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NAVISTAR: SUPPLY MANAGEMENT

Joseph J. Schiele prepared this case under the supervision of Professor Lyn Purdy solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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On February 3, 1998, Andy Ramsz, assembly supervisor, at Navistar's assembly plant in Chatham, Ontario, was considering the interior truck trim supply problem. His company had been experiencing interior trim part shortages for Navistar's premium conventional trucks. Having gathered the key information he believed to be relevant, Andy wondered what action to take next.

NAVISTAR INTERNATIONAL: GENERAL COMPANY BACKGROUND

Navistar International could trace its roots back to the early 1800s when it produced Cyrus McCormick's mechanical reaper. On August 13, 1902, a merger between the McCormick Harvesting Machine Company, Deering Harvester Company, Milwaukee Harvester Company, Plano Manufacturing Company, and Warder, Bushnell and Glessner, formed the International Harvester Company to produce a range of farm machinery. In 1922, the first truck rolled off the Chatham assembly line with a total of 217 trucks built in the plant's first year of operation. A new plant was constructed in 1948 to replace the old Chatham Wagon Works facility.

The International Harvester Company continued to manufacture both trucks and agricultural equipment until 1985, when the agricultural equipment division was sold to Tenneco Incorporated's J.I. Case Company as part of a restructuring plan. In January 1986, the International Harvester Company changed its name to Navistar International Corporation (Navistar), while still maintaining the International brand name for its trucks.

In 1997, Navistar manufactured and marketed the International brand medium and heavy-duty trucks, school buses, and mid-range diesel engines for North American and selected export markets. The company operated eight manufacturing facilities and two technical centres, employing more than 16,000 people worldwide. Sales for 1997 were $6.37 billion. Exhibit 1 provides a summary of Navistar's financial results for 1996 and 1997.

Navistar led the North American market in sales of medium and heavy trucks for 17 consecutive years, achieving a 28.6 per cent share for 1997, which was 2.2 per cent higher than 1996. The company was also

a worldwide leader in the manufacturing of 160 to 300 horsepower diesel engines. The company's products, parts and services were sold through a network of 1,000 dealer outlets in the United States, Canada and Mexico, 80 dealers in 75 other countries, eight parts and distribution centres, and 16 used truck centres. Navistar also provided financing for its customers, dealers and distributors through the Navistar Financial Corporation.

Navistar's premium conventional trucks were produced at the Chatham assembly plant, while its medium and cab over trucks were manufactured and assembled at the company's Springfield, Ohio plant. Exhibit 2 illustrates the 9,400 premium conventional "Eagle" sleeper truck built at the Chatham assembly plant during 1997. The Chatham assembly plant first began producing Navistar's premium line in 1983.

OUTLOOK FOR 1998

Navistar forecasted industry demand for heavy trucks in the United States and Canada at 220,000 units for fiscal 1998, compared with 196,800 heavy trucks sold by the industry in 1997. Industry demand for medium trucks in the United States and Canada was expected to reach 123,000 units in 1998, compared with the 117,400 trucks sold in 1997. Major competitors included Ford, Freightliner, Mack PACCAR (maker of the Kenworth and Peterbilt brands) and Volvo GM. Demand for school buses in fiscal 1998 was expected to be 33,000, which compared with 1997.

NAVISTAR INTERNATIONAL: CHATHAM ASSEMBLY PLANT

The Chatham assembly plant, which had been expanded and modernized over the years, occupied a 790,000 square foot facility, situated on 80 acres of property, and employed approximately 2,250 people during 1997. The plant operated a 5,059 foot assembly line.

Truck assembly operations started in the chassis frame assembly area and progressed through chassis paint and chassis assembly. Components, such as axles, transmissions and engines, were sub-assembled and mounted to truck chassis as they passed through the initial stages of the assembly process.

Truck cabs and hoods were assembled separately from the chassis assembly process. Truck cabs were first delivered to the paint preparation area, and then moved through the paint department. Truck cabs would then move on to the sleeper and cab trim area where internal and external trim was applied. Once cabs were deemed trimmed-complete, they were moved to a sub-assembly area where they would be attached onto the completed truck chassis. It was at this time that hoods and tires were attached, appropriate fluids were filled, and air conditioning units charged. Each truck was then sent to the Final Quality Centre, where final inspection and adjustments took place, before shipping. It took approximately 55 hours for a truck to move through this process once all parts were available. A plant layout is provided in Exhibit 3.

