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Frito-Lay: The Backhaul Decision

In the fall of 1983, Ed Kugler, group manager of the Freight Operations Group (FOG) at Frito-Lay, Inc., looked at the proposal sitting on his desk. Originally conceived by Ernest Harris, group manager of Distribution Services, the proposal recommended that Frito-Lay use its privately-owned fleet of trucks to haul goods for other companies. Frito-Lay's fleet of over 600 trucks was used to transport its products from its manufacturing plants and regional warehouses to storage locations where goods were made available to the sales force. Because the trucks were generally empty on the backhaul (return) portion of each trip, Harris had proposed selling those backhaul miles to other companies needing transportation services. The proposal had to be approved by management, not only in distribution, but in manufacturing and sales as well.

Frito-Lay, Inc.

Frito-Lay, Inc. was the largest manufacturer of salty snacks in the United States. With 27,000 employees and sales of $2.053 billion in 1982, it was the only full-line salty snack manufacturer distributing its product nationwide.

Frito-Lay, Inc. resulted from the 1961 merger of the Frito Company of San Antonio and the H.W. Lay Company of Atlanta. In 1965, Frito-Lay was acquired by PepsiCo, Inc., and was a highly profitable subsidiary (see **Exhibit 1**). Following the practical admonishment "If it ain't broke, don't fix it," PepsiCo permitted Frito-Lay's management team to operate with little interference or direction from corporate headquarters. By 1983 PepsiCo also owned Pizza Hut, Taco Bell, North American Van Lines, Lee Way Motor Freight, and Wilson's Sporting Goods.

Product Line

Frito-Lay's product line consisted of potato chips, corn chips, tortilla chips, cheese-flavored snacks, pretzels, and a variety of other snack items and dips. Six "core" products accounted for 80% of Frito-Lay's sales. Each core product (see **Table 1**) was a short-shelf-life (25 to 30 days), low-density (that is, high-volume and low-weight) product that had sales in excess of $100 million per year. Because of their short shelf lives, core products had to move very quickly through Frito-Lay's distribution system. In less than nine days, core products were converted from raw materials to finished goods by the manufacturing organization, shipped to sales storage locations by the logistics organization, and delivered to retail outlets by the sales organization.

This case was prepared as a basis for class discussion rather than to illustrate either effective or ineffective handling of an administrative situation.

Table 1 Frito-Lay Products

Core Products	Specialty Products
LAY'S® Potato Chips (16%)*	GRANDMA'S® Cookies
RUFFLES® Potato Chips (16%)	BAKEN-ETS® Fried Pork Skins
FRITOS® Corn Chips (12%)	FUNYUNS® Onion Flavored Snacks
DORITOS® Tortilla Chips (22%)	ROLD GOLD® Pretzels
TOSTITOS® Tortilla Chips (6%)	Popcorn
CHEETOS® Cheese Flavored Snacks (8%)	Beef Jerky
	Nuts
	Cheese & Peanut Butter Crackers
	Enchilada & Jalapeno Bean Dips
	Picante Sauce

*The numbers in parentheses indicate the portion of Frito-Lay revenue due to each core product.

In contrast to core products, specialty products had lower sales and longer shelf lives, in some cases exceeding 90 days. Because of these differences, specialty products moved through the Frito-Lay distribution system at a slower rate than core products.

The Frito-Lay product line comprised 180 SKUs.[1] The growth of the number of SKUs (up from 120 in the early 1970s), could be attributed to several factors: the development of new products (e.g., Tostitos® round tortilla chips, introduced in 1981); acquisition (e.g., Grandma's® cookies, acquired in 1980); and the introduction of different flavorings and product variations (e.g., Cheetos® snacks were sold in two varieties—"puffed" and "extra crunchy," and Lay's® potato chips were offered in regular, barbecue, sour cream and onion, and cheese flavors).

Competition[2]

In the early 1980s, Frito-Lay was reaching the end of a period of tremendous growth. Having completed its expansion to nationwide distribution from its original base in the South and Southwest, the company could no longer count on continued geographical expansion to fuel growth. At the same time, growth in the salty-snack[3] market was slowing.

Frito-Lay faced three types of competitors in the salty-snack market: national, regional, and private label. National competitors, none of which competed head-to-head with Frito-Lay's entire product line, included Bordens (Wise® potato chips and pretzels, Guys® potato and corn chips, Old London® cheese crackers, and Cracker Jack® caramel corn), Nabisco (Nabisco® pretzels and crackers), Standard Brands (Planters® nuts, pretzels, cheese puffs, corn and tortilla chips, and Pinata® tortilla chips), and Procter & Gamble (Pringles® processed potato chips). The national brands, including Frito-Lay's, accounted for just over half (by weight) of all of the salty snacks manufactured in the country.

Regional manufacturers were especially strong in potato chips and pretzels. In the Northeast, for example, Snyder and Bachman held strong positions with their branded potato chips and pretzels. In the West, Laura Scudder and Sunshine shared 20% of the salty snack market between them. In the early 1980s, these regional manufacturers, with their established brand identities and high regional market shares, were becoming increasingly strong competitors for Frito-Lay. The regional companies

[1] An SKU is a stock-keeping unit. An SKU represents a particular product in a particular flavor and size (e.g., a one-pound bag of barbecue-flavored Lay's® potato chips).

[2] Portions of this section are based on material in the Harvard Business School case *Frito-Lay, Incorporated (A)*, #9-582-110, Rev. 11/85.

[3] For the purposes of this case, we will refer to the market that Frito-Lay served as the salty-snack market.

were large enough to achieve manufacturing economies yet did not incur the overhead expenses associated with full nationwide marketing and distribution of their products. Regional manufacturers held approximately one-third (by weight) of the domestic salty-snack market.

The rest of the market was held by private-label goods produced under contract by local or regional manufacturers for customers such as major supermarket chains. The products were marketed under the customer's "house" brand or with the "captive" brand of the manufacturer which was granted exclusively to a given customer in a geographic area.

Frito-Lay products accounted for nearly half (by weight) of the salty-snacks consumed in the U.S. In corn and tortilla chips, Frito-Lay served about 80% (by weight) of the market. In potato chips and pretzels, it held a 32% and 14% share, respectively (see **Exhibit 2**).

Store-Door Delivery

Rather than distribute its products through third-party distributors and brokers or via its customers' warehouses or distribution centers, Frito-Lay chose to deliver its products directly to retail establishments. The only exception to this practice was its delivery to vending machine operators, who stocked their own machines. These "vend" accounts comprised 5% of Frito-Lay's sales.

For all but the vend accounts, Frito-Lay salespeople were responsible for moving Frito-Lay products from the company's network of 169 distribution centers and well over a thousand bin locations[4] to store shelves. The sales force served 300,000 retail outlets, replenishing each an average of twice a week.

The company estimated that using direct store delivery cost from 5% to 10% more than distribution through a broker or through chain warehouses, but was willing to incur this additional cost because of the total control direct delivery offered over the distribution network. Direct store delivery allowed Frito-Lay to maintain product freshness and quality, and to closely monitor the sales of its products. Direct store delivery also allowed Frito-Lay salespeople to merchandise their displays, stocking new product and removing stale and damaged product.

Frito-Lay considered direct store delivery to be a competitive advantage in the salty-snack market, and the delivery system was backed by a corporate culture that emphasized "service to sales." *In Search of Excellence* describes this culture:

> What is striking is Frito's nearly 10,000-person sales force, its "99.5% service level." In practical terms, what does this mean? In means that Frito will do some things that in the short run clearly are uneconomic. It will spend several hundred dollars sending a truck to restock a store with a couple of $30 cartons of potato chips. You don't make money that way, it would seem. . . . You can always make a case for saving money by cutting back a percentage point or two. But Frito management, looking at market shares and margins, won't tamper with the zeal of the sales force.
>
> Frito simply lives for its sales force. The system succeeds because it supports the route salesman, believes in him, and makes him feel essential to its success. There are about 25,000 employees in the company. Those who are not selling live by the simple dictum "Service to Sales." While the plant manager, to pick an example, is clearly evaluated on the traditional basis of whether or not he makes his cost budget,

[4] Bins were unstaffed locations (often a salesperson's garage or a "mini-warehouse") that served as a stocking point for one or two salespeople.

when the sales force is in a crunch he won't hesitate to run the plant overtime to make sure sales gets what it needs. If he doesn't, he'll hear about it from all quarters.[5]

Manufacturing

Frito-Lay operated 35 plants spread across the nation (see **Exhibit 3**). Except for a few minor specialty items such as cheese dip, popcorn, crackers, brownies, and nuts, which were purchased from outside suppliers, core and specialty products alike were produced at Frito-Lay plants. Many products were produced at multiple plant locations. For example, of the 35 plants, 21 made potato chips, 22 made Tostitos® tortilla chips, and 23 made Doritos® tortilla chips. In contrast, dips made by Frito-Lay were manufactured in a single plant in Texas.

