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**Functional Description of Inventory Replenishment Model
for the Regional Hazardous Material Management System (RHMMS)**

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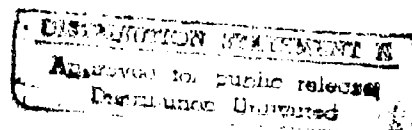
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INVENTORY REPLENISHMENT MODEL
FOR THE REGIONAL HAZARDOUS MATERIAL
MANAGEMENT SYSTEM (RHMMS)**

TASK 7-2- 91

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FUNCTIONAL DESCRIPTION OF INVENTORY REPLENISHMENT MODEL FOR THE REGIONAL HAZARDOUS MATERIAL MANAGEMENT SYSTEM (RHMMS)

Introduction

Under Project Description (PD) 7-2-001, AFMA was tasked to create a mathematical inventory model to be used for replenishment of HAZMIN Centers under the Regional Hazardous Material Management System (RHMMS). AFMA has developed a functional description of the mathematical inventory replenishment model based on forecasted requirements, repetitive demand, lead times, excess material available in the region for redistribution, and the cost of disposal. This functional description includes graphical layouts depicting the data to be used by the Regional Inventory Manager (RIM) and reports to be generated for use by the RIM.

Forecasting

Pursuant to creating the replenishment model, AFMA focused on demand forecasting as the most fundamental aspect of a successful inventory management system.

The demand forecasting model was developed using the following methodology:

1. Investigation and selection of a potential demand forecasting model(s) - Several methods of demand forecasting were researched and a candidate selected for testing and evaluation using historic demand data. The candidate model selected was an exponential smoothing method.
2. Collection of historic demand data - Site visits to operating HAZMIN Centers at FISC, Norfolk; FISC, San Diego; and FISC, Puget Sound were used to collect background information and historic demand data.
3. Data Reduction - Erroneous or otherwise unusable data were eliminated.
4. Data Analysis - Statistics regarding demand for Hazardous Material (HM) were compiled and the potential forecasting model(s) were tested, simulated, and evaluated.
5. Selection - The most appropriate forecasting model was selected and parameters defining its usefulness were quantified.

Replenishment

The forecasting model became the basis for the inventory replenishment model. Other factors considered in development of the replenishment model include:

1. A lead time factor, tied to the material source, to prevent stock outs while material is on order.
2. The need for a High Limit (HL) and a Low Limit (LL) on inventory levels.
3. Methods of determining the Reorder Quantity (ROQ).
4. Suggestions and recommendations from FISC personnel. (i.e., several people recommended that the replenishment model include a feature for remarks by the RIM.
5. Methods of managing materials that have low frequency of issue.
6. Use of data derived from the HICS database. Implicit in this assumption is that such data represents the combined totals for all HAZMIN Centers in the region.
7. The need to minimize the amount of data supplied by the RIM, consistent with proper functioning of the Replenishment Model.

Section I: Summary of Results

Forecasting

A forecasting model called "exponential smoothing" was chosen as the best method of forecasting demand for Hazardous Materials. In simulation and testing of the exponential smoothing model, demand for items with a high frequency of issue was forecasted with reasonable accuracy. Several variations of the exponential smoothing model were tested and simulated. The variation between actual demand and forecasted demand was measured to determine the best version of the model. The resultant model is represented by the following equation:

$$\text{Next Period Demand} = 0.1 * \text{Previous Actual Demand} + 0.9 * \text{Previous Forecast}$$

The equation shown above forecasts demand with reasonable accuracy for items that are issued 24 or more times per year. The first iteration of this model requires an initial value for the first "previous forecast". An arithmetic average of previous annual demand is recommended for the initial value, if enough data is available. Otherwise, the first value for the "previous forecast" must be selected by the RIM based on his/her knowledge of demand for the item.

It is important to note that this forecasting method is only viable for items with high levels of demand and high frequency of issue. Such items represent the vast majority of transactions at HAZMIN Centers; however, they are only a small percentage of the number of inventory items. Therefore, the following basic inventory management practices are recommended to minimize the number of low demand items:

1. Periodic review and update of Authorized Use Lists to eliminate items from the inventory that are no longer in use.
2. Elimination of low demand items from the inventory whenever possible, particularly items that are not mission critical. Items that are required for planned activities are good candidates because they can be ordered when required, rather than provided "off the shelf".

Despite efforts to eliminate them, items with low frequency of issue and/or low demand need to be managed as part of the inventory. Demand for these items must be determined from the inventory manager's knowledge of the customer's needs.

Replenishment

With the capabilities and limitations of demand forecasting in mind, a Replenishment Model for regional hazardous material management was created. It utilizes an Optional Replenishment (OR) inventory system combined with Selective Inventory Control (SIC). The integration of these two systems, combined with the ability to forecast demand for HM, provide the inventory manager with powerful tools to ensure that no stock outs occur and that no excess material is sent to disposal. A discussion of the five primary elements of the replenishment model follows.

1. Optional Replenishment Inventory System:

The OR system is one of two fundamental elements of inventory management in the replenishment model. It is similar to many classical inventory management models and contains the following basic elements:

- a fixed review period
- a High Limit on inventory levels,
- a Low Limit, also called the Reorder Point (ROP), on inventory levels,
- replenishment when inventory levels fall below the low limit, and
- a Reorder Quantity (ROQ) based on the HL and inventory position at the time the order is placed.

Typically, High and Low limits in the OR system are chosen arbitrarily by the inventory manager.

The RHMMS Replenishment Model includes the following modifications to the OR system to satisfy the unique requirements of HM management, especially the excessive cost of surplus inventory:

- calculating the HL and LL for each inventory item based on demand forecasting (for items conducive to demand forecasting),
- providing a means for the regional inventory manager to identify trends in demand for inventory items,
- providing tools for the inventory manager to identify (via reports) items that are above the HL, below the LL, or otherwise in need of attention, and
- a method of sorting and organizing inventory information rapidly and accurately.

2. Selective Inventory Management:

Selective inventory management, sometimes called ABC analysis, is a common inventory management technique and the second fundamental element in the replenishment model. It involves dividing inventory items into three classes (Class A, Class B and Class C), based on dollar volume. The class division allows the inventory manager to concentrate on the class or classes of materials that require more intense management. The selective inventory management approach, in conjunction with OR, allows inventory managers to concentrate on HM posing particular problems with respect to forecasting, availability, or mission readiness. The replenishment model contains a field used by the inventory manager to assign a class to each HM in the inventory. The classes are designated 'I, II, III and IV' rather than 'A, B, C...' to avoid confusion with the designations 'A' condition and 'CA' material currently used in RHMMS.

3. Material Classification in the Replenishment Model:

In the Replenishment Model, the class determines the specific forecasting technique applied to the inventory item. The following classes are included in the replenishment model:

- Class I - Materials with a high frequency of issue (24 or more issues per year). These materials have moderate to high turnover, demand that can be forecasted with reasonable accuracy, and represent the bulk of HAZMIN Center issues. They require minimal attention from the inventory manager.

Demand for items in this class is forecasted using the forecasting model discussed above. The High Limits and Low Limits for these items are based on the forecasted demand and a lead time factor. Replenishment is initiated when the inventory level drops below the low limit. The reorder quantity for replenishments is simply the high limit minus the current inventory level.

- Class II - Materials with a low frequency of issue (less than 24 issues per year). These are materials with low turnover, fairly constant demand and no unusual inventory considerations (e.g. restricted supply, extremely short shelf life). The items in this class are expected to require moderate time and management effort because they do not have high turnover or do not respond well to demand forecasting. High limits and low limits are set by the inventory manager based on knowledge of customer requirements or historic demand patterns. Replenishment is initiated when the inventory level drops below the low limit. The reorder quantity for replenishments is calculated in the same manner as Class I materials.
- Class III - These are materials which exhibit unpredictable demand fluctuations or other unique complications (e.g. can only be ordered once each year, extremely critical to the customers mission) requiring more frequent review and attention by the inventory manager. High Limits and Low Limits are set by the inventory manager based on knowledge of customer requirements or historic demand patterns. Replenishment is initiated when the inventory level drops below the low limit. The reorder quantity for replenishments is calculated the same as Class I materials.
- Class IV - Reserved for items of particular interest to the inventory manager either on a temporary or permanent basis. For example, Class IV may be used for discontinued items that will be consumed, but not replenished.

4. Data Management:

A database management system is required for implementation of the inventory management system discussed above. It offers several features needed to ensure the replenishment model succeeds including 1) the ability to manipulate large quantities of data associated with inventory management, and 2) maximum flexibility for the Regional Inventory Manager to make informed decisions regarding replenishment. Enclosure (1) is a collection of graphics developed by AFMA illustrating the type of system envisioned. It contains graphical layouts of recommended functions, screens, and reporting capability for an inventory management system. The basic screen for the Replenishment Module is shown in Figure 1 on the following page.

The Replenishment Module, as illustrated in enclosure (1), provides the inventory manager with the ability to sort and organize inventory data rapidly and accurately using the **Sort**, **Search**, and **Browse** functions. It also allows the inventory manager to execute various replenishment options via the **Replenish** function; and the ability to generate standard or custom reports using the **Reports** function. A **Remarks** window allows the inventory manager to recall comments for each inventory item. A second window for **Trends** graphically displays historic demand and inventory data. The inventory data is organized in a database window called **Inventory and Demand Data**.

Figure 1. Basic Screen for the Replenishment Model

The inventory manager can edit any field, other than those derived from HICS, at his or her discretion using the **Edit** function. The fields contained in the database and the source of the data for each field is summarized in Table 1.

Table 1. Fields in the Replenishment Model

Field	Description	Source of Data
Mark	Used to select items	N/A
Class	Identifies Mat'l Class	RIM
NSN	National Stock Number	HICS
Nomen	Item's common name	HICS
UI	Unit of Issue	HICS
Total	Total Qty of item in stock	HICS
A	Qty of A cond mat'l in stock	HICS
CA	Qty of CA mat'l in stock	HICS
Surplus	Qty of mat'l in excess of HL	Calculated by Replen. Model
Short	Difference between LL and Total	Calculated by Replen. Model
Forecast	Estimated Demand	Calculated by Replen. Model
HL	Maximum Recommended Inventory Level	Class I and II: Replen Model Class III and IV: RIM
LL	Minimum Recommended Inventory Level	Class I and II: Replen Model Class III and IV: RIM
ROQ	Reorder Quantity	Calculated by Replen. Model

Table 1. Fields in the Replenishment Model (Cont'd)

Field	Description	Source of Data
Lead Time	Time required to order & receive material	RIM
Date Order	When the order was placed	RIM
On Order	Qty of material ordered	RIM
ETA	Expected arrival date of mat'l	RIM

The Replenishment Model also contains provisions for standard and custom reports that can be output to the screen or to a printer. All of the standard reports contain the 18 fields from Table 1. The report categories are:

1. Inventory and Demand Data - A report containing all items in the inventory.
2. Surplus Material - A report containing only those inventory items in which the inventory level exceeds the High Limit.
3. Low Stock - A report containing only those inventory items for which the inventory level is below the low limit.
4. Mat'l On Order - A report of those inventory items with pending orders.
5. Custom - Reports that can be generated for any of the standard report categories or for selected items. Custom reporting also allows the inventory manager to select the fields that will be included in the report.

5. Replenishment Model Variables:

The key inventory variables in the Replenishment model are the forecast, the high limit, the low limit, and the reorder quantity. The Replenishment Model calculates forecasts, reorder quantities, High Limits and Low Limits for items with high demand only (Class I items). The inventory manager may edit or change the values calculated by the model at any time. The Replenishment Model variables are shown below:

$$\text{Forecast} = 0.1 * \text{Last Period Demand} + 0.9 * \text{Previous Forecast}$$

$$\text{Low Limit} = 2.5 * \text{Forecast} + \text{Lead Time Factor}$$

$$\text{High Limit} = 6.5 * \text{Forecast} + \text{Lead Time Factor}$$

$$\text{Reorder Quantity} = \text{High Limit} - \text{Current Inventory Level}$$

If the forecast falls below 5 units per month, the High Limit defaults to 40 and the low limit defaults to 20 units. Section II contains a detailed description of the development of these replenishment equations.

Conclusions

The information provided herein comprises a functional description of a Replenishment Model for regional inventory management under the RHMMS concept. It was developed using data from operating HAZMIN Centers and information and recommendations from NAVSUP HM inventory managers.

This model is designed to meet all regional requirements for hazardous materials managed using RHMMS without sending any excess HM to disposal. It differs from classical replenishment models because it does not rely on Economic Order Quantities (EOQs) to optimize costs. Rather, it focuses on minimizing materials held in the inventory to avoid the costs associated with disposal of excess HM.

The model presented above can be used to manage materials with any level of demand. However, it provides the most benefit for items that experience consistent, significant, levels of demand. This is consistent with the policy of stocking only high turnover items at HAZMIN Centers. Despite this policy, HAZMIN Centers must stock certain slow moving items that are extremely critical or difficult to obtain. Therefore, a need exists for dealing with slow moving items. Just-in-Time (JIT) delivery and lead time minimization methods present viable options for dealing with this issue. Integration of such methods into the replenishment model would enhance its effectiveness for dealing with slow moving items.

Based on AFMA's research and development of the replenishment model, several recommendations for optimizing its performance have been compiled. They are:

- Class I items should be limited to items with moderate to high levels of demand and high frequency of issue (approx. 24 issues or more per year).
- Periodic review and update of Authorized Use Lists is necessary to avoid stocking items that are no longer used. This also avoids loading the database with unnecessary information.
- HAZMIN Centers should eliminate slow moving items from the inventory whenever possible. Demand for such items is difficult to predict and time consuming for the inventory manager.
- NAVSUP and FISCs should develop strategies to minimize lead times as much as possible to reduce the amount of material required to satisfy demand while orders are pending.
- HAZMIN Centers should pursue a strict policy of First-in, First-out (FIFO) with regard to HM inventories. This means issuing materials with the shortest remaining shelf-life first. This policy is required to ensure that shelf-life expiration does not occur.

Section II: Detailed Description of Methods Used in Model Development

The forecasting and replenishment models resulted from research, historic demand data from operating HAZMIN Centers, site visits, and interviews with FISC inventory managers. The development of the forecasting model was based entirely on analytic methods. However, the replenishment model was created using subjective as well as analytic methods. These methods, the resultant findings and conclusions are discussed in detail below.

Development of the Forecasting Model

Development of the forecasting model followed a standard engineering methodology comprised of five basic steps:

1. Research,
2. Data Collection,
3. Data Analysis,
4. Simulation and Testing,
5. Evaluation of Results.

1. Research

Creation of the forecasting model began with research into existing candidate models. This research was limited to two basic reference documents cited in the Project Description for this task:

- *Principles of Inventory and Materials Management*, 4th Edition, Richard J Tersine, and
- *Development of Inventory Models in Support of the Hazardous Material Minimization Concept at FISC, Puget Sound*, Naval Post Graduate School Thesis, Pilourn and Smith

The above references cover several independent demand forecasting models potentially adaptable to inventory management under the RHMMS concept. After analyzing the advantages and disadvantages of each model, a candidate model called 'exponential smoothing' was selected for simulation and testing. This model has the greatest potential for accurate demand forecasting with minimal data storage requirements. It is more complex than other models; however, the complexity is not a detriment since implementation will be via software. The only drawback remains the inability to forecast items with low frequency of issue, a difficulty common to all independent, deterministic models. A brief description of the principal forecasting methods and their advantages and disadvantages is summarized in Table 2 on the next page.

The exponential smoothing model forecasts demand using the most recent forecast plus an adjustment for the error between the previous forecast and previous actual demand. It effectively predicts the constant component of demand and eliminates random fluctuations. If necessary, the model can be modified to adjust for trend, seasonal and/or cyclical demand fluctuations. The basic formula for this forecasting method is:

Forecast = Previous Forecast + a*(Previous Actual Demand - Previous Forecast)

where 'a' is the exponential smoothing constant (adjustment factor) ranging from 0 to 1.

Table 2. Comparison of Demand Forecasting Methods

Method	Description	Advantages	Disadvantages
Last Period Demand	Next period demand is simply equal to the actual demand for the previous time period.	1. Simple concept. 2. Easy to Implement. 3. Requires very little historic demand information	1. Large fluctuations in forecasts. 2. Forecasts reflect random demand rather than constant demand elements. 3. Ignores all factors that indicate future changes in demand. 4. Not accurate for items with low frequency of issue.
Arithmetic Average	Demand is equal to the average demand for all past time periods.	1. Simple to use. 2. Easy to implement.	1. Responds very slowly to changes in demand. 2. Requires retention of large quantities of data. 3. Weights all prior demand periods equally. 4. Not accurate for items with low frequency of issue.
Moving Average	This method computes demand as an average of demand for the last 'n' time periods. The number of periods, n, is selected by analyzing historic demand data.	1. Simple to use. 2. Easy to implement. 3. Responds to trends (with a delay). 4. Gives greater weight to recent demand periods than arithmetic averaging.	1. Requires retention of significant quantities of historic demand data. 2. Does not correct for errors in prior forecasts. 3. Not accurate for items with low frequency of issue.
Exponential Smoothing	Similar to moving average, but provides for a correction factor based on error in the previous periods forecast.	1. Responds to trends. 2. Predicts constant components of demand. 3. Reduces random demand fluctuations. 4. Gives greater weight to more recent demand periods. 5. Responds to errors in previous forecasts. 6. Requires retention of minimal historic demand data.	1. More complex than other methods. 2. Requires more effort to implement. 3. Not accurate for items with low frequency of issue.

The basic exponential smoothing formula given on the previous page reduces algebraically to this form:

$$\text{Forecast} = a^*(\text{Previous Actual Demand}) + (1-a)^*(\text{Previous Forecast})$$

The value for 'a' in the exponential smoothing model lies between 0 and 1 and is chosen by analysis of historic demand data. As the value of 'a' approaches 0, this model exhibits minimal response to previous actual demand. Conversely, as the value of 'a' approaches 1, this model responds almost exclusively to previous actual demand (In fact, it approximates a last period demand model). In practice, selecting the appropriate value for 'a' requires real, historic demand data for use in forecasting simulations. Data collection for testing of the exponential smoothing model in the context of the RHMMS concept is discussed below.

2. Data Collection

After choosing the exponential smoothing method as the best candidate for forecasting under the RHMMS concept, data collection began. The data collection effort included these goals:

- Obtaining historic demand data representative of typical items stocked in operating HAZMIN Centers. This information is required to select an appropriate value for 'a' in the exponential smoothing model. It can also help identify trend, cyclical and/or seasonal components of demand that may need to be added to the exponential smoothing model.
- Obtaining statistics, or raw data from which to derive statistics, that characterize the nature of demand for items stocked in operating HAZMIN Centers. These statistics are used to identify any limitations that may affect use of the forecasting model. They also identify factors that might preclude the use of the forecasting model.

The necessary data were obtained from FISC, Norfolk and FISC, San Diego, during site visits by AFMA personnel. The data were provided in the form of copies of the HICS databases from operating HAZMIN Centers at each FISC. It includes transactions from several HAZMIN Centers over the course of one year (July 1994 through July 1995) and copies of HAZMIN Centers' AULs.

The HICS databases contain a number of fields not relevant to the demand forecasting model. These fields were culled from the data using a relational database management program. The resultant database is comprised of fields with the following information:

- National Stock Number
- Date of each transaction (material issue)
- Unit of Issue
- Material Type ('A' Condition or CA)
- Product Nomenclature

In addition, data for items other than 'A' Condition and 'CA' materials were discarded. Appendix A contains a copy of the data remaining after the reductions described above. It is provided in electronic format (Microsoft AccessTM) due to its large size (approx. 500 pages).

3. Data Analysis

The data collected were analyzed to quantify aggregate regional demand and to determine the annual frequency of issue for HM. Aggregate demand information was derived from analysis of the data in Appendix A. Table 3 shows the results of this analysis.

Table 3. Aggregate Demand Data - FISC, Norfolk and FISC, San Diego

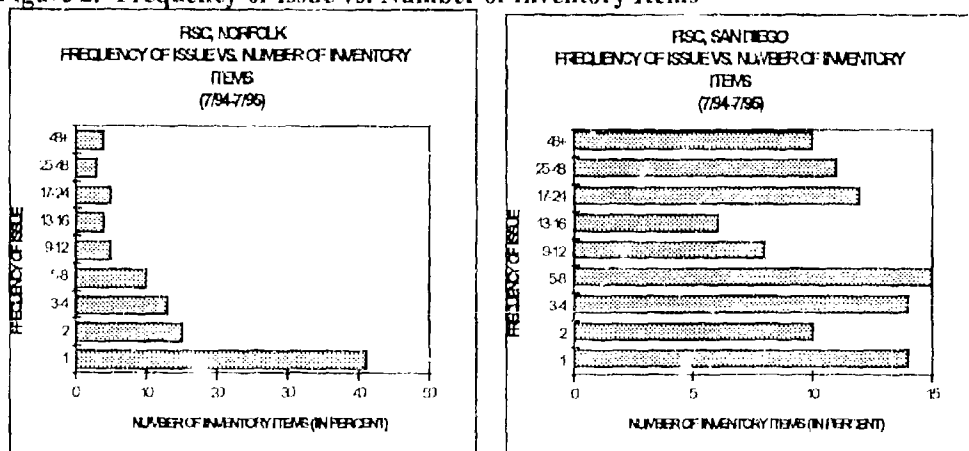
	FISC, Norfolk	FISC, San Diego
Total HM Issues	27,778	18,101
'A' Condition HM Issues	8,834	12,064
Number of Items Stocked	1,039	568
Number of Items on AULs	4,494	650

A number of observations were made regarding aggregate demand based on the information in Table 3. First, a large number of HM transactions are processed via HAZMIN Centers under the purview of each FISC. Second, issues of 'A' condition materials represent a significant fraction of the issues at FISC, Norfolk; and, comprise the bulk of HM issues at FISC, San Diego. Third, the number of items authorized for issue exceeds the number of inventory items actually issued at both FISCs.

The data in Appendix A were sorted to determine the annual frequency of issue for each item. This information was later used as an index of forecast accuracy (see remarks on this subject in the *Research* section above). Appendix B lists the inventory items and the frequency of issue for each.

The data in Appendix B were grouped by frequency of issue to determine the percentage of inventory items exhibiting the same or similar frequency of issue. The results of this exercise are shown graphically in Figure 2, for FISC, Norfolk and FISC, San Diego. These graphs indicate that items with relatively low frequency of issue comprise a significant fraction of the items stocked at each FISC.

Figure 2. Frequency of Issue vs. Number of Inventory Items



4. Simulation and Testing

Following the data analysis, simulation and testing of the exponential smoothing model commenced. The simulation and testing was performed to provide a basis for evaluating:

- the suitability of the exponential smoothing model for use in the replenishment model,
- the appropriate value for the exponential smoothing constant 'a', and
- minimum frequency of issue for accurate forecasting (if one exists).
- cyclical, seasonal, or other demand components not included in the basic exponential smoothing model, and
- the effect of CA items in the inventory on demand

Simulation and testing were performed on a random sample of inventory items selected from both FISC, Norfolk and FISC, San Diego HAZMIN Center inventories. The simulation proceeded using thirty-two inventory items with frequency of issue ranging from 6 to 366 issues, over a one year period. Historic demand data on these items were used to simulate real time forecasts calculated by the exponential smoothing model. This simulation was repeated four times for each inventory item. In each repetition, the value of 'a' in the exponential smoothing model changed while all other factors were held constant. Four values of 'a' were used: 0.1, 0.3, 0.6 and 0.9.

To perform the simulations, individual transactions from Appendix A were utilized to determine the monthly demand for each item. Then, the exponential smoothing model was used to simulate monthly forecasts. Because the first forecast in each repetition required an initial value for the 'previous forecast', the first month's actual demand datum was used for the initial 'previous forecast'. The resultant forecasts (one for each value of 'a') were charted, along with the actual monthly demand for analysis and interpretation of the results.

In order to assess the results of the simulations, the variance between the actual demand for each monthly forecast in each repetition was calculated. The variance was defined as the Mean Absolute Deviation (MAD) between the forecasted demand and the actual demand for each month. The MAD represents the magnitude of the difference between the forecasted demand and actual demand for each month. The lower the MAD (variance), the more accurate the forecast. Algebraically MAD is given by:

$$\text{MAD} = \text{ABS}(\text{forecasted demand} - \text{actual demand})$$

In addition to calculating the MAD for each monthly forecast, MAD values were averaged for each forecast repetition. An example of the data derived from one inventory item is shown in figure 3 on the following page. Appendix C contains similar information for each of the 32 inventory items included in the forecasting simulations.

In order to compare the variation in forecast simulations among several different inventory items, the average MAD was indexed to the average monthly issue quantity for the item under study. The resulting MAD Index is expressed as a percentage

Figure 3. Sample Forecast and MAD Tables from Appendix C

Date	Actual Demand	Mean Absolute Deviation (MAD)				Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9			a=0.1	a=0.3	a=0.6	a=0.9
7/94	14	n/a	n/a	n/a	n/a	7/94	14	n/a	n/a	n/a	n/a
8/94	11	3	3	3	3	8/94	11	14	14	14	14
9/94	24	10	11	12	10	9/94	24	14	13	12	14
10/94	18	3	2	1	6	10/94	18	15	10	19	12
11/94	15	0	2	4	4	11/94	15	15	17	19	19
12/94	90	75	74	74	71	12/94	90	15	16	16	19
1/95	24	1	14	37	7	1/95	24	23	38	61	17
2/95	156	133	122	117	100	2/95	156	23	34	39	58
3/95	253	217	182	144	213	3/95	253	36	71	100	40
4/95	109	51	16	86	7	4/95	109	38	125	195	102
5/95	197	134	77	53	11	5/95	197	63	120	144	183
6/95	121	46	22	55	27	6/95	121	76	143	176	148
AVG	135	61	48	53	42						

representing an average range of forecasting accuracy. A MAD Index of 31% indicates that the forecast, on average, lies within 31% (above or below) the average issue quantity for a given item.

MAD Indexes were calculated for all of the forecast simulations and consolidated into a single table along with frequency of issue and average issue quantity data, for comparison purposes. Next, seven items were eliminated because the MAD values were extremely high and the frequency of issue very low, indicating that the forecasting model is not suitable for these items. Four additional items were eliminated because they were not stocked by the HAZMIN Centers for the entire duration of the simulation. The remaining MAD Indexes and related information are presented in Table 4.