Hourly workers at the plant were represented by the Canadian Auto Workers (CAW) union, and earned approximately $23 per hour. As on many assembly lines, workers had specific work assignments that were timed to support smooth line flow. The clerical office employees were represented by CAW Local 35. During 1997, truck production at the Chatham assembly plant was 19,260 units and was expected to increase to 26,658 units in 1998. The production line was operating in two eight-hour shifts, five days each week.

Approximately 850 suppliers, with 1,430 shipping points, provided over 13,000 different components that were assembled into each truck. The company issued orders to its suppliers via electronic data interchange (EDI), specifying delivery schedules and quantities. Navistar dictated shipping requirements for each component, and attempted to use returnable containers whenever possible. Navistar's suppliers were chosen on the basis of their ability to provide an uninterrupted supply of high quality, competitively priced parts.

ANDY RAMSZ — ASSEMBLY SUPERVISOR

Andy Ramsz, assembly supervisor at Navistar's Chatham assembly plant, had been with Navistar for nearly 20 years. During this time, he had been employed in various positions including accounting, financial planning, and production and materials supervision. Andy had an honors business administration degree from the University of Windsor.

As an assembly supervisor, Andy was responsible for internal process improvement implementation, supplier quality evaluations, supplier documentation needs for accurate delivery schedules, internal accuracy of process documentation, co-ordinating material availability for each vehicle, and the control of material movement assigned to vehicles.

A typical day for Andy would include both scheduled and non-scheduled meetings, unforeseen crisis resolution, employee complaints, top management inquiries, and many other tasks. Andy's position was both stressful and time-consuming and often required long hours and weekend work.

NAVISTAR CUSTOMER REQUIREMENTS

The Chatham assembly plant's truck customers were serviced through Navistar's dealer network. These customers included independent truckers as well as small and large companies. Orders for the premium conventional trucks could range in design from no-frill models to highly customized units. The no-frill models were usually service units designed to complement a company's current trucking fleet. They were manufactured according to specific requirements. The mix of custom trucks to no-frill models varied considerably. At any given time, customized units could represent 50 to 80 per cent of production volumes, the balance allocated for no-frill models.

The trucks, which were custom designed, offered a range of styling and features, and were designed to be "a home away from home." The sleeper cabs for long distance truckers could include features like beds, televisions, microwave ovens, refrigerators, and plush interiors in a variety of layouts. The cost of a premium conventional truck ranged between $120,000 and $150,000, depending upon the features. Sometimes customized trucks could be priced as high as $200,000.

Navistar customers spent a significant amount of time designing their own trucks. It was not uncommon for a company or individual to spend months deciding on various options and accessories. Customers were intolerant of delays, quality problems, or any other factor that failed to meet their expectations.

QUALITY AT NAVISTAR

Quality improvement at Navistar was focused on getting everyone to "do it right the first time." Management had committed to ensure that three basic tasks were performed:

1. Establish the requirements that employees were to meet.
2. Supply the wherewithal that the employees needed in order to meet those requirements.
3. Spend all its time encouraging and helping employees to meet those requirements.

Over the years, Navistar had been involved with several quality improvement initiatives including employee suggestion systems, statistical process control, root cause analysis, and design for quality. A manager could be faced with several quality concerns at one time. At Navistar, quality concerns were addressed in the order in which they affected customer requirements and costs. When a quality concern affected the on-time delivery of quality Navistar products to its customers, it was given top priority. This priority even came before costs. However, quality concerns that affected the bottom line were also regarded as serious issues that had to be corrected. Thus, top management supported all initiatives that produced quality and delivery improvements to Navistar's products and processes.

THE INTERIOR TRIM QUALITY AND DELIVERY PROBLEM

In early June 1997, Andy was taking part in a quality training initiative. As part of this initiative, Andy had to identify an ongoing quality concern that required resolving. Andy was aware that Chatham assemblers, attempting to assemble interior trim into various truck cabs, were not always able to do so because of missing or inappropriate trim parts.