Plants were classified into three categories: full-mix, core-mix, and no-mix. These categories were based not on what a plant produced, but rather on the product mix the plant shipped from its warehouse to sales bins and distribution centers. A full-mix plant supplied Frito-Lay's entire line of products from its warehouse facility. Because no plant actually produced the entire product line, full-mix plants relied on shipments from other plants to complete their product offering. One-third of Frito-Lay's plants were full-mix.

Core-mix plants shipped all core products from their warehouses. Those that did not produce the full range of core products relied on interplant shipments to augment their product offering. One-third of Frito-Lay's plants were core-mix. The remaining third of Frito-Lay's plants were no-mix plants which shipped only the product(s) they produced. No-mix plants typically produced specialty products.

Every plant was assigned a product service area (PSA) for each product it produced. The boundaries of the PSAs were flexible and changed frequently, depending on which plant could provide a particular product to a particular area most economically. PSAs were determined by the least landed cost of supplying product to the sales force. Landed cost had two major components: manufacturing cost, which included the cost of raw materials and the cost of conversion to finished product, and delivery cost, the cost of shipping the product to distribution centers and bins.

PSA assignment was described as a Darwinian system in which efficient plants survived by getting larger service areas and plants vied with one another to increase their PSAs. The concept of least landed cost was deeply ingrained in Frito-Lay's manufacturing and logistics managers. Although many PSA changes were initiated by requests from plant managers, it was the Product Supply Group, established in 1981 as a neutral party to negotiate tradeoffs between manufacturing and distribution costs, that calculated savings and reassigned territory. During its first year of existence, the Product Supply Group made PSA reassignments that resulted in savings of more than $10 million. Each subsequent year typically saw 20 PSA changes moving a total of 10 million pounds of product from one plant to another, with a net savings to the company of $1.5 million.

Regional Warehouses

In addition to the small plant warehouses where finished goods awaiting shipment were stored, Frito-Lay operated two regional warehouses which were used almost exclusively for specialty products. Core products, because of their short shelf lives and high sales volumes, moved directly from a plant to the sales force.

[5] Thomas J. Peters and Robert H. Waterman Jr., *In Search of Excellence* (New York: Harper & Row, 1982).

Frito-Lay had added the regional warehouses because several of the plant warehouses were reaching capacity. The regional warehouses were used not only as additional storage space but also as consolidation points for specialty products moving long distances. Therefore, when appropriate, specialty products moved through a multi-tier distribution system, going from plant to regional warehouse and then on to the sales storage locations. The company expected to add additional regional warehouses where and when sales volume and space constraints dictated.

Purchasing

Purchasing was a centralized function within Frito-Lay. Operating out of company headquarters, it was responsible for the acquisition of basic materials used by the plants. Purchases included potatoes, corn and corn meal, cooking oils, seasonings, packaging material, shipping cartons, and some finished specialty items such as cheese dip and popcorn. Most purchases were made on the basis of delivered price, with the supplier arranging transport of the inbound goods. Occasionally Frito-Lay would arrange the inbound transport of purchased materials. On those occasions, purchasing might call upon the logistics organization to assist with transportation arrangements. This assistance often took the form of informal advice on how to negotiate with railroads or motor carriers for inbound transport. In addition, logistics would occasionally arrange transport of inbound materials on Frito-Lay trucks. Less than five percent of inbound shipments were carried on Frito-Lay equipment.

There had been some discussion in the company about the possibility of Frito-Lay assuming responsibility for the transport of purchased materials. Although doing so would require a change in the company's purchasing practices, some believed that controlling inbound transport would reduce purchasing costs and increase control over incoming materials. Assuming this responsibility would require increased internal coordination: purchasing and logistics would have to work together so that inbound shipments would be transported on Frito-Lay equipment whenever a shipment could be conveniently carried on an idle truck or on the backhaul leg of a route, and on a third-party carrier when transport on Frito-Lay equipment was not attractive.

The inbound transport of potatoes would be particularly challenging. Frito-Lay consumed 1.5 billion pounds annually—5% of all of the potatoes grown in the U.S. Potatoes are living organisms that continues to undergo biological change even after harvest. Because of this, the storage and handling of potatoes had to be conducted with care. In addition, potatoes were not all alike. Different strains had different characteristics (e.g., color, sugar content, ratio of solids to water) and grew only in specific regions. During the potato harvest, which started in April in Texas, Florida, and southern California and gradually moved north to end in October in Maine, Wisconsin, and Idaho, potatoes had to be moved all about the country. During the remainder of the year, they were purchased from farmers' storage facilities.

Logistics at Frito-Lay

Frito-Lay's corporate mission was to sell the freshest, best-tasting snack foods in the world. To support this goal, logistics defined as its mission "to deliver the right product, to the right place, at the right time, in the right amount, in a cost-effective manner." Logistics' role was to provide a bridge between manufacturing and sales, distributing the product from plants and regional warehouses to sales distribution centers and bins. (As part of this responsibility, logistics also provided for interplant shipments and the movement of goods from the plants to regional warehouses.) Logistics' responsibility for finished goods ended at the sales distribution centers and bins: from those locations, the sales force was responsible for the delivery of finished goods to retail locations.

Prior to 1981, distribution activities were the responsibility of the manufacturing organization. From 1978 to 1981, the delivery cost per standard case[6] had risen from 36¢ to 41¢. In addition, logistics' share of the average cost of Frito-Lay products delivered to the retail store had grown to 4.17%, well above the historical range of 3.5% to 4%. Logistics costs were escalating as a result of the increasingly complex nature of logistics activities. The rise in SKUs, the declining levels of slack capacity in the system and addition of regional warehouses made operations more complex and more expensive. In response to these cost increases, the logistics function had been established as an entity separate from the manufacturing organization, and Frito-Lay senior management had issued a charge to the newly formed group to reduce distribution costs to their historic levels.

Organization

Heading the Frito-Lay logistics organization was Mark Wheless, vice president of Logistics, who reported to James O'Neal, vice president of Manufacturing and Logistics (see **Exhibit 4**). Mark Wheless also had responsibility for the product supply function. Tom Lehr, vice president of Distribution, reported to Wheless and was responsible for field logistics in six geographic zones as well as the Freight Operations Group, a headquarters group managed by Ed Kugler. The Distribution Services Group was managed by Ernest Harris, who also reported to Mark Wheless. It provided support and coordination services to the six zones, including planning, accounting, training, systems development, and some negotiating with railroads and large trucking firms.

Logistics was a field-managed business. The six zone managers had a great deal of autonomy to operate as they saw fit. The zone managers were responsible for logistics within their zones, including the operation of traffic centers and warehouses. Generally, there was little interaction between zones.

Operations

Frito-Lay used both its own private fleet of trucks and third-party carriers to transport its products. Third-party carriers were occasionally less expensive than the company's own private fleet; decisions to use third-party carriers were either cost- or capacity-based. Third-party carriers were used primarily on less service-sensitive shipments such as interplant and plant-to-regional-warehouse deliveries. For example, half of the company's interplant shipments were transported by third-party carriers.

Where service was critical, such as to distribution centers and bins, Frito-Lay relied on its own fleet. Eighty-five percent of all outbound sales loads were carried on company equipment. The company's private fleet,[7] which ran 69 million miles per year, comprised 678 tractors and 1,550 trailers operated by 900 drivers. Frito-Lay's equipment strategy, driven by the extremely low density of its products, was to use the largest equipment allowed by state and federal laws. Eighty-five percent of its trailers were high-volume drop-frame trailers; the remainder consisted of straight-frame and roller-bed trailers.

The floor of a drop-frame trailer was two feet off the ground, as compared with four feet for a standard straight-frame freight trailer (see **Exhibit 5**). The lower floor gave a drop-frame a load capacity of 3,773 to 4,562 cubic feet, a considerable increase over the 3,289- to 3,502-cubic-foot

[6] A standard case was a Frito-Lay accounting convention representing an average-sized case of Frito-Lay product.

[7] Apart from the fleet described here, which was owned by Frito-Lay's logistics organization, the Frito-Lay sales organization owned a fleet of smaller "route trucks" that salespeople used to carry goods from the distribution centers and bins to retail establishments.

capacity of an industry-standard straight-frame trailer (see **Exhibit 6**). The weight capacity of a tandem-axle drop-frame was about 36,000 pounds, as compared with the 40,000- to 45,000-pound capacity of an industry-standard tandem-axle straight-frame trailer. The drop-frame floor was not flat, but had raised portions at the front of the trailer and over the rear wheels which prevented the use of forklifts in the trailer. Drop frames were fairly uncommon equipment for carrying general freight—loading docks had to be specially constructed to accommodate their lower height, and loading and unloading were made more difficult and time consuming because they had to be done manually.

