EFFECTS OF FACILITY CONFIGURATIONS AND SCHEDULING TECHNIQUES ON AIRCRAFT THROUGHPUT FOR WARNER ROBINS ALC PAINT/DEPAINT FACILITIES

THESIS

David V. McELveen, Captain, USAF

AFT/GCE/ENS/92M-19

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DEPARTMENT OF THE AIR FORCE
AIR UNIVERSITY
AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio
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THESIS

Presented to the Faculty of the School of Engineering of the Air Force Institute of Technology Air University In partial Fulfillment of the Requirements for the Degree of Master of Science in Operations Research

David V. McElveen, B.S.
Captain, USAF

March 1992

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THESIS APPROVAL

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<thead>
<tr>
<th>NAME/DEPARTMENT</th>
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<tbody>
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</tbody>
</table>
Preface

The objective of this research was to determine the effects of configuration options and scheduling techniques on aircraft throughput on Warner Robins ALC paint/depaint facilities. This was accomplished by means of several computer simulation models with data collected from WR-ALC "field experts." The idea for this research came as a result of an simulation studies course at AFIT during the Summer of 1991, in which the WR-ALC C-141 maintenance system was investigated.

I wish to acknowledge those people that have provided assistance and guidance in preparing this thesis. First, a word of thanks to my advisors, Captains John Borsi and Wendell Simpson for their time and support throughout this research effort. Also, I would like to thank all those people at WR-ALC - In particular, Capt Dale Colter, Col Scoskie, and Denise Yawn - for providing all the data, providing the opportunity to tackle this real-world problem, and showing a genuine interest in the results. I would like to express my deepest gratitude to my wife, Darbie, for her sacrifices, far to many to mention here, continued support, and for providing assistance throughout this research.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>ii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>vi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>vii</td>
</tr>
<tr>
<td>Abstract</td>
<td>x</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.1 Background</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Paint/Depaint Operations</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Paint/Depaint Facility Configurations</td>
<td>6</td>
</tr>
<tr>
<td>1.4 Dispatching Rules</td>
<td>7</td>
</tr>
<tr>
<td>1.5 Preemption</td>
<td>9</td>
</tr>
<tr>
<td>1.6 Specific Objective</td>
<td>9</td>
</tr>
<tr>
<td>1.7 Sub-Objectives</td>
<td>9</td>
</tr>
<tr>
<td>1.8 Plan of the Report</td>
<td>10</td>
</tr>
<tr>
<td>2. Literature Review</td>
<td>11</td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>11</td>
</tr>
<tr>
<td>2.2 Scheduling Theory</td>
<td>11</td>
</tr>
<tr>
<td>2.2.1 Flow Shop versus Job Shop</td>
<td>12</td>
</tr>
<tr>
<td>2.2.2 Arrival Process</td>
<td>12</td>
</tr>
<tr>
<td>2.2.3 Basic Model</td>
<td>14</td>
</tr>
<tr>
<td>2.2.4 Multiprocessor (Parallel Machine) Shop</td>
<td>15</td>
</tr>
<tr>
<td>2.2.5 Preemption Techniques</td>
<td>16</td>
</tr>
<tr>
<td>2.2.6 Resource Constraints</td>
<td>17</td>
</tr>
<tr>
<td>2.2.7 Dispatching Rules</td>
<td>18</td>
</tr>
<tr>
<td>2.3 Simulation</td>
<td>20</td>
</tr>
<tr>
<td>2.4 Chapter Summary</td>
<td>21</td>
</tr>
<tr>
<td>3. Model Formulation</td>
<td>23</td>
</tr>
<tr>
<td>3.1 Simulation Language</td>
<td>24</td>
</tr>
<tr>
<td>3.2 Aircraft Flow</td>
<td>24</td>
</tr>
<tr>
<td>3.2.1 C-141 Aircraft Maintenance Flow</td>
<td>25</td>
</tr>
<tr>
<td>3.2.2 C-130 Aircraft Maintenance Flow</td>
<td>27</td>
</tr>
<tr>
<td>3.3 Description of Simulation Model</td>
<td>29</td>
</tr>
<tr>
<td>3.3.1 System Constraints</td>
<td>29</td>
</tr>
<tr>
<td>3.3.1.1 Facility Constraints</td>
<td>30</td>
</tr>
<tr>
<td>3.3.1.2 MOG Constraints</td>
<td>30</td>
</tr>
<tr>
<td>3.3.2 Arrival Process</td>
<td>31</td>
</tr>
<tr>
<td>3.3.3 Warm-up of System</td>
<td>31</td>
</tr>
</tbody>
</table>

iii
3.3.4 Queues for Aircraft Awaiting Paint/Depaint Operations .......... 33
3.3.5 Configuration Options .......... 34
3.3.6 Dispatching Rules for Aircraft entering Paint/Depaint Facilities .......... 38
  3.3.6.1 FCFS Dispatching Rule .......... 38
  3.3.6.2 SPT Dispatching Rule .......... 39
  3.3.6.3 LNQ Dispatching Rule .......... 41
  3.3.6.4 AHEAD Dispatching Rule .......... 42
3.3.7 Dispatching Rules for Facility Utilization .......... 42
3.4 Simulation Output .......... 44
3.5 Verification and Validation .......... 44
  3.5.1 Verification .......... 45
  3.5.2 Validation .......... 45
3.6 Chapter Summary .......... 46

4. Analysis Methodology .......... 48
  4.1 Experimental Design .......... 48
  4.2 Sensitivity Analysis .......... 50
    4.2.1 Arrival Process .......... 50
    4.2.2 System Capacity .......... 51
    4.2.3 Increase pressure on Facilities .......... 51
  4.3 Statistical Significance Testing .......... 52
  4.4 Utilization Rate Issues .......... 54

5. Results .......... 55
  5.1 Facility Capacities .......... 55
  5.2 Configuration Option Comparison .......... 62
  5.3 Output Analysis .......... 66
    5.3.1 Analysis of Aircraft Throughput .......... 67
    5.3.2 Analysis of Aircraft Wait Time .......... 69
  5.4 Sensitivity Analysis .......... 69
    5.4.1 All Aircraft Available at T=0 .......... 72
      5.4.1.1 Analysis of Results on Throughput .......... 73
      5.4.1.2 Analysis of Results on Wait Time .......... 73
      5.4.1.3 Comparison of Arrival Rates .......... 73
    5.4.2 MOG Sensitivity Analysis .......... 74
    5.4.3 Increased Pressure on Facilities .......... 77
      5.4.3.1 Analysis of Results on Throughput .......... 78
      5.4.3.2 Analysis of Results on Wait Time .......... 79
      5.4.3.3 Comparison of Results .......... 80
    5.4.4 Preemption .......... 81

6. Conclusions and Recommendations .......... 84
  6.1 Conclusions .......... 84
  6.2 Recommendations .......... 86

Appendix A. Simulation Output Results .......... 88
Appendix B. Additional Analysis ................. 103
Appendix C. Facility Utilization Dispatching Rules . 118
Appendix D. Statistical Analysis Results ............ 121
Appendix E. SLAM II Code ........................ 164
Appendix F. FORTRAN Code ...................... 227
Bibliography .................................... 285
Vita ............................................ 288
### List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Paint/Depaint Flow</td>
<td>3</td>
</tr>
<tr>
<td>3.1</td>
<td>C-141 Flow</td>
<td>26</td>
</tr>
<tr>
<td>3.2</td>
<td>C-130 Flow</td>
<td>28</td>
</tr>
<tr>
<td>3.3</td>
<td>Dispatching Rule for Freed Facility</td>
<td>39</td>
</tr>
<tr>
<td>5.1</td>
<td>Configuration Option vs Aircraft Throughput (EXP Arrivals)</td>
<td>65</td>
</tr>
<tr>
<td>5.2</td>
<td>Configuration Option vs Wait Time (EXP Arrivals)</td>
<td>66</td>
</tr>
<tr>
<td>B.1</td>
<td>Configuration Option vs Aircraft Throughput (Arrivals at T=0)</td>
<td>102</td>
</tr>
<tr>
<td>B.2</td>
<td>Configuration Option vs Wait Time (Arrivals at T=0)</td>
<td>103</td>
</tr>
<tr>
<td>B.3</td>
<td>Configuration Option vs Aircraft Throughput, Increase # of Paint Aircraft</td>
<td>109</td>
</tr>
<tr>
<td>B.4</td>
<td>Configuration Option vs Wait Time, Increase # of Paint Aircraft</td>
<td>110</td>
</tr>
<tr>
<td>C.1</td>
<td>Dispatching Rule for Facility Utilization</td>
<td>116</td>
</tr>
</tbody>
</table>
## List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Example Configuration Options</td>
<td>8</td>
</tr>
<tr>
<td>3.1</td>
<td>C-141 Maintenance Designations</td>
<td>27</td>
</tr>
<tr>
<td>3.2</td>
<td>C-141 Throughput Goals</td>
<td>27</td>
</tr>
<tr>
<td>3.3</td>
<td>C-130 Throughput Goals</td>
<td>29</td>
</tr>
<tr>
<td>3.4</td>
<td>Input Locations for Warm-up Aircraft</td>
<td>32</td>
</tr>
<tr>
<td>3.5</td>
<td>Additional Aircraft</td>
<td>33</td>
</tr>
<tr>
<td>3.6</td>
<td>Configuration Option #1</td>
<td>35</td>
</tr>
<tr>
<td>3.7</td>
<td>Configuration Option #2</td>
<td>35</td>
</tr>
<tr>
<td>3.8</td>
<td>Configuration Option #3</td>
<td>36</td>
</tr>
<tr>
<td>3.9</td>
<td>Configuration Option #5</td>
<td>37</td>
</tr>
<tr>
<td>3.10</td>
<td>Configuration Option #6</td>
<td>37</td>
</tr>
<tr>
<td>3.11</td>
<td>Building 50 SPT Order (Configuration Options 1, 3, 5)</td>
<td>40</td>
</tr>
<tr>
<td>3.12</td>
<td>Building 54 and 89 SPT Order (Configuration Options 1, 3, 5)</td>
<td>41</td>
</tr>
<tr>
<td>3.13</td>
<td>Building 50, 54 and 89 SPT Order (Configuration Option 6)</td>
<td>41</td>
</tr>
<tr>
<td>4.1</td>
<td>Experimental Design Factors and Levels</td>
<td>48</td>
</tr>
<tr>
<td>4.2</td>
<td>Experimental Design</td>
<td>49</td>
</tr>
<tr>
<td>5.1</td>
<td>Simulation Results for Exponential Arrival Rates</td>
<td>64</td>
</tr>
<tr>
<td>5.2</td>
<td>Facility Utilization Rates (EXP Arrivals)</td>
<td>65</td>
</tr>
<tr>
<td>5.3</td>
<td>Main Configuration Option Effect on Aircraft Throughput (EXP Arrival Rate)</td>
<td>68</td>
</tr>
<tr>
<td>5.4</td>
<td>Main Dispatching Rule Effect on Aircraft Throughput (EXP Arrival Rate)</td>
<td>68</td>
</tr>
</tbody>
</table>
5.5  Main Configuration Option Effect on Wait Time (EXP Arrival Rate) ......... 70
5.6  Main Dispatching Rule Effect on Aircraft Throughput (EXP Arrival Rate) ......... 71
5.7  Accumulation of Queue sizes to Enter Speedline and Speedline-PDM Hangars ......... 77
5.8  Simulation Results for Exponential Arrival Rate and Allowed Preemption ............. 82
5.9  Facility Utilization Rates (Allowed Preemption) 82
A.1  Time in System and Throughput Data (EXP Arrivals) 89
A.2  Utilization Rates and Wait Time Data (EXP Arrivals) 90
A.3  Time of Last Completion (EXP Arrivals) .... 91
A.4  Time in System and Throughput Data (Preemption) 92
A.5  Utilization Rates and Wait Time Data (Preemption) 92
A.6  Time of Last Completion (Preemption) .... 93
A.7  Time in System and Throughput Data (Arrivals at T=0) 94
A.8  Utilization and Wait Time Data (Arrivals at T=0) 95
A.9  Time of Last Completion (Arrivals at T=0) .... 96
A.10 Time in System and Throughput Data (Arrivals at T=0 and MOG Constraints Removed) . 97
A.11 Utilization Rates and Wait Time Data (Arrivals at T=0 and MOG Constraints Removed) 98
A.12 Time of Last Completion (Arrivals at T=0 and MOG Constraints Removed) 99
A.13 Time in System and Throughput Data (EXP Arrivals, Increase # of Paint AC) .... 100
A.14 Utilization and Wait Time Data (EXP Arrivals, Increase # of Paint AC) .... 101
A.15 Time of Last Completion (EXP Arrivals, Increase # of Paint AC) .... 102

viii
B.1 Simulation Results for Arrivals at T=0 . . . 104
B.2 Facility Utilization Rates (Arrivals at T=0) . 105
B.3 Main Configuration Option Effect on Aircraft Throughput (Arrivals at T=0) . . . . . . . 106
B.4 Main Dispatching Rule Effect on Aircraft Throughput (Arrivals at T=0) . . . . . . . 107
B.5 Main Configuration Option Effect on Wait Time (Arrivals at T=0) . . . . . . . 108
B.6 Main Dispatching Rule Effect on Aircraft Throughput (Arrivals at T=0) . . . . . . . 109
B.7 Simulation Results for Increased # of SL-Paint AC 110
B.8 Facility Utilization Rates (Increased # of Paint AC) 111
B.9 Main Configuration Option Effect on Aircraft Throughput (Increased # of Paint AC) . . . . . 112
B.10 Main Dispatching Rule Effect on Aircraft Throughput (Increased # of Paint AC) . . . . . 113
B.11 Main Configuration Option Effect on Wait Time (Increased # of Paint AC) . . . . . . . 114
B.12 Main Dispatching Rule Effect on Aircraft Throughput (Increased # of Paint AC) . . . . . 115
Abstract

The purpose of this research was to determine the effects of configuration options and dispatching techniques on aircraft throughput for the Warner Robins Air Logistics Center paint/depaint facilities. The primary measure of effectiveness used was aircraft throughput. A secondary measure of effectiveness, wait time, was also evaluated.

A simulation model was constructed and used for this analysis as the primary means to conduct the research. The model was modified to produce a series of runs within an experimental design consisting of factors for configuration option and dispatching rules. The alternative facility configurations were defined by management at WR-ALC. The dispatching rules considered were first come first served (FCFS), largest number in queue (LNQ), shortest processing time (SPT), and a look ahead heuristic (AHEAD).

Due to a reduction in the number of paint aircraft, no configuration option differing from the baseline significantly affected aircraft throughput. Dispatching rules were also found to produce no significant differences on aircraft throughput.

Configuration options were found to produce significant differences in wait time. Only when the proportion of aircraft requiring paint was increased did the shortest processing time dispatching rule produce
significant and important differences in aircraft wait times.
I. Introduction

1.1 Background

Warner Robins Air Logistics Center (WR-ALC), at Robins Air Force Base, Georgia, is the main depot for C-141 and C-130 aircraft. These aircraft undergo various maintenance procedures at WR-ALC throughout their lifecycle including periodic scheduled maintenance, implementation of aircraft modifications, and unscheduled maintenance necessary to return an aircraft to an airworthy condition.

For C-141 aircraft, the primary maintenance requirements include speedline inspections, programmed depot maintenance, and a replacement of the center wing box. The speedline procedure involves the inspection of the wings and fuel cells for stress fractures and cracks and repairing any found. Programmed depot maintenance (PDM) is the routine preventative maintenance performed on the aircraft throughout its lifecycle.

Due to the extended life of the C-141 aircraft, wing cracks have developed along the main wing root of a number of C-141 airframes. To correct the situation, the center
wing box is replaced. The center wing box replacement involves first, removing the wings from the fuselage, then removing the existing wing box, installing a new wing box, and finally, re-joining the wings to the fuselage.

Maintenance for C-130 aircraft includes speedline inspections and PDM performed in a similar manner to that of the C-141 aircraft described above. C-130 aircraft may also require modifications while at WR-ALC which may include upgrades their electrical system and/or support structure of the airframe [Yawn, 1992].

In conjunction with these maintenance procedures, all C-130 aircraft and the majority of the C-141 aircraft arriving at WR-ALC undergo a paint/depaint process to remove existing corrosion, protect the aircraft from future corrosion, and provide an improved appearance.

1.2 Paint/Depaint Operations

The basic flow of aircraft that are to be repainted includes first, depainting the aircraft, followed by completion of the required maintenance procedures. After maintenance has been completed and the aircraft has been reassembled, aircraft undergo a wash, etch and alodine (W/E/A) treatment to clean the surfaces and prepare them to receive the paint. The final step is to repainting the aircraft. A portion of the C-130 aircraft requiring
repainting will undergo a limited version of this process. These C-130 aircraft are referred to as scuff sanded aircraft. A scuff sanded C-130 aircraft is subjected to an initial wash process, followed by completion of required maintenance, an outgoing wash, and a limited depaint and paint procedure. The flows for aircraft to be repainted are shown in Figure 1.1.

To depaint a C-141 aircraft, the aircraft is coated with a chemical solvent which strips the paint from the airframe. Current depaint procedures for C-130 aircraft, other than those which are scuff sanded, require these aircraft to be depainted by a process known as media blasting. This procedure uses high pressurized sprayers to
project small beads of plastic onto the surface of an aircraft to physically remove the paint. This procedure has proven to be less harsh to the skin of the aircraft, however, the disadvantage is an increase in required processing time. Scuff sanded C-130 aircraft, as opposed to standard C-130 aircraft, are not depainted. These aircraft require sanding down of the existing paint on the airframe with the use of sanding disks. This sanding process is referred to as scuff sanding and is required to prepare the aircraft to properly receive the paint.

The wash, etch and alodine (W/E/A) process removes any existing corrosion from the aircraft, provides protection from future corrosion, and prepares the skin to receive the paint. As shown in Figure 1.1, scuff sanded aircraft only undergo the wash portion of this process. Scuff sanded C-130s are washed prior to, and at the conclusion of required maintenance.

The final process of the paint/depaint process is repainting the aircraft. This process involves applying the paint as well as appropriate insignia and markings to the aircraft. Processing time required to paint an aircraft differ for each type of aircraft due to their differences in size (C-141 being larger and therefore requiring a longer time to paint). A scuff sanded aircraft requires only an overspray to repaint the aircraft.
Currently, WR-ALC has one hangar dedicated to the painting process and one hangar that must conduct both W/E/A and depaint operations. These hangars are currently responsible for painting and depainting of both aircraft types (C-141 and C-130). Construction of a new, modernized paint/depaint facility for the C-130 aircraft is currently underway at WR-ALC. This facility will be capable of performing each of the paint/depaint operations on an aircraft. Current plans are to dedicate this facility solely for C-130 aircraft; however, the potential exists for this to be expanded to C-141s.

Management has long considered the paint/depaint process as a bottleneck in the maintenance process at WR-ALC causing delays in returning these aircraft to their respective users. As part of "Proud MAC," WR-ALC may be tasked with repainting a large portion of the C-141 and C-130 aircraft with new paint schemes within the next three years [Davis, 1991]. Obviously, this will add additional pressure on the paint/depaint facilities.

The potential for an increase in future demands on the WR-ALC maintenance process necessitates reducing or eliminating the paint/depaint and other bottlenecks within the system to achieve aircraft throughput requirements.
This research will focus on removing the paint/depaint process as a system bottleneck.

One possible alternative to alleviate the paint/depaint bottleneck is to contract out the painting and depainting of a portion of these aircraft to capable contractors. This option would increase the cost of maintaining these aircraft and is therefore an undesirable option. A second and possibly more economic option is to better utilize the existing facilities at WR-ALC. WR-ALC management has identified these possible ways to improve the utilization of the facilities: reconfigure the paint/depaint facilities, adjust dispatching rules which control the order that waiting aircraft enter the facilities, or allow preemption of aircraft being processed to allow higher priority aircraft to use a facility.

1.3 Paint/Depaint Facility Configurations

As discussed above, only two facilities are currently available to perform all paint/depaint operations. With the addition of the new, modernized facility, delays associated with paint/depaint operations should be decreased. The extent to which these delays will be reduced is uncertain and it is unknown if the paint/depaint bottleneck will be eliminated as a result of this increase in capability.
The management policy on how these facilities are utilized may also affect aircraft throughput. As described above, current plans are to use the new paint/depaint facility solely for C-130 aircraft. The impact of using this facility as dedicated or non-dedicated (for both C-130 and C-141 aircraft) on aircraft throughput has not been examined and may be significant.

In addition to management policy changes, the effects of increasing the capabilities of the existing facilities on aircraft throughput is uncertain. It may be possible, for example, to increase the capability of the current paint facility to include the W/E/A process.

The effects of these possible changes in either one or both policy and capabilities of the paint/depaint facilities on aircraft throughput is uncertain. Examples of possible configuration options are shown in Table 1.1.

1.4 Dispatching Rules

When more than one aircraft is waiting for the same paint/depaint operation a decision must be made on which aircraft will undergo the operation first. This decision will be considered as a dispatching rule. The effects of alternate dispatching rules have not been investigated in past research for WR-ALC and could have an impact on aircraft throughput. The current dispatching rule used for
the paint/depaint facilities focuses primarily on the number and type of aircraft waiting to be processed.

Table 1.1

Example Configuration Options

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<th>Bldg</th>
<th>for C-141 AC</th>
<th>for C-130 AC</th>
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<tr>
<td></td>
<td>Depaint</td>
<td>W/E/A Paint</td>
</tr>
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<td></td>
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<td>54</td>
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<td>Yes</td>
</tr>
<tr>
<td>89</td>
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<td>Yes</td>
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<tr>
<td>89</td>
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<td>No</td>
</tr>
<tr>
<td>50</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Facilities Non-Dedicated; modifications to buildings 54 &amp; 89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>89</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>50</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Bldgs 54 and 89 are current hangars
Bldg 50 is new, modernized facility
W/E/A = Wash, Etch and Alodine (Preparation of AC for Paint)

Typically, aircraft at WR-ALC are serviced on a first come, first served basis. If more than one aircraft arrive concurrently, the dispatching decision is based on earliest scheduled due date if the aircraft are identical (i.e., both C-130s). If the aircraft are of different types (i.e., C-141 and C-130 arrive simultaneously) the dispatching decision is made after consultation with the respective
aircraft's organization. Factors such as current waiting time or job duration required for waiting aircraft are not considered within the current dispatching decision.

1.5 Preemption

One technique attempted by WR-ALC management to increase aircraft throughput is preemption, or breaking, an aircraft's processing. Under this technique, an aircraft in the process of W/E/A, incoming wash, or outgoing wash is preempted to allow an awaiting aircraft to undergo W/E/A, if the paint facility is available. The decision to preempt aircraft is based on the reduction in flow days for the preempting aircraft with no formal analysis conducted to determine the overall impact of this technique.

1.6 Specific Objective

The primary objective of this research is to determine the effects of configurations and dispatching techniques on aircraft throughput for the WR-ALC paint/depaint facilities.

1.7 Sub-Objectives

The sub-objectives of this research will include:

1. Research current scheduling procedures and practices at WR-ALC concentrating on the allocation of resources as well as determining the limiting resources and constraints of the system. Also, processing and operation times for the system will be collected.
2. Investigate different dispatching and preemption techniques to determine those which are most applicable to the WR-ALC system.

3. Identify alternative configuration options that are acceptable to WR-ALC management.

4. Determine a method to evaluate the effects of facility configuration options and dispatching techniques on aircraft throughput.

5. Determine if there exists a single dispatching technique for the paint/depaint facilities which maximizes aircraft throughput independent of facility configuration.

6. Determine the effects of aircraft preemption on aircraft throughput.

7. Determine an upper bound on capacity for paint/depaint facility throughput and determine facility utilization rates under each configuration option.

1.8 Plan of the Report

Chapter I provided an introduction to this research effort, including the background of the problem, characteristics of the system, the specific objectives of the research, and subsidiary problems. Chapter II provides a review of the literature to include scheduling theory and a discussion of simulation issues. Chapter III details the formulation of the model. Chapter IV describes the experimental design constructed and statistical significance testing used. Chapter V presents the results of the research, and Chapter VI summarize the results and detail the solutions to both the specific objective, and each sub-objective as well as providing recommendations for further research.
II. Literature Review

2.1 Introduction

The purpose of this chapter is to review the published results that apply to the analysis of the WR-ALC paint/depaint facility configurations and scheduling policies. Specific topics to be covered include scheduling theory, multiprocessor systems, preemption techniques, resource-constrained scheduling, and dispatching rules. The chapter concludes with a discussion of issues in simulation modeling.

2.2 Scheduling Theory

"Scheduling is the allocation of resources over time to perform a collection of tasks." [Baker, 1974:2]. One type of problem known as a sequencing problem is primarily concerned with the ordering of a set of operations on a given set of machines. A job is defined as a set of operations interrelated by precedence restrictions derived from technological constraints [Hax and Candea, 1984:259]. A machine is defined as a device or facility capable of performing a required operation. The WR-ALC problem falls within the sequencing category since the concern is the
ordering of aircraft as they enter each paint/depaint facility.

2.2.1 Flow Shop versus Job Shop. The system, or shop, containing the facilities or machines necessary to perform each operation is typically classified as a flow shop or a job shop. The distinction between a job shop and a flow shop is based on the sequence of machines used by each job. "A flow shop is one in which all the jobs follow essentially the same path from one machine to another" [Conway et al, 1967:7]. The ordering of machines used by each job in a job shop can be completely random. Although scheduling problems typically classify the shop into one of these categories, actual systems usually fall somewhere between these two definitions.

The WR-ALC paint/depaint system, or shop, falls somewhere between the flow shop and a completely random job shop definitions. Although the actual flow of operations is essentially the same (depaint, W/E/A, paint) the hangar, or machine, which performs the operation can vary depending on the configuration option investigated.

2.2.2 Arrival Process. Scheduling problems are further classified by how jobs arrive into the system. Within the reviewed literature, a static system is defined
as one in which the order and number of jobs is known and does not change over time. Also, in a static system, the system is assumed to be idle and immediately available to process the jobs. No further jobs are allowed to enter the system and therefore, priority is given to the known set of jobs. A dynamic system is defined as one in which jobs arrive over time according to a known or unknown statistical distribution [Conway, 1967:7]. Using these definitions, the WR-ALC system must be considered as dynamic. Due to the stochastic nature of the maintenance process, the arrival process at each paint/depaint facility is random. Dynamic scheduling problems have proven to be the most difficult to solve, typically requiring heuristic solution techniques [Baker, 1974:6]. Recent as well as past research has focused on the use of simulation to model the arrival rates and times for the dynamic process [Dumond and Mabert, 1988:107], [Baker, 1974:Ch 8]. Simulation is also widely used to investigate dynamic flow shops that contain stochastic processing times [Holloway and Nelson, 1974:1264-1272]. Although most past studies assume an arrival process as well as operation processing times following an exponential distribution, Baker concludes the nature of the arrival process or the service process is not critical in comparing scheduling rules [Baker, 1974:215].
2.2.3 Basic Model. Scheduling problems are also classified by the assumptions used to model the problem. The most simple and often studied type of job shop is the single machine job shop. "Each job has a single operation that is to be performed on the single machine existing in the shop" [Hax and Candea, 1984:266]. Much of the research work has been conducted on the basic process with the following assumptions:

1. Each machine is continuously available for assignment, without significant division of the time scale into shifts or days, and without consideration of temporary unavailability for causes such as breakdown or maintenance.

2. Jobs are strictly-ordered sequences of operations.

3. Each operation can be performed by only one machine in the shop.

4. There is only one machine of each type in the shop.

5. Preemption is not allowed—once an operation is started on a machine, it must be completed before another operation can begin on that machine.

6. The processing-times of successive operations of a particular job may not be overlapped. A job can be in process on at most one operation at a time.

7. Each machine can handle at most one operation at a time. [Conway et al, 1967:5-6]

Although this model does not completely represent the paint/depaint facilities at WR-ALC, it will be used as the basic building block from which a model representative of
the WR-ALC system will be developed. Further refinement of these assumptions will be discussed as part of this review.

2.2.4 Multiprocessor (parallel machine) shop. The number and configuration of machines within the shop factor into the classification of scheduling problems. For this research, both the number and configuration of the paint/depaint facilities will be altered to determine the impact on aircraft throughput. Several of the configuration options will consider more than one machine (hangar) performing the same operation (i.e., painting). Therefore, assumption 3 of the basic model must be relaxed. The possible configuration options will include a three parallel machine system in which all hangars are nondedicated, or available to perform all operations (paint, depaint, W/E/A, and C-130 Wash). A review of the literature on multiprocessor shops shows the studies to be very specific, with none found to be directly transferable to this system. Past research has been applied primarily to systems with identical parallel machines. Horn [Horn, 1974:177-185] provides a technique to reduce the mean flow time problem to a linear assignment problem, but this research is only applicable to an identical machine system. In the WR-ALC system, the new facilities has a longer processing time for depaint then do the current facilities. Also, facility
capabilities will vary dependent upon investigated configuration option.

2.2.5 Preemption Techniques. Due to possible allowance for preemption, assumption 5 of the basic model will be relaxed. Cho and Sahni [Cho and Sahni, 1978:197-199] demonstrate the increased complexity for models containing this assumption.

Two types of preemption techniques have been described throughout the literature. These techniques are preempt-resume and preempt-repeat [Conway et al, 1967:67]. In terms of this system, the preempt repeat discipline can be related to an aircraft being preempted from an operation for an aircraft of higher priority. After the higher priority aircraft has completed its operation, service on the preempted aircraft will start over with no credit for the earlier processing. In the preempt-resume discipline, the preempted aircraft will return and processing time will pick up from the time of the preemption. The preemption technique at WR-ALC, as with most systems, falls somewhere between the preempt-resume and preempt repeat disciplines.

At WR-ALC, the past preemption rules allowed for an aircraft being depainted, or one being washed, to be preempted by an aircraft requiring W/E/A if the paint facility is available. Typically 8 hours of processing time
will be lost for the preempted aircraft, and if the aircraft remains preempted for more than 48 hours, the depaint process must go through W/E/A again due to the chemicals used in the depaint process. This 8 hours of incurred delay time is not considered in either the preempt-resume or preempt-repeat disciplines. Schrage [Schrage, 1972:668-677] provides an implicit enumeration algorithm for solving resource-constrained problems allowing for preemption-resume discipline. One criteria for this research is to minimize project length. Schrage concludes that for the cases examined in this study, allowance for preemption does not dramatically decrease minimum or maximum completion times [Schrage, 1972:676].

2.2.6 Resource Constraints. As described in Chapter I, WR-ALC is responsible for performing several types of maintenance procedures on arriving aircraft. A large portion of these aircraft require the usage of the paint/depaint facilities. With several types of aircraft competing for the use of a fixed number of paint/depaint facilities, the system is subject to resource constraints. Although resource constraints are typically applied to project scheduling problems, the concept of resource constraints is applicable to the WR-ALC problem. Past research has presented a conceptual mathematical programming
formulation to gain insight into the resource constrained scheduling problem [Talbot and Patterson, 1978:1163-1174]. A very valuable tool used to adequately model the flow shop subject to these types of resource constraints is computer simulation. Most simulation software language capable of modeling the use of resources as well as providing priority options on how to allocate resources [Pritsker, 1986:Ch 1].

2.2.7 Dispatching Rules. For the WR-ALC paint/depaint system, as aircraft arrive at the paint/depaint facilities, queues will develop. The rule used to select one of the awaiting aircraft to enter the next available facility is defined as a dispatching rule. Over 100 such dispatching rules have been defined by Panwalker and Islander [Panwalker and Islander, 1977:45-61]. The dispatching rules that appear to have applications to this research include shortest processing time (SPT), largest processing times (LPT), first come first served (FCFS), expected due date (EDD), shortest remaining processing time (SRPT), and largest remaining processing time (LRPT). One of the most popular of these dispatching rules, SPT, has been found to work well for a large number of scheduling problems and measures of effectiveness.

Many simulation studies have been conducted to examine the effects of different dispatching techniques on various
scheduling criteria such as flow time, lateness, and missed due dates. WR-ALC has requested the measure of effectiveness for this research to be aircraft throughput, or number of aircraft completing the system over a specified period of time. Although no simulation study reviewed specifically addressed throughput as the criteria, other factors can be examined which do have an impact on aircraft throughput. For example, Conway describes a theoretical example of an Air Force maintenance shop. He states that management should be interested in scheduling to minimize the number of jobs in the maintenance system since this should maximize the number of aircraft available for service [Conway et al, 1967:14].

Baker references the minimization of flowtime, or time in system, in order to optimize most criteria. Time in system is an important measurement from the using command's standpoint, determining when the aircraft can be returned to service. In addition, Kan provides a proof demonstrating that, in general, maximizing the ratio of mean completion time over maximum completion time is equivalent to maximizing expected throughput for a given time interval [Kan, 1976:23]. These measurements will be collected, however maximizing aircraft throughput will remain the primary measure of effectiveness.
2.3 Simulation

Throughout the literature, a common tool used to investigate scheduling problems is computer simulation. To conduct a simulation analysis, Pritsker points out the following ten stages of analysis development which have been followed in this research effort:

1. Problem Formulation - The definition of the problem to be studied including a statement of the problem-solving objective.

2. Model Building - The abstraction of the system into mathematical, logical relationships in accordance with the problem formulation.

3. Data Acquisition - The identification, specification, and collection of data.

4. Model Translation - The preparation of the model for computer processing.

5. Verification - The process of establishing that the computer program executes as intended.

6. Validation - The process of establishing that the simulation model accurately represents the real system to the degree necessary to draw valid inferences.

7. Strategic and Tactical Planning - The process of establishing the experimental conditions for using the model.

8. Experimentation - The execution of the simulation model to obtain output values.

9. Analysis of Results - The process of analyzing the simulation outputs to draw inferences and make recommendations for problem resolution.

10. Implementation and Documentation - The process of implementing decision results from the simulation and documenting the model and its use. [Pritsker, 1986:10-11]
The areas of verification and validation are of great importance to any research effort. Obviously, if the model is not accurate, or the results are not representative of the system, conclusions are of no significance. Verification techniques which are useful include the use of degenerative tests [Sargent, 1987:33] in which portions of the model are removed to determine the impact on other sections of the model. Also input values can be modified and a comparison made between expected analytical results and simulation results. To validate that the simulation model adequately represents the true system, a structured walk-through of the model is conducted with key personnel familiar with the actual system [Law and McComas, 1990:51]. This walk-through will ensure the flow of the model is accurate as well as provide a consensus of operation times for each task within the system.

2.4 Chapter Summary

The primary purpose of this literature review was to find applicable techniques and models that could be applied to modeling the WR-ALC paint/depaint facilities. Although past research captured specific characteristics of this system, none could be found that captured them all. Since this system involves dynamic inputs, stochastic processing times, allowed preemption, and resource constraints,
simulation modeling has been used to evaluate the given
paint/depaint facility configuration options and commonly
used dispatching rules on aircraft throughput at WR-ALC.
III. Model Formulation

To evaluate the effects of aircraft throughput, a simulation of the aircraft flow at Warner Robins Air Logistics Center, WR-ALC, has been used to evaluate five paint/depaint facility configuration options and several dispatching rules. Simulation was chosen based on its capabilities for handling the randomness of the system, as well as the complex interactions between resources and aircraft flows. The dispatching rules are broken down into dispatching rules for aircraft entering a facility, and dispatching rules for facility utilization. Aircraft dispatching rules include first come first served (FCFS), a look ahead heuristic (AHEAD), largest number in queue (LNQ), and shortest processing time (SPT). Dispatching rules for facility utilization are based on first freed (FF) and minimum utilization (MINU). These dispatching rules will be described in detail in Section 3.3.6. The throughput goal is 235 aircraft (191 C-141s and 44 C-130s) over the two year period covering FY92 and FY93.

This chapter will describe the model, the flow of aircraft through WR-ALC, the assumptions used for this research, and the verification and validation techniques used for the simulation model.
3.1 Simulation Language

To determine the effects of configuration options and dispatching rules on aircraft throughput, simulation was chosen as the evaluation tool. Simulation was chosen based on its capability for handling the dynamic characteristics of the arrival process. In addition, simulation is capable of representing the complex interactions between resources and aircraft flows, which standard analytical techniques could not. The simulation language chosen to construct the model is SLAM II [Pritsker, 1986: Ch 1]. SLAM II was used with discrete event orientation to construct the models for this research due to its flexibility for exploring alternate configurations, as well as providing appropriate output. Discrete event systems simulation is defined as "the modeling of systems in which the state variables change only at a discrete set of points in time and not continuously over time [Banks, 1984:11]." Activity durations for the simulation model are assumed to be triangularly distributed with median, high and low values gathered from appropriate "field experts" at WR-ALC. These field experts vary from front line supervisors to management personnel.

3.2 Aircraft Flow

Although WR-ALC is responsible for C-130, C-141, and F-15 aircraft, only the flows for C-130 and C-141 aircraft
are considered. F-15 aircraft are not considered due to the anticipated construction of their own independent paint/depaint facilities. Aircraft arriving at WR-ALC undergo several possible maintenance procedures discussed in the following sections. In total, 235 C-130 and C-141 aircraft are expected to complete the system over the next two years.

3.2.1 C-141 Aircraft Maintenance Flow. The types of C-141 maintenance which WR-ALC performs, are as follows:

**Speedline:** TCTO 773. Inspection of wings for cracks and repairing those found. Replacement of beam cap at joint of wing if necessary.

**Programmed Depot Maintenance (PDM):** Routine preventative maintenance performed periodically on each aircraft over its lifecycle.

**Center Wing Box Replacement:** After the aircraft's fuselage is separated from the wings, a complete replacement of the center wing box is conducted.

**Build-Up:** Rewiring and re-assembly of the aircraft after completion of maintenance.

**Functional Test:** Complete testing (on ground and flight testing) of the aircraft after maintenance and build-up.

**DePaint:** Process of removing paint from the aircraft (chemical).

**Wash, Etch and Alodine (W/E/A):** Process for corrosion control and prevention as well as preparing the skin of the aircraft to receive paint.

**Paint:** Process of painting the aircraft and applying appropriate markings.
Figure 3.1 provides a graphical representation of the flow of C-141 aircraft. Table 3.1 details C-141 aircraft flow as well as each type of processing will be referred to throughout this thesis. All aircraft go through initial prep and functional test, so these steps are omitted from Table 3.1.

The throughput goal for each type of C-141 aircraft is shown in Table 3.2, where "Number" is the amount of aircraft scheduled. All aircraft flows begin in FY92 and end after FY93.
Table 3.1 C-141 Maintenance Designations

<table>
<thead>
<tr>
<th>Type</th>
<th>Actual Flow (excluding Initial Prep and Functional Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Speedline, Build-up</td>
</tr>
<tr>
<td>SL-Paint</td>
<td>DePaint, Speedline, Build-up, W/E/A, Paint</td>
</tr>
<tr>
<td>SL-PDM</td>
<td>Speedline, PDM, Build-up</td>
</tr>
<tr>
<td>SL-PDM-Paint</td>
<td>DePaint, Speedline, PDM, Build-up, W/E/A, Paint</td>
</tr>
<tr>
<td>CW Box</td>
<td>Depaint, Center Wing Box Replacement, Build-up, W/E/A, Paint</td>
</tr>
<tr>
<td>PDM</td>
<td>PDM, Build-up</td>
</tr>
<tr>
<td>PDM-Paint</td>
<td>DePaint, PDM, Build-up, W/E/A, Paint</td>
</tr>
</tbody>
</table>

Table 3.2 C-141 Throughput Goals

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>81</td>
</tr>
<tr>
<td>SL-Paint</td>
<td>33</td>
</tr>
<tr>
<td>SL-PDM</td>
<td>9</td>
</tr>
<tr>
<td>SL-PDM-Paint</td>
<td>46</td>
</tr>
<tr>
<td>CW Box</td>
<td>8</td>
</tr>
<tr>
<td><strong>Total C-141 AC:</strong></td>
<td><strong>191</strong></td>
</tr>
</tbody>
</table>

3.2.2 C-130 Maintenance Flow. Although detailed maintenance tasks for C-130 aircraft were not provided, C-130 aircraft are divided into two possible flow types: standard C-130, and scuff sanded C-130 aircraft. A standard
C-130 will be defined as a C-130 aircraft requiring a standard depaint process, followed by its required maintenance tasks, W/E/A, and finally paint. A scuff sanded C-130 will require tasks in the following order: incoming wash, required maintenance, outgoing wash, scuff sand, paint. The scuff sanding will occur during the outgoing wash process for the scuff sanded C-130. Figure 3.2 graphically depicts the two possible C-130 flows.

