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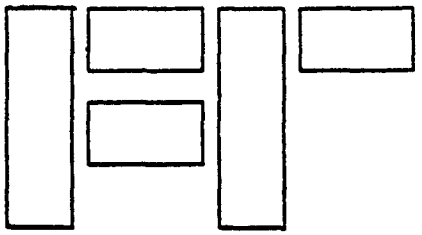
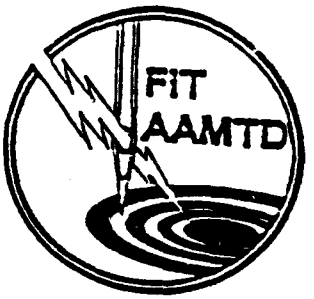
FASHION INSTITUTE OF TECHNOLOGY

RESEARCH REPORT

IMPROVED MANUFACTURING METHODS FOR NAVY PEACOATS

Fashion Institute of Technology





DLA900-87-D-0016/0004 SEPTEMBER 1991

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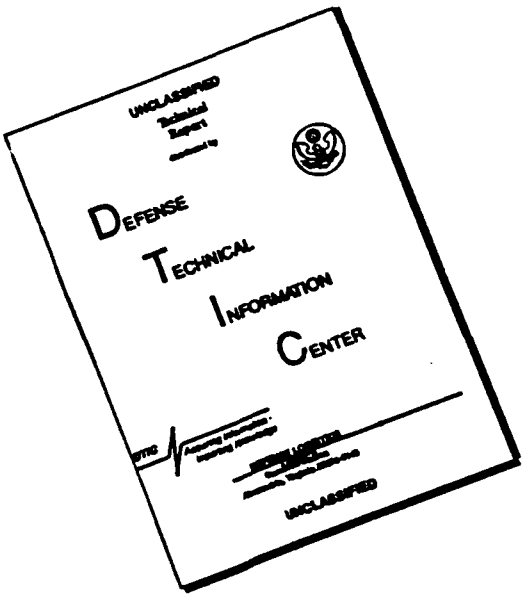

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	30 Sep 1991 FINAL	Aug 1989 to Sep 1991
(U) Improved Manufacturing Methods for Navy Peacoats		Contract DLA900-87-D-0016/0004
Mr. Josef Korngruen		Program Element No. 78011S
Educational Foundation for the Fashion Industries Fashion Institute of Technology 227 West 27th Street New York, NY 10001		FIT Delivery Order 0004
Defense Logistics Agency (DLA-PRM) Cameron Station Alexandria, VA 22304-6100		DLA900-87-D-0016/0004

Unclassified/Unlimited

Analyses of components, patterns, and manufacturing methods of men's and women's peacoats (U.S. Navy) were conducted in order to improve procurement and utility of the garments. Recommendations are made to combine men's and women's coats in a unisex program; reduce size tariffs by 28%; improve the wear life and insulation (warmth) characteristics while reducing the average garment weight by 14%; and lower component materials cost by 12%. Revised and improved patterns were developed, and recommended manufacturing procedures employing three graduated levels of mechanization/automation are provided. Total annual savings based on historical procurement levels, are estimated to exceed $350,000.

(U) Apparel, (U) Navy, (U) Peacoat, (U) Overcoat, (U) Manufacturing, (U) Cost, (U) Production, (U) Manufacturing	75

Unclassified	Unclassified	Unclassified	Unlimited

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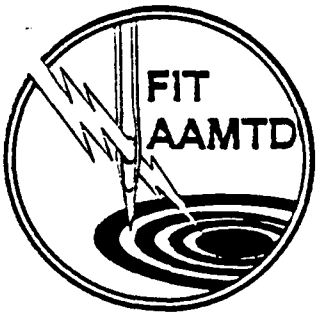

IMPROVED MANUFACTURING METHODS FOR NAVY PEACOATS

FINAL TECHNICAL REPORT A008

Josef Korngruen
Project Leader

September 30, 1991

This project has been sponsored by the
DEFENSE LOGISTICS AGENCY
CAMERON STATION
ALEXANDRIA, VA 22304-6100

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It is hereby submitted to the DLA office (DPMSO), Cameron Station, Alexandria, VA 22304-6100 in accordance with the Contract Data Requirements List, sequence A008.

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ACKNOWLEDGEMENTS

The project leader wishes to express his sincere appreciation to the following people and organizations for their assistance, advice, counsel, and help in the completion of this project.

Beisler Corp.
Noah Brenner
George Cohen, QST Corp.
Louis Curcio
Tony Ferraro
Gerber Garment Technology
Rich Gold, Juki Corp.
Nick Ippoliti, Sr.
Ben Martin
Henry Smith
Cassandra Williams
Harry Winer

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INTRODUCTION

This is the final report of the DLA project to improve the manufacturing methods used for the U.S. Navy peacoat.

The peacoat has been part of Navy uniform for about 100 years. Each era has brought some changes to the coat and over the years it has become an integral part of Navy tradition. The historical aspect of the coat has created a lot of resistance to any changes in the exterior appearance of the garment. One cannot quarrel with this attitude, especially since the peacoat is a very comfortable, utilitarian garment.

However, garment manufacturing methods, fabrics, and textile components have changed greatly since the last revision of the peacoat specifications. The Navy issues, on the average, 90,000 men's and 12,000 women's peacoats per year. Even a minor reduction in the cost of the coat would amount to a great deal of money. Therefore, personnel at the Navy Clothing and Textile Research Facility (NCTRF), Natick, MA decided it was time to investigate how they could take advantage of the technical advances applicable to the construction of this coat.

In the spring of 1989 NCTRF placed a request with the DLA for a short term research project to investigate potential approaches which would simplify the production of the peacoat. The funding for the 13 month project was awarded to the AAMTD facility at the Fashion Institute of Technology in early September of 1989. The parameters for this research effort had only two major constraints: the 22 ounce wool melton shell fabric had to stay; and, the exterior appearance of the peacoat could not be changed.

PROJECT TEAM

The project team assigned to this effort was Josef Korngruen, principal investigator, Cassandra Williams, computerized grading and markermaking specialist, Ben Martin, tailoring consultant, and Noah Brenner, project coordinator. Additionally, an upper class Textile Science student was enlisted to assist in finding alternate interior components for the peacoat.

PROJECT DIVISIONS

The project was divided into five sections:

1. Construction and Manufacturing
2. Components
3. Sizing
4. Patterns, Prototypes, and Final Size Samples
5. Analysis and Reports

PROJECT GUIDELINES

The project team took the position of impartial observer and reviewed the function, construction, and components of the peacoat. In fact, we performed a value analysis of the women's and men's coats. This review developed several conclusions which guided the entire research effort.

A. The construction of the men's and women's coats is identical. The peacoat is double breasted and women button the coat in the opposite direction from the men. Therefore, it was decided to offer a unisex peacoat which can be buttoned either way, thereby reducing the size tariff from 84 sizes to 60, a 28.6% reduction.

B. The exterior coat fabric, the 22 ounce wool melton, and the 50 ligne anchor buttons could not be changed. All other components such as linings, interlinings, etc., were open to change.

C. Only the women's coats have epaulets or shoulder loops which are used for shoulder boards. Therefore, it was decided to design epaulets which could be attached after the coats were completed.

D. We would make every effort to modify the design and construction of the coat to suit technologically advanced production methods without altering the exterior appearance.

After we completed the value analysis we realized that the sequence of steps we had outlined in the project proposal would have to be altered. We worked Section 2 (Components) and Section 4 (Patterns, Prototypes, and Final Size Samples) concurrently. This was followed by Section 3 (Sizing) and Section 1 (Construction and Manufacturing).

DELAYS

The project ran according to schedule for the first six months and then we encountered a number of delays. It took three months for the Navy Uniform Board to approve our unisex garment approach. And then the project was further delayed by the hospitalization of Cassandra Williams and Josef Korngruen.

COST SAVINGS

Even with the noted problems, however, the project results were very satisfactory and the projected savings that can be obtained by using the newly recommended methods of construction in conjunction with more up-to-date manufacturing equipment, based on 102,000 peacoat issues per year, is projected to be in excess of $350,000.00 annually.

CURRENTLY SPECIFIED COMPONENT FABRICS

MELTON SHELL FABRIC

The present construction of the peacoat uses nine different fabrics. The shell fabric, a 22 ounce wool melton, is produced by two approved vendors: Forstmann & Co., Inc. and Carleton Woolen Mills, Inc. Both companies produce the fabric only when they have a firm Government contract. As a result, fabric availability created a problem for us: we could not get all the yardage of the melton fabric needed to make all the required sample coats. Since we could not use a substitute for this fabric we had to make some modifications and adjustments to the sizes/quantities of sample garments produced. This matter is explained later in this report.

KNITBACK FLEECE LINING

Another problem fabric was the knitback fleece lining used to line the back and front of the peacoat. It is a Government furnished fabric, stocked and supplied by Defense Personnel Support Center (DPSC). This fabric cannot be bought on the open market and DPSC has to purchase and stock large quantities of it in order to ensure a continuous supply. This, of course, offers a good reason for finding an alternate fabric to replace this component. The purpose of the knitback fleece lining is to act as a thermal barrier to help keep the wearer warm. However, it is a knit fabric which lacks dimensional stability. One cannot set a breast pocket in it because continuous use of the pocket will stretch the lining out of shape and it will become baggy. Also, designers cannot use the fabric as a sleeve lining because it is too bulky and impedes arm movement.

NYLON TAFFETA

In the current specification a nylon taffeta lining fabric is used to give the knitback fleece lining dimensional stability where needed. The nylon taffeta is used for a one piece back yoke and for the left and right front yokes which start several inches below the armhole. This reinforces the knitback fleece lining in the areas where it is most needed. The wearer can stretch and reach without distorting the fleece lining and the back distance between the armholes is stabilized. The nylon taffeta lining also permits the setting of the breast pocket which then is tacked to the front. This prevents any potential distortion in that area.

NAPPED SATEEN SLEEVE LINING

The sleeve lining called for in the current specification, a napped acetate/rayon sateen fabric, can only be obtained from one vendor. It was chosen originally because it offered a combination of features: the napping provided a limited thermal barrier and the smooth face side helped to make the sleeves more comfortable. Unfortunately, this fabric has another feature which does create a problem, it wears out much faster than the other components.

STANDARD FABRICS

The standard fabrics used in the construction of the peacoat and which can be obtained from several sources are:

1) A cotton or poly/cotton twill used for the breast pocket bag and for the front right side cash pocket
2) The cotton flannel or corduroy used for the front side slash pockets
3) The undercollar interlining, a cotton warp and wool filling fabric
4) The cotton, canvas-like sleeve wigan.

CANVAS COAT FRONTS

Additionally, the front of the peacoat is given shape and body by means of cotton canvas coat fronts which are prepared by a vendor of such items and supplied as paired units.

RECOMMENDED COMPONENT FABRIC REPLACEMENTS

The project team reviewed the peacoat's interior components with the intention of improving upon the quality and/or the functionality of the coat. However, since the overall aim of the project was to improve the production methods used to manufacture the peacoat it was felt that achievement of this goal would be enhanced if the number of interior components could be reduced. Therefore, consideration was given to those fabrics that had a potential for a multiplicity of purposes.

NYLON SATEEN

An obvious candidate would be a fabric that could replace the knitback fleece body lining which is costly ($3.67 per yard, as of January, 1990) and hard to obtain, the nylon yoke lining, and the napped sateen sleeve lining. The search for such a fabric led to a nylon sateen with a water repellent finish. It is a very strong fabric and outperformed the napped sateen sleeve lining by a ratio of two to one during Taber abrasion tests. The water repellent finish acts as a light thermal barrier and allows the fabric to breathe. It's main drawback is that it has a stiff hand. However, it was felt that with wear and cleaning the stiffness would disappear. Based on this assumption, the nylon sateen was used in the first sample peacoat that was submitted to NCTRF.

The peacoat that was submitted had a thermally interlined front and back and was completely lined with the nylon sateen. After NCTRF personnel examined the coat the project team was asked to change the nylon sateen to another fabric with a softer hand, preferably a polyester-content fabric. The submission of that peacoat serendipitously provided the project team with a very important piece of information: Navy tests had proven that if a person's extremities (nose, ears, toes, and fingers) are kept warm, the other body parts protected by a coat will be warm. This means that it is not necessary to use thermal linings in the sleeves, a single ply of lining fabric will work fine.

POLYESTER LINING

In response to the NCTRF change request, the project team looked for and found an appropriate all-polyester fabric. It's construction is 75 x 100 denier and 76 x 120 count and in the Taber abrasion test it also outperformed the napped sateen fabric by almost two to one. NCTRF found our candidate fabric acceptable and it was subsequently used for all the garments that were submitted after that.

THERMAL INTERLINING

There have been many advances in the technology of thermal linings and interlinings. The textile industry had developed thin and light weight thermal materials for the outerwear garment industry, some of which had already been adopted by the military services. We investigated the applicability of these thermal interlinings. Each one of the suppliers we worked with had an excellent support staff that helped us greatly with our technical and application concerns.

Each producer of thermal interlinings that the project team contacted supplied us with several variations of their products. In our first effort we chose one that was sandwiched between two scrims and was ultrasonically quilted. We felt that that interlining would be appropriate for our first sample coat which had a bagged lining in which the lining and shell hems are sewn together. When a coat is constructed in this manner the designer must make sure that the lining does not restrict the wearer's movements. Another concern with a bagged lining is that there must be enough ease to allow for any uneven shrinkage that might occur between the major fabric components.

At the same time that NCTRF rejected the nylon sateen lining they also asked us to change the peacoat construction from a bagged lining to an open lining. This meant the lining and shell hems would no longer be joined together. It also meant that we had to use a different thermal interlining. We changed it to a 1/4", 3 ounce batting which is sandwiched between two layers of non-woven polyester interlining.

FUSIBLE COAT FRONT

We concentrated next on the fabric component that had a major impact on the production and cost of the peacoat: the canvas interlining for the coat front. This interlining is not very expensive in itself nor is it hard to obtain, but the labor necessary to attach it to the coat fronts is costly. The canvas is sewn to the coat fronts with a blindstitch machine. To gain benefit from the canvas it must be held in place with at least seven rows of stitching. This is a skilled operation which impacts the appearance of the coat front and for a sewing machine operator to become proficient in it takes a lot of training.

To ease the above noted problem we opted to use a fusible interlining for the coat front, a system now widely used in the civilian market. Fusibles have also been approved for use in jackets and coats supplied to other military services. It is important to consider that the peacoat is a utility garment meant to keep the wearer warm and comfortable, a much used and abused garment. The fusible interlining ensures that the coat fronts will hold their shape and that constant handling or dry cleaning will not cause them to come loose. All the coats we produced for this project have fused fronts.

FUSIBLE COLLAR INTERLINING

The present collar has a four piece undercollar and the collar interlining consists of four parts as well. By changing the collar to what the trade calls a "banana collar" we reduced the number of collar parts and were able to use a fusible interlining. This eliminated the joining operations of the four piece undercollars and interlinings and the quilting of the interlinings to the undercollars.

POCKETING

Although we found several uncertified vendors who could supply us with the two types of pocketing fabric needed for the peacoat the fabrics we used for all the coat pockets were purchased from a certified U.S. Navy source.

SUMMARY

Making the changes in the components we have just described significantly impacts the construction and cost of the coat. These changes also brought another unexpected positive result - they reduced the weight of our peacoats which are, on average, 14% lighter than the same size coats presently produced.

As stated earlier, we wanted to accomplish two positive results in our work with the interior components: we wanted to reduce the number of fabrics used and thereby reduce inventory requirements; and, we wanted to simplify the coat's construction and thereby gain a cost advantage over the production methods used in the present construction. We obtained fabric costs from NCTRF, DPSC, and the various vendors and found the total cost of the interior components we used in our peacoat samples to be $1.58 lower than those used in the present construction. Table 1, Fabric Cost Comparison, illustrates this 17.08% reduction in direct cost which, on the basis of 102,000 peacoats per year, represents a potential annual saving of $161,160.00 in the cost of fabrics alone. This figure does not include any potential reductions in purchasing, freight, or inventory costs, nor does it include any price breaks that might be derived as a result of large quantity purchasing.