Table 4. Mad Indexes

Item NSN	AIQ	FOI	Mad Index% (a=0.1)	Mad Index% (a=0.3)	Mad Index% (a=0.6)	Mad Index% (a=0.9)
7930011770795	214	366	43	33	28	23
6850012350872	77	350	19	16	18	18
8010013540963	78	275	27	32	36	38
8030005468637	114	211	28	26	26	28
8010012002637	52	193	48	46	40	33
8010013316107	57	184	37	35	33	35
8010012930789	79	160	41	29	28	29
9150002500926	15	122	47	53	60	73
9150001497432	270	120	46	39	38	37
9150012602534	35	106	49	57	66	77
6840006877904	136	92	45	35	39	31
8040001178510	20	62	50	60	70	70
6850012340219	8	43	57	71	71	86
9150002319071	9	51	78	67	78	89
8010001817568	7	49	43	43	46	46
915000985709	291	48	97	93	86	80
8040003152246	4	37	50	50	50	75
8030010668156	10	30	50	50	60	70
6810002499354	16	25	69	75	75	75
9150002316676	8	21	63	75	88	100

An example of a MAD Index calculation, using the forecasting data from figure 3 is shown below:

Given: Exponential Smoothing Forecast with 'a' = 0.1,
Average Monthly Issue Quantity = 136,
Average MAD = 61,
then: Mad Index = Average MAD / Average Monthly Issue Qty = 61/136
= 31%

The average of the MAD Indexes for each value of 'a' in Table 4 are of particular interest in evaluating the results of the simulation. Therefore, they are shown in Table 5:

Table 5. Average MAD Indexes

Exponential Smoothing Factor	Average of MAD Indexes from Table 3
a = 0.1	49%
a = 0.3	49%
a = 0.6	52%
a = 0.9	56%

5. Evaluation of Results

Evaluation of the results of the simulations took place after calculation of the MAD Indexes. The feasibility of using the exponential smoothing model for demand forecasting under the RHMMS concept was examined first. An examination of Tables 4 and 5 indicated that the model is feasible for certain inventory items based on the accuracy of the forecasts. In general, average MAD values of 75% were considered acceptable in this determination.

Next, the appropriate value of 'a' was selected based on the average of the MAD values for each value of 'a', and examination of the forecast charts in Appendix C. The lowest average MAD Index value normally indicates the best value for 'a'. Table 4 shows that two values of 'a', 0.1 and 0.3 tied for the lowest value (49%). Because lower values of 'a' produce a more consistent forecast (see graphical results of forecasting simulations in Appendix C), they are preferred when a single value cannot be selected based on the MAD. Therefore, 0.1 was chosen as the most appropriate value for 'a' in the exponential smoothing model. The basic forecasting model was then determined to be.

$$\text{Next Period Demand} = 0.1 * \text{Previous Actual Demand} + 0.9 * \text{Previous Forecast}$$

Following identification of the basic forecasting model above, limitations and capabilities of the model were investigated in greater detail. The minimum frequency of issue was established at 24 issues per year. This is based on the fact that below a frequency of issue of 24 issues, the average MAD is consistently greater than 75%, regardless of the value of 'a'. While evaluating frequency of issue, a negative correlation

between average monthly issue quantity and forecasting accuracy was observed. This means that the forecasting model may not provide accurate results when the monthly demand is low (generally less than 5 units per month). However, in most cases, low issue quantities can be ignored because they are typically associated with low frequency of issue. This issue is addressed further in following sections dealing with the replenishment model.

The data, charts and graphs developed during forecasting simulations were also used to find examples of trend, seasonal, cyclical and other components and demand. This was accomplished by visually inspecting each graph in Appendix C for actual demand fluctuations consistent with trend, seasonal, cyclical or other components of demand. Seasonal, and Cyclical demand patterns were not found, in part, because of insufficient data (a minimum of two years historic data is necessary to fully quantify such patterns). However, trends were evident in several cases. It is not possible to determine whether these trends are seasonal, cyclical, or driven by independent factors. Therefore, no modifications were made to the forecasting model to compensate for trends. However, this does not preclude provisions in the Replenish Model to handle trends.

The effect of CA materials on demand was investigated following the forecasting model simulations. The result of this investigation was indeterminate. No evidence was found linking the amount of CA material in the inventory and the demand (or lack thereof) for inventory items. The data, charts and graphs used in this investigation are included as Appendix D of this report. Despite the lack of information on this subject, the forecasting model has proven effective within acceptable parameters; therefore, the subject was not pursued further.

The ultimate result of the forecasting model development is a simple, accurate exponential smoothing model that operates with reasonable limits on frequency of issue.

Development of the Replenishment Model

The Replenishment model was developed based on the capabilities of the forecasting model as described previously. The basis of the design was:

1. A review of potential **aggregate inventory management models** available.
2. **Selection of the appropriate models** for adaptation to IIM management.
3. Identification of appropriate **data management methods** consistent with the needs of the RIM.
4. **Data Analysis and Simulation of the model** to determine the appropriate values for variables in the Replenishment Model and to verify its effectiveness.
5. **Evaluation of Simulation Results**

1. Aggregate Inventory Management Models

Several aggregate inventory models were considered for use in the replenishment model. In addition, a management method potentially applicable to any inventory model, called 'ABC Analysis', was examined. The models and 'ABC Analysis' are described briefly below:

- Perpetual Inventory System - This system keeps a running total of the inventory quantity that is checked every time an item is issued. If the issue causes the inventory position to fall below the ROP, an order is placed. Safety

Stock is used to prevent stock outs. Order size is determined by Economic Order Quantity (EOQ) calculations. The two variables that define this system are the ROP and the EOQ.

- Two-Bin Inventory System - This system also relies on ROP and EOQ calculations, however; the inventory is not monitored continuously. A secondary inventory (bin) is maintained to cover demand while materials are on order.
- Periodic Inventory System - This system relies on a fixed order time period with High Limits on inventory. At the time of review, an order is placed for a quantity equal to the High Limit minus the current inventory position for the item. Safety Stocks are used to prevent stock outs.
- Optional Replenishment Inventory System - This system combines elements of the perpetual and periodic inventory systems. It uses both a High Limit and Low Limit on inventory items with a fixed period of review. If the inventory level is at or below the Low Limit, an order is placed. Order size is determined by subtracting the current inventory position from the High Limit. Safety Stocks are used to prevent stock outs.
- Selective Inventory Control - (also called ABC Analysis) This management technique divides inventories into three classes based on dollar volume sold. The purpose is to allow the inventory manager to focus resources on the class or classes of materials that need more intensive management.

2. Selection of an Aggregate Inventory Model

Based on the capabilities and limitations of demand forecasting for HM inventories, an appropriate aggregate inventory model was selected. The Optional Replenishment (OR) model was selected, along with Selective Inventory Control (SIC). These methods were selected because they are compatible with demand forecasting and do not rely on Economic Order Quantities to determine the appropriate amount of material for replenishment. Economic Order Quantities were rejected because they tend to increase replenishment quantities in order to achieve discounts on orders. Such methods are incompatible with HM management where inventories are minimized to avoid disposal costs associated with shelf-life items. The OR model and Selective Inventory Control measures selected are discussed in detail in Section I of this report. The details regarding exact values for high and low limits are discussed below in the section on simulation.

The methods selected for use in the Replenishment Model were modified from their theoretical origins to accommodate the unique requirements of HM management. First, SIC was modified to contain four classes of materials, without regard to dollar volume:

- Class I - for items that can be forecast with reasonable accuracy
- Class II - for items with low frequency of issue (DHPC has indicated that they have developed a method of setting high and low limits for these items).
- Class III - for items that do not fit into Class I or II
- Class IV - for items of particular interest to the RIM

This modification was necessary to distinguish between items for which demand can be forecast and those for which it cannot. Moreover, it provides a means for isolating items of unique interest to the RIM, such as items extremely critical to a customer's mission.

Second, the High and Low Limits on inventory (for Class I items) were tied directly to the demand forecast. In practice, High and Low Limits are often set arbitrarily. Tying these values to the forecast ensures that they respond to demand and, therefore, prevent stock outs or shelf life expiration without the need for adjustment by the RIM. The high and low limits were validated via simulations as discussed in sections 4 and 5 below.

3. Data Management Methods

Due to the vast quantities of data handled by each Region under the RHMMS concept, data management methods were a major concern in development of the replenishment model. As discussed in Section 1, a database management system was chosen as the primary means of data management. A database management system was selected for several reasons:

1. Database management systems have the ability to handle and manipulate large quantities of data.
2. Two of the FISCs visited during the development of the Replenishment Model currently employ commercial database management systems to monitor their inventory levels. FISC personnel are familiar with this type of software and are likely to be amenable to a system employing similar methods.
3. Development of the Replenishment Model required the use of database management systems in a manner similar to that expected of RIMs using the Replenishment Model. Database management software proved to be the simplest, easiest way to perform replenishment and related operations.

The details of the database management system envisioned for the RHMMS replenishment model (see Section 1) were created based primarily on suggestions proposed by FISC HIM managers integrated with the data requirements required for replenishment calculations.

4. Data Analysis and Simulation

Data Analysis and Simulation were used to determine the High and Low Limits for Class I items and to determine the effectiveness of the Replenishment Model. Low Limits were quantified first, using historic demand data for several items used in derivation of the forecasting model. These items are shown in Table 6 on the following page.

For the items listed in Table 6, each month's demand was compared to the forecast for the same month to identify the maximum amount by which actual demand can exceed forecasted demand in any one month. The results of this comparison are illustrated in Appendix E. Appendix E shows that actual demand can exceed forecasted demand by as much as 800%. However, in only 6 cases out of 165, does actual demand in any one month exceed forecasted demand by more than 250%. Therefore, the Low Limit was set at 2.5 times the forecasted demand. For simulation purposes, a lead time factor of 1.5 (one and one-half months) was added to the Low Limit, resulting in a low limit of four times the monthly forecast. In practice, lead times will vary, but for simulation purposes a

lead time factor of 1.5 was used in all simulations since this value is consistent with actual lead times observed for items obtained via the Navy Supply System.

Table 6. Items Selected for Data Analysis and Simulation

Item NSN
9150002316676
6810002499354
8030010668156
8040005152246
6850012340219
8010001817568
9150002319071
8040001178510
9150012602534
9150002500926
8010013316107
8030005468637
8010013540963
6850012350872

A High Limit was arbitrarily set at five times the forecast (plus a lead time factor of 1.5), but this value tended to produce numerous stock outs during simulation. Therefore, the High Limit was gradually increased to a level where stock outs were not observed. The resulting High Limit was 6.5 times the forecast, plus a lead time factor of 1.5.

After establishing the High and Low Limits, a basic set of assumptions were required to ensure consistency in the simulations. The following assumptions were used for the simulations:

1. The initial inventory position is slightly above the low limit for each item. This ensures that the simulation includes at least one cycle of replenishment.
2. No orders are pending at the start of the simulation. This condition is also designed to force at least one replenishment cycle during the simulation.
3. The first forecast in each simulation is an arithmetic average of the previous three months' actual demand. This is designed to increase the accuracy of the forecast and, subsequently, the replenishment model. The arithmetic average provides a more accurate first forecast than the last period demand method used in development of the forecasting model.
4. All orders are placed at the end of the month and have a lead time of 45 days.
5. All incoming orders arrive at or near the middle of the month in which they are received.
6. An incoming order can be used to satisfy demand incurred prior to arrival of the order, but only if the demand occurs in the same month in which the order is received.
7. The inventory position shown for any month is the position at the end of the last day of that month.

Using the assumptions listed above, a first round of simulations were conducted. These first simulations resulted in numerous stockouts for items that have a monthly issue quantity less than five units. Therefore, a floor was established for the High and Low Limits equivalent to a forecasted demand of five units. This means that a minimum values were established for the High and Low Limits of 40 and 20 units, respectively. Anytime the forecasted demand dropped below five units, the minimums took effect. A second, final round of simulations followed. The results of the final round of simulations are illustrated graphically in Appendix F.

5. Evaluation of Results of Simulation

The final round of simulations showed excellent results. The simulation covered a 14 items over a nine month period in which one stock out occurred, lasting less than one month. In addition, three items experienced minor inventory surpluses as a result of decreasing demand. The surpluses were low in magnitude; therefore, it is not likely that they would necessitate redistribution. Further, because the High and Low Limits decreased over time, with the forecast, new orders (that would exacerbate the situation) were prevented. Items with forecasted demand of less than five units responded extremely well to the floor values set for the high and low limits. The results obtained from the simulations validated the selection of replenishment model variables first discussed in Section I of this report:

$$\text{Forecast} = 0.1 * \text{Last Period Demand} + 0.9 * \text{Previous Forecast}$$

$$\text{Low Limit} = 2.5 * \text{Forecast} + \text{Lead Time Factor}$$

$$\text{High Limit} = 6.5 * \text{Forecast} + \text{Lead Time Factor}$$

$$\text{Reorder Quantity} = \text{High Limit} - \text{Current Inventory Level}$$

ENCLOSURE (1): RHIMMS
REPLENISHMENT MODEL GRAPHICS

DIN PD 12.001 u1

Enclosure (1)

[Faint, illegible handwritten notes or bleed-through from the reverse side of the page.]

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Graphic #3 - Options for sorting data

The screenshot shows the 'RHMMS REPLENISHMENT' menu with options: SORT, SEARCH, BROWSE, REPLENISH, REPORTS, QUIT, and HELP. The 'SORT' option is selected. Below the menu, there are two input fields: 'Sort by:' and 'Order:'. The 'Sort by:' field has a dropdown menu with 'NSN' selected, and the 'Order:' field has a dropdown menu with 'Ascending' selected. Below these fields is a table titled 'INVENTORY AND DEMAND DATA' with columns: MARK, ITEM, PHONY, CLASS, NUMBER, TOTAL, A, CA, SUPPLY, SHORT, FORECAST, IN, AL, MON, and LEAD TIME. The table is currently empty.

Graphic #4 - Searching for specific inventory information.

The screenshot shows the 'RHMMS REPLENISHMENT' menu with options: SORT, SEARCH, BROWSE, REPLENISH, REPORTS, QUIT, and HELP. The 'SEARCH' option is selected. Below the menu, there is a 'Search for:' field with a dropdown menu showing 'NSN' selected. Below this field is a text input field labeled 'Enter the NSN you are searching for:'. Below the input field is a table titled 'INVENTORY AND DEMAND DATA' with columns: MARK, ITEM, PHONY, CLASS, NUMBER, TOTAL, A, CA, SUPPLY, SHORT, FORECAST, IN, AL, MON, and LEAD TIME. The table is currently empty.

Graphic #5 - Using the "Browse" function to move through the database.

RHMMS REPLENISHMENT									
<u>S</u> ORT	<u>E</u> ARCH	<u>B</u> RWSE	<u>R</u> EPLENISH	<u>R</u> EPORTS	<u>Q</u> UIT	<u>H</u> ELP			
Start from:									
Top		Bottom		NSN	FSC	NIN	Class		
(Select One)									
Select the Inventory Class: I II III IV									

Graphic #6 - Replenishment.

[illegible]

Graphic #7 - Reports

[illegible]

Graphic #8 - Custom Report Options.

[illegible]

**APPENDIX A:
DATA USED TO DEVELOP
FORECASTING AND REPLENISHMENT MODELS
UNDER THE RHMMS CONCEPT**

DIN PD 7 2,001 #7
17 29 95

DATA: The basic inventory and demand data used to develop the forecasting and replenishment models presented in this report is contained in the 3.5", 1.44 Mb floppy disc in the envelope below. The data is contained in a Microsoft (TM) Access Database. The file has been compressed due to its size (5Mb) using PKZIP. To view the data, decompress the file using PKUNZIP and open the database using a database management program such as Access.

**APPENDIX B:
FREQUENCY OF ISSUE DATA
FROM FISC, NORFOLK
AND FISC, SAN DIEGO**

DEN - PD 7.2.001 #7
12/29/95

Frequency of Issue - FISC, Norfolk

Item NSN Frequency of Issue

3439009148390	1	3439LLL205987	1
4210010560883	1	5350001931349	1
5610009264562	1	5610HZ0000280	1
5610HZ0000281	1	5970002959298	1
6135008357210	1	6140012034694	1
6505002998095	1	6570001478973	1
6640LLL204580	1	6640LLL204581	1
6640LLL204582	1	6640LLL204583	1
6640LLL204584	1	6640LLL204585	1
6640LLL204586	1	6640LLL204587	1
6640LLL204588	1	6640LLL204589	1
6640LLL204590	1	6640LLL204591	1
6640LLL204592	1	6640LLL204593	1
6640LLL204594	1	6640LLL204595	1
6650001795142	1	6750007271063	1
6750009586549	1	6750009654846	1
6750LLL148242	1	6810000064205	1
6810002372954	1	6810002411203	1
6810002703254	1	6810002709978	1
6810002709988	1	6810002812686	1
6810002863783	1	6810002929625	1
6810005272476	1	6810005844070	1
6810007822686	1	6810008179929	1
6810008238004	1	6810009306311	1
681000B160024	1	681000N048799	1
6810010652410	1	6810HZ0000062	1
6810HZ0000063	1	6810HZ00000306	1
6810HZMIN0013	1	6810HZMIN0014	1
6810LLL100051	1	6810LLL106524	1
6810LLL115110	1	6810LLL188086	1
6810LLL188289	1	6810LLL195235	1
6810LLL200040	1	6830001061656	1
6830LLL209309	1	6840010334481	1
6840010653662	1	6840012781336	1
6840013599208	1	6840HZMIN0003	1
6840HZMIN0008	1	6840HZMIN0010	1
6840HZMIN0012	1	6850000632842	1
6850001094362	1	6850001452255	1
6850001806165	1	6850001817933	1
6850002645771	1	6850002649038	1
6850005505565	1	6850005637514	1
6850005709360	1	6850005856426	1
6850005923283	1	6850006649067	1
6850009059098	1	6850009279461	1
685000N000348	1	685000N001126	1
685000N041511	1	685000N041765	1
6850010260107	1	6850011589378	1
6850011630277	1	6850012770595	1
6850013722968	1	6850013779360	1
6850013779368	1	6850HZ0000232	1

68501.L1.115898	1
68501.L1.142527	1
68501.L1.195265	1
7220002050389	1
7930002247901	1
7930003577386	1
7930009856906	1
7930010522868	1
7930013980990	1
793011Z0000076	1
793011Z00000204	1
793011ZMIN0006	1
793011ZMIN0009	1
79301.L1.127688	1
8010000643415	1
8010001412451	1
8010001656111	1
8010001817791	1
8010002801751	1
8010002921813	1
8010004184667	1
8010005272053	1
8010005305559	1
8010005774739	1
8010005977844	1
8010006160009	1
8010006167816	1
8010007219742	1
8010007219749	1
8010009018038	1
8010009269129	1
8010009357085	1
8010009982845	1
8010001.OC1111	1
8010001.OC1006	1
8010001.OC1008	1
8010001.OC7048	1
801000N017527	1
801000N023090	1
8010G10532647	1
8010G11816275	1
8010G12853035	1
8010G12853043	1
8010G12854046	1
8010G12931365	1
8010G13064934	1
8010G13142524	1
8010G13163038	1
8010G13296304	1
8010G13339450	1
8010G13365061	1
8010G13445312	1
8010G13446703	1
8010G13502073	1

8010013536550 1
 8010013539055 1
 8010013801703 1
 8010GLOSSBLAC 1
 8010HZ0000002 1
 8010HZ0000010 1
 8010HZ0000021 1
 8010HZ0000060 1
 8010HZ0000085 1
 8010HZ0000122 1
 8010HZ0000280 1
 8010HZMIN0002 1
 8010HZMIN0024 1
 8010HZMIN0027 1
 8010HZMIN0049 1
 8010HZMIN0053 1
 8010HZMIN0073 1
 8010HZMIN0079 1
 8010HZMIN0101 1
 8010HZMIN0108 1
 8010HZMIN0111 1
 8010HZMIN0125 1
 8010LLL144803 1
 8010LLL148253 1
 8010LLL154745 1
 8010LLL195016 1
 8010LLL195021 1
 8010LLL1200732 1
 8010LLL1200748 1
 8010LLL1200885 1
 8010LLL1200888 1
 8010LLL1205883 1
 8010LLL1205990 1
 8010LLL1209591 1
 8030000812325 1
 8030001112762 1
 8030001806315 1
 8030002921102 1
 8030006523562 1
 8030006644019 1
 8030007535004 1
 8030007614010 1
 8030009656704 1
 8030001001008 1
 803000N034088 1
 8030010661971 1
 8030011376964 1
 8030011586070 1
 8030013568690 1
 8030HZMIN00017 1
 8030LLL118411 1
 8030LLL130815 1
 8030LLL148449 1
 8030LLL195297 1

8010013536551 1
 8010013582900 1
 8010CATYELLOW 1
 8010HAZMIN064 1
 8010HZ0000004 1
 8010HZ0000019 1
 8010HZ0000032 1
 8010HZ0000072 1
 8010HZ0000102 1
 8010HZ0000276 1
 8010HZ0000285 1
 8010HZMIN0017 1
 8010HZMIN0025 1
 8010HZMIN0047 1
 8010HZMIN0051 1
 8010HZMIN0059 1
 8010HZMIN0074 1
 8010HZMIN0088 1
 8010HZMIN0105 1
 8010HZMIN0109 1
 8010HZMIN0112 1
 8010HZMIN0126 1
 8010LLL148066 1
 8010LLL148262 1
 8010LLL188114 1
 8010LLL195018 1
 8010LLL1200082 1
 8010LLL1200747 1
 8010LLL1200749 1
 8010LLL1200887 1
 8010LLL1200927 1
 8010LLL1205947 1
 8010LLL1205991 1
 8030000087207 1
 8030000812337 1
 8030001450300 1
 8030002758114 1
 8030005261455 1
 8030006561426 1
 8030007235345 1
 8030007535011 1
 8030008893535 1
 8030001001006 1
 803000N029758 1
 8030010462947 1
 8030011191901 1
 8030011522275 1
 8030011633483 1
 8030HZMIN0001 1
 8030HZMIN00018 1
 8030LLL126918 1
 8030LLL135272 1
 8030LLL195242 1
 8030LLL1209320 1

I

[illegible]

91501.1.188303	1	9160002271023	1
1234121231234	2	1650008567939	2
5610000361095	2	6750002174913	2
6810001071510	2	6810002237612	2
6810002756010	2	6810002812763	2
6810002813021	2	6810002900046	2
6810003554936	2	6810009954804	2
681000D002915	2	6810010513050	2
6810010825415	2	6810011521143	2
68101HZMIN0011	2	68101.1.1079759	2
68101.1.106803	2	6840010676674	2
6840013599207	2	6850005507453	2
6850006061221	2	6850006801998	2
6850008411347	2	6850009830282	2
685000N003791	2	6850010139937	2
6850010150834	2	6850010634760	2
6850011728376	2	6850013436998	2
6850013718048	2	68501.1.102311	2
68501.1.120658	2	68501.1.145572	2
79101HZMIN0002	2	7930001775217	2
7930002667128	2	7930007218592	2
7930013306187	2	7930013795418	2
7930013795743	2	7930013981010	2
79301HZMIN0001	2	79301HZMIN0010	2
79301.1.148427	2	8010000675437	2
8010001412952	2	8010001417842	2
8010001654422	2	8010001658627	2
8010001658628	2	8010001817568	2
8010002812077	2	8010002838294	2
8010002867725	2	8010002867854	2
8010005985733	2	8010006160017	2
8010009269174	2	8010009588148	2
801000L008569	2	801000L001020	2
801000L002028	2	801000N006942	2
801000N010453	2	8010010088151	2
8010010171512	2	8010011154745	2
8010012137898	2	8010013026838	2
8010013144703	2	8010013339449	2
8010013445119	2	8010013445314	2
8010013743336	2	8010A1.PINTEGRN	2
80101HZ0000001	2	80101HZ0000009	2
80101HZ0000026	2	80101HZ0000041	2
80101HZ0000043	2	80101HZ0000073	2
80101HZ0000098	2	80101HZ0000115	2
80101HZ0000231	2	80101HZMIN0021	2
80101HZMIN0042	2	80101HZMIN0054	2
80101HZM020102	2	80101HZMIN0103	2
80101HZMIN0124	2	80101.1.113678	2
80101.1.119927	2	80101.1.119928	2
80101.1.148201	2	80101.1.148236	2
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8520000822146	24	8030004853237	40
9150002316676	24	8030010432295	40
9150008431636	24	8030011432702	40
6810000521371	25	8040011680077	40
6810002499354	25	8040009591854	42
8030000095023	25	9150009857248	42
8040001393674	25	6850012340219	43
9150002617899	25	8010011930519	44
6830007826512	26	9150011045227	44
8030007535005	26	8010001429273	46
8030011549252	26	8010013540960	46
9150006574959	26	8030010454780	46
2090003726064	27	8030000801549	47
8010012180856	27	6850010457929	49
8010013316117	27	8010001817568	49
8010013316110	28	8040011633481	49
6850012378004	29	8010013540965	50
9150006982382	29	8040010340401	50
8030003487888	30	8010001818079	51
8030010668156	30	8030001429272	51
8040002738716	30	8030007535009	51
9150008237860	30	9150002319071	51
561011118000	31	9150004089635	51
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8030000087207	31	6850013780402	54
8040011936717	31	8040002738717	54
9150002316689	31	8040001450450	57
9150007542595	31	8030009030931	58
9150009857247	31	9150010546453	58
6850000035295	32	6850013780425	59
8010013540979	32	6850009640838	61
8030007235345	32	8040001178510	62
9150001806290	32	9150012092684	63
9150006631170	32	9150009448953	64
9150009857246	32	8010013316109	66
6810009838551	33	8040000168662	68
6850008807616	33	8010013316114	71
7930000156923	33	8010013505254	71
8010013540959	33	8040000922816	71
8010013540977	33	6850001053084	73
8010013540981	33	8010012930789	74
8010013682633	33	8010013316115	75
8040001449774	33	6810007534993	81
8040002003793	34	6850006211820	82
7930013068369	35	7930009353794	83
8010013316121	35	8030000087198	84
8030013420972	35	9150012101938	86
9150008368641	35	8010009357085	88
8030002813980	36	8010013316105	90
8030007534599	37	6810002388119	91
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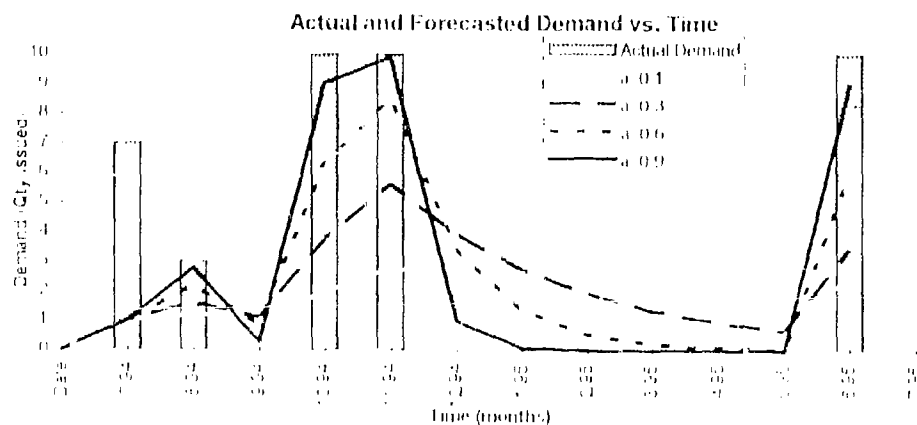
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9150002800926	122
8010013540966	147
9160013367174	156
8030006020045	177
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8010013316107	184
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8030010411596	192
9150009354018	194
6850001487161	200
6850001104498	207
8030008468637	211
8010009357064	229
8010013540961	231
8030007535006	236
8030009381947	272
6810002865435	275
8010009356609	275
8010013540963	275
8010013540964	319
8040001450020	320
8010009357079	326
6850000055305	335
6850002745421	335
6850012350872	350
8010006169181	418
8010001818080	477
9150004580075	746
9150009857099	963
9150001497432	1056