Figure 3.2 C-130 Flow

The data provided for C-130 maintenance duration (excluding Paint/Depaint times) were a minimum of 70 days, a median of 80 days, and a maximum of 90 days. The expected number of C-130 aircraft to complete the system is 22 per
year for the next four years. The breakout for number and type of C-130 aircraft per year is shown in Table 3.3.

Table 3.3 C-130 Throughput Goals

<table>
<thead>
<tr>
<th>Type of C-130</th>
<th>Throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard C-130</td>
<td>15 AC/yr</td>
</tr>
<tr>
<td>Scuff Sanded C-130</td>
<td>7 AC/yr</td>
</tr>
<tr>
<td>Total C-130 AC</td>
<td>22 AC/yr</td>
</tr>
</tbody>
</table>

3.3 Description of Simulation Model

The simulation model used to compare the different configuration options is a simplified version of a model produced as a result of an independent study course conducted at the Air Force Institute of Technology in the Summer of 1991. Recent changes in policy at WR-ALC, modification of anticipated workload, and updates to activity duration due to a higher quality in worker performance resulted in the need for additional modifications to the model. The incorporation of paint/depaint facility configuration options also required modifications to the model.

3.3.1 System Constraints. Constraints for the model include facilities and overall number of aircraft on ground. These constraints are described below.
3.3.1.1 Facility Constraints. These constraints are based on facility limitations as well as manpower levels. The system is limited by number of paint/depaint facilities: 1 each of Bldgs 50, 54, and 89; PDM positions: C-130 (7 slots), and C-141 (8 slots); and Mate/Demate facilities (to remove and reinstall wings of C-141 aircraft requiring center wing replacement): 1 position. Also, the number of speedline positions is limited by the available hangar space. Currently 6 positions are available for SL and by 1 APR 93, additional hangars will be constructed increasing the number of SL hangar positions to 8, and constructing 11 SL-PDM positions.

The model assumes manpower levels are available to adequately staff each available maintenance position. For current capabilities, this assumption is valid, however as new facilities are constructed (in particular C-141 speedline hangars), additional manpower resources may be required.

3.3.1.2 Maximum Number of Aircraft on Ground (MOG) Constraints. The system is further constrained by the number of aircraft allowed on the ground at any given time. These MOG constraints are based on MAC policy requiring a minimum number of aircraft to be in service at all times.
As provided from WR-ALC management, the MOG constraint for C-141 aircraft is 35 aircraft, and 9 for C-130 aircraft.

3.3.2 Arrival Process. With changes in aircraft throughput requirements at WR-ALC, an exact input schedule was not available. Therefore, for purposes of this research, two types of arrival processes are examined. The first arrival process to be examined will assume an exponentially distributed aircraft arrival rate, with the mean determined by output requirements. This arrival rate will serve as a "best-guess" estimate of the actual input schedule.

The second arrival process considered will assume all aircraft are available to enter the system at t=0. Although the arrival process assumes all aircraft are available, the maximum number of aircraft on the ground (MOG) constraints based on aircraft type and maintenance requirements will limit the input flow of aircraft into the system. This arrival process will be used to determine an approximate upperbound on system throughput capacity.

3.3.3 Warm-up of System. To provide a realistic warm-up period for the system, aircraft were placed at various points within the system at the start of each simulation run. The aircraft initially entered into the system are
shown in Table 3.4. The location and number of the warm-up aircraft were verified by WR-ALC management [Colter and Scoskie, 1992].

<table>
<thead>
<tr>
<th>Type Aircraft (###)</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard C-130 (2)</td>
<td>C-130 PDM</td>
</tr>
<tr>
<td>Scuff Sanded C-130 (1)</td>
<td>Incoming Wash</td>
</tr>
<tr>
<td>SL C-141 (1)</td>
<td>Speedline</td>
</tr>
<tr>
<td>SL C-141 (1)</td>
<td>Build-up</td>
</tr>
<tr>
<td>SL C-141 (1)</td>
<td>W/E/A</td>
</tr>
<tr>
<td>SL-Paint C-141 (1)</td>
<td>Depaint</td>
</tr>
<tr>
<td>SL-PDM-Paint C-141 (1)</td>
<td>PDM</td>
</tr>
<tr>
<td>SL-PDM-Paint C-141 (1)</td>
<td>Functional Test</td>
</tr>
<tr>
<td>CW Box (1)</td>
<td>Center Wing</td>
</tr>
<tr>
<td>SL-PDM (1)</td>
<td>Speedline</td>
</tr>
</tbody>
</table>

In addition to an initial warm-up, additional aircraft are inserted into the model to maintain pressure on the paint/depaint facilities after all scheduled aircraft have entered the system. For this period, aircraft begin arrival at beginning of FY94. The model assumes an exponentially distributed arrival process with means appropriate to mirror FY93 inputs. Listed below are these additional aircraft types along with mean time between arrivals (MTBA):
Table 3.5 Additional Aircraft

<table>
<thead>
<tr>
<th>Aircraft Type</th>
<th>MTBA (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard C-130</td>
<td>23.6</td>
</tr>
<tr>
<td>Scuff Sanded C-130</td>
<td>50.6</td>
</tr>
<tr>
<td>CW Box</td>
<td>70.8</td>
</tr>
<tr>
<td>SL</td>
<td>7.5</td>
</tr>
<tr>
<td>SL-Paint</td>
<td>18.2</td>
</tr>
</tbody>
</table>

3.3.4 Queues for aircraft awaiting Paint/Depaint Operation. As aircraft arrive requiring a paint/depaint operation, if all facilities are busy the aircraft will enter a queue associated with the required operation. When an aircraft is selected to enter a facility (after facility has been freed) it is transferred from the operation queue to a queue associated with one of the paint/depaint facilities. The selection criteria for an aircraft to enter the facility is based on the dispatching rule under investigation. The facility queue is required when more than one facility is capable of performing the required operation. An aircraft will enter these queues only when the corresponding facility is free. Therefore, every aircraft in the facility queue is waiting for service. An exception to this rule will be for aircraft just completing W/E/A. An aircraft has only 48 hours to be painted after concluding W/E/A. To stay within this constraint, aircraft completing W/E/A will be given highest priority to enter the next available paint facility.
3.3.5 *Configuration Options.* The primary objective of this research is to examine the capabilities of several paint/depaint facility configuration options. The configurations were chosen based on WR-ALC requests. These configuration options represent configuration options ranging from a baseline (Option 1), current configuration (Option 2), two configurations based on changes in policy at WR-ALC (Option 3 and Option 5), and a configuration option based on change in policy as well as upgrades in capabilities of the facilities (Option 6). It should be noted, no configuration option 4 exists. This option was reserved for a possible configuration option which, after discussions with WR-ALC management, was determined to not be worthy of consideration for this research. Those configuration options considered are as follows:

**Configuration Option #1:** This configuration option represents the configuration of the paint/depaint facilities prior to the existence of Building 50 (modernized C-130 paint/depaint facility). All aircraft requiring paint utilize buildings 54 and 89 for all paint/depaint operations. The model assumes both C-130 and C-141 aircraft are chemically depainted. Table 3.6 provides an illustration of this configuration option.
Table 3.6 Configuration Option #1

<table>
<thead>
<tr>
<th>Bldg</th>
<th>for C-141 AC</th>
<th>for C-130 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depaint W/E/A Paint</td>
<td>Wash Depaint W/E/A Paint</td>
</tr>
<tr>
<td>54</td>
<td>Yes No</td>
<td>Yes No</td>
</tr>
<tr>
<td>89</td>
<td>No Yes No</td>
<td>No Yes No</td>
</tr>
</tbody>
</table>

Configuration Option #2: This paint/depaint facility configuration option brings Building 50 into operation. All C-141 paint/depaint operations utilize Buildings 54 and 89, and all C-130 aircraft utilize Building 50. C-130 aircraft now undergo a media blast depaint procedure as opposed to C-141 undergoing a chemical depaint procedure. This configuration option is the current facility configuration at WR-ALC. Table 3.7 presents Configuration Option #2.

Table 3.7 Configuration Option #2

<table>
<thead>
<tr>
<th>Bldg</th>
<th>for C-141 AC</th>
<th>for C-130 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depaint W/E/A Paint</td>
<td>Wash Depaint W/E/A Paint</td>
</tr>
<tr>
<td>54</td>
<td>Yes No</td>
<td>No No</td>
</tr>
<tr>
<td>89</td>
<td>No Yes No</td>
<td>No Yes No</td>
</tr>
<tr>
<td>50</td>
<td>No No No</td>
<td>Yes Yes Yes</td>
</tr>
</tbody>
</table>

Configuration Option #3: This configuration option utilizes Building 50 to W/E/A and/or Paint C-141 aircraft.
only when Building 89 is occupied and Building 50 is free. Table 3.8 presents Configuration option 3.

Table 3.8 Configuration Option #3

<table>
<thead>
<tr>
<th>Bldg</th>
<th>for C-141 AC</th>
<th>for C-130 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depaint</td>
<td>W/E/A</td>
</tr>
<tr>
<td>54</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>89</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>50</td>
<td>No</td>
<td>No*</td>
</tr>
</tbody>
</table>

* Building 50 will W/E/A and/or Paint a C-141 if 89 is busy and 50 is free

Configuration Option #5: This configuration option utilizes building 50, 54, and 89 independent of aircraft type. For depaint, building 50 is not capable of performing a chemical depaint, and therefore, will not be used for this operation. The model also assumes building 54 will not be utilized to depaint a C-130 aircraft. Table 3.9 presents configuration option 5.
Table 3.9 Configuration Option #5

<table>
<thead>
<tr>
<th>Bldg</th>
<th>C-141 AC</th>
<th>C-130 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depaint</td>
<td>W/E/A</td>
</tr>
<tr>
<td>54</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>89</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>50</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Configuration Option #6: This configuration option utilizes Building 50, 54, and 89 independent of aircraft type, as well as allowing for an increase in capabilities for Buildings 54 and 89. The model assumes building 54 is now capable of painting operations, and building 89 is capable of performing wash, depaint, and W/E/A operations. Table 3.10 presents configuration option 6.

Table 3.10 Configuration Option #6

<table>
<thead>
<tr>
<th>Bldg</th>
<th>C-141 AC</th>
<th>C-130 AC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Depaint</td>
<td>W/E/A</td>
</tr>
<tr>
<td>54</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>89</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>50</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Due to increases in paint/depaint facility capability and flexibility, it was expected that aircraft throughput
would increase as configuration option number increases. Similarly, wait times were expected to decrease as configuration option number increases. As an aircraft arrives for a paint/depaint process within the simulation coding, it is marked to designate which facility(ies) is/are capable of performing its required procedure. By altering this "need" variable, alternate configuration options are modeled.

### 3.3.6 Dispatching Rules for Aircraft entering Paint/Depaint Facility

Besides configuration options, dispatching rules for entering each paint/depaint facility were analyzed. When a facility has been freed, the appropriate subroutine will be called to determine which, if any, awaiting aircraft will be brought into the facility specified by the rules of the applied dispatching technique. If all awaiting aircraft require a facility other than the freed facility, no aircraft will enter the facility.

The dispatching techniques chosen were based on dispatching rules or modifications to those rules found within the literature review and found to be appropriate and/or applicable to the WR-ALC system (as verified by WR-ALC management). The following paragraphs define the dispatching techniques explored. Figure 3.3 provides a flow chart representation of these dispatching techniques.
3.3.6.1 First Come First Served (FCFS) 

Dispatching Rule. The first dispatching technique explored is FCFS. The rationale for selection of this dispatching rule is its similarity to the current dispatching techniques used at WR-ALC. This technique queries each awaiting aircraft to decide first if the available building is capable of performing the required operation, and finally determining which of these aircraft has been waiting the longest amount of time. FCFS is the current dispatching technique utilized at WR-ALC in most occasions.

3.3.6.2 Shortest Processing Time (SPT) 

Dispatching Rule. After a facility has been freed, a sort will be made of aircraft waiting for a specific paint/depaint operation (Wash, Depaint, W/E/A, or Paint) in order of smallest to largest expected processing times. Ties will be broken based on longest waiting time. This dispatching rule is examined due to its robustness in optimizing numerous criteria as found throughout the literature review [Baker, 1974:Ch 8] [Conway et al, 1967: Ch 11]. Table 3.11 and Table 3.12 lists the dispatching priorities for configuration options 1, 3, and 5 for building 50 and 54 respectively, and Table 3.13 shows the dispatching priorities for configuration option 6.
Figure 3.3 Dispatching Rule for Freed Facility

![Diagram of dispatching rule for Freed Facility]

Table 3.11 Building 50 SPT Order Configuration Options 1, 3, or 5

<table>
<thead>
<tr>
<th>Bldg 50 (Configuration Options: 1, 3, 5)</th>
<th>Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paint C-141</td>
<td>4.0</td>
</tr>
<tr>
<td>2. C-130 Incoming Wash</td>
<td>0.65</td>
</tr>
<tr>
<td>3. W/E/A C-141</td>
<td>1.0</td>
</tr>
<tr>
<td>4. Outgoing Wash &amp; Scuff Sand C-130</td>
<td>1.3</td>
</tr>
<tr>
<td>5. Paint Scuff Sanded C-130</td>
<td>1.5</td>
</tr>
<tr>
<td>6. W/E/A &amp; Paint Standard C-130</td>
<td>4.0</td>
</tr>
<tr>
<td>7. DePaint C-130 (Media Blast)</td>
<td>10.0</td>
</tr>
</tbody>
</table>
Table 3.12 Building 54 & 89 SPT Order Configuration Options 1, 3, or 5

<table>
<thead>
<tr>
<th>Bldg 50 (Configuration Options: 1, 3, 5)</th>
<th>Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Paint Standard C-130</td>
<td>3.0'</td>
</tr>
<tr>
<td>2. Paint C-141</td>
<td>4.0'</td>
</tr>
<tr>
<td>3. C-130 Wash</td>
<td>0.65</td>
</tr>
<tr>
<td>4. W/E/A C-130 or C-141</td>
<td>1.0</td>
</tr>
<tr>
<td>5. Outgoing Wash &amp; Scuff Sand C-130</td>
<td>1.3</td>
</tr>
<tr>
<td>6. Paint Scuff Sanded C-130</td>
<td>1.5</td>
</tr>
<tr>
<td>7. DePaint C-130 (Chemical)</td>
<td>3.0</td>
</tr>
<tr>
<td>8. DePaint C-141 (Chemical)</td>
<td>4.0</td>
</tr>
</tbody>
</table>

* Paint C-141 and C-130 are given highest priority due to maximum 2 days wait constraint after W/E/A.

Table 3.13 Building 50, 54, & 89 SPT Order Configuration Option 6

<table>
<thead>
<tr>
<th>Bldg 50 (Configuration Option: 6)</th>
<th>Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. C-130 Incoming Wash</td>
<td>0.65</td>
</tr>
<tr>
<td>2. Outgoing Wash &amp; Scuff Sand C-130</td>
<td>1.3</td>
</tr>
<tr>
<td>3. Paint Scuff Sanded C-130</td>
<td>1.5</td>
</tr>
<tr>
<td>4. DePaint C-141 (Chemical)</td>
<td>3.0</td>
</tr>
<tr>
<td>5. W/E/A &amp; Paint Standard C-130</td>
<td>4.0</td>
</tr>
<tr>
<td>6. W/E/A &amp; Paint C-141</td>
<td>5.0</td>
</tr>
<tr>
<td>7. DePaint C-130 (Media Blast)</td>
<td>10.0</td>
</tr>
</tbody>
</table>

3.3.6.3 Largest Number In Queue (LNQ) Dispatching Rule. In an effort to minimize paint/depaint wait times, the third dispatching rule examined is a LNQ technique. For this dispatching rule, when a paint/depaint facility becomes free, it will search the queues in front of each paint/depaint process (Wash, DePaint, W/E/A, and Paint). The order of search will be determined by decreasing order
of number of aircraft waiting for the specific process. The largest queue will be queried first and the aircraft waiting the longest amount of time with a need for the freed facility is selected for service.

3.3.6.4 Look Ahead (AHEAD) Dispatching Rule. The look ahead dispatching rule, AHEAD, is similar in approach to the LNQ dispatching rule discussed in Section 3.3.6.3. With more than one aircraft waiting for a freed facility, the aircraft with the smallest queue size at its next required operation is selected. The aircraft with the shortest "look ahead" queue will be allowed into the freed facility next. The tie breaking criterion will be based on longest current wait time. This dispatching rule is based on the look ahead dispatching rule discussed by Panwalkar and Iskander [Panwalkar and Iskander, 1977:52].

Based on the literature review, it is expected that wait times should be reduced with the SPT dispatching rules. No direct comparisons of the LNQ, AHEAD, and FCFS were found, and therefore expected results are uncertain.

3.3.7 Dispatching rules for Facility Utilization. In addition to the application of dispatching rules after a facility has been freed, dispatching rules are also applied
in the case when two or more facilities are available and capable of processing an arriving aircraft. For example, in configuration option 6, if a C-141 aircraft arrives for depaint and buildings 50, 54, and 89 are available, a dispatching rule is required to determine which facility the aircraft will enter. Two dispatching rules investigated are based on minimum utilization and maximum current idle time. These dispatching rules are executed upon arrival of an aircraft for a paint/depaint operation which more than one facility is capable of performing. These two rules were investigated in a preliminary analysis and found to have no significant difference in effect on aircraft throughput. Since the facility dispatch rule based on maximum idle time appeared to do better in terms of average wait time, it was selected as the rule and fixed for all future investigations. For this technique, if more than one facility is available and capable of performing the operation, the facility which has been available the longest will be selected.

The two facility utilization techniques are described in Appendix C. Results of simulation runs using both facility dispatching techniques are provided in Appendix A. Figure 3.4 provides a flow chart representation of these dispatching techniques.
3.4 Simulation Output

To adequately determine the effects of configuration and dispatching techniques, the following output data was collected on each simulation model:

**Time in System.** Time in system statistics were collected for all aircraft, all aircraft requiring paint, C-130 aircraft, C-141 aircraft, and C-141 aircraft requiring usage of the paint/depaint facilities.

**Completion Times.** Time of completion (amount of time required to process all scheduled aircraft) was collected for all aircraft requiring speedline work (183 scheduled), completion of last CW Box aircraft (8 scheduled), last C-141 aircraft (191 scheduled), and last C-130 aircraft (44 scheduled).

**Wait Times.** The average amount of time an aircraft waits for usage of each paint/depaint facility as well as an overall average.

**Facility Utilization.** The percent of time buildings 50, 54, and 89 are busy will also be collected.

3.5 Verification and Validation

Verification and validation (V & V) of the simulation models is a significant process in the model formulation. The model was verified for accuracy throughout its construction and modifications. Validation of the simulation results was a more difficult task to accomplish due lack of data from the actual system.
3.5.1 Verification. The model was verified by several verification techniques including degenerative tests, and executing a computerized trace of aircraft flow through the model. Degenerative tests were conducted by removing all but one aircraft input type. The flow days for this type of aircraft were compared to expected total critical path times for the aircraft type plus average waiting times for resources. Resource capacities were also increased to eliminate wait times and again flow times were compared to critical path time.

The model was also verified by executing a computerized trace of the aircraft through the model. SLAM II is well suited to conduct such a trace with the MONTR,TRACE command. Aircraft flow as well as file manipulations were verified by the trace to ensure flow and dispatching occurred as intended.

3.5.2 Validation. Validation is the process of establishing that the simulation model is an accurate representation of the system under study [Law and Kelton, 1991:299]. Actual data was not available for modeled resource levels or arrival rates. However, flow days for aircraft by type were compared to field expert estimations (estimations were gathered through a combination of telecons and TDYs). By comparing estimated values with those
resulting from the model while considering wait times, the only conclusion that could be made is the output values were within reason.

A structured walk through of the model with personnel form WR-ALC (Col Scoskie, WR-ALC/LJP, and Capt Colter, WR-ALC/LJPL) was conducted. The purpose of this walk through was to validate the model's accuracy and logic, as well as verify the accuracy of the assumptions for activity durations [Scoskie and Colter, 1992].

3.5 Chapter Summary

Within this chapter, the simulation model was discussed along with the progression of C-130 and C-141 aircraft through the model. The flow of the aircraft is determined by the maintenance it requires. Aircraft are inserted into the system to serve as an initial warm-up for the system, as well as to maintain pressure on the system after the last scheduled aircraft has entered the model. As aircraft require a paint/depaint operation, the facility to perform the operation is chosen based on need and facility dispatching rule. The facility dispatching rules considered include evenly distributing facility utilization, and selection based on current free time. If no facility is available to perform the required operation, the aircraft is placed in the file associated with the operation required.
When a facility becomes free, if aircraft are waiting, a dispatching rule is used to determine which aircraft enters the facility. These following dispatching rules were tested: first come, first served (FCFS), shortest processing time (SPT), largest number in queue (LNQ), or a look ahead heuristic.
IV. Analysis Methodology

This chapter will layout the framework of the experimental design used within this research, describe the sensitivity analysis conducted, and describe the statistical analysis performed on the output data. Also, this chapter will present issues which bound utilization rates.

4.1 Experimental Design

To conduct the analysis, a full factorial experimental design is established to examine each possible factor option. The factors and levels to be analyzed for the experimental design are provided in Table 4.1. The full factorial design is detailed in Table 4.2.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration Options</td>
<td>5 (1, 2, 3, 5, 6)</td>
</tr>
<tr>
<td>Aircraft Dispatching Rules</td>
<td>4 (FCFS, AHEAD, LNQ, SPT)</td>
</tr>
</tbody>
</table>

A detailed description of each factor and its associated levels is provided in Chapter III. These levels were chosen by request from WR-ALC (in the case of
configuration options), for ease of implementation, and potential for impact on aircraft throughput and wait time. In total, 20 simulation models were constructed to complete this experimental design.

Table 4.2 Experimental Design

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>Dispatching Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FCFS</td>
</tr>
<tr>
<td>1</td>
<td>AHEAD</td>
</tr>
<tr>
<td>1</td>
<td>LNQ</td>
</tr>
<tr>
<td>1</td>
<td>SPT</td>
</tr>
<tr>
<td>2</td>
<td>FCFS</td>
</tr>
<tr>
<td>2</td>
<td>AHEAD</td>
</tr>
<tr>
<td>2</td>
<td>LNQ</td>
</tr>
<tr>
<td>2</td>
<td>SPT</td>
</tr>
<tr>
<td>3</td>
<td>FCFS</td>
</tr>
<tr>
<td>3</td>
<td>AHEAD</td>
</tr>
<tr>
<td>3</td>
<td>LNQ</td>
</tr>
<tr>
<td>3</td>
<td>SPT</td>
</tr>
<tr>
<td>5</td>
<td>FCFS</td>
</tr>
<tr>
<td>5</td>
<td>AHEAD</td>
</tr>
<tr>
<td>5</td>
<td>LNQ</td>
</tr>
<tr>
<td>5</td>
<td>SPT</td>
</tr>
<tr>
<td>6</td>
<td>FCFS</td>
</tr>
<tr>
<td>6</td>
<td>AHEAD</td>
</tr>
<tr>
<td>6</td>
<td>LNQ</td>
</tr>
<tr>
<td>6</td>
<td>SPT</td>
</tr>
</tbody>
</table>

This experimental design will be conducted with an assumed exponential arrival rate to provide a reasonable
estimate of the actual aircraft arrival process. Each model will consist of 30 independent runs. The number of runs were chosen to minimize the possibility of making a Type I (rejecting Null hypothesis when Null is true) or Type II (do not reject Null hypothesis when Null is false) error during hypothesis testing, and to ensure error terms are normally distributed random variables.

4.2 Sensitivity Analysis

The areas of concern for the sensitivity analysis include the arrival process, determination of WR-ALC system throughput capacity, and increased pressure on paint/depaint facilities. The rationale for conducting an analysis in each of these areas as well as how they were conducted is presented below.

4.2.1 Arrival Process. Since an exact two year aircraft input schedule is not available, the exponential arrival process was assumed for the above described analysis. It may be possible to increase the aircraft throughput by bettering this input schedule. Although alternate input schedules were not developed as part of this research, an arrival process assuming all aircraft are available to enter the system at time zero was considered. This arrival process should provide an upper bound for
aircraft throughput under current imposed maximum number on ground (MOG) constraints. Although not analytically proven, it is expected that aircraft throughput would increase under this arrival process.

4.2.2 System Capacity. In addition to the above listed experiment, an additional analysis has been conducted to determine the effects on C-130 and C-141 throughput when all MOG constraints are eliminated, and all aircraft are available to start maintenance at time zero. The results of this analysis was expected to provide an upperbound on the capacity of the paint/depaint facilities. Again, the experimental design detailed in Section 4.1 was used with the arrival process with all aircraft available at time equals zero, and all MOG constraints removed.

4.2.3 Increased Pressure on Paint/Depaint Facilities. With the possibility of "Operation Proud MAC" being implemented in the near future, an area of concern at WR-ALC is the excess capacity of the paint/depaint facilities. To determine the effect of increased pressure on aircraft throughput across each configuration option and dispatching rule, the experimental design of Section 4.1 was repeated, with the arrival process assumed exponential. The difference with this analysis is the number of aircraft
which undergo paint/depaint operation was increased by 48 aircraft. This is conducted by converting 48 of the C-141 SL aircraft to SL-Paint type aircraft.

4.3 Statistical Significance Testing

Throughput, defined as the total number of aircraft (both C-130 and C-141) completing the system within the two year period of interest, has been used as the primary criteria for evaluation of this experimental design. In addition to aircraft throughput, the average time each aircraft spends waiting for a paint/depaint facility will also be evaluated. A complete pairwise comparison is necessary to determine the best configuration option/dispatching rule combination. To accomplish these comparisons, the PROC GLM procedure of the SAS Language will be utilized. The PROC GLM procedure uses the method of least squares to fit General Linear Models. The factor levels in this experimental design are qualitative in nature which is accommodated by PROC GLM. The main effects of each factor will be investigated as well as each interaction term for significant effect on aircraft throughput and wait time. All testing and comparisons will be conducted at a 90% confidence level. It is assumed that all error terms within the theoretical model are independent normal random variables, with a mean of 0 and a constant variance. This
assumption will be verified using a plot of residual values versus predicted values from the estimated linear model.

The strategy for the analysis will be as follows [Neter et al., 1990:730]:

1. **Determine whether the two factors interact.** To determine if the two factors interact, the null hypothesis that interaction effects are not present is tested. The test statistic, $F^*$ (interaction mean squares/mean squared error) will be computed automatically by PROC GLM and provided in the ANOVA table. A large $F^*$ indicates the possible existence of interactions. $F^*$ is compared to $F$ critical to test these hypothesis.

2. **If factors do not interact, determine whether the main factor effects are important.** To determine if the main factors effects are important, the null hypothesis that main factor effects are not present is tested. This test is conducted for each factor. The test statistic, $F^*$ (main effect mean squares/mean squared error) will be computed automatically by PROC GLM and provided in the ANOVA table. A large $F^*$ indicates the existence main factor effects. $F^*$ is compared to $F$ critical to test these hypothesis.

   2.a. **If main effects are important, conduct a comparison of means.** Since only pairwise comparisons will be made, the method of choice is the Tukey Method [Neter et al., 1990:585-587]. The Tukey method comparison will be used if one or both main effects is/are determined to be important.

3. **If the factors do interact, determine if interactions are important or unimportant.** The determination of important versus unimportant will be based on the severity of the interaction effects, and is, admittedly, a judgement decision. Differences in wait times of less than 1.5 days and differences in throughput values of 1 AC or less will be considered unimportant [Colter, 1992].

   3.a. **If the interactions are unimportant, proceed as in step 2.**

   3.b. **If the interactions are important, attempt to eliminate interaction effects using simple transformations of scale.** If transformations eliminate interactions, proceed as in step 2. For important interactions that
cannot be made unimportant, analyze the two factor effects jointly in terms of treatment means.

4.4 Utilization Rate Issues

WR-ALC management requested that utilization rates for the facilities be considered within this research. Ravindran, Phillips, and Solberg [Ravindran et al, 1987:321-322] demonstrate that for a stochastic, single server queue model, a 100% utilization rate may not be achievable. As the utilization rate approaches 100%, queue sizes approach infinite length. Not only does the queue size approach an infinite length, but the average queue length also approaches infinity. Obviously, this is not a feasible consideration for the WR-ALC system. It is further concluded by the authors that by limiting the average queue length of the single server model to 5, the utilization rate achieved is only 85%. A further complicating factor not considered by this model, is the induced variability due to random arrival times as well as service times. Considering these factors, it should not be of great concern if the facilities do not achieve a 100% utilization rate under either arrival rate investigated.
V. Results

This chapter reports the outcome of the research analysis described in the previous chapter. The primary purpose of this research was to determine the effects of configuration options and dispatching rules on aircraft throughput. Additionally, aircraft waiting times for paint/depaint facilities are also considered. This chapter will initially describe and present an upper bound for facility capacity, provide output results, and finally present the sensitivity analysis on the models.

5.1 Facility Capacities

An understanding of the capacity for each configuration option is required to gain an insight on expected results. A rough estimate for each option's capacity is presented below.

First, the time required to process each aircraft type is computed as follows:

C-141 Aircraft:

A C-141 aircraft which will undergo the paint/depaint process will require on the average, 4 days for Depaint, 1 day for wash, etch and alodine (W/E/A), and 4 days for paint, or a total of 9 days/aircraft required processing.
time. Under the current schedule, 87 C-141 aircraft will require this process (33 SL-Paint, 46 SL-PDM-Paint, 8 CW) over the next two years. Therefore total expected processing time required can be computed as follows:

\[ 87 \text{ AC} \times 9 \text{ days/AC} = 783 \text{ days processing time required.} \]

**Standard C-130 Aircraft:**

A C-130 aircraft which will undergo the paint/depaint process will require, on the average, 1 day for W/E/A and 3 days for paint. Time required to depaint is dependent upon configuration option. In configuration option 1, C-130 aircraft are chemically depainted. The duration for this process is 3 days. Under Options 2, 3, 5, and 6, C-130 aircraft are depainted by media blasting. Media blasting requires 10 days to process. Therefore a standard C-130 under Option 1 will require 7 days per aircraft, and under all other options require 14 days per aircraft. With the current schedule, 30 standard C-130 aircraft will require the paint/depaint process. Therefore, total expected processing time for a standard C-130 is determined as follows:

(Option 1)

\[ 30 \text{ AC} \times 7 \text{ days/AC} = 210 \text{ days processing time required.} \]

(Options 2, 3, 5, 6)

\[ 30 \text{ AC} \times 14 \text{ days/AC} = 420 \text{ days processing time required.} \]
Scuff Sand C-130 Aircraft:

A scuff sanded C-130 aircraft requires, on the average, .65 days for the incoming wash, .65 days scuff sanding, .65 days for outgoing wash, and 1.5 days for paint. Under the current schedule, 14 C-130 aircraft will require this process. Therefore the total processing time requirement for a scuff sanded C-130 aircraft is determined as follows:

\[ 14 \text{ AC} \times 3.45 \text{ days/AC} = 48.3 \text{ days processing time required.} \]

Next, the total expected processing time required for C-141 and C-130 processing is determined. As discussed above, with configuration Option 1, all standard C-130 aircraft will be chemically depainted, and media blasted in all other possible configuration options. With this in mind, the capacity for each paint/depaint configuration option is presented below:

**Option 1:**

<table>
<thead>
<tr>
<th>Processing Time Requirement</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C-141</td>
<td>783 days</td>
</tr>
<tr>
<td>Standard C-130</td>
<td>210 days</td>
</tr>
<tr>
<td>Scuff Sand C-130</td>
<td>48.3 days</td>
</tr>
<tr>
<td>Total Processing Time Required</td>
<td>1,041.3 days</td>
</tr>
</tbody>
</table>

For Option 1, to determine a lower bound for expected processing time, it can be assumed 2 aircraft can be
processed simultaneously (1 in paint, 1 in depaint, or W/E/A). Therefore, the expected time needed to process these aircraft will be at least:

\[
\frac{1,041.3 \text{ days}}{2 \text{ machines}} = 520.65 \text{ days required}
\]

Assuming there are 354 work days available each year, 709 days are available over the period of interest (FY92 and FY93). Total processing days required falls well within the 709 days available (73.4% of available time required).

Option 2:

<table>
<thead>
<tr>
<th>Processing Time Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-141</td>
</tr>
<tr>
<td>Standard C-130</td>
</tr>
<tr>
<td>Scuff Sand C-130</td>
</tr>
<tr>
<td><strong>Total Processing Time</strong></td>
</tr>
<tr>
<td><strong>Required</strong></td>
</tr>
</tbody>
</table>

For Option 2, all C-130 aircraft are processed within building 50, and all C-141 aircraft are processed by buildings 54 and 89. These aircraft may be considered separately under this configuration option. For C-141 aircraft, it can again be assumed 2 aircraft can be processed simultaneously (1 in paint, 1 in depaint, or
W/E/A). Therefore, the time needed to process C-141 aircraft will be:

\[
\frac{783 \text{ days}}{2 \text{ machines}} = 391.5 \text{ days required}
\]

This time requirement falls well within the 709 processing days available (55.2% of available time required).

For C-130 aircraft, only one aircraft can be processed at a given time. Therefore, the time needed to process C-130 aircraft will be:

\[
\frac{468.3 \text{ days}}{1 \text{ machine}} = 468.3 \text{ days required}
\]

This time requirement falls well within the 709 processing days available (66.1% of available time required).

Option 3:
Option 3 allows a C-141 aircraft to undergo W/E/A and/or paint in building 50 if building 89 is occupied. Although not directly computed, it is inferred expected time requirements in buildings 54 and 89 will decrease, and building 50 time requirements will increase. However, it
should be noted that since the lower bound or expected time to complete C-130 processing in building 50 is greater than expected C-141 processing, this option would not improve the time required for all the aircraft processing.

**Option 5:**

Option 5 uses each paint/depaint facility independently (available to process C-130 or C-141 aircraft). For this configuration option, facility capabilities are slightly less than an option for which each facility is capable of performing all paint/depaint operations (Option 6). Therefore, to determine a lower bound on expected processing time required, it can be assumed 2.75 aircraft can be processed simultaneously. The time needed to process these aircraft will be:

\[
\frac{1,251.3 \text{ days}}{2.75 \text{ machines}} = 455 \text{ days required}
\]

Assuming there are 354 work days available each year, 709 days are available over the period of interest (FY92 and FY93). Total processing days required falls well within the 709 days available (64.2% of available time required).
**Option 6:**

Option 6 increases the capability of buildings 54 and 89 such that all three buildings can accomplish any paint/depaint operation, independent of aircraft type. To determine a lower bound on expected processing time required, it is assumed 3 aircraft can be processed simultaneously. Therefore, the time needed to process these aircraft will be:

\[
\frac{1,251.3 \text{ days}}{3 \text{ machines}} = 417.1 \text{ days required}
\]

And as expected, processing days required falls well within the 709 days available (58.8% of available time required).

From these estimates of each configuration option's capacity, it does not appear that the paint/depaint facilities will be a bottleneck under current input goals. Given the low expected utilization rates, from the research of Ravindran, Phillips, and Solberg [Ravindran et al., 1987:321-322] (presented in Section 4.4), average queue sizes are also expected to be small. Therefore it is expected that waiting times for the paint/depaint facilities will be small. Unfortunately, these estimates do not take into consideration the inherent variability and complexities
of the WR-ALC system. Therefore, these estimates will only be used for comparison purposes to determine if simulation results appear reasonable.

5.2 Configuration Option Comparison

The primary measure of effectiveness for comparison of configuration options is aircraft throughput, or how many aircraft the system can process in the two year period of interest. Each configuration option was combined with each of four dispatching techniques considered in this analysis. The abbreviations for dispatching techniques are as follows:

- **FCFS** - First Come, First Serviced
- **AHEAD** - Look Ahead heuristic
- **LNQ** - Largest Number in Queue
- **SPT** - Shortest Processing Time

Each combination of configuration option and dispatching technique was evaluated with an assumed exponential aircraft arrival rate. Table 5.1 presents the simulation output results (based on 30 simulation runs per configuration option/dispatching technique option). Figures 5.1 and 5.2 provide this data in graphical format. Table 5.2 provides facility utilization rates defined as the percent of time each facility is busy. Aircraft throughput is defined as all aircraft (C-130, and C-141) which depart the system within the two year period of interest. The
desired number of aircraft to complete the system in two years is 235. Wait times are defined as the average time which all aircraft (C-130 and C-141) wait for paint/depaint facilities. Simulation output results including times in system, completion times, facility utilization, as well as further breakouts of presented data are available in Appendix A.
Table 5.1 Simulation results for Exponential Arrival Rates

<table>
<thead>
<tr>
<th>Option</th>
<th>Dispatching Rule</th>
<th>ave. Aircraft Throughput (# AC)</th>
<th>ave Wait Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FCFS</td>
<td>169.2</td>
<td>7.1</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>167.5</td>
<td>7.6</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>168.1</td>
<td>7.7</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>169.8</td>
<td>5.6</td>
</tr>
<tr>
<td>2</td>
<td>FCFS</td>
<td>171.6</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>171.2</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>171.2</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>171.4</td>
<td>3.9</td>
</tr>
<tr>
<td>3</td>
<td>FCFS</td>
<td>171.2</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>170.8</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>171.4</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>173.3</td>
<td>3.7</td>
</tr>
<tr>
<td>5</td>
<td>FCFS</td>
<td>169.8</td>
<td>2.9</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>171.7</td>
<td>2.7</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>169.1</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>170.9</td>
<td>2.8</td>
</tr>
<tr>
<td>6</td>
<td>FCFS</td>
<td>172.2</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>170.5</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>171.4</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>169.2</td>
<td>0.8</td>
</tr>
</tbody>
</table>
Table 5.2 Facility Utilization Rates (Exponential Arrival Rate)

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>Facility Utilization Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bldg 50</td>
</tr>
<tr>
<td>1</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>0.68</td>
</tr>
<tr>
<td>3</td>
<td>0.72</td>
</tr>
<tr>
<td>5</td>
<td>0.73</td>
</tr>
<tr>
<td>6</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Figure 5.1 Configuration Option vs Aircraft Throughput (EXP Arrivals)
5.3 Output Analysis

The following sections will provide an analysis of the output results obtained from the simulation. An analysis will be presented for both throughput and wait time results.
5.3.1 Effects of Configuration Options and Dispatching Rules on Aircraft Throughput. As can best be shown by Figure 5.1, the investigated factors (configuration option and dispatching rules) have minimal, if any, impact on aircraft throughput. A complete analysis (As described in Chapter IV) was performed on the output data and provided in Appendix D and discussed below.

