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THESIS

AN ANALYSIS OF SPECIFIC COGNIZANCE SYMBOL
MATERIAL IN THE ADVANCED TRACEABILITY AND
CONTROL (ATAC) PROGRAM

by

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and
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December 1992

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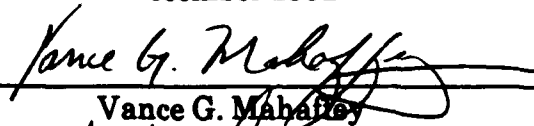
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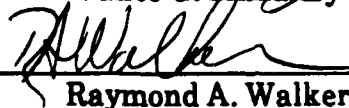
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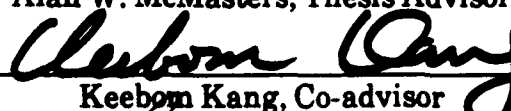
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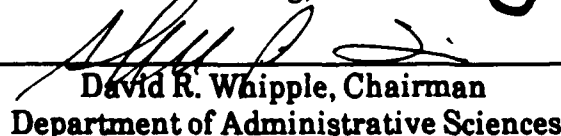
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ABSTRACT

The purpose of this thesis is to conduct a statistical analysis of the behavior of Depot Level Repairables (DLRs) by individual Cognizance Symbol (COG) in .he Advanced Traceability and Control (ATAC) Program. It begins with a background of the ATAC program and the steps of current operating procedures of ATAC. The ATAC system is then analyzed by individual COG at each step to show a characteristic day-to-day behavior of a COG in the system. The database maintained by the Navy Material Transportation Office (NAVMTO) spanning one year, from 31 August 1990 to 31 August 1991, was used to obtain the necessary details. Finally, problems identified in the NAVMTO database and problems discovered in the DLR turn-in process are discussed.

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I. INTRODUCTION

A. BACKGROUND

Mandatory Turn-in Repairable (MTR) items are those components or subassemblies which can be repaired upon failure and are required to be turned into the supply system for forwarding to a designated repair activity. MTR's can be repaired at the lowest maintenance level that has the required capability in accordance with the assigned Source, Maintenance, and Recoverability (SM&R) code. MTR's are classified as either Field Level Repairable (FLR) or Depot Level Repairable (DLR) items. Items are designated as FLR's if inventory and repair economies can be achieved by returning these support items to service through repair at field level maintenance facilities, e.g., ships, Tenders, Shore Intermediate Maintenance Activities (SIMA's), or Naval Air Stations (NAS). FLR's are to be repaired locally, if possible, and are also to be disposed of locally if they are beyond the capability of these maintenance facilities. FLR's all have a Material Control Code (MCC) of "D" and are identified by COGs 1H, 2H, 3H and 1R. DLR's can be repaired at the lowest maintenance level possible but can only be condemned at the depot level or at the direction of the depot maintenance activity. Most DLR's are repaired at the Depot

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level due to lack of expertise, available manpower, and time at the Intermediate or Organizational levels. DLR's are identified by MCC's "E", "G", "H", "Q", and "X". All MTR's are listed in the Master Repairable Item List (MRIL). [Ref 1, p. II-4]

Prior to 1981, a DLR was considered an investment type item; that is, it was financed through Appropriation Purchases Account (APA) financing. These DLR's were provided to the end user at no charge, so there was very little motivation for the end user to provide timely turn-in or properly monitor the return of the old carcass. The end user was supposed to turn-in the DLR to one of a variety of commercial or organic Designated Stock Points (DSPs) or Designated Overhaul Points (DOPs) as identified in Part II of the MRIL.

In 1978, the Vice-Chief of Naval Operations (VCNO) directed a study to evaluate alternative funding for DLR's which would result in improved availability of repairables. The study concluded that the Navy Stock Fund (NSF) could be used as the method for financially achieving this. In 1979, the Chief of Naval Material (CHNAVMAT) developed a plan of action and milestones to carry out the CNO decision and, in 1981, developed a prototype using non-aviation DLR's managed by SPCC. As a result, items migrated from even-numbered Cognizance Symbol (COG) material (under APA financing) to cdd-numbered COGs (unique 7_ COG's funded by the Navy Stock Fund (NSF)). Operating activities were then required to pay for

Ready-for-Issue (RFI) DLR's through a two-price system: standard price when there is no Not-Ready-For-Issue (NRFI) carcass to be turned-in, or net price when an NRFI carcass is being, or is intended to be, turned-in (as indicated by the advice code on the requisition). (If a NRFI carcass is not turned-in within time-frames outlined in the NAVSUP P-485, then the activity is billed for the difference between standard and net prices to cover the total cost.) The results of the SPCC prototype were so successful in obtaining the return of the NRFI carcasses that the Aviation Supply Office (ASO) applied the same funding strategy for ASO-managed DLR items in 1985. [Ref. 2, p. 5-I-36]

The standard and net price procedures solved the funding problem but there were still major problems in monitoring DLR material movements or having visibility of the DLR in the transportation pipeline. For instance, upon receipt of the material at the DSP or DOP, the material was to be physically checked to verify part number against National Stock Number (NSN) and was to be reported to the Inventory Control Point (ICP) via Transaction Item Report (TIR) as on hand and available for repair. This was not always the case at all DSP/DOP sites. In some cases, DSPs/DOPs were not able to report material receipt to the ICP and/or were only able to verify material prone to misidentification. The DLRs were transported by various means, many without positive traceability or controls. Delays in reporting on-hand assets

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and delays in transportation increased the reporting errors in the DLR carcass tracking system. This led to increased customer billings, many of which were erroneous. [Ref. 3, p. 1]

So, in 1986, the Advanced Traceability and Control (ATAC) Program was established to expedite the return of NRFI DLR's through the supply system to the DOP. ATAC provides for the return of DLR's through a centralized processing system basically composed of three main processing locations called HUBs - one on each coast at Norfolk and San Diego (these two are for Navy activities) and one at Marine Corps Air Station, Cherry Point, N.C. (for USMC activities under MCAS Cherry Points geographical support). Until this year (1992) there was also a HUB located at Subic Bay, Philippines. However, it has been closed as part of the removal of military forces from the Philippines. Norfolk handles all CONUS activities east of the Mississippi River and those on the Gulf coast, and all Atlantic Ocean OUTCONUS activities and afloat forces including the Mediterranean. San Diego handles all CONUS activities west of the Mississippi River, and all Pacific Ocean OUTCONUS activities and afloat forces including the Indian Ocean. [Ref. 1, p. VI-2]

In the late 1980's and continuing to the present, DoD has suffered enormous cutbacks in funding. In an attempt to apportion these budget reductions in the most efficient and intelligent manner, the Secretary of Defense has issued many

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Defense Management Review Decisions (DMRDs) which specifically direct where reductions are going to take place. In 1990, DMRD 901 (Reducing Supply System Costs) stated, in part, that the military services should retain material turn-ins at the closest stock point to reduce transportation/double handling costs until the Item Manager (IM) decides that a carcass needs to be inducted into the repair pipeline. [Ref 4] The intent of this aspect of DMRD 901 is to reduce shipment of DLR's through ATAC down to those that require immediate repair. This part of DMRD 901 used the assumption that demand will decrease for most of the NRFI items and, therefore, will not need to be repaired.

In 1989, Mr. Kevin Fitzpatrick, NAVSUP Code 0631, presented a linear break-even model that incorporated the average number of carcasses flowing through the ATAC system and the total annual costs associated with both the current DLR repair process and the process as proposed under DMRD 901. The conclusion he reached was that it was not economical to delay shipping carcasses from the HUBs when at least 30% of them required immediate redistribution. [Ref. 4] Fitzpatrick did not, however, account for the stochastic or probabalistic nature of the failure and carcass return process for NRFI's.

Fitzpatrick pointed out various problems associated with DMRD 901, which were:

1. The inability of ATAC HUBs to create additional storage space to accommodate the increased storage requirements of DMRD 901;

2. Increased pipeline requirements while awaiting repair decisions and redistributions;

3. Increased labor costs at the HUBs could be greater than possible transportation cost savings;

4. Accountability and control problems with material in-transit. [Ref 5]

Fitzpatrick's boss, Captain Paul Tully, NAVSUP Code 06, recognized the shortcomings that a linear break-even model has, and asked Dr. Alan McMasters of the Administrative Sciences Department at the Naval Postgraduate School to consider the process using a stochastic model. [Ref. 6]

McMasters suggested three levels of effort to develop a model for the analysis of the carcass return process. Level I involved building an aggregated model with an average type carcass reflecting average repairable characteristics in the system. Carcass arrivals would be assumed to be Poisson distributed and service times would be assumed to be constant or follow an exponential distribution. This was accomplished in the thesis work of Harris and Munson who, using queuing theory, determined that stockpiles of material would quickly build up at DOPs, DSPs, and HUBs. [Ref. 7; p. 40-43]

The thesis work of Dryer and Jacobs [Ref 8] continued the Level I efforts. They developed a simple serial queuing model using a simplified carcass routing process which was based on

limited data. Tapes sent by the ATAC system manager originally contained problems so they requested additional tapes but the tapes arrived too late to be used in their thesis.

Level II involves the determination of realistic probability distributions for demand, repair time, processing and transportation times which are to be applied to the average type carcass routing model of Level I. The second set of tapes sent to Dryer and Jacobs were used by Pritchard [Ref. 9] in his thesis, which was the start of the Level II effort.

Level III proposes a much more elaborate model, involving a detailed realistic simulation model of the ATAC system that would provide answers to many different policy questions. This model would reflect a detailed understanding of each stage in the process and would incorporate real-world probability distributions for those stages characterized by random times. All of the costs (including transportation, storage, receipt and issue, disposal, holding, administrative repair order and depot repair costs) and decision variables (such as carcass return routing, storage at each location, shipment consolidation, disposal decisions and repair induction control rules) would be incorporated in the model. The goal would be to develop a comprehensive processing policy for each repairable item. [Ref. 9, p.5]

This thesis picks up where Pritchard's thesis left off in the Level II effort. Pritchard separated the various steps in

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the ATAC process but retained the aggregate or average type of carcass concept. This thesis breaks each step down for individual Cognizance Symbol (COG) items. The data is from the same set of data tapes used by Pritchard.

B. OBJECTIVES

The objective of this thesis is (1) to analyze the times for the various steps in the ATAC repairable process for the major DLR COGs, (2) to determine if there is a theoretical probability distribution which can be used to describe each step, and (3) to determine if the data presents any problems that may affect policy making decisions.

C. RESEARCH QUESTIONS

The following specific questions were developed to guide the thesis' research efforts to achieve the above objective:

1. Can a model be constructed which simulates the number of items of a given COG which arrive at a specific HUB on a day-to-day basis and how the items of that COG behave at each step in the ATAC system?

2. Is the information from the ATAC database sufficient to identify start and stop times for each step in the material movement process?

3. Are there problems in the data, and if so, are they significant and what effect do they have on system or step processing times?

4. Is there enough information to reach a conclusion to support or oppose DMRD 901?

5. Does the data suggest a priority system be set up for processing certain material before other material?

D. SCOPE, LIMITATIONS, AND ASSUMPTIONS

This thesis is constrained to the analysis of individual items by COG. Due to the vast amount of data supplied on magnetic tape by NAVMTO (over 641,000 records with each record containing 786 data fields), only the most common COGs are analyzed. These are 7R, 7H, 7G, 7Z, and 7E (listed in order of magnitude). Additionally, 7_ COG in the aggregate is analyzed. Also, only the most important steps of the process are analyzed. Omitted are the steps or processes in the ATAC system that are duplicative in nature or not relevant to the analysis (such as shipment time from the NODE to the HUB also includes for overseas shipments, the time from NODE to Military Airlift Command (MAC), MAC to CONUS port, and pickup at the CONUS port by a freight carrier to delivery at the HUB).

It is assumed that there are only two HUBs (Norfolk and San Diego) which are co-located with a DSP/DOP. There are also a number of NODES providing material to each HUB and a number of activities providing NRFI material to each NODE or directly to a HUB.

E. ORGANIZATION OF THE THESIS

Chapter II gives an overview of the ATAC system based on the authors' research, previous studies, and the authors' phone calls to the ATAC HUB in San Diego.

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Chapter III provides an overview of the ATAC database and the research methodology used to analysis that database. This includes the procedures used by the authors to convert the data into a format conducive to statistical analysis.

Chapter IV presents the data analysis for both HUBs by each step, showing means, standard deviations, and record counts for each COG. Additionally, it discusses the results of the Chi-square goodness-of-fit tests.

Chapter V discusses the non-DLR COG items identified in the ATAC database and provides statistical information and conclusions reached regarding the occurrence of this material.

Chapter VI provides a summary, conclusions, and recommendations for further research.

The appendices, which range from Appendix A to Appendix AF, contain amplifying and supporting information. Appendix A furnishes a glossary of acronyms, abbreviations, and definitions used in this thesis. Appendix B provides a detailed listing of all COGs processed into the ATAC system. Appendices C through AD contain histograms and supporting data for the various ATAC events and processes associated with each HUB. Appendices AE and AF provide summaries of the results of the Chi-square goodness-of-fit tests for the Norfolk and San Diego HUBs, respectively.

II. THE ATAC SYSTEM

The ATAC program was developed to expedite the return of NRFI DLRs through the supply system to the designated overhaul point (DOP) where repair will take place. The main purposes of the ATAC system are to:

1. Reduce the repairable parts pipeline by providing for faster movement of NRFI DLRs being returned for repair.

2. Ensure accountability and visibility of all returned NRFI components.

3. Reduce transportation costs through consolidation of shipments from NODEs and HUBs.

4. Consolidate and reduce labor resources controlled by NAVSUP through economies of scale attained at the HUBs.

5. Minimize the cost of processing by developing "centers of excellence" at the two HUBs. [Ref. 5, p. 3]

In this chapter, we discuss the operation of the ATAC system. Included is some of the more significant actions and procedures that occur at various stages of the system.

A. TURN-IN PROCEDURES UNDER THE ATAC PROGRAM

1. NODEs

To further assist fleet activities in returning NRFI carcasses to each HUB, there are NODEs established at Charleston, SC, Jacksonville, FL, Pensacola, FL, Corpus Christi, TX, Bremerton, WA, Oakland, CA, Long Beach, CA,

Cherry Point, NC, Pearl Harbor, HI, NAS Sigonella, Sicily, Italy, and NSD Yokosuka, Japan. The NODEs are operated by a freight agent or Government personnel who provide processing and transportation services for fleet activities in their geographic area. Pierside pickup of DLRs is available at Naval Station Mayport, Naval Base Charleston, Naval Base Norfolk, Naval Amphibious Base Little Creek, and Naval Station San Diego. They consolidate shipments to achieve economies of scale and attempt to also save transportation dollars by sending full truck loads (TL) vice less than truckloads (LTL).

The NODE is also the first point of receipt of the NRFI material in the ATAC system unless the originating activity mails or directly delivers the item to a HUB or transfers the item to a Combat Logistics Force (CLF) ship while underway. In the aforementioned case, the NODE is the first step in the ATAC system where information on the NRFI item is entered into a computer database for tracking and management. NODEs validate drawing/part numbers to NSNs but do not perform Transaction Item Reporting (TIR). [Ref. 3, p. 1-2]

ATAC personnel at the NODEs then turn the material over to a commercial freight agent who provides the transportation link between the NODEs, the HUBs, and the DSP/DOPs. The freight agent is contracted by the Navy to provide an on-site daily pick-up of DLRs at pre-determined end-user sites, DLR receipt and consolidation for shipment at

the NODEs, forwarding material via traceable transportation to the HUBs, and maintaining an automated database for tracking and management control of the DLRs in transit. At the HUBs, the freight agent is again responsible for receipt, and after HUB processing, delivery of the DLRs to DOPs/DSPs.

2. HUBs

ATAC provides for the return of NRFI DLRs to centralized DLR processing locations on the East and West coasts called HUBs. These HUBs are located at Norfolk, VA, and San Diego, CA. There is a HUB located at Marine Corps Air Station, Cherry Point, NC, but it was not considered in this thesis because its primary function is to serve USMC activities under its geographical control.

The HUB is a Navy-operated facility which provides verification of drawing/part number to NSN, corrects erroneous documents, makes a MRIL inquiry to determine the DOP/DSP, prepares and submits Reports of Discrepancy (ROD) /Transportation Discrepancy Reports (TDR) as required, submits TIRs to stop carcass tracking of the DLR at the ICPs, and repacks material for shipment. [Ref. 3, p. 1]

3. Receiving, Screening, Processing, Packing, and Shipping at HUBs

The first step, receiving, is accomplished by a contractor who receives a shipment from either a NODE or directly from a Navy activity through the mail or direct

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delivery. A visual screen and a quick review of the attached paperwork is done to determine if the material is appropriate for ATAC handling. The following material is excluded from ATAC handling [Ref. 3, p. 3]:

1. Aircraft Engines

2. Marine Gas Turbine Engines

3. Fleet Ballistic Missile Components

4. Classified Items (e.g., encryption equipment)

5. Redistributed Assets

6. Nuclear Reactor Plant Material

7. RADIAC Equipment

8. Uncertified Hazardous/Flammable Items

9. Small Arms

10. All Material Coded for Disposal

11. Engineering Investigation (EI)/Quality Deficiency Report (QDR) material destined for a location other than the Norfolk or San Diego area

In addition to the above, exclusion listings are developed for each activity collocated with a DSP/DOP. These listings are developed jointly by the Naval Supply Systems Command (NAVSUP) and the local activity. The listings identify DLRs which are best repaired at the local DOP because the DLR's weight/size render them uneconomical to transport to the processing HUB. For example, DLRs turned in to the ATAC system by NAS Moffet Field which meet the size/weight exclusion criteria and which have Naval Supply Center Oakland

as the DSP, will not be shipped to the HUB. They will be shipped to NSC Oakland for storage. [Ref 3, p.3]

If the material is appropriate for ATAC processing, the document number and NSN are entered into the ATAC database. This allows ATAC management to follow-up on shipments from NODEs and ensure that all NRFI DLRs shipped from NODEs are, in fact, received at the HUB. The receipt date also allows management to calculate other performance parameters such as shipment time from NODEs and provides a start time for calculating other ATAC system steps or processes.

The NRFI item is then inspected for a bar-code label that should have been attached at the NODE. If the label is missing or the material did not come through a NODE a label is prepared and attached to the DLR. The material is then turned over to the Navy representative at the HUB for the next step.

The second step, technical screening, is accomplished by Navy personnel at the HUB who enter the date the item transferred from the receipt section into technical screening. The bar-code label is scanned by a Parts Master workstation (a database containing pertinent information on NSNs) and a printout describing the item is generated for attachment to the material. The printout part number is compared to the part number actually on the item. If there is no part number on the item or if the part numbers do not match, further technical research is required which lengthens the screening

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time since it is less automated, often requiring the use of microfiche or manual publications.

The third step at the HUB is "processing" where a shipping document is created, stowage identified (either locally or at another HUB or NODE), or disposition is determined. This is done by the use of a mechanized (MRIL) which is a consolidated listing of all items classified as repairable by the Navy (therefore it includes FLRs as well as DLRs). The MRIL is published monthly by the Fleet Material Support Office (FMSO) using the item classification, maintenance level determination, and DSP/DOP assignment information provided by the Hardware System Commands, Program Managers, and Inventory Managers. The MRIL simplifies the identification and movement of repairables and, as such, is used to determine items to be repaired at intermediate maintenance levels, items to be returned for depot repair i beyond organizational and intermediate level capabilities, identification of DSPs/DOPs, and other special information such as security classification and long supply status. A DD Form 1348-1 is then computer generated as a shipping or storage document. A Material Movement Document (MMD) is generated rather than the 1348-1 for activities participating in the Advanced Shipping Program (all Navy DSPs are participants). Under this program, the MMD indicates the shipping address and specific storage location at the receiving activity (either locally or at another HUB).

The fourth step is packing, where material is prepared for shipment, storage or disposal. Items being stowed or disposed of are sent directly from the packing area to their final destination (again, either locally or at another HUB). Items being shipped to another destination are appropriately packaged and a shipping label is attached to the item.

The fifth and final step at the HUB is shipping. Packaged NRFI items are returned from the packaging area to the ATAC contractor and consolidated for shipment to a DSP/DOP. The date and fact of transfer are entered into the ATAC database to establish ATAC contractor accountability and release from accountability by the Navy. The ATAC contractor produces a bar-coded shipping label which contains the lead Transportation Control Number (TCN), number of pieces, weight, and destination. This label is affixed to the consolidated transportation container and the ATAC contractor turns the material over to the freight forwarder. The freight carrier then transports and delivers the material to the central receiving area of the designated DOP.

III. RESEARCH METHODOLOGY

The research methodology for this thesis consisted primarily of data analysis of a portion of the ATAC database using the Naval Postgraduate School's mainframe computer with the Statistical Analysis Software (SAS) program.

A. DATABASE

The data was taken from the existing four data sets developed by J. Pritchard in his original analysis [Ref 9]. The database consists of approximately 642,000 records that were extracted from four tapes originally obtained from the Naval Material Transportation Office (NAVMTO) who maintains the database for the entire ATAC system. The tapes mainly covered a time period from September 1990 to September 1991. However, there were some records on the tapes that had been established prior to and subsequent to those dates. This was due to the transitioning of the database from being contractor-maintained to government-maintained. Due to the inconsistent nature in which these records were recorded, they were excluded from analysis since they did not accurately reflect the behavior of the ATAC system. The analysis was therefore limited to items that arrived at the HUB between Julian dates 0242 and 1242 (31 August 1990 and 31 August 1991, respectively).

Pritchard focused his analysis of the ATAC system on the aggregate of all the DLR's to determine how material in the system behaved as a whole. No differentiation was made for different types of material (i.e., by cognizance symbol) or for which of the two HUBs processed the item. In contrast, this thesis analysis subdivided the data to the cognizance symbol level for each HUB so that the behavior patterns for different types of material could be analyzed as they passed through each HUB. We focused primarily on DLR COG items (i.e., 7_ COG material) since that is the type of material an ATAC HUB is principally designed to process. In addition to looking at all 7_ COG material, we examined in detail the 7E, 7G, 7H, 7R, and 7Z COG items as those COGs represented over 85% of all material processed by the two HUBs. (A detailed listing of all COGs processed into the ATAC system is presented in Appendix B). We also briefly analyzed non-DLR COG material to determine any behavioral characteristics and, if possible, to determine why the material was processed by the ATAC system.

B. STATISTICAL ANALYSIS

As noted above, we used a statistical analysis program called SAS which was developed and sold by the SAS Corporation in Cary, N.C. The primary reason for choosing SAS as opposed to FORTRAN, which had been used in previous analyses, was the nature of the analysis that was to be performed. SAS is

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particularly useful for determining means, standard deviations, frequency counts, tests for normality, etc. All these outputs are readily available as SAS procedures and this eliminated the need to write FORTRAN programs to generate these outputs.

Many SAS routines were required to adequately analyze the data. However, the two most frequently used routines were ones that (1) determined the processing times for the various steps of the ATAC process and (2) determined the number of arrivals of retrograde DLRs.

The various steps of the ATAC process for which the processing times were determined are shown in Figure 3.1 and listed as follows:

1. Direct shipment time from originating activity to a HUB;

2. Shipment time from originating activity to a NODE;

3. NODE processing time;

4. Shipment time from a NODE to a HUB;

5. HUB in-processing time;

6. Government screening time for items sent to a depot for repair or storage at other locations;

7. Processing time for items stored on site;

8. Processing and shipping time for items to be stored at other locations;

9. HUB consolidation and packing time after government screening for items sent to a depot;

10. Total time at the HUB;

11. Shipment time from HUB to a depot.
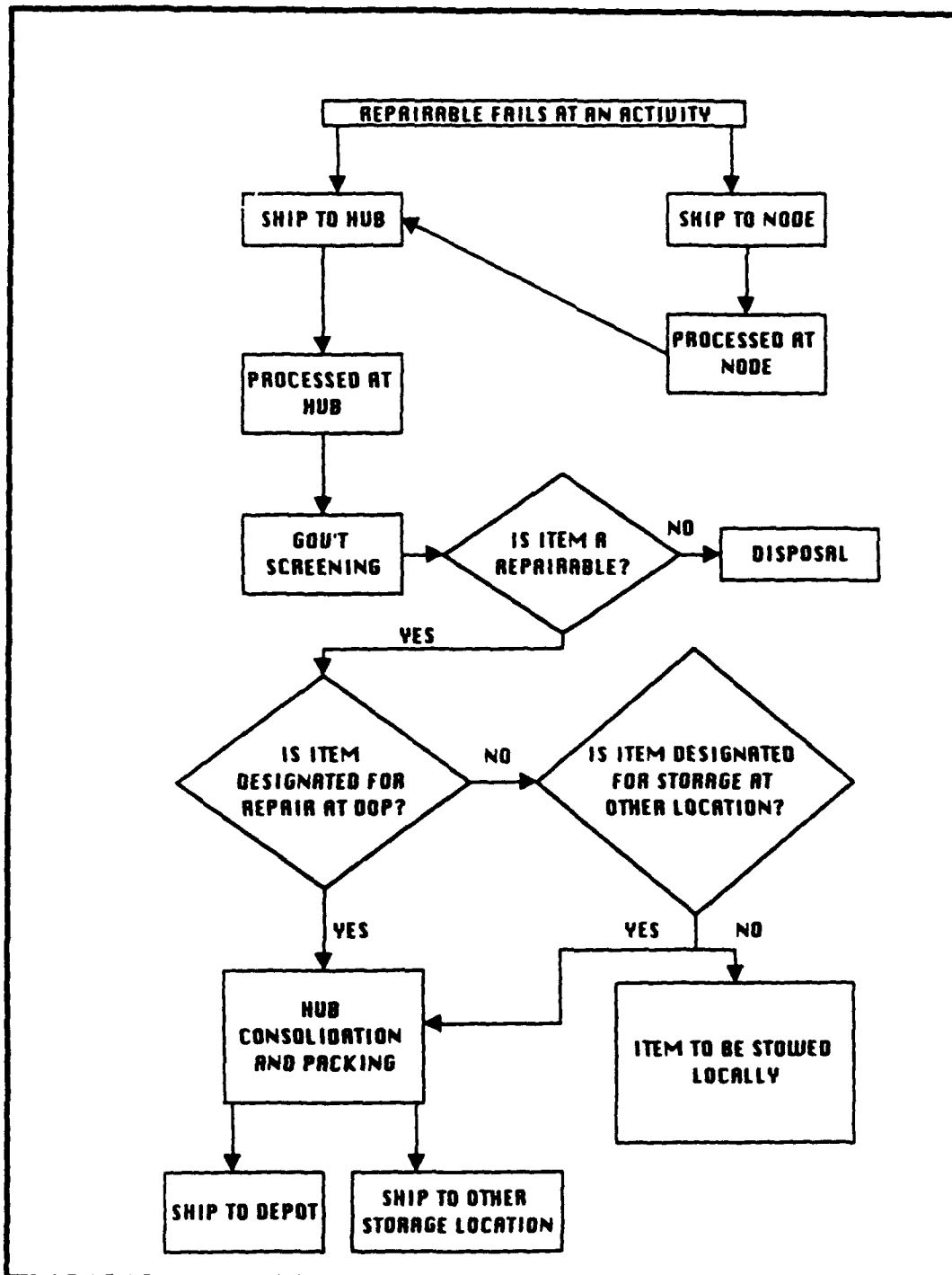
FIGURE 3.1 ATAC FLOW DIAGRAM

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As noted above, the arrivals of the DLR carcasses were also analyzed. The arrivals were separated into two different categories to determine any distinct differences in the arrival pattern. The categories were as follows:

1. Arrivals of material sent direct from an originating activity to the HUB;

2. Arrivals of material from NODES.

An initial problem in the processing times program was that all dates in the database are expressed in four-digit Julian dates. This led to the difficulty of subtracting two four-digit Julian dates with different calendar years. Subtracting 30 December 1990 (Julian date 0364) from 15 January 1991 (Julian date 1015) would result in a difference of 651 days, obviously an incorrect calculation. To overcome this, the Julian dates were conv rted to a "time serial number" based on an origin of January 1, 1900. The difference between these "time serial numbers" would be expressed in days. For example, the Julian dates 0364 (30 December 1990) and 1015 (15 January 1991) were converted to 33214 and 33230, respectively. These numbers were computed according to the following steps:

1. Change the Julian date from a four-digit to a five-digit Julian date and separate the date into its year and day components;

2. Multiply the year component by 365 and add the day component to the result.

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In the above example, Julian date 0364 is changed to 90364 which then becomes 90*365+364 which equals 33214. Likewise, Julian date 1015 becomes 91*365+15 which is equal to 33230. The difference between these two "time serial numbers" is 16 days as opposed to the incorrect 651 days. After determining the processing times by the above calculations, a half (0.5) day was added to all times derived. This was to compensate for the fact that items that complete one stage of the ATAC process in the same day as received would show a processing time of zero days.

It should be noted that the Julian date conversion program includes logic to determine if the new five-digit Julian date should begin with an eight or a nine. The logic was based on the assumption that any dates in advance of the inclusive dates of the original tapes were actually from the 1980's. This assumption was only necessary for the Julian dates on the originators' documents. All other Julian dates such HUB receipt dates, etc, were generally within the time period for which the tapes covered.

Once the range and frequency of processing times for a given step of the process was determined, the data was downloaded from the mainframe computer to a PC and analyzed for goodness-of-fit with a variety of theoretical probability distributions utilizing a simulation modeling program called SIMAN developed by System Modeling Corporation. SIMAN has an interactive input processor (distribution fitting) capability.

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This PC version is simpler, quicker, and more convenient than main frame computer-based programs.

The data sets that were created as a result of the analysis of each of the above described steps were slightly modified prior to the subsequent distribution analysis. Approximately 1% or less of the observations were excluded from analysis. The excluded observations represented extreme values that erroneously would extend the range of observations to sometimes as long as 10 years processing time for a particular step of the ATAC process. Research determined that for many of these extreme values the cause was most probably a keypunch error. For other extreme values, there was insufficient data to prove or disprove the legitimacy. Therefore, these values were also excluded as they represented an infrequent exception and needlessly skewed the analysis. The potentially legitimate data excluded represented generally much less than half of a percent of the total observations.

Other programs were written to determine what type of non-DLR material was being processed into the system and what was the disposition of the material once it was in the system. The reason for looking into this problem was to determine whether or not non-DLR material was putting a burden on the ATAC system and needlessly using scarce resources. These programs will be discussed more fully in Chapter V.

IV. DATA ANALYSIS

A. OVERVIEW

This chapter presents results of the data analysis performed on the ATAC database. The time period analyzed was for items that arrived at the HUBs between 31 August 1990 and 31 August 1991. This chapter discusses our findings for both the Norfolk and San Diego HUBs. The following sections break the data down by what the authors defined as the 12 key measurable activities in the ATAC system. As described in Chapter III and, in order of presentation, they are: (1) direct shipment times from originating activity to a HUB, (2) shipment times from originating activity to a NODE, (3) NODE processing times, (4) shipment times from a NODE to a HUB, (5) arrivals at the HUBs, (6) HUB in-processing times, (7) government screening times for items sent to a depot for repair, (8) processing times for items stored on site, (9) processing and shipping times for items to be stored at other locations, (10) HUB consolidation and packing times after government screening for items sent to a depot, (11) total time at the HUB, and (12) shipment times from the HUB to a depot.

The individual sections that follow discuss each of these activities for five individual COGs (7R, 7H, 7G, 7Z, and 7E)

and all 7_ COG items combined. As noted before, these five COGs were chosen because they represent the majority of DLRs entering the ATAC system. In each case, 99% or more of the data for each of these COGs was used in calculating means and standard deviations for the measures. The remaining 1% were considered outliers or anomalies and were ignored. Several of the activities that are discussed below have goals for processing times established by NAVSUP. Where applicable, the actual measurement times are compared to these goals.

Once the data sets were created and modified as described above, histograms of the data were created. This was done in order to better visualize the behavior of the material in the ATAC system. These histograms, which will be discussed in the following sections, are contained in Appendices C through AD. While histograms were created for each of the COGs analyzed, the appendices contain only histograms for 7R and 7E COG. The other histograms that were excluded exhibit generally the same shape, or nearly so, as those two COGs.

These two COGs were chosen to provide a contrast between a large and small volume COG. 7R COG represents the vast majority of all items processed in the system. 7E COG represents the least number of items processed (for the COGs that were analyzed). The histograms for the excluded COGs is part of the supporting documentation that has been provided to Professors McMasters and Kang of the Administrative Sciences Department, Naval Postgraduate School.

B. SHIPMENT TIME FROM ORIGINATORS TO THE HUBs

This section pertains to the shipments from the originator to the HUB. These shipments go directly to the HUB by either U.S. Mail or other means of delivery. An alternate method of shipping material, through a NODE, will be discussed in the next section. The shipping times were calculated by subtracting the date received at the HUB from the date of the originator's requisition for a RFI unit (this is the same date that is used on the shipping documents to send the carcass to the HUB). The requisition date is probably a day or more later than the date that the failure of the equipment occurred. This is due to the time it takes to isolate the failed component, time consumed by repairmen in trying to fix the equipment locally, and administrative lead time in preparing the requisition and other required documentation. Another problem with the requisition date is that it does not indicate the date that the material actually began to be transported toward the HUB. If a ship was at sea or away from homeport, it may submit requisitions by message and then hold the retrograde material for turn-in until a port call is made or a transfer to a Combat Logistics Force ship is possible. This will make shipping times appear to be far longer than what is actually true.

Table 4.1 provides a summary of the means and the standard deviations of shipping times in days from originators to the

Norfolk HUB for the major COGs analyzed. Table 4.2 provides the same information for the San Diego HUB.

TABLE 4.1.   SHIPMENT TIME (IN DAYS) FROM ORIGINATORS TO THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	29.88	45.87	194,711
7R	21.80	32.48	120,617
7H	45.57	60.80	49,287
7G	41.66	58.72	17,956
7Z	19.06	35.02	4,050
7E	43.48	61.22	2,573

TABLE 4.2.   SHIPMENT TIME (IN DAYS) FROM ORIGINATORS TO THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	27.04	46.10	143,570
7R	25.23	42.36	87,960
7H	28.20	48.60	40,225
7G	38.21	60.54	10,523
7Z	20.63	48.61	3,207
7E	36.54	57.79	1,577

Since the database provides no information as to which method of shipment was used by the originator, it is difficult to determine the effect a particular shipping method may have had on the means and the standard deviations. Also, as noted above, it is not possible to determine how long the material awaited transportation after the requisition date was annotated on the shipping documents. However, it appears that

some 7R and 7Z COG material is being shipped to the HUBs using a higher movement priority designator than the remaining COGs. This is particularly true for 7R and 7Z material sent to Norfolk. In addition, the lower average shipping times probably reflect the fact that there are many aviation activities in the Norfolk area who are most likely requisitioning 7R COG material and turning the carcasses in using high priorities for the requisitions and shipping documentation.

Supporting documentation for Tables 4.1 and 4.2 are provided in Appendices C and D. Appendix C presents the Norfolk data for the individual and the aggregate of the 7_ COG items. For each, a table of the frequency of shipping times from 0.5 days to greater than 365 days, and the cumulative percent of total requisitions is presented first. These tables are followed by histograms of the shipping times for 7R and 7E COGs over the range of 0.5 to 365.5 days. Appendix D presents the data and associated histograms for San Diego. (Note: This pattern for the layout of the appendices remains consistent for Appendices G through AD, also.)

Several of the reasons for the excessive shipping times were discussed above, but another reason is due to requisitions for DLRs that are designated Remain-in-Place (RIP). A DLR designated RIP means that a requisition for a replacement DLR is submitted, but the carcass is not turned in until after receipt and installation of the replacement part.

DLRs are so designated if the removal of the DLR would cause further degradation of the system in which it is a component of or its removal would cause a safety hazard. This type of requisitioning and turn-in can add substantially to the apparent shipping time. Such requisitions are annotated with an advice code of '5S'. However, it was not possible to exclude those requisitions from the above analysis. The data sets on the mainframe developed by Pritchard [Ref 9] did not contain a field for the advice code. It is available on the original tapes from NAVMTO, however, analyzing the shipping times was beyond the scope of this thesis.

While the times displayed in the histograms may not reflect the entire time an item was actually being shipped and may include waiting for transportation time, they do show the length of time the material is in a non-ready-for-issue (NRFI) condition until it arrives at a HUB. As the data shows, a year or more may pass before a carcass is available to be inducted into the ATAC system and, therefore, into the repair cycle. This can complicate an inventory item manager's task of forecasting demand and maintaining an adequate level of ready-for-issue material.

Also evident from the tables and histograms is the fact that the bulk of the DLR carcasses are shipped to a HUB in relatively few days. This is most likely due to the fact that the two HUBs are located where the majority of each Fleet (Atlantic and Pacific) is homeported.

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C. SHIPMENT TIME FROM ORIGINATING ACTIVITIES TO A NODE

Originators may also send material to any one of 10 NODEs located around the world depending on which one is located the closest to them geographically. (If a NODE is not located in the same geographic location as the originating activity, then the originator normally will send the material directly to the HUB.) These NODEs were listed in Chapter II, Section A.1. Material is sent to a NODE by direct delivery; i.e., hand-carried by the originator or it is picked up at pierside by ATAC personnel and taken to the local NODE. As with shipment to the HUBs, the requisition date is the start date for calculating the shipping times. Tables 4.3 and 4.4 provide a summary of those shipment times from originating activities to NODEs. Supporting documentation is provided in Appendices E and F. As in the previous section, the range of the shipping times extends from 0.5 days to 365.5 days.

TABLE 4.3. SHIPMENT TIME (IN DAYS) FROM ORIGINATING ACTIVITIES TO NODES FOR MATERIAL BOUND FOR THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	19.62	40.84	84,118
7R	12.30	27.97	59,082
7H	38.67	60.35	19,088
7G	31.20	47.91	4,576
7Z	31.70	43.86	474
7E	31.32	51.02	836

TABLE 4.4. SHIPMENT TIME (IN DAYS) FROM ORIGINATING ACTIVITIES TO NODES FOR MATERIAL BOUND FOR THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	31.85	58.34	72,317
7R	22.41	45.93	41,987
7H	47.56	71.46	20,804
7G	42.11	70.58	6,510
7Z	33.76	56.63	1,675
7E	32.49	54.49	1,229

For most of the COGs analyzed for material bound for San Diego, the mean shipping time is longer when material is shipped to a NODE instead of a HUB. For Norfolk, the reverse is generally true. The standard deviations also exhibit the same pattern. This may be explained in part by the pierside pickup program. For the naval activities east of the Mississippi River, it is generally available in areas that have a large volume of carcass returns. For activities west of the Mississippi, it is not as available. Additionally, the overseas NODEs may influence the data. Ships overseas may have sent message requisitions and then held the material for turn-in until able to off-load to an overseas NODE. The shipping documentation would have been annotated with the original requisition date only. This would add more variability to the data.

The data suggests that the pierside pickup is a useful program and should be implemented at all NODE locations.

Additional factors affecting shipping times to a NODE are the same as discussed in Section B above.

D. NODE PROCESSING TIME

NODE processing time begins with receipt of material at the NODE to the time it is shipped from the NODE to a HUB. The mean and the standard deviation of the NODEs processing times are provided in Tables 4.5 and 4.6. Supporting documentation is provided in Appendices G and H. The range of the processing times used in the analysis extends from 0.5 days to greater than 4.5 days.

TABLE 4.5. NODE PROCESSING TIME (IN DAYS) FOR MATERIAL BOUND FOR NORFOLK

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	0.74	0.67	83,784
7R	0.75	0.66	58,265
7H	0.70	0.62	19,478
7G	0.69	0.57	4,576
7Z	0.66	0.54	476
7E	0.73	0.61	833

TABLE 4.6. NODE PROCESSING TIME (IN DAYS) FOR MATERIAL BOUND FOR SAN DIEGO

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	1.54	0.99	74,057
7R	1.57	0.95	42,088
7H	1.47	0.99	22,175
7G	1.48	1.01	6,652
7Z	1.50	1.06	1,700
7E	1.71	0.91	1,230

The mean processing time at the NODEs serving the Norfolk HUB is less than one day while the mean processing time at the NODEs serving the San Diego HUB is about a day and a half. The standard deviations are less than two-thirds of a day for NODES serving Norfolk and approximately a day for NODEs serving San Diego. The NAVSUP goal for NODE processing is one day [Ref. 8, p.33]. It should be noted, however, that the processing times include an extra half-day, as discussed in Chapter III, Section B. After adjusting for that half-day, both sets of NODEs are within, or nearly so, the NAVSUP goal on the average. However, the higher standard deviations at the San Diego-bound NODEs indicate that this goal will not be met as frequently as at the Norfolk-bound NODEs. It is not known why the means and the standard deviations is greater for San Diego. San Diego does have more NODEs serving it which will inherently increase variability. However, it was beyond the scope of this thesis to determine any behavioral

differences between individual NODEs. Additional research in this area is recommended.

The means and the standard deviations being similar for all 7_ COG items at each HUB suggests that all material is being processed in the same way with no distinction as to COG. This is consistent with the NODEs' primary mission of transshipping material to the HUBs.

Examination of the data and histograms in Appendices G and H reveal a dip in the frequency distributions for a processing time of 2.5 days. This dip is particularly significant for the NODEs serving San Diego. This is attributable to the NAVSUP standard of one day processing time. Since the NODEs attempt to process as many items as possible in one day or less, they concentrate on the latest arrivals. Inevitably, some items are not processed in the one day time-frame. The items experiencing longer processing times generally have some sort of problem associated with them such as inadequate documentation or a size/weight problem. This accounts for the slight increase in frequency (as compared to the 2.5 days) for 3.5 days processing time. Also affecting the slight increase is the fact that non-working days (i.e., week-ends) are included in the processing times computations. This effect is much less noticeable at the NODEs serving the Norfolk HUB where a majority of the items are processed the same day as received.

The range of processing times extended from 0.5 days to greater than 21.5 days. Fortunately, the number of observations having processing times greater than 4.5 days were no more than 0.4 percent of the total number of observations. These were considered anomalies and were excluded from analysis (as discussed in Chapter III Section B).

E. SHIPMENT TIME FROM NODES TO THE HUBS

The shipping time from a NODE to the HUBs is measured from the time the material is shipped from the NODE to when it arrives at the HUB (referred to as the tailgate date). Tables 4.7 and 4.8 show the mean and the standard deviation of the number of days these shipments took. Supporting documentation is provided in Appendices I and J.

TABLE 4.7. SHIPMENT TIME (IN DAYS) FROM NODES TO THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	5.00	3.55	82,195
7R	5.33	3.77	57,142
7H	4.12	2.48	19,115
7G	4.31	2.86	4,482
7Z	4.39	3.02	472
7E	4.64	3.05	824

TABLE 4.8. SHIPMENT TIME (IN DAYS) FROM NODES TO THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	5.12	3.56	73,673
7R	4.84	3.32	41,868
7H	5.47	3.96	22,167
7G	6.10	1.60	6,674
7Z	4.76	3.72	1,663
7E	4.60	2.32	1,223

As can be seen from these tables, shipping time from NODEs to both HUBs averaged five days and had a standard deviation of 3.6 days. However, the range of the shipping times, as displayed by the histograms in Appendices I and J extended from 0.5 days to greater than 30 days. The low values for the means appear to be remarkably good numbers considering the distance and expected transshipment delays from NODEs located overseas; such as Pearl Harbor, Yokosuka, and Sigonella.

F. CARCASS ARRIVALS

As briefly discussed in Chapter III, daily arrivals at the HUBs fall into one of two categories. The material can either be received directly from the originator or from a NODE. For the Norfolk HUB, the majority of the material, approximately 71%, arrives directly from originators. The remainder, 29%, is received from a NODE. For San Diego, approximately 66% of the material arrives directly from originators and 34% from

the NODEs. The material sent by an originator could arrive via U.S. Mail, as a result of the pierside pickup program, or by the originating activity delivering the material to the HUB. The material from the NODEs usually arrives in a multi-pack fiber-board container on a large pallet.

These various forms of arrival methods complicate characterizing the arrival process. The arrival pattern for the carcasses, depending on who sent it and how, could be a single arrival or a batch arrival. A batch arrival could take many forms. For example, it could be a truckload of material, a multi-pack container with different items packed inside, a multi-pack with the same material packed inside, or a pallet with individual boxes and containers from a local originator. Another complication is that for batch arrivals, the problem is compounded by not having a record of how many items are in each batch. The ATAC database does contain a field for recording the number of pieces that arrived for a particular document number. However, it does not indicate if the material arrived in a batch or in a series of separate shipments. Additionally, for items received with different document numbers (the normal occurrence), the database provides no information on whether they arrived together on the same truck as a batch and how many were in that batch. To adequately determine a more realistic arrival pattern, an on-site sampling of the arrivals over a extended period of time should be conducted; an activity beyond the scope of this

thesis. Because of the above problems associated with characterizing the daily arrival pattern, the arrivals were assumed to be one-for-one. The focus was then on the two categories mentioned at the beginning of this section. Additionally, the aggregate arrivals were also analyzed.

For Norfolk, the summary data for the two categories of arrivals and the aggregate of the two are contained in Tables 4.9 through 4.11. For San Diego, Tables 4.12 through 4.14 provide the arrival information. Tables 4.9 and 4.12 contain the means and the standard deviations for the arrivals of material received directly from originators without passing through a NODE. Tables 4.10 and 4.13 provide the same information for material arriving from the NODEs. Tables 4.11 and 4.14 provide the statistics on the aggregate arrivals.

TABLE 4.9. AVERAGE NUMBER OF ARRIVALS PER DAY AT THE NORFOLK HUB FROM ORIGINATORS

COG	MEAN	STD DEV
All 7 COG Items	789.69	311.63
7R	488.03	210.57
7H	209.06	111.19
7G	73.98	46.01
7Z	16.23	30.18
7E	10.62	7.03

TABLE 4.10. AVERAGE NUMBER OF ARRIVALS PER DAY AT THE NORFOLK HUB FROM NODES

COG	MEAN	STD DEV
All 7_ COG Items	326.02	262.71
7R	232.62	195.87
7H	77.13	71.27
7G	18.17	17.76
7Z	1.90	3.13
7E	3.30	3.86

TABLE 4.11. AVERAGE NUMBER OF AGGREGATE ARRIVALS PER DAY AT THE NORFOLK HUB

COG	MEAN	STD DEV
All 7_ COG Items	1123.93	479.93
7R	706.83	346.25
7H	283.14	146.29
7G	92.91	53.94
7Z	18.06	30.59
7E	13.94	8.58

TABLE 4.12. AVERAGE NUMBER OF ARRIVALS PER DAY AT THE SAN DIEGO HUB FROM ORIGINATORS

COG	MEAN	STD DEV
All 7_ COG Items	549.69	205.42
7R	338.45	127.27
7H	158.40	116.15
7G	41.64	23.62
7Z	12.82	14.10
7E	6.29	10.12
ALL 7_	549.69	205.42

TABLE 4.13. AVERAGE NUMBER OF ARRIVALS PER DAY AT THE SAN DIEGO HUB FROM NODES

COG	MEAN	STD DEV
All 7_ COG Items	288.54	161.85
7R	164.24	97.36
7H	87.73	58.32
7G	26.55	22.37
7Z	6.68	10.00
7E	4.91	8.63

TABLE 4.14. AVERAGE NUMBER OF AGGREGATE ARRIVALS PER DAY AT THE SAN DIEGO HUB

COG	MEAN	STD DEV
All 7_ COG Items	840.19	287.19
7R	495.82	182.14
7H	247.95	134.97
7G	91.85	54.48
7Z	19.83	16.55
7E	11.32	13.36

The data and histograms for the data associated with these tables can be found in Appendices K through M for Norfolk and N through P for San Diego. Appendices K and N contain data and histograms of arrivals from originators, Appendices L and O contain data and histograms of arrivals from NODEs, and Appendices M and P have data and histograms of arrivals in the aggregate.

In the aggregate, the arrivals on a daily basis ranged anywhere from zero to over 1800 for Norfolk and over 1500 for San Diego. This wide range in daily arrivals is consistent

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down to the COG level. This observation is well supported by the large standard deviations contained in the above tables. Given the large variance in the arrival pattern, it is evident that the workload at each HUB can vary significantly on a day-to-day basis and could be difficult to adequately provide manning for.

The data contained in Tables 4.9 through 4.14 was further separated down to the average arrivals for each day of the week and is summarized in Tables 4.15 through 4.20.

TABLE 4.15. DAILY ARRIVALS AT THE NORFOLK HUB FROM ORIGINATORS

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
All 7	783.28 440.08	762.28 294.78	822.64 315.23	729.19 318.37	699.00 322.09
7R	482.19 287.88	476.92 204.12	529.85 234.53	433.57 204.55	396.51 200.02
7H	196.42 133.35	195.02 101.05	199.53 119.30	204.11 106.32	198.34 129.25
7G	77.75 55.21	64.57 44.25	68.30 37.91	63.98 38.69	77.02 58.44
7Z	14.96 29.68	14.40 24.23	14.13 22.83	16.38 37.10	17.32 32.96
7E	11.15 8.28	9.94 8.98	10.23 5.34	9.89 6.87	9.28 6.26

TABLE 4.16. DAILY ARRIVALS AT THE NORFOLK HUB FROM NODES

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
ALL 7	554.62 319.64	334.85 285.20	222.53 191.71	213.58 161.79	258.53 169.94
7R	404.89 252.58	220.13 196.42	152.04 144.63	145.51 122.62	180.75 117.90
7H	112.83 77.32	90.23 91.70	55.21 54.55	51.72 46.51	58.21 58.97
7G	27.66 21.63	19.55 19.71	11.34 11.18	12.85 12.93	15.26 16.71
7Z	2.94 4.75	1.42 1.70	1.62 2.91	1.36 2.55	1.68 2.46
7E	5.98 5.38	3.23 3.95	2.08 2.39	2.06 2.40	2.43 2.74

TABLE 4.17. AGGREGATE DAILY ARRIVALS AT THE NORFOLK HUB

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
ALL 7	1363.63 670.33	1118.23 475.24	1065.27 436.51	960.90 407.33	975.94 401.21
7R	887.08 472.54	697.06 345.25	681.89 332.96	579.08 283.34	577.26 269.53
7H	309.25 186.96	285.25 148.75	254.74 147.22	255.83 130.49	256.55 146.76
7G	105.42 70.19	84.11 53.60	79.64 42.50	76.83 46.27	92.28 63.14
7Z	17.91 30.56	15.81 24.48	15.75 23.84	17.74 37.04	19.00 33.55
7E	17.13 10.95	13.17 10.37	12.30 6.52	11.94 7.19	11.72 7.77

TABLE 4.18. DAILY ARRIVALS AT THE SAN DIEGO HUB FROM ORIGINATORS

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
ALL 7_	517.23 234.80	596.71 228.21	559.15 148.19	539.94 198.01	578.08 164.00
7R	326.96 155.46	355.40 148.84	346.38 96.33	316.43 130.77	326.04 105.69
7H	134.38 112.71	166.30 118.82	138.53 95.34	159.51 109.90	174.36 144.33
7G	32.40 20.05	43.77 21.80	42.62 29.89	37.51 21.88	44.47 26.37
7Z	8.15 11.37	12.36 12.58	15.51 17.31	9.64 10.79	15.91 15.89
7E	5.30 4.85	7.28 20.50	5.26 4.09	6.30 4.57	6.15 5.07

TABLE 4.19. DAILY ARRIVALS THE SAN DIEGO HUB FROM NODES

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
ALL 7_	370.58 192.48	296.17 153.82	237.77 124.80	306.04 164.01	234.85 132.39
7R	207.40 122.87	151.30 88.19	133.81 76.60	180.42 103.69	133.79 80.05
7H	105.98 64.60	101.45 63.78	66.96 45.97	81.87 60.05	67.28 51.50
7G	34.75 26.69	26.74 21.27	21.34 20.59	27.08 22.10	19.98 18.97
7Z	7.06 9.23	6.91 8.01	7.66 12.60	5.89 11.37	4.81 7.57
7E	7.85 14.72	3.79 4.84	3.11 4.74	4.45 6.87	4.32 6.57

TABLE 4.20. AGGREGATE DAILY ARRIVALS AT THE SAN DIEGO HUB

COG	MONDAY MEAN/ STD DEV	TUESDAY MEAN/ STD DEV	WEDNESDAY MEAN/ STD DEV	THURSDAY MEAN/ STD DEV	FRIDAY MEAN/ STD DEV
ALL 7_	887.81 373.79	892.88 313.68	796.92 215.97	845.98 261.61	812.92 205.52
7R	544.63 237.56	516.44 181.14	489.42 124.02	506.40 171.16	468.67 126.09
7H	244.98 145.08	272.90 148.50	209.44 117.25	246.02 119.09	246.29 152.40
7G	68.44 36.38	71.87 32.40	65.19 37.98	65.83 29.03	65.69 33.30
7Z	15.50 14.87	19.63 14.73	23.62 20.92	15.83 15.00	21.12 16.16
7E	13.65 15.70	11.35 21.33	8.69 6.81	11.08 7.57	10.75 9.63

These tables show that the mean and the standard deviation of the number of arrivals from originators for each COG is generally consistent day-to-day. The pattern of arrivals from NODEs at both HUBs appears to be a downward sloping trend for the week with most arrivals on Monday, second most on Tuesday, and, generally, the last three days are the least. In the aggregate, the Norfolk HUB arrival pattern is a downward trend for the week while San Diego exhibits a more consistent pattern on a daily basis.

G. HUB IN-PROCESSING TIME

In-processing time begins on the date that the material arrives at the HUB and ends when the ATAC HUB contractor turn

the material over to government personnel for screening. The
ATAC contractor enters the DLR document number and NSN into
the database via computer terminal, prepares a bar-coded label
(if the material did not go through a NODE first), and then
turns the DLR over to Navy personnel for screening. Tables
4.21 and 4.22 for Norfolk and San Diego, respectively, provide
the means and the standard deviations for the amount of time
it took the ATAC HUB contractor to process the DLRs.
Supporting documentation is provided in Appendices Q and R.

TABLE 4.21. NORFOLK HUB IN-PROCESSING TIME (DAYS)

COG	MEAN	STD DEV	COUNT
All 7 COG Items	2.57	2.07	280,844
7R	2.48	1.83	177,149
7H	2.55	1.92	70,954
7G	2.50	1.89	22,861
7Z	2.51	1.94	4,535
7E	2.53	2.15	3,437

TABLE 4.22. SAN DIEGO HUB IN-PROCESSING TIME (DAYS)

COG	MEAN	STD DEV	COUNT
All 7 COG Items	1.76	0.95	220,706
7R	1.75	0.93	131,719
7H	1.77	0.95	63,356
7G	1.75	0.96	17,516
7Z	1.84	0.99	4,951
7E	1.65	0.94	2,851

The NAVSUP goal for this process is one day [Ref. 6, p. 22]. After adjusting for the extra half-day, it appears that San Diego is meeting the goal (on the average) whereas Norfolk requires nearly twice the desired time. Norfolk also has standard deviations for the processing times which are approximately twice that for San Diego. For all 7_ COG at Norfolk, the range of the processing times extends from 0.5 days to greater than 24 days. This includes 99.9% of the observations. For San Diego, the range is from 0.5 days to greater than 7.5 days for nearly 100% of the observations. The Norfolk HUB does receive nearly 30% more material than San Diego which could account for the increased in-processing time, particularly if manning levels are about the same.

H. GOVERNMENT SCREENING TIME

Government screening time is computed as the difference between the in-screen date and out-screen date. Generally, this is the time from when the material is turned over to the Navy by the ATAC contractor and returned to the contractor after the Navy personnel perform the screening steps outlined in Chapter II, Section A.3. Following this screening, the material is either sent to a DOP for immediate repair, stored locally, sent to another site for storage, or sent to disposal. This section presents the data for DLRs that are sent to a DOP for repair or to another site for storage. It does not include the screening time for items going into local

storage. The reason is due to the fact that for items going into local storage, the out-screen date is generally blank and the next available date is the storage date. Section I will discuss the screening to local storage processing time.

Tables 4.23 and 4.24 list the means and the standard deviations for the government screening time. The supporting documentation for Tables 4.23 and 4.24 is provided in Appendices S and T.

TABLE 4.23. GOVERNMENT SCREENING TIME (IN DAYS) FOR THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7 COG Items	6.43	4.32	168,495
7R	6.27	4.22	119,879
7H	6.46	4.96	35,321
7G	6.80	4.76	9,517
7Z	7.49	5.90	1,943
7E	6.84	5.14	1,962

TABLE 4.24. GOVERNMENT SCREENING TIME (IN DAYS) FOR THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7 COG Items	7.12	4.89	131,685
7R	6.93	4.37	86,746
7H	7.12	4.75	35,373
7G	7.19	2.68	6,804
7Z	6.87	4.07	667
7E	6.59	3.91	1,457

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The NAVSUP goal for this process is 3 days [Ref. 6, p. 22]. As is evident from these tables and the supporting documentation in Appendices S and T, the screening process is taking at least twice as long as the NAVSUP goal. One factor affecting the screening process is non-DLR material that enters into the screening process. While that type of material does not require the same packaging and handling as DLRs do, it still requires time and manpower to identify and dispose of it. Another factor affecting the means and the standard deviations is that the computations for the screening time include weekends and holidays, which are generally non-working days. Even so, this still does not account for the wide range for the screening times. Depending on the COG, the screening time could extend beyond 40 days. These long screening times indicate a possible problem with identification of the material and inconsistency in following a first-in first-out material movement policy.

I. SCREENING TO LOCAL STORAGE TIME

This section presents the data for DLRs that are screened and sent local storage. The time period for this process includes the screening time as well as the time required to package (if required) and store the item. Tables 4.25 and 4.26 show the mean and the standard deviation for items being screened and sent to local storage. Supporting documentation is included in Appendices U and V.

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TABLE 4.25. SCREENING TO LOCAL STORAGE TIME (IN DAYS) AT THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	3.88	2.84	61,854
7R	3.67	2.51	31,741
7H	4.00	2.83	19,847
7G	4.04	2.63	7,922
7Z	3.93	3.09	1,272
7E	3.97	2.93	891

TABLE 4.26. SCREENING TO LOCAL STORAGE TIME (IN DAYS) AT THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	5.26	3.91	55,222
7R	5.15	3.87	24,651
7H	5.49	3.85	18,929
7G	5.34	4.03	7,516
7Z	4.12	3.03	3,266
7E	5.48	3.67	905

For all COGs examined, the range of this data extended from 0.5 days to greater than 30 days. However, generally 99% of all observations were within 20 days. The NAVSUP goal for this process is two days and it is not being met at either HUB for any 7_ COG items. The same problems that affected the means and the standard deviations in the previous section also affect the ones for this process. Material identification can be a difficult and lengthy process for items that arrive at the HUB without proper documentation.

Table 4.27 shows the percentage of all arrivals that go into local storage for both HUBs. A portion of these items stored are awaiting induction into a local NADEP or NSY for repair. Another portion of those items stored may reflect decreased demand for those items. This would be attributable to the down-sizing of the military and to obsolescence of equipment.

TABLE 4.27. LOCALLY STORED MATERIAL AS A PERCENTAGE OF ALL ARRIVALS

COG	NORFOLK	SAN DIEGO
All 7_ COG Items	21.67%	24.99%
7R	17.47%	18.69%
7H	27.49%	29.65%
7G	34.09%	42.78%
7Z	27.84%	65.53%
7E	25.36%	31.68%

The large percentage for 7Z COG material is due to the fact that it was awaiting induction into the repair cycle. Most 7Z COG material is repaired at the Long Beach Naval Shipyard.

J. PROCESSING AND SHIPPING TIME FOR ITEMS TO BE STORED AT OTHER LOCATIONS

This section deals with DLRs that are screened by government personnel and then sent for storage at other

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locations. It is essentially a combination of government screening time, consolidation and packing time (discussed later), and shipping time to the new storage location. In other words, it encompasses the time from induction into the screening process until receipt at the storage site. It does not include the time to actually stow the item at the new location. The end date for this process was so chosen due to DLRs which belong to this category are part of the Advance Shipping program. That program requires the sending activity to generate a Material Movement Document (MMD) which includes the storage location at the receiving activity. It also records the date the MMD is generated as the storage date. This storage date is in advance of the shipping date. Therefore, using the storage date as the end date for this process would not be rational.

Tables 4.28 and 4.29 show the mean and the standard deviation for items being screened and then sent for storage at other locations. Supporting documentation for this section is contained in Appendices W and X. Even though the data from this section is included in Sections H and K through M (discussed below), this process was identified as a separate process so as to determine the number of items affected by this process. There is no NAVSUP goal for this particular process.

TABLE 4.28. PROCESSING AND SHIPPING TIME (IN DAYS) AT THE NORFOLK HUB FOR ITEMS TO BE STORED AT OTHER LOCATIONS

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	13.31	5.26	24,123
7R	13.03	5.08	7,127
7H	13.46	5.36	10,916
7G	13.29	5.00	3,853
7Z	14.05	6.58	1,421
7E	13.01	4.91	787

TABLE 4.29. PROCESSING AND SHIPPING TIME (IN DAYS) AT THE SAN DIEGO HUB FOR ITEMS TO BE STORED AT OTHER LOCATIONS

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	14.15	4.96	33,521
7R	14.01	4.75	11,546
7H	14.19	4.88	17,167
7G	14.10	4.96	3,182
7Z	13.27	4.55	272
7E	13.73	4.64	270

The primary storage site for DLRs falling into this category for the Norfolk HUB is the San Diego HUB. For all 7_ COG items sent to off-site storage, nearly 89% were sent to San Diego. Likewise, the primary off-site storage location for the San Diego HUB is Norfolk. For all 7_ COG material, approximately 99% were sent there. The reason the DLRs are sent to the other HUB for storage is that the receiving HUB is closest to the DOP that will repair the item. Once at the new

storage location, the material is sent directly to the storage location annotated on the MMD. No in-screening is necessary.

Table 4.30 shows the percentage of all arrivals that is shipped to other storage locations.

TABLE 4.30. MATERIAL STORED AT OTHER SITES AS A PERCENTAGE OF ALL ARRIVALS

COG	NORFOLK	SAN DIEGO
All 7_ COG Items	8.45%	14.72%
7R	3.92%	8.75%
7H	15.12%	27.04%
7G	16.58%	18.11%
7Z	31.10%	5.46%
7E	22.40%	9.45%

K. HUB CONSOLIDATION AND PACKING TIME AFTER GOVERNMENT SCREENING

The HUB consolidation and packing time is the time from when the Navy returns the material back to the ATAC contractor to the time the material is shipped to a DOP. As discussed in Chapter II, Section A.3, this step encompasses preparation of shipping documents, identification of stowage locations at the depot or other storage location, and packaging. This section includes those items that are shipped to other locations. Items that go into local storage are excluded. Tables 4.31 and 4.32 provide the mean and the standard deviation for the time it took HUB contractors to perform this step for each

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COG. The supporting documentation for Tables 4.31 and 4.32 is shown in Appendices Y and Z.

TABLE 4.31. NORFOLK HUB CONSOLIDATION AND PACKING TIME (IN DAYS)

COG	MEAN	STD DEV	COUNT
All 7_COG Items	1.12	0.95	98,127
7R	1.05	0.91	59,455
7H	1.23	1.02	27,925
7G	1.19	0.91	7,498
7Z	1.27	1.13	1,561
7E	1.15	0.91	1,620

TABLE 4.32. SAN DIEGO HUB CONSOLIDATION AND PACKING TIME (IN DAYS)

COG	MEAN	STD DEV	COUNT
All 7_COG Items	1.67	1.01	120,345
7R	1.57	1.02	78,163
7H	1.86	0.98	33,819
7G	1.79	0.96	6,308
7Z	1.56	0.98	635
7E	1.75	0.93	1,311

The NAVSUP goal for this step is 24 hours [Ref. 6, p. 22]. After adjustment for the extra half-day, the Norfolk HUB is meeting the goal while the San Diego HUB is just over it. This is apparent by examination of the histograms in Appendices Y and Z . A factor that affects the means and the standard deviations is that some DLRs are held until a

consolidated amount can be accumulated and sent to a DOP in order to save transportation costs.

L. TIME SPENT AT THE HUB

The time a DLR spends at the HUB is calculated as the difference between the tailgate date and the date the DLR is shipped. The tailgate date is the date that the material physically arrives at the HUB, regardless of unloading or staging delays. Only those items that were shipped from the HUB are included in this calculation. The items going into local storage are not included. This is due to the fact that the data fields necessary for this calculation are blank for those items going into local storage. Tables 4.33 and 4.34 display the means and the standard deviations for the total time DLRs spend at the HUBs. Supporting documentation can be found in Appendices AA and AB.

TABLE 4.33. TIME SPENT (IN DAYS) AT THE NORFOLK HUB

COG	MEAN	STD DEV	COUNT
All 7 COG Items	9.11	5.14	104,295
7R	8.93	5.22	63,511
7H	9.80	5.87	29,846
7G	9.57	5.80	8,060
7Z	10.42	7.03	1,692
7E	9.15	5.80	1,705

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TABLE 4.34. TIME SPENT (IN DAYS) AT THE SAN DIEGO HUB

COG	MEAN	STD DEV	COUNT
All 7 COG Items	9.46	4.40	137,522
7R	9.24	4.17	89,600
7H	9.76	4.48	37,974
7G	9.41	4.02	7,191
7Z	9.34	3.95	728
7E	9.05	4.00	1,450

The time a DLR spends at the HUB is about 9 days with a standard deviation of about 4 or 5 days depending on which HUB being examined. By totalling up all of the NAVSUP goals included in this all-encompassing time period, the overall goal would be five days. As the above tables suggest, it would be a difficult goal to meet. This would suggest that manning levels may be inadequate. Given current budgetary constraints, however, this particular problem may not be resolvable.

M. SHIPMENT TIME FROM HUB TO A DOP

The shipping time from the HUB to a DOP is measured from the time the DLR is turned over by the ATAC HUB contractor to a freight carrier to the time it is received at a DOP. After this point the DLR loses visibility in the ATAC system and is tracked by item managers at Inventory Control Points (ICPs). Tables 4.35 and 4.36 list the means and the standard

deviations of the shipping times from HUB to DOP. Supporting

documentation is provided in Appendices AC and AD.

TABLE 4.35.   SHIPMENT TIME (IN DAYS) FROM THE NORFOLK HUB TO A DOP

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	5.25	1.71	105,272
7R	5.12	1.83	63,903
7H	5.39	1.58	29,794
7G	5.54	1.49	8,014
7Z	5.96	1.28	1,686
7E	5.58	1.46	1,693

TABLE 4.36.   SHIPMENT TIME (IN DAYS) FROM THE SAN DIEGO HUB TO A DOP

COG	MEAN	STD DEV	COUNT
All 7_ COG Items	5.51	2.09	137,544
7R	5.27	1.97	89,236
7H	5.76	1.76	37,773
7G	5.72	1.84	7,187
7Z	5.96	1.67	729
7E	5.36	2.15	1,427

The similarity of the means and the standard deviations

between COGs is understandable since they should not affect

shipment times. The only variables that could come into play

would be the number of pieces, weight, cube, etc. The NAVSUP

goal for shipments from the HUB to the DOP is 4 working days

[Ref. 6, p.22]. The one to two days difference that both HUBs

are showing could be attributable to the inclusion of

non-workdays (weekends and holidays) in the database. It should also be noted that some of the DOPs are located in near the HUBs and, accordingly, the shipping times should be low.

N. GOODNESS-OF-FIT TESTS

After the means and the standard deviations were computed and the histograms were developed that were just discussed in Sections B through M, Chi-square goodness-of-fit tests were performed for a variety of theoretical probability distributions. This was accomplished using the input processor program in SIMAN (the simulation modeling software referred to in Chapter III) which determines the most likely theoretical probability distribution based on the smallest of the squared error computed for each distribution. An example of the SIMAN output is shown in Figure 4.1.

The procedure for the Chi-square goodness-of-fit tests requires that a null and alternative hypothesis (H_o and H_a) be stated. In the tests referred to above, the null hypothesis was that the data conformed to a certain distribution. The alternative hypothesis was that it did not conform. After the hypotheses were determined, the Chi-square test statistic was computed and a p-value was determined. SIMAN performs the hypothesis formulation and calculations of the Chi-square test statistic and p-value without any input from the user other than the initial data input.

REAL data   Data pts = 277   Intervals = 8   Range: 0 to 8
Mean = 2.46   StdDev = 1.78   Min = 0.5   Max = 7.5

LOGNORMAL DISTRIBUTION: LOGN(2.51, 2.21)
Sq Error = 0.0197   Chi Sq: p <   0.005   KS: p <   0.01

BEST FIT SUMMARY

Data File: D2.DAT

Function	Sq Error
Lognormal	0.0197
Gamma	0.0311
Erlang	0.0313
Weibull	0.0383
Beta	0.0506
Triangular	0.0635
Normal	0.0719
Exponential	0.0729
Uniform	0.115
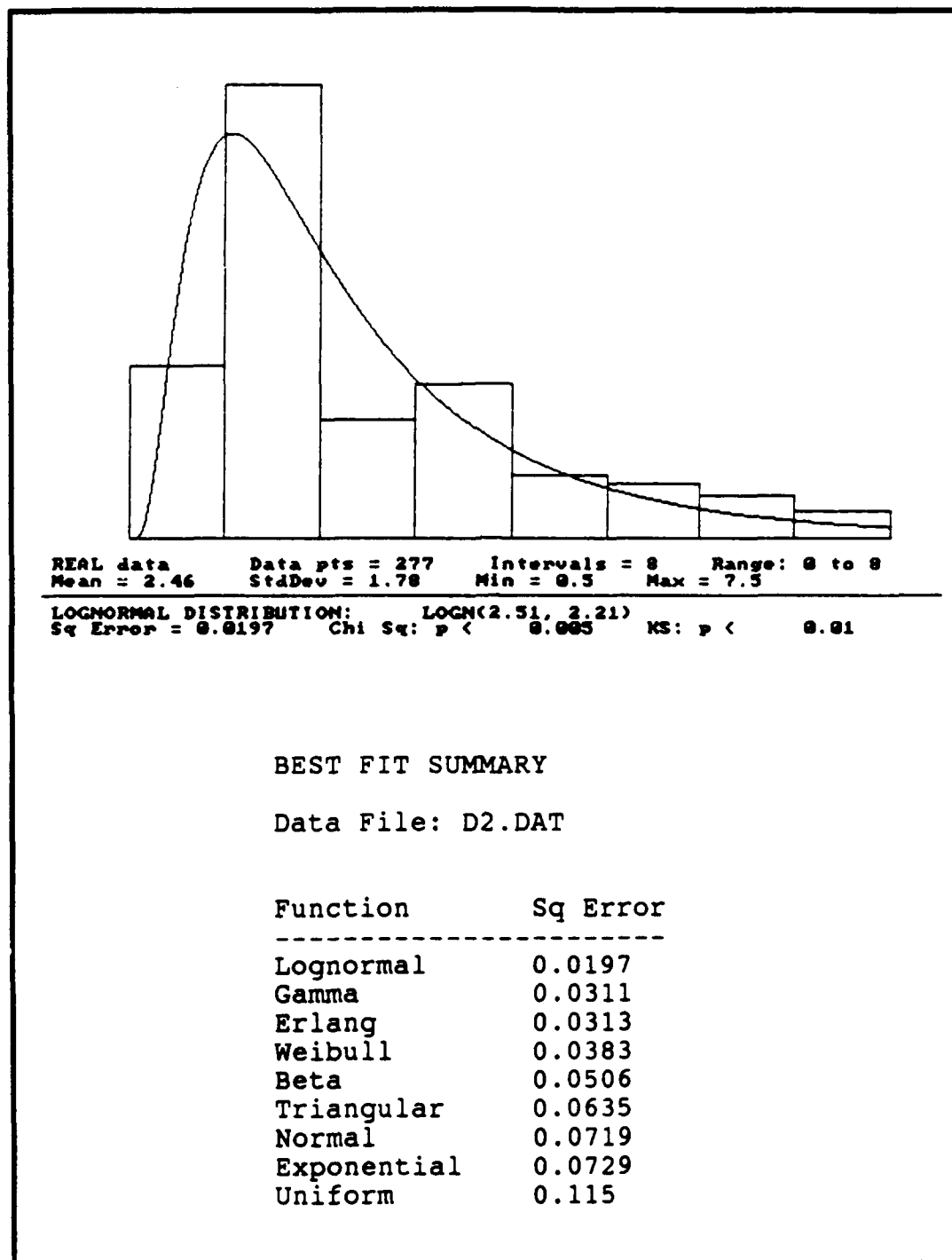
FIGURE 4.1 SIMAN OUTPUT

In the test results, the p-value represents the probability that if the hypothesized probability distribution is rejected, it will be an incorrect decision. For most of the data sets analyzed, the p-value was very low ($p < .005$) which indicates that the hypothesized probability distributions do not adequately fit to any of the theoretical distributions listed in SIMAN. While other hypothesized distributions may also have a similarly low p-values, SIMAN selects as the best-fit the probability distribution which has the least squared error.

Summaries of the SIMAN-produced Chi-square goodness-of-fit tests are contained in Appendices AE and AF for Norfolk and San Diego, respectively. Those appendices show the probability distribution that SIMAN determined as the best fit as well as the squared error values for all the distributions tested. As is also shown in those appendices, the p-value is generally less than .005 for almost all COGs and all processes analyzed. This indicates that the data generally does not fit any theoretical probability distribution that it was tested for. Therefore, to simulate the ATAC system, the empirical distributions based on the data presented above should be used.

V. IDENTIFICATION OF NON-DLRs IN THE ATAC DATABASE

A. NON-DLR COG MATERIAL

Upon examination of the ATAC database, it was discovered that there was a notable amount of non-DLR COG material arriving at the ATAC HUBS. SAS programs were written to extract this specific data from the NAVMTO database. The reports generated included all odd COG symbols except for 7_ COG. (Note: Even COG symbols correspond to DLRs which are provided to the Fleet without charge. They are procured by the Hardware System Commands using the Appropriation Purchases Account.) The results of these programs are summarized in Tables 5.1, 5.2, and 5.3.

Table 5.1 shows that 3.5% of the total arrivals were non-DLR COG items that entered the ATAC system during the period from 31 August 1990 to 31 August 1991. The breakdown for the Norfolk and San Diego HUBs were 4.0% and 2.8%, respectively. This percentage of non-DLR material entering ATAC is fairly low. However, given a declining military budget, every effort needs to be made to prevent inappropriate or misidentified material from entering the system. Handling such material depletes manpower which depletes dollars, both of which are destined to become scarce resources as budgets decline further.

TABLE 5.1. NON-DLR COGS IN THE ATAC SYSTEM

	Norfolk	San Diego	Total
Non-DLR COGs Entering ATAC System	12,416 (4.0%)	6,704 (2.8%)	19,120 (3.5%)
Total Material Entering ATAC	307,417 (100%)	235,954 (100%)	543,371 (100%)

The data was next analyzed to find out how much of this material was disposed of locally at the HUBs. Table 5.2 below shows that Norfolk disposed of 30% of the non-DLR COG material locally and San Diego disposed of 49% locally. The combined total of material in this category was 36%.

Table 5.2 also shows that about 15% of the non-DLR COG items were eventually shipped to a DOP for repair. The HUB at Norfolk shipped almost 13% while the HUB at San Diego shipped about 19% to a DOP for repair. This suggests that some of these non-DLR COG items may have, in fact, been DLRs.

TABLE 5.2. DISPOSITION OF NON-DLR COGS AT THE HUBS

	Norfolk	San Diego	Total
Disposed of Locally	3,694 (30%)	3,276 (49%)	6,970 (36%)
Shipped to a DOP	1,602 (13%)	1,306 (19%)	2,908 (15%)
Total	12,416 (100%)	6,704 (100%)	19,120 (100%)

To pursue this idea, additional reports for a sample of this data were generated using SAS which provided listings by COG showing individual Federal Supply Codes (FSCs), National Item Identification Numbers (NIINs), shipping dates, and processing dates for various steps of the ATAC process. The sample size for Norfolk was 36% of the total population of non-DLR COG material and for San Diego it was 31%. These reports showed that a majority of these "non-DLR COG items" were, in fact, DLRs. The result of this sampling is presented in Table 5.3.

TABLE 5.3. SUBMISSION ERRORS OF NON-DLR COGS IN THE ATAC SYSTEM

	Norfolk	San Diego	Total
Items Not Listed in MRIL	2,112	1,064	3,176
	(47%)	(51%)	(48%)
Submitted Using Wrong COG	459	588	1,047
	(10%)	(28%)	(16%)
Submitted with Valid COG	1,892	445	2,337
	(42%)	(21%)	(36%)
Total	4,463	2,097	6,560
	(100%)	(100%)	(100%)

These items were confirmed to be or not to be DLRs by trying to find each individual NIIN in the MRIL. For Norfolk, 47% of the items were not found to be listed in the MRIL, which indicates they were not DLRs. For San Diego, 51% of these items were found to be not listed in the MRIL. All but

three NIINs in this category were in-screened by the HUB and then either stowed, or the database provided no information as to the ultimate disposition of the material. For both HUBs this equates to 9,560 items per year, or about 2% of the total material entering ATAC. As expected, almost all of the 9_ COG items fell into the category of items not listed in the MRIL. The few exceptions were for items that were submitted as 9_ COGs and were, in fact, 7_ COGs. 9_ COG material is primarily Navy-owned stock of consumable type material under the responsibility of various activities. It includes construction, electronic, general, medical, subsistence, and industrial material. There was a total of 2,327 items submitted as 9_ COG to the HUBs. Although this is a fairly large figure, it represents only 0.43% of the total number of items entering the ATAC system.