Frito-Lay's fleet also included straight-frame, roller-bed, and "reefer" trailers. Roller-bed trailers had the same dimensions as straight-frame trailers and were equipped with rollers on the floor. The rollers facilitated the loading and unloading of palletized loads without the use of forklifts. Reefers were refrigerated trailers.

The typical movement of a Frito-Lay logistics truck was along a route from a plant or regional warehouse to a number of distribution centers and bins. On an average day, 600,000 standard cases were hauled to 1,800 distribution centers and bins. Routes had anywhere from one to twenty stops. At each location the driver would drop off that portion of the load destined for that particular location. The driver would also pick up empty cartons, called KDs[8], for return to the plant. After completing an assigned route, the driver would drop off any KDs in the truck and return to his or her traffic center (described below) with an empty trailer. If the driver had time available according to the Department of Transportation's "Hours of Service of Drivers" regulations, the driver would then accept an assignment for another route. The majority of routes took less than one day to complete. In some metropolitan areas, a driver could cover as many as four routes in one day. Of those routes that took more than one day to cover, two-thirds required that the driver lay over for a night, and one-third required the use of driver teams.[9] Even in the most remote areas of the country, routes were covered on a regular schedule: Bins received deliveries twice a week, and distribution centers received product up to five times a week. Routes were assigned to drivers through a bidding system. Drivers bid on the available routes, with first choice going to the driver with greatest seniority. Routes were finalized, bids submitted, and assignments confirmed three days before departure.

Frito-Lay drivers were highly trained and highly skilled. Driver turnover was less than 3%, and Frito-Lay drivers typically had more than 15 years of driving experience, far above the industry average. Compensation was also well above industry norms, averaging $35,000 per year in 1983. A driver's pay was based on the number of miles driven, on the number of cases delivered, and on an hourly rate during idle periods. (Because Frito-Lay drivers adhered to very tight schedules, idle periods rarely resulted from normal operations. Compensation for idle time was issued primarily for infrequent equipment breakdowns.)

Drivers' performance was measured by a service-to-sales index (SSI), a composite measure combining the timeliness and quality of deliveries as measured by the sales force. Fifty percent of the SSI was determined by on-time arrival, the remainder was based on the following quality standards:

Were KDs picked up?
Were returned products picked up?
Was the order stacked neatly?

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[8] Frito-Lay reused the cardboard cartons used to ship its product an average of 4.7 times. This was a cost savings measure; a new carton cost approximately 50¢. After emptying a carton at a customer location, a salesperson would fold, or "knock down," the carton (hence the name KD) and return it to his or her distribution center or bin. On average, a KD occupied 15% of the volume of a filled carton. Up to 25% of a driver's trailer might be filled on the return leg of a trip.

[9] Driver teams consisted of two drivers who shared driving responsibilities. When not driving, one member of the team would sleep in a bunk attached to the back of the truck cab.

Was the order stacked by product class?
Was it stacked with the labels facing out?
Was the bin left in good condition?
Was the bin locked after delivery?
Were the lights turned off after delivery?
Was the paperwork picked up by the driver?

Frito-Lay's private fleet operated with 99.1% on-time service, with on-time defined as arrival within the specified delivery window.[10] Other trucking firms frequently defined on-time as delivery within the scheduled day of arrival, from 12:00 a.m. to 11:59 p.m.

Traffic Centers

The Frito-Lay private fleet operated out of 24 traffic centers, each managed by a plant distribution manager (PDM). Traffic centers were located near plants and regional warehouses (see **Exhibit 3**). Each traffic center was responsible for routing its fleet and scheduling the transportation needs of its associated plants or regional warehouse. At each traffic center, two to three traffic supervisors were responsible for routing and scheduling the center's fleet. (See **Exhibit 7** for a typical set of traffic center route profiles.) Traffic center personnel also decided when to use Frito-Lay trucks and drivers and when to hire third-party carriers. PDMs were heavily involved in day-to-day traffic center operations. Because of lean staffing, they would often be found assisting or substituting for various traffic center personnel. Their objective was simple-to get product into the hands of the sales force, where and when they needed it, in the most economical way possible. To support this objective, PDMs were measured on service-to-sales levels and the cost per carton to deliver the company's products.

Systems

Frito-Lay used a variety of information and decision support systems to support its logistics operations. Two of the most important were the CADEC and VSP systems.

CADEC was an on-board data gathering instrument for Frito-Lay's private fleet. Using sensors that recorded data from a truck's odometer, tachometer, and ignition, a CADEC unit continually gathered information such as speed, RPMs, and mileage. Drivers were required to manually input information regarding their work activities, rest periods, and the crossing of state lines. CADEC was used as a primary data feed for internal audit and control and to gather data to generate a printed driver log that met the reporting requirements of the Department of Transportation. Because CADEC gathered certain data automatically, Frito-Lay had been granted a waiver of some DOT driver-logging requirements. The primary objectives of the system were to increase fuel efficiency (e.g., by monitoring driver performance), to increase safety (e.g., by monitoring each driver's speed and hours of service), and to increase the accuracy and integrity of the gathered data. (A detailed description of the CADEC system appears in **Appendix A**.)

The company used run-based accounting with point-to-point standards for the performance of its trucks and drivers. Logistics managers felt that to be effective, "you have to control logistics at the point-to-point level, and CADEC gives us the information that allows that sort of control."

The introduction of CADEC in 1983, however, was not straight-forward. Ernest Harris, group manager of the Distribution Services Group, commented, "you can't 'slam-dunk' a system like CADEC. We spent a great deal of time training, talking to, and convincing drivers that we weren't

[10] Delivery windows at Frito-Lay's distribution centers were two hours long; those at the bins were twenty hours long.

trying to spy on them. We spent as much time on people as we did on the development of the technology." Although drivers were initially wary of CADEC, the system gradually gained acceptance, primarily because it freed the drivers from a great deal of log-keeping and paperwork at the end of each trip.

VSP (Vehicle Scheduling Program) was a vehicle routing package that Frito-Lay had purchased from IBM. According to internal logistics documents:

> VSP, an IBM mainframe routing system, has been used in Logistics for over a decade to route each Traffic Center's sales deliveries. While VSP has served us well, it has neither the expandability nor flexibility to accommodate an ever changing environment. The Clark and Wright algorithm used in VSP is archaic when compared to the algorithms used in current routing and scheduling systems. The unsophisticated VSP algorithm usually creates inefficient routes and these routes can only be manipulated manually. Furthermore, since each Traffic Center's VSP database must be updated via Headquarters, the data is not maintained accurately.

Headquarters logistics had started to test new systems to find one that would better meet its needs. It was expected that a new PC-based system would be installed at the traffic centers within the next two to three years.

The Backhaul Proposal

The backhaul proposal recommended using the backhaul (return) portion of the routes covered by the company's private fleet to carry goods for other companies. In other words, use idle assets (here, empty-truck miles and idle equipment) to bring in additional revenue for the company. As Ed Kugler put it, the purpose of backhaul would be "to offset distribution costs by generating revenue through the use of our available capacity, while maintaining required levels of service."

Of the 69 million miles that company's private fleet ran per year, approximately 35 million were empty return miles. After eliminating routes under 100 miles which he assumed would not be used for backhaul, Kugler estimated that approximately 20 million miles would be available to fill. His preliminary analysis showed that if Frito-Lay filled or saturated the backhaul miles in the lanes its trucks traveled, the company could realize a potential income of $15 million, with a net revenue of $7 million to $9 million (see **Exhibit 8**).

The backhaul proposal was driven by two developments: the deregulation of the trucking industry and the mandate from Frito-Lay management to halt the rise in delivery costs. Ernest Harris had proposed the backhaul program as a productivity tool to defray network operating costs, improve asset utilization, and offset inflation. He had requested and received the budget authorization to establish the FOG (Freight Operations Group) and had moved members of his organization to the new group. The FOG, after preliminary study, estimated that the cost offset due to backhaul would range from 0.3¢ per standard case in 1984 to 2.7¢ per standard case ten years into the program (see **Exhibit 9**).

Deregulation made the backhaul proposal possible. With the passage of the Motor Carrier Act of 1980, the Interstate Commerce Commission (ICC) began deregulation of motor carriers, thereby allowing new opportunities for private carriers such as Frito-Lay. Before 1980, private fleets were generally prohibited from hauling goods of other companies. Frito-Lay, however, did have experience hauling goods for other PepsiCo companies, which had been allowed under previously existing regulations.

Frito-Lay also had limited experience with for-hire carriage. A driver operating out of the Killingly, Connecticut, traffic center had identified an opportunity to backhaul agricultural goods from Maine to a feed and grain store in Connecticut.[11] Following six months of discussions with sales, manufacturing, quality control and others functions within Frito-Lay, Mike Cawley, the Killingly PDM, had set up the backhaul service, which then operated for approximately one year before the backhaul proposal was introduced. Experience with that one customer on the single backhaul land was good. Sales experienced no deterioration in service, manufacturing had trailers to load when it needed them, and quality control was satisfied that, following fumigation, the trailers were clean enough to haul the company's goods. The success Mike Cawley and his drivers achieved had established a positive precedent for backhaul services.