PEACOAT DESIGN ANALYSIS AND CHANGES

UNISEX CONCEPT

The AAMTD team analyzed the physical peacoat samples and the Military Specifications for both the women's and the men's coats and quickly discovered that both coat constructions were basically the same. One has to keep in mind the intended use of the peacoat as a utility garment to be worn over a sweater or other uniform top. It is not a fitted coat and is not tailored to fit snugly. The only differences between the women's and men's coats are that the women's coats have epaulets and that they are buttoned opposite to the way men's coats are buttoned. None of these differences alter in any way the main part of the peacoat assembly process. The peacoat is a double breasted coat which can be buttoned either way, right to left or left to right. All one has to do is add one button and two buttonholes to make it a unisex garment.

SIZE TARIFF REDUCTION

The unisex concept brings with it substantial potential benefits. At present the women's peacoats are made in 36 sizes and the men's coats are produced in 48 sizes, a total size tariff of 84 sizes. Reducing the size tariff would reduce inventory requirements and attendant costs. We plotted the specified dimensions of the women's and men's peacoats and found that the women's regular and tall size groups were very close in dimensions to the men's small and regular size groups. In fact, if one were to take the specified tolerances into consideration, the dimensional similarities of these four groups is even greater.

ALTERATIONS

However, before we proceeded to work with this information we wanted to know whether there was any extensive alteration work done to the peacoats when issued to new recruits. Primarily, the question was whether there was much lengthening or shortening of coat lengths for either sex. Of course, we also wanted to make sure that if we were to make changes in the construction process such changes would ease potential alteration needs, not increase them. To obtain that information we contacted the three Clothing Officers at the

three uniform issuing sites, Great Lakes, IL, San Diego, CA, and Orlando, FL. The three officers corroborated each others' findings that newly issued peacoats require few alterations and that the vast majority of the alterations which are required involve sleeve lengths.

EPAULET ATTACHMENT

This information fell in line with the design direction we wanted to take. However, we still had to resolve our concern about how to attach epaulets to coat shoulders after the finished coats have been issued to women recruits. After trying several methods we narrowed the choice down to two possible methods. The simpler, but less acceptable method was to hand sew the epaulets to the shoulders. The reason for objecting to this method is that there is no allowance for any readjustments without completely redoing the attachment procedure. The preferred method requires the use of a heavy gauge bar pin which attaches the epaulet to the shoulder at the armhole seam. The bar pin is sewn into the end of the shoulder loop and attaching the epaulet requires no special skills or tools. The pointed end of each epaulet which finishes at the peacoat collar and which has a buttonhole in it is held in place by a cloth covered metal pivot button and a 5/16" tack. The cloth covering the button is fall-off melton shell fabric. The tack is pushed through the shoulder of the coat from the inside, and since the head is flat it isn't felt by the wearer.

We submitted our peacoat sample incorporating the bar pin/pivot button shoulder loops and unisex design to NCTRF for approval in late March, 1990. They gave us a favorable response but told us that final approval must come from the Uniform Board in Washington, DC. We received formal approval of the unisex concept on June 21, 1990 and approval of the updated construction and design concepts on August 14, 1990.

OPEN LINING CONSTRUCTION

Our first sample coat, as noted earlier, had a bagged lining, which makes sleeve length and any other internal alterations difficult. NCTRF's request that we change the lining design to an open construction greatly eased any problems that would be encountered when working on interior changes. We changed the sleeve construction and attached the sleeve lining to the shell cuff with a lockstitch machine. To change the sleeve length now one has only to open the cuff topstitching and the

joining seam, adjust the length, and then resew the cuff. The advantage of this construction is that no special sewing machines are required, all the sewing can be done on standard lockstitch machines.

MAJOR CONSTRUCTION CHANGES

Even though we were not to change the exterior appearance of the peacoat we determined that three major construction changes would simplify the manufacturing process: the way the coat is lined; the construction of the collar; and, the way that the front slash pockets are assembled and set.

Front Slash Pockets

The first change we worked on was the front slash pockets which were composed of two welts, a pocket facing, and a two piece pocket bag. While we could not eliminate any of these components, we did change the way they were assembled. The two piece pocket bag was changed to a single piece. As part of the cutting process two drill holes are placed into the pocket bag and used to line up the pocket opening. The pocket facing and cash pocket are set first and then we use an automatic pocket welting machine to set the pocket welts and bag. The welts are topstitched with a double needle machine and the triangle on each end of the pocket is sewn with a programmable fixed cycle machine. (We also use that machine for the parallelogram tack above the coat center back vent and to set the breast pocket label on the lining.)

This change eliminates three operations and makes cutting of the pocket bag simpler. The one piece unit does not change the fabric usage, the pattern fits well into 45" and 60" width fabric, and it reduces the marking and cutting time.

Table 2A, Potential Labor Content Reduction, Front Pockets, shows a comparison of the present and recommended operations lists, and shows a potential annual cost savings of $24,582.00, almost a 44.8% reduction in estimated direct labor cost. This dollar figure does not include manufacturing overhead costs, nor does it calculate the value of the time saved during cutting and bundling.

Collar

The present peacoat collar consists of a one piece top collar, a four section undercollar and a four section interlining. By angling the undercollar joining seam a cupping effect is created when the parts are assembled which helps to shape the collar. In order to retain the shaping effect, the interlining must also be made up of four sections. The preparation of undercollar/interlining assembly means cutting eight parts and performing the following operations:

1) Joining the 4 undercollar parts (3 seams)
2) Pressing the 3 seams open
3) Marking and sewing the undercollar break line
4) Joining the four collar interlining parts (3 seams)
5) Quilting the interlining to the undercollar.

We decided to simplify the collar construction by using fewer parts and a fusible interlining which would reduce the cutting and sewing of so many parts. Fusing of the interlining to a two-part undercollar is much faster and has a lower skill requirement than the quilting operation of the 4-part undercollar. This led us to what is called a "banana collar", which takes it's name from the way the collar stand is shaped. The top and undercollar each have two parts; a collar and a collar stand with the joining seam of the two collar parts acting as the break line. This type of collar requires the following operations:

1) Fusing the interlining to the undercollar and stand
2) Joining the undercollar and stand (1 seam)
3) Topstitching the seam on the collar stand side

This simplified collar construction shaped very well. It also lowered the collar labor content by an estimated 45.6%, a potential saving of $12,546.00 (Table 2B, Potential Labor Content Reduction, Collar), excluding any possible savings in manufacturing overhead costs.

Open Lining

NCTRF's request to design the peacoat with an open lining led to the assembling of the shell and lining separately and then joining them in the final assembly process. The choice of the new interior fabric components complemented this construction change: the polyester lining holds it's shape much better and is easier to handle than the knitback fleece lining.

Other Changes

The new assembly method eases production flow whether the company uses a UPS (Unit Production System), progressive bundle, modular, or a combination of the systems. The completed collar is set on the undercollar side to the shell section of the coat which makes the shell ready for joining to the lining. The sequence of both assemblies, shell and lining, is described in the manufacturing section of this report (Appendix I) and is shown on the Sequence Flow Chart in that section. However, during the manufacturing of the size samples we discovered that some notches will have to be added to the patterns to facilitate the assembly of the coats: a notch has to be added at the sleeve cuff to give the operator the sleeve fold location; and another notch has to be added at the lower part of the coat facing to indicate where the lining joining starts or finishes.

We made several other small construction changes which relate specifically to the manufacturing process and which are described in that section.

SIZE TARIFF AND GRADING RULES

GRADING RULES

Once we had approval of the peacoat unisex concept we prepared a Grading Rule Table, Table 3, for the five coat lengths we were to use. The grade point numbers 001 through 022 match the numbers in the black squares in Appendix II, Plotted Pattern Pieces, which are small-scale reproductions of the peacoat pattern parts which show the grading points.

SIZE TARIFF

As a guide for preparing the grading table we used the same size comparison table, Table 4, Peacoat Size Comparison, Comparable Men's and Women's Sizes, which we had submitted to NCTRF when we asked them to consider the unisex concept. In order to fit the measurements given in the Military Specifications for the peacoats, Tables 5A and 5B, Sizes and Measurements, Men's and Women's Peacoats, respectively, we determined that it was necessary to have five coat and sleeve lengths in order to accommodate all possible size combinations: extra short, short, regular, long, and extra long. See Table 6, Size Tariff. The extra short is equal to the women's short, the short and regular lengths overlap the women's regular and tall and the men's short and regular lengths. The tall and extra tall are meant for anyone of either sex over 5'9" in height.

Effectively we finished up with 60 sizes, even though the grading table shows 65 sizes. We used size 33 to balance the grade dimensions, but we do not recommend using that size since a potential wearer can use either a size 32 or 34. A size tariff of 60 sizes is a vast improvement over the present tariff of 84 sizes, a 28% reduction.

HISTORICAL SIZE DATA

The project team believes that the size tariff can be reduced even further. NCTRF furnished us with the Navy's annual peacoat needs, broken down by sizes. This data, Tables 7A and 7B, Demand History, Men's and Women's Peacoats, respectively, shows that some sizes, such as women's sizes 6 short and 6 long and men's sizes 32 short and 32 long, have not been issued at

all while several other sizes have been issued only in very small quantities. The project team feels that when fewer than 100 coats of a size are issued in any one year coats of those sizes should only be ordered as needed. This procedure would greatly reduce finished goods inventory.

MANUFACTURING METHODS

METHODOLOGY

The project team's approach to finding the best method for the assembly of the peacoat was simple: review the specified procedures and the ways in which they were being followed, analyze them, and find ways to improve upon them. This approach, however, proved to be difficult. In January 1990, only two military contractors were producing peacoats, Sterling Manufacturing, of Boston, MA, and a division of Cavalier Uniform Company, in Puerto Rico. Sterling Manufacturing refused to let a member of the project team visit its plant and Cavalier Uniform's plant was new and had not yet finished any peacoats. Therefore, the project team had to develop its own manufacturing methodology which might be different from the methodologies practiced in the military contractor's plants. Nonetheless, the quality level of our construction method is well within military requirements.

MANUFACTURING SEQUENCE

The flow chart of the sequence of operations we followed is shown in Appendix I, Manufacturing Sequence Flow Chart. The number to the left of each operation matches the number on the three sets of operation descriptions in Appendix III, Construction Sequences and Method Descriptions. Each set of operation descriptions, Sequences 1, 2, and 3 details a different level of mechanization: Sequence 1 details Advanced Mechanization; Sequence 2 details First Generation Mechanization; and, Sequence 3 details Manual Methodology. In the description of the highly mechanized methods (Advanced Mechanization, Sequence 1) we assumed that collars, sleeves, and coat fronts are produced as subassemblies under a progressive bundle system and all other operations are fed by a Unit Production System. This yields a more efficient utilization of certain mechanized equipment such as fusing conveyors, automatic side seamers, and pocket setters.

MACHINERY

We did not list any specific brands of equipment because we feel that each coat manufacturer has his/her own preferences. However, in the discussions which follow we do list the brands of the machines which we used for each operation. This, however, is not an endorsement of any machine for any particular operation, it just means that that was what was available to us. All the machinery we describe in the operation descriptions is readily available. Some machines will have to be programmed for particular operations, others will need special work aids. This is particularly true for programmable tackers.

Programmable Tackers

The AAMTD-F.I.T. team used the Mitsubishi PLK 0804 programmable tacker to set the label on the breast pocket, the vent tack, and the triangle at each end of the front pocket. The program to make the triangle tack at the end of the front pocket alternated between left and right triangles. This allowed us to slide the front from one end of the pocket to the other end, which is faster than turning the coat front.

This type of tacker is very productive but will only pay for itself in a coat manufacturing environment if it is used for as many operations as possible. Since it only takes two minutes, at most, to change the unit from one application to the next, it can be kept busy most of the day in an average size coat shop. Besides the three operations discussed above, it can also be used to join the coat facing to the front at the lapel and to join the collar points. Using this type of machine for this purpose would ensure that the left and right points are equal. However, these operations, as well as those discussed above, are best done in a standing mode. All of them require special clamps and work aids to support the full weight of the coat during the sewing cycle.

Automatic Side Seamer

The automatic side seamer can be used for several operations, such as closing the sleeves of the shell and lining and for closing the center back and side shell seams. However, in a 200 coats-per-day plant these seven seams would only keep the machine busy for about four or five hours. Therefore, payback for such use becomes a major consideration.

Welt Pocket Setter

The choice of the welt pocket setter is very important. It should be programmable for rapid change-over from one size pocket to another and should have target lights for locating the pocket position. It also should have clamps to hold the pocket bag in position while the front is located on top of it. In some cases this will mean adding locating clamps or pins to the machine which is not difficult to do. As a matter of fact, that is how the pockets were set on the sample size peacoats produced at the AAMTD-F.I.T. facility. Using this machine set-up allowed the project team to reduce the labor content in the pocket setting on the front of the coat by 45% from the method used on the two sample peacoats supplied to us by the Navy.

Programmable Lockstitch Machines

Programmable lockstitch machines have many applications in the construction of the peacoat. We found the units with ply sensors which hold multiple programs to be the most flexible. Only one or two keys on the console need to be pressed to change the sewing program. This, and possibly changing a presser foot and mounting an edge guide, is all that is required to change from one operation to another. While standard drop feed lockstitch machines can be used for most operations on the peacoat calling for that type of stitch, it is advisable to use needle or top feed machines for some operations (see Appendix III). The use of such feeds helps the operators to control the handling of the parts to be sewn.

CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS

Appendix III, Construction Sequences and Method Descriptions, lists recommended types of equipment for use under three levels of mechanization: Advanced, First Generation, and Manual. The machines that are best used for specific operations are described. The charts also show that only 72 operations are required to complete a peacoat when our recommendations are followed, this is almost a 22% reduction from the 92 operations needed for the construction of the peacoat as described in the current applicable Military Specifications.

CLERICAL EFFORT REDUCTION

We cannot estimate the impact on cost of the clerical effort in the production control and payroll departments as a result of the reduction in the number of operations because each plant has its own production control system. In a Unit Production System environment fewer workstations are needed which reduces the clerical effort needed. Under a progressive bundle system fewer bundle tickets will have to be made and tracked, thereby also reducing the necessary clerical effort. Under both systems there will be shorter throughput times and less work-in-process.

DIRECT LABOR CONTENT

To arrive at the direct labor content (time) of peacoat construction with advanced mechanization sequencing we assumed that collar, sleeve, coat front pocket assemble, and lining breast pocket would all be done off-line (bundle system) and all other operations would be performed on a Unit Production System. We also assumed that the other two production methods would use progressive bundle systems and that the average coat shop operates at about 80% efficiency. We analyzed all the operations based on these assumptions and arrived at the following direct labor content per peacoat, excluding cutting:

Advanced Mechanization	67 minutes
First Generation Mechanization	77 minutes
Manual Methodology	83 minutes

It is very difficult for us to determine, for any specific manufacturing plant, what the present labor content (time) is to produce a peacoat. We do not know what methods are being used in cutting, sewing, and/or pressing. Since methods change from manufacturer to manufacturer it would be unfair to state, for example, that we reduced the cutting cost of a peacoat by 50% because we used a CAD system to grade the patterns and make the markers and used a computer controlled cutter. Therefore, we did not use cutting cost as a direct labor cost factor. Besides, these are improvements in machine utilization, not in coat construction.

OBSOLETE OPERATIONS

Table 8, Obsolete Operations, shows the estimated labor content of the operations needed to produce the presently specified peacoat but which were not used in the production of the size samples which we submitted. The noted operation times were calculated with the use of a computerized predetermined labor standard program into which we inputted operation elements. The software calculated the standard allowed minutes for each element and then summarized all the elements and extraneous components of each operation. They totalled $150,960.00.