By examination of the ANOVA table, it is concluded that the interaction effects are not significant at a 90% confidence level. Also, by reviewing the ANOVA table it is concluded that the main dispatching rule effect on aircraft throughput is not statistically significant. Only the main configuration option effect is determined to be significant.

Looking at the main configuration option effect, no statistical difference is found between configuration Options 2, 3, 5, or 6. However, configuration Option 1 (baseline model) is found to be significantly different from the grouping of configuration options 2, 3, 5, and 6.

The Tukey groupings showing main configuration option effect and main dispatching rule effect on aircraft throughput are shown in Table 5.3 and 5.4, respectively. Means with the same Tukey grouping letter are determined to not be significantly different from each other.

67
From a visual inspection of the residual plot (provided in Appendix D), the model assumptions of random residual and constant variance is verified.

Table 5.3 Main Configuration Option Effect on Aircraft Throughput (Exponential Arrival Rate)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput (# of AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>168.63</td>
<td>1</td>
</tr>
<tr>
<td>A</td>
<td>171.31</td>
<td>2</td>
</tr>
<tr>
<td>A</td>
<td>171.65</td>
<td>3</td>
</tr>
<tr>
<td>A</td>
<td>170.37</td>
<td>5</td>
</tr>
<tr>
<td>A</td>
<td>170.83</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

Table 5.4 Main Dispatching Rule Effect on Aircraft Throughput (Exponential Arrival Rate)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput (# of AC)</th>
<th>Dispatching Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>170.79</td>
<td>FCFS</td>
</tr>
<tr>
<td>A</td>
<td>170.28</td>
<td>AHEAD</td>
</tr>
<tr>
<td>A</td>
<td>170.23</td>
<td>LNQ</td>
</tr>
<tr>
<td>A</td>
<td>170.91</td>
<td>SPT</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

The rationale for these results can be attributed to the utilization of the facilities. As described in Section 5.1, total paint/depaint processing time required falls well below processing time available for each configuration option. Under the present aircraft input
requirements, paint/depaint facilities are not a major constraint on the system. This issue will be further investigated within the sensitivity analysis portion of this chapter.

To further demonstrate that the paint/depaint facilities are no longer a bottleneck of the WR-ALC system, a model was constructed by modifying option 6. This model used the facility capabilities of option 6 (all facilities capable of performing each paint/depaint operation) and increased the number of each to 10. In essence, this model assumed 30 fully capable paint/depaint facilities were available. If the paint/depaint facilities were a bottleneck, it would be expected that throughput results would increase significantly. However, based on ten model runs, throughput results increased by only one aircraft over the two year period of interest, further verifying the paint/depaint facilities are not constraining the WR-ALC system.

5.3.2 Effects of Configuration Options and Dispatching Rules on Aircraft Wait Times. As best demonstrated in Figure 5.2, there does appear to exist a correlation between the investigated factors and average wait time. As with aircraft throughput analysis, the initial step is to determine if interaction effects are significant. From the
ANOVA table it is concluded that the interaction effects are statistically significant at a 90% confidence level. However, using the criteria discussed in Chapter IV, by inspection of these interaction effects, it is assumed interaction effects are not important (effects are minimal). Also by reviewing the ANOVA table it is concluded that both main factor effects are significant.

Looking at the main configuration option effect on wait time, difference exists between each configuration option, with the exception of configuration options 2 and 3. For dispatching rules, no statistical difference is found between FCFS and AHEAD dispatching rules, however this testing concludes LNQ and SPT differ from each other as well as AHEAD or FCFS. Although a statistical difference does exist between dispatching rules, this difference can be considered unimportant (less than .7 days in worst case).

The Tukey groupings showing main configuration option effect and main dispatching rule effect on wait time are presented in Table 5.5 and 5.6, respectively.
Table 5.5 Main Configuration Option Effect on Wait Time (Exponential Arrival Rate)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Wait Time (days/AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7.00</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>4.34</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>4.19</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>2.86</td>
<td>5</td>
</tr>
<tr>
<td>D</td>
<td>0.76</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different.

Table 5.6 Main Dispatching Rule Effect on Wait Time (Exponential Arrival Rate)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Wait Time (days/AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>B A</td>
<td>3.92</td>
<td>FCFS</td>
</tr>
<tr>
<td>B A</td>
<td>3.94</td>
<td>AHEAD</td>
</tr>
<tr>
<td>A</td>
<td>4.13</td>
<td>LNQ</td>
</tr>
<tr>
<td>C</td>
<td>3.32</td>
<td>SPT</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different.

The wait time results appear to fall within reason. With less than full pressure on the paint/depaint facilities, dispatching rules are not capable of having an impact on wait times. Minimal queue sizes are developing at each facility, and therefore facility entry decisions will closely resemble those of the FCFS dispatching rules. The impact of this can best be shown in Figure 5.4. By design, configuration Option 1 provides the most pressure on the paint/depaint facilities due to limited capabilities of the facilities (utilization rate computed to be 79% for Bldg 54.
and 56% for Bldg 89). The effects of dispatching rules are seen for this option and the robustness of the SPT dispatching rule is once again demonstrated. Overall, the effects of dispatching rules decrease as facility capabilities increase.

From a visual inspection of the residual plot (provided in Appendix D), the model assumptions of random residual is verified, however it does appear that as facility capabilities increase, the variance of the output data decreases.

5.4 Sensitivity Analysis

The areas to be covered within this sensitivity analysis include determination of system capacity, increased pressure on paint/depaint facilities, and effects of aircraft preemption. The rationale for conducting each sensitivity analysis is presented in Chapter IV.

5.4.1 All aircraft available at T=0. By assuming all aircraft are available for maintenance at time zero, an upper bound for aircraft throughput has been estimated under current MOG constraints, input order and mix of required processing. The analysis of output results are summarized below and presented in detail in Appendix A. Additional simulation output results including times in system,
completion times, facility utilization, as well as further breakouts of presented data are available in Appendix A.

5.4.1.1 Effects of Configuration Options and Dispatching Rules on Aircraft Throughput. As with the exponential arrival rate data, the investigated factors (configuration option and dispatching rules) have minimal, if any, impact on aircraft throughput. These results further verify the conclusion that the paint/depaint facilities are no longer a bottleneck of the WR-ALC system.

5.4.1.2 Analysis of Results on Aircraft Wait Times. The wait time results differ only slightly from those obtained under the exponential arrival rate assumption. A statistical difference is now found between configuration Options 2 and 3, however this difference is assumed unimportant (0.14 days). Differences are again found for dispatching rule levels and, as with the exponential arrival rate, are assumed unimportant (0.53 days in worst case scenario).

5.4.1.3 Comparison of Arrival Rates. Aircraft throughput, across all factor effects, is increased by allowing all aircraft to be available for maintenance at T = 0. The overall mean for aircraft throughput under the
exponential arrival process is 170.55 aircraft over the two year period, and 179.18 aircraft for arrivals at T=0 assumption. Due to the large number of simulation runs (600 for each arrival rate), it is concluded without a formal statistical comparison that this difference is significant and important. It can be concluded from these results that by establishing a better aircraft input schedule, aircraft throughput can be increased by approximately 5 aircraft per year. Although the best input schedule for the WR-ALC system is not known, these results do show that at least 5 more aircraft could be expected to be processed per year under a different input schedule.

For wait time, the overall mean for wait time under the exponential arrival process is 3.82 days per aircraft, and 3.41 days for the arrivals at T=0 assumption. Although these differences may be statistically significant, they are not considered important (0.41 day difference). These values are contrary to expected results (as arrival rate is increased, wait times expected to increase). The exact reason for this is not known, however it is speculated that system constraints are affecting the arrival process to each paint/depaint facility.

5.4.2 MOG Sensitivity Analysis. Simulation models were constructed to determine the overall capacity of the
WR-ALC C-130 and C-141 maintenance operation. To accomplish this task all maximum number of aircraft (MOG) constraints are removed from the model, and all aircraft are assumed to be available to enter the system at the start of the simulation, or time = 0. It is expected that by eliminating the MOG constraints, throughput values should increase. For configuration Options 1 and 2, throughput results for the constrained system were found to be less than those of the unconstrained system. Also for the unconstrained system, as facility capabilities increased (from Options 3 to 5 or 6), throughput results decreased. Output result are provided in Appendix A. These output result anomalies appear to be dependent upon decisions and constraints from factors other than those considered within this research (configuration options and dispatching rules). Therefore, these results are not presented formally within this research. An in-depth examination of the output identifies the decision criteria on entering C-141 speedline hangars as a likely cause for these anomalies.

A speedline-PDM (SL-PDM) or SL-PDM-Paint aircraft entering SL hangars has the option of entering the SL-PDM hangar and completing both operations in hangar, or if these hangars are full, entering a standard SL hangar for SL operations, followed by the completion of PDM outside of hangar. A SL or SL-Paint C-141 can only enter a SL hangar
and will not have the option of entering the SL-PDM hangar. The decision process for determining when a SL-PDM or SL-PDM-Paint utilizes the SL hangar appears to have a significant impact on the results of these models.

With MOG constraints in place, if the queue of aircraft awaiting the SL-PDM hangar exceeded 4 aircraft, the next arriving aircraft would enter the SL hangar queue. Using this criteria for the capacity models, very poor output results for aircraft throughput resulted. Initially this critical queue size was increased to 6 with little improvement to output anomalies. The final decision process attempted allowed an arriving SL-PDM or SL-PDM-Paint aircraft to enter the smallest queue. Output results did improve, however Option 6 results remained suspicious. To validate these assumptions, models for configuration Options 2, 5, and 6 under FCFS dispatching techniques were terminated at various times to gain an insight on how these queues filled. These results are presented in Table 5.7. Queue sizes are based on 3 observations per simulation run.
Table 5.7 Accumulation of Queue sizes to enter Speedline and Speedline-PDM hangars

<table>
<thead>
<tr>
<th>Time (days)</th>
<th>Option 2</th>
<th>Option 5</th>
<th>Option 6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hangar queue</td>
<td>Hangar queue</td>
<td>Hangar queue</td>
</tr>
<tr>
<td></td>
<td>SL / SL-PDM</td>
<td>SL / SL-PDM</td>
<td>SL / SL-PDM</td>
</tr>
<tr>
<td>200</td>
<td>67 / 44</td>
<td>68 / 39</td>
<td>102 / 5</td>
</tr>
<tr>
<td>300</td>
<td>62 / 53</td>
<td>62 / 53</td>
<td>100 / 22</td>
</tr>
<tr>
<td>400</td>
<td>51 / 54</td>
<td>52 / 54</td>
<td>89 / 21</td>
</tr>
<tr>
<td>500</td>
<td>33 / 45</td>
<td>36 / 47</td>
<td>72 / 14</td>
</tr>
<tr>
<td>600</td>
<td>16 / 32</td>
<td>18 / 33</td>
<td>54 / 1</td>
</tr>
<tr>
<td>709</td>
<td>0 / 14</td>
<td>0 / 15</td>
<td>33 / 0</td>
</tr>
</tbody>
</table>

Although these differences in queue size accumulation may not be solely dependent upon the queue entry decision, these differences will have an impact on aircraft throughput results. These effects are most evident when comparing throughput values of configuration option #6 against all other options (throughput is less despite increased paint/depaint facility capabilities). Further analysis to determine the appropriate decision criteria is outside the scope of this research but should be investigated further for impact on the MOG constrained system.

5.4.3 Increased pressure on Paint/Depaint Facilities.

As discussed in above sections, under the current input schedule, the paint/depaint facilities do not appear to be a constraint on aircraft throughput. This conclusion is based on the results of the facility capacity analysis presented.
in Section 5.1 and utilization rates and wait time results presented in Section 5.3 (both found to be low). To increase the pressure on the system and to further evaluate the effects of configuration options and dispatching techniques, the number of aircraft requiring paint is increased in the simulation model. An increase of 48 C-141 aircraft requiring paint are added by alternating the number of SL and SL-Paint aircraft entered into the system. Previous models assumed 81 SL aircraft and 33 SL-Paint aircraft would enter the system over the two year period of interest. For the following evaluation these values are reversed, or 33 SL aircraft and 81 SL-Paint aircraft are entered into the system. The total number of aircraft entering the system remains at 235, however the total number to undergo the paint/depaint process increases from 131 to 179. Arrival rates for this analysis are assumed to be exponentially distributed. A formal analysis of this data is provided in Appendix D and summarized below. Additional simulation output results including times in system, completion times, facility utilization, as well as further breakouts of presented data are available in Appendix A.

5.4.3.1 Effects of Configuration Options and Dispatching Rules on Aircraft Throughput. For these models with an increased number of paint aircraft, a more distinct correlation is demonstrated between aircraft throughput and
configuration option. Configuration option 6, as originally anticipated, does provide an statistically significant increase in aircraft throughput (averaging 171.9 aircraft over two year period). Configuration options 2, 3, and 5 provide almost identical throughput results (averaging approximately 167), and Option 1 provided, as expected, the worst throughput results (averaging 156.1). Although the configuration option does have a significant effect on aircraft throughput, dispatching rules however, have minimal, if any, impact on aircraft throughput.

5.4.3.2 Effects of Configuration Option and Dispatching Rules on Wait Time. A statistical difference is found between the effect of each configuration on wait time. As expected, configuration option 6 produces the minimum wait time (2.56 days), followed by each configuration option in descending order.

For dispatching rule level effects, FCFS, LNQ, and AHEAD provide no significant difference in effect on wait times. However, under this increased pressure on paint/depaint facilities, the robustness of the SPT dispatching rule is demonstrated. Wait time under the SPT dispatching rule are decreased by approximately 3 days per aircraft over other investigated dispatching rules.
These results conform to the expected results for the system (increase in throughput and decrease in wait time as facility capabilities increase).

5.4.3.3 Comparison of Results. Aircraft throughput, across all factor effects is, as expected, decreased by increasing the number of paint aircraft. The overall mean for aircraft throughput with 131 paint aircraft entered into the system (Section 5.2) is 170.55 aircraft over the two year period, and 166.05 aircraft for the increased pressured system (179 paint aircraft entered). Due to the large number of simulation runs (600 for each arrival rate), it is concluded without a formal statistical comparison that this difference is significant and important. However, the statistical testing does not measure the full impact of these results. By increasing the number of paint aircraft by 48, overall expected aircraft throughput is decreased by only 2 aircraft per year. The effects of the dispatching rules are brought out by the increase in pressure, however overall impact of dispatching rule on aircraft throughput is minimal under this altered input (less than 1 aircraft per year).

For wait time, the overall mean under the anticipated aircraft input levels is 3.82 days per aircraft, and 12.15 days for the increased pressured system. Obviously these
differences are statistically significant and important. The rationale for these results is due to the increased pressure on the system as demonstrated by the increase in facility utilization rates.

5.4.4 Preemption. A preemption technique has been utilized in the past at WR-ALC to preempt, or "break" an aircraft within depaint or wash, for an aircraft awaiting wash, etch and alodine (W/E/A), if the paint facility is unoccupied. To determine the effects of this preemption, this analysis has been limited to configuration options 2 and 3, and assumed an exponential aircraft arrival rate. These assumptions are used since Option 1 is only being used as a baseline for comparisons, and Options 5 and 6 increase the available paint facilities which eliminates the need for preemption. Each preempted aircraft will have first priority to reenter the facility once it has been released. Also, the preempted aircraft will require its remaining processing time, as well as incur an additional 8 hours of required processing time accounting for towing in and out of the facility and remasking of the surface of the aircraft. For this study, a C-141 aircraft undergoing depaint (Bldg 54) will be preempted if an aircraft arrives requiring W/E/A (Bldg 54) and the paint facility (Bldg 89) is available.
Simulation results are presented in Table 5.8. Facility utilization rates are presented in Table 5.9.

Table 5.8 Simulation results for Exponential Arrival Rates and allowed Preemption

<table>
<thead>
<tr>
<th>Option</th>
<th>Dispatching Rule</th>
<th>ave. Aircraft Throughput (# AC)</th>
<th>ave Wait Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>FCFS</td>
<td>171.4</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>170.1</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>170.9</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>168.3</td>
<td>5.3</td>
</tr>
<tr>
<td>3</td>
<td>FCFS</td>
<td>170.8</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>169.9</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>171.2</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>170.7</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Table 5.9 Facility Utilization Rates for Exponential Arrival Rate and Allowed Preemption

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>Facility Utilization Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bldg 50</td>
</tr>
<tr>
<td>2</td>
<td>0.69</td>
</tr>
<tr>
<td>3</td>
<td>0.77</td>
</tr>
</tbody>
</table>

Comparing these results to the non-preempted data (Table 5.1) shows this preemption technique does not
significantly improve or worsen aircraft throughput, or decrease wait times. Based on observation, approximately 28 aircraft were preempted under configuration option 2, and 22 aircraft were preempted under configuration option 3 over the two year simulation.
VI. Conclusions and Recommendations

This chapter summarizes the results of this research and provides a discussion relevant to these results. This chapter will also provide suggestions and recommendations for future work uncovered as part of this research.

6.1 Conclusions

The primary objective of this research was to determine the effects of configuration options and dispatching rules on aircraft throughput for Warner Robins Air Logistics Center (WR-ALC) paint/depaint facilities. To determine these effects, an experimental design was constructed to study the effects of configuration options and dispatching rules on aircraft throughput. The configuration options investigated included a baseline model (Option 1), an "as is" model (Option 2), two models representing policy changes (Options 3 and 5), and an option representing both policy changes and upgrades to current paint/depaint facility capabilities. Manpower was assumed adequate to perform all operations. Simulation was used as the tool to evaluate each configuration option. Dispatching rules considered were based on first come, first served (FCFS), a look ahead
heuristic (AHEAD), largest number in queue (LNQ), and shortest processing time (SPT).

While this research was ongoing, policy changes at WR-ALC altered the aircraft throughput goals, and, more relevant to this research, reduced the number of aircraft requiring the paint/depaint facilities. At the time this research began, the paint/depaint facilities were identified as a bottleneck of the system. With the reduction in number of aircraft requiring paint, and under current throughput goals, paint/depaint facilities are no longer a bottleneck for the system. Therefore, excluding the baseline configuration, none of the configuration options investigated provided a significantly larger aircraft throughput than any of the others.

This conclusion proved valid over each dispatching rule investigated and over two aircraft arrival assumptions. The two arrival process assumptions investigated represented a best estimate for current input schedule (exponential arrival rate) and a best case input schedule (all aircraft available to enter the system at time zero).

The conclusion also proved valid when preemption of aircraft was allowed. The effect of preemption on aircraft throughput was found to be insignificant.

The proportion of aircraft requiring paint was increased while maintaining overall aircraft input levels

85
constant in an effort to increase the pressure on the paint/depaint facilities. A significant result stemming from this analysis showed even with an increase in number of paint aircraft (38), only a slight decrease in aircraft throughput resulted (4 aircraft over a two year period).

The average amount of time an aircraft waits for a paint/depaint facility was also used as a measure of effectiveness. Due to the increase in facility capabilities, configuration options did significantly affect wait times, however due to limited pressure on the facilities, the effect of dispatching rules on wait times was found to be insignificant.

6.2 Recommendations for Future Analysis

Two areas were found which warrant further investigation or analysis. These areas include the decision criteria for entering speedline hangar queues and the effects of different input schedules.

The decision criteria for speedline PDM aircraft to enter either the queue of the SL-PDM hangar or the SL hangar when both hangars are full had significant impact on results when maximum number of aircraft on the ground (MOG) constraints were removed. Determining the effect of
altering this decision criteria on the MOG constrained system may be useful.

This analysis investigated two aircraft arrival assumptions for aircraft entering the WR-ALC system; an exponential arrival rate, and all aircraft being available to enter the system at time zero. These arrival assumptions had a significant effect on aircraft throughput. Future research towards developing an optimal input schedule could be useful for WR-ALC.

It is also recommended that more accurate data be collected for the model. The majority of activity durations are based on best guess estimates from field experts and the accuracy of these guesses is uncertain. Also, detailed flows of C-130 aircraft were not provided and may also impact results.
Appendix A: Simulation Output Results

This appendix provides the summary of output results for each experimental design constructed. The results provided are the average value of the 30 simulation runs.
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**CN** = Facility Configuration Option  
**DS** = Dispatching Rule  
**HU** = Hangar Utilization  
**FF** = First Freed  
**MU** = Minimum Utilization  
**PAINT** = All Aircraft requiring Paint  
**ALL** = All Aircraft (C-141 and C-130)  
**C-141** = C-141 AC requiring Paint  
**C-141 PAINT** = C-141 AC requiring Paint  
**CW** = C-141 Center Wing AC  
**SL** = All C-141 speedline AC  

89
Table A.2 Utilization Rates and Wait Times Data (Exponential Arrival Rate)

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LQ = LNQ
SP = SPT
HU = Hangar Utilization
FF = First Freed
MU = Minimum Utilization
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CN = Facility Configuration Option  
DS = Dispatching Rule  
FC = FCFS  
AH = AHEAD  
LQ = LNQ  
SP = SPT  
PAINT = All Aircraft requiring Paint  
ALL = All Aircraft (C-141 and C-130)  
C-141 Paint = C-141 AC requiring Paint  
CW = C-141 Center Wing AC  
SL = All C-141 speedline AC (SL, SL-Paint, SL-PDM, SL-PDM-Paint)

HU = Hangar Utilization  
FF = First Freed  
MU = Minimum Utilization

Table A.5 Utilization Rates and Wait Times Data (Preemption)

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CN = Facility Configuration Option  
DS = Dispatching Rule  
FC = FCFS  
AH = AHEAD  
LQ = LNQ  
SP = SPT  
HU = Hangar Utilization  
FF = First Freed  
MU = Minimum Utilization
### Table A.6 Time of Last Completion (Preemption)

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**CN = Facility Configuration Option**

**DS = Dispatching Rule**

- **FC = FCFS**
- **AH = AHEAD**
- **LQ = LNQ**
- **SP = SPT**

**HU = Hangar Utilization**

- **FF = First Freed**
- **MU = Minimum Utilization**

---

ALL PAINT = All Aircraft requiring Paint

ALL = All Aircraft (C-141 and C-130)

C-141 Paint = C-141 AC requiring Paint

CW = C-141 Center Wing AC

SL = All C-141 speedline AC

(SL, SL-Paint, SL-PDM, SL-PDM-Paint)
Table A.7 Time in System and Throughput Data (Arrivals at T=0)

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**CN** = Facility Configuration Option  
**DS** = Dispatching Rule  
**FC** = FCFS  
**AH** = AHEAD  
**LQ** = LNQ  
**SP** = SPT  
**HU** = Hangar Utilization  
**FF** = First Freed  
**MU** = Minimum Utilization  

**ALL PAINT** = All Aircraft requiring Paint  
**ALL** = All Aircraft (C-141 and C-130)  
**C-141 Paint** = C-141 AC requiring Paint  
**C-141** = C-141 PAINT  
**CW** = C-141 Center Wing AC  
**SL** = All C-141 speedline AC  

94
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CN = Facility Configuration Option
DS = Dispatching Rule
FC = FCFS
AH = AHEAD
LQ = LNQ
SP = SPT
HU = Hangar Utilization
FF = First Freed
MU = Minimum Utilization

95
### Table A.9 Time of Last Completion (Arrivals at T=0)

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**CN** = Facility Configuration Option

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**CW** = C-141 Center Wing AC

**SL** = All C-141 speedline AC

(SL, SL-Paint, SL-PDM, SL-PDM-Paint)

96
### Table A.10  Time in System and Throughput Data (Arrivals at T=0, MOG Constraints Removed)

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**ALL** = All Aircraft (C-141 and C-130)  
**C-141 Paint** = C-141 AC requiring Paint  
**CW** = C-141 Center Wing AC  
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97
Table A.11  Utilization Rates and Wait Times Data (Arrivals at T=0, MOG Constraints Removed)

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CN = Facility Configuration Option  
DS = Dispatching Rule  
FC = FCFS  
AH = AHEAD  
LQ = LNQ  
SP = SPT  
HU = Hangar Utilization  
FF = First Freed  
MU = Minimum Utilization
Table A.12 Time of Last Completion (Arrivals at T=0, MOG Constraints Removed)

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C-141 Paint = C-141 AC requiring Paint
CM = C-141 Center Wing AC
SL = All C-141 speedline AC
(SL, SL-Paint, SL-PDM, SL-PDM-Paint)
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<td>SF</td>
<td>127.3 124.9 102.6 130.0 135.4</td>
</tr>
</tbody>
</table>

**CN** = Facility Configuration Option  
**DS** = Dispatching Rule  
**FC** = FCFS  
**AB** = AHEAD  
**LQ** = LNQ  
**SF** = SPT  
**HU** = Hangar Utilization  
**FF** = First Freed  
**MU** = Minimum Utilization  
**ALL PAINT** = All Aircraft requiring Paint  
**C-130 & C-141** = All Aircraft (C-141 and C-130)  
**C-141 PAINT** = C-141 Aircraft requiring Paint  
**C-141 Center Wing** = CW  
**All C-141 speedline** = SL  

100
Table A.14 Utilization Rates and Wait Times Data (Exponential Arrival Rate, Increase # Paint AC)

<table>
<thead>
<tr>
<th>OPTION</th>
<th>UTILIZATION RATE</th>
<th>WAIT TIME (in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
<td>54</td>
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<tr>
<td>CN</td>
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<td>HU</td>
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<tr>
<td>1</td>
<td>FC</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>AH</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>LQ</td>
<td>0.00</td>
</tr>
<tr>
<td>1</td>
<td>SP</td>
<td>0.00</td>
</tr>
<tr>
<td>2</td>
<td>FC</td>
<td>0.68</td>
</tr>
<tr>
<td>2</td>
<td>AH</td>
<td>0.67</td>
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<td>3</td>
<td>FC</td>
<td>0.74</td>
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<td>AH</td>
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<td>SP</td>
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<tr>
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<td>AH</td>
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<td>LQ</td>
<td>0.87</td>
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<tr>
<td>5</td>
<td>SP</td>
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<td>FC</td>
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<tr>
<td>5</td>
<td>AH</td>
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<td>0.91</td>
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<td>SP</td>
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<td>FC</td>
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<td>AH</td>
<td>0.70</td>
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<tr>
<td>6</td>
<td>LQ</td>
<td>0.70</td>
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<tr>
<td>6</td>
<td>SP</td>
<td>0.70</td>
</tr>
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<td>6</td>
<td>FC</td>
<td>0.69</td>
</tr>
<tr>
<td>6</td>
<td>AH</td>
<td>0.70</td>
</tr>
<tr>
<td>6</td>
<td>LQ</td>
<td>0.70</td>
</tr>
<tr>
<td>6</td>
<td>SP</td>
<td>0.70</td>
</tr>
</tbody>
</table>

CN = Facility Configuration Option
DS = Dispatching Rule
FC = FCFS
AH = AHEAD
LQ = LNQ
SP = SPT
HU = Hangar Utilization
FF = First Freed
MU = Minimum Utilization
### Table A.15 Time of Last Completion (Exponential Arrival Rate, Increase # Paint AC)

<table>
<thead>
<tr>
<th>OPTION</th>
<th>Time of Last Completion</th>
</tr>
</thead>
<tbody>
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<td>AH</td>
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<tr>
<td>1</td>
<td>LQ</td>
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<td>1</td>
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<td>2</td>
<td>LQ</td>
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<td>2</td>
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<td>LQ</td>
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<tr>
<td>5</td>
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<td>AH</td>
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<tr>
<td>6</td>
<td>LQ</td>
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<tr>
<td>6</td>
<td>SP</td>
</tr>
</tbody>
</table>

**CN** = Facility Configuration Option  
**DS** = Dispatching Rule  
**FC** = FCFS  
**AH** = AHEAD  
**LQ** = LNQ  
**SP** = SPT  
**HU** = Hangar Utilization  
**FF** = First Freed  
**MU** = Minimum Utilization  

**ALL PAINT** = All Aircraft requiring Paint  
**ALL** = All Aircraft (C-141 and C-130)  
**C-141 Paint** = C-141 AC requiring Paint  
**CW** = C-141 Center Wing AC  
**SL** = All C-141 speedline AC (SL, SL-Paint, SL-PDM, SL-PDM-Paint)
Appendix B: Additional Analysis

This appendix provides the analysis of arrival rate at time zero data and the data from the system with an increased number of aircraft requiring paint as described in Section 5.

B.1 All aircraft available at T=0. Table B.1 presents the simulation output results given all aircraft are available to enter the system at T=0 (based on 30 simulation runs per configuration option/dispatching technique option). Figures B.1 and B.2 provide this data in graphical format. Aircraft throughput and wait times are defined in Section 5.2.1. Table B.2 provides the facility utilization rates for this arrival rate assumption.
Table B.1 Simulation Results for Arrivals at T=0

<table>
<thead>
<tr>
<th>Option</th>
<th>Dispatching Rule</th>
<th>ave. Aircraft Throughput (# AC)</th>
<th>ave Wait Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FCFS</td>
<td>178.4</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>178.7</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>178.8</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>178.3</td>
<td>4.6</td>
</tr>
<tr>
<td>2</td>
<td>FCFS</td>
<td>180.2</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>AHEAD</td>
<td>179.6</td>
<td>3.9</td>
</tr>
<tr>
<td></td>
<td>LNQ</td>
<td>178.8</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
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<td>3.7</td>
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<td>FCFS</td>
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<td>3.9</td>
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<td></td>
<td>AHEAD</td>
<td>179.7</td>
<td>3.8</td>
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<tr>
<td></td>
<td>LNQ</td>
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<td>3.9</td>
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<td>LNQ</td>
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<td></td>
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<td>2.6</td>
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<tr>
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<td>FCFS</td>
<td>178.7</td>
<td>1.2</td>
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<tr>
<td></td>
<td>AHEAD</td>
<td>178.9</td>
<td>1.0</td>
</tr>
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<td></td>
<td>LNQ</td>
<td>179.1</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>SPT</td>
<td>178.7</td>
<td>0.9</td>
</tr>
</tbody>
</table>
Table B.2 Facility Utilization Rates
(Arrivals at T=0)

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>Facility Utilization Rate</th>
<th>Bldg 50</th>
<th>Bldg 54</th>
<th>Bldg 89</th>
</tr>
</thead>
<tbody>
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<td>1</td>
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<td>0.81</td>
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<td>0.57</td>
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<td>0.56</td>
<td>0.56</td>
<td>0.56</td>
<td></td>
</tr>
</tbody>
</table>

Figure B.1 Configuration Option vs Aircraft Throughput
(Arrivals @ T=0)
B.1.1 Analysis of Results on Aircraft Throughput.

As can best be shown by Figure B.1, the investigated factors (configuration option and dispatching rules) have minimal, if any, impact on aircraft throughput. A complete analysis (as described in Chapter 4) was performed on the output data and provided in Appendix D. The results of this analysis are summarized below.

Interaction effects were considered and found to not be
significant. The main factor effects were next tested for significance and, as with the exponential arrival process, only the main configuration option effect on aircraft throughput was found to be significant.

The Tukey groupings showing main factor effects of configuration option and dispatching rules on aircraft throughput are shown in Table B.3 and B.4, respectively. Means with the same Tukey grouping letter are determined to not be significantly different from each other.

Table B.3 Main Configuration Option Effect on Aircraft Throughput (Arrivals at T=0)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput (# of AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>178.55</td>
<td>1</td>
</tr>
<tr>
<td>B A</td>
<td>179.54</td>
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<tr>
<td>A</td>
<td>179.63</td>
<td>3</td>
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<td>B A</td>
<td>179.31</td>
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</tr>
<tr>
<td>B C</td>
<td>178.85</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

Table B.4 Main Dispatching Rule Effect on Aircraft Throughput (Arrivals at T=0)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput (# of AC)</th>
<th>Dispatching Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>179.29</td>
<td>FCFS</td>
</tr>
<tr>
<td>A</td>
<td>179.19</td>
<td>AHEAD</td>
</tr>
<tr>
<td>A</td>
<td>179.17</td>
<td>LNQ</td>
</tr>
<tr>
<td>A</td>
<td>179.05</td>
<td>SPT</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different
The rationale for these results can be attributed to the accelerated arrival rate of aircraft into the system as demonstrated by facility utilization rates presented in Table B.2.

**B.1.2 Analysis of Results on Aircraft Wait Times.**

From the statistical analysis, interaction effects were found to be significant, however they are determined to be unimportant (differences found to be very small). Main factor effects for both configuration option and dispatching rule are found to be significant.

Tukey groupings of main factor effects are presented for configuration option and dispatching rules in Table B.5 and B.6 respectively.

Table B.5 Main Configuration Option Effect on Wait Time (Arrivals at T=0)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Wait Time (days/AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>5.65</td>
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</tr>
<tr>
<td>B</td>
<td>3.93</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>3.79</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>2.66</td>
<td>5</td>
</tr>
<tr>
<td>E</td>
<td>1.01</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different.
Table B.6 Main Dispatching Rule Effect on Wait Time (Arrivals at T=0)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Wait Time (days/AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>3.49</td>
<td>FCFS</td>
</tr>
<tr>
<td>B</td>
<td>3.46</td>
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<tr>
<td>A</td>
<td>3.60</td>
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<tr>
<td>C</td>
<td>3.07</td>
<td>SPT</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

The wait time results differ only slightly from those obtained under the exponential arrival rate assumption. A statistical difference is now found between configuration Options 2 and 3, however this difference is assumed unimportant (0.14 days). Differences are again found for dispatching rule levels and, as with the exponential arrival rate, are assumed unimportant (0.53 days in worst case scenario).
B.2 Increased pressure on Paint/Depaint Facilities. To increase the pressure on the system and to further evaluate the effects of configuration options and dispatching techniques, the number of aircraft requiring paint is increased in the simulation model. The total number of aircraft entering the system remains at 235, however the total number to undergo the paint/depaint process increases from 131 to 179. Arrival rates for this analysis are assumed to be exponentially distributed. Table B.7 presents the output results. Figures B.3 and B.4 present this data in graphical format. Table B.8 presents the facility utilization rates across each dispatching rule. Simulation output results including times in system, completion times, facility utilization, as well as further breakouts of presented data are available in Appendix D.
Table B.7 Simulation results for Increased # of SL-Paint Aircraft

<table>
<thead>
<tr>
<th>Option</th>
<th>Dispatching Rule</th>
<th>ave. Aircraft Throughput (# AC)</th>
<th>ave Wait Time (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FCFS</td>
<td>155.4</td>
<td>20.9</td>
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<td></td>
<td>AHEAD</td>
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<td>11.9</td>
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<td>AHEAD</td>
<td>168.1</td>
<td>10.8</td>
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<td>LNQ</td>
<td>166.3</td>
<td>12.1</td>
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<tr>
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<td>SPT</td>
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<tr>
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<td>SPT</td>
<td>171.4</td>
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</tr>
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</table>
Table B.8 Facility Utilization Rates
(EXP Arrivals, Increased # of Paint AC)

<table>
<thead>
<tr>
<th>Configuration Option</th>
<th>Facility Utilization Rate</th>
</tr>
</thead>
<tbody>
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<td></td>
<td>Bldg 50</td>
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<td>2</td>
<td>0.68</td>
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<tr>
<td>3</td>
<td>0.74</td>
</tr>
<tr>
<td>5</td>
<td>0.86</td>
</tr>
<tr>
<td>6</td>
<td>0.70</td>
</tr>
</tbody>
</table>

Figure B.3 Configuration Option vs Aircraft Throughput
(EXP Arrivals), Increase in # Paint Aircraft
As shown in Figures B.3 and B.4, a more distinct correlation is demonstrated between aircraft throughput and configuration option. From the statistical analysis, interaction effects are found to be significant on aircraft throughput, however they are considered unimportant. Main factor effects for both configuration option and dispatching are considered unimportant. Therefore, dispatching is found to be the most significant factor affecting aircraft throughput.

Figure B.4: Configuration Option vs. Wait Time (Exp. Arrivals), Increase in # Paint Aircraft

**Figure B.4: Configuration Option vs. Wait Time (Exp. Arrivals), Increase in # Paint Aircraft**
rule are, however, found to be significant.

No statistical significance is found on differences in effect of configuration options 2, 3 or 5 on aircraft throughput. Differences are found between this grouping of configuration options (2, 3, and 5) and configuration options 1 and 6. As expected, configuration option 6 provides the highest aircraft throughput, followed by the grouping of Options 2, 3, and 5, followed by Option 1.

Tukey groupings of main factor effects on aircraft throughput are presented for configuration option and dispatching rules in Table B.9 and B.10 respectively.

Table B.9 Main Configuration Option Effect on Aircraft Throughput (Arrivals at T=0, Increased # of Paint AC)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput ( # of AC)</th>
<th>Configuration Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>156.08</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>167.21</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>167.67</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>167.90</td>
<td>5</td>
</tr>
<tr>
<td>A</td>
<td>171.90</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different
Table B.10 Main Dispatching Rule Effect on Aircraft Throughput (Arrivals at T=0, Increased # of Paint AC)

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean Aircraft Throughput (# of AC)</th>
<th>Dispatching Rule</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>165.63</td>
<td>FCFS</td>
</tr>
<tr>
<td>A B</td>
<td>165.99</td>
<td>AHEAD</td>
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<tr>
<td>B</td>
<td>165.51</td>
<td>LNQ</td>
</tr>
<tr>
<td>A</td>
<td>167.06</td>
<td>SPT</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

B.2.2 Analysis of Results on Wait Time. Upon initial review statistical analysis, the interaction effects on wait time are found to be significant. Upon review of these interaction effects, they are assumed unimportant. Main factor effects for both configuration option and dispatching rules on wait times are found to be significant.

Although a statistical difference does exist between configuration options 2 and 3, these differences are assumed unimportant in practical terms (0.72 days). Differences between all other configuration option effects on wait time are statistically significant and are important. As expected, configuration option 6 produces the minimum wait time (2.56 days), followed by each configuration option in descending order.

For dispatching rule level effects, FCFS, LNQ, and AHEAD provide no significant difference in effect on wait
times. However, under this increased pressure on paint/depaint facilities, the robustness of the SPT dispatching rule is demonstrated. Wait time under the SPT dispatching rule are decreased by approximately 3 days per aircraft over other investigated dispatching rules.

Tukey groupings of main factor effects on wait time are presented for configuration option and dispatching rules in Table B.11 and B.12 respectively.

<p>| Table B.11 Main Configuration Option Effect on Wait Time (Arrivals at T=0, Increased # of Paint AC) |
|-------------------------------------------------|----------------------------------|</p>
<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Wait Time (days/AC)</th>
<th>Configuration Option</th>
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</thead>
<tbody>
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<td>B</td>
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<tr>
<td>C</td>
<td>10.27</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>8.89</td>
<td>5</td>
</tr>
<tr>
<td>E</td>
<td>2.56</td>
<td>6</td>
</tr>
</tbody>
</table>

Means with the same letter are not significantly different

<p>| Table B.12 Main Dispatching Rule Effect on Wait Time (Arrivals at T=0, Increased # of Paint AC) |
|-------------------------------------------------|----------------------------------|</p>
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<th>Configuration Option</th>
</tr>
</thead>
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<tr>
<td>B</td>
<td>9.76</td>
<td>SPT</td>
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</table>

Means with the same letter are not significantly different
These results conform to the expected results for the system (increase in throughput and decrease in wait time as facility capabilities increase).
Appendix C: Facility Utilization Dispatching Rules

This appendix provides a discussion of the two facility utilization dispatching techniques investigated as part of this research (as discussed in Section 3.3.7)

C.1 Dispatching Rules for Facility Utilization. In addition to the application of dispatching rules after a facility has been freed, dispatching rules are also required in the case when two or more facilities are available and capable of processing an arriving aircraft. For example, in configuration option 6, if a C-141 aircraft arrives for depaint and buildings 50, 54, and 89 are available, a dispatching rule is required to determine which facility the aircraft will enter. Two dispatching rules investigated are based on minimum utilization and maximum current idle time. These dispatching rules are executed upon arrival of an aircraft for a paint/depaint operation which more than one facility is capable of performing. These two rules were investigated in a preliminary analysis and found to have no significant difference in effect on aircraft throughput. Since the facility dispatch rule based on maximum idle time appeared to do better in terms of average wait time, it was selected as the rule and fixed for all future
investigations. The two facility utilization techniques are described below. Results of simulation runs using both facility dispatching techniques are provided in Appendix A. Figure C.1 provides a flow chart representation of these dispatching techniques.