**APPENDIX C:
CHARTS AND GRAPHS FROM
FORECASTING MODEL SIMULATIONS**

DIS. PD. 7-001-87
11-79-95

Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	7	n/a	n/a	n/a	n/a
8/94	3	1	1	1	1
9/94	6	1	2	2	3
10/94	10	1	1	1	0
11/94	10	2	4	6	9
12/94	0	3	6	9	10
1/95	0	2	4	3	1
2/95	0	2	3	1	0
3/95	0	2	2	1	0
4/95	0	2	1	0	0
5/95	0	2	1	0	0
6/95	10	1	1	0	0
7/95	0	2	3	6	9

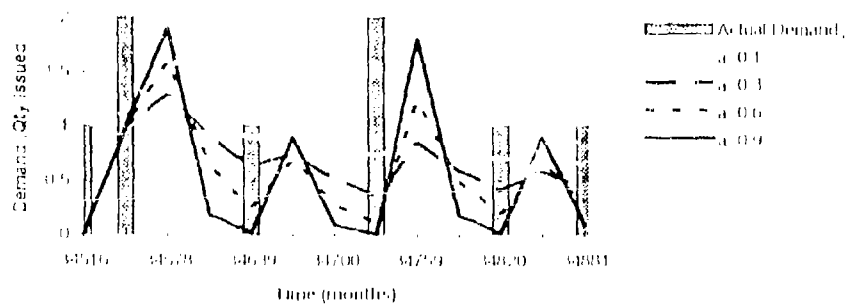
Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.5$	$\alpha=0.9$
7/94	7	n/a	n/a	n/a	n/a
8/94	3	2	2	2	2
9/94	0	1	2	2	3
10/94	10	9	9	9	10
11/94	10	8	6	4	1
12/94	0	3	6	9	10
1/95	0	2	4	3	1
2/95	0	2	3	1	0
3/95	0	2	2	1	0
4/95	0	2	1	0	0
5/95	0	2	1	0	0
6/95	10	9	9	10	10
7/95	0	2	3	6	9
AVG	3	4	4	4	4



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	2	1	1	1	1
9/94	0	1	1	2	2
10/94	0	1	1	1	0
11/94	1	1	1	0	0
12/94	0	1	1	1	1
1/95	0	1	1	0	0
2/95	2	1	0	0	0
3/95	0	1	1	1	2
4/95	0	1	1	0	0
5/95	1	1	0	0	0
6/95	0	1	1	1	1
7/95	1	1	0	0	0

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	2	1	1	1	1
9/94	0	1	1	2	2
10/94	0	1	1	1	0
11/94	1	0	0	1	1
12/94	0	1	1	1	1
1/95	0	1	1	0	0
2/95	2	1	2	2	2
3/95	0	1	1	1	2
4/95	0	1	1	0	0
5/95	1	0	1	1	1
6/95	0	1	1	1	1
7/95	1	0	1	1	1
AVG	1	1	1	1	1

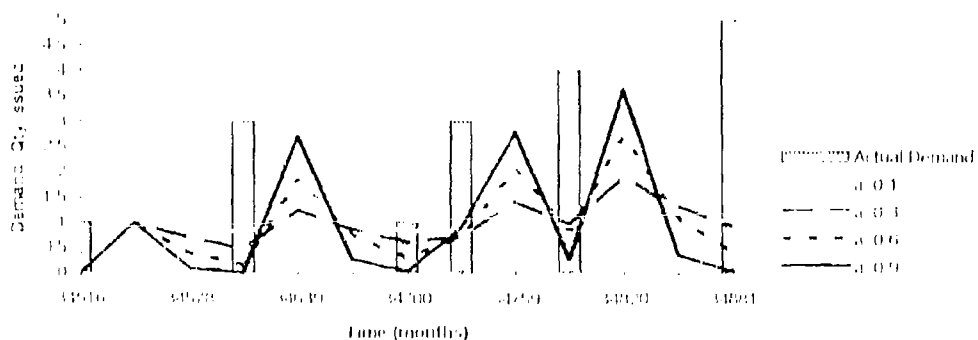
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	1	n/a	n/a	n/a	n/a
8/94	0	1	1	1	1
9/94	0	1	1	0	0
10/94	3	1	0	0	0
11/94	0	1	1	2	3
12/94	0	1	1	1	0
1/95	1	1	1	0	0
2/95	3	1	1	1	1
3/95	0	1	1	2	3
4/95	4	1	1	1	0
5/95	0	1	2	3	4
6/95	0	1	1	1	0
7/95	5	1	1	0	0

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	1	n/a	n/a	n/a	n/a
8/94	0	1	1	1	1
9/94	0	1	1	0	0
10/94	3	2	3	3	3
11/94	0	1	1	2	3
12/94	0	1	1	1	0
1/95	1	0	0	1	1
2/95	3	2	2	2	2
3/95	0	1	1	2	3
4/95	4	3	3	3	4
5/95	0	1	2	3	4
6/95	0	1	1	1	0
7/95	5	4	4	5	5
AVG	1	2	2	2	2

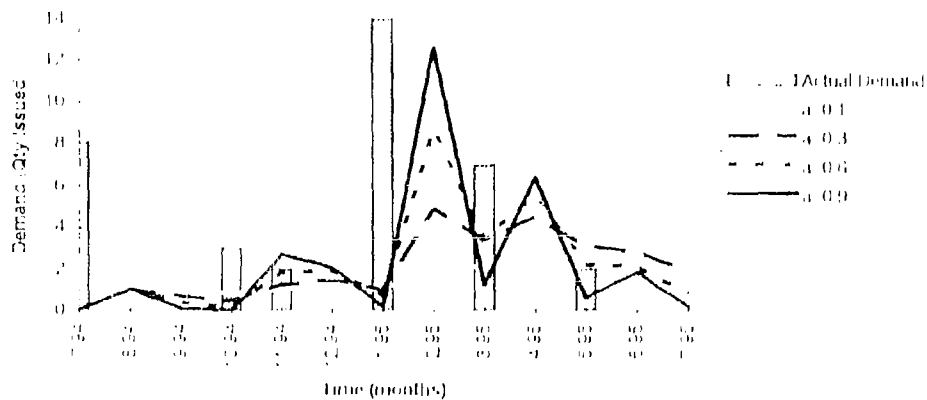
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	8	n/a	n/a	n/a	n/a
8/94	0	1	1	1	1
9/94	0	1	1	0	0
10/94	3	1	0	0	0
11/94	2	1	1	2	3
12/94	0	1	1	2	2
1/95	14	1	1	1	0
2/95	0	2	5	9	13
3/95	7	2	3	3	1
4/95	0	3	5	6	6
5/95	2	2	3	2	1
6/95	0	2	3	2	2
7/95	0	2	2	1	0

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	8	n/a	n/a	n/a	n/a
8/94	0	1	1	1	1
9/94	0	1	1	0	0
10/94	3	2	3	3	3
11/94	2	1	1	0	1
12/94	0	1	1	2	2
1/95	14	13	13	13	14
2/95	0	2	5	9	13
3/95	7	5	4	4	6
4/95	0	3	5	6	6
5/95	2	0	1	0	1
6/95	0	2	3	2	2
7/95	0	2	2	1	0
AVG	2	3	3	3	4

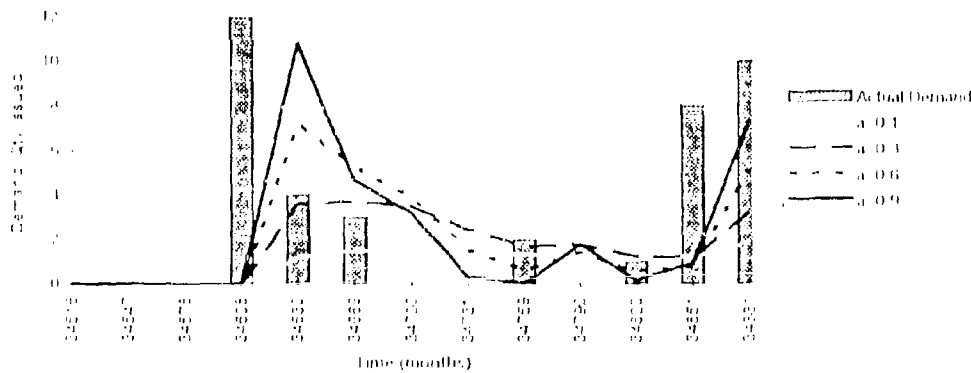
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	0	0	0	0	0
9/94	0	0	0	0	0
10/94	12	0	0	0	0
11/94	4	1	4	7	11
12/94	3	1	4	5	5
1/95	0	2	4	4	3
2/95	0	1	2	2	0
3/95	2	1	2	1	0
4/95	0	1	2	1	2
5/95	1	1	1	1	0
6/95	8	1	1	1	1
7/95	10	2	3	5	7

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	0	0	0	0	0
9/94	0	0	0	0	0
10/94	12	12	12	12	12
11/94	4	3	0	3	7
12/94	3	2	1	2	2
1/95	0	2	4	4	3
2/95	0	1	2	2	0
3/95	2	1	0	1	2
4/95	0	1	2	1	2
5/95	1	0	0	0	1
6/95	8	7	7	7	7
7/95	10	8	7	5	3
AVG	3	3	3	3	3

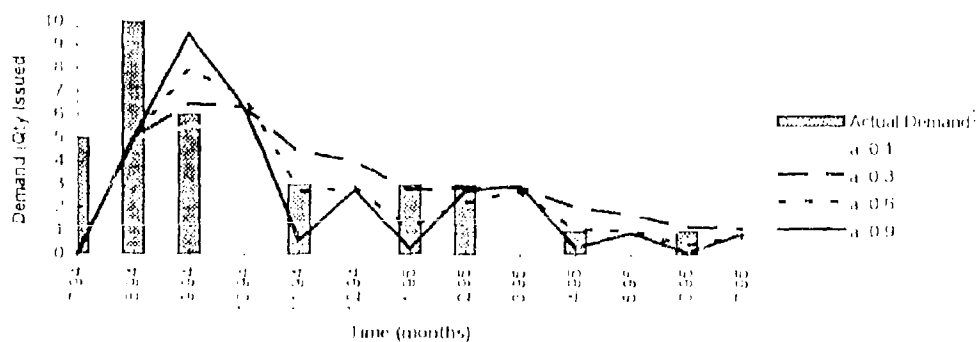
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	5	n/a	n/a	n/a	n/a
8/94	10	5	5	5	5
9/94	6	6	7	8	10
10/94	0	6	6	7	6
11/94	3	5	4	3	1
12/94	0	5	4	3	3
1/95	2	4	3	1	0
2/95	3	4	3	2	3
3/95	0	4	3	3	3
4/95	1	4	2	1	0
5/95	0	3	2	1	1
6/95	1	3	1	0	0
7/95	0	3	1	1	1

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	5	n/a	n/a	n/a	n/a
8/94	10	5	5	5	5
9/94	6	1	1	2	4
10/94	0	6	6	7	6
11/94	3	2	1	0	2
12/94	0	5	4	3	3
1/95	3	1	0	2	3
2/95	3	1	0	1	0
3/95	0	4	3	3	3
4/95	1	3	1	0	1
5/95	0	3	2	1	1
6/95	1	2	0	1	1
7/95	0	3	1	1	1
AVG	2	3	2	2	2

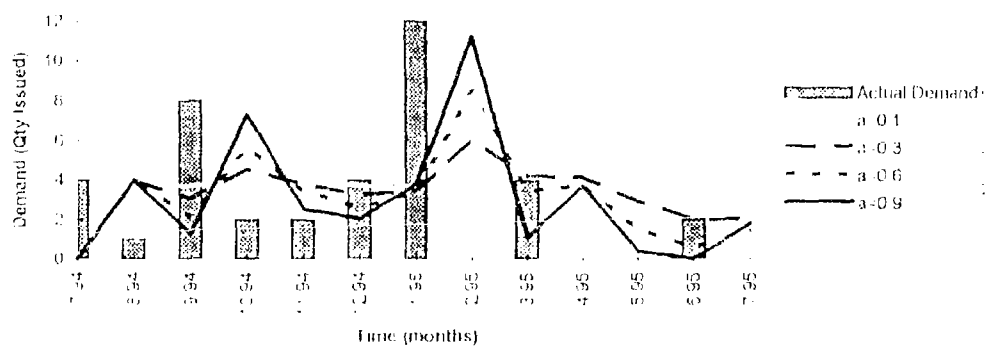
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	4	n/a	n/a	n/a	n/a
8/94	1	4	4	4	4
9/94	8	4	3	2	1
10/94	2	4	5	6	7
11/94	2	4	4	3	3
12/94	4	4	3	3	2
1/95	12	4	3	3	4
2/95	0	5	6	9	11
3/95	4	4	4	3	1
4/95	0	4	4	4	4
5/95	0	4	3	2	0
6/95	2	3	2	1	0
7/95	0	3	2	1	2

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	4	n/a	n/a	n/a	n/a
8/94	1	3	3	3	3
9/94	8	4	5	6	7
10/94	2	2	3	4	5
11/94	2	2	2	1	1
12/94	4	0	1	1	2
1/95	12	8	9	9	8
2/95	0	5	6	9	11
3/95	4	0	0	1	3
4/95	0	4	4	4	4
5/95	0	4	3	2	0
6/95	2	1	0	1	2
7/95	0	3	2	1	2
AVG	3	3	3	3	4

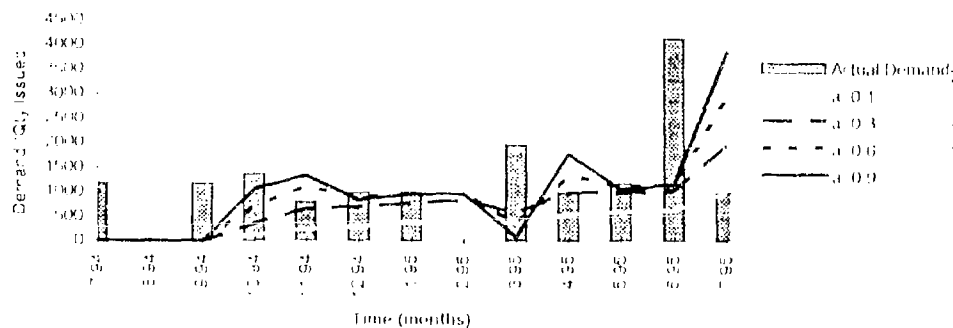
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	1182	n/a	n/a	n/a	n/a
8/94	0	4	4	4	4
9/94	1182	4	3	2	0
10/94	1379	121	357	710	1064
11/94	788	247	663	1111	1347
12/94	985	301	701	917	844
1/95	985	370	786	958	971
2/95	0	431	846	974	984
3/95	1970	338	592	390	98
4/95	985	546	1005	1338	1783
5/95	1182	590	999	1126	1065
6/95	4137	649	1054	1160	1170
7/95	985	998	1979	2946	3840

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	1182	n/a	n/a	n/a	n/a
8/94	0	1182	1182	1182	1182
9/94	1182	1178	1179	1180	1182
10/94	1379	1258	1022	669	315
11/94	788	541	125	323	559
12/94	985	684	284	68	141
1/95	985	615	199	27	14
2/95	0	431	846	974	984
3/95	1970	1582	1378	1580	1872
4/95	985	439	20	353	798
5/95	1182	592	183	56	117
6/95	4137	3488	3083	2977	2967
7/95	985	13	994	1961	2855
AVG	1215	1000	875	946	1082

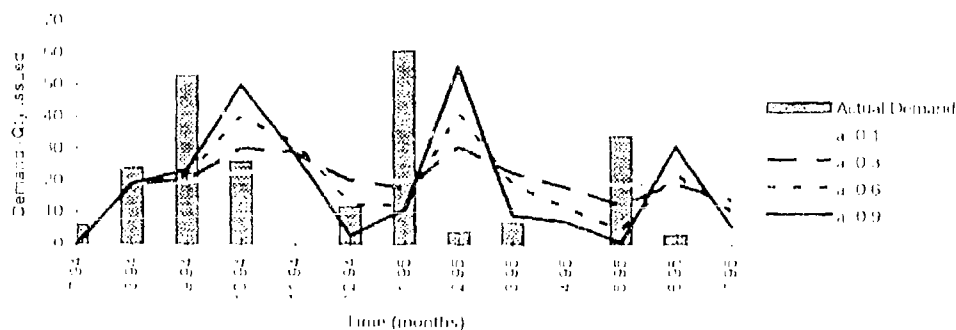
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	6	n/a	n/a	n/a	n/a
8/94	24	19	19	19	19
9/94	53	20	21	22	24
10/94	26	23	30	41	50
11/94	0	23	29	32	28
12/94	12	21	20	13	3
1/95	61	20	18	12	11
2/95	4	24	31	42	56
3/95	7	22	23	19	9
4/95	0	21	18	12	7
5/95	34	18	13	5	1
6/95	3	20	19	22	31
7/95	0	18	14	11	6

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	6	n/a	n/a	n/a	n/a
8/94	24	5	5	5	5
9/94	53	34	33	31	30
10/94	26	3	4	15	24
11/94	0	23	29	32	28
12/94	12	9	8	1	9
1/95	61	41	43	49	50
2/95	4	20	27	38	52
3/95	7	15	16	12	2
4/95	0	21	18	12	7
5/95	34	16	21	29	33
6/95	3	17	16	19	28
7/95	0	18	14	11	6
AVG	19	18	20	21	23

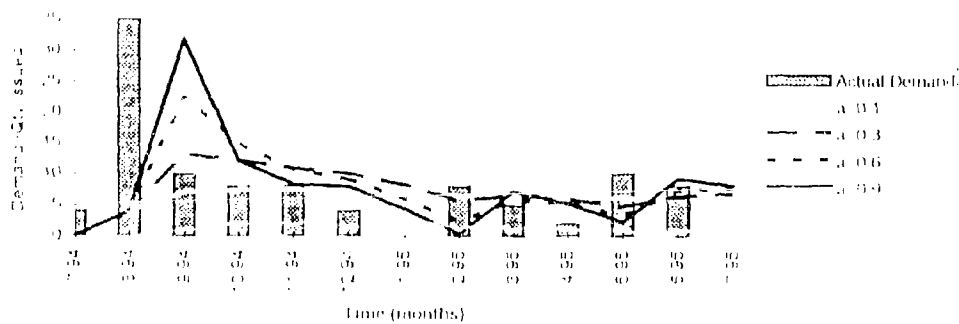
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	4	n/a	n/a	n/a	n/a
8/94	35	4	4	4	4
9/94	10	7	13	23	32
10/94	8	7	12	15	12
11/94	8	7	11	11	8
12/94	4	8	10	9	8
1/95	0	7	8	6	4
2/95	8	6	6	2	0
3/95	5	7	6	6	7
4/95	2	6	6	5	5
5/95	10	6	5	3	2
6/95	8	6	6	7	9
7/95	0	7	7	8	8

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	4	n/a	n/a	n/a	n/a
8/94	35	31	31	31	31
9/94	10	3	3	13	22
10/94	8	1	4	7	4
11/94	8	1	3	3	0
12/94	4	4	6	5	4
1/95	0	7	8	6	4
2/95	8	2	2	6	8
3/95	5	2	1	1	2
4/95	2	4	4	3	3
5/95	10	4	5	7	8
6/95	8	2	2	1	1
7/95	0	7	7	8	8
AVG	8	5	6	7	8

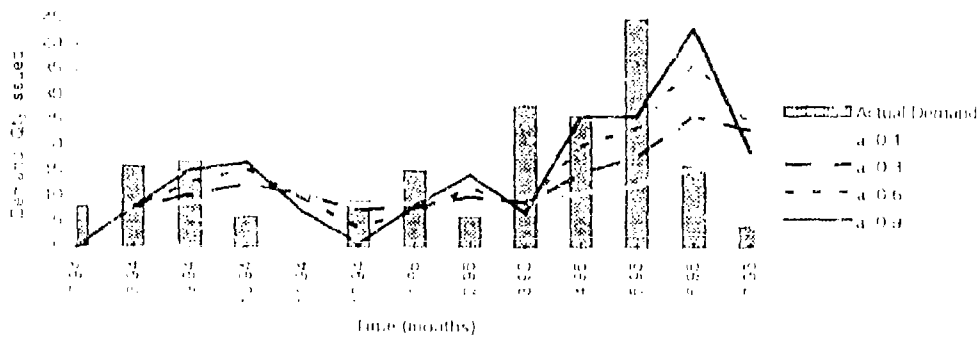
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	8	n/a	n/a	n/a	n/a
8/94	16	8	8	8	8
9/94	17	9	10	13	15
10/94	6	10	12	15	17
11/94	0	9	10	10	7
12/94	9	8	7	4	1
1/95	15	8	8	7	8
2/95	6	9	10	12	14
3/95	28	9	9	8	7
4/95	26	11	15	20	26
5/95	45	12	18	24	26
6/95	16	15	26	36	43
7/95	4	16	23	24	19

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	8	n/a	n/a	n/a	n/a
8/94	16	16	16	16	16
9/94	17	8	7	4	2
10/94	6	4	6	9	11
11/94	0	9	10	10	7
12/94	9	1	2	5	8
1/95	15	7	7	8	7
2/95	6	3	4	6	8
3/95	28	19	19	20	21
4/95	26	15	11	6	0
5/95	45	33	27	21	19
6/95	16	1	10	20	27
7/95	4	12	19	20	15
AVG	16	11	12	12	12

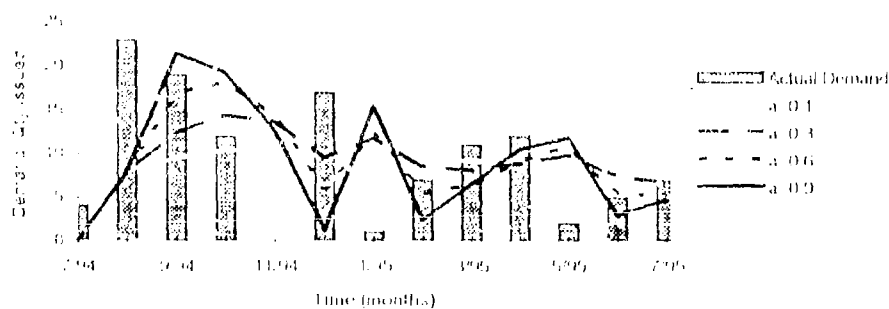
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	4	n/a	n/a	n/a	n/a
8/94	23	3	8	8	8
9/94	19	10	13	17	22
10/94	12	10	14	18	19
11/94	0	11	14	14	13
12/94	17	10	10	6	1
1/95	1	10	12	13	15
2/95	7	9	9	6	2
3/95	11	9	8	6	7
4/95	12	9	9	9	11
5/95	2	10	10	11	12
6/95	5	9	8	6	3
7/95	7	8	7	5	5

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	4	n/a	n/a	n/a	n/a
8/94	23	4	4	4	4
9/94	19	10	7	2	3
10/94	12	2	2	6	7
11/94	0	11	14	14	13
12/94	17	7	7	11	16
1/95	1	9	11	12	14
2/95	7	2	2	1	5
3/95	11	2	3	5	4
4/95	12	3	3	3	1
5/95	2	8	8	9	10
6/95	5	4	3	1	2
7/95	7	1	0	2	2
AVG	10	5	5	6	7

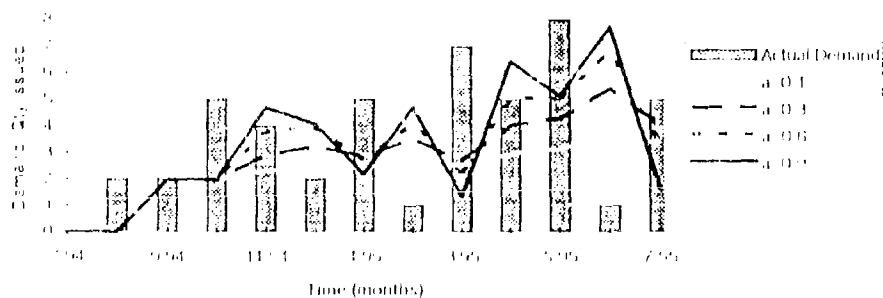
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.5	a=0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	2	n/a	n/a	n/a	n/a
9/94	2	2	2	2	2
10/94	5	2	2	2	2
11/94	4	2	3	4	5
12/94	2	2	3	4	4
1/95	5	2	3	3	2
2/95	1	3	4	4	5
3/95	7	3	3	2	1
4/95	5	3	4	5	6
5/95	8	3	4	5	5
6/95	1	4	5	7	8
7/95	5	3	4	3	2