Interior trim included items such as door panelling, floor mats, carpeting, handles, and specially cut panels. External trim included items such as reflectors, horns, lights, door handles, bumper trim and various chrome pieces. The application of interior truck trim could be an arduous task given the customization of various orders. Exhibit 4 illustrates a typical truck interior.

Interior trim was provided for each truck in the form of "kits" that contained a specific group of sequenced interior trim parts necessary to complete each truck. A typical kit included 18 to 26 individual trim pieces, at a direct material cost of $630 to $770. These kits were moved along the assembly line in a "caboose." A caboose is a container for trim kits, that travels along with and in front of each respective truck, from which the assemblers selected and installed trim parts into respective units.

The problem arose when assemblers, attempting to assemble the trim into truck cabs, were not able to do so because of missing or inappropriate interior trim parts. The consequences included the subsequent reordering of trim parts, additional material handling, post-assembly installation that usually required overtime to complete, and the delay in the delivery of the finished truck to the customer.

DATA GATHERING

During the last seven months, Andy had been busy gathering data on the interior trim supply problem. Andy estimated that the costs associated with the trim part shortages to be over $200,000 per year. This included direct material costs for the replacement of trim parts, as well as the overtime required at $42 per

hour. Exhibit 5 outlines monthly repair costs as a result of interior trim part shortages from July 1997 through December 1997.

In addition to these costs, the shortages caused the delivery to customers of the completed trucks to be delayed anywhere from a few hours to a few days, while Navistar awaited replacement parts from its supplier. These delays also affected the timing of transportation arrangements made to ship trucks to the various destination points. It was, therefore, imperative to have the timely delivery of the correct number and types of component trim parts within each kit to ensure that these delays did not occur.

In order to understand the causes of the interior trim shortages, Andy felt that he needed several pieces of key information. Included in Andy's data gathering was a summary of the situation with respect to Navistar's trim supplier — Trimco Industries; a flow chart that outlined the process involved when trim was applied to trucks and what happened when trim shortages occurred; an identification of the reasons for some of the interior trim shortages; and a breakdown of these reasons in order to provide insight into where Andy needed to focus his attention.

Trimco Industries

Andy was responsible for managing the business relationship Navistar had with Trimco. Consequently, he had in-depth knowledge of their operations, their relative strengths and weaknesses, and the processes involved for the manufacturing and assembly of trim parts.

Trimco Industries was a key supplier that provided Navistar with over 450 different sequenced trim parts in five different colors and three different trim levels for the premium conventional truck. Trimco not only supplied parts to Chatham's assembly plant but also to the Springfield, Ohio plant. In total, the Chatham assembly plant would receive approximately 420,000 parts from Trimco during the course of a year. Of these parts, approximately 3,100 were either defective, missing or inappropriate for installation.

Trimco Industries was a privately owned and operated company headquartered in Ohio. Trimco Industries was one of the larger automotive part suppliers in the world, with over 5,100 employees, and 26 manufacturing facilities worldwide. Trimco produced various types of automotive interior trim parts including, side door panels, headliners, dash panelling, seats and seat covers. Trimco's customers included General Motors, Ford, Chrysler, Nissan, Honda and Toyota.

In general, the level of manufacturing automation at Trimco plants was mixed. With interior trim parts such as door panels and roof liners, the level of automation in the assembly process was high. For example, a door panel, including various integrated trim pieces, assembly clips and fasteners, as well as the raw material resin, could be molded together in a single-step manufacturing process using technologically advanced, "state of the art" equipment. This level of automation did not exist in the manufacture and assembly of seats and seat covers, which was still a "cut and sew" process requiring a significant amount of manual labor.

Although Trimco was QS9000 certified, Trimco's quality control procedures varied. Within their manufacturing processes, Trimco employed numerous quality control techniques, including statistical process control (SPC), manual inspection, and lean production techniques. However, because of a lack of centralization and limited computer system capability, Trimco had difficulty monitoring outgoing parts and sometimes sent shipments with inappropriate component trim parts or insufficient quantities of the right part.