![Flow Chart for Facility Utilization Dispatching Rules]

**Figure C.1 Dispatching Rules for Facility Utilization**

**C.1.1 Minimum Utilization (MINU) Facility Dispatching Rule.** The first building utilization dispatching rule investigated is based on minimum
utilization. This facility dispatching techniques attempts to evenly distribute the workload for the paint/depaint facilities. Therefore, when more than one facility is available and capable to perform the required paint/depaint operation, the facility with the smaller utilization rate is selected under this dispatching rule.

C.1.2 First Freed (FF) Facility Dispatching Rule. The second building utilization dispatching rule considered is based on longest current idle time. When an aircraft arrives for a paint/depaint operation with more than one facility available and capable of performing the operation, the facility which has been available the longest is selected.

As discussed in Chapter III, these facility dispatching techniques had no affect on aircraft throughput. The FF dispatching rule appeared to reduce wait time and was therefore fixed as the facility dispatching rule and used for all analysis presented in Chapter V.
APPENDIX D. STATISTICAL ANALYSIS RESULTS

This appendix provides the statistical analysis output for the analysis presented in Chapter V. The following analysis are presented:

- Exponential Arrival Rate Data.................122
- Arrivals at T=0 Data..........................136
- Increase in # of Paint AC Data...............150
Exponential Arrival Rate Data
General Linear Models Procedure
Class Level Information

<table>
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<th>Levels</th>
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</table>

Number of observations in data set = 600
### Exponential Arrival Rate Data
### General Linear Models Procedure

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<td>435.996667</td>
<td>36.333056</td>
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<td>0.2186</td>
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Tukey's Studentized Range (HSD) Test for variable: THROUGHP

NOTE: This test controls the type I experimentwise error rate.

Alpha = 0.1  Confidence = 0.9  df = 560  MSE = 28.11994
Critical Value of Studentized Range = 3.487
Minimum Significant Difference = 1.6879

Comparisons significant at the 0.1 level are indicated by '***'.

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Exponential Arrival Rate Data 4
12:17 Wednesday, February 12, 1992

General Linear Models Procedure

Tukey’s Studentized Range (HSD) Test for variable: THROUGHP

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGQ.

Alpha= 0.1 df= 580 MSE= 28.11994
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 1.6879

Means with the same letter are not significantly different.

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<th>Tukey Grouping</th>
<th>Mean</th>
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<th>OPTION</th>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGH

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MSE= 28.11994  
Critical Value of Studentized Range= 3.248  
Minimum Significant Difference= 1.4062  

Comparisons significant at the 0.1 level are indicated by '***'.

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<th>Simultaneous Difference Between Means</th>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGH

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

\[
\alpha = 0.1 \quad df = 580 \quad MSE = 28.11994
\]

Critical Value of Studentized Range = 3.248
Minimum Significant Difference = 1.4062

Means with the same letter are not significantly different.

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127
Exponential Arrival Rate Data

Plot of RESIDT*PREDT. Legend: A = 1 obs, B = 2 obs, etc.
Exponential Arrival Rate Data
12:17 Wednesday, February 12, 1992

General Linear Models Procedure
Class Level Information

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<th>Class</th>
<th>Levels</th>
<th>Values</th>
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</thead>
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Number of observations in data set = 600
General Linear Models Procedure

Dependent Variable: WAITTIME

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R-Square    C.V.    Root MSE    WAITTIME Mean
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<th>F Value</th>
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<td>OPTION*DISP</td>
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<td>58.84478</td>
<td>4.90373</td>
<td>8.83</td>
<td>0.0001</td>
</tr>
</tbody>
</table>
Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MEE= 0.555343
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 0.2372

Comparisons significant at the 0.1 level are indicated by '***'.

<table>
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<tr>
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<th>Simultaneous Difference Between Means</th>
<th>Simultaneous Upper Confidence Limit</th>
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<td>3.04919 ***</td>
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<td>4.37411 ***</td>
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<td>6.47748 ***</td>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

\[
\text{Alpha} = 0.1 \quad \text{df} = 580 \quad \text{MSE} = 0.555343 \\
\text{Critical Value of Studentized Range} = 3.487 \\
\text{Minimum Significant Difference} = 0.2372
\]

Means with the same letter are not significantly different.

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean</th>
<th>N</th>
<th>OPTION</th>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate.

Alpha = 0.1  Confidence = 0.9  df = 580  MSE = 0.555343
Critical Value of Studentized Range = 3.248
Minimum Significant Difference = 0.1976

Comparisons significant at the 0.1 level are indicated by '***'.

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Exponential Arrival Rate Data
General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.1 df= 580 MSE= 0.555343
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.1976

Means with the same letter are not significantly different.

Tukey Grouping

<table>
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</table>
Exponential Arrival Rate Data

Plot of RESIDW*PREDW. Legend: A = 1 obs, B = 2 obs, etc.

RESIDW

5
4
3
2
1
0
-1
-2
-3
0 2 4 6 8

-2 0 2 4 6 8

NOTE: 32 obs hidden.
General Linear Models Procedure
Class Level Information

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Number of observations in data set = 600
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R-Square: 0.061928  C.V.: 1.151783  Root MSE: 2.06373  THROUGHP Mean: 179.177

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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGHP

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MEE= 4.258966
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 0.6569

Comparisons significant at the 0.1 level are indicated by ‘***’.

<table>
<thead>
<tr>
<th>OPTION Comparison</th>
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<th>Difference Between Means</th>
<th>Simultaneous Upper Limit</th>
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</table>
General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGHP

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.1  df= 580  MSE= 4.258966
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 0.5569

Means with the same letter are not significantly different.

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean</th>
<th>N</th>
<th>OPTION</th>
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Arrival AT T=0 Data
12:18 Wednesday, February 12, 1992

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGHP

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1 Confidence= 0.9 df= 580 MSE= 4.258966
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.5473

Comparisons significant at the 0.1 level are indicated by '***'.

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<th>Difference Between Means</th>
<th>Upper Confidence Limit</th>
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**Tukey's Studentized Range (HSD) Test for variable: THROUGHP**

**NOTE:** This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

- **Alpha = 0.1**
- **df = 580**
- **MSE = 4.258666**
- **Critical Value of Studentized Range = 3.248**
- **Minimum Significant Difference = 0.5473**

Means with the same letter are not significantly different.

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Arrival AT T=0 Data
Plot of RESIDT*PREDT. Legend: A = 1 obs, B = 2 obs, etc.

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178.0 178.5 179.0 179.5 180.0 180.5

PREDT
General Linear Models Procedure
Class Level Information

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Number of observations in data set = 600
General Linear Models Procedure

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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MSE= 0.082977
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 0.0917

Comparisons significant at the C.1 level are indicated by '***'.

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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.1  df= 580  MSE= 0.082977
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 0.0917

Means with the same letter are not significantly different.

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General Linear Models Procedure

Tukey's Studentized Range (BSD) Test for variable: WAITTIE

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MSE= 0.082977
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.0764

Comparisons significant at the 0.1 level are indicated by '***'.

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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.1 df= 580 MSE= 0.082877
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.0764

Means with the same letter are not significantly different.

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Plot of RESIDW*PREDW. Legend: A = 1 obs, B = 2 obs, etc.
General Linear Models Procedure
Class Level Information

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Number of observations in data set = 600
Exponential Arrival Rate Data, Increase # of Paint AC

12:22 Wednesday, February 12, 1992

General Linear Models Procedure

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R-Square: 0.499376  C.V. 3.235548  Root MSE 5.37247  THROUGH Mean 166.045

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151
Tukey's Studentized Range (HSD) Test for variable: THROUHPH

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MSE= 28.86339
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 1.7101

Comparisons significant at the 0.1 level are indicated by '***'.

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<th>OPTION Comparison</th>
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<th>Simultaneous Difference Between Means</th>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGH

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha= 0.1  df= 580  MSE= 28.86339
Critical Value of Studentized Range= 3.487
Minimum Significant Difference= 1.7101

Means with the same letter are not significantly different.

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<thead>
<tr>
<th>Tukey Grouping</th>
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General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGH

NOTE: This test controls the type I experimentwise error rate.

Alpha = 0.1  Confidence = 0.9  df = 580  MSE = 28.86339
Critical Value of Studentized Range = 3.248
Minimum Significant Difference = 1.4247

Comparisons significant at the 0.1 level are indicated by '***'.

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Exponential Arrival Rate Data, Increase $\#$ of Paint AC
12:22 Wednesday, February 12, 1992

General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: THROUGH

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha = 0.1 df = 580 MSE = 28.86339
Critical Value of Studentized Range = 3.248
Minimum Significant Difference = 1.4247

Means with the same letter are not significantly different.

<table>
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Level of Level of
OPTION DISP N Mean SD

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155
Exponential Arrival Rate Data, Increase # of Paint AC

Plot of RESIDT*PREDT. Legend: A = 1 obs, B = 2 obs, etc.

20 +

15 +

B

A

BA

A A A

A A A

AA

CB AEAA A A

D A

BB BA C C

DA B

BA AA BAA

5 +

B

EC CEEA B E A A

B A

D NECB B AC

AA C

BB AFAB B BBE A

E

JD BPCA B A A

G D

DF AAFB B EB B

EC A

DC BEH A ABA E

0 +

AC

EA BBBA B AAD

AB E

F GIC D AC

EC C

ED DDAA G AC C

AA B

CD ABBD C A C

C B

E CACB B BC

BA C

DC A CAE A

-5 +

CA

P CEB A A A A

B

C GE A AB

CC

DA BAA A D

A A

CC ADA A

B A

A A A A

A

AA A A A

-10 +

B

BA A

A A B

A A A

A

A

A

AA A

-15 +

A

A

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155 160 165 170 175

PREDT
### General Linear Models Procedure

**Class Level Information**

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Number of observations in data set = 600
### General Linear Models Procedure

**Dependent Variable:** WAITTIME

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</tbody>
</table>
Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate.

Alpha = 0.1  Confidence = 0.9  df = 580  MSE = 4.1955
Critical Value of Studentized Range = 3.487
Minimum Significant Difference = 0.652

Comparisons significant at the 0.1 level are indicated by ***.

<table>
<thead>
<tr>
<th>OPTION Comparison</th>
<th>Simultaneous Lower Confidence Limit</th>
<th>Simultaneous Difference Between Means</th>
<th>Simultaneous Upper Confidence Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ONE - TWO</td>
<td>16.4242</td>
<td>17.0762</td>
<td>17.7282</td>
</tr>
<tr>
<td>ONE - THREE</td>
<td>17.1476</td>
<td>17.7995</td>
<td>18.4515</td>
</tr>
<tr>
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<td>18.5229</td>
<td>19.1749</td>
<td>19.8268</td>
</tr>
<tr>
<td>ONE - SIX</td>
<td>24.8520</td>
<td>25.5040</td>
<td>26.1560</td>
</tr>
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<td>-17.0762</td>
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<tr>
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<td>0.0714</td>
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<td>1.3753</td>
</tr>
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<td>2.7506</td>
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<td>-17.7995</td>
<td>-17.1476</td>
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<td>SIX - FIVE</td>
<td>-6.9811</td>
<td>-6.3291</td>
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</table>
Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGWQ.

Alpha = 0.1  df = 580  MSE = 4.1955
Critical Value of Studentized Range = 3.487
Minimum Significant Difference = 0.652

Means with the same letter are not significantly different.

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean</th>
<th>N</th>
<th>OPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>28.0647</td>
<td>120</td>
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<tr>
<td>B</td>
<td>10.9885</td>
<td>120</td>
<td>TWO</td>
</tr>
<tr>
<td>C</td>
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<td>THREE</td>
</tr>
<tr>
<td>D</td>
<td>8.8899</td>
<td>120</td>
<td>FIVE</td>
</tr>
<tr>
<td>E</td>
<td>2.5607</td>
<td>120</td>
<td>SIX</td>
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</table>
General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate.

Alpha= 0.1  Confidence= 0.9  df= 580  MSE= 4.1955
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.5432

Comparisons significant at the 0.1 level are indicated by '***'.

<table>
<thead>
<tr>
<th>DISP Comparison</th>
<th>Simultaneous Lower Confidence Limit</th>
<th>Simultaneous Difference Between Means</th>
<th>Simultaneous Upper Confidence Limit</th>
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<td>2.8609</td>
<td>3.4041</td>
<td>3.9472 ***</td>
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<td>3.7742 ***</td>
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<td>-3.4732</td>
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<td>-2.3869 ***</td>
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161
General Linear Models Procedure

Tukey's Studentized Range (HSD) Test for variable: WAITTIME

NOTE: This test controls the type I experimentwise error rate, but generally has a higher type II error rate than REGW.

Alpha= 0.1 df= 580 MSE= 4.1955
Critical Value of Studentized Range= 3.248
Minimum Significant Difference= 0.5432

Means with the same letter are not significantly different.

<table>
<thead>
<tr>
<th>Tukey Grouping</th>
<th>Mean</th>
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<td>A</td>
<td>12.6926</td>
<td>150 AHEAD</td>
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<td>B</td>
<td>9.7625</td>
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</table>

<table>
<thead>
<tr>
<th>Level of OPTION</th>
<th>Level of DISP</th>
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</tbody>
</table>
Exponential Arrival Rate Data, Increase $\phi$ of Paint AC

Plot of RESID*PRED. Legend: A = 1 obs, B = 2 obs, etc.

RESID
\begin{align*}
10 + & \quad A \\
8 + & \quad B \\
6 + & \quad A \\
4 + & \quad A \\
2 + & \quad A \\
0 + & \quad A \\
-2 + & \quad A \\
-4 + & \quad A \\
-6 + & \quad A \\
-8 + & \quad A \\
\end{align*}

\begin{align*}
& 0 \quad 5 \quad 10 \quad 15 \quad 20 \quad 25 \quad 30 \quad 35 \\
& \text{PRED}
\end{align*}
Appendix E. SLAM II Code

Appendix E provides the SLAM II coding for this research. The first coding presented is the SLAM II coding for Option 1 under the FCFS dispatching rule. To alter the dispatching rule for the experimental design, INTLC values are modified as defined in the code.

To model each configuration option, changes are made by altering the logic in the following sections of the code: C-130 Wash, DePaint, W/E/A, and Paint. These modifications are also provided in this Appendix.

To model aircraft preemption, changes to the following sections of the code: Depaint, W/E/A. These modifications are provided within this Appendix.

A table of contents for this appendix is provided below:

SLAM II Source Code for Option 1, FCFS.............165
Modification for Option 2..........................184
Modification for Option 3.........................193
Modification for Option 5.........................202
Modification for Option 6.........................211
Modification for Aircraft Preemption............222
SLAM II Code For Option 1, FCFS Dispatching

GEN,McELVEEN,THESIS OPTION 1 FCFS,1/10/1992,30,N,N,,N,72;
LIMITS,45,30,1000;
INIT,0,1500;
EQUIVALENCE/ATRIB(1),MT/ATRIB(2),WARM/ATRIB(3),WORK/ATRIB(4),TAIL;
EQUIVALENCE/ATRIB(5),TYPE/ATRIB(7),HNG CHS/ATRIB(9),HNG FLG;
EQUIVALENCE/ATRIB(10),DPT HGR/ATRIB(11),WEA HGR/ATRIB(12),PNT HGR;
EQUIVALENCE/ATRIB(13),WASH HGR/ATRIB(14),X WASH/ATRIB(15),NEED;
EQUIVALENCE/ATRIB(16),ARV TIME/ATRIB(17),PDM PNT;
EQUIVALENCE/ATRIB(22),WASH WT/ATRIB(23),DP WT/ATRIB(24),WEA WT
EQUIVALENCE/ATRIB(25),PNT WT/ATRIB(26),SUM WT/ATRIB(27),MK WT;
EQUIVALENCE/XX(10),D_50/XX(11),D_54/XX(12),D_89;
EQUIVALENCE/XX(13),D_WASH/XX(14),D_DP/XX(15),D_WEA/XX(16),D_PNT;

INTLC,XX(10)=10,XX(11)=11,XX(12)=12;
INTLC,D_WASH=26,D_DP=27,D_WEA=28,D_PNT=29;

INTLC USED TO SET DISPATCHING RULES

The Following Code Represents the respective dispatching rules:
(For Bldgs 50, 54, 89)

10, 11, 12: FCFS
13, 14, 15: SPT (options 1, 2, 3, and 5)
16, 17, 18: SPT (Option 6)
19, 20, 21: LNQ
41, 46, 51: AHEAD (Option 1)
42, 47, 52: AHEAD (Option 2)
43, 48, 53: AHEAD (Option 3)
44, 49, 54: AHEAD (Option 5)
45, 50, 55: AHEAD (Option 6)

The Following Code Represents the respective Facility Dispatching rules (For Wash, Depaint, W/E/A, and Paint)

26, 27, 28, 29: FF
22, 23, 24, 25: MINU

INTLC,XX(10)=10,XX(11)=11,XX(12)=12;
INTLC,D_WASH=26,D_DP=27,D_WEA=28,D_PNT=29;

---

THIS IS OPTION 1 (INDEPENDENT FACILITIES, CURRENT CAPABILITIES)

FCFS
EXPONENTIAL ARRIVAL PROCESS
BLDG 50 - WASH, DEPAINT, W/E/A, PAINT - C-130 AC
BLDG 54 - DEPAINT, W/E/A - C-141 AC
BLDG 89 - PAINT - C-141 AC
NETWORK:
RESOURCE/1, IN_C141(35), 1; LIMITS C-141S IN SYSTEM
RESOURCE/2, IN_C130(9), 2; LIMITS C-130S IN SYSTEM
RESOURCE/3, BLDG_54, 11; BUILDING 54
RESOURCE/4, BLDG_89, 12; BUILDING 89
RESOURCE/5, BLDG_50, 10; BUILDING 50
RESOURCE/7, SNGL_HNG(6), 20; SINGLE BAY HANGARS
RESOURCE/8, DBL_HNG(0), 21; HANGAR IN WHICH A/C MOVED IN PAIRS;
RESOURCE/9, DMPREP(1), 31; DeMATE PREP
RESOURCE/10, M_DEM(1), 32, 33; MATE DEMATE FACILITY
RESOURCE/11, Pre_WS(1), 34; PRE WING SHOP
RESOURCE/12, WING(1), 35; WING SHOP
RESOURCE/13, POST_WS(1), 36; POST WING SHOP
RESOURCE/14, CIGAR(1), 37; CIGAR SHOP
RESOURCE/15, FUNCTEST(4), 17; FUNCTIONAL TEST
RESOURCE/16, SL_SLOT(20), 40; LIMITS SPEEDLINE AC INTO SYSTEM
RESOURCE/17, CW_SLOT(2), 41; LIMITS CW AC IN SYSTEM
RESOURCE/18, PDM_SLOT(8), 42; LIMITS PDM SLOTS IN SYSTEM
RESOURCE/19, PDM_ACT(6), 29; LIMITS # OF PDM AC IN WORK
RESOURCE/20, C130_PDM(7), 43; C-130 PDM

CREATE,,104,,1; SL + PDM HANGAR ON 15 JAN 92
ALTER, DBL_HNG/+3;
TERM;

CREATE,,265,,1; CONVERSION OF HANGARS, 1 JUL 92
ALTER, SNGL_HNG/+2;
ALTER, DBL_HNG/-2;
TERM;

CREATE,,384,,1; ADDITIONAL 4 SL + PDM HANGARS, 1 NOV 92
ALTER, DBL_HNG/+4;
TERM;

CREATE,,443,,1; ADDITIONAL 2 SL + PDM HANGARS, 1 JAN 93
ALTER, DBL_HNG/+2;
TERM;

CREATE,,514,,1;
ALTER, SL_SLOT/+5;
TERM;

CREATE,,531,,1; ADDITIONAL 4 SL + PDM HANGARS, 1 APR 93
ALTER, DBL_HNG/+4;
TERM;

CREATE,,709,,1;
ALTER, SL_SLOT/-25;
TERM;

;********************************************************************
;WARM UP SYSTEM BY INPUTTING AC INTO SYSTEM
;********************************************************************

CREATE, 0,1,1,1; GENERATING 1/3 WARM-UP C-130 AC
ASSIGN,XX(1)=XX(1)+1,TYPE=130,WORK=10,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(2),IN_C130,,1;
ACTIVITY;
EVENT,31,1;
TERM;

CREATE, 0,1,1,1; GENERATING 2/3 WARM-UP C-130 AC
ASSIGN,XX(1)=XX(1)+1,TYPE=130,WORK=10,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(2),IN_C130,,1;
ACTIVITY;
EVENT,31,1;
TERM;

CREATE, 0,1,1,1; GENERATING 3/3 WARM-UP C-130 AC
ASSIGN,XX(1)=XX(1)+1,TYPE=130,WORK=11,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(2),IN_C130,,1;
ACTIVITY,,1;
EVENT,32,1;
TERM;

CREATE, 0,1,1,1; GENERATE 1/3 TYPE-1 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=1,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(40),SL_SLOT,,1;
AWAIT(1),IN_C141,,1;
ACTIVITY;
EVENT,33,1;
TERM;

CREATE, 0,1,1,1; GENERATE 2/3 TYPE-1 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=1,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(40),SL_SLOT,,1;
AWAIT(1),IN_C141,,1;
ACTIVITY;
EVENT,34,1;
TERM;

CREATE, 0,1,1,1; GENERATE 3/3 TYPE-1 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=1,WARM=1,TAIL=XX(1),1;
ACTIVITY;
AWAIT(40),SL SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,35,1;
TERM;

CREATE,,0,1,1,1; GENERATE 1/1 TYPE-2 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=2,WARM=1,TAIL=-XX(1),1;
ACTIVITY;
AWAIT(40),SL SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,36,1;
TERM;

CREATE,,0,1,1,1; GENERATE 1/2 TYPE-3 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=3,WARM=1,TAIL=-XX(1),1;
ACTIVITY;
AWAIT(40),SL SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,37,1;
TERM;

CREATE,,0,1,1,1; GENERATE 2/2 TYPE-3 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=3,WARM=1,TAIL=-XX(1),1;
ACTIVITY;
AWAIT(40),SL SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,38,1;
TERM;

CREATE,,0,1,1,1; GENERATE 1/1 TYPE-4 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=4,WARM=1,TAIL=-XX(1),1;
ACTIVITY;
AWAIT(41),CW SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,39,1;
TERM;

CREATE,,0,1,1,1; GENERATE 1/1 TYPE-6 WARM-UP AC
ASSIGN,XX(1)=XX(1)+1,TYPE=141,WORK=6,WARM=1,TAIL=-XX(1),1;
ACTIVITY;
AWAIT(40),SL SLOT,,1;
AWAIT(1),IN_G141,,1;
ACTIVITY;
EVENT,40,1;

168
TERM;

;**********************************************************************
;GENERATION OF 5 TYPES OF PLANES WITH A USER FUNCTION
;**********************************************************************

;**********************************************************************
;CREATE,EXPON(21,2),,1,30,1; GENERATING C-130 TYPE-10 AC @ 15/yr
ASSIGN,TYPE-130,WARM-0,WORK-10,1;
ACTIVITY,,,DP30;

;CREATE,EXPON(46,2),,1,14,1; GENERATING C-130 TYPE-11 AC @ 7/yr
ASSIGN,TYPE-130,WARM-0,WORK-11,1;
ACTIVITY,,,WS30;

;CREATE,EXPON(7.5,2),,1,81,1; GENERATE C-141 TYPE-1, SL ONLY
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-1,WARM-0,TAIL-XX(1),1;
ACTIVITY,,,CHSE;

;CREATE,EXPON(17.7,2),,1,33,1; GENERATE C-141 TYPE-2, SL PAINT
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-2,WARM-0,TAIL-XX(1),1;
ACTIVITY,,,CHSE;

;CREATE,EXPON(10.1,2),,1,46,1; GENERATE C-141 TYPE-3, SL PDM PAINT
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-3,WARM-0,TAIL-XX(1),1;
ACTIVITY,,,CHSE;

;CREATE,EXPON(50.3,2),,1,8,1; GENERATE C-141 TYPE-4, CW BOX
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-4,WARM-0,TAIL-XX(1),1;
ACTIVITY,,,CHSE;

;CREATE,EXPON(20,2),,1,23,1; GENERATE C-141 TYPE-6, SL PDM
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-6,WARM-0,TAIL-XX(1),1;
ACTIVITY,,,CHSE;

;**********************************************************************
;ALL AIRCRAFT IN SYSTEM, MAINTAIN PRESSURE ON SYSTEM
;**********************************************************************

CREATE,EXPON(21,2),710,1,30,1; GENERATING C-130 TYPE-10 AC @ 15/yr
ASSIGN,TYPE-130,WARM-1,WORK-10,1;
ACTIVITY,,,DP30;

CREATE,EXPON(46,2),710,1,14,1; GENERATING C-130 TYPE-11 AC @ 7/yr
ASSIGN,TYPE-130,WARM-1,WORK-11,1;
ACTIVITY,,,WS30;

CREATE,EXPON(7.5,2),710,1,81,1; GENERATE C-141 TYPE-1, SL ONLY
ASSIGN,XX(1)-XX(1)+1,TYPE-141,WORK-1,WARM-1,TAIL-XX(1),1;

169
ACTIVITY, CHSE;

CREATE, EXPON(17.7, 2), 710, 1, 33, 1; GENERATE C-141 TYPE-2, SL PAINT
ASSIGN, XX(1) = XX(1) + 1, TYPE=141, WORK=2, WARM=1, TAIL=XX(1), 1;
ACTIVITY, , CHSE;

CREATE, EXPON(10.1, 2), 710, 1, 46, 1; GENERATE C-141 TYPE-3, SLPDM PAINT
ASSIGN, XX(1) = XX(1) + 1, TYPE=141, WORK=3, WARM=1, TAIL=XX(1), 1;
ACTIVITY, , CHSE;

CREATE, EXPON(50.3, 2), 710, 1, 8, 1; GENERATE C-141 TYPE-4, CW BOX
ASSIGN, XX(1) = XX(1) + 1, TYPE=141, WORK=4, WARM=1, TAIL=XX(1), 1;
ACTIVITY, , CHSE;

CREATE, EXPON(20.2, 2), 710, 1, 23, 1; GENERATE C-141 TYPE-6, SL PDM
ASSIGN, XX(1) = XX(1) + 1, TYPE=141, WORK=6, WARM=1, TAIL=XX(1), 1;
ACTIVITY, , CHSE;

;****************************************************************************
; DETERMINE WHERE AC SHOULD GO BASED AN ATTRIB(WORK)
;****************************************************************************

CHSE GOON, 1;
ACTIVITY, , WORK.EQ.1.OR.WORK.EQ.2.OR.WORK.EQ.3.OR.WORK.EQ.6, SLSLT;
ACTIVITY, , WORK.EQ.4, CWSLT;
ACTIVITY, , WORK.EQ.5.OR.WORK.EQ.7, PMSLT;

SLSLT AWAIT(40), SL_SLOT, , 1;
AWAIT(1), IN_C141, , 1;
ACTIVITY, , SLT2;

SLT2 ASSIGN, MT-TNOW, 1;
ACTIVITY, , WORK.EQ.2.OR.WORK.EQ.3, PREP;
ACTIVITY, , WORK.EQ.1.OR.WORK.EQ.6, SPLN;

CWSLT AWAIT(41), CW_SLOT, , 1;
AWAIT(1), IN_C141, , 1;
ACTIVITY;
ASSIGN, MT-TNOW, 1;
ACTIVITY, , PREP;

PMSLT AWAIT(42), PDM_SLOT, , 1;
AWAIT(1), IN_C141, , 1;
ACTIVITY;
ASSIGN, MT-TNOW, 1;
ACTIVITY, , WORK.EQ.7, PREP;
ACTIVITY, , WORK.EQ.5, PDM;

DP30 AWAIT(2), IN_C130, , 1;
ACTIVITY;
ASSIGN, WORK-10, MT-TNOW, 1;

170
ACTIVITY, PREP;

WS30  AWAIT(2), IN_C130, 1;
ACTIVITY;
ASSIGN, WORK-11, MT-TNOW, 1;
ACTIVITY, , WASH;
;
C-130 WASH (INCOMING & OUTGOING) BLDG 50
;
ENTER, 32, 1;
ACTIVITY;
ASSIGN, NEED-2, ARV_TIME-TNOW, MKWT-TNOW, 1;
ACTIVITY, , NNRSC(3).EQ.1, WSE4; IF 54 BUSY
ACTIVITY, , WSEV; FILE ENTITY FILE 3

WSEV  EVENT, 6, 1;       FILEM(3, ATRIB)
TERM;

ENTER, 5, 1;
ACTIVITY;
WSE4  AWAIT(11), BLDG_54, 1;
ACTIVITY;
ASSIGN, WASH_HGR-54, WASH_WM-TNOW-MK_WM, SUM_WM=SUM_WM+WASH_WM, 1;
ACTIVITY, , WASA;

WASA  GOON, 1;
ACTIVITY, TRIAG( .5, .65, .8, 1);
ASSIGN, X_WASH=X_WASH+1, 1;
ACTIVITY, TRIAG( .5, .65, .8, 1), X_WASH.GE.2, WAAS; SCUFF SAND C-130
ACTIVITY, , WAAS;

WAAS  GOON, 1;
ACTIVITY, WASH_HGR.EQ.54, WF54;

WF54  FREE, BLDG_54, 2;
ACTIVITY, , WSGO;
ACTIVITY;
GOON, 1;
ACTIVITY, , NNQ(11).GT.0, TERM;
ACTIVITY;
GOON, 1;
ACTIVITY, , NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0, TERM;
ACTIVITY;
WFREE  GOON, 1;
ACTIVITY, , D_54.EQ.11, WC54;
ACTIVITY, , D_54.EQ.14, WS54;
ACTIVITY, , D_54.EQ.20, WL54;
ACTIVITY, , D_54.EQ.46, WA54;

171
WC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED (LOOK 54)
TERM;

WS54 EVENT,14,1; LOOK TO SEE IF BLDG 54 NEEDED (SPT 54)
TERM;

WL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54)
TERM;

WA54 EVENT,46,1; LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54)
TERM;

WSGO GOON,1;
ACTIVITY,,X_WASH.EQ.1,PD30;
ACTIVITY,,X_WASH.EQ.2;
GOON,1;
ACTIVITY,TRIAG(1.6,2,2.6,1),,PAINT; INCLUDES C-130 PREP FOR PAINT
;
---------------------------------------------------------------------
PREP FOR DePAINT
---------------------------------------------------------------------
PREP GOON,1;
ACTIVITY/1,TRIAG(4.56,5.70,7.41,1),,DEPT;DePaint
;
---------------------------------------------------------------------
DePAINT (50 OR 54)
---------------------------------------------------------------------
;
ENTER,36,1;
ACTIVITY;
DEPT ASSIGN,NEED=2,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,NNSRC(3).EQ.1,DPA7;
ACTIVITY,,DEPE;

DEPE EVENT,7,1; CALL FILEM(4,ATRIB)
TERM;

ENTER,8
ACTIVITY;
DPA7 AWAIT(11),BLDG_54,1;
ACTIVITY;
ASSIGN,DPT_HGR=54,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,DP54;

DPTA GOON,1;
ACTIVITY,,DPT_HGR.EQ.54,DP54;

DP54 GOON,1;
ACTIVITY,TRIAG(3,4,5,1),,FRDP;
FRDP
    GOON,1;
    ACTIVITY,,DPT_HGR.EQ.54,DF54;

DF54
    FREE,BLDG_54,2;
    ACTIVITY,,,DPGO;
    ACTIVITY,;
    GOON,1;
    ACTIVITY,,NNQ(11).GT.0,TERM;
    ACTIVITY,;
    GOON,1;
    ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
    ACTIVITY;
    FREE, GOON,1
    ACTIVITY,,D_54.EQ.11,DC54;
    ACTIVITY,,D_54.EQ.14,DS54;
    ACTIVITY,,D_54.EQ.20,DL54;
    ACTIVITY,,D_54.EQ.46,DA54;

DC54
    EVENT,11,1;
    LOOK TO SEE IF BLDG 54 NEEDED (LOOK 54)
    TERM;

DS54
    EVENT,14,1;
    LOOK TO SEE IF BLDG 54 NEEDED (SPT 54)
    TERM;

DL54
    EVENT,20,1;
    LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54)
    TERM;

DA54
    EVENT,46,1;
    LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54)
    TERM;

DPGO
    GOON,1
    ACTIVITY,,TYPE.EQ.130,PD30;
    ACTIVITY,,TYPE.EQ.141,DPG1;

; DPG1
    GOON,1;
    ACTIVITY,,WORK.EQ.4,CWBX;
    ACTIVITY,,WORK.EQ.7,PDM;
    ACTIVITY,,WORK.EQ.2.OR.WORK.EQ.3,SPLN;

;-----------------------------------------------
; SPEED LINE
;-----------------------------------------------
    ENTER,33,1;
    ACTIVITY;
SPLN
    ASSIGN,ATRIB(20)-TNOW,1;
    ACTIVITY/2,,SLPR;SL

;*** SPEEDLINE PREP ***
;*** RECEIVE HANGAR ASSIGNMENTS ***

; ENTER,40,1; ACTIVITY;

HNGR GOON,1; HANGAR SELECTION;
ACTIVITY.,WORK.EQ.3.OR.WORK.EQ.6,DHNG; - BASED ON SHORTEST;
ACTIVITY.,SHNG; WAITING LINE;

DHNG GOON,1;
ACTIVITY/3.,,NNQ(21).GE.3.AND.TNOW.LE.300,SHNG;9 TO S
ACTIVITY/4.,,NNQ(21).GE.4,SHNG;9 TO S
ACTIVITY/5;TO DBL HGR
AWAIT(21),DBL_HNG/1,1; WAITING FOR DOUBLE BAY HANGAR;
ASSIGN,ATRIB(9)=1,ATRIB(21)=TNOW,1;HANGAR TYPE FLAG - 1=DOUBLE;
ACTIVITY.,,SPLW;

SHNG AWAIT(20),SNGL_HNG/1,1; WAITING FOR SINGLE BAY HANGAR;
ASSIGN,ATRIB(9)=0,ATRIB(21)=TNOW,1; HANGAR TYPE FLAG - 0=SINGLE;
ACTIVITY.,,SPLW;

;*** ACTUAL SPEEDLINE WORK ***

SPLW GOON,2;
ACTIVITY.,,SPL3;
ACTIVITY.,,SPL3;

SPL3 GOON,1;
ACTIVITY,TRIAG(21.472,26.84,34.892,1),0.88,FACT;NOT NEED NEW BEAM CAP;
ACTIVITY,TRIAG(34.192,42.74,55.562,1),,FACT; NEEDS NEW BEAM CAP;

FACT BATCH,30/4,2,,1;
ACTIVITY,TRIAG(3.92,4.9,6.37,1),WORK.EQ.1,SLIN;
ACTIVITY,TRIAG(0.48,0.6,0.78,1),WORK.EQ.2,SLIN;
ACTIVITY,TRIAG(0.72,0.9,1.17,1),WORK.EQ.3.OR.WORK.EQ.6,SLIN;

SLIN GOON,1;
ACTIVITY,TRIAG(24,30,39,1),ATRIB(9).EQ.1,SLN2;
ACTIVITY.,,SLN2;

SLN2 GOON,1;
ACTIVITY.,,TNOW.LT.178.AND.TAIL.GT.9,FRHNG; CHORDWISE INSPECTION
ACTIVITY,TRIAG(8,10,13,1),TNOW.GE.178.OR.TAIL.LE.9,FRHNG;
:: FREE HANGARS ::

FRHNG  GOON,1;  
        SORT BY HANGAR TYPE;  
        ACTIVITY, ATRIB(9).EQ.1,FDBL;  
        ACTIVITY,, FSNG;  

FDBL  FREE, DBL_HNG;  
       FREE DOUBLE HANGAR; 
       ACTIVITY,, RTE;  

FSNG  FREE, SNGL_HNG;  
       FREE SINGLE HANGAR;  
       ACTIVITY,, RTE;  

RTE  FREE, SL_SLOT,1;  
       SEND TO APPROPRIATE FOLLOW-ON;  
       ACTIVITY,, SLGO PROCEDURES;  

SLGO  GOON,1;  
       ACTIVITY,, WORK.EQ.1.OR.WORK.EQ.2,BUILD; TO SL BUILD UP;  
       ACTIVITY,, WORK.EQ.3.OR.WORK.EQ.6,PDM; TO PDM;  

:---------------------------------  
PDM  
:---------------------------------  

ENTER, 37,1;  
ACTIVITY;  
PDM  

PDM  

PDM2  FREE, PDM_ACT,1;  
       ACTIVITY,, WORK.EQ.3.OR.WORK.EQ.6,BUILD;  
       ACTIVITY;  
       FREE, PDM_SLOT,1;  
       ACTIVITY,, BUILD;  

:---------------------------------  
GW BOX MODULE  
:---------------------------------  

:*****************************************************  
PREP FOR DEMATE  
:*****************************************************  

ENTER, 39,1;  
ACTIVITY;  
CWBX  

CWBX  

175
FREE,DMPREP,1;
ACTIVITY,,DMATE;

;************************
WING REMOVAL 
;************************
;
DMATE AWAIT(32),M_DEM,,1;
ACTIVITY,TRIAG(3.2,4,5.2,1);
FREE,M_DEM,2;
ACTIVITY,,WING;
ACTIVITY,TRIAG(1.6,2,2.6,1),,CIGR; Prep Fuselage

;************************
WING SHOP 
;************************
;
; Pre Wing Shop
;
WING AWAIT(34),Pre_WS,,1;
ACTIVITY,TRIAG(1.6,2,2.6,1);
FREE,Pre_WS,1;
ACTIVITY,,WSaC;

; Actual Wing Work
;
WSaC AWAIT(35),WING,,1;
ACTIVITY,TRIAG(40,50,65,1);
FREE,WING,1;
ACTIVITY,,WJOI;

;*** Post Wing Shop ***
;
WJOI AWAIT(36),POST_WS,,1;
ACTIVITY,TRIAG(5.4,6,7.8,1);
FREE,POST_WS,1;
ACTIVITY,,MATE;

;************************
CIGAR SHOP 
;************************
;
CIGR AWAIT(37),CIGAR,,1;
ACTIVITY,TRIAG(72,90,117,1);
FREE,CIGAR,1;
ACTIVITY,,MATE;

;************************
Mate Facility 
;************************
; MATE  BATCH,100/4,2,,,1;
   ACTIVITY;
   AWAIT(33),M_DEM,,1;
   ACTIVITY,TRIAG(16.8,21,27.3,1);
   FREE,M_DEM,1;
   ACTIVITY;
   FREE,CW_SLOT,1;
   ACTIVITY,,,BUILD;

;----------------------------------
; C-130 PDM
;----------------------------------
   ENTER,30,1;
   ACTIVITY;
   F30  AWAIT(43),C130_PDM,,1;
       ACTIVITY,TRIAG(70,80,90,3);
       FREE,C130_PDM,1;
       ACTIVITY;
       COON,1;
       ACTIVITY,,WORK.EQ.10,WEA;
       ACTIVITY,,WORK.EQ.11,WASH;