Labor-cost savings are composed of money as well as time. Time savings were relatively easy to calculate. The savings in money are much harder to determine. Each company has different labor rates, fringe benefits, and manufacturing and administrative overhead percentages. Therefore, to arrive at a meaningful cost analysis we used an hourly labor rate of $5.50 per hour but did not include overhead costs because they vary greatly between companies. (Each peacoat producer can extend the labor time rates according to his/her own data.) Therefore, using the noted parameters and the construction and production methods we recommend, and assuming the U.S. Navy's continued need of 102,000 peacoats per year, the potential annual labor cost reduction, in direct labor, could reach $188,436.00. With the addition of savings in manufacturing overhead costs that figure will become much greater.

CONCLUSIONS

The effort to improve the manufacturing methods used for the U.S. Navy peacoats showed that substantial functional improvements can be achieved without affecting the traditional and functional integrity of the garment. Also, it was found that the potential cost reductions can be substantial, amounting to more than $350,000.00 when overhead costs are included. Our peacoat design and construction methods are very flexible and the Navy can adopt the entire package or any part of it as it chooses. For example, it can maintain the present construction and only change the lining to the one we recommend; or it can change to the construction methods we recommend and keep the present lining, etc. The choices must be based on what is decided to be best for the Navy.

ADDENDUM

In fulfillment of the project requirements we furnished NCTRF with additional data not previously discussed in this report. This data consisted of

- Computer tapes for the Gerber AM5 Pattern Grading and Marker Making System holding the graded patterns for all five lengths of the peacoat.

- List of pattern parts by pattern piece numbers (See Table 9, Peacoat Pattern Numbers)

- A list of companies that furnished the components of the sample peacoats produced under this project (See Table 10, Peacoat Component Suppliers)

Due to the shortage of 100% Wool 22-Ounce Melton Shell Fabric in the commercial market we were not able to obtain enough cloth to produce two sample garments of each size. With NCTRF's permission we produced only one garment in each of the following sizes.

Lengths	Sizes
Extra Short	34, 40, 46
Short	34, 40
Regular	34, 48
Long	40, 48
Extra Long	40

Two samples of all other sizes were produced

TABLE 1

FABRIC COST COMPARISON

	REPLACED FABRICS			REPLACEMENT FABRICS		
FABRIC/PART DESCRIPTION	YDS PER UNIT	COST PER YARD	COST PER UNIT	YDS PER UNIT	COST PER YD	COST PER UNIT
FLEECE LINING 60"	.94	$3.67	$3.45			
YOKE LINING 60"	.5	$2.90	$1.45			
NAPPED SATEEN SLEEVE LINING	.63	$4.15	$2.61			
CANVAS INTERLINING 54"	.56	$3.10	$1.74			
QUILTED POLYESTER LINING				.94	$5.13	$4.82
POLYESTER LINING 60"				.63	$2.90	$1.83
NON-WOVEN FUSIBLE INTERLINING 54"				.56	$1.82	$1.02
	TOTAL COST:		$9.25	TOTAL COST:		$7.67
				NET POTENTIAL GAIN:		$1.58
				PERCENTAGE REDUCTION:		17.08
				ANNUAL POTENTIAL SAVINGS OVER 102,000 COATS:		$161,160.00

TABLE 2A

POTENTIAL LABOR CONTENT REDUCTION
FRONT POCKETS

PRESENT CONSTRUCTION OPER. DESCRIPTION	PRESENT METHOD S.A.M.	RECOMMENDED CONSTRUCTION OPER. DESCRIPTION	PROPOSED METHOD S.A.M.
SET FACING TO POCKET	.458	SET FACING TO POCKET	.391
SET CASH POCKET	.686	SET CASH POCKET	.261
SET POCKET WELTS	.594	SET POCKET WELTS & BAG	.516
TURN & PRESS WELTS	.424	TURN & PRESS WELTS	.419
SET POCKET BAGS	.969	DN TOPSTITCH WTLS	.641
DN TOPSTITCH WELTS	.740	CLOSE POCKET BAGS	.685
CLOSE POCKET BAGS	.834	SEW TRIANGLES AT TACKS	.327
TACK END OF WELTS	.520		
SEW TRIANGLE AT TACKS	.642		
			3.240
TOTAL S.A.M.	5.867	NET GAIN S.A.M.	2.627
		NET GAIN IN %	44.776
		COST SAVINGS AT $5.50/HR	$.241
		COST SAVINGS OVER 102,000 COATS	$24,582.00

S.A.M. - STANDARD ALLOWED MINUTES
D.N. - DOUBLE NEEDLE

TABLE 2B

POTENTIAL LABOR CONTENT REDUCTION
COLLAR

PRESENT CONSTRUCTION OPER. DESCRIPTION	PRESENT METHOD S.A.M.	RECOMMENDED CONSTRUCT. OPER. DESCRIPTION	PROPOSED METHOD S.A.M.
JOIN UNDERCOLLAR	.536	SET FUSIBLE TO UNDERCOLLAR & STAND	.420
PRESS UNDERCOLLAR SEAMS	.294	SET COLLAR STANDS	.491
MARK UNDERCOLLAR BREAKLINE	.255	TOPSTITCH COLLAR STANDS	.696
JOIN UNDERCOLLAR INTER-LINING	.536		
JOIN UNDERCOLLAR & IN-TERLINING AT BREAKLINE	.260		
QUILT UNDERCOLLAR	.711		
SHAPE UNDERCOLLAR	.360		
TOTAL S.A.M.	2.952		1.609
		NET GAIN S.A.M	1.345
		NET GAIN IN %	45.562
		COST SAVINGS AT $5.50/HR	$.123
		COST SAVINGS OVER 102,000 COATS	$12,546.00

S.A.M. - STANDARD ALLOWED MINUTES
DN - DOUBLE NEEDLE

TABLE 3

GRADING RULE TABLE
(NAVY PEACOAT)

SIZE LINE	(30 TO 40)		(40 TO 52)	
001	0000			
002	0937	1171		
003	1250	0625		
004	1250	0000		
005	0000	-1250		
006	0000	2500		
007	0000	1250		
008	0625	1250		
009	1250	1250		
010	0937	-0468		
011	0468	-1250		
012	0000	-0625		
013	0468	-1875		
014	0156	-1250		
015	0000	0625		
016	0625	1250		
017	1250	-0625		
018	1250	-1250		
019	0625	-1250		
020	1093	-0625		
021	0078	1250	0234	1250
022	0078	-1250	0234	-1250

TABLE 4

PEACOAT SIZE COMPARISON
COMPARABLE MEN'S AND WOMEN'S SIZES

THE SIZE GROUPS THAT COME CLOSEST TO EACH OTHER ARE THE MEN'S SHORT AND REGULAR AND THE WOMEN'S REGULAR AND LONG IN THE SIZES LISTED BELOW . THE SLEEVE LENGHTS AND CENTER BACK DIMENSIONS OF THE OTHER MEN'S SIZES ARE TOO LARGE TO MATCH UP WITH ANY OF THE WOMEN'S SIZES. THE WOMEN'S SMALL SIZE GROUP HAS DIMENSIONS THAT ARE TOO SMALL TO MATCH UP WITH ANY MEN'S SIZES.

THE TABLE BELOW MATCHES UP THOSE SIZES WHOSE DIMENSIONS (IN INCHES) ARE WITHIN WORKING RANGE OF EACH OTHER.

SIZE	MALE FEMALE	CHEST/BUST	SLEEVE LENGTH	CENTER BACK LENGTH
32 S	M	44"	17"	29 3/4"
6 R	F	44"	17"	28 1/4"
8 R	F	45"	17"	28 1/2"
32 R	M	44"	18"	31 1/4"
6 L	F	44"	18"	30 1/4"
8 L	F	45"	18"	30 1/2"
34 S	M	46"	17"	30 1/4"
10 R	F	46"	17"	28 3/4"
34 R	M	46"	18"	31 3/4"
10 L	F	46"	18"	30 3/4"
36 S	M	48"	17"	30 3/4"
12 R	F	47 1/2"	17"	29"
36 R	M	48"	18"	32 1/4"
12 L	F	47 1/2"	18"	31"
38 S	M	50"	17"	31 1/4"
14 R	F	49"	17"	29 1/4"
16 R	F	50 1/2"	17"	29 1/2"

TABLE 4 - Cont.

SIZE	MALE FEMALE	CHEST/BUST	SLEEVE LENGTH	CENTER BACK LENGTH
38 R	M	50"	18"	32 1/4"
14 L	F	49"	18"	31 1/4"
16 L	F	50 1/2"	18"	31 1/2"
40 S	M	52"	17"	31 3/4"
18 R	F	52 1/2"	17"	29 3/4"
40 R	M	52"	18"	33 1/4"
16 L	F	52 1/2"	18"	31"
42 S	M	54"	17"	32 1/2"
20 R	F	54 1/2	17"	30"
42 R	M	54"	18"	33 3/4"
20 L	F	54 1/2"	18"	32"
44 S	M	56"	17"	32 3/4"
38 R	F	56 1/2"	17"	30 1/4"
44 R	M	56"	18"	34 1/4"
38 L	F	56 1/2"	18"	32 1/4"
46 S	M	58"	17"	32 3/4"
40 R	F	58 1/2"	17"	30 1/2"
46 R	M	58"	18"	34 1/4"
40 L	F	58 1/2"	18"	32 1/2"
48 S	M	60"	17"	33"
42 R	F	60 1/2"	17"	30 3/4"
48 R	M	60"	18"	34 1/2"
42 L	F	60 1/2"	18"	32 3/4"
50 S	M	62"	17"	33"
44 R	F	62 1/2"	17"	31"
50 R	M	62"	18"	34 1/2"
44 L	F	62 1/2"	18"	33"

TABLE 5A

SIZES AND MEASUREMENTS
MEN'S PEACOATS

MIL-O-2414H(NU)

Size	Measurements								
	Chest	Sleeve Inseam Length				Center Back Length			
		Short	Regular	Long	X-Long	Short	Regular	Long	X Long
30	42	17	18	19	20	29 1/4	30 3/4	32 3/4	34 3/4
32	44	17	18	19	20	29 3/4	31 1/4	33 1/4	35 1/4
34	46	17	18	19	20	30 1/4	31 3/4	33 3/4	35 3/4
36	48	17	18	19	20	30 3/4	32 1/4	34 1/4	36 1/4
38	50	17	18	19	20	31 1/4	32 3/4	34 3/4	36 3/4
40	52	17	18	19	20	31 3/4	33 1/4	35 1/4	37 1/4
42	54	17	18	19	20	32 1/4	33 3/4	35 3/4	37 3/4
44	56	17	18	19	20	32 3/4	34 1/4	36 1/4	38 1/4
46	58	17	18	19	20	32 3/4	34 1/4	36 1/4	38 1/4
48	60	17	18	19	20	33	34 1/2	36 1/2	38 1/2
50	62	17	18	19	20	33	34 1/2	36 1/2	38 1/2
52	64	17	18	19	20	33 1/4	34 3/4	36 3/4	38 3/4
Tolerances	±1	±1/2	±1/2	±1/2	±1/2	±3/8	±3/8	±3/8	±3/8

(A) Chest - Twice the measurement taken along the base of armhole from left front edge to center back seam with the overcoat laid out open and flat.

(B) Sleeve inseam length - Measurement taken along sleeve inseam from base of armhole to bottom of sleeve.

(c) Center back length - Measurement taken from the neckline seam to bottom edge of overcoat.

All measurements and toleraces are in inches.

TABLE 5B

SIZES AND MEASUREMENTS
WOMEN'S PEACOATS
MIL-O-24926

	Measurements						
		Sleeve Inseam Length			Center Back Length		
Size	Bust	Short	Regular	Long	Short	Regular	Long
6	44	16	17	18	26 3/4	28 1/4	30 1/4
8	45	16	17	18	27	28 1/2	30 1/2
10	46	16	17	18	27 1/4	28 3/4	30 3/4
12	47 1/2	16	17	18	27 1/2	29	31
14	49	16	17	18	27 3/4	29 1/4	31 1/4
16	50 1/2	16	17	18	28	29 1/2	31 1/2
18	52 1/2	16	17	18	28 1/4	29 3/4	31 3/4
20	54 1/2	16	17	18	28 1/2	30	32
38	56 1/2	16	17	18	28 3/4	30 1/4	32 1/4
40	58 1/2	16	17	18	29	30 1/2	32 1/2
42	60 1/2	16	17	18	29 1/4	30 3/4	32 3/4
44	62 1/2	16	17	18	29 1/2	31	33
Tolerances	±1	±1/2	±1/2	±1/2	±1/2	±1/2	±1/2

(A) Bust - Twice the measurement taken along the base of armhole from left front edge to center back seam with the overcoat laid out open and flat.

(B) Sleeve inseam length - Measurement taken along sleeve inseam from base of armhole to bottom of sleeve.

(C) Center back length - Measurement taken from the neckline seam to bottom edge of overcoat.

All measurements and tolerances are in inches.

TABLE 6

SIZE TARIFF

SIZE	CHEST	MEASUREMENTS									
		SLEEVE INSEAM					CENTER BACK LENGTH				
		XTR SHORT (SHORT)	SHORT (REG)	REG (LONG)	LONG	XTR LONG	XTR SHORT (SHORT)	SHORT (REG)	REG (LONG)	LONG	XTR LONG
30 (6)	43	16	17	18	19	20	27.5	29.75	31.5	33.75	36
32 (8)	44.5	16	17	18	19	20	27.7	30	31.75	34	36.25
33 (10)	46	16	17	18	19	20	27.875	30.125	31.875	34.125	36.375
34 (12)	47.5	16	17	18	19	20	28	30.25	32	34.25	36.5
36 (14)	49	16	17	18	19	20	28.25	30.55	32.25	334.5	36.75
38 (16)	50.5	16	17	18	19	20	28.5	30.75	32.5	34.75	37
40 (18)	52.5	16	17	18	19	20	28.75	31	32.75	35	37.25
42 (20)	54.5	16	17	18	19	20	30	32.25	34	36.25	38.5
44 (36)	56.5	16	17	18	19	20	30.25	32.55	34.25	36.5	38.75
46 (38)	58.5	16	17	18	19	20	30.5	32.75	34.5	36.75	39
48 (40)	60.5	16	17	18	19	20	30.75	33	34.75	37	39.25
50 (42)	62.5	16	17	18	19	20	31	33.25	35	37.25	39.5
52 (44)	64.5	16	17	18	19	20	31.25	33.5	35.25	37.5	39.75

SIZES IN PARENTHESIS ARE WOMEN'S SIZES
ALL MEASUREMENTS ARE IN INCHES

TABLE 7A

DEMAND HISTORY
MEN'S PEACOATS
1987-1990

COAT SIZE	3RD QTR FY 89 2ND QTR FY 90	3RD QTR FY 88 2ND QTR FY 89	3RD QTR FY 87 2ND QTR FY 88
32R	177	200	329
34S	81	189	671
34R	52	170	668
34L	107	117	106
34XL	0	7	11
36S	687	1512	4064
36R	743	1210	3044
36L	183	228	619
36XL	2	10	2401
38S	6188	9055	82018
38R	10935	8746	12178
38L	2785	4075	3445
38XL	132	302	492
40S	6654	9648	7295
40R	15061	13121	13994
40L	5528	6960	5657
40XL	812	455	899
42S	5272	4183	4118
42R	11126	11096	10301
42L	5514	5200	4253
42XL	791	983	782
44S	2464	2479	2218
44R	5119	4010	6239
44L	3132	2967	2703
44XL	477	298	446
46R	2308	1442	2267
46L	1233	914	1023
46XL	80	192	216
48R	692	619	456
48L	531	458	397
48XL	56	46	142
50R	119	80	45
50L	122	86	62
50XL	57	35	40
TOTAL/YR:	89220	91093	97402

TABLE 7B

DEMAND HISTORY
WOMEN'S PEACOATS
1988-1990

COAT SIZE	MAY 89 MAY 90	MAY 88 MAY 89
6R	44	20
8S	732	563
8R	613	45
10S	791	626
10R	827	1388
10L	370	768
12S	1114	794
12R	1991	1415
12L	446	770
14S	544	178
14R	2834	1346
14L	526	874
16S	470	225
16R	1216	519
16L	556	562
18S	161	55
18R	540	213
18L	329	211
20S	36	40
20R	196	103
20L	167	90
TOTAL/YR:	14503	11210