At Norfolk, 10% of the sample items were DLRs but were submitted to the HUB by the activity using the wrong COG. For example, an item was submitted with a 1_ COG and it should have been a 7_ COG. At San Diego, 28% of the sample items were found to be DLRs which had been submitted to the HUB by the activity using the wrong COG. The implication is that some originators have a lax DLR management program and/or inadequate quality control on document preparation. This was particularly noticeable on documents that contained entries of CZ or JZ for the COG. CZ and JZ are SAC-207 fund codes and not valid COGs. (Note: A fund code is a two-element code that

identifies the budget holder and the type of material; i.e., a consumable or repairable item, being requisitioned).

At Norfolk, 42% of the items received were, in fact, non-DLR material and correctly identified as non-DLR material on their attached shipping documentation. For San Diego, 21% of the items received belonged to this category. These items fell primarily under the following COGs: 1H, 1R, 3H, and 5R and thus were probably FLRs (defined in Chapter I, Section A). However, even if they were FLRs, NAVSUPINST 4421.20 states they still should not have been shipped via the ATAC system [Ref. 2, p.3].

VI. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

This chapter summarizes the previous chapters and presents the conclusions reached. That is followed by recommendations for the ATAC system and for further research required to develop a simulation model.

A. SUMMARY

Chapter I introduced the concept of DLRs and gave a brief historical overview of the ATAC Program. Chapter I also discussed DMRD 901 and previous efforts and thesis work on the ATAC Program.

Chapter II presented an overview of the ATAC system. Turn-in procedures for DLR's were discussed and each step of the turn-in process was described in general. The functions and locations of the NODEs and HUBs were discussed and the main purposes of the ATAC system presented.

Chapter III discussed the research methodology used for this thesis. It provided the methods used to convert data into a format conducive to statistical analysis. Chapter III also presented the specific COGs researched in this thesis, explained Julian date conversion for calculating processing times, and the specific computer programs used to derive information required for analysis.

Chapter IV presented an analysis of the data conducted on each COG for each step or process in the ATAC system. Specific data was summarized in tables for each step. The supporting data for these tables was provided in appendices along with histograms for each COG at each step. The data was compared to NAVSUP goals where applicable to determine where improvements need to be made or to identify where the system is functioning satisfactorily.

Chapter V discussed the problem of non-DLR material in the ATAC database. This data was reviewed to discover why it was entering the ATAC system and if it was either consumable type material that should not have been sent to ATAC or if it was, in fact, DLR material that was misidentified on the shipping documentation.

B. CONCLUSIONS

In this section, we discuss the conclusions to the research questions addressed in Chapter I. The format will be an abbreviated restatement of the research question followed by the conclusion.

Is the information in the ATAC database sufficient to identify start and stop times for each event of the process? For the most part, the answer is yes. The exception is the screening of items that go into local storage. Due to the lack information in the database, it was not possible to break into separate activities the screening times and the time to

store. This information could have provided insights into how the material that belonged to this category behaved differently from material slated for shipment to a DOP or another storage site.

Are there any significant problems with the data and what is the effect on the ATAC system? The database contains numerous problems such as number transpositions, missing and incomplete entries, card column shifts, invalid entries, etc. Appendix B, which is the listing of all COGs that entered the ATAC system, contains examples of these types of errors. As discussed in Chapter IV, the quantity of all errors is insignificant compared to the entire database. However, each of those errors still represented a problem that had to be identified so that those records were not included in the analysis. The effect these errors have on the ATAC system is unknown, however, any effect should be minimal given the relative low numbers of errors found.

Does the data suggest that a priority system for material handling be established? Looking at just the data itself, a priority system does not appear to be warranted. For each process, the processing times are similar for each COG (not including shipping times). This indicates that most items are processed the same regardless of COG. To determine if a priority system is needed, further analysis concerning the demand for each COG as well as material availability needs to

be conducted. This is discussed in more detail below in Section C.

Can a model of the ATAC system be developed that mimics the behavior of the material? A model could be developed from the data provided in the appendices if items are aggregated into their respective two-digit COGs. The model would be based upon an average-type DLR for a particular COG. It would not reflect the statistical behavioral differences for individual NIINs. Additionally, it would be based on assumptions that are not necessarily realistic. One is that the arrival rate is assumed to be one-for-one on a first-come first-served basis, neither of which may be true. Another assumption is that all material is processed the same way with no variation in procedures. This is not known to be true and would therefore require someone to actually observe the process. Yet another assumption which needs to be visually confirmed is that there is no priority system either explicit or implicit for handling the material during a particular process. Finally, the number of servers (employees) used for each step in the process is needed but is unknown. Initially, it might be assumed that only one server worked at each step of the process. Therefore, to develop a more realistic model, additional research as well as actual observation of the various ATAC processes is required. This is discussed in the next section.

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Is there enough information to support or oppose DMRD 901? No, not without additional research. Full implementation of DMRD 901 will require knowledge of the demand rates of material down to the NIIN level.

C. RECOMMENDATIONS

In this section, we discuss recommendations for possible improvements to the ATAC system. Additionally, we discuss recommendations for additional research required in order to develop a simulation model of the system and to provide an answer to DMRD 901. The recommendations are as follows:

1. Increase manning levels at the HUBs so that the NAVSUP goals can be met. The material screening portion of the process particularly needs additional personnel. The goal for this process is 3 days. However, the overall average for each HUB is more than double that goal. Based on the this fact, it appears that the screening process is a potential bottleneck in the system. Reducing the bottleneck will help increase material availability and potentially reduce inventory investment.

2. If it is not possible to increase manning levels (a likely occurrence given the current budgetary problems), adjust the NAVSUP goals to match the manning levels. This should only be done, though, if it can be determined that the longer processing times do not affect material availability (and, therefore, fleet readiness).

3. Emphasize to the fleet the necessity for properly identifying material and correctly annotating shipping documentation. Even though misidentified material accounted for a small percentage of all material arrivals, it still represents a waste of scarce resources and contributed to the increase in processing times.

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4. To develop a realistic simulation model of the system and, therefore, to provide an answer to DMRD 901, the following areas are suggested for additional research:

a. Determine the expected demand for material down to the NIIN level. This can be approximated by determining the arrival rate at the HUB for a particular NIIN. Additionally, item managers at the ICPs and program offices at the Hardware Systems commands may be able to provide information on projected demand based on weapon system deployment and phase-out schedules.

Obtaining data down to the NIIN level may entail the use of FORTRAN rather than SAS. For some SAS routines such as the frequency procedure, SAS can only produce output data for up to 32,767 discrete values or items. For 7R COG (and hence, all 7_ COG), the number of different NIINs exceeded that amount. Therefore, using FORTRAN, which is not so constrained, is an option. In addition, the database could be split into smaller data sets.

b. At the NIIN level, determine if the processing times for each step of the ATAC system will reasonably fit a theoretical probability distribution. If not, determine the empirical distribution for each step.

c. Determine if material arrivals are processed on a first-come first-served basis or if there is any implicit priority system in use. If there is a priority system, is it based on COG, NSN, size/weight, etc.? Are there commonly-seen NIINs that are processed faster due to the servers' familiarity with those items?

d. Determine the true arrival pattern (i.e., one-for-one or batch) of material at the HUBs. This will require a visit to a HUB to conduct sampling of the arrivals.

e. Determine the number of servers (workers) used in each stage of the process. This will require visits to both HUBs to observe the number of workers involved in each step. Once a model is developed, the number of servers can be adjusted to determine the effect on system processing times.

f. Determine if the servers follow a consistent pattern in processing the material. The servers being inconsistent in the procedures used may be a source

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of the variability in the processing times. This will also require visits to both HUBs.

g. Determine the character and pattern of misidentified NSNs. Are certain NSNs or families of NIINs repeatedly misidentified? If so, why?

h. Analyze the operating procedures for the individual NODEs. Determine why the NODEs serving San Diego have higher means and standard deviations than those serving Norfolk.

Students continuing research on this project should have a good understanding of queuing models, probability distributions, and experience with mainframe computer languages and programs such as FORTRAN and SAS. Experience with a PC-based spreadsheet program will be of benefit also. Copies of the SAS programs, the spreadsheet files, and other supporting documentation used for the analysis in this thesis will be available from Professors McMasters and Kang. If additional or more current data tapes of the ATAC system are required, Mr. Paul Barraco at NAVMTO should be contacted.

APPENDIX A

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

APA	Appropriation Purchase Account
ASO	Aviation Supply Office
ATAC	Advanced Traceability and Control
CHNAVMAT	Chief of Naval Material
CLF	Combat Logistics Force
CNO	Chief of Naval Operations
COG	Cognizance Symbol
CONUS	Continental United States
DLR	Depot Level Repairable
DMRD	Defense Management Review Decision
DOD	Department of Defense
DOP	Designated Overhaul Point
DSP	Designated Support Point
EI	Engineering Investigation
FLR	Field Level Repairable
FMSO	Fleet Material Support Office
FSC	Federal Supply Code
ICP	Inventory Control Point
IM	Inventory Manager
INCONUS	Inside the Continental United States
LTL	Less Than Truckload

MAC	Military Airlift Command
MCAS	Marine Corps Air Station
MCC	Material Control Code
MMD	Material Movement Document
MRIL	Master Repairable Item List
MTR	Mandatory Turn-in Repairable
NADEP	Naval Aviation Depot
NAS	Naval Air Station
NAVMTO	Navy Material Transportation Office
NAVSUP	Naval Supply Systems Command
NIIN	National Item Identification Number
NRFI	Not-Ready-For-Issue
NSC	Naval Supply Center
NSD	Naval Supply Depot
NSF	Navy Stock Fund
NSN	National Stock Number
NSY	Naval Shipyard
OUTCONUS	Outside the Continental United States
PC	Personal Computer
QDR	Quality Deficiency Report
RFI	Ready-For-Issue
RIP	Remain-in-Place
ROD	Report of Discrepancy
SAS	Statistical Analysis Software

SIMA	Shore Intermediate Maintenance Activity
SM&R	Source, Maintenance and Recoverability Code
SPCC	Ships Parts Control Center
TCN	Transportation Control Number
TDR	Transportation Discrepancy Report
TIR	Transaction Item Report
TL	Truckload
USMC	United States Marine Corps
VCNO	Vice-Chief of Naval Operations

COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent	COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
.7	3	0.001	3	0.001	NZ	16	0.005	304	0.101
+	1	0.000	4	0.001	OH	1	0.000	305	0.101
+7	2	0.001	6	0.002	OJ	1	0.000	306	0.102
.	1	0.000	7	0.003	OR	11	0.004	317	0.106
	2	0.000	9	0.003	OO	18	0.006	335	0.112
C	1	0.000	13	0.003	O1	14	0.005	349	0.117
J	3	0.001	13	0.004	PN	1	0.000	350	0.117
S	2	0.001	15	0.005	PX	1	0.000	351	0.117
A	2	0.001	17	0.006	P5	1	0.000	352	0.118
A1	20	0.007	37	0.013	R	5	0.002	357	0.120
A2	47	0.015	84	0.028	RH	1	0.000	358	0.120
A3	8	0.003	92	0.031	RO	1	0.000	359	0.120
A4	2	0.001	94	0.032	R1	2	0.001	361	0.121
A5	1	0.000	95	0.032	R7	9	0.003	370	0.124
A7	22	0.007	117	0.039	SB	2	0.001	372	0.125
BI	6	0.002	123	0.041	SG	2	0.001	374	0.126
B1	2	0.001	125	0.042	SK	1	0.000	375	0.127
CA	4	0.001	129	0.043	SN	21	0.007	396	0.134
CG	1	0.000	130	0.044	SP	15	0.005	411	0.139
CR	1	0.000	131	0.044	SR	1	0.000	412	0.139
CS	95	0.031	226	0.075	TG	1	0.000	413	0.139
D7	2	0.001	228	0.076	TH	2	0.001	415	0.140
FG	1	0.000	229	0.076	TR	1	0.000	416	0.141
FH	1	0.000	230	0.077	VU	1	0.000	417	0.141
FO	1	0.000	231	0.077	VZ	3	0.001	420	0.142
FO	1	0.000	232	0.077	Y	1	0.000	421	0.142
GE	1	0.000	233	0.078	YG	1	0.000	422	0.143
GK	1	0.000	234	0.078	YH	1	0.000	423	0.143
G7	15	0.005	249	0.083	YR	1	0.000	424	0.143
HD	2	0.001	251	0.084	Y6	6	0.002	430	0.145
HO	1	0.000	252	0.084	Z	4	0.001	434	0.146
H1	1	0.000	253	0.085	ZR	2	0.001	436	0.147
H7	4	0.001	257	0.086	Z1	3	0.001	439	0.148
JB	2	0.001	259	0.087	Z3	1	0.000	440	0.149
JX	4	0.001	263	0.088	Z7	1	0.000	441	0.149
JZ	1	0.000	264	0.088	Z9	3	0.001	444	0.150
J7	1	0.000	265	0.088	0	2	0.001	446	0.151
K0	1	0.000	266	0.089	0A	5	0.002	451	0.153
K5	1	0.000	267	0.089	0C	1	0.000	452	0.153
K9	1	0.000	268	0.089	0E	1	0.000	453	0.154
LK	1	0.000	269	0.090	0F	1	0.000	454	0.154
LO	1	0.000	270	0.090	0G	4	0.001	458	0.155
NH	1	0.000	271	0.090	0H	13	0.004	471	0.159
NN	17	0.006	288	0.096	0J	8	0.003	479	0.162
NZ	16	0.005	304	0.101	0O	788	0.256	1267	0.418
OH	1	0.000	305	0.101	0Q	11	0.004	1278	0.422
OJ	1	0.000	306	0.102	0R	989	0.322	2267	0.744
OR	11	0.004	317	0.106	0U	3	0.001	2270	0.745
OO	18	0.006	335	0.112	0X	1	0.000	2271	0.745
O1	14	0.005	349	0.117	0Z	1	0.000	2272	0.746

B-2: COG LISTING BY HUB - NORFOLK HUB

COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent	COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
00	188	0.061	2460	0.807	3U	1	0.000	15518	5.058
01	281	0.091	2741	0.898	3Z	2	0.001	15520	5.059
02	3	0.001	2744	0.899	37	7	0.002	15527	5.061
03	44	0.014	2788	0.913	4G	18	0.006	15545	5.067
05	3	0.001	2791	0.914	4H	4	0.001	15549	5.068
06	1	0.000	2792	0.914	4M	5	0.002	15554	5.070
07	2	0.001	2794	0.915	4N	6	0.002	15560	5.072
1	40	0.013	2834	0.928	4R	386	0.126	15946	5.198
1B	1	0.000	2835	0.928	4T	2	0.001	15948	5.199
1D	1	0.000	2836	0.929	4V	59	0.019	16007	5.218
1E	2	0.001	2838	0.930	4X	2	0.001	16009	5.219
1F	2	0.001	2840	0.931	4Y	2	0.001	16011	5.220
1G	3	0.001	2843	0.932	4Z	2133	0.694	18144	5.914
1H	1740	0.566	4583	1.498	40	1	0.000	18145	5.914
1N	1	0.000	4584	1.498	42	4	0.001	18149	5.915
1R	7992	2.600	12576	4.098	5	1	0.000	18150	5.916
1S	3	0.001	12579	4.099	5A	1	0.000	18151	5.916
1U	2	0.001	12581	4.100	5D	1	0.000	18152	5.916
1Z	1	0.000	12582	4.100	5G	9	0.003	18161	5.919
13	7	0.002	12589	4.102	5H	4	0.001	18165	5.920
16	1	0.000	12590	4.103	5K	3	0.001	18168	5.921
17	2	0.001	12592	4.104	5M	4	0.001	18172	5.922
2	1	0.000	12593	4.104	5R	88	0.029	18260	5.951
2A	2	0.001	12595	4.105	5S	4	0.001	18264	5.952
2C	3	0.001	12598	4.106	5Z	1	0.000	18265	5.952
2E	3	0.001	12601	4.107	56	1	0.000	18266	5.953
2F	719	0.234	13320	4.341	6A	12	0.004	18278	5.957
2G	5	0.002	13325	4.343	6B	67	0.022	18345	5.979
2H	48	0.016	13373	4.359	6C	8	0.003	18353	5.982
2I	1	0.000	13374	4.359	6D	16	0.005	18369	5.987
2J	36	0.012	13410	4.371	6E	1	0.000	18370	5.987
2L	1	0.000	13411	4.372	6G	26	0.008	18396	5.995
2M	2	0.001	13413	4.373	6H	17	0.006	18413	6.001
2N	4	0.001	13417	4.374	6J	1	0.000	18414	6.001
2P	3	0.001	13420	4.375	6K	193	0.063	18607	6.064
2Q	54	0.018	13474	4.393	6L	28	0.009	18635	6.073
2R	89	0.029	13563	4.422	6M	7	0.002	18642	6.075
2S	90	0.029	13653	4.451	6N	3	0.001	18645	6.076
2T	2	0.001	13655	4.452	6Q	2	0.001	18647	6.077
2V	274	0.089	13929	4.541	6R	1641	0.534	20288	6.611
2W	16	0.005	13945	4.546	6T	6	0.002	20294	6.613
2X	2	0.001	13947	4.547	6V	7	0.002	20301	6.615
2Z	909	0.296	14856	4.843	6X	2	0.001	20303	6.616
26	1	0.000	14857	4.843	6Y	23	0.007	20326	6.623
3	5	0.002	14862	4.845	66	1	0.000	20327	6.624
3A	6	0.002	14868	4.847	67	2	0.001	20329	6.625
3F	1	0.000	14869	4.847	7	18	0.006	20347	6.631
3H	643	0.209	15512	5.056	7A	4	0.001	20351	6.632
3M	1	0.000	15513	5.057	7B	5	0.002	20356	6.634
3R	4	0.001	15517	5.058	7C	5	0.002	20361	6.636

B-3: COG LISTING BY HUB - NORFOLK HUB

COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent	COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
7D	1	0.000	20362	6.636	9K	16	0.005	306664	99.766
7E	3514	1.143	23876	7.779	9L	8	0.003	306672	99.769
7F	24	0.008	23900	7.787	9N	387	0.126	307059	99.895
7G	23239	7.559	47139	15.346	9O	1	0.000	307060	99.895
7H	72203	23.487	119342	38.833	9Q	42	0.014	307102	99.909
7J	4	0.001	119346	38.834	9R	5	0.002	307107	99.911
7K	2	0.001	119348	38.835	9S	6	0.002	307113	99.913
7L	26	0.008	119374	38.843	9V	49	0.016	307162	99.929
7M	3	0.001	119377	38.844	9W	40	0.013	307202	99.942
7N	12	0.004	119389	38.848	9X	4	0.002	307206	99.944
7O	2	0.001	119391	38.849	9Y	58	0.019	307264	99.963
7Q	4	0.001	119395	38.850	9Z	115	0.037	307379	100.000
7R	181661	59.093	301056	97.943	92	1	0.000	307380	100.000
7S	5	0.002	301061	97.945	99	37	0.012	307417	100.000
7T	24	0.008	301085	97.953					
7W	1	0.000	301086	97.953					
7X	7	0.002	301093	97.955					
7Y	4	0.001	301097	97.956					
7Z	4569	1.486	305666	99.442					
70	13	0.004	305679	99.446					
71	7	0.002	305686	99.448					
72	86	0.028	305772	99.476					
73	1	0.000	305773	99.477					
74	35	0.011	305808	99.488					
75	2	0.001	305810	99.489					
76	2	0.001	305812	99.490					
77	9	0.003	305821	99.493					
78	1	0.000	305822	99.493					
8A	13	0.004	305835	99.497					
8B	1	0.000	305836	99.497					
8E	2	0.001	305838	99.498					
8H	5	0.002	305843	99.500					
8N	219	0.071	306062	99.571					
8P	1	0.000	306063	99.572					
8R	13	0.004	306076	99.576					
8U	1	0.000	306077	99.576					
8X	5	0.002	306082	99.578					
8Z	1	0.000	306083	99.578					
87	1	0.000	306084	99.579					
9	4	0.001	306088	99.580					
9A	22	0.007	306110	99.587					
9B	26	0.008	306136	99.595					
9C	121	0.039	306257	99.634					
9D	11	0.004	306268	99.638					
9E	7	0.002	306275	99.640					
9F	123	0.040	306398	99.680					
9G	170	0.055	306568	99.735					
9H	22	0.007	306590	99.742					
9I	20	0.007	306610	99.749					
9J	38	0.012	306648	99.761					

B-4: COG LISTING BY HUB - SAN DIEGO HUB

COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent	COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
+7	3	0.001	3	0.001	TR	1	0.000	854	0.364
AG	1	0.000	4	0.001	UB	1	0.000	855	0.365
AZ	1	0.000	5	0.002	VN	2	0.001	857	0.366
A0	2	0.001	7	0.003	XX	2	0.001	859	0.367
A1	3	0.001	10	0.004	Y	1	0.000	860	0.367
A7	15	0.006	25	0.010	YY	4	0.002	864	0.369
B	1	0.000	26	0.010	Y6	16	0.007	880	0.376
BC	1	0.000	27	0.011	Y9	1	0.000	881	0.376
BQ	1	0.000	28	0.011	Z	14	0.006	895	0.382
CZ	10	0.004	38	0.015	ZA	1	0.000	896	0.383
DR	1	0.000	39	0.016	ZG	1	0.000	897	0.383
D7	1	0.000	40	0.016	Z7	16	0.007	913	0.390
FA	1	0.000	41	0.016	0	6	0.003	919	0.393
GP	10	0.004	51	0.020	0H	1	0.000	920	0.394
GX	6	0.003	57	0.023	0I	1	0.000	921	0.394
G2	4	0.002	61	0.025	0J	11	0.005	932	0.399
G7	1	0.000	62	0.026	0O	592	0.251	1524	0.650
H	1	0.000	63	0.026	0Q	7	0.003	1531	0.653
H2	1	0.000	64	0.027	0R	1172	0.497	2703	1.150
I	2	0.001	66	0.028	0Z	88	0.037	2791	1.187
IH	2	0.001	68	0.029	00	61	0.026	2852	1.213
IR	2	0.001	70	0.030	01	16	0.007	2868	1.220
JY	6	0.003	76	0.033	03	51	0.022	2919	1.242
JZ	485	0.206	561	0.239	05	3	0.001	2922	1.243
J7	15	0.006	576	0.245	06	2	0.001	2924	1.244
K6	1	0.000	577	0.245	1	18	0.008	2942	1.252
K9	31	0.013	608	0.258	1B	1	0.000	2943	1.253
LT	2	0.001	610	0.259	1E	1	0.000	2944	1.253
MH	1	0.000	611	0.260	1H	872	0.370	3816	1.623
NB	4	0.002	615	0.262	1R	3031	1.285	6847	2.908
NO	2	0.001	617	0.263	1T	1	0.000	6848	2.908
NO	13	0.006	630	0.269	1Z	5	0.000	6853	2.909
NU	68	0.029	698	0.298	11	2	0.001	6855	2.910
NY	2	0.001	700	0.299	13	2	0.001	6857	2.911
OI	1	0.000	701	0.299	17	1	0.000	6858	2.911
OJ	4	0.002	705	0.301	2E	2	0.001	6860	2.912
OO	11	0.005	716	0.306	2F	576	0.244	7436	3.156
OR	74	0.031	790	0.337	2G	2	0.001	7438	3.157
OU	1	0.000	791	0.337	2H	131	0.056	7569	3.213
O0	42	0.018	833	0.355	2J	10	0.004	7579	3.217
P7	1	0.000	834	0.356	2N	4	0.002	7583	3.219
QR	1	0.000	835	0.356	2Q	60	0.025	7643	3.244
RA	1	0.000	836	0.357	2R	186	0.079	7829	3.323
RE	1	0.000	837	0.357	2S	37	0.016	7866	3.339
RH	1	0.000	838	0.357	2V	47	0.020	7913	3.359
RY	1	0.000	839	0.358	2W	14	0.006	7927	3.365
R0	3	0.001	842	0.359	2Z	685	0.290	8612	3.655
R7	9	0.004	851	0.363	26	1	0.000	8613	3.656
SF	1	0.000	852	0.363	3B	2	0.001	8615	3.657
TA	1	0.000	853	0.364	3H	506	0.214	9121	3.871

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COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3R	3	0.001	9124	3.872
4A	1	0.000	9125	3.872
4G	51	0.022	9176	3.894
4H	8	0.003	9184	3.897
4M	3	0.001	9187	3.898
4N	55	0.023	9242	3.921
4R	168	0.071	9410	3.992
4T	3	0.001	9413	3.993
4V	17	0.007	9430	4.000
4Z	1815	0.769	11245	4.769
5G	13	0.006	11258	4.775
5H	1	0.000	11259	4.776
5M	8	0.003	11267	4.779
5N	1	0.000	11268	4.779
5R	88	0.037	11356	4.816
5S	6	0.003	11362	4.819
6	1	0.000	11363	4.819
6A	18	0.008	11381	4.827
6B	33	0.014	11414	4.841
6C	2	0.001	11416	4.842
6D	2	0.001	11418	4.843
6F	2	0.001	11420	4.844
6G	42	0.018	11462	4.862
6H	23	0.010	11485	4.872
6J	6	0.003	11491	4.875
6K	480	0.203	11971	5.078
6L	14	0.006	11985	5.084
6M	9	0.004	11994	5.088
6N	2	0.001	11996	5.089
6Q	1	0.000	11997	5.090
6R	1698	0.720	13695	5.810
6S	1	0.000	13696	5.810
6Y	20	0.008	13716	5.818
6Z	1	0.000	13717	5.819
7	19	0.008	13736	5.827
7A	2	0.001	13738	5.828
7B	1	0.000	13739	5.828
7C	1	0.000	13740	5.828
7E	2857	1.211	16597	7.039
7F	8	0.003	16605	7.042
7G	17568	7.446	34173	14.488
7H	63494	26.909	97667	41.397
7J	3	0.001	97670	41.398
7L	9	0.004	97679	41.402
7M	1	0.000	97680	41.403
7N	38	0.016	97718	41.419
7O	3	0.001	97721	41.420
7Q	2	0.001	97723	41.421
7R	131895	55.899	229618	97.320
7S	58	0.025	229676	97.345

COG	Frequency	Percent	Cumulative Frequency	Cumulative Percent
7T	21	0.009	229697	97.354
7V	1	0.000	229698	97.354
7W	1	0.000	229699	97.355
7X	1	0.000	229700	97.355
7Y	3	0.001	229703	97.356
7Z	4984	2.112	234687	99.468
70	8	0.003	234695	99.471
71	2	0.001	234697	99.472
72	1	0.000	234698	99.473
74	1	0.000	234699	99.473
76	2	0.001	234701	99.474
77	4	0.002	234705	99.476
78	2	0.001	234707	99.477
79	2	0.001	234709	99.478
8A	9	0.004	234718	99.482
8G	1	0.000	234719	99.482
8H	37	0.016	234756	99.498
8K	3	0.001	234759	99.499
8N	187	0.079	234946	99.578
8P	2	0.001	234948	99.579
8R	7	0.003	234955	99.582
8S	1	0.000	234956	99.583
8T	1	0.000	234957	99.583
8U	1	0.000	234958	99.584
8X	5	0.002	234963	99.586
8Y	2	0.001	234965	99.587
9A	10	0.004	234975	99.591
9C	79	0.033	235054	99.624
9D	1	0.000	235055	99.624
9E	5	0.002	235060	99.626
9F	174	0.074	235234	99.700
9G	136	0.058	235370	99.758
9H	8	0.003	235378	99.761
9I	55	0.023	235433	99.784
9J	87	0.037	235520	99.821
9K	100	0.042	235620	99.863
9L	5	0.002	235625	99.865
9N	80	0.034	235705	99.899
9O	1	0.000	235706	99.900
9Q	1	0.000	235707	99.900
9R	1	0.000	235708	99.900
9S	11	0.005	235719	99.905
9V	76	0.032	235795	99.937
9W	36	0.015	235831	99.952
9X	8	0.003	235839	99.955
9Y	35	0.015	235874	99.970
9Z	74	0.031	235948	100.000
99	6	0.003	235954	100.000

APPENDIX C: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	6116	3.14%	3.14%	46.5	679	0.35%	84.05%
1.5	14160	7.27%	10.41%	47.5	702	0.36%	84.41%
2.5	6023	3.09%	13.51%	48.5	722	0.37%	84.78%
3.5	5122	2.63%	16.14%	49.5	724	0.37%	85.15%
4.5	4610	2.37%	18.50%	50.5	712	0.37%	85.62%
5.5	4789	2.46%	20.96%	51.5	537	0.28%	85.79%
6.5	6563	3.37%	24.34%	52.5	586	0.30%	86.09%
7.5	8632	4.43%	28.77%	53.5	486	0.25%	86.34%
8.5	7068	3.63%	32.40%	54.5	567	0.29%	86.63%
9.5	6088	3.13%	35.52%	55.5	554	0.28%	86.92%
10.5	5620	2.89%	38.41%	56.5	564	0.29%	87.21%
11.5	5576	2.86%	41.28%	57.5	496	0.25%	87.46%
12.5	6245	3.21%	44.48%	58.5	379	0.19%	87.66%
13.5	6423	3.30%	47.78%	59.5	360	0.18%	87.84%
14.5	6396	3.28%	51.07%	60.5	320	0.16%	88.01%
15.5	4975	2.56%	53.62%	61.5	841	0.43%	88.44%
16.5	3930	2.02%	55.64%	62.5	511	0.26%	88.70%
17.5	3620	1.86%	57.50%	63.5	481	0.25%	88.95%
18.5	3359	1.73%	59.22%	64.5	445	0.23%	89.18%
19.5	3500	1.80%	61.02%	65.5	296	0.15%	89.33%
20.5	3756	1.93%	62.95%	66.5	372	0.19%	89.52%
21.5	3766	1.93%	64.88%	67.5	332	0.17%	89.69%
22.5	2846	1.46%	66.35%	68.5	357	0.18%	89.87%
23.5	2381	1.22%	67.57%	69.5	319	0.16%	90.04%
24.5	2281	1.17%	68.74%	70.5	384	0.20%	90.23%
25.5	2236	1.15%	69.89%	71.5	275	0.14%	90.37%
26.5	2153	1.11%	70.99%	72.5	216	0.11%	90.49%
27.5	2487	1.28%	72.27%	73.5	307	0.16%	90.64%
28.5	2409	1.24%	73.51%	74.5	269	0.14%	90.78%
29.5	1766	0.91%	74.42%	75.5	303	0.16%	90.94%
30.5	1709	0.88%	75.29%	76.5	265	0.14%	91.07%
31.5	1515	0.78%	76.07%	77.5	263	0.14%	91.21%
32.5	1406	0.72%	76.79%	78.5	222	0.11%	91.32%
33.5	1414	0.73%	77.52%	79.5	170	0.09%	91.41%
34.5	1392	0.71%	78.23%	80.5	255	0.13%	91.54%
35.5	1382	0.71%	78.94%	81.5	229	0.12%	91.66%
36.5	1241	0.64%	79.58%	82.5	226	0.12%	91.77%
37.5	901	0.46%	80.04%	83.5	244	0.13%	91.90%
38.5	905	0.46%	80.51%	84.5	218	0.11%	92.01%
39.5	952	0.49%	81.00%	85.5	260	0.13%	92.15%
40.5	958	0.49%	81.49%	86.5	166	0.09%	92.23%
41.5	1009	0.52%	82.01%	87.5	232	0.12%	92.35%
42.5	1032	0.53%	82.54%	88.5	335	0.17%	92.52%
43.5	836	0.43%	82.97%	89.5	230	0.12%	92.64%
44.5	667	0.34%	83.31%	90.5	172	0.09%	92.73%
45.5	754	0.39%	83.70%	>90.5	14159	7.27%	100.00%
					194,711		

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C-2: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR 7R COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	4468	3.70%	3.70%	46.5	326	0.27%	89.86%
1.5	10939	9.07%	12.77%	47.5	284	0.24%	90.09%
2.5	3888	3.22%	16.00%	48.5	346	0.29%	90.38%
3.5	3707	3.07%	19.07%	49.5	317	0.26%	90.64%
4.5	3252	2.70%	21.77%	50.5	309	0.26%	90.90%
5.5	3058	2.54%	24.30%	51.5	260	0.22%	91.11%
6.5	4384	3.63%	27.94%	52.5	245	0.20%	91.32%
7.5	6042	5.01%	32.95%	53.5	240	0.20%	91.52%
8.5	5166	4.28%	37.23%	54.5	285	0.24%	91.75%
9.5	4080	3.38%	40.61%	55.5	262	0.22%	91.97%
10.5	3983	3.30%	43.91%	56.5	227	0.19%	92.16%
11.5	4201	3.48%	47.40%	57.5	230	0.19%	92.35%
12.5	4620	3.83%	51.23%	58.5	166	0.14%	92.49%
13.5	4704	3.90%	55.13%	59.5	164	0.14%	92.62%
14.5	4442	3.68%	58.81%	60.5	156	0.13%	92.75%
15.5	3478	2.88%	61.69%	61.5	203	0.17%	92.92%
16.5	2656	2.20%	63.89%	62.5	275	0.23%	93.15%
17.5	2314	1.92%	65.81%	63.5	238	0.20%	93.34%
18.5	2233	1.85%	67.66%	64.5	235	0.19%	93.54%
19.5	2220	1.84%	69.51%	65.5	136	0.11%	93.65%
20.5	2303	1.91%	71.41%	66.5	123	0.10%	93.75%
21.5	2408	2.00%	73.41%	67.5	174	0.14%	93.90%
22.5	1643	1.36%	74.77%	68.5	144	0.12%	94.02%
23.5	1484	1.23%	76.00%	69.5	160	0.13%	94.15%
24.5	1329	1.10%	77.11%	70.5	144	0.12%	94.27%
25.5	1266	1.05%	78.15%	71.5	136	0.11%	94.38%
26.5	1237	1.03%	79.18%	72.5	98	0.08%	94.46%
27.5	1341	1.11%	80.29%	73.5	114	0.09%	94.56%
28.5	1393	1.15%	81.45%	74.5	113	0.09%	94.65%
29.5	909	0.75%	82.20%	75.5	138	0.11%	94.77%
30.5	774	0.64%	82.84%	76.5	98	0.08%	94.85%
31.5	794	0.66%	83.50%	77.5	92	0.08%	94.92%
32.5	748	0.62%	84.12%	78.5	77	0.06%	94.99%
33.5	741	0.61%	84.74%	79.5	93	0.08%	95.06%
34.5	735	0.61%	85.34%	80.5	107	0.09%	95.15%
35.5	669	0.55%	85.90%	81.5	124	0.10%	95.26%
36.5	634	0.53%	86.42%	82.5	134	0.11%	95.37%
37.5	454	0.38%	86.80%	83.5	114	0.09%	95.46%
38.5	455	0.38%	87.18%	84.5	82	0.07%	95.53%
39.5	442	0.37%	87.54%	85.5	116	0.10%	95.63%
40.5	520	0.43%	87.98%	86.5	69	0.06%	95.68%
41.5	455	0.38%	88.35%	87.5	105	0.09%	95.77%
42.5	463	0.38%	88.74%	88.5	204	0.17%	95.94%
43.5	350	0.29%	89.03%	89.5	154	0.13%	96.07%
44.5	308	0.26%	89.28%	90.5	99	0.08%	96.15%
45.5	366	0.30%	89.59%	>90.5	4645	3.85%	100.00%
					120617		

C-3: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR 7H COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	1287	2.61%	2.61%	46.5	240	0.49%	72.29%
1.5	2327	4.72%	7.33%	47.5	322	0.65%	72.95%
2.5	1272	2.58%	9.91%	48.5	250	0.51%	73.45%
3.5	925	1.88%	11.79%	49.5	296	0.60%	74.05%
4.5	873	1.77%	13.56%	50.5	306	0.62%	74.67%
5.5	941	1.91%	15.47%	51.5	212	0.43%	75.10%
6.5	1298	2.63%	18.10%	52.5	256	0.52%	75.62%
7.5	1459	2.96%	21.06%	53.5	176	0.36%	75.98%
8.5	953	1.93%	23.00%	54.5	201	0.41%	76.39%
9.5	893	1.81%	24.81%	55.5	234	0.47%	76.86%
10.5	940	1.91%	26.72%	56.5	251	0.51%	77.37%
11.5	811	1.65%	28.36%	57.5	192	0.39%	77.76%
12.5	925	1.88%	30.24%	58.5	152	0.31%	78.07%
13.5	1129	2.29%	32.53%	59.5	144	0.29%	78.36%
14.5	1242	2.52%	35.05%	60.5	119	0.24%	78.60%
15.5	932	1.89%	36.94%	61.5	585	1.19%	79.79%
16.5	830	1.68%	38.62%	62.5	164	0.33%	80.12%
17.5	891	1.81%	40.43%	63.5	171	0.35%	80.47%
18.5	804	1.63%	42.06%	64.5	172	0.35%	80.82%
19.5	910	1.85%	43.91%	65.5	106	0.22%	81.04%
20.5	968	1.96%	45.87%	66.5	193	0.39%	81.43%
21.5	990	2.01%	47.88%	67.5	112	0.23%	81.65%
22.5	895	1.82%	49.70%	68.5	153	0.31%	81.96%
23.5	598	1.21%	50.91%	69.5	120	0.24%	82.21%
24.5	648	1.31%	52.23%	70.5	193	0.39%	82.60%
25.5	671	1.36%	53.59%	71.5	100	0.20%	82.80%
26.5	650	1.32%	54.91%	72.5	84	0.17%	82.97%
27.5	711	1.44%	56.35%	73.5	149	0.30%	83.28%
28.5	682	1.38%	57.73%	74.5	93	0.19%	83.46%
29.5	599	1.22%	58.95%	75.5	105	0.21%	83.68%
30.5	539	1.09%	60.04%	76.5	130	0.26%	83.94%
31.5	504	1.02%	61.06%	77.5	116	0.24%	84.18%
32.5	485	0.98%	62.05%	78.5	91	0.18%	84.36%
33.5	448	0.91%	62.96%	79.5	57	0.12%	84.48%
34.5	455	0.92%	63.88%	80.5	116	0.24%	84.71%
35.5	498	1.01%	64.89%	81.5	79	0.16%	84.87%
36.5	414	0.84%	65.73%	82.5	72	0.15%	85.02%
37.5	300	0.61%	66.34%	83.5	88	0.18%	85.20%
38.5	318	0.65%	66.99%	84.5	86	0.17%	85.37%
39.5	385	0.78%	67.77%	85.5	86	0.17%	85.55%
40.5	291	0.59%	68.36%	86.5	59	0.12%	85.67%
41.5	414	0.84%	69.20%	87.5	83	0.17%	85.83%
42.5	403	0.82%	70.01%	88.5	80	0.16%	86.00%
43.5	352	0.71%	70.73%	89.5	54	0.11%	86.11%
44.5	241	0.49%	71.22%	90.5	43	0.09%	86.19%
45.5	290	0.59%	71.81%	>90.5	6805	13.81%	100.00%
					49,287		

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C-4: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR 7G COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	302	1.68%	1.68%	46.5	97	0.54%	76.52%
1.5	613	3.41%	5.10%	47.5	81	0.45%	76.97%
2.5	676	3.76%	8.86%	48.5	105	0.58%	77.56%
3.5	390	2.17%	11.03%	49.5	94	0.52%	78.08%
4.5	384	2.14%	13.17%	50.5	80	0.45%	78.53%
5.5	386	2.15%	15.32%	51.5	56	0.31%	78.84%
6.5	420	2.34%	17.66%	52.5	71	0.40%	79.23%
7.5	640	3.56%	21.22%	53.5	60	0.33%	79.57%
8.5	451	2.51%	23.74%	54.5	75	0.42%	79.98%
9.5	413	2.30%	26.04%	55.5	46	0.26%	80.24%
10.5	385	2.14%	28.18%	56.5	75	0.42%	80.66%
11.5	455	2.53%	30.71%	57.5	63	0.35%	81.01%
12.5	481	2.68%	33.39%	58.5	55	0.31%	81.32%
13.5	459	2.56%	35.95%	59.5	43	0.24%	81.55%
14.5	565	3.15%	39.10%	60.5	36	0.20%	81.76%
15.5	368	2.05%	41.15%	61.5	43	0.24%	81.99%
16.5	348	1.94%	43.08%	62.5	42	0.23%	82.23%
17.5	357	1.99%	45.07%	63.5	58	0.32%	82.55%
18.5	239	1.33%	46.40%	64.5	31	0.17%	82.72%
19.5	308	1.72%	48.12%	65.5	44	0.25%	82.97%
20.5	423	2.36%	50.47%	66.5	53	0.30%	83.26%
21.5	301	1.68%	52.15%	67.5	35	0.19%	83.46%
22.5	247	1.38%	53.53%	68.5	48	0.27%	83.73%
23.5	241	1.34%	54.87%	69.5	31	0.17%	83.90%
24.5	273	1.52%	56.39%	70.5	41	0.23%	84.13%
25.5	255	1.42%	57.81%	71.5	33	0.18%	84.31%
26.5	212	1.18%	58.99%	72.5	30	0.17%	84.48%
27.5	324	1.80%	60.79%	73.5	28	0.16%	84.63%
28.5	266	1.48%	62.27%	74.5	24	0.13%	84.77%
29.5	213	1.19%	63.46%	75.5	51	0.28%	85.05%
30.5	345	1.92%	65.38%	76.5	31	0.17%	85.22%
31.5	156	0.87%	66.25%	77.5	44	0.25%	85.47%
32.5	131	0.73%	66.98%	78.5	49	0.27%	85.74%
33.5	183	1.02%	68.00%	79.5	6	0.03%	85.78%
34.5	152	0.85%	68.85%	80.5	27	0.15%	85.93%
35.5	171	0.95%	69.80%	81.5	20	0.11%	86.04%
36.5	149	0.83%	70.63%	82.5	14	0.08%	86.12%
37.5	112	0.62%	71.25%	83.5	31	0.17%	86.29%
38.5	102	0.57%	71.82%	84.5	35	0.19%	86.48%
39.5	97	0.54%	72.36%	85.5	51	0.28%	86.77%
40.5	100	0.56%	72.92%	86.5	31	0.17%	86.94%
41.5	112	0.62%	73.54%	87.5	41	0.23%	87.17%
42.5	153	0.85%	74.39%	88.5	49	0.27%	87.44%
43.5	100	0.56%	74.95%	89.5	18	0.10%	87.54%
44.5	101	0.56%	75.51%	90.5	26	0.14%	87.69%
45.5	84	0.47%	75.98%	>90.5	2211	12.31%	100.00%
					17,956		

85

C-5: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	27	0.67%	0.67%	46.5	5	0.12%	92.22%
1.5	182	4.49%	5.16%	47.5	6	0.15%	92.37%
2.5	123	3.04%	8.20%	48.5	6	0.15%	92.52%
3.5	46	1.14%	9.33%	49.5	6	0.15%	92.67%
4.5	45	1.11%	10.44%	50.5	9	0.22%	92.89%
5.5	328	8.10%	18.54%	51.5	5	0.12%	93.01%
6.5	357	8.81%	27.36%	52.5	5	0.12%	93.14%
7.5	387	9.56%	36.91%	53.5	3	0.07%	93.21%
8.5	391	9.65%	46.57%	54.5	3	0.07%	93.28%
9.5	645	15.93%	62.49%	55.5	2	0.05%	93.33%
10.5	244	6.02%	68.52%	56.5	3	0.07%	93.41%
11.5	49	1.21%	69.73%	59.5	2	0.05%	93.46%
12.5	160	3.95%	73.68%	60.5	2	0.05%	93.51%
13.5	43	1.06%	74.74%	61.5	2	0.05%	93.56%
14.5	50	1.23%	75.98%	62.5	8	0.20%	93.75%
15.5	124	3.06%	79.04%	63.5	3	0.07%	93.83%
16.5	43	1.06%	80.10%	65.5	4	0.10%	93.93%
17.5	14	0.35%	80.44%	67.5	6	0.15%	94.07%
18.5	21	0.52%	80.96%	68.5	8	0.20%	94.27%
19.5	29	0.72%	81.68%	69.5	1	0.02%	94.30%
20.5	19	0.47%	82.15%	70.5	1	0.02%	94.32%
21.5	11	0.27%	82.42%	71.5	3	0.07%	94.40%
22.5	12	0.30%	82.72%	72.5	2	0.05%	94.44%
23.5	34	0.84%	83.56%	73.5	13	0.32%	94.77%
24.5	11	0.27%	83.83%	74.5	37	0.91%	95.68%
25.5	16	0.40%	84.22%	75.5	1	0.02%	95.70%
26.5	23	0.57%	84.79%	76.5	3	0.07%	95.78%
27.5	57	1.41%	86.20%	77.5	5	0.12%	95.90%
28.5	29	0.72%	86.91%	78.5	2	0.05%	95.95%
29.5	10	0.25%	87.16%	79.5	10	0.25%	96.20%
30.5	15	0.37%	87.53%	80.5	2	0.05%	96.25%
31.5	29	0.72%	88.25%	81.5	1	0.02%	96.27%
32.5	17	0.42%	88.67%	83.5	4	0.10%	96.37%
33.5	11	0.27%	88.94%	84.5	6	0.15%	96.52%
34.5	10	0.25%	89.19%	85.5	1	0.02%	96.54%
35.5	17	0.42%	89.60%	86.5	3	0.07%	96.62%
36.5	20	0.49%	90.10%	87.5	1	0.02%	96.64%
37.5	11	0.27%	90.37%	89.5	2	0.05%	96.69%
38.5	10	0.25%	90.62%	91.5	1	0.02%	96.72%
39.5	8	0.20%	90.81%	>91.5	130	3.28%	100.00%
40.5	6	0.15%	90.96%		4,050		
41.5	12	0.30%	91.26%				
42.5	5	0.12%	91.38%				
43.5	25	0.62%	92.00%				
44.5	3	0.07%	92.07%				
45.5	1	0.02%	92.10%				

C-6: SHIPPING TIMES FROM ORGINATORS TO THE NORFOLK HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	30	1.17%	1.17%	46.5	10	0.39%	76.72%
1.5	95	3.69%	4.86%	47.5	9	0.35%	77.07%
2.5	62	2.41%	7.27%	48.5	15	0.58%	77.65%
3.5	51	1.98%	9.25%	49.5	8	0.31%	77.96%
4.5	56	2.18%	11.43%	50.5	7	0.27%	78.24%
5.5	60	2.33%	13.76%	51.5	3	0.12%	78.35%
6.5	100	3.89%	17.64%	52.5	9	0.35%	78.70%
7.5	99	3.85%	21.49%	53.5	7	0.27%	78.97%
8.5	76	2.95%	24.45%	54.5	3	0.12%	79.09%
9.5	51	1.98%	26.43%	55.5	9	0.35%	79.44%
10.5	63	2.45%	28.88%	56.5	8	0.31%	79.75%
11.5	57	2.22%	31.09%	57.5	10	0.39%	80.14%
12.5	55	2.14%	33.23%	58.5	6	0.23%	80.37%
13.5	81	3.15%	36.38%	59.5	6	0.23%	80.61%
14.5	75	2.91%	39.29%	60.5	7	0.27%	80.88%
15.5	57	2.22%	41.51%	61.5	7	0.27%	81.15%
16.5	51	1.98%	43.49%	62.5	8	0.31%	81.46%
17.5	43	1.67%	45.16%	63.5	10	0.39%	81.85%
18.5	60	2.33%	47.49%	64.5	7	0.27%	82.12%
19.5	31	1.20%	48.70%	65.5	5	0.19%	82.32%
20.5	40	1.55%	50.25%	66.5	3	0.12%	82.43%
21.5	50	1.94%	52.20%	67.5	5	0.19%	82.63%
22.5	45	1.75%	53.94%	68.5	4	0.16%	82.78%
23.5	22	0.86%	54.80%	69.5	6	0.23%	83.02%
24.5	15	0.58%	55.38%	70.5	4	0.16%	83.17%
25.5	26	1.01%	56.39%	71.5	3	0.12%	83.29%
26.5	30	1.17%	57.56%	72.5	1	0.04%	83.33%
27.5	46	1.79%	59.35%	73.5	3	0.12%	83.44%
28.5	36	1.40%	60.75%	74.5	2	0.08%	83.52%
29.5	32	1.24%	61.99%	75.5	8	0.31%	83.83%
30.5	34	1.32%	63.31%	76.5	3	0.12%	83.95%
31.5	32	1.24%	64.55%	77.5	6	0.23%	84.18%
32.5	25	0.97%	65.53%	78.5	3	0.12%	84.30%
33.5	31	1.20%	66.73%	79.5	4	0.16%	84.45%
34.5	39	1.52%	68.25%	80.5	3	0.12%	84.57%
35.5	25	0.97%	69.22%	81.5	4	0.16%	84.73%
36.5	23	0.89%	70.11%	82.5	6	0.23%	84.96%
37.5	23	0.89%	71.01%	83.5	7	0.27%	85.23%
38.5	20	0.78%	71.78%	84.5	9	0.35%	85.58%
39.5	20	0.78%	72.56%	85.5	6	0.23%	85.81%
40.5	40	1.55%	74.12%	86.5	3	0.12%	85.93%
41.5	16	0.62%	74.74%	87.5	1	0.04%	85.97%
42.5	7	0.27%	75.01%	88.5	2	0.08%	86.05%
43.5	7	0.27%	75.28%	89.5	2	0.08%	86.13%
44.5	14	0.54%	75.83%	90.5	4	0.16%	86.28%
45.5	13	0.51%	76.33%	>90.5	353	13.72%	100.00%
					2,573		

SHIPPING TIME FROM ORIGINATOR TO HUB

7R 68620

MEAN = 21.80 Days
ST DEV = 32.48 Days

SHIPPING TIME FROM ORIGINATOR TO HUB
7E 68620

MEAN = 43.48 Days
ST DEV = 61.22 Days

Frequency of Observation
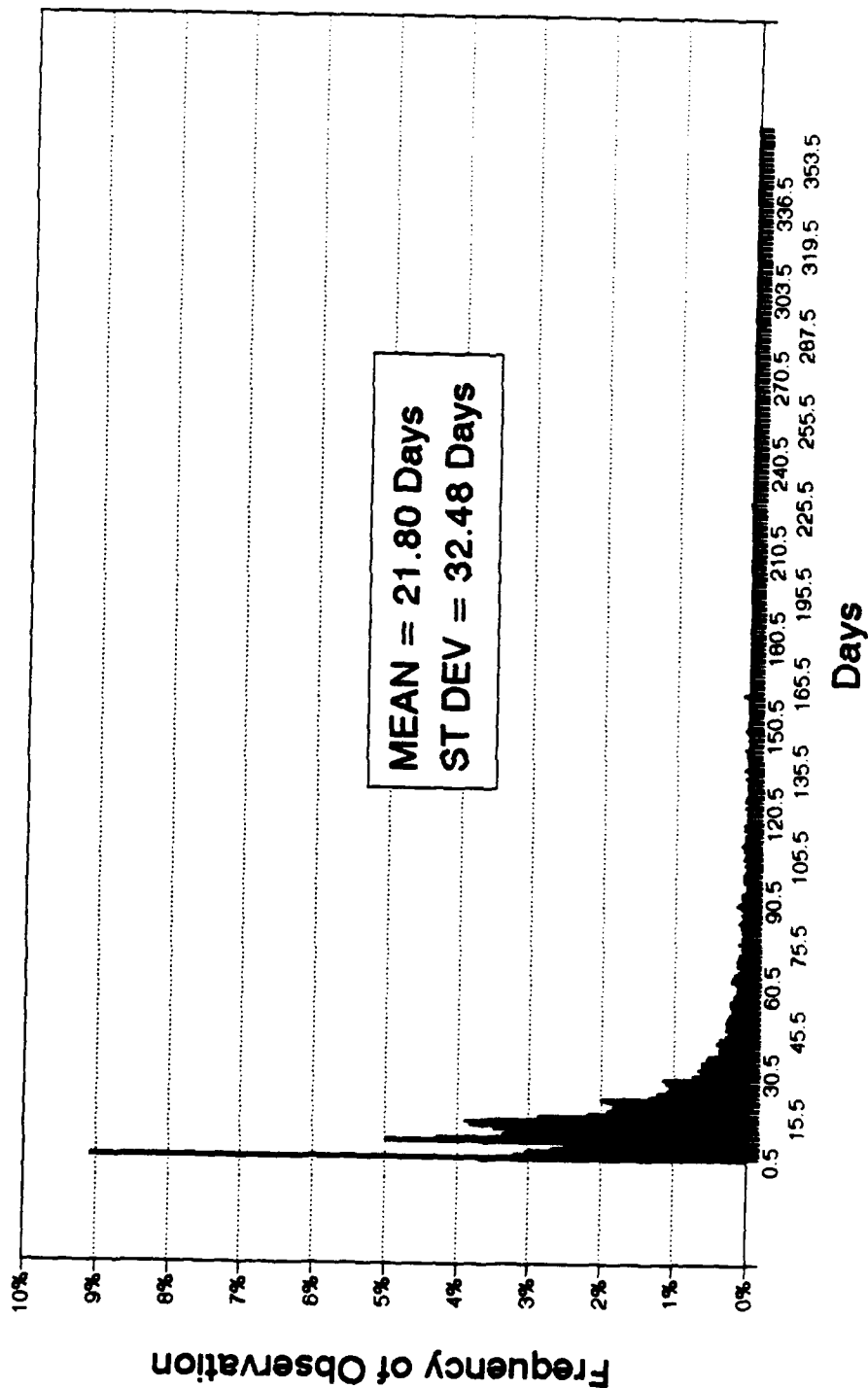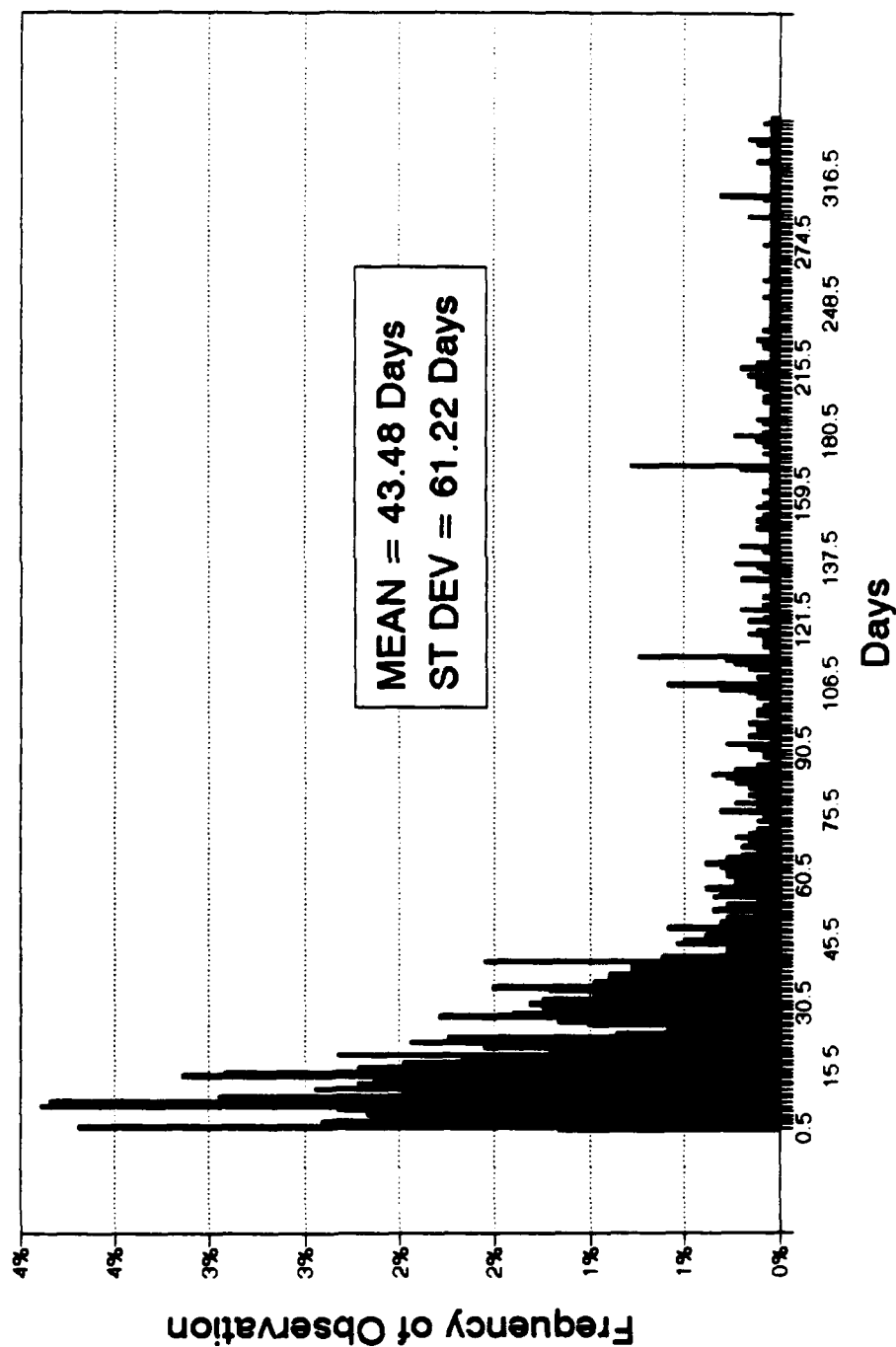
Days

APPENDIX D: SHIPPING TIMES FROM ORGINATORS TO THE SAN DIEGO HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	3359	2.34%	2.34%	46.5	430	0.30%	84.63%
1.5	20794	14.48%	16.82%	47.5	410	0.29%	84.92%
2.5	8000	5.57%	22.40%	48.5	503	0.35%	85.27%
3.5	7529	5.24%	27.64%	49.5	513	0.36%	85.62%
4.5	6739	4.69%	32.33%	50.5	320	0.22%	85.85%
5.5	5863	4.08%	36.42%	51.5	377	0.26%	86.11%
6.5	6372	4.44%	40.86%	52.5	254	0.18%	86.29%
7.5	5949	4.14%	45.00%	53.5	230	0.16%	86.45%
8.5	4299	2.99%	47.99%	54.5	344	0.24%	86.69%
9.5	3051	2.13%	50.12%	55.5	362	0.25%	86.94%
10.5	2424	1.69%	51.81%	56.5	370	0.26%	87.20%
11.5	2334	1.63%	53.43%	57.5	316	0.22%	87.42%
12.5	3207	2.23%	55.67%	58.5	297	0.21%	87.62%
13.5	3181	2.22%	57.88%	59.5	259	0.18%	87.80%
14.5	3372	2.35%	60.23%	60.5	247	0.17%	87.98%
15.5	2537	1.77%	62.00%	61.5	189	0.13%	88.11%
16.5	1881	1.31%	63.31%	62.5	254	0.18%	88.28%
17.5	2292	1.60%	64.90%	63.5	261	0.18%	88.47%
18.5	1846	1.29%	66.19%	64.5	205	0.14%	88.61%
19.5	2150	1.50%	67.69%	65.5	223	0.16%	88.76%
20.5	1867	1.30%	68.99%	66.5	196	0.14%	88.90%
21.5	1949	1.36%	70.35%	67.5	248	0.17%	89.07%
22.5	1651	1.15%	71.50%	68.5	213	0.15%	89.22%
23.5	1213	0.84%	72.34%	69.5	226	0.16%	89.38%
24.5	1124	0.78%	73.12%	70.5	256	0.18%	89.56%
25.5	1082	0.75%	73.88%	71.5	244	0.17%	89.73%
26.5	1077	0.75%	74.63%	72.5	351	0.24%	89.97%
27.5	1367	0.95%	75.58%	73.5	290	0.20%	90.17%
28.5	1333	0.93%	76.51%	74.5	225	0.16%	90.33%
29.5	1083	0.75%	77.26%	75.5	341	0.24%	90.57%
30.5	777	0.54%	77.80%	76.5	221	0.15%	90.72%
31.5	997	0.69%	78.50%	77.5	209	0.15%	90.87%
32.5	771	0.54%	79.03%	78.5	137	0.10%	90.96%
33.5	723	0.50%	79.54%	79.5	201	0.14%	91.10%
34.5	751	0.52%	80.06%	80.5	466	0.32%	91.43%
35.5	680	0.47%	80.53%	81.5	187	0.13%	91.56%
36.5	706	0.49%	81.03%	82.5	165	0.11%	91.67%
37.5	597	0.42%	81.44%	83.5	168	0.12%	91.79%
38.5	545	0.38%	81.82%	84.5	201	0.14%	91.93%
39.5	580	0.40%	82.23%	85.5	214	0.15%	92.08%
40.5	488	0.34%	82.57%	86.5	163	0.11%	92.19%
41.5	536	0.37%	82.94%	87.5	145	0.10%	92.29%
42.5	590	0.41%	83.35%	88.5	168	0.12%	92.41%
43.5	513	0.36%	83.71%	89.5	143	0.10%	92.51%
44.5	393	0.27%	83.98%	90.5	131	0.09%	92.60%
45.5	503	0.35%	84.33%	>90.5	10622	7.40%	100.00%
					143570		

90

D-2: **SHIPPING TIMES FROM ORGINATORS TO THE SAN DIEGO HUB FOR 7R COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	899	1.02%	1.02%	46.5	211	0.24%	85.39%
1.5	12637	14.37%	15.39%	47.5	150	0.17%	85.56%
2.5	5005	5.69%	21.08%	48.5	331	0.38%	85.93%
3.5	5474	6.22%	27.30%	49.5	292	0.33%	86.27%
4.5	4695	5.34%	32.64%	50.5	204	0.23%	86.50%
5.5	4262	4.85%	37.49%	51.5	153	0.17%	86.67%
6.5	4058	4.61%	42.10%	52.5	107	0.12%	86.79%
7.5	3772	4.29%	46.39%	53.5	139	0.16%	86.95%
8.5	2761	3.14%	49.53%	54.5	203	0.23%	87.18%
9.5	1801	2.05%	51.57%	55.5	188	0.21%	87.40%
10.5	1653	1.88%	53.45%	56.5	180	0.20%	87.60%
11.5	1634	1.86%	55.31%	57.5	200	0.23%	87.83%
12.5	2040	2.32%	57.63%	58.5	113	0.13%	87.96%
13.5	1854	2.11%	59.74%	59.5	156	0.18%	88.13%
14.5	2205	2.51%	62.24%	60.5	174	0.20%	88.33%
15.5	1685	1.92%	64.16%	61.5	128	0.15%	88.48%
16.5	1251	1.42%	65.58%	62.5	137	0.16%	88.63%
17.5	1048	1.19%	66.77%	63.5	146	0.17%	88.80%
18.5	1130	1.28%	68.06%	64.5	139	0.16%	88.96%
19.5	1256	1.43%	69.49%	65.5	157	0.18%	89.13%
20.5	1190	1.35%	70.84%	66.5	131	0.15%	89.28%
21.5	1226	1.39%	72.23%	67.5	177	0.20%	89.48%
22.5	1060	1.21%	73.44%	68.5	159	0.18%	89.67%
23.5	730	0.83%	74.27%	69.5	97	0.11%	89.78%
24.5	729	0.83%	75.10%	70.5	166	0.19%	89.96%
25.5	707	0.80%	75.90%	71.5	175	0.20%	90.16%
26.5	657	0.75%	76.65%	72.5	210	0.24%	90.40%
27.5	651	0.74%	77.39%	73.5	243	0.28%	90.68%
28.5	659	0.75%	78.14%	74.5	165	0.19%	90.87%
29.5	652	0.74%	78.88%	75.5	142	0.16%	91.03%
30.5	460	0.52%	79.40%	76.5	183	0.21%	91.24%
31.5	407	0.46%	79.86%	77.5	157	0.18%	91.41%
32.5	448	0.51%	80.37%	78.5	94	0.11%	91.52%
33.5	420	0.48%	80.85%	79.5	162	0.18%	91.71%
34.5	473	0.54%	81.39%	80.5	130	0.15%	91.85%
35.5	421	0.48%	81.87%	81.5	141	0.16%	92.01%
36.5	440	0.50%	82.37%	82.5	130	0.15%	92.16%
37.5	349	0.40%	82.76%	83.5	105	0.12%	92.28%
38.5	298	0.34%	83.10%	84.5	155	0.18%	92.46%
39.5	280	0.32%	83.42%	85.5	140	0.16%	92.62%
40.5	282	0.32%	83.74%	86.5	101	0.11%	92.73%
41.5	280	0.32%	84.06%	87.5	70	0.08%	92.81%
42.5	325	0.37%	84.43%	88.5	123	0.14%	92.95%
43.5	248	0.28%	84.71%	89.5	70	0.08%	93.03%
44.5	185	0.21%	84.92%	90.5	59	0.07%	93.10%
45.5	198	0.23%	85.15%	>90.5	6072	6.90%	100.00%
					87960		

D-3:   **SHIPPING TIMES FROM ORGINATORS**
         TO THE SAN DIEGO HUB FOR 7H COG

			Cumulative				Cumulative
Days	**Count**	**Percent**	**Percent**	**Days**	**Count**	**Percent**	**Percent**
0.5	1385	3.44%	3.44%	46.5	178	0.44%	83.75%
1.5	6825	16.97%	20.41%	47.5	219	0.54%	84.30%
2.5	2292	5.70%	26.11%	48.5	107	0.27%	84.56%
3.5	1606	3.99%	30.10%	49.5	193	0.48%	85.04%
4.5	1574	3.91%	34.01%	50.5	76	0.19%	85.23%
5.5	1213	3.02%	37.03%	51.5	194	0.48%	85.72%
6.5	1590	3.95%	40.98%	52.5	95	0.24%	85.95%
7.5	1567	3.90%	44.88%	53.5	56	0.14%	86.09%
8.5	1042	2.59%	47.47%	54.5	117	0.29%	86.38%
9.5	806	2.00%	49.47%	55.5	136	0.34%	86.72%
10.5	453	1.13%	50.60%	56.5	146	0.36%	87.08%
11.5	485	1.21%	51.80%	57.5	93	0.23%	87.31%
12.5	821	2.04%	53.84%	58.5	145	0.36%	87.67%
13.5	986	2.45%	56.30%	59.5	52	0.13%	87.80%
14.5	814	2.02%	58.32%	60.5	49	0.12%	87.93%
15.5	516	1.28%	59.60%	61.5	42	0.10%	88.03%
16.5	423	1.05%	60.65%	62.5	88	0.22%	88.25%
17.5	991	2.46%	63.12%	63.5	88	0.22%	88.47%
18.5	459	1.14%	64.26%	64.5	49	0.12%	88.59%
19.5	660	1.64%	65.90%	65.5	42	0.10%	88.69%
20.5	455	1.13%	67.03%	66.5	46	0.11%	88.81%
21.5	492	1.22%	68.25%	67.5	54	0.13%	88.94%
22.5	353	0.88%	69.13%	68.5	42	0.10%	89.05%
23.5	320	0.80%	69.93%	69.5	105	0.26%	89.31%
24.5	268	0.67%	70.59%	70.5	72	0.18%	89.49%
25.5	256	0.64%	71.23%	71.5	50	0.12%	89.61%
26.5	304	0.76%	71.99%	72.5	110	0.27%	89.88%
27.5	513	1.28%	73.26%	73.5	28	0.07%	89.95%
28.5	453	1.13%	74.39%	74.5	48	0.12%	90.07%
29.5	312	0.78%	75.16%	75.5	179	0.44%	90.52%
30.5	238	0.59%	75.75%	76.5	21	0.05%	90.57%
31.5	461	1.15%	76.90%	77.5	41	0.10%	90.67%
32.5	224	0.56%	77.46%	78.5	24	0.06%	90.73%
33.5	201	0.50%	77.96%	79.5	22	0.05%	90.79%
34.5	150	0.37%	78.33%	80.5	328	0.82%	91.60%
35.5	152	0.38%	78.71%	81.5	23	0.06%	91.66%
36.5	182	0.45%	79.16%	82.5	24	0.06%	91.72%
37.5	160	0.40%	79.56%	83.5	54	0.13%	91.85%
38.5	169	0.42%	79.98%	84.5	34	0.08%	91.94%
39.5	252	0.63%	80.60%	85.5	56	0.14%	92.08%
40.5	135	0.34%	80.94%	86.5	43	0.11%	92.18%
41.5	194	0.48%	81.42%	87.5	72	0.18%	92.36%
42.5	162	0.40%	81.82%	88.5	38	0.09%	92.46%
43.5	193	0.48%	82.30%	89.5	56	0.14%	92.60%
44.5	156	0.39%	82.69%	90.5	34	0.08%	92.68%
45.5	249	0.62%	83.31%	>90.5	2944	7.32%	100.00%
					40225		

D-4: **SHIPPING TIMES FROM ORGINATORS TO THE SAN DIEGO HUB FOR 7G COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	478	4.54%	4.54%	46.5	36	0.34%	80.78%
1.5	489	4.65%	9.19%	47.5	33	0.31%	81.10%
2.5	404	3.84%	13.03%	48.5	53	0.50%	81.60%
3.5	212	2.01%	15.04%	49.5	25	0.24%	81.84%
4.5	272	2.58%	17.63%	50.5	33	0.31%	82.15%
5.5	219	2.08%	19.71%	51.5	24	0.23%	82.38%
6.5	547	5.20%	24.91%	52.5	43	0.41%	82.79%
7.5	463	4.40%	29.31%	53.5	29	0.28%	83.07%
8.5	401	3.81%	33.12%	54.5	20	0.19%	83.26%
9.5	254	2.41%	35.53%	55.5	22	0.21%	83.46%
10.5	237	2.25%	37.78%	56.5	38	0.36%	83.83%
11.5	166	1.58%	39.36%	57.5	17	0.16%	83.99%
12.5	292	2.77%	42.14%	58.5	20	0.19%	84.18%
13.5	286	2.72%	44.85%	59.5	37	0.35%	84.53%
14.5	276	2.62%	47.48%	60.5	19	0.18%	84.71%
15.5	272	2.58%	50.06%	61.5	17	0.16%	84.87%
16.5	169	1.61%	51.67%	62.5	23	0.22%	85.09%
17.5	209	1.99%	53.65%	63.5	19	0.18%	85.27%
18.5	175	1.66%	55.32%	64.5	13	0.12%	85.39%
19.5	201	1.91%	57.23%	65.5	13	0.12%	85.52%
20.5	194	1.84%	59.07%	66.5	14	0.13%	85.65%
21.5	181	1.72%	60.79%	67.5	13	0.12%	85.77%
22.5	191	1.82%	62.61%	68.5	12	0.11%	85.89%
23.5	99	0.94%	63.55%	69.5	12	0.11%	86.00%
24.5	103	0.98%	64.53%	70.5	9	0.09%	86.09%
25.5	93	0.88%	65.41%	71.5	16	0.15%	86.24%
26.5	86	0.82%	66.23%	72.5	25	0.24%	86.48%
27.5	174	1.65%	67.88%	73.5	11	0.10%	86.58%
28.5	206	1.96%	69.84%	74.5	11	0.10%	86.69%
29.5	87	0.83%	70.66%	75.5	16	0.15%	86.84%
30.5	65	0.62%	71.28%	76.5	11	0.10%	86.94%
31.5	101	0.96%	72.24%	77.5	4	0.04%	86.98%
32.5	65	0.62%	72.86%	78.5	14	0.13%	87.11%
33.5	90	0.86%	73.71%	79.5	15	0.14%	87.26%
34.5	94	0.89%	74.61%	80.5	6	0.06%	87.31%
35.5	85	0.81%	75.42%	81.5	11	0.10%	87.42%
36.5	67	0.64%	76.05%	82.5	7	0.07%	87.48%
37.5	74	0.70%	76.76%	83.5	8	0.08%	87.56%
38.5	59	0.56%	77.32%	84.5	8	0.08%	87.64%
39.5	35	0.33%	77.65%	85.5	16	0.15%	87.79%
40.5	52	0.49%	78.14%	86.5	11	0.10%	87.89%
41.5	45	0.43%	78.57%	87.5	1	0.01%	87.90%
42.5	69	0.66%	79.23%	88.5	6	0.06%	87.96%
43.5	50	0.48%	79.70%	89.5	15	0.14%	88.10%
44.5	34	0.32%	80.02%	90.5	32	0.30%	88.41%
45.5	44	0.42%	80.44%	>90.5	1220	11.59%	100.00%
					10523		

D-5: SHIPPING TIMES FROM ORGINATORS TO THE SAN DIEGO HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	545	16.99%	16.99%	46.5	2	0.06%	89.24%
1.5	751	23.42%	40.41%	47.5	1	0.03%	89.27%
2.5	250	7.80%	48.21%	48.5	9	0.28%	89.55%
3.5	193	6.02%	54.23%	49.5	2	0.06%	89.62%
4.5	147	4.58%	58.81%	50.5	2	0.06%	89.68%
5.5	125	3.90%	62.71%	51.5	6	0.19%	89.87%
6.5	115	3.59%	66.29%	52.5	5	0.16%	90.02%
7.5	70	2.18%	68.48%	53.5	1	0.03%	90.05%
8.5	60	1.87%	70.35%	55.5	7	0.22%	90.27%
9.5	62	1.93%	72.28%	56.5	4	0.12%	90.40%
10.5	42	1.31%	73.59%	57.5	4	0.12%	90.52%
11.5	21	0.65%	74.24%	58.5	12	0.37%	90.89%
12.5	24	0.75%	74.99%	59.5	6	0.19%	91.08%
13.5	20	0.62%	75.62%	61.5	1	0.03%	91.11%
14.5	32	1.00%	76.61%	62.5	4	0.12%	91.24%
15.5	23	0.72%	77.33%	63.5	3	0.09%	91.33%
16.5	18	0.56%	77.89%	64.5	2	0.06%	91.39%
17.5	15	0.47%	78.36%	65.5	10	0.31%	91.71%
18.5	19	0.59%	78.95%	66.5	3	0.09%	91.80%
19.5	5	0.16%	79.11%	69.5	10	0.31%	92.11%
20.5	8	0.25%	79.36%	70.5	1	0.03%	92.14%
21.5	21	0.65%	80.01%	71.5	2	0.06%	92.20%
22.5	30	0.94%	80.95%	73.5	5	0.16%	92.36%
23.5	46	1.43%	82.38%	76.5	1	0.03%	92.39%
24.5	6	0.19%	82.57%	77.5	2	0.06%	92.45%
25.5	14	0.44%	83.01%	78.5	3	0.09%	92.55%
26.5	6	0.19%	83.19%	81.5	9	0.28%	92.83%
27.5	12	0.37%	83.57%	82.5	3	0.09%	92.92%
28.5	3	0.09%	83.66%	85.5	1	0.03%	92.95%
29.5	13	0.41%	84.07%	86.5	6	0.19%	93.14%
30.5	7	0.22%	84.28%	87.5	2	0.06%	93.20%
31.5	5	0.16%	84.44%	88.5	1	0.03%	93.23%
32.5	23	0.72%	85.16%	89.5	2	0.06%	93.30%
33.5	8	0.25%	85.41%	90.5	6	0.19%	93.48%
34.5	27	0.84%	86.25%	>90.5	209	6.52%	100.00%
35.5	8	0.25%	86.50%		3207		
36.5	7	0.22%	86.72%				
37.5	4	0.12%	86.84%				
38.5	7	0.22%	87.06%				
39.5	6	0.19%	87.25%				
40.5	13	0.41%	87.65%				
41.5	8	0.25%	87.90%				
42.5	21	0.65%	88.56%				
43.5	9	0.28%	88.84%				
44.5	10	0.31%	89.15%				
45.5	1	0.03%	89.18%				