;-------------------------------------------------------------------------
; PREP FOR PAINT
;-------------------------------------------------------------------------
   PPNT  COON,1;
       ACTIVITY,TRIAG(1.76,2.2,2.86,1),,WEA;     PREP FOR PAINT

;-------------------------------------------------------------------------
; W/E/A
;-------------------------------------------------------------------------
   ENTER,35,1;
   ACTIVITY;
   WEA  ASSIGN,NEED=2,ARV_TIME=TNOW,MK_WT=TNOW,1;
       ACTIVITY,,NNRSC(3).EQ.1.AND.NNQ(11).EQ.0,WE11;  IF 50 BUSY
       ACTIVITY,,,WEEV;
       FILE ENTITY (5)

   WEEV EVENT,8,1;                             CALL FILEM(5,AATTRIB)
       TERM;

   ENTER,11,1;
   ACTIVITY;
   W11  AWAIT(11),BLDG_54,1;
       ACTIVITY;
       ASSIGN,WEA_HGR=54,WEA_WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,1;
       ACTIVITY,,,WEAA;

177
WEAA  GOON,1;
      ACTIVITY/8,TRIAG(.8,1,1,3,1);WEA
      GOON,1;
      ACTIVITY,,WEA_HGR.EQ.54,WEF54;

WEF54  FREE,BLDG_54,2;
       ACTIVITY,,WEFE;
       ACTIVITY,,WEFF;

WEFE  ASSIGN,NEED=3,PK_WT-TNOW,1;       NEED FOR PAINT
       ACTIVITY,,PE15;

WEFF  GOON,1;
       ACTIVITY,,NNQ(I1).GT.0,TERM;
       ACTIVITY;
       GOON,1;
       ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
       ACTIVITY;
       GOON,1;
       ACTIVITY,,D_54.EQ.11,EC54;
       ACTIVITY,,D_54.EQ.14,ES54;
       ACTIVITY,,D_54.EQ.20,EL54;
       ACTIVITY,,D_54.EQ.46,EA54;

EC54  EVENT,11,1;              LOOK TO SEE IF BLDG 54 NEEDED (LOOK 54)
       TERM;

ES54  EVENT,14,1;              LOOK TO SEE IF BLDG 54 NEEDED (SPT 54)
       TERM;

EL54  EVENT,20,1;              LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54)
       TERM;

EA54  EVENT,46,1;              LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54)
       TERM;

-----------------------------------------------
| PAINT (50 OR 89)                            |
-----------------------------------------------

PAINT ASSIGN,NEED=3,ARV_TIME-TNOW,PK_WT-TNOW,1;
       ACTIVITY,,NNRSC(4).EQ.1.AND.NNQ(12).EQ.0,PE15;  89 BUSY
       ACTIVITY,,PAEN;
       FILE ENTITY (6)

PAEN  EVENT,9,1;               CALL FILEM(6,ATRIB)
       TERM;

      ENTER,15,1;
      ACTIVITY;

178
PE15  AWAIT(12), BLDG_89, 1;
       ACTIVITY;
       ASSIGN, PNTHGR=89, PNTWT=TNOW-MKWT, SUMWT=SUMWT+PNTWT, 1;
       ACTIVITY, , PNTA;

PNTA  GOON, 1;
       ACTIVITY/9, TRIAG(3.2, 4, 5.2, 1), TYPE.EQ.141, PTST; PAINT
       ACTIVITY, TRIAG(2.4, 3, 3.9, 1), TYPE.EQ.130, AND.WORK.EQ.10, PTST;
       ACTIVITY, TRIAG(1.2, 1.5, 1.95, 1), TYPE.EQ.130, AND.WORK.EQ.11, PTST;

PTST  GOON, 1;
       ACTIVITY, , PNTHGR.EQ.89, PF89;

PF89  FREE, BLDG_89, 2;
       ACTIVITY, , OUT;
       ACTIVITY;
       GOON, 1;
       ACTIVITY, , NNQ(12).GT.0, TERM;
       ACTIVITY;

PFFREE GOON, 1;
       ACTIVITY, , D_89.EQ.12, PC89;
       ACTIVITY, , D_89.EQ.15, PS89;
       ACTIVITY, , D_89.EQ.21, PL89;
       ACTIVITY, , D_89.EQ.51, PA89;

PC89  EVENT, 12, 1;          LOOK TO SEE IF BLDG 89 NEEDED (LOOK 89)
       TERM;

PS89  EVENT, 15, 1;          LOOK TO SEE IF BLDG 89 NEEDED (SPT 89)
       TERM;

PL89  EVENT, 21, 1;          LOOK TO SEE IF BLDG 89 NEEDED (LNQ 89)
       TERM;

PA89  EVENT, 51, 1;          LOOK TO SEE IF BLDG 89 NEEDED (AHEAD 89)
       TERM;

OUT   GOON, 1;
       ACTIVITY, , TYPE.EQ.130, CLC1;
       ACTIVITY, TRIAG(.32, .4, .52, 1), , FTEST;

;--------------------- BUILD ----------------------------------------
;
; BUILD UP FOR SPEEDLINE AND SPEEDLINE/PAINT ***

    ENTER, 34, 1;
    ACTIVITY;

179
BUILD GOON, 1;
ACTIVITY /10; BUILD
GOON, 1;
ACTIVITY, TRIAG(2.64, 3.30, 4.29, 1), WORK . EQ . 1, FTEST; SL ONLY BUILD
ACTIVITY, TRIAG(3.2, 4.0, 5.2, 1), WORK . EQ . 2, PPNT; SL/PNT BUILD UP
ACTIVITY, TRIAG(8, 10, 13, 1), WORK . EQ . 3, PPNT;
ACTIVITY, TRIAG(16, 20, 30, 1), WORK . EQ . 4, PPNT;
ACTIVITY, TRIAG(8, 10, 13, 1), WORK . EQ . 5 OR WORK . EQ . 6 OR WORK . EQ . 7;
GOON, 1;
ACTIVITY, WORK . EQ . 5 OR WORK . EQ . 6, FTEST;
ACTIVITY, WORK . EQ . 7, PPNT;

FUNCTIONAL TEST

ENTER, 38, 1;
ACTIVITY;
FTEST GOON, 1;
ACTIVITY /11; FTEST
GOON, 1;
ACTIVITY, TRIAG(4.16, 5.2, 6.76, 1), WORK . EQ . 1 OR WORK . EQ . 2, FTEQ;
ACTIVITY, TRIAG(5.2, 6.5, 8.45, 1), WORK . GT. 2 AND WORK . NE. 4, FTEQ;
ACTIVITY, TRIAG(5.6, 7.6, 9.1, 1), WORK . EQ . 4, FTEQ;
FTEQ AWAIT(17), FUNCTEST, 1;
ACTIVITY, TRIAG(4.5, 6.5, 1), WORK . EQ . 1 OR WORK . EQ . 2, BAD;
ACTIVITY, TRIAG(5.2, 6.5, 8.45, 1), WORK . GT. 2 AND WORK . NE. 4, BAD;
ACTIVITY, TRIAG(5.6, 7.6, 8.45, 1), WORK . EQ . 4, BAD;
BAD GOON, 1;
ACTIVITY, TRIAG(4.5, 6.5, 1), . 7, FFT;
ACTIVITY, . , FFT;
FFT FREE, FUNCTEST, 1;
ACTIVITY, . , CLC1;

ALL ACTIVITIES COMPLETE, COLECT STATS

CLC1 GOON, 1;
ACTIVITY, TYPE . EQ . 141, FR41;
ACTIVITY, TYPE . EQ . 130;
FREE, INC_130, 1;
ACTIVITY,,CLC3;

FR41 FREE,IN_C141,1;
ACTIVITY,,CLC3;

CLC3 GOON,1;
ACTIVITY/30,,WARM.EQ.1,WMRS; REMOVE WARMERS
ACTIVITY/31,,CLAL;

CLAL COLCT(1),INT(1),TIS ALL,,1;
COLCT(2),ALL,ALL OUTPUT,,1;
COLCT(3),ATRIB(22),WAIT IN WASH,,1;
COLCT(4),ATRIB(23),WAIT IN DEPAINT,,1;
COLCT(5),ATRIB(24),WAIT IN WEA,,1;
COLCT(6),ATRIB(25),WAIT IN PAINT,,1;
COLCT(7),ATRIB(26),TOTAL WAIT TIME,,1;
ACTIVITY,,TNOW.GT.709,CLCN;
ACTIVITY;
COLCT(8),ALL,ALL BY FY93,,1;
ACTIVITY,,CLCN;

CLCN GOON,1;
ACTIVITY,,WORK.EQ.1.OR.WORK.EQ.5.OR.WORK.EQ.6,TYPS;NOT NEED PAINT
ACTIVITY;
COLCT(9),INT(1),TIS ALL PNT,,1;
ACTIVITY,,TYPS;

TYPS GOON,1
ACTIVITY,,TYPE.EQ.130,C3OS;
ACTIVITY,,PE.EQ.141,SORT;

C3OS GOON,1;
ACTIVITY,,WORK.EQ.10,C300;
ACTIVITY,,WORK.EQ.11,C301;

C300 GOON,1;
COLCT(10),INT(1),C130 PATH 10,,1;
ACTIVITY,,C30T;

C301 GOON,1;
COLCT(11),INT(1),C130 PATH 11,,1;
ACTIVITY,,C30T;

C30T COLCT(12),INT(1),TIS C130,,1;
COLCT(13),ALL,ALL C130,,1;
ACTIVITY,,TNOW.GT.709,TRM1;
ACTIVITY;
COLCT(14),ALL,C130 BY FY93,,1;
ACTIVITY,,TRM1;

181
SORT COLCT(15), INT(1), TIS C141,,1;
   COLCT(16), ALL, ALL C141,,1;
   ACTIVITY, TNOW.GT.709, SRT1;
   ACTIVITY;
   COLCT(17), ALL, C141 BY FY93,,1;
   ACTIVITY,, SRT1;

SRT1 GOON,1;
   ACTIVITY,, WORK.EQ.1.OR.WORK.EQ.6.OR.WORK.EQ.5, SRT2;
   ACTIVITY;
   COLCT(18), INT(1), C141 PAINT,,1;
   ACTIVITY,, SRT2;

SRT2 GOON,1;
   ACTIVITY,, WORK.EQ.1, C411;
   ACTIVITY,, WORK.EQ.2, C412;
   ACTIVITY,, WORK.EQ.3, C413;
   ACTIVITY,, WORK.EQ.4, C414;
   ACTIVITY,, WORK.EQ.5, C415;
   ACTIVITY,, WORK.EQ.6, C416;
   ACTIVITY,, WORK.EQ.7, C417;

C411 COLCT(19), INT(1), TIS SL,,1;
   ACTIVITY,, CLCT;

C412 COLCT(20), INT(1), TIS SL PT,,1;
   ACTIVITY,, CLCT;

C413 COLCT(21), INT(1), TIS SL PDM PT,,1;
   ACTIVITY,, CLCT;

C414 COLCT(22), INT(1), TIS CW,,1;
   ACTIVITY;
   COLCT(23), ALL, ALL CW,,1;
   ACTIVITY,, TNOW.GT.709, CLCT;
   ACTIVITY;
   COLCT(24), ALL, CW BY FY93,,1;
   ACTIVITY,, CLCT;

C415 COLCT(25), INT(1), TIS PDM,,1;
   ACTIVITY,, CLPD;

C416 COLCT(26), INT(1), TIS SL PDM,,1;
   ACTIVITY,, CLCT;

C417 COLCT(27), INT(1), TIS PDM PAINT,,1;
   ACTIVITY,, CLPD;

CLPD COLCT(28), ALL, ALL PDM,,1;
   ACTIVITY,, TNOW.GT.709, CLCT;
ACTIVITY;
COLCT(29),ALL,PDM BY FY94,,1;
ACTIVITY,,CLCT;

WMRS  COLCT(30),BET,WARMERS,,1;;
TERM;

CLCT  GOON,1;
      ACTIVITY,,WORK.EQ.4.OR.WORK.EQ.5.OR.WORK.EQ.7,TRM1;
      ACTIVITY;
      COLCT(31),ALL,SL AC OUT SYS,,1;
      ACTIVITY,,TNOW.GT.710,TRM1;
      ACTIVITY;
      COLCT(32),ALL,SL AC OUT BY FY93,,1;
      ACTIVITY;
TRM1  TERM,235;

TERM  TERM;
END;
FIN
Modifications for Option 2

;=======================================================================
;   C-130 WASH (INCOMING & OUTGOING) BLDG 50
;=======================================================================

  ENTER, 32, 1;
  ACTIVITY;
  WASH  ASSIGN,NEED=1,ARV_TIME=TNOW,MK_WT=TNOW,1;
          ACTIVITY,,NNRSC(5).EQ.1,WSE4; IF 50 BUSY
          ACTIVITY,,WSEV;
          FILE ENTITY FILE

  WSEV  EVENT, 6, 1;
  FILEM(3,ATRIB)
           TERM;

  ENTER, 4, 1;
  ACTIVITY;
  WSE4  AWAIT(10), BLDG_50, 1;
  ACTIVITY;

  ASSIGN, WASH_HGR=50, WASH_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WASH_WT, 1;
          ACTIVITY,,WASA;

  WASA  GOON, 1;
          ACTIVITY, TRIAG(.5,.65,.8,1);
          ASSIGN, X_WASH=X_WASH+1;
          ACTIVITY, TRIAG(.5,.65,.8,1), X_WASH.GE.2, WAAS;
          SCUFF
  SAND  C-130
          ACTIVITY,,WAAS;

  WAAS  GOON, 1;
          ACTIVITY,,WASH_HGR.EQ.50, WF50;

  WF50  FREE, BLDG_50, 2;
          ACTIVITY,,WSGO;
          ACTIVITY;
          GOON, 1;
          ACTIVITY,,NNQ(10).GT.0, TERM;
          ACTIVITY;
          GOON, 1;

          ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
          ACTIVITY;
  WFREE  GOON, 1;
          ACTIVITY,,D_50.EQ.10, WC50;

184
ACTIVITY,,D_50.EQ.13,WS50;
ACTIVITY,,D_50.EQ.19,WL50;
ACTIVITY,,D_50.EQ.42,WA50;
ACTIVITY,,TERM;

WC50 EVENT,10,1; LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

WS50 EVENT,13,1; LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;

WL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED
(LNQ 50)
TERM;

WA50 EVENT,42,1; LOOK TO SEE IF BLDG 50 NEEDED
(AHEAD 50)
TERM;

WSG0 GOON,1;
ACTIVITY,,X_WASH.EQ.1,PD30;
ACTIVITY,,X_WASH.EQ.2;
GOON,1;
ACTIVITY,TRIAG(1.6,2,2.6,1),PAINT; INCLUDES C-130
PREP FOR PAINT
;
;==================================================================
; PREP FOR DEPAINT
;==================================================================
PREP GOON,1;
ACTIVITY/1,TRIAG(4.56,5.70,7.41,1),DEPT;DEPAINT
;
;==================================================================
; DEPAINT (50 OR 54)
;==================================================================
;
ENTER,36,1;
ACTIVITY;
DEPT GOON,1;
ACTIVITY,,TYPE.EQ.130,DEP3;
ACTIVITY,,TYPE.EQ.141,DP41;

DEP3 ASSIGN,NEED=1,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,NNRSC(5).EQ.1.AND.NNQ(10).EQ.0,DPA7;
ACTIVITY,,DEPE;

DP41 ASSIGN,NEED=2,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,NNRSC(3).EQ.1.AND.NNQ(11).EQ.0,DPA8;
ACTIVITY,,DEPE;

DEPE EVENT, 7, 1;
TERM;

ENTER, 7, 1;
ACTIVITY;

DPA7 AWAIT (10), BLDG_50, 1;
ACTIVITY;

ASSIGN, DPT_HGR = 50, DP_WT = TNOW-MK_WT, SUM_WT = SUM_WT + DP_WT, 1;
ACTIVITY,, DPTA;

ENTER, 8, 1;
ACTIVITY;

DPA8 AWAIT (11), BLDG_54, 1;
ACTIVITY;

ASSIGN, DPT_HGR = 54, DP_WT = TNOW-MK_WT, SUM_WT = SUM_WT + DP_WT, 1;
ACTIVITY,, DPTA;

DPTA GOON, 1;
ACTIVITY,, DPT_HGR .EQ. 50, DP50;
ACTIVITY,, DPT_HGR .EQ. 54, DP54;

DP54 GOON, 1;
ACTIVITY, TRIAG (3, 4, 5, 1), TYPE .EQ. 141, FRDP;

DP50 GOON, 1;
ACTIVITY, TRIAG (8, 10, 13, 1), TYPE .EQ. 130, FRDP;

FRDP GOON, 1;
ACTIVITY,, DPT_HGR .EQ. 54, DF54;
ACTIVITY,, DPT_HGR .EQ. 50, DF50;

DF54 FREE, BLDG_54, 2;
ACTIVITY,, DPGO;
ACTIVITY;
GOON, 1;
ACTIVITY,, NNQ (11) .GT. 0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY,, NNQ (3) .EQ. 0 AND NNQ (4) .EQ. 0 AND NNQ (5) .EQ. 0, TERM;
ACTIVITY;

DFREE GOON, 1
ACTIVITY,, D_54 .EQ. 11, DC54;
ACTIVITY,, D_54 .EQ. 14, DS54;
ACTIVITY,, D_54 .EQ. 20, DL54;
ACTIVITY,, D_54 .EQ. 47, DA54;

186
DC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54)
TERM;

DS54 EVENT,14,1; LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54)
TERM;

DL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED
(INQ 54)
TERM;

DA54 EVENT,47,1; LOOK TO SEE IF BLDG 54 NEEDED
(AHEAD 54)
TERM;

DF50 FREE,BLDG_50,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,D_50.EQ.10,DC50;
ACTIVITY,,D_50.EQ.13,DS50;
ACTIVITY,,D_50.EQ.19,DC50;
ACTIVITY,,D_50.EQ.42,DC50;

DC50 EVENT,10,1; LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

DS50 EVENT,13,1; LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;

DL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED
(INQ 50)
TERM;

DA50 EVENT,42,1; LOOK TO SEE IF BLDG 50 NEEDED
(AHEAD 50)
TERM;

DPGO GOON,1
ACTIVITY,,TYPE.EQ.130,PD30;
ACTIVITY,,TYPE.EQ.141,DPG1;

; DPG1 GOON,1;
ACTIVITY,,WORK.EQ.4,CWBX;
ACTIVITY,,WORK.EQ.7,PDM;
ACTIVITY,,WORK.EQ.2.OR.WORK.EQ.3,SPLN;
;============================================================================
; W/E/A
;============================================================================

ENTER, 35, 1;
ACTIVITY;

WEA
  GOON, 1;
  ACTIVITY,, TYPE.EQ.130, WE30;
  ACTIVITY,, TYPE.EQ.141, WE41;

WE30
  ASSIGN, NEED=1, ARV_TIME=TNOW, MK WT=TNOW, 1;
  ACTIVITY,, NNRSC(5).EQ.1.AND.NNQ(10).EQ.0, WE10;
  IF 50 BUSY
    ACTIVITY,,, WEEV;
  FILE ENTITY (5)

WE41
  ASSIGN, NEED=2, ARV_TIME=TNOW, MK WT=TNOW, 1;
  ACTIVITY,, NNRSC(3).EQ.1.AND.NNQ(11).EQ.0, WE11;
  IF 50 BUSY
    ACTIVITY,,, WEEV;
  FILE ENTITY (5)

WEEV
  EVENT, 8, 1;
  CALL FILEM(5, ATRIB)
  TERM;

  ENTER, 10, 1;
  ACTIVITY;

WE10
  AWAIT(10), BLDG_50, 1;
  ACTIVITY;

  ASSIGN, WEA_HGR=50, WEA WT=TNOW-MK WT, SUM WT=SUM WT+WEA WT, 1;
  ACTIVITY,,, WEA;

  ENTER, 11, 1;
  ACTIVITY;

WE11
  AWAIT(11), BLDG_54, 1;
  ACTIVITY;

  ASSIGN, WEA_HGR=54, WEA WT=TNOW-MK WT, SUM WT=SUM WT+WEA WT, 1;
  ACTIVITY,,, WEA;

WEAA
  GOON, 1;
  ACTIVITY/8, TRIAG(.8, 1, 1.3, 1); WEA
  GOON, 1;
  ACTIVITY,, WEA_HGR.EQ.54, WEF54;
  ACTIVITY,, WEA_HGR.EQ.50;
ASSIGN,PNT_HGR=50,PNT_WT=0,1;
ACTIVITY,,PNTA;

WEF54 FREE,BLDG_54,2;
ACTIVITY,,WEFE;
ACTIVITY,,WEFF;

WEFE ASSIGN,NEED=3,MK_WT=TNOW,1; NEED FOR PAINT
ACTIVITY,,PE15;

WEFF GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
ACTIVITY;
AFREE GOON,1;
ACTIVITY,,D_54.EQ.11,EC54;
ACTIVITY,,D_54.EQ.14,ES54;
ACTIVITY,,D_54.EQ.20,EL54;
ACTIVITY,,D_54.EQ.47,EA54;

EC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54)
TERM;

ES54 EVENT,14,1; LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54)
TERM;

EL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED
(LNQ 54)
TERM;

EA54 EVENT,47,1; LOOK TO SEE IF BLDG 54 NEEDED
(AHEAD 54)
TERM;

;=================================================================
; PAINT (50 OR 89)
;=================================================================
;
PAINT GOON,1;
ACTIVITY,,TYPE.EQ.130,P130;
ACTIVITY,,TYPE.EQ.141,P141;

P130 ASSIGN,NEED=1,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,NNRSC(5).EQ.1.AND.NNQ(10).EQ.0,PE14;

189
ACTIVITY,,PAEN;

P141 ASSIGN,NEED=3,ARV_TIME=TNOW,MK WT=TNOW,1;
    ACTIVITY,,NRRSC(4).EQ.1.AND.NNQ(12).EQ.0,PE15; 89
    BUSY
    ACTIVITY,,PAEN;
    ENTITY (6)

PAEN EVENT,9,1;
    TERM;
    ENTER,13,1;
    ACTIVITY,
PE14 AWAIT(10),BLDG_50,1;
    ACTIVITY;

ASSIGN,PNT_HGR=50,PNT WT=TNOW-MK WT,SUM WT=SUM WT+PNT WT,1;
    ACTIVITY,,PNTA;
    ENTER,15,1;
    ACTIVITY,
PE15 AWAIT(12),BLDG_89,1;
    ACTIVITY;

ASSIGN,PNT_HGR=89,PNT WT=TNOW-MK WT,SUM WT=SUM WT+PNT WT,1;
    ACTIVITY,,PNTA;

PNTA GOON,1;
    ACTIVITY/9,TRIAG(3.2,4,5.2,1),TYPE.EQ.141,PTST;PAINT
    ACTIVITY,TRIAG(2.4,3,3.9,1),TYPE.EQ.130.AND.WORK.EQ.10,PTST;
    ACTIVITY,TRIAG(1.2,1.5,1.95,1),TYPE.EQ.130.AND.WORK.EQ.11,PTST;

PTST GOON,1;
    ACTIVITY,,PNT_HGR.EQ.50,PF50;
    ACTIVITY,,PNT_HGR.EQ.89,PF89;

PF50 FREE,BLDG_50,2;
    ACTIVITY,,OUT;
    ACTIVITY;
    GOON,1;
    ACTIVITY,,NNQ(10).GT.0,TERM;
    ACTIVITY;
    GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
    ACTIVITY;

190
GOON, 1;
ACTIVITY,, D_50.EQ.10,PC50;
ACTIVITY,, D_50.EQ.13,PS50;
ACTIVITY,, D_50.EQ.19,PL50;
ACTIVITY,, D_50.EQ.42,PA50;

PC50 EVENT, 10, 1;
(LOOK 50 TERM);

PS50 EVENT, 13, 1;
(SPT 50 TERM);

PL50 EVENT, 19, 1;
(LNQ 50 TERM);

PA50 EVENT, 42, 1;
(AHEAD 50 TERM);

PF89 FREE,BLDG_89,2;
ACTIVITY,,OUT;
ACTIVITY;
GOON, 1;
ACTIVITY,,NNQ(12).GT.0,TERM;
ACTIVITY;

PFREE GOON,1;
ACTIVITY,, D_89.EQ.12,PC89;
ACTIVITY,, D_89.EQ.15,PS89;
ACTIVITY,, D_89.EQ.21,PL89;
ACTIVITY,, D_89.EQ.52,PA89;

PC89 EVENT,12,1;
(LOOK 89 TERM);

PS89 EVENT,15,1;
(SPT 89 TERM);

PL89 EVENT,21,1;
(LNQ 89 TERM);

PA89 EVENT,52,1;
(AHEAD 89 TERM);

LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 50 NEEDED
LOOK TO SEE IF BLDG 89 NEEDED
LOOK TO SEE IF BLDG 89 NEEDED
LOOK TO SEE IF BLDG 89 NEEDED
LOOK TO SEE IF BLDG 89 NEEDED
191
OUT  GOON,1;
ACTIVITY, TYPE.EQ.130,CLC1;
ACTIVITY,TRIAG(.32,.4,.52,1),,FTEST;
Modifications for Option 3

;============================================================
; C-130 WASH (INCOMING & OUTGOING) BLDG 50
;============================================================

ENTER, 32, 1;
ACTIVITY;

WASH ASSIGN, NEED=1, ARV TIME=TNOW, MK WT=TNOW, 1;
ACTIVITY, NNRSC(5).EQ.1, WSE4; IF 50 BUSY
ACTIVITY, WSEV; FILE ENTITY FILE

3

WSEV EVENT, 6, 1;
FILEM(3, ATRIB)
TERM;

ENTER, 4, 1;
ACTIVITY;

WSE4 AWAIT(10), BLDG_50, 1;
ACTIVITY;

ASSIGN, WASH_HGR=50, WASH_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WASH_WT, 1;
ACTIVITY, WASA:

WASA GOON, 1;
ACTIVITY, TRIAG(.5, .65, .8, 1);
ASSIGN, X_WASH=X_WASH+1, 1;
ACTIVITY, TRIAG(.5, .65, .8, 1), X_WASH.GE.2, WAAS; SCUFF

SAND C-130
ACTIVITY, WAAS;

WAAS GOON, 1;
ACTIVITY, WASH_HGR.EQ.50, WF50;

WF50 FREE, BLDG_50, 2;
ACTIVITY, WSGO;
ACTIVITY;
GOON, 1;
ACTIVITY, NNQ(10).GT.0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0, TERM;
ACTIVITY;

WFREE GOON, 1;
ACTIVITY, D_50.EQ.10, WC50;
ACTIVITY, D_50.EQ.13, WS50;
ACTIVITY, D_50.EQ.19, WL50;
ACTIVITY, D_50.EQ.42, WA50;
ACTIVITY,, TERM;

WC50  EVENT,10,1;  LOOK TO SEE IF BLDG 50 NEEDED
       (LOOK 50) TERM;

WS50  EVENT,13,1;  LOOK TO SEE IF BLDG 50 NEEDED
       (SPT 50) TERM;

WL50  EVENT,19,1;  LOOK TO SEE IF BLDG 50 NEEDED
       (LNQ 50) TERM;

WA50  EVENT,42,1;  LOOK TO SEE IF BLDG 50 NEEDED
       (AHEAD 50) TERM;

WSGO  GOON,1;
       ACTIVITY,, X_WASH.EQ.1, PD30;
       ACTIVITY,, X_WASH.EQ.2;
       GOON,1;
       ACTIVITY, TRIAG(1.6,2,2.6,1),, PAINT; INCLUDES C-130
       PREP FOR PAINT
       ;
       ;===============================================
       ; PREP FOR DEPAINT
       ;===============================================
       PREP GOON,1;
       ACTIVITY/1, TRIAG(4.56,5.70,7.41,1),, DEPT; DEPAINT
       ;
       ;===============================================
       ; DEPAINT (50 OR 54)
       ;===============================================
       ENTER,36,1;
       ACTIVITY;

DEPT GOON,1;
       ACTIVITY,, TYPE.EQ.130, DEP3;
       ACTIVITY,, TYPE.EQ.141, DP41;

DEP3  ASSIGN, NEED=1, ARV_TIME=TNOW, MK_WT=TNOW, 1;
       ACTIVITY,, NNRSC(5).EQ.1.AND.NNQ(10).EQ.0, DPA7;
       ACTIVITY,, DEPE;

DP41  ASSIGN, NEED=2, ARV_TIME=TNOW, MK_WT=TNOW, 1;
       ACTIVITY,, NNRSC(3).EQ.1.AND.NNQ(11).EQ.0, DPA8;
ACTIVITY,,DEPE;

DEPE EVENT,7,1;
TERM;

ENTER,7,1;
ACTIVITY;

DPA7 AWAIT(10),BLDG_50,1;
ACTIVITY;

ASSIGN,DPT_HGR=50,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,,DPTA;

ENTER,8,1;
ACTIVITY;

DPA8 AWAIT(11),BLDG_54,1;
ACTIVITY;

ASSIGN,DPT_HGR=54,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,,DPTA;

DPTA GOON,1;
ACTIVITY,,DPT_HGR.EQ.50,DP50;
ACTIVITY,,DPT_HGR.EQ.54,DP54;

DP54 GOON,1;
ACTIVITY,TRIAG(3,4,5,1),TYPE.EQ.141,FRDP;

DP50 GOON,1;
ACTIVITY,TRIAG(8,10,13,1),TYPE.EQ.130,FRDP;

FRDP GOON,1;
ACTIVITY,,DPT_HGR.EQ.54,DF54;
ACTIVITY,,DPT_HGR.EQ.50,DF50;

DF54 FREE,BLDG_54,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
ACTIVITY;

DFREE GOON,1
ACTIVITY,,D_54.EQ.11,DC54;
ACTIVITY,,D_54.EQ.14,DS54;
ACTIVITY,,D_54.EQ.20,DL54;
ACTIVITY,,D_54.EQ.47,DA54;
DC54 EVENT,11,1;
(LOOK 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED

DS54 EVENT,14,1;
(SPT 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED

DL54 EVENT,20,1;
(LNQ 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED

DA54 EVENT,47,1;
(AHEAD 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED

DF50 FREE,BLDG_50,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,D_50.EQ.10,DC50;
ACTIVITY,,D_50.EQ.13,DS50;
ACTIVITY,,D_50.EQ.19,DC50;
ACTIVITY,,D_50.EQ.42,DC50;

DC50 EVENT,10,1;
(LOOK 50)
TERM;

LOOK TO SEE IF BLDG 50 NEEDED

DS50 EVENT,13,1;
(SPT 50)
TERM;

LOOK TO SEE IF BLDG 50 NEEDED

DL50 EVENT,19,1;
(LNQ 50)
TERM;

LOOK TO SEE IF BLDG 50 NEEDED

DA50 EVENT,42,1;
(AHEAD 50)
TERM;

LOOK TO SEE IF BLDG 50 NEEDED

DPGO GOON,1
ACTIVITY,,TYPE.EQ.130,PD30;
ACTIVITY,,TYPE.EQ.141,DPG1;

DPG1 GOON,1;
ACTIVITY,,WORK.EQ.4,CWBX;
ACTIVITY,,WORK.EQ.7,PDM;

196
;=============================================================================
;       W/E/A
;=============================================================================

       ENTER,35,1;
       ACTIVITY;
       WEA    GOON,1;
       ACTIVITY,,TYPE.EQ.130,WE30;
       ACTIVITY,,TYPE.EQ.141,WE41;

       WE30  ASSIGN,NEED=1,ARV_TIME=TNOW,MK_WT=TNOW,1;
             ACTIVITY,,NNRSC(5).EQ.1.AND.NNQ(10).EQ.0,WE10;   IF 50
             BUSY
             ACTIVITY,,,WEEV;
             ENTITY (5)

       WE41  ASSIGN,NEED=2,ARV_TIME=TNOW,MK_WT=TNOW,1;
             ACTIVITY,,NNRSC(3).EQ.1.AND.NNQ(11).EQ.0,WE11;   IF 50
             BUSY
             ACTIVITY,,,WEEV;
             ENTITY (5)

       WEEV  EVENT,8,1;
             CALL FILEM(5,ATRIB)
             TERM;

       ENTER,10,1;
       ACTIVITY;
       WE10  AWAIT(10),BLDG_50,1;
       ACTIVITY;

       ASSIGN,WEA_HGR=50,WEA_WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,1;
       ACTIVITY,,,WEAA;

       ENTER,11,1;
       ACTIVITY;
       WE11  AWAIT(11),BLDG_54,1;
       ACTIVITY;

       ASSIGN,WEA_HGR=54,WEA_WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,1;
       ACTIVITY,,,WEAA;

       WEAA  GOON,1;
       ACTIVITY/8,TRIAG(.8,1,1.3,1);WEA
       GOON,1;
       ACTIVITY,,WEA_HGR.EQ.54,WEF54;
       ACTIVITY,,WEA_HGR.EQ.50;
       ASSIGN,PNT_HGR=50,PNT_WT=0,1;
       ACTIVITY,,,PNTA;

       WEF54 FREE,BLDG_54,2;

       197
ACTIVITY,,WEFE;
ACTIVITY,,WEFF;

WEFE ASSIGN, NEED=3, MK_WT=TNOW, 1;
ACTIVITY,, NRUSE(4).EQ.0, PE15;
ACTIVITY,, NRUSE(5).EQ.0, PE14;
ACTIVITY,, PE15;

WEFF GOON, 1;
ACTIVITY,, NNQ(11).GT.0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY,, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0, TERM;
ACTIVITY;
AFREE GOON, 1;
ACTIVITY,, D_54.EQ.11, EC54;
ACTIVITY,, D_54.EQ.14, ES54;
ACTIVITY,, D_54.EQ.20, EL54;
ACTIVITY,, D_54.EQ.47, EA54;

EC54 EVENT, 11, 1;
(LOOK 54)
TERM;

ES54 EVENT, 14, 1;
(SPT 54)
TERM;

EL54 EVENT, 20, 1;
(INQ 54)
TERM;

EA54 EVENT, 47, 1;
(AHEAD 54)
TERM;

;===============================================================================
; PAINT (50 OR 89)
;===============================================================================
;
PAINT GOON, 1;
ACTIVITY,, TYPE.EQ.130, P130;
ACTIVITY,, TYPE.EQ.141, P141;

P130 ASSIGN, NEED=1, ARV_TIME=TNOW, MK_WT=TNOW, 1;
ACTIVITY,, NNRSC(5).EQ.1.AND.NNQ(10).EQ.0, PE14;
ACTIVITY,, PAEN;

198
ASSIGN, NEED=3, ARV_TIME=TNOW, MK_WT=TNOW, 1;
ACTIVITY,, NNRSC(4).EQ.1.AND.NNQ(12).EQ.0, PE15; 89

BUSY

ACTIVITY,, PAEN;
ENTITY (6)

PAEN EVENT, 9, 1;
TERM;
ENTER, 13, 1;
ACTIVITY;
PE14 AWAIT(10), BLDG_50, 1;
ACTIVITY;

ASSIGN, PNT_HGR=50, PNT_WT=TNOW-MK_WT, SUM_WT=SUM_WT+PNT_WT, 1;
ACTIVITY,, PNTA;
ENTER, 15, 1;
ACTIVITY;
PE15 AWAIT(12), BLDG_89, 1;
ACTIVITY;

ASSIGN, PNT_HGR=89, PNT_WT=TNOW-MK_WT, SUM_WT=SUM_WT+PNT_WT, 1;
ACTIVITY,, PNTA;

PTST GOON, 1;
ACTIVITY,, PNT_HGR.EQ.50, PF50;
ACTIVITY,, PNT_HGR.EQ.89, PF89;

PF50 FREE, BLDG_50, 2;
ACTIVITY,, OUT;
ACTIVITY;
GOON, 1;
ACTIVITY,, NNQ(10).GT.0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY,, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0, TERM;
ACTIVITY;
GOON, 1;
ACTIVITY,, D_50.EQ.10, PC50;
ACTIVITY,,\_50.EQ.13,PS50;
ACTIVITY,,\_50.EQ.19,PL50;
ACTIVITY,,\_50.EQ.42,PA50;

PC50 EVENT,10,1; LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

PS50 EVENT,13,1; LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;

PL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED
(LNQ 50)
TERM;

PA50 EVENT,42,1; LOOK TO SEE IF BLDG 50 NEEDED
(AHEAD 50)
TERM;

PF89 FREE,BLDG\_89,2;
ACTIVITY,,\,OUT;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(12).GT.0,TERM;
ACTIVITY;
PFREE GOON,1;
ACTIVITY,,\_89.EQ.12,PC89;
ACTIVITY,,\_89.EQ.15,PS89;
ACTIVITY,,\_89.EQ.21,PL89;
ACTIVITY,,\_89.EQ.52,PA89;

PC89 EVENT,12,1; LOOK TO SEE IF BLDG 89 NEEDED
(LOOK 89)
TERM;

PS89 EVENT,15,1; LOOK TO SEE IF BLDG 89 NEEDED
(SPT 89)
TERM;

PL89 EVENT,21,1; LOOK TO SEE IF BLDG 89 NEEDED
(LNQ 89)
TERM;

PA89 EVENT,52,1; LOOK TO SEE IF BLDG 89 NEEDED
(AHEAD 89)
TERM;

OUT GOON,1;
ACTIVITY,,\,TYPE.EQ.130,CLC1;

200
ACTIVITY,TRIAG(.32,.4,.52,1),,FTEST;
Modifications for Option 5

=================================
; C-130 WASH (INCOMING & OUTGOING) BLDG 50
=================================

ENTER,32,1;
ACTIVITY;

WASH ASSIGN,NEED=4,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY;
EVENT,26,1;
TERM;

ENTER,4,1;
ACTIVITY;

WSE4 AWAIT(10),BLDG_50,1;
ACTIVITY;

ASSIGN,WASH_HGR=50,WASH_WT=TNOW-MK_WT,SUM_WT=SUM_WT+WASH_WT,1;
ACTIVITY,,WASA;

ENTER,5,1;
ACTIVITY;

WSE5 AWAIT(11),BLDG_54,1;
ACTIVITY;

ASSIGN,WASH_HGR=54,WASH_WT=TNOW-MK_WT,SUM_WT=SUM_WT+WASH_WT,1;
ACTIVITY,,WASA;

WASA GOON,1;
ACTIVITY,TRIAG(.5,.65,.8,1);
ASSIGN,X_WASH=X_WASH+1,1;
ACTIVITY,TRIAG(.5,.65,.8,1),X_WASH.GE.2,WAAS; SCUFF

SAND C130
ACTIVITY,,WAAS;

WAAS GOON,1
ACTIVITY,,WASH_HGR.EQ.50,WF50;
ACTIVITY,,WASH_HGR.EQ.54,WF54;

WF50 FREE,BLDG_50,2;
ACTIVITY,,WSGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(10).GT.0,TERM;
ACTIVITY;
GOON,1;

202
ACTIVITY, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1;
ACTIVITY,,D_50.EQ.10,WC50;
ACTIVITY,,D_50.EQ.13,WS50;
ACTIVITY,,D_50.EQ.19,WL50;
ACTIVITY,,D_50.EQ.44,WA50;
ACTIVITY,,TERM;

WC50 EVENT,10,1; LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

WS50 EVENT,13,1; LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;

WL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED
(LNQ 50)
TERM;

WA50 EVENT,44,1; LOOK TO SEE IF BLDG 50 NEEDED
(AHEAD 50)
TERM;