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.5$	$\alpha=0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	2	n/a	n/a	n/a	n/a
9/94	2	0	0	0	0
10/94	5	3	3	3	3
11/94	4	2	1	0	1
12/94	2	0	1	2	2
1/95	5	3	2	2	3
2/95	1	2	3	3	4
3/95	7	4	4	5	6
4/95	5	2	1	0	1
5/95	8	5	4	3	3
6/95	1	3	4	6	7
7/95	5	2	1	2	3
AVG	4	2	2	2	3

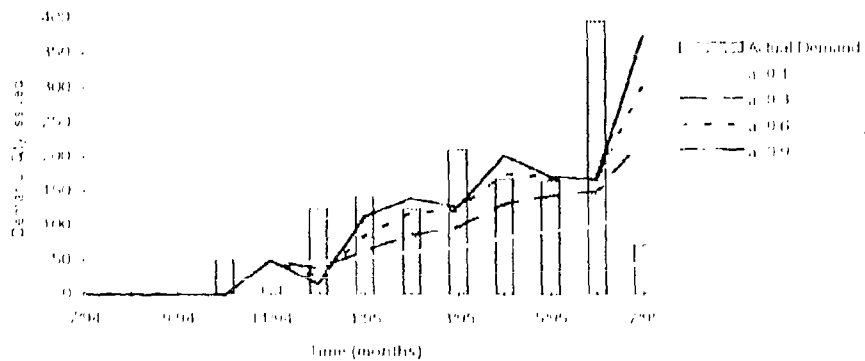
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a-0.1	a-0.3	a-0.6	a-0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	50	n/a	n/a	n/a	n/a
11/94	11	50	50	50	50
12/94	124	46	38	27	15
1/95	142	54	64	85	113
2/95	125	62	67	119	139
3/95	211	69	99	123	126
4/95	168	83	132	176	203
5/95	166	92	143	171	171
6/95	397	99	150	168	167
7/95	72	129	224	305	374

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a-0.1	a-0.3	a-0.6	a-0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	50	n/a	n/a	n/a	n/a
11/94	11	39	39	39	39
12/94	124	78	86	91	105
1/95	142	88	78	57	29
2/95	125	62	38	6	14
3/95	211	142	112	88	85
4/95	168	85	36	8	35
5/95	166	74	23	5	5
6/95	397	298	247	229	230
7/95	72	57	152	233	302
AVG	157	103	90	85	94

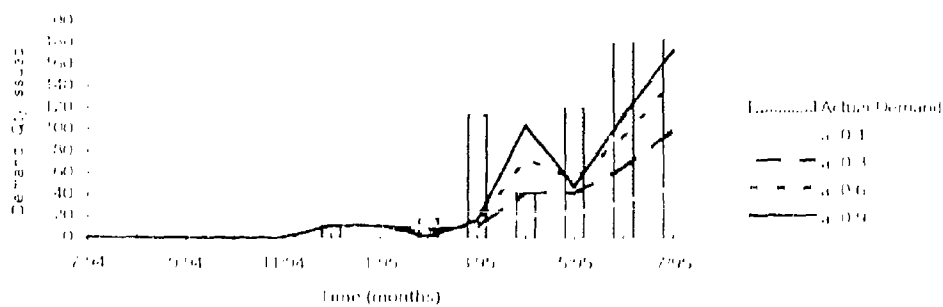
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	0	n/a	n/a	n/a	n/a
11/94	0	n/a	n/a	n/a	n/a
12/94	11	11	11	11	11
1/95	0	11	11	11	11
2/95	18	10	8	4	1
3/95	114	11	11	13	16
4/95	42	21	42	73	104
5/95	120	23	42	55	48
6/95	180	33	65	94	113
7/95	184	48	100	146	173

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	0	n/a	n/a	n/a	n/a
11/94	0	n/a	n/a	n/a	n/a
12/94	11	0	0	0	0
1/95	0	11	11	11	11
2/95	18	8	10	14	17
3/95	114	103	103	101	98
4/95	42	21	0	31	62
5/95	120	97	78	65	72
6/95	180	147	115	86	67
7/95	184	136	84	38	11
AVG	84	65	50	43	42

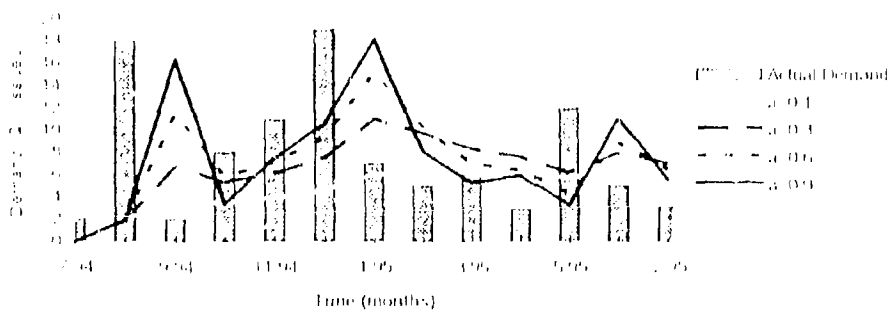
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	2	n/a	n/a	n/a	n/a
8/94	18	2	2	2	2
9/94	2	4	7	12	16
10/94	8	3	5	6	3
11/94	11	4	6	7	8
12/94	19	5	8	9	11
1/95	7	6	11	15	18
2/95	5	6	10	10	8
3/95	6	6	8	7	5
4/95	3	6	8	6	6
5/95	12	6	6	4	3
6/95	5	6	8	9	11
7/95	3	6	7	7	6

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	2	n/a	n/a	n/a	n/a
8/94	18	n/a	n/a	n/a	n/a
9/94	2	2	5	10	14
10/94	8	5	3	2	5
11/94	11	7	5	4	3
12/94	19	14	11	10	8
1/95	7	1	4	8	11
2/95	5	1	5	5	3
3/95	6	0	2	1	1
4/95	3	3	5	3	3
5/95	12	6	6	8	9
6/95	5	1	3	4	6
7/95	3	3	4	4	3
AVG	7	4	5	5	6

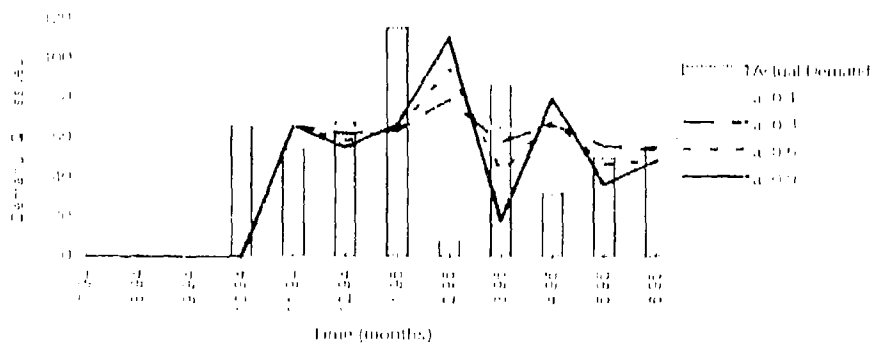
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	66	n/a	n/a	n/a	n/a
11/94	54	66	66	66	66
12/94	68	65	62	59	55
1/95	116	65	64	64	67
2/95	8	70	80	95	111
3/95	87	64	58	43	18
4/95	32	66	67	69	80
5/95	50	63	56	47	37
6/95	56	62	54	49	49

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	66	n/a	n/a	n/a	n/a
11/94	54	n/a	n/a	n/a	n/a
12/94	68	3	6	9	13
1/95	116	51	52	52	49
2/95	8	62	72	87	103
3/95	87	23	29	44	69
4/95	32	34	35	37	48
5/95	50	13	6	3	13
6/95	56	6	2	7	7
AVG	60	27	29	34	43

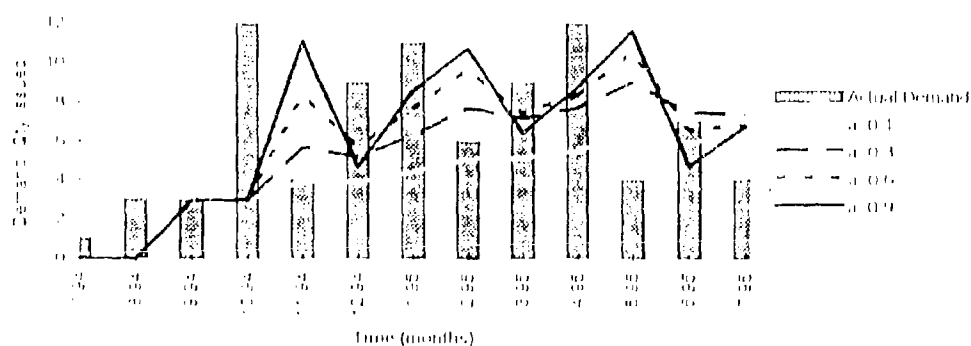
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	3	n/a	n/a	n/a	n/a
9/94	3	3	3	3	3
10/94	12	3	3	3	3
11/94	4	4	6	8	11
12/94	9	4	5	6	5
1/95	11	4	6	8	9
2/95	6	5	8	10	11
3/95	9	5	7	7	6
4/95	12	6	8	8	9
5/95	4	6	9	11	12
6/95	7	6	8	7	5
7/95	4	6	7	7	7

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	3	n/a	n/a	n/a	n/a
9/94	3	0	0	0	0
10/94	12	9	9	9	9
11/94	4	0	2	4	7
12/94	9	5	4	3	4
1/95	11	7	5	3	2
2/95	6	1	2	4	5
3/95	9	4	2	2	3
4/95	12	6	4	4	3
5/95	4	2	5	7	8
6/95	7	1	1	0	2
7/95	4	2	3	3	3
AVG	7	3	3	4	4

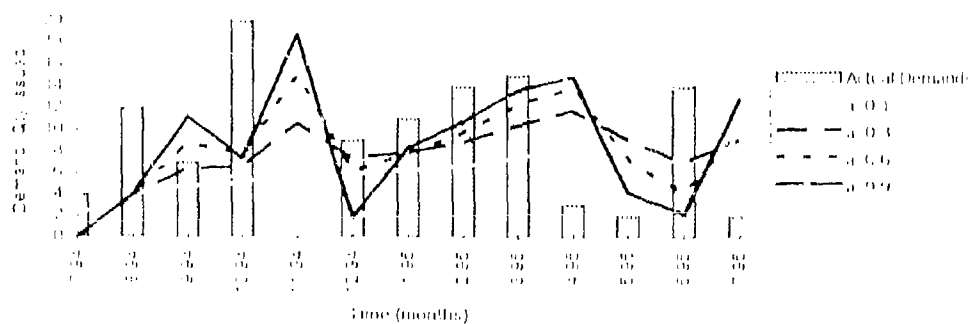
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	4	n/a	n/a	n/a	n/a
8/94	12	4	4	4	4
9/94	7	5	6	9	11
10/94	20	5	7	8	7
11/94	0	7	11	15	19
12/94	9	6	7	6	2
1/95	11	6	8	8	8
2/95	14	7	9	10	11
3/95	15	7	10	12	14
4/95	3	8	12	14	15
5/95	2	8	9	7	4
6/95	14	7	7	4	2
7/95	2	8	9	10	13

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	4	n/a	n/a	n/a	n/a
8/94	12	8	8	8	8
9/94	7	2	1	2	4
10/94	20	15	13	12	13
11/94	0	7	11	15	19
12/94	9	3	2	3	7
1/95	11	5	3	3	3
2/95	14	7	5	4	3
3/95	15	8	5	3	1
4/95	3	5	9	11	12
5/95	2	6	7	5	2
6/95	14	7	7	10	12
7/95	2	6	7	8	11
AVG	9	7	6	7	8

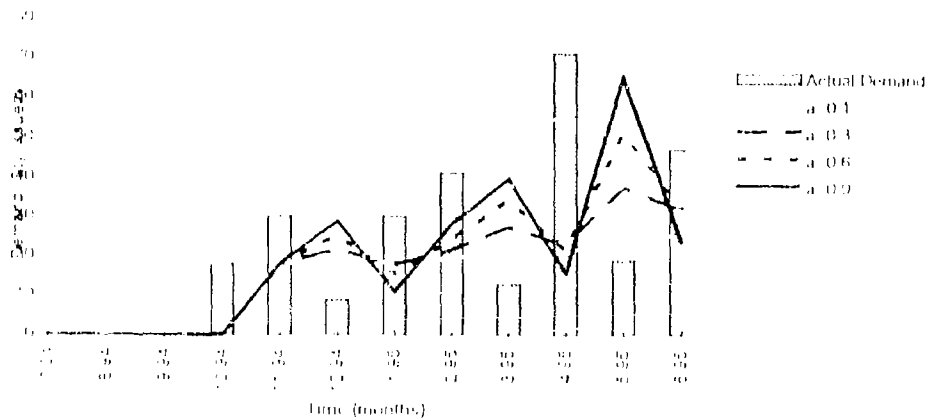
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	18	n/a	n/a	n/a	n/a
11/94	30	18	18	18	18
12/94	9	19	22	25	29
1/95	30	18	18	15	11
2/95	41	19	21	24	28
3/95	13	22	27	34	40
4/95	71	21	23	22	16
5/95	19	26	37	51	65
6/95	47	25	32	32	24

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	0	n/a	n/a	n/a	n/a
8/94	0	n/a	n/a	n/a	n/a
9/94	0	n/a	n/a	n/a	n/a
10/94	18	n/a	n/a	n/a	n/a
11/94	30	12	12	12	12
12/94	9	10	13	16	20
1/95	30	12	12	15	19
2/95	41	22	20	17	13
3/95	13	9	14	21	27
4/95	71	50	48	49	55
5/95	19	7	18	32	46
6/95	47	22	15	15	23
AVG	33	18	19	22	27

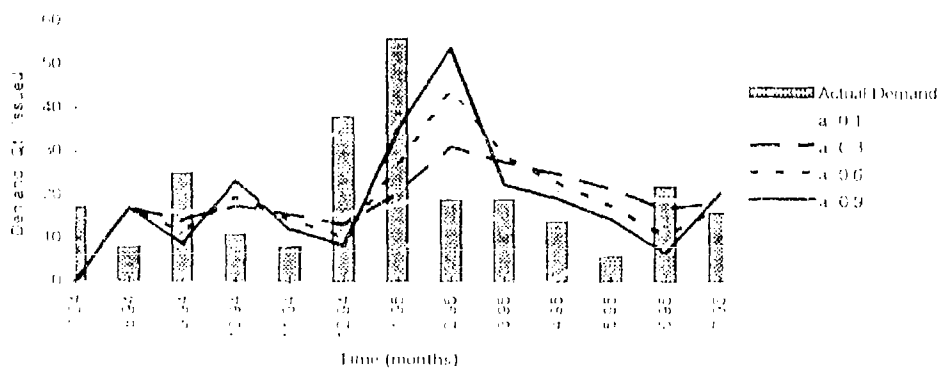
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	17	n/a	n/a	n/a	n/a
8/94	8	17	17	17	17
9/94	25	16	14	12	9
10/94	11	17	18	20	23
11/94	8	16	16	14	12
12/94	38	16	13	11	8
1/95	56	18	21	27	35
2/95	19	22	31	44	54
3/95	19	21	28	29	22
4/95	14	21	25	23	19
5/95	6	20	22	18	15
6/95	22	19	17	11	7
7/95	16	19	19	17	20

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	17	n/a	n/a	n/a	n/a
8/94	8	9	9	9	9
9/94	25	9	11	13	16
10/94	11	6	7	9	12
11/94	8	8	8	6	4
12/94	38	22	25	27	30
1/95	56	38	35	29	21
2/95	19	3	12	25	35
3/95	19	2	9	10	3
4/95	14	7	11	9	5
5/95	6	14	16	12	9
6/95	22	3	5	11	15
7/95	16	3	3	1	4
AVG	20	10	12	14	14

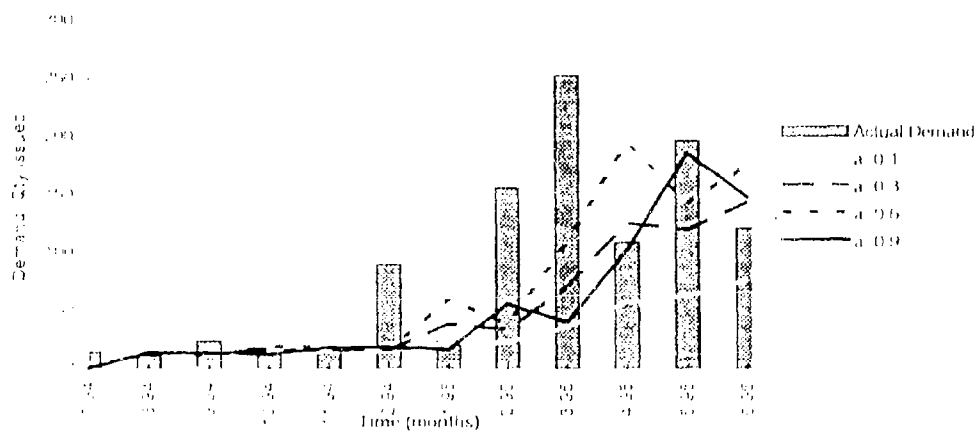
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	14	n/a	n/a	n/a	n/a
8/94	11	14	14	14	14
9/94	24	14	13	12	14
10/94	18	15	16	19	12
11/94	15	15	17	19	19
12/94	90	15	16	16	19
1/95	24	23	38	61	17
2/95	156	23	34	39	56
3/95	253	36	71	109	40
4/95	109	58	125	195	102
5/95	197	63	120	144	186
6/95	121	76	143	176	148

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	14	n/a	n/a	n/a	n/a
8/94	11	3	3	3	3
9/94	24	10	11	12	10
10/94	18	3	2	1	6
11/94	15	0	2	4	4
12/94	90	75	74	74	71
1/95	24	1	14	37	7
2/95	156	133	122	117	100
3/95	253	217	182	144	113
4/95	109	51	16	86	1
5/95	197	134	77	53	11
6/95	121	45	22	55	27
AVG	136	61	48	53	42

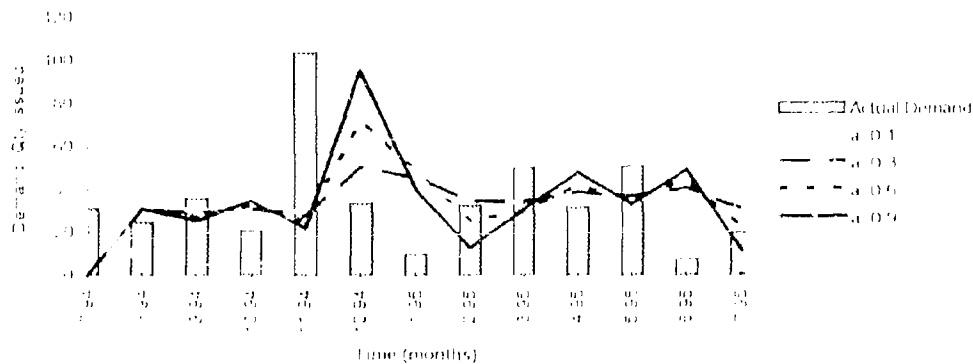
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	31	n/a	n/a	n/a	n/a
8/94	25	31	31	31	31
9/94	36	30	29	27	26
10/94	21	31	31	33	35
11/94	104	30	28	26	22
12/94	34	37	51	73	96
1/95	10	37	46	49	40
2/95	33	34	35	26	13
3/95	50	34	34	30	31
4/95	32	36	39	42	48
5/95	51	35	37	36	34
6/95	8	37	41	45	49
7/95	20	34	31	23	12

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	31	n/a	n/a	n/a	n/a
8/94	25	6	6	6	6
9/94	36	6	7	9	10
10/94	21	10	10	12	14
11/94	104	74	76	78	82
12/94	34	3	17	39	62
1/95	10	27	36	39	30
2/95	33	1	2	7	20
3/95	50	16	16	20	19
4/95	32	4	7	10	16
5/95	51	16	14	15	17
6/95	8	29	33	37	41
7/95	20	14	11	3	8
AVG	35	17	20	23	27

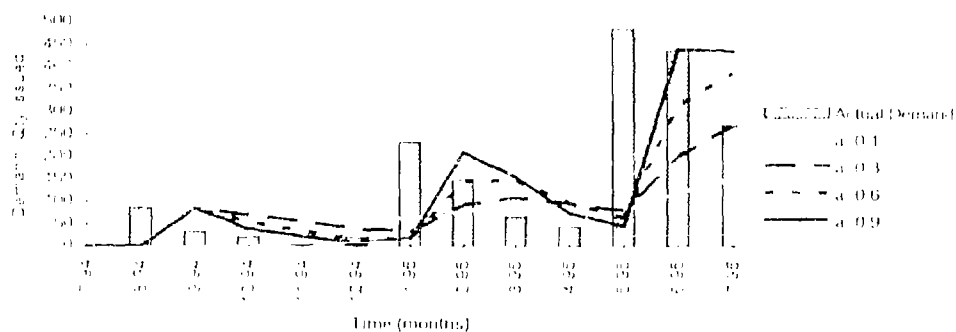
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	86	n/a	n/a	n/a	n/a
9/94	33	86	86	86	86
10/94	20	81	70	54	38
11/94	6	75	55	34	22
12/94	19	69	40	17	8
1/95	231	63	34	18	18
2/95	149	80	93	146	210
3/95	66	87	110	148	155
4/95	43	85	97	99	75
5/95	484	80	81	65	46
6/95	436	121	202	317	440
7/95	270	152	272	388	436

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	1	n/a	n/a	n/a	n/a
8/94	86	n/a	n/a	n/a	n/a
9/94	33	53	53	53	53
10/94	20	61	50	34	18
11/94	6	69	49	26	16
12/94	19	49	21	2	11
1/95	231	168	197	213	213
2/95	149	69	56	3	61
3/95	66	21	44	82	89
4/95	43	42	54	56	32
5/95	484	404	403	419	438
6/95	436	315	234	119	4
7/95	270	118	2	118	166
AVG	270	124	106	102	100

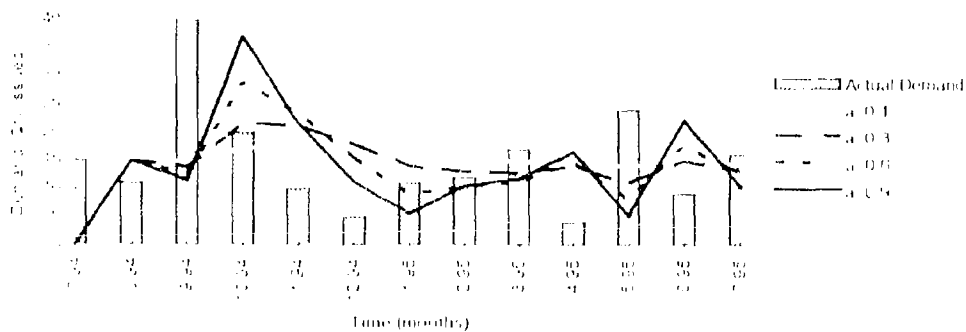
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	15	n/a	n/a	n/a	n/a
8/94	11	15	15	15	15
9/94	40	15	14	13	11
10/94	20	17	22	29	37
11/94	10	17	21	24	22
12/94	5	17	18	15	11
1/95	11	16	14	9	6
2/95	12	15	13	10	10
3/95	17	15	13	11	12
4/95	4	15	14	15	16
5/95	24	14	11	8	5
6/95	9	15	15	13	22
7/95	16	14	13	12	10

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	15	n/a	n/a	n/a	n/a
8/94	11	4	4	4	4
9/94	40	25	26	27	29
10/94	20	3	2	9	17
11/94	10	7	11	14	12
12/94	5	12	13	10	6
1/95	11	5	3	2	5
2/95	12	3	1	2	2
3/95	17	2	4	6	5
4/95	4	11	10	11	12
5/95	24	10	13	16	19
6/95	9	6	6	9	13
7/95	16	2	3	4	6
AVG	15	7	8	9	11

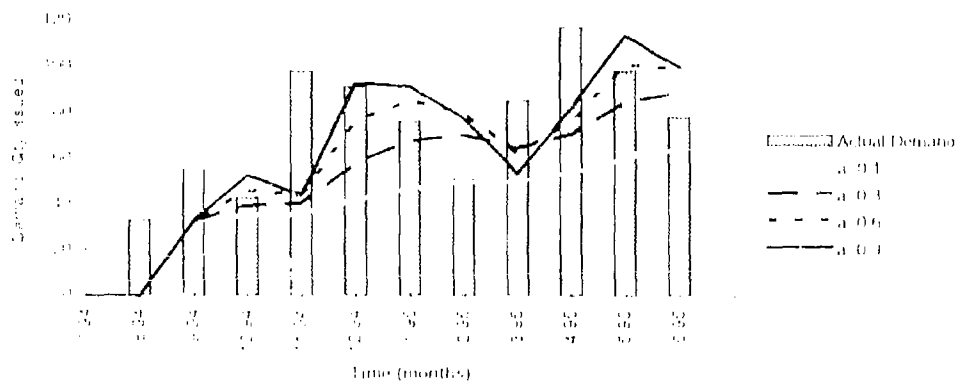
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	33	n/a	n/a	n/a	n/a
9/94	55	33	33	33	33
10/94	43	35	40	46	53
11/94	98	36	41	44	44
12/94	91	42	58	77	93
1/95	76	47	68	85	91
2/95	51	50	70	80	78
3/95	85	50	64	62	54
4/95	117	54	71	76	82
5/95	98	60	85	101	113
6/95	78	64	89	99	100

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		a=0.1	a=0.3	a=0.6	a=0.9
7/94	0	n/a	n/a	n/a	n/a
8/94	33	n/a	n/a	n/a	n/a
9/94	55	22	22	22	22
10/94	43	8	3	3	10
11/94	98	62	57	54	54
12/94	91	49	33	14	2
1/95	76	29	8	9	15
2/95	51	1	19	29	27
3/95	85	35	21	23	31
4/95	117	63	46	41	35
5/95	98	38	13	3	15
6/95	78	14	11	21	22
AVG	79	32	23	22	23