D-6: SHIPPING TIMES FROM ORGINATORS TO THE SAN DIEGO HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	50	3.17%	3.17%	46.5	3	0.19%	81 67%
1.5	,87	5.52%	8.69%	47.5	6	0.38%	82.05%
2.5	48	3.04%	11.73%	48.5	3	0.19%	82.24%
3.5	42	2.66%	14.39%	49.5	1	0.06%	82.31%
4.5	50	3.17%	17.56%	50.5	5	0.32%	82.63%
5.5	42	2.66%	20.23%	52.5	4	0.25%	82.88%
6.5	60	3.80%	24.03%	53.5	4	0.25%	83.13%
7.5	76	4.82%	28.85%	54.5	4	0.25%	83.39%
8.5	35	2.22%	31.07%	55.5	9	0.57%	83.96%
9.5	126	7.99%	39.06%	56.5	1	0.06%	84 02%
10.5	32	2.03%	41.09%	57.5	2	0.13%	84.15%
11.5	27	1.71%	42.80%	58.5	6	0.38%	84.53%
12.5	29	1.84%	⟨ 4%	59.5	6	0.38%	84.91%
13.5	33	2.09%	73%	60.5	5	0.32%	85.23%
14.5	44	2.79%	.2%	61.5	1	0.06%	85.29%
15.5	34	2.16%	.68%	62.5	2	0.13%	85.42%
16.5	20	1.27%	52.95%	63.5	4	0.25%	85.67%
17.5	27	1.71%	54.66%	64.5	2	0.13%	85.80%
18.5	62	3.93%	58.59%	65.5	1	0.06%	85.86%
19.5	28	1.78%	60.37%	66.5	2	0.13%	85.99%
20.5	20	1.27%	61.64%	67.5	4	0.25%	86.24%
21.5	27	1.71%	63.35%	69.5	1	0.06%	86.30%
22.5	16	1.01%	64.36%	70.5	8	0.51%	86.81%
23.5	17	1.08%	65.44%	71.5	1	0.06%	86.87%
24.5	18	1.14%	66.58%	72.5	6	0.38%	87.25%
25.5	12	0.76%	67.34%	73.5	3	0.19%	87.44%
26.5	22	1.40%	68.74%	74.5	1	0.06%	87.51%
27.5	16	1.01%	69.75%	75.5	4	0.25%	87.76%
28.5	11	0.70%	70.45%	76.5	5	0.32%	88.08%
29.5	18	1.14%	71.59%	77.5	4	0.25%	88.33%
30.5	6	0.38%	71.97%	78.5	2	0.13%	88.46%
31.5	23	1.46%	73.43%	79.5	2	0.13%	88.59%
32.5	11	0.70%	74.13%	80.5	2	0.13%	88.71%
33.5	3	0.19%	74.32%	81.5	3	0.19%	88.90%
34.5	6	0.38%	74.70%	82.5	1	0.06%	88.97%
35.5	14	0.89%	75.59%	83.5	1	0.06%	89.03%
36.5	9	0.57%	76.16%	84.5	3	0.19%	89.22%
37.5	10	0.63%	76.79%	85.5	1	0.06%	89.28%
38.5	12	0.76%	77.55%	86.5	2	0.13%	89.41%
39.5	6	0.38%	77.93%	91.5	1	0.06%	89.47%
40.5	6	0.38%	78.31%	>91.5	166	10.53%	100.00%
41.5	9	0.57%	78.88%		1577		
42.5	13	0.82%	79.71%				
43.5	13	0.82%	80.53%				
44.5	6	0.38%	80.91%				
45.5	9	0.57%	81.48%				

SHIPPING TIME FROM ORIGINATOR TO HUB
7R 46433

MEAN = 25.23 Days
ST DEV = 42.36 Days

Frequency of Observation

Days

SHIPPING TIME FROM ORIGINATOR TO HUB
7E 46433

MEAN = 36.54 Days
ST DEV = 57.79 Days

97
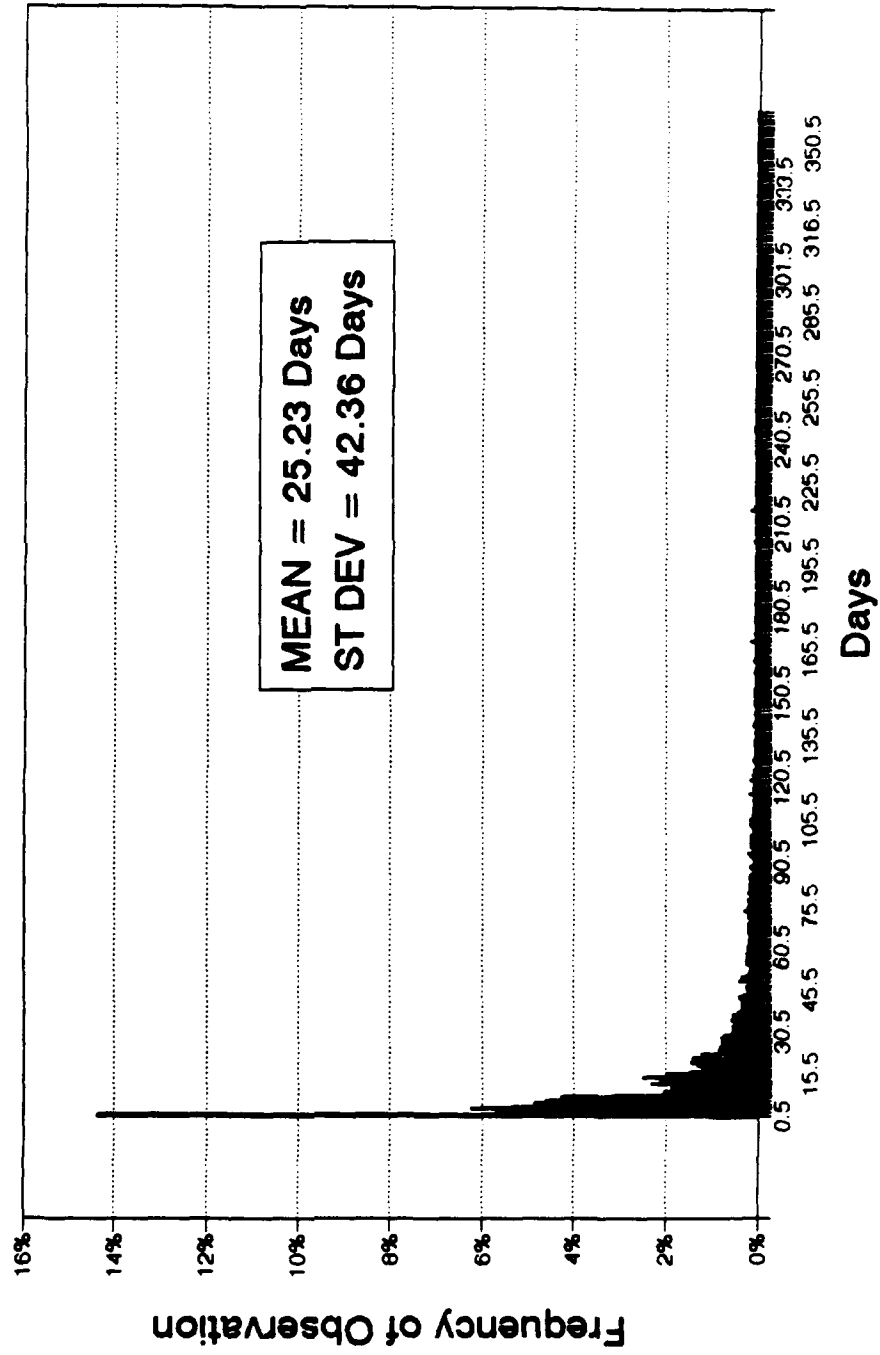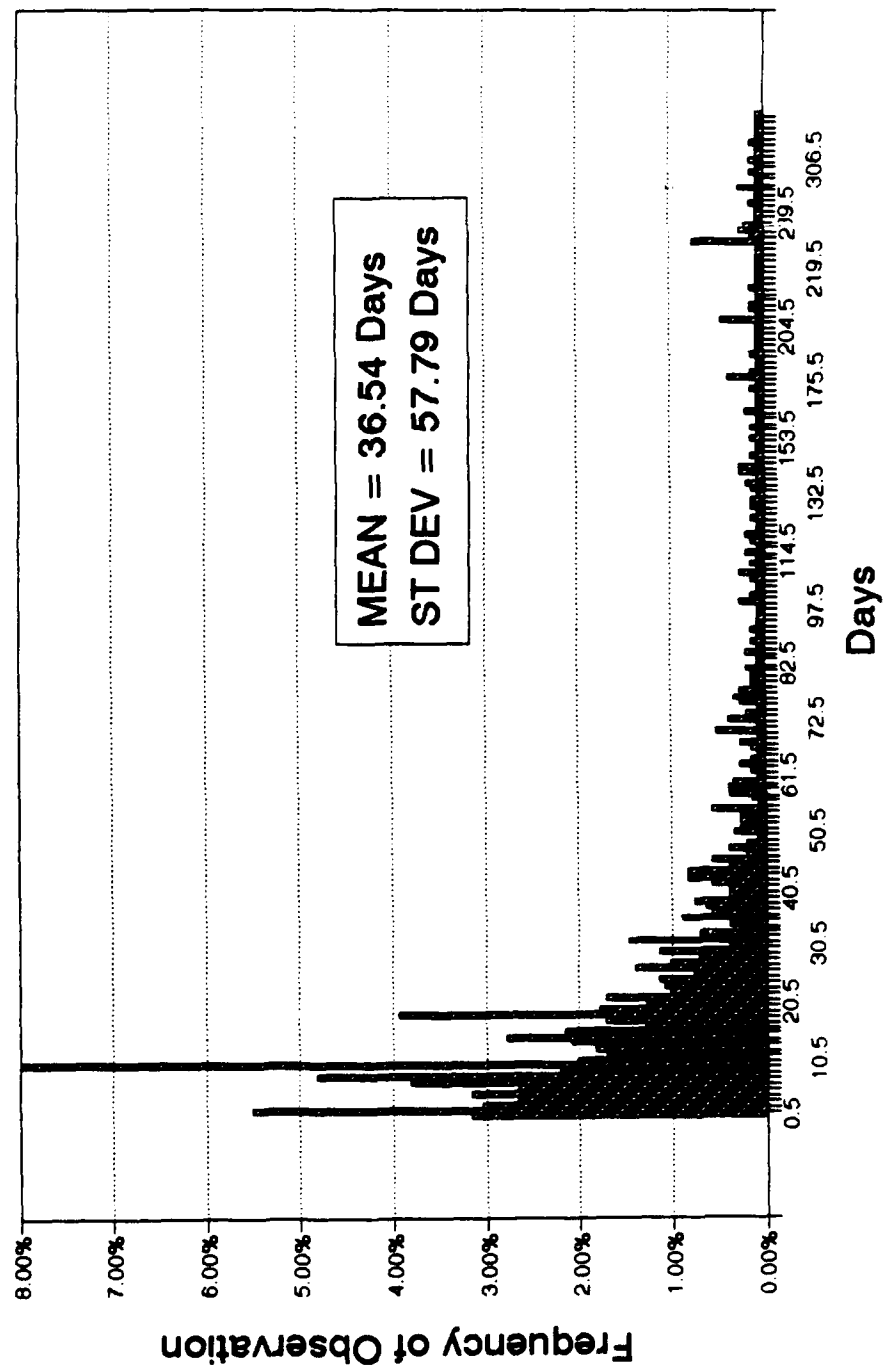
APPENDIX E: SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO NORFOLK FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	3450	4.10%	4.10%	46.5	148	0.18%	90.39%
1.5	10521	12.51%	16.61%	47.5	130	0.15%	90.54%
2.5	8000	9.51%	26.12%	48.5	169	0.20%	90.75%
3.5	6512	7.74%	33.86%	49.5	187	0.22%	90.97%
4.5	5980	7.11%	40.97%	50.5	153	0.18%	91.15%
5.5	5630	6.69%	47.66%	51.5	215	0.26%	91.40%
6.5	5053	6.01%	53.67%	52.5	114	0.14%	91.54%
7.5	4800	5.71%	59.38%	53.5	101	0.12%	91.66%
8.5	3292	3.91%	63.29%	54.5	95	0.11%	91.77%
9.5	2192	2.61%	65.90%	55.5	138	0.16%	91.94%
10.5	1611	1.92%	67.81%	56.5	163	0.19%	92.13%
11.5	1551	1.84%	69.65%	57.5	98	0.12%	92.25%
12.5	1354	1.61%	71.26%	58.5	97	0.12%	92.36%
13.5	1415	1.68%	72.95%	59.5	106	0.13%	92.49%
14.5	1377	1.64%	74.58%	60.5	85	0.10%	92.59%
15.5	1035	1.23%	75.81%	61.5	79	0.09%	92.68%
16.5	885	1.05%	76.87%	62.5	113	0.13%	92.82%
17.5	741	0.88%	77.75%	63.5	70	0.08%	92.90%
18.5	655	0.78%	78.53%	64.5	88	0.10%	93.01%
19.5	679	0.81%	79.33%	65.5	83	0.10%	93.10%
20.5	708	0.84%	80.17%	66.5	62	0.07%	93.18%
21.5	735	0.87%	81.05%	67.5	54	0.06%	93.24%
22.5	624	0.74%	81.79%	68.5	55	0.07%	93.31%
23.5	567	0.67%	82.46%	69.5	56	0.07%	93.37%
24.5	435	0.52%	82.98%	70.5	115	0.14%	93.51%
25.5	532	0.63%	83.61%	71.5	77	0.09%	93.60%
26.5	356	0.42%	84.04%	72.5	65	0.08%	93.68%
27.5	426	0.51%	84.54%	73.5	60	0.07%	93.75%
28.5	528	0.63%	85.17%	74.5	71	0.08%	93.84%
29.5	409	0.49%	85.66%	75.5	52	0.06%	93.90%
30.5	380	0.45%	86.11%	76.5	83	0.10%	94.00%
31.5	288	0.34%	86.45%	77.5	81	0.10%	94.09%
32.5	248	0.29%	86.75%	78.5	69	0.08%	94.17%
33.5	259	0.31%	87.05%	79.5	77	0.09%	94.27%
34.5	281	0.33%	87.39%	80.5	70	0.08%	94.35%
35.5	301	0.36%	87.75%	81.5	57	0.07%	94.42%
36.5	227	0.27%	88.02%	82.5	47	0.06%	94.47%
37.5	278	0.33%	88.35%	83.5	71	0.08%	94.56%
38.5	224	0.27%	88.61%	84.5	77	0.09%	94.65%
39.5	258	0.31%	88.92%	85.5	52	0.06%	94.71%
40.5	180	0.21%	89.13%	86.5	60	0.07%	94.78%
41.5	208	0.25%	89.38%	87.5	35	0.04%	94.82%
42.5	228	0.27%	89.65%	88.5	43	0.05%	94.88%
43.5	177	0.21%	89.86%	89.5	55	0.07%	94.94%
44.5	141	0.17%	90.03%	90.5	38	0.05%	94.99%
45.5	155	0.18%	90.21%	>90.5	4218	8.25%	100.00%
					84,118		

E-2: **SHIPPING TIMES FROM ORIGINATORS**
TO NODES THAT TRANSSHIP TO NORFOLK
FOR 7R COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	2698	4.57%	4.57%	46.5	68	0.12%	95.32%
1.5	8395	14.21%	18.78%	47.5	55	0.09%	95.42%
2.5	6572	11.12%	29.90%	48.5	65	0.11%	95.53%
3.5	5487	9.29%	39.19%	49.5	84	0.14%	95.67%
4.5	5013	8.48%	47.67%	50.5	56	0.09%	95.76%
5.5	4632	7.84%	55.51%	51.5	76	0.13%	95.89%
6.5	4161	7.04%	62.55%	52.5	51	0.09%	95.98%
7.5	3752	6.35%	68.90%	53.5	36	0.06%	96.04%
8.5	2627	4.45%	73.35%	54.5	38	0.06%	96.10%
9.5	1475	2.50%	75.85%	55.5	56	0.09%	96.20%
10.5	1187	2.01%	77.86%	56.5	41	0.07%	96.27%
11.5	1042	1.76%	79.62%	57.5	54	0.09%	96.36%
12.5	886	1.50%	81.12%	58.5	52	0.09%	96.45%
13.5	941	1.59%	82.71%	59.5	40	0.07%	96.52%
14.5	769	1.30%	84.01%	60.5	31	0.05%	96.57%
15.5	594	1.01%	85.02%	61.5	45	0.08%	96.64%
16.5	499	0.84%	85.86%	62.5	49	0.08%	96.73%
17.5	371	0.63%	86.49%	63.5	32	0.05%	96.78%
18.5	385	0.65%	87.14%	64.5	35	0.06%	96.84%
19.5	379	0.64%	87.78%	65.5	34	0.06%	96.90%
20.5	382	0.65%	88.43%	66.5	30	0.05%	96.95%
21.5	377	0.64%	89.07%	67.5	19	0.03%	96.98%
22.5	291	0.49%	89.56%	68.5	26	0.04%	97.02%
23.5	272	0.46%	90.02%	69.5	25	0.04%	97.07%
24.5	247	0.42%	90.44%	70.5	37	0.06%	97.13%
25.5	277	0.47%	90.91%	71.5	31	0.05%	97.18%
26.5	193	0.33%	91.24%	72.5	31	0.05%	97.23%
27.5	248	0.42%	91.66%	73.5	23	0.04%	97.27%
28.5	189	0.32%	91.98%	74.5	32	0.05%	97.33%
29.5	200	0.34%	92.31%	75.5	27	0.05%	97.37%
30.5	181	0.31%	92.62%	76.5	28	0.05%	97.42%
31.5	135	0.23%	92.85%	77.5	28	0.05%	97.47%
32.5	133	0.23%	93.07%	78.5	33	0.06%	97.52%
33.5	127	0.21%	93.29%	79.5	20	0.03%	97.56%
34.5	151	0.26%	93.54%	80.5	21	0.04%	97.59%
35.5	119	0.20%	93.75%	81.5	16	0.03%	97.62%
36.5	111	0.19%	93.93%	82.5	18	0.03%	97.65%
37.5	125	0.21%	94.15%	83.5	31	0.05%	97.70%
38.5	87	0.15%	94.29%	84.5	30	0.05%	97.75%
39.5	81	0.14%	94.43%	85.5	19	0.03%	97.79%
40.5	75	0.13%	94.56%	86.5	15	0.03%	97.81%
41.5	81	0.14%	94.69%	87.5	15	0.03%	97.84%
42.5	99	0.17%	94.86%	88.5	18	0.03%	97.87%
43.5	86	0.15%	95.01%	89.5	31	0.05%	97.92%
44.5	60	0.10%	95.11%	90.5	15	0.03%	97.95%
45.5	59	0.10%	95.21%	>90.5	1214	2.05%	100.00%

59,082

E-3: **SHIPPING TIMES FROM ORIGINATORS**
TO NODES THAT TRANSSHIP TO NORFOLK
FOR 7H COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	632	3.31%	3.31%	46.5	59	0.31%	77.62%
1.5	1717	9.00%	12.31%	47.5	60	0.31%	77.93%
2.5	1047	5.49%	17.79%	48.5	87	0.46%	78.39%
3.5	807	4.23%	22.02%	49.5	75	0.39%	78.78%
4.5	778	4.08%	26.09%	50.5	70	0.37%	79.15%
5.5	800	4.19%	30.29%	51.5	108	0.57%	79.72%
6.5	613	3.21%	33.50%	52.5	50	0.26%	79.98%
7.5	763	4.00%	37.49%	53.5	49	0.26%	80.23%
8.5	471	2.47%	39.96%	54.5	39	0.20%	80.44%
9.5	591	3.10%	43.06%	55.5	72	0.38%	80.82%
10.5	318	1.67%	44.72%	56.5	88	0.46%	81.28%
11.5	400	2.10%	46.82%	57.5	29	0.15%	81.43%
12.5	325	1.70%	48.52%	58.5	33	0.17%	81.60%
13.5	316	1.66%	50.18%	59.5	53	0.28%	81.88%
14.5	455	2.38%	52.56%	60.5	47	0.25%	82.12%
15.5	283	1.48%	54.04%	61.5	32	0.17%	82.29%
16.5	236	1.24%	55.28%	62.5	48	0.25%	82.54%
17.5	269	1.41%	56.69%	63.5	29	0.15%	82.70%
18.5	177	0.93%	57.62%	64.5	44	0.23%	82.93%
19.5	231	1.21%	58.83%	65.5	36	0.19%	83.12%
20.5	233	1.22%	60.05%	66.5	27	0.14%	83.26%
21.5	266	1.39%	61.44%	67.5	27	0.14%	83.40%
22.5	210	1.10%	62.54%	68.5	26	0.14%	83.53%
23.5	199	1.04%	63.58%	69.5	27	0.14%	83.68%
24.5	148	0.78%	64.36%	70.5	45	0.24%	83.91%
25.5	200	1.05%	65.41%	71.5	31	0.16%	84.07%
26.5	124	0.65%	66.06%	72.5	24	0.13%	84.20%
27.5	104	0.54%	66.60%	73.5	31	0.16%	84.36%
28.5	263	1.38%	67.98%	74.5	32	0.17%	84.53%
29.5	159	0.83%	68.81%	75.5	20	0.10%	84.63%
30.5	157	0.82%	69.64%	76.5	45	0.24%	84.87%
31.5	107	0.56%	70.20%	77.5	44	0.23%	85.10%
32.5	92	0.48%	70.68%	78.5	34	0.18%	85.28%
33.5	89	0.47%	71.14%	79.5	43	0.23%	85.50%
34.5	97	0.51%	71.65%	80.5	35	0.18%	85.69%
35.5	142	0.74%	72.40%	81.5	31	0.16%	85.85%
36.5	92	0.48%	72.88%	82.5	17	0.09%	85.94%
37.5	114	0.60%	73.48%	83.5	26	0.14%	86.08%
38.5	102	0.53%	74.01%	84.5	31	0.16%	86.24%
39.5	131	0.69%	74.70%	85.5	23	0.12%	86.36%
40.5	87	0.46%	75.15%	86.5	19	0.10%	86.46%
41.5	95	0.50%	75.65%	87.5	13	0.07%	86.53%
42.5	113	0.59%	76.24%	88.5	22	0.12%	86.64%
43.5	71	0.37%	76.61%	89.5	19	0.10%	86.74%
44.5	54	0.28%	76.90%	90.5	20	0.10%	86.85%
45.5	79	0.41%	77.31%	>90.5	2511	13.15%	100.00%
					19,088		

E-4: SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO NORFOLK FOR 7G COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	86	1.88%	1.88%	46.5	15	0.33%	82.34%
1.5	324	7.08%	8.96%	47.5	11	0.24%	82.58%
2.5	302	6.60%	15.56%	48.5	12	0.26%	82.85%
3.5	153	3.34%	18.90%	49.5	21	0.46%	83.30%
4.5	145	3.17%	22.07%	50.5	17	0.37%	83.68%
5.5	148	3.23%	25.31%	51.5	21	0.46%	84.13%
6.5	208	4.55%	29.85%	52.5	12	0.26%	84.40%
7.5	227	4.96%	34.81%	53.5	13	0.28%	84.68%
8.5	156	3.41%	38.22%	54.5	13	0.28%	84.97%
9.5	92	2.01%	40.23%	55.5	8	0.17%	85.14%
10.5	77	1.68%	41.91%	56.5	30	0.66%	85.80%
11.5	88	1.92%	43.84%	57.5	11	0.24%	86.04%
12.5	95	2.08%	45.91%	58.5	12	0.26%	86.30%
13.5	128	2.80%	48.71%	59.5	11	0.24%	86.54%
14.5	133	2.91%	51.62%	60.5	7	0.15%	86.69%
15.5	121	2.64%	54.26%	61.5	1	0.02%	86.71%
16.5	123	2.69%	56.95%	62.5	14	0.31%	87.02%
17.5	74	1.62%	58.57%	63.5	5	0.11%	87.13%
18.5	71	1.55%	60.12%	64.5	8	0.17%	87.30%
19.5	59	1.29%	61.41%	65.5	7	0.15%	87.46%
20.5	67	1.46%	62.87%	66.5	4	0.09%	87.54%
21.5	73	1.60%	64.47%	67.5	7	0.15%	87.70%
22.5	110	2.40%	66.87%	68.5	3	0.07%	87.76%
23.5	75	1.64%	68.51%	69.5	2	0.04%	87.81%
24.5	23	0.50%	69.01%	70.5	16	0.35%	88.16%
25.5	48	1.05%	70.06%	71.5	12	0.26%	88.42%
26.5	30	0.66%	70.72%	72.5	9	0.20%	88.61%
27.5	53	1.16%	71.88%	73.5	3	0.07%	88.68%
28.5	57	1.25%	73.12%	74.5	7	0.15%	88.83%
29.5	34	0.74%	73.86%	75.5	2	0.04%	88.88%
30.5	34	0.74%	74.61%	76.5	5	0.11%	88.99%
31.5	39	0.85%	75.46%	77.5	7	0.15%	89.14%
32.5	20	0.44%	75.90%	78.5	2	0.04%	89.18%
33.5	30	0.66%	76.55%	79.5	11	0.24%	89.42%
34.5	25	0.55%	77.10%	80.5	12	0.26%	89.69%
35.5	29	0.63%	77.73%	81.5	10	0.22%	89.90%
36.5	17	0.37%	78.10%	82.5	11	0.24%	90.14%
37.5	27	0.59%	78.69%	83.5	10	0.22%	90.36%
38.5	27	0.59%	79.28%	84.5	13	0.28%	90.65%
39.5	28	0.61%	79.90%	85.5	9	0.20%	90.84%
40.5	14	0.31%	80.20%	86.5	24	0.52%	91.37%
41.5	26	0.57%	80.77%	87.5	7	0.15%	91.52%
42.5	11	0.24%	81.01%	88.5	2	0.04%	91.56%
43.5	12	0.26%	81.27%	89.5	5	0.11%	91.67%
44.5	20	0.44%	81.71%	90.5	2	0.04%	91.72%
45.5	14	0.31%	82.01%	>90.5	379	8.28%	100.00%
					4,576		

E-5: **SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO NORFOLK FOR 7Z COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	22	4.64%	4.64%	48.5	1	0.21%	81.22%
1.5	27	5.70%	10.34%	50.5	2	0.42%	81.65%
2.5	19	4.01%	14.35%	51.5	3	0.63%	82.28%
3.5	19	4.01%	18.35%	54.5	1	0.21%	82.49%
4.5	13	2.74%	21.10%	57.5	2	0.42%	82.91%
5.5	20	4.22%	25.32%	62.5	1	0.21%	83.12%
6.5	19	4.01%	29.32%	63.5	1	0.21%	83.33%
7.5	17	3.59%	32.91%	65.5	4	0.84%	84.18%
8.5	12	2.53%	35.44%	67.5	1	0.21%	84.39%
9.5	8	1.69%	37.13%	69.5	1	0.21%	84.60%
10.5	12	2.53%	39.66%	70.5	14	2.95%	87.55%
11.5	4	0.84%	40.51%	71.5	3	0.63%	88.19%
12.5	30	6.33%	46.84%	72.5	1	0.21%	88.40%
13.5	1	0.21%	47.05%	73.5	1	0.21%	88.61%
14.5	5	1.05%	48.10%	75.5	2	0.42%	89.03%
15.5	13	2.74%	50.84%	76.5	1	0.21%	89.24%
16.5	12	2.53%	53.38%	79.5	2	0.42%	89.66%
17.5	8	1.69%	55.06%	83.5	3	0.63%	90.30%
18.5	9	1.90%	56.96%	84.5	2	0.42%	90.72%
19.5	2	0.42%	57.38%	86.5	1	0.21%	90.93%
20.5	15	3.16%	60.55%	91.5	1	0.21%	91.14%
21.5	5	1.05%	61.60%	>91.5	42	8.86%	100.00%
22.5	4	0.84%	62.45%		474		
23.5	11	2.32%	64.77%				
24.5	7	1.48%	66.24%				
25.5	2	0.42%	66.67%				
26.5	3	0.63%	67.30%				
27.5	2	0.42%	67.72%				
28.5	7	1.48%	69.20%				
29.5	6	1.27%	70.46%				
30.5	2	0.42%	70.89%				
31.5	2	0.42%	71.31%				
33.5	8	1.69%	73.00%				
34.5	2	0.42%	73.42%				
35.5	2	0.42%	73.84%				
36.5	2	0.42%	74.26%				
37.5	2	0.42%	74.68%				
38.5	2	0.42%	75.11%				
39.5	15	3.16%	78.27%				
40.5	2	0.42%	78.69%				
41.5	1	0.21%	78.90%				
42.5	2	0.42%	79.32%				
43.5	1	0.21%	79.54%				
44.5	5	1.05%	80.59%				
45.5	1	0.21%	80.80%				
46.5	1	0.21%	81.01%				

E-6: **SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO NORFOLK FOR 7E COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	10	1.20%	1.20%	46.5	5	0.60%	82.89%
1.5	54	6.46%	7.66%	47.5	3	0.36%	83.25%
2.5	56	6.70%	14.35%	48.5	4	0.48%	83.73%
3.5	40	4.78%	19.14%	49.5	7	0.84%	84.57%
4.5	28	3.35%	22.49%	50.5	7	0.84%	85.41%
5.5	29	3.47%	25.96%	51.5	7	0.84%	86.24%
6.5	45	5.38%	31.34%	52.5	1	0.12%	86.36%
7.5	38	4.55%	35.89%	53.5	3	0.36%	86.72%
8.5	25	2.99%	38.88%	54.5	4	0.48%	87.20%
9.5	23	2.75%	41.63%	55.5	2	0.24%	87.44%
10.5	16	1.91%	43.54%	56.5	4	0.48%	87.92%
11.5	17	2.03%	45.57%	57.5	2	0.24%	88.16%
12.5	15	1.79%	47.37%	59.5	2	0.24%	88.40%
13.5	27	3.23%	50.60%	61.5	1	0.12%	88.52%
14.5	14	1.67%	52.27%	62.5	1	0.12%	88.64%
15.5	23	2.75%	55.02%	63.5	2	0.24%	88.88%
16.5	15	1.79%	56.82%	64.5	1	0.12%	89.00%
17.5	18	2.15%	58.97%	65.5	2	0.24%	89.23%
18.5	12	1.44%	60.41%	66.5	1	0.12%	89.35%
19.5	7	0.84%	61.24%	69.5	1	0.12%	89.47%
20.5	10	1.20%	62.44%	70.5	2	0.24%	89.71%
21.5	13	1.56%	64.00%	73.5	1	0.12%	89.83%
22.5	7	0.84%	64.83%	75.5	1	0.12%	89.95%
23.5	9	1.08%	65.91%	76.5	4	0.48%	90.43%
24.5	9	1.08%	66.99%	77.5	2	0.24%	90.67%
25.5	5	0.60%	67.58%	79.5	1	0.12%	90.79%
26.5	6	0.72%	68.30%	80.5	1	0.12%	90.91%
27.5	19	2.27%	70.57%	82.5	1	0.12%	91.03%
28.5	12	1.44%	72.01%	83.5	1	0.12%	91.15%
29.5	10	1.20%	73.21%	84.5	1	0.12%	91.27%
30.5	6	0.72%	73.92%	85.5	1	0.12%	91.39%
31.5	4	0.48%	74.40%	86.5	1	0.12%	91.51%
32.5	3	0.36%	74.76%	88.5	1	0.12%	91.63%
33.5	5	0.60%	75.36%	90.5	1	0.12%	91.75%
34.5	6	0.72%	76.08%	>90.5	69	8.25%	100.00%
35.5	9	1.08%	77.15%		836		
36.5	5	0.60%	77.75%				
37.5	10	1.20%	78.95%				
38.5	6	0.72%	79.67%				
39.5	2	0.24%	79.90%				
40.5	2	0.24%	80.14%				
41.5	4	0.48%	80.62%				
42.5	3	0.36%	80.98%				
43.5	7	0.84%	81.82%				
44.5	2	0.24%	82.06%				
45.5	2	0.24%	82.30%				

SHIPPING TIME FROM ORIGINATOR TO NODE

7R 68620

MEAN = 12.30 Days
ST DEV = 27.97 Days

Frequency of Observation

Days

SHIPPING TIME FROM ORIGINATOR TO NODE
7E 68620

MEAN = 31.32 Days
ST DEV = 51.02 Days
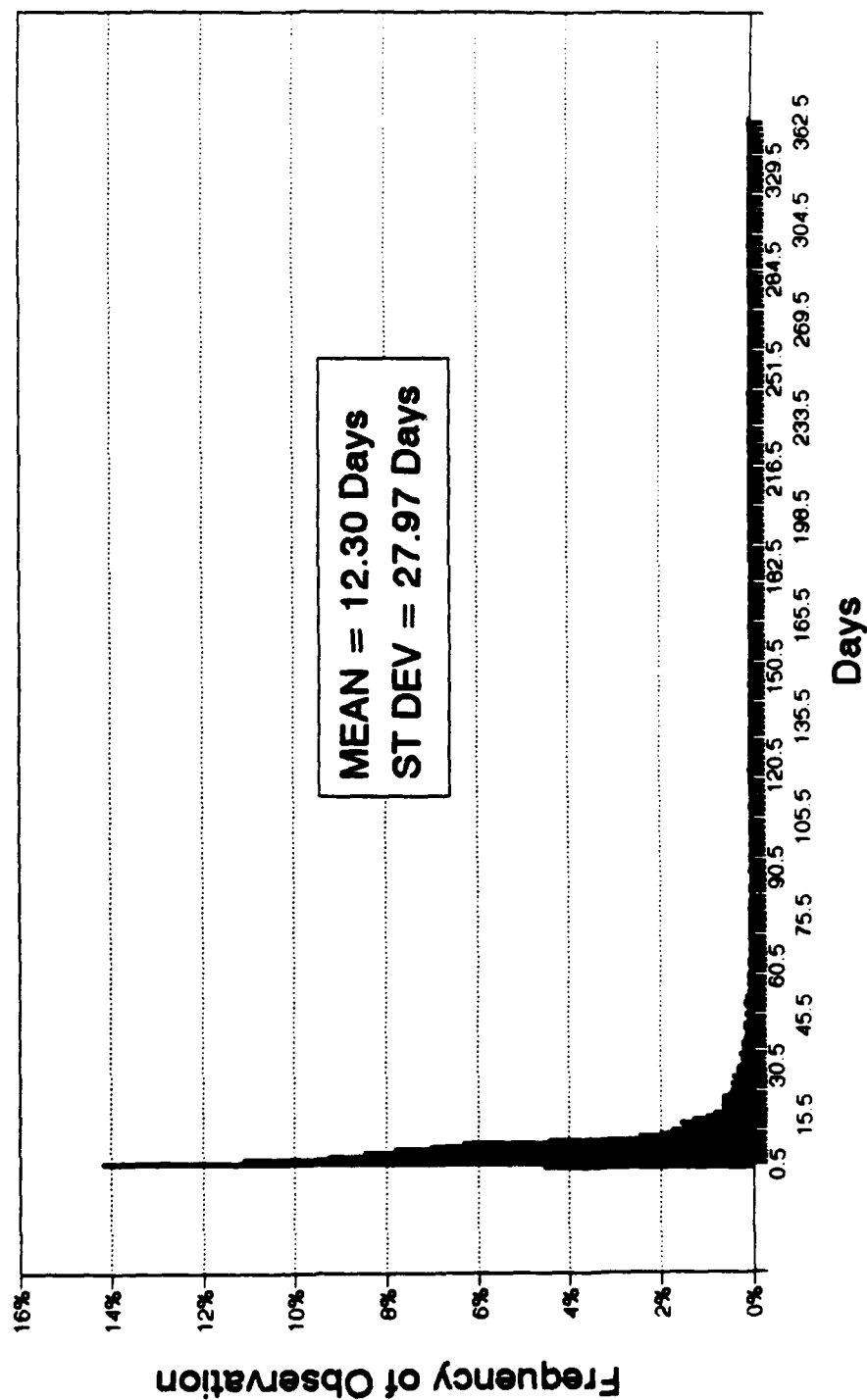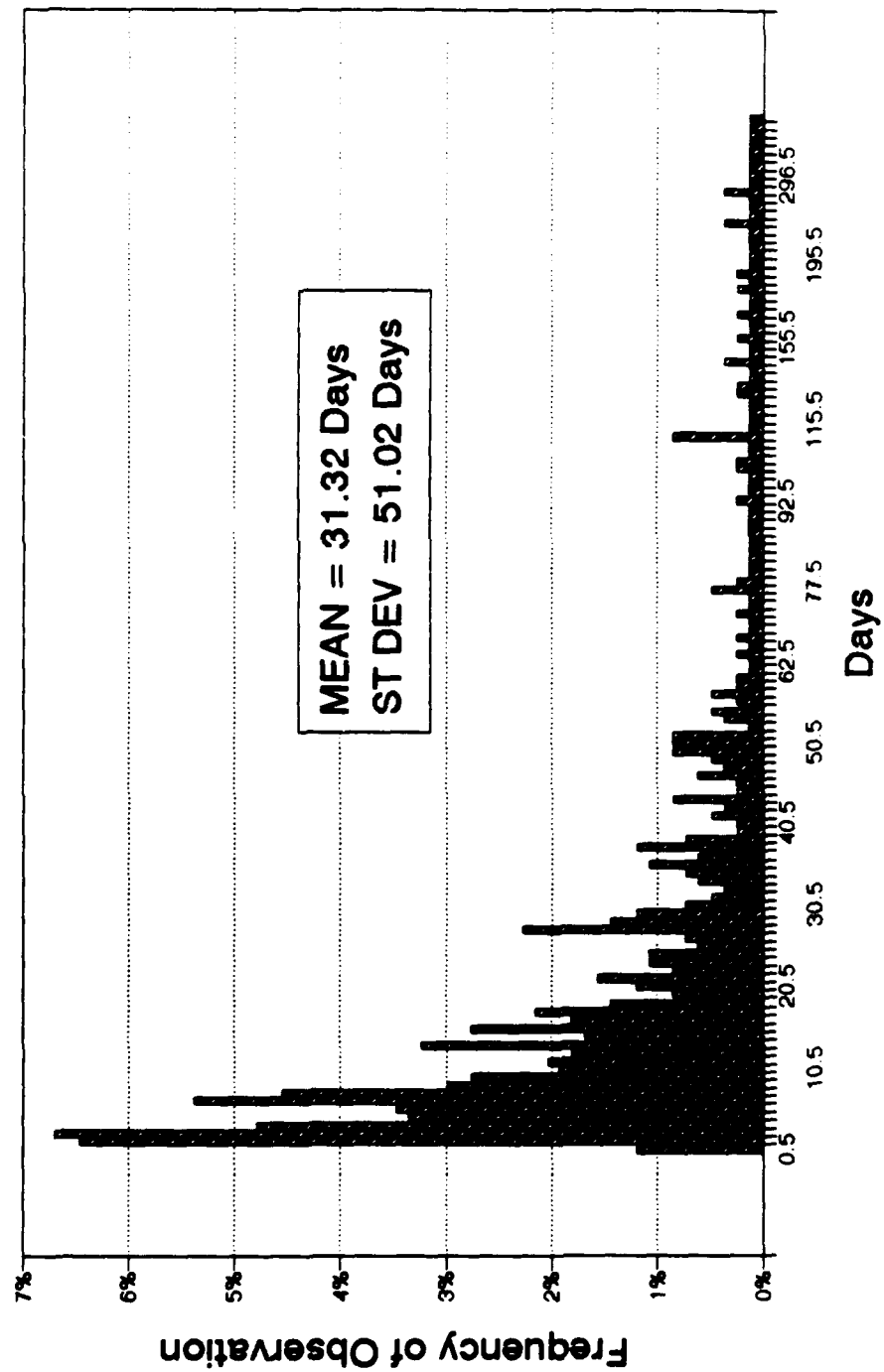
APPENDIX F: SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO SAN DIEGO FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	2463	3.41%	3.41%	46.5	146	0.20%	83.29%
1.5	7207	9.97%	13.37%	47.5	172	0 24%	83.53%
2.5	5556	7.68%	21.05%	48.5	192	0.27%	83.79%
3.5	3473	4.80%	25.86%	49.5	253	0.35%	84.14%
4.5	4094	5.66%	31.52%	50.5	223	0.31%	84.45%
5.5	3747	5.18%	36.70%	51.5	112	0.15%	84.61%
6.5	3507	4.85%	41.55%	52.5	183	0.25%	84.86%
7.5	3443	4.76%	46.31%	53.5	140	0.19%	85.05%
8.5	2597	3.59%	49.90%	54.5	132	0.18%	85.24%
9.5	1842	2.55%	52.45%	55.5	137	0.19%	85.43%
10.5	1394	1.93%	54.38%	56.5	154	0.21%	85.64%
11.5	1417	1.96%	56.34%	57.5	162	0.22%	85.86%
12.5	1436	1.99%	58.32%	58.5	74	0.10%	85.97%
13.5	1613	2.23%	60.55%	59.5	104	0.14%	86.11%
14.5	1530	2.12%	62.67%	60.5	119	0.16%	86.27%
15.5	1195	1.65%	64.32%	61.5	151	0.21%	86.48%
16.5	902	1.25%	65.57%	62.5	138	0.19%	86.67%
17.5	727	1.01%	66.57%	63.5	127	0.18%	86.85%
18.5	695	0.96%	67.53%	64.5	133	0.18%	87.03%
19.5	830	1.15%	68.68%	65.5	91	0.13%	87.16%
20.5	820	1.13%	69.81%	66.5	93	0.13%	87.29%
21.5	742	1.03%	70.84%	67.5	93	0.13%	87.42%
22.5	643	0.89%	71.73%	68.5	69	0.10%	87.51%
23.5	543	0.75%	72.48%	69.5	108	0.15%	87.66%
24.5	665	0.92%	73.40%	70.5	131	0.18%	87.84%
25.5	526	0.73%	74.13%	71.5	60	0.08%	87.93%
26.5	554	0.77%	74.89%	72.5	74	0.10%	88.03%
27.5	497	0.69%	75.58%	73.5	67	0.09%	88.12%
28.5	593	0.82%	76.40%	74.5	60	0.08%	88.20%
29.5	398	0.55%	76.95%	75.5	75	0.10%	88.31%
30.5	431	0.60%	77.55%	76.5	86	0.12%	88.43%
31.5	261	0.36%	77.91%	77.5	93	0.13%	88.55%
32.5	330	0.46%	78.36%	78.5	87	0.12%	88.67%
33.5	268	0.37%	78.74%	79.5	114	0.16%	88.83%
34.5	281	0.39%	79.12%	80.5	58	0.08%	88.91%
35.5	319	0.44%	79.56%	81.5	71	0.10%	89.01%
36.5	431	0.60%	80.16%	82.5	41	0.06%	89.07%
37.5	371	0.51%	80.67%	83.5	87	0.12%	89.19%
38.5	217	0.30%	80.97%	84.5	161	0.22%	89.41%
39.5	191	0.26%	81.24%	85.5	48	0.07%	89.48%
40.5	251	0.35%	81.59%	86.5	62	0.09%	89.56%
41.5	266	0.37%	81.95%	87.5	48	0.07%	89.63%
42.5	279	0.39%	82.34%	88.5	75	0.10%	89.73%
43.5	206	0.28%	82.62%	89.5	60	0.08%	89.82%
44.5	158	0.22%	82.84%	90.5	54	0.07%	89.89%
45.5	179	0.25%	83.09%	>90.5	7311	10.11%	100.00%
					72317		

F-2: **SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO THE SAN DIEGO HUB FOR 7R COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	517	1.23%	1.23%	46.5	44	0.10%	89.85%
1.5	4859	11.57%	12.80%	47.5	78	0.19%	90.03%
2.5	4061	9.67%	22.48%	48.5	84	0.20%	90.23%
3.5	2286	5.44%	27.92%	49.5	136	0.32%	90.56%
4.5	2973	7.08%	35.00%	50.5	61	0.15%	90.70%
5.5	2579	6.14%	41.14%	51.5	63	0.15%	90.85%
6.5	2261	5.39%	46.53%	52.5	96	0.23%	91.08%
7.5	2294	5.46%	51.99%	53.5	67	0.16%	91.24%
8.5	1742	4.15%	56.14%	54.5	78	0.19%	91.43%
9.5	1196	2.85%	58.99%	55.5	61	0.15%	91.57%
10.5	854	2.03%	61.02%	56.5	85	0.20%	91.77%
11.5	846	2.01%	63.04%	57.5	57	0.14%	91.91%
12.5	1012	2.41%	65.45%	58.5	26	0.06%	91.97%
13.5	1095	2.61%	68.06%	59.5	33	0.08%	92.05%
14.5	1063	2.53%	70.59%	60.5	43	0.10%	92.15%
15.5	749	1.78%	72.37%	61.5	61	0.15%	92.30%
16.5	609	1.45%	73.82%	62.5	69	0.16%	92.46%
17.5	479	1.14%	74.96%	63.5	52	0.12%	92.59%
18.5	386	0.92%	75.88%	64.5	43	0.10%	92.69%
19.5	555	1.32%	77.20%	65.5	35	0.08%	92.77%
20.5	507	1.21%	78.41%	66.5	37	0.09%	92.86%
21.5	428	1.02%	79.43%	67.5	41	0.10%	92.96%
22.5	396	0.94%	80.37%	68.5	23	0.05%	93.01%
23.5	303	0.72%	81.10%	69.5	37	0.09%	93.10%
24.5	367	0.87%	81.97%	70.5	47	0.11%	93.21%
25.5	257	0.61%	82.58%	71.5	28	0.07%	93.28%
26.5	269	0.64%	83.22%	72.5	40	0.10%	93.37%
27.5	247	0.59%	83.81%	73.5	15	0.04%	93.41%
28.5	301	0.72%	84.53%	74.5	16	0.04%	93.45%
29.5	226	0.54%	85.07%	75.5	29	0.07%	93.52%
30.5	199	0.47%	85.54%	76.5	32	0.08%	93.59%
31.5	100	0.24%	85.78%	77.5	40	0.10%	93.69%
32.5	198	0.47%	86.25%	78.5	27	0.06%	93.75%
33.5	130	0.31%	86.56%	79.5	42	0.10%	93.85%
34.5	144	0.34%	86.90%	80.5	17	0.04%	93.89%
35.5	141	0.34%	87.24%	81.5	16	0.04%	93.93%
36.5	151	0.36%	87.60%	82.5	18	0.04%	93.97%
37.5	126	0.30%	87.90%	83.5	19	0.05%	94.02%
38.5	83	0.20%	88.10%	84.5	19	0.05%	94.06%
39.5	83	0.20%	88.29%	85.5	17	0.04%	94.11%
40.5	112	0.27%	88.56%	86.5	25	0.06%	94.16%
41.5	135	0.32%	88.88%	87.5	17	0.04%	94.21%
42.5	104	0.25%	89.13%	88.5	31	0.07%	94.28%
43.5	107	0.25%	89.38%	89.5	11	0.03%	94.31%
44.5	61	0.15%	89.53%	90.5	22	0.05%	94.36%
45.5	89	0.21%	89.74%	>90.5	2369	5.64%	100.00%
					41987		

F-3: **SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO THE SAN DIEGO HUB FOR 7H COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	1180	5.67%	5.67%	46.5	66	0.32%	72.35%
1.5	1482	7.12%	12.80%	47.5	77	0.37%	72.72%
2.5	988	4.75%	17.54%	48.5	71	0.34%	73.06%
3.5	816	3.92%	21.47%	49.5	77	0.37%	73.43%
4.5	673	3.23%	24.70%	50.5	102	0.49%	73.92%
5.5	729	3.50%	28.21%	51.5	27	0.13%	74.05%
6.5	840	4.04%	32.24%	52.5	46	0.22%	74.27%
7.5	828	3.98%	36.22%	53.5	54	0.26%	74.53%
8.5	608	2.92%	39.15%	54.5	35	0.17%	74.70%
9.5	475	2.28%	41.43%	55.5	54	0.26%	74.96%
10.5	346	1.66%	43.09%	56.5	50	0.24%	75.20%
11.5	362	1.74%	44.83%	57.5	65	0.31%	75.51%
12.5	337	1.62%	46.45%	58.5	30	0.14%	75.66%
13.5	376	1.81%	48.26%	59.5	60	0.29%	75.95%
14.5	356	1.71%	49.97%	60.5	61	0.29%	76.24%
15.5	280	1.35%	51.32%	61.5	71	0.34%	76.58%
16.5	179	0.86%	52.18%	62.5	49	0.24%	76.82%
17.5	158	0.76%	52.94%	63.5	54	0.26%	77.08%
18.5	218	1.05%	53.98%	64.5	69	0.33%	77.41%
19.5	165	0.79%	54.78%	65.5	32	0.15%	77.56%
20.5	224	1.08%	55.85%	66.5	26	0.12%	77.69%
21.5	238	1.14%	57.00%	67.5	30	0.14%	77.83%
22.5	188	0.90%	57.90%	68.5	34	0.16%	77.99%
23.5	189	0.91%	58.81%	69.5	59	0.28%	78.28%
24.5	206	0.99%	59.80%	70.5	64	0.31%	78.59%
25.5	185	0.89%	60.69%	71.5	23	0.11%	78.70%
26.5	140	0.67%	61.36%	72.5	20	0.10%	78.79%
27.5	180	0.87%	62.23%	73.5	24	0.12%	78.91%
28.5	201	0.97%	63.19%	74.5	33	0.16%	79.07%
29.5	112	0.54%	63.73%	75.5	35	0.17%	79.23%
30.5	170	0.82%	64.55%	76.5	25	0.12%	79.35%
31.5	118	0.57%	65.12%	77.5	36	0.17%	79.53%
32.5	85	0.41%	65.53%	78.5	47	0.23%	79.75%
33.5	99	0.48%	66.00%	79.5	68	0.33%	80.08%
34.5	93	0.45%	66.45%	80.5	33	0.16%	80.24%
35.5	115	0.55%	67.00%	81.5	51	0.25%	80.48%
36.5	204	0.98%	67.98%	82.5	17	0.08%	80.57%
37.5	183	0.88%	68.86%	83.5	46	0.22%	80.79%
38.5	98	0.47%	69.33%	84.5	119	0.57%	81.36%
39.5	81	0.39%	69.72%	85.5	19	0.09%	81.45%
40.5	87	0.42%	70.14%	86.5	24	0.12%	81.57%
41.5	96	0.46%	70.60%	87.5	23	0.11%	81.68%
42.5	113	0.54%	71.14%	88.5	38	0.18%	81.86%
43.5	70	0.34%	71.48%	89.5	42	0.20%	82.06%
44.5	66	0.32%	71.80%	90.5	20	0.10%	82.16%
45.5	49	0.24%	72.03%	>90.5	3712	17.84%	100.00%
					20804		

F-4: **SHIPPING TIMES FROM ORIGINATORS
TO NODES THAT TRANSSHIP TO THE
SAN DIEGO HUB FOR 7G COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	437	6.71%	6.71%	46.5	25	0.38%	76.76%
1.5	565	8.68%	15.39%	47.5	13	0.20%	76.96%
2.5	393	6.04%	21.43%	48.5	19	0.29%	77.25%
3.5	301	4.62%	26.05%	49.5	35	0.54%	77.79%
4.5	337	5.18%	31.23%	50.5	43	0.66%	78.45%
5.5	239	3.67%	34.90%	51.5	14	0.22%	78.66%
6.5	298	4.58%	39.48%	52.5	19	0.29%	78.96%
7.5	236	3.63%	43.10%	53.5	18	0.28%	79.23%
8.5	167	2.57%	45.67%	54.5	12	0.18%	79.42%
9.5	135	2.07%	47.74%	55.5	16	0.25%	79.66%
10.5	118	1.81%	49.55%	56.5	16	0.25%	79.91%
11.5	121	1.86%	51.41%	57.5	14	0.22%	80.12%
12.5	64	0.98%	52.40%	58.5	15	0.23%	80.35%
13.5	82	1.26%	53.66%	59.5	10	0.15%	80.51%
14.5	72	1.11%	54.76%	60.5	15	0.23%	80.74%
15.5	125	1.92%	56.68%	61.5	11	0.17%	80.91%
16.5	69	1.06%	57.74%	62.5	15	0.23%	81.14%
17.5	58	0.89%	58.63%	63.5	14	0.22%	81.35%
18.5	56	0.86%	59.49%	64.5	18	0.28%	81.63%
19.5	74	1.14%	60.63%	65.5	17	0.26%	81.89%
20.5	48	0.74%	61.37%	66.5	19	0.29%	82.18%
21.5	47	0.72%	62.09%	67.5	19	0.29%	82.47%
22.5	38	0.58%	62.67%	68.5	10	0.15%	82.63%
23.5	36	0.55%	63.23%	69.5	8	0.12%	82.75%
24.5	66	1.01%	64.24%	70.5	14	0.22%	82.96%
25.5	56	0.86%	65.10%	71.5	7	0.11%	83.07%
26.5	78	1.20%	66.30%	72.5	11	0.17%	83.24%
27.5	40	0.61%	66.91%	73.5	25	0.38%	83.63%
28.5	51	0.78%	67.70%	74.5	10	0.15%	83.78%
29.5	23	0.35%	68.05%	75.5	9	0.14%	83.92%
30.5	37	0.57%	68.62%	76.5	11	0.17%	84.09%
31.5	31	0.48%	69.09%	77.5	14	0.22%	84.30%
32.5	35	0.54%	69.63%	78.5	12	0.18%	84.49%
33.5	26	0.40%	70.03%	79.5	4	0.06%	84.55%
34.5	38	0.58%	70.61%	80.5	6	0.09%	84.64%
35.5	44	0.68%	71.29%	81.5	4	0.06%	84.70%
36.5	58	0.89%	72.18%	82.5	5	0.08%	84.78%
37.5	54	0.83%	73.01%	83.5	20	0.31%	85.08%
38.5	24	0.37%	73.38%	84.5	21	0.32%	85.41%
39.5	11	0.17%	73.55%	85.5	7	0.11%	85.51%
40.5	42	0.65%	74.19%	86.5	9	0.14%	85.65%
41.5	30	0.46%	74.65%	87.5	5	0.08%	85.73%
42.5	48	0.74%	75.39%	88.5	5	0.08%	85.81%
43.5	19	0.29%	75.68%	89.5	1	0.02%	85.82%
44.5	21	0.32%	76.01%	90.5	6	0.09%	85.91%
45.5	24	0.37%	76.37%	>90.5	917	14.09%	100.00%
					6510		

F-5: **SHIPPING TIMES FROM ORIGINATORS
TO NODES THAT TRANSSHIP TO THE
SAN DIEGO HUB FOR 7Z COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	274	16.37%	16.37%	46.5	5	0.30%	79.69%
1.5	235	14.04%	30.41%	47.5	4	0.24%	79.93%
2.5	54	3.23%	33.63%	48.5	8	0.48%	80.41%
3.5	35	2.09%	35.72%	49.5	1	0.06%	80.47%
4.5	31	1.85%	37.57%	50.5	12	0.72%	81.18%
5.5	50	2.99%	40.56%	51.5	7	0.42%	81.60%
6.5	29	1.73%	42.29%	52.5	20	1.19%	82.80%
7.5	23	1.37%	43.67%	54.5	7	0.42%	83.21%
8.5	31	1.85%	45.52%	55.5	5	0.30%	83.51%
9.5	16	0.96%	46.48%	56.5	3	0.18%	83.69%
10.5	23	1.37%	47.85%	57.5	25	1.49%	85.19%
11.5	20	1.19%	49.04%	58.5	2	0.12%	85.30%
12.5	17	1.02%	50.06%	61.5	8	0.48%	85.78%
13.5	7	0.42%	50.48%	62.5	1	0.06%	85.84%
14.5	18	1.08%	51.55%	63.5	5	0.30%	86.14%
15.5	33	1.97%	53.52%	64.5	1	0.06%	86.20%
16.5	31	1.85%	55.38%	65.5	5	0.30%	86.50%
17.5	7	0.42%	55.79%	66.5	10	0.60%	87.10%
18.5	13	0.78%	56.57%	67.5	1	0.06%	87.16%
19.5	23	1.37%	57.95%	68.5	2	0.12%	87.28%
20.5	26	1.55%	59.50%	69.5	2	0.12%	87.40%
21.5	20	1.19%	60.69%	70.5	5	0.30%	87.69%
22.5	18	1.08%	61.77%	71.5	1	0.06%	87.75%
23.5	5	0.30%	62.07%	72.5	3	0.18%	87.93%
24.5	18	1.08%	63.14%	73.5	2	0.12%	88.05%
25.5	22	1.31%	64.46%	74.5	1	0.06%	88.11%
26.5	50	2.99%	67.44%	75.5	1	0.06%	88.17%
27.5	18	1.08%	68.52%	77.5	2	0.12%	88.29%
28.5	28	1.67%	70.19%	78.5	1	0.06%	88.35%
29.5	31	1.85%	72.04%	80.5	2	0.12%	88.47%
30.5	22	1.31%	73.36%	84.5	1	0.06%	88.53%
31.5	5	0.30%	73.66%	85.5	3	0.18%	88.71%
32.5	7	0.42%	74.07%	86.5	3	0.18%	88.89%
33.5	9	0.54%	74.61%	87.5	3	0.18%	89.07%
34.5	4	0.24%	74.85%	88.5	1	0.06%	89.13%
35.5	10	0.60%	75.45%	89.5	6	0.36%	89.49%
36.5	5	0.30%	75.75%	90.5	4	0.24%	89.73%
37.5	2	0.12%	75.87%	>90.5	172	10.27%	100.00%
38.5	5	0.30%	76.16%		1674		
39.5	5	0.30%	76.46%				
40.5	3	0.18%	76.64%				
41.5	4	0.24%	76.88%				
42.5	11	0.66%	77.54%				
43.5	6	0.36%	77.90%				
44.5	9	0.54%	78.43%				
45.5	16	0.96%	79.39%				

F-6: **SHIPPING TIMES FROM ORIGINATORS TO NODES THAT TRANSSHIP TO THE SAN DIEGO HUB FOR 7E COG**

Days	Count	Percent	Cumulative Percent	Days	Count	Percent	Cumulative Percent
0.5	28	2.28%	2.28%	46.5	5	0.41%	83.48%
1.5	48	3.91%	6.18%	48.5	9	0.73%	84.21%
2.5	47	3.82%	10.01%	49.5	4	0.33%	84.54%
3.5	34	2.77%	12.77%	50.5	4	0.33%	84.87%
4.5	69	5.61%	18.39%	51.5	1	0.08%	84.95%
5.5	142	11.55%	29.94%	52.5	2	0.16%	85.11%
6.5	76	6.18%	36.13%	53.5	1	0.08%	85.19%
7.5	60	4.88%	41.01%	55.5	1	0.08%	85.27%
8.5	45	3.66%	44.67%	57.5	1	0.08%	85.35%
9.5	20	1.63%	46.30%	58.5	1	0.08%	85.44%
10.5	50	4.07%	50.37%	59.5	1	0.08%	85.52%
11.5	65	5.29%	55.66%	62.5	4	0.33%	85.84%
12.5	4	0.33%	55.98%	63.5	2	0.16%	86.00%
13.5	53	4.31%	60.29%	64.5	2	0.16%	86.17%
14.5	20	1.63%	61.92%	65.5	2	0.16%	86.33%
15.5	8	0.65%	62.57%	66.5	1	0.08%	86.41%
16.5	13	1.06%	63.63%	67.5	2	0.16%	86.57%
17.5	24	1.95%	65.58%	69.5	2	0.16%	86.74%
18.5	21	1.71%	67.29%	70.5	1	0.08%	86.82%
19.5	13	1.06%	68.35%	71.5	1	0.08%	86.90%
20.5	15	1.22%	69.57%	73.5	1	0.08%	86.98%
21.5	9	0.73%	70.30%	75.5	1	0.08%	87.06%
22.5	3	0.24%	70.55%	76.5	18	1.46%	88.53%
23.5	10	0.81%	71.36%	77.5	1	0.08%	88.61%
24.5	8	0.65%	72.01%	82.5	1	0.08%	88.69%
25.5	6	0.49%	72.50%	83.5	2	0.16%	88.85%
26.5	17	1.38%	73.88%	84.5	1	0.08%	88.93%
27.5	12	0.98%	74.86%	85.5	2	0.16%	89.10%
28.5	11	0.90%	75.75%	86.5	1	0.08%	89.18%
29.5	6	0.49%	76.24%	90.5	1	0.08%	89.26%
30.5	3	0.24%	76.48%	>90.5	132	10.74%	100.00%
31.5	7	0.57%	77.05%		1229		
32.5	5	0.41%	77.46%				
33.5	4	0.33%	77.79%				
34.5	2	0.16%	77.95%				
35.5	9	0.73%	78.68%				
36.5	13	1.06%	79.74%				
37.5	6	0.49%	80.23%				
38.5	7	0.57%	80.80%				
39.5	11	0.90%	81.69%				
40.5	7	0.57%	82.26%				
41.5	1	0.08%	82.34%				
42.5	3	0.24%	82.59%				
43.5	4	0.33%	82.91%				
44.5	1	0.08%	82.99%				
45.5	1	0.08%	83.08%				

111

SHIPPING TIME FROM ORIGINATOR TO NODE
7R 46433

MEAN = 22.41 Days
ST DEV = 45.93 Days

Frequency of Observation

Days

112
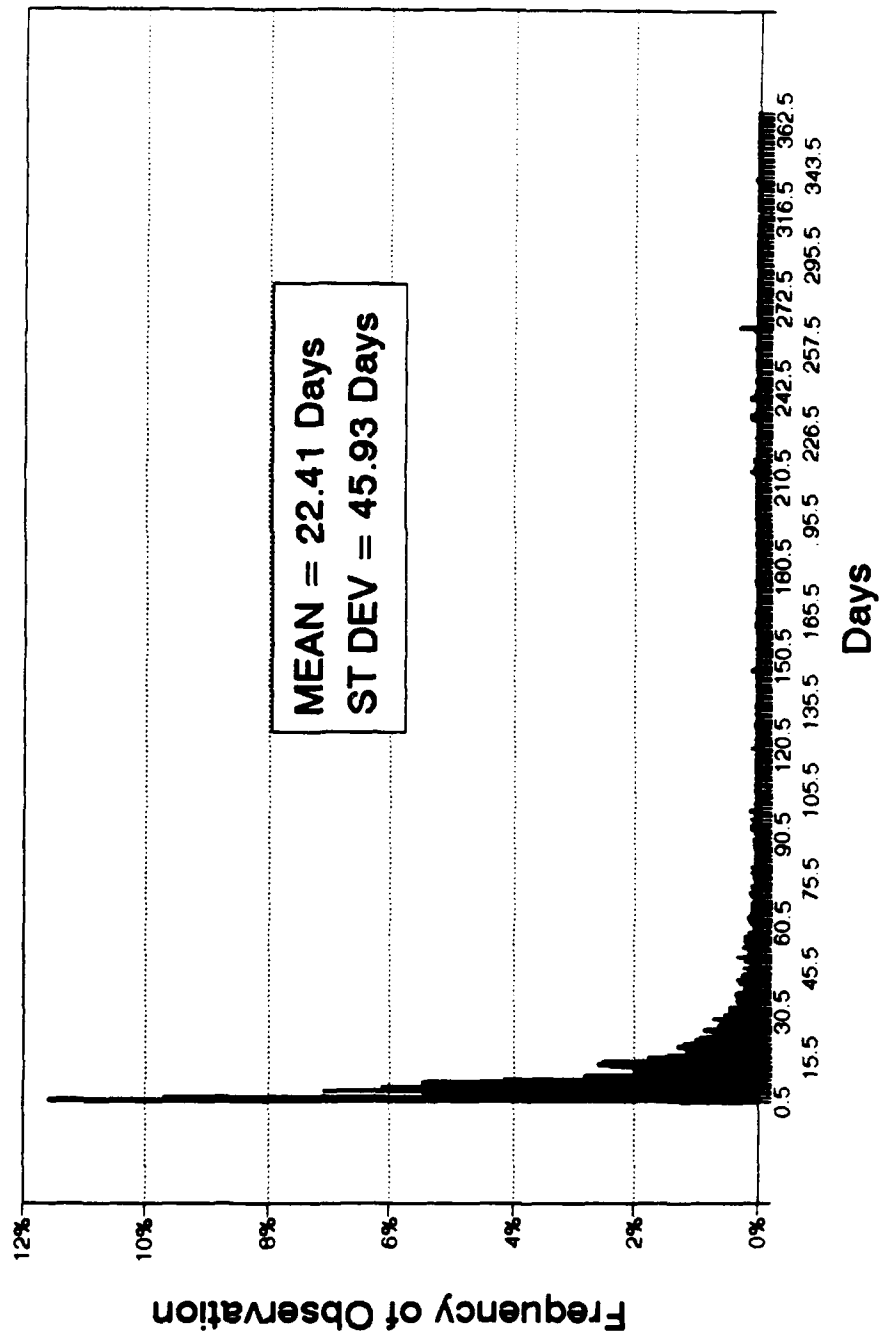
SHIPPING FROM ORIGINATOR TO NODE
7E 46433

MEAN = 32.49 Days
ST DEV = 54.49 Days

Days

Frequency of Observation
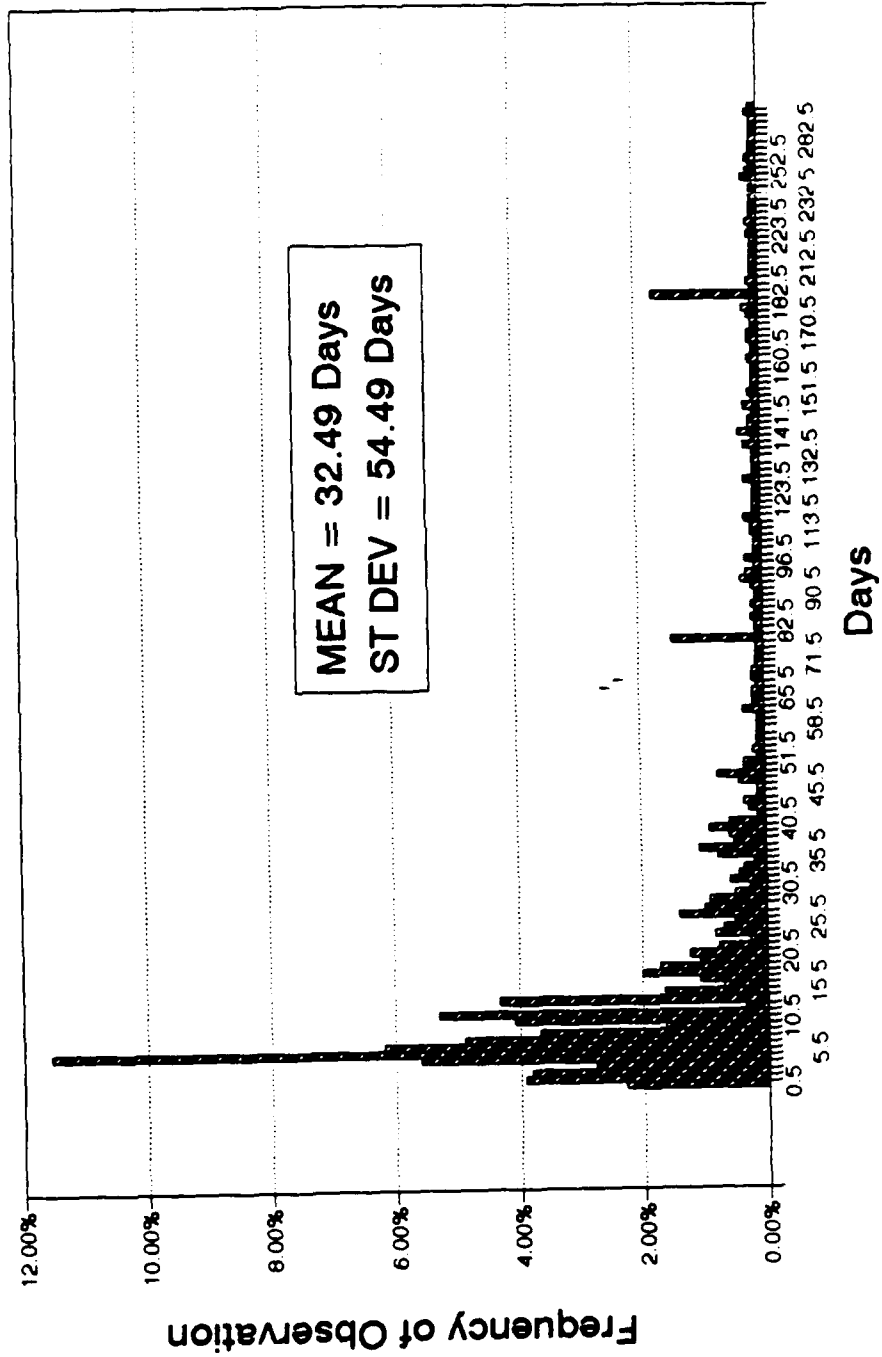
APPENDIX G: PROCESSING TIMES FOR NODES THAT TRANSSHIP TO THE NORFOLK HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	69975	83.52%	83.52%
1.5	10802	12.89%	96.41%
2.5	565	0.67%	97.09%
3.5	1833	2.19%	99.27%
4.5	368	0.44%	99.71%
5.5	151	0.18%	99.89%
6.5	80	0.10%	99.99%
7.5	10	0.01%	100.00%
	83784		

7R 68620

Days	Count	Percent	Cumulative Percent
0.5	47917	82.2%	82.24%
1.5	8199	14.1%	96.31%
2.5	437	0.8%	97.06%
3.5	1357	2.3%	99.39%
4.5	261	0.4%	99.84%
5.5	94	0.2%	100.00%
	58265		

7H 68620

Days	Count	Percent	Cumulative Percent
0.5	16966	87.10%	87.10%
1.5	1906	9.79%	96.89%
2.5	99	0.51%	97.40%
3.5	373	1.91%	99.31%
4.5	84	0.43%	99.74%
5.5	50	0.26%	100.00%
	19478		

7G 68620

Days	Count	Percent	Cumulative Percent
0.5	3937	86.04%	86.04%
1.5	511	11.17%	97.20%
2.5	25	0.55%	97.75%
3.5	86	1.88%	99.63%
4.5	17	0.37%	100.00%
	4576		

7Z 68620

Days	Count	Percent	Cumulative Percent
0.5	412	86.55%	86.55%
1.5	60	12.61%	99.16%
2.5	0	0.00%	99.16%
3.5	2	0.42%	99.58%
4.5	0	0.00%	99.58%
5.5	0	0.00%	99.58%
6.5	2	0.42%	100.00%
	476		

7E 68620

Days	Count	Percent	Cumulative Percent
0.5	693	83.19%	83.19%
1.5	116	13.93%	97.12%
2.5	4	0.48%	97.60%
3.5	14	1.68%	99.28%
4.5	6	0.72%	100.00%
	833		

NODE PROCESSING TIME
7R 68620

MEAN = .75 Days
ST DEV = .66 Days

Days

Frequency of Observation

90%
80%
70%
60%
50%
40%
30%
20%
10%
0%

0.5   1.5   2.5   3.5   4.5   5.5

115

NODE PROCESSING TIME
7E 68620

MEAN = .73 Days
ST DEV = .61 Days

Frequency of Observation
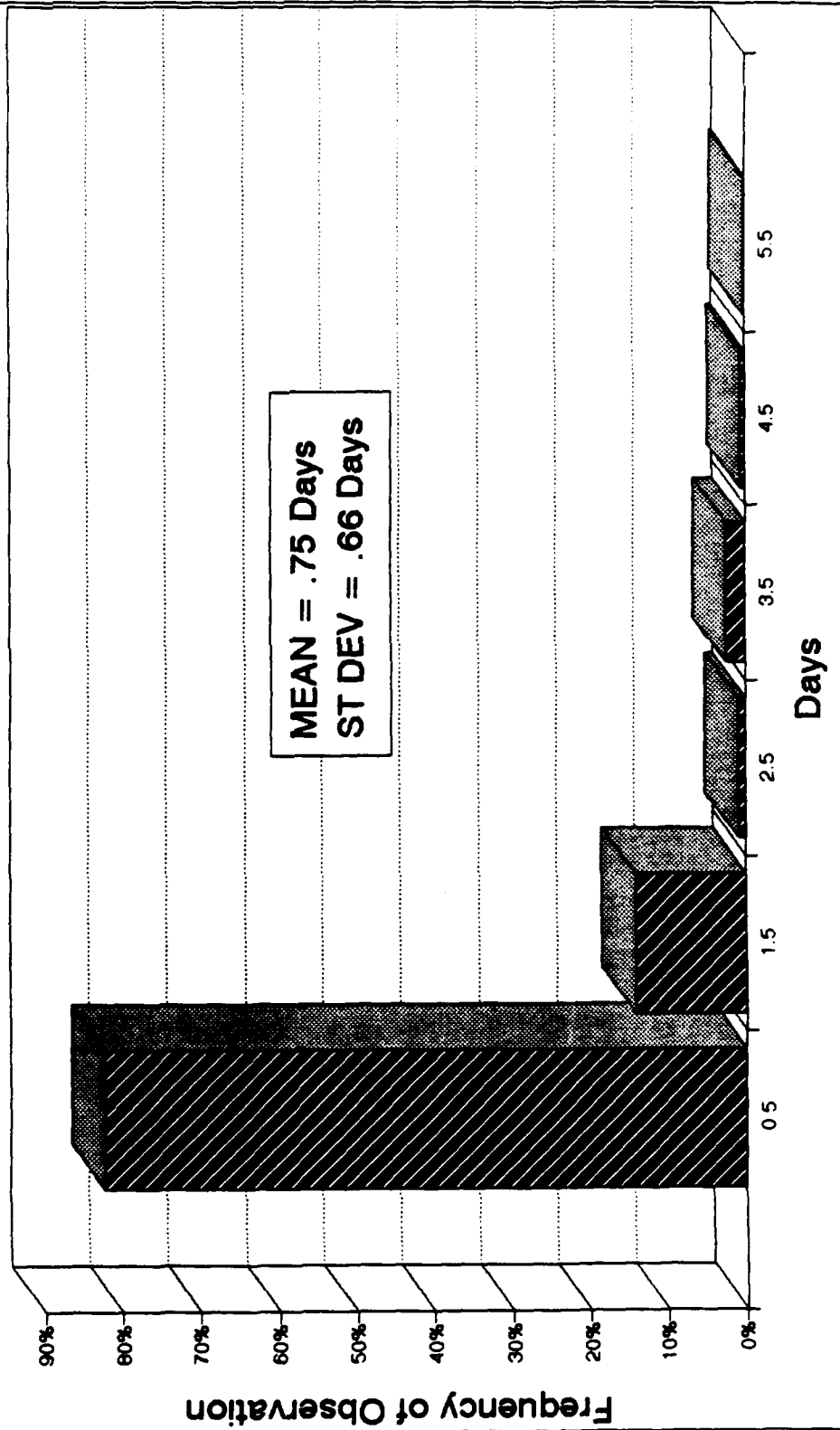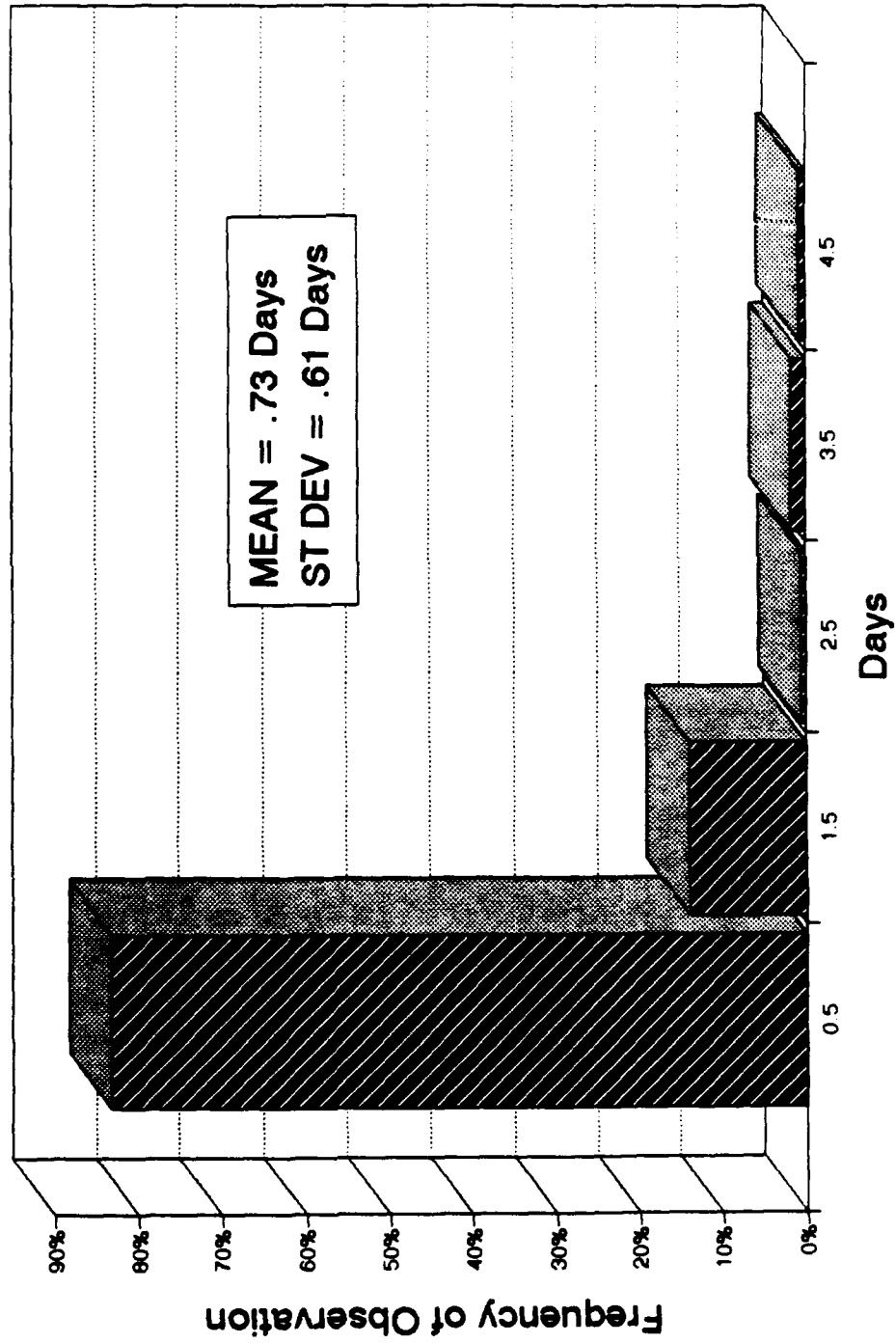
Days