Implementation Plan

The first step in implementing the backhaul proposal would be to gain operating authority from the ICC and state agencies. Frito-Lay expected to be able to obtain contract carrier authority to operate "in interstate or foreign commerce, over irregular routes, transporting general commodities (except class A and B explosives, household goods and commodities in bulk)" between points in the lower 48 states. By operating under contract to an ICC-licensed property broker, Frito-Lay would be able to solicit interstate freight nationwide. The company's goal was to eventually obtain property-broker certification and eliminate the third-party broker. A broker's license would also offer an additional business opportunity, as it would allow Frito-Lay to broker loads for its for-hire accounts. By matching a customer's needs to the services of another carrier, brokers could claim 7% to 10% of the shipment's revenues.

The company also expected to be able to obtain common carrier authority, preferably by purchasing the authority from an existing trucking firm. (Purchasing the authority would eliminate the often-lengthy ICC hearing that was necessary to obtain a new authority.) Common carrier authority would also permit operations "in interstate or foreign commerce, over irregular routes, transporting general commodities (except class A and B explosives and household goods)" between points in the lower 48 states. Common carrier operation was not as flexible as that of a contract carrier because the ICC publicly reviewed all rates, claims, and billing disputes. Frito-Lay would pursue the common carrier authorization, however, "as a hedge against a possible future change in the deregulatory mood in Washington."

Finally, the company would apply to the California Public Utility Commission (PUC) for intrastate authority. Most states had regulatory bodies like the PUC that were similar to the ICC and regulated intrastate transport of goods. Because Frito-Lay operated a significant number of miles within California as a private carrier, California intrastate authority would permit backhaul carriage within the state. Applications for other intrastate authorities would be made as they were justified by market opportunities. Each state that regulated intrastate surface transportation operated with its own set of rules and guidelines, requiring that Frito-Lay prepare a separate and unique application for each state.

Ed Kugler envisioned each traffic center as an independent local business. Marketing of the company's backhaul services would be conducted by the traffic center's PDM, who would receive training in sales and telemarketing. The PDMs were the cornerstone of the backhaul plan. It would be their job to optimize the existing outbound routes, determine which routes or lanes were available for backhaul, rank the backhaul lanes by the number of miles available (i.e., frequency x distance), make

[11] Frito-Lay was allowed to serve this route because agricultural goods were exempt from ICC economic regulation. The exemption for agricultural products, long in effect, was made to allow farmers to get their crops to market without delay, using any means available.

pricing decisions for each lane, identify suitable customers, and then sell the backhaul services to those customers.

Customer identification and backhaul sales would be the two most critical portions of the PDM's backhaul responsibility. Although hauling other companies' goods would not be new to the PDMs, since they had been responsible for moving PepsiCo product, initiating leads for the backhaul program would be.

Objections to the Backhaul Proposal

Preliminary discussions about the backhaul proposal with other functions within the company met with reactions ranging from indifference to strong opposition. Sales, for example, was strongly opposed to any activities that might compromise service to sales. In addition to their concerns about the timely delivery of product to the distribution centers and bins, the salespeople worried that the backhaul program would interfere with the removal of KDs from these facilities, many of which were nearing capacity as the number of Frito-Lay products increased.

Manufacturing also voiced concerns about service. Many plants loaded trailers well in advance of their actual departure, allowing the plants the flexibility to produce larger lot sizes without accumulating product in their small plant warehouses. The plants were concerned that backhaul would reduce both the number of trailers available and the length of time that each was available to be loaded.

Quality control worried that backhaul cargo might lead to contamination of company equipment. Agricultural products, for example, might harbor rodents and insects that could infest the trailers and harm Frito-Lay goods, whereas rubberized products might impart an odor to the company's goods and chemicals might contaminate them.

The legal department expressed reservations about company liability for backhaul cargo. Carriage of high-value products such as electronics, cigarettes, or alcohol could increase the likelihood of theft and the claims that would accompany such losses. Hazardous cargoes were also a concern due to the potential liability for a spill or accident, to say nothing of the image problems such a cargo could create. Frito-Lay trailers emblazoned with hazardous cargo signs would not portray the image the company wished to present to the public.

The FOG also experienced passive resistance from areas such as advertising and accounting. Both indicated that they were too busy with other more important matters to help create the marketing brochures and tracking systems necessary to implement backhaul.

Even within logistics there was resistance to the backhaul plan. Many PDMs did not want to take on the additional tasks required by backhaul. Most had risen to their current positions through the manufacturing organization. It was widely recognized that one of the reasons Frito-Lay had one of the best private fleets in the country was that the PDMs knew their jobs. What they did not know—and many were not inclined to learn—was how to be a salesperson.

The drivers also objected to the additional responsibilities of backhaul. Adding backhauls increased the chance of overnight layovers in distant cities away from home and family. In addition, backhaul routes would be subject to more frequent, last-minute changes than established Frito-Lay routes, and would complicate the bidding process for routes. And finally, the compensation system had no provision for the new duties required by backhaul.

Conclusion

Ed Kugler was aware of all of the objections surrounding the backhaul proposal. He thought about the concerns the proposal had generated: of losing sight of the company's reason for being; of being overworked; of how the drivers would react. Kugler thought these concerns were unwarranted; it should be possible to implement the backhaul program without losing sight of the company's primary objectives. By offering the same level of service to its for-hire customers as its sales organization enjoyed, Frito-Lay could provide a transportation service of exceptional quality and substantially reduce logistics costs at the same time. As he put the finishing touches on the backhaul proposal, Kugler wondered how best to sell the proposal, both to those within the logistics organization and to others in the company.

Exhibit 1 PepsiCo Operating Statistics

	1982		1981		1980	
REVENUE (in millions)						
Beverage	$2,908.0	39%	$2,772.3	39%	$2,367.8	40%
Food Products[a]	2,323.8	31	2,177.9	31	1,830.7	31
Food Services	1,260.6	17	1,069.8	15	872.7	15
Transportation	688.1	9	725.9	10	655.1	11
Sporting Goods	318.5	4	277.3	4	230.2	4
Total	$7,480.5	100%	$7,023.2	100%	$5,956.5	100%
OPERATING PROFITS (in millions)						
Beverage	$217.7	31%	$251.6	37%	$243.9	41%
Food Products	326.4	47	298.5	44	245.8	41
Food Services	119.3	17	81.9	12	59.8	10
Transportation	15.2	2	32.4	5	39.9	6
Sporting Goods	19.2	3	14.0	2	10.9	2
Total	$697.8	100%	$678.4	100%	$594.0	100%
CAPITAL EXPENDITURES (in millions)						
Beverage	$111.2	23%	$129.4	31%	$142.1	32%
Food Products	166.8	35	141.9	34	176.1	39
Food Services	128.0	27	87.8	21	83.4	19
Transportation	28.9	6	38.2	9	32.7	7
Sporting Goods	11.0	2	9.5	2	4.1	1
Corporate	30.3	6	7.6	2	9.0	2
Total	$476.2	100%	$414.4	100%	$447.4	100%

Source: PepsiCo, Inc. Annual Reports.

[a]Includes both Frito-Lay and PepsiCo Foods International, which operates in the overseas snack market.

Exhibit 2 Top Six Vendors by Product Class—Market Share by Weight, Total U.S.—1980

Total Salty Snacks		Potato Chips		Corn Chips		Tortilla Chips		Cheese Puffs		Pretzels	
Vendors	**S.O.M.**	**Vendors**	**S.O.M.**	**Vendors**	**S.O.M.**	**Vendors**	**S.O.M.**	**Vendors**	**S.O.M.**	**Vendors**	**S.O.M.**
Frito-Lay	45.8%	Frito-Lay	31.7%	Frito-Lay	78.5%	Frito-Lay	82.9%	Frito-Lay	55.1%	Frito-Lay	14.2%
Bordens	5.7	Laura Scudder	3.1	Nabisco	3.4	Laura Scudder	1.7	Planters	5.4	Nabisco	12.4
Nabisco	2.5	Bordens	3.0	Planters	1.7	Nabisco	1.4	Bachman	4.0	Snyders	6.5
Laura Scudder	2.2	Jay's	2.8	Laura Scudder	1.3	Bordens	.6	Bordens	2.4	Bachman	6.2
Bachman	2.0	Snyders	2.0	Blue/Bell	1.0	Bachman	.5	Laura Scudder	2.2	Reisman	5.0
Snyders	1.7	Seyferts	1.8	Bachman	.8	Granny Goose	.5	Nabisco	1.9	Keebler	3.9

Source: Thomas V. Bonoma, *Frito-Lay, Incorporated (A)*, HBS case #9-582-110, Rev. 11/85.