TABLE 8

OBSOLETE OPERATIONS
(OPERATIONS USED IN THE PRESENT
CONSTRUCTION WHICH ARE NOT NEEDED FOR THE
RECOMMENDED CONSTRUCTION)

PRESENT CONSTRUCTION OPER. DESCRIPTION	PRESENT METHOD S.A.M.
SET WIGGING	1.140
PAD CANVAS	2.324
TAPE BACK SHOULDERS	.307
BASTE SHOULDER PADS	.761
SHAPE FRONTS	1.108
PRESS FRONTS	.620
TRIM CANVAS	1.300
SET NYLON BACK YOKE	.343
SET NYLON FRONT YOKE	.615
BASTE NYLON YOKES - FRONT AND BACK	.755
REMOVE BASTING STITCHES	1.825
SET LOWER ARMHOLE	1.357
FELL STITCH UPPER ARMHOLE	1.779
CLOSE SLEEVE LINING	1.319
BASTE COLLAR FOR FELLING	.298
FELL UNDERCOLLAR	.332
TOTAL S.A.M.	16.183
NET POTENTIAL REDUCTION BASED ON $5.50 PER HR	$1.48
POTENTIAL COST REDUCTION OVER 102,000 COATS PER YEAR	$150,960.00

S.A.M. - STANDARD ALLOWED MINUTES

TABLE 9
PEACOAT PATTERN NUMBERS

PART DESCRIPTION	PCS/ UNIT	EXTRA SHORT	SHORT	REGULAR	LONG	EXTRA LONG
SHELL						
COAT FRONT	2	10389	10377	10350	10401	10413
COAT BACK	2	10390	10378	10351	10402	10414
FRONT FACING	2	10391	10379	10352	10403	10415
TOP SLEEVE	2	10392	10380	10353	10404	10416
UNDER SLEEVE	2	10393	10381	10354	10405	10417
TOP COLLAR	1	10355	10355	10355	10355	10355
UNDER COLLAR	1	10356	10356	10356	10356	10356
TOP COLLAR STAND	1	10357	10357	10357	10357	10357
UNDER COLLAR STAND	1	10358	10358	10358	10358	10358
FRONT POCKET WELT	2	10359	10359	10359	10359	10359
FRONT POCKET FACING	2	10360	10360	10360	10360	10360
TOP EPAULETTE	2	10375	10375	10373		
BOTTOM EPAULETE	2	10376	10376	10374		
QUILTED LINING						
FRONT	2	10394	10382	10361	10406	10418
RIGHT BACK	1	10395	10383	10362	10407	10419
LEFT BACK	1	10396	10384	10363	10408	10420
LINING						
TOP SLEEVE	2	10397	10385	10364	10409	10421
UNDER SLEEVE	2	10398	10386	10365	10410	10422
BREAST POCKET WELT	1	10366	10366	10366	10366	10366
NAPPED POCKETING						
FRONT SIDE POCKET	2	10367	10367	10367	10367	10367
POLY TWILL						
BREAST POCKET BAG	1	10368	10368	10368	10368	10368
CASH POCKET	1	10369	10369	10369	10369	10369
FUSIBLE INTERLINING						
FRONT	2	10399	10387	10370	10411	10423
UNDER COLLAR	1	10356	10356	10356	10356	10356
UNDER COLLAR STAND	1	10358	10358	10358	10358	10358
TEMPLATES						
FINISH LAPEL	1	10371	10371	10371	10371	10371
BUTTON MAKER	1	10400	10388	10372	10412	10424

TABLE 10

PEACOAT COMPONENT SUPPLIERS

22-Ounce Melton Shell Fabric

Forstmann & Co, Inc.

60" Polyester Lining Fabric

S.M. Cristall Co., Inc.

60" 3-Ounce Thermalite Interlining quilted to the above Lining with a Remay Scrim

QST - Samuel Haber & Sons

60" Fusible Interlining

Pellon Sales

QST - Samuel Haber & Sons

60" Polytwill Pocketing

QST - Samuel Haber & Sons

45" Flannel Pocketing

QST - Samuel Haber & Sons

1" Nylon Bias Binding

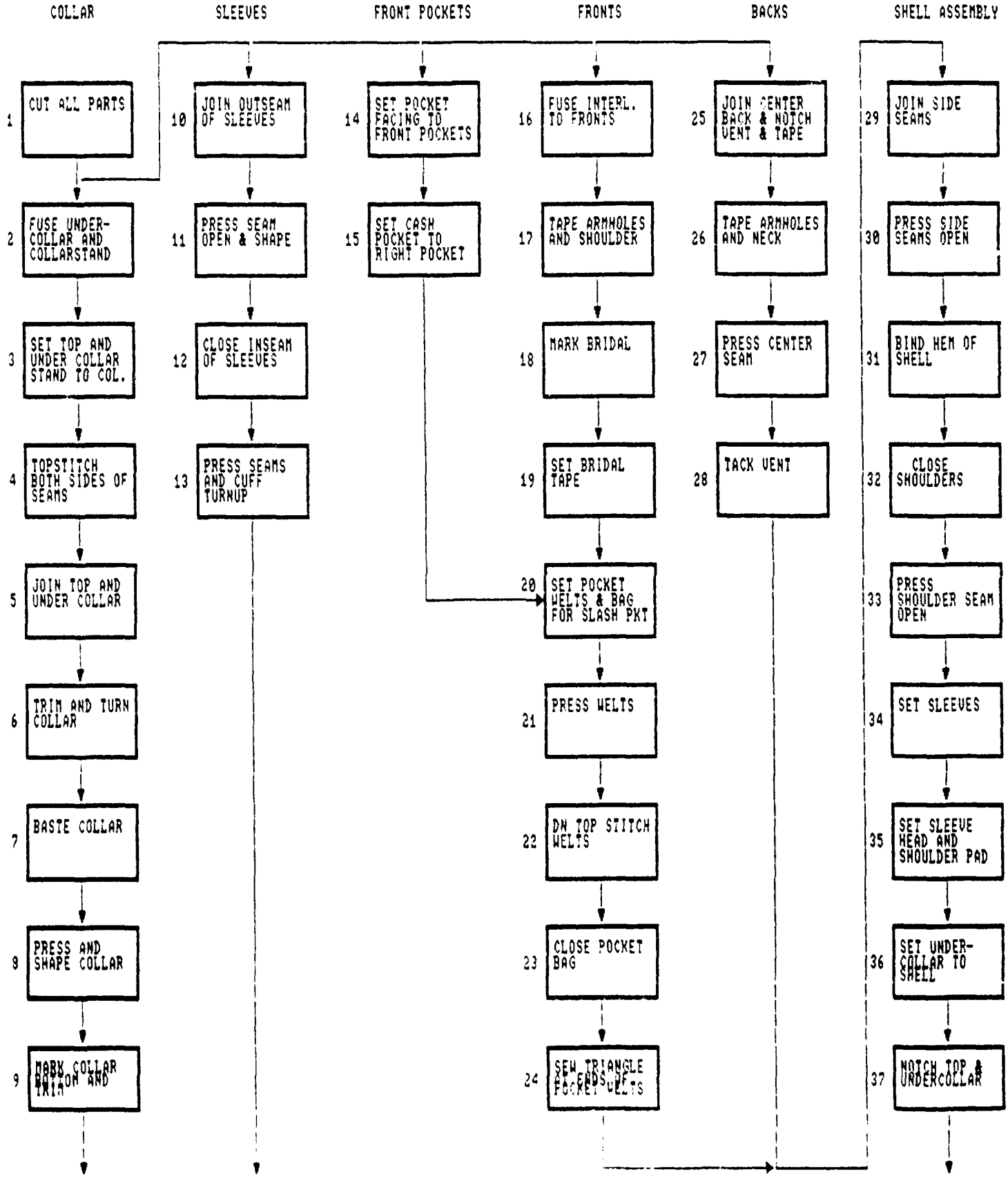
Roxy Bias Binding

50 Ligne Black Anchor Buttons

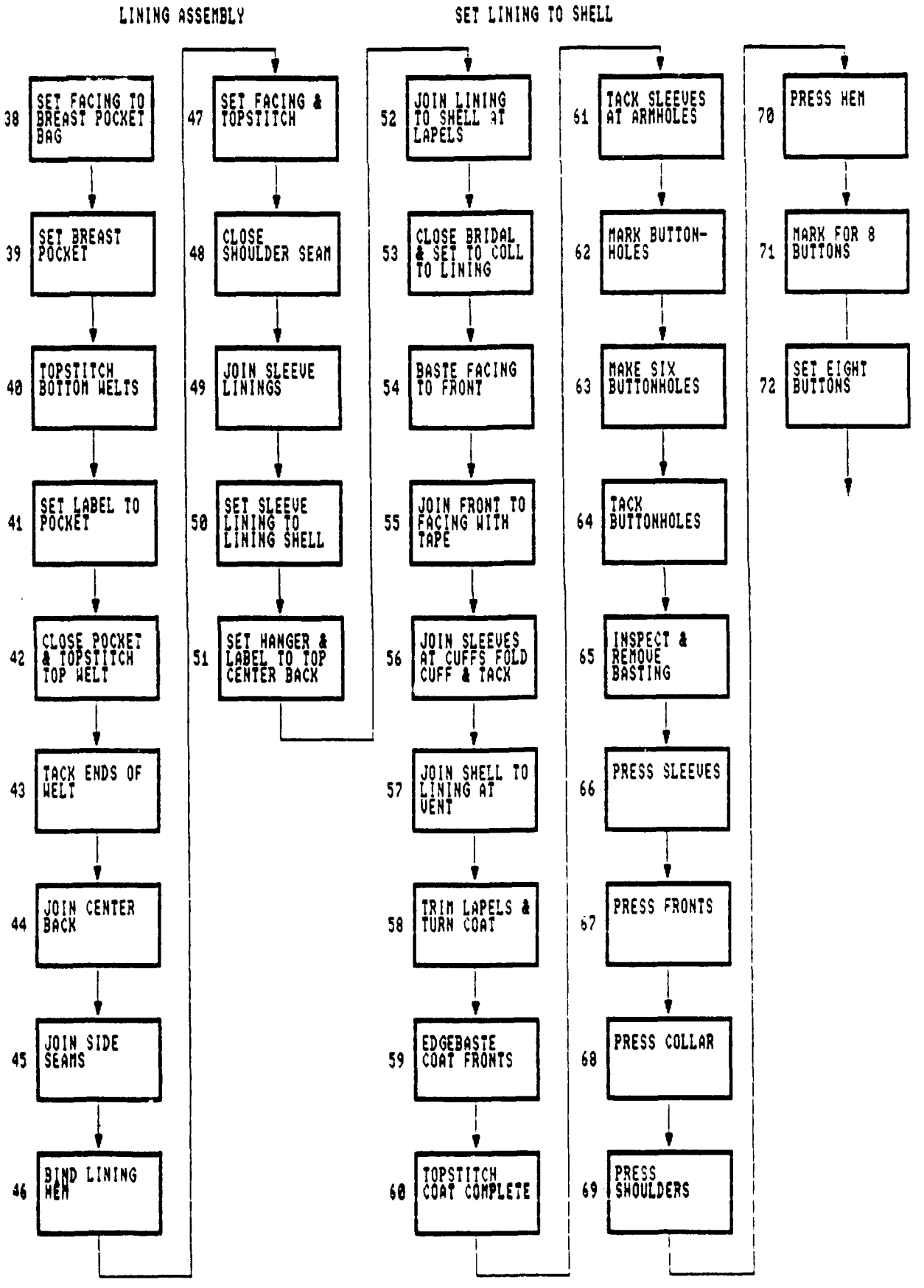
Isaacson & Kalter Co.

Shoulder Pads and Bridle Tape was supplied by Ippoliti Inc. when that company assembled the peacoats.