One of Trimco's significant challenges was with its employees. Trimco had a relatively high level of employee turnover, and, thus, found it difficult at times to maintain training levels. Employees at times were not properly trained in various techniques, and were not always familiar with the details associated with individual Trimco customer requirements.

Additionally, Trimco had difficulty responding to Navistar's design changes that could include the repositioning of locking or door mechanisms, size and location changes for the holes for instrumentation, and various other design details like color or material changes. Difficulty arose when Navistar made design changes to truck interiors and failed to communicate these changes to Trimco before production runs were completed for delivery to Navistar's Chatham facility. This meant that parts were shipped with different specifications than those needed for proper fit during assembly.

This lack of co-ordination had a significant affect on the delivery of appropriate parts for production. To complicate matters, Trimco and Navistar employed a Just in Time (JIT) system, which meant that time between orders and the delivery of parts produced was significantly compressed. It took Trimco approximately five days to deliver an order of trim parts to the Chatham assembly plant once received from Navistar. After trim parts arrived at Navistar, they would be assembled into truck interiors within hours of their arrival.

INTERIOR TRIM ASSEMBLY AT NAVISTAR

The interior trim process at Navistar involved a series of steps from the time a customer first placed an order to the time a truck was finally completed. Complicating this process was the problem of interior trim part shortages. Exhibit 6 provides a flow chart for the interior trim process, including both value added (VA) and non-value added (NVA) processes, and what happened when interior trim part shortages occurred.

Depending upon demand and the number of orders already received by Navistar, it could take anywhere from two to six months for a customer to receive their truck once an order was placed. After a customer order was received by a Navistar dealer, the order was sent to Navistar assembly to be verified, to ensure that production was capable of producing the truck(s) as ordered. If the order could not be verified at that time, engineering reviewed the order and made the necessary design changes.

Once an order was fully coded or verified, it entered a system where material and labor planning took place. Trimco then began to see, through EDI supply requirement notifications, what parts would be needed. At that time, Trimco ensured that it had the needed parts on hand or built parts as necessary. When Trimco had the required parts on hand they would be shipped from two Trimco Ohio manufacturing facilities to a local Trimco warehouse, dedicated to Navistar and located within Chatham, where they were then assembled into kits three days before Navistar production runs.

The Trimco warehouse checked to see if all required parts were on hand, if they were not, the missing parts were highlighted by Trimco staff and marked for a later pick up. Sometimes missing parts would arrive before the kits were sent to Navistar and could be included in the incomplete kits. When Trimco confirmed that kits were as complete as possible and were ready for shipment to Navistar, they were loaded in line sequence onto a trailer and delivered to Navistar assembly. Missing parts not included in the kits were often shipped to Navistar by van.

When the kits arrived at Navistar, on one of the two daily shipments from the local Trimco warehouse, they were unloaded and delivered to a kitting area where operators placed the various kits in sequence with each truck being produced. At this time defective, damaged, missing or parts requiring rework were identified by Navistar. A "chaser" was notified to contact the material handler who reordered the part. When the part arrived at Navistar, the material handler notified the chaser. The chaser then picked up the part and delivered it to the operator for normal installation. If the part did not arrive in time for normal installation, then the truck had to be placed in a repair area until the replacement part arrived. Parts that could be punched or reworked by Navistar had to go to a rework area before they could be assembled into the truck interiors. When parts were reordered from Trimco, it could take as little as a couple of hours for the missing or defective parts to arrive if they were in stock at the local Trimco warehouse; however, if parts had to be reordered from Ohio, then the waiting period could be as long as three days before they arrived.

Once all the required trim was assembled into the truck's interior, the truck went through a final inspection area. It was at this time that any additional repairs or changes were made that had gone unnoticed throughout the assembly process.

The success of the trim process depended upon several things. First, Trimco had to have the total part requirements, including any design changes made, in enough time before production runs so that the local Trimco warehouse could complete the kits before being delivered to Navistar. Second, parts that were identified by Navistar as being defective, damaged or requiring rework, had to be replaced in a timely manner. Third, any rework or repairs required had to be completed within the normal assembly process without delay.