APPENDIX H: PROCESSING TIMES FOR NODES THAT TRANSSHIP TO THE SAN DIEGO HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	20968	28.31%	28.31%
1.5	41670	56.27%	84.58%
2.5	661	0.89%	85.47%
3.5	9465	12.78%	98.25%
4.5	1164	1.57%	99.83%
5.5	42	0.06%	99.88%
6.5	46	0.06%	99.94%
7.5	41	0.06%	100.00%
	74057		

7R 46433

Days	Count	Percent	Cumulative Percent
0.5	10296	24.46%	24.46%
1.5	25407	60.37%	84.83%
2.5	362	0.86%	85.69%
3.5	5325	12.65%	98.34%
4.5	668	1.59%	99.93%
5.5	30	0.07%	100.00%
	42088		

7H 46433

Days	Count	Percent	Cumulative Percent
0.5	7611	34.32%	34.32%
1.5	11161	50.33%	84.65%
2.5	221	1.00%	85.65%
3.5	2870	12.94%	98.59%
4.5	312	1.41%	100.00%
	22175		

7G 46433

Days	Count	Percent	Cumulative Percent
0.5	2261	33.99%	33.99%
1.5	3360	50.51%	84.50%
2.5	55	0.83%	85.33%
3.5	861	12.94%	98.27%
4.5	115	1.73%	100.00%
	6652		

7Z 46433

Days	Count	Percent	Cumulative Percent
0.5	584	34.35%	34.35%
1.5	840	49.41%	83.76%
2.5	14	0.82%	84.59%
3.5	212	12.47%	97.06%
4.5	50	2.94%	100.00%
	1700		

7E 46433

Days	Count	Percent	Cumulative Percent
0.5	170	13.82%	13.82%
1.5	849	69.02%	82.85%
2.5	9	0.73%	83.58%
3.5	187	15.20%	98.78%
4.5	15	1.22%	100.00%
	1230		

NODE PROCESSING TIME
7R 46433

MEAN = 1.57 Days
ST DEV = .95 Days

Frequency of Observation

Days

NODE PROCESSING TIME
7E 46433

MEAN = 1.71 Days
ST DEV = .91 Days
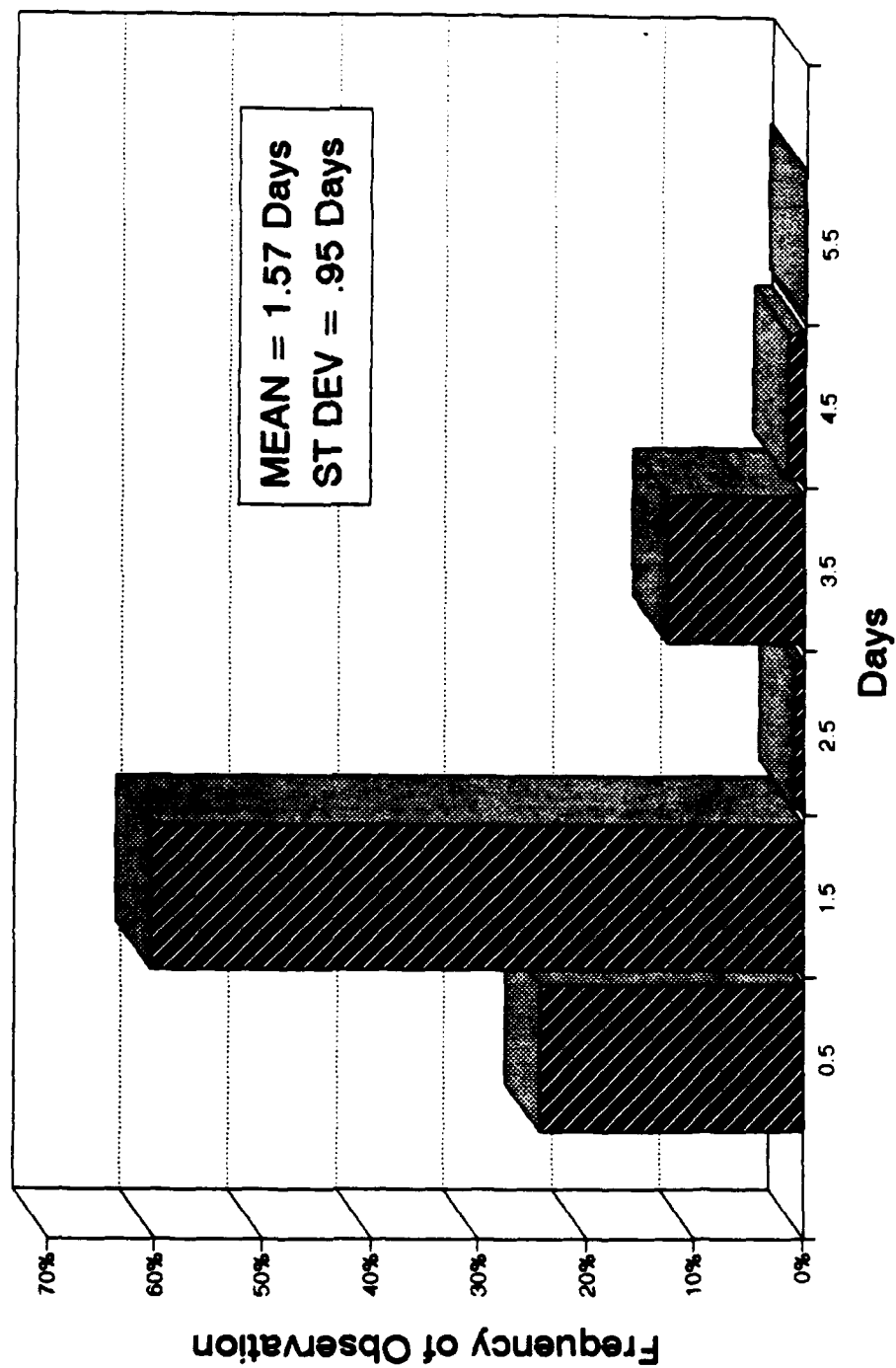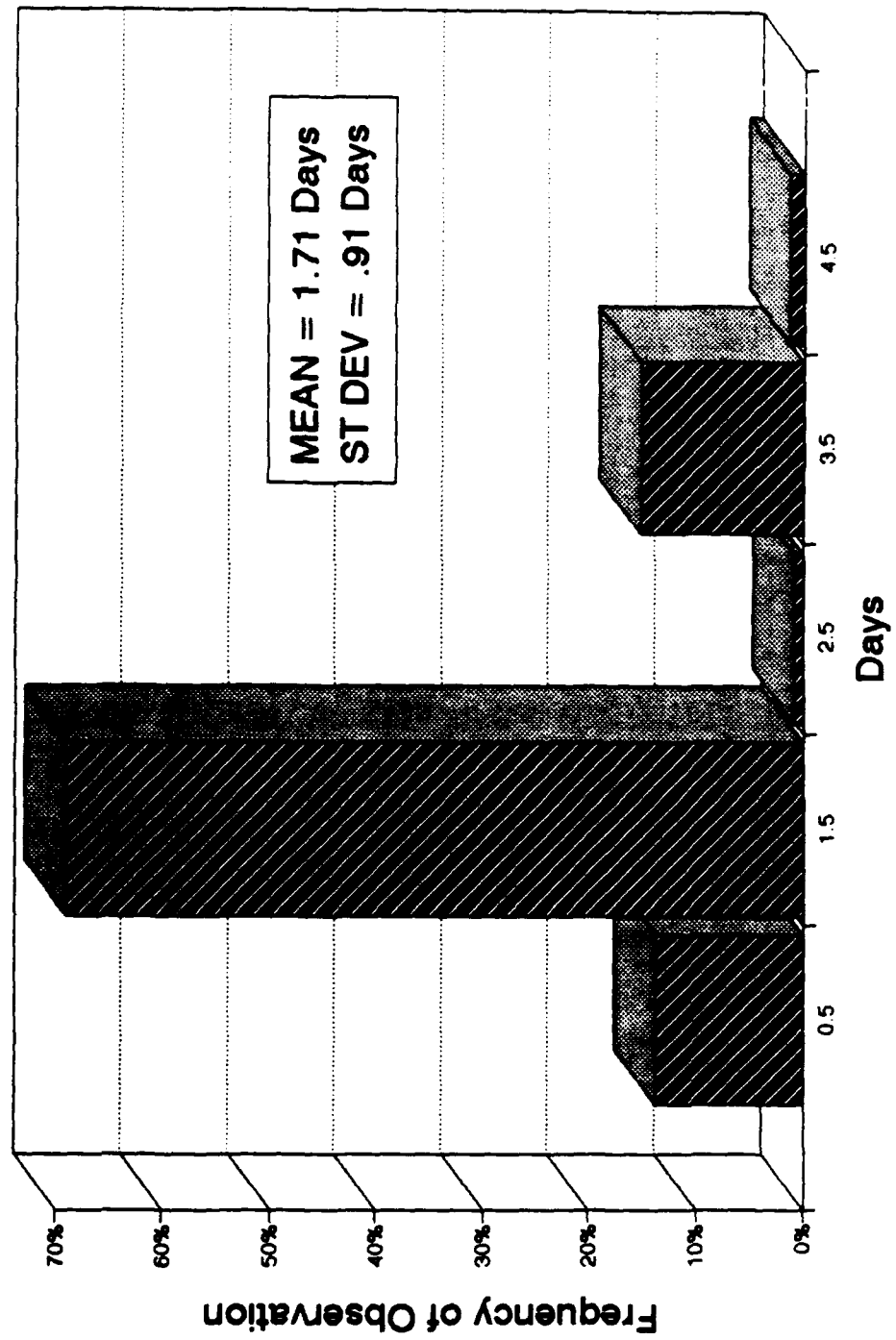
APPENDIX I: SHIPPING TIMES FROM NODES TO THE NORFOLK HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	1323	1.61%	1.61%
1.5	11940	14.53%	16.14%
2.5	9724	11.83%	27.97%
3.5	14224	17.31%	45.27%
4.5	10250	12.47%	57.74%
5.5	11378	13.84%	71.58%
6.5	9495	11.55%	83.14%
7.5	5293	6.44%	89.58%
8.5	2117	2.58%	92.19%
9.5	948	1.15%	93.30%
10.5	1311	1.59%	94.90%
11.5	856	1.04%	95.94%
12.5	622	0.76%	96.70%
13.5	425	0.52%	97.22%
14.5	475	0.58%	97.80%
15.5	603	0.73%	98.53%
16.5	109	0.13%	98.66%
17.5	53	0.06%	98.73%
18.5	88	0.11%	98.83%
19.5	46	0.06%	98.89%
20.5	110	0.13%	99.03%
21.5	106	0.13%	99.15%
22.5	67	0.08%	99.24%
23.5	170	0.21%	99.44%
24.5	106	0.13%	99.57%
25.5	7	0.01%	99.58%
26.5	15	0.02%	99.60%
27.5	83	0.10%	99.70%
28.5	167	0.20%	99.90%
29.5	53	0.06%	99.97%
30.5	27	0.03%	100.00%
	82195		

7R CO920

Days	Count	Percent	Cumulative Percent
0.5	922	1.61%	1.61%
1.5	6613	11.57%	13.19%
2.5	6195	10.77%	23.96%
3.5	10254	17.94%	41.90%
4.5	6648	11.63%	53.54%
5.5	8301	14.53%	68.06%
6.5	7047	12.33%	80.40%
7.5	4109	7.19%	87.59%
8.5	1674	2.93%	90.52%
9.5	831	1.45%	91.97%
10.5	1065	1.86%	93.83%
11.5	611	1.07%	94.90%
12.5	534	0.93%	95.84%
13.5	409	0.72%	96.55%
14.5	404	0.71%	97.26%
15.5	531	0.93%	98.19%
16.5	107	0.19%	98.38%
17.5	52	0.09%	98.47%
18.5	81	0.14%	98.61%
19.5	30	0.05%	98.66%
20.5	100	0.18%	98.84%
21.5	86	0.15%	98.99%
22.5	22	0.04%	99.03%
23.5	161	0.28%	99.31%
24.5	74	0.13%	99.44%
25.5	5	0.01%	99.45%
26.5	14	0.02%	99.47%
27.5	78	0.14%	99.61%
28.5	143	0.25%	99.86%
29.5	41	0.07%	99.93%
30.5	27	0.05%	99.98%
31.5	3	0.01%	99.98%
32.5	9	0.02%	100.00%
33.5	1	0.00%	100.00%
	57142		

7H CO920

Days	Count	Percent	Cumulative Percent
0.5	305	1.60%	1.60%
1.5	4136	21.64%	23.28%
2.5	2790	14.64%	37.87%
3.5	2957	15.47%	53.34%
4.5	2882	15.08%	68.42%
5.5	2368	12.39%	80.81%
6.5	1819	9.50%	90.31%
7.5	884	4.62%	94.93%
8.5	319	1.67%	96.60%
9.5	99	0.52%	97.12%
10.5	149	0.78%	97.90%
11.5	189	0.99%	98.89%
12.5	69	0.36%	99.25%
13.5	16	0.08%	99.33%
14.5	46	0.24%	99.58%
15.5	47	0.25%	99.83%
16.5	2	0.01%	99.84%
18.5	6	0.03%	99.87%
19.5	6	0.03%	99.90%
20.5	8	0.04%	99.94%
21.5	11	0.06%	100.00%
	19119		

7G CO920

Days	Count	Percent	Cumulative Percent
0.5	67	1.49%	1.49%
1.5	959	21.31%	22.80%
2.5	590	13.16%	35.97%
3.5	805	17.96%	53.93%
4.5	550	12.27%	66.20%
5.5	538	11.96%	78.16%
6.5	447	9.97%	88.13%
7.5	235	5.24%	93.37%
8.5	84	1.87%	95.25%
9.5	15	0.33%	95.58%
10.5	82	1.83%	97.41%
11.5	42	0.94%	98.35%
12.5	13	0.29%	98.64%
14.5	15	0.33%	98.97%
15.5	16	0.36%	99.33%
17.5	1	0.02%	99.35%
18.5	1	0.02%	99.38%
19.5	7	0.16%	99.53%
20.5	2	0.04%	99.58%
21.5	6	0.13%	99.71%
22.5	9	0.20%	99.91%
23.5	4	0.09%	100.00%
	4482		

7Z 68620

Days	Count	Percent	Cumulative Percent
0 5	15	3 18%	3 18%
1 5	105	22 25%	25 42%
2 5	61	12 92%	38 35%
3 5	60	12 71%	51 06%
4 5	58	12 29%	63 35%
5 5	47	9 96%	73 31%
6 5	68	14 41%	87 71%
7 5	14	2 97%	90 68%
8 5	24	5 08%	95 76%
9 5	0	0 00%	95 76%
10 5	6	1 27%	97 03%
11 5	4	0 85%	97 88%
12 5	1	0 21%	98 09%
13 5	0	0 00%	98 09%
14 5	0	0 00%	98 09%
15 5	5	1 06%	99 15%
16 5	0	0 00%	99 15%
17 5	0	0 00%	99 15%
18 5	0	0 00%	99 15%
19 5	4	0 85%	100 00%
	472		

7E 68620

Days	Count	Percent	Cumulative Percent
0 5	14	1 70%	1 70%
1 5	123	14 93%	16 63%
2 5	116	14 08%	30 70%
3 5	144	17 48%	48 18%
4 5	103	12 50%	60 68%
5 5	119	14 44%	75 12%
6 5	109	13 23%	88 35%
7 5	39	4 73%	93 08%
8 5	14	1 70%	94 78%
9 5	2	0 24%	95 02%
10 5	8	0 97%	96 00%
11 5	12	1 46%	97 45%
12 5	5	0 61%	98 06%
13 5	0	0 00%	98 06%
14 5	5	0 61%	98 67%
15 5	3	0 36%	99 03%
16 5	0	0 00%	99 03%
17 5	0	0 00%	99 03%
18 5	0	0 00%	99 03%
19 5	0	0 00%	99 03%
20 5	0	0 00%	99 03%
21 5	3	0 36%	99 39%
22 5	5	0 61%	100 00%
	824		

121

SHIPPING TIME FROM NODE TO HUB
7R 68620

MEAN = 5.33 Days
ST DEV = 3.77 Days

Frequency of Observation

Days

122
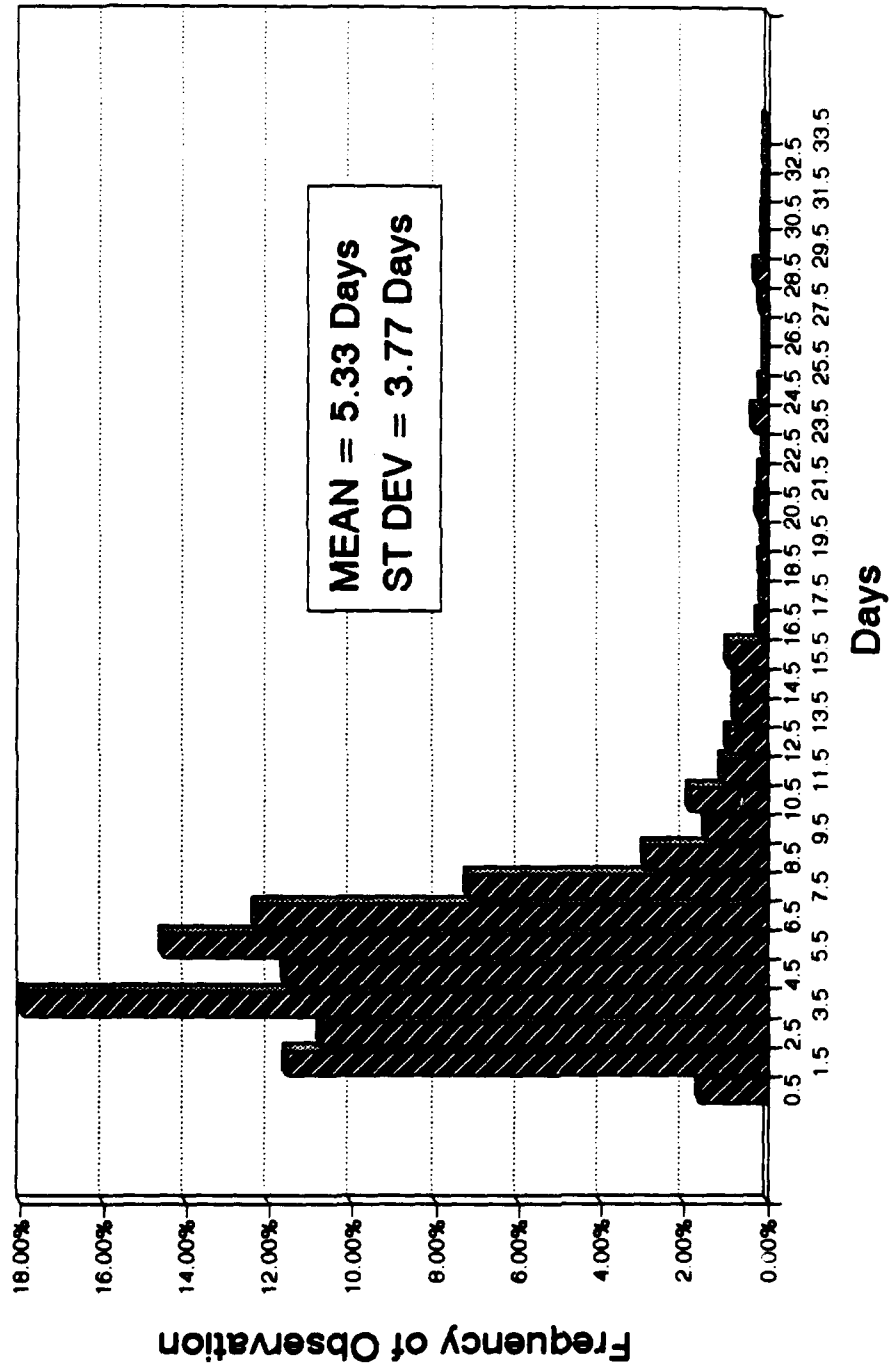
SHIPPING TIME FROM NODE TO HUB
7E 68620

MEAN = 4.64 Days
ST DEV = 3.05 Days

Frequency of Observation
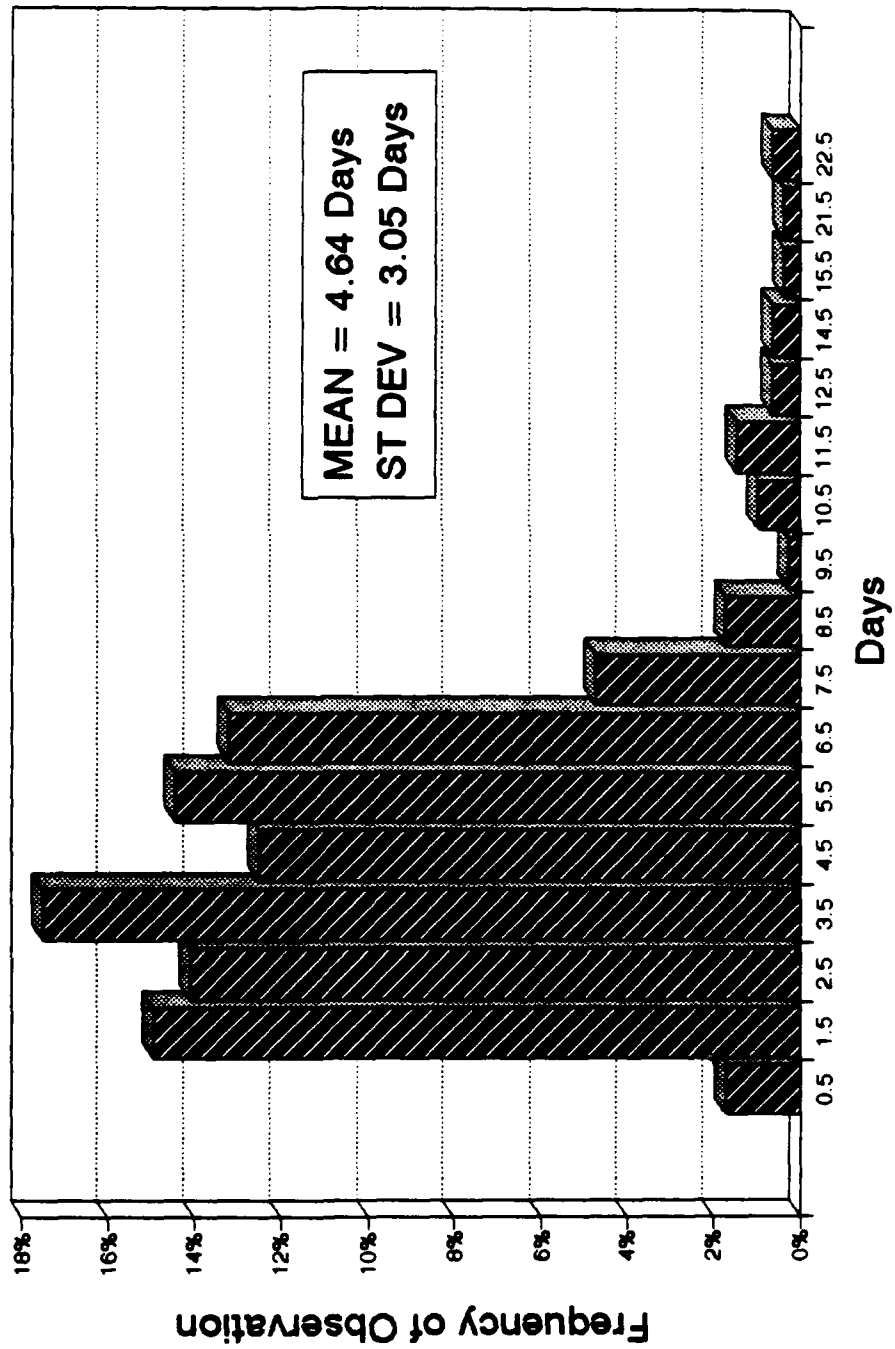
Days

APPENDIX J: SHIPPING TIMES FROM NODES TO THE SAN DIEGO HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	335	0.45%	0.45%
1.5	13907	18.88%	19.33%
2.5	9118	12.38%	31.71%
3.5	8679	11.78%	43.49%
4.5	9450	12.83%	56.32%
5.5	10020	13.60%	69.92%
6.5	7462	10.13%	80.04%
7.5	4593	6.23%	86.28%
8.5	2118	2.87%	89.15%
9.5	835	1.13%	90.29%
10.5	1377	1.87%	92.16%
11.5	1725	2.34%	94.50%
12.5	623	0.85%	95.34%
13.5	1044	1.42%	96.76%
14.5	880	1.19%	97.95%
15.5	325	0.44%	98.40%
16.5	223	0.30%	98.70%
17.5	156	0.21%	98.91%
18.5	215	0.29%	99.20%
19.5	81	0.11%	99.31%
20.5	191	0.26%	99.57%
21.5	189	0.26%	99.83%
22.5	65	0.09%	99.92%
23.5	62	0.08%	100.00%
	73673		

7R 46433

Days	Count	Percent	Cumulative Percent
0.5	213	0.51%	0.51%
1.5	8213	19.62%	20.13%
2.5	5625	13.44%	33.56%
3.5	5194	12.41%	45.97%
4.5	5905	14.10%	60.07%
5.5	5800	13.85%	73.92%
6.5	4072	9.73%	83.65%
7.5	2053	4.90%	88.55%
8.5	1029	2.46%	91.01%
9.5	312	0.75%	91.76%
10.5	722	1.72%	93.48%
11.5	816	1.95%	95.43%
12.5	303	0.72%	96.15%
13.5	525	1.25%	97.41%
14.5	470	1.12%	98.53%
15.5	118	0.28%	98.81%
16.5	127	0.30%	99.11%
17.5	29	0.07%	99.18%
18.5	138	0.33%	99.51%
19.5	16	0.04%	99.55%
20.5	58	0.14%	99.69%
21.5	102	0.24%	99.93%
22.5	28	0.07%	100.00%
	41868		

7H 46433

Days	Count	Percent	Cumulative Percent
0.5	109	0.49%	0.49%
1.5	4147	18.71%	19.20%
2.5	2404	10.84%	30.04%
3.5	2459	11.09%	41.14%
4.5	2579	11.63%	52.77%
5.5	2762	12.46%	65.23%
6.5	2392	10.79%	76.02%
7.5	1706	7.70%	83.72%
8.5	745	3.36%	87.08%
9.5	329	1.48%	88.56%
10.5	411	1.85%	90.42%
11.5	598	2.70%	93.12%
12.5	245	1.11%	94.22%
13.5	366	1.65%	95.87%
14.5	278	1.25%	97.13%
15.5	113	0.51%	97.64%
16.5	72	0.32%	97.96%
17.5	51	0.23%	98.19%
18.5	58	0.26%	98.45%
19.5	44	0.20%	98.65%
20.5	109	0.49%	99.14%
21.5	65	0.29%	99.44%
22.5	21	0.09%	99.53%
23.5	17	0.08%	99.61%
24.5	53	0.24%	99.85%
25.5	1	0.00%	99.85%
26.5	25	0.11%	99.96%
27.5	1	0.00%	99.97%
28.5	7	0.03%	100.00%
	22167		

7G 46433

Days	Count	Percent	Cumulative Percent
0.5	8	0.12%	0.12%
1.5	773	11.58%	11.70%
2.5	797	11.94%	23.64%
3.5	622	9.32%	32.95%
4.5	745	11.16%	44.11%
5.5	1008	15.10%	59.21%
6.5	690	10.34%	69.55%
7.5	583	8.73%	78.28%
8.5	280	4.19%	82.47%
9.5	135	2.02%	84.50%
10.5	201	3.01%	87.51%
11.5	259	3.88%	91.39%
12.5	70	1.05%	92.44%
13.5	131	1.96%	94.40%
14.5	121	1.81%	96.21%
15.5	91	1.36%	97.57%
16.5	19	0.28%	97.86%
17.5	53	0.79%	98.65%
18.5	15	0.22%	98.88%
19.5	20	0.30%	99.18%
20.5	23	0.34%	99.52%
21.5	16	0.24%	99.76%
22.5	14	0.21%	99.97%
23.5	2	0.03%	100.00%
	6676		

7Z 46433

Days	Count	Percent	Cumulative Percent
0 5	2	0 12%	0 12%
1 5	606	36 44%	36 56%
2 5	88	5 29%	41 85%
3 5	181	10 88%	52 74%
4 5	85	5 11%	57 85%
5 5	123	7 40%	65 24%
6 5	175	10 52%	75 77%
7 5	191	11 49%	87 25%
8 5	44	2 65%	89 90%
9 5	32	1 92%	91 82%
10 5	29	1 74%	93 57%
11 5	47	2 83%	96 39%
12 5	3	0 18%	96 57%
13 5	13	0 78%	97 35%
14 5	9	0.54%	97.90%
15 5	1	0.06%	97 96%
16 5	1	0.06%	98 02%
17 5	22	1 32%	99 34%
18 5	2	0.12%	99.46%
19 5	0	0.00%	99 46%
20 5	0	0.00%	99 46%
21 5	5	0.30%	99.76%
22 5	2	0 12%	99.88%
23 5	0	0.00%	99 88%
24 5	0	0.00%	99 88%
25 5	0	0.00%	99 88%
26 5	1	0.06%	99.94%
27 5	0	0.00%	99 94%
28 5	0	0 00%	99 94%
29 5	1	0.06%	100.00%
	1663		

7E 46433

Days	Count	Percent	Cumulative Percent
0 5	3	0 25%	0 25%
1 5	151	12 35%	12 59%
2 5	182	14 88%	27 47%
3 5	215	17 58%	45 05%
4 5	114	9 32%	54 37%
5 5	301	24 61%	78 99%
6 5	122	9 98%	88 96%
7 5	58	4 74%	93 70%
8 5	18	1 47%	95 18%
9 5	26	2 13%	97 30%
10 5	14	1 14%	98 45%
11 5	5	0 41%	98 86%
12 5	2	0 16%	99 02%
13 5	8	0 65%	99 67%
14 5	2	0 16%	99 84%
15 5	2	0 16%	100 00%
	1223		

125

SHIPPING TIME FROM NODE TO HUB
7R 46433

MEAN = 4.84 Days
ST DEV = 3.32 Days

Frequency of Observation

Days
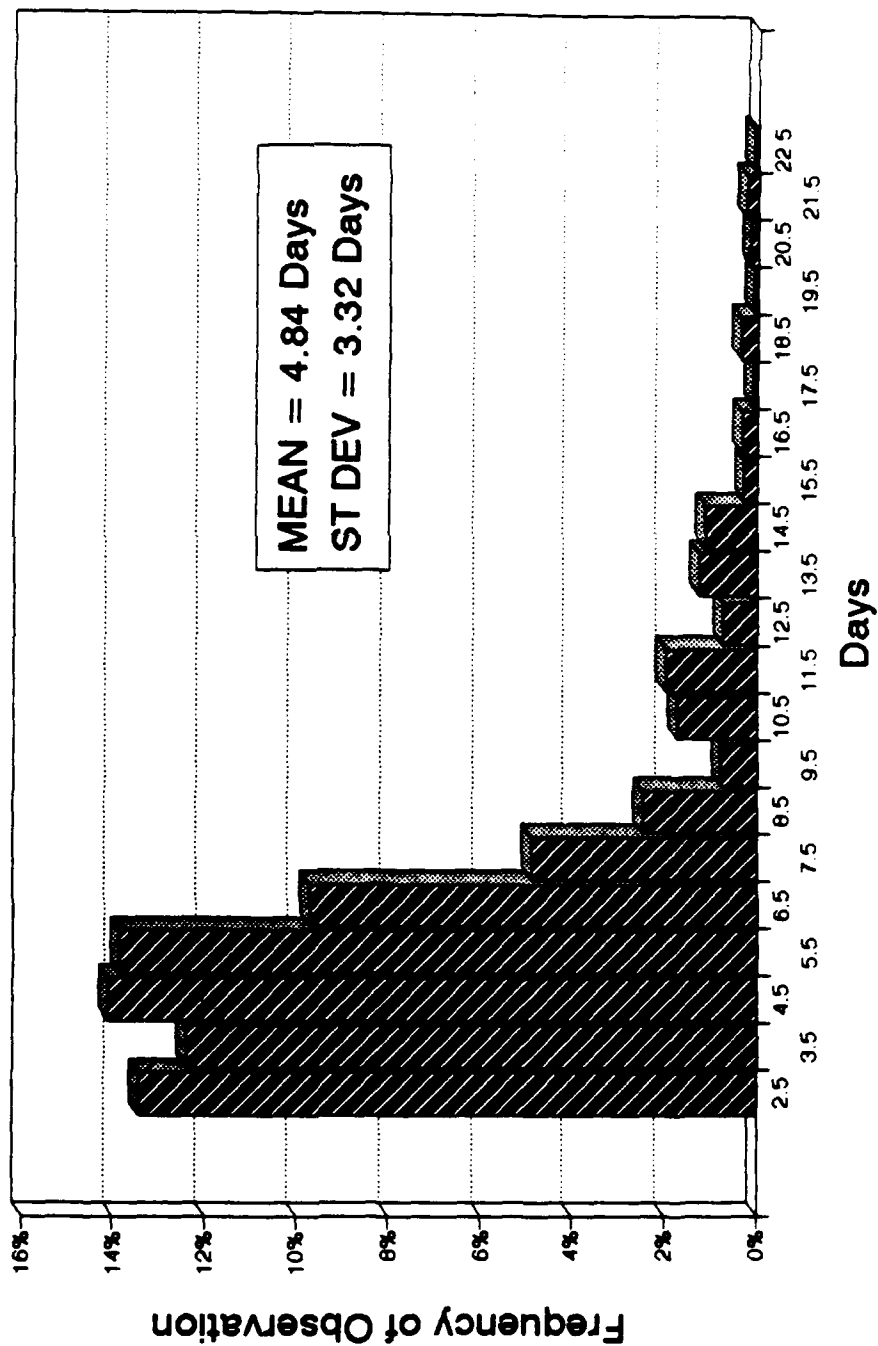
SHIPPING FROM NODE TO HUB
7E 46433

MEAN = 4.60 Days
ST DEV = 2.32 Days

Frequency of Observation

Days
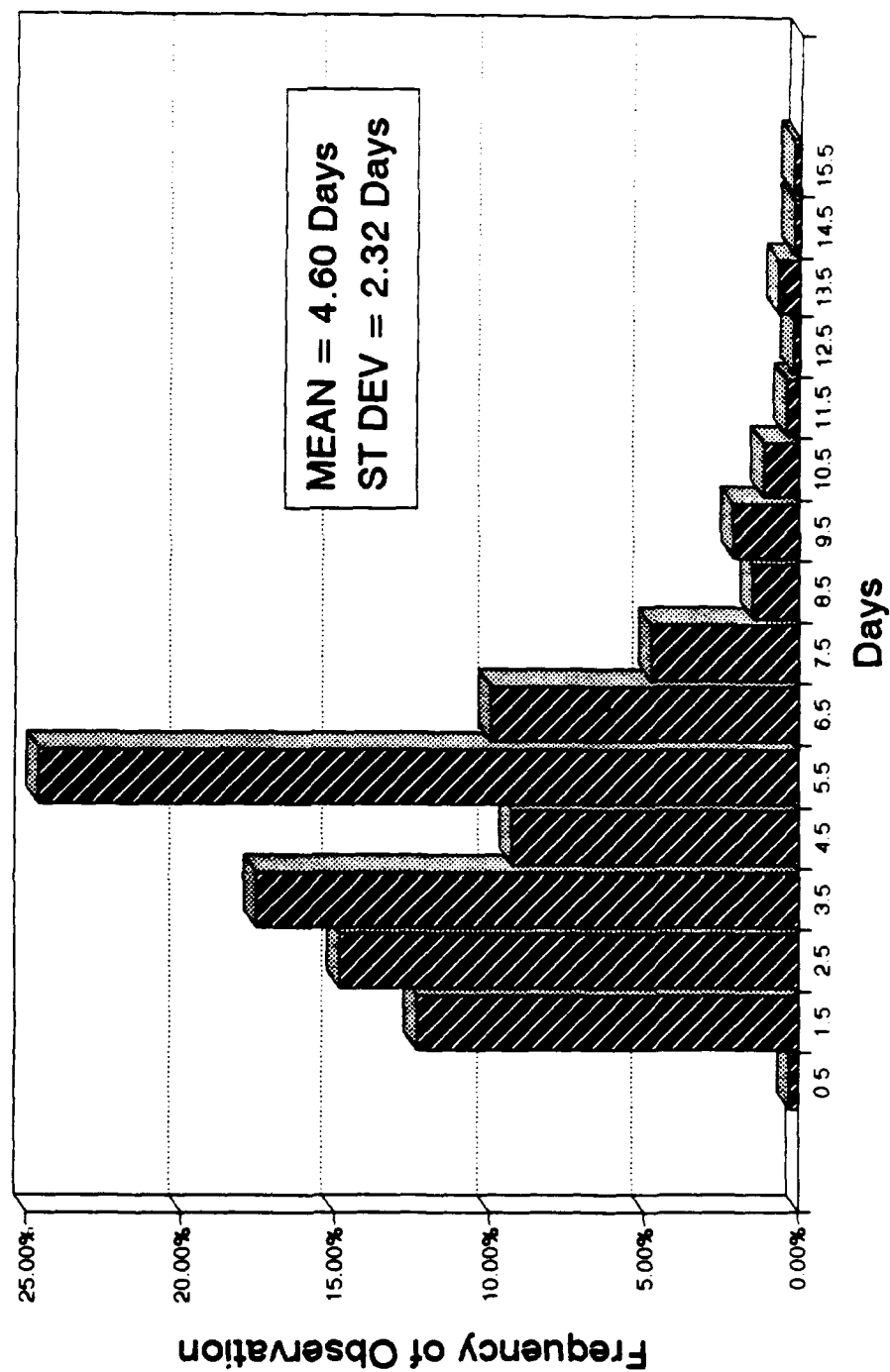
APPENDIX K: **DAILY ARRIVALS FROM ORIGINATORS**
AT THE NORFOLK HUB FOR ALL 7 COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	766	639	750	1000	0	0
	795	953	953	1389	154	0	0
	359	1069	553	595	769	0	0
	970	672	878	672	671	0	0
	793	692	933	1087	1125	1	0
	0	663	1338	823	25	0	0
	919	535	1003	900	519	0	0
	990	715	1208	1383	73	0	0
	871	550	1191	1164	506	81	0
	694	852	633	91	803	0	0
	0	884	742	902	665	0	0
	821	1038	203	0	449	0	0
	1405	977	1042	1025	531	0	0
	1444	405	941	696	935	0	0
	1838	1000	674	1033	818	2	0
	817	721	813	815	347	0	0
	434	0	638	414	536	0	0
	301	0	731	343	619	3	0
	1178	1004	1053	743	687	0	0
	764	485	1408	485	635	0	2
	0	1581	501	515	572	0	0
	1308	555	1637	787	453	0	0
	1450	846	469	805	447	31	0
	1806	638	1018	716	1007	1	0
	0	1197	1212	926	566	0	1
	912	1325	793	1267	1108	0	0
	993	1116	1067	737	1250	0	0
	1327	891	1217	859	1612	46	0
	883	687	1587	785	811	0	0
	837	704	565	760	452	0	0
	852	1024	781	750	706	0	0
	1143	764	613	708	461	0	0
	810	985	890	333	769	0	0
	514	779	601	1157	949	0	0
	559	734	576	956	547	1	0
	625	747	896	811	1087	0	0
	870	902	824	866	898	0	0
	794	865	544	981	649	0	0
	0	802	896	373	644	0	0
	783	656	654	770	525	0	0
	1011	637	728	637	651	0	0
	828	754	617	964	1115	0	0
	1184	672	732	944	1189	0	0
	766	564	662	0	667	0	0
	950	764	834	508	825	0	0
	706	1027	550	412	425	0	0
	382	347	566	640	251	0	0
	497	450	754	501	727	0	0
	578	1035	476	528	1202	0	0
	884	907	1144	980	816	0	0
	833	764	1077	506	795	0	0
	1036	701	545	855	1004	0	0
Total	41514	40401	43600	38647	37047	166	3
Mean	798.35	776.94	838.46	743.21	712.44	3.19	0.06
ST DEV	430.35	277.47	296.31	304.50	309.86	13.38	0.31

K-2: DAILY ARRIVALS FROM ORIGINATORS
AT THE NORFOLK HUB FOR 7R COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	559	302	509	509	0	0
589	622	497	829	117	0	0
189	510	421	363	454	0	0
462	338	632	377	397	0	0
401	437	734	704	677	0	0
0	522	785	403	20	0	0
678	319	718	605	277	0	0
585	541	621	749	65	0	0
426	258	771	723	422	53	0
426	636	357	71	342	0	0
0	657	420	586	404	0	0
436	564	200	0	224	0	0
845	552	832	621	282	0	0
886	354	645	496	413	0	0
847	571	369	599	452	0	0
554	436	417	575	261	0	0
274	0	428	216	310	0	0
210	0	462	196	379	3	0
762	553	546	406	221	0	0
435	237	965	222	366	0	2
0	1041	377	335	332	0	0
902	387	1200	403	201	0	0
753	611	272	483	219	21	0
1345	432	789	488	683	0	0
0	994	535	523	240	0	1
581	813	598	918	699	0	0
837	753	689	396	921	0	0
911	598	907	656	605	43	0
586	443	1253	530	537	0	0
562	406	421	481	231	0	0
520	790	508	513	396	0	0
778	434	397	287	267	0	0
633	549	557	208	344	0	0
331	550	365	667	608	0	0
380	423	410	447	307	1	0
301	500	673	476	627	0	0
392	596	419	254	632	0	0
475	516	403	594	411	0	0
0	578	553	252	233	0	0
267	406	276	515	272	0	0
798	284	397	472	298	0	0
560	491	440	601	468	0	0
675	267	472	410	677	0	0
444	334	477	0	479	0	0
487	419	429	329	449	0	0
495	542	332	250	208	0	0
179	227	304	195	118	0	0
275	297	601	241	529	0	0
366	467	350	338	879	0	0
567	596	461	577	546	0	0
509	385	807	368	548	0	0
642	482	288	522	459	0	0
Total 25556	25277	28082	22979	21015	121	3

	MON	TUES	WED	THUR	FRI	SAT	SUN
Mean	491 46	486 10	540.04	441 90	404 13	2 33	0 06
ST DEV	282.59	194 77	224 66	197 24	194 03	9 73	0 31

MON	TUES	WED	THUR	FRI	SAT	SUN
0	149	258	167	316	0	0
138	237	281	346	19	0	0
109	454	82	143	226	0	0
229	287	147	241	213	0	0
254	200	137	300	299	1	0
0	90	414	353	5	0	0
161	122	162	211	141	0	0
241	151	375	518	6	0	0
265	251	250	289	53	25	0
176	115	147	9	302	0	0
0	147	215	238	175	0	0
295	310	1	0	183	0	0
299	226	130	283	165	0	0
431	35	200	137	427	0	0
728	356	225	321	142	2	0
168	217	338	169	49	0	0
98	0	134	176	137	0	0
68	0	152	111	192	0	0
331	336	256	163	151	0	0
215	180	335	198	189	0	0
0	358	85	137	143	0	0
307	140	268	330	204	0	0
393	158	163	216	157	6	0
317	93	162	141	208	1	0
0	133	588	252	251	0	0
191	372	150	273	281	0	0
115	254	301	222	268	0	0
327	193	248	145	853	2	0
88	185	203	172	187	0	0
177	236	95	210	156	0	0
198	141	202	168	231	0	0
266	229	146	174	106	0	0
132	343	211	93	320	0	0
133	162	113	337	208	0	0
84	243	118	222	183	0	0
172	170	129	264	366	0	0
241	230	237	410	141	0	0
237	208	99	243	170	0	0
0	130	259	90	114	0	0
366	174	226	164	191	0	0
151	187	225	108	226	0	0
189	163	137	274	278	0	0
368	253	204	313	356	0	0
167	91	92	0	115	0	0
312	280	286	130	280	0	0
159	148	162	114	159	0	0
116	87	82	345	106	0	0
150	114	90	158	137	0	0
132	435	88	151	206	0	0
217	222	638	311	141	0	0
221	190	159	77	183	0	0
278	151	168	201	197	0	0
Total 10410	10336	10575	10818	10512	37	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Mean	200.19	198.77	203.37	208.04	202.15	0.71	0.00
ST DEV	131.76	98.25	117.12	103.41	127.47	3.56	0.00

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	47	60	48	142	0	0
	58	72	92	177	15	0	0
	51	73	35	67	74	0	0
	210	37	57	49	43	0	0
	126	44	39	62	95	0	0
	0	27	99	33	0	0	0
	54	27	97	44	64	0	0
	143	20	122	99	2	0	0
	145	39	143	63	13	2	0
	39	58	90	11	81	0	0
	0	65	93	55	72	0	0
	78	81	1	0	34	0	0
	182	107	72	97	67	0	0
	98	11	80	37	84	0	0
	221	61	72	83	72	0	0
	80	57	55	60	31	0	0
	55	0	65	17	81	0	0
	18	0	106	27	39	0	0
	67	90	231	140	170	0	0
	60	62	90	51	70	0	0
	0	155	31	36	77	0	0
	80	19	88	41	45	0	0
	137	54	26	78	59	4	0
	115	39	57	31	71	0	0
	0	58	74	144	68	0	0
	75	122	42	68	109	0	0
	27	87	66	95	50	0	0
	80	86	48	45	136	0	0
	62	49	96	63	76	0	0
	80	47	43	53	50	0	0
	108	67	46	50	60	0	0
	87	45	42	55	38	0	0
	37	73	95	31	96	0	0
	36	47	105	135	96	0	0
	56	57	41	111	46	0	0
	138	58	74	67	73	0	0
	208	59	70	86	110	0	0
	54	125	35	115	61	0	0
	0	86	65	29	204	0	0
	127	61	60	82	51	0	0
	55	65	94	53	103	0	0
	71	76	32	60	343	0	0
	118	135	41	144	133	0	0
	143	65	82	0	53	0	0
	102	58	42	34	70	0	0
	40	280	41	44	50	0	0
	37	28	119	83	13	0	0
	41	34	45	84	45	0	0
	69	94	22	27	85	0	0
	73	69	34	76	102	0	0
	87	93	91	53	42	0	0
	93	53	74	98	218	0	0
Total	4121	3422	3620	3391	4082	6	0
Mean	79.25	65.81	69.62	65.21	78.50	0.12	0.00
ST DEV	54.65	43.74	37.04	38.01	57.99	0.62	0.00

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K-6: **DAILY ARRIVALS FROM ORIGINATORS**
AT THE NORFOLK HUB FOR 7Z COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	6	3	7	27	0	0
2	15	66	8	0	0	0
4	9	5	7	4	0	0
52	3	28	1	0	0	0
6	6	13	4	33	0	0
0	14	26	15	0	0	0
18	56	12	21	35	0	0
2	0	73	14	0	0	0
18	0	6	66	14	0	0
44	21	31	0	69	0	0
0	6	4	10	2	0	0
4	22	0	0	3	0	0
52	83	2	16	7	0	0
2	0	2	10	0	0	0
5	2	3	8	143	0	0
0	8	3	2	3	0	0
6	0	0	1	4	0	0
0	0	3	7	9	0	0
6	4	2	12	143	0	0
38	0	2	0	3	0	0
0	12	2	2	5	0	0
4	2	66	5	2	0	0
152	7	2	10	5	0	0
5	67	2	18	23	0	0
0	1	4	3	4	0	0
54	8	2	1	4	0	0
1	0	5	9	3	0	0
4	4	2	5	3	0	0
136	3	16	2	0	0	0
2	5	1	2	3	0	0
7	8	15	8	6	0	0
7	9	5	190	41	0	0
3	7	5	0	2	0	0
0	4	8	6	23	0	0
2	5	1	167	1	0	0
8	2	8	0	13	0	0
19	5	78	100	4	0	0
13	3	0	5	2	0	0
0	1	7	1	76	0	0
1	3	78	1	3	0	0
3	101	6	0	19	0	0
1	12	0	17	5	0	0
6	9	2	64	12	0	0
3	66	2	0	6	0	0
32	2	67	5	2	0	0
4	43	1	1	3	0	0
38	2	56	7	7	0	0
5	1	10	3	0	0	0
0	19	7	1	18	0	0
12	5	1	2	6	0	0
4	88	3	2	2	0	0
8	4	3	22	116	0	0
Total 793	763	749	868	918	0	0
Mean 15.25	14.67	14.40	16.69	17.65	0.00	0.00
ST DEV 29.90	24.39	22.96	37.39	33.20	0.00	0.00

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	5	16	18	4	0	0
	8	7	12	27	3	0	0
	6	18	8	15	11	0	0
	15	5	14	4	18	0	0
	6	5	10	17	20	0	0
	0	10	12	19	0	0	0
	9	11	13	18	2	0	0
	19	1	16	1	0	0	0
	16	2	19	23	3	1	0
	8	20	8	0	9	0	0
	0	9	9	11	10	0	0
	7	61	1	0	3	0	0
	26	9	6	8	10	0	0
	24	4	13	16	10	0	0
	33	9	5	20	7	0	0
	14	3	0	9	3	0	0
	1	0	10	3	4	0	0
	5	0	3	2	0	0	0
	11	15	17	5	2	0	0
	16	6	15	14	7	0	0
	0	15	6	5	15	0	0
	14	6	15	8	1	0	0
	13	16	6	18	7	0	0
	11	6	6	12	21	0	0
	0	10	11	4	2	0	0
	9	10	1	6	13	0	0
	13	20	6	14	8	0	0
	4	10	12	8	14	1	0
	11	7	19	18	10	0	0
	16	7	5	14	11	0	0
	19	18	10	11	13	0	0
	5	6	22	2	9	0	0
	4	13	22	0	6	0	0
	14	16	9	12	14	0	0
	37	6	6	9	10	0	0
	6	17	11	4	8	0	0
	9	12	20	15	10	0	0
	15	13	7	23	4	0	0
	0	7	11	1	15	0	0
	22	11	14	8	8	0	0
	3	0	6	3	5	0	0
	7	12	8	11	20	0	0
	14	8	12	13	10	0	0
	8	8	8	0	14	0	0
	15	5	8	8	24	0	0
	8	13	13	3	5	0	0
	12	3	5	10	6	0	0
	26	4	8	14	16	0	0
	11	19	9	11	14	0	0
	15	14	10	13	21	0	0
	12	7	17	5	19	0	0
	15	8	12	11	13	0	0
Total	591	527	542	524	492	2	0
Mean	11.37	10.13	10.42	10.08	9.46	0.04	0.00
ST DEV	8.22	8.95	5.20	6.79	6.18	0.19	0.00

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ARRIVALS DIRECT FROM ORIGINATORS
7R 68620

MEAN = 488.03 DLRs/Day
ST DEV = 210.57 DLRs

Number of Arrivals

Julian Date

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ARRIVALS DIRECT FROM ORIGINATORS
7E 68620

MEAN = 10.62 DLRs/Day
ST DEV = 7.03 DLRs
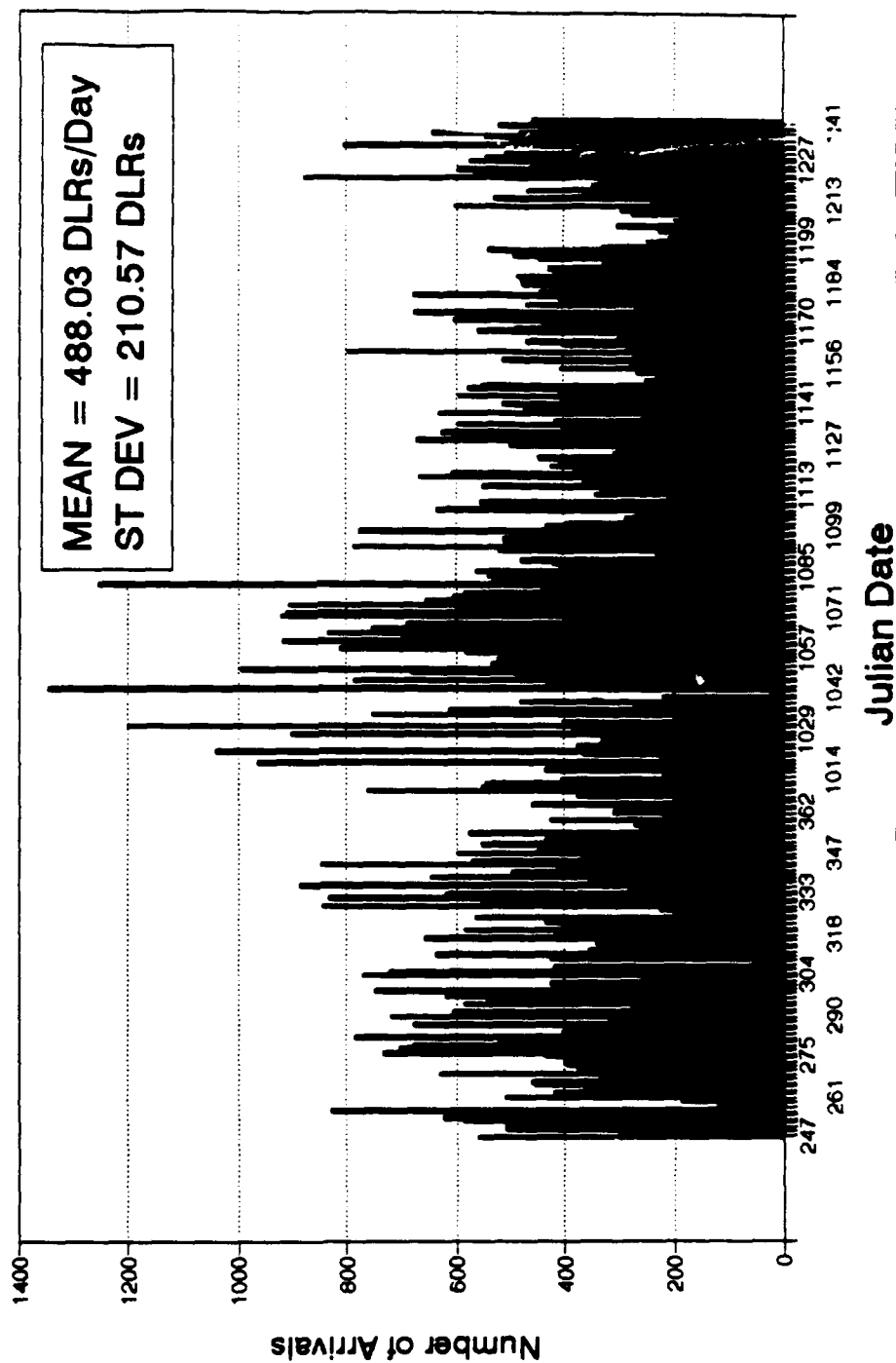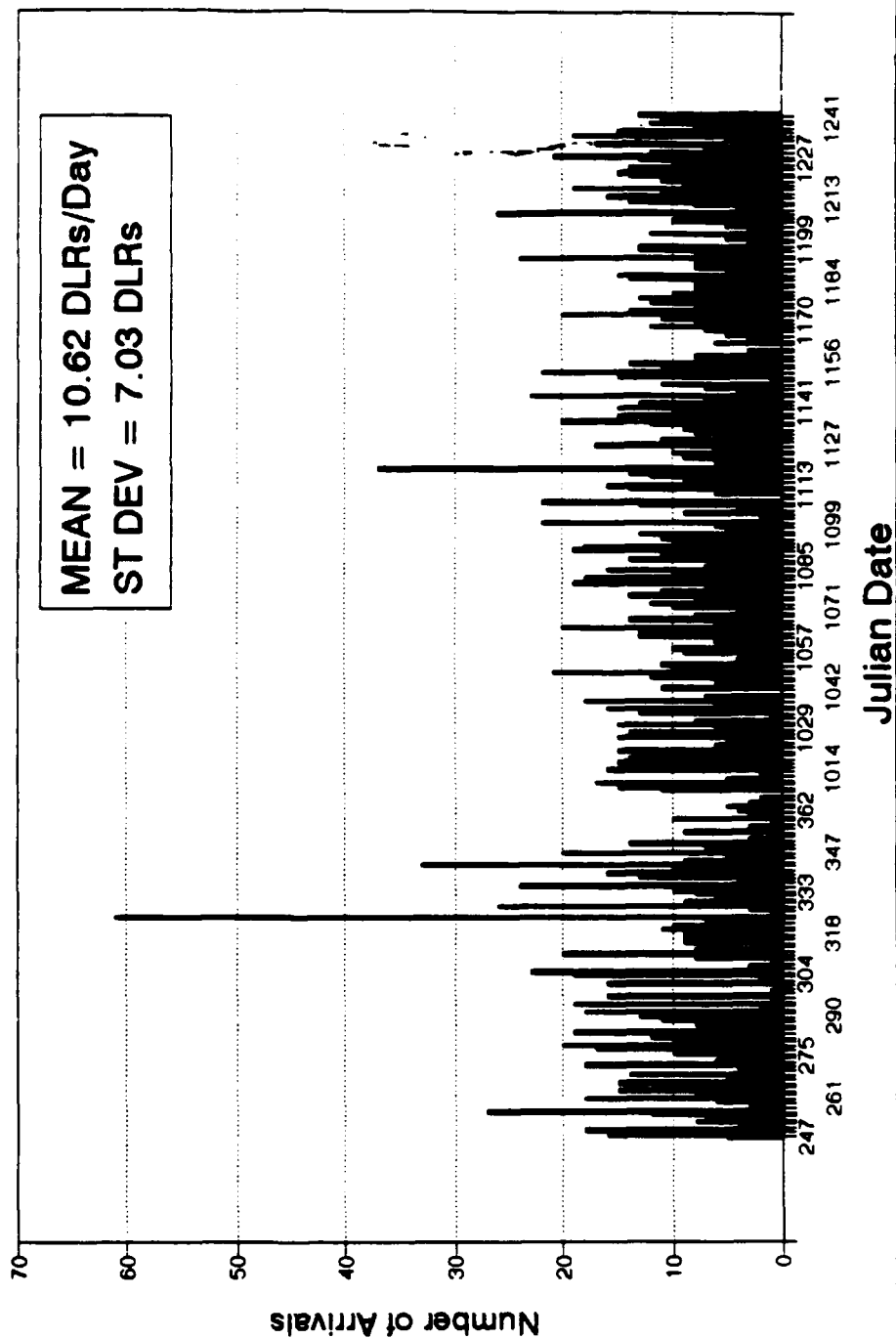
APPENDIX L: DAILY ARRIVALS FROM NODES AT THE NORFOLK HUB FOR ALL 7 COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	3	33	154	150	0	0
556	335	249	376	93	0	0
869	373	317	38	404	0	0
1046	121	251	253	106	1	0
734	440	218	255	501	0	0
0	773	628	340	122	0	0
325	402	486	51	279	0	0
443	8	660	444	91	0	0
608	184	89	62	193	110	0
199	647	245	65	255	0	0
0	1534	255	223	283	0	0
965	434	19	0	53	0	0
383	370	33	438	253	0	0
659	358	464	155	95	0	0
1131	528	84	433	245	0	0
560	200	193	708	252	0	0
247	0	302	249	252	0	0
357	0	132	53	403	1	0
1060	114	66	119	147	0	0
639	145	630	252	76	0	0
0	1025	324	200	174	0	0
433	32	661	97	105	0	0
940	214	115	117	277	0	0
988	330	75	60	306	0	0
0	630	440	174	206	0	0
866	600	156	639	312	37	0
808	282	495	92	572	0	0
768	356	264	411	63	7	0
964	99	588	136	371	0	0
959	233	9	375	329	0	0
589	184	52	280	235	0	0
774	296	18	326	157	0	0
480	756	157	14	637	0	0
755	297	118	297	276	0	0
842	454	243	316	76	0	0
831	105	180	61	610	0	0
869	214	298	188	325	0	0
704	109	99	275	472	0	0
0	237	333	400	90	0	0
493	529	201	397	183	0	0
340	696	152	386	7	0	0
183	532	21	236	740	0	0
238	661	67	279	177	0	0
766	258	104	0	180	0	0
567	67	413	1	297	0	0
463	270	32	92	396	0	0
516	8	253	136	180	0	0
537	143	26	208	181	0	0
387	248	490	161	251	0	0
615	235	94	35	669	0	0
438	324	17	160	343	0	0
501	354	5	103	252	0	0
Total 29395	17747	11794	11320	13702	156	0
Mean 565.29	341.29	226.81	217.69	263.50	3.00	0.00
ST DEV 313.09	284.06	191.00	160.56	167.66	16.00	0.00

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L-2: DAILY ARRIVALS FROM NODES AT THE NORFOLK HUB FOR 7R COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	2	8	121	64	0	0
387	181	154	268	85	0	0
614	269	246	23	317	0	0
752	50	220	238	90	1	0
537	280	176	200	423	0	0
0	503	500	253	33	0	0
259	323	317	46	167	0	0
224	6	397	332	89	0	0
394	165	29	55	173	110	0
178	410	218	50	246	0	0
0	979	158	177	262	0	0
576	250	17	0	47	0	0
133	287	26	242	165	0	0
417	211	401	52	85	0	0
820	260	52	270	166	0	0
317	92	165	613	145	0	0
152	0	227	242	210	0	0
220	0	73	26	260	1	0
915	103	28	6	138	0	0
475	19	487	237	36	0	0
0	836	290	107	145	0	0
233	31	513	91	91	0	0
741	86	57	94	216	0	0
837	222	68	7	198	0	0
0	468	296	96	162	0	0
783	306	88	436	274	33	0
592	218	435	82	368	0	0
500	299	184	292	62	7	0
724	91	329	117	330	0	0
604	188	9	233	198	0	0
358	112	38	174	173	0	0
597	180	12	238	157	0	0
467	395	117	13	370	0	0
604	199	103	136	159	0	0
717	356	133	184	64	0	0
603	94	98	55	407	0	0
627	95	118	94	220	0	0
624	70	91	214	170	0	0
0	196	244	286	78	0	0
311	377	127	233	155	0	0
254	549	41	283	7	0	0
135	403	21	77	531	0	0
187	279	43	156	130	0	0
633	113	0	0	93	0	0
440	46	155	1	151	0	0
433	89	13	73	365	0	0
423	8	127	87	147	0	0
283	88	7	104	116	0	0
253	205	315	73	106	0	0
460	212	67	31	426	0	0
376	153	17	125	206	0	0
290	313	3	69	104	0	0
Total 21459	11667	8058	7712	9580	152	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Mean	412.67	224.37	154.96	148.31	184.23	2.92	0.00
ST DEV	248.54	195.88	144.46	122.10	116.28	15.84	0.00

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L-3: DAILY ARRIVALS FROM NODES AT THE
NORFOLK HUB FOR 7H COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	1	19	16	74	0	0
	147	68	69	90	4	0	0
	190	73	55	12	57	0	0
	223	62	15	10	10	0	0
	132	108	29	46	36	0	0
	0	233	104	60	35	0	0
	40	58	139	0	81	0	0
	176	2	218	89	2	0	0
	160	12	51	7	9	0	0
	11	177	19	14	8	0	0
	0	446	78	32	9	0	0
	286	129	0	0	5	0	0
	205	66	7	161	72	0	0
	219	124	47	77	3	0	0
	235	212	28	129	65	0	0
	210	90	18	73	64	0	0
	83	0	58	3	26	0	0
	110	0	48	16	123	0	0
	95	5	27	48	5	0	0
	116	111	112	13	39	0	0
	0	129	21	70	24	0	0
	157	0	100	5	11	0	0
	163	109	47	14	43	0	0
	87	68	6	35	85	0	0
	0	122	117	58	32	0	0
	66	226	62	170	28	0	0
	158	47	39	8	160	0	0
	169	38	54	95	0	0	0
	186	2	190	13	27	0	0
	260	38	0	110	98	0	0
	172	55	12	77	49	0	0
	112	85	6	79	0	0	0
	9	328	25	1	220	0	0
	129	83	11	127	51	0	0
	79	83	91	118	10	0	0
	126	8	62	3	152	0	0
	190	94	153	72	83	0	0
	62	31	3	46	239	0	0
	0	23	58	92	9	0	0
	129	126	58	101	23	0	0
	63	118	93	80	0	0	0
	38	117	0	134	155	0	0
	45	326	14	88	35	0	0
	114	119	93	0	73	0	0
	100	15	215	0	100	0	0
	21	146	18	10	19	0	0
	69	0	93	35	28	0	0
	207	48	15	84	54	0	0
	94	35	103	65	122	0	0
	124	19	24	4	177	0	0
	43	128	0	26	114	0	0
	170	39	2	25	137	0	0
Total	5980	4782	2926	2741	3085	0	0
Mean	115.00	91.96	56.27	52.71	59.33	0.00	0.00
ST DEV	76.43	91.71	54.53	46.39	58.97	0.00	0.00

L-4: **DAILY ARRIVALS FROM NODES AT THE NORFOLK HUB FOR 7G COG**

MON	TUES	WED	THUR	FRI	SAT	SUN
0	0	5	9	8	0	0
14	81	21	14	0	0	0
35	24	10	3	26	0	0
49	5	10	4	5	0	0
52	48	6	2	20	0	0
0	32	15	27	53	0	0
19	20	24	5	27	0	0
34	0	29	18	0	0	0
34	6	7	0	7	0	0
6	44	6	0	1	0	0
0	84	14	8	8	0	0
76	50	1	0	1	0	0
40	14	0	29	12	0	0
17	21	10	12	5	0	0
63	45	2	26	5	0	0
30	13	7	15	40	0	0
11	0	13	0	11	0	0
20	0	8	6	11	0	0
33	3	7	59	4	0	0
39	10	26	2	1	0	0
0	43	11	13	1	0	0
28	1	37	1	2	0	0
28	15	9	8	13	0	0
44	31	1	18	16	0	0
0	34	15	19	9	0	0
10	50	6	22	7	4	0
43	11	14	1	32	0	0
58	18	12	21	1	0	0
36	3	56	6	11	0	0
70	3	0	23	25	0	0
51	14	2	25	12	0	0
51	27	0	6	0	0	0
2	26	11	0	40	0	0
17	12	3	29	62	0	0
33	10	13	12	2	0	0
91	3	15	3	41	0	0
45	22	22	19	16	0	0
9	8	5	11	55	0	0
0	10	24	15	3	0	0
49	22	12	57	3	0	0
17	23	16	11	0	0	0
6	6	0	22	49	0	0
2	44	10	32	9	0	0
17	19	10	0	12	0	0
19	3	36	0	36	0	0
8	28	0	6	5	0	0
20	0	25	13	5	0	0
36	4	2	17	5	0	0
32	7	11	19	20	0	0
24	3	2	0	49	0	0
17	35	0	7	16	0	0
31	1	0	6	7	0	0
Total	1466	1036	601	681	809	4	0
Mean	28.19	19.92	11.56	13.10	15.56	0.08	0.00
ST DEV	21.49	19.71	11.17	12.93	16.74	0.55	0.00

**L-5: DAILY ARRIVALS FROM NODES AT THE
NORFOLK HUB FOR 7Z COG**

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	0	0	8	4	0	0
	4	2	0	2	3	0	0
	10	0	3	0	0	0	0
	3	3	5	0	0	0	0
	4	2	5	2	13	0	0
	0	1	8	0	0	0	0
	2	0	3	0	2	0	0
	2	0	14	0	0	0	0
	9	0	0	0	0	0	0
	2	5	0	0	0	0	0
	0	3	0	1	3	0	0
	12	0	0	0	0	0	0
	0	1	0	0	2	0	0
	2	1	1	14	1	0	0
	3	4	0	2	8	0	0
	2	2	0	2	0	0	0
	0	0	2	0	4	0	0
	5	0	1	5	3	0	0
	4	2	0	5	0	0	0
	4	3	1	0	0	0	0
	0	9	2	4	1	0	0
	3	0	0	0	0	0	0
	3	0	0	1	0	0	0
	0	2	0	0	3	0	0
	0	1	4	0	0	0	0
	0	4	0	5	1	0	0
	2	1	3	0	6	0	0
	30	0	12	0	0	0	0
	11	0	3	0	0	0	0
	6	2	0	4	1	0	0
	4	0	0	1	0	0	0
	1	3	0	2	0	0	0
	1	2	0	0	4	0	0
	0	0	0	0	0	0	0
	5	2	5	0	0	0	0
	1	0	2	0	1	0	0
	1	2	2	1	2	0	0
	3	0	0	0	6	0	0
	0	1	1	6	0	0	0
	0	2	0	2	2	0	0
	2	2	2	0	0	0	0
	2	2	0	1	2	0	0
	3	4	0	0	2	0	0
	0	1	0	0	0	0	0
	1	0	3	0	1	0	0
	0	1	0	1	2	0	0
	1	0	4	0	0	0	0
	5	0	0	1	0	0	0
	1	1	0	1	1	0	0
	1	1	0	0	4	0	0
	0	3	0	1	4	0	0
	1	0	0	0	3	0	0
Total	156	75	86	72	89	0	0
Mean	3.00	1.44	1.65	1.38	1.71	0.00	0.00
ST DEV	4.78	1.71	2.93	2.57	2.48	0.00	0.00

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DAILY ARRIVALS FROM NODES AT THE NORFOLK HUB FOR 7E COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	0	1	0	0	0	0
	4	2	5	2	1	0	0
	20	4	3	0	4	0	0
	18	1	1	1	1	0	0
	9	1	1	5	6	0	0
	0	4	1	0	1	0	0
	5	0	3	0	2	0	0
	7	0	1	4	0	0	0
	8	1	2	0	4	0	0
	2	10	1	1	0	0	0
	0	22	4	4	0	0	0
	15	5	1	0	0	0	0
	4	1	0	5	1	0	0
	4	1	2	0	1	0	0
	8	7	2	5	1	0	0
	1	3	3	5	2	0	0
	1	0	2	4	1	0	0
	2	0	2	0	5	0	0
	13	0	4	1	0	0	0
	4	2	4	0	0	0	0
	0	7	0	6	3	0	0
	11	0	10	0	1	0	0
	4	4	2	0	5	0	0
	20	7	0	0	3	0	0
	0	4	8	0	3	0	0
	5	14	0	6	2	0	0
	12	4	1	1	6	0	0
	9	1	2	3	0	0	0
	7	3	10	0	3	0	0
	19	2	0	5	7	0	0
	4	3	0	3	1	0	0
	13	0	0	1	0	0	0
	1	5	4	0	3	0	0
	5	3	1	5	4	0	0
	8	3	0	2	0	0	0
	9	0	3	0	8	0	0
	6	1	3	2	4	0	0
	6	0	0	4	2	0	0
	0	7	6	1	0	0	0
	4	1	4	4	0	0	0
	4	4	0	12	0	0	0
	1	4	0	2	3	0	0
	1	8	0	3	1	0	0
	2	5	1	0	2	0	0
	7	3	4	0	9	0	0
	1	5	0	2	5	0	0
	3	0	4	1	0	0	0
	6	3	2	2	6	0	0
	7	0	1	3	2	0	0
	6	0	1	0	13	0	0
	2	5	0	1	2	0	0
	9	1	0	3	1	0	0
Total	317	171	110	109	129	0	0
Mean	6.10	3.29	2.12	2.10	2.48	0.00	0.00
ST DEV	5.37	3.96	2.40	2.40	2.74	0.00	0.00

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ARRIVALS FROM NODES

7R 68620

MEAN = 232.62 DLRs/Day
ST DEV = 195.87 DLRs

Number of Arrivals

Julian Date

ARRIVALS FROM NODES
7E 68620

MEAN = 3.30 DLRs/Day
ST DEV = 3.86 DLRs
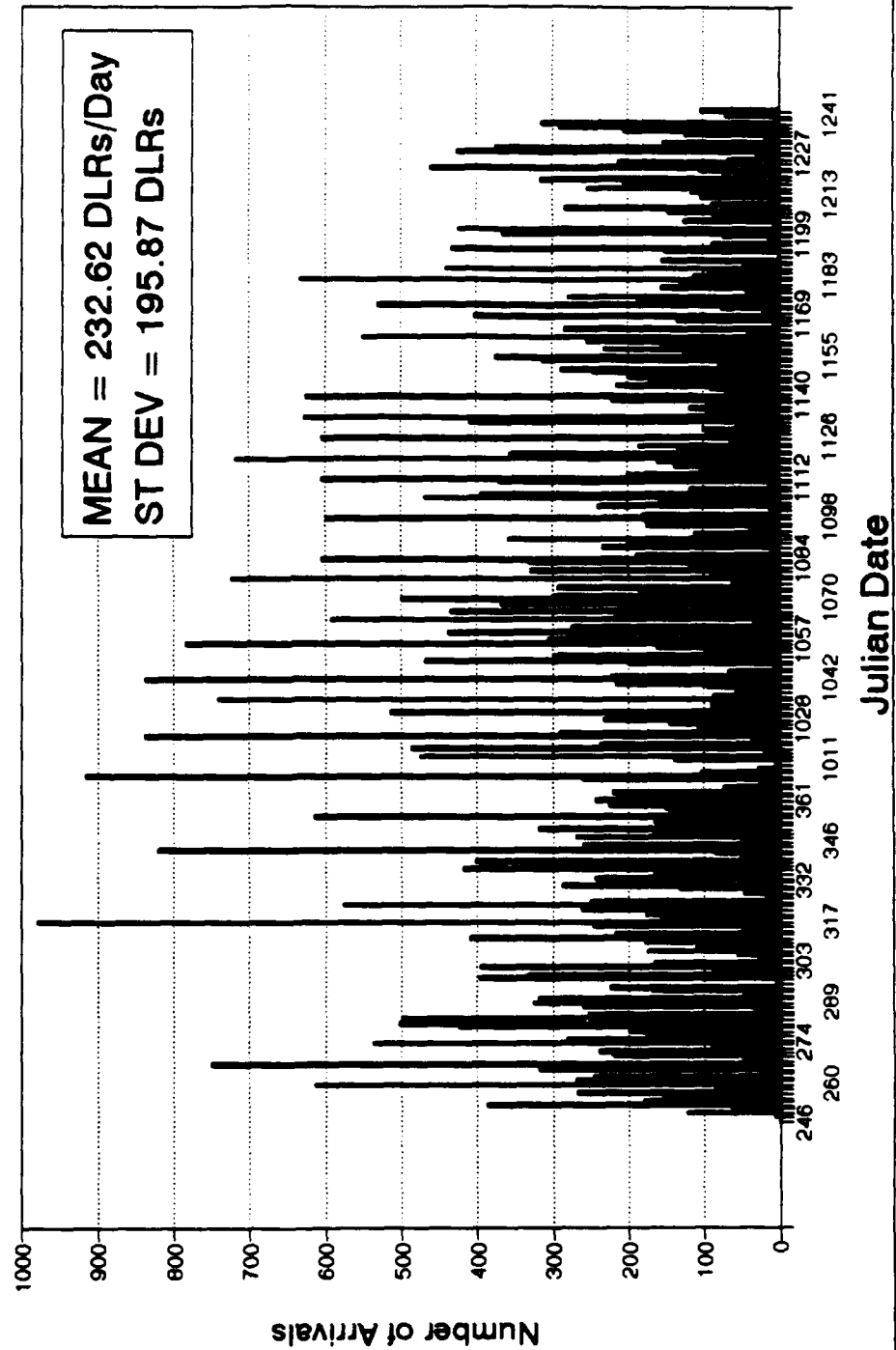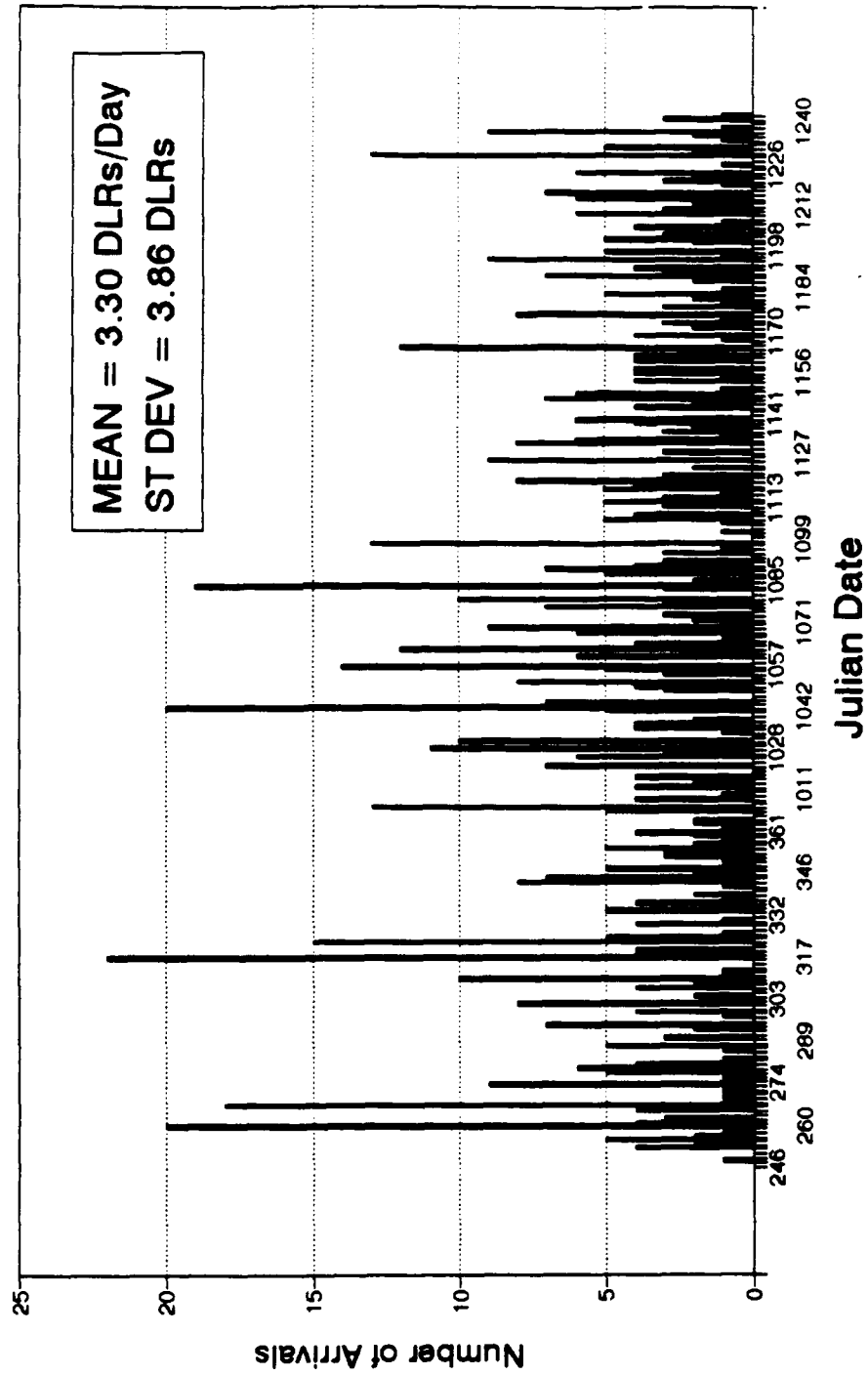
APPENDIX M: TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR ALL 7 COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	769	672	904	1150	0	0
1351	1288	1202	1765	247	0	0
1228	1442	870	633	1173	0	0
2016	793	1129	925	777	1	0
1527	1132	1151	1342	1626	1	0
0	1436	1966	1163	147	0	0
1244	937	1489	951	798	0	0
1433	723	1868	1827	164	0	0
1479	734	1280	1226	699	191	0
893	1499	878	156	1058	0	0
0	2418	997	1125	948	0	0
1786	1472	222	0	502	0	0
1788	1347	1075	1463	784	0	0
2103	763	1405	851	1030	0	0
2969	1528	758	1466	1063	2	0
1377	921	1006	1523	599	0	0
681	0	940	663	788	0	0
658	0	863	396	1022	4	0
2238	1118	1119	862	834	0	0
1403	630	2038	737	711	0	2
0	2606	825	715	746	0	0
1741	587	2298	884	558	0	0
2390	1060	584	922	724	31	0
2794	968	1093	776	1313	1	0
0	1827	1652	1100	772	0	1
1778	1925	949	1906	1420	37	0
1801	1398	1562	829	1822	0	0
2095	1247	1481	1270	1675	53	0
1847	786	2175	921	1182	0	0
1796	937	574	1135	781	0	0
1441	1208	833	1030	941	0	0
1917	1060	631	1034	618	0	0
1290	1741	1047	347	1406	0	0
1269	1076	719	1454	1225	0	0
1401	1188	819	1272	623	1	0
1456	852	1076	872	1697	0	0
1739	1116	1122	1054	1223	0	0
1498	974	643	1256	1121	0	0
0	1039	1229	773	734	0	0
1276	1185	855	1167	708	0	0
1351	1333	880	1023	658	0	0
1011	1286	638	1200	1855	0	0
1422	1333	799	1223	1366	0	0
1532	822	766	0	847	0	0
1517	831	1247	509	1122	0	0
1169	1297	582	504	821	0	0
898	355	819	776	431	0	0
1034	593	780	709	908	0	0
965	1283	906	689	1453	0	0
1499	1142	1238	1015	1485	0	0
1271	1088	1094	666	1138	0	0
1537	1055	550	958	1256	0	0
Total 70909	58148	55394	49967	50749	322	3
Mean 1363.63	1118.23	1065.27	960.90	975.94	6.19	0.06
ST DEV 670.33	475.24	436.51	407.33	401.21	27.88	0.31