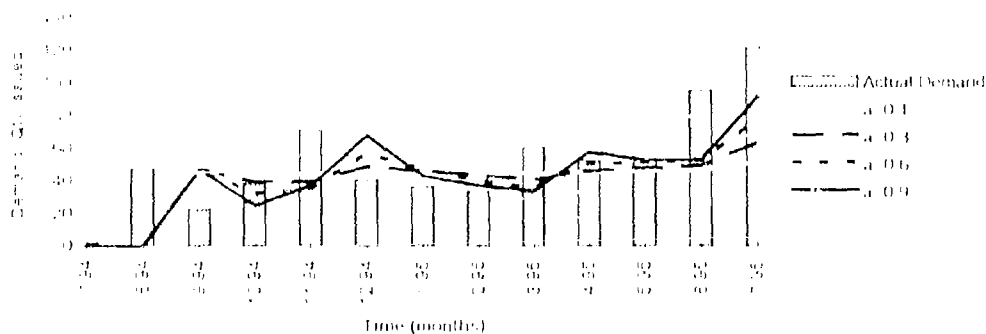
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	2	n/a	n/a	n/a	n/a
8/94	48	n/a	n/a	n/a	n/a
9/94	23	48	48	48	48
10/94	39	46	41	33	26
11/94	72	45	40	37	38
12/94	41	48	50	58	69
1/95	37	47	47	48	44
2/95	34	46	44	41	38
3/95	61	45	41	37	34
4/95	53	46	47	51	58
5/95	54	47	49	52	54
6/95	96	48	50	53	54
7/95	122	53	64	79	92

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	2	n/a	n/a	n/a	n/a
8/94	48	n/a	n/a	n/a	n/a
9/94	23	25	25	25	25
10/94	39	7	1	6	14
11/94	72	27	32	35	34
12/94	41	7	9	17	28
1/95	37	10	10	11	7
2/95	34	12	10	7	4
3/95	61	16	20	24	27
4/95	53	7	6	7	5
5/95	54	7	5	7	0
6/95	96	48	46	43	42
7/95	122	69	58	43	30
AVG	57	21	20	19	20

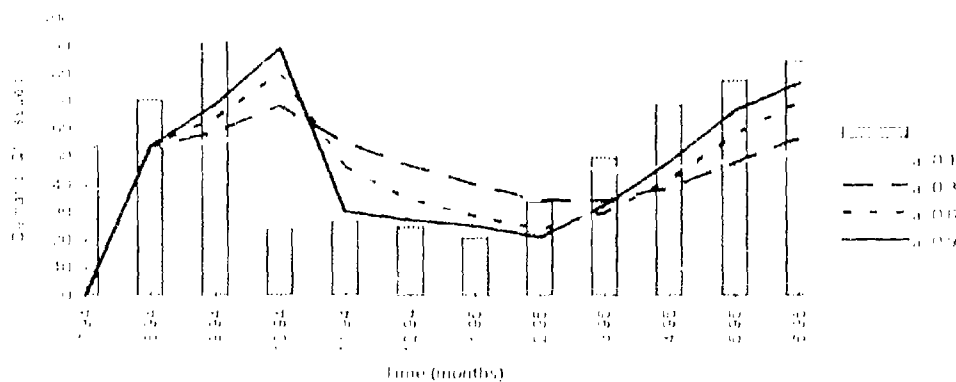
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	54	n/a	n/a	n/a	n/a
8/94	71	54	54	54	54
9/94	92	56	59	64	69
10/94	24	59	69	81	90
11/94	27	56	55	47	31
12/94	25	53	47	35	27
1/95	21	50	40	29	25
2/95	34	47	35	24	21
3/95	50	46	34	30	33
4/95	69	46	39	42	48
5/95	78	49	48	58	67
6/95	85	52	57	70	77

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	54	n/a	n/a	n/a	n/a
8/94	71	17	17	17	17
9/94	92	36	33	28	23
10/94	24	35	45	57	66
11/94	27	29	28	20	4
12/94	25	28	22	10	2
1/95	21	29	19	8	4
2/95	34	13	1	10	13
3/95	50	4	16	20	17
4/95	69	23	30	27	21
5/95	78	29	30	20	11
6/95	85	33	28	15	8
AVG	52	25	24	21	17

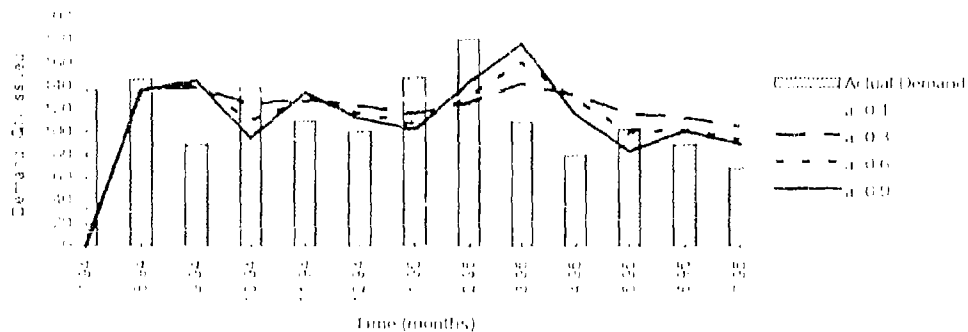
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	137	n/a	n/a	n/a	n/a
8/94	146	137	137	137	137
9/94	89	138	140	142	145
10/94	139	133	124	110	95
11/94	110	134	129	128	135
12/94	101	131	123	117	112
1/95	148	128	117	107	102
2/95	181	130	126	132	143
3/95	109	135	142	161	177
4/95	80	133	132	130	116
5/95	103	127	117	100	84
6/95	89	125	113	102	101
7/95	69	121	106	94	90

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	137	n/a	n/a	n/a	n/a
8/94	146	9	9	9	9
9/94	89	49	51	53	56
10/94	139	6	15	29	44
11/94	110	24	19	18	25
12/94	101	30	22	16	11
1/95	148	20	31	41	46
2/95	181	51	55	49	38
3/95	109	26	33	52	68
4/95	80	53	52	50	36
5/95	103	24	14	3	19
6/95	89	36	24	13	12
7/95	69	52	37	25	21
AVG	114	32	30	30	32

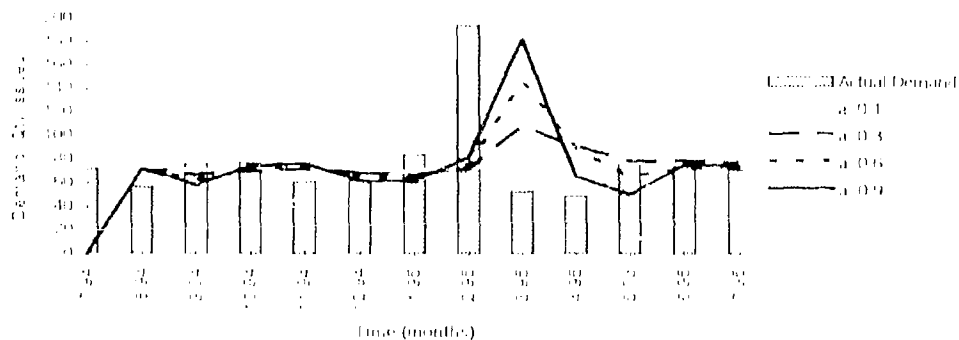
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	72	n/a	n/a	n/a	n/a
8/94	57	72	72	72	72
9/94	76	71	68	63	59
10/94	77	71	70	71	74
11/94	61	72	72	75	77
12/94	62	71	69	66	63
1/95	34	70	67	64	62
2/95	194	71	72	76	82
3/95	53	83	109	147	183
4/95	49	80	92	91	66
5/95	78	77	79	66	51
6/95	74	77	79	73	75
7/95	71	77	77	74	74

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	72	n/a	n/a	n/a	n/a
8/94	57	15	15	15	15
9/94	76	6	9	13	18
10/94	77	6	7	6	3
11/94	61	11	11	14	16
12/94	62	9	7	4	1
1/95	34	14	17	20	22
2/95	194	123	122	118	112
3/95	53	30	56	94	130
4/95	49	31	43	42	17
5/95	78	1	1	12	27
6/95	74	3	5	1	1
7/95	71	6	6	3	3
AVG	78	21	25	28	30

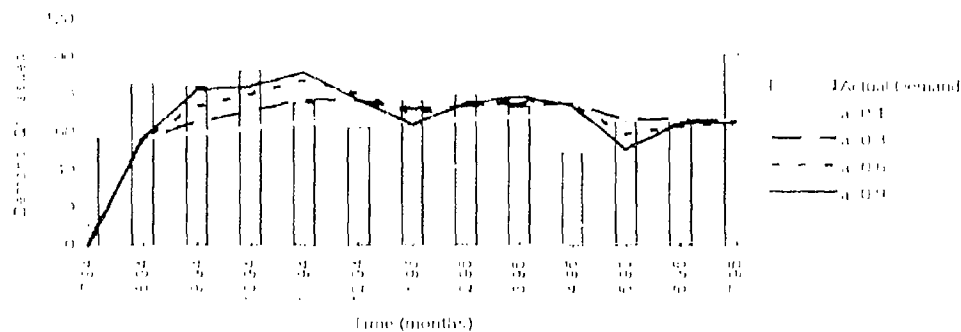
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	57	n/a	n/a	n/a	n/a
8/94	86	57	57	57	57
9/94	85	60	66	74	83
10/94	93	62	71	81	85
11/94	76	65	78	88	92
12/94	63	67	77	81	78
1/95	77	66	73	70	64
2/95	80	67	74	74	76
3/95	74	69	76	78	80
4/95	49	69	75	75	75
5/95	67	67	67	60	52
6/95	66	67	67	64	65
7/95	102	67	67	65	66

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha = 0.1$	$\alpha = 0.3$	$\alpha = 0.6$	$\alpha = 0.9$
7/94	57	n/a	n/a	n/a	n/a
8/94	86	29	29	29	29
9/94	85	25	19	11	2
10/94	93	31	22	12	8
11/94	76	11	2	12	16
12/94	63	4	14	18	15
1/95	77	11	4	7	13
2/95	80	13	6	6	4
3/95	74	5	2	4	6
4/95	49	20	26	26	26
5/95	67	0	0	7	15
6/95	66	1	1	2	1
7/95	102	35	35	37	36
AVG	77	15	13	14	14

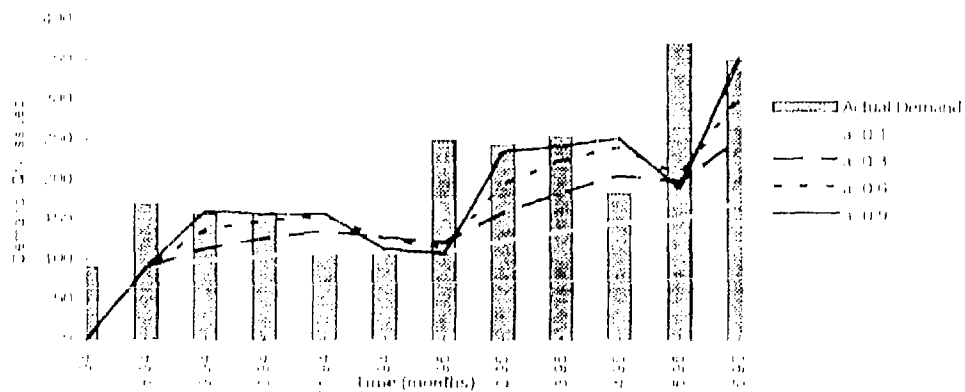
Actual and Forecasted Demand vs. Time



Date	Actual Demand	Forecasted Demand			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	91	n/a	n/a	n/a	n/a
8/94	170	91	91	91	91
9/94	157	99	115	138	162
10/94	159	105	127	150	158
11/94	110	110	137	155	159
12/94	108	110	129	128	115
1/95	250	110	123	116	109
2/95	244	124	161	196	236
3/95	254	136	186	225	243
4/95	184	148	206	242	253
5/95	370	151	200	207	191
6/95	350	173	251	305	352

Date	Actual Demand	Mean Absolute Deviation (MAD)			
		$\alpha=0.1$	$\alpha=0.3$	$\alpha=0.6$	$\alpha=0.9$
7/94	91	n/a	n/a	n/a	n/a
8/94	170	79	79	79	79
9/94	157	58	42	19	5
10/94	159	54	32	9	1
11/94	110	0	27	45	49
12/94	108	2	21	20	7
1/95	250	140	127	134	141
2/95	244	120	83	48	8
3/95	254	118	68	29	11
4/95	184	36	22	58	69
5/95	370	219	170	163	179
6/95	350	177	99	45	2
AVG	214	91	70	59	50

Actual and Forecasted Demand vs. Time



APPENDIX D:
DATA FROM ANALYSIS OF DEMAND
FOR CA MATERIAL

DEVELOPMENT
1970-1975

[illegible]

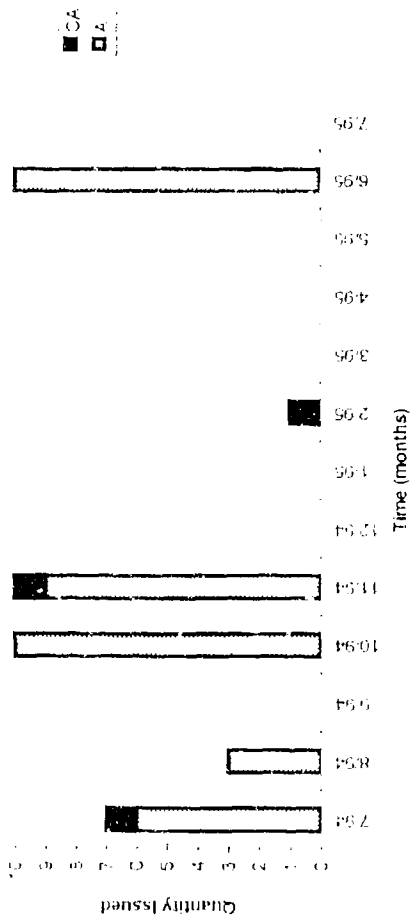
Analysis A Demand

NSN
3439002203827

NOMENCLATURE:
FLUX LIQUID

Soldering Flux, NSN: 3439002203827
'CA' and 'A' Condition Material Issues vs. Time

Date	Demand	
	Total	A CA
7-84	7	5 1
8-84	3	3 0
9-84	0	0 0
10-84	10	10 0
11-84	12	9 1
12-84	0	0 0
1-85	0	0 0
2-85	1	0 1
3-85	0	0 0
4-85	0	0 0
5-85	0	0 0
6-85	10	10 0
7-85	0	0 0
Totals	38	3



0-2

0-2

Analysis A Demand

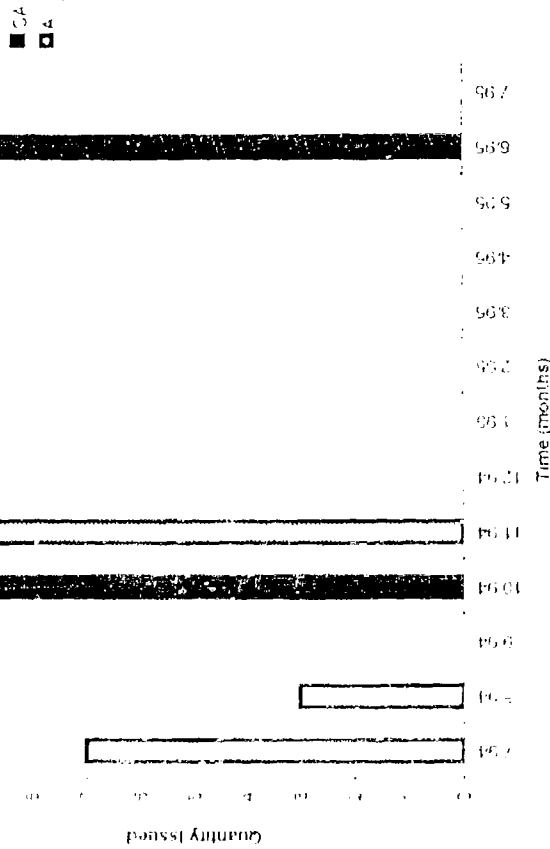
NSN
804009023871

Silicone Sealant, NSN: 804009023871

'CA' and 'A' Condition Material Issues vs. Time

NOVENCATURE
SILICONE SEALANT

Date	Demand		
	Total	A	CA
1-94	7	1	0
3-94	3	3	0
5-94	0	0	0
7-94	10	0	10
9-94	10	10	0
11-94	0	0	0
1-95	0	0	0
3-95	0	0	0
5-95	0	0	0
7-95	0	0	0
9-95	10	0	10
11-95	0	0	0
Total	40	20	20



EX-100-107
11-95

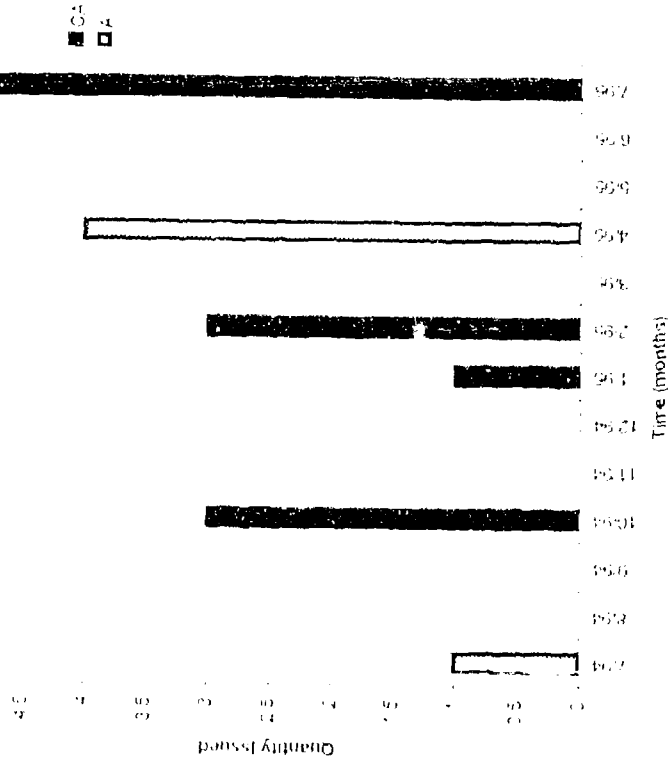
D-5

Analysis - Demand

NSN
8030000625866

NONENCLATURE
CORROSION PREV COMPOUND

5 Corrosion Prevention Compound, NSN: 8030000625866
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	A CA
7/74	1	0
8/74	0	0
9/74	0	0
10/74	0	0
11/74	0	0
12/74	0	0
1/75	0	0
2/75	0	0
3/75	0	0
4/75	0	0
5/75	0	0
6/75	0	0
7/75	0	0
8/75	0	0
9/75	0	0
10/75	0	0
11/75	0	0
12/75	0	0
1/76	0	0
2/76	0	0
3/76	0	0
4/76	0	0
5/76	0	0
6/76	0	0
7/76	0	0
8/76	0	0
9/76	0	0
10/76	0	0
11/76	0	0
12/76	0	0
1/77	0	0
2/77	0	0
3/77	0	0
4/77	0	0
5/77	0	0
6/77	0	0
7/77	0	0
8/77	0	0
9/77	0	0

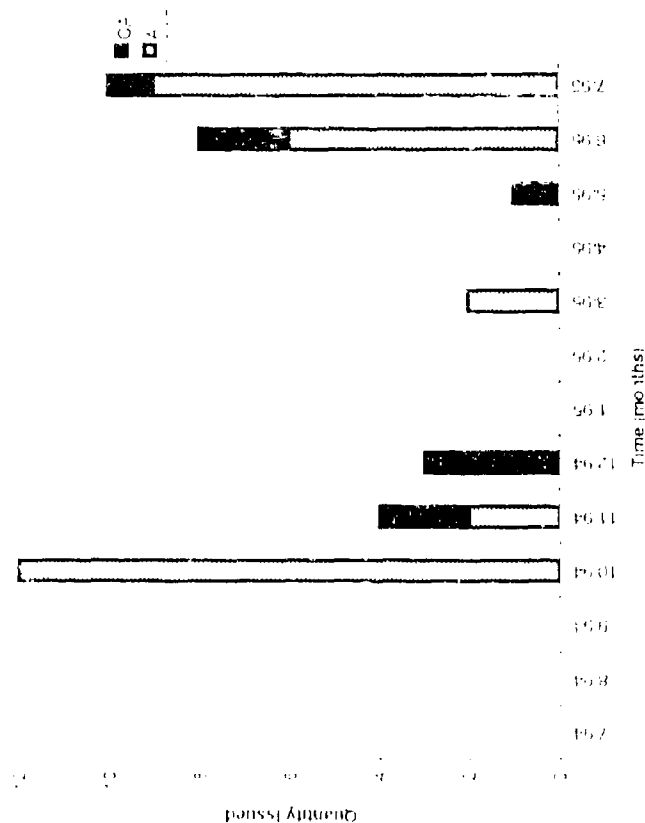
8030000625866

4 Cyls. A Demand

NSI
EC-60133-0119

NOVEMBER
PAINT LAQUER BLUE

Paint, Blue, Laquer, FSN: 8010013316119
'CA' and 'A' Condition Material Issues vs. Time

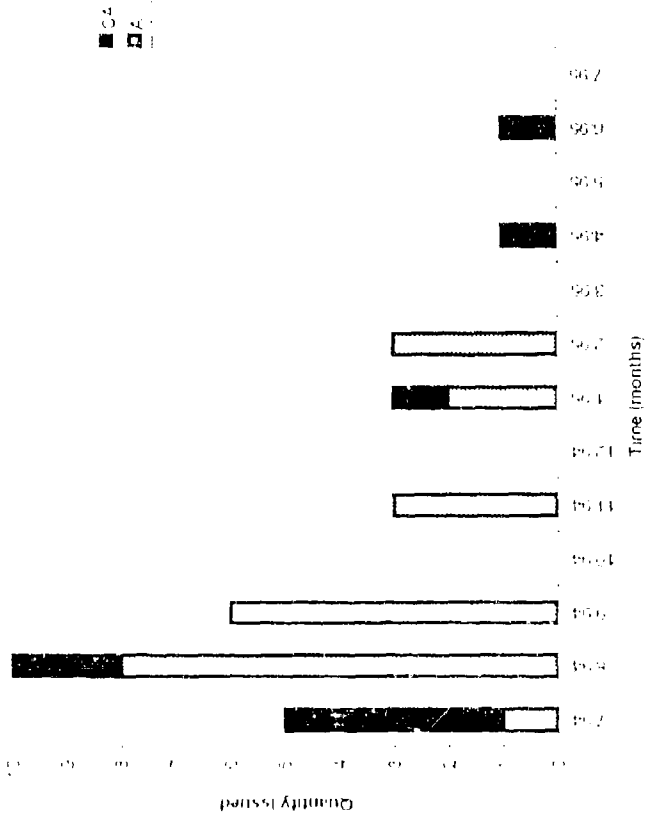


18456 Demand

NSN
8010012180858

ACMECULTURE
PAINT EPOXY PRIMER GREEN

Paint, Epoxy, Primer, Gree 1, NSN: 8010012180858
'CA' and 'A' Condition Material Issues vs. Time

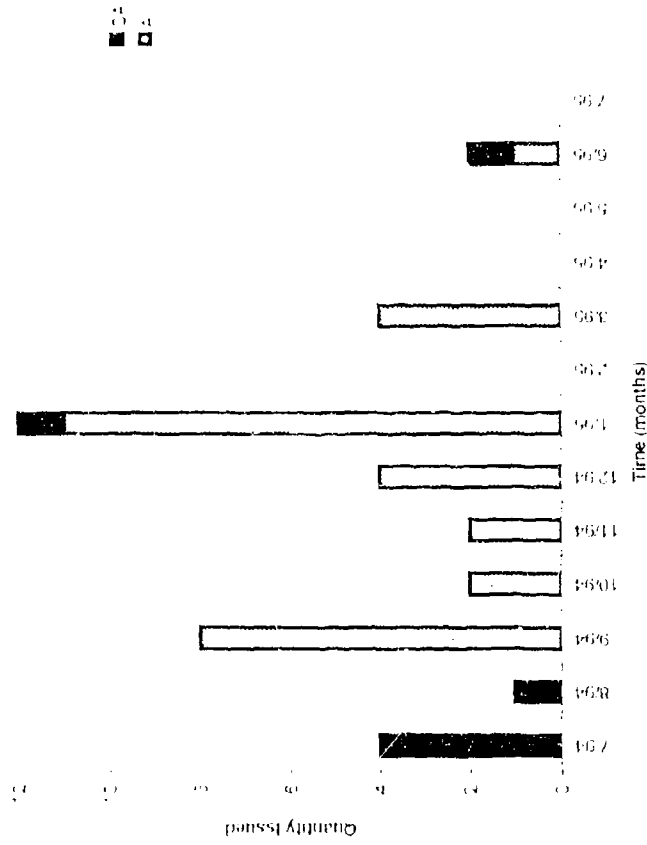


10-6

AS,
9150001817724

NOVELLOURE
GREASE AIRCRAFT

Grease, Aircraft, NSN: 9150001817724
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	CA	A
7/94	4	0
8/94	1	0
9/94	0	12
10/94	0	2
11/94	0	2
12/94	0	12
1/95	0	12
2/95	0	12
3/95	0	12
4/95	0	12
5/95	0	12
6/95	0	12
7/95	0	12
TOTALS	50	32

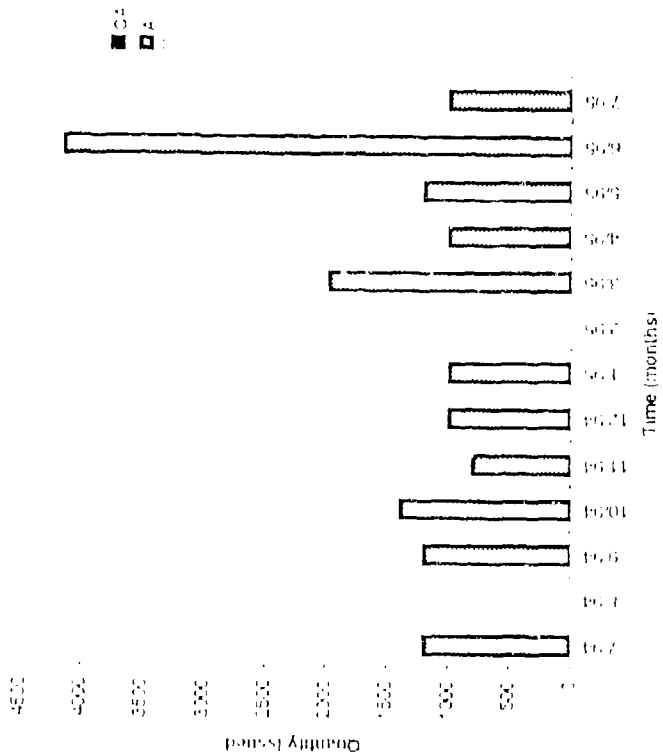
NOVELLOURE
GREASE AIRCRAFT

NOVELLOURE
GREASE AIRCRAFT

NOVELLOURE
GREASE AIRCRAFT

(1)	(1)
(2)	(2)
(3)	(3)
(4)	(4)
(5)	(5)
(6)	(6)
(7)	(7)
(8)	(8)
(9)	(9)
(10)	(10)
(11)	(11)
(12)	(12)

Year	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099																																								
1900	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240



(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

(11) (12) (13) (14) (15) (16) (17) (18) (19) (20)

(21) (22) (23) (24) (25) (26) (27) (28) (29) (30)

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(91) (92) (93) (94) (95) (96) (97) (98) (99) (100)

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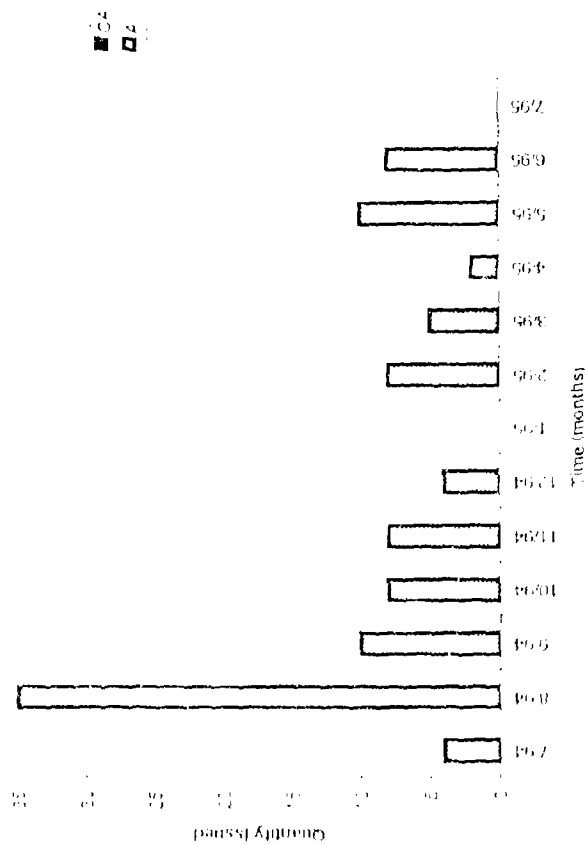
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(781) (782) (783) (784) (785) (786) (787) (788) (789) (790)

(791) (792) (793) (

(1) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (2) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (3) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (4) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (5) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (6) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (7) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (8) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (9) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .
 (10) R is a local Gorenstein ring with maximal ideal $\mathfrak{m}$ and residue field k .