APPENDIX I
MANUFACTURING SEQUENCE FLOW CHART
ALL PARTS ARE CUT
ALL SHELL PARTS ARE SHADE MARKED

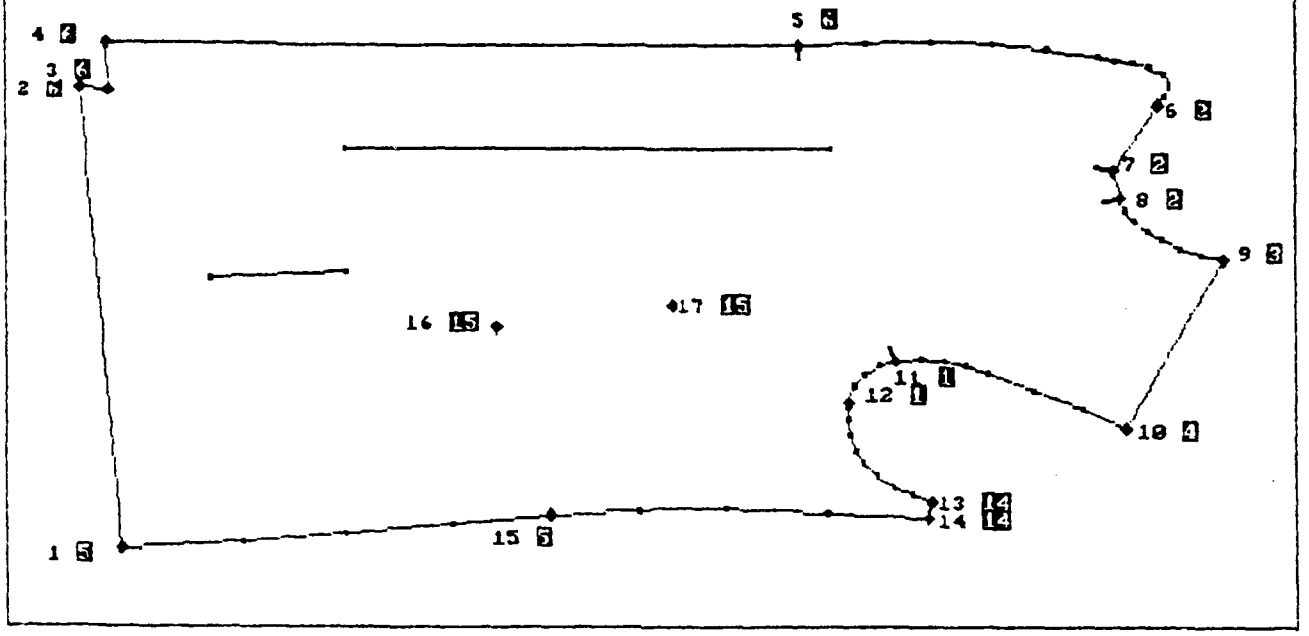


MANUFACTURING SEQUENCE FLOW CHART. CONTINUED

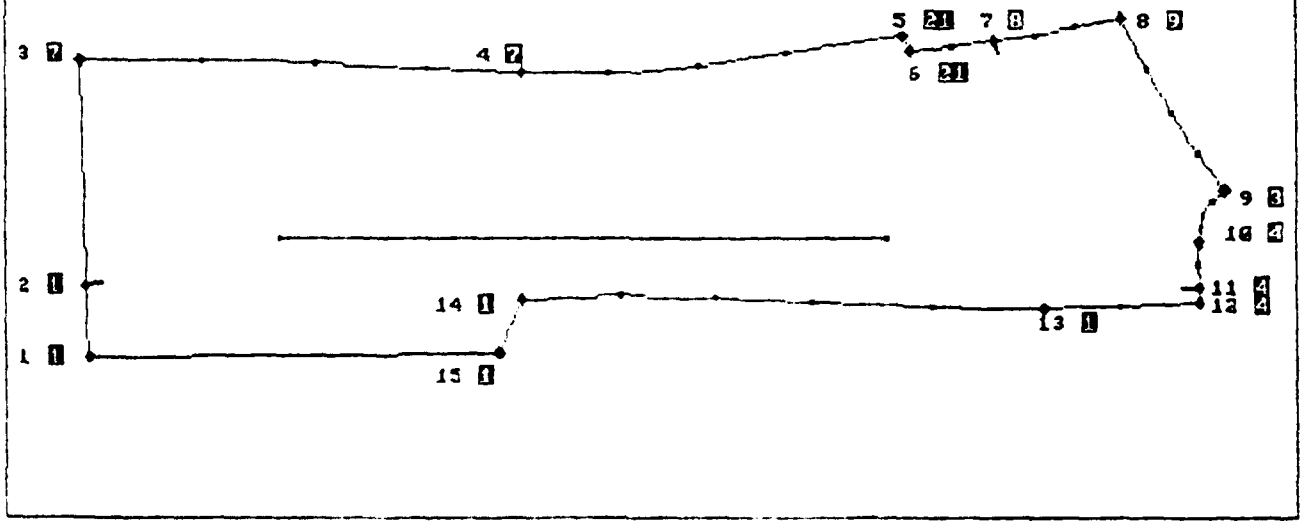


APPENDIX II
PLOTTED PATTERN PIECES

PIECE NAME: 10320	CATEGORY : 10
DESCRIPTION: REG SELF FRT	RULE TABLE: NPC

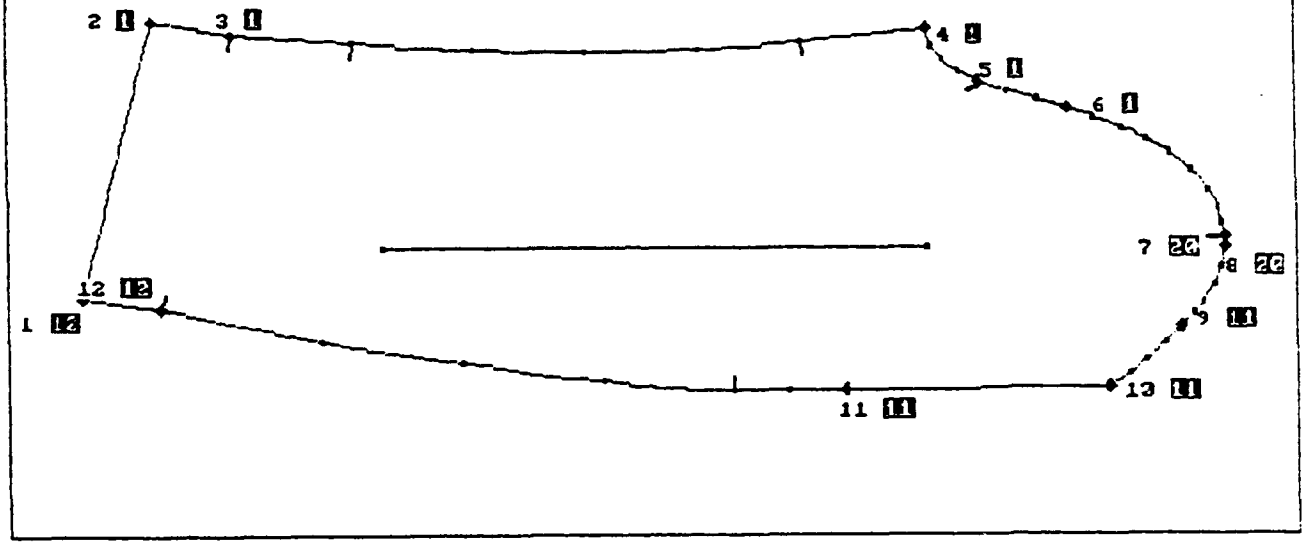


PIECE NAME: 10321	CATEGORY : 20
DESCRIPTION: REG SELF BACK	RULE TABLE: NPC

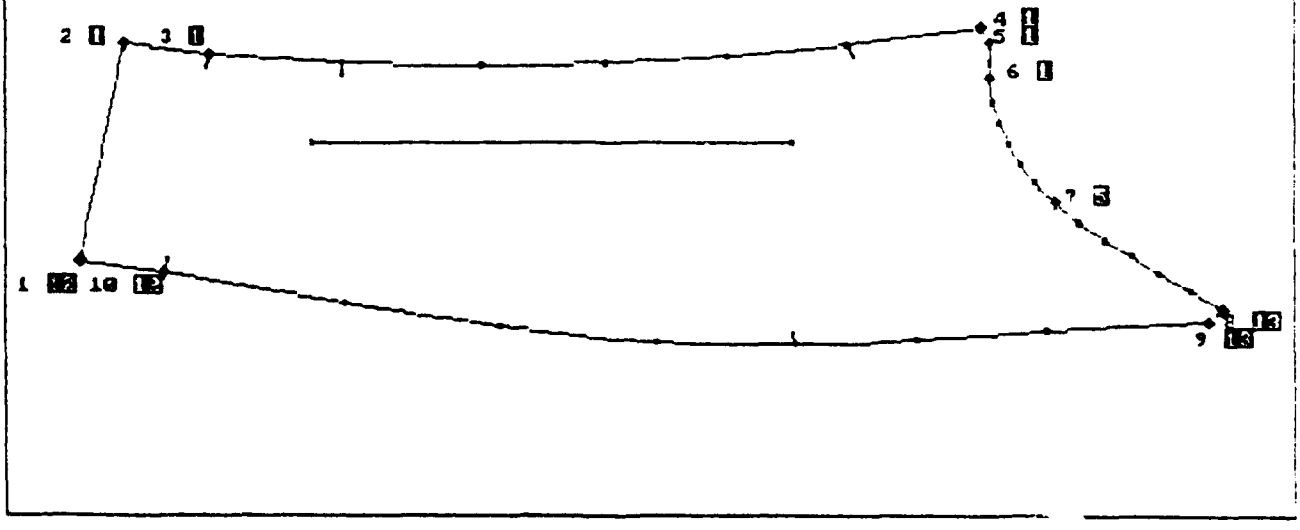


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10323	CATEGORY : 30
DESCRIPTION: REG SELF TP SLV	RULE TABLE: NPC

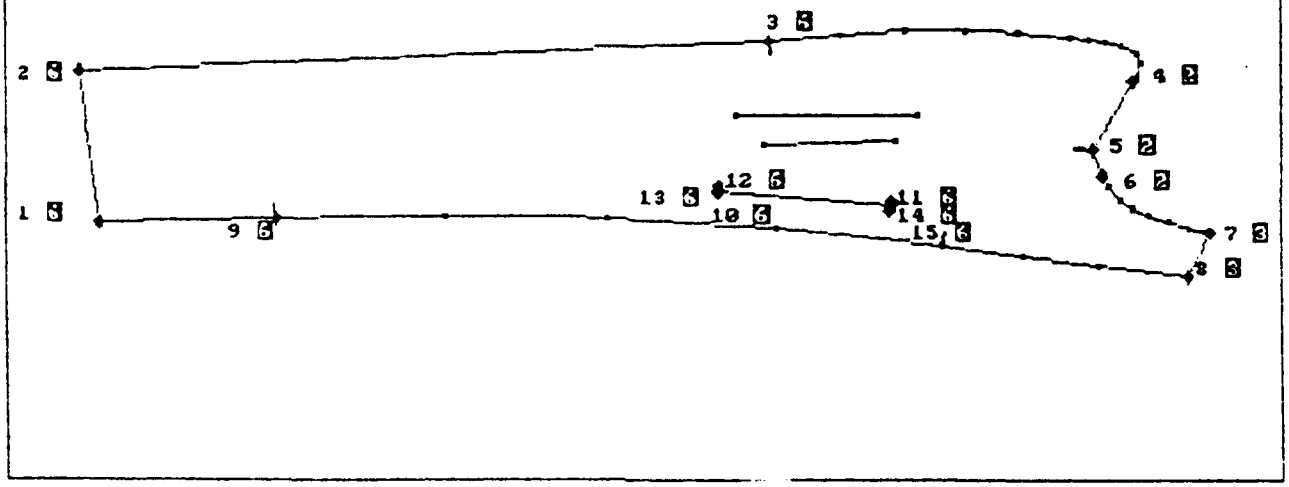


PIECE NAME: 10324	CATEGORY : 31
DESCRIPTION: REG SELF UN SLV	RULE TABLE: NPC

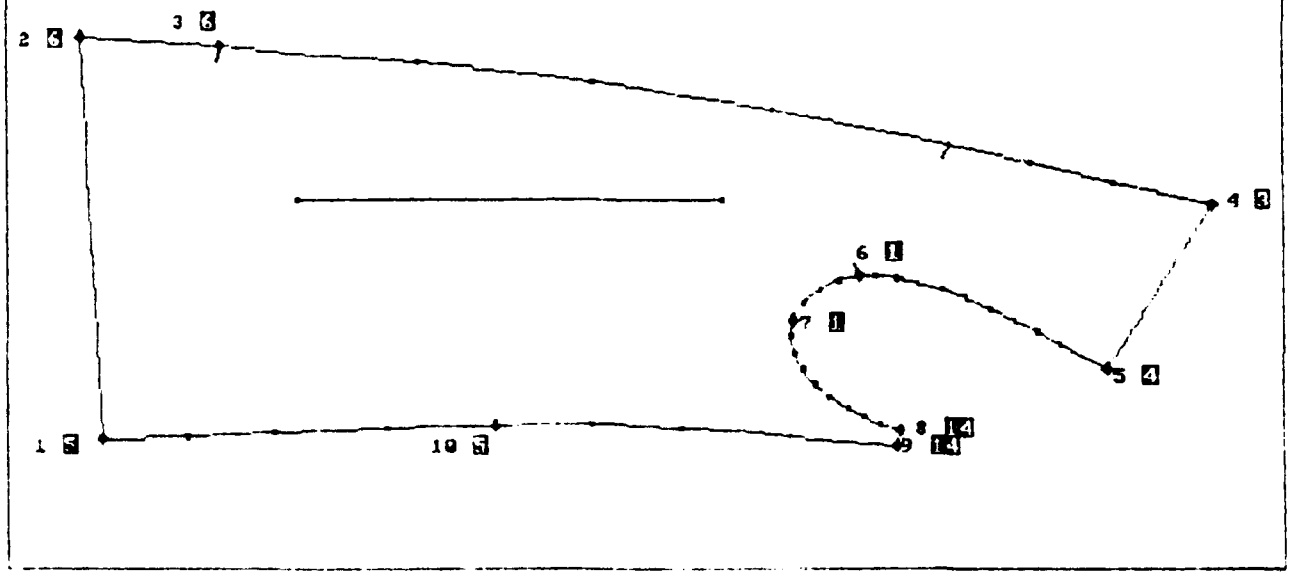


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10322	CATEGORY : 11
DESCRIPTION: REG SELF FT FAC	RULE TABLE: NPC