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**M-2:   TOTAL DAILY ARRIVALS AT THE
NORFOLK HUB FOR 7R COG**

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	561	310	630	573	0	0
	976	803	651	1097	202	0	0
	803	779	667	386	771	0	0
	1214	388	852	615	487	1	0
	938	717	910	904	1100	0	0
	0	1025	1285	656	53	0	0
	937	642	1035	651	444	0	0
	809	547	1018	1081	164	0	0
	820	423	800	778	595	163	0
	604	1046	575	121	588	0	0
	0	1636	578	763	666	0	0
	1012	814	217	0	271	0	0
	978	839	858	863	447	0	0
	1303	565	1046	548	498	0	0
	1667	831	421	869	618	0	0
	871	528	582	1188	406	0	0
	426	0	655	458	520	0	0
	430	0	535	222	639	4	0
	1677	656	574	412	359	0	0
	910	256	1452	459	402	0	2
	0	1877	667	442	477	0	0
	1135	418	1713	494	292	0	0
	1494	697	329	577	435	21	0
	2182	654	857	495	881	0	0
	0	1462	831	619	402	0	1
	1364	1119	686	1354	973	33	0
	1429	971	1124	478	1289	0	0
	1411	897	1091	948	667	50	0
	1310	534	1582	647	867	0	0
	1166	594	430	714	429	0	0
	878	902	546	687	569	0	0
	1375	614	409	525	424	0	0
	1100	944	674	221	714	0	0
	935	749	468	803	767	0	0
	1097	779	543	631	371	1	0
	904	594	771	531	1034	0	0
	1019	691	537	348	852	0	0
	1099	586	494	808	581	0	0
	0	774	797	538	311	0	0
	578	783	403	748	427	0	0
	1052	833	438	755	305	0	0
	695	894	461	678	999	0	0
	862	546	515	566	807	0	0
	1077	447	477	0	572	0	0
	927	465	584	330	600	0	0
	928	631	345	323	573	0	0
	602	235	431	282	265	0	0
	558	385	608	345	645	0	0
	619	672	665	411	985	0	0
	1027	808	528	608	972	0	0
	885	538	824	493	754	0	0
	932	795	291	591	563	0	0
Total	47015	36944	36140	30691	30595	273	3
Mean	904 13	710 46	695.00	590 21	588 37	5 25	0 06
ST DEV	460 38	334.40	322 10	274 14	259 64	23.92	0.31

M-3: TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR 7H COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	150	277	183	390	0	0
285	305	350	436	23	0	0
299	527	137	155	283	0	0
452	349	162	251	223	0	0
386	308	166	346	335	1	0
0	323	518	413	40	0	0
201	180	301	211	222	0	0
417	153	593	607	8	0	0
425	263	301	296	62	25	0
187	292	166	23	310	0	0
0	593	293	270	184	0	0
581	439	1	0	188	0	0
504	292	137	444	237	0	0
650	159	247	214	430	0	0
963	568	253	450	207	2	0
378	307	356	242	113	0	0
181	0	192	179	163	0	0
178	0	200	127	315	0	0
426	341	283	211	156	0	0
331	291	447	211	228	0	0
0	487	106	207	167	0	0
464	140	368	335	215	0	0
556	267	210	230	200	6	0
404	161	168	176	293	1	0
0	255	705	310	283	0	0
257	598	212	443	309	0	0
273	301	340	230	428	0	0
496	231	302	240	853	2	0
274	187	393	185	214	0	0
437	274	95	320	254	0	0
370	196	214	245	280	0	0
378	314	152	253	106	0	0
141	671	236	94	540	0	0
262	245	124	464	259	0	0
163	326	209	340	193	0	0
298	178	191	267	518	0	0
431	324	390	482	224	0	0
299	239	102	289	409	0	0
0	153	317	182	123	0	0
495	300	284	265	214	0	0
214	305	318	168	226	0	0
227	280	137	408	433	0	0
413	579	218	401	391	0	0
281	210	185	0	186	0	0
412	295	503	130	380	0	0
180	294	180	124	178	0	0
185	87	175	380	134	0	0
357	162	105	242	191	0	0
226	470	191	216	328	0	0
341	241	662	315	318	0	0
264	318	159	103	297	0	0
448	190	170	226	334	0	0
Total 16390	15118	13501	13559	13597	37	0
Mean 315.19	290.73	259.63	260.75	261.48	0.71	0.00
ST DEV 183.66	144.68	144.23	126.70	143.68	3.56	0.00

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M-4: TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR 7G COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	47	65	57	150	0	0
72	153	113	191	15	0	0
86	97	45	70	100	0	0
259	42	67	53	48	0	0
178	92	45	64	115	0	0
0	59	114	60	53	0	0
73	47	121	49	91	0	0
177	20	151	117	2	0	0
179	45	150	63	20	2	0
45	102	96	11	82	0	0
0	149	107	63	80	0	0
154	131	2	0	35	0	0
222	121	72	126	79	0	0
115	32	90	49	89	0	0
284	106	74	109	77	0	0
110	70	62	75	71	0	0
66	0	78	17	92	0	0
38	0	114	33	50	0	0
100	93	238	199	174	0	0
99	72	116	53	71	0	0
0	198	42	49	78	0	0
108	20	125	42	47	0	0
165	69	35	86	72	4	0
159	70	58	49	87	0	0
0	92	89	163	77	0	0
85	172	48	90	116	4	0
70	98	80	96	82	0	0
138	104	60	66	137	0	0
98	52	152	69	87	0	0
150	50	43	76	75	0	0
159	81	48	75	72	0	0
138	72	42	61	38	0	0
39	99	106	31	136	0	0
53	59	108	164	158	0	0
89	67	54	123	48	0	0
229	61	89	70	114	0	0
253	81	92	105	126	0	0
63	133	40	126	116	0	0
0	96	89	44	207	0	0
176	83	72	139	54	0	0
72	88	110	64	103	0	0
77	82	32	82	392	0	0
120	179	51	176	142	0	0
160	84	92	0	65	0	0
121	61	78	34	106	0	0
48	308	41	50	55	0	0
57	28	144	96	18	0	0
77	38	47	101	50	0	0
101	101	33	46	105	0	0
97	72	36	76	151	0	0
104	128	91	60	58	0	0
124	54	74	104	225	0	0
Total 5587	4458	4221	4072	4891	10	0
Mean 107.44	85.73	81.17	78.31	94.06	0.19	0.00
ST DEV 69.29	52.80	41.41	45.44	62.41	0.82	0.00

M-6: TOTAL DAILY ARRIVALS AT THE
NORFOLK HUB FOR 7Z COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	6	3	15	31	0	0
6	17	66	10	3	0	0
14	9	8	7	4	0	0
55	6	33	1	0	0	0
10	8	18	6	46	0	0
0	15	34	15	0	0	0
20	56	15	21	37	0	0
4	0	87	14	0	0	0
27	0	6	66	14	0	0
46	26	31	0	69	0	0
0	9	4	11	5	0	0
16	22	0	0	3	0	0
52	84	2	16	9	0	0
4	1	3	24	1	0	0
8	6	3	10	151	0	0
2	10	3	4	3	0	0
6	0	2	1	8	0	0
5	0	4	12	12	0	0
10	6	2	17	143	0	0
42	3	3	0	3	0	0
0	21	4	6	6	0	0
7	2	66	5	2	0	0
155	7	2	11	5	0	0
5	69	2	18	26	0	0
0	2	8	3	4	0	0
54	12	2	6	5	0	0
3	1	8	9	9	0	0
34	4	14	5	3	0	0
147	3	19	2	0	0	0
8	7	1	6	4	0	0
11	8	15	9	6	0	0
8	12	5	192	41	0	0
4	9	5	0	6	0	0
0	4	8	6	23	0	0
7	7	6	167	1	0	0
9	2	10	0	14	0	0
20	7	80	101	6	0	0
16	3	0	5	8	0	0
0	2	8	7	76	0	0
1	5	78	3	5	0	0
5	103	8	0	19	0	0
3	14	0	18	7	0	0
9	13	2	64	14	0	0
3	67	2	0	6	0	0
33	2	70	5	3	0	0
4	44	1	2	5	0	0
39	2	60	7	7	0	0
10	1	10	4	0	0	0
1	20	7	2	19	0	0
13	6	1	2	10	0	0
4	91	3	3	6	0	0
9	4	3	22	119	0	0
Total 949	838	835	940	1007	0	0
Mean 18.25	16.12	16.06	18.08	19.37	0.00	0.00
ST DEV 30.75	24.62	23.97	37.31	33.77	0.00	0.00

M-6: TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR 7E COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	5	17	18	4	0	0
12	9	17	29	4	0	0
26	22	11	15	15	0	0
33	6	15	5	19	0	0
15	6	11	22	26	0	0
0	14	13	19	1	0	0
13	11	16	18	4	0	0
26	1	17	5	0	0	0
24	3	21	23	7	1	0
10	30	9	1	9	0	0
0	31	13	15	10	0	0
22	66	2	0	3	0	0
30	10	6	13	11	0	0
28	5	15	16	11	0	0
41	16	7	25	8	0	0
15	6	3	14	5	0	0
2	0	12	7	5	0	0
7	0	5	2	5	0	0
24	15	21	6	2	0	0
20	8	19	14	7	0	0
0	22	6	11	18	0	0
25	6	25	8	2	0	0
17	20	8	18	12	0	0
31	13	6	12	24	0	0
0	14	19	4	5	0	0
14	24	1	12	15	0	0
25	24	7	15	14	0	0
13	11	14	11	14	1	0
18	10	29	18	13	0	0
35	9	5	19	18	0	0
23	21	10	14	14	0	0
18	6	22	3	9	0	0
5	18	26	0	9	0	0
19	19	10	17	18	0	0
45	9	6	11	10	0	0
15	17	14	4	16	0	0
15	13	23	17	14	0	0
21	13	7	27	6	0	0
0	14	17	2	15	0	0
26	12	18	12	8	0	0
7	4	6	15	5	0	0
8	16	8	13	23	0	0
15	16	12	16	11	0	0
10	13	9	0	16	0	0
22	8	12	8	33	0	0
9	18	13	5	10	0	0
15	3	9	11	6	0	0
32	7	10	16	22	0	0
18	19	10	14	16	0	0
21	14	11	13	34	0	0
14	12	17	6	21	0	0
24	9	12	14	14	0	0
Total 908	698	652	633	621	2	0
Mean 17.46	13.42	12.54	12.17	11.94	0.04	0.00
ST DEV 10.79	10.31	6.35	7.06	7.67	0.19	0.00

149

DAILY ARRIVALS AT HUB
7R 68620

MEAN = 706.83 DLRs/Day
ST DEV = 346.25 DLRs

DAILY ARRIVALS AT HUB
7E 68620

MEAN = 13.94 DLRs/Day
ST DEV = 8.58 DLRs

Number of Arrivals

Julian Date
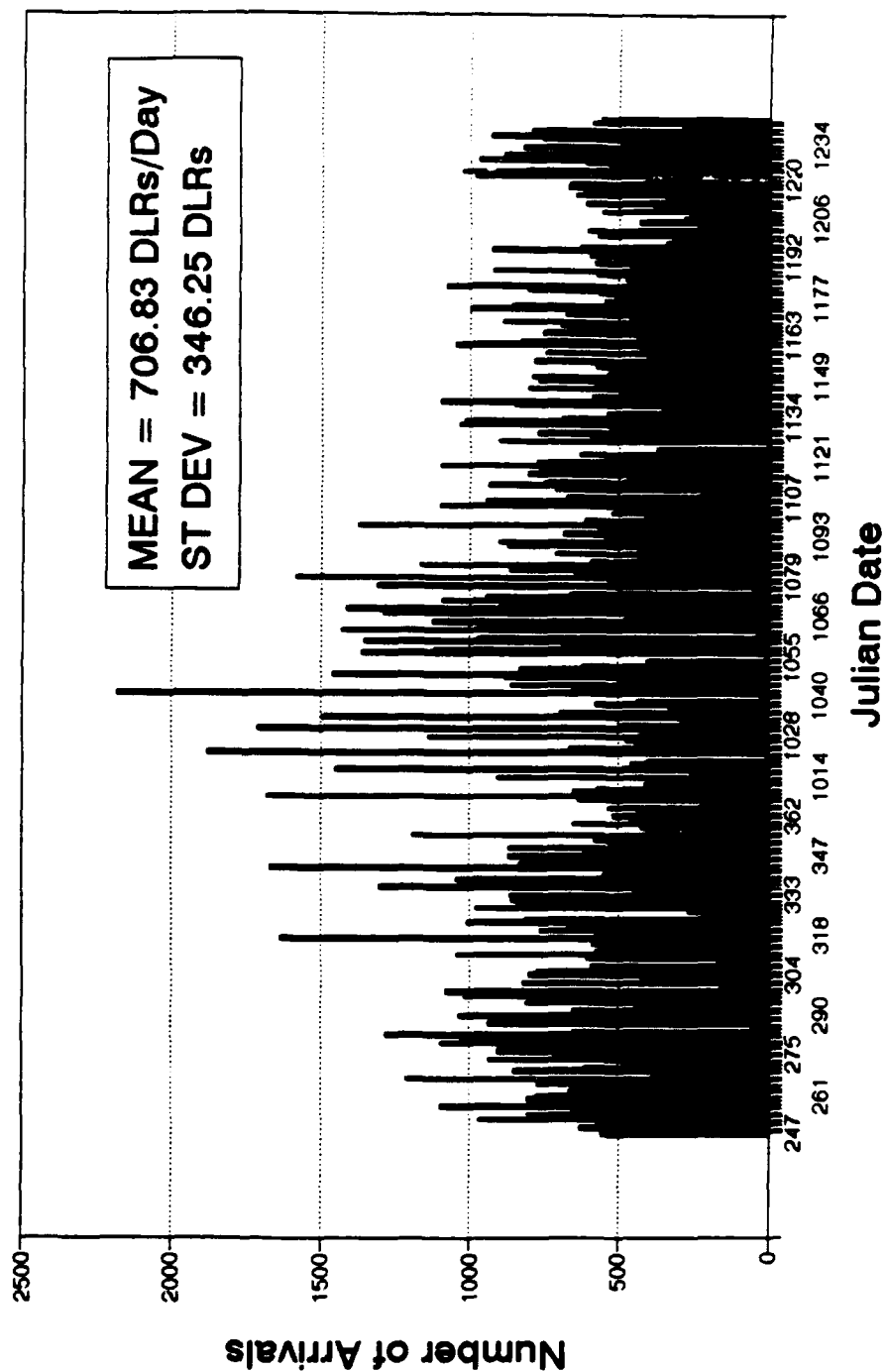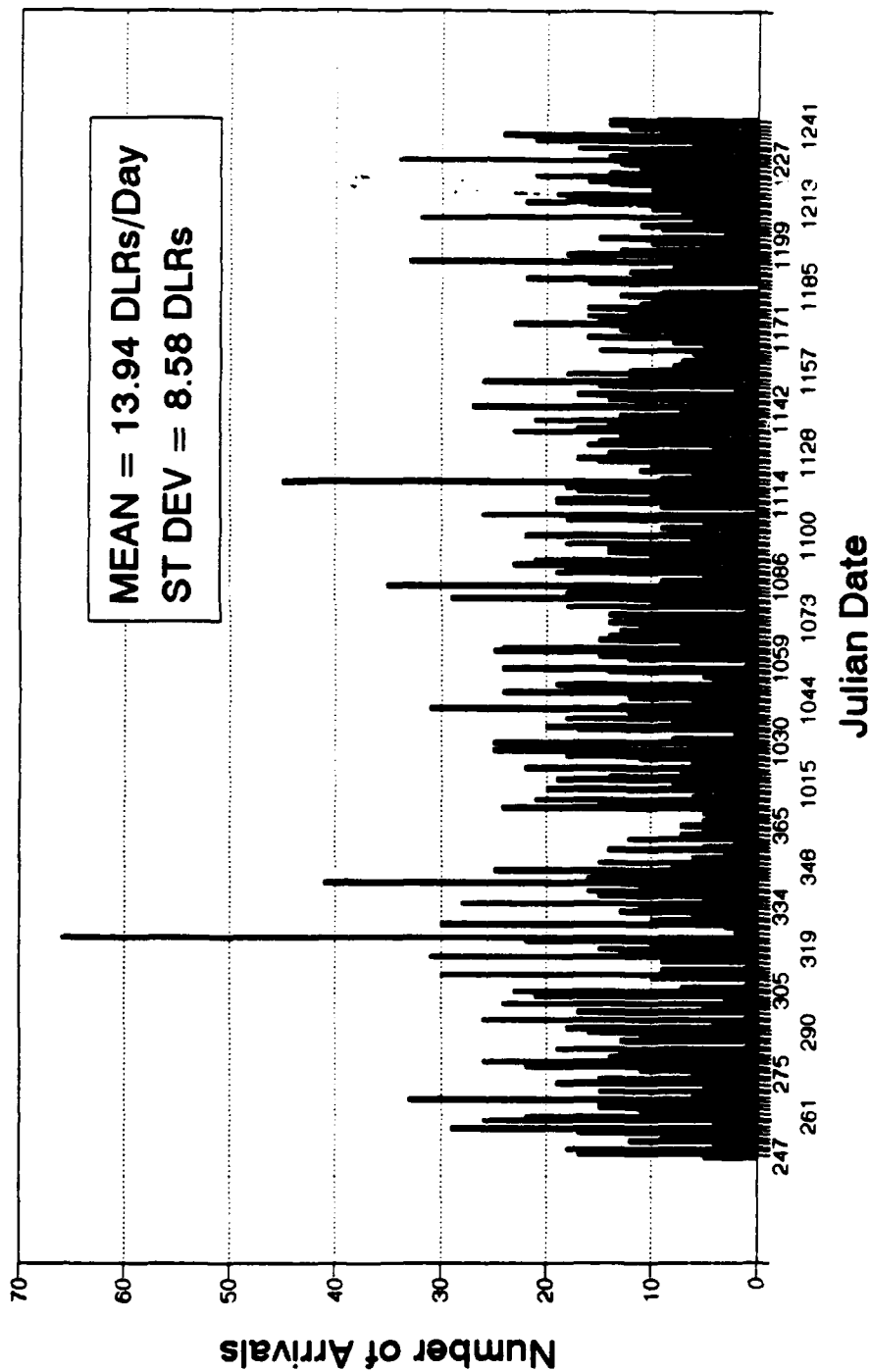
APPENDIX N: DAILY ARRIVALS FROM ORIGINATORS
AT THE SAN DIEGO HUB FOR ALL 7 COG

MON	TUES	WED	THUR	FRI	SAT	SUN
41	620	456	674	786	66	0
754	752	500	713	686	5	0
610	601	501	660	907	0	0
562	298	919	844	755	67	42
589	643	1037	577	639	0	2
65	486	842	584	610	42	36
874	904	538	594	282	0	0
741	536	731	703	748	0	0
543	568	617	498	538	7	0
611	411	612	536	623	75	1
5	790	608	940	675	0	0
715	828	542	101	848	58	71
570	1055	477	602	623	0	0
637	813	480	454	346	41	30
587	747	597	486	461	0	0
636	578	594	403	510	0	0
349	0	463	810	385	0	0
404	0	490	665	492	0	0
396	347	415	547	568	0	0
1068	1062	764	1195	739	0	0
0	890	705	617	651	0	0
494	601	645	388	462	0	0
347	586	852	477	520	0	0
802	449	578	248	648	0	0
0	494	382	557	668	0	0
503	446	753	296	494	0	0
452	707	730	703	645	0	0
494	502	477	403	561	0	0
386	753	341	405	459	0	0
538	376	373	486	458	0	0
528	623	345	461	448	0	0
428	466	468	469	1193	0	0
524	375	546	382	465	0	0
610	527	454	436	432	0	0
632	511	539	489	580	0	0
663	855	521	641	631	0	0
567	508	459	790	406	0	0
485	390	560	767	279	0	0
0	474	434	403	458	0	0
608	983	483	678	463	0	0
485	938	533	600	520	0	0
546	840	368	447	521	0	0
541	454	356	362	645	0	0
602	386	441	0	794	0	0
716	487	442	448	535	0	0
955	716	580	530	454	0	0
340	395	564	308	601	0	0
697	541	679	700	759	0	0
775	679	615	536	624	0	0
630	597	632	447	624	0	0
315	931	510	600	354	0	0
476	510	528	417	487	0	0
Total 26896	31029	29076	28077	30060	361	182
Mean 517.23	596.71	559.15	539.94	578.08	6.94	3.50
ST DEV 234.80	228.21	148.19	198.01	164.00	19.22	12.81

152

N-2: DAILY ARRIVALS FROM ORIGINATORS AT THE SAN DIEGO HUB FOR 7R COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	38	363	228	385	501	65	0
	488	582	378	448	448	4	0
	413	429	348	291	373	0	0
	398	201	435	408	414	59	38
	522	320	461	271	391	0	2
	29	432	521	400	331	16	33
	600	439	306	317	156	0	0
	358	301	436	294	496	0	0
	363	308	452	316	336	6	0
	454	206	379	359	402	71	1
	0	550	481	423	395	0	0
	409	563	390	61	381	23	64
	380	682	340	318	392	0	0
	413	396	357	241	279	41	29
	463	545	380	252	321	0	0
	475	410	300	275	177	0	0
	197	0	198	456	199	0	0
	293	0	407	502	248	0	0
	261	257	295	301	304	0	0
	433	435	352	572	235	0	0
	0	475	442	382	383	0	0
	362	479	516	199	180	0	0
	276	340	521	339	418	0	0
	406	300	392	129	376	0	0
	0	350	218	308	177	0	0
	349	237	322	186	437	0	0
	306	418	379	393	345	0	0
	214	306	339	205	475	0	0
	265	471	174	226	289	0	0
	354	293	255	404	335	0	0
	317	455	268	314	306	0	0
	313	270	349	325	191	0	0
	311	209	415	235	223	0	0
	323	341	269	330	304	0	0
	392	378	471	217	174	0	0
	267	402	368	489	435	0	0
	461	345	370	669	273	0	0
	288	254	334	408	217	0	0
	0	318	313	273	255	0	0
	481	425	222	245	270	0	0
	298	347	328	497	403	0	0
	382	417	202	228	400	0	0
	392	274	273	291	458	0	0
	495	207	354	0	404	0	0
	282	257	316	321	359	0	0
	405	257	320	236	227	0	0
	217	262	291	155	487	0	0
	543	368	422	530	452	0	0
	575	492	339	470	386	0	0
	479	355	410	273	334	0	0
	194	799	317	338	225	0	0
	393	316	405	266	303	0	0
Total	17329	18836	18358	16771	17280	285	167
Mean	333.25	362.23	353.04	322.52	332.31	5.48	3.21
ST DEV	150.02	141.64	84.04	124.23	96.25	16.39	11.66

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DAILY ARRIVALS FROM ORIGINATORS
AT THE SAN DIEGO HUB FOR 7H COG

MON	TUES	WED	THUR	FRI	SAT	SUN
1	177	198	246	229	1	0
176	128	79	173	143	1	0
137	102	97	320	430	0	0
107	65	438	395	264	2	1
46	279	473	230	126	0	0
27	45	223	146	230	18	1
220	349	171	202	60	0	0
328	135	239	339	191	0	0
117	182	105	90	154	1	0
101	158	140	143	149	4	0
2	175	87	446	202	0	0
238	205	87	35	393	22	7
147	260	69	179	153	0	0
143	347	91	106	50	0	1
77	135	118	183	88	0	0
111	118	229	75	323	0	0
145	0	209	295	122	0	0
92	0	44	90	180	0	0
77	60	83	185	234	0	0
507	526	283	500	454	0	0
0	381	201	187	141	0	0
101	87	98	142	212	0	0
50	134	106	89	84	0	0
301	95	126	99	169	0	0
0	113	136	157	394	0	0
120	174	355	52	35	0	0
87	232	185	196	159	0	0
231	131	104	136	60	0	0
86	174	59	145	95	0	0
163	55	78	58	55	0	0
148	83	27	125	70	0	0
62	144	66	105	877	0	0
126	94	58	108	176	0	0
230	130	149	73	105	0	0
160	85	37	183	320	0	0
354	265	90	106	84	0	0
42	98	64	91	77	0	0
158	99	96	296	42	0	0
0	75	58	74	117	0	0
64	450	180	385	148	0	0
110	442	153	56	85	0	0
120	338	85	155	64	0	0
90	108	65	45	56	0	0
91	119	50	0	329	0	0
399	152	70	65	97	0	0
464	378	197	242	181	0	0
65	86	202	100	80	0	0
106	92	179	105	256	0	0
129	153	246	52	131	0	0
117	195	136	130	181	0	0
98	79	145	204	84	0	0
51	127	78	107	102	0	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Total	7122	8814	7342	8454	9241	49	10
Mean	136.96	169.50	141.19	162.58	177.71	0.94	0.19
ST DEV	112.21	117.65	94.26	108.66	143.64	3.92	0.99

N-4: DAILY ARRIVALS FROM ORIGINATORS
AT THE SAN DIEGO HUB FOR 7G COG

MON	TUES	WED	THUR	FRI	SAT	SUN
1	56	29	30	48	0	0
67	35	37	79	62	0	0
46	54	47	44	50	0	0
28	30	33	19	56	2	1
18	37	69	57	51	0	0
8	8	83	35	33	8	1
44	77	42	56	22	0	0
52	64	46	54	26	0	0
51	51	26	50	31	0	0
48	36	74	27	33	0	0
3	42	36	51	37	0	0
48	50	31	4	66	11	0
35	81	46	88	45	0	0
67	60	19	65	8	0	0
38	57	60	38	20	0	0
33	24	46	49	10	0	0
5	0	30	42	21	0	0
17	0	34	34	55	0	0
46	28	31	34	26	0	0
70	66	80	116	38	0	0
0	27	45	32	94	0	0
26	29	27	36	53	0	0
16	66	212	20	11	0	0
49	35	39	19	66	0	0
0	23	23	49	48	0	0
31	34	68	39	13	0	0
43	4	66	61	98	0	0
25	37	32	58	22	0	0
24	68	67	30	28	0	0
11	24	32	19	41	0	0
53	77	41	12	51	0	0
35	42	29	27	96	0	0
69	47	48	28	39	0	0
51	37	25	24	17	0	0
62	32	17	78	77	0	0
20	32	42	28	87	0	0
45	43	22	15	27	0	0
22	35	75	41	17	0	0
0	59	28	34	43	0	0
48	71	32	19	37	0	0
23	99	22	22	22	0	0
25	65	60	39	28	0	0
50	57	13	20	101	0	0
11	40	28	0	52	0	0
27	70	28	26	43	0	0
66	63	22	32	33	0	0
22	33	25	29	28	0	0
36	50	44	56	51	0	0
36	29	26	13	99	0	0
25	25	58	30	95	0	0
19	50	27	46	25	0	0
22	61	37	34	77	0	0
Total 1717	2320	2259	1988	2357	21	2
Mean 33 02	44 62	43 44	38 23	45 33	0 40	0.04
ST DEV 19 73	21 13	29 58	21 44	25 87	1 88	0 19

N-6:   DAILY ARRIVALS FROM ORIGINATORS
AT THE SAN DIEGO HUB FOR 7Z COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	17	0	8	2	0	0
17	2	2	3	28	0	0
11	5	6	3	39	0	0
22	0	7	5	3	2	2
1	4	17	14	69	0	0
0	0	5	0	14	0	0
3	29	6	15	39	0	0
0	27	1	12	30	0	0
9	23	24	30	6	0	0
3	8	16	2	33	0	0
0	19	1	8	29	0	0
13	2	28	0	4	1	0
7	24	18	9	26	0	0
6	1	6	29	1	0	0
6	4	32	8	31	0	0
14	19	19	2	0	0	0
1	0	24	2	34	0	0
1	0	2	27	7	0	0
4	0	1	22	1	0	0
52	20	40	3	1	0	0
0	0	3	10	28	0	0
2	1	3	6	10	0	0
0	42	11	12	1	0	0
24	18	20	1	29	0	0
0	5	1	34	45	0	0
0	1	0	15	2	0	0
15	50	96	48	33	0	0
20	24	0	0	1	0	0
7	33	35	0	35	0	0
3	2	4	0	24	0	0
2	2	7	5	20	0	0
10	6	19	5	4	0	0
1	17	21	7	27	0	0
0	14	6	2	6	0	0
4	14	7	2	3	0	0
15	4	7	5	12	0	0
4	19	1	12	26	0	0
12	0	42	11	0	0	0
0	19	33	18	29	0	0
12	29	45	27	5	0	0
48	46	27	18	2	0	0
7	10	17	19	24	0	0
3	7	0	6	23	0	0
3	11	6	0	0	0	0
1	4	27	28	34	0	0
0	14	29	1	0	0	0
33	9	43	14	2	0	0
0	22	23	0	0	0	0
24	3	2	0	4	0	0
2	18	20	1	2	0	0
1	3	6	1	14	0	0
9	4	6	1	1	0	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Total	432	655	822	511	843	3	2
Mean	8.31	12.60	15.81	9.83	16.21	0.06	0.04
ST DEV	11.42	12.58	17.34	10.81	15.88	0.31	0.28

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N-6: DAILY ARRIVALS FROM ORIGINATORS
AT THE SAN DIEGO HUB FOR 7E COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	1	7	1	5	6	0	0
	6	4	4	10	5	0	0
	3	11	3	2	15	0	0
	6	2	5	17	18	2	0
	2	3	16	4	2	0	0
	1	1	10	3	2	0	1
	7	7	10	3	5	0	0
	3	9	9	4	5	0	0
	3	4	9	11	11	0	0
	4	3	3	5	5	0	0
	0	3	3	11	12	0	0
	7	4	6	1	4	1	0
	0	6	4	7	4	0	0
	6	9	7	13	8	0	0
	2	5	7	5	0	0	0
	3	6	0	2	0	0	0
	0	0	2	14	9	0	0
	1	0	3	11	2	0	0
	8	2	5	3	3	0	0
	6	14	9	2	11	0	0
	0	7	14	3	5	0	0
	3	5	1	4	7	0	0
	3	4	2	17	5	0	0
	21	1	1	0	8	0	0
	0	3	3	8	4	0	0
	3	0	8	4	7	0	0
	1	3	4	5	9	0	0
	4	4	2	4	3	0	0
	4	6	6	4	12	0	0
	7	2	4	5	3	0	0
	8	4	2	5	1	0	0
	7	4	5	6	25	0	0
	16	8	3	4	0	0	0
	6	5	4	7	0	0	0
	14	2	7	9	5	0	0
	7	152	14	13	13	0	0
	15	3	2	3	3	0	0
	5	2	13	10	3	0	0
	0	3	2	4	13	0	0
	3	8	4	2	2	0	0
	6	4	2	7	8	0	0
	11	10	4	6	4	0	0
	6	8	5	0	7	0	0
	2	9	2	0	9	0	0
	7	4	1	8	2	0	0
	19	4	10	19	13	0	0
	3	5	3	10	3	0	0
	12	9	11	9	0	0	0
	8	2	1	1	4	0	0
	7	3	8	5	12	0	0
	3	0	14	10	5	0	0
	1	2	1	9	4	0	0
Total	281	386	279	334	326	3	1
Mean	5.40	7.42	5.37	6.42	6.27	0.06	0.02
ST DEV	4.84	20.67	4.06	4.53	5.05	0.31	0.14

ARRIVALS DIRECT FROM ORIGINATORS
7R 46433

MEAN = 338.45 DLRs/Day
ST DEV = 122.27 DLRs

Number of Arrivals

Julian Date

ARRIVALS DIRECT FROM ORIGINATORS
7E 46433

MEAN = 6.29 DLRs/Day
ST DEV = 10.12 DLRs

Number of Arrivals

Julian Date

159
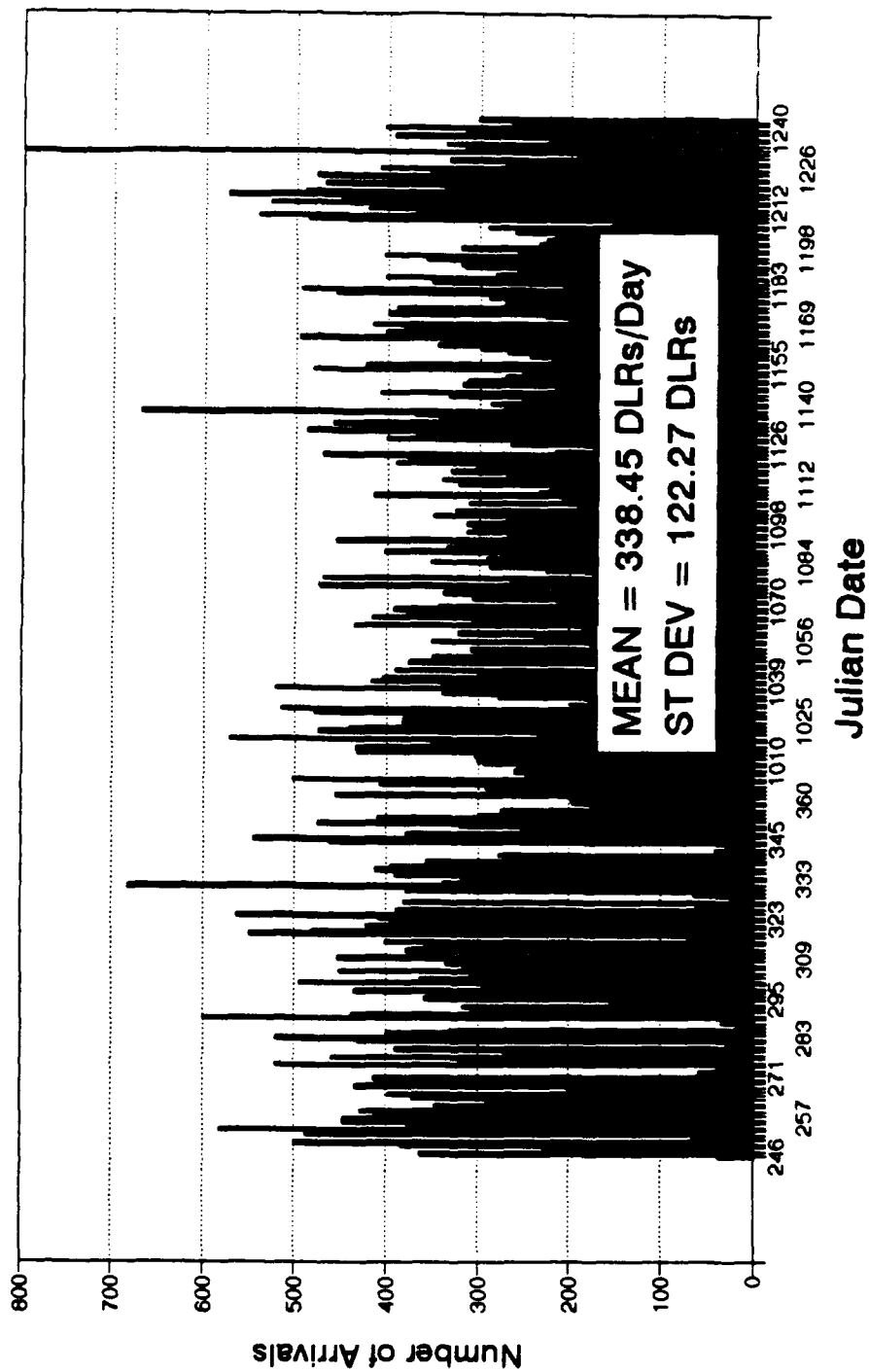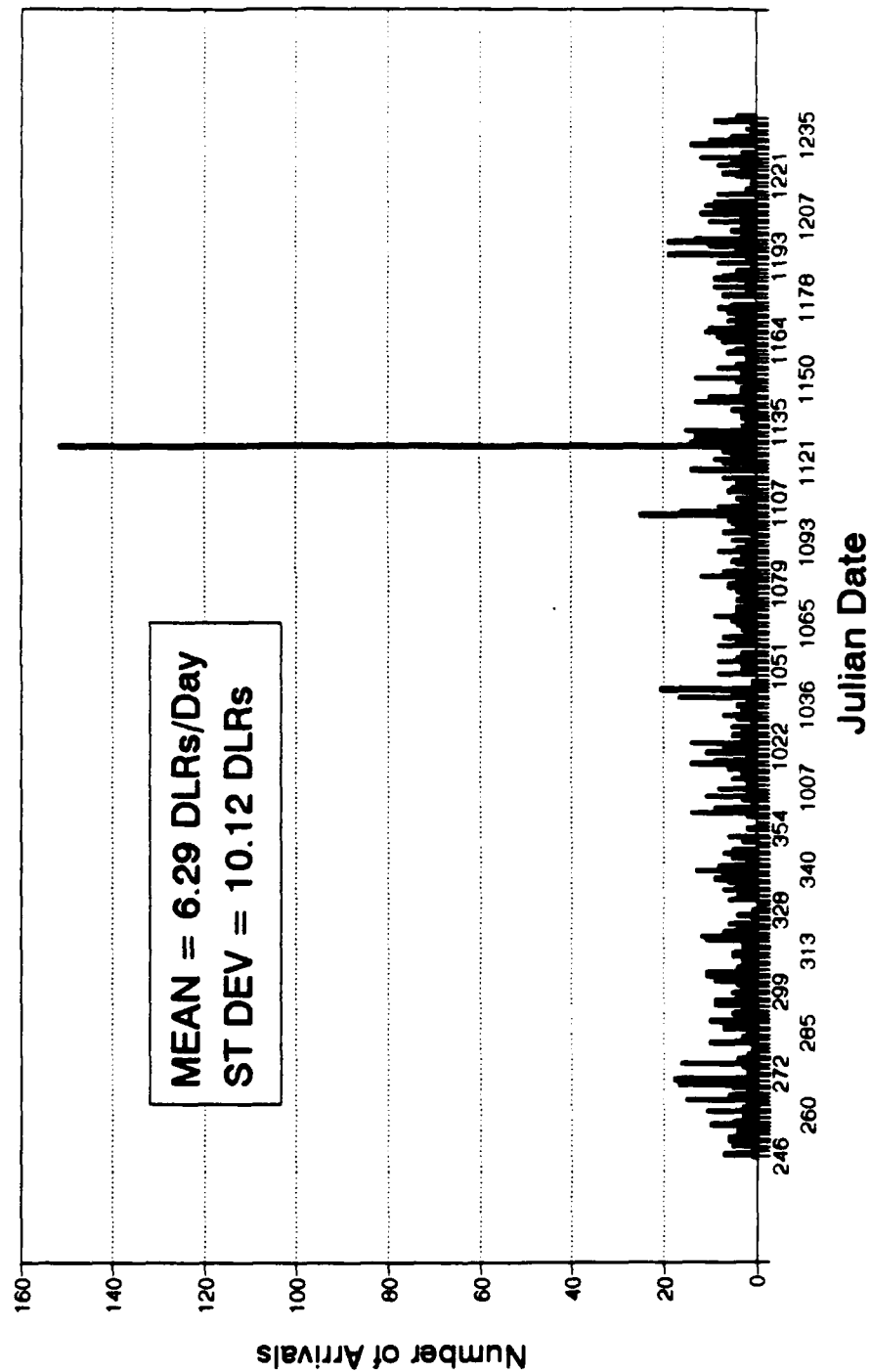
APPENDIX O: DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR ALL 7 COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	8	21	6	24	183	28	0
	349	289	341	248	173	1	0
	449	474	254	358	73	0	0
	393	368	394	201	418	33	13
	233	847	334	471	100	0	0
	14	513	377	368	278	16	16
	708	475	323	193	426	0	0
	486	221	272	374	12	0	0
	638	277	235	161	234	0	0
	371	79	102	403	51	21	0
	0	510	386	328	316	0	0
	187	139	139	44	206	9	11
	726	353	93	441	277	0	0
	322	189	311	189	213	0	0
	438	185	357	143	76	0	0
	418	102	118	515	68	0	0
	500	0	120	23	86	0	0
	426	0	578	50	277	0	0
	302	139	264	313	43	0	0
	493	370	475	195	392	0	0
	0	371	96	411	217	0	0
	371	238	44	540	240	0	0
	527	208	247	275	201	0	0
	251	325	305	572	425	0	0
	0	280	359	536	11	0	0
	380	337	258	149	144	0	0
	425	345	163	214	91	0	0
	671	239	264	38	537	0	0
	482	209	5	318	254	0	0
	512	248	185	205	224	0	0
	226	463	277	482	43	1	0
	625	180	180	173	345	0	0
	367	243	265	219	168	0	0
	305	254	116	598	264	0	0
	558	258	457	288	211	0	0
	260	310	87	358	432	0	0
	304	356	108	380	228	0	0
	525	360	159	232	392	0	0
	0	409	277	344	197	0	0
	324	305	286	488	436	0	0
	184	257	245	398	390	0	0
	204	537	159	295	219	0	0
	426	329	174	394	132	0	0
	766	267	149	0	269	0	0
	232	233	213	620	111	0	0
	420	551	115	405	297	0	0
	451	256	279	175	409	0	0
	300	505	223	448	149	0	0
	489	105	241	572	195	0	0
	410	309	184	341	488	0	0
	261	251	519	307	244	0	0
	553	312	246	97	357	0	0
Total	19270	15401	12364	15914	12212	109	40
Mean	370.58	296.17	237.77	306.04	234.85	2.10	0.77
ST DEV	192.48	153.82	124.80	164.01	132.39	6.89	3.18

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O-2: DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR 7R COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	7	12	0	8	128	23	0
	248	107	245	155	86	1	0
	287	291	107	170	34	0	0
	220	172	264	140	226	30	10
	135	326	129	171	75	0	0
	1	261	161	209	214	3	13
	374	258	179	96	196	0	0
	253	94	206	170	11	0	0
	337	134	106	109	185	0	0
	146	55	57	181	44	19	0
	0	296	153	279	218	0	0
	77	23	107	20	59	2	11
	450	183	52	241	92	0	0
	253	54	181	151	109	0	0
	208	121	192	103	67	0	0
	153	53	65	387	30	0	0
	340	0	88	20	43	0	0
	287	0	359	15	102	0	0
	192	91	191	221	31	0	0
	206	164	228	142	226	0	0
	0	142	68	201	109	0	0
	274	134	32	341	88	0	0
	270	121	154	144	82	0	0
	178	160	158	298	246	0	0
	0	175	154	339	10	0	0
	129	163	144	63	105	0	0
	212	102	92	150	52	0	0
	440	90	163	28	304	0	0
	252	115	3	162	110	0	0
	386	123	104	66	138	0	0
	118	275	162	275	39	1	0
	318	100	137	98	206	0	0
	229	143	179	178	70	0	0
	185	199	54	262	142	0	0
	255	210	174	144	158	0	0
	105	163	30	285	306	0	0
	176	174	64	234	167	0	0
	354	147	52	162	268	0	0
	0	191	201	254	139	0	0
	205	141	140	355	188	0	0
	94	143	133	214	259	0	0
	126	377	94	200	138	0	0
	339	241	140	257	65	0	0
	441	83	122	0	195	0	0
	147	112	137	399	97	0	0
	131	343	9	241	186	0	0
	166	141	191	129	189	0	0
	175	260	161	281	76	0	0
	296	51	145	345	149	0	0
	334	220	138	180	243	0	0
	90	147	347	218	215	0	0
	313	138	140	71	175	0	0
Total	10992	8019	7092	9562	7091	79	34
Mean	211.38	154.21	136.38	183.88	136.37	1.52	0.65
ST DEV	120.56	86.44	75.00	101.54	78.59	5.75	2.69

161

O-3: DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR 7H COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	1	6	6	16	48	2	0
	71	132	50	70	72	0	0
	111	143	126	134	31	0	0
	129	121	91	43	135	2	0
	72	381	179	250	10	0	0
	9	210	139	138	43	6	1
	193	119	114	34	196	0	0
	175	100	54	146	0	0	0
	209	103	83	48	37	0	0
	113	21	16	168	5	0	0
	0	103	174	41	54	0	0
	84	90	22	10	108	2	0
	200	109	26	149	154	0	0
	46	93	101	26	52	0	0
	155	53	88	29	9	0	0
	111	46	46	89	30	0	0
	87	0	19	0	8	0	0
	94	0	136	20	140	0	0
	73	39	44	58	10	0	0
	165	148	185	45	124	0	0
	0	187	18	89	77	0	0
	70	76	5	135	111	0	0
	180	77	41	91	82	0	0
	46	109	120	184	137	0	0
	0	72	110	128	0	0	0
	173	125	84	64	22	0	0
	169	164	49	56	35	0	0
	144	113	77	4	177	0	0
	135	69	0	109	109	0	0
	102	105	57	112	53	0	0
	70	134	68	142	4	0	0
	205	44	19	50	97	0	0
	114	65	66	20	72	0	0
	84	43	47	257	115	0	0
	204	45	121	86	30	0	0
	118	116	53	56	86	0	0
	100	133	36	68	40	0	0
	91	162	24	65	69	0	0
	0	174	53	58	27	0	0
	87	114	113	87	158	0	0
	61	96	82	133	67	0	0
	45	118	56	77	68	0	0
	38	69	25	83	62	0	0
	226	153	21	0	44	0	0
	70	85	72	138	10	0	0
	203	152	45	72	62	0	0
	192	90	71	40	133	0	0
	111	197	44	126	44	0	0
	147	39	81	170	42	0	0
	47	65	40	77	128	0	0
	147	70	108	29	13	0	0
	140	99	49	19	126	0	0
Total	5617	5377	3549	4339	3566	12	1
Mean	108.02	103.40	68.25	83.44	68.58	0.23	0.02
ST DEV	63.49	62.79	45.44	59.52	51.13	0.94	0.14

162

O-4: **DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR 7G COG**

	MON	TUES	WED	THUR	FRI	SAT	SUN
	0	2	0	0	5	3	0
	27	29	25	8	13	0	0
	36	21	14	43	4	0	0
	31	56	19	15	37	0	1
	19	115	21	30	8	0	0
	3	27	31	19	19	7	2
	105	63	17	62	27	0	0
	44	21	11	30	1	0	0
	85	22	38	2	3	0	0
	75	2	28	43	2	2	0
	0	73	40	6	19	0	0
	24	25	10	14	29	5	0
	55	42	8	47	23	0	0
	20	38	20	10	14	0	0
	53	10	53	9	0	0	0
	36	3	6	25	7	0	0
	55	0	11	3	35	0	0
	37	0	35	8	19	0	0
	12	3	21	24	1	0	0
	30	46	31	7	31	0	0
	0	32	3	44	29	0	0
	21	11	7	31	28	0	0
	49	9	42	34	25	0	0
	19	29	21	62	33	0	0
	0	18	51	50	0	0	0
	39	42	21	10	9	0	0
	26	58	17	7	4	0	0
	56	27	17	2	32	0	0
	76	17	2	27	28	0	0
	20	10	24	5	28	0	0
	21	50	39	57	0	0	0
	91	26	16	19	17	0	0
	12	26	18	21	14	0	0
	33	9	2	69	4	0	0
	82	1	120	54	17	0	0
	27	17	3	16	16	0	0
	17	40	4	45	21	0	0
	53	46	57	3	43	0	0
	0	39	17	16	29	0	0
	22	30	26	22	41	0	0
	22	15	28	45	28	0	0
	24	30	4	16	11	0	0
	21	14	5	32	4	0	0
	83	11	5	0	29	0	0
	8	30	3	53	2	0	0
	62	37	4	78	37	0	0
	80	23	12	6	80	0	0
	10	39	11	28	7	0	0
	29	13	11	37	2	0	0
	27	21	5	82	99	0	0
	23	15	50	56	10	0	0
	42	34	47	3	35	0	0
Total	1842	1417	1131	1435	1059	17	3
Mean	35.42	27.25	21.75	27.60	20.37	0.33	0.06
ST DEV	26.50	21.15	20.57	21.99	18.94	1.26	0.31

163

O-6: DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR 7Z COG

MON	TUES	WED	THUR	FRI	SAT	SUN
0	0	0	0	1	0	0
2	16	14	10	0	0	0
8	8	4	8	2	0	0
3	15	19	2	8	1	2
5	20	2	15	6	0	0
0	9	42	2	0	0	0
6	26	5	0	1	0	0
10	3	0	2	0	0	0
4	11	4	2	3	0	0
32	0	0	8	0	0	0
0	9	17	0	25	0	0
0	1	0	0	1	0	0
6	15	6	1	1	0	0
2	1	3	2	1	0	0
17	0	21	1	0	0	0
6	0	1	1	0	0	0
16	0	2	0	0	0	0
2	0	43	7	13	0	0
23	4	8	1	0	0	0
2	11	7	1	7	0	0
0	8	6	76	2	0	0
0	15	0	7	11	0	0
10	0	2	1	10	0	0
1	21	2	17	0	0	0
0	0	44	1	1	0	0
12	5	3	10	0	0	0
11	9	5	0	0	0	0
10	8	2	3	15	0	0
18	5	0	17	6	0	0
2	7	0	22	3	0	0
15	2	0	0	0	0	0
3	10	7	6	2	0	0
4	5	0	0	12	0	0
0	0	13	8	0	0	0
4	0	19	0	5	0	0
6	11	0	1	10	0	0
3	6	0	7	0	0	0
5	0	22	0	0	0	0
0	2	3	10	2	0	0
10	8	4	12	42	0	0
7	0	0	0	13	0	0
6	8	2	0	0	0	0
0	2	0	20	0	0	0
11	18	1	0	0	0	0
5	2	0	1	2	0	0
7	1	55	7	10	0	0
9	0	0	0	1	0	0
3	7	7	8	10	0	0
15	1	2	11	0	0	0
0	0	0	0	9	0	0
0	17	7	1	5	0	0
53	39	2	3	15	0	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Total	374	366	406	312	255	1	2
Mean	7.19	7.04	7.81	6.00	4.90	0.02	0.04
ST DEV	9.27	8.03	12.68	11.45	7.61	0.14	0.26

164

O-6: **DAILY ARRIVALS FROM NODES AT THE SAN DIEGO HUB FOR 7E COG**

MON	TUES	WED	THUR	FRI	SAT	SUN
0	1	0	0	1	0	0
1	5	5	4	1	0	0
6	11	3	3	2	0	0
10	3	1	1	11	0	0
2	4	3	5	1	0	0
1	6	4	0	2	0	0
30	9	8	1	6	0	0
4	3	1	22	0	0	0
3	7	4	0	6	0	0
5	1	1	3	0	0	0
0	26	2	2	0	0	0
2	0	0	0	9	0	0
15	3	1	3	7	0	0
1	0	0	0	37	0	0
5	1	3	1	0	0	0
98	0	0	12	1	0	0
2	0	0	0	0	0	0
6	0	:	0	3	0	0
2	2	0	9	1	0	0
10	1	24	0	4	0	0
0	1	1	1	0	0	0
4	0	0	25	0	0	0
17	1	4	2	2	0	0
3	6	4	9	3	0	0
0	13	0	7	0	0	0
26	1	1	1	7	0	0
5	12	0	1	0	0	0
20	1	5	1	9	0	0
1	2	0	2	1	0	0
1	3	0	0	2	0	0
1	1	6	8	0	0	0
8	0	1	0	23	0	0
7	4	2	0	0	0	0
3	3	0	2	3	0	0
13	2	23	4	1	0	0
4	3	1	0	13	0	0
8	2	4	26	0	0	0
22	4	4	1	11	0	0
0	2	2	5	0	0	0
0	12	3	12	7	0	0
0	3	2	5	13	0	0
3	4	3	2	2	0	0
26	3	4	2	1	0	0
5	2	0	0	1	0	0
2	4	1	29	0	0	0
17	17	2	7	2	0	0
4	2	5	0	6	0	0
1	2	0	5	12	0	0
2	1	2	8	2	0	0
2	3	1	2	9	0	0
1	2	11	2	1	0	0
5	2	8	1	6	0	0
Total 416	201	165	236	229	0	0
Mean 8.00	3.87	3.17	4.54	4.40	0.00	0.00
ST DEV 14.82	4.96	4.76	6.90	6.61	0.00	0.00

165

ARRIVALS FROM NODES

7R 46433

MEAN = 164.24 DLRs/Day

ST DEV = 97.36 DLRs

ARRIVALS FROM NODES

7E 46433

MEAN = 4.91 DLRs/Day
ST DEV = 8.63 DLRs

167
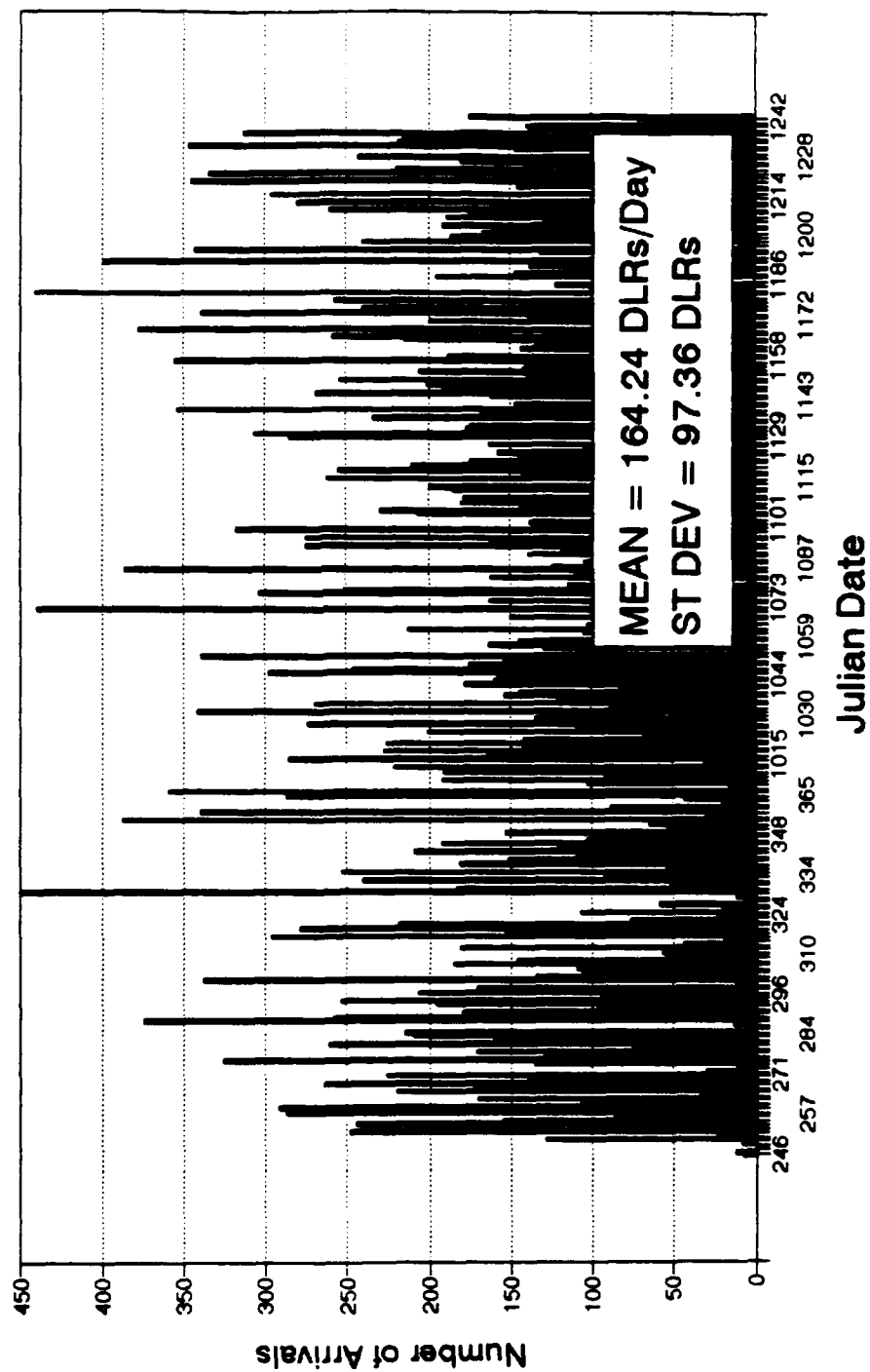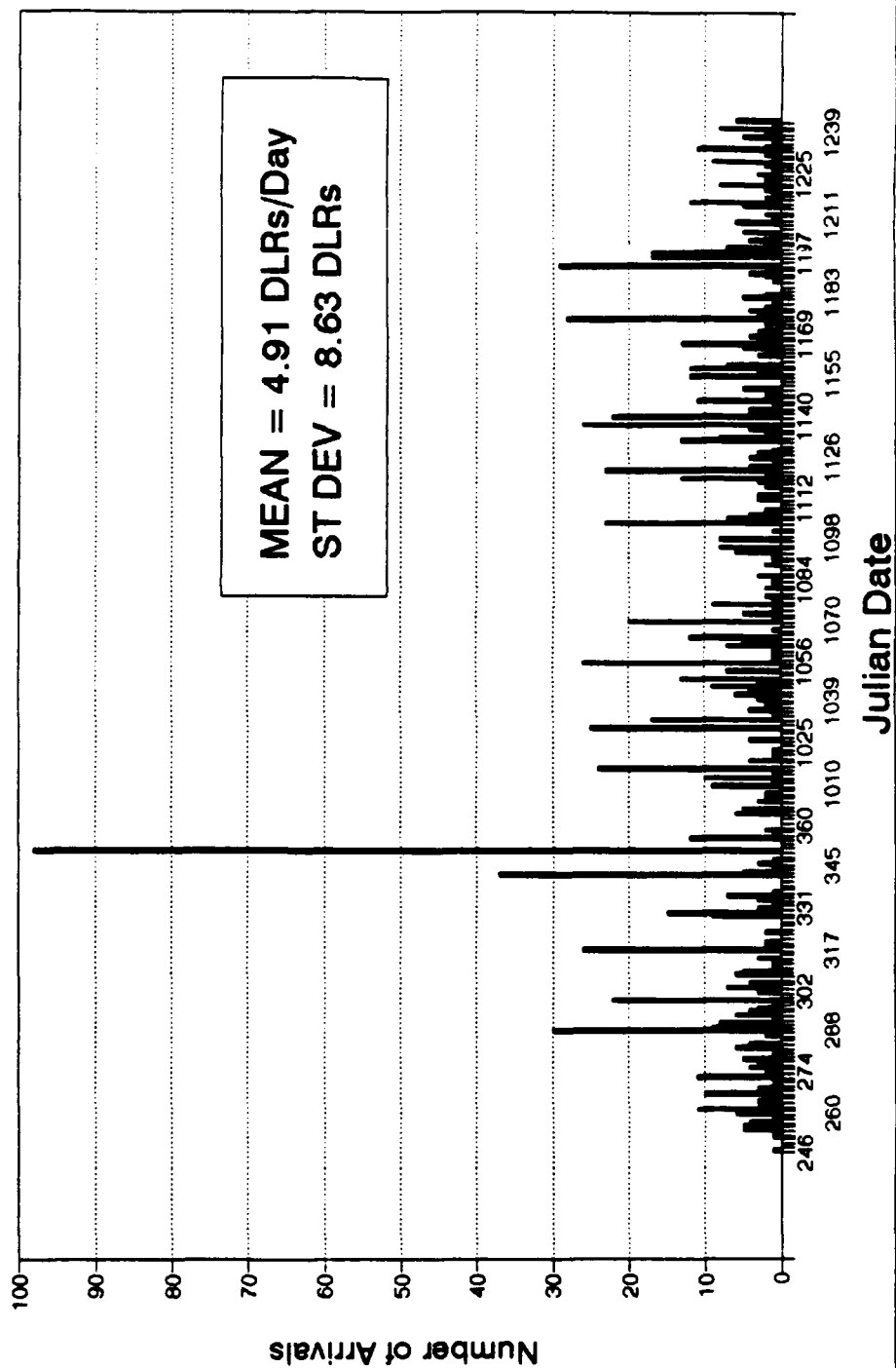
APPENDIX P: TOTAL DAILY ARRIVALS AT THE
SAN DIEGO HUB FOR ALL 7 COG

MON	TUES	WED	THUR	FRI	SAT	SUN
49	641	462	698	969	94	0
1103	1041	841	961	859	6	0
1059	1075	755	1018	980	0	0
955	666	1313	1045	1173	100	55
822	1490	1371	1048	739	0	2
79	999	1219	952	888	58	52
1582	1379	861	787	708	0	0
1227	757	1003	1077	760	0	0
1181	845	852	659	772	7	0
982	490	714	939	674	96	1
5	1300	994	1268	991	0	0
902	967	681	145	1054	67	82
1296	1408	570	1043	900	0	0
959	1002	791	643	559	41	30
1025	932	954	629	537	0	0
1054	680	712	918	578	0	0
849	0	583	833	471	0	0
830	0	1068	715	769	0	0
698	486	679	860	611	0	0
1561	1432	1239	1390	1131	0	0
0	1261	801	1028	868	0	0
865	839	689	928	702	0	0
874	794	1099	752	721	0	0
1053	774	883	820	1073	0	0
0	774	741	1093	679	0	0
883	783	1011	445	638	0	0
877	1052	893	917	736	0	0
1165	741	741	441	1098	0	0
868	962	346	723	713	0	0
1050	624	558	691	682	0	0
754	1086	622	943	491	1	0
1053	646	648	642	1538	0	0
891	618	811	601	633	0	0
915	781	570	1034	696	0	0
1190	769	996	777	791	0	0
923	1165	608	999	1063	0	0
871	864	567	1170	634	0	0
1010	750	719	999	671	0	0
0	883	711	747	655	0	0
932	1288	769	1166	899	0	0
669	1195	778	998	900	0	0
750	1377	527	742	740	0	0
967	783	530	756	777	0	0
1365	653	590	0	1063	0	0
948	720	655	1068	646	0	0
1375	1267	695	935	751	0	0
791	651	843	483	1010	0	0
997	1046	902	1146	908	0	0
1264	784	856	1108	819	0	0
1040	906	816	788	1112	0	0
576	1182	1029	907	598	0	0
1029	822	774	514	844	0	0
Total						
70909	58148	55394	49967	50749	322	3
Mean						
1363.63	1118.23	1065.27	960.90	975.94	6.19	0.06
ST DEV						
670.33	475.24	436.51	407.33	401.21	27.88	0.31

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P-2:   TOTAL DAILY ARRIVALS AT THE
        SAN DIEGO FOR 7R COG

MON	TUES	WED	THUR	FRI	SAT	SUN
45	375	228	393	629	88	0
736	689	623	603	534	5	0
700	720	455	461	407	0	0
618	373	699	548	640	89	48
657	646	590	442	466	0	2
30	693	682	609	545	19	46
974	697	485	413	352	0	0
611	395	642	464	507	0	0
700	442	558	425	521	6	0
600	261	436	540	446	90	1
0	846	634	702	613	0	0
486	586	497	81	440	25	75
830	865	392	559	484	0	0
666	450	538	392	388	41	29
671	666	572	355	388	0	0
628	463	365	662	207	0	0
537	0	286	476	242	0	0
580	0	766	517	350	0	0
453	348	486	522	335	0	0
719	599	580	714	461	0	0
0	617	510	583	492	0	0
636	613	548	540	268	0	0
548	461	675	483	500	0	0
584	460	550	427	622	0	0
0	525	372	647	187	0	0
478	400	466	249	542	0	0
518	520	471	543	397	0	0
654	396	502	233	779	0	0
517	586	177	388	399	0	0
740	416	359	470	473	0	0
435	730	430	589	345	1	0
631	370	486	423	397	0	0
540	352	594	413	293	0	0
508	540	323	592	446	0	0
647	588	645	361	332	0	0
372	565	398	774	741	0	0
637	519	434	903	440	0	0
642	401	386	570	486	0	0
0	509	514	527	394	0	0
686	566	362	600	458	0	0
392	490	461	711	662	0	0
508	794	296	428	538	0	0
731	515	413	548	523	0	0
936	290	476	0	599	0	0
429	369	453	720	456	0	0
536	600	329	477	413	0	0
383	403	482	284	676	0	0
718	628	583	811	528	0	0
871	543	484	815	535	0	0
813	575	548	453	577	0	0
284	946	664	556	440	0	0
706	454	545	337	478	0	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Total	47015	36944	36140	30691	30595	273	3
Mean	544 63	516 44	489 42	506 40	468 67	7 00	3 87
ST DEV	237 56	181 14	124 02	171 16	126 09	21 67	14 08

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P-3: TOTAL DAILY ARRIVALS AT THE
SAN DIEGO FOR 7H COG

	MON	TUES	WED	THUR	FRI	SAT	SUN
	2	183	204	262	277	3	0
	247	260	129	243	215	1	0
	248	245	223	454	461	0	0
	236	186	529	438	399	4	1
	118	660	652	480	136	0	0
	36	255	362	284	273	24	2
	413	468	285	236	256	0	0
	503	235	293	485	191	0	0
	326	285	188	138	191	1	0
	214	179	156	311	154	4	0
	2	278	261	487	256	0	0
	322	295	109	45	501	24	7
	347	369	95	328	307	0	0
	189	440	192	132	102	0	1
	232	188	206	212	97	0	0
	222	164	275	164	353	0	0
	232	0	228	295	130	0	0
	186	0	180	110	320	0	0
	150	99	127	243	244	0	0
	672	674	468	545	578	0	0
	0	568	219	276	218	0	0
	171	163	103	277	323	0	0
	230	211	147	180	166	0	0
	347	204	246	283	306	0	0
	0	185	246	285	394	0	0
	293	299	439	116	57	0	0
	256	396	234	252	194	0	0
	375	244	181	140	237	0	0
	221	243	59	254	204	0	0
	265	160	135	170	108	0	0
	218	217	95	267	74	0	0
	267	188	85	155	974	0	0
	240	159	124	128	248	0	0
	314	173	196	330	220	0	0
	364	130	158	269	350	0	0
	472	381	143	162	170	0	0
	142	231	100	159	117	0	0
	249	261	120	361	111	0	0
	0	249	111	132	144	0	0
	151	564	293	472	306	0	0
	171	538	235	189	152	0	0
	165	456	141	232	132	0	0
	128	177	90	128	118	0	0
	317	272	71	0	373	0	0
	469	237	142	203	107	0	0
	667	530	242	314	243	0	0
	257	176	273	140	213	0	0
	217	269	223	231	300	0	0
	276	192	327	222	173	0	0
	164	260	176	215	309	0	0
	245	149	248	233	97	0	0
	191	226	127	126	228	0	0
Total	47015	36944	36140	30691	30595	273	3
Mean	244.98	272.90	209.44	246.02	246.29	1.17	0.21
ST DEV	145.08	148.50	117.25	119.09	152.40	4.69	1.02

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P-4: **TOTAL DAILY ARRIVALS AT THE**
SAN DIEGO FOR 7G COG

MON	TUES	WED	THUR	FRI	SAT	SUN
1	58	29	30	53	3	0
94	64	62	87	75	0	0
82	75	61	87	54	0	0
59	86	52	34	93	2	2
37	152	90	87	59	0	0
11	35	114	54	52	15	3
149	140	59	118	49	0	0
96	85	57	84	27	0	0
136	73	64	52	34	0	0
123	38	102	70	35	2	0
3	115	76	57	56	0	0
72	75	41	18	95	16	0
90	123	54	135	68	0	0
87	98	39	75	22	0	0
91	67	113	47	20	0	0
69	27	52	74	17	0	0
60	0	41	45	56	0	0
54	0	69	42	74	0	0
58	31	52	58	27	0	0
100	112	111	123	69	0	0
0	59	48	76	123	0	0
47	40	34	67	81	0	0
65	75	254	54	36	0	0
68	64	60	81	99	0	0
0	41	74	99	48	0	0
70	76	89	49	22	0	0
69	62	83	68	102	0	0
81	64	49	60	54	0	0
100	85	69	57	56	0	0
31	34	56	24	69	0	0
74	127	80	69	51	0	0
126	68	45	46	113	0	0
81	73	66	49	53	0	0
84	46	27	93	21	0	0
144	33	137	132	94	0	0
47	49	45	44	103	0	0
62	83	26	60	48	0	0
75	81	132	44	60	0	0
0	98	45	50	72	0	0
70	101	58	41	78	0	0
45	114	50	67	50	0	0
49	95	64	55	39	0	0
71	71	18	52	105	0	0
94	51	33	0	81	0	0
35	100	31	79	45	0	0
128	100	26	110	70	0	0
102	56	37	35	108	0	0
46	89	55	84	58	0	0
65	42	37	50	101	0	0
52	46	63	112	194	0	0
42	65	77	102	35	0	0
64	95	84	37	112	0	0
Total 47015	36944	36140	30691	30595	273	3
Mean 68.44	71.87	65.19	65.83	65.69	0.73	0.10
ST DEV 36.28	32.40	37.98	29.03	33.30	3.04	0.50

171

P-5: **TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR 7Z COG**

MON	TUES	WED	THUR	FRI	SAT	SUN
0	17	0	8	3	0	0
19	18	16	13	28	0	0
19	13	10	11	41	0	0
25	15	26	7	11	3	4
6	24	19	29	75	0	0
0	9	47	2	14	0	0
9	55	11	15	40	0	0
10	30	1	14	30	0	0
13	34	28	32	9	0	0
35	8	16	10	33	0	0
0	28	18	8	54	0	0
13	3	28	0	5	1	0
13	39	24	10	27	0	0
8	2	9	31	2	0	0
23	4	53	9	31	0	0
20	19	20	3	0	0	0
17	0	26	2	34	0	0
3	0	45	34	20	0	0
27	4	9	23	1	0	0
54	31	47	4	8	0	0
0	8	9	86	30	0	0
2	16	3	13	21	0	0
10	42	13	13	11	0	0
25	39	22	18	29	0	0
0	5	45	35	46	0	0
12	6	3	25	2	0	0
26	59	101	48	33	0	0
30	32	2	3	16	0	0
25	38	35	17	41	0	0
5	9	4	22	27	0	0
17	4	7	5	20	0	0
13	16	26	11	6	0	0
5	22	21	7	39	0	0
0	14	19	10	6	0	0
8	14	26	2	8	0	0
21	15	7	6	22	0	0
7	25	1	19	26	0	0
17	0	64	11	0	0	0
0	21	36	28	31	0	0
22	37	49	39	47	0	0
55	46	27	18	15	0	0
13	18	19	19	24	0	0
3	9	0	26	23	0	0
14	29	7	0	0	0	0
6	6	27	29	36	0	0
7	15	84	8	10	0	0
42	9	43	14	3	0	0
3	29	30	8	10	0	0
39	4	4	11	4	0	0
2	18	20	1	11	0	0
1	20	13	2	19	0	0
62	43	8	4	16	0	0
Total						
47015	36944	36140	30691	30595	273	3
Mean						
15.50	19.63	23.62	15.83	21.12	0.08	0.08
ST DEV						
14.87	14.73	20.92	15.00	16.16	0.44	0.55

172

TOTAL DAILY ARRIVALS AT THE NORFOLK HUB FOR 7E COG

MON	TUES	WED	THUR	FRI	SAT	SUN
1	8	1	5	7	0	0
7	9	9	14	6	0	0
9	22	6	5	17	0	0
16	5	6	18	29	2	0
4	7	19	9	3	0	0
2	7	14	3	4	0	1
37	16	18	4	11	0	0
7	12	10	26	5	0	0
6	11	13	11	17	0	0
9	4	4	8	5	0	0
0	29	5	13	12	0	0
9	4	6	1	13	1	0
15	9	5	10	11	0	0
7	9	7	13	45	0	0
7	6	10	6	0	0	0
101	6	0	14	1	0	0
2	0	2	14	9	0	0
7	0	8	11	5	0	0
10	4	5	12	4	0	0
16	15	33	2	15	0	0
0	8	15	4	5	0	0
7	5	1	29	7	0	0
20	5	6	19	7	0	0
24	7	5	9	11	0	0
0	16	3	15	4	0	0
29	1	9	5	14	0	0
6	15	4	6	9	0	0
24	5	7	5	12	0	0
5	8	6	6	13	0	0
8	5	4	5	5	0	0
9	5	8	13	1	0	0
15	4	6	6	48	0	0
23	12	5	4	0	0	0
9	8	4	9	3	0	0
27	4	30	13	6	0	0
11	155	15	13	26	0	0
23	5	6	29	3	0	0
27	6	17	11	14	0	0
0	5	4	9	13	0	0
3	20	7	14	9	0	0
6	7	4	12	21	0	0
14	14	7	8	6	0	0
34	11	9	2	8	0	0
7	11	2	0	10	0	0
9	8	2	37	2	0	0
36	21	12	26	15	0	0
7	7	8	10	9	0	0
13	11	11	14	12	0	0
10	3	3	9	6	0	0
9	6	9	7	21	0	0
4	2	25	12	6	0	0
6	4	9	10	10	0	0

	MON	TUES	WED	THUR	FRI	SAT	SUN
Total	47015	36944	36140	30691	30595	273	3
Mean	13 40	11 29	8 54	10 96	10 67	0 06	0 02
ST DEV	15 64	21 12	6 82	7 54	9 55	0 31	0 14