Lube Oil, Aircraft Turbine NSN: 9150002316676
'CA' and 'A' Condition Material Issues vs. Time

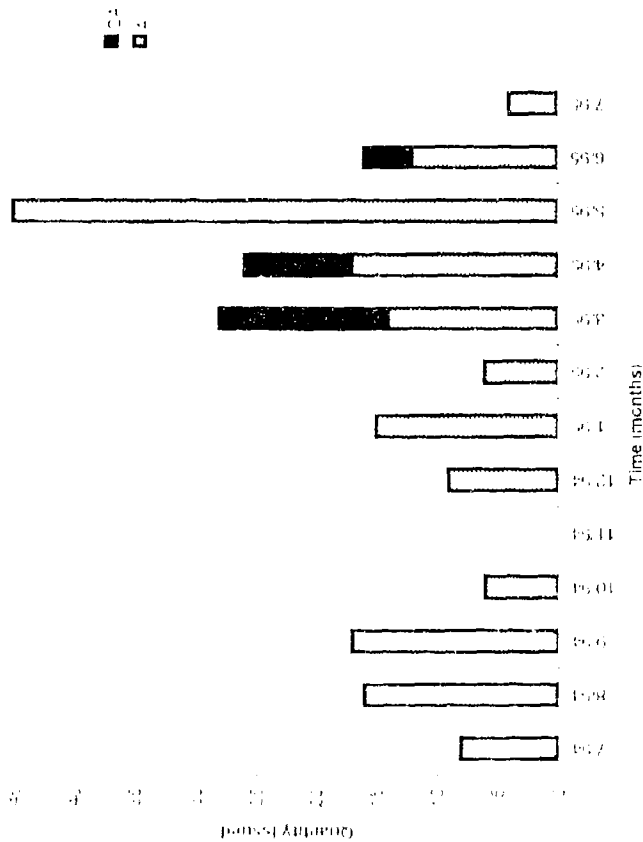
[illegible]

(1)

Analysis - 1 Dec 53

NSN
631000499354
UNCLASSIFIED
NOFORN
C O C
A O C

Battery Acid, NSN: 6310002499354
'CA' and 'A' Condition Material Issues vs. Time



Condition	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5
'CA'	0	0	0	0	0	0	0	0	0	0	0
'A'	1	1	15	1	1	1	1	1	1	1	1
Total	1	1	15	1	1	1	1	1	1	1	1

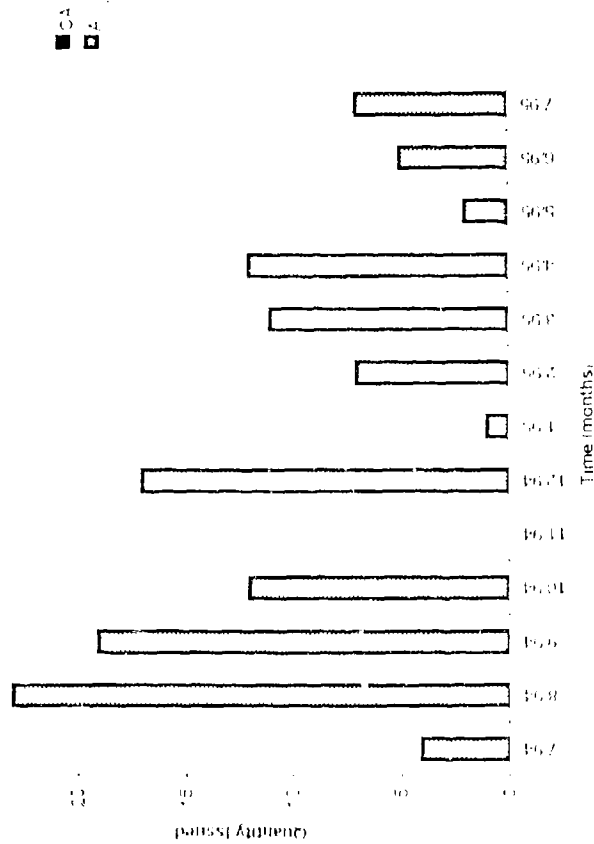
D-10

Analysis - CA Demand

NSN
8030010668156

NOVENCURE
CONDOUSEE MOBILE

Compound, Sealing, Blue, NSN: 8030010668156
'CA' and 'A' Condition Material Issues vs. Time



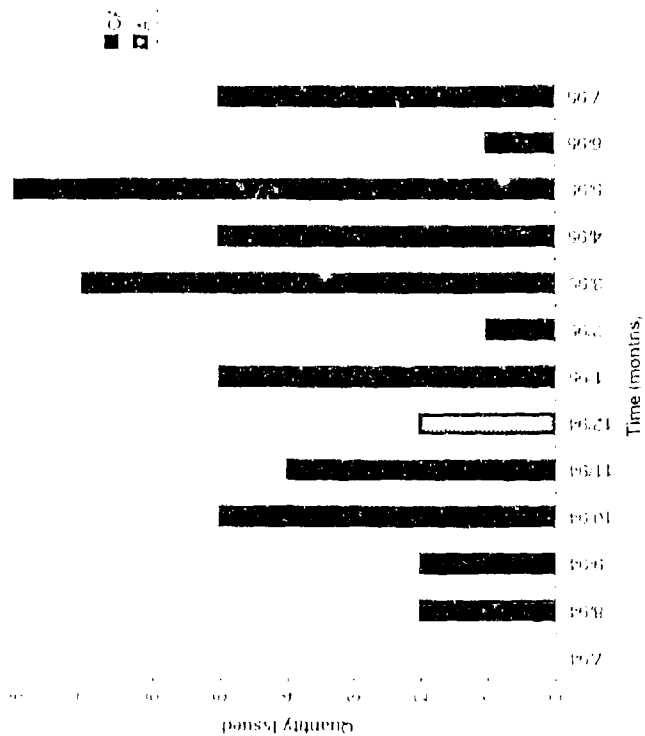
Date	Demand	
	CA	A
1967	4	4
1968	22	22
1969	12	12
1970	12	12
1971	12	12
1972	12	12
1973	12	12
1974	12	12
1975	12	12
1976	12	12
1977	12	12
1978	12	12
1979	12	12
1980	12	12
1981	12	12
1982	12	12
1983	12	12
1984	12	12
1985	12	12
1986	12	12
1987	12	12
1988	12	12
1989	12	12
1990	12	12
1991	12	12
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2002	12	12
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2005	12	12
2006	12	12
2007	12	12
2008	12	12
2009	12	12
2010	12	12
2011	12	12
2012	12	12
2013	12	12
2014	12	12
2015	12	12
2016	12	12
2017	12	12
2018	12	12
2019	12	12
2020	12	12
2021	12	12
2022	12	12
2023	12	12
2024	12	12
2025	12	12
2026	12	12
2027	12	12
2028	12	12
2029	12	12
2030	12	12

NSN 7540-01-280-5555

NSN 7540-01-280-5555

NSN 7540-01-280-5555

Adhesive, Polychloroprene, NSN: 8040005152246
'CA' and 'A' Condition Material Issues vs. Time

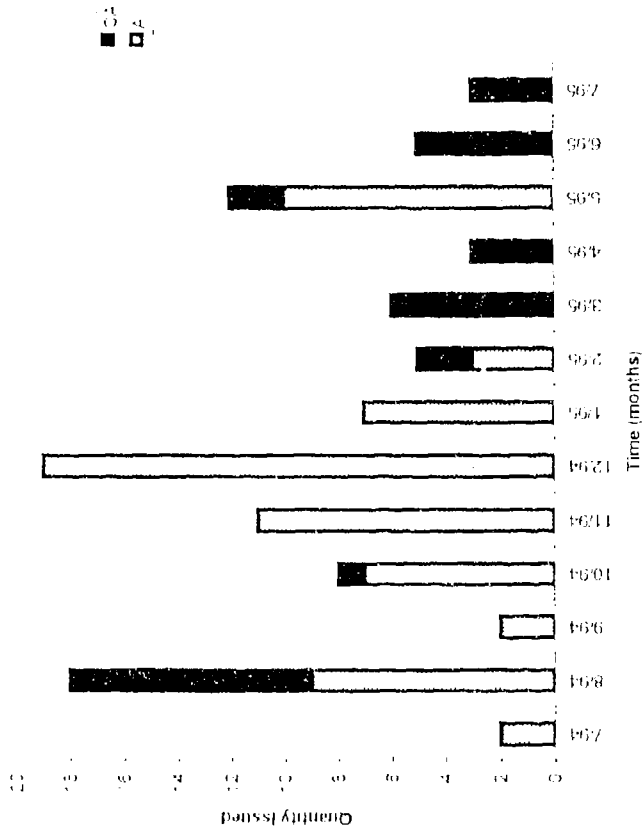


Condition	Quantity Issued	Time (months)
'CA'	0	7/64
'CA'	0	8/64
'CA'	0	9/64
'CA'	0	10/64
'CA'	0	11/64
'CA'	0	12/64
'CA'	0	1/65
'CA'	0	2/65
'CA'	0	3/65
'CA'	0	4/65
'CA'	0	5/65
'CA'	0	6/65
'CA'	0	7/65
'CA'	0	8/65
'CA'	0	9/65
'CA'	0	10/65
'CA'	0	11/65
'CA'	0	12/65
'CA'	0	1/66
'CA'	0	2/66
'CA'	0	3/66
'CA'	0	4/66
'CA'	0	5/66
'CA'	0	6/66
'CA'	0	7/66
'CA'	0	8/66
'CA'	0	9/66
'CA'	0	10/66
'CA'	0	11/66
'CA'	0	12/66
'CA'	0	1/67
'CA'	0	2/67
'CA'	0	3/67
'CA'	0	4/67
'CA'	0	5/67
'CA'	0	6/67
'CA'	0	7/67
'CA'	0	8/67
'CA'	0	9/67
'A'	0	7/64
'A'	0	8/64
'A'	0	9/64
'A'	0	10/64
'A'	0	11/64
'A'	0	12/64
'A'	0	1/65
'A'	0	2/65
'A'	0	3/65
'A'	0	4/65
'A'	0	5/65
'A'	0	6/65
'A'	0	7/65
'A'	0	8/65
'A'	0	9/65
'A'	0	10/65
'A'	0	11/65
'A'	0	12/65
'A'	0	1/66
'A'	0	2/66
'A'	0	3/66
'A'	0	4/66
'A'	0	5/66
'A'	0	6/66
'A'	0	7/66
'A'	0	8/66
'A'	0	9/66
'A'	0	10/66
'A'	0	11/66
'A'	0	12/66
'A'	0	1/67
'A'	0	2/67
'A'	0	3/67
'A'	0	4/67
'A'	0	5/67
'A'	0	6/67
'A'	0	7/67
'A'	0	8/67
'A'	0	9/67

0 1 2

Analysis of Demand

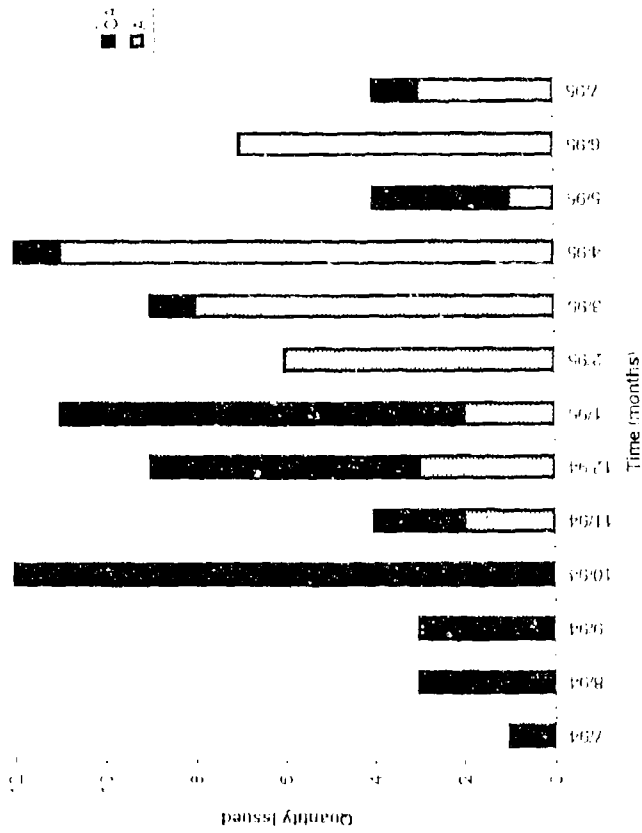
Cleaning Compound, NSN: 6850012340219
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	'A' Condition
1/54	2	2
2/54	10	10
3/54	2	2
4/54	10	10
5/54	10	10
6/54	10	10
7/54	10	10
8/54	10	10
9/54	10	10
10/54	10	10
11/54	10	10
12/54	10	10
1/55	10	10
2/55	10	10
3/55	10	10
4/55	10	10
5/55	10	10
6/55	10	10
7/55	10	10
8/55	10	10
9/55	10	10
10/55	10	10
11/55	10	10
12/55	10	10
1/56	10	10

Analysis of Demand

Paint Remover, NSN: 8010001817568
'CA' and 'A' Condition Material Issues vs. Time



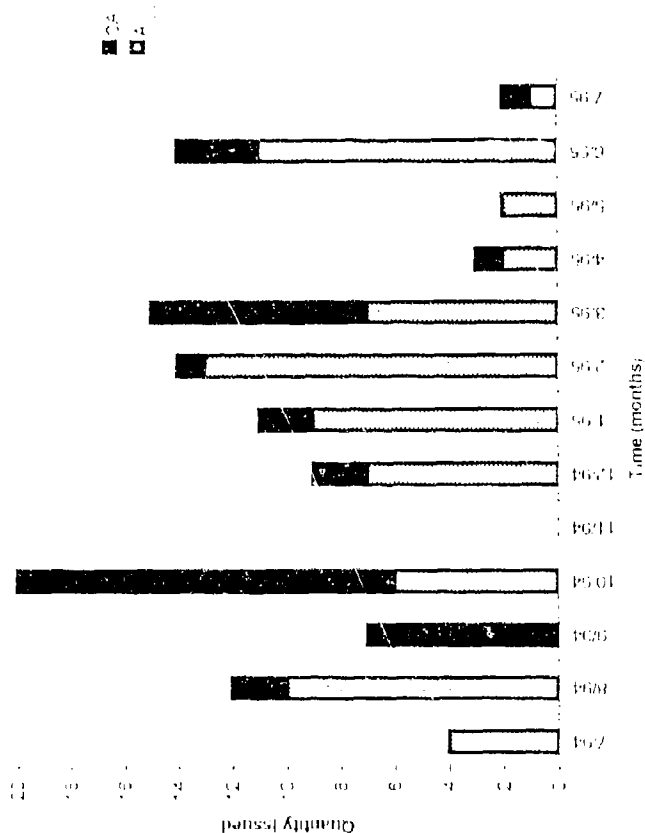
Condition		Quantity	
CA	A	CA	A
1	1	1	1
2	1	2	1
3	1	3	1
4	1	4	1
5	1	5	1
6	1	6	1
7	1	7	1
8	1	8	1
9	1	9	1
10	1	10	1
11	1	11	1
12	1	12	1
13	1	13	1
14	1	14	1
15	1	15	1
16	1	16	1
17	1	17	1
18	1	18	1
19	1	19	1
20	1	20	1
21	1	21	1
22	1	22	1
23	1	23	1
24	1	24	1
25	1	25	1
26	1	26	1
27	1	27	1
28	1	28	1
29	1	29	1
30	1	30	1
31	1	31	1
32	1	32	1
33	1	33	1
34	1	34	1
35	1	35	1
36	1	36	1
37	1	37	1
38	1	38	1
39	1	39	1
40	1	40	1
41	1	41	1
42	1	42	1
43	1	43	1
44	1	44	1
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46	1	46	1
47	1	47	1
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62	1	62	1
63	1	63	1
64	1	64	1
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66	1	66	1
67	1	67	1
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69	1	69	1
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71	1	71	1
72	1	72	1
73	1	73	1
74	1	74	1
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89	1	89	1
90	1	90	1
91	1	91	1
92	1	92	1
93	1	93	1
94	1	94	1
95	1	95	1
96	1	96	1
97	1	97	1
98	1	98	1
99	1	99	1
100	1	100	1

Analysis • A Demand

NSN
9150002319071

NOVENOCTURE
FLUID BRAKE HOSE

Automotive Brake Fluid, NSN: 9150002319071
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	A CA
7/64	1	1
7/65	1	1
7/66	1	1
7/67	1	1
7/68	1	1
7/69	1	1
7/70	1	1
7/71	1	1
7/72	1	1
7/73	1	1
7/74	1	1
7/75	1	1
7/76	1	1
7/77	1	1
7/78	1	1
7/79	1	1
7/80	1	1
7/81	1	1
7/82	1	1
7/83	1	1
7/84	1	1
7/85	1	1
7/86	1	1
7/87	1	1
7/88	1	1
7/89	1	1
7/90	1	1
7/91	1	1
7/92	1	1
7/93	1	1
7/94	1	1
7/95	1	1
7/96	1	1
7/97	1	1
7/98	1	1
7/99	1	1
7/00	1	1

9150002319071

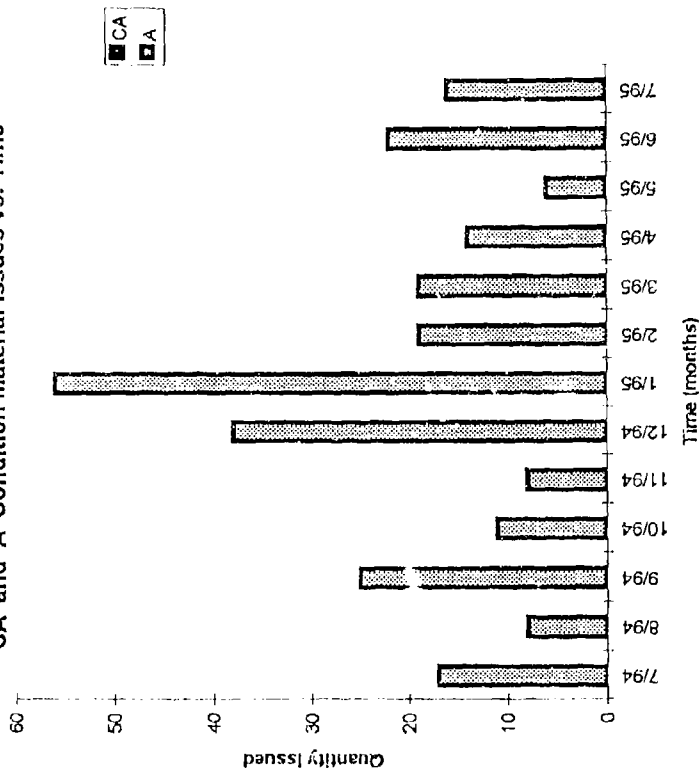
Analysis ● CA Demand

NSN:
8040001178510

NOMENCLATURE:
ADHESIVE, SILICONE RUBBER,

Date	Demand	
	Total	CA
7/94	17	0
8/94	8	0
9/94	25	0
10/94	11	0
11/94	8	0
12/94	38	0
1/95	56	0
2/95	19	0
3/95	19	0
4/95	14	0
5/95	6	0
6/95	22	0
7/95	16	0
Totals	259	0

Adhesive, Silicone Rubber, NSN: 8040001178510
'CA' and 'A' Condition Material Issues vs. Time

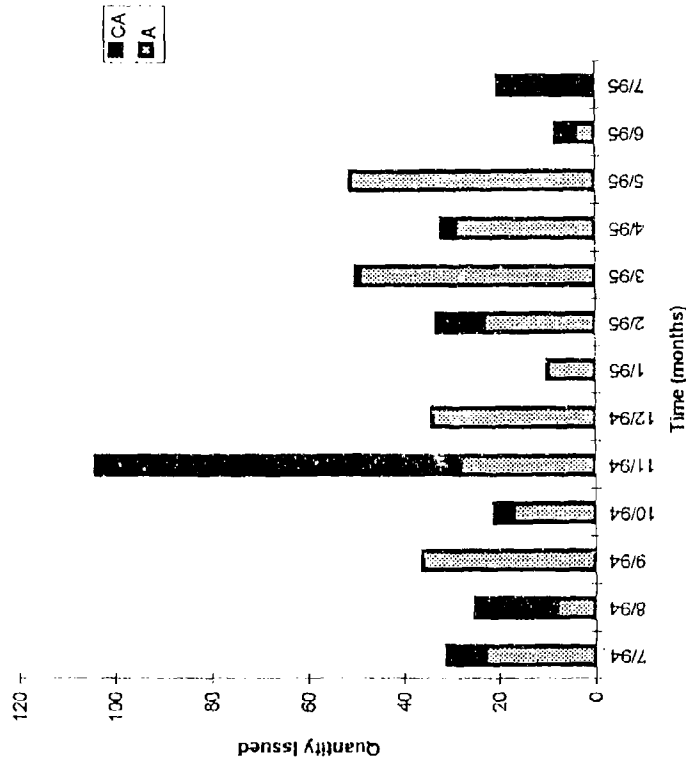


DIN: PD-7-2-001/#7
12/29/95

NSN:
9150012602534

NOMENCLATURE:
LUBE, SOLID FILM

Lube, Solid Film, NSN 9150012602534
'CA' and 'A' Condition Material Issues vs. Time



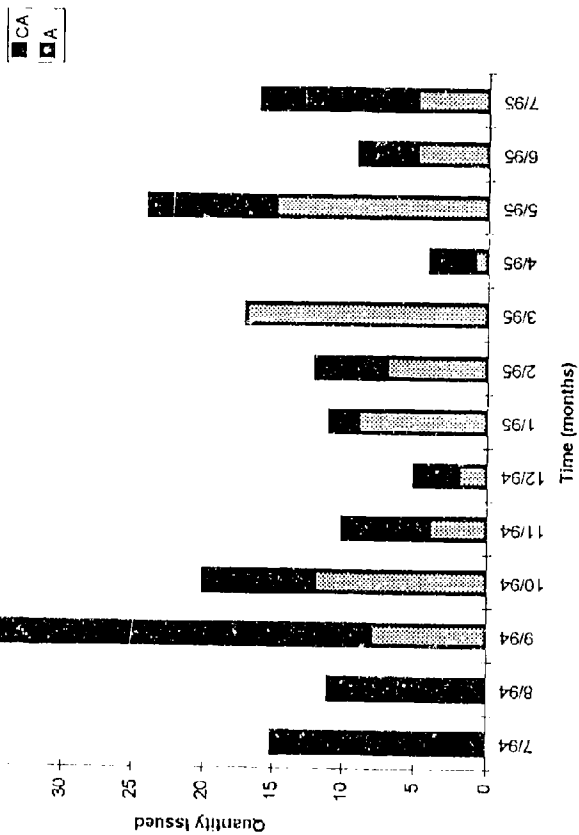
Date	Demand	
	Total	CA
7/94	31	8
8/94	25	17
9/94	36	0
10/94	21	4
11/94	104	76
12/94	34	0
1/95	10	0
2/95	33	10
3/95	50	1
4/95	32	3
5/95	51	0
6/95	8	4
7/95	20	19
Totals	455	313