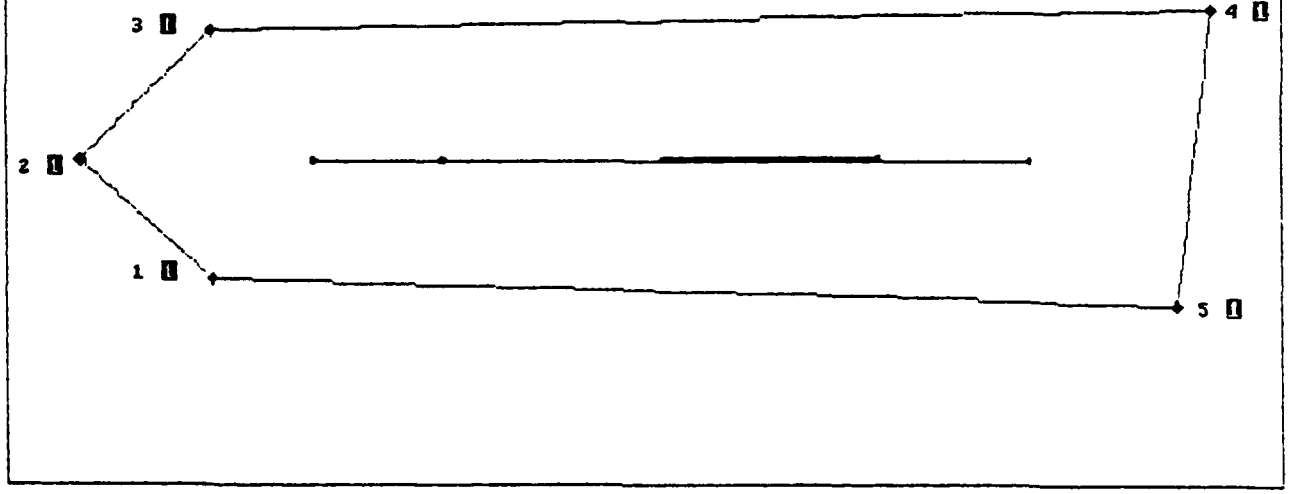


PIECE NAME: 10331	CATEGORY : 10
DESCRIPTION: REG FRONT LIN	RULE TABLE: NPC

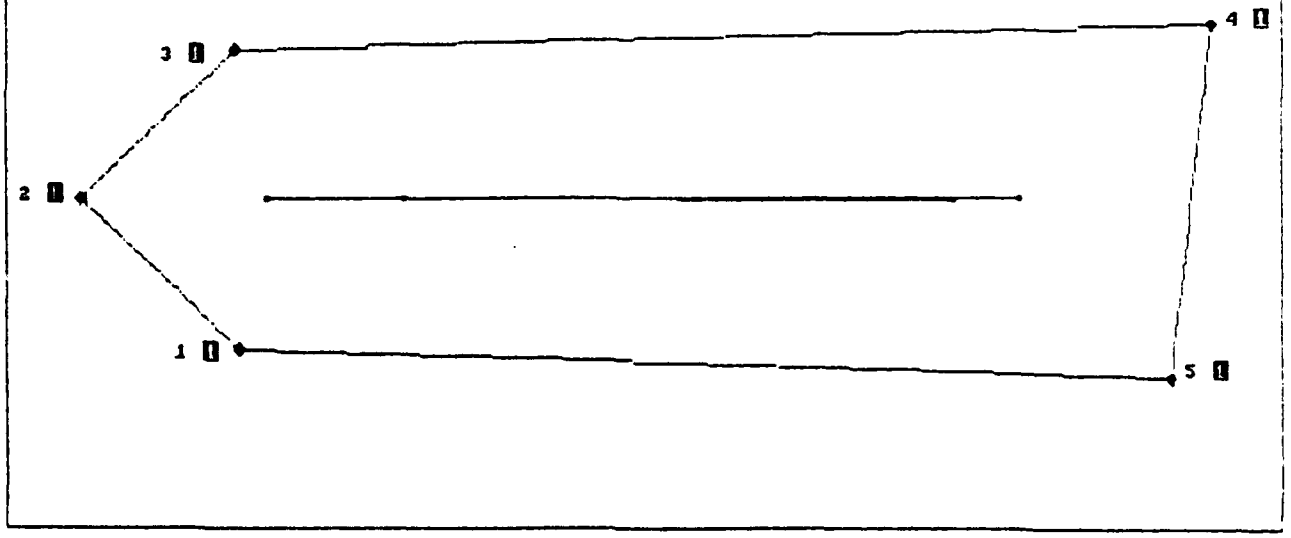


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10343	CATEGORY : 70
DESCRIPTION: REG TP EPAU	RULE TABLE: NPC

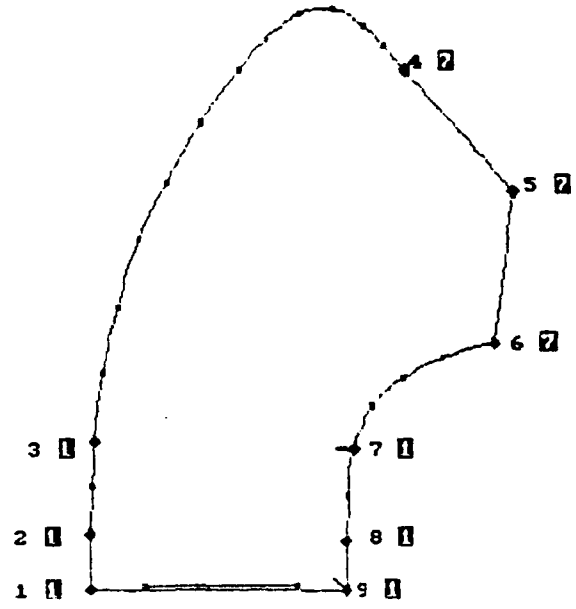


PIECE NAME: 10344	CATEGORY : 71
DESCRIPTION: REG BT EPAU	RULE TABLE: NPC

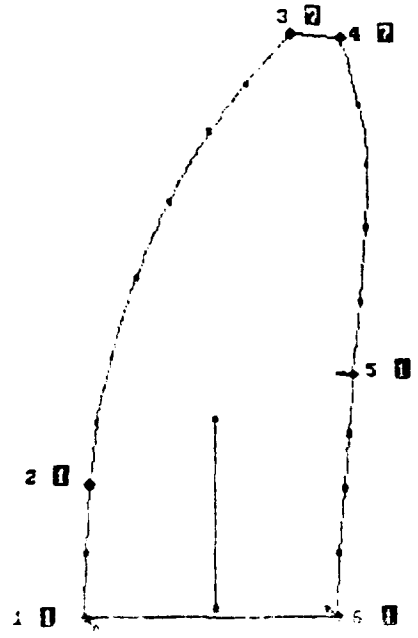


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10325	CATEGORY : 40
DESCRIPTION: REG SELF TP COL	RULE TABLE: MPC



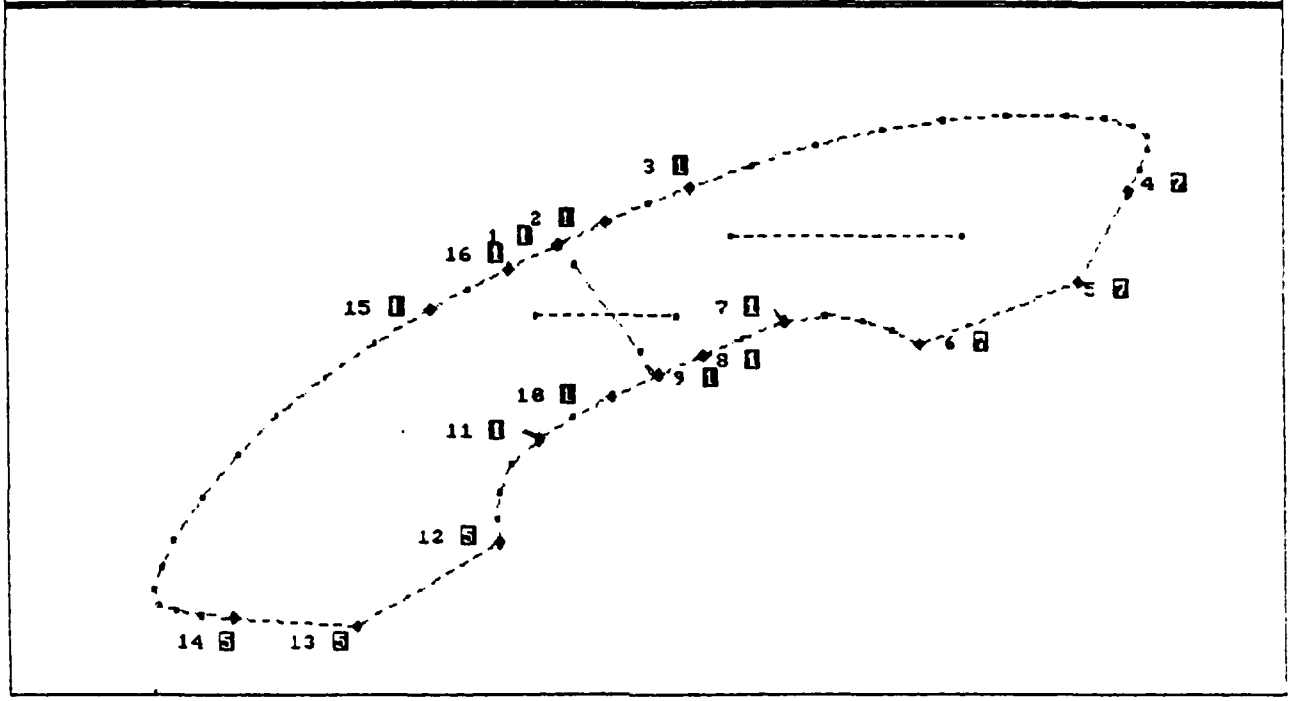
PIECE NAME: 10327	CATEGORY : 50
DESCRIPTION: S TP COL ST	RULE TABLE: MPC



PLOTTED PATTERN PIECES
-Continued-

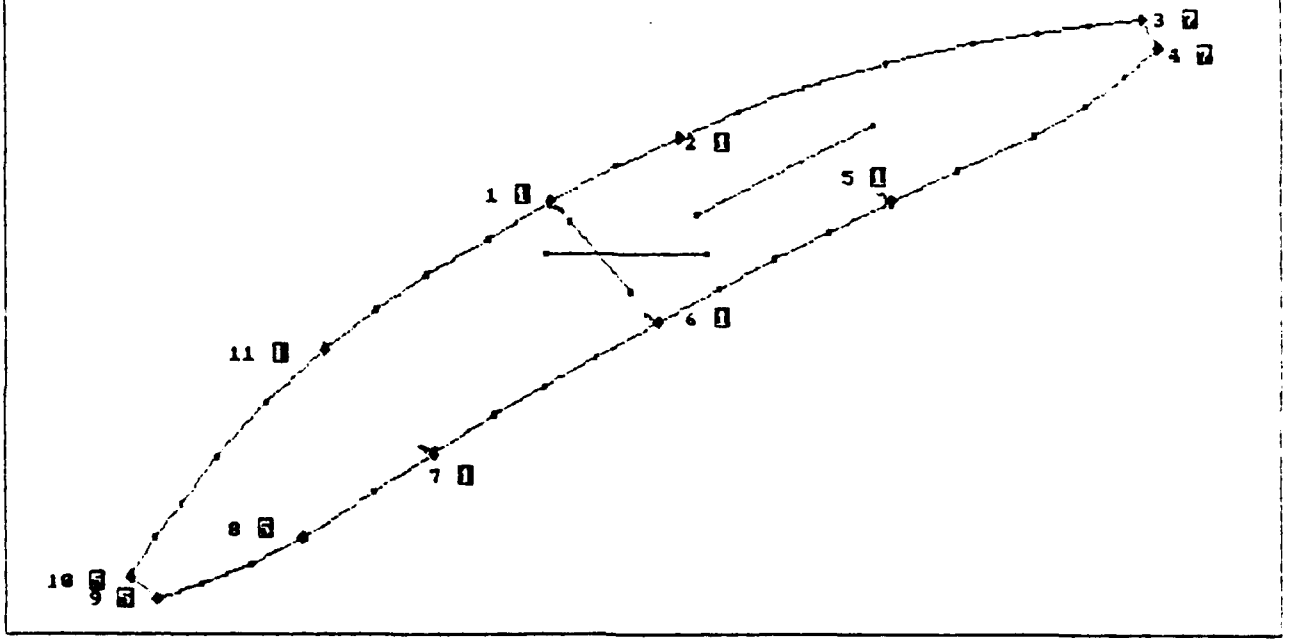
PIECE NAME: 10326
DESCRIPTION: REG S&F UN COL

CATEGORY : 41
RULE TABLE: NPC



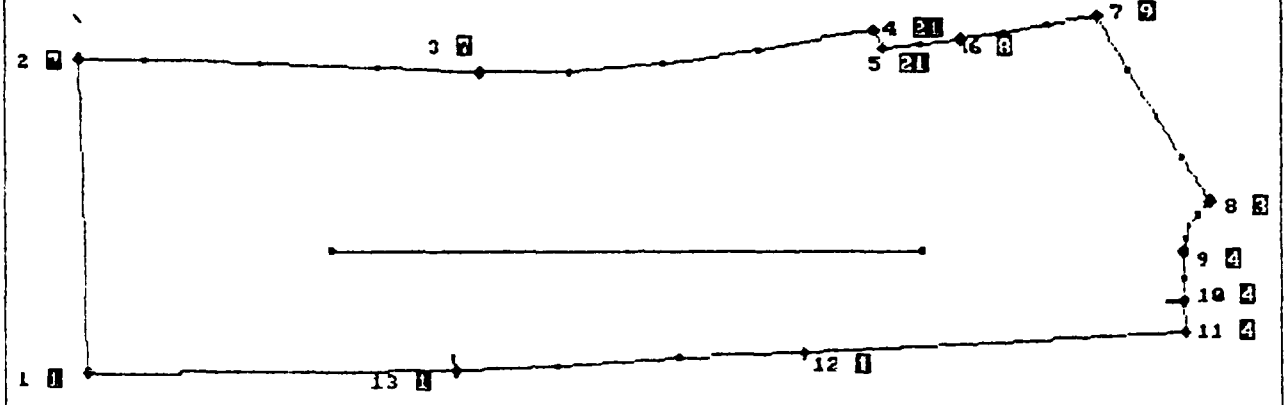
PIECE NAME: 10328
DESCRIPTION: S+F UN COL ST