DAILY ARRIVALS AT HUB

7R 46433

MEAN = 495.82 DLRs/Day

ST DEV = 182.14 DLRs

174

DAILY ARRIVALS AT HUB
7E 46433

MEAN = 11.32 DLRs/Day
ST DEV = 13.36 DLRs

175
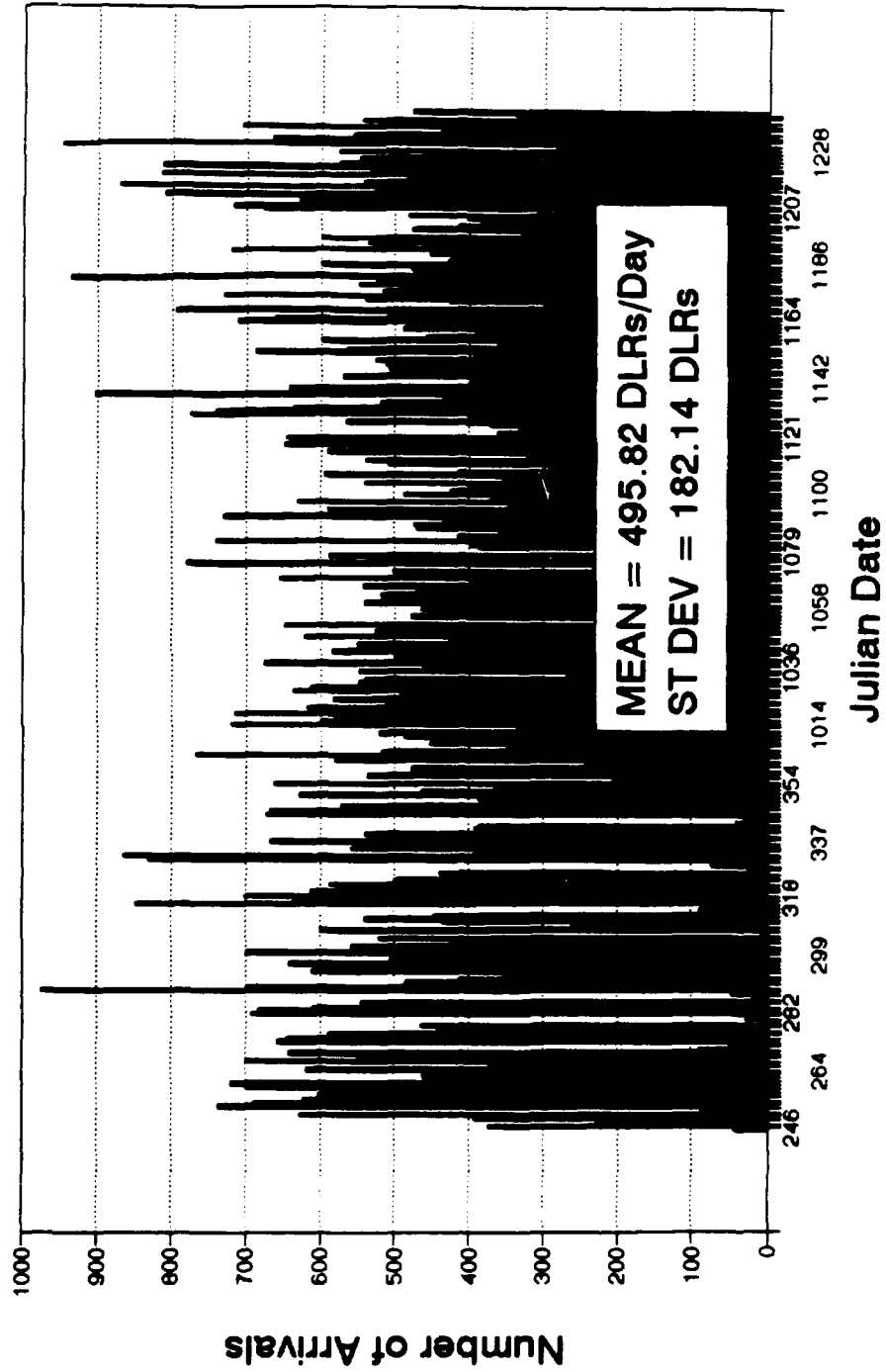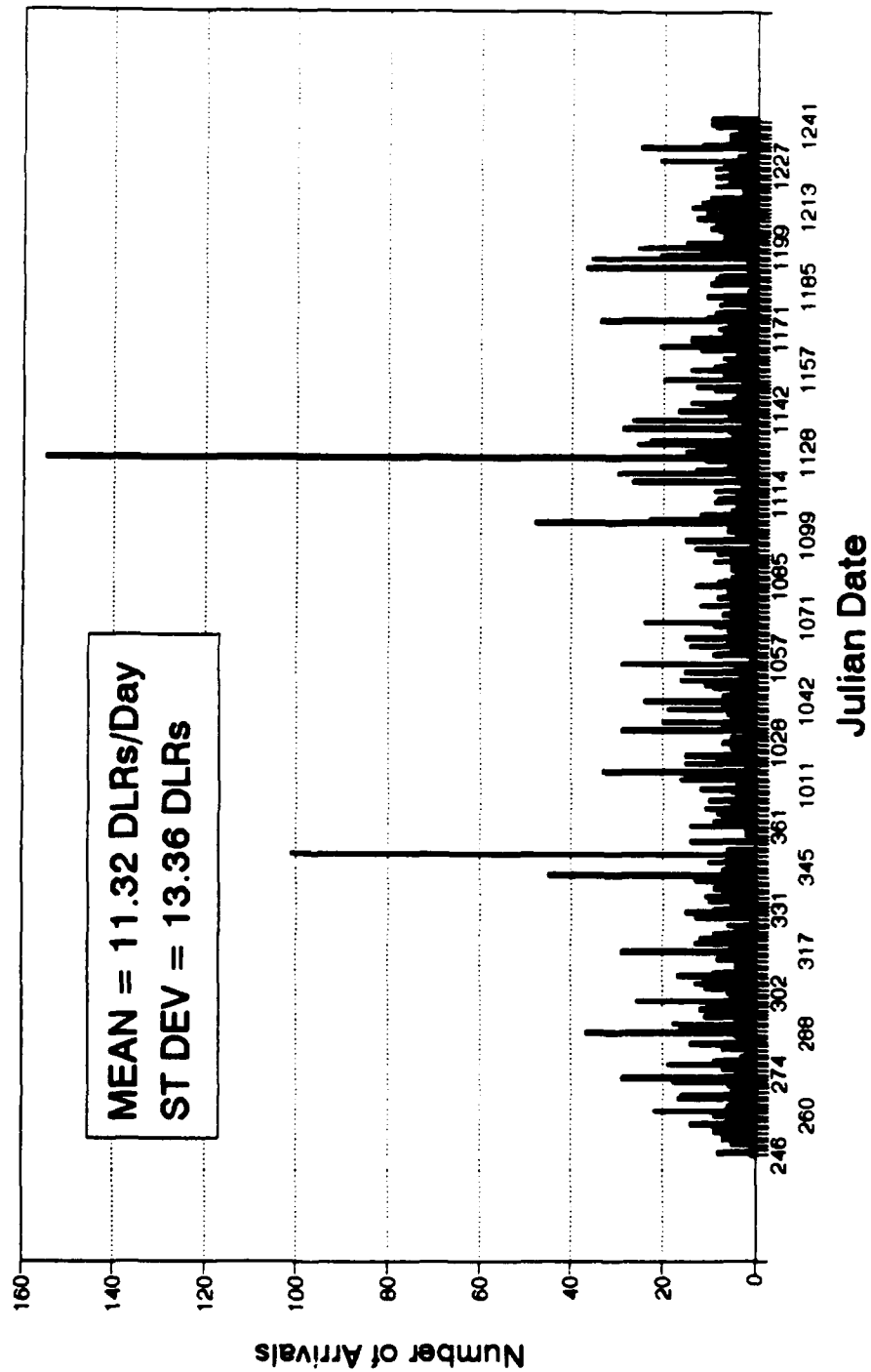
APPENDIX Q: NORFOLK HUB IN-PROCESSING TIMES

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0 5	44404	15 81%	15.81%
1 5	116239	41 39%	57.20%
2 5	29852	10 63%	67 83%
3 5	39065	13 91%	81 74%
4 5	15813	5 63%	87 37%
5 5	13588	4 84%	92.21%
6 5	11224	4 00%	96.20%
7 5	7049	2.51%	98.71%
8 5	1297	0 46%	99 18%
9 5	278	0 10%	99.28%
10 5	204	0 07%	99.35%
11 5	426	0.15%	99 50%
12 5	224	0 08%	99.58%
13 5	79	0.03%	99.61%
14 5	427	0.15%	99 76%
15 5	269	0.10%	99 86%
16 5	406	0.14%	100.00%
	280844		

7R 68620

Days	Count	Percent	Cumulative Percent
0 5	27037	15 3%	15 26%
1 5	75406	42 6%	57 83%
2 5	19964	11 3%	69 10%
3 5	24163	13 6%	82 74%
4 5	9506	5 4%	88 10%
5 5	8484	4 8%	92 89%
6 5	6956	3 9%	96 82%
7 5	4545	2.6%	99 39%
8 5	798	0 5%	99 84%
9 5	150	0 1%	99 92%
10 5	140	0 1%	100 00%
	177149		

7H 68620

Days	Count	Percent	Cumulative Percent
0 5	11761	16.58%	16 58%
1 5	28597	40.30%	56 88%
2 5	6837	9 64%	66.51%
3 5	10336	14.57%	81.08%
4 5	4419	6.23%	87.31%
5 5	3543	4 99%	92.30%
6 5	3016	4.25%	96.55%
7 5	1818	2.56%	99.12%
8 5	374	0.53%	99 64%
9 5	58	0 08%	99.73%
10 5	53	0.07%	99.80%
11 5	109	0.15%	99 95%
12 5	24	0.03%	99.99%
13 5	9	0 01%	100 00%
	70954		

7G 68620

Days	Count	Percent	Cumulative Percent
0 5	3974	17 38%	17 38%
1 5	8893	38.90%	56.28%
2 5	2509	10.98%	67.26%
3 5	3476	15.20%	82.46%
4 5	1440	6.30%	88 76%
5 5	992	4 34%	93.10%
6 5	838	3.67%	96 77%
7 5	514	2.25%	99 02%
8 5	85	0.37%	99.39%
9 5	70	0.31%	99.69%
10 5	7	0.03%	99.72%
11 5	55	0.24%	99.97%
12 5	5	0 02%	99 99%
13 5	3	0.01%	100.00%
	22861		

7Z 68620

Days	Count	Percent	Cumulative Percent
0 5	909	20.04%	20.04%
1 5	1869	41.21%	61.26%
2 5	168	3 70%	64.96%
3 5	621	13.69%	78.65%
4 5	221	4.87%	83.53%
5 5	396	8.73%	92.26%
6 5	279	6.15%	98 41%
7 5	56	1.23%	99.65%
8 5	16	0.35%	100.00%
	4535		

7E 68620

Days	Count	Percent	Cumulative Percent
0 5	680	19 78%	19 78%
1 5	1329	38.67%	58 45%
2 5	351	10.21%	68 66%
3 5	439	12.77%	81 44%
4 5	201	5.85%	87 29%
5 5	155	4 51%	91 80%
6 5	124	3.61%	95 40%
7 5	113	3.29%	98 69%
8 5	18	0 52%	99.21%
10 5	2	0 06%	99 27%
11 5	3	0.09%	99 36%
12 5	3	0 09%	99 45%
13 5	2	0 06%	99 51%
14 5	9	0 26%	99 77%
15 5	1	0 03%	99 80%
16 5	7	0 20%	100 00%
	3437		

HUB IN-PROCESSING TIME
7R 68620

MEAN = 2.48 Days
ST DEV = 1.83 Days

HUB IN-PROCESSING TIME
7E 68620

MEAN = 2.53 Days
ST DEV = 2.15 Days

Frequency of Observation
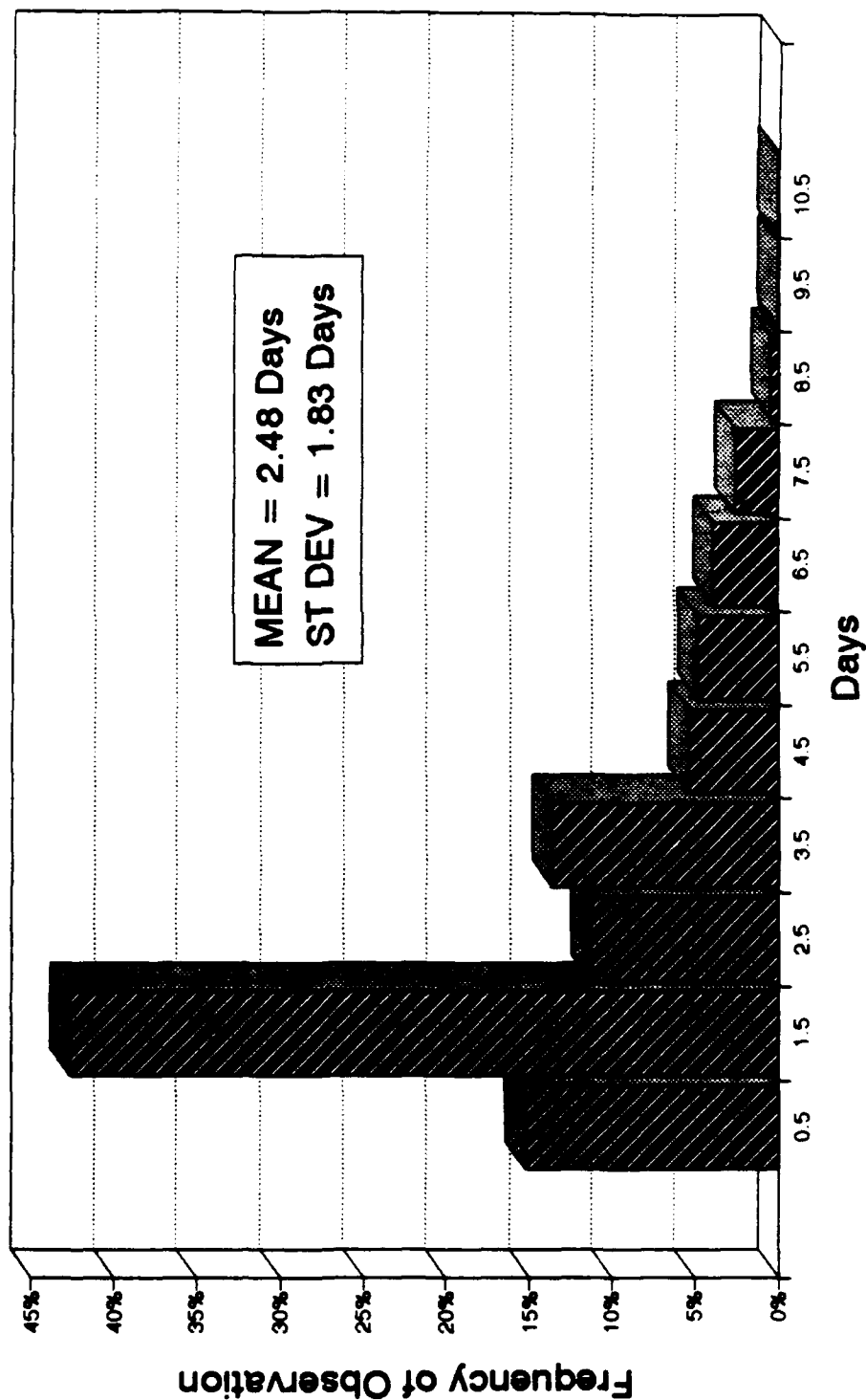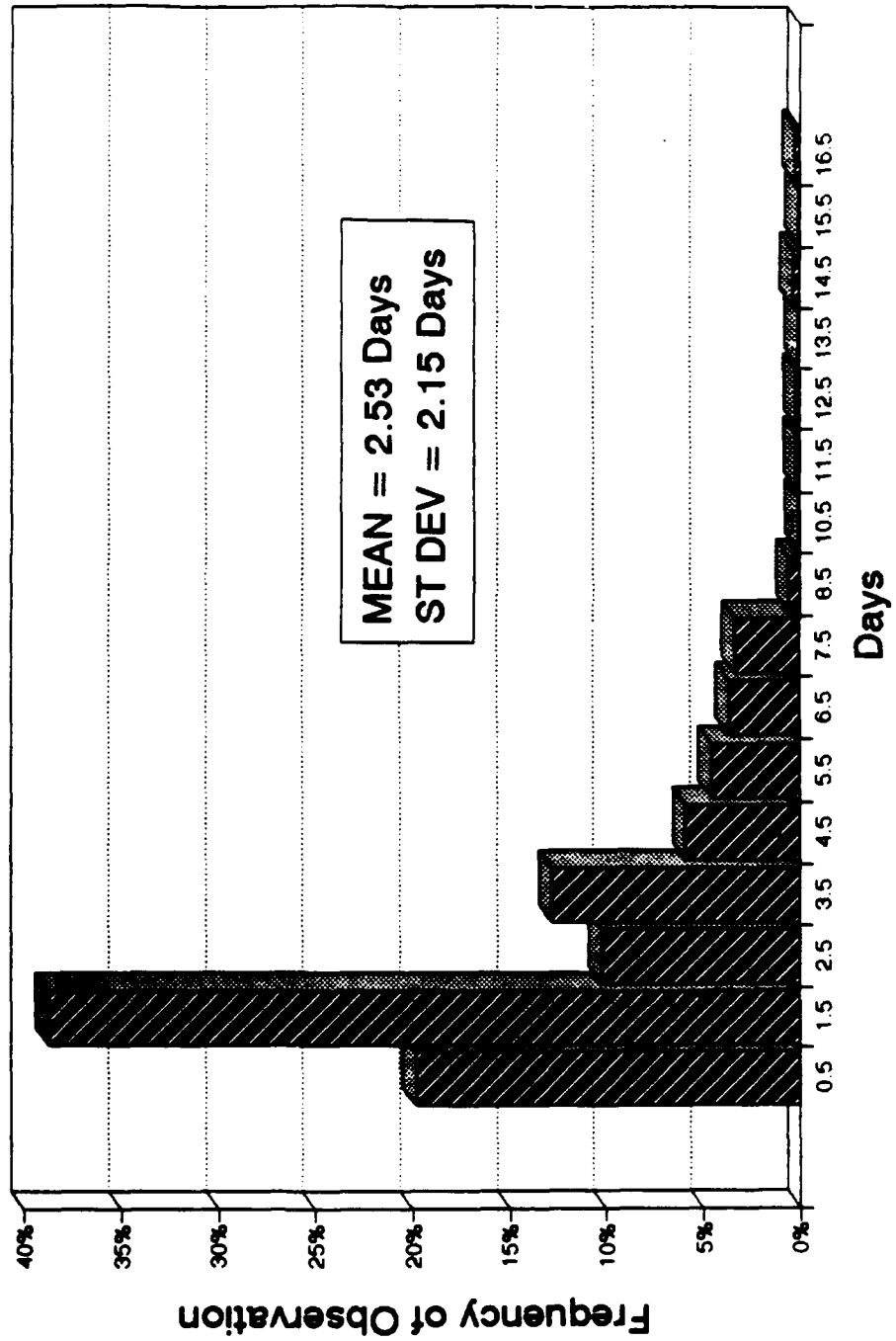
Days

APPENDIX R: SAN DIEGO HUB IN-PROCESSING TIMES

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	27104	12.28%	12.28%
1.5	152768	69.22%	81.50%
2.5	2663	1.21%	82.71%
3.5	32832	14.86%	97.58%
4.5	5067	2.30%	99.88%
5.5	178	0.08%	99.96%
6.5	48	0.02%	99.98%
7.5	46	0.02%	100.00%
	220706		

7R 46433

Days	Count	Percent	Cumulative Percent
0.5	15707	11.92%	11.92%
1.5	92168	69.97%	81.90%
2.5	1929	1.46%	83.36%
3.5	18847	14.31%	97.67%
4.5	2915	2.21%	99.88%
5.5	89	0.07%	99.95%
6.5	35	0.03%	99.98%
7.5	29	0.02%	100.00%
	131719		

7H 46433

Days	Count	Percent	Cumulative Percent
0.5	7890	12.45%	12.45%
1.5	43438	68.56%	81.02%
2.5	506	0.80%	81.81%
3.5	10019	15.81%	97.63%
4.5	1503	2.37%	100.00%
	63356		

7G 46433

Days	Count	Percent	Cumulative Percent
0.5	2377	13.57%	13.57%
1.5	11856	67.69%	81.26%
2.5	158	0.90%	82.16%
3.5	2690	15.36%	97.52%
4.5	435	2.48%	100.00%
	17516		

7Z 46433

Days	Count	Percent	Cumulative Percent
0.5	569	11.49%	11.49%
1.5	3311	66.88%	78.37%
2.5	53	1.07%	79.44%
3.5	868	17.53%	96.97%
4.5	150	3.03%	100.00%
	4951		

7E 46433

Days	Count	Percent	Cumulative Percent
0.5	526	18.45%	18.45%
1.5	1862	65.31%	83.76%
2.5	16	0.56%	84.32%
3.5	391	13.71%	98.04%
4.5	56	1.96%	100.00%
	2851		

HUB IN-PROCESSING TIME
7R 46433

MEAN = 1.75 Days
ST DEV = .93 Days

Frequency of Observation

Days

HUB IN-PROCESSING TIME
7E 46433

MEAN = 1.65 Days
ST DEV = .94 Days

Frequency of Observation
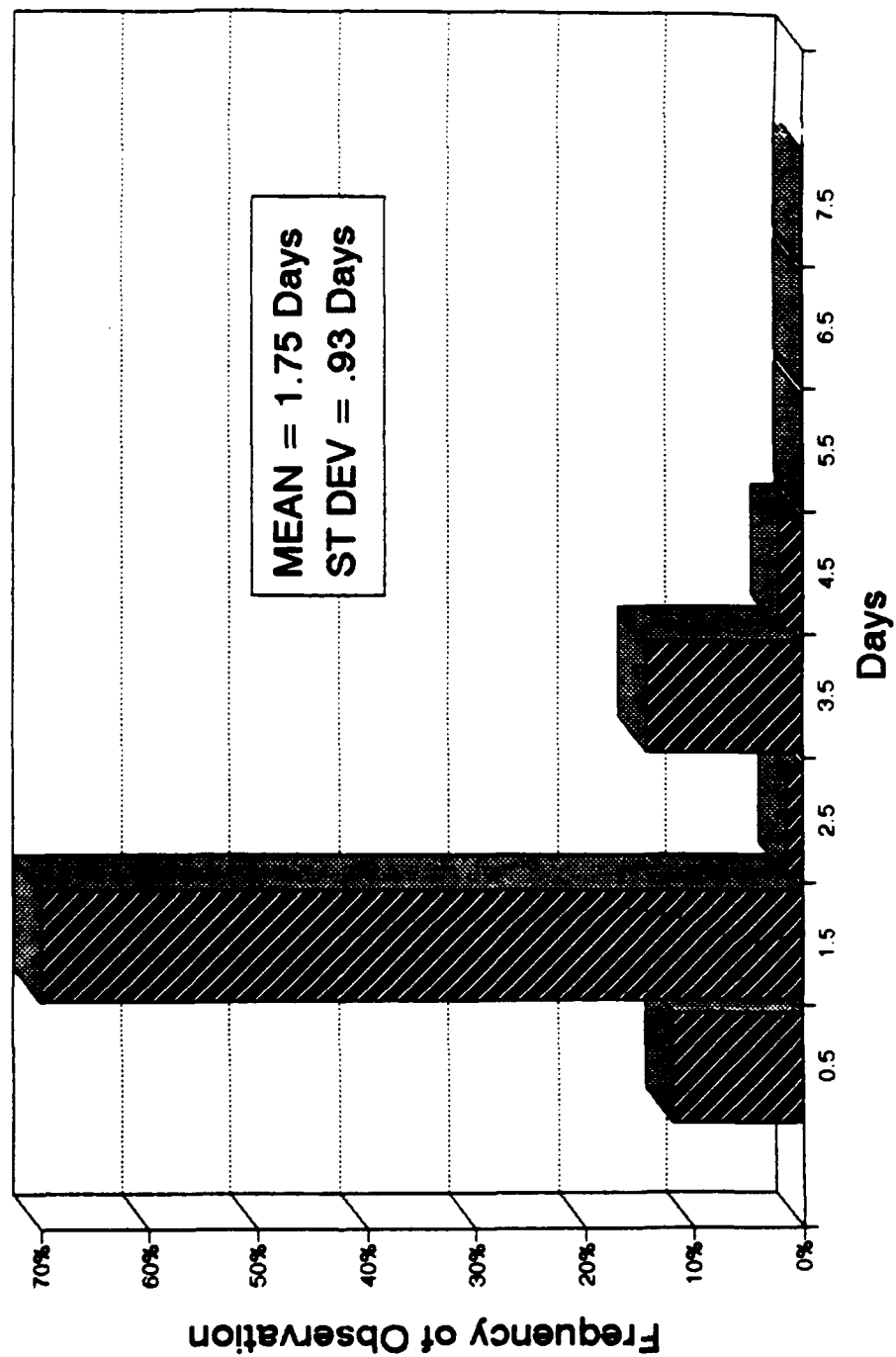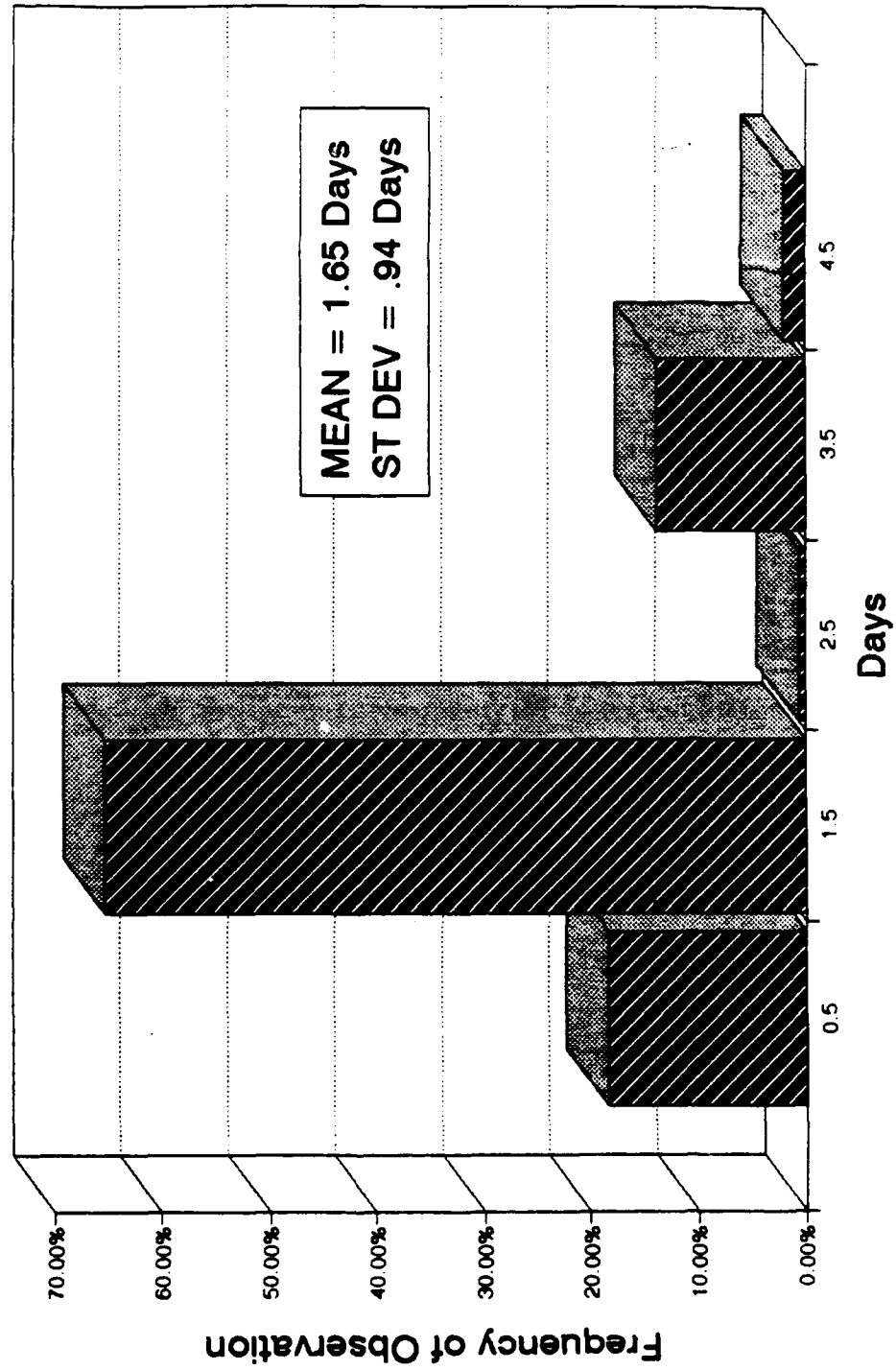
Days

APPENDIX S: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	391	0.23%	0.23%
1.5	7628	4.53%	4.75%
2.5	26536	15.75%	20.50%
3.5	19951	11.84%	32.34%
4.5	19360	11.49%	43.83%
5.5	20850	12.37%	56.21%
6.5	18220	10.81%	67.02%
7.5	15486	9.19%	76.21%
8.5	9713	5.76%	81.96%
9.5	5154	3.06%	85.03%
10.5	4333	2.57%	87.61%
11.5	4037	2.40%	90.00%
12.5	3540	2.10%	92.10%
13.5	3179	1.89%	93.99%
14.5	2617	1.55%	95.54%
15.5	1624	0.96%	96.51%
16.5	914	0.54%	97.05%
17.5	888	0.53%	97.56%
18.5	585	0.34%	97.91%
19.5	552	0.33%	98.24%
20.5	483	0.29%	98.53%
21.5	514	0.31%	98.83%
22.5	384	0.22%	99.05%
23.5	205	0.12%	99.17%
24.5	220	0.13%	99.30%
25.5	189	0.11%	99.41%
26.5	171	0.10%	99.51%
27.5	175	0.10%	99.62%
28.5	200	0.12%	99.74%
29.5	160	0.09%	99.83%
30.5	124	0.07%	99.90%
31.5	93	0.06%	99.96%
32.5	69	0.04%	100.00%
	168495		

S-2: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR 7R COG

Days	Count	Percent	Cumulative Percent
0.5	287	0.2%	0.24%
1.5	5874	4.9%	5.14%
2.5	19720	16.4%	21.59%
3.5	14672	12.2%	33.83%
4.5	13904	11.6%	45.43%
5.5	14722	12.3%	57.71%
6.5	12752	10.6%	68.34%
7.5	10738	9.0%	77.30%
8.5	6793	5.7%	82.97%
9.5	3557	3.0%	85.94%
10.5	2860	2.4%	88.32%
11.5	2880	2.4%	90.72%
12.5	2378	2.0%	92.71%
13.5	2147	1.8%	94.50%
14.5	1702	1.4%	95.92%
15.5	1082	0.9%	96.82%
16.5	568	0.5%	97.29%
17.5	629	0.5%	97.82%
18.5	353	0.3%	98.11%
19.5	360	0.3%	98.41%
20.5	321	0.3%	98.69%
21.5	331	0.3%	98.96%
22.5	243	0.2%	99.16%
23.5	131	0.1%	99.27%
24.5	128	0.1%	99.38%
25.5	115	0.1%	99.47%
26.5	103	0.1%	99.56%
27.5	117	0.1%	99.65%
28.5	122	0.1%	99.76%
29.5	112	0.1%	99.85%
30.5	77	0.1%	99.92%
31.5	53	0.0%	99.96%
32.5	48	0.0%	100.00%
	119879		

S-3: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR 7H COG

Days	Count	Percent	Cumulative Percent
0.5	67	0.19%	0.19%
1.5	1262	3.57%	3.76%
2.5	4847	13.72%	17.49%
3.5	3772	10.68%	28.16%
4.5	3953	11.19%	39.36%
5.5	4405	12.47%	51.83%
6.5	4075	11.54%	63.36%
7.5	3501	9.91%	73.26%
8.5	2093	5.93%	79.20%
9.5	1154	3.27%	82.47%
10.5	1046	2.97%	85.44%
11.5	823	2.33%	87.77%
12.5	834	2.36%	90.13%
13.5	764	2.16%	92.29%
14.5	663	1.88%	94.17%
15.5	380	1.06%	95.24%
16.5	253	0.72%	95.96%
17.5	196	0.55%	96.51%
18.5	159	0.45%	96.96%
19.5	133	0.38%	97.34%
20.5	112	0.32%	97.66%
21.5	135	0.38%	98.04%
22.5	96	0.27%	98.31%
23.5	51	0.14%	98.46%
24.5	65	0.18%	98.64%
25.5	56	0.16%	98.80%
26.5	52	0.15%	98.95%
27.5	42	0.12%	99.07%
28.5	52	0.15%	99.21%
29.5	37	0.10%	99.32%
30.5	31	0.09%	99.41%
31.5	27	0.08%	99.48%
32.5	15	0.04%	99.52%
33.5	22	0.06%	99.59%
34.5	26	0.07%	99.66%
35.5	32	0.09%	99.75%
36.5	18	0.05%	99.80%
37.5	19	0.05%	99.86%
38.5	17	0.05%	99.90%
39.5	15	0.04%	99.95%
40.5	19	0.05%	100.00%
	35321		

S-4: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR 7G COG

Days	Count	Percent	Cumulative Percent
0.5	24	0.25%	0.25%
1.5	365	3.84%	4.09%
2.5	1347	14.15%	18.24%
3.5	1115	11.72%	29.96%
4.5	1030	10.82%	40.78%
5.5	1204	12.65%	53.43%
6.5	1009	10.60%	64.03%
7.5	884	9.29%	73.32%
8.5	608	6.39%	79.71%
9.5	290	3.05%	82.76%
10.5	296	3.11%	85.87%
11.5	240	2.52%	88.39%
12.5	223	2.34%	90.73%
13.5	192	2.02%	92.75%
14.5	187	1.96%	94.71%
15.5	99	1.04%	95.75%
16.5	64	0.67%	96.43%
17.5	47	0.49%	96.92%
18.5	35	0.37%	97.29%
19.5	40	0.42%	97.71%
20.5	30	0.32%	98.02%
21.5	33	0.35%	98.37%
22.5	15	0.16%	98.53%
23.5	17	0.18%	98.71%
24.5	11	0.12%	98.82%
25.5	13	0.14%	98.96%
26.5	10	0.11%	99.06%
27.5	11	0.12%	99.18%
28.5	18	0.19%	99.37%
29.5	6	0.06%	99.43%
30.5	9	0.09%	99.53%
31.5	11	0.12%	99.64%
32.5	1	0.01%	99.65%
33.5	8	0.08%	99.74%
34.5	3	0.03%	99.77%
35.5	8	0.08%	99.85%
36.5	10	0.11%	99.96%
37.5	4	0.04%	100.00%
	9517		

S-5: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent
1.5	62	3.19%	3.19%
2.5	323	16.62%	19.81%
3.5	161	8.29%	28.10%
4.5	213	10.96%	39.06%
5.5	240	12.35%	51.42%
6.5	168	8.65%	60.06%
7.5	183	9.42%	69.48%
8.5	99	5.10%	74.58%
9.5	92	4.73%	79.31%
10.5	73	3.76%	83.07%
11.5	35	1.80%	84.87%
12.5	59	3.04%	87.91%
13.5	30	1.54%	89.45%
14.5	26	1.34%	90.79%
15.5	35	1.80%	92.59%
16.5	23	1.18%	93.77%
17.5	12	0.62%	94.39%
18.5	10	0.51%	94.90%
19.5	8	0.41%	95.32%
20.5	17	0.87%	96.19%
21.5	8	0.41%	96.60%
22.5	7	0.36%	96.96%
23.5	4	0.21%	97.17%
24.5	12	0.62%	97.79%
25.5	3	0.15%	97.94%
26.5	4	0.21%	98.15%
27.5	1	0.05%	98.20%
28.5	6	0.31%	98.51%
29.5	3	0.15%	98.66%
30.5	2	0.10%	98.76%
31.5	1	0.05%	98.82%
32.5	2	0.10%	98.92%
33.5	2	0.10%	99.02%
34.5	2	0.10%	99.13%
35.5	2	0.10%	99.23%
36.5	7	0.36%	99.59%
37.5	2	0.10%	99.69%
39.5	5	0.26%	99.95%
40.5	1	0.05%	100.00%
	1943		

S-6: GOVERNMENT SCREENING TIMES AT THE NORFOLK HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent
0.5	3	0.15%	0.15%
1.5	64	3.26%	3.41%
2.5	286	14.58%	17.99%
3.5	222	11.31%	29.31%
4.5	251	12.79%	42.10%
5.5	260	13.25%	55.35%
6.5	195	9.94%	65.29%
7.5	172	8.77%	74.06%
8.5	114	5.81%	79.87%
9.5	60	3.06%	82.93%
10.5	53	2.70%	85.63%
11.5	57	2.91%	88.53%
12.5	42	2.14%	90.67%
13.5	45	2.29%	92.97%
14.5	37	1.89%	94.85%
15.5	27	1.38%	96.23%
16.5	5	0.25%	96.48%
17.5	3	0.15%	96.64%
18.5	8	0.41%	97.04%
19.5	11	0.56%	97.60%
20.5	3	0.15%	97.76%
21.5	6	0.31%	98.06%
22.5	3	0.15%	98.22%
23.5	2	0.10%	98.32%
24.5	4	0.20%	98.52%
26.5	1	0.05%	98.57%
27.5	2	0.10%	98.67%
28.5	2	0.10%	98.78%
29.5	2	0.10%	98.88%
30.5	5	0.25%	99.13%
31.5	1	0.05%	99.18%
32.5	2	0.10%	99.29%
33.5	2	0.10%	99.39%
34.5	3	0.15%	99.54%
35.5	1	0.05%	99.59%
36.5	1	0.05%	99.64%
37.5	1	0.05%	99.69%
39.5	2	0.10%	99.80%
40.5	1	0.05%	99.85%
43.5	1	0.05%	99.90%
44.5	2	0.10%	100.00%
	1962		

GOVT SCREENING TIME
7R 68620

MEAN = 6.27 Days
ST DEV = 4.22 Days

Frequency of Observation

Days

GOVT SCREENING TIME
7E 68620

MEAN = 6.84 Days
ST DEV = 5.14 Days

Frequency of Observation
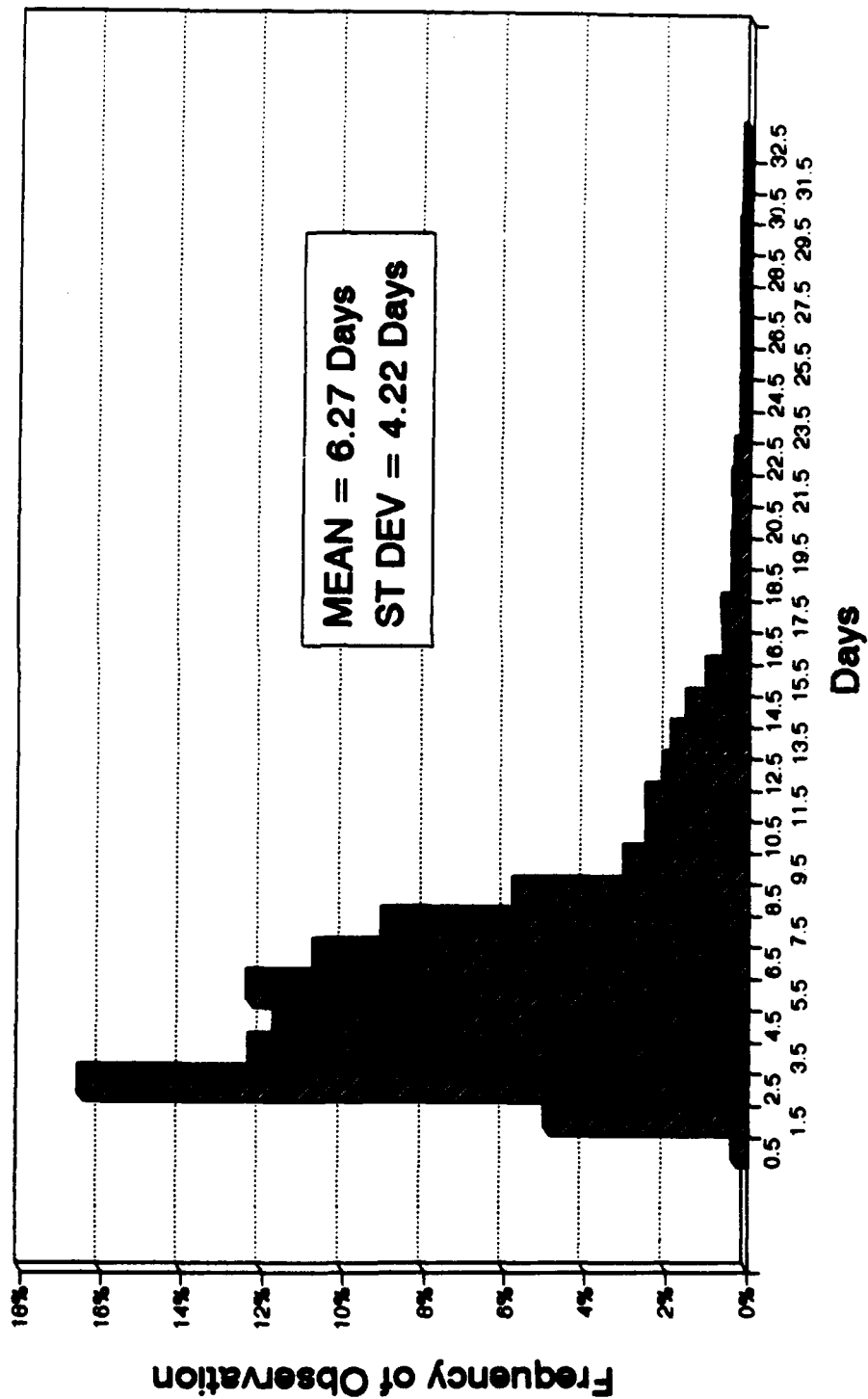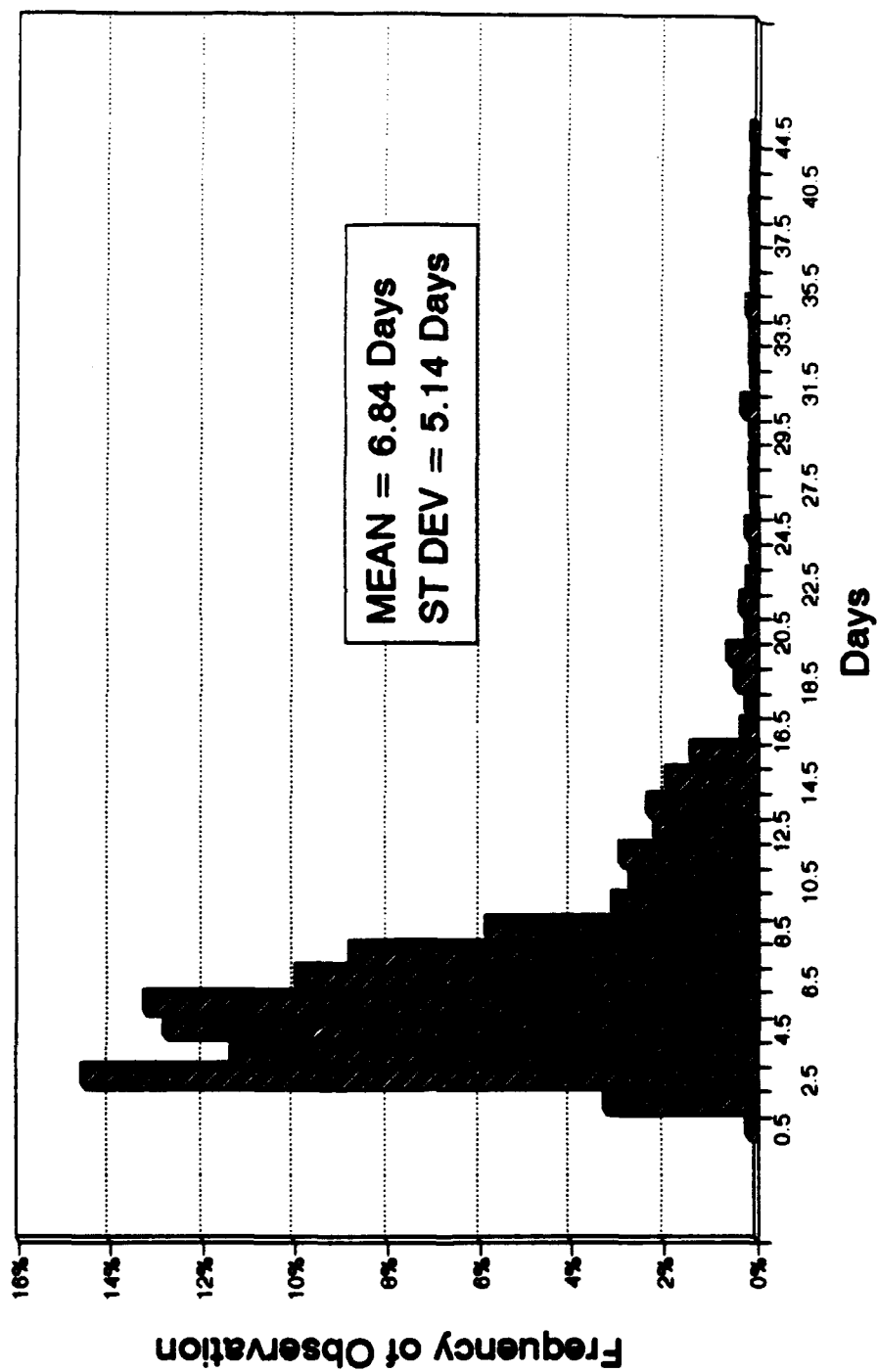
Days

APPENDIX T: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	345	0.26%	0.26%
1.5	7996	6.07%	6.33%
2.5	15304	11.62%	17.96%
3.5	11437	8.69%	26.64%
4.5	13600	10.33%	36.97%
5.5	13401	10.18%	47.15%
6.5	15352	11.66%	58.80%
7.5	14283	10.85%	69.65%
8.5	8991	6.83%	76.48%
9.5	5430	4.12%	80.60%
10.5	4376	3.32%	83.92%
11.5	3608	2.74%	86.66%
12.5	3631	2.76%	89.42%
13.5	3717	2.82%	92.24%
14.5	3068	2.33%	94.57%
15.5	1542	1.17%	95.74%
16.5	953	0.72%	96.47%
17.5	755	0.57%	97.04%
18.5	763	0.58%	97.62%
19.5	557	0.42%	98.04%
20.5	383	0.29%	98.33%
21.5	332	0.25%	98.59%
22.5	171	0.13%	98.72%
23.5	109	0.08%	98.80%
24.5	101	0.08%	98.88%
25.5	132	0.10%	98.98%
26.5	174	0.13%	99.11%
27.5	120	0.09%	99.20%
28.5	143	0.11%	99.31%
29.5	77	0.06%	99.37%
30.5	135	0.10%	99.47%
31.5	59	0.04%	99.51%
32.5	61	0.05%	99.56%
33.5	47	0.04%	99.60%
34.5	106	0.08%	99.68%
35.5	63	0.05%	99.72%
36.5	50	0.04%	99.76%
37.5	80	0.06%	99.82%
38.5	59	0.04%	99.87%
39.5	28	0.02%	99.89%
40.5	23	0.02%	99.91%
41.5	20	0.02%	99.92%
42.5	30	0.02%	99.94%
43.5	11	0.01%	99.95%
44.5	13	0.01%	99.96%
45.5	10	0.01%	99.97%
46.5	14	0.01%	99.98%
47.5	15	0.01%	99.99%
48.5	10	0.01%	100.00%
	131685		

T-2: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR 7R COG

Days	Count	Percent	Cumulative Percent
0.5	204	0.24%	0.24%
1.5	5001	5.77%	6.00%
2.5	10109	11.65%	17.65%
3.5	7473	8.61%	26.27%
4.5	9702	11.18%	37.45%
5.5	9181	10.58%	48.04%
6.5	10234	11.80%	59.83%
7.5	9284	10.70%	70.54%
8.5	5945	6.85%	77.39%
9.5	3530	4.07%	81.46%
10.5	2788	3.21%	84.67%
11.5	2457	2.83%	87.51%
12.5	2336	2.69%	90.20%
13.5	2369	2.73%	92.93%
14.5	184	2.13%	95.06%
15.5	10	1.22%	96.28%
16.5	5	0.67%	96.95%
17.5	516	0.59%	97.54%
18.5	489	0.56%	98.10%
19.5	354	0.41%	98.51%
20.5	251	0.29%	98.80%
21.5	201	0.23%	99.03%
22.5	111	0.13%	99.16%
23.5	80	0.09%	99.25%
24.5	70	0.08%	99.33%
25.5	92	0.11%	99.44%
26.5	131	0.15%	99.59%
27.5	95	0.11%	99.70%
28.5	103	0.12%	99.82%
29.5	49	0.06%	99.88%
30.5	66	0.08%	99.95%
31.5	41	0.05%	100.00%
	86746		

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T-3: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR 7H COG

Days	Count	Percent	Cumulative Percent
0.5	121	0.34%	0.34%
1.5	2468	6.96%	7.32%
2.5	4122	11.65%	18.97%
3.5	3234	9.14%	28.11%
4.5	2967	8.39%	36.50%
5.5	3307	9.35%	45.85%
6.5	4084	11.55%	57.40%
7.5	3994	11.29%	68.69%
8.5	2388	6.75%	75.44%
9.5	1506	4.26%	79.70%
10.5	1309	3.70%	83.40%
11.5	908	2.57%	85.96%
12.5	1016	2.87%	88.84%
13.5	1091	3.08%	91.92%
14.5	985	2.78%	94.71%
15.5	384	1.09%	95.79%
16.5	292	0.83%	96.62%
17.5	192	0.54%	97.16%
18.5	??	0.57%	97.73%
19.5	80	0.45%	98.19%
20.5	94	0.26%	98.46%
21.5	09	0.31%	98.79%
22.5	53	0.15%	98.94%
23.5	27	0.06%	99.01%
24.5	24	0.07%	99.06%
25.5	27	0.06%	99.16%
26.5	35	0.10%	99.26%
27.5	16	0.05%	99.31%
28.5	32	0.09%	99.40%
29.5	27	0.06%	99.47%
30.5	53	0.15%	99.62%
31.5	14	0.04%	99.66%
32.5	10	0.03%	99.69%
33.5	14	0.04%	99.73%
34.5	45	0.13%	99.86%
35.5	27	0.06%	99.93%
36.5	23	0.07%	100.00%
	35373		

T-4: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR 7G COG

Days	Count	Percent	Cumulative Percent
0.5	10	0.15%	0.15%
1.5	393	5.78%	5.92%
2.5	829	12.18%	18.11%
3.5	529	7.77%	25.88%
4.5	645	9.48%	35.36%
5.5	661	9.71%	45.06%
6.5	781	11.48%	56.55%
7.5	786	11.55%	68.11%
8.5	509	7.48%	75.58%
9.5	285	4.19%	79.78%
10.5	209	3.07%	82.85%
11.5	188	2.76%	85.61%
12.5	219	3.22%	88.83%
13.5	186	2.73%	91.56%
14.5	180	2.65%	94.21%
15.5	85	1.25%	95.46%
16.5	68	1.00%	96.46%
17.5	38	0.56%	97.02%
18.5	61	0.90%	97.91%
19.5	37	0.54%	98.46%
20.5	22	0.32%	98.78%
21.5	16	0.24%	99.02%
22.5	6	0.09%	99.10%
23.5	2	0.03%	99.13%
24.5	4	0.06%	99.19%
25.5	12	0.18%	99.37%
26.5	7	0.10%	99.47%
27.5	7	0.10%	99.57%
28.5	2	0.03%	99.60%
29.5	1	0.01%	99.62%
30.5	16	0.24%	99.85%
31.5	3	0.04%	99.90%
32.5	1	0.01%	99.91%
33.5	6	0.09%	100.00%
	6804		

T-5: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent
0.5	3	0.45%	0.45%
1.5	44	6.60%	7.05%
2.5	77	11.54%	18.59%
3.5	49	7.35%	25.94%
4.5	77	11.54%	37.48%
5.5	68	10.19%	47.66%
6.5	77	11.54%	59.22%
7.5	65	9.75%	68.97%
8.5	46	6.90%	75.86%
9.5	35	5.25%	81.11%
10.5	18	2.70%	83.81%
11.5	17	2.55%	86.36%
12.5	23	3.45%	89.81%
13.5	25	3.75%	93.55%
14.5	16	2.40%	95.95%
15.5	7	1.05%	97.00%
16.5	6	0.90%	97.90%
17.5	5	0.75%	98.65%
18.5	3	0.45%	99.10%
20.5	4	0.60%	99.70%
21.5	1	0.15%	99.85%
24.5	1	0.15%	100.00%
	667		

T-6: GOVERNMENT SCREENING TIMES AT THE SAN DIEGO HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent
0.5	7	0.48%	0.48%
1.5	89	6.11%	6.59%
2.5	161	11.05%	17.64%
3.5	132	9.06%	26.70%
4.5	196	13.45%	40.15%
5.5	173	11.87%	52.02%
6.5	157	10.78%	62.80%
7.5	135	9.27%	72.07%
8.5	100	6.86%	78.93%
9.5	69	4.74%	83.67%
10.5	48	3.29%	86.96%
11.5	35	2.40%	89.36%
12.5	35	2.40%	91.76%
13.5	38	2.61%	94.37%
14.5	37	2.54%	96.91%
15.5	12	0.82%	97.74%
16.5	5	0.34%	98.08%
17.5	4	0.27%	98.35%
18.5	7	0.48%	98.83%
19.5	6	0.41%	99.25%
20.5	2	0.14%	99.38%
21.5	5	0.34%	99.73%
22.5	1	0.07%	99.79%
24.5	2	0.14%	99.93%
25.5	1	0.07%	100.00%
	1457		

GOVT SCREENING TIME
7R 46433

MEAN = 6.93 Days
ST DEV = 4.37 Days

Frequency of Observation

Days

GOVT SCREENING TIME
7E 46433

MEAN = 6.59 Days
ST DEV = 3.91 Days

Frequency of Observation
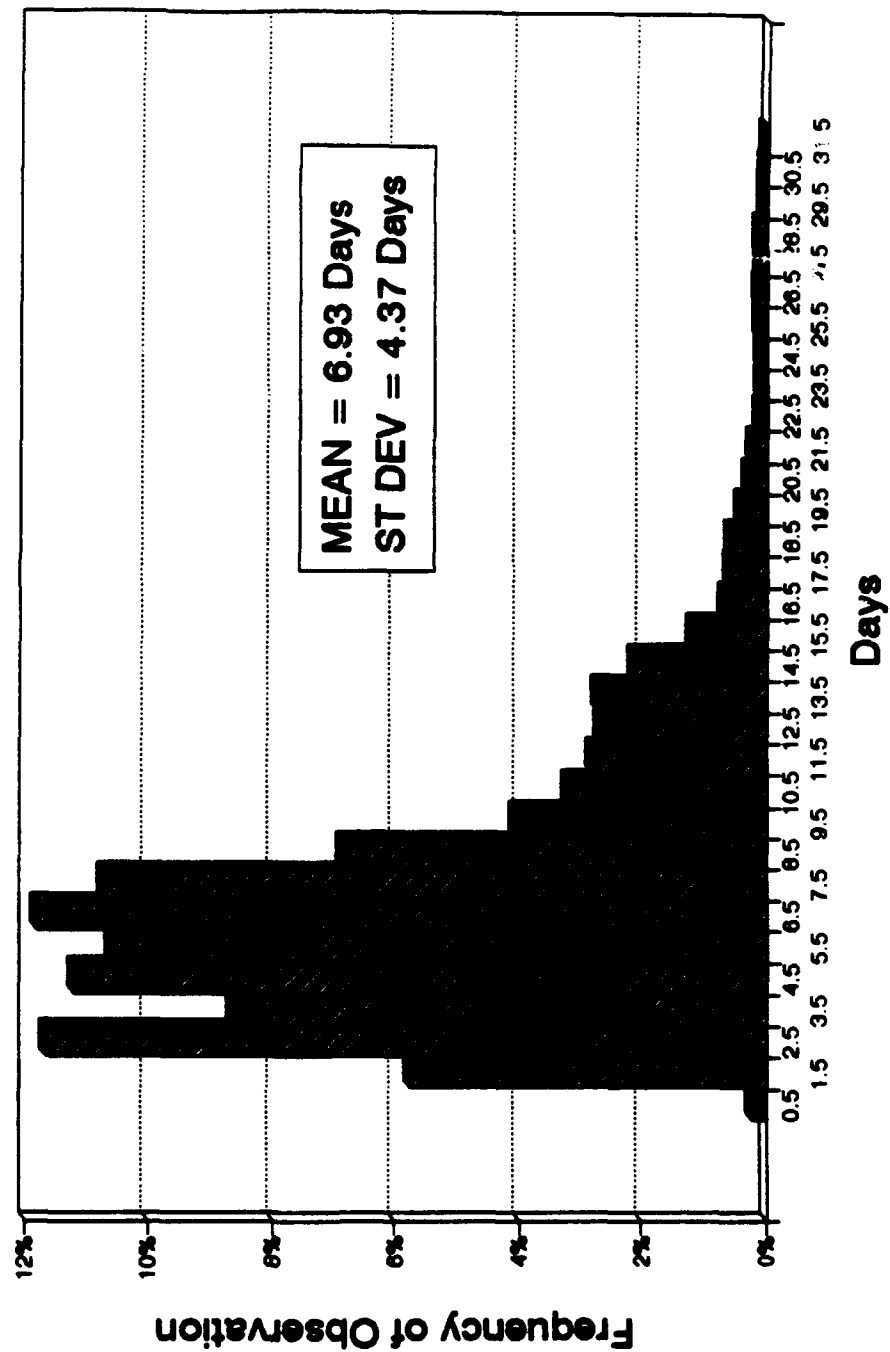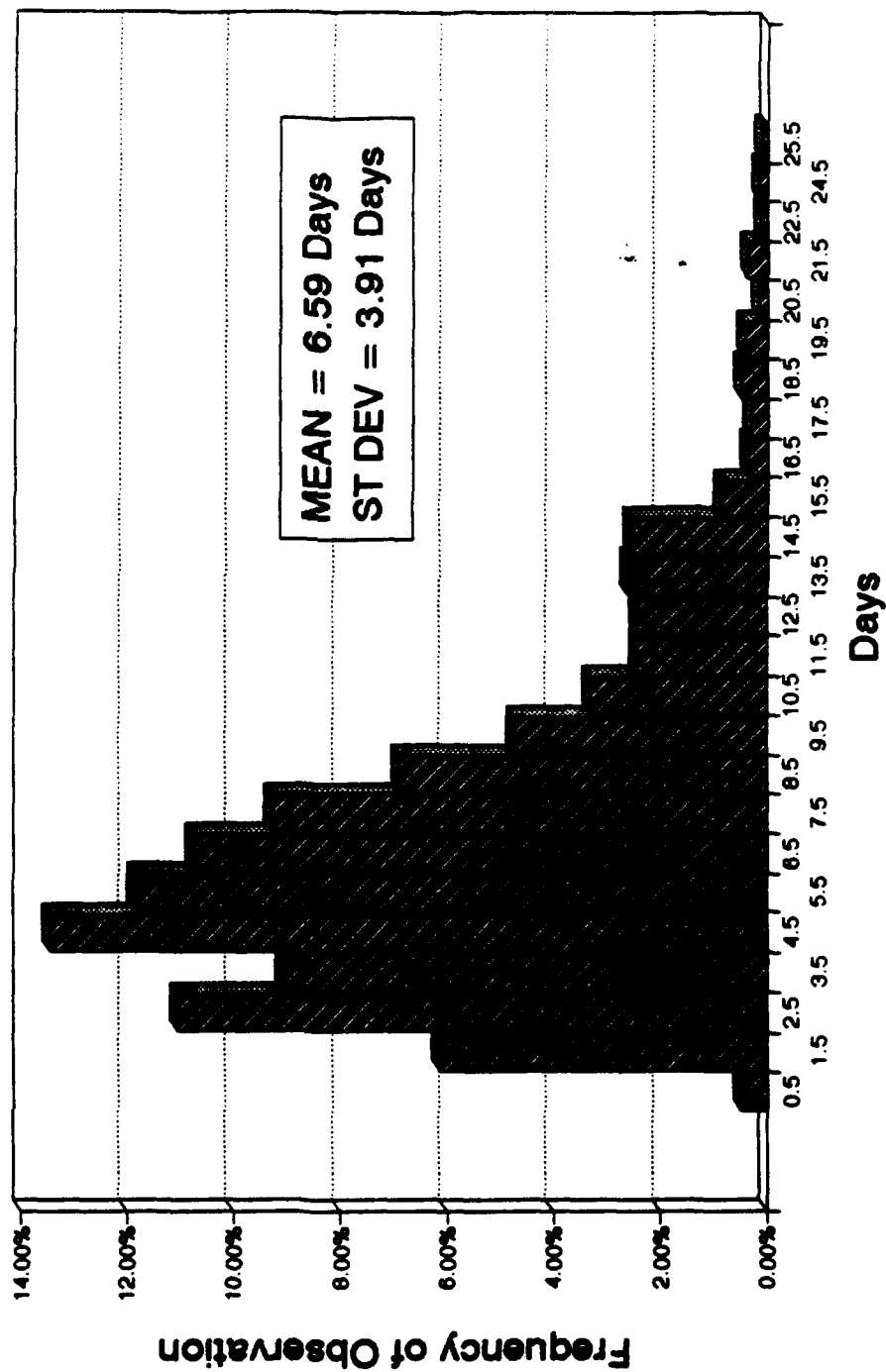
Days

APPENDIX U: GOVERNMENT SCREENING TO LOCAL STORAGE
TIMES AT THE NORFOLK HUB - ALL 7 COG

			Cumulative
Days	Count	Percent	Percent
0.5	1737	2.81%	2.81%
1.5	14705	23.77%	26.58%
2.5	13045	21.09%	47.67%
3.5	7995	12.93%	60.60%
4.5	7852	12.69%	73.29%
5.5	6749	10.91%	84.20%
6.5	4253	6.88%	91.08%
7.5	2367	3.83%	94.91%
8.5	974	1.57%	96.48%
9.5	331	0.54%	97.02%
10.5	379	0.61%	97.63%
11.5	288	0.47%	98.09%
12.5	243	0.39%	98.49%
13.5	199	0.32%	98.81%
14.5	154	0.25%	99.06%
15.5	71	0.11%	99.17%
16.5	66	0.11%	99.28%
17.5	101	0.16%	99.44%
18.5	51	0.08%	99.52%
19.5	42	0.07%	99.59%
20.5	47	0.08%	99.67%
21.5	29	0.05%	99.72%
22.5	33	0.05%	99.77%
23.5	28	0.05%	99.81%
24.5	14	0.02%	99.84%
25.5	8	0.01%	99.85%
26.5	18	0.03%	99.88%
27.5	19	0.03%	99.91%
28.5	20	0.03%	99.94%
29.5	13	0.02%	99.96%
30.5	8	0.01%	99.98%
31.5	6	0.01%	99.99%
32.5	9	0.01%	100.00%
	61854		

U-2: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE NORFOLK HUB - 7R COG

Days	Count	Percent	Cumulative Percent
0.5	1052	3.31%	3.31%
1.5	7973	25.12%	28.43%
2.5	6932	21.84%	50.27%
3.5	4100	12.92%	63.19%
4.5	3939	12.41%	75.60%
5.5	3340	10.52%	86.12%
6.5	2055	6.47%	92.60%
7.5	1039	3.27%	95.87%
8.5	435	1.37%	97.24%
9.5	145	0.46%	97.70%
10.5	167	0.53%	98.22%
11.5	105	0.33%	98.55%
12.5	120	0.38%	98.93%
13.5	89	0.28%	99.21%
14.5	66	0.21%	99.42%
15.5	21	0.07%	99.49%
16.5	20	0.06%	99.55%
17.5	73	0.23%	99.78%
18.5	16	0.05%	99.83%
19.5	8	0.03%	99.86%
20.5	13	0.04%	99.90%
21.5	14	0.04%	99.94%
22.5	11	0.03%	99.97%
23.5	8	0.03%	100.00%
	31741		

U-3: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE NORFOLK HUB - 7H COG

Days	Count	Percent	Cumulative Percent
0.5	459	2.31%	2.31%
1.5	4519	22.77%	25.08%
2.5	4121	20.76%	45.85%
3.5	2559	12.89%	58.74%
4.5	2466	12.43%	71.16%
5.5	2225	11.21%	82.36%
6.5	1489	7.50%	89.86%
7.5	840	4.23%	94.11%
8.5	358	1.80%	95.91%
9.5	119	0.60%	96.51%
10.5	143	0.72%	97.23%
11.5	124	0.62%	97.86%
12.5	90	0.45%	98.31%
13.5	75	0.38%	98.69%
14.5	54	0.27%	98.96%
15.5	39	0.20%	99.16%
16.5	32	0.16%	99.32%
17.5	15	0.08%	99.40%
18.5	24	0.12%	99.52%
19.5	24	0.12%	99.64%
20.5	26	0.13%	99.77%
21.5	13	0.07%	99.83%
22.5	21	0.11%	99.94%
23.5	12	0.06%	100.00%
	19847		

U-4: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE NORFOLK HUB - 7G COG

Days	Count	Percent	Cumulative Percent
0.5	152	1.92%	1.92%
1.5	1668	21.06%	22.97%
2.5	1571	19.83%	42.80%
3.5	1017	12.84%	55.64%
4.5	1179	14.88%	70.53%
5.5	972	12.27%	82.79%
6.5	551	6.96%	89.75%
7.5	388	4.90%	94.65%
8.5	146	1.84%	96.49%
9.5	51	0.64%	97.13%
10.5	58	0.73%	97.87%
11.5	43	0.54%	98.41%
12.5	21	0.27%	98.67%
13.5	26	0.33%	99.00%
14.5	25	0.32%	99.32%
15.5	8	0.10%	99.42%
16.5	7	0.09%	99.51%
17.5	11	0.14%	99.65%
18.5	7	0.09%	99.73%
19.5	7	0.09%	99.82%
20.5	5	0.06%	99.89%
22.5	1	0.01%	99.90%
23.5	8	0.10%	100.00%
	7922		

U-5: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE NORFOLK HUB - 7Z COG

Days	Count	Percent	Cumulative Percent
0.5	46	3.62%	3.62%
1.5	368	28.93%	32.55%
2.5	202	15.88%	48.43%
3.5	160	12.58%	61.01%
4.5	156	12.26%	73.27%
5.5	100	7.86%	81.13%
6.5	100	7.86%	88.99%
7.5	58	4.56%	93.55%
8.5	19	1.49%	95.05%
9.5	7	0.55%	95.60%
10.5	8	0.63%	96.23%
11.5	10	0.79%	97.01%
12.5	10	0.79%	97.80%
13.5	6	0.47%	98.27%
14.5	3	0.24%	98.51%
15.5	2	0.16%	98.66%
16.5	7	0.55%	99.21%
17.5	1	0.08%	99.29%
18.5	3	0.24%	99.53%
19.5	1	0.08%	99.61%
20.5	2	0.16%	99.76%
21.5	2	0.16%	99.92%
27.5	1	0.08%	100.00%
	1272		

U-6: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE NORFOLK HUB - 7E COG

Days	Count	Percent	Cumulative Percent
0.5	28	3.14%	3.14%
1.5	170	19.08%	22.22%
2.5	204	22.90%	45.12%
3.5	147	16.50%	61.62%
4.5	101	11.34%	72.95%
5.5	100	11.22%	84.16%
6.5	52	5.84%	90.01%
7.5	39	4.38%	94.39%
8.5	15	1.68%	96.07%
9.5	9	1.01%	97.08%
10.5	3	0.34%	97.42%
11.5	6	0.67%	98.09%
12.5	2	0.22%	98.32%
13.5	3	0.34%	98.65%
14.5	4	0.45%	99.10%
15.5	1	0.11%	99.21%
17.5	1	0.11%	99.33%
19.5	2	0.22%	99.55%
20.5	1	0.11%	99.66%
24.5	1	0.11%	99.78%
29.5	2	0.22%	100.00%
	891		

GOVT SCREENING TO LOCAL STORAGE TIME
7R 68620

MEAN = 3.67 Days
ST DEV = 2.51 Days

GOVT SCREENING TO LOCAL STORAGE TIME
7E 68620

MEAN = 3.97 Days
ST DEV = 2.93 Days
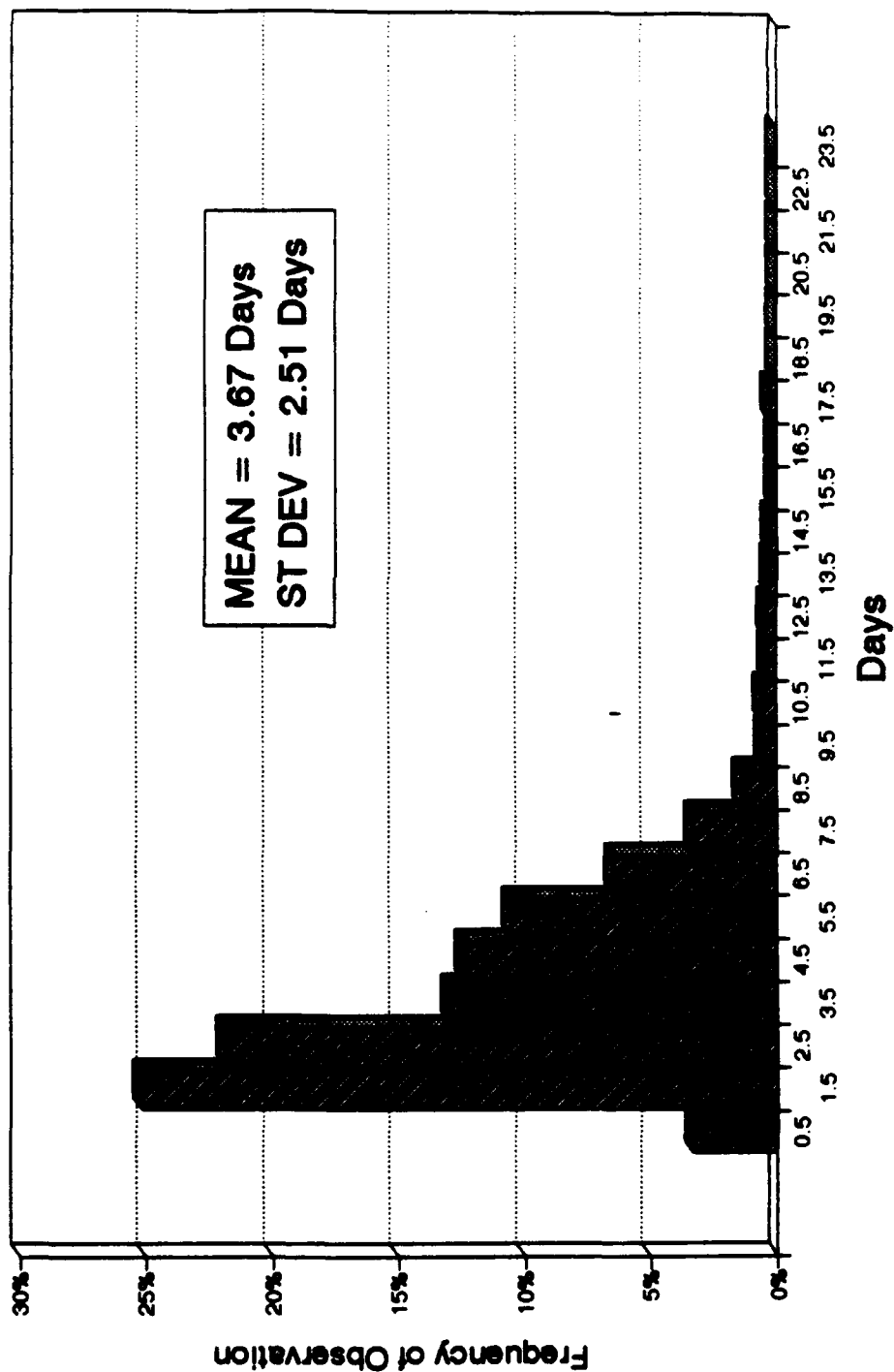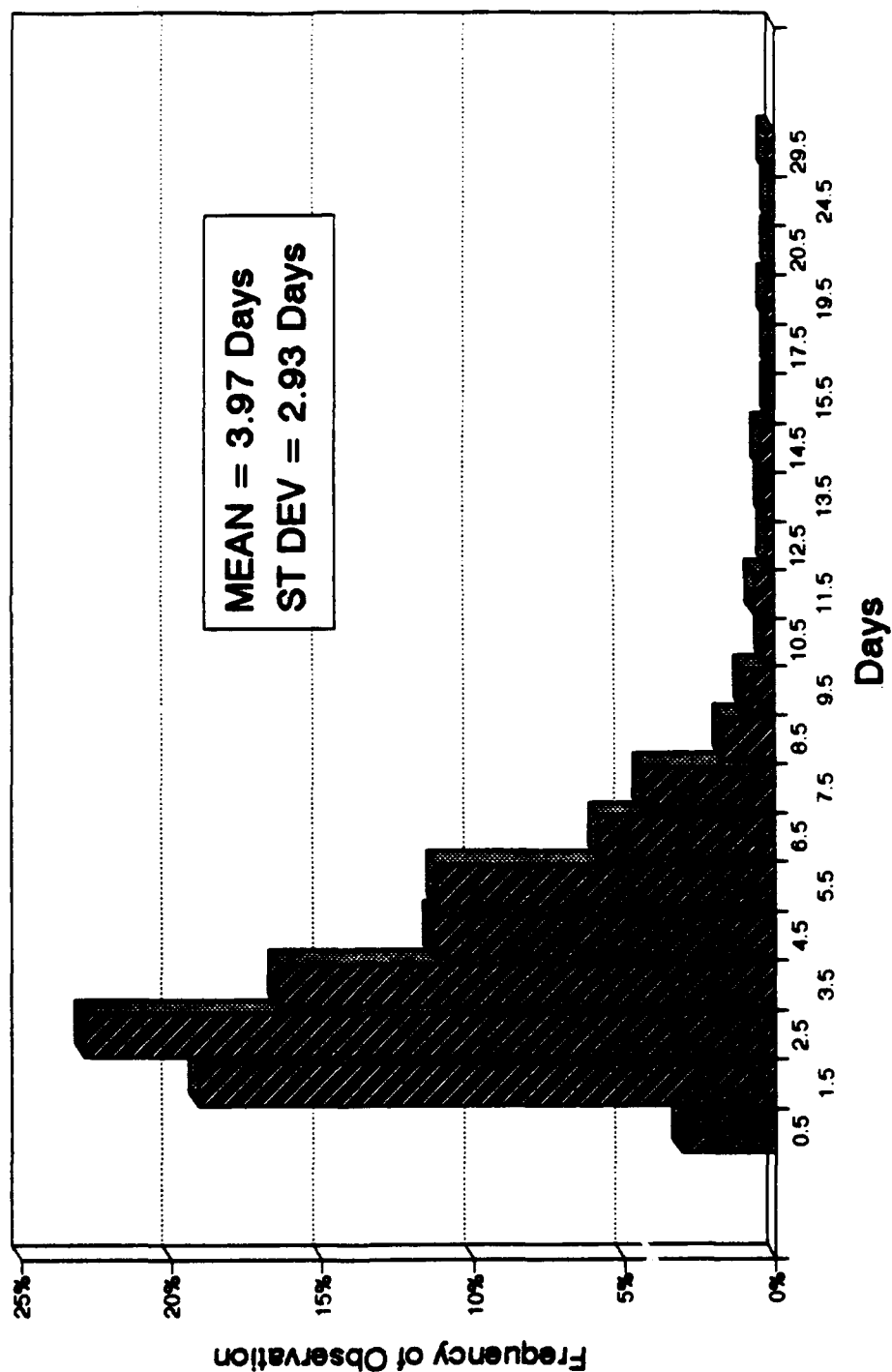
APPENDIX V: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	1821	3.30%	3.30%
1.5	10159	18.40%	21.69%
2.5	7020	12.71%	34.41%
3.5	6214	11.25%	45.66%
4.5	5652	10.24%	55.89%
5.5	5115	9.26%	65.16%
6.5	5150	9.33%	74.48%
7.5	4210	7.62%	82.11%
8.5	2661	4.82%	86.93%
9.5	1338	2.42%	89.35%
10.5	1076	1.95%	91.30%
11.5	1036	1.86%	93.16%
12.5	1018	1.84%	95.02%
13.5	828	1.50%	96.52%
14.5	626	1.13%	97.65%
15.5	343	0.62%	98.27%
16.5	147	0.27%	98.54%
17.5	173	0.31%	98.85%
18.5	96	0.17%	99.03%
19.5	99	0.18%	99.21%
20.5	144	0.26%	99.47%
21.5	60	0.11%	99.58%
22.5	40	0.07%	99.65%
23.5	18	0.03%	99.68%
24.5	28	0.05%	99.73%
25.5	54	0.10%	99.83%
26.5	18	0.03%	99.86%
27.5	30	0.05%	99.91%
28.5	18	0.03%	99.95%
29.5	7	0.01%	99.96%
30.5	15	0.03%	99.99%
31.5	6	0.01%	100.00%
32.5	2	0.00%	100.00%
	55222		