Exhibit 3 Map of Frito-Lay Facilities

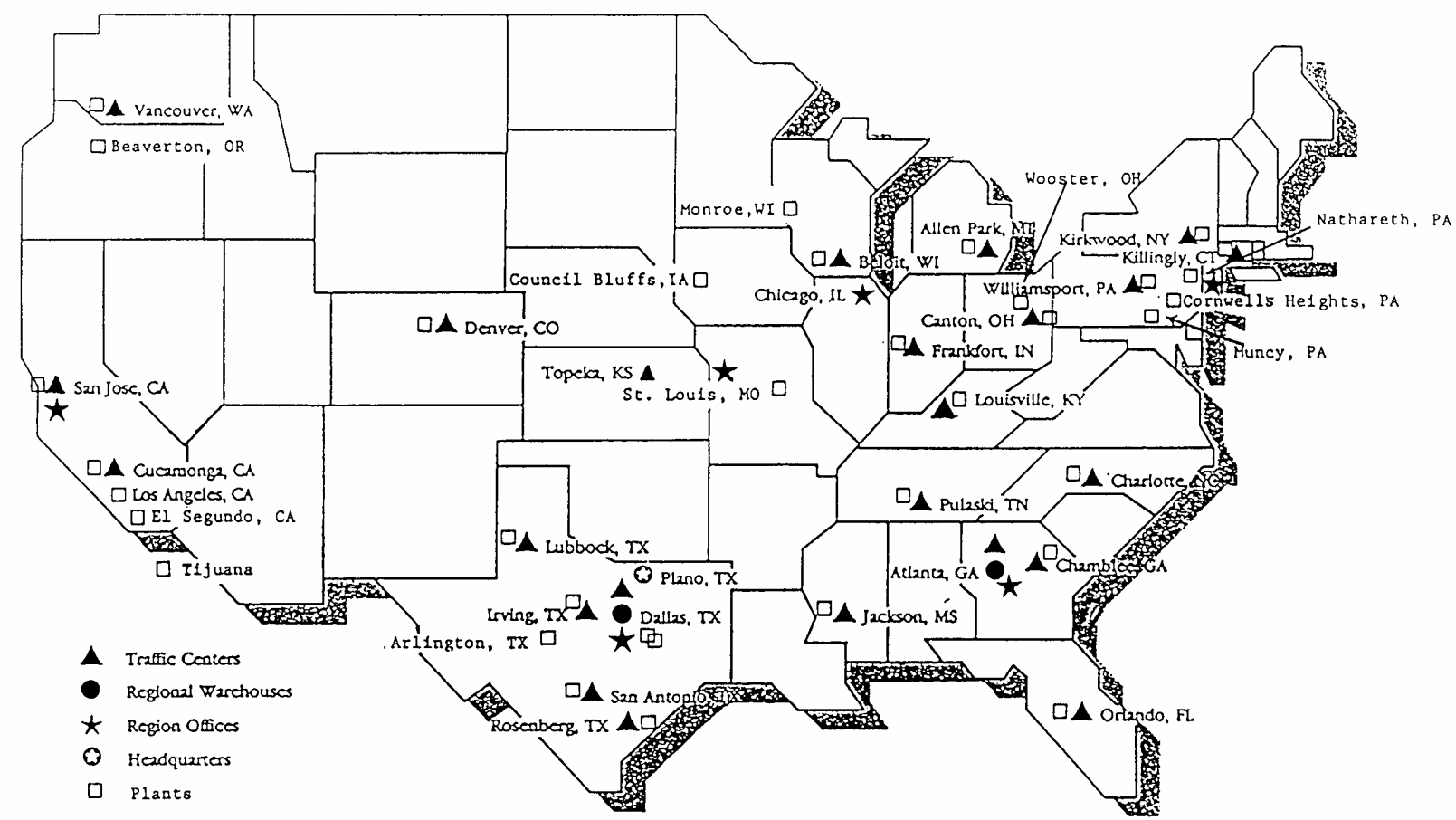

Exhibit 4 Partial Logistics Organization Chart

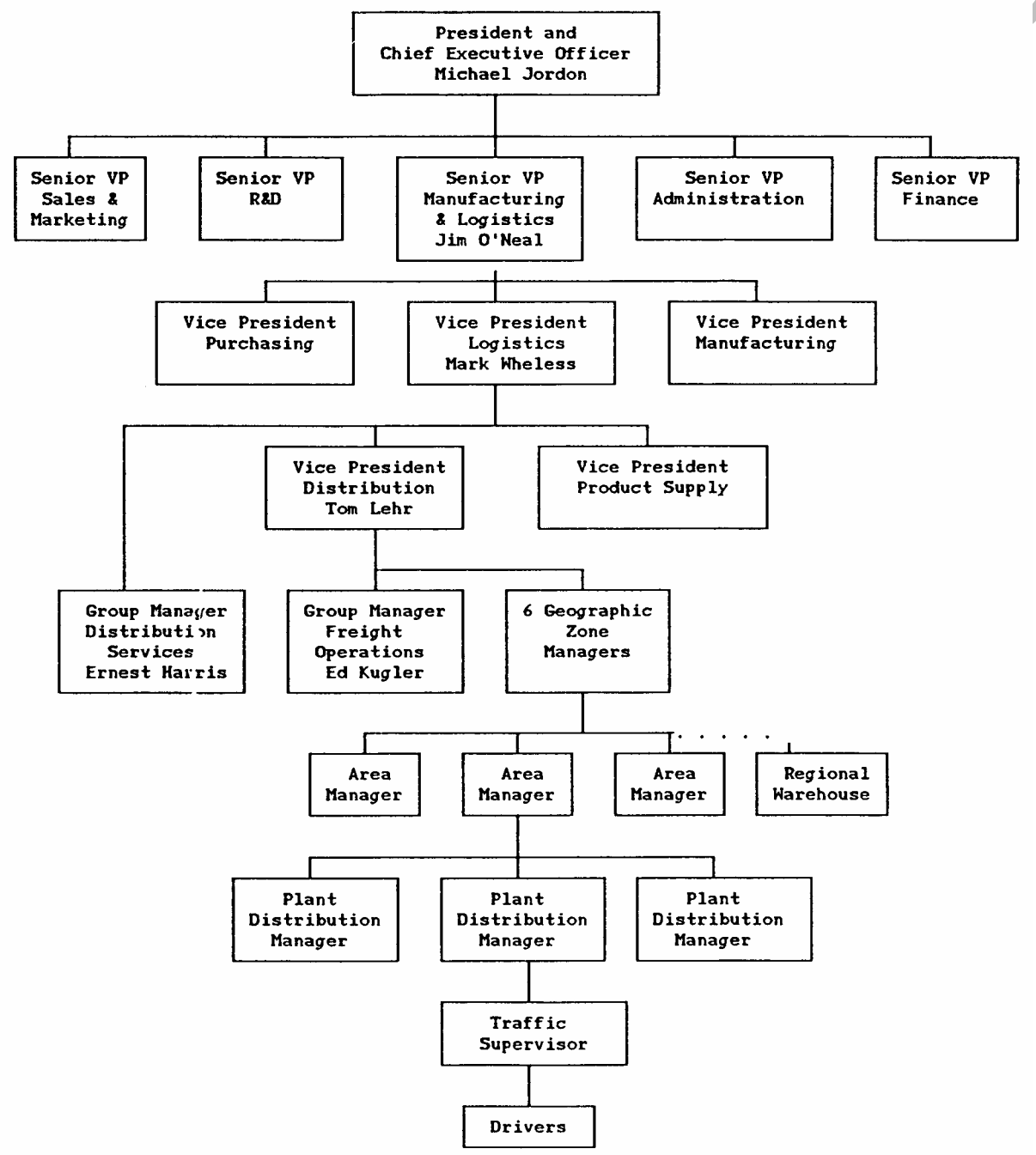

Exhibit 5 Frito-Lay's Equipment Profile

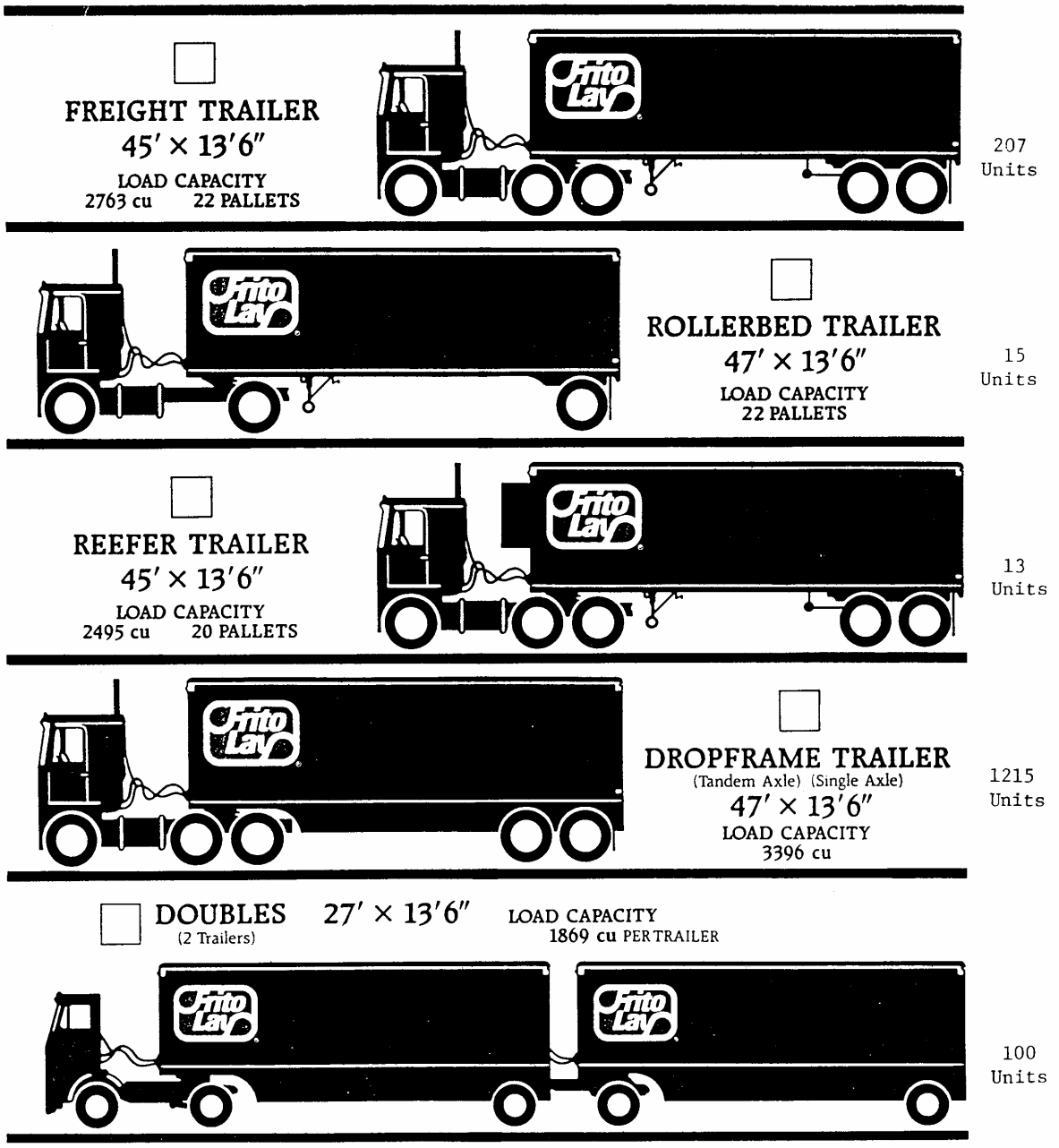

Exhibit 6 Dimensions of Frito-Lay Equipment

Trailer Type	Trailer Dimensions[1]	Water Cube[2]
Drop Frame	47' x 96"	3,773
	48' x 96"	3,858
	48' x 102"	4,109
	52' x 102"	4,472
	53' x 102"	4,562
	2 @ 27' x 96"	4,154
	2 @ 31' x 96"	4,832
	2 @ 28' x 102"	4,606
	2 @ 30' x 102"	4,968
Straight Frame	48' x 96"	3,289
	48' x 102"	3,502
	2 @ 28' x 102"	4,050

[1] Industry-standard equipment.
[2] The water cube is the number of cubic feet of water that the trailer can hold. Water cube indicates the maximum volume that a trailer can carry.