WF54 FREE,BLDG_54,2;
ACTIVITY,,WSGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
ACTIVITY;
GOON,1;
ACTIVITY,,D_54.EQ.11,WC54;
ACTIVITY,,D_54.EQ.14,WS54;
ACTIVITY,,D_54.EQ.20,WL54;
ACTIVITY,,D_54.EQ.49,WA54;

WC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54)
TERM;

WS54 EVENT,14,1; LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54)
TERM;

203
WL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54) TERM;

WA54 EVENT,49,1; LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54) TERM;

WSGO GOON,1;
ACTIVITY,,X_WASH.EQ.1,PD30;
ACTIVITY,,X_WASH.EQ.2;
GOON,1;
ACTIVITY,TRIAG(1.6,2,2.6,1),,PAINT; INCLUDES C-130 PREP FOR PAINT
;
;================================================================================
; PREP FOR DePAINT
;================================================================================
PREP GOON,1;;
ACTIVITY/1,TRIAG(4.56,5.70,7.41,1),,DEPT;DePaint
;
;================================================================================
; DePAINT (50 OR 54)
;================================================================================
;
ENTER,36,1;
ACTIVITY;

DEPT GOON,1;
ACTIVITY,,TYPE.EQ.130,DEP3;
ACTIVITY,,TYPE.EQ.141,DP41;

DEP3 ASSIGN,NEED=1,ARV_TIME=TNOW,MARK_WT=TNOW,1;
ACTIVITY,,D_DP.EQ.27,DP27;
ACTIVITY,,D_DP.EQ.23,DP23;

DP23 EVENT,23,1;
TERM;

DP27 EVENT,27,1;
TERM;

DP41 ASSIGN,NEED=2,ARV_TIME=TNOW,MARK_WT=TNOW,1;
ACTIVITY,,D_DP.EQ.27,DP27;
ACTIVITY,,D_DP.EQ.23,DP23;

ENTER,7,1;
ACTIVITY;

DPA7 AWAIT(10),BLDG_50,1;
ACTIVITY;

204
ASSIGN, DPT_HGR=50, DP_WT=TNOW-MK_WT, SUM_WT=SUM_WT+DP_WT, 1;
ACTIVITY,, DPTA;

ENTER, 8, 1;
ACTIVITY;

DPA8 AWAIT(11), BLDG_54, 1;
ACTIVITY;

ASSIGN, DPT_HGR=54, DP_WT=TNOW-MK_WT, SUM_WT=SUM_WT+DP_WT, 1;
ACTIVITY,, DPTA;

DPTA GOON, 1;
ACTIVITY,, DPT_HGR.EQ.50, DP50;
ACTIVITY,, DPT_HGR.EQ.54, DP54;

DP50 GOON, 1;
ACTIVITY, TRIAG(8, 10, 13, 1), TYPE.EQ.130, FRDP;

DP54 GOON, 1;
ACTIVITY, TRIAG(3, 4, 5, 1), TYPE.EQ.141, FRDP;

FRDP GOON, 1;
ACTIVITY,, DPT_HGR.EQ.54, DF54;
ACTIVITY,, DPT_HGR.EQ.50, DF50;

DF50 FREE, BLDG_50, 2;
ACTIVITY,, DPGO;
ACTIVITY;
GOON, 1;
ACTIVITY,, NNQ(10).GT.0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY,, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0, TERM;
ACTIVITY;
GOON, 1
ACTIVITY,, D_50.EQ.10, DC50;
ACTIVITY,, D_50.EQ.13, DS50;
ACTIVITY,, D_50.EQ.19, DL50;
ACTIVITY,, D_50.EQ.44, DA50;

DC50 EVENT, 10, 1;  LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

DS50 EVENT, 13, 1;  LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;

205
DL50  EVENT,19,1;  LOOK TO SEE IF BLDG 50 NEEDED
     (LNQ 50)
     TERM;

DA50  EVENT,44,1;  LOOK TO SEE IF BLDG 50 NEEDED
     (AHEAD 50)
     TERM;

DF54  FREE,BLDG_54,2;
     ACTIVITY,,DPGO;
     ACTIVITY;
     GOON,1;
     ACTIVITY,,NNQ(11).GT.0,TERM;
     ACTIVITY;
     GOON,1;

     ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
     ACTIVITY;
     GOON,1
     ACTIVITY,,D_54.EQ.11,DC54;
     ACTIVITY,,D_54.EQ.14,DS54;
     ACTIVITY,,D_54.EQ.20,DL54;
     ACTIVITY,,D_54.EQ.49,DA54;

DC54  EVENT,11,1;  LOOK TO SEE IF BLDG 54 NEEDED
     (LOOK 54)
     TERM;

DS54  EVENT,14,1;  LOOK TO SEE IF BLDG 54 NEEDED
     (SPT 54)
     TERM;

DL54  EVENT,20,1;  LOOK TO SEE IF BLDG 54 NEEDED
     (LNQ 54)
     TERM;

DA54  EVENT,49,1;  LOOK TO SEE IF BLDG 54 NEEDED
     (AHEAD 54)
     TERM;

DPGO  GOON,1
     ACTIVITY,,TYPE.EQ.130,PD30;
     ACTIVITY,,TYPE.EQ.141,DPG1;

;  DPG1  GOON,1;
     ACTIVITY,,WORK.EQ.4,CWBX;
     ACTIVITY,,WORK.EQ.7,PDM;
     ACTIVITY,,WORK.EQ.2.OR.WORK.EQ.3,SPLN;
;==============================================
;    W/E/A (50 OR 54)
;==============================================

    ENTER, 35, 1;
    ACTIVITY;
    WEA  ASSIGN, NEED=4, ARV_TIME=TNOW, MK WT=TNOW, 1;
          ACTIVITY,, D_WEA.EQ.24, DW24;
          ACTIVITY,, D_WEA.EQ.28, DW28;

    DW24  EVENT, 24, 1;
           TERM;
    DW28  EVENT, 28, 1;
           TERM;

    WEEV  EVENT, 8, 1;
           CALL FILEM(5, ATRIB)
           TERM;
    ENTER, 10, 1;
    ACTIVITY;
    WE10  AWAIT(10), BLDG 50, 1;
          ACTIVITY;
          ASSIGN, WEA_HGR=50, WEA_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WEA_WT, 1;
          ACTIVITY,, WEA;
    ENTER, 11, 1;
    ACTIVITY;
    WE11  AWAIT(11), BLDG 54, 1;
          ACTIVITY;
          ASSIGN, WEA_HGR=54, WEA_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WEA_WT, 1;
          ACTIVITY,, WEA;

    WEA  GOON, 1;
          ACTIVITY/8, TRIAG(.8, 1, 1.3, 1), WEA
          GOON, 1;
          ACTIVITY,, WEA_HGR.EQ.54, WEF54;
          ACTIVITY,, WEA_HGR.EQ.50;
          ASSIGN, PNT_HGR=50, PNT_WT=0, 1;
          ACTIVITY,, PNTA;

    WEF54  FREE, BLDG 54, 2;
           ACTIVITY,, WEF;
           ACTIVITY,, WEF;

    WEF  ASSIGN, NEED=5, MK_WT=TNOW, 1;
         NEED FOR PAINT
          ACTIVITY,, NRUSE(4).EQ.0, PE15;
          ACTIVITY,, NRUSE(5).EQ.0, PE14;

207
ACTIVITY;
EVENT,56,1;
TERM;

WEFF GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0,TERM;
ACTIVITY;

AFREE GOON,1;
ACTIVITY,,D_54.EQ.11,EC54;
ACTIVITY,,D_54.EQ.14,ES54;
ACTIVITY,,D_54.EQ.20,EL54;
ACTIVITY,,D_54.EQ.49,EA54;

EC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED (LOOK 54)
TERM;

ES54 EVENT,14,1; LOOK TO SEE IF BLDG 54 NEEDED (SPT 54)
TERM;

EL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54)
TERM;

EA54 EVENT,49,1; LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54)
TERM;

;=================================================================
; PAINT (50 OR 89)
;=================================================================

PAINT ASSIGN,NEED=5,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,D_PNT.EQ.25,DP25;
ACTIVITY,,D_PNT.EQ.29,DP29;

DP25 EVENT,25,1;
TERM;

DP29 EVENT,29,1;
TERM;

ENTER,13,1;
ACTIVITY;

208
PE14  AWAIT(10), BLDG_50, 1;
       ACTIVITY;

       ASSIGN, PNT_HGR=50, PNT_WT=TNOW-MK_WT, SUM_WT=SUN_WT+PNT_WT, 1;
       ACTIVITY,, PNTA;

       ENTER, 15, 1;
       ACTIVITY;

PE15  AWAIT(12), BLDG_89, 1;
       ACTIVITY;

       ASSIGN, PNT_HGR=89, PNT_WT=TNOW-MK_WT, SUM_WT=SUN_WT+PNT_WT, 1;
       ACTIVITY,, PNTA;

PNTA  GOON, 1;
       ACTIVITY/9, TRIAG(3.2, 4, 5.2, 1), TYPE.EQ.141, PTST; PAINT

ACTIVITY, TRIAG(2.4, 3, 3.9, 1), TYPE.EQ.130.AND.WORK.EQ.10, PTST;

ACTIVITY, TRIAG(1.2, 1.5, 1.95, 1), TYPE.EQ.130.AND.WORK.EQ.11, PTST;

PTST  GOON, 1;
       ACTIVITY,, PNT_HGR.EQ.50, PF50;
       ACTIVITY,, PNT_HGR.EQ.89, PF89;

PF50  FREE, BLDG_50, 2;
       ACTIVITY,, OUT;
       ACTIVITY;
       GOON, 1;
       ACTIVITY,, NNQ(10).GT.0, TERM;
       ACTIVITY;
       GOON, 1;

ACTIVITY,, NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0, TERM;
       ACTIVITY;
       GOON, 1;
       ACTIVITY,, D_50.EQ.10, PC50;
       ACTIVITY,, D_50.EQ.13, PS50;
       ACTIVITY,, D_50.EQ.19, PL50;
       ACTIVITY,, D_50.EQ.44, PA50;

PC50  EVENT, 10, 1;  LOOK TO SEE IF BLDG 50 NEEDED
       TERM;

PS50  EVENT, 13, 1;  LOOK TO SEE IF BLDG 50 NEEDED
       (SPT 50)
       TERM;

209
PL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED (LNQ 50) TERM;

PA50 EVENT,44,1; LOOK TO SEE IF BLDG 50 NEEDED (AHEAD 50) TERM;

PF89 FREE,BLDG_89,2; ACTIVITY,,,OUT; ACTIVITY;
GOON,1;
ACTIVITY,,,NNQ(12).GT.0,TERM;
ACTIVITY;
PFREE GOON,1;
ACTIVITY,,,D_89.EQ.12,PC89;
ACTIVITY,,,D_89.EQ.15,PS89;
ACTIVITY,,,D_89.EQ.21,PL89;
ACTIVITY,,,D_89.EQ.54,PA89;

PC89 EVENT,12,1; LOOK TO SEE IF BLDG 89 NEEDED (LOOK 89) TERM;

PS89 EVENT,15,1; LOOK TO SEE IF BLDG 89 NEEDED (SPT 89) TERM;

PL89 EVENT,21,1; LOOK TO SEE IF BLDG 89 NEEDED (LNQ 89) TERM;

PA89 EVENT,54,1; LOOK TO SEE IF BLDG 89 NEEDED (AHEAD 89) TERM;

OUT GOON,1;
ACTIVITY,,,TYPE.EQ.130,CLC1;
ACTIVITY,TRIAG(.32,.4,.52,1),,FTEST;
Modifications for Option 6

;=====================================================================
; C-130 WASH (INCOMMING & OUTGOING) BLDG 50
;=====================================================================

EN32 ENTER,32,1;
   ACTIVITY;
WASH ASSIGN,NEED=6,ARV_TIME=TNOW, MK_WT=TNOW,1;
   ACTIVITY,,D_WASH.EQ.22,DP22;
   ACTIVITY,,D_WASH.EQ.26,DP26;

DP22 EVENT,22,1;  BUILDING DISPATCHING (MINUWASH) TERM;

DP26 EVENT,26,1;  BUILDING DISPATCHING (FCWASH) TERM;

EN4 ENTER,4,1;
   ACTIVITY;
WSE4 AWAIT(10),BLDG_50,1;
   ACTIVITY;

ASSIGN,WASH_HGR=50,WASH_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WASH_WT, 1;
   ACTIVITY,,WASA;

EN5 ENTER,5,1;
   ACTIVITY;
WSE5 AWAIT(11),BLDG_54,1;
   ACTIVITY;

ASSIGN,WASH_HGR=54,WASH_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WASH_WT, 1;
   ACTIVITY,,WASA;

EN6 ENTER,6,1;
   ACTIVITY;
WSE6 AWAIT(12),BLDG_89,1;
   ACTIVITY;

ASSIGN,WASH_HGR=89,WASH_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WASH_WT, 1;
   ACTIVITY,,WASA;

WASA GOON,1;
   ACTIVITY,TRIAG(.5,.65,.8,1);
   ASSIGN,X_WASH=X_WASH+1,1;
   ACTIVITY,TRIAG(.5,.65,.8,1),X_WASH.GE.2,WAAS;
ACTIVITY,,X_WASH.LT.2,WAAS;

WAAS GOON,1;
ACTIVITY,,WASH_HGR.EQ.50,WF50;
ACTIVITY,,WASH_HGR.EQ.54,WF54;
ACTIVITY,,WASH_HGR.EQ.89,WF89;

WF50 FREE,BLDG_50,2;
ACTIVITY,,,WSGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(10).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;

WFREE GOON,1;
ACTIVITY,,D_50.EQ.10,WC50;
ACTIVITY,,D_50.EQ.16,WS50;
ACTIVITY,,D_50.EQ.19,WL50;
ACTIVITY,,D_50.EQ.45,WA50;
ACTIVITY,,TERM;

WC50 EVENT,10,1; LOOK TO SEE IF BLDG 50 NEEDED (LOOK 50) TERM;

WS50 EVENT,16,1; LOOK TO SEE IF BLDG 50 NEEDED (SPT_6 50) TERM;

WL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED (LNQ 50) TERM;

WA50 EVENT,45,1; LOOK TO SEE IF BLDG 50 NEEDED (AHEAD 50) TERM;

WF54 FREE,BLDG_54,2;
ACTIVITY,,,WSGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;

212
Q(6).EQ.0,TERM;
  ACTIVITY;
  GOON,1;
  ACTIVITY,,D_54.EQ.11,WC54;
  ACTIVITY,,D_54.EQ.17,WS54;
  ACTIVITY,,D_54.EQ.20,WL54;
  ACTIVITY,,D_54.EQ.50,WA54;

WC54 EVENT,11,1;  LOOK TO SEE IF BLDG 54 NEEDED
  (LOOK 54)
  TERM;

WS54 EVENT,17,1;  LOOK TO SEE IF BLDG 54 NEEDED
  (SPT_6 54)
  TERM;

WL54 EVENT,20,1;  LOOK TO SEE IF BLDG 54 NEEDED
  (LNQ 54)
  TERM;

WA54 EVENT,50,1;  LOOK TO SEE IF BLDG 54 NEEDED
  (AHEAD 54)
  TERM;

WF89 FREE,BLDG_89,2;
  ACTIVITY,,WSGO;
  ACTIVITY;
  GOON,1;
  ACTIVITY,,NNQ(12).GT.0,TERM;
  ACTIVITY;
  GOON,1;

  ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NN
  Q(6).EQ.0,TERM;
  ACTIVITY;
  GOON,1;
  ACTIVITY,,D_89.EQ.12,WC89;
  ACTIVITY,,D_89.EQ.18,WS89;
  ACTIVITY,,D_89.EQ.21,WL89;
  ACTIVITY,,D_89.EQ.55,WA89;

WC89 EVENT,12,1;  LOOK TO SEE IF BLDG 89 NEEDED
  (LOOK 89)
  TERM;

WS89 EVENT,18,1;  LOOK TO SEE IF BLDG 89 NEEDED
  (SPT_6 89)
  TERM;

WL89 EVENT,21,1;  LOOK TO SEE IF BLDG 89 NEEDED

213
TERM;

WA89 EVENT,55,1; LOOK TO SEE IF BLDG 89 NEEDED (AHEAD 89)
TERM;

WSGO GOON,1;
ACTIVITY,,X_WASH.EQ.1,PD30;
ACTIVITY,,X_WASH.EQ.2;
GOON,1;
ACTIVITY,TRIAG(1.6,2.6,2.6,1),,PAINT; INCLUDES C-130
PREP FOR PAINT
;

PREP FOR DePAINT
;

PREP GOON,1;
ACTIVITY/1,TRIAG(4.56,5.70,7.41,1),,DEPT;DePaint
;

DEPAINT (50 OR 54)
;

EN36 ENTER,36,1;
ACTIVITY;
DEPT ASSIGN,NEED=6,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,D_DP.EQ.23,DP23;
ACTIVITY,,D_DP.EQ.27,DP27;

DP23 EVENT,23,1; BUILDING DISPATCHING (MINUDP)
TERM;

DP27 EVENT,27,1; BUILDING DISPATCHING (FCDP)
TERM;

EN7 ENTER,7,1;
ACTIVITY;
DPA7 AWAIT(10),BLDG_50,1;
ACTIVITY;

ASSIGN,DPT_HGR=50,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,,DPTA;

EN8 ENTER,8,1;
ACTIVITY;
DPA8 AWAIT(11),BLDG_54,1;
ACTIVITY;

ASSIGN,DPT_HGR=54,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,DPTA;

EN9 ENTER,9,1;
ACTIVITY;
DPA9 AWAIT(12),BLDG_89,1;
ACTIVITY;

ASSIGN,DPT_HGR=89,DP_WT=TNOW-MK_WT,SUM_WT=SUM_WT+DP_WT,1;
ACTIVITY,,DPTA;

DPTA GOON,1;
ACTIVITY,TRIAG(3,4,5,1),TYPE.EQ.141,FRDP;
ACTIVITY,TRIAG(8,10,13,1),TYPE.EQ.130,FRDP;

FRDP GOON,1;
ACTIVITY,,DPT_HGR.EQ.54,DF54;
ACTIVITY,,DPT_HGR.EQ.50,DF50;
ACTIVITY,,DPT_HGR.EQ.89,DF89;

DF50 FREE,BLDG_50,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(10).GT.0,TERM;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1
ACTIVITY,,D_50.EQ.10,DC50;
ACTIVITY,,D_50.EQ.16,DS50;
ACTIVITY,,D_50.EQ.19,DL50;
ACTIVITY,,D_50.EQ.45,DA50;

DC50 EVENT,10,1;
(LOOK 50)
TERM;

DS50 EVENT,16,1;
(SPT 50)
TERM;

DL50 EVENT,19,1;
(INQ 50)
TERM;

DA50 EVENT,45,1;
(AHEAD 50)

LOOK TO SEE IF BLDG 50 NEEDED

215
TERM;

DF54 FREE,BLDG_54,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1
ACTIVITY,,D_54.EQ.11,DC54;
ACTIVITY,,D_54.EQ.17,DS54;
ACTIVITY,,D_54.EQ.20,DL54;
ACTIVITY,,D_54.EQ.50,DA54;

DC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED (LOOK 54)
TERM;

DS54 EVENT,17,1; LOOK TO SEE IF BLDG 54 NEEDED (SPT 54)
TERM;

DL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED (LNQ 54)
TERM;

DA54 EVENT,50,1; LOOK TO SEE IF BLDG 54 NEEDED (AHEAD 54)
TERM;

DF89 FREE,BLDG_89,2;
ACTIVITY,,DPGO;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(12).GT.0,TERM;
ACTIVITY;
GOON,1;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1
ACTIVITY,,D_89.EQ.12,DC89;
ACTIVITY,,D_89.EQ.18,DS89;
ACTIVITY,,D_89.EQ.21,DL89;

216
ACTIVITY,,D_89.EQ.55,DA89;

DC89 EVENT,12,1;  LOOK TO SEE IF BLDG 89 NEEDED (LOOK 89) TERM;

DS89 EVENT,18,1;  LOOK TO SEE IF BLDG 89 NEEDED (SPT 89) TERM;

DL89 EVENT,21,1;  LOOK TO SEE IF BLDG 89 NEEDED (LNQ 89) TERM;

DA89 EVENT,55,1;  LOOK TO SEE IF BLDG 89 NEEDED (AHEAD 89) TERM;

DPGO GOON,1
ACTIVITY,,TYPE.EQ.130,PD30;
ACTIVITY,,TYPE.EQ.141,DPG1;
;
DPG1 GOON,1;
ACTIVITY,,WORK.EQ.4,CWBX;
ACTIVITY,,WORK.EQ.7,PDM;
ACTIVITY,,WORK.EQ.2.OR.WORK.EQ.3,SPLN;

;======================================================================
; W/E/A
;======================================================================
;
EN35 ENTER,35,1;
ACTIVITY;
WEA ASSIGN,NEED=6,ARV_TIME=TNOW,MK_WT=TNOW,1;
ACTIVITY,,D_WEA.EQ.24,DP24;
ACTIVITY,,D_WEA.EQ.28,DP28;

DP24 EVENT,24,1;  BUILDING DISPATCHING (MINUWEA) TERM;

DP28 EVENT,28,1;  BUILDING DISPATCHING (FCWEA) TERM;

EN10 ENTER,10,1;
ACTIVITY;
WE10 AWAIT(10),BLDG_50,1;
ACTIVITY;
ASSIGN, WEA_HGR=50, WEA_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WEA_WT, 1;  
ACTIVITY,,,WEAA;

EN11 ENTER,11,1;  
ACTIVITY;
WE11 AWAIT(11), BLDG_54,1;  
ACTIVITY;

ASSIGN, WEA_HGR=54, WEA_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WEA_WT, 1;  
ACTIVITY,,,WEAA;

EN12 ENTER,12,1;  
ACTIVITY;
WE12 AWAIT(12), BLDG_89,1;  
ACTIVITY;

ASSIGN, WEA_HGR=89, WEA_WT=TNOW-MK_WT, SUM_WT=SUM_WT+WEA_WT, 1;  
ACTIVITY,,,WEAA;

WEAA ASSIGN, PNT_HGR=WEA_HGR, PNT_WT=0,1  
ACTIVITY/8, TRIAG(.8,1,1.3,1),, PNTA; WEAA;

;==================================================================================
; PAINT (50 OR 89)
;==================================================================================

PAINT ASSIGN, NEED=6, ARV_TIME=TNOW, MK_WT=TNOW, 1;  
ACTIVITY,, D_PNT.EQ.25, DP25;  
ACTIVITY,, D_PNT.EQ.29, DP29;

DP25 EVENT, 25, 1;  BUILDING DISPATCHING (MINUPNT)  
TERM;

DP29 EVENT, 29, 1;  BUILDING DISPATCHING (FCPNT)  
TERM;

EN13 ENTER,13,1;  
ACTIVITY;
PE13 AWAIT(10), BLDG_50,1;  
ACTIVITY;

ASSIGN, PNT_HGR=50, PNT_WT=TNOW-MK_WT, SUM_WT=SUM_WT+PNT_WT, 1;  
ACTIVITY,,, PNTA;

EN14 ENTER,14,1;  
ACTIVITY;
PE14 AWAIT(11), BLDG_54,1;  
ACTIVITY;

218
ASSIGN, PNT_HGR=54, PNT_WT=TNOW-MK_WT, SUM_WT=SUM_WT+PNT_WT, 1:
ACTIVITY,, PNTA;

EN15 ENTER, 15, 1;
ACTIVITY;
PE15 AWAIT(12), BLDG_89, 1;
ACTIVITY;

ASSIGN, PNT_HGR=89, PNT_WT=TNOW-MK_WT, SUM_WT=SUM_WT+PNT_WT, 1:
ACTIVITY,, PNTA;

PNTA GOON, 1;
ACTIVITY/9, TRIAG(3.2, 4.5.2, 1), TYPE.EQ.141, PTST; PAINT
ACTIVITY, TRIAG(2.4, 3.9, 1), TYPE.EQ.130 AND WORK.EQ.10, PTST;
ACTIVITY, TRIAG(1.2, 1.5, 1.95, 1), TYPE.EQ.130 AND WORK.EQ.11, PTST;

PTST GOON, 1;
ACTIVITY,, PNT_HGR.EQ.50, PF50;
ACTIVITY,, PNT_HGR.EQ.54, PF54;
ACTIVITY,, PNT_HGR.EQ.89, PF89;

PF50 FREE, BLDG_50, 2;
ACTIVITY,, OUT;
ACTIVITY;
GOON, 1;
ACTIVITY,, NNQ(10) GT. 0, TERM;
ACTIVITY;
GOON, 1;

ACTIVITY,, NNQ(3) EQ. 0 AND NNQ(4) EQ. 0 AND NNQ(5) EQ. 0 AND NNQ(6) EQ. 0, TERM;
ACTIVITY;
GOON, 1;
ACTIVITY,, D_50.EQ.10, PC50;
ACTIVITY,, D_50.EQ.16, PS50;
ACTIVITY,, D_50.EQ.19, PL50;
ACTIVITY,, D_50.EQ.45, PA50;

PC50 EVENT, 10, 1; LOOK TO SEE IF BLDG 50 NEEDED
(LOOK 50)
TERM;

PS50 EVENT, 16, 1; LOOK TO SEE IF BLDG 50 NEEDED
(SPT 50)
TERM;
PL50 EVENT,19,1; LOOK TO SEE IF BLDG 50 NEEDED
(LNQ 50) TERM;

PA50 EVENT,45,1; LOOK TO SEE IF BLDG 50 NEEDED
(AHEAD 50) TERM;

PF54 FREE,BLDG_54,2;
ACTIVITY,,OUT;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(11).GT.0,TERM;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1;
ACTIVITY,,D_54.EQ.11,PC54;
ACTIVITY,,D_54.EQ.17,PS54;
ACTIVITY,,D_54.EQ.20,PL54;
ACTIVITY,,D_54.EQ.50,PA54;

PC54 EVENT,11,1; LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54) TERM;

PS54 EVENT,17,1; LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54) TERM;

PL54 EVENT,20,1; LOOK TO SEE IF BLDG 54 NEEDED
(LNQ 54) TERM;

PA54 EVENT,50,1; LOOK TO SEE IF BLDG 54 NEEDED
(AHEAD 54) TERM;

PF89 FREE,BLDG_89,2;
ACTIVITY,,OUT;
ACTIVITY;
GOON,1;
ACTIVITY,,NNQ(12).GT.0,TERM;

ACTIVITY,,NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.NNQ(6).EQ.0,TERM;
ACTIVITY;
GOON,1;
ACTIVITY,,D_89.EQ.12,PC89;

220
ACTIVITY,,D_89.EQ.18,PS89;  
ACTIVITY,,D_89.EQ.21,PL89;  
ACTIVITY,,D_89.EQ.55,PA89;  

PC89  EVENT,12,1;  
      (LOOK 89) TERM;  
      LOOK TO SEE IF BLDG 89 NEEDED  

PS89  EVENT,18,1;  
      (SPT 89) TERM;  
      LOOK TO SEE IF BLDG 89 NEEDED  

PL89  EVENT,21,1;  
      (LNQ 89) TERM;  
      LOOK TO SEE IF BLDG 89 NEEDED  

PA89  EVENT,55,1;  
      (AHEAD 89) TERM;  
      LOOK TO SEE IF BLDG 89 NEEDED  

OUT   GOON,1;  
      ACTIVITY,,TYPE.EQ.130,CLC1;  
      ACTIVITY,TRIAG(.32,.4,.52,1),,FTEST;
Modifications for Preemption

;==============================================
; DePAINT (50 OR 54)
;==============================================
;
ENTER, 36,1;
ACTIVITY;
DEPT GOON,1;
ACTIVITY,,TYPE.EQ.130,DEP3;
ACTIVITY,,TYPE.EQ.141,DP41;

DEP3 ASSIGN,NEED=1,ARV_TIME=TNOW,MK WT=TNOW,1;
ACTIVITY,,NNRSC(5).EQ.1.AND.NNQ(10).EQ.0,DP41;
ACTIVITY,,DEPE;

DP41 ASSIGN,NEED=2,ARV_TIME=TNOW,MK WT=TNOW,1;
ACTIVITY,,NNRSC(3).EQ.1.AND.NNQ(11).EQ.0,DP41;
ACTIVITY,,DEPE;

DEPE EVENT,7,1; CALL FILEM(4,ATRIB)
TERM;

DPPT ASSIGN,PREMPT=1,1;
ACTIVITY,,DPA8;

ENTER,7,1;
ACTIVITY;

DPA7 AWAIT(10),BLDG_50,1;
ACTIVITY;

ASSIGN,DPT_HGR=50,DP WT=TNOW-MK WT,SUM WT=SUM WT+DP WT,1;
ACTIVITY,,DPTA;

ENTER,8,1;
ACTIVITY;

DPA8 AWAIT(11),BLDG_54,1;
ACTIVITY;

ASSIGN,DPT_HGR=54,DP WT=TNOW-MK WT,SUM WT=SUM WT+DP WT,FLAG_54=1,1;
ACTIVITY,,DPTA;

DPTA GOON,1;
ACTIVITY,,DPT_HGR.EQ.50,DP50;
ACTIVITY,,DPT_HGR.EQ.54,DP54;

DP54 GOON,1;
ACTIVITY,TRIAG(3,4,5,1),TYPE.EQ.141;
ACTIVITY;
GOON,1;
ACTIVITY,TRIAG(.54, .8, 1.04, 1), PREMPT.EQ.1, FRDP;
ACTIVITY,, , , FRDP;

DP50 GOON,1;
ACTIVITY, TRIAG(8, 10, 13, 1), TYPE.EQ.130, FRDP;

FRDP GOON,1;
ACTIVITY,, , DPT_HGR.EQ.54, DF54;
ACTIVITY,, , DPT_HGR.EQ.50, DF50;

DF54 FREE, BLDG_54, 1;
ACTIVITY;
ASSIGN, FLAG_54=0,2;
ACTIVITY,, , , DP50;
ACTIVITY;
GOON,1;
ACTIVITY,, , NNQ(11).GT.0, TERM;
ACTIVITY;
GOON,1;
ACTIVITY,, , NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0, TERM;
ACTIVITY;

DFREE GOON,1
ACTIVITY,, , D_54.EQ.11, DC54;
ACTIVITY,, , D_54.EQ.14, DS54;
ACTIVITY,, , D_54.EQ.20, DL54;
ACTIVITY,, , D_54.EQ.47, DA54;

DC54 EVENT, 11, 1; LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54)
TERM;

DS54 EVENT, 14, 1; LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54)
TERM;

DL54 EVENT, 20, 1; LOOK TO SEE IF BLDG 54 NEEDED
(INQ 54)
TERM;

DA54 EVENT, 47, 1; LOOK TO SEE IF BLDG 54 NEEDED
(AHEAD 54)
TERM;

DF50 FREE, BLDG_50, 2;
ACTIVITY,, , , DP50;
ACTIVITY;

223
GOON, 1;
ACTIVITY, , D_50.EQ.10, DC50;
ACTIVITY, , D_50.EQ.13, DS50;
ACTIVITY, , D_50.EQ.19, DC50;
ACTIVITY, , D_50.EQ.42, DC50;

DC50 EVENT, 10, 1;
(LOOK 50) TERM;

DS50 EVENT, 13, 1;
(SPT 50) TERM;

DL50 EVENT, 19, 1;
(LNQ 50) TERM;

DA50 EVENT, 42, 1;
(AHEAD 50) TERM;

DPGO GOON, 1
ACTIVITY, , TYPE.EQ.130, PD30;
ACTIVITY, , TYPE.EQ.141, DPG1;

DPG1 GOON, 1;
ACTIVITY, , WORK.EQ.4, CWBX;
ACTIVITY, , WORK.EQ.7, PDM;
ACTIVITY, , WORK.EQ.2.OR.WORK.EQ.3, SPLN;

; ;=====================================================================
; W/E/A
;=====================================================================

ENTER, 35, 1;
ACTIVITY;

WEA GOON, 1;
ACTIVITY, , TYPE.EQ.130, WE30;
ACTIVITY, , TYPE.EQ.141, WE41;

WE30 ASSIGN, NEED=1, ARV_TIME=TNOW, MK_WT=TNOW, 1;
ACTIVITY, , NNRSEQ(5).EQ.1 AND NNRSEQ(10).EQ.0, WE10; IF 50 BUSY
ACTIVITY, , WEEV;
FILE ENTITY (5)

WE41 ASSIGN, NEED=2, ARV_TIME=TNOW, MK_WT=TNOW, 1;
ACTIVITY,,NNRSC(3).EQ.1.AND.NNQ(11).EQ.0,WE11; IF 54 BUSY
ACTIVITY,,NRUSE(4).EQ.1.OR.FLAG_54.EQ.2,WEEV
ACTIVITY;
PREEMPT(7),BLDG_54,DPPT,,1;
ACTIVITY/29;

ASSIGN,WEA_HGR=54,WEA WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,FLAG_54=2,1;
ACTIVITY,,,WEAA;

WEEV EVENT,8,1;
TERM;

ENTER,10,1;
ACTIVITY;

WE10 AWAIT(10),BLDG_50,1;
ACTIVITY;

ASSIGN,WEA_HGR=50,WEA WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,1;
ACTIVITY,,,WEAA;

ENTER,11,1;
ACTIVITY;

WE11 AWAIT(11),BLDG_54,,1;
ACTIVITY;

ASSIGN,WEA_HGR=54,WEA WT=TNOW-MK_WT,SUM_WT=SUM_WT+WEA_WT,1;
ACTIVITY,,,WEAA;

WEAA GOON,1;
ACTIVITY/8,TRIAG(.8,1,1.3,1);WEA
GOON,1;
ACTIVITY,,,WEA_HGR.EQ.54,WEF54;
ACTIVITY,,,WEA_HGR.EQ.50;
ASSIGN,PNT_HGR=50,PNT_WT=0,1;
ACTIVITY,,,PNTA;

WEF54 FREE,BLDG_54,1;
ACTIVITY;
ASSIGN,FLAG_54=0,2;
ACTIVITY,,,WEFE;
ACTIVITY,,,WEFF;

WEFE ASSIGN,NEED=3,MK_WT=TNOW,1; NEED FOR PAINT
ACTIVITY,,,PE15;

WEFF GOON,1;
ACTIVITY,,,NNQ(11).GT.0,TERM;
ACTIVITY;

225
GOON, 1;

ACTIVITY , NNQ(3) . EQ . 0 . AND . NNQ(4) . EQ . 0 . AND . NNQ(5) . EQ . 0 , TERM;
ACTIVITY;
AFREE GOON, 1;
ACTIVITY , D_54 . EQ . 11 , EC54;
ACTIVITY , D_54 . EQ . 14 , ES54;
ACTIVITY , D_54 . EQ . 20 , EL54;
ACTIVITY , D_54 . EQ . 47 , EA54;

EC54 EVENT , 11 , 1;
(LOOK 54)
TERM;

ES54 EVENT , 14 , 1;
(SPT 54)
TERM;

EL54 EVENT , 20 , 1;
(LNQ 54)
TERM;

EA54 EVENT , 47 , 1;
(AHEAD 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED
(LOOK 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED
(SPT 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED
(LNQ 54)
TERM;

LOOK TO SEE IF BLDG 54 NEEDED
(AHEAD 54)
TERM;
Appendix F. FORTRAN Source Code

Due to some complex coding required for this research, FORTRAN inserts were required to model areas for which SLAM II coding was not possible. This Appendix provides this FORTRAN Source code
PROGRAM MAIN
DIMENSION NSET(900000)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
COMMON QSET(5000)
EQUIVALENCE(NSET(1),QSET(1))
NNSET=500000
NCRDR=5
NPRNT=6
NTAPE=7
OPEN(UNIT=1, FILE='WTE.EXP', STATUS='NEW')
OPEN(UNIT=2,FILE='TIS.EXP',STATUS='NEW')
OPEN(UNIT=3,FILE='UTL.EXP',STATUS='NEW')
OPEN(UNIT=4,FILE='MAX.EXP',STATUS='NEW')
OPEN(UNIT=8,FILE='CNT.EXP',STATUS='NEW')
OPEN(UNIT=9,FILE='TWT.EXP',STATUS='NEW')
CALL SLAM
WRITE(1,*)
WRITE(2,*)
WRITE(3,*)
WRITE(4,*)
WRITE(8,*)
WRITE(9,*)
CLOSE(1)
CLOSE(2)
CLOSE(3)
CLOSE(4)
CLOSE(8)
CLOSE(9)
STOP 
END

C
C***********************************************
C THE FOLLOWING INTLC SUBROUTINE
C***********************************************
C SUBROUTINE INTLC
SUBROUTINE INTLC
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
XX(1)=0
XX(2)=0
XX(3)=0
RETURN
END

C
C THE FOLLOWING IS SUBROUTINE EVENT
C SUBROUTINE EVENT (I)
SUBROUTINE EVENT (I)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE (ATRIB(3), WORK)
EQUIVALENCE (ATRIB(2), WARM), (ATRIB(15), NEED), (ATRIB(16), ARV_TIME)
GO TO (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20
2, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40
3, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57), I
1  CALL ENTER(1, ATRIB)
   RETURN
2  REWIND(1)
   RETURN
3  CALL ENTER(2, ATRIB)
   RETURN
4  CALL ENTER(3, ATRIB)
   RETURN
5  CALL CLEAR
   RETURN
6  CALL FILEM(3, ATRIB)
   RETURN
7  CALL FILEM(4, ATRIB)
   RETURN
8  CALL FILEM(5, ATRIB)
   RETURN
9  CALL FILEM(6, ATRIB)
   RETURN
10 CALL LOOK50
    RETURN
11 CALL LOOK54
    RETURN
12 CALL LOOK89
    RETURN
13 CALL SPT50
    RETURN
14 CALL SPT54
    RETURN
15 CALL SPT89
    RETURN
16 CALL SPT50_6
    RETURN
17 CALL SPT54_6
    RETURN
18 CALL SPT89_6
    RETURN
19 CALL LNQ(50)
    RETURN
20 CALL LNQ(54)
    RETURN
21 CALL LNQ(89)
    RETURN
22 CALL MINUWASH
    RETURN
23 CALL MINUDP
RETURN
24 CALL MINUWEA
RETURN
25 CALL MINUPAINT
RETURN
26 CALL FCWASH
RETURN
27 CALL FCDP
RETURN
28 CALL FCWEA
RETURN
29 CALL FCPAINT
RETURN
30 CALL ENTER(30, ATRIB)
RETURN
31 CALL ENTER(30, ATRIB)
RETURN
32 CALL ENTER(32, ATRIB)
RETURN
33 CALL ENTER(33, ATRIB)
RETURN
34 CALL ENTER(34, ATRIB)
RETURN
35 CALL ENTER(35, ATRIB)
RETURN
36 CALL ENTER(36, ATRIB)
RETURN
37 CALL ENTER(37, ATRIB)
RETURN
38 CALL ENTER(38, ATRIB)
RETURN
39 CALL ENTER(39, ATRIB)
RETURN
40 CALL ENTER(40, ATRIB)
RETURN
41 CALL AHEAD(50, 1)
RETURN
42 CALL AHEAD(50, 2)
RETURN
43 CALL AHEAD(50, 3)
RETURN
44 CALL AHEAD(50, 5)
RETURN
45 CALL AHEAD(50, 6)
RETURN
46 CALL AHEAD(54, 1)
RETURN
47 CALL AHEAD(54, 2)
RETURN
48 CALL AHEAD(54, 3)

