)		97.1%	96.1%		97.2%	97.3%
Current Ratio (Current Assets/Current Liabilities)		1.18	1.14		.80	.90
Return on Investment (Net Profit/Owners' Equity)		19.9%	18.3%		12.0%	7.1%
Sales to Accounts Receivable (Gross Revenue/Accounts Receivable)		16.3	13.6		17.3	13.8
Collection Period (254/(Sales to Accounts Receivable))		16 days	19 days		15 days	19 days
Current Liabilities to Total Liabilities and Owners' Equity (Current Liabilities/Total Liabilities & Owners' Equity)		32.4%	33.1%		40.0%	41.6%
Total Debt Ratio (Total Liabilities/Total Assets)		.63	.68		.57	.57
Owners' Equity Ratio (Owners' Equity/Total Assets)		.37	.32		.43	.43
Total Debt to Worth Ratio (Total Liabilities/Owners' Equity)		1.70	1.86		1.35	1.33



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