CATEGORY : 51
RULE TABLE: NPC

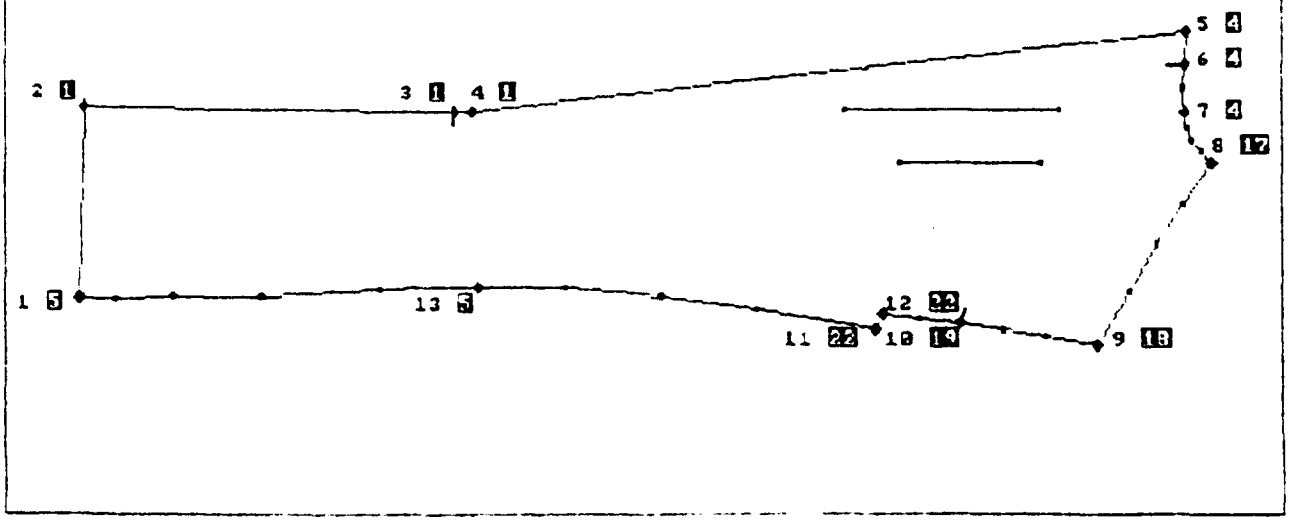


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10332	CATEGORY : 20
DESCRIPTION: REG RT BACK LIN	RULE TABLE: MPC

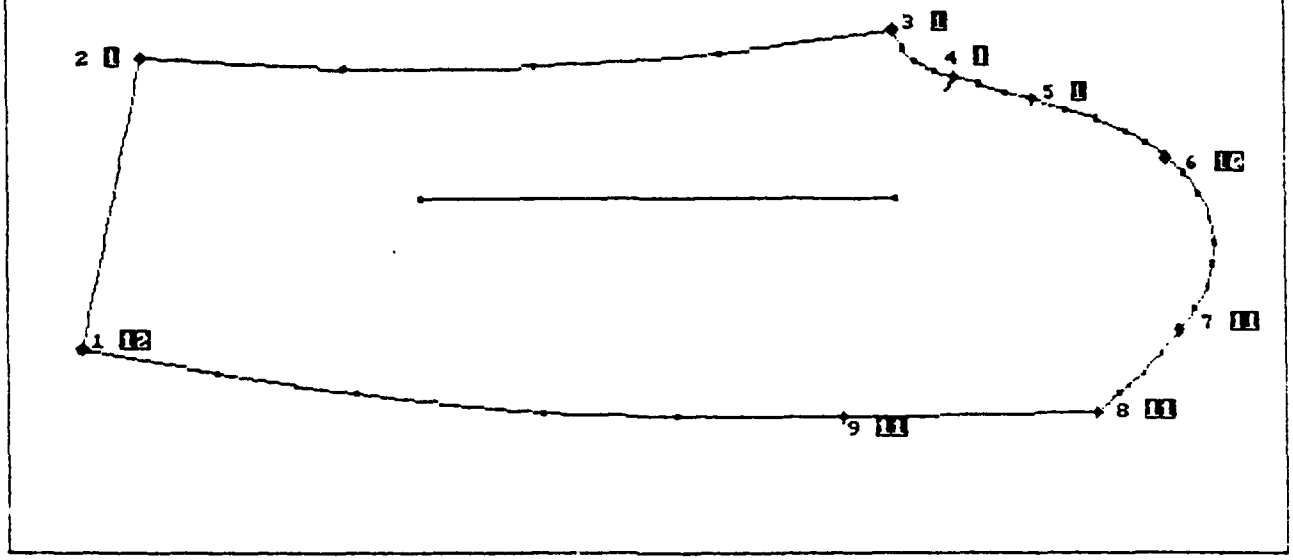


PIECE NAME: 10333	CATEGORY : 21
DESCRIPTION: REG L BACK LIN	RULE TABLE: MPC

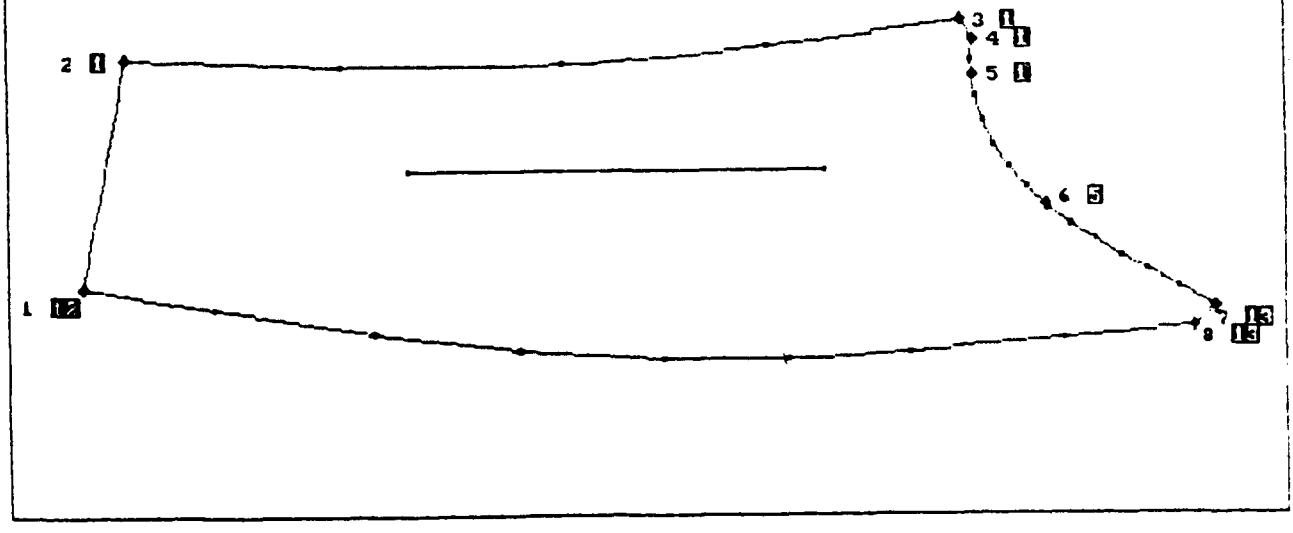


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10334	CATEGORY : 30
DESCRIPTION: REG LIN TP SLV	RULE TABLE: NPC

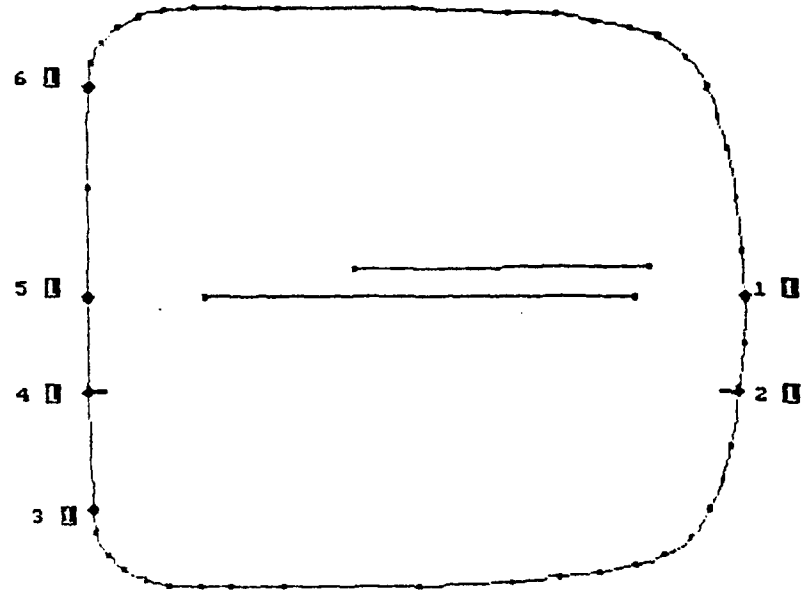


PIECE NAME: 10335	CATEGORY : 31
DESCRIPTION: REG LIN UN SLV	RULE TABLE: NPC

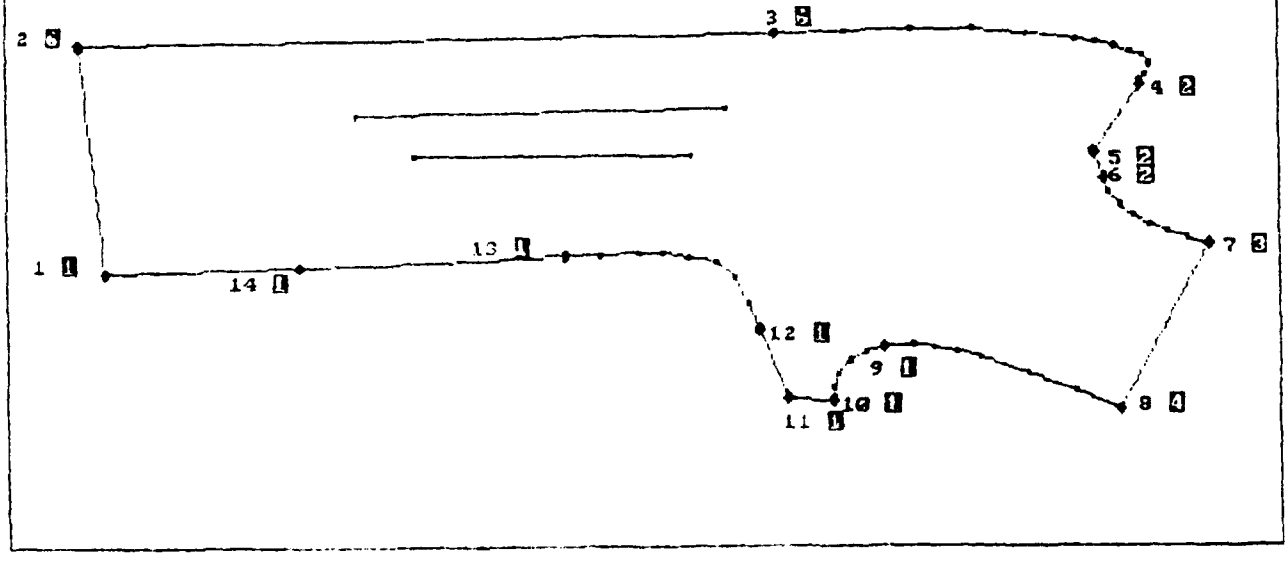


PLOTTED PATTERN PIECES
-Continued-

PIECE NAME: 10337	CATEGORY : 60
DESCRIPTION: FRT SIDE POC	RULE TABLE: NPC



PIECE NAME: 10340	CATEGORY : 10
DESCRIPTION: REG FUS FRT	RULE TABLE: NPC



APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
1) Cut all parts. Open markers are best for this product since several parts are single items. Cutting face-up eases shade marking and bundling. Drill pocket location on front and on front pockets for easy alignment		Create markers on a CAD system such as: Gerber AM 5, AccuMark 300 Micro Dynamics Lectra Corporation Spread with an automatic spreader such as supplied by: CRA Corp. SME Corp. Gerber Garment Tech. Cut garment parts on a computer controlled cutter such as : Gerber High Ply Cutter Lectra High Ply Cutter
2) Fuse non-woven interlining to undercollar and under collar stand		Fuse parts on a belt type fusing press fitted with a parts stacker
3) Set top and undercollar to collar stands	301	Use a programmable lockstitch with a ply sensor to set collar stands to collar. Program the machine to backtack at start and finish, stop sewing at the edge of the fabric and cut the thread
4) Topstitch 1/16" both sides of the topcollar and lower side of the undercollar of joining seam	301	Use a programmable lockstitch with a ply sensor to top stitch collar joining seam. Program machine to stop and cut the thread at the end of the seam. Machine should be fitted with a 1/16" raising presser foot. Backtack at start and finish
5) Join top and undercollar. Join with topcollar on the bottom. Undercollar is smaller than top collar and has to be eased in evenly	301	Use a programmable tacker to join ends and a programmable lockstitch to close the top of the collar. This method will ensure that both points are the same
6) Trim collar points and turn collar		Trim collar points manually then use a compressed air activated collar turner fitted with a special blade shaped to the contour of the collar

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
7) Edgebaste collar	101	Use an edgebasting machine which beads the outer edge of the collar
8) Press and shape collar		Use a programmable pressing machine fitted with a collar shaping buck
9) Mark lower edge of collar and collar stand and trim edge so that it is even		This is a manual table operation
10) Join outseam of sleeves	301 or 401	There are several automatic side seamers available for this operation. They can be programmed for any ease-in that is required. The machines maintain the seam allowances well and stack the sewn parts
11) Press sleeve outseam open and shape		This operation should be done on a self-contained underpressing unit with a built in vacuum and a shaped sleeve buck
12) Close inseam of sleeves	301 or 401	There are several automatic side seamers available for this operation. They can be programmed for any ease-in that is required. The machines maintain the seam allowances well and stack the sewn parts
13) Press inseams open and press cuff turn-up		This operation should be done on a self-contained underpressing unit with a built in vacuum and sleeve buck
14) Set pocket facing to front pockets. Facings have to be lined up with the notches at the top and bottom of the pocket	301	Setting the facing requires an "L" shaped seam. A programmable lockstitch machine can be programmed to do this work. The operator only has to guide the

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
15) Set cash pocket to the right front pocket. Fold pocket piece in half, place with folded edge up and set to front pocket	301	Use a programmable lockstitch with a ply sensor. Program the machine to backtack at start, finish, and at turning points
16) Fuse interlining to fronts		Fuse parts on a belt type fusing press fitted with a parts stacker
17) Tape armholes and shoulders	301	This operation is repeated on several sections of the coat and requires a special set-up. The single needle needle-feed lockstitch should be fitted with a tape feeder so that the tape is relaxed when sewn on. The machine's presser foot has to be fitted with a tape guide and an automatic before-and-after tape cutter
18) Mark bridle for tape location		This is done manually with a template
19) Set bridle tape	301	Set bridle tape with a blind-stitch machine fitted with a needle positioner and thread trimmer
20) Set pocket welts and pocket bag for front pockets	301 or 101	There are several pocket welting machines available. For this operation it is best to use one that has clamps to hold the pocket bag in place and is fitted with target lights to align the pocket and front
21) Turn and press welts		Turn welts through to the left side of the front and press the welts with a hand steam iron. It should be a self contained unit

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
22) Double needle top stitch both pocket welts with a 1/4" machine	301	The double needle programmable lockstitch machine should be programmed for a two stitch backtack start and finish, a fixed stitch count and a thread trim at the end. The machine should be fitted with a 1/16" raising presser foot.
23) Close pocket bags on a single needle lockstitch	301	Use a programmable lockstitch with a ply sensor. Program the machine to backtack at start and finish and cut the thread at the end of the seam.
24) Finish ends of pocket welts with a triangle tack	301	The machine for this operation is a programmable tacking machine. The program is for an alternating equal sided triangle. The base of the triangle is a zig zag bartack running from front to back and the sides of the triangle are straight line stitches
25) Join coat shell center back from vent to neck and notch seam	301 or 401	This is best done on the automatic side seamer listed in operation number 10. The seam must be started at the vent
26) Tape back armholes and neck	301	Taping is to be done on a lockstitch machine fitted with a tape feeder and a tape cutter that reads the end of the fabric
27) Press seam open and press vent		This underpressing operation is best done on a self contained underpressing unit fitted with a vacuum system.
28) Tack top of vent	301	A programmable tacking machine is best suited for this operation
29) Join shell side seams	301	A programmable single needle needle-feed lockstitch fitted with a ply sensor to read the end of the fabric is the best unit for this operation

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE I: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
30) Press side seams open		This underpressing operation is best done on a self contained underpressing unit fitted with a vacuum system.
31) Bind shell hem	301	The binding has to be done on a machine fitted with a cutter that automaticaly cuts the binding at start and finish
32) Close shell shoulder seam	301	A programmable single needle needle-feed lockstitch fitted with a ply sensor to read the end of the fabric is the best unit for this operation
33) Press shoulder seams open		This underpressing operation is best done on a self contained underpressing unit fitted with a vacuum system
34) Set shell sleeves	301	Sleeve setting has to be done on a programmable post bed sleeve setting machine. The machine has to be programmed for the right amount of ease-in
35) Set sleeve heads and shoulder pads	301	This operation must be done on a heavy duty needle feed machine with an edge cutter. The machine should also be fitted with a needle positioner and undertrimmer
36) Set undercollar to coat shell	301	A programmable top feed single needle lockstitch will work well for on this operation
37) Notch top and undercollar		This is a manual operation which will help to join the parts

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
38) Set pocket facing to breast pocket bag	301	The facing is best set with a programmable lockstitch machine which is programmed for the width of the pocket and automatic thread trim. The work station should also be fitted with a flip stacker for automatic disposal and stacking
39) Set breast pocket welts and pocket bag	301 or 101	This operation requires an automatic pocket welting machine fitted with a clamp to hold the pocket bag and a stacker for the sewn parts
40) Turn welts and pocket bag and [illegible] welt	301	This should be sewn on a programmable lockstitch machine. The machine has to be set for the length of the welt with an automatic backtack at start and finish. The machine should be fitted with the proper raising presser foot
41) Set garment label to breast pocket.	301	There are several programmable label tackers which will efficiently set the label. A label separator will increase the efficiency
42) Fold breast pocket and close the sides. Topstitch top welt	301	This operation is best done on a programmable lockstitch machine programmed for the length of the pocket sides and a backtack at start and finish
43) Tack ends of breast pocket welts	301	A compressed air-activated single pedal bartack machine has to be used for this operation
44) Join quilted lining at center back	301 or 401	The automatic side closing machine, listed for operation number 16, will work well for this operation

APPENDIX III

CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
45) Join quilted lining side seams	301	A programmable needle-feed lockstitch fitted with a ply sensor to read the end of the seam is the best unit for this operation
46) Bind lining hem	301	The binding has to be done on a machine fitted with a cutter that automaticaly cuts the binding at start and finish
47) Join facings to front linings and topstitch joined seam 1/16" on lining side	301 or 401	The facing is joined to the lining on a programmable lockstitch machine. The sewing machine should be be fitted with a top feed system. This operation is best done with the quilted lining being the bottom ply
48) Close lining shoulder seam	301	This operation is best done on a programmable lockstitch machine which is programmed for the length of the shoulder seam and a back tack at start and finish
49) Join top and underseams on sleeve lining	301 or 401	There are several automatic side seamers available for this operation. They can be programmed for any ease-in that is required. The machines maintain the seam allowances well and stack the sewn parts
50) Set sleeve linings to quilted body lining	301	Sleeve setting has to be done on a programmable post bed sleeve setting machine. The machine nas to be programmed for the right amount of ease-in
51) Baste size label and hanger tape to lining top center back	101 or 301	A programmble lockstitch machine programmed for the label and tape will work well for this operation

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
52) Join lining to shell at lapels	301	Use a programmable tacker to join the facing to the fronts at the lapels. This method will ensure that both lapels are the same shape
53) Close bridle and set topcollar to quilted lining.	301	The materials at this seam are quite thick, for that reason it is best to use a topfeed lockstitch machine fitted with an automatic backtack and undertrimmer
54) Baste coat facings to fronts	101 or 301	This can be done either with a single thread chainstitch basting machine or jump baster. Operator must allow for proper ease-in at lapel
55) Join fronts to facings with a 3/8" seam allowance and tape	301	The fronts and facings should be joined on a programmable lockstitch fitted with tape feeding device and an automatic tape cutter that reads the end of the seam
56) Join sleeve lining to shell at cuff, fold back and tack seam allowances	301	A programmable top feed single needle lockstitch will work well on this operation
57) Join lining to shell at vent	301	A programmable top feed single needle lockstitch will work well for on this operation
58) Trim lapels and corners and turn coat		This is manual table operation
59) Edgebaste fronts	101 or 401	The most efficient method for this operation is to use a jump basting machine

APPENDIX III

CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
60) Topstitch coat complete	301	This operation requires a heavy duty needle feed machine with a needle positioner and undertrimmer
61) Tack sleeve linings to shell at the armholes	301	This can be done either with a 1/2" bartack or a programmable lockstitch set for linear tack
62) Mark for buttonholes		Use buttonhole marking machine for consistent spacing
63) Sew buttonholes	301 or 401	Sew buttonholes on a cut first eyelet buttonhole machine
64) Tack ends of buttonhole	301	Bartack ends of each buttonhole
65) Inspect coat and remove basting stitches		Manual operation
66) Finish press sleeves		Use programmable presses to press the coats
67) Finish press fronts		Use programmable presses to press the coats
68) Finish press collar		Use programmable presses to press the coats
69) Finish press shoulders		Use programmable presses to press the coats
70) Finish press hem		Use programmable presses to press the coats

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 1: ADVANCED MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION - MAXIMUM USE OF ADVANCED MECHANIZED SYSTEMS
71) Mark coat for 8 buttons		Since the setting of the buttons has to match the buttonholes this is a manual operation
72) Set buttons	201 or 301	The best machine for this purpose is one of the units that wraps the stem of the button

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
1) Cut all parts. Open markers are best for this product since several parts are single items. Cutting face-up eases shade marking and bundling. Drill pocket location on front and on front pockets for easy alignment.		Create markers on a CAD system such as: Gerber AM 5, AccuMark 300 Micro Dynamics Lectra Corporation Spread with an automatic spreader such as supplied by: CRA Corp. SME Corp. Gerber Garment Tech. Cut manually
2) Fuse non-woven interlining to undercollar and undercollar stand		Fuse parts on a belt type fusing press
3) Set top and undercollar to collar stands	301	Use a lockstitch fitted with an undertrimmer
4) Topstitch 1/16" both sides of the topcollar and lower side of the undercollar of joining seam	301	Use a lockstitch fitted with an undertrimmer and with a 1/16" raising presser foot
5) Join top and undercollar. Join with topcollar on the bottom. Undercollar is smaller than top collar and has to be eased in evenly	301	Use a lockstitch fitted with an undertrimmer to join parts
6) Trim collar points and turn collar		Turn collar manually
7) Edgebaste collar	101	This can be done with an edge baster or on a single needle single thread chain stitch machine