230
RETURN
49    CALL AHEAD(54,5)
RETURN
50    CALL AHEAD(54,6)
RETURN
51    CALL AHEAD(89,1)
RETURN
52    CALL AHEAD(89,2)
RETURN
53    CALL AHEAD(89,3)
RETURN
54    CALL AHEAD(89,5)
RETURN
55    CALL AHEAD(89,6)
RETURN
56    CALL WEA_5_FC
RETURN
57    CALL WEA_5_MINU
RETURN
END

C
C*************************************************************************
C THE FOLLOWING IS THE LOOK50 SUBROUTINE
C---
C   This subroutine is used after Bldg 50 has been freed under FCFS
C   dispatching rules. The subroutine searched each file to find an
C   aircraft needing its usage, which has been waiting the longest.
C---
C*************************************************************************
C
SUBROUTINE LOOK50
DIMENSION A(100), B(100)
INTEGER NEXT, POINT
COMMON/SCOM1/ATRIB(100),DD(100),DDL(100),DTNOW,II,MFA,MSTOP,NCLNR
1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)
EQUIVALENCE(ATRIB(3),WORK)
EQUIVALENCE(ATRIB(2),WARM)
EQUIVALENCE(A(15),NEED)
EQUIVALENCE(A(16),ARIVE)

C
RANK50 = 0
LGWT50 = 9999
FILE50 = 0
POINT = 0

C---
C CHECK FILE 3 (Wash)
C---

231
NEXT3-MMFE(3)

1 IF (NEXT3.EQ.0) GOTO 6
   CALL COPY(-NEXT3,3,A)
   IF (A(16).GT.LGWT50) GOTO 5
   LGWT50=A(16)
   FILE50-3
   POINT-NEXT3

5 IF (NSUCR(NEXT3).EQ.0) GOTO 6
   NEXT3-NSUCR(NEXT3)
   GOTO 1

C
C CHECK FILE 4 (DePaint)
C

6 NEXT4-MMFE(4)

7 IF (NEXT4.EQ.0) GOTO 11
   CALL COPY(-NEXT4,4,A)
   IF (A(16).GT.LGWT50) GOTO 10
   LGWT50=A(16)
   FILE50-4
   POINT-NEXT4

10 IF (NSUCR(NEXT4).EQ.0) GOTO 11
    NEXT4-NSUCR(NEXT4)
    GOTO 7

C
C CHECK FILE 5 (W/E/A)
C

11 NEXT5-MMFE(5)

12 IF (NEXT5.EQ.0) GOTO 16
   CALL COPY(-NEXT5,5,A)
   IF (A(16).GT.LGWT50) GOTO 15
   LGWT50=A(16)
   FILE50-5
   POINT-NEXT5

15 IF (NSUCR(NEXT5).EQ.0) GOTO 16
    NEXT5-NSUCR(NEXT5)
    GOTO 12

C
C CHECK FILE 6 (Paint)
C

16 NEXT6-MMFE(6)

17 IF (NEXT6.EQ.0) GOTO 21

232
CALL COPY(-NEXT6, 6, A)
IF (A(16).GT.LGWT5O) GOTO 20
LGWT50 = A(16)
FILE50 = 6
POINT = NEXT6
20 IF (NSUCR(NEXT6).EQ.0) GOTO 21
NEXT6 = NSUCR(NEXT6)
GOTO 17
21 IF (POINT.EQ.0) GOTO 99
IF (FILE50.LT.6) GOTO 25
CALL RMOVE(-POINT, 6, ATRIB)
CALL ENTER(13, ATRIB)
GOTO 99
25 IF (FILE50.LT.5) GOTO 26
CALL RMOVE(-POINT, 5, ATRIB)
CALL ENTER(10, ATRIB)
GOTO 99
26 IF (FILE50.LT.4) GOTO 27
CALL RMOVE(-POINT, 4, ATRIB)
CALL ENTER(7, ATRIB)
GOTO 99
27 CALL RMOVE(-POINT, 3, ATRIB)
CALL ENTER(4, ATRIB)
99 RETURN
END
C
C********************************************************************
C THE FOLLOWING IS THE LOOK54 SUBROUTINE
C----------
C This subroutine is used after Bldg 54 has been freed under FCFS
C dispatching rules. The subroutine searched each file to find an
C aircraft needing its usage, which has been waiting the longest.
C
C********************************************************************
C SUBROUTINE LOOK54
DIMENSION A(100), B(100)
INTEGER NEXT, POINT
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE(ATRIB(3), WORK)
EQUIVALENCE(ATRIB(2), WARM)
EQUIVALENCE(A(15), NEED)
EQUIVALENCE(A(16), ARIVE)
C
RANK54 = 0
LGWT54 = 5000
FILE54 = 0

233
POINT - 0

C

C CHECK FILE 3 (Wash)

C

NEXT3-MMFE(3)

1 IF (NEXT3.EQ.0)GOTO 6
CALL COPY(-NEXT3,3,A)
IF (A(16).GT.LGWT54)GOTO 5
LGWT54=A(16)
FILE54=3
POINT=NEXT3

5 IF (NSUCR(NEXT3).EQ.0)GOTO 6
NEXT3=NSUCR(NEXT3)
GOTO 1

C

C CHECK FILE 4 (DePaint)

C

NEXT4-MMFE(4)

7 IF (NEXT4.EQ.0)GOTO 11
CALL COPY(-NEXT4,4,A)
IF (A(16).GT.LGWT54)GOTO 10
LGWT54=A(16)
FILE54=4
POINT=NEXT4

10 IF (NSUCR(NEXT4).EQ.0)GOTO 11
NEXT4=NSUCR(NEXT4)
GOTO 7

C

C CHECK FILE 5 (W/E/A)

C

NEXT5-MMFE(5)

12 IF (NEXT5.EQ.0)GOTO 16
CALL COPY(-NEXT5,5,A)
IF (A(16).GT.LGWT54)GOTO 15
LGWT54=A(16)
FILE54=5
POINT=NEXT5

15 IF (NSUCR(NEXT5).EQ.0)GOTO 16
NEXT5=NSUCR(NEXT5)
GOTO 12

C
C CHECK FILE 6 (Paint)

16 NEXT6-MMFE(6)
17 IF (NEXT6.EQ.0)GOTO 21
   CALL COPY(-NEXT6,6,A)
   IF (A(16).GT.LGWT54)GOTO 20
   LGWT54=A(16)
   FILE54=6
   POINT=NEXT6
20 IF (NSUCR(NEXT6).EQ.0)GOTO 21
   NEXT6=NSUCR(NEXT6)
   GOTO 17
21 IF (POINT.EQ.0)GOTO 99
   IF (FILE54.LT.6)GOTO 25
   CALL RMOVE(-POINT,6,ATRIB)
   CALL ENTER(14,ATRIB)
   GOTO 99
25 IF (FILE54.LT.5)GOTO 26
   CALL RMOVE(-POINT,5,ATRIB)
   CALL ENTER(11,ATRIB)
   GOTO 99
26 IF (FILE54.LT.4)GOTO 27
   CALL RMOVE(-POINT,4,ATRIB)
   CALL ENTER(8,ATRIB)
   GOTO 99
27 CALL RMOVE(-POINT,3,ATRIB)
   CALL ENTER(5,ATRIB)
99 RETURN
END

C*****************************************
C C THE FOLLOWING IS THE LOOK89 SUBROUTINE
C C*****************************************
C
C This subroutine is used after Bldg 89 has been freed under FCFS dispatching rules. The subroutine searched each file to find an aircraft needing its usage, which has been waiting the longest.

C*******************************************************************************
C SUBROUTINE LOOK89
DIMENSION A(100), B(100)
INTEGER NEXT, POINT
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE (ATRIB(3), WORK)
EQUIVALENCE (ATRIB(2), WARM)
EQUIVALENCE (A(15), NEED)
EQUIVALENCE (A(16), ARRIVE)

C
LGWT89 = 9999
FILE89 = 0
POINT = 0

C CHECK FILE 3 (Wash)

C NEXT3-MMFE(3)
1 IF (NEXT3.EQ.0) GOTO 6
CALL COPY (-NEXT3, 3, A)
IF (A(16).GT.LGWT89) GOTO 6
LGWT89 = A(16)
FILE89 = 3
POINT = NEXT3

5 IF (NSUCR(NEXT3).EQ.0) GOTO 6
NEXT3 = NSUCR(NEXT3)
GOTO 1

C CHECK FILE 4 (DePaint)

C NEXT4-MMFE(4)
6 IF (NEXT4.EQ.0) GOTO 11
CALL COPY (-NEXT4, 4, A)
IF ((A(15).NE.3).AND.(A(15).NE.5)) GOTO 10
IF (A(16).GT.LGWT89) GOTO 11
LGWT89 = A(16)
FILE89 = 4
POINT = NEXT4

10 IF (NSUCR(NEXT4).EQ.0) GOTO 11
NEXT4 = NSUCR(NEXT4)
GOTO 7

C CHECK FILE 5 (W/E/A)

C NEXT5-MMFE(5)
11 IF (NEXT5.EQ.0) GOTO 16
CALL COPY (-NEXT5, 5, A)
IF (A(16).GT.LGWT89) GOTO 16
LGWT89 = A(16)

236
FILE89=5
POINT-NEXT5
15 IF (NSUCR(NEXT5).EQ.0)GOTO 16
NEXT5-NSUCR(NEXT5)
GOTO 12
C
C
C CHECK FILE 6 (Paint)
C
C
C
C 16 NEXT6-MMFE(6)
17 IF (NEXT6.EQ.0)GOTO 21
CALL COPY(-NEXT6,6,A)
IF (A(16).GT.LGWT89)GOTO 21
LGWT89-A(16)
FILE89-6
POINT-NEXT6
20 IF (NSUCR(NEXT6).EQ.0)GOTO 21
NEXT6-NSUCR(NEXT6)
GOTO 17
21 IF (POINT.EQ.0)GOTO 99
IF (FILE89.LT.6)GOTO 25
CALL RMOVE(-POINT,6,ATRIB)
CALL ENTER(15,ATRIB)
GOTO 99
25 IF (FILE89.LT.5)GOTO 26
CALL RMOVE(-POINT,5,ATRIB)
CALL ENTER(12,ATRIB)
GOTO 99
26 IF (FILE89.LT.4)GOTO 27
CALL RMOVE(-POINT,4,ATRIB)
CALL ENTER(9,ATRIB)
GOTO 99
27 CALL RMOVE(-POINT,3,ATRIB)
CALL ENTER(6,ATRIB)
99 RETURN
END
C
C******************************************************************************
C
C THIS IS SUBROUTINE SPT50
C
C
C This subroutine is used after Bldg 50 has been freed under SPT dispatching rules. The subroutine searches each file from smallest to largest expected processing times
C
C The order searched for Bldg 50 is as follows:
1) C-130 Wash
2) W/E/A C-141
3) Wash & SS C-130
4) Paint SS C-130
5) W/E/A & Paint Sndrd C-130
6) Depaint C-130

Assumption: Bldg 50 will not Depaint a C-141 ac

SUBROUTINE SPT50
DIMENSION A(100), B(100)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR,
1, NCRDNR, NPNRT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE(ATRIB(3), WORK)
EQUIVALENCE(ATRIB(2), WARM)
EQUIVALENCE(A15), NEED)
EQUIVALENCE(A16), ARIVE)

(1) CHECK IF C-130 AWAITING INCOMING WASH

NEXT-MMFE(3)
1 IF (NEXT.EQ.0) GOTO 6
CALL COPY(-NEXT, 3, A)
IF (A15).EQ.2 OR A15).EQ.3 OR A15).EQ.7 GOTO 5
IF (A14).GT.1 GOTO 5
CALL RMOVE(-NEXT, 3, ATRIB)
CALL ENTER(4, ATRIB)
GOTO 99
5 IF (NSUCR(NEXT).EQ.0) GOTO 6
NEXT-NSUCR(NEXT)
GOTO 1

(2) CHECK FOR W/E/A C-141 AIRCRAFT

NEXT-MMFE(5)
6 IF (NEXT.EQ.0) GOTO 11
CALL COPY(-NEXT, 5, A)
IF (A15).EQ.2 OR A15).EQ.3 OR A15).EQ.7 GOTO 10
IF (A5).NE.141 GOTO 10
CALL RMOVE(-NEXT, 5, ATRIB)
CALL ENTER(10, ATRIB)
GOTO 99
10 IF (NSUCR(NEXT).EQ.0) GOTO 11
NEXT-NSUCR(NEXT)
GOTO 7
(3) CHECK IF C-130 AWAITING OUTGOING WASH & SCUFF SAND

11 NEXT-MMFE(3)
12 IF (NEXT.EQ.0) GOTO 16
    CALL COPY(-NEXT, 3, A)
    IF (A(14).LT.1) GOTO 15
    CALL RMOVE(-NEXT, 3, ATRIB)
    CALL ENTER(4, ATRIB)
    GOTO 99
15 IF (NSUCR(NEXT).EQ.0) GOTO 16
    NEXT-NSUCR(NEXT)
    GOTO 12

(4) CHECK FOR A PAINT TYPE = 11

16 NEXT-MMFE(6)
17 IF (NEXT.EQ.0) GOTO 21
    CALL COPY(-NEXT, 6, A)
    IF (A(3).NE.11) GOTO 20
    CALL RMOVE(-NEXT, 6, ATRIB)
    CALL ENTER(13, ATRIB)
    GOTO 99
20 IF (NSUCR(NEXT).EQ.0) GOTO 21
    NEXT-NSUCR(NEXT)
    GOTO 17

(3) CHECK FOR W/E/A & PAINT TYPE = 10

21 NEXT-MMFE(5)
22 IF (NEXT.EQ.0) GOTO 26
    CALL COPY(-NEXT, 5, A)
    IF (A(3).NE.10) GOTO 25
    CALL RMOVE(-NEXT, 5, ATRIB)
    CALL ENTER(10, ATRIB)
    GOTO 99
25 IF (NSUCR(NEXT).EQ.0) GOTO 26
    NEXT-NSUCR(NEXT)
    GOTO 22

(6) CHECK FOR A DePAINT C-130

239
C
26      NEXT-MMFE(4)
27      IF (NEXT.EQ.0)GOTO 99
      CALL COPY(-NEXT,4,A)
      IF (A(5).NE.130)GOTO 30
      CALL RMOVE(-NEXT,4,ATRIB)
      CALL ENTER(7,ATRIB)
      GOTO 99
30      IF (NSUCR(NEXT).EQ.0)GOTO 99
      NEXT-NSUCR(NEXT)
      GOTO 27
99      RETURN
      END
      
C
C*----------------------------------------------------------------------
C
C   THIS IS SUBROUTINE SPT54
C
C-----------------------------------------------------------------------
C   This subroutine is used after Bldg 54 has been freed under SPT
C   dispatching rules. The subroutine searches each file from
C   smallest to largest expected processing times
C
C   The order searched for Bldg 54 is as follows:
C
C   1) C-130 Incoming Wash  2) W/E/A aircraft  3) Outgoing Wash & SS C-130
C   4) Paint Scuff Sanded C-130  5) DePaint C-130
C   6) DePaint C-141
C
C*----------------------------------------------------------------------
C   SUBROUTINE SPT54
DIMENSION A(100), B(100)
COMMON/SCOMI/ATRIB(100),DD(100),DDL(100),DTNOW,II,MFA,MSTOP,NCLNR
1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)
EQUIVALENCE(ATRIB(3),WORK)
EQUIVALENCE(ATRIB(2),WARM)
EQUIVALENCE(A(15),NEED)
EQUIVALENCE(A(16),ARIVE)

C
C-----------------------------------------------------------------------
C   (1) CHECK IF C-130 AWAITING INCOMING WASH
C-----------------------------------------------------------------------
C
C      NEXT-MMFE(3)
1      IF (NEXT.EQ.0)GOTO 6
      CALL COPY(-NEXT,3,A)
IF (A(14).GE.1)GOTO 5
CALL RMOVE(-NEXT,3,ATRIB)
CALL ENTER(5,ATRIB)
GOTO 99

5 IF (NSUCR(NEXT).EQ.0)GOTO 6
NEXT-NSUCR(NEXT)
GOTO 1

C

C (2) CHECK FOR W/E/A AIRCRAFT
C

6 NEXT-MMFE(5)
7 IF (NEXT.EQ.0)GOTO 11
CALL COPY(-NEXT,5,A)
    CALL RMOVE(-NEXT,5,ATRIB)
    CALL ENTER(11,ATRIB)
    GOTO 99
10 IF (NSUCR(NEXT).EQ.0)GOTO 11
NEXT-NSUCR(NEXT)
GOTO 7

C

C (3) CHECK IF C-130 AWAITING OUTGOING WASH & SCUFF SAND
C

11 NEXT-MMFE(3)
12 IF (NEXT.EQ.0)GOTO 16
CALL COPY(-NEXT,3,A)
    IF (A(14).LT.1)GOTO 15
    CALL RMOVE(-NEXT,3,ATRIB)
    CALL ENTER(5,ATRIB)
    GOTO 99
15 IF (NSUCR(NEXT).EQ.0)GOTO 16
NEXT-NSUCR(NEXT)
GOTO 12

C

C (4) CHECK FOR A PAINT TYPE - 11
C

16 NEXT-MMFE(6)
17 IF (NEXT.EQ.0)GOTO 21
CALL COPY(-NEXT,6,A)
    IF (A(3).NE.11)GOTO 20
    CALL RMOVE(-NEXT,6,ATRIB)
    CALL ENTER(14,ATRIB)
    GOTO 241
GOTO 99
20 IF (NSUCR(NEXT).EQ.0)GOTO 21
NEXT-NSUCR(NEXT)
GOTO 17

C

(5) CHECK FOR A DePAINT C-130 (CHEMICAL)

21 NEXT-MMFE(4)
22 IF (NEXT.EQ.0)GOTO 26
CALL COPY(-NEXT,4,A)
IF (A(5).NE.130)GOTO 25
CALL RMOVE(-NEXT,4,ATRIB)
CALL ENTER(8,ATRIB)
GOTO 99
25 IF (NSUCR(NEXT).EQ.0)GOTO 26
NEXT-NSUCR(NEXT)
GOTO 22

C

(6) CHECK FOR A DePAINT C-141

26 NEXT-MMFE(4)
27 IF (NEXT.EQ.0)GOTO 99
CALL COPY(-NEXT,4,A)
IF (A(5).NE.141)GOTO 30
CALL RMOVE(-NEXT,4,ATRIB)
CALL ENTER(8,ATRIB)
GOTO 99
30 IF (NSUCR(NEXT).EQ.0)GOTO 99
NEXT-NSUCR(NEXT)
GOTO 27
99 RETURN

END

C

C************SUBROUTINE SPT89
C
C This subroutine is used after Bldg 89 has been freed under SPT dispatching rules. The subroutine searches each file from smallest to largest expected processing times
C
C The order searched for Bldg 54 is as follows:

242
C 1) C-130 Incoming Wash  2) W/E/A aircraft  3) Outgoing Wash & SS
C-130
C 4) Paint Scuff Sanded C-130  5) DePaint C-130
C 6) DePaint C-141
C
C***********************************************************************
C
SUBROUTINE SPT89
DIMENSION A(100), B(100)
INTEGER NEXT
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NFRNT, NNRUN, NTAPE, S(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE (ATRIB (3), WORK)
EQUIVALENCE (ATRIB (2), WARM)
EQUIVALENCE (A (15), NEED)
EQUIVALENCE (A (16), ARIVE)
C
C-------------------------------------------------------------------
C CHECK FOR A PAINT TYPE - 11 (SS C-130)
C
C
NEXT-MMFE(6)
17 IF (NEXT.EQ.0)GOTO 99
CALL COPY(-NEXT,6,A)
CALL REMOVE(-NEXT,6,ATRIB)
CALL ENTER(15,ATRIB)
GOTO 99
20 IF (NSUCR(NEXT).EQ.0)GOTO 99
NEXT=NSUCR(NEXT)
GOTO 17
99 RETURN
END
C
C***********************************************************************
C
C THIS IS SUBROUTINE SPT50_6
C
C---------------------
C This subroutine is used after Bldg 50 has been freed under SPT
C dispatching rules IN CONFIGURATION OPTION #6. The subroutine
C searches each file from smallest to largest expected processing times
C
C The order searched for Bldg 50 is as follows:
C
C 1) C-130 INCOMING Wash  2) Outgoing Wash & SS C-130
C 3) Paint C-130 SS AC   4) DePaint C-141 AC
C 7) DePaint C-130 ac (media blast)
C
243
SUBROUTINE SPT50_6
DIMENSION A(100), B(100)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE (ATRIB(3), WORK)
EQUIVALENCE (ATRIB(2), WARM)
EQUIVALENCE (A(15), NEED)
EQUIVALENCE (A(16), ARIVE)

C
C************************************************************
C
C (1) CHECK IF C-130 WAITING INCOMING WASH
C
C NEXT-MMFE(3)
1 IF (NEXT.EQ.0) GOTO 6
CALL COPY(-NEXT, 3, A)
IF (A(14).GE.1) GOTO 5
CALL RMOVE(-NEXT, 3, ATRIB)
CALL ENTER(4, ATRIB)
GOTO 99
5 IF (NSUCR(NEXT).EQ.0) GOTO 6
NEXT=NSUCR(NEXT)
GOTO 1

C
C*************************************************************
C
C (2) CHECK IF C-130 WAITING OUTGOING WASH & SCUFF SAND
C
C NEXT-MMFE(3)
6 IF (NEXT.EQ.0) GOTO 11
CALL COPY(-NEXT, 3, A)
IF (A(14).LT.1) GOTO 10
CALL RMOVE(-NEXT, 3, ATRIB)
CALL ENTER(4, ATRIB)
GOTO 99
10 IF (NSUCR(NEXT).EQ.0) GOTO 11
NEXT=NSUCR(NEXT)
GOTO 7

C
C*************************************************************
C
C (3) CHECK FOR A PAINT TYPE = 11
C
C NEXT-MMFE(6)
12 IF (NEXT.EQ.0) GOTO 16
    CALL COPY(-NEXT,6,A)
    IF ((A(15).EQ.2) .OR. (A(15).EQ.3) .OR. (A(15).EQ.7)) GOTO 15
    IF (A(3).NE.11) GOTO 15
    CALL RMOVE(-NEXT,6,ATRIB)
    CALL ENTER(13,ATRIB)
    GOTO 99
15 IF (NSUCR(NEXT).EQ.0) GOTO 16
    NEXT-NSUCR(NEXT)
    GOTO 12

C

---------------------------------------
C (4) CHECK FOR A DePAINT C-141
C
C
16 NEXT-MMFE(4)
17 IF (NEXT.EQ.0) GOTO 21
    CALL COPY(-NEXT,4,A)
    IF ((A(15).EQ.2) .OR. (A(15).EQ.3) .OR. (A(15).EQ.7)) GOTO 20
    IF (A(5).NE.141) GOTO 20
    CALL RMOVE(-NEXT,4,ATRIB)
    CALL ENTER(7,ATRIB)
    GOTO 99
20 IF (NSUCR(NEXT).EQ.0) GOTO 21
    NEXT-NSUCR(NEXT)
    GOTO 17

C

---------------------------------------
C (5) CHECK FOR W/E/A & Paint C-130 AIRCRAFT
C
C
21 NEXT-MMFE(5)
22 IF (NEXT.EQ.0) GOTO 26
    CALL COPY(-NEXT,5,A)
    IF (A(3).NE.10) GOTO 25
    CALL RMOVE(-NEXT,5,ATRIB)
    CALL ENTER(10,ATRIB)
    GOTO 99
25 IF (NSUCR(NEXT).EQ.0) GOTO 26
    NEXT-NSUCR(NEXT)
    GOTO 22

C

---------------------------------------
C (6) CHECK FOR W/E/A & Paint C-141 AIRCRAFT
C
C
26 NEXT-MMFE(5)
27 IF (NEXT.EQ.0) GOTO 31
    CALL COPY(-NEXT,5,A)
IF (A(5).NE.141)GOTO 30
CALL RMOVE(-NEXT,5,ATRIB)
CALL ENTER(10,ATRIB)
GOTO 99
30 IF (NSUCR(NEXT).EQ.0)GOTO 31
NEXT=NSUCR(NEXT)
GOTO 27

C
C-------------------------------------------------------
C  (7) CHECK FOR A DePAINT C-130
C-------------------------------------------------------
C
31 NEXT-MMFE(4)
32 IF (NEXT.EQ.0)GOTO 99
CALL COPY(-NEXT,4,A)
IF (A(5).NE.130)GOTO 35
CALL RMOVE(-NEXT,4,ATRIB)
CALL ENTER(7,ATRIB)
GOTO 99
35 IF (NSUCR(NEXT).EQ.0)GOTO 99
NEXT=NSUCR(NEXT)
GOTO 32
99 RETURN
END

C******************************************************
C
C THIS IS SUBROUTINE SPT54_6
C
C-------------------------------------------------------
C This subroutine is used after Bldg 54 has been freed under SPT
C dispatching rules IN CONFIGURATION OPTION #6. The subroutine
C searches each file from smallest to largest expected processing times
C The order searched for Bldg 54 is as follows:
C 1) C-130 INCOMING Wash  2) Outgoing Wash & SS C-130
C 3) Paint C-130 SS AC  4) DePaint C-141 AC
C 7) DePaint C-130 ac (media blast)
C
C******************************************************
C
SUBROUTINE SPT54_6
DIMENSION A(100), B(100)
COMMON/SCOMI/ATRIB(100),DD(100),DDL(IO0),DTNOW,II,MFA,MSTOP,NCLNR
1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(IO0),TNEXT,TNOW,XX(100)
EQUIVALENCE(A(15),NEED)
EQUIVALENCE(A(16),ARIVE)

C
C-----------------------------------------------

C (1) CHECK IF C-130 AWAITING INCOMING WASH
C-----------------------------------------------

NEXT-MMFE(3)
1 IF (NEXT.EQ.0)GOTO 6
CALL COPY(-NEXT,3,A)
IF (A(14).GE.1)GOTO 5
CALL RMOVE(-NEXT,3,ATRIB)
CALL ENTER(5,ATRIB)
GOTO 99
5 IF (NSUCR(NEXT).EQ.0)GOTO 6
NEXT-NSUCR(NEXT)
GOTO 1

C

C-----------------------------------------------

C (2) CHECK IF C-130 AWAITING OUTGOING WASH & SCUFF SAND
C-----------------------------------------------

C
6 NEXT-MMFE(3)
7 IF (NEXT.EQ.0)GOTO 11
CALL COPY(-NEXT,3,A)
IF (A(14).LT.1)GOTO 10
CALL RMOVE(-NEXT,3,ATRIB)
CALL ENTER(5,ATRIB)
GOTO 99
10 IF (NSUCR(NEXT).EQ.0)GOTO 11
NEXT-NSUCR(NEXT)
GOTO 7

C

C-----------------------------------------------

C (3) CHECK FOR A PAINT TYPE = 11
C-----------------------------------------------

C
11 NEXT-MMFE(6)
12 IF (NEXT.EQ.0)GOTO 16
CALL COPY(-NEXT,6,A)
IF (A(3).NE.11)GOTO 15
CALL RMOVE(-NEXT,6,ATRIB)
CALL ENTER(14,ATRIB)
GOTO 99

247
15 IF (NSUCR(NEXT).EQ.0)GOTO 16
   NEXT=NSUCR(NEXT)
   GOTO 12
C
C----------------------------------------
C (4) CHECK FOR A DePAINT C-141
C----------------------------------------

16 NEXT-MMFE(4)
17 IF (NEXT.EQ.0)GOTO 21
   CALL COPY(-NEXT,4,A)
   IF (A(5).NE.141)GOTO 20
   CALL RMOVE(-NEXT,4,ATRIB)
   CALL ENTER(8,ATRIB)
   GOTO 99
20 IF (NSUCR(NEXT).EQ.0)GOTO 21
   NEXT=NSUCR(NEXT)
   GOTO 17
C
C----------------------------------------
C (5) CHECK FOR W/E/A & Paint C-130 AIRCRAFT
C----------------------------------------

21 NEXT-MMFE(5)
22 IF (NEXT.EQ.0)GOTO 26
   CALL COPY(-NEXT,5,A)
   IF (A(3).NE.10)GOTO 25
   CALL RMOVE(-NEXT,5,ATRIB)
   CALL ENTER(11,ATRIB)
   GOTO 99
25 IF (NSUCR(NEXT).EQ.0)GOTO 26
   NEXT=NSUCR(NEXT)
   GOTO 22
C
C----------------------------------------
C (6) CHECK FOR W/E/A & Paint C-141 AIRCRAFT
C----------------------------------------

26 NEXT-MMFE(5)
27 IF (NEXT.EQ.0)GOTO 31
   CALL COPY(-NEXT,5,A)
   IF (A(5).NE.141)GOTO 30
   CALL RMOVE(-NEXT,5,ATRIB)
   CALL ENTER(11,ATRIB)
   GOTO 99
30 IF (NSUCR(NEXT).EQ.0)GOTO 31
   NEXT=NSUCR(NEXT)

248
GOTO 27
C
-----------------------------------------------
C (7) CHECK FOR A DePAINT C-130
C-----------------------------------------------
C
31  NEXT=MMFE(4)
32  IF (NEXT.EQ.0)GOTO 99
    CALL COPY(=NEXT,4,A)
    IF (A(5).NE.130)GOTO 35
    CALL RMOVE(=NEXT,4,ATRIB)
    CALL ENTER(8,ATRIB)
    GOTO 99
35  IF (NSUCR(NEXT).EQ.0)GOTO 99
    NEXT=NSUCR(NEXT)
    GOTO 32
99  RETURN
END
C
**********************************************************************
C
C THIS IS SUBROUTINE SPT89_6
C
C---------------------------------
C This subroutine is used after Bldg 89 has been freed under SPT
C dispatching rules IN CONFIGURATION OPTION #6. The subroutine
C searches each file from smallest to largest expected processing times
C
C The order searched for Bldg 89 is as follows:
C
C 1) C-130 INCOMING Wash  2) Outgoing Wash & SS C-130
C 3) Paint C-130 SS AC   4) DePaint C-141 AC
C 7) DePaint C-130 ac (media blast)
C
C
**********************************************************************
C
SUBROUTINE SPT89_6
DIMENSION A(100), B(100)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NMSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
EQUIVALENCE(ATRIB(3), WORK)
EQUIVALENCE(ATRIB(2), WARM)
EQUIVALENCE(A(15), NEED)
EQUIVALENCE(A(16), ARIVE)

C
C  (1) CHECK IF C-130 AWAITING INCOMING WASH
C
C  NEXT-MMFE(3)
1  IF (NEXT.EQ.0)GOTO 6
 CALL COPY(-NEXT,3,A)
 IF (A(14).GE.1)GOTO 5
 CALL RMOVE(-NEXT,3,ATRIB)
 CALL ENTER(6,ATRIB)
 GOTO 99
5  IF (NSUCR(NEXT).EQ.0)GOTO 6
 NEXT-NSUCR(NEXT)
 GOTO 1
C
C  (2) CHECK IF C-130 AWAITING OUTGOING WASH & SCUFF SAND
C
C  NEXT-MMFE(3)
6  IF (NEXT.EQ.0)GOTO 11
 CALL COPY(-NEXT,3,A)
 IF (A(14).LT.1)GOTO 10
 CALL RMOVE(-NEXT,3,ATRIB)
 CALL ENTER(6,ATRIB)
 GOTO 99
10 IF (NSUCR(NEXT).EQ.0)GOTO 11
 NEXT-NSUCR(NEXT)
 GOTO 7
C
C  (3) CHECK FOR A PAINT TYPE = 11
C
C  NEXT-MMFE(6)
11 IF (NEXT.EQ.0)GOTO 16
 CALL COPY(-NEXT,6,A)
 IF (A(3).NE.11)GOTO 15
 CALL RMOVE(-NEXT,6,ATRIB)
 CALL ENTER(15,ATRIB)
 GOTO 99
15 IF (NSUCR(NEXT).EQ.0)GOTO 16
 NEXT-NSUCR(NEXT)
 GOTO 12
C
C  (4) CHECK FOR A DePAINT C-141
C
C

16 NEXT-MMFE(4)
17 IF (NEXT.EQ.0)GOTO 21
   CALL COPY(-NEXT,4,A)
   IF (A(5).NE.141)GOTO 20
   CALL RMOVE(-NEXT,4,ATRIB)
   CALL ENTER(9,ATRIB)
   GOTO 99
20 IF (NSUCR(NEXT).EQ.0)GOTO 21
   NEXT-NSUCR(NEXT)
   GOTO 17

C

C (5) CHECK FOR W/E/A & Paint C-130 AIRCRAFT

C

21 NEXT-MMFE(5)
22 IF (NEXT.EQ.0)GOTO 26
   CALL COPY(-NEXT,5,A)
   IF (A(5).NE.141)GOTO 25
   CALL RMOVE(-NEXT,5,ATRIB)
   CALL ENTER(12,ATRIB)
   GOTO 99
25 IF (NSUCR(NEXT).EQ.0)GOTO 26
   NEXT-NSUCR(NEXT)
   GOTO 22

C

C (6) CHECK FOR W/E/A & Paint C-141 AIRCRAFT

C

26 NEXT-MMFE(5)
27 IF (NEXT.EQ.0)GOTO 31
   CALL COPY(-NEXT,5,A)
   IF (A(5).NE.141)GOTO 30
   CALL RMOVE(-NEXT,5,ATRIB)
   CALL ENTER(12,ATRIB)
   GOTO 99
30 IF (NSUCR(NEXT).EQ.0)GOTO 31
   NEXT-NSUCR(NEXT)
   GOTO 27

C

C (7) CHECK FOR A DePAINT C-130

C

31 NEXT-MMFE(4)

251
32 IF (NEXT.EQ.O)GOTO 99
CALL COPY(-NEXT,4,A)
IF (A(5).NE.130)GOTO 35
CALL RMOVE(-NEXT,4,ATRI)
CALL ENTER(9,ATRI)
GOTO 99
35 IF (NSUCR(NEXT).EQ.O)GOTO 99
NEXT-NSUCR(NEXT)
GOTO 32
99 RETURN
END
C
C******************************************************************************
C    THIS IS SUBROUTINT LNQ
C******************************************************************************
C This subroutine is used for each Largest Number in Queue Rule Option. Passed to this subroutine is the
C hangar number which has just been freed (50, 54, or 89)
C******************************************************************************
C
SUBROUTINE LNQ(BLDG)
DIMENSION A(100),ORDER(100)
INTEGER BLDG, C, J
COMMON/SCOM1/ATRIB(100),DD(100),DDL(100),DINOW,II,MFA,MSTP,NCLNR
1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)
C
C = 0
DO 5 J = 1, 4
ORDER(J) = 0
5 CONTINUE
C FIST, DETERMINE THE RANK ORDER OF NUMBER IN QUEUE (Descending size)
C
IF (((NNQ(3).GE.NNQ(4)).AND.(NNQ(3).GE.NNQ(5))).AND
2.((NNQ(3).GE.NNQ(6))))GOTO 10
C
IF (((NNQ(4).GE.NNQ(3)).AND.(NNQ(4).GE.NNQ(5))).AND
3.((NNQ(4).GE.NNQ(6))))GOTO 15
C
IF (((NNQ(5).GE.NNQ(3)).AND.(NNQ(5).GE.NNQ(4))).AND
4.((NNQ(5).GE.NNQ(6))))GOTO 20
C
IF (((NNQ(6).GE.NNQ(3)).AND.(NNQ(6).GE.NNQ(4))).AND
5.((NNQ(6).GE.NNQ(5))))GOTO 25
C
ORDER(1) = 3
IF (((NNQ(4).GE.NNQ(5)).AND.(NNQ(4).GE.NNQ(6))))THEN
ORDER(2) = 4
GOTO 35
ELSE
  IF ((NNQ(5).GE.NNQ(4)).AND.(NNQ(5).GE.NNQ(6)))THEN
    ORDER(2) = 5
    GOTO 34
  ELSE
    ORDER(2) = 6
    GOTO 33
ENDIF
ENDIF

ORDER(1) = 4
IF ((NNQ(3).GE.NNQ(5)).AND.(NNQ(3).GE.NNQ(6)))THEN
  ORDER(2) = 3
  GOTO 35
ELSE
  IF ((NNQ(5).GE.NNQ(3)).AND.(NNQ(5).GE.NNQ(6)))THEN
    ORDER(2) = 5
    GOTO 32
  ELSE
    ORDER(2) = 6
    GOTO 31
ENDIF
ENDIF

ORDER(1) = 5
IF ((NNQ(3).GE.NNQ(4)).AND.(NNQ(3).GE.NNQ(6)))THEN
  ORDER(2) = 3
  GOTO 34
ELSE
  IF ((NNQ(4).GE.NNQ(3)).AND.(NNQ(4).GE.NNQ(6)))THEN
    ORDER(2) = 4
    GOTO 32
  ELSE
    ORDER(2) = 6
    GOTO 30
ENDIF
ENDIF

ORDER(1) = 6
IF (NNQ(3).GE.NNQ(4).AND.NNQ(3).GE.NNQ(5))THEN
  ORDER(2) = 3
  GOTO 33
ELSE
  IF (NNQ(4).GE.NNQ(3).AND.NNQ(4).GE.NNQ(5))THEN
    ORDER(2) = 4
    GOTO 31
  ELSE
    ORDER(2) = 5
GOTO 30
ENDIF
ENDIF

C
30 IF (NNQ(3) .GE. NNQ(4)) THEN
ORDER(3) = 3
ORDER(4) = 4
GOTO 50
ELSE
ORDER(3) = 4
ORDER(4) = 3
GOTO 50
ENDIF

C
31 IF (NNQ(3) .GE. NNQ(5)) THEN
ORDER(3) = 3
ORDER(4) = 5
GOTO 50
ELSE
ORDER(3) = 5
ORDER(4) = 3
GOTO 50
ENDIF

C
32 IF (NNQ(3) .GE. NNQ(6)) THEN
ORDER(3) = 3
ORDER(4) = 6
GOTO 50
ELSE
ORDER(3) = 6
ORDER(4) = 3
GOTO 50
ENDIF

C
33 IF (NNQ(4) .GE. NNQ(5)) THEN
ORDER(3) = 4
ORDER(4) = 5
GOTO 50
ELSE
ORDER(3) = 5
ORDER(4) = 4
GOTO 50
ENDIF

C
34 IF (NNQ(4) .GE. NNQ(6)) THEN
ORDER(3) = 4
ORDER(4) = 6
GOTO 50
ELSE
ORDER(3) = 6
ORDER(4) = 4
GOTO 50
ENDIF

C
35 IF (NNQ(5).GE.NNQ(6)) THEN
ORDER(3) = 5
ORDER(4) = 6
GOTO 50
ELSE
ORDER(3) = 6
ORDER(4) = 5
GOTO 50
ENDIF

C ORDER DETERMINED
C
50 C = C + 1
IF (ORDER(C).EQ.3) GOTO 300
IF (ORDER(C).EQ.4) GOTO 400
IF (ORDER(C).EQ.5) COTO 500
IF (ORDER(C).EQ.6) GOTO 600

C LOOK INTO FILE 3 (Wash)
C
300 NEXT-MMFE(3)
310 IF (NEXT.EQ.0) GOTO 700
CALL COPY(-NEXT, 3, A)
IF (BLDG.NE.50) GOTO 311
GOTO 314
311 IF (BLDG.NE.54) GOTO 312
GOTO 314
314 CALL REMOVE(-NEXT, 3, ATRIB)
GOTO 930
315 IF (NSUCR(NEXT).EQ.0) GOTO 700
NEXT-NSUCR(NEXT)
GOTO 310

C
C
C LOOK INTO FILE 4 (DePaint)
C
C
400 NEXT-MMFE(4)
410 IF (NEXT.EQ.0) GOTO 700
CALL COPY(-NEXT, 4, A)
IF (BLDG.NE.50) GOTO 411
GOTO 414
411 IF (BLDG.NE.54) GOTO 412
GOTO 414
414 CALL RMOVE(-NEXT, 4, ATRIB)
GOTO 940
415 IF (NSUCR(NEXT).EQ.0) GOTO 700
NEXT-NSUCR(NEXT)
GOTO 410

C
C LOOK INTO FILE 5 (W/E/A)
C
500 NEXT-MMFE(5)
510 IF (NEXT.EQ.0) GOTO 700
CALL COPY(-NEXT, 5, A)
IF (BLDG.NE.50) GOTO 511
GOTO 514
511 IF (BLDG.NE.54) GOTO 512
GOTO 514
514 CALL RMOVE(-NEXT, 5, ATRIB)
GOTO 950
515 IF (NSUCR(NEXT).EQ.0) GOTO 700
NEXT-NSUCR(NEXT)
GOTO 510

C
C LOOK INTO FILE 6 (Paint)
C
600 NEXT-MMFE(6)
610 IF (NEXT.EQ.0) GOTO 700
CALL COPY(-NEXT, 6, A)
IF (BLDG.NE.50) GOTO 611
GOTO 614
611 IF (BLDG.NE.54) GOTO 612
GOTO 614
614 CALL RMOVE(-NEXT, 6, ATRIB)
GOTO 960
IF (NSUCR(NEXT).EQ.0)GOTO 700
NEXT=NSUCR(NEXT)
GOTO 610

C
700 IF (C.LT.4)GOTO 50
GOTO 999

C
930 IF (BLDG.NE.50)GOTO 931
CALL ENTER(4,ATRIB)
GOTO 999
931 IF (BLDG.EQ.89)GOTO 932
CALL ENTER(5,ATRIB)
GOTO 999
932 CALL ENTER(6,ATRIB)
GOTO 999

C
940 IF (BLDG.NE.50)GOTO 941
CALL ENTER(7,ATRIB)
GOTO 999
941 IF (BLDG.EQ.89)GOTO 942
CALL ENTER(8,ATRIB)
GOTO 999
942 CALL ENTER(9,ATRIB)
GOTO 999

C
950 IF (BLDG.NE.50)GOTO 951
CALL ENTER(10,ATRIB)
GOTO 999
951 IF (BLDG.EQ.89)GOTO 952
CALL ENTER(11,ATRIB)
GOTO 999
952 CALL ENTER(12,ATRIB)
GOTO 999

C
960 IF (BLDG.NE.50)GOTO 961
CALL ENTER(13,ATRIB)
GOTO 999
961 IF (BLDG.EQ.89)GOTO 962
CALL ENTER(14,ATRIB)
GOTO 999
962 CALL ENTER(15,ATRIB)

999 RETURN
END

C
C
C
C**************************************************************
C THIS IS SUBROUTINT AHEAD(BLDG,OPTION)
C**************************************************************
C—–
This subroutine is used for each Look Ahead dispatching Rule Option. Passed to this subroutine is the hangar number which has just been freed (55, 54, or 89), and the coded configuration Option (1, 2, 3, 5, or 6).