NSN:
9150002500926

NOMENCLATURE:
PETROLATUM TECHNICAL

Date	Demand		
	Total	A	CA
7/94	15	0	15
8/94	11	0	11
9/94	40	8	32
10/94	20	12	8
11/94	10	4	6
12/94	5	2	3
1/95	11	9	2
2/95	12	7	5
3/95	17	17	0
4/95	4	1	3
5/95	24	15	9
6/95	9	5	4
7/95	16	5	11
Totals	194	85	109

Petrolatum, Chemical, NSN: 9150002500926
'CA' and 'A' Condition Material Issues vs. Time

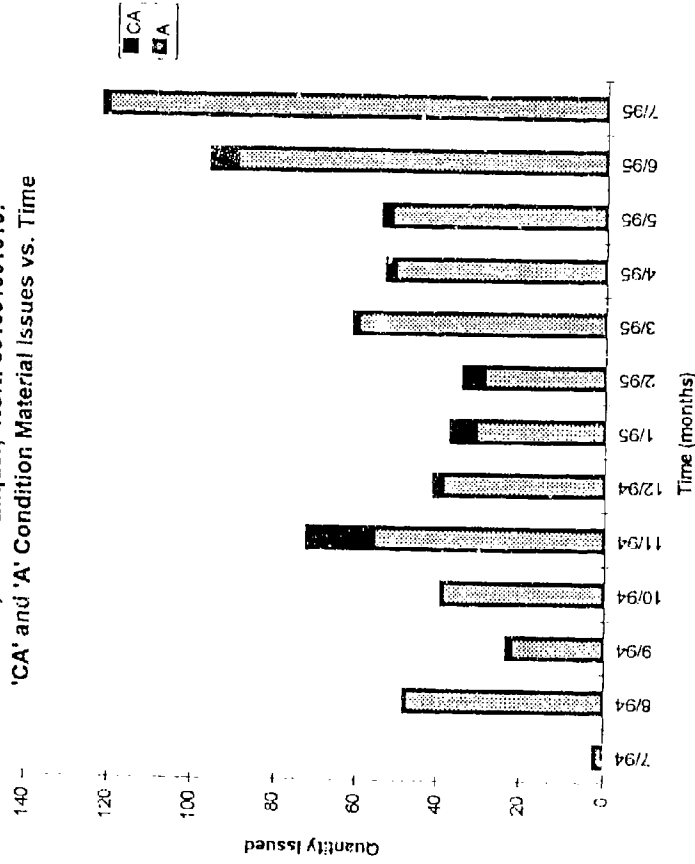


DIN: PD-74-C01 #7
12.29.95

NSN:
8010013316107

NOMENCLATURE:
PAINT, LACQUER, BLACK, 17

Paint, Black Laquer, NSN: 8010013316107
'CA' and 'A' Condition Material Issues vs. Time



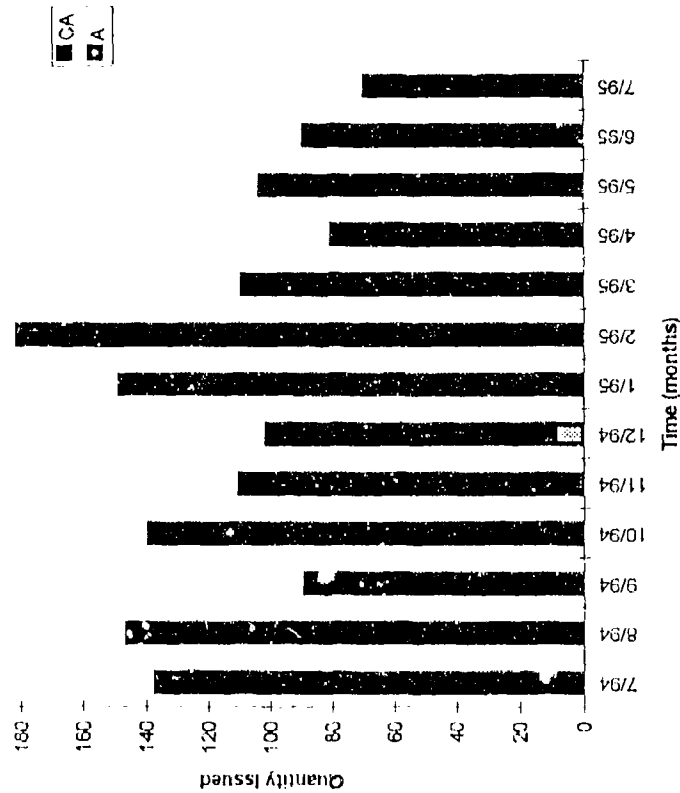
Date	Demand	
	Total	CA
7/94	2	0
8/94	48	0
9/94	23	1
10/94	39	0
11/94	72	16
12/94	41	39
1/95	37	31
2/95	34	29
3/95	61	60
4/95	53	51
5/95	54	52
6/95	96	90
7/95	122	121
Totals	682	640

SN: PD-7-2-001-47
12-29-95

NSN:
8030005468637

NOMENCLATURE:
COMPOUND, CORROSION PREV.

Compound, Corrosion Prevention, NSN: 8030005468637
200 - 'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	CA
7/94	137	0
8/94	146	0
9/94	89	0
10/94	139	0
11/94	110	2
12/94	101	9
1/95	148	0
2/95	181	0
3/95	109	0
4/95	80	0
5/95	103	0
6/95	89	0
7/95	69	0
Totals	1501	11

DDI: PD-7-2-001-7
12/29/95

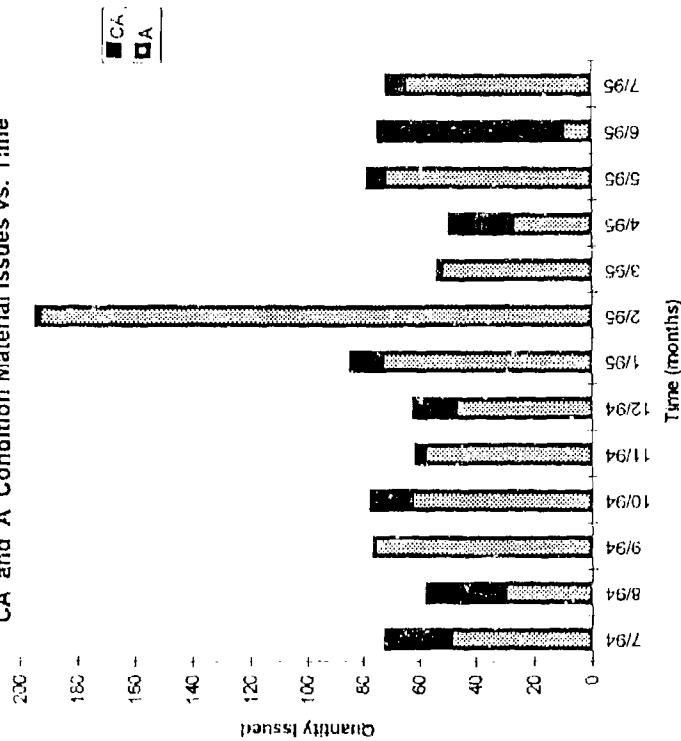
Analysis - A Demand

PAINT,S/P, TOPCOAT, GRAY,

NSN:
8010013540963

NOMENCLATURE:
PAINT,S/P, TOPCOAT, GRAY,

Compound, Corrosion Prev., NSN: 8030005468637
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	CA
7/94	72	49
8/94	57	30
9/94	76	76
10/94	77	63
11/94	61	58
12/94	62	47
1/95	84	73
2/95	194	193
3/95	53	52
4/95	49	27
5/95	78	72
6/95	74	10
7/95	71	65
Totals	1008	815

DIN: PD-7-2001 #7
122935

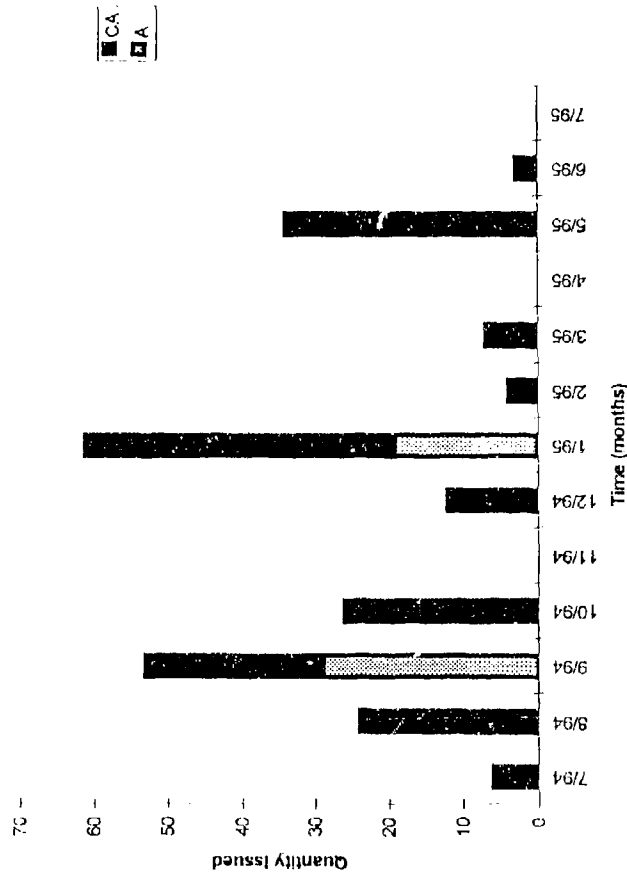
D-21

Analysis - CA Demand

NSN:
7930006646910

NOMENCLATURE:
GLASS CLEANER

Glass Cleaner NSN: 790006646910
'CA' and 'A' Condition Material Issues vs. Time



Date	Demand	
	Total	CA
7/94	6	0
8/94	24	0
9/94	53	29
10/94	26	0
11/94	0	0
12/94	12	0
1/95	51	19
2/95	4	0
3/95	7	0
4/95	0	0
5/95	34	0
6/95	3	0
7/95	0	0
Totals	230	48

DIN: PD-7-2-001-7
12 29 95

**APPENDIX E:
COMPARISON OF THE MAGNITUDE OF
ACTUAL DEMAND VS. THE MAGNITUDE
OF FORECASTED DEMAND**

ACTUAL VS. FORECASTED DEMAND, COMPARISON OF MAGNITUDES

NSN	AFOI	Date	%Variance From Forecast	Actual Demand	Forecast Demand	Nomenclature
6850012350872	350	7/94	n/a	57	n/a	COMPOUND, CLEANING, MA102
6850012350872	350	8/94	51%	86	57	COMPOUND, CLEANING, MA102
6850012350872	350	9/94	42%	85	60	COMPOUND, CLEANING, MA102
6850012350872	350	10/94	49%	93	62	COMPOUND, CLEANING, MA102
6850012350872	350	11/94	16%	76	65	COMPOUND, CLEANING, MA102
6850012350872	350	12/94	-5%	63	67	COMPOUND, CLEANING, MA102
6850012350872	350	1/95	16%	77	66	COMPOUND, CLEANING, MA102
6850012350872	350	2/95	19%	80	67	COMPOUND, CLEANING, MA102
6850012350872	350	3/95	8%	74	69	COMPOUND, CLEANING, MA102
6850012350872	350	4/95	-29%	49	69	COMPOUND, CLEANING, MA102
6850012350872	350	5/95	0%	67	67	COMPOUND, CLEANING, MA102
6850012350872	350	6/95	-2%	66	67	COMPOUND, CLEANING, MA102
6850012350872	350	7/95	52%	102	67	COMPOUND, CLEANING, MA102
8010013540963	275	7/94	n/a	72	n/a	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	8/94	-21%	57	72	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	9/94	8%	76	71	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	10/94	8%	77	71	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	11/94	-15%	61	72	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	12/94	-12%	62	71	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	1/95	20%	84	70	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	2/95	173%	194	71	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	3/95	-36%	53	83	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	4/95	-39%	49	80	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	5/95	1%	78	77	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	6/95	-4%	74	77	PAINT, S/P, TOPCOAT, GRAY,
8010013540963	275	7/95	-8%	71	77	PAINT, S/P, TOPCOAT, GRAY,
8030005468637	211	7/94	n/a	137	n/a	COMPOUND, CORROSION PREVE
8030005468637	211	8/94	7%	146	137	COMPOUND, CORROSION PREVE
8030005468637	211	9/94	-35%	89	138	COMPOUND, CORROSION PREVE
8030005468637	211	10/94	5%	139	133	COMPOUND, CORROSION PREVE
8030005468637	211	11/94	-18%	110	134	COMPOUND, CORROSION PREVE
8030005468637	211	12/94	-23%	101	131	COMPOUND, CORROSION PREVE
8030005468637	211	1/95	15%	148	128	COMPOUND, CORROSION PREVE
8030005468637	211	2/95	39%	181	130	COMPOUND, CORROSION PREVE
8030005468637	211	3/95	-19%	109	135	COMPOUND, CORROSION PREVE
8030005468637	211	4/95	40%	80	133	COMPOUND, CORROSION PREVE
8030005468637	211	5/95	-19%	103	127	COMPOUND, CORROSION PREVE
8030005468637	211	6/95	-29%	89	125	COMPOUND, CORROSION PREVE
8030005468637	211	7/95	-43%	69	121	COMPOUND, CORROSION PREVE
8010013316107	184	7/94	n/a	2	n/a	PAINT, LACQUER, BLACK, 17
8010013316107	184	8/94	n/a	48	n/a	PAINT, LACQUER, BLACK, 17
8010013316107	184	9/94	-52%	23	48	PAINT, LACQUER, BLACK, 17
8010013316107	184	10/94	-14%	39	46	PAINT, LACQUER, BLACK, 17
8010013316107	184	11/94	61%	72	45	PAINT, LACQUER, BLACK, 17
8010013316107	184	12/94	-14%	41	48	PAINT, LACQUER, BLACK, 17
8010013316107	184	1/95	-21%	37	47	PAINT, LACQUER, BLACK, 17
8010013316107	184	2/95	-26%	34	46	PAINT, LACQUER, BLACK, 17
8010013316107	184	3/95	36%	61	45	PAINT, LACQUER, BLACK, 17
8010013316107	184	4/95	14%	53	46	PAINT, LACQUER, BLACK, 17

ACTUAL VS. FORECASTED DEMAND, COMPARISON OF MAGNITUDES

NSN	AFOI	Date	%Variance From Forecast	Actual Demand	Forecast Demand	Nomenclature
8010013316107	184	5/95	15%	54	47	PAINT, LACQUER, BLACK, 17
8010013316107	184	6/95	101%	96	48	PAINT, LACQUER, BLACK, 17
8010013316107	184	7/95	132%	122	53	PAINT, LACQUER, BLACK, 17
9150002500926	122	7/94	n/a	15	n/a	PETROLATUM, TECHNICAL
9150002500926	122	8/94	-27%	11	15	PETROLATUM, TECHNICAL
9150002500926	122	9/94	174%	40	15	PETROLATUM, TECHNICAL
9150002500926	122	10/94	17%	20	17	PETROLATUM, TECHNICAL
9150002500926	122	11/94	-43%	10	17	PETROLATUM, TECHNICAL
9150002500926	122	12/94	-70%	5	17	PETROLATUM, TECHNICAL
9150002500926	122	1/95	-29%	11	16	PETROLATUM, TECHNICAL
9150002500926	122	2/95	-20%	12	15	PETROLATUM, TECHNICAL
9150002500926	122	3/95	15%	17	15	PETROLATUM, TECHNICAL
9150002500926	122	4/95	-73%	4	15	PETROLATUM, TECHNICAL
9150002500926	122	5/95	73%	24	14	PETROLATUM, TECHNICAL
9150002500926	122	6/95	-40%	9	15	PETROLATUM, TECHNICAL
9150002500926	122	7/95	12%	16	14	PETROLATUM, TECHNICAL
9150012602534	106	7/94	n/a	31	n/a	LUBE, SOLID FILM
9150012602534	106	8/94	-19%	25	31	LUBE, SOLID FILM
9150012602534	106	9/94	18%	36	30	LUBE, SOLID FILM
9150012602534	106	10/94	-32%	21	31	LUBE, SOLID FILM
9150012602534	106	11/94	247%	104	30	LUBE, SOLID FILM
9150012602534	106	12/94	-9%	34	37	LUBE, SOLID FILM
9150012602534	106	1/95	-73%	10	37	LUBE, SOLID FILM
9150012602534	106	2/95	-4%	33	34	LUBE, SOLID FILM
9150012602534	106	3/95	46%	50	34	LUBE, SOLID FILM
9150012602534	106	4/95	-11%	32	36	LUBE, SOLID FILM
9150012602534	106	5/95	44%	51	35	LUBE, SOLID FILM
9150012602534	106	6/95	-78%	8	37	LUBE, SOLID FILM
9150012602534	106	7/95	-41%	20	34	LUBE, SOLID FILM
8040001178510	62	7/94	n/a	17	n/a	ADHESIVE, SILICONE RUBBER,
8040001178510	62	8/94	-53%	8	17	ADHESIVE, SILICONE RUBBER,
8040001178510	62	9/94	55%	25	16	ADHESIVE, SILICONE RUBBER,
8040001178510	62	10/94	-35%	11	17	ADHESIVE, SILICONE RUBBER,
8040001178510	62	11/94	-51%	8	16	ADHESIVE, SILICONE RUBBER,
8040001178510	62	12/94	144%	38	16	ADHESIVE, SILICONE RUBBER,
8040001178510	62	1/95	215%	56	18	ADHESIVE, SILICONE RUBBER,
8040001178510	62	2/95	-12%	19	22	ADHESIVE, SILICONE RUBBER,
8040001178510	62	3/95	-11%	19	21	ADHESIVE, SILICONE RUBBER,
8040001178510	62	4/95	-34%	14	21	ADHESIVE, SILICONE RUBBER,
8040001178510	62	5/95	-71%	6	20	ADHESIVE, SILICONE RUBBER,
8040001178510	62	6/95	16%	22	19	ADHESIVE, SILICONE RUBBER,
8040001178510	62	7/95	-17%	16	19	ADHESIVE, SILICONE RUBBER,
9150002319071	51	7/94	n/a	4	n/a	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	8/94	200%	12	4	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	9/94	46%	7	5	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	10/94	298%	20	5	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	11/94	-100%	0	7	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	12/94	53%	9	6	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	1/95	78%	11	6	FLUID, BRAKE, AUTOMOTIVE

ACTUAL VS. FORECASTED DEMAND, COMPARISON OF MAGNITUDES

NSN	AFOI	Date	%Variance From Forecast	Actual Demand	Forecast Demand	Nomenclature
9150002319071	51	2/95	110%	14	7	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	3/95	103%	15	7	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	4/95	-63%	3	8	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	5/95	-74%	2	8	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	6/95	98%	14	7	FLUID, BRAKE, AUTOMOTIVE
9150002319071	51	7/95	-74%	2	8	FLUID, BRAKE, AUTOMOTIVE
8010001817568	49	7/94	n/a	1	n/a	REMOVER, PAINT
8010001817568	49	8/94	n/a	3	n/a	REMOVER, PAINT
8010001817568	49	9/94	0%	3	3	REMOVER, PAINT
8010001817568	49	10/94	300%	12	3	REMOVER, PAINT
8010001817568	49	11/94	3%	4	4	REMOVER, PAINT
8010001817568	49	12/94	130%	9	4	REMOVER, PAINT
8010001817568	49	1/95	149%	11	4	REMOVER, PAINT
8010001817568	49	2/95	18%	6	5	REMOVER, PAINT
8010001817568	49	3/95	74%	9	5	REMOVER, PAINT
8010001817568	49	4/95	116%	12	6	REMOVER, PAINT
8010001817568	49	5/95	-35%	4	6	REMOVER, PAINT
8010001817568	49	6/95	17%	7	6	REMOVER, PAINT
8010001817568	49	7/95	-34%	4	6	REMOVER, PAINT
6850012340219	43	7/94	n/a	2	n/a	CLEANING COMP
6850012340219	43	8/94	800%	18	2	CLEANING COMP
6850012340219	43	9/94	-44%	2	4	CLEANING COMP
6850012340219	43	10/94	133%	8	3	CLEANING COMP
6850012340219	43	11/94	182%	11	4	CLEANING COMP
6850012340219	43	12/94	312%	19	5	CLEANING COMP
6850012340219	43	1/95	16%	7	6	CLEANING COMP
6850012340219	43	2/95	-19%	5	6	CLEANING COMP
6850012340219	43	3/95	0%	6	6	CLEANING COMP
6850012340219	43	4/95	-50%	3	6	CLEANING COMP
6850012340219	43	5/95	110%	12	6	CLEANING COMP
6850012340219	43	6/95	-21%	5	6	CLEANING COMP
6850012340219	43	7/95	-52%	3	6	CLEANING COMP
8040005152246	37	7/94	n/a	0	n/a	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	8/94	n/a	2	n/a	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	9/94	0%	2	2	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	10/94	150%	5	2	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	11/94	74%	4	2	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	12/94	-19%	2	2	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	1/95	106%	5	2	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	2/95	-63%	1	3	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	3/95	179%	7	3	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	4/95	69%	5	3	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	5/95	153%	8	3	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	6/95	-73%	1	4	ADHESIVE, POLYCHLOROPRENE
8040005152246	37	7/95	48%	5	3	ADHESIVE, POLYCHLOROPRENE
8030010668156	30	7/94	n/a	4	n/a	COMPOUND, SEALING-BLUE
8030010668156	30	8/94	188%	23	8	COMPOUND, SEALING-BLUE
8030010668156	30	9/94	100%	19	10	COMPOUND, SEALING-BLUE
8030010668156	30	10/94	15%	12	10	COMPOUND, SEALING-BLUE

ACTUAL VS. FORECASTED DEMAND, COMPARISON OF MAGNITUDES

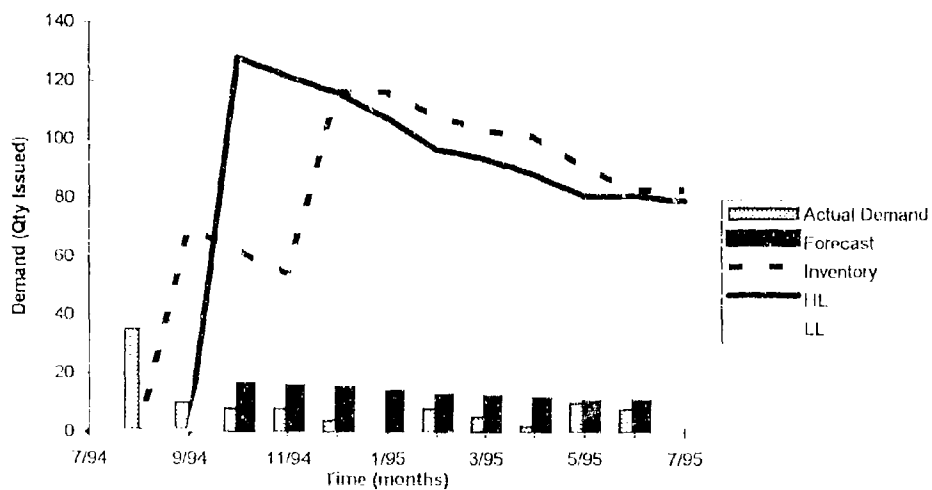
NSN	AFOI	Date	%Variance From Forecast	Actual Demand	Forecast Demand	Nomenclature
8030010668156	30	11/94	-100%	0	11	COMPOUND, SEALING BLUE
8030010668156	30	12/94	78%	17	10	COMPOUND, SEALING BLUE
8030010668156	30	1/95	-90%	1	10	COMPOUND, SEALING BLUE
8030010668156	30	2/95	-25%	7	9	COMPOUND, SEALING BLUE
8030010668156	30	3/95	21%	11	9	COMPOUND, SEALING BLUE
8030010668156	30	4/95	29%	12	9	COMPOUND, SEALING BLUE
8030010668156	30	5/95	-79%	2	10	COMPOUND, SEALING BLUE
8030010668156	30	6/95	-43%	5	9	COMPOUND, SEALING BLUE
8030010668156	30	7/95	-17%	7	8	COMPOUND, SEALING BLUE
6810002499354	25	7/94	n/a	8	n/a	ACID, BATTERY
6810002499354	25	8/94	100%	16	8	ACID, BATTERY
6810002499354	25	9/94	93%	17	9	ACID, BATTERY
6810002499354	25	10/94	-38%	6	10	ACID, BATTERY
6810002499354	25	11/94	-100%	0	9	ACID, BATTERY
6810002499354	25	12/94	8%	9	8	ACID, BATTERY
6810002499354	25	1/95	79%	15	8	ACID, BATTERY
6810002499354	25	2/95	-34%	6	9	ACID, BATTERY
6810002499354	25	3/95	220%	28	9	ACID, BATTERY
6810002499354	25	4/95	143%	26	11	ACID, BATTERY
6810002499354	25	5/95	269%	45	12	ACID, BATTERY
6810002499354	25	6/95	3%	16	15	ACID, BATTERY
6810002499354	25	7/95	-74%	4	16	ACID, BATTERY
9150002316676	24	7/94	n/a	4	n/a	OIL, LUBRICATING, A/C TURB
9150002316676	24	8/94	775%	35	4	OIL, LUBRICATING, A/C TURB
9150002316676	24	9/94	41%	10	7	OIL, LUBRICATING, A/C TURB
9150002316676	24	10/94	8%	8	7	OIL, LUBRICATING, A/C TURB
9150002316676	24	11/94	7%	8	7	OIL, LUBRICATING, A/C TURB
9150002316676	24	12/94	-47%	4	8	OIL, LUBRICATING, A/C TURB
9150002316676	24	1/95	-100%	0	7	OIL, LUBRICATING, A/C TURB
9150002316676	24	2/95	24%	8	6	OIL, LUBRICATING, A/C TURB
9150002316676	24	3/95	-24%	5	7	OIL, LUBRICATING, A/C TURB
9150002316676	24	4/95	-69%	2	6	OIL, LUBRICATING, A/C TURB
9150002316676	24	5/95	67%	10	6	OIL, LUBRICATING, A/C TURB
9150002316676	24	6/95	25%	8	5	OIL, LUBRICATING, A/C TURB
9150002316676	24	7/95	-100%	0	7	OIL, LUBRICATING, A/C TURB