V-2: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - 7R COG

Days	Count	Percent	Cumulative Percent
0.5	871	3.53%	3.53%
1.5	4761	19.31%	22.85%
2.5	3160	12.82%	35.67%
3.5	2795	11.34%	47.00%
4.5	2656	10.77%	57.76%
5.5	2200	8.92%	66.70%
6.5	2230	9.05%	75.75%
7.5	1722	6.99%	82.73%
8.5	1159	4.70%	87.44%
9.5	550	2.23%	89.67%
10.5	424	1.72%	91.39%
11.5	493	2.00%	93.39%
12.5	441	1.79%	95.18%
13.5	324	1.31%	96.49%
14.5	272	1.10%	97.59%
15.5	147	0.60%	98.19%
16.5	73	0.30%	98.49%
17.5	99	0.40%	98.89%
18.5	40	0.16%	99.05%
19.5	35	0.14%	99.19%
20.5	75	0.30%	99.50%
21.5	32	0.13%	99.63%
22.5	25	0.10%	99.73%
23.5	10	0.04%	99.77%
24.5	13	0.05%	99.82%
25.5	18	0.07%	99.89%
26.5	3	0.01%	99.91%
27.5	13	0.05%	99.96%
28.5	10	0.04%	100.00%
	24651		

V-3: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - 7H COG

| | | | Cumulative |
Days	Count	Percent	Percent
0.5	541	2.87%	2.87%
1.5	2959	15.72%	18.59%
2.5	2272	12.07%	30.65%
3.5	2220	11.79%	42.45%
4.5	1920	10.20%	52.64%
5.5	1820	9.67%	62.31%
6.5	1810	9.61%	71.92%
7.5	1597	8.48%	80.40%
8.5	980	5.20%	85.61%
9.5	498	2.64%	88.25%
10.5	446	2.37%	90.62%
11.5	343	1.82%	92.44%
12.5	389	2.07%	94.51%
13.5	355	1.89%	96.39%
14.5	253	1.34%	97.74%
15.5	131	0.70%	98.43%
16.5	52	0.28%	98.71%
17.5	49	0.26%	98.97%
18.5	31	0.16%	99.13%
19.5	47	0.25%	99.38%
20.5	42	0.22%	99.61%
21.5	22	0.12%	99.72%
22.5	10	0.05%	99.78%
23.5	2	0.01%	99.79%
24.5	7	0.04%	99.82%
25.5	14	0.07%	99.90%
26.5	9	0.05%	99.95%
27.5	6	0.03%	99.98%
28.5	4	0.02%	100.00%
	18829		

V-4: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - 7G COG

Days	Count	Percent	Cumulative Percent
0.5	283	3.77%	3.77%
1.5	1354	18.01%	21.78%
2.5	997	13.27%	35.05%
3.5	734	9.77%	44.81%
4.5	674	8.97%	53.78%
5.5	747	9.94%	63.72%
6.5	713	9.49%	73.20%
7.5	628	8.36%	81.56%
8.5	369	4.91%	86.47%
9.5	209	2.78%	89.25%
10.5	159	2.12%	91.37%
11.5	143	1.90%	93.27%
12.5	136	1.81%	95.08%
13.5	106	1.41%	96.49%
14.5	69	0.92%	97.41%
15.5	48	0.64%	98.04%
16.5	16	0.21%	98.26%
17.5	17	0.23%	98.48%
18.5	23	0.31%	98.79%
19.5	12	0.16%	98.95%
20.5	20	0.27%	99.22%
21.5	5	0.07%	99.28%
22.5	4	0.05%	99.33%
23.5	5	0.07%	99.40%
24.5	7	0.09%	99.49%
25.5	22	0.29%	99.79%
26.5	3	0.04%	99.83%
27.5	12	0.16%	99.99%
28.5	1	0.01%	100.00%
	7516		

V-5: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - 7Z COG

Days	Count	Percent	Cumulative Percent
0.5	134	4.10%	4.10%
1.5	942	28.84%	32.95%
2.5	465	14.24%	47.18%
3.5	359	10.99%	58.18%
4.5	316	9.68%	67.85%
5.5	261	7.99%	75.84%
6.5	282	8.63%	84.48%
7.5	180	5.51%	89.99%
8.5	110	3.37%	93.36%
9.5	51	1.56%	94.92%
10.5	28	0.86%	95.77%
11.5	34	1.04%	96.82%
12.5	39	1.19%	98.01%
13.5	27	0.83%	98.84%
14.5	21	0.64%	99.48%
15.5	13	0.40%	99.88%
16.5	4	0.12%	100.00%
	3266		

V-6: GOVERNMENT SCREENING TO LOCAL STORAGE TIMES AT THE SAN DIEGO HUB - 7E COG

Days	Count	Percent	Cumulative Percent
0.5	21	2.32%	2.32%
34	134	14.81%	17.13%
2.5	118	13.04%	30.17%
3.5	104	11.49%	41.66%
4.5	87	9.61%	51.27%
5.5	81	8.95%	60.22%
6.5	112	12.38%	72.60%
7.5	80	8.84%	81.44%
8.5	42	4.64%	86.08%
9.5	29	3.20%	89.28%
10.5	16	1.77%	91.05%
11.5	25	2.76%	93.81%
12.5	12	1.33%	95.14%
13.5	15	1.66%	96.80%
14.5	10	1.10%	97.90%
15.5	4	0.44%	98.34%
16.5	2	0.22%	98.56%
17.5	7	0.77%	99.34%
18.5	1	0.11%	99.45%
19.5	1	0.11%	99.56%
20.5	3	0.33%	99.89%
22.5	1	0.11%	100.00%
	905		

GOVT SCREENING TO LOCAL STORAGE TIME
7R 46433

MEAN = 5.15 Days
ST DEV = 3.87 Days

Frequency of Observation

Days

GOVT SCREENING TO LOCAL STORAGE TIME
7E 46433

MEAN = 5.48 Days
ST DEV = 3.67 Days

Frequency of Observation
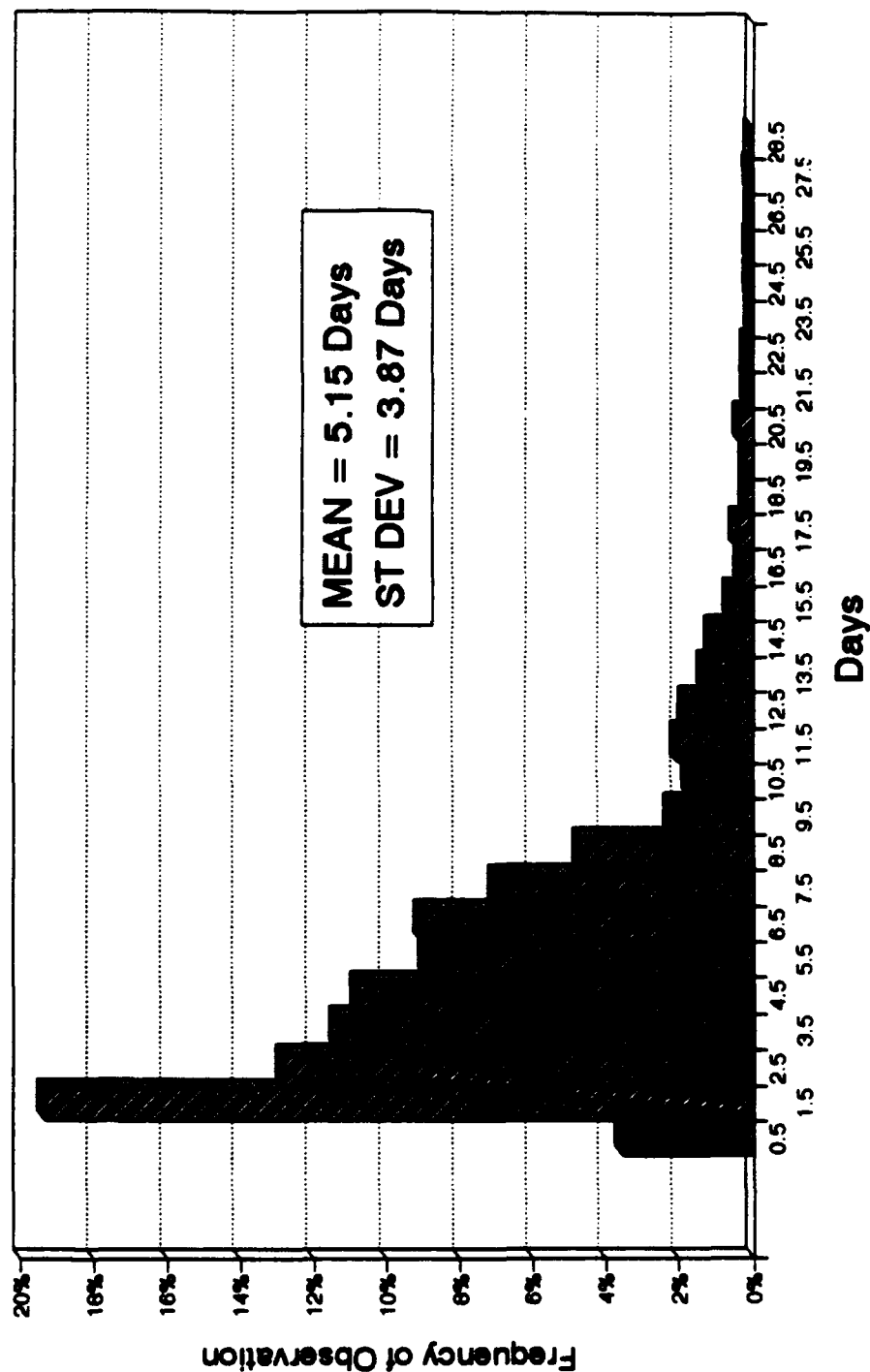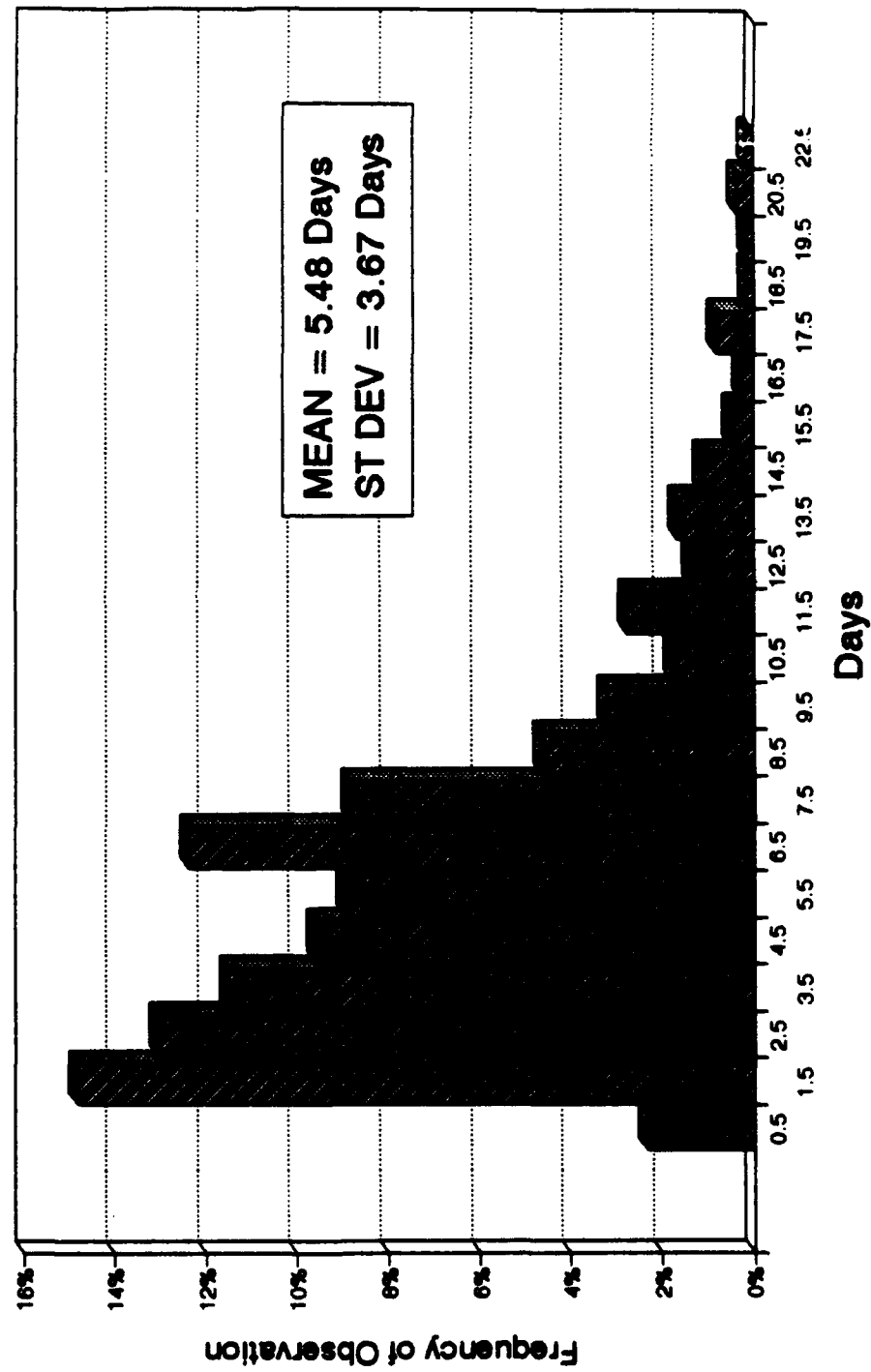
Days

APPENDIX W: SCREENING AND SHIPPING TIMES AT NORFOLK
FOR MATERIAL STORED OFF-SITE - ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	21	0.09%	0.09%
1.5	31	0.13%	0.22%
2.5	42	0.17%	0.39%
3.5	17	0.07%	0.46%
4.5	18	0.07%	0.53%
5.5	48	0.20%	0.73%
6.5	235	0.97%	1.71%
7.5	1439	5.97%	7.67%
8.5	2273	9.42%	17.10%
9.5	2608	10.81%	27.91%
10.5	2416	10.02%	37.92%
11.5	2264	9.39%	47.31%
12.5	2512	10.41%	57.72%
13.5	2117	8.78%	66.50%
14.5	1964	8.14%	74.64%
15.5	1091	4.52%	79.16%
16.5	726	3.01%	82.17%
17.5	631	2.62%	84.79%
18.5	566	2.35%	87.13%
19.5	630	2.61%	89.74%
20.5	630	2.61%	92.36%
21.5	433	1.79%	94.15%
22.5	265	1.10%	95.25%
23.5	118	0.49%	95.74%
24.5	139	0.58%	96.31%
25.5	135	0.56%	96.87%
26.5	134	0.56%	97.43%
27.5	115	0.48%	97.91%
28.5	77	0.32%	98.23%
29.5	48	0.20%	98.42%
30.5	40	0.17%	98.59%
31.5	38	0.16%	98.75%
32.5	48	0.20%	98.95%
33.5	36	0.15%	99.10%
34.5	41	0.17%	99.27%
35.5	36	0.15%	99.41%
36.5	27	0.11%	99.52%
37.5	18	0.07%	99.60%
38.5	10	0.04%	99.64%
39.5	15	0.06%	99.70%
40.5	15	0.06%	99.76%
41.5	19	0.08%	99.84%
42.5	25	0.10%	99.95%
43.5	13	0.05%	100.00%
	24123		

W-2: SCREENING AND SHIPPING TIMES AT NORFOLK FOR MATERIAL STORED OFF-SITE - 7R COG

Days	Count	Percent	Cumulative Percent
0.5	4	0.06%	0.06%
1.5	9	0.13%	0.18%
2.5	8	0.11%	0.29%
3.5	3	0.04%	0.34%
4.5	8	0.11%	0.45%
5.5	8	0.11%	0.56%
6.5	80	1.12%	1.68%
7.5	392	5.50%	7.18%
8.5	780	10.94%	18.13%
9.5	869	12.19%	30.32%
10.5	725	10.17%	40.49%
11.5	714	10.02%	50.51%
12.5	721	10.12%	60.63%
13.5	634	8.90%	69.52%
14.5	509	7.14%	76.67%
15.5	295	4.14%	80.81%
16.5	213	2.99%	83.79%
17.5	188	2.64%	86.43%
18.5	141	1.98%	88.41%
19.5	168	2.36%	90.77%
20.5	181	2.54%	93.31%
21.5	110	1.54%	94.85%
22.5	62	0.87%	95.72%
23.5	24	0.34%	96.06%
24.5	53	0.74%	96.80%
25.5	34	0.48%	97.28%
26.5	39	0.55%	97.83%
27.5	26	0.36%	98.19%
28.5	22	0.31%	98.50%
29.5	7	0.10%	98.60%
30.5	9	0.13%	98.72%
31.5	12	0.17%	98.89%
32.5	10	0.14%	99.03%
33.5	10	0.14%	99.17%
34.5	13	0.18%	99.35%
35.5	11	0.15%	99.51%
36.5	5	0.07%	99.58%
37.5	6	0.08%	99.66%
38.5	1	0.01%	99.68%
39.5	4	0.06%	99.73%
40.5	1	0.01%	99.75%
41.5	7	0.10%	99.85%
42.5	9	0.13%	99.97%
43.5	2	0.03%	100.00%
	7127		

**W-3: SCREENING AND SHIPPING TIMES AT NORFOLK
FOR MATERIAL STORED OFF-SITE - 7H COG**

Days	Count	Percent	Cumulative Percent
0.5	10	0.09%	0.09%
1.5	21	0.19%	0.28%
2.5	29	0.27%	0.55%
3.5	13	0.12%	0.67%
4.5	6	0.05%	0.72%
5.5	30	0.27%	1.00%
6.5	96	0.88%	1.88%
7.5	668	6.12%	8.00%
8.5	928	8.50%	16.50%
9.5	1100	10.08%	26.58%
10.5	1157	10.60%	37.17%
11.5	922	8.45%	45.62%
12.5	1155	10.58%	56.20%
13.5	937	8.58%	64.79%
14.5	942	8.63%	73.42%
15.5	519	4.75%	78.17%
16.5	328	3.00%	81.17%
17.5	272	2.49%	83.67%
18.5	273	2.50%	86.17%
19.5	330	3.02%	89.19%
20.5	292	2.67%	91.87%
21.5	187	1.71%	93.58%
22.5	154	1.41%	94.99%
23.5	56	0.51%	95.50%
24.5	59	0.54%	96.04%
25.5	67	0.61%	96.65%
26.5	63	0.58%	97.23%
27.5	58	0.53%	97.76%
28.5	35	0.32%	98.09%
29.5	26	0.24%	98.32%
30.5	17	0.16%	98.48%
31.5	21	0.19%	98.67%
32.5	29	0.27%	98.94%
33.5	18	0.16%	99.10%
34.5	16	0.15%	99.25%
35.5	18	0.16%	99.41%
36.5	12	0.11%	99.52%
37.5	8	0.07%	99.60%
38.5	3	0.03%	99.62%
39.5	8	0.07%	99.70%
40.5	7	0.06%	99.76%
41.5	5	0.05%	99.81%
42.5	11	0.10%	99.91%
43.5	10	0.09%	100.00%
	10916		

W-4: SCREENING AND SHIPPING TIMES AT NORFOLK FOR MATERIAL STORED OFF-SITE - 7G COG

Days	Count	Percent	Cumulative Percent
0.5	5	0.13%	0.13%
2.5	4	0.10%	0.23%
5.5	8	0.21%	0.44%
6.5	40	1.04%	1.48%
7.5	194	5.04%	6.51%
8.5	379	9.84%	16.35%
9.5	428	11.11%	27.46%
10.5	349	9.06%	36.52%
11.5	361	9.37%	45.89%
12.5	423	10.98%	56.86%
13.5	351	9.11%	65.97%
14.5	342	8.88%	74.85%
15.5	178	4.62%	79.47%
16.5	126	3.27%	82.74%
17.5	104	2.70%	85.44%
18.5	108	2.80%	88.24%
19.5	80	2.08%	90.32%
20.5	97	2.52%	92.84%
21.5	89	2.31%	95.15%
22.5	31	0.80%	95.95%
23.5	25	0.65%	96.60%
24.5	17	0.44%	97.04%
25.5	16	0.42%	97.46%
26.5	19	0.49%	97.95%
27.5	12	0.31%	98.26%
28.5	11	0.29%	98.55%
29.5	8	0.21%	98.75%
30.5	2	0.05%	98.81%
31.5	2	0.05%	98.86%
32.5	5	0.13%	98.99%
33.5	6	0.16%	99.14%
34.5	8	0.21%	99.35%
35.5	6	0.16%	99.51%
36.5	5	0.13%	99.64%
37.5	1	0.03%	99.66%
38.5	3	0.08%	99.74%
39.5	2	0.05%	99.79%
40.5	1	0.03%	99.82%
41.5	2	0.05%	99.87%
42.5	4	0.10%	99.97%
43.5	1	0.03%	100.00%
	3853		

W-5: SCREENING AND SHIPPING TIMES AT NORFOLK
FOR MATERIAL STORED OFF-SITE - 7Z COG

Days	Count	Percent	Cumulative Percent
4.5	4	0.28%	0.28%
6.5	10	0.70%	0.99%
7.5	140	9.85%	10.84%
8.5	102	7.18%	18.02%
9.5	128	9.01%	27.02%
10.5	96	6.76%	33.78%
11.5	182	12.81%	46.59%
12.5	130	9.15%	55.74%
13.5	117	8.23%	63.97%
14.5	122	8.59%	72.55%
15.5	57	4.01%	76.57%
16.5	23	1.62%	78.18%
17.5	49	3.45%	81.63%
18.5	34	2.39%	84.03%
19.5	34	2.39%	86.42%
20.5	37	2.60%	89.02%
21.5	27	1.90%	90.92%
22.5	15	1.06%	91.98%
23.5	10	0.70%	92.68%
24.5	8	0.56%	93.24%
25.5	13	0.91%	94.16%
26.5	9	0.63%	94.79%
27.5	13	0.91%	95.71%
28.5	6	0.42%	96.13%
29.5	7	0.49%	96.62%
30.5	10	0.70%	97.33%
31.5	2	0.14%	97.47%
32.5	3	0.21%	97.68%
33.5	2	0.14%	97.82%
34.5	3	0.21%	98.03%
36.5	4	0.28%	98.31%
37.5	3	0.21%	98.52%
38.5	3	0.21%	98.73%
39.5	2	0.14%	98.87%
40.5	4	0.28%	99.16%
41.5	4	0.28%	99.44%
42.5	1	0.07%	99.51%
44.5	2	0.14%	99.65%
47.5	1	0.07%	99.72%
52.5	1	0.07%	99.79%
54.5	1	0.07%	99.86%
55.5	2	0.14%	100.00%
	1421		

W-6: SCREENING AND SHIPPING TIMES AT NORFOLK FOR MATERIAL STORED OFF-SITE - 7E COG

Days	Count	Percent	Cumulative Percent
0.5	2	0.25%	0.25%
1.5	1	0.13%	0.38%
2.5	1	0.13%	0.51%
3.5	1	0.13%	0.64%
5.5	1	0.13%	0.76%
6.5	9	1.14%	1.91%
7.5	44	5.59%	7.50%
8.5	83	10.55%	18.04%
9.5	79	10.04%	28.08%
10.5	89	11.31%	39.39%
11.5	82	10.42%	49.81%
12.5	79	10.04%	59.85%
13.5	74	9.40%	69.25%
14.5	46	5.84%	75.10%
15.5	42	5.34%	80.43%
16.5	36	4.57%	85.01%
17.5	·5	2.03%	87.04%
18.5	8	1.02%	88.06%
19.5	18	2.29%	90.34%
20.5	23	2.92%	93.27%
21.5	19	2.41%	95.68%
22.5	3	0.38%	96.06%
23.5	3	0.38%	96.44%
24.5	2	0.25%	96.70%
25.5	5	0.64%	97.33%
26.5	4	0.51%	97.84%
27.5	6	0.76%	98.60%
28.5	3	0.38%	98.98%
30.5	2	0.25%	99.24%
31.5	1	0.13%	99.36%
32.5	1	0.13%	99.49%
34.5	1	0.13%	99.62%
36.5	1	0.13%	99.75%
40.5	1	0.13%	99.87%
41.5	1	0.13%	100.00%
	787		

SCREENING TO OFF-SITE STORAGE TIMES
7R 68620

MEAN = 13.03 Days
ST DEV = 5.08 Days

Frequency of Observation

Days

SCREENING TO OFF-SITE STORAGE TIMES
7E 68620

MEAN = 13.01 Days
ST DEV = 4.91 Days

Days

Frequency of Observation
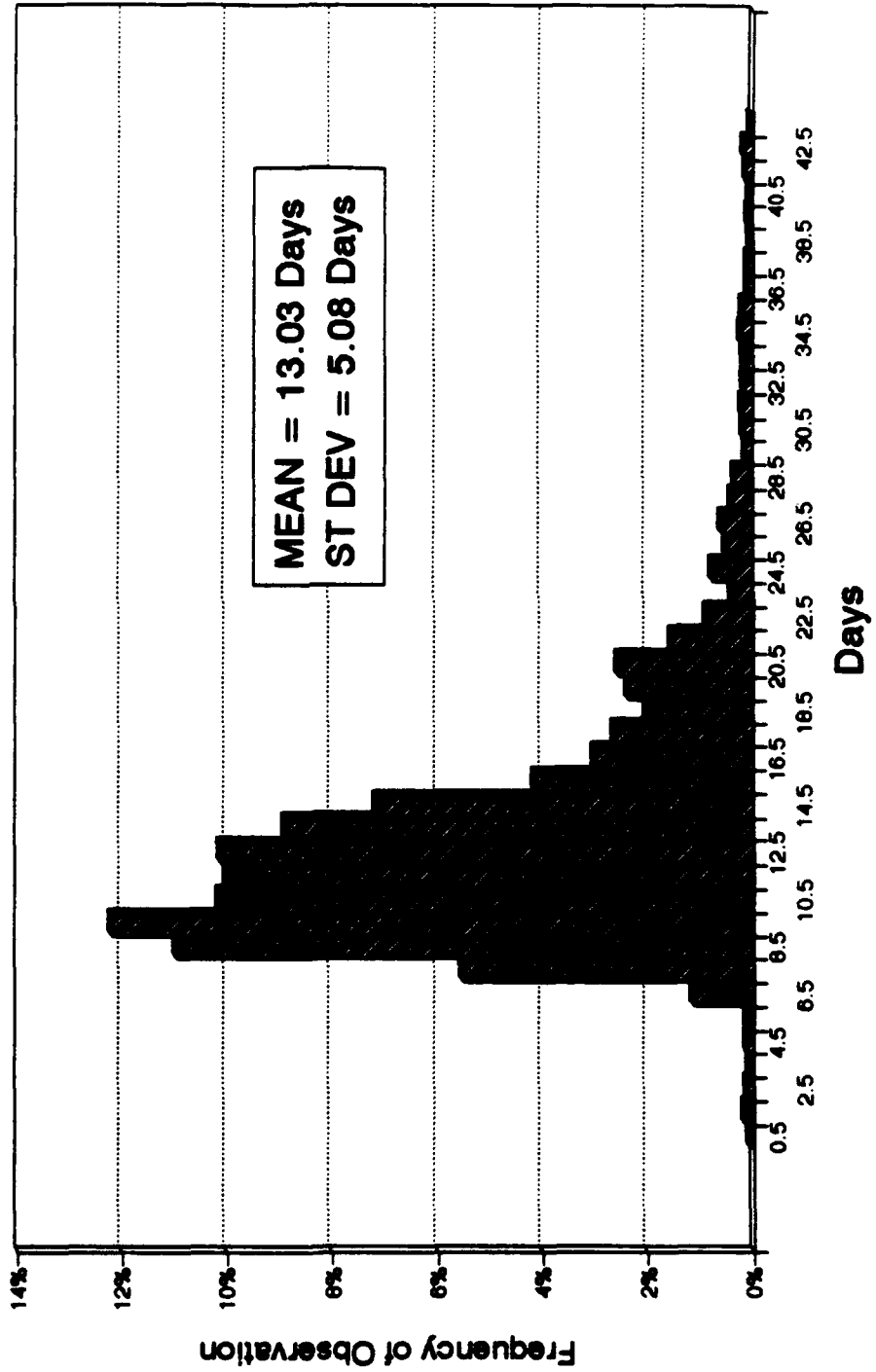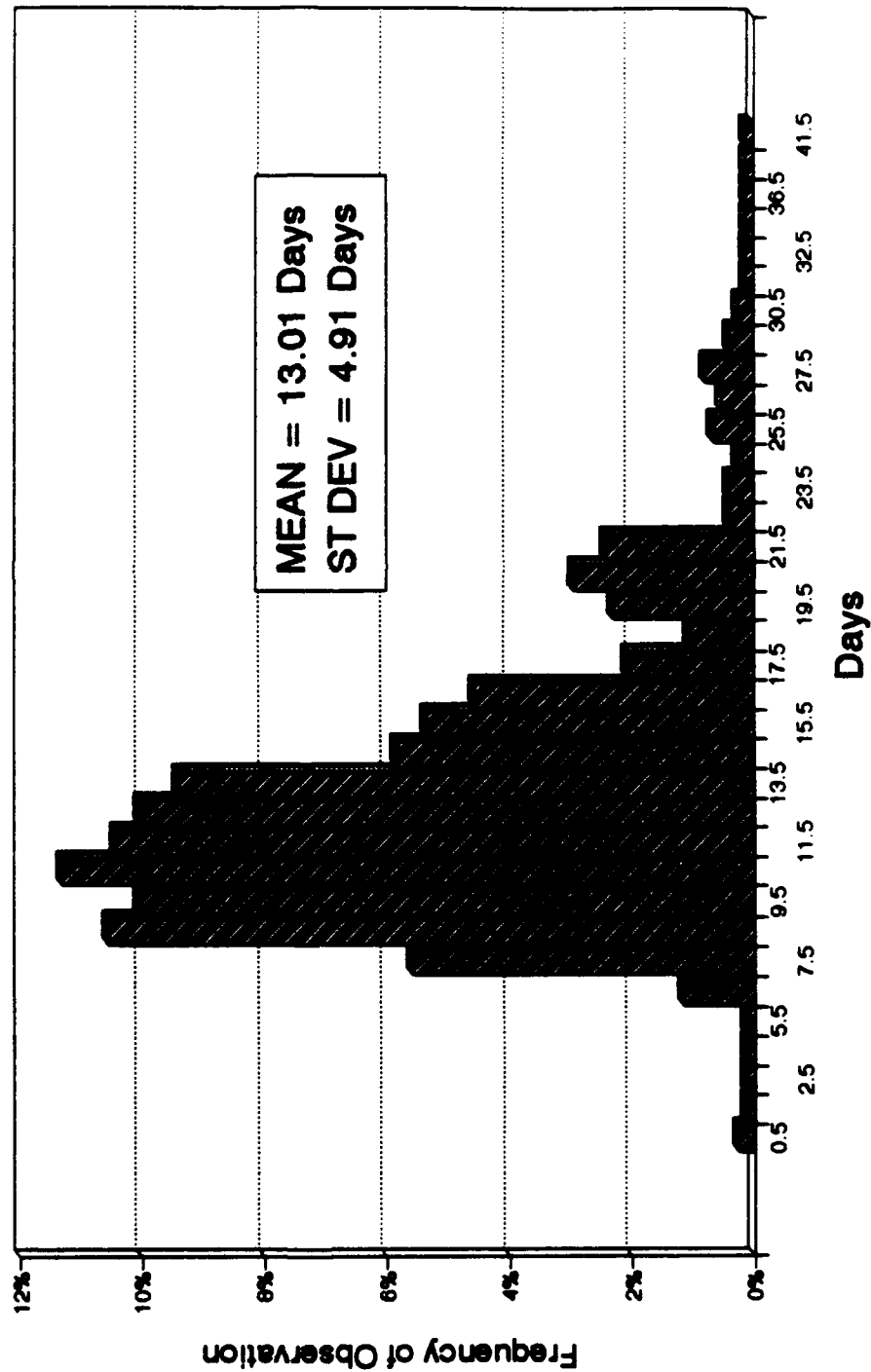
APPENDIX X: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	1	0.00%	0.00%
3.5	4	0.01%	0.02%
4.5	10	0.03%	0.05%
5.5	71	0.22%	0.26%
6.5	302	0.93%	1.19%
7.5	1340	4.12%	5.31%
8.5	1979	6.09%	11.40%
9.5	2286	7.03%	18.43%
10.5	2187	6.72%	25.15%
11.5	3210	9.87%	35.02%
12.5	3701	11.38%	46.40%
13.5	3877	11.92%	58.33%
14.5	3531	10.86%	69.18%
15.5"	1607	4.94%	74.12%
16.5	1049	3.23%	77.35%
17.5	1274	3.92%	81.27%
18.5	1063	3.27%	84.54%
19.5	1249	3.84%	88.38%
20.5	1181	3.63%	92.01%
21.5	710	2.18%	94.19%
22.5	350	1.08%	95.27%
23.5	198	0.61%	95.88%
24.5	233	0.72%	96.59%
25.5	192	0.59%	97.18%
26.5	194	0.60%	97.78%
27.5	124	0.38%	98.16%
28.5	126	0.39%	98.55%
29.5	67	0.21%	98.76%
30.5	38	0.12%	98.88%
31.5	20	0.06%	98.94%
32.5	46	0.14%	99.08%
33.5	84	0.26%	99.34%
34.5	42	0.13%	99.47%
35.5	35	0.11%	99.58%
36.5	26	0.08%	99.66%
37.5	7	0.02%	99.68%
38.5	9	0.03%	99.70%
39.5	11	0.03%	99.74%
40.5	33	0.10%	99.84%
41.5	14	0.04%	99.88%
42.5	32	0.10%	99.98%
43.5	6	0.02%	100.00%
	32521		

X-2: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - 7R COG

Days	Count	Percent	Cumulative Percent
3.5	1	0.01%	0.01%
5.5	1	0.01%	0.02%
6.5	68	0.59%	0.61%
7.5	442	3.83%	4.43%
8.5	886	7.67%	12.11%
9.5	845	7.32%	19.42%
10.5	894	7.74%	27.17%
11.5	1148	9.94%	37.11%
12.5	1360	11.78%	48.89%
13.5	1275	11.04%	59.93%
14.5	1133	9.81%	69.74%
15.5	566	4.90%	74.64%
16.5	329	2.85%	77.49%
17.5	419	3.63%	81.12%
18.5	397	3.44%	84.56%
19.5	437	3.78%	88.34%
20.5	385	3.33%	91.68%
21.5	248	2.15%	93.83%
22.5	146	1.26%	95.09%
23.5	64	0.55%	95.64%
24.5	121	1.05%	96.69%
25.5	85	0.74%	97.43%
26.5	87	0.75%	98.18%
27.5	39	0.34%	98.52%
28.5	61	0.53%	99.05%
29.5	15	0.13%	99.18%
30.5	12	0.10%	99.28%
31.5	7	0.06%	99.34%
32.5	21	0.18%	99.52%
33.5	40	0.35%	99.87%
34.5	15	0.13%	100.00%
	11546		

X-3: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - 7H COG

Days	Count	Percent	Cumulative Percent
4.5	5	0.03%	0.03%
5.5	69	0.40%	0.43%
6.5	193	1.12%	1.56%
7.5	762	4.44%	5.99%
8.5	834	4.86%	10.85%
9.5	1137	6.62%	17.46%
10.5	1025	5.97%	23.45%
11.5	1704	9.93%	33.37%
12.5	1891	11.02%	44.39%
13.5	2211	12.88%	57.27%
14.5	2017	11.75%	69.02%
15.5	836	4.87%	73.89%
16.5	618	3.60%	77.49%
17.5	718	4.18%	81.67%
18.5	540	3.15%	84.81%
19.5	681	3.97%	88.78%
20.5	660	3.84%	92.63%
21.5	363	2.11%	94.74%
22.5	164	0.96%	95.70%
23.5	102	0.59%	96.29%
24.5	85	0.50%	96.78%
25.5	84	0.49%	97.27%
26.5	87	0.51%	97.78%
27.5	72	0.42%	98.20%
28.5	52	0.30%	98.50%
29.5	44	0.26%	98.76%
30.5	26	0.15%	98.91%
31.5	12	0.07%	98.98%
32.5	19	0.11%	99.09%
33.5	35	0.20%	99.30%
34.5	23	0.13%	99.43%
35.5	25	0.15%	99.57%
36.5	18	0.10%	99.68%
37.5	4	0.02%	99.70%
38.5	4	0.02%	99.73%
39.5	3	0.02%	99.74%
40.5	25	0.15%	99.89%
41.5	4	0.02%	99.91%
42.5	15	0.09%	100.00%
	17167		

X-4: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - 7G COG

Days	Count	Percent	Cumulative Percent
3.5	2	0.06%	0.06%
4.5	5	0.16%	0.22%
5.5	1	0.03%	0.25%
6.5	35	1.10%	1.35%
7.5	105	3.30%	4.65%
8.5	224	7.04%	11.69%
9.5	250	7.86%	19.55%
10.5	222	6.98%	26.52%
11.5	308	9.68%	36.20%
12.5	377	11.85%	48.05%
13.5	333	10.47%	58.52%
14.5	321	10.09%	68.60%
15.5	184	5.78%	74.39%
16.5	88	2.77%	77.15%
17.5	117	3.68%	80.83%
18.5	102	3.21%	84.04%
19.5	122	3.83%	87.87%
20.5	116	3.65%	91.51%
21.5	87	2.73%	94.25%
22.5	38	1.19%	95.44%
23.5	26	0.82%	96.26%
24.5	19	0.60%	96.86%
25.5	18	0.57%	97.42%
26.5	16	0.50%	97.93%
27.5	13	0.41%	98.33%
28.5	13	0.41%	98.74%
29.5	4	0.13%	98.87%
31.5	1	0.03%	98.90%
32.5	6	0.19%	99.09%
33.5	9	0.28%	99.37%
34.5	4	0.13%	99.50%
35.5	2	0.06%	99.56%
36.5	1	0.03%	99.59%
37.5	1	0.03%	99.62%
39.5	6	0.19%	99.81%
40.5	5	0.16%	99.97%
42.5	1	0.03%	100.00%
	3182		

X-5: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - 7Z COG

Days	Count	Percent	Cumulative Percent
6.5	3	1.10%	1.10%
7.5	21	7.72%	8.82%
8.5	20	7.35%	16.18%
9.5	23	8.46%	24.63%
10.5	23	8.46%	33.09%
11.5	33	12.13%	45.22%
12.5	32	11.76%	56.99%
13.5	27	9.93%	66.91%
14.5	22	8.09%	75.00%
15.5	7	2.57%	77.57%
16.5	11	4.04%	81.62%
17.5	6	2.21%	83.82%
18.5	13	4.78%	88.60%
19.5	5	1.84%	90.44%
20.5	6	2.21%	92.65%
21.5	8	2.94%	95.59%
22.5	1	0.37%	95.96%
23.5	2	0.74%	96.69%
24.5	4	1.47%	98.16%
25.5	1	0.37%	98.53%
29.5	4	1.47%	100.00%
	272		

X-6: SCREENING AND SHIPPING TIMES AT SAN DIEGO FOR MATERIAL STORED OFF-SITE - 7E COG

Days	Count	Percent	Cumulative Percent
0.5	1	0.37%	0.37%
3.5	1	0.37%	0.74%
6.5	3	1.11%	1.85%
7.5	10	3.70%	5.56%
8.5	15	5.56%	11.11%
9.5	31	11.48%	22.59%
10.5	21	7.78%	30.37%
11.5	16	5.93%	36.30%
12.5	36	13.33%	49.63%
13.5	27	10.00%	59.63%
14.5	36	13.33%	72.96%
15.5	14	5.19%	78.15%
16.5	1	0.37%	78.52%
17.5	13	4.81%	83.33%
18.5	10	3.70%	87.04%
19.5	3	1.11%	88.15%
20.5	12	4.44%	92.59%
21.5	3	1.11%	93.70%
22.5	1	0.37%	94.07%
23.5	4	1.48%	95.56%
24.5	2	0.74%	96.30%
25.5	4	1.48%	97.78%
26.5	4	1.48%	99.26%
28.5	2	0.74%	100.00%
	270		

SCREENING TO OFF-SITE STORAGE TIMES
7R 46433

MEAN = 14.01 Days
ST DEV = 4.75 Days

Days

Frequency of Observation

228

SCREENING TO OFF-SITE STORAGE TIMES
7E 46433

MEAN = 13.73 Days
ST DEV = 4.64 Days
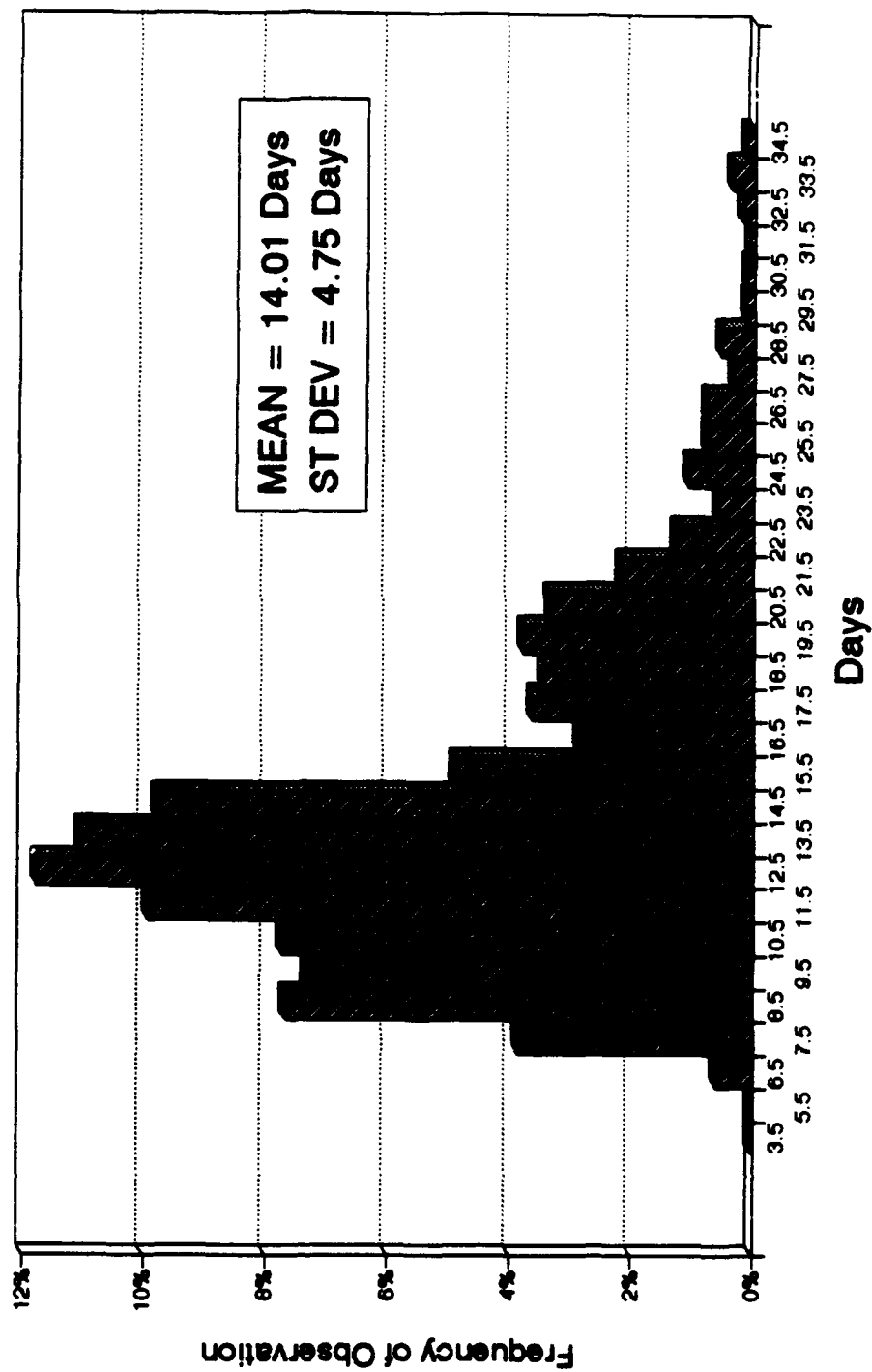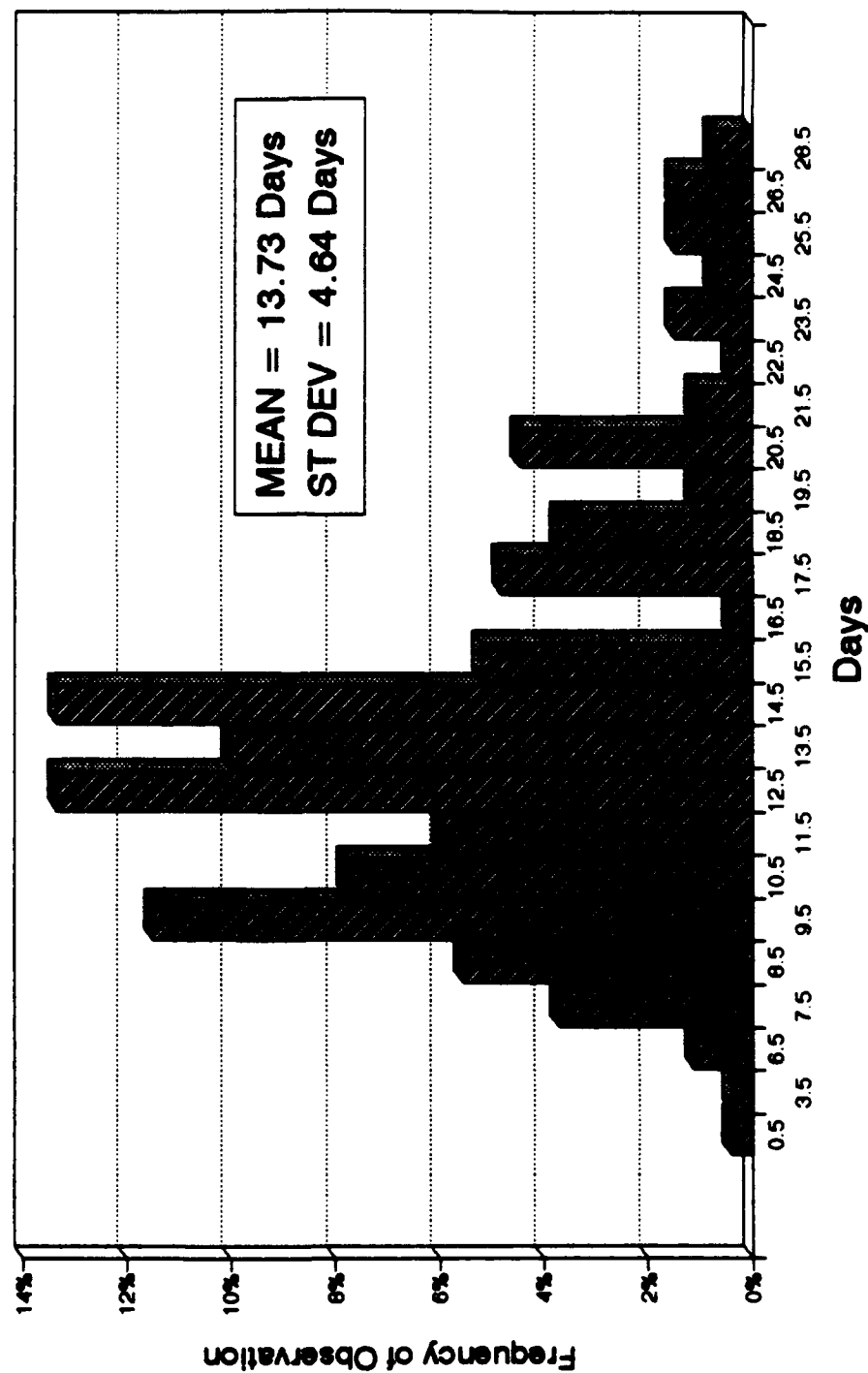
APPENDIX Y: CONSOLIDATION AND PACKING TIMES AT THE NORFOLK HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	56879	57.96%	57.96%
1.5	31341	31.94%	89.90%
2.5	2699	2.75%	92.65%
3.5	5361	5.46%	98.12%
4.5	1251	1.27%	99.39%
5.5	436	0.44%	99.84%
6.5	160	0.16%	100.00%
	98127		

7R 68620

Days	Count	Percent	Cumulative Percent
0.5	36815	62.0%	61.97%
1.5	17418	29.3%	91.30%
2.5	1320	2.2%	93.52%
3.5	2869	4.8%	98.35%
4.5	673	1.1%	99.46%
5.5	271	0.5%	99.94%
6.5	38	0.1%	100.00%
	59404		

7H 68620

Days	Count	Percent	Cumulative Percent
0.5	14388	51.52%	51.52%
1.5	10136	36.30%	87.82%
2.5	969	3.47%	91.29%
3.5	1785	6.39%	97.68%
4.5	425	1.52%	99.21%
5.5	100	0.36%	99.56%
6.5	104	0.37%	99.94%
7.5	18	0.06%	100.00%
	27925		

7G 68620

Days	Count	Percent	Cumulative Percent
0.5	3892	51.91%	51.91%
1.5	2741	36.56%	88.46%
2.5	285	3.80%	92.26%
3.5	488	6.51%	98.77%
4.5	92	1.23%	100.00%
	7498		

7Z 68620

Days	Count	Percent	Cumulative Percent
0.5	850	54.45%	54.45%
1.5	475	30.43%	84.88%
2.5	71	4.55%	89.43%
3.5	101	6.47%	95.90%
4.5	41	2.63%	98.53%
5.5	20	1.28%	99.81%
6.5	3	0.19%	100.00%
	1561		

7E 68620

Days	Count	Percent	Cumulative Percent
0.5	894	55.19%	55.19%
1.5	547	33.77%	88.95%
2.5	49	3.02%	91.96%
3.5	112	6.91%	98.89%
4.5	18	1.11%	100.00%
	1620		

HUB CONSOLIDATION AND PACKING TIME

7R 68620

MEAN = 1.05 Days
ST DEV = .91 Days

Frequency of Observation

Days

HUB CONSOLIDATION AND PACKING TIME
7E 68620

MEAN = 1.15 Days
ST DEV = .91 Days

Days

Frequency of Observation
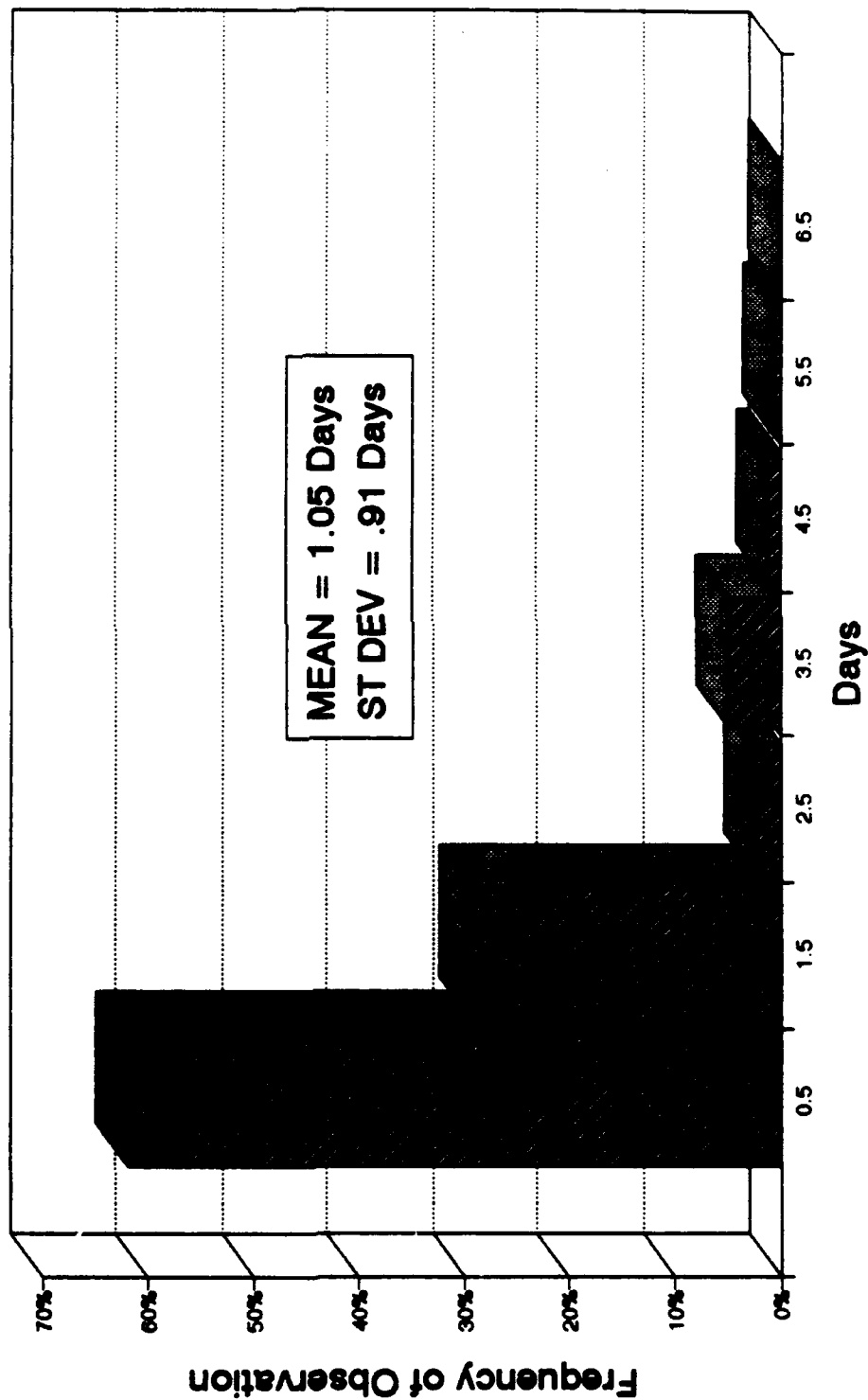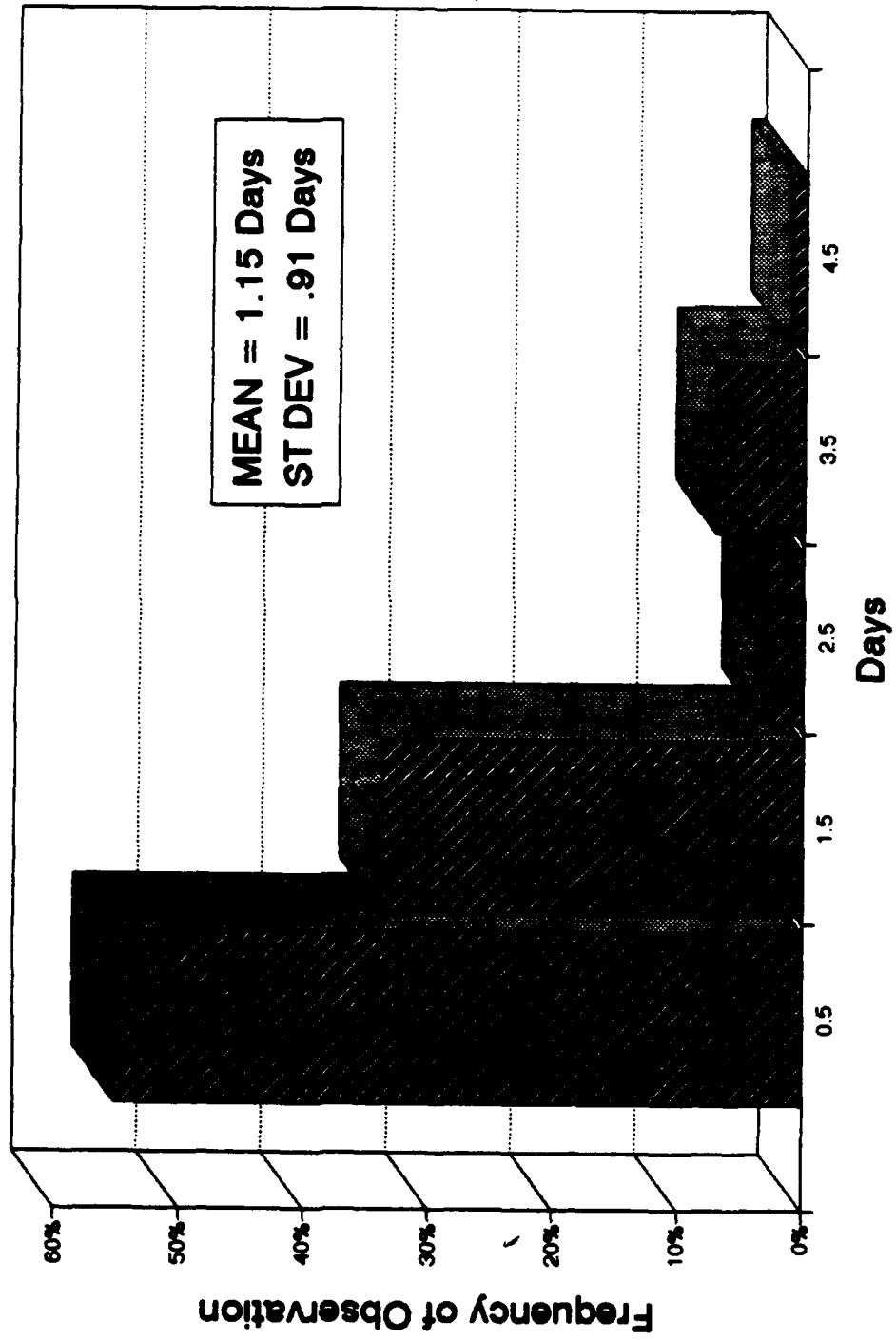
APPENDIX Z: CONSOLIDATION AND PACKING TIMES AT THE SAN DIEGO HUB

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	26938	22.38%	22.38%
1.5	68833	57.20%	79.58%
2.5	5425	4.51%	84.09%
3.5	15765	13.10%	97.19%
4.5	3270	2.72%	99.91%
5.5	114	0.09%	100.00%
	120345		

7R 46433

Days	Count	Percent	Cumulative Percent
0.5	21818	27.91%	27.91%
1.5	42098	53.86%	81.77%
2.5	3150	4.03%	85.80%
3.5	8927	11.42%	97.22%
4.5	2059	2.63%	99.86%
5.5	111	0.14%	100.00%
	78163		

7H 46433

Days	Count	Percent	Cumulative Percent
0.5	3923	11.60%	11.60%
1.5	21395	63.26%	74.86%
2.5	1824	5.39%	80.26%
3.5	5685	16.81%	97.07%
4.5	992	2.93%	100.00%
	33819		

7G 46433

Days	Count	Percent	Cumulative Percent
0.5	827	13.11%	13.11%
1.5	4062	64.39%	77.50%
2.5	361	5.72%	83.23%
3.5	879	13.93%	97.16%
4.5	179	2.84%	100.00%
	6308		

7Z 46433

Days	Count	Percent	Cumulative Percent
0.5	174	27.40%	27.40%
1.5	349	54.96%	82.36%
2.5	20	3.15%	85.51%
3.5	83	13.07%	98.58%
4.5	9	1.42%	100.00%
	635		

7E 46433

Days	Count	Percent	Cumulative Percent
0.5	178	13.58%	13.58%
1.5	863	65.83%	79.41%
2.5	62	4.73%	84.13%
3.5	181	13.81%	97.94%
4.5	27	2.06%	100.00%
	1311		

HUB CONSOLIDATION AND PACKING TIME
7R 46433

MEAN = 1.57 Days
ST DEV = 1.02 Days

Frequency of Observation

Days

234

HUB CONSOLIDATION AND PACKING TIME
7E 46433

MEAN = 1.75 Days
ST DEV = .93 Days

Frequency of Observation
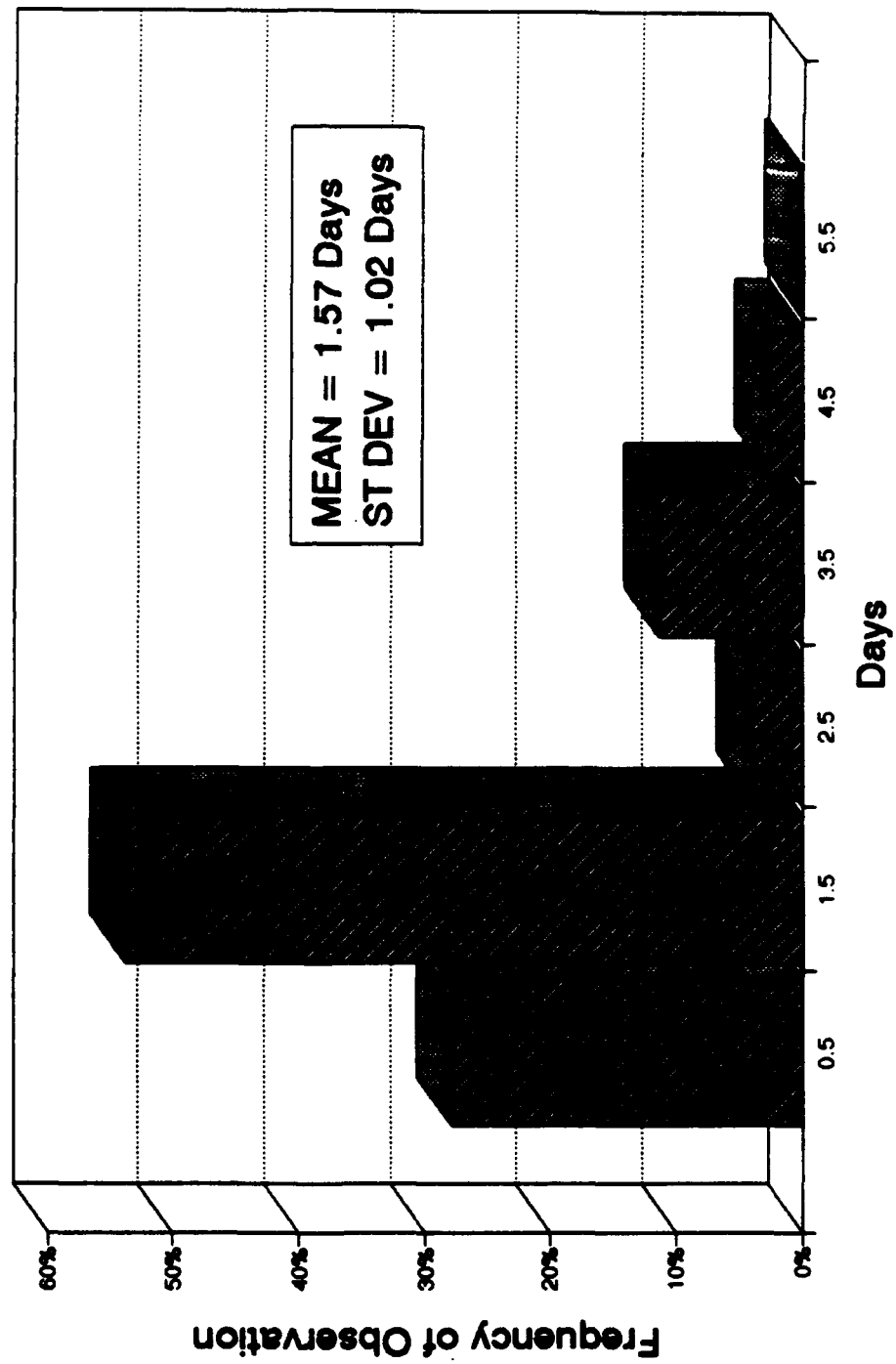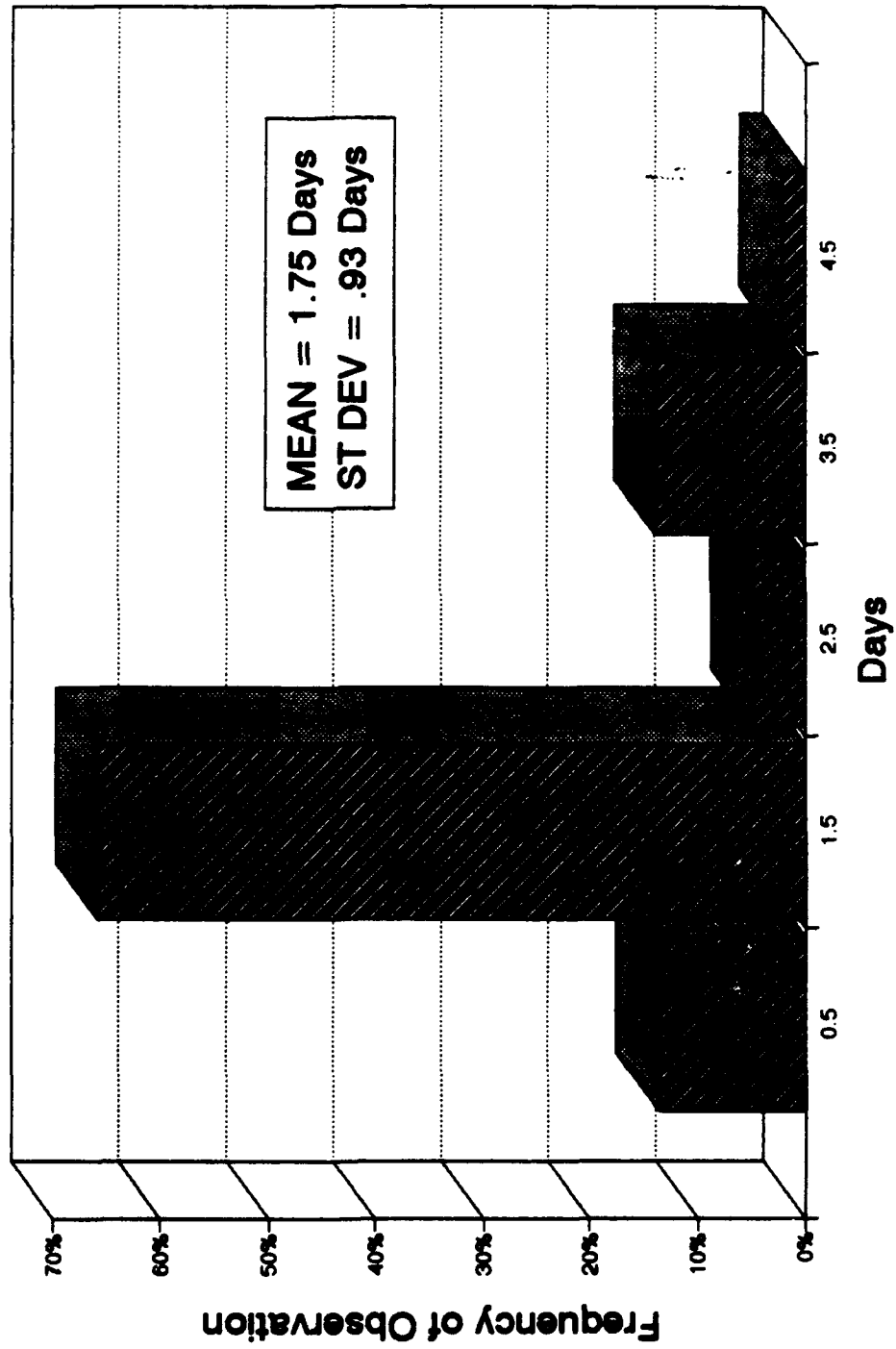
Days

APPENDIX AA: TIME SPENT AT THE NORFOLK HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	4	0.00%	0.00%
1.5	64	0.06%	0.07%
2.5	2963	2.84%	2.91%
3.5	8480	8.13%	11.04%
4.5	7366	7.06%	18.10%
5.5	10431	10.00%	28.10%
6.5	16506	15.83%	43.93%
7.5	14011	13.43%	57.36%
8.5	7399	7.09%	64.46%
9.5	4165	3.99%	68.45%
10.5	4251	4.08%	72.53%
11.5	3169	3.04%	75.56%
12.5	2957	2.84%	78.40%
13.5	4073	3.91%	82.30%
14.5	4661	4.47%	86.77%
15.5	2978	2.86%	89.63%
16.5	1987	1.91%	91.53%
17.5	1503	1.44%	92.97%
18.5	1377	1.32%	94.30%
19.5	1143	1.10%	95.39%
20.5	1143	1.10%	96.49%
21.5	922	0.88%	97.37%
22.5	652	0.63%	98.00%
23.5	421	0.40%	98.40%
24.5	307	0.29%	98.69%
25.5	252	0.24%	98.94%
26.5	230	0.22%	99.16%
27.5	230	0.22%	99.38%
28.5	238	0.23%	99.60%
29.5	179	0.17%	99.78%
30.5	106	0.10%	99.88%
31.5	127	0.12%	100.00%
	104295		

AA-2: TIME SPENT AT THE NORFOLK HUB FOR 7R COG

Days	Count	Percent	Cumulative Percent
0.5	2	0.00%	0.00%
1.5	46	0.07%	0.08%
2.5	2094	3.30%	3.37%
3.5	5805	9.14%	12.51%
4.5	4735	7.46%	19.97%
5.5	6414	10.10%	30.07%
6.5	9948	15.66%	45.73%
7.5	8400	13.23%	58.96%
8.5	4509	7.10%	66.06%
9.5	2482	3.91%	69.96%
10.5	2446	3.85%	73.82%
11.5	1850	2.91%	76.73%
12.5	1762	2.77%	79.50%
13.5	2510	3.95%	83.45%
14.5	2643	4.16%	87.62%
15.5	1732	2.73%	90.34%
16.5	1083	1.71%	92.05%
17.5	799	1.26%	93.31%
18.5	748	1.18%	94.48%
19.5	653	1.03%	95.51%
20.5	661	1.04%	96.55%
21.5	505	0.80%	97.35%
22.5	379	0.60%	97.95%
23.5	218	0.34%	98.29%
24.5	155	0.24%	98.53%
25.5	142	0.22%	98.76%
26.5	114	0.18%	98.94%
27.5	126	0.20%	99.13%
28.5	130	0.20%	99.34%
29.5	99	0.16%	99.49%
30.5	55	0.09%	99.58%
31.5	62	0.10%	99.68%
32.5	54	0.09%	99.76%
33.5	72	0.11%	99.88%
34.5	33	0.05%	99.93%
35.5	45	0.07%	100.00%
	63511		

AA-3: TIME SPENT AT THE NORFOLK HUB FOR 7H COG

Days	Count	Percent	Cumulative Percent
0.5	1	0.00%	0.00%
1.5	12	0.04%	0.04%
2.5	575	1.93%	1.97%
3.5	1909	6.40%	8.37%
4.5	1807	6.05%	14.42%
5.5	2907	9.74%	24.16%
6.5	4659	15.61%	39.77%
7.5	4138	13.86%	53.64%
8.5	2130	7.14%	60.77%
9.5	1240	4.15%	64.93%
10.5	1290	4.32%	69.25%
11.5	901	3.02%	72.27%
12.5	859	2.88%	75.15%
13.5	1158	3.88%	79.03%
14.5	1481	4.96%	83.99%
15.5	901	3.02%	87.01%
16.5	663	2.22%	89.23%
17.5	494	1.66%	90.88%
18.5	504	1.69%	92.57%
19.5	372	1.25%	93.82%
20.5	338	1.13%	94.95%
21.5	317	1.06%	96.01%
22.5	196	0.66%	96.67%
23.5	158	0.53%	97.20%
24.5	108	0.36%	97.56%
25.5	71	0.24%	97.80%
26.5	86	0.29%	98.09%
27.5	80	0.27%	98.35%
28.5	80	0.27%	98.62%
29.5	56	0.19%	98.81%
30.5	40	0.13%	98.94%
31.5	43	0.14%	99.09%
32.5	33	0.11%	99.20%
33.5	35	0.12%	99.32%
34.5	27	0.09%	99.41%
35.5	39	0.13%	99.54%
36.5	27	0.09%	99.63%
37.5	23	0.08%	99.71%
38.5	13	0.04%	99.75%
39.5	22	0.07%	99.82%
40.5	20	0.07%	99.89%
41.5	15	0.05%	99.94%
42.5	18	0.06%	100.00%
	29846		

AA-4: TIME SPENT AT THE NORFOLK HUB FOR 7G COG

Days	Count	Percent	Cumulative Percent
0.5	1	0.01%	0.01%
1.5	6	0.07%	0.09%
2.5	203	2.52%	2.61%
3.5	510	6.33%	8.93%
4.5	573	7.11%	16.04%
5.5	717	8.90%	24.94%
6.5	1363	16.91%	41.85%
7.5	1049	13.01%	54.86%
8.5	550	6.82%	61.69%
9.5	318	3.95%	65.63%
10.5	397	4.93%	70.56%
11.5	323	4.01%	74.57%
12.5	222	2.75%	77.32%
13.5	268	3.33%	80.65%
14.5	367	4.55%	85.20%
15.5	242	3.00%	88.20%
16.5	174	2.16%	90.36%
17.5	147	1.82%	92.18%
18.5	94	1.17%	93.35%
19.5	73	0.91%	94.26%
20.5	92	1.14%	95.40%
21.5	76	0.94%	96.34%
22.5	57	0.71%	97.05%
23.5	28	0.35%	97.39%
24.5	33	0.41%	97.80%
25.5	18	0.22%	98.03%
26.5	19	0.24%	98.26%
27.5	14	0.17%	98.44%
28.5	22	0.27%	98.71%
29.5	10	0.12%	98.83%
30.5	7	0.09%	98.92%
31.5	15	0.19%	99.11%
32.5	3	0.04%	99.14%
33.5	7	0.09%	99.23%
34.5	7	0.09%	99.32%
35.5	13	0.16%	99.48%
36.5	7	0.09%	99.57%
37.5	4	0.05%	99.62%
38.5	2	0.02%	99.64%
39.5	2	0.02%	99.67%
40.5	4	0.05%	99.71%
41.5	5	0.06%	99.76%
42.5	13	0.16%	99.94%
43.5	4	0.05%	99.99%
44.5	1	0.01%	100.00%
	8060		

AA-5: TIME SPENT AT THE NORFOLK HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent
2.5	34	2.01%	2.01%
3.5	98	5.79%	7.80%
4.5	125	7.39%	15.19%
5.5	216	12.77%	27.96%
6.5	240	14.18%	42.14%
7.5	191	11.29%	53.43%
8.5	91	5.38%	58.81%
9.5	63	3.72%	62.53%
10.5	45	2.66%	65.19%
11.5	39	2.30%	67.49%
12.5	65	3.84%	71.34%
13.5	77	4.55%	75.89%
14.5	86	5.08%	80.97%
15.5	61	3.61%	84.57%
16.5	30	1.77%	86.35%
17.5	37	2.19%	88.53%
18.5	13	0.77%	89.30%
19.5	24	1.42%	90.72%
20.5	29	1.71%	92.43%
21.5	15	0.89%	93.32%
22.5	10	0.59%	93.91%
23.5	10	0.59%	94.50%
24.5	5	0.30%	94.80%
25.5	18	1.06%	95.86%
26.5	8	0.47%	96.34%
27.5	8	0.47%	96.81%
28.5	4	0.24%	97.04%
29.5	10	0.59%	97.64%
30.5	3	0.18%	97.81%
31.5	6	0.35%	98.17%
32.5	2	0.12%	98.29%
34.5	4	0.24%	98.52%
35.5	4	0.24%	98.76%
36.5	2	0.12%	98.88%
37.5	5	0.30%	99.17%
38.5	4	0.24%	99.41%
39.5	2	0.12%	99.53%
40.5	1	0.06%	99.59%
41.5	1	0.06%	99.65%
42.5	1	0.06%	99.70%
44.5	1	0.06%	99.76%
45.5	2	0.12%	99.88%
47.5	1	0.06%	99.94%
51.5	1	0.06%	100.00%
	1692		

AA-6: TIME SPENT AT THE NORFOLK HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent
2.5	55	3.23%	3.23%
3.5	154	9.03%	12.26%
4.5	125	7.33%	19.59%
5.5	170	9.97%	29.56%
6.5	282	16.54%	46.10%
7.5	220	12.90%	59.00%
8.5	112	6.57%	65.57%
9.5	60	3.52%	69.09%
10.5	68	3.99%	73.08%
11.5	52	3.05%	76.13%
12.5	49	2.87%	79.00%
13.5	56	3.28%	82.29%
14.5	80	4.69%	86.98%
15.5	41	2.40%	89.38%
16.5	32	1.88%	91.26%
17.5	26	1.52%	92.79%
18.5	17	1.00%	93.78%
19.5	20	1.17%	94.96%
20.5	22	1.29%	96.25%
21.5	9	0.53%	96.77%
22.5	10	0.59%	97.36%
23.5	7	0.41%	97.77%
24.5	6	0.35%	98.12%
25.5	3	0.18%	98.30%
26.5	2	0.12%	98.42%
27.5	2	0.12%	98.53%
28.5	2	0.12%	98.65%
29.5	3	0.18%	98.83%
30.5	1	0.06%	98.89%
31.5	1	0.06%	98.94%
33.5	3	0.18%	99.12%
34.5	3	0.18%	99.30%
35.5	2	0.12%	99.41%
36.5	1	0.06%	99.47%
37.5	1	0.06%	99.53%
38.5	1	0.06%	99.59%
39.5	2	0.12%	99.71%
40.5	1	0.06%	99.77%
42.5	1	0.06%	99.82%
43.5	1	0.06%	99.88%
46.5	2	0.12%	100.00%
	1705		