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
8) Press and shape collar		Use a pressing machine fitted with collar shaping buck
9) Mark lower edge of collar and collar stand and trim edge so that it is even		This is a manual table operation
10) Join outseam of sleeves	301 or 401	This operation can be done on a single needle two thread chainstitch or lockstitch machine. The machine should be fitted with an undertrimmer and a stacking device
11) Press sleeve outseam open and shape		This operation should be done on a self-contained underpressing unit with a built in vacuum and a shaped sleeve buck
12) Close inseam of sleeves	301 or 401	This operation can be done on a single needle two thread chainstitch or lockstitch machine. The machine should be fitted with an undertrimmer and a stacking device
13) Press inseams open and press cuff turn-up		This operation should be done on a self-contained underpressing unit with a built in vacuum and a sleeve buck
14) Set pocket facing to front pockets. Facings have to be lined up with the notches at the top and bottom of the pocket	301	The L shaped seam should be sewn on a lockstitch machine fitted with a needle positioner and undertrimmer
15) Set cash pocket to the right front pocket. Fold pocket piece in half, place with folded edge up and set to front pocket	301	The U shaped seam should be sewn on a programmable lockstitch or a machine fitted with a needle positioner and undertrimmer

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
16) Fuse interlining to fronts		Fuse parts on a belt type fusing press
17) Tape armholes and shoulders	301	This operation is repeated on several sections of the coat and requires a special set-up. The single needle needle feed lockstitch should be fitted with a tape feeder so that the tape is relaxed when sewn on. The machine's presser foot has to be fitted with a tape guide. The tape has to be cut manually or with a tape chopper
18) Mark bridle for tape location		This is done manually with a template
19) Set bridle tape	301	Set bridle tape with a blind-stitch machine fitted with a thread trimmer
20) Set pocket welts and pocket bag for front pockets	301 or 101	It is best to use a machine with target lights and pocket clamps which allows the use of a one piece pocket bag
21) Turn and press welts		Turn welts through to the left side of the front and press the welts with a hand steam iron
22) Double needle top stitch both pocket welt with 1/4" machine	301	A double needle lockstitch with a reverse feed and undertrimmer. The machine should be fitted with a 1/16" raising presser foot.
23) Close pocket bags on single needle lockstitch	301	The "U" shaped seam should be sewn on a lockstitch machine fitted with a needle positioner and undertrimmer

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
24) Finish ends of pocket welts with a triangle tack	301	Use a programmable tacker or a cam machine coverted to sew the triangle tack.
25) Join coat shell center back from vent to neck and notch seam	301 or 401	The joining should be done with a single needle lockstitch fitted with an undertrimmer
26) Tape back armholes and neck	301	Taping is to be done on a lockstitch machine fitted with a tape feeder and tape chopper
27) Press seam open and press vent		The underpressing has to be done with a steam hand iron
28) Tack top of vent	301	This best done with a programmable tacker or programmable single needle lockstitch
29) Join shell side seams	301	This operation is best done on a needle feed single needle lockstitch machine fitted with a reverse feed and an undertrimmer
30) Press side seams open		The underpressing has to be done with a steam hand iron
31) Bind shell hem	301	The binding machine used for this operation should be fitted with an air operated binding cutter
32) Close shell shoulder seam	301	This operation is best done on a needle feed single needle lockstitch machine fitted with a reverse feed and an undertrimmer
33) Press shoulder seams open		The underpressing has to be done with a steam hand iron

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
34) Set shell sleeves	301	Sleeve setting should be done on a machine built for sleeve setting or on a cylinder or post machine fitted with an undertrimmer.
35) Set sleeve heads and shoulder pads	301	This operation must be done on a heavy duty needle feed machine with an edge cutter.
36) Set undercollar to coat shell	301	This operation is best done on a needle feed lockstitch machine with an undertrimmer
37) Notch top and undercollar		This is manual operation which will help to join the parts
38) Set pocket facing to breast pocket bag	301	The facing should be set with a lockstitch machine fitted with a 1/16" raising presser foot and an undertrimmer.
39) Set breast pocket welts and pocket bag	301 or 101	This operation requires an automatic pocket welting machine fitted with a clamp to hold the pocket bag
40) Turn welts and pocket bag and topstitch bottom welt	301	This sewing operation is best done on a lockstitch fitted with a reverse feed system, the proper raising presser foot and an undertrimmer.
41) Set garment label to breast pocket	301	The label can be set with a programmable tacker or a programmable lockstitch machine
42) Fold breast pocket and close the sides. Topstitch top welt	301	This operation should be performed on a lockstitch machine fitted with a reverse feed and an undertrimmer

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
43) Tack ends of breast pocket welts	301	This operation can be done on a standard bartack machine
44) Join quilted lining at center back	301 or 401	A needle-feed or top-feed machine fitted with an undertrimmer is well suited for this operation
45) Join quilted lining side seams	301	This operation is best done on a needle-feed single needle lockstitch machine fitted with a reverse feed and an undertrimmer
46) Bind lining hem	301	The binding machine used for this operation should be fitted with an air-operated binding cutter
47) Join facings to front lining and topstitch joining seam 1/16" on lining side.	301 ot 401	The joining should be done with a single needle lockstitch fitted with a top-feed system, edge guide and undertrimmer
48) Close lining shoulder seam	301	This operation should worked on a lockstitch machine fitted with a reverse feed and an under-trimmer
49) Join top and under seams on sleeve lining	301 or 401	This operation can be done on a single needle two thread chainstitch or lockstitch machine. The machine should be fitted with an undertrimmer and a stacking device
50) Set sleeve linings to quilted body lining.	301	Sleeve setting should be done on either a cylinder or post bed machine fitted with an undertrimmer
51) Baste size label and hanger tape to lining top center back	101 or 301	The hanger tape and label can be basted into place with a lock-stitch fitted with an undertrimmer

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
52) Join lining to shell at lapels	301	Use a lockstitch fitted with an under trimmer to join parts
53) Close bridle and set top-collar to quilted lining	301	This seam should be sewn on a topfeed lockstitch machine fitted with an undertrimmer
54) Baste coat facings to fronts	101 or 301	This can be done either with a single thread chainstitch basting machine or jump baster. Operator must allow for proper ease-in at lapel
55) Join fronts to facings with a 3/8" seam allowance and tape	301	The fronts and facings should be joined on a single needle lockstitch fitted with a tape feeding device
56) Join sleeve lining to shell at cuff, fold back and tack seam allowances	301	This operation is best done on a needle-feed lockstitch machine with an undertrimmer
57) Join lining to shell at vent	301	This operation is best done on a needle-feed lockstitch machine with an undertrimmer
58) Trim lapels and corners and turn coat		This is manual table operation
59) Edgebaste fronts	101 or 401	this can be done on edge basting machine or a jump basting machine
60) Topstitch coat complete	301	This operation requires a heavy duty needle feed machine with a needle positioner and undertrimmer

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
61) Tack sleeve linings to shell at the armholes	301	This can be done either with a 1/2" bartack or a lockstitch machine with an undertrimmer and backtack
62) Mark for buttonholes		Use buttonhole marking machine for consistent spacing
63) Sew buttonholes	301 or 401	Sew buttonholes on a cut first eyelet buttonhole machine
64) Tack ends of buttonhole	301	Bartack ends of each buttonhole
65) Inspect coat and remove basting stitches		Manual operation
66) Finish press sleeves		Use compressed air activated presses to finish the coats
67) Finish press fronts		Use compressed air activated presses to finish the coats
68) Finish press collar		Use compressed air activated presses to finish the coats
69) Finish press shoulders		Use compressed air activated presses to finish the coats
70) Finish press hem		Use compressed air activated presses to finish the coats

APPENDIX III
CONSTRUCTION SEQUENCES AND METHOD DESCRIPTIONS
SEQUENCE 2: FIRST GENERATION MECHANIZATION

OPERATION DESCRIPTION	STITCH TYPE	METHOD DESCRIPTION FIRST GENERATION MECH. EQUIPMENT
71) Mark coat for 8 buttons		Since the setting of the buttons has to match the buttonholes this is a manual operation
72) Set buttons	201 or 301	This operation can be done on a button sewing machine in two stages or on a AMF type of buttonsewer

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
1) Cut all parts. Open markers are best for this product since several parts are single items. Cutting face-up eases shade marking and bundling. Drill pocket location on front and on front pockets for easy alignment		Make markers manually Spread with a manual spreading machine Cut manually
2) Fuse non-woven interlining to undercollar and undercollar stand		Fuse parts on a fusing belt or on a conventional fusing press
3) Set top and undercollar to collar stands	301	Use a plain lockstitch and cut thread manually
4) Topstitch 1/16" both sides of the topcollar and lower side of the undercollar of joining seam	301	Use a plain lockstitch fitted with 1/16" raising presser foot
5) Join top and undercollar. Join with topcollar on the bottom. Undercollar is smaller than top-collar and has to be eased-in evenly	301	Use a plain lockstitch and cut thread manually
6) Trim collar points and turn collar		Trim collar points and turn collar manually
7) Edgebaste collar	101	This can be done on a single needle basting machine
8) Press and shape collar		Use a pressing machine fitted with collar shaping buck

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
9) Mark lower edge of collar and collar stand and trim edge so that it is even		This is a manual table operation
10) Join outseam of sleeves	301 or 401	The sleeves can be sewn in a chain on either a single needle lockstitch or two thread chain stitch machine
11) Press sleeve outseam open and shape		This operation has to done with a hand steam iron and on a shaped buck
12) Close inseam of sleeves	301 or 401	The sleeves can be sewn in a chain on either a single needle lockstitch or two thread chain stitch machine
13) Press inseams open and press cuff turn-up		This operation has to done with a hand steam iron and on a shaped buck
14) Set pocket facing to front pockets Facings have to be lined up with the notches at the top and bottom of the pocket	301	The facings should be set with a plain lockstitch machine
15) Set cash pocket to the right front pocket. Fold pocket piece in half, place with folded edge up and set to front pocket	301	The pocket should be set with a plain lockstitch
16) Fuse interlining to fronts		Fuse parts on a fusing belt or on a conventional fusing press

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
17) Tape armholes and shoulder	301	The operation should be done on a single needle needle-feed lockstitch machine. It's presser foot should be fitted with a tape guide
18) Mark bridle for tape location		This is done manually with a template
19) Set bridle tape	301	Set bridle tape with a blind-stitch machine
20) Set pocket welts and pocket bag for front pockets	301 or 101	Set pocket welts on a pocket welting machine and set the two piece pocket bag to the welts
21) Turn and press welts		Turn welts through to the left side of the front and press the welts with a hand steam iron
22) Double needle [illegible]ch both pocket welt wit[illegible] machine	301	A 1/4" double needle lockstitch machine is used for this operation
23) Close pocket bags on single needle lockstitch	301	The pocket should be closed with a plain lockstitch
24) Finish ends of pocket welts with a triangle tack	301	This operation has to be done in two steps. First make a 1" tack at each end of the welts. Then finish the triangle with a plain single needle lockstitch
25) Join coat shell center back from vent to neck and notch seam	301 or 401	The joining can be done on a plain single needle lockstitch

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
26) Tape back armholes and neck	301	Taping is to be done on a lockstitch machine fitted with a tape guiding presser foot
27) Press seam open and press vent		The underpressing has to be done with a steam hand iron
28) Tack top of vent	301	The rectangular tack should be done with a heavy duty needle-feed lockstitch machine
29) Join shell side seams	301	A plain needle-feed or drop-feed lockstitch machine can be used to complete this operation
30) Press side seams open		The underpressing has to be done with a steam hand iron
31) Bind shell hem	301	A plain binding set-up will work very well
32) Close shell shoulder seam	301	A plain needle-feed or drop-feed lockstitch machine can be used to complete this operation
33) Press shoulder seams open		The underpressing has to be done with a steam hand iron
34) Set shell sleeves	301	While the sleeves can be set on a plain machine it is best to do this operation an a cylinder or post bed machine
35) Set sleeve heads and shoulder pads.	301	This operation must be done on a heavy duty needle-feed machine with an edge cutter. If an edge cutter is not available the sleeve must be trimmed manually

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
36) Set undercollar to coat shell	301	A plain lockstitch can be used for this operation
37) Notch top and undercollar		This is manual operation which will help to join the parts
38) Set pocket facing to breast pocket bag	301	This operation requires a plain lockstitch machine fitted with a 1/16" raising presser foot
39) Set breast pocket welts and pocket bag	301 or 101	This operation can be done manually like the front pocket, or with an automatic pocket setter. The pocket bag has to be placed under the machine clamp at the same time
40) Turn welts and pocket bag and topstitch bottom welt	301	This sewing operation is best done on a lockstitch fitted with a reverse feed system and the proper raising presser foot
41) Set garment label to breast pocket	301	The label can be set with a plain lockstitch or a cam operated label tacking machine
42) Fold breast pocket and close the sides and topstitch top welt	301	The pocket sides can be closed on a plain lockstitch machine
43) Tack ends of breast pocket welts	301	This operation can be done on a standard bar-tack machine
44) Join quilted lining at center back	301 or 401	The operation can be completed on a plain lockstitch machine

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
45) Join quilted lining side seams	301	A plain needle-feed or drop-feed lockstitch machine can be used to complete this operation
46) Bind lining hem	301	A plain binding set up will work very well
47) Join facings to front linings and topstitch joining seam 1/16" on lining side	301 ot 401	The joining can be done with a plain lockstitch fitted with a raising foot and a swing-out edge guide
48) Close lining shoulder seam	301	The shoulder seams can be closed on a plain lockstitch machine
49) Join top and under seams on sleeve lining	301 or 401	The sleeves can be sewn in a chain on either a sinngle needle lockstitch or two-thread chain stitch machine
50) Set sleeve linings to quilted body lining	301	While the sleeves can be set on a plain machine it is best to do this operation on a cylinder or post bed machine
51) Baste size label and hanger tape to lining top center back	101 or 301	The label and hanger tape can be basted into place with a plain lockstitch or single thread chain-stitch machine
52) Join lining to shell at lapels	301	Use a plain lockstitch and cut the thread manually
53) Close bridle and set top collar to quilted lining	301	This operation is best done on a topfeed lockstitch machine, but it can also be sewn on a plain machine

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
54) Baste coat facings to fronts	101 or 301	This can be done either with a single thread chainstitch basting machine or jump baster. Operator must allow for proper ease-in at lapel
55) Join fronts to facings with a 3/8" seam allowance and tape	301	The fronts and facings should be joined on a plain lockstitch fitted with a tape guiding presser foot
56) Join sleeve lining to shell at cuff, fold back and tack seam allowances	301	A plain lockstitch can be used for this operation
57) Join lining to shell at vent	301	A plain lockstitch can be used for this operation
58) Trim lapels and corners and turn coat		This is a manual table operation
59) Edgebaste fronts	101 or 401	This operation can be completed on a single-needle flat bed one-thread chain basting machine
60) Topstitch [illegible]	301	This operation requires a heavy needle feed machine
61) Tack sleeve lining to shell at the armholes	301	This can be done either with a 1/2" bartack or a lockstitch machine
62) Mark for buttonholes		Mark buttonhole location with the use of a template
63) Sew buttonholes	301 or 401	Sew buttonholes on a cut first [illegible] buttonhole machine

APPENDIX III
CONSTRUCTION SEQUENCE AND METHOD DESCRIPTION
SEQUENCE 3: MANUAL METHODOLOGY

OPERATION DESCRIPTION	STITCH TYPE	METHODS DESCRIPTION MANUAL EQUIPMENT
64) Tack ends of buttonhole	301	Bartack ends of each buttonhole
65) Inspect coat and remove basting stitches		Manual operation
66) Finish press sleeves		Finish press the coats on manually operated presses
67) Finish press fronts		Finish press the coats on manually operated presses
68) Finish press collar		Finish press the coats on manually operated presses
69) Finish press shoulders		Finish press the coats on manually operated presses
70) Finish press hem		Finish press the coats on manually operated presses
71) Mark coat for 8 buttons		Since the setting of the buttons has to match the buttonholes this is a manual operation
72) Set buttons	201	Sew the eight buttons to the coat manually