**APPENDIX F:
CHARTS AND GRAPHS FROM
REPLENISHMENT MODEL SIMULATIONS**

DIN- P12-7-2-001 #7
12/29/95

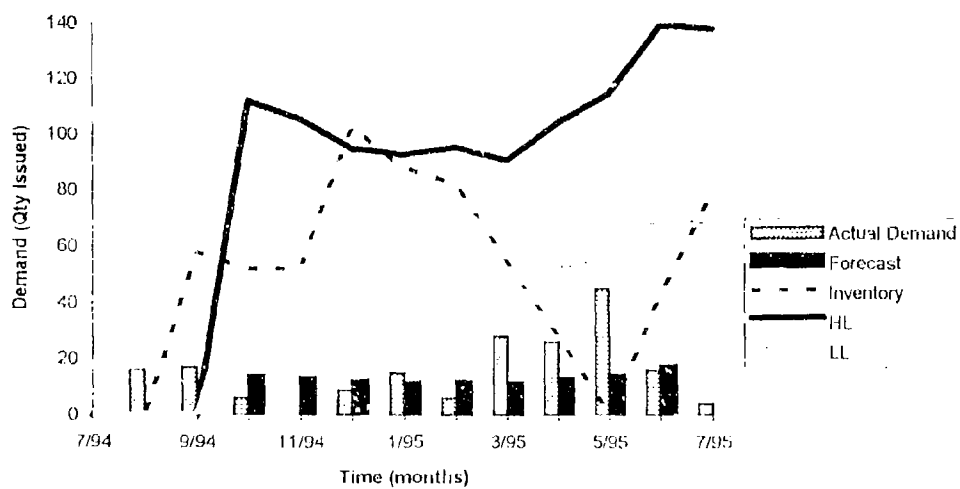
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	4	n/a	n/a	n/a	n/a	n/a
8/94	35	n/a	n/a	n/a	n/a	n/a
9/94	10	n/a	70	n/a	n/a	n/a
10/94	8	16	62	128	64	66
11/94	8	15	54	122	61	66
12/94	4	14	116	116	58	0
1/95	0	13	116	107	54	0
2/95	8	12	108	97	48	0
3/95	5	12	103	93	47	0
4/95	2	11	101	88	44	0
5/95	10	10	91	81	40	0
6/95	8	10	83	81	40	0
7/95	0	10	83	79	40	0

Demand, Inventory Level, Forecast, High Limit and Low Limit vs. Time

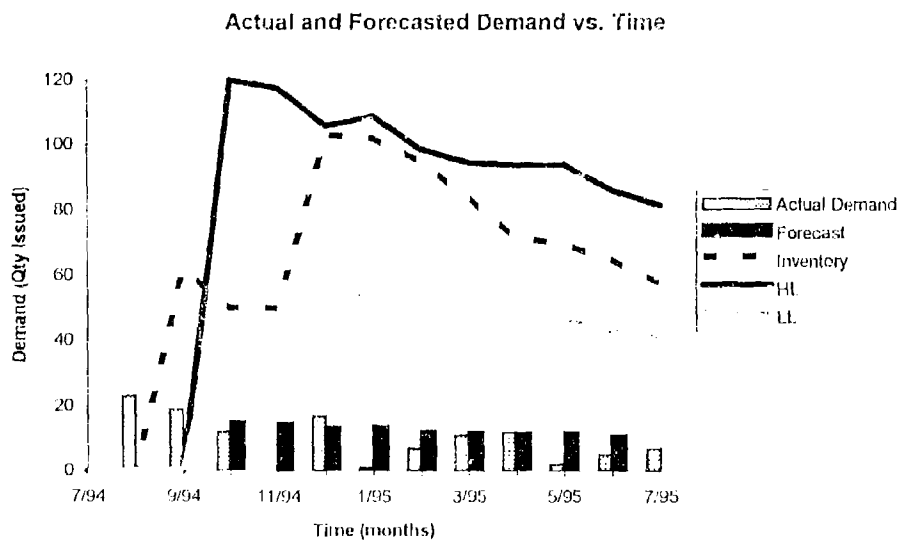


Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	8	n/a	n/a	n/a	n/a	n/a
8/94	16	n/a	n/a	n/a	n/a	n/a
9/94	17	n/a	58	n/a	n/a	n/a
10/94	6	14	52	112	56	60
11/94	0	13	52	106	53	60
12/94	9	12	103	95	48	0
1/95	15	12	88	93	46	0
2/95	6	12	82	95	48	0
3/95	28	11	54	91	45	0
4/95	26	13	28	104	52	76
5/95	45	14	0	114	57	76
6/95	16	17	43	139	69	96
7/95	4	17	80	138	69	96

Actual and Forecasted Demand vs. Time

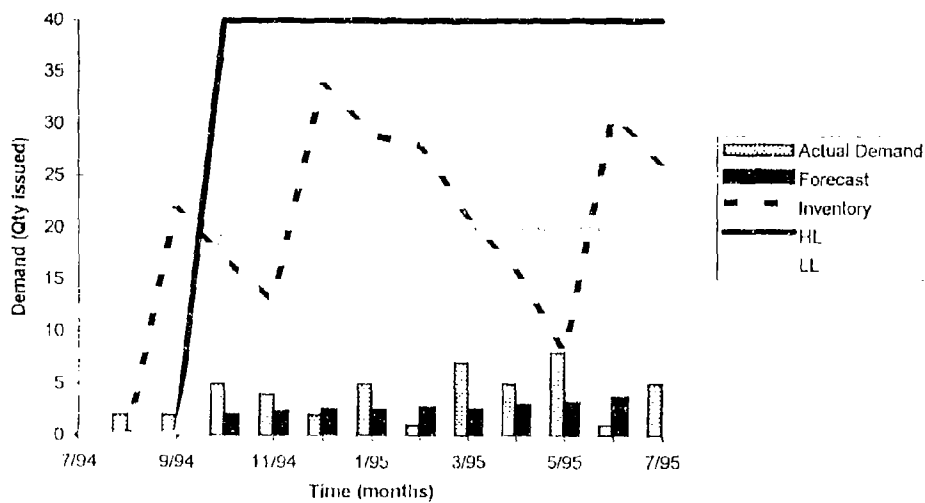


Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	4	n/a	n/a	n/a	n/a	n/a
8/94	23	n/a	n/a	n/a	n/a	n/a
9/94	19	n/a	62	n/a	n/a	n/a
10/94	12	15	50	120	60	70
11/94	0	15	50	118	59	70
12/94	17	13	103	106	53	0
1/95	1	14	102	109	54	0
2/95	7	12	95	99	49	0
3/95	11	12	84	94	47	0
4/95	12	12	72	94	47	28
5/95	2	12	70	94	47	28
6/95	5	11	65	86	43	0
7/95	7	10	58	82	41	0



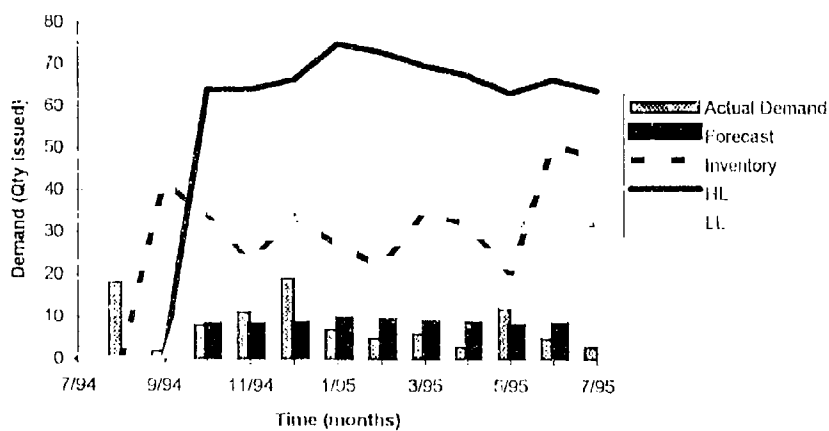
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	0	n/a	n/a	n/a	n/a	n/a
8/94	2	n/a	n/a	n/a	n/a	n/a
9/94	2	n/a	22	n/a	n/a	n/a
10/94	5	2	17	40	20	23
11/94	4	2	13	40	20	23
12/94	2	2	34	40	20	0
1/95	5	2	29	40	20	0
2/95	1	3	28	40	20	0
3/95	7	3	21	40	20	0
4/95	5	3	16	40	20	24
5/95	8	3	8	40	20	24
6/95	1	4	31	40	20	0
7/95	5	3	26	40	20	0

Actual and Forecasted Demand vs. Time



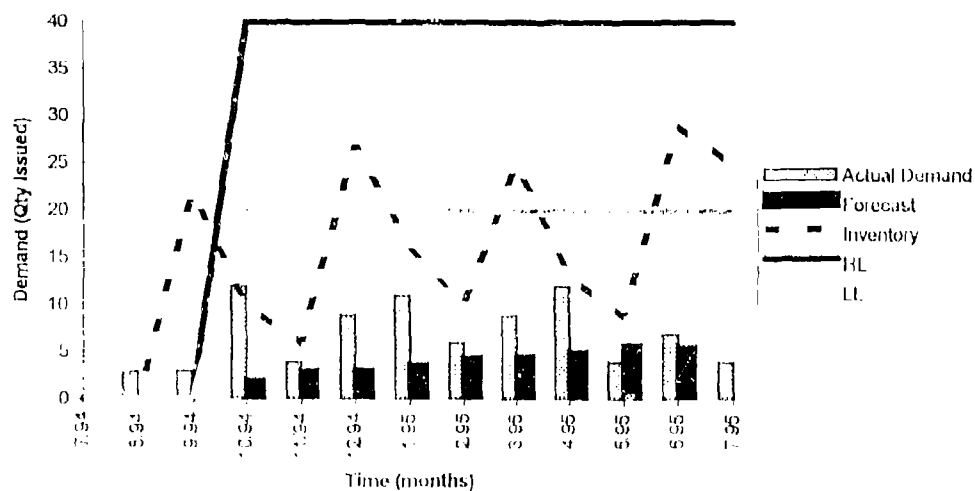
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	2	n/a	n/a	n/a	n/a	n/a
8/94	18	n/a	n/a	n/a	n/a	n/a
9/94	2	n/a	42	n/a	n/a	n/a
10/94	8	8	34	64	32	0
11/94	11	8	23	64	32	41
12/94	19	8	34	66	33	41
1/95	7	9	27	75	37	48
2/95	5	9	22	73	37	48
3/95	6	9	35	70	35	0
4/95	3	8	32	68	34	36
5/95	12	8	20	63	32	36
6/95	5	8	51	67	33	21
7/95	3	8	48	64	32	21

Actual and Forecasted Demand vs. Time



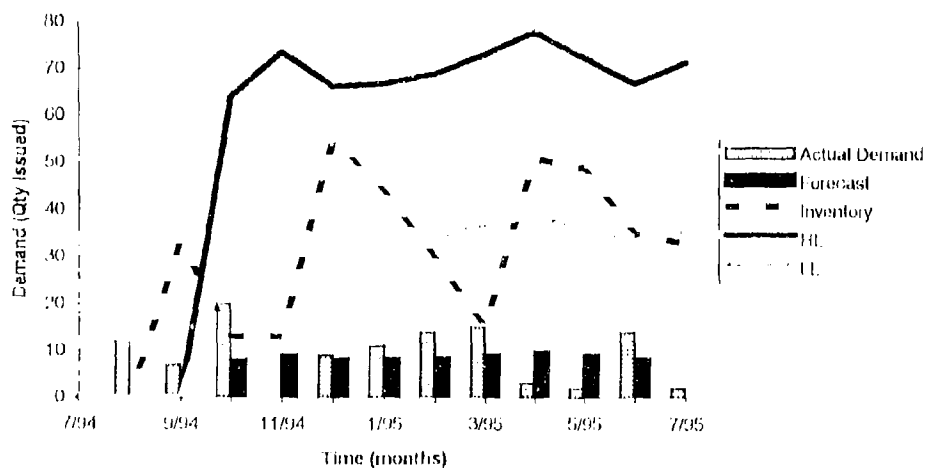
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	1	n/a	n/a	n/a	n/a	n/a
8/94	3	n/a	n/a	n/a	n/a	n/a
9/94	3	n/a	22	n/a	n/a	n/a
10/94	12	2	10	40	20	30
11/94	4	3	6	40	20	30
12/94	9	3	27	40	20	0
1/95	11	4	16	40	20	24
2/95	6	4	10	40	20	24
3/95	9	5	25	40	20	0
4/95	12	5	13	40	20	27
5/95	4	6	9	40	20	27
6/95	7	6	29	40	20	0
7/95	4	6	25	40	20	0

Actual and Forecasted Demand vs. Time



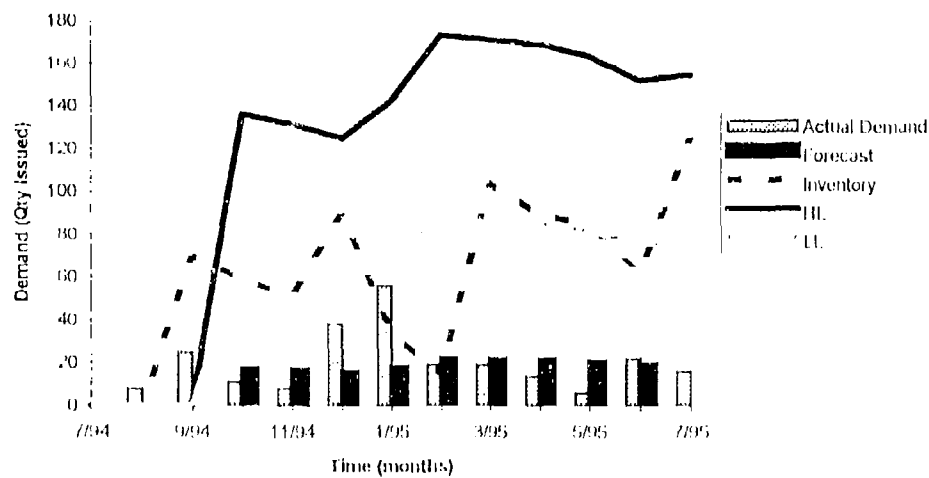
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	4	n/a	n/a	n/a	n/a	n/a
8/94	12	n/a	n/a	n/a	n/a	n/a
9/94	7	n/a	33	n/a	n/a	n/a
10/94	20	8	13	64	32	51
11/94	0	9	13	74	37	51
12/94	9	8	55	66	33	0
1/95	11	8	44	67	33	0
2/95	14	9	30	69	34	39
3/95	15	9	15	73	37	39
4/95	3	10	51	78	39	0
5/95	2	9	49	73	36	0
6/95	14	8	35	67	33	0
7/95	2	9	33	71	36	38

Actual and Forecasted Demand vs. Time



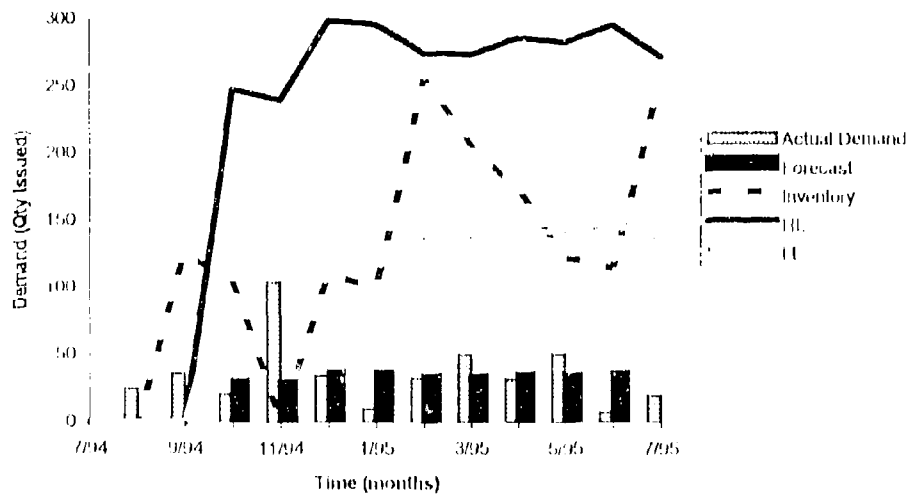
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	17	n/a	n/a	n/a	n/a	n/a
8/94	8	n/a	n/a	n/a	n/a	n/a
9/94	25	n/a	70	n/a	n/a	n/a
10/94	11	17	59	136	68	77
11/94	8	16	51	131	66	77
12/94	38	16	90	124	62	0
1/95	56	18	34	142	71	108
2/95	19	22	15	173	86	108
3/95	19	21	104	171	85	0
4/95	14	21	90	169	85	0
5/95	6	20	84	163	82	79
6/95	22	19	62	152	76	79
7/95	16	19	125	154	77	0

Actual and Forecasted Demand vs. Time



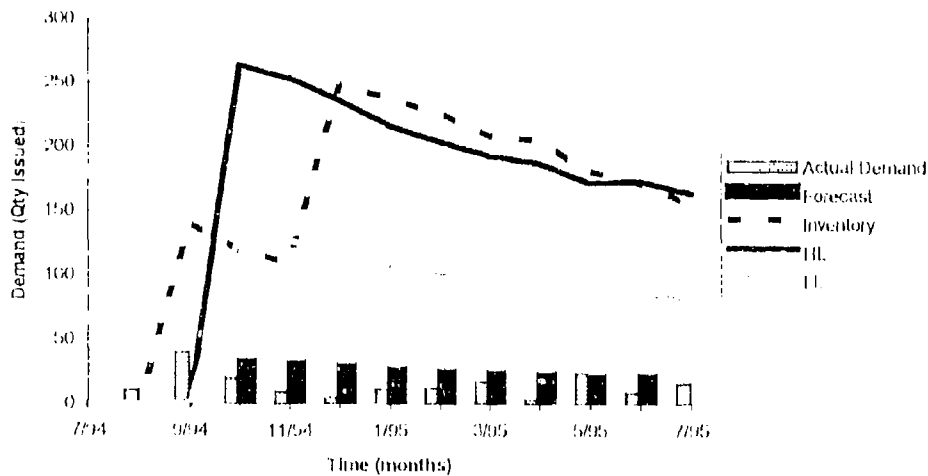
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	31	n/a	n/a	n/a	n/a	n/a
8/94	25	n/a	n/a	n/a	n/a	n/a
9/94	36	n/a	126	n/a	n/a	n/a
10/94	21	31	105	248	124	143
11/94	104	30	1	240	120	143
12/94	34	37	110	299	150	189
1/95	10	37	100	296	148	189
2/95	33	34	256	275	137	0
3/95	50	34	206	274	137	0
4/95	32	36	174	286	143	0
5/95	51	35	123	283	142	160
6/95	8	37	115	295	148	160
7/95	20	34	255	273	136	0

Actual and Forecasted Demand vs. Time



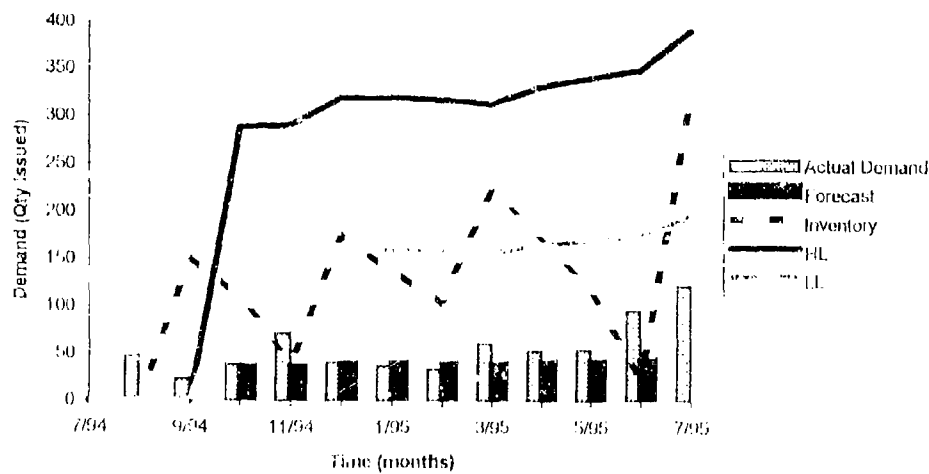
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	15	n/a	n/a	n/a	n/a	n/a
8/94	11	n/a	n/a	n/a	n/a	n/a
9/94	40	n/a	140	n/a	n/a	n/a
10/94	20	33	120	264	132	144
11/94	10	32	110	254	127	144
12/94	5	30	249	236	118	0
1/95	11	27	238	217	108	0
2/95	12	25	226	204	102	0
3/95	17	24	209	193	96	0
4/95	4	23	205	187	94	0
5/95	24	21	181	172	86	0
6/95	9	22	172	174	87	0
7/95	16	20	156	164	82	0

Actual and Forecasted Demand vs. Time



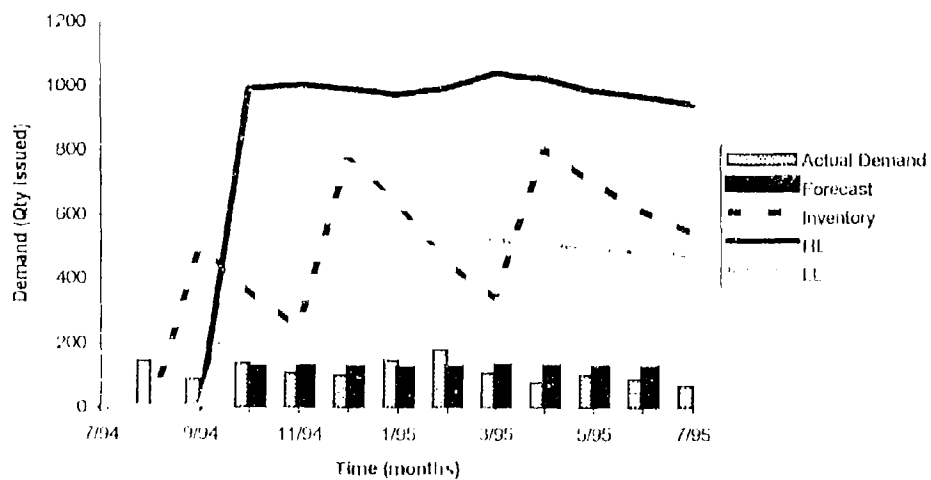
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	2	n/a	n/a	n/a	n/a	n/a
8/94	48	n/a	n/a	n/a	n/a	n/a
9/94	23	n/a	150	n/a	n/a	n/a
10/94	39	36	111	288	144	177
11/94	72	36	39	290	145	177
12/94	41	40	175	319	159	0
1/95	37	40	138	320	160	182
2/95	34	40	104	317	159	182
3/95	61	39	225	313	156	0
4/95	53	41	172	330	165	0
5/95	54	42	118	340	170	222
6/95	96	44	22	349	175	222
7/95	122	49	322	391	195	145

Actual and Forecasted Demand vs. Time



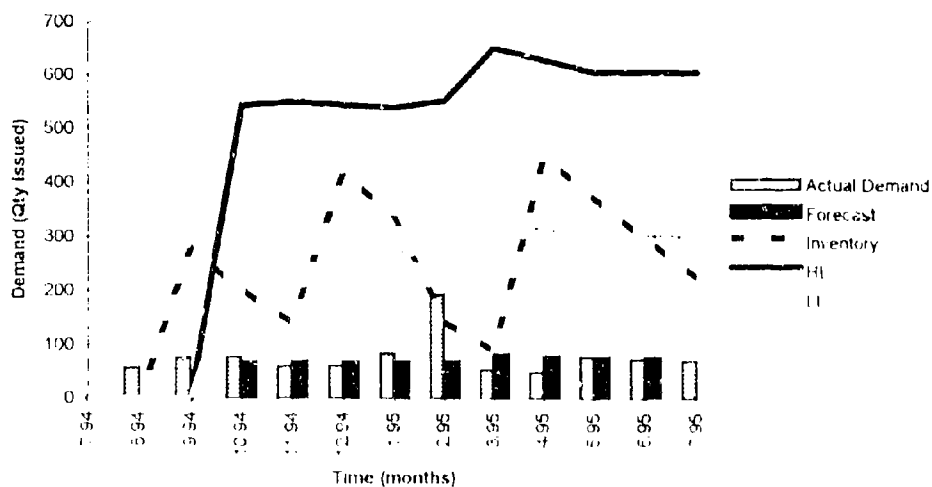
Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	137	n/a	n/a	n/a	n/a	n/a
8/94	146	n/a	n/a	n/a	n/a	n/a
9/94	89	n/a	500	n/a	n/a	n/a
10/94	139	124	361	992	496	631
11/94	110	126	251	1004	502	631
12/94	101	124	781	992	496	0
1/95	148	122	633	973	487	0
2/95	181	124	452	994	497	542
3/95	109	130	343	1040	520	542
4/95	80	128	805	1023	511	0
5/95	103	123	702	985	492	0
6/95	89	121	613	969	484	0
7/95	69	118	544	943	471	0

Actual and Forecasted Demand vs. Time



Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	72	n/a	n/a	n/a	n/a	n/a
8/94	57	n/a	n/a	n/a	n/a	n/a
9/94	76	n/a	280	n/a	n/a	n/a
10/94	77	68	203	544	272	341
11/94	61	69	142	551	276	341
12/94	62	68	421	545	272	0
1/95	84	67	337	540	270	0
2/95	194	69	143	553	277	410
3/95	53	82	90	653	327	410
4/95	49	79	451	630	315	0
5/95	78	76	373	606	303	0
6/95	74	76	299	608	304	309
7/95	71	76	228	607	303	309

Actual and Forecasted Demand vs. Time



Date	Actual Demand	Inventory Parameters				
		Forecast	Inventory	HL	LL	On Order
7/94	57	n/a	n/a	n/a	n/a	n/a
8/94	86	n/a	n/a	n/a	n/a	n/a
9/94	85	n/a	310	n/a	n/a	n/a
10/94	93	76	203	608	304	405
11/94	76	78	127	622	311	405
12/94	63	78	469	620	310	0
1/95	77	76	392	609	304	0
2/95	80	76	312	609	305	0
3/95	74	77	238	612	306	374
4/95	49	76	189	610	305	374
5/95	67	74	496	589	294	0
6/95	66	73	430	583	292	0
7/95	102	72	328	578	289	0