241

TOTAL TIME AT HUB
7R 68620

MEAN = 8.93 Days
ST DEV = 5.22 Days

Frequency of Observation

Days

242

TOTAL TIME AT HUB
7E 68620

MEAN = 9.15 Days
ST DEV = 5.80 Days

Frequency of Observation
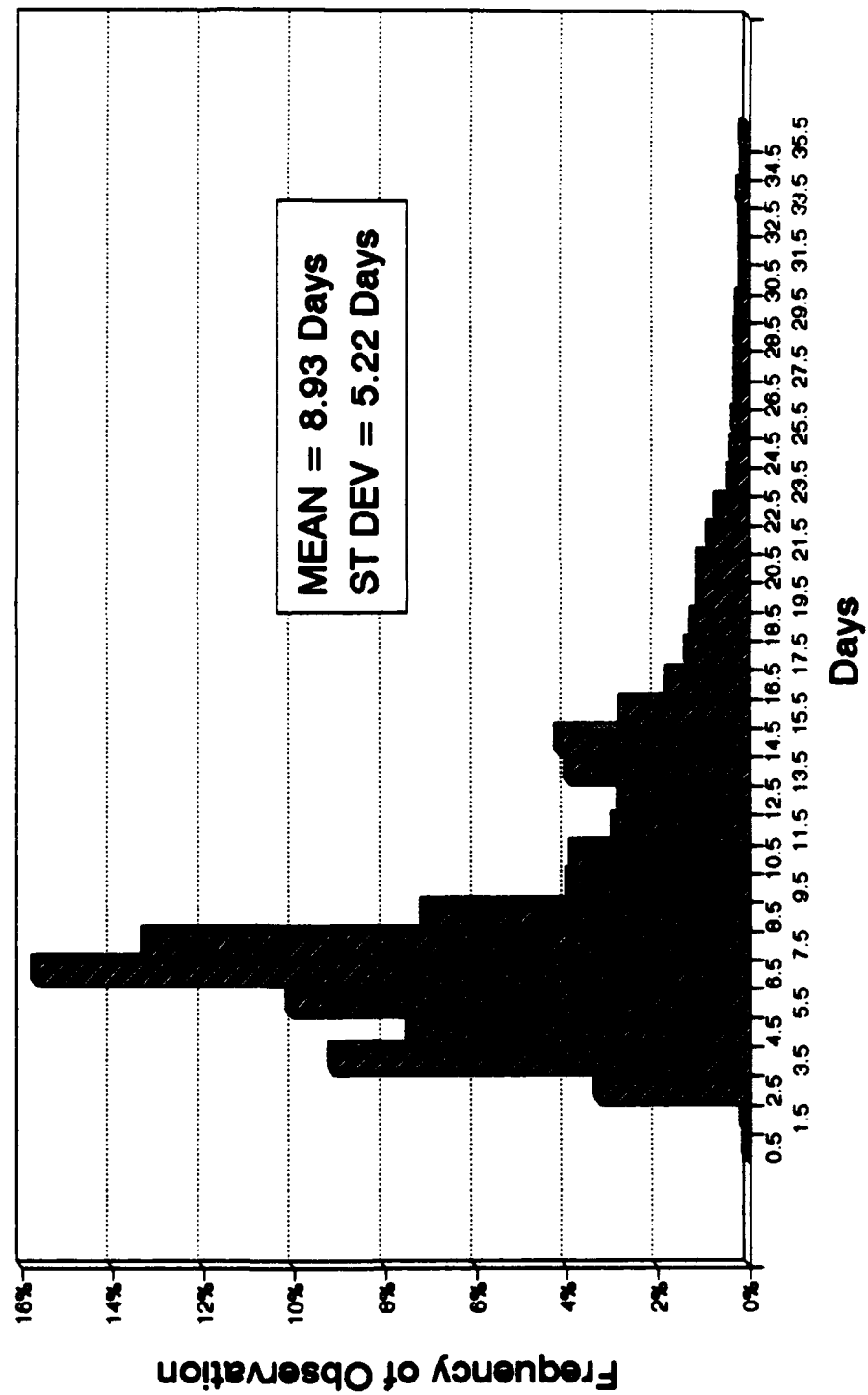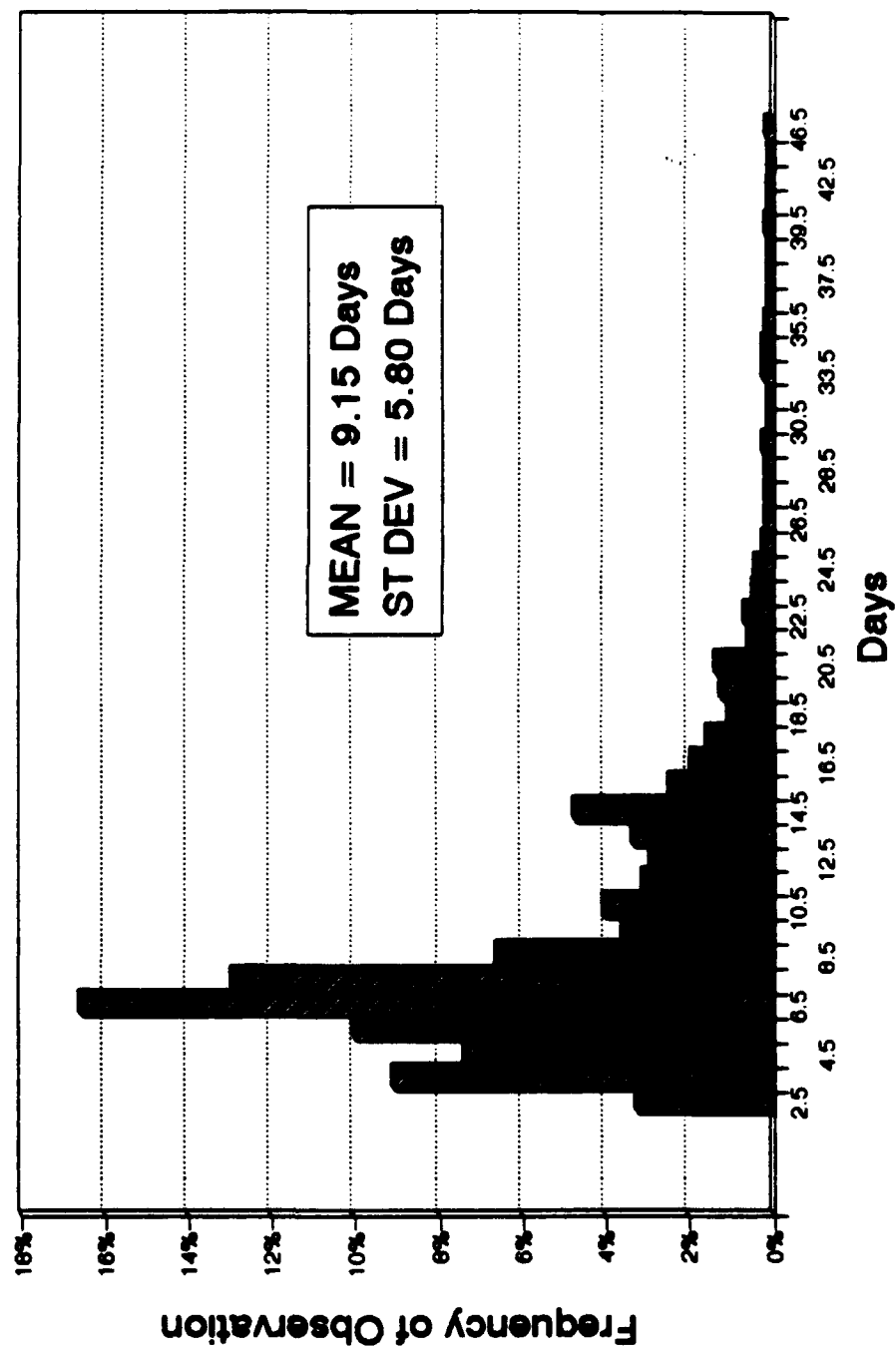
Days

APPENDIX AB: TIME SPENT AT THE SAN DIEGO HUB FOR ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	3	0.00%	0.00%
1.5	38	0.03%	0.03%
2.5	1216	0.89%	0.92%
3.5	6832	4.97%	5.89%
4.5	5897	4.29%	10.17%
5.5	9163	6.66%	16.83%
6.5	19232	13.98%	30.82%
7.5	21962	15.97%	46.79%
8.5	16193	11.77%	58.56%
9.5	9103	6.62%	65.18%
10.5	8117	5.90%	71.09%
11.5	7322	5.32%	76.41%
12.5	6100	4.44%	80.85%
13.5	6519	4.74%	85.59%
14.5	6083	4.42%	90.01%
15.5	3555	2.59%	92.59%
16.5	1934	1.41%	94.00%
17.5	1583	1.15%	95.15%
18.5	1463	1.06%	96.22%
19.5	1145	0.83%	97.05%
20.5	1030	0.75%	97.80%
21.5	850	0.62%	98.41%
22.5	432	0.31%	98.73%
23.5	246	0.18%	98.91%
24.5	208	0.15%	99.06%
25.5	257	0.19%	99.25%
26.5	195	0.14%	99.39%
27.5	192	0.14%	99.53%
28.5	219	0.16%	99.69%
29.5	142	0.10%	99.79%
30.5	101	0.07%	99.86%
31.5	71	0.05%	99.91%
32.5	68	0.05%	99.96%
33.5	49	0.04%	100.00%
	137522		

AB-2: TIME SPENT AT THE SAN DIEGO HUB FOR 7R COG

Days	Count	Percent	Cumulative Percent
0.5	2	0.00%	0.00%
1.5	30	0.03%	0.04%
2.5	804	0.90%	0.93%
3.5	4860	5.42%	6.36%
4.5	4176	4.66%	11.02%
5.5	6361	7.10%	18.12%
6.5	13025	14.54%	32.65%
7.5	14309	15.97%	48.62%
8.5	10296	11.49%	60.11%
9.5	5786	6.46%	66.57%
10.5	5138	5.73%	72.31%
11.5	4707	5.25%	77.56%
12.5	3811	4.25%	81.82%
13.5	4182	4.67%	86.48%
14.5	3875	4.32%	90.81%
15.5	2173	2.43%	93.23%
16.5	1222	1.36%	94.60%
17.5	1007	1.12%	95.72%
18.5	897	1.00%	96.72%
19.5	766	0.86%	97.58%
20.5	634	0.71%	98.29%
21.5	529	0.59%	98.88%
22.5	284	0.32%	99.19%
23.5	155	0.17%	99.37%
24.5	130	0.15%	99.51%
25.5	195	0.22%	99.73%
26.5	131	0.15%	99.88%
27.5	111	0.12%	100.00%
	89600		

AB-3: TIME SPENT AT THE SAN DIEGO HUB FOR 7H COG

Days	Count	Percent	Cumulative Percent
0.5	1	0.00%	0.00%
1.5	6	0.02%	0.02%
2.5	310	0.82%	0.83%
3.5	1556	4.10%	4.93%
4.5	1333	3.51%	8.44%
5.5	2224	5.86%	14.30%
6.5	4885	12.86%	27.16%
7.5	6038	15.90%	43.06%
8.5	4806	12.66%	55.72%
9.5	2609	6.87%	62.59%
10.5	2411	6.35%	68.94%
11.5	2115	5.57%	74.51%
12.5	1804	4.75%	79.26%
13.5	1884	4.96%	84.22%
14.5	1819	4.79%	89.01%
15.5	1130	2.98%	91.99%
16.5	556	1.46%	93.45%
17.5	464	1.22%	94.67%
18.5	490	1.29%	95.96%
19.5	290	0.76%	96.73%
20.5	334	0.88%	97.61%
21.5	262	0.69%	98.30%
22.5	118	0.31%	98.61%
23.5	74	0.19%	98.80%
24.5	66	0.17%	98.98%
25.5	52	0.14%	99.11%
26.5	53	0.14%	99.25%
27.5	58	0.16%	99.41%
28.5	55	0.14%	99.55%
29.5	40	0.11%	99.66%
30.5	31	0.08%	99.74%
31.5	17	0.04%	99.78%
32.5	15	0.04%	99.82%
33.5	22	0.06%	99.88%
34.5	45	0.12%	100.00%
	37974		

AB-4: TIME SPENT AT THE SAN DIEGO HUB FOR 7G COG

Days	Count	Percent	Cumulative Percent
1.5	2	0.03%	0.03%
2.5	77	1.07%	1.10%
3.5	295	4.10%	5.20%
4.5	279	3.88%	9.08%
5.5	404	5.62%	14.70%
6.5	980	13.63%	28.33%
7.5	1244	17.30%	45.63%
8.5	871	12.11%	57.74%
9.5	560	7.79%	65.53%
10.5	427	5.94%	71.46%
11.5	367	5.10%	76.57%
12.5	369	5.13%	81.70%
13.5	344	4.78%	86.48%
14.5	286	3.98%	90.46%
15.5	199	2.77%	93.23%
16.5	117	1.63%	94.85%
17.5	86	1.20%	96.05%
18.5	60	0.83%	96.88%
19.5	60	0.83%	97.72%
20.5	49	0.68%	98.40%
21.5	49	0.68%	99.08%
22.5	25	0.35%	99.43%
23.5	15	0.21%	99.64%
24.5	11	0.15%	99.79%
25.5	6	0.08%	99.87%
26.5	9	0.13%	100.00%
	7191		

AB-5: TIME SPENT AT THE SAN DIEGO HUB FOR 7Z COG

Days	Count	Percent	Cumulative Percent
2.5	5	0.69%	0.69%
3.5	32	4.40%	5.09%
4.5	22	3.02%	8.10%
5.5	64	8.79%	16.90%
6.5	118	16.21%	33.10%
7.5	108	14.84%	47.94%
8.5	69	9.48%	57.42%
9.5	50	6.87%	64.29%
10.5	38	5.22%	69.51%
11.5	44	6.04%	75.55%
12.5	36	4.95%	80.49%
13.5	45	6.18%	86.68%
14.5	31	4.26%	90.93%
15.5	16	2.20%	93.13%
16.5	11	1.51%	94.64%
17.5	12	1.65%	96.29%
18.5	10	1.37%	97.66%
19.5	8	1.10%	98.76%
20.5	3	0.41%	99.18%
21.5	2	0.27%	99.45%
22.5	4	0.55%	100.00%
	728		

248

AB-6: TIME SPENT AT THE SAN DIEGO HUB FOR 7E COG

Days	Count	Percent	Cumulative Percent
2.5	22	1.52%	1.52%
3.5	86	5.93%	7.45%
4.5	73	5.03%	12.48%
5.5	104	7.17%	19.66%
6.5	214	14.76%	34.41%
7.5	238	16.41%	50.83%
8.5	130	8.97%	59.79%
9.5	87	6.00%	65.79%
10.5	97	6.69%	72.48%
11.5	82	5.66%	78.14%
12.5	74	5.10%	83.24%
13.5	57	3.93%	87.17%
14.5	65	4.48%	91.66%
15.5	35	2.41%	94.07%
16.5	26	1.79%	95.86%
17.5	14	0.97%	96.83%
18.5	4	0.28%	97.10%
19.5	18	1.24%	98.34%
20.5	10	0.69%	99.03%
21.5	8	0.55%	99.59%
22.5	1	0.07%	99.66%
23.5	2	0.14%	99.79%
24.5	1	0.07%	99.86%
25.5	2	0.14%	100.00%
	1450		

TOTAL TIME AT HUB
7R 46433
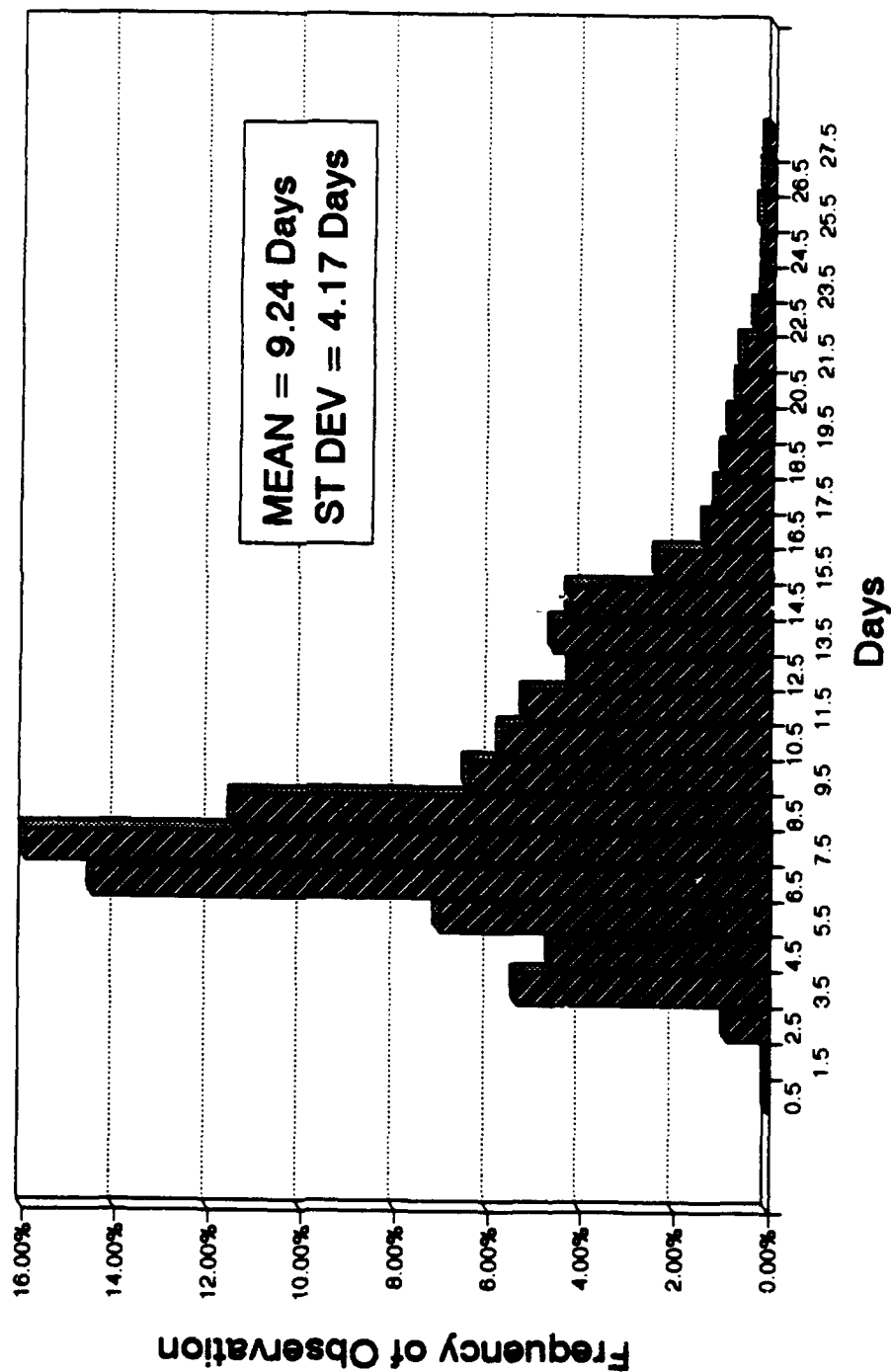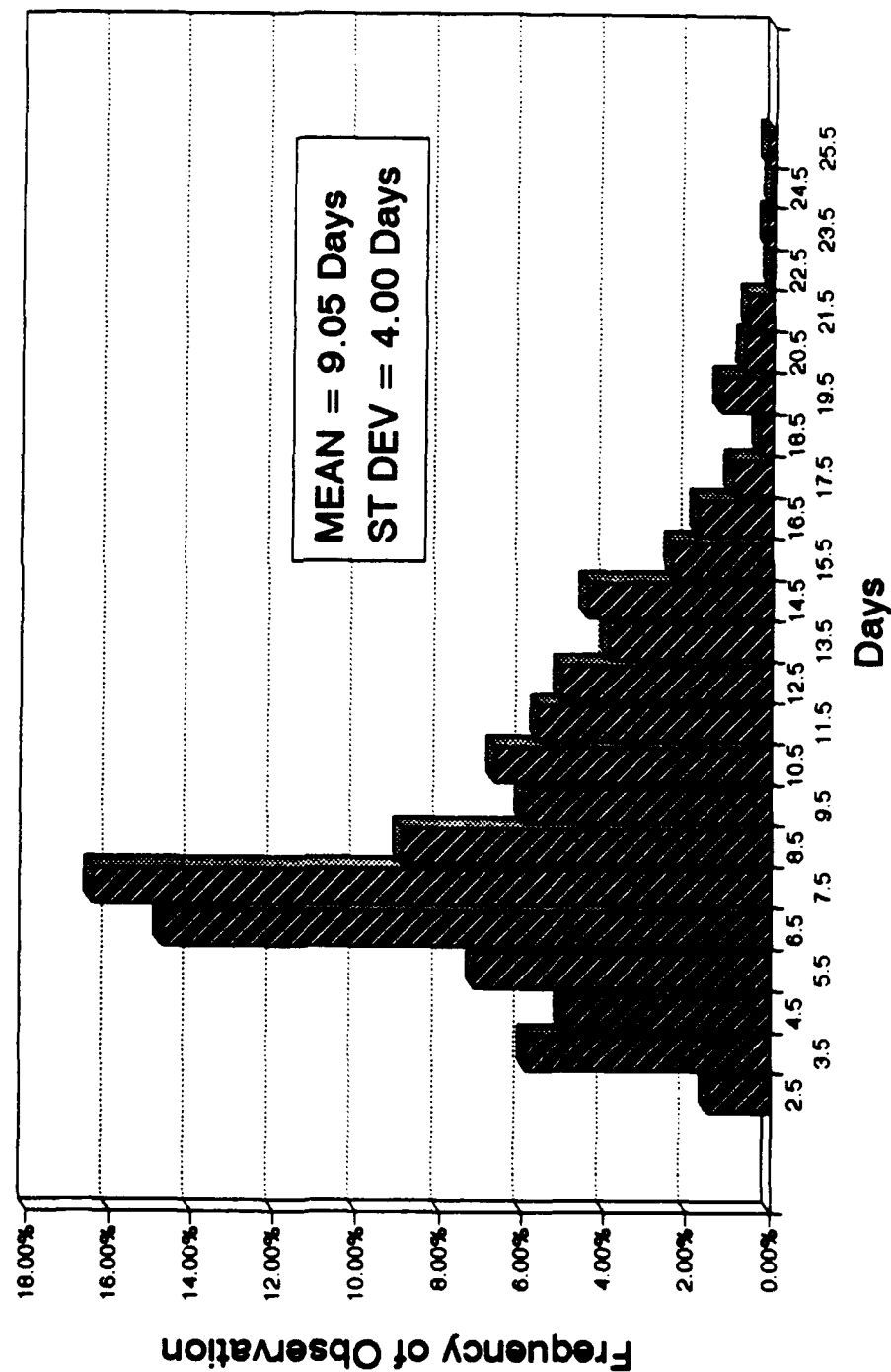
MEAN = 9.24 Days
ST DEV = 4.17 Days

TOTAL TIME AT HUB
7E 46433

MEAN = 9.05 Days
ST DEV = 4.00 Days

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	196	0.19%	0.19%
1.5	1037	0.99%	1.17%
2.5	11683	11.10%	12.27%
3.5	9720	9.23%	21.50%
4.5	21749	20.66%	42.16%
5.5	26610	25.28%	67.44%
6.5	22194	21.08%	88.52%
7.5	7825	7.43%	95.96%
8.5	2326	2.21%	98.16%
9.5	995	0.95%	99.11%
10.5	303	0.29%	99.40%
11.5	244	0.23%	99.63%
12.5	223	0.21%	99.84%
13.5	167	0.16%	100.00%
	105272		

7R 66620

Days	Count	Percent	Cumulative Percent
0.5	159	0.25%	0.25%
1.5	914	1.43%	1.68%
2.5	8332	13.05%	14.73%
3.5	6420	10.05%	24.78%
4.5	13630	21.34%	46.12%
5.5	15670	24.53%	70.65%
6.5	12296	19.25%	89.91%
7.5	4051	6.34%	96.25%
8.5	1157	1.81%	98.06%
9.5	519	0.81%	98.87%
10.5	162	0.25%	99.13%
11.5	190	0.30%	99.42%
12.5	134	0.21%	99.63%
13.5	107	0.17%	99.80%
14.5	30	0.05%	99.85%
15.5	53	0.08%	99.93%
16.5	44	0.07%	100.00%
17.5	35	0.05%	100.05%
	63903		

7H 66620

Days	Count	Percent	Cumulative Percent
0.5	29	0.10%	0.10%
1.5	88	0.30%	0.39%
2.5	2633	8.84%	9.23%
3.5	2606	8.75%	17.98%
4.5	6033	20.25%	38.23%
5.5	7839	26.31%	64.54%
6.5	6693	22.46%	87.00%
7.5	2610	8.76%	95.76%
8.5	797	2.68%	98.44%
9.5	381	1.28%	99.71%
10.5	85	0.29%	100.00%
	29794		

7G 66620

Days	Count	Percent	Cumulative Percent
0.5	7	0.09%	0.09%
1.5	33	0.41%	0.50%
2.5	609	7.60%	8.10%
3.5	472	5.89%	13.99%
4.5	1448	18.07%	32.06%
5.5	2158	26.93%	58.98%
6.5	2222	27.73%	86.71%
7.5	771	9.62%	96.33%
8.5	244	3.04%	99.38%
9.5	50	0.62%	100.00%
	8014		

7Z 66620

Days	Count	Percent	Cumulative Percent
0.5	1	0.06%	0.06%
1.5	2	0.12%	0.18%
2.5	13	0.77%	0.95%
3.5	73	4.33%	5.28%
4.5	291	17.26%	22.54%
5.5	458	27.16%	49.70%
6.5	550	32.62%	82.33%
7.5	213	12.63%	94.96%
8.5	56	3.32%	98.28%
9.5	29	1.72%	100.00%
	1686		

7E 66620

Days	Count	Percent	Cumulative Percent
0.5	0	0.00%	0.00%
1.5	0	0.00%	0.00%
2.5	88	5.20%	5.20%
3.5	139	8.21%	13.41%
4.5	333	19.67%	33.08%
5.5	471	27.82%	60.90%
6.5	407	24.04%	84.94%
7.5	171	10.10%	95.04%
8.5	68	4.02%	99.05%
9.5	16	0.95%	100.00%
	1693		

SHIPPING TIME FROM HUB TO DEPOT
7R 68620
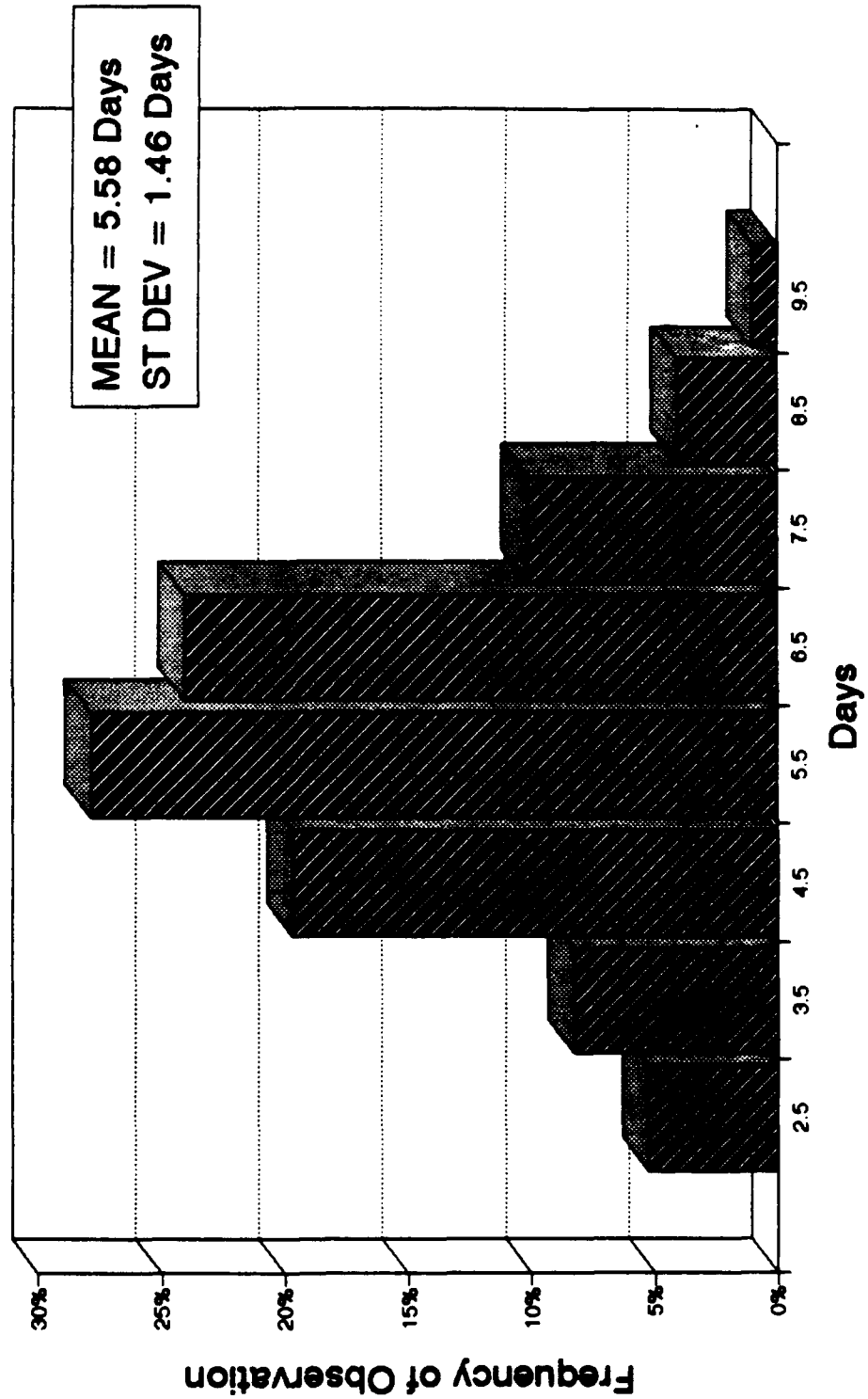
MEAN = 5.12 Days
ST DEV = 1.83 Days

253

SHIPPING TIME FROM HUB TO DEPOT
7E 68620

MEAN = 5.58 Days
ST DEV = 1.46 Days

Frequency of Observation

Days

ALL 7 COG

Days	Count	Percent	Cumulative Percent
0.5	433	0.31%	0.31%
1.5	6837	4.97%	5.29%
2.5	9289	6.75%	12.04%
3.5	13105	9.53%	21.57%
4.5	21654	15.74%	37.31%
5.5	29265	21.28%	58.59%
6.5	30694	22.32%	80.90%
7.5	16573	12.05%	92.95%
8.5	5254	3.82%	96.77%
9.5	1319	0.96%	97.73%
10.5	1032	0.75%	98.48%
11.5	1025	0.75%	99.23%
12.5	274	0.20%	99.43%
13.5	92	0.07%	99.49%
14.5	315	0.23%	99.72%
15.5	138	0.10%	99.82%
16.5	88	0.06%	99.89%
17.5	86	0.06%	99.95%
18.5	71	0.05%	100.00%
	137544		

7R 48433

Days	Count	Percent	Cumulative Percent
0.5	279	0.31%	0.31%
1.5	5345	5.99%	6.30%
2.5	7678	8.60%	14.91%
3.5	9462	10.60%	25.51%
4.5	14349	16.08%	41.59%
5.5	18248	20.45%	62.04%
6.5	18271	20.47%	82.51%
7.5	10219	11.45%	93.97%
8.5	3374	3.78%	97.75%
9.5	807	0.90%	98.65%
10.5	635	0.71%	99.36%
11.5	569	0.64%	100.00%
	89236		

7H 48433

Days	Count	Percent	Cumulative Percent
0.5	118	0.31%	0.31%
1.5	1034	2.74%	3.05%
2.5	1152	3.05%	6.10%
3.5	2954	7.82%	13.92%
4.5	5991	15.86%	29.78%
5.5	9030	23.91%	53.69%
6.5	10056	26.62%	80.31%
7.5	4925	13.04%	93.35%
8.5	1374	3.64%	96.98%
9.5	385	1.02%	98.00%
10.5	332	0.88%	98.88%
11.5	422	1.12%	100.00%
	37773		

7G 48433

Days	Count	Percent	Cumulative Percent
0.5	25	0.35%	0.35%
1.5	332	4.62%	4.97%
2.5	298	4.15%	9.11%
3.5	482	6.71%	15.82%
4.5	1005	13.98%	29.80%
5.5	1556	21.65%	51.45%
6.5	1907	26.53%	77.99%
7.5	1044	14.53%	92.51%
8.5	366	5.09%	97.61%
9.5	95	1.32%	98.93%
10.5	54	0.75%	99.68%
11.5	23	0.32%	100.00%
	7187		

7Z 48433

Days	Count	Percent	Cumulative Percent
0.5	0	0.00%	0.00%
1.5	15	2.06%	2.06%
2.5	14	1.92%	3.98%
3.5	62	8.50%	12.48%
4.5	99	13.58%	26.06%
5.5	162	22.22%	48.29%
6.5	186	25.51%	73.80%
7.5	116	15.91%	89.71%
8.5	61	8.37%	98.08%
9.5	9	1.23%	99.31%
10.5	5	0.69%	100.00%
	729		

7E 48433

Days	Count	Percent	Cumulative Percent
0.5	10	0.70%	0.70%
1.5	103	7.22%	7.92%
2.5	139	9.74%	17.66%
3.5	132	9.25%	26.91%
4.5	194	13.59%	40.50%
5.5	244	17.10%	57.60%
6.5	244	17.10%	74.70%
7.5	249	17.45%	92.15%
8.5	78	5.47%	97.62%
9.5	18	1.26%	98.88%
10.5	6	0.42%	99.30%
11.5	10	0.70%	100.00%
	1427		

SHIPPING TIME FROM HUB TO DEPOT
7R 46433

MEAN = 5.27 Days
ST DEV = 1.97 Days

SHIPPING TIME FROM HUB TO DEPOT
7E 46433

MEAN = 5.36 Days
ST DEV = 2.15 Days

Days

Frequency of Observation
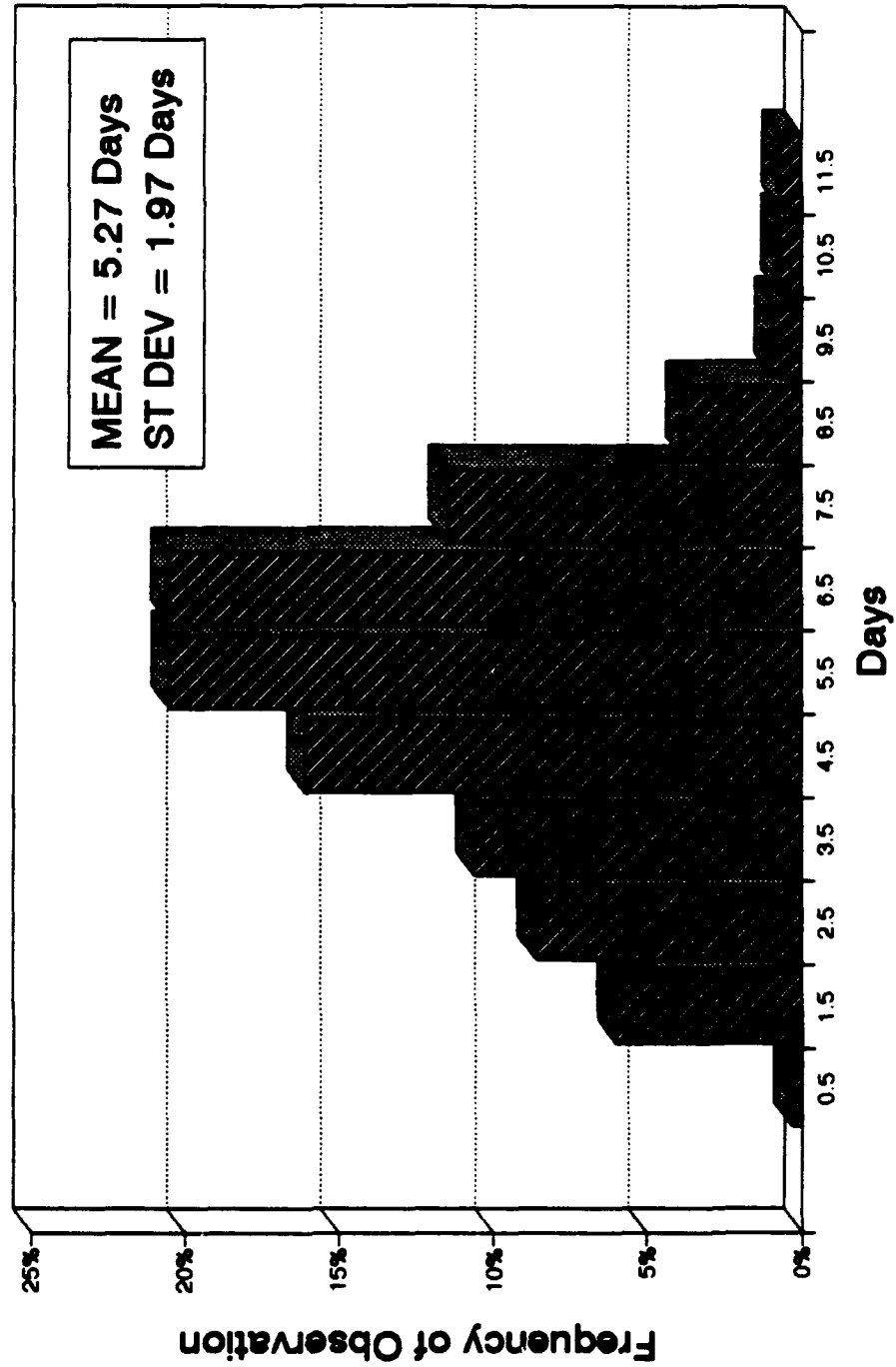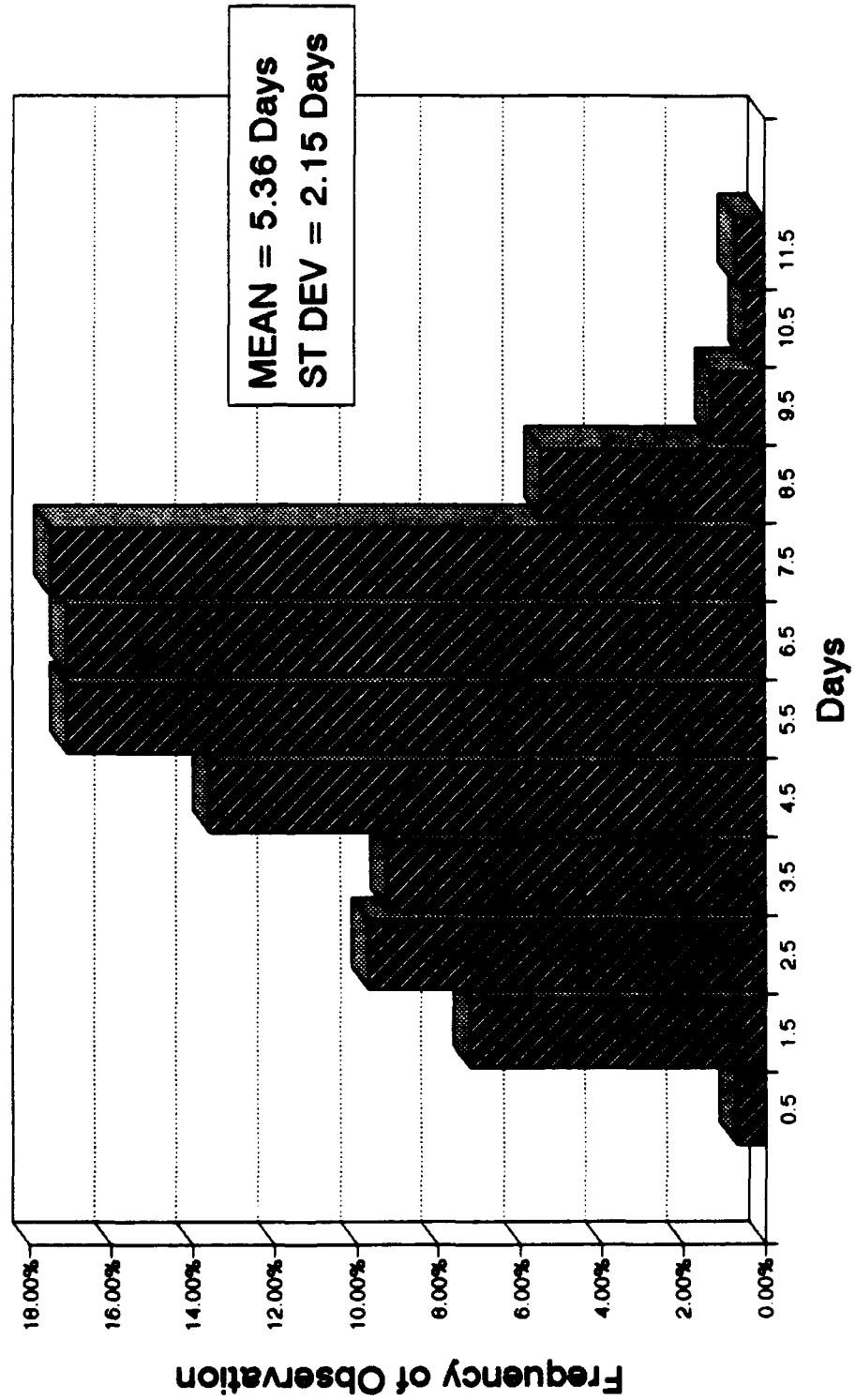
APPENDIX AE

CHI-SQUARE GOODNESS-OF-FIT TEST RESULTS
NORFOLK

SHIPPING TIMES FROM ORIGINATORS TO HUB

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Beta p<.005	Beta	.00949
		Erlang	.0118
		Exponential	.0118
		Gamma	.0143
		Triangular	.0168
		Normal	.0201
		Lognormal	.0245
		Uniform	.0323
		Weibull	.0599
7H	Beta p<.005	Beta	.0035
		Erlang	.00392
		Exponential	.00392
		Gamma	.0044
		Lognormal	.0105
		Triangular	.011
		Normal	.0155
		Uniform	.0262
		Weibull	.22
7G	Lognormal p<.005	Lognormal	.00242
		Exponential	.00376
		Erlang	.00376
		Gamma	.00412
		Beta	.0109
		Normal	.0394
		Triangular	.0477
		Uniform	.0664
		Weibull	.263
7Z	Gamma p<.005	Gamma	.0375
		Erlang	.0386
		Lognormal	.0386
		Beta	.0446
		Normal	.0526
		Triangular	.0585
		Exponential	.0592
		Uniform	.0794
		Weibull	.135

7E	Gamma p<.005	Gamma	.00484
		Beta	.00505
		Exponential	.00663
		Erlang	.00663
		Lognormal	.00779
		Triangular	.00948
		Normal	.0107
		Uniform	.018
		Weibull	.15
ALL	Beta p<.005	Beta	.00863
		Erlang	.0104
		Exponential	.0104
		Gamma	.0121
		Triangular	.0146
		Normal	.0186
		Lognormal	.0206
		Uniform	.0272
		Weibull	.121

SHIPPING TIMES FROM ORIGINATORS TO NODES

		BEST FIT DATA	
COG	BEST FIT DISTRIBUTION	Distribution	Sq Error
7R	Lognormal p<.005	Lognormal Weibull Gamma Beta Exponential Erlang Triangular Normal Uniform	.0191 .0268 .0278 .0393 .0406 .0406 .0547 .0566 .0889
7H	Beta p<.005	Beta Gamma Exponential Erlang Lognormal Triangular Normal Uniform Weibull	.0044 .00464 .00494 .00494 .00918 .0209 .0276 .0372 .0936
7G	Gamma p<.005	Gamma Exponential Erlang Beta Lognormal Normal Triangular Uniform Weibull	.00525 .00533 .00533 .00594 .00841 .0361 .0366 .058 .0948
7Z	Beta p<.005	Beta Erlang Exponential Triangular Gamma Weibull Lognormal Normal Uniform	.00953 .0126 .0126 .0149 .0152 .0152 .0215 .0262 .0271

7E	Erlang	Erlang	.00511
	p<.005	Exponential	.00511
		Gamma	.00554
		Beta	.00636
		Lognormal	.0082
		Weibull	.0168
		Triangular	.0189
		Normal	.0194
		Uniform	.0233
ALL	Erlang	Erlang	.0102
	p<.005	Exponential	.0102
		Gamma	.0111
		Beta	.0129
		Lognormal	.0141
		Weibull	.0454
		Normal	.0493
		Triangular	.0507
		Uniform	.0732

NODE PROCESSING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.00123
		Erlang	.0115
		Gamma	.0118
		Exponential	.0124
		Beta	.0193
		Normal	.124
		Weibull	.126
		Triangular	.42
		Uniform	.53
7H	Lognormal p<.005	Lognormal	.00096
		Beta	.00915
		Gamma	.0111
		Erlang	.0126
		Exponential	.0201
		Normal	.136
		Weibull	.235
		Triangular	.495
		Uniform	.602
7G	Lognormal p<.005	Lognormal	.00189
		Erlang	.00215
		Gamma	.00309
		Exponential	.00817
		Beta	.0101
		Weibull	.0103
		Normal	.107
		Triangular	.42
		Uniform	.543
7Z	Exponential p<.005	Exponential	.000643
		Beta	.0016
		Normal	.00517
		Weibull	.00707
		Erlang	.0196
		Gamma	.0202
		Lognormal	.0255
		Triangular	.434
		Uniform	.565

7E	Gamma p<.005	Gamma	.00307
		Erlang	.000326
		Exponential	.00395
		Lognormal	.00516
		Beta	.00602
		Weibull	.0281
		Normal	.0617
		Triangular	.402
		Uniform	.531
ALL	Erlang p<.005	Erlang	.00161
		Gamma	.00163
		Exponential	.00177
		Beta	.00371
		Lognormal	.00829
		Normal	.0491
		Weibull	.139
		Triangular	.389
		Uniform	.517

SHIPPING TIMES FROM NODES TO HUB

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Gamma p<.005	Gamma	.0374
		Erlang	.0375
		Weibull	.0388
		Beta	.0402
		Lognormal	.0403
		Normal	.0406
		Triangular	.0483
		Exponential	.0729
		Uniform	.0755
7H	Beta p<.005	Beta	.00968
		Erlang	.0102
		Gamma	.0105
		Weibull	.0125
		Lognormal	.0127
		Triangular	.0155
		Normal	.0178
		Exponential	.058
		Uniform	.0673
7G	Erlang p<.005	Erlang	.0114
		Gamma	.0114
		Beta	.0116
		Lognormal	.0133
		Triangular	.0154
		Weibull	.0198
		Normal	.0201
		Exponential	.057
		Uniform	.065
7Z	Triangular p<.005	Triangular	.0138
		Beta	.0166
		Gamma	.0179
		Weibull	.0181
		Lognormal	.0187
		Erlang	.021
		Normal	.0264
		Exponential	.0514
		Uniform	.0553

7E	Erlang p<.005		Erlang	.00698
			Gamma	.00699
			Beta	.00793
			Weibull	.0088
			Lognormal	.0105
			Normal	.0163
			Exponential	.0527
			Triangular	.0539
			Uniform	.0864
ALL	Gamma p<.005		Gamma	.00562
			Erlang	.00571
			Beta	.00576
			Lognormal	.00949
			Weibull	.0104
			Normal	.0117
			Triangular	.037
			Exponential	.0479
			Uniform	.0716

HUB IN-PROCESSING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.0204
		Gamma	.033
		Erlang	.0331
		Beta	.044
		Normal	.0758
		Exponential	.0768
		Triangular	.0941
		Weibull	.0948
		Uniform	.152
7H	Lognormal p<.005	Lognormal	.0202
		Erlang	.0308
		Gamma	.0308
		Beta	.041
		Exponential	.065
		Normal	.0704
		Triangular	.0776
		Weibull	.09
		Uniform	.13
7G	Lognormal p<.005	Lognormal	.0152
		Erlang	.0233
		Gamma	.0234
		Beta	.0323
		Exponential	.0578
		Normal	.0597
		Triangular	.0727
		Weibull	.0844
		Uniform	.126
7Z	Erlang p<.005	Erlang	.102
		Lognormal	.107
		Gamma	.107
		Weibull	.127
		Beta	.144
		Normal	.147
		Triangular	.173
		Exponential	.26
		Uniform	.278

7E	Lognormal p<.005	Lognormal	.0144
		Gamma	.0236
		Erlang	.024
		Weibull	.0284
		Beta	.0367
		Exponential	.05
		Normal	.0655
		Triangular	.0716
		Uniform	.116
ALL	Lognormal p<.005	Lognormal	.0197
		Gamma	.0311
		Erlang	.0313
		Weibull	.0383
		Beta	.0506
		Exponential	.0635
		Triangular	.0719
		Normal	.0729
		Uniform	.115

GOVT SCREENING TIMES

		BEST FIT DATA	
COG	**BEST FIT DISTRIBUTION**	**Distribution**	**Sq Error**
7R	Lognormal p<.005	Lognormal	.0403
		Erlang	.0405
		Gamma	.0405
		Beta	.0423
		Triangular	.0474
		Normal	.0476
		Weibull	.0507
		Exponential	.0622
		Uniform	.0711
7H	Lognormal p<.005	Lognormal	.00368
		Erlang	.00433
		Gamma	.00433
		Beta	.00766
		Normal	.0164
		Weibull	.0208
		Triangular	.0239
		Exponential	.0389
		Uniform	.0564
7G	Lognormal p<.005	Lognormal	.00329
		Erlang	.00349
		Gamma	.00351
		Weibull	.00629
		Beta	.00759
		Triangular	.0109
		Normal	.0132
		Exponential	.0394
		Uniform	.0444
7Z	Lognormal p<.005	Lognormal	.0387
		Gamma	.0403
		Erlang	.0404
		Weibull	.0426
		Beta	.0439
		Exponential	.0501
		Triangular	.0523
		Normal	.053
		Uniform	.073

7E	Erlang p<.005	Erlang Gamma Lognormal Beta Normal Weibull Triangular Exponential Uniform	.0404 .0405 .041 .0427 .0477 .0486 .0503 .0617 .0719
ALL	Beta p<.005	Beta Gamma Erlang Weibull Lognormal Normal Triangular Uniform Exponential	.00799 .0108 .0112 .0117 .0124 .014 .0198 .0271 .0725

HUB CONSOLIDATION AND PACKING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.00272
		Erlang	.00797
		Exponential	.00844
		Gamma	.0089
		Beta	.00996
		Weibull	.022
		Normal	.0863
		Triangular	.201
		Uniform	.312
7H	Lognormal p<.005	Lognormal	.00639
		Erlang	.00918
		Gamma	.00925
		Beta	.0161
		Exponential	.0212
		Normal	.0694
		Triangular	.157
		Weibull	.164
		Uniform	.26
7G	Lognormal p<.005	Lognormal	.00595
		Erlang	.0081
		Gamma	.00824
		Beta	.0153
		Exponential	.0209
		Weibull	.0304
		Normal	.0641
		Triangular	.127
		Uniform	.236
7Z	Lognormal p<.005	Lognormal	.00367
		Exponential	.0083
		Beta	.0118
		Weibull	.0119
		Gamma	.012
		Erlang	.0149
		Normal	.0938
		Triangular	.133
		Uniform	.232

7E	Erlang		Erlang	.00715
	p<.005		Gamma	.00744
			Weibull	.00905
			Lognormal	.0117
			Beta	.0169
			Exponential	.0173
			Normal	.0676
			Triangular	.116
			Uniform	.229
ALL	Lognormal		Lognormal	.00364
	p<.005		Erlang	.00899
			Gamma	.00926
			Beta	.0112
			Exponential	.0114
			Weibull	.0579
			Normal	.0835
			Triangular	.196
			Uniform	.298

TOTAL TIME AT HUB

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.00788
		Gamma	.00892
		Erlang	.00892
		Weibull	.00997
		Beta	.014
		Normal	.0206
		Triangular	.0209
		Exponential	.0401
		Uniform	.0453
7H	Lognormal p<.005	Lognormal	.0128
		Erlang	.0148
		Gamma	.015
		Beta	.0185
		Triangular	.0268
		Normal	.0282
		Exponential	.0296
		Weibull	.0315
		Uniform	.0467
7G	Gamma p<.005	Gamma	.00934
		Erlang	.0101
		Lognormal	.0103
		Weibull	.0138
		Beta	.0146
		Triangular	.0159
		Normal	.0204
		Exponential	.0307
		Uniform	.037
7Z	Lognormal p<.005	Lognormal	.0103
		Gamma	.0142
		Erlang	.0144
		Beta	.0186
		Weibull	.0237
		Exponential	.0252
		Triangular	.0276
		Normal	.029
		Uniform	.0445

7E	Erlang p<.005	Erlang	.0269
		Gamma	.0272
		Beta	.0286
		Normal	.0301
		Triangular	.0315
		Lognormal	.0322
		Uniform	.0392
		Weibull	.0395
		Exponential	.0438
ALL	Gamma p<.005	Gamma	.0257
		Erlang	.0268
		Beta	.0274
		Normal	.0284
		Triangular	.0285
		Lognormal	.0306
		Uniform	.0366
		Weibull	.043
		Exponential	.0437

SHIPPING TIMES FROM HUB TO DEPOTS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Normal p<.005	Normal	.00787
		Beta	.0101
		Weibull	.0108
		Erlang	.0173
		Gamma	.0175
		Lognormal	.0253
		Triangular	.0415
		Uniform	.0927
		Exponential	.12
7H	Normal p<.005	Normal	.00463
		Beta	.00518
		Gamma	.0131
		Erlang	.0133
		Weibull	.0178
		Lognormal	.0203
		Triangular	.0253
		Uniform	.0937
		Exponential	.133
7G	Normal p<.005	Normal	.00907
		Beta	.00927
		Weibull	.0182
		Gamma	.0219
		Erlang	.0225
		Triangular	.0299
		Lognormal	.0313
		Uniform	.102
		Exponential	.151
7Z	Normal p<.005	Normal	.004
		Beta	.00481
		Gamma	.0075
		Erlang	.00773
		Lognormal	.0112
		Weibull	.0147
		Triangular	.0546
		Uniform	.137
		Exponential	.183

7E	Normal p<.005	Normal	.0273
		Triangular	.0381
		Beta	.0394
		Gamma	.0569
		Erlang	.0589
		Weibull	.0681
		Lognormal	.0785
		Uniform	.0952
		Exponential	.127
ALL	Weibull p<.005	Weibull	.0442
		Erlang	.0458
		Gamma	.0464
		Beta	.0471
		Triangular	.0479
		Lognormal	.0496
		Normal	.0524
		Uniform	.0902
		Exponential	.11

DIRECT ARRIVALS FROM ORIGINATORS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Normal p<.00643	Normal	.00714
		Beta	.00753
		Weibull	.00865
		Erlang	.0151
		Gamma	.0152
		Triangular	.0209
		Lognormal	.0526
		Uniform	.0658
		Exponential	.0741
7H	Erlang p<.005	Erlang	.00994
		Beta	.0105
		Weibull	.0124
		Gamma	.0148
		Normal	.0156
		Triangular	.0529
		Lognormal	.0553
		Exponential	.0864
		Uniform	.111
7G	Gamma p<.005	Gamma	.00848
		Weibull	.0101
		Beta	.0118
		Erlang	.014
		Normal	.0192
		Lognormal	.0378
		Triangular	.0663
		Exponential	.0728
		Uniform	.116
7Z	Beta p<.0242	Beta	.00464
		Weibull	.00506
		Gamma	.067
		Erlang	.0719
		Exponential	.0719
		Lognormal	.0727
		Normal	.37
		Triangular	.453
		Uniform	.497

7E	Normal p<.0817	Normal	.00374
		Weibull	.00376
		Beta	.00415
		Gamma	.00503
		Erlang	.00555
		Lognormal	.0103
		Exponential	.0167
		Triangular	.0211
		Poisson	.0248
		Uniform	.0328
ALL	Normal p<.177	Normal	.00467
		Beta	.00846
		Weibull	.0116
		Triangular	.0217
		Erlang	.0268
		Gamma	.0272
		Uniform	.0579
		Lognormal	.0684
		Exponential	.0785

ARRIVALS FROM NODES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Weibull p<.154	Weibull	.00317
		Gamma	.00407
		Erlang	.00824
		Exponential	.00824
		Beta	.00846
		Lognormal	.0217
		Normal	.0255
		Triangular	.0341
		Uniform	.0651
7H	Beta p<.366	Beta	.00266
		Erlang	.00519
		Exponential	.00519
		Gamma	.00989
		Weibull	.0129
		Lognormal	.0384
		Normal	.0486
		Triangular	.0669
		Uniform	.118
7G	Beta p<.745	Beta	.00231
		Gamma	.00301
		Weibull	.00311
		Erlang	.00317
		Exponential	.00317
		Lognormal	.00732
		Triangular	.0102
		Normal	.0115
		Uniform	.0188
		Poisson	.0569
7?	Beta p<.005	Beta	.00616
		Weibull	.0111
		Exponential	.0144
		Erlang	.0144
		Lognormal	.0177
		Gamma	.0185
		Normal	.116
		Poisson	.12
		Triangular	.185
		Uniform	.217

7E	Erlang p<.23		Erlang	.00295
			Exponential	.00295
			Weibull	.00359
			Beta	.00438
			Gamma	.00468
			Lognormal	.0084
			Normal	.0409
			Triangular	.0534
			Poisson	.0742
			Uniform	.0906
ALL	Beta p<.386		Beta	.00279
			Weibull	.0033
			Gamma	.00572
			Erlang	.00789
			Exponential	.00789
			Normal	.0227
			Triangular	.0266
			Lognormal	.037
			Uniform	.073

ALL ARRIVALS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Beta p<.005	Beta	.0101
		Normal	.0102
		Weibull	.0133
		Gamma	.0241
		Triangular	.026
		Erlang	.0268
		Uniform	.068
		Exponential	.0687
		Lognormal	.0761
7H	Beta p<.005	Beta	.0115
		Normal	.0146
		Weibull	.0161
		Erlang	.0242
		Gamma	.0285
		Triangular	.0455
		Exponential	.0705
		Uniform	.0798
		Lognormal	.0939
7G	Erlang p<.224	Erlang	.0025
		Gamma	.00453
		Weibull	.008
		Beta	.00846
		Normal	.0191
		Lognormal	.0282
		Triangular	.052
		Exponential	.0723
		Uniform	.105
7Z	Weibull p<.0267	Weibull	.00511
		Beta	.00926
		Lognormal	.0353
		Gamma	.0407
		Exponential	.0564
		Erlang	.0564
		Normal	.313
		Triangular	.388
		Uniform	.434

280

7E	Beta	Beta	.00326
	p<.581	Weibull	.0033
		Erlang	.00384
		Normal	.00391
		Gamma	.00401
		Lognormal	.00688
		Exponential	.0158
		Triangular	.017
		Poisson	.0228
		Uniform	.0251
ALL	Normal	Normal	.00638
	p<.0216	Beta	.00766
		Weibull	.00929
		Erlang	.0175
		Gamma	.0181
		Triangular	.0215
		Lognormal	.0588
		Uniform	.0614
		Exponential	.0735

APPENDIX AF

CHI-SQUARE GOODNESS-OF-FIT TEST RESULTS
SAN DIEGO

SHIPPING TIMES FROM ORIGINATORS TO HUB

		BEST FIT DATA	
COG	**BEST FIT DISTRIBUTION**	**Distribution**	**Sq Error**
7R	Beta p<.005	Beta	.0124
		Erlang	.0154
		Exponential	.0154
		Gamma	.018
		Lognormal	.0249
		Triangular	.0324
		Normal	.0373
		Uniform	.0494
		Weibull	.0856
7H	Lognormal p<.005	Lognormal	.0142
		Gamma	.0217
		Erlang	.0218
		Exponential	.0218
		Beta	.0284
		Triangular	.0337
		Normal	.0423
		Weibull	.0457
		Uniform	.0485
7G	Beta p<.005	Beta	.00703
		Erlang	.00824
		Exponential	.00824
		Gamma	.0905
		Triangular	.0108
		Lognormal	.0156
		Normal	.0181
		Uniform	.0248
		Weibull	.034
7Z	Gamma p<.005	Gamma	.0607
		Beta	.0617
		Exponential	.062
		Erlang	.062
		Lognormal	.0674
		Weibull	.0887
		Normal	.101
		Triangular	.11
		Uniform	.121

7E	Gamma p<.005	Gamma	.015
		Beta	.0167
		Exponential	.0169
		Erlang	.0169
		Lognormal	.0176
		Normal	.0223
		Triangular	.0262
		Uniform	.0275
		Weibull	.0695
ALL	Beta p<.005	Beta	.00618
		Gamma	.00803
		Exponential	.00918
		Erlang	.00918
		Lognormal	.0134
		Triangular	.0363
		Normal	.0399
		Uniform	.0548
		Weibull	.0571

SHIPPING TIMES FROM ORIGINATORS TO NODES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.00579
		Gamma	.0127
		Erlang	.018
		Exponential	.018
		Beta	.0194
		Triangular	.0315
		Normal	.0322
		Weibull	.0333
		Uniform	.05
7H	Beta p<.005	Beta	.0071
		Gamma	.00878
		Exponential	.0103
		Erlang	.0103
		Lognormal	.014
		Triangular	.0265
		Normal	.034
		Uniform	.0413
		Weibull	.0868
7G	Lognormal p<.005	Lognormal	.0117
		Gamma	.0152
		Weibull	.0157
		Exponential	.0168
		Erlang	.0168
		Beta	.0234
		Triangular	.0314
		Normal	.0409
		Uniform	.0515
7Z	Lognormal p<.005	Lognormal	.0139
		Beta	.0167
		Gamma	.0183
		Erlang	.0348
		Exponential	.0348
		Weibull	.0429
		Triangular	.0573
		Normal	.0692
		Uniform	.0694

7E	Lognormal	Lognormal	.0282
	p<.005	Gamma	.0284
		Erlang	.0289
		Exponential	.0365
		Beta	.0365
		Triangular	.0397
		Normal	.0427
		Uniform	.054
		Weibull	.0893
ALL	Erlang	Erlang	.00569
	p<.005	Exponential	.00569
		Gamma	.00571
		Beta	.00754
		Lognormal	.00872
		Triangular	.033
		Normal	.0355
		Weibull	.0361
		Uniform	.0533

NODE PROCESSING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Erlang p<.005	Erlang	.0691
		Lognormal	.0694
		Gamma	.0717
		Beta	.0734
		Normal	.109
		Weibull	.134
		Triangular	.189
		Exponential	.196
		Uniform	.274
7H	Lognormal p<.005	Lognormal	.0424
		Gamma	.0428
		Erlang	.0504
		Beta	.0528
		Normal	.0794
		Weibull	.0908
		Exponential	.105
		Triangular	.173
		Uniform	.221
7G	Gamma p<.005	Gamma	.0509
		Erlang	.0516
		Lognormal	.0586
		Weibull	.0656
		Beta	.0675
		Normal	.0806
		Exponential	.108
		Triangular	.145
		Uniform	.187
7Z	Erlang p<.005	Erlang	.04
		Gamma	.0407
		Weibull	.0455
		Lognormal	.047
		Beta	.0589
		Normal	.0727
		Exponential	.0921
		Triangular	.128
		Uniform	.165

7E	Lognormal p<.C		Lognormal	.116
			Gamma	.122
			Erlang	.134
			Beta	.164
			Normal	.174
			Triangular	.194
			Weibull	.214
			Exponential	.316
			Uniform	.319
ALL	Erlang p<.005		Erlang	.0528
			Beta	.0539
			Lognormal	.0583
			Gamma	.0595
			Normal	.0955
			Weibull	.108
			Exponential	.156
			Triangular	.203
			Uniform	.271

SHIPPING TIMES FROM NODES TO HUB

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.0106
		Gamma	.0106
		Erlang	.0116
		Beta	.0136
		Weibull	.0147
		Normal	.025
		Triangular	.039
		Exponential	.047
		Uniform	.0811
7H	Erlang p<.005	Erlang	.0114
		Gamma	.0115
		Lognormal	.0133
		Beta	.0134
		Weibull	.0234
		Normal	.0241
		Triangular	.0329
		Exponential	.0388
		Uniform	.0703
7G	Gamma p<.005	Gamma	.00711
		Erlang	.00754
		Beta	.00967
		Weibull	.00972
		Lognormal	.0102
		Normal	.0142
		Triangular	.0229
		Exponential	.0385
		Uniform	.0409
7Z	Beta p<.005	Beta	.0271
		Erlang	.0503
		Exponential	.0503
		Weibull	.0561
		Gamma	.0567
		Lognormal	.0608
		Triangular	.092
		Normal	.111
		Uniform	.113

7E	Beta p<.005	Beta	.0195
		Weibull	.0204
		Normal	.0214
		Gamma	.0222
		Erlang	.0222
		Lognormal	.0273
		Triangular	.052
		Uniform	.0802
		Exponential	.081
ALL	Gamma p<.005	Gamma	.0105
		Erlang	.0108
		Lognormal	.0119
		Beta	.0134
		Weibull	.0159
		Normal	.0243
		Triangular	.0349
		Exponential	.0421
		Uniform	.0745

HUB IN-PROCESSING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.0971
		Erlang	.115
		Gamma	.116
		Beta	.14
		Normal	.184
		Triangular	.234
		Weibull	.248
		Exponential	.327
		Uniform	.359
7H	Lognormal p<.005	Lognormal	.10
		Erlang	.115
		Gamma	.12
		Beta	.144
		Normal	.188
		Weibull	.218
		Triangular	.224
		Exponential	.312
		Uniform	.343
7G	Lognormal p<.005	Lognormal	.113
		Gamma	.122
		Erlang	.128
		Beta	.175
		Normal	.178
		Triangular	.183
		Weibull	.205
		Exponential	.3
		Uniform	.3
7Z	Lognormal p<.005	Lognormal	.114
		Gamma	.13
		Erlang	.137
		Weibull	.16
		Triangular	.178
		Beta	.184
		Normal	.194
		Uniform	.294
		Exponential	.304

7E	Erlang p<.005	Erlang	.102
		Lognormal	.107
		Gamma	.107
		Weibull	.127
		Beta	.144
		Normal	.147
		Triangular	.173
		Exponential	.26
		Uniform	.278
ALL	Lognormal p<.005	Lognormal	.0984
		Erlang	.114
		Gamma	.118
		Beta	.142
		Normal	.186
		Weibull	.215
		Triangular	.228
		Exponential	.317
		Uniform	.35

GOVT SCREENING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Erlang p<.005	Erlang	.019
		Gamma	.019
		Lognormal	.0198
		Beta	.0203
		Normal	.0257
		Weibull	.0282
		Exponential	.0428
		Triangular	.0463
		Uniform	.0588
7H	Gamma p<.005	Gamma	.0234
		Beta	.0239
		Erlang	.024
		Lognormal	.0251
		Normal	.0286
		Triangular	.0346
		Exponential	.0403
		Weibull	.0437
		Uniform	.0557
7G	Triangular p<.005	Triangular	.0272
		Erlang	.0276
		Gamma	.0277
		Beta	.0285
		Lognormal	.0293
		Normal	.0306
		Weibull	.0333
		Uniform	.0457
		Exponential	.0497
7Z	Gamma p<.005	Gamma	.00374
		Erlang	.0039
		Triangular	.00557
		Beta	.00558
		Lognormal	.00612
		Normal	.00946
		Weibull	.0102
		Uniform	.0308
		Exponential	.0316

7E	Gamma p<.005	Gamma	.0405
		Erlang	.0405
		Beta	.0416
		Lognormal	.0418
		Normal	.0445
		Triangular	.0464
		Weibull	.0511
		Exponential	.0588
		Uniform	.062
ALL	Gamma p<.005	Gamma	.0177
		Erlang	.018
		Beta	.0184
		Weibull	.0201
		Lognormal	.0215
		Normal	.0227
		Exponential	.0379
		Triangular	.0434
		Uniform	.0575

HUB CONSOLIDATION AND PACKING TIMES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Erlang p<.005	Erlang	.0372
		Lognormal	.0419
		Gamma	.0434
		Beta	.0519
		Normal	.0784
		Exponential	.131
		Weibull	.143
		Triangular	.148
		Uniform	.217
7H	Lognormal p<.005	Lognormal	.0827
		Gamma	.095
		Erlang	.101
		Triangular	.134
		Weibull	.134
		Beta	.139
		Normal	.149
		Uniform	.246
		Exponential	.259
7G	Lognormal p<.005	Lognormal	.0807
		Gamma	.0884
		Erlang	.0944
		Weibull	.126
		Beta	.136
		Normal	.138
		Triangular	.139
		Uniform	.255
		Exponential	.259
7Z	Gamma p<.005	Gamma	.0584
		Lognormal	.0662
		Erlang	.0693
		Beta	.0782
		Weibull	.0797
		Normal	.0821
		Triangular	.127
		Exponential	.147
		Uniform	.195

7E	Lognormal p<.005	Lognormal	.0879
		Gamma	.0937
		Erlang	.102
		Beta	.137
		Normal	.141
		Triangular	.153
		Weibull	.167
		Uniform	.273
		Exponential	.275
ALL	Lognormal p<.005	Lognormal	.0515
		Erlang	.0535
		Gamma	.0572
		Beta	.0759
		Normal	.0985
		Weibull	.104
		Triangular	.144
		Exponential	.167
		Uniform	.228

TOTAL TIME AT HUB

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Lognormal p<.005	Lognormal	.0226
		Erlang	.0233
		Gamma	.0233
		Beta	.0258
		Normal	.03
		Weibull	.0319
		Triangular	.0416
		Exponential	.0556
		Uniform	.0616
7H	Lognormal p<.005	Lognormal	.0235
		Gamma	.024
		Erlang	.0245
		Beta	.0268
		Normal	.0303
		Triangular	.0381
		Exponential	.0571
		Uniform	.0601
		Weibull	.0767
7G	Gamma p<.005	Gamma	.0287
		Erlang	.0296
		Lognormal	.0307
		Beta	.0312
		Weibull	.032
		Triangular	.0322
		Normal	.0324
		Uniform	.0525
		Exponential	.0558
7Z	Lognormal p<.005	Lognormal	.0231
		Gamma	.0234
		Erlang	.0239
		Triangular	.026
		Beta	.0268
		Normal	.03
		Weibull	.0318
		Uniform	.0499
		Exponential	.0512

7E	Erlang p<.005	Erlang	.0373
		Gamma	.0374
		Beta	.0381
		Lognormal	.0396
		Normal	.0408
		Triangular	.0439
		Exponential	.0561
		Weibull	.0573
		Uniform	.0605
ALL	Lognormal p<.005	Lognormal	.0226
		Gamma	.0232
		Erlang	.0232
		Beta	.0251
		Normal	.0296
		Triangular	.0405
		Weibull	.0409
		Exponential	.0556
		Uniform	.0609

SHIPPING TIMES FROM HUB TO DEPOTS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Normal p<.005	Normal	.00428
		Beta	.00806
		Erlang	.0152
		Gamma	.0157
		Weibull	.0249
		Lognormal	.025
		Triangular	.0342
		Uniform	.0743
		Exponential	.09
7H	Beta p<.005	Beta	.00453
		Normal	.00707
		Gamma	.0184
		Erlang	.02
		Lognormal	.0286
		Triangular	.0475
		Weibull	.0724
		Uniform	.102
		Exponential	.13
7G	Normal p<.005	Normal	.0088
		Beta	.0126
		Weibull	.0195
		Gamma	.0266
		Erlang	.0266
		Triangular	.0301
		Lognormal	.0397
		Uniform	.0854
		Exponential	.119
7Z	Triangular p<.005	Triangular	.045
		Beta	.0487
		Weibull	.0518
		Erlang	.0528
		Gamma	.0531
		Lognormal	.0558
		Normal	.056
		Uniform	.0826
		Exponential	.118

7E	Normal p<.005	Normal	.00854
		Beta	.00897
		Triangular	.0166
		Gamma	.0199
		Erlang	.0199
		Lognormal	.029
		Weibull	.0327
		Uniform	.0506
		Exponential	.0768
ALL	Normal p<.005	Normal	.00517
		Beta	.00762
		Gamma	.018
		Erlang	.0184
		Lognormal	.0281
		Weibull	.0306
		Triangular	.0366
		Uniform	.0822
		Exponential	.101

DIRECT ARRIVALS FROM ORIGINATORS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Normal	Normal	.0035
	p<.607	Beta	.00741
		Weibull	.0108
		Triangular	.0189
		Gamma	.0294
		Erlang	.031
		Uniform	.0618
		Lognormal	.0666
		Exponential	.0791
7H	Erlang	Erlang	.0124
	p<.005	Gamma	.0192
		Weibull	.0217
		Beta	.0276
		Normal	.0464
		Exponential	.0615
		Lognormal	.0657
		Triangular	.083
		Uniform	.138
7G	Erlang	Erlang	.00161
	p<.524	Beta	.00384
		Gamma	.00404
		Weibull	.00449
		Normal	.011
		Lognormal	.0272
		Exponential	.0716
		Triangular	.0749
		Uniform	.123
7Z	Weibull	Weibull	.00538
	p<.00984	Gamma	.00555
		Beta	.00575
		Lognormal	.0058
		Exponential	.00814
		Erlang	.00814
		Normal	.026
		Triangular	.0284
		Uniform	.039
		Poisson	.092

7E	Weibull	Weibull	.00329
	p<.005	Exponential	.00335
		Erlang	.00335
		Beta	.00829
		Gamma	.0101
		Lognormal	.0427
		Normal	.241
		Triangular	.598
		Uniform	.647
ALL	Normal	Normal	.0124
	p<.005	Beta	.0179
		Weibull	.0215
		Triangular	.0234
		Gamma	.0417
		Erlang	.0425
		Uniform	.063
		Lognormal	.0789
		Exponential	.0853

ARRIVALS FROM NODES

COG	BEST FIT DISTRIBUTION	BEST FIT DATA	
		Distribution	Sq Error
7R	Normal p<.00702	Normal	.00605
		Beta	.0063
		Weibull	.00797
		Erlang	.0105
		Triangular	.0119
		Gamma	.0128
		Uniform	.0252
		Exponential	.0253
		Lognormal	.0344
7H	Beta p<.75	Beta	.00122
		Weibull	.00292
		Gamma	.00749
		Normal	.00881
		Exponential	.0193
		Erlang	.0193
		Triangular	.024
		Lognormal	.0439
		Uniform	.0635
7G	Beta p<.0279	Beta	.0058
		Weibull	.00799
		Exponential	.00854
		Erlang	.00854
		Gamma	.0104
		Normal	.0247
		Triangular	.0281
		Lognormal	.046
		Uniform	.0706
7Z	Beta p<.005	Beta	.00583
		Weibull	.00932
		Gamma	.0124
		Lognormal	.0153
		Exponential	.0279
		Erlang	.0279
		Normal	.0728
		Triangular	.0876
		Uniform	.101
		Poisson	.142

7E	Lognormal p<.719	Lognormal	.00112
		Weibull	.00509
		Gamma	.00528
		Exponential	.00611
		Erlang	.00611
		Beta	.0162
		Normal	.0649
		Triangular	.0946
		Uniform	.107
		Poisson	.109
ALL	Normal p<.032	Normal	.00586
		Beta	.00827
		Weibull	.0109
		Triangular	.0127
		Erlang	.015
		Gamma	.0175
		Exponential	.0317
		Uniform	.0358
		Lognormal	.0388

ALL ARRIVALS

COG	BEST FIT DISTRIBUTION	BEST FIT DATA Distribution	Sq Error
7R	Normal p<.005	Normal Beta Triangular Weibull Erlang Gamma Uniform Lognormal Exponential	.00841 .0136 .014 .0174 .0361 .0383 .0484 .07 .0735
7H	Beta p<.005	Beta Normal Weibull Erlang Gamma Triangular Exponential Uniform Lognormal	.0172 .02 .0248 .0261 .0405 .0782 .0851 .115 .125
7G	Beta p<.005	Beta Weibull Erlang Gamma Normal Triangular Exponential Lognormal Uniform	.00807 .0101 .0108 .0151 .0171 .052 .0663 .0796 .102
7Z	Beta p<.106	Beta Weibull Exponential Erlang Gamma Normal Triangular Lognormal Uniform	.004 .00666 .00839 .00839 .011 .0256 .0553 .0588 .0902

7E	Beta	Beta	.00418
	p<.005	Lognormal	.0113
		Exponential	.0118
		Erlang	.0118
		Gamma	.0138
		Weibull	.0151
		Normal	.199
		Triangular	.54
		Uniform	.612
ALL	Normal	Normal	.00794
	p<.0603	Beta	.0127
		Weibull	.0155
		Triangular	.0168
		Gamma	.0368
		Erlang	.0377
		Uniform	.0517
		Lognormal	.0733
		Exponential	.0787

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