Exhibit 7 Typical Traffic Center Route Map

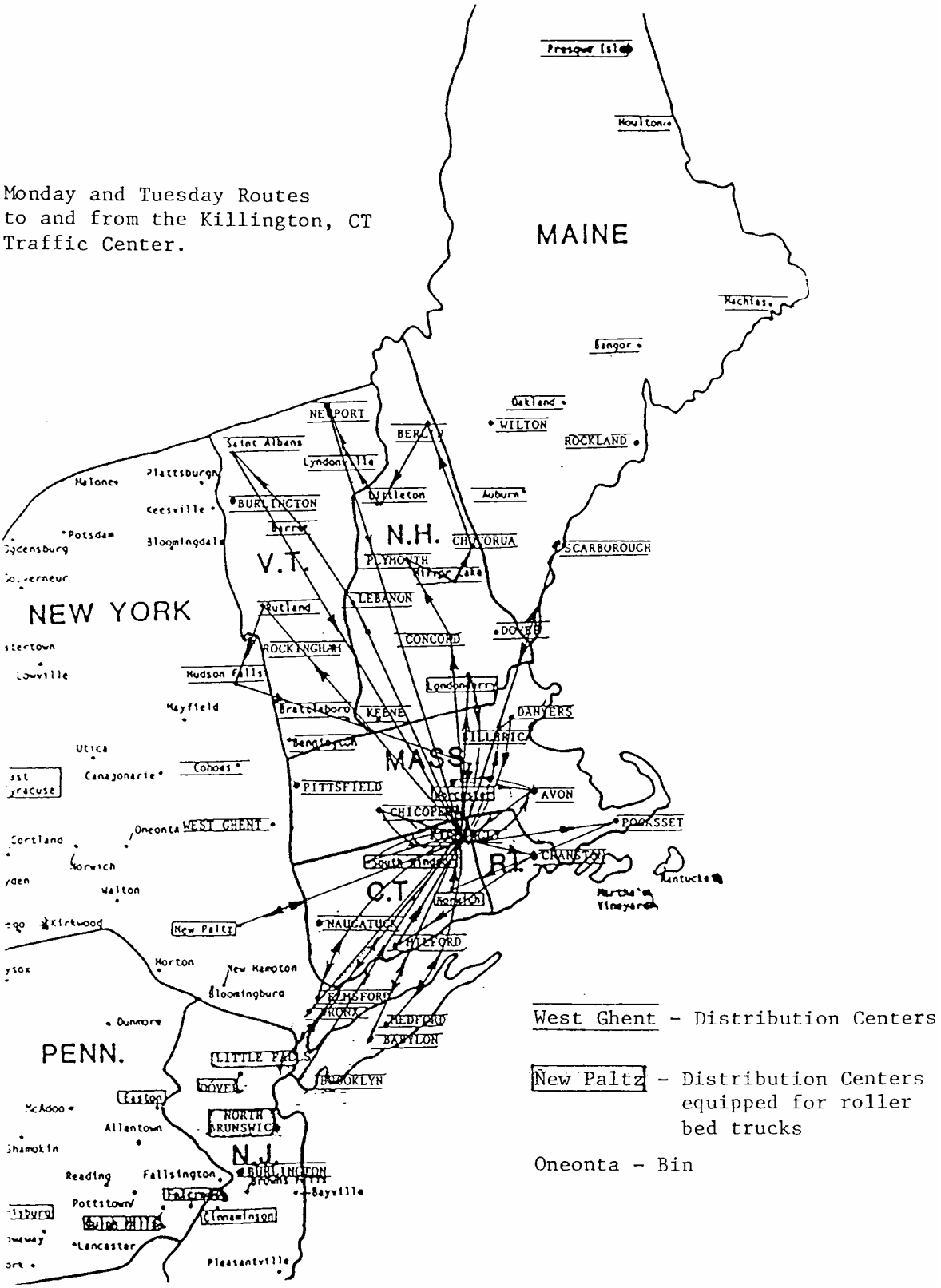

Exhibit 8 Backhaul Services Life Cycle Business Analysis

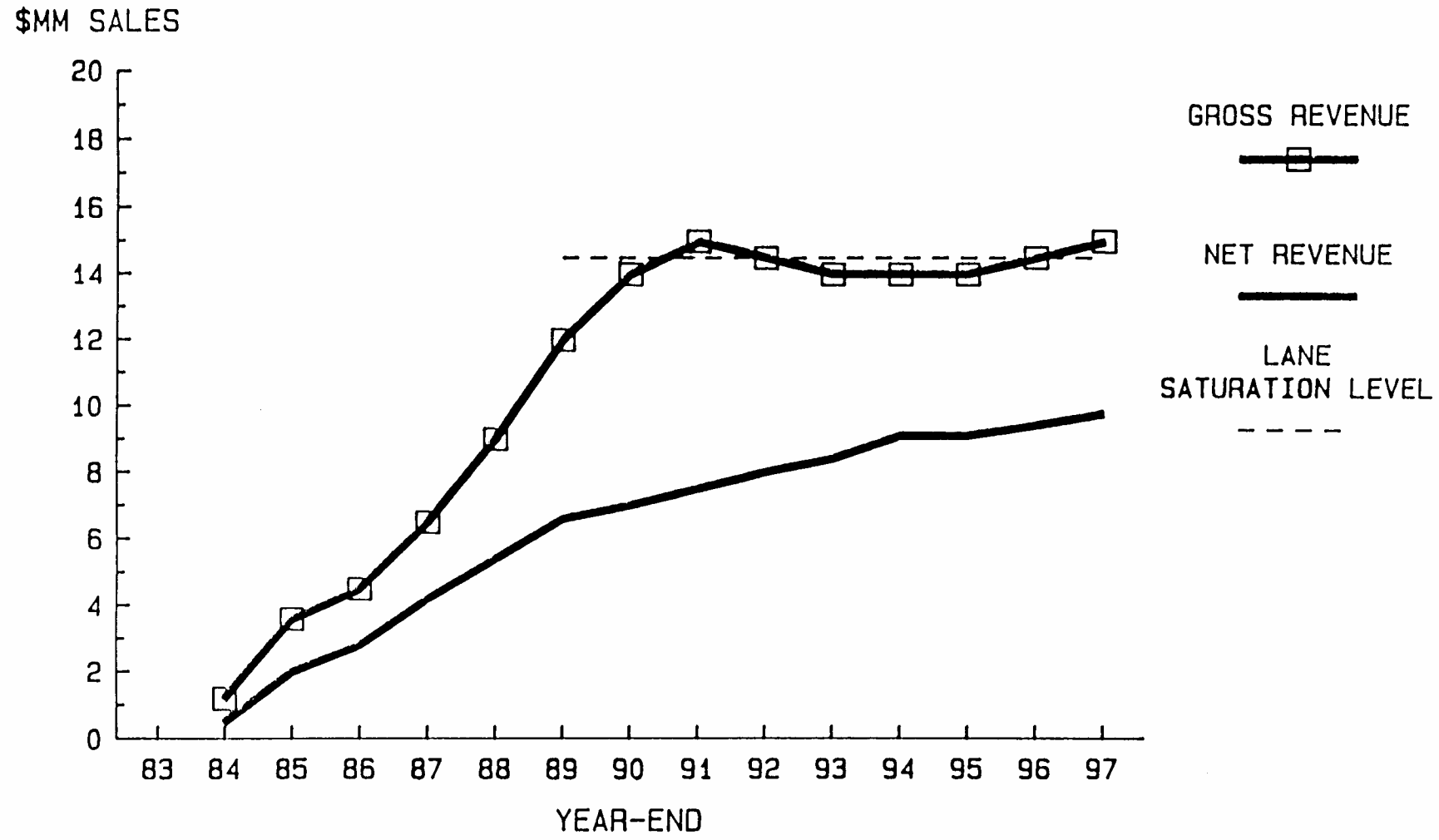

Exhibit 9 Backhaul Services Financial Impact

Year	Gross Revenue ($MM)	Net Revenue ($MM)	Net Gross Margin	Cost/Std. Operating Profit After Tax ($MM)	Case Offset	Business Life Cycle
1984	1.2	.5	45%	.25	.3¢	
1985	3.6	2.0	55	1.00	.9	INTRO
1986	4.5	2.8	60	1.40	1.2	MARKET
1987	6.5	4.2	65	2.10	1.6	DEV.
1988	9.0	5.4	60	2.70	2.0	GROWTH
1989	12.0	6.6	55	3.30	2.3	STAGE
1990	14.0	7.0	50	3.50	2.4	
1991	15.0	7.5	50	3.75	2.5	
1992	14.5	8.0	55	4.00	2.5	SATURATION/
1993	14.0	8.4	60	4.20	2.6	STABILIZATION
1994	14.0	9.1	65	4.55	2.7	
CUMULATIVE						
10 YEARS	108.4	61.5		30.75		

Appendix A

The CADEC System

The CADEC system implemented at Frito-Lay, Inc. was not simply a new means of generating and maintaining the driver logs required by the Department of Transportation. Rather, it was a total system that focused on safety, prevention of violations, electronic recordkeeping, rapid identification of violations if they occurred, and the instantaneous and automatic audit of driver logs at numerous terminal (dispatch) locations at the end of the trip. It also provided a method for centralized recordkeeping to facilitate corporate and governmental audits.

This system was developed by CADEC Systems, Inc.[12] as the CADEC 300 Vehicle Information System, and had been adapted to the specific requirements of Frito-Lay, Inc. and BMCS[13] regulations. Personnel of CADEC and Frito-Lay worked together closely to tailor the system and develop enhancements to it. The following text is extracted from a document written by CADEC to introduce the system to Frito-Lay.

Components of the System

As an aid to understanding the scope of the CADEC system, the individual components are described below, followed by a description of the logical systems cycle for electronic log generation. The components include:

1. *A dispatcher computer located at each dispatch location.* This computer can be of any manufacture and could be a minicomputer, a microcomputer, or a computer terminal that is in constant communication with a large mainframe computer at another remote facility. In the case of Frito-Lay, the dispatcher computer is an IBM-XT personal computer equipped with IBM 3270 emulation.

2. *Data link*. A data link is a microcomputer-based unit that interconnects to dispatcher computers (described above). The data link decodes memory modules that contain trip data from the on-board computer, and communicates this data to the dispatcher computer.

3. *CADEC 300*. Each truck is equipped with an on-board computer installed in the cab of a truck. It runs, alternately, off the power generated by the vehicle, off the vehicle's battery, and off the internal battery back-up in the on-board unit. **Exhibit A-1** contains a diagram of the on-board computer.

   The on-board computer accepts involuntary data from sensors and voluntary data from driver keyboard entry. All the data from sensors connected to the on-board computers are automatically collected and recorded under computer program control. The on-board

[12] CADEC Systems, Inc. was formed in February 1976 as a New Hampshire corporation with a charter to develop a digital radio communications terminal that could be mounted in vehicles and transmit digital data over conventional two-way voice radio frequencies. In 1982, CADEC expanded its charter and development efforts to become a supplier of on-board computers for the transportation and physical distribution industries.
[13] Bureau of Motor Carrier Safety.

computer records data from odometer, tachometer, and ignition sensors. These data are recorded in the memory module for subsequent transmission to the dispatcher computer via the data link. Data are entered by the driver via a numeric keypad and are verified as correct by the driver on an electronic display before they are recorded in the memory module.