SUBROUTINE AHEAD(BLDG, OPTION)
DIMENSION WASH(50), DP(50), WEA(50), PNT(50), A(50)
INTEGER POINT3, POINT4, POINT5, POINT6, I, P, BLDG, OPTION
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)

SIZE3 = 900
SIZE4 = 900
SIZE5 = 900
SIZE6 = 900
IF (NNQ(3).EQ.0.AND.NNQ(4).EQ.0.AND.NNQ(5).EQ.0.AND.
2NNQ(6).EQ.0) RETURN

1 POINT3-MMFE(3)
2 IF (POINT3.EQ.0) THEN
   SIZE3 = 900
   GOTO 10
ENDIF
CALL COPY(-POINT3, 3,WASH)

3 IF (BLDG.NE.50) GOTO 3
ARRIVE3 = WASH(16)
GOTO 9
4 IF (BLDG.NE.54) GOTO 4
ARRIVE3 = WASH(16)
GOTO 9
7 IF (NSUCR(POINT3).EQ.0) THEN
   SIZE3 = 900
   GOTO 10
ELSE
   POINT3-NSUCR(POINT3)
   GOTO 2
ENDIF
C
9 IF (WASH(14).LT.1) THEN
C
C SS C-130 AWAITING INCOMING WASH
C
SIZE3 = NNQ(43)
GOTO 10
ENDIF
IF (OPTION.EQ.1) THEN

C SS C-130 AWAITING OUTGOING WASH & SCUFF SAND
C
SIZE3 = (NNQ(6) + NNQ(12))
GOTO 10
ENDIF
IF (OPTION.EQ.2.OR.OPTION.EQ.3) THEN
SIZE3 = (NNQ(6) + NNQ(10))
GOTO 10
ENDIF
IF (OPTION.EQ.5) THEN
SIZE3 = (NNQ(6) + NNQ(10) + NNQ(12))
GOTO 10
ENDIF
IF (OPTION.EQ.6) THEN
SIZE3 = (NNQ(6) + NNQ(10) + NNQ(11) + NNQ(12))
GOTO 10
ENDIF
C
C CHECK FILE 4 (DEPAINT)
C
C
10 POINT4-MMFE(4)
11 IF (POINT4.EQ.0) THEN
SIZE4 = 900
GOTO 20
ENDIF
CALL COPY(-POINT4,4,DP)
IF (BLDG.NE.50) GOTO 12
IF (DP(15).EQ.2.OR.DP(15).EQ.3.OR.DP(15).EQ.7) GOTO 17
ARRIVE4 = DP(16)
GOTO 19
12 IF (BLDG.NE.54) GOTO 13
IF (DP(15).EQ.1.OR.DP(15).EQ.3.OR.DP(15).EQ.5) GOTO 17
ARRIVE4 = DP(16)
GOTO 19
13 IF (DP(15).EQ.1.OR.DP(15).EQ.2.OR.DP(15).EQ.4) GOTO 17
ARRIVE4 = DP(16)
GOTO 19

259
17 IF (NSUCR(POINT4).EQ.0) THEN
    SIZE4 = 900
    GOTO 20
ELSE
    POINT4-NSUCR(POINT4)
    GOTO 11
ENDIF
C
19 IF (DP(3).EQ.10) THEN
C
C ** STANDARD C-130
C
    SIZE4 = NNQ(43)
    GOTO 20
ENDIF
IF (DP(3).EQ.2) THEN
C
C ** SL C-141
C
    SIZE4 = NNQ(20)
    GOTO 20
ENDIF
IF (DP(3).EQ.3) THEN
C
C ** SL-PAINT C-141
C
    SIZE4 = NNQ(21)
    GOTO 20
ENDIF
IF (DP(3).EQ.4) THEN
C
C ** CW BOX C-141
C
    SIZE4 = NNQ(31)
    GOTO 20
ENDIF

C CHECK FILE 5 (W/E/A)
C
C
20 POINT5-MMFE(5)
21 IF (POINT5.EQ.0) THEN
    SIZE5 = 900
    GOTO 30
ENDIF
    CALL COPY(-POINT5,5,W EA)
    IF (BLDG.NE.50) GOTO 22
    ARRIVE5 = WEA(16)
GOTO 29
22 IF (BLDG. NE. 54) GOTO 23
   IF (WEA(15). EQ. 1. OR WEA(15). EQ. 3. OR WEA(15). EQ. 5) GOTO 27
      ARRIVES = WEA(16)
      GOTO 29
23 IF (WEA(15). EQ. 1. OR WEA(15). EQ. 2. OR WEA(15). EQ. 4) GOTO 27
   ARRIVES = WEA(16)
   GOTO 29
27 IF (NSUCR(POINT5). EQ. 0) THEN
      SIZES = 900
      GOTO 30
   ELSE
      POINT5 = NSUCR(POINT5)
      GOTO 21
   ENDIF
29 IF (WEA(3). EQ. 10) THEN
C
C   SS C-130
C
   IF (OPTION. EQ. 1) THEN
      SIZES = (NNQ(6) + NNQ(12))
      GOTO 30
   ENDIF
   ENDIF
   IF (OPTION. EQ. 2 OR OPTION. EQ. 3) THEN
      SIZES = (NNQ(6) + NNQ(10))
      GOTO 30
   ENDIF
261
C
C   IF (OPTION. EQ. 5) THEN
      SIZES = (NNQ(6) + NNQ(10) + NNQ(12))
      GOTO 30
   ENDIF
   IF (OPTION. EQ. 6) THEN
      SIZES = (NNQ(6) + NNQ(10) + NNQ(11) + NNQ(12))
      GOTO 30
   ENDIF
C
C   IF (WEA(3). EQ. 2) THEN
C
C   SL C-141
C
   SIZES = NNQ(20)
   GOTO 30
   ENDIF
   IF (WEA(3). EQ. 3) THEN
C
C   SL-PAINT C-141
C
   SIZES = NNQ(21)
GOTO 30
ENDIF
IF (WEA(3).EQ.4)THEN
C
CW BOX C-141
C
SIZE5 = NNQ(31)
GOTO 30
ENDIF
C
C CHECK FILE(6) PAINT (CANS ONLY BE SS C-130) IN THIS FILE
C
30 IF (OPTION.EQ.1.AND.BLDG.EQ.54)THEN
    SIZE6 = 900
    GOTO 50
ENDIF
IF (OPTION.EQ.2.AND.BLDG.NE.50)THEN
    SIZE6 = 900
    GOTO 50
ENDIF
IF (OPTION.EQ.3.AND.BLDG.NE.50)THEN
    SIZE6 = 900
    GOTO 50
ENDIF
IF (OPTION.EQ.5.AND.BLDG.EQ.54)THEN
    SIZE6 = 900
    GOTO 50
ENDIF
POINT6-MMFE(6)
IF (POINT6.EQ.0)THEN
    SIZE6 = 900
    GOTO 50
ENDIF
CALL COPY(-POINT6,6,PNT)
ARRIVE6 = PNT(16)
SIZE6 = 0
GOTO 50
C
C ALL FILES CHECKED DETERMINE LARGEST QUEUE
C
50 IF (SIZE3.LT.SIZE4.AND.SIZE3.LT.SIZE5)GOTO 500
IF (SIZE4.LT.SIZE3.AND.SIZE4.LT.SIZE5)GOTO 600
IF (SIZE5.LT.SIZE3.AND.SIZE5.LT.SIZE4)GOTO 700
IF (SIZE3.EQ.SIZE4.AND.SIZE3.EQ.SIZE5)GOTO 100
IF (SIZE3.EQ.SIZE4.AND.SIZE3.LT.SIZE5)GOTO 200
IF (SIZE3.EQ.SIZE5.AND.SIZE3.LT.SIZE4)GOTO 300
IF (SIZE4.EQ.SIZE5.AND.SIZE4.LT.SIZE3)GOTO 400
C
C ALL AHEAD QUEUES ARE EQUAL IN SIZE
C
100 IF (SIZE3.EQ.900.AND.SIZE6.EQ.900)GOTO 999
   IF (SIZE3.EQ.900.AND.SIZE6.NE.900)GOTO 800
   IF (ARRIVE3.LE.ARRIVE4.AND.ARRIVE3.LE.ARRIVE5)GOTO 500
   IF (ARRIVE4.LE.ARRIVE3.AND.ARRIVE4.LE.ARRIVE5)GOTO 600
   IF (ARRIVE5.LE.ARRIVE3.AND.ARRIVE5.LE.ARRIVE4)GOTO 700
C
C
C (1-2)>3 (LOOK AHEAD QUEUES FOR WASH AND DEPAINT EQUAL)
C
200 IF (ARRIVE3.LE.ARRIVE4)GOTO 500
   GOTO 600
C
C
C (1-3)>2 (LOOK AHEAD QUEUES FOR WASH AND W/E/A EQUAL)
C
300 IF (ARRIVE3.LE.ARRIVE5)GOTO 500
   GOTO 700
C
C
C (2-3)>1 (LOOK AHEAD QUEUES FOR DEPAINT AND W/E/A EQUAL)
C
400 IF (ARRIVE4.LE.ARRIVE5)GOTO 600
   GOTO 700
C
C
C CHOICE HAS BEEN MADE FOR PRIORITY OF SIZE3
   SIZE4, AND SIZE5...NOW COMPARE AGAINST SIZE6
C
C
C FILE 3 HAS PRIORITY
C
500 IF (SIZE6.GE.900)THEN
   CALL RMOVE(-POINT3, 3, ATRIB)
   GOTO 930
ENDIF
   IF (ARRIVE6.LE.ARRIVE3)THEN
   CALL RMOVE(-POINT6, 6, ATRIB)
   GOTO 960
ELSE
   CALL RMOVE(-POINT3, 3, ATRIB)
   GOTO 930
ENDIF
C
C FILE 4 HAS PRIORITY
C
600 IF (SIZE6.GE.900)THEN
   CALL RMOVE(-POINT4, 4, ATRIB)
   GOTO 940
ENDIF
IF (ARRIVE6.LE.ARRIVE4) THEN
   CALL RMOVE(-POINT6,6,ATRIB)
   GOTO 960
ELSE
   CALL RMOVE(-POINT4,4,ATRIB)
   GOTO 940
ENDIF

C——
C FILE 5 HAS PRIORITY
C——
700 IF (SIZE6.GE.900) THEN
   CALL RMOVE(-POINT5,5,ATRIB)
   GOTO 950
ENDIF
IF (ARRIVE6.LE.ARRIVE5) THEN
   CALL RMOVE(-POINT6,6,ATRIB)
   GOTO 960
ELSE
   CALL RMOVE(-POINT5,5,ATRIB)
   GOTO 950
ENDIF
C
800 CALL RMOVE(-POINT6,6,ATRIB)
   GOTO 960
C
930 IF (BLDG.NE.50) GOTO 931
   CALL ENTER(4,ATRIB)
   GOTO 999
931 IF (BLDG.EQ.89) GOTO 932
   CALL ENTER(5,ATRIB)
   GOTO 999
932 CALL ENTER(6,ATRIB)
   GOTO 999
C
940 IF (BLDG.NE.50) GOTO 941
   CALL ENTER(7,ATRIB)
   GOTO 999
941 IF (BLDG.EQ.89) GOTO 942
   CALL ENTER(8,ATRIB)
   GOTO 999
942 CALL ENTER(9,ATRIB)
   GOTO 999
C
950 IF (BLDG.NE.50) GOTO 951
   CALL ENTER(10,ATRIB)
   GOTO 999
951 IF (BLDG.EQ.89) GOTO 952
   CALL ENTER(11,ATRIB)
   GOTO 999
952 CALL ENTER(12,ATRIB)

264
GOTO 999
C
960 IF (BLDG.NE.50)GOTO 961
CALL ENTER(13, ATRIB)
GOTO 999
961 IF (BLDG.EQ.54)GOTO 962
CALL ENTER(15, ATRIB)
GOTO 999
962 CALL ENTER(14, ATRIB)
GOTO 999
999 RETURN
END
C
C******************************************************************************************
C THIS IS SUBROUTINE MINUWASH
C******************************************************************************************
C
SUBROUTINE MINUWASH
DIMENSION RANK(S)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
C
COUNT = 0
K = 0
DO 1 N = 1, 3
RANK(K) = 0
1 CONTINUE
C
UTL54=RRAVG(3)
UTL89=RRAVG(4)
UTL50=RRAVG(5)
IF ((UTL50.LE.UTL54).AND.(UTL50.LE.UTL89))GOTO 2
IF ((UTL54.LE.UTL89).AND.(UTL54.LE.UTL50))GOTO 3
IF ((UTL89.LE.UTL54).AND.(UTL89.LE.UTL50))GOTO 4
C
2 RANK(1) = 50
IF (UTL54.LE.UTL89)THEN
  RANK(2) = 54
  RANK(3) = 89
  GOTO 5
ELSE
  RANK(2) = 89
  RANK(3) = 54
  GOTO 5
ENDIF
RETURN
C
3 RANK(1) = 54
IF (UTL50.LE.UTL89)THEN
RANK(2) = 50
RANK(3) = 89
GOTO 5
ELSE
  RANK(2) = 89
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
RANK(1) = 89
IF (UTL50.LE.UTL54) THEN
  RANK(2) = 50
  RANK(3) = 54
  GOTO 5
ELSE
  RANK(2) = 54
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
** RANK DETERMINED **
C
COUNT = COUNT + 1
IF (RANK(COUNT).EQ.50) GOTO 10
IF (RANK(COUNT).EQ.54) GOTO 20
IF (RANK(COUNT).EQ.89) GOTO 30
C
This portion used if Bldg 50 has smallest utilization
C
IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0) THEN
  CALL ENTER(4,ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3) GOTO 5
  IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN
C
This portion used if Bldg 54 has smallest utilization
C
IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5) GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0) THEN
  CALL ENTER(5,ATRIB)
RETURN
ELSE
22 IF (COUNT.LT.3) GOTO 5
     IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN

C
C This portion used if Bldg 89 has smallest utilization

C
30 IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4) GOTO 32
    IF (NNUSE(4).EQ.0.AND.NNQ(12).EQ.0) THEN
        CALL ENTER(6, ATRIB)
        RETURN
    ELSE
        32 IF (COUNT.LT.3) GOTO 5
             IF (COUNT.GE.3) GOTO 90
    ENDIF
90 CALL FILEM(3, ATRIB)
99 RETURN
END

C******************************************************************************
C THIS IS SUBROUTINE MINUDP
C******************************************************************************

SUBROUTINE MINUDP
DIMENSION RANK(5)
INTEGER K, N, COUNT
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR,
1, NCRDR, NPRNT, NNRUN, NSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)

C
COUNT = 0
K = 0
DO 1 N = 1, 3
    RANK(K) = 0
1 CONTINUE

C
UTL54=RRAVG(3)
UTL89=RRAVG(4)
UTL50=RRAVG(5)
IF ((UTL50.LE.UTL54).AND.(UTL50.LE.UTL89)) GOTO 2
IF ((UTL54.LE.UTL89).AND.(UTL54.LE.UTL50)) GOTO 3
IF ((UTL89.LE.UTL54).AND.(UTL89.LE.UTL50)) GOTO 4

C
2 RANK(1) = 50
    IF (UTL54.LE.UTL89) THEN
        RANK(2) = 54
        RANK(3) = 89
        RETURN
    ELSE
        RANK(1) = 89
        RANK(2) = 50
        RANK(3) = 54
    ENDIF
    RETURN
GOTO 5
ELSE
   RANK(2) = 89
   RANK(3) = 54
   GOTO 5
ENDIF
RETURN
C
3 RANK(1) = 54
IF (UTL50.LE.UTL89)THEN
   RANK(2) = 50
   RANK(3) = 89
   GOTO 5
ELSE
   RANK(2) = 89
   RANK(3) = 50
   GOTO 5
ENDIF
RETURN
C
4 RANK(1) = 89
IF (UTL50.LE.UTL54)THEN
   RANK(2) = 50
   RANK(3) = 54
   GOTO 5
ELSE
   RANK(2) = 54
   RANK(3) = 50
   GOTO 5
ENDIF
RETURN
C ** RANK DETERMINED **
C
5 COUNT = COUNT + 1
IF (RANK(COUNT).EQ.50)GOTO 10
IF (RANK(COUNT).EQ.54)GOTO 20
IF (RANK(COUNT).EQ.89)GOTO 30
C
C This portion used if Bldg 50 has smallest utilization
C
   IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0)THEN
      CALL ENTER(7,ATRIB)
      RETURN
   ELSE
      IF (COUNT.LT.3)GOTO 5
      IF (COUNT.GE.3)GOTO 90
   ENDIF
   RETURN
12 IF (COUNT.LT.3)GOTO 5
   IF (COUNT.GE.3)GOTO 90
This portion used if Bldg 54 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5)GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0)THEN
    CALL ENTER(8,ATRIB)
    RETURN
ELSE
    IF (COUNT.LT.3)GOTO 5
    IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN

This portion used if Bldg 89 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4)GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0)THEN
    CALL ENTER(9,ATRIB)
    RETURN
ELSE
    IF (COUNT.LT.3)GOTO 5
    IF (COUNT.GE.3)GOTO 90
ENDIF
90 CALL FILEM(4,ATRIB)
99 RETURN
END

SUBROUTINE MINUWEA
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100),DD(100),DDL(100),DTNOW,II,MFA,MSTOP,NCLNR,1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)
COUNT = 0
K = 0
DO 1 N = 1, 3
    RANK(K) = 0
    1 CONTINUE
UTL54=RRAVG(3)
UTL89=RRAVG(4)
UTL50 = RRAVG(5)
IF ((UTL50 .LE. UTL54) .AND. (UTL50 .LE. UTL89)) GOTO 2
IF ((UTL54 .LE. UTL89) .AND. (UTL54 .LE. UTL50)) GOTO 3
IF ((UTL89 .LE. UTL54) .AND. (UTL89 .LE. UTL50)) GOTO 4

C 2
RANK(1) = 50
IF (UTL54 .LE. UTL89) THEN
   RANK(2) = 54
   RANK(3) = 89
   GOTO 5
ELSE
   RANK(2) = 89
   RANK(3) = 54
   GOTO 5
ENDIF
RETURN

C 3
RANK(1) = 54
IF (UTL50 .LE. UTL89) THEN
   RANK(2) = 50
   RANK(3) = 89
   GOTO 5
ELSE
   RANK(2) = 89
   RANK(3) = 50
   GOTO 5
ENDIF
RETURN

C 4
RANK(1) = 89
IF (UTL50 .LE. UTL54) THEN
   RANK(2) = 50
   RANK(3) = 54
   GOTO 5
ELSE
   RANK(2) = 54
   RANK(3) = 50
   GOTO 5
ENDIF
RETURN

C 5
COUNT = COUNT + 1
IF (RANK(COUNT) .EQ. 50) GOTO 10
IF (RANK(COUNT) .EQ. 54) GOTO 20
IF (RANK(COUNT) .EQ. 89) GOTO 30

C---
C This portion used if Bldg 50 has smallest utilization

270
IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0) THEN
   CALL ENTER(10, ATRIB)
   RETURN
ELSE
   IF (COUNT.LT.3) GOTO 5
   IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN
C
C This portion used if Bldg 54 has smallest utilization
C
I
IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5) GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0) THEN
   CALL ENTER(11, ATRIB)
   RETURN
ELSE
   IF (COUNT.LT.3) GOTO 5
   IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN
C
C This portion used if Bldg 89 has smallest utilization
C
IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4) GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0) THEN
   CALL ENTER(12, ATRIB)
   RETURN
ELSE
   IF (COUNT.LT.3) GOTO 5
   IF (COUNT.GE.3) GOTO 90
ENDIF
90 CALL FILEM(5, ATRIB)
99 RETURN
END
C
C**************************************************************************
C THIS IS SUBROUTINE MINUPAINT
C**************************************************************************
C
SUBROUTINE MINUPAINT
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR 1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
COUNT = 0
K = 0
DO 1 N = 1, 3
RANK(K) = 0
1 CONTINUE
C
UTL54 = RRAVG(3)
UTL89 = RRAVG(4)
UTL50 = RRAVG(5)
IF (UTL50 .LE. UTL54) .AND. (UTL50 .LE. UTL89) GOTO 2
IF (UTL54 .LE. UTL89) .AND. (UTL54 .LE. UTL50) GOTO 3
IF (UTL89 .LE. UTL54) .AND. (UTL89 .LE. UTL50) GOTO 4
C
2 RANK(1) = 50
IF (UTL54 .LE. UTL89) THEN
  RANK(2) = 54
  RANK(3) = 89
  GOTO 5
ELSE
  RANK(2) = 89
  RANK(3) = 54
  GOTO 5
ENDIF
RETURN
C
3 RANK(1) = 54
IF (UTL50 .LE. UTL89) THEN
  RANK(2) = 50
  RANK(3) = 89
  GOTO 5
ELSE
  RANK(2) = 89
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
4 RANK(1) = 89
IF (UTL50 .LE. UTL54) THEN
  RANK(2) = 50
  RANK(3) = 54
  GOTO 5
ELSE
  RANK(2) = 54
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
272
** RANK DETERMINED **

COUNT = COUNT + 1

IF (RANK(COUNT).EQ.50)GOTO 10
IF (RANK(COUNT).EQ.54)GOTO 20
IF (RANK(COUNT).EQ.89)GOTO 30

This portion used if Bldg 50 has smallest utilization

IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0)THEN
  CALL ENTER(13,ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN

This portion used if Bldg 54 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5)GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0)THEN
  CALL ENTER(14,ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN

This portion used if Bldg 89 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4)GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0)THEN
  CALL ENTER(15,ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF

CALL FILEM(6,ATRIB)
RETURN
END
SUBROUTINE FCWASH
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)

COUNT = 0
K = 0
DO 1 N = 1, 3
   RANK(K) = 0
1 CONTINUE

TLC54 = RRTLC(3)
TLC89 = RRTLC(4)
TLC50 = RRTLC(5)

IF ((TLC50 .LE. TLC54) .AND. (TLC50 .LE. TLC89)) GO TO 2
IF ((TLC54 .LE. TLC89) .AND. (TLC54 .LE. TLC50)) GO TO 3
IF ((TLC89 .LE. TLC54) .AND. (TLC89 .LE. TLC50)) GO TO 4

2 RANK(1) = 50
IF (TLC54 .LE. TLC89) THEN
   RANK(2) = 54
   RANK(3) = 89
   GO TO 5
ELSE
   RANK(2) = 89
   RANK(3) = 54
   GO TO 5
ENDIF
RETURN

3 RANK(1) = 54
IF (TLC50 .LE. TLC89) THEN
   RANK(2) = 50
   RANK(3) = 89
   GO TO 5
ELSE
   RANK(2) = 89
   RANK(3) = 50
   GO TO 5
ENDIF
RETURN

4 RANK(1) = 89
IF (TLC50 .LE. TLC54) THEN
RANK(2) = 50
RANK(3) = 54
GOTO 5
ELSE
  RANK(2) = 54
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN

** RANK DETERMINED **

COUNT = COUNT + 1
IF (RANK(COUNT).EQ.50)GOTO 10
IF (RANK(COUNT).EQ.54)GOTO 20
IF (RANK(COUNT).EQ.89)GOTO 30

This portion used if Bldg 50 has smallest utilization

IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0)THEN
  CALL ENTER(4, ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN

This portion used if Bldg 54 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5)GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0)THEN
  CALL ENTER(5, ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN

This portion used if Bldg 89 has smallest utilization

IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4)GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0) THEN
    CALL ENTER(6, ATRIB)
    RETURN
ELSE
    IF (COUNT.LT.3) GOTO 5
    IF (COUNT.GE.3) GOTO 90
ENDIF
90 CALL FILEM(3, ATRIB)
99 RETURN
END

C******************************************************************************
C THIS IS SUBROUTINE FCDP
C******************************************************************************

SUBROUTINE FCDP
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
C
COUNT = 0
K = 0
DO 1 N = 1, 3
    RANK(K) = 0
1 CONTINUE
C
TLC54-RRTLC(3)
TLC89-RRTLC(4)
TLC50-RRTLC(5)
IF ((TLC50.LE.TLC54).AND.(TLC50.LE.TLC89)) GOTO 2
IF ((TLC54.LE.TLC89).AND.(TLC54.LE.TLC50)) GOTO 3
IF ((TLC89.LE.TLC54).AND.(TLC89.LE.TLC50)) GOTO 4
C
2 RANK(1) = 50
   IF (TLC54.LE.TLC89) THEN
       RANK(2) = 54
       RANK(3) = 89
       GOTO 5
   ELSE
       RANK(2) = 89
       RANK(3) = 54
       GOTO 5
   ENDIF
RETURN
C
3 RANK(1) = 54
   IF (TLC50.LE.TLC89) THEN
       RANK(2) = 50
       RANK(3) = 89
       GOTO 5
   ELSE
       RANK(2) = 89
       RANK(3) = 54
       GOTO 5
   ENDIF
RETURN

276
ELSE
    RANK(2) = 89
    RANK(3) = 50
    GOTO 5
ENDIF
RETURN

C 4
RANK(1) = 89
IF (TLC50.LE.TLC54) THEN
    RANK(2) = 50
    RANK(3) = 54
    GOTO 5
ELSE
    RANK(2) = 54
    RANK(3) = 50
    GOTO 5
ENDIF
RETURN

C ** RANK DETERMINED **

C 5
COUNT = COUNT + 1
IF (RANK(COUNT).EQ.50) GOTO 10
IF (RANK(COUNT).EQ.54) GOTO 20
IF (RANK(COUNT).EQ.89) GOTO 30

C This portion used if Bldg 50 has smallest utilization
C
C 10
IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0) THEN
    CALL ENTER(7, ATRIB)
    RETURN
ELSE
12 IF (COUNT.LT.3) GOTO 5
    IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN

C This portion used if Bldg 54 has smallest utilization
C
C 20
IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.3.OR.ATRIB(15).EQ.5) GOTO 22
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0) THEN
    CALL ENTER(8, ATRIB)
    RETURN
ELSE
22 IF (COUNT.LT.3) GOTO 5

277
IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN

This portion used if Bldg 89 has smallest utilization

30 IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4) GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0) THEN
   CALL ENTER(9, ATRIB)
   RETURN
ELSE
   IF (COUNT.LE.3) GOTO 5
   IF (COUNT.GE.3) GOTO 90
ENDIF
90 CALL FILEM(4, ATRIB)
99 RETURN
END

C******************************************************************************
C THIS IS SUBROUTINE FCWEA
C******************************************************************************

SUBROUTINE FCWEA
DIMENSION RANK(S)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)

COUNT = 0
K = 0
DO 1 N = 1, 3
   RANK(K) = 0
1 CONTINUE

TLC54-RRTLC(3)
TLC89-RRTLC(4)
TLC50-RRTLC(5)
IF (((TLC50.LE.TLC54).AND.(TLC50.LE.TLC89)) GOTO 2
IF (((TLC54.LE.TLC89)) AND (TLC54.LE.TLC50)) GOTO 3
IF (((TLC89.LE.TLC54)) AND (TLC89.LE.TLC50)) GOTO 4

2 RANK(1) = 50
IF (TLC54.LE.TLC89) THEN
   RANK(2) = 54
   RANK(3) = 89
   GOTO 5
ELSE
   RANK(2) = 89
   RANK(3) = 54
GOTO 5
ENDIF
RETURN
C
3 RANK(1) = 54
IF (TLC50.LE.TLC89)THEN
  RANK(2) = 50
  RANK(3) = 89
  GOTO 5
ELSE
  RANK(2) = 89
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
4 RANK(1) = 89
IF (TLC50.LE.TLC54)THEN
  RANK(2) = 50
  RANK(3) = 54
  GOTO 5
ELSE
  RANK(2) = 54
  RANK(3) = 50
  GOTO 5
ENDIF
RETURN
C
C ** RANK DETERMINED **
C
5 COUNT = COUNT + 1
IF (RANK(COUNT).EQ.50)GOTO 10
IF (RANK(COUNT).EQ.54)GOTO 20
IF (RANK(COUNT).EQ.89)GOTO 30
C
C This portion used if Bldg 50 has smallest utilization
C
IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0)THEN
  CALL ENTER(10,ATRIB)
  RETURN
ELSE
  IF (COUNT.LT.3)GOTO 5
  IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN
C
C
279
C This portion used if Bldg 54 has smallest utilization
C
C
IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0)THEN
    CALL ENTER(11,ATRIB)
    RETURN
ELSE
    IF (COUNT.LT.3)GOTO 5
    IF (COUNT.GE.3)GOTO 90
ENDIF
RETURN
C
C This portion used if Bldg 89 has smallest utilization
C
C
30 IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4)GOTO 32
IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0)THEN
    CALL ENTER(12,ATRIB)
    RETURN
ELSE
    IF (COUNT.LT.3)GOTO 5
    IF (COUNT.GE.3)GOTO 90
ENDIF
90 CALL FILEM(5,ATRIB)
99 RETURN
END
C
C**************************************************************
C THIS IS SUBROUTINE FCPAINT
C**************************************************************
C
SUBROUTINE FCPAINT
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100),DD(100),DDL(100),DTNOW,II,MFA,MSTOP,NCLNR
1,NCRDR,NPRNT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)
C
COUNT = 0
K = 0
DO 1 N = 1, 3
RANK(K) = 0
1 CONTINUE
C
TLC54-RRTL(3)
TLC89-RRTL(4)
TLC50-RRTL(5)
IF ((TLC50.LE.TLC54).AND.(TLC50.LE.TLC89))GOTO 2
IF ((TLC54.LE.TLC89).AND.(TLC54.LE.TLC50))GOTO 3
IF ((TLC89.LE.TLC54).AND.(TLC89.LE.TLC50))GOTO 4
2 RANK(1) = 50
   IF (TLC54.LE.TLC89) THEN
      RANK(2) = 54
      RANK(3) = 89
      GOTO 5
   ELSE
      RANK(2) = 89
      RANK(3) = 54
      GOTO 5
   ENDIF
   RETURN
3 RANK(1) = 54
   IF (TLC50.LE.TLC89) THEN
      RANK(2) = 50
      RANK(3) = 89
      GOTO 5
   ELSE
      RANK(2) = 89
      RANK(3) = 50
      GOTO 5
   ENDIF
   RETURN
4 RANK(1) = 89
   IF (TLC50.LE.TLC54) THEN
      RANK(2) = 50
      RANK(3) = 54
      GOTO 5
   ELSE
      RANK(2) = 54
      RANK(3) = 50
      GOTO 5
   ENDIF
   RETURN
C ** RANK DETERMINED **
C
5 COUNT = COUNT + 1
   IF (RANK(COUNT).EQ.50) GOTO 10
   IF (RANK(COUNT).EQ.54) GOTO 20
   IF (RANK(COUNT).EQ.89) GOTO 30
C
C This portion used if Bldg 50 has smallest utilization
C
   IF (NRUSE(5).EQ.0.AND.NNQ(10).EQ.0) THEN
CALL ENTER(13, ATRIB)
RETURN
ELSE
12   IF (COUNT.LT.3) GOTO 5
    IF (COUNT.GE.3) GOTO 90
ENDIF
RETURN

C
---
C This portion used if Bldg 54 has smallest utilization
C---
C
    IF (NRUSE(3).EQ.0.AND.NNQ(11).EQ.0) THEN
      CALL ENTER(14, ATRIB)
      RETURN
    ELSE
      22   IF (COUNT.LT.3) GOTO 5
      IF (COUNT.GE.3) GOTO 90
    ENDIF
RETURN

C
---
C This portion used if Bldg 89 has smallest utilization
C---
C
30   IF (ATRIB(15).EQ.1.OR.ATRIB(15).EQ.2.OR.ATRIB(15).EQ.4) GOTO 32
    IF (NRUSE(4).EQ.0.AND.NNQ(12).EQ.0) THEN
      CALL ENTER(15, ATRIB)
      RETURN
    ELSE
      32   IF (COUNT.LT.3) GOTO 5
      IF (COUNT.GE.3) GOTO 90
    ENDIF
90   CALL FILEM(6, ATRIB)
99   RETURN
END
C
**** SUBROUTINE WEA_5_FC
C*************************
C SUBROUTINE WEA_5_FC
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR
1, NCRDR, NFRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)

C TLC89=RRTL(4)
TLC50=RRTL(5)
IF (TLC50.LE.TLC89) GOTO 4
IF (TLC89.LE.TLC50)GOTO 2
C
2 IF (NRUSE(4).EQ.0) THEN
   CALL ENTER(15, ATRIB)
   RETURN
ELSE
   CALL ENTER(13, ATRIB)
   RETURN
ENDIF
C
4 IF (NRUSE(5).EQ.0) THEN
   CALL ENTER(13, ATRIB)
   RETURN
ELSE
   CALL ENTER(15, ATRIB)
   RETURN
ENDIF
END
C
******************************************************************************************
C THIS IS SUBROUTINT WEA_5_MINU
******************************************************************************************
C
SUBROUTINE WEA_5_MINU
DIMENSION RANK(5)
COMMON/SCOM1/ATRIB(100), DD(100), DDL(100), DTNOW, II, MFA, MSTOP, NCLNR, 1, NCRDR, NPRNT, NNRUN, NNSET, NTAPE, SS(100), SSL(100), TNEXT, TNOW, XX(100)
C
UTL89=RRAVG(4)
UTL50=RRAVG(5)
IF (UTL50.LE.UTL89)GOTO 4
IF (UTL89.LE.UTL50)GOTO 2
C
2 IF (NRUSE(4).EQ.0) THEN
   CALL ENTER(15, ATRIB)
   RETURN
ELSE
   CALL ENTER(13, ATRIB)
   RETURN
ENDIF
C
4 IF (NRUSE(5).EQ.0) THEN
   CALL ENTER(13, ATRIB)
   RETURN
ELSE
   CALL ENTER(15, ATRIB)
   RETURN
ENDIF
END
C
SUBROUTINE OTPUT
COMMON/SCOM1/AIRIB(100),DD(100),DDL(100),DTNOW,II,MFA,MSTOP,NCLNR
1,NCRDR,NPRRT,NNRUN,NNSET,NTAPE,SS(100),SSL(100),TNEXT,TNOW,XX(100)

COLLECT TIME IN SYSTEM STATS

WRITE(2,*), CCAVG(9), CCAVG(1), CCAVG(12), CCAVG(15), CCAVG(18)

COLLECT UTILIZATION RATES

WRITE(3,*), RRAVG(3), RRAVG(4), RRAVG(5), CCAVG(22), RRAVG(1)

COLLECT COMPLETION TIMES

WRITE(4,*), CCMAX(2), CCMAX(13), CCMAX(16), CCMAX(23), CCMAX(31)

COLLECT COUNTS BY FY93

WRITE(8,*), CCNUM(8), CCNUM(14), CCNUM(17), CCNUM(24), CCNUM(32)

COLLECT WAIT TIMES (ONLY THOSE WHO WAIT)

WRITE(1,*), FFAWT(3), FFAWT(4), FFAWT(5), FFAWT(6), FFAWT(12)

COLLECT TOTAL WAIT TIMES

WRITE(9,*), CCAVG(3), CCAVG(4), CCAVG(5), CCAVG(6), CCAVG(7)
Bibliography


Captain David V. McElveen was born October 29, 1964 in Savannah, Georgia. He graduated from Coral Springs High School in Coral Springs, Florida in 1982 and attended Cornell College in Mt Vernon, Iowa, and Georgia Southern College in Statesboro, Georgia graduating with a Bachelor of Science in Electrical Engineering Technology in August 1986. Upon graduation, he was selected for Officer Training School at Lackland AFB, Texas where he received his commission into the USAF on 16 January, 1987. His first tour of duty was as a product assurance engineer and lead system engineer at Training Systems System Program Office, Aeronautical Systems Division, Air Force Systems Command, Wright Patterson AFB, Ohio. There he was responsible for directing and evaluating reliability and maintainability aspects of evolving Air Force training systems as well as serving as lead engineer on the KC-135 Operational Flight Trainer Refurbishment and the C-5A/C-141B Aerial Refueling Part Task Trainer. He entered the School of Engineering, Air Force Institute of Technology, in August 1990.

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The purpose of this research was to determine the effects of configuration options and dispatching rules on aircraft throughput for the WR-ALC paint/depaint facilities. A simulation model was constructed and used for this analysis as the primary means to conduct the research. The dispatching rules considered were first come first served, largest number in queue, shortest processing time, and a look ahead heuristic.

Due to a reduction in the number of paint aircraft, no configuration option differing from the baseline significantly affected aircraft throughput. Dispatching rules were also found to produce no significant differences on aircraft throughput. Configuration options were found to produce significant differences in wait time. Only when the proportion of aircraft requiring paint was increased did the shortest processing time dispatching rule provide significant differences in aircraft wait times.