Reasons Identified for Trim Part Shortages

Historically, Navistar had not kept records on the reasons for trim part shortages. Since Andy recognized the need for such data in order to solve the problem, he instructed the shipping and receiving people at both Navistar and Trimco to record the frequency of the trim problems as well as the root causes for each occurrence, over a six-month period. Andy felt this to be an appropriate length of time given the data he needed to collect. In addition, Andy discussed the trim part problem with various managers, material handlers, assemblers and repair people. Based on the records received and the discussions Andy had, he determined that there were seven reasons for the interior trim part shortages. These included: missing parts, defective parts, damaged parts, incorrectly punched parts, incorrect specifications, incorrectly sent parts and parts missing that were "robbed" for other interiors. Exhibit 7 provides a summary of these reasons from July 1997 through December 1997.

Missing Parts

Missing parts resulted from actual part shortages at Trimco as well as oversights by Trimco employees. The result was the shipment of kits that did not contain all parts as required.

Defective Parts

Defective parts, with quality or production-related defects, were sometimes received by Navistar and went undetected until installation. These parts had to be either scrapped or returned to Trimco for replacement and credit.

Damaged Parts

Often parts contained within kits were damaged to the point where they could not be installed into truck interiors. This damage occurred both en route to Navistar and while at Navistar. It appeared that incorrect or improper packaging was causing trim parts to be damaged during shipment. At Navistar, parts being stored and prepared for installation were also subject to damage. Damaged parts could not be installed into truck interiors.

Incorrectly Punched Parts

Some trim parts included in trim kits were incorrectly punched by Trimco and, therefore, did not fit into truck interiors. Last-minute design changes made to truck interiors by Navistar were not conveyed in time for Trimco to incorporate changes before parts were produced and shipped. Incorrectly punched parts sometimes could be custom fitted by Navistar repair workers but, often, new parts needed to be ordered.

Incorrect Specifications

Incorrectly specified parts received from Trimco were a result of improper design specifications received from Navistar as well as last-minute design or part changes. Navistar had to rework these parts or order new parts.

Incorrectly Sent Parts

At times, kits would contain parts that were incorrect. For example, Trimco may send a silver colored part instead of a grey part. Other times, two left door panels might be included instead of one right and one left. This meant that Navistar had to reorder and wait for the correct parts to arrive.

Robbed Parts

Management expectations of minimal shortages in trim parts encouraged assemblers to “rob” missing trim parts from other kits not yet required in production. This approach perpetuated continual shortages, lost stock and excessive ordering. Management believed that robbing parts from kits not yet required in production was acceptable so long as a replacement part arrived before the robbed kit was required in production. However, replacement often did not arrive in a timely manner causing excessive trim part shortages.

Having gathered the key information he believed to be relevant to the trim supply problem, Andy wondered what action to take next.

Exhibit 1

NAVISTAR FINANCIAL RESULTS FISCAL 1996 AND 1997
(billions of dollars except for per share data)

	1997	1996
Sales and Revenue	$6,371	$5,754
Income Before Tax	242	105
Net Income	150	65
Net Income per Common Share	1.65	.49
Manufacturing Gross Margin	14.2%	12.5%
Return On Equity	14.7%	7.1%
Cash and Marketable Securities	965	881