4. *Memory module*. A memory module is a separate solid-state recording device with its own internal clock and battery back-up. All the trip data gathered by the sensors attached to the on-board computer or entered by the driver via the keypad are recorded on this reusable, solid-state memory device.

   In actual operation, a memory module is inserted into the on-board computer at the beginning of a trip and removed and given to the dispatcher at the end of the trip. The dispatcher then inserts the memory module into the data link, and the information in the memory module is transferred to the dispatcher computer and recorded on a disk file for permanent storage. After the dispatcher has transferred the information from the memory module to the dispatcher computer (a process that takes but a few seconds), the memory module is electronically erased and can be used again for another trip.

5. *Applications firmware*. Firmware is defined as software that is stored in hardware form. The on-board computer is controlled by firmware that is electronically etched in PROMs (Programmed Read-Only Memories). The firmware in the on-board computer controls what is automatically sensed and recorded at preselected intervals or conditions. It prompts the driver through keyboard input sequences by way of tutorial messages that are displayed on the on-board computer display. It maintains and allows for inquiry into the driver status and log information that is continuously updated throughout the entire trip.

6. *Applications Software*. In the Frito-Lay application, insofar as the BMCS driver log requirement is concerned, applications software includes all of the utility programs required to transfer data from the memory module, to record a permanent and unalterable file of the memory module image on the disk file connected to the dispatcher's computer, to edit a copy of the image file in a way that allows the dispatcher to make any necessary corrections or generate driver trip reports and 24-hour driver logs, to update and maintain duty status and associated computer files on the dispatcher computer, and to transfer data from the dispatcher computer to other computers in the Frito-Lay information system network for ongoing, internal audit and control.

   The dispatcher can edit only a copy of the original trip file. It is physically impossible for the dispatcher to alter, in any way, the original contents of the memory module image file, which is maintained as a permanent record. From an auditing perspective, it is important to note that reports generated by the system highlight any information that has been altered by the dispatcher.

Description of Systems Cycle

The benefits of the Frito-Lay system are seen in a review of the logical systems cycle. In the paragraphs that follow, each step in that logical system cycle is described, together with the specific benefits that relate to it. Although the major explanations of benefits relate to issues involving both safety and compliance with BMCS regulations, other benefits are mentioned in passing because they represent significant improvement in both efficiency and effectiveness.

1. *Dispatch*. The first step in the system involves dispatching a driver on a trip. In this operation, relative to the seven- and eight-day rules,[14] a determination has to be made whether the driver has sufficient time available to make the specific trip. Under the previous system, the determination was made manually, by reference to several handwritten documents, including the driver's logs; it was error-prone and occasionally resulted in assigning a driver without sufficient time to make a run.