Source: Company Annual Report 1997

Exhibit 2

9400 PREMIUM CONVENTIONAL "EAGLE" SLEEPER TRUCK

Welcome to.... **Chatham Assembly Plant**

9400 PREMIUM CONVENTIONAL "EAGLE"
WITH 72" HI-RISE PRO SLEEPER

BUILT AT
CHATHAM ASSEMBLY PLANT

INTERNATIONAL®

Exhibit 3

CHATHAM ASSEMBLY PLANT LAYOUT

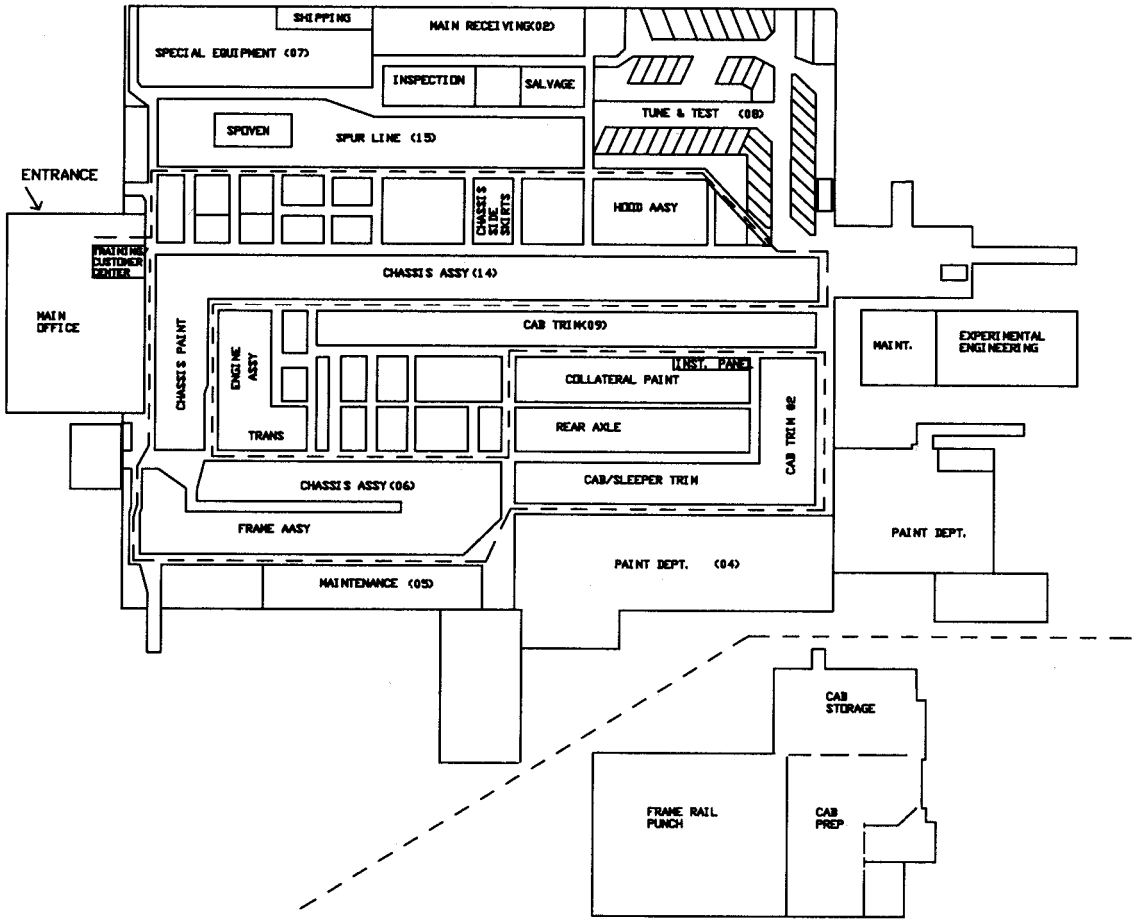


Exhibit 4

A TYPICAL TRUCK INTERIOR

Exhibit 5

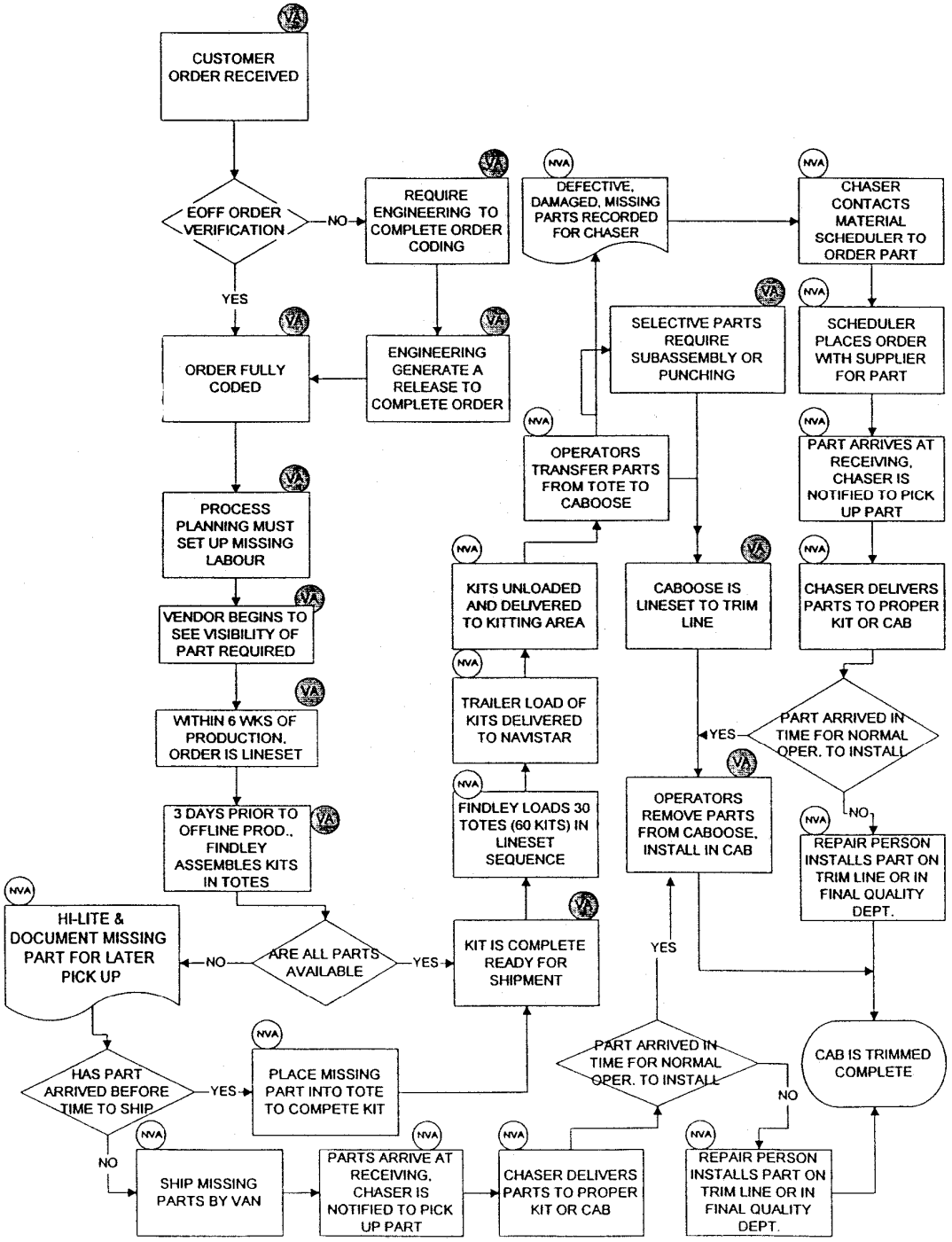
MONTHLY REPAIR COST FOR INTERIOR TRIM PART SHORTAGES
for a six-month period July 1997 through December 1997

Repair Costs 6 months ended 1997	
Date	Repair Cost
July	$13,903
August	$13,785
September	$15,755
October	$20,654
November	$24,675
December	$11,983
Total	$100,755

Source: Internal Company Documents

Exhibit 6

INTERIOR TRIM ASSEMBLY PROCESS FLOW CHART



Source: company files

Exhibit 7

REASONS IDENTIFIED FOR TRIM PART SHORTAGES:

Trimco Summary	Reasons Identified for Part Shortages of Total Defective Parts Ordered							
Date	Total Defective Parts	Missing Part	Defective Part	Damaged Part	Punched Wrong	Specs Wrong	Sent Wrong	Robbed for Other
July	259	144	12	27	10	30	25	8
August	224	117	7	27	2	21	42	5
September	240	144	0	21	7	18	37	9
October	301	193	6	50	5	10	12	25
November	467	307	25	63	11	11	21	24
December 13	80	30	5	11	9	0	10	14
Totals	1,571	935	55	199	44	90	147	85

Source: Internal Company Documents