   In the Frito-Lay system, an electronic driver master file is maintained on the dispatcher's computer. This file is always up-to-date with the available hours of every driver who is dispatched from the respective Frito-Lay location. Consequently, the dispatcher merely enters the driver's employee number into the dispatcher computer, and the respective driver's record of hours is displayed on a video display screen, showing current status, available hours, and other pertinent information for the driver and the assigned trip.

   The major benefits in using this approach are: (1) a potential violation is not inadvertently caused by the dispatcher before the trip begins, because all calculations are done without error by the computer; (2) safety hazards are avoided—specifically, the need for the driver to speed to shorten his on-duty or driving time in order to avoid a rules violations that may have originated as a dispatcher error; (3) productivity increases because the dispatcher can quickly review the available hours of all his drivers, preplan trips, and minimize yard time and other types of pretrip delays associated with manpower and cargo loading; and (4) driver compensation is maximized, consistent with overall productivity improvements.

2. *Pretrip activities*. Prior to the start of a trip, and while in on-duty/not-driving status, the driver inspects his vehicle and performs other steps required by federal and corporate regulations. After completion of the required pretrip activities, the driver enters the vehicle, and keys in the appropriate duty status using the proper program selection button and code. If the driver is a member of a team and is going into the sleeper berth status, the appropriate code entry is made. As soon as these entries are made:

   (a) events (or records) are permanently written in the memory module; and
   (b) the driver status information is updated in the main memory of the on-board computer.

   This information is available for immediate review.

3. *Trip activities*. During the trip, the procedure of driver entry continues. Events associated with the driver log, and other events, such as state line crossings, toll road entries and exits, expense entries, and pick-up and delivery information, are entered by the driver. The voluntary (keyboard) information entered by the driver is supplemented by involuntary information collected from the sensors attached to the on-board computer. For example, if a driver fails to enter that he is going into driver status via the keyboard, the on-board computer automatically records a DEPARTURE event (from sensor readings) after the vehicle has moved 1/2 mile—the indication that driving has begun. Similarly, if the driver fails to insert the memory module into the on-board computer, he would instantly know because he would not be able to enter any voluntary information unless the memory module was inserted correctly. All the automatic events are recorded in the on-board computer's main memory until the memory module is eventually inserted, at which time they are written into the memory module. In addition, the message INSERT MODULE flashes continuously on and off, instructing the driver to insert the memory module.

[14] D.O.T. restrictions limited the number of hours a driver could be on duty to 60 hours in any consecutive seven-day period and to 70 hours during any consecutive eight-day period.

In the interest of safety, only Program Selection Button 4 (STATE/TOLL) can be activated while the vehicle is moving. A single depression of the STATE/TOLL button establishes a time and mileage marker in the main memory of the on-board computer. This marker will be appended to the transaction that is eventually written in the memory module, after the driver has stopped the vehicle and has completed the transaction. ALL OTHER PROGRAM SELECTION BUTTONS ARE LOCKED OUT AND CANNOT BE USED UNTIL THE VEHICLE IS NOT MOVING. If a driver depresses an unauthorized program selection while the vehicle is moving, an audible beep sounds and the display remains unchanged.

During the trip, information that was formerly manually written on the driver log is automatically updated in the memory of the on-board computer in a way that it cannot be altered. Thus, the potential abuse of double logs is eliminated by the combination of the computer-generated paper logs and the up-to-the-minute driver duty status provided by the on-board computer.

Additional information is collected during the trip as a by-product of the involuntary (sensor-collected) information that is gathered to validate the driver's voluntary entries. The most significant safety-related information involves how the vehicle is driven. The on-board computer keeps track of each speeding occurrence and records it in the memory module with the time and duration of each speeding event. Both the individual speeding events, and a summary of all driving time by preselected speed and engine RPM ranges that occurred during the trip are available at the end of the trip. The driver is aware that his driving habits are being monitored automatically, which encourages him to drive safely and within the speed limits. As a result, accidents tend to decrease in frequency and severity, and lives are saved.

In addition to the decrease in accidents that results from safe driving habits and compliance with other related laws, rules, and regulations, the use of on-board computers substantially reduces fuel costs, maintenance costs, and costs associated with breakdowns.

4. *Roadside inspection capability*. The driver has in his possession all the computer-printed logs for the previous seven consecutive days, in compliance with existing BMCS regulations for driver log retention. This means that the driver has available the hard copies (computer-generated) of the required logs up to the point that the driver went on duty. These logs are generated from data that the driver entered into the on-board computer during the previous duty tours (trips).

   In addition to the hard copies of the previous trip logs, the on-board computer maintains an up-to-the-minute electronic log in its memory. At any given point in time (provided the vehicle is not moving), the driver can query the on-board computer by depressing the program election button labeled TRIP RECAP. In doing so, the driver can display the date, the time, the duty status code, and the location code associated with each duty status change—including the time, date, and origin of the current trip. Under this system, the driver is able to display the equivalent of the driver log, on an event-by-event basis, for any inspector.

5. *Post-trip activities and reporting cycle*. When the driver returns to the domicile dispatch location at the end of the trip, the driver makes a final transaction on the on-board computer which is called a LOG-OUT event. Following the LOG OUT, the driver removes the memory module from the on-board computer and delivers it to the dispatcher. When the dispatcher receives the memory module from the driver, it is inserted into the data link. The dispatcher activates a program in the dispatcher computer and transfers the contents of the memory module to the disk file in the dispatcher computer. This transferred file is called the module image file and cannot

be altered. It is a comprehensive record of the trip, including all the entries that the driver made. It also includes a record of involuntary entries that show where the driver should have made entries, but failed to do so.

After transferring the contents of the memory module to a disk file, the dispatcher computer makes a copy of the module image file which is called the trip file. The trip file can be edited by the dispatcher to complete or correct entries made by the driver. The dispatcher then requests the reports to be printed that detail the events that occurred during the trip. Any report lines to which corrections or deletions were made by the dispatcher are noted by an asterisk as having been edited. Separate reports are run for each driver in the case of a team trip.

6. *List of computer-generated reports*.

   a. *Driving performance report*: This report shows how the vehicle was being driven and identifies any speeding violations. Speeding violations are shown individually as well as aggregately.

   b. *The driver log in BMCS GRID format*: This report plots all entries made by the driver that relate to the log requirements. All the driver entries are verified against events that are involuntarily recorded during the trip from the sensors attached to the on-board computer. Any discrepancies are identified, and there is no opportunity for log falsification or keeping duplicate logs.

   c. *Driver's trip and expense reports (TDTR)*: The driver's trip report provides further verification for the log, reconciling starting times, ending times, and specific tasks that were performed.

   d. *Back-up reports*: There is substantial back-up and redundancy throughout the system to prevent loss or falsification of information and to address safety and compliance issues.

Safety Benefits of Frito-Lay System

1. *Accident reduction.* The Frito-Lay system monitors and provides information on all speeding occurrences. Because speed and other driving habits are monitored automatically during the course of a trip, with the driver's knowledge, the driver will tend to stay within prescribed speed limits. When this occurs, accidents will decrease. Conditions existing when an accident occurs can also be identified and described from the data collected by the on-board computer.

2. *Elimination of double logs and log falsification.* The Frito-Lay system provides computer-generated logs and maintains duty status in the memory of the on-board computer for instant access. For this reason, computer-generated logs cannot be falsified.

3. *Proper trip assignments are made.* Because the dispatcher's computer maintains complete, ongoing records on all the drivers assigned to a dispatch location, the dispatcher knows whether a driver has sufficient hours for a trip before the trip assignment is made.

4. *Auditing and safety inspections are simplified.* Copies of the computer-generated driver logs can be transferred via data communication links to centralized facilities for recordkeeping and auditing, eliminating the need to address problems associated with the illegibility of logs. Internal audits are facilitated.

5. *Availability of specialized reports*. Several reports have been developed recently for future incorporation into the Frito-Lay system. These reports are currently being tested for accuracy and feasibility and include:

    a. BMCS Violations Report;
    b. Vehicle Inspection Report; and
    c. Accident Event Reports.

Productivity Benefits of the Frito-Lay System

The Frito-Lay system will promote improved management information and the elimination of the manual preparation of various reports resulting in productivity gains as follows:

1. reduction of nonproductive driver time;
2. decrease in clerical processing time;
3. reduction in supervisory review time;
4. increased miles-per-gallon performance;
5. correction and improvement of driving habits; and
6. improved equipment maintenance.

This system allows management to:

1. monitor speeding;
2. identify excessive engine fueling/lugging;
3. monitor unauthorized stop time;
4. give objective employee feedback; and
5. make corrective measures.

Benefits to Public

The primary benefit to the public will be safer operations on the highways by Frito-Lay equipment. Specifically, the public will benefit as a result of:

1. improved driving habits and elimination of driver hours violations;
2. improved equipment utilization and maintenance;
3. cost savings and direct contribution to lower inflation;
4. prompt and accurate enforcement of BMCS regulations.

Exhibit A-1 Front View of CADEC Unit