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AUTOMATING SATELLITE RANGE SCHEDULING

THESIS

S. Michael Schalck, Captain, USAF

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AUTOMATING SATELLITE RANGE SCHEDULING

THESIS

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S. Michael Schalck, B.S.

Captain, USAF

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COMMITTEE:	NAME/DEPARTMENT	SIGNATURE
Co-Advisor	Lt Col James T. Moore / ENS	James T. Moore
Co-Advisor	Maj John J. Borsi / ENS	John J. Borsi

Preface

Satellite range scheduling (SRS) is a complex process. I obtained invaluable advice and information in understanding how satellite supports are scheduled. I would like to thank Ken Chambers of the 21 SOPS, Onizuka AFB, CA, John List, Paramax Systems Corporation, and Mitch Finney, 22 SOPS, Falcon AFB, CO, for their technical assistance and support.

Developing an algorithm to automate SRS and writing a thesis document are complex processes. I obtained invaluable advice and information in understanding how to approach both problems. Thank you Captain Tim Gooley for your effort and support in this research. I would also like to especially thank Major John Borsi and Lieutenant Colonel James Moore for their patience, insight, and guidance.

Life at AFIT and in general is a complex process. I obtained invaluable advice and information in understanding how to approach life. Thanks to all my friends and family. Your support and understanding continually uplift me. A special thanks to my mother, my best friend and sanity check. Finally, I would like to thank my Lord for his love, all I do is for his glory.

S. Michael Schalck

Table of Contents

List of Figures

List of Tables

Abstract

The objective of this study was to develop a computer based satellite range scheduling (SRS) algorithm to create a 24 hour satellite support schedule. The algorithm's goal was to schedule as many satellite support requests as possible.

An iterative heuristic approach was used to schedule satellite support requests in three successive sub problems. The first sub problem involves scheduling low altitude satellite support requests using a mixed integer programming approach. The next two sub problems each involve scheduling 12 hour blocks of medium and high altitude satellite support requests, again using a mixed integer programming approach.

Fourteen 24 hour schedules were generated using actual data with encouraging results. At least 95 percent of the satellite support requests were scheduled for each day. These results are in-line with results obtained by range schedulers and previous studies. Because of the promising results, this algorithm may be used to automate a portion of the satellite range scheduling problem.

AUTOMATING SATELLITE RANGE SCHEDULING

I. INTRODUCTION

Overview

Complex, earth-orbiting satellites perform the necessary functions to provide the capabilities required for space support, operation, and control. Although efforts are being made to increase the autonomy of space systems, satellites generally require frequent ground contact to maintain operational health and to transfer satellite mission data. Many satellite systems use the Air Force Satellite Control Network (AFSCN) to communicate with the appropriate ground center.

The AFSCN provides the hardware, software and personnel that allow communication between the satellite and the personnel responsible for the operation and/or mission of the satellite. The AFSCN consists of remote tracking stations (RTSs), communication lines, mission control complexes (MCCs), and resource control complexes (RCCs).

RTSs are located around the world and have one to four antennas and the equipment required to communicate with satellites. Each antenna communicates with one satellite at a time. Because the antenna must track the satellite in order to communicate, satellites must be visible (above the horizon) to the RTS for a support to be scheduled. Communicating with a satellite includes down-linking satellite status telemetry, tracking the satellite, and sending commands to the satellite. Each MCC is responsible for determining the support requirements for the satellites it controls and making satellite

support requests to the RCCs. The RCCs are responsible for allocating RTS time to each MCC in order to meet satellite program requirements. Schedulers in the RCC match satellite support requests from the MCC to a particular RTS.

Satellite range scheduling is the matching of satellite support requests with available and visible RTS antennas. Given the finite number of RTS antennas and the visibility constraints of each satellite, the RCC needs to schedule the maximum number of satellite support requests possible during a 24-hour period. A more detailed explanation of each of the AFSCN component's responsibilities and relationships in the next section defines the scheduling process and the problems encountered.

Background.

Satellite. A satellite is any object which orbits around a larger object and follows the physical laws of orbital mechanics. Presently, millions of objects, mostly debris, orbit the earth, but only tens of thousands are larger than one centimeter in diameter. The United States Space Surveillance Center tracks and catalogs less than ten thousand of the objects which are greater than ten centimeters in diameter. The AFSCN supports around one hundred man-made, operational satellites on a regular basis. These are the satellites referred to for the balance of this thesis.

Satellites are placed at orbital altitudes based on the satellite's intended function and are frequently classified as low, medium, or high altitude. Low altitude satellites have orbital altitudes between 100 and 200 nautical miles in mostly polar orbits. These satellites have the most restrictive RTS visibilities because they are visible over a particular RTS for only 2.5 to 15 minutes. Medium altitude satellites orbit between 1,000 and 12,000 nautical miles above the earth with pass durations over RTSs ranging between 20 minutes and 11 hours. High altitude satellites orbit at altitudes exceeding 12,000 nautical miles with RTS visibilities varying between eleven hours and continuous visibility. As the orbital altitude of a satellite increases, the amount of time the satellite is visible to a RTS

generally increases. RTS visibility and support criticality determine how restrictive a support is in the scheduling process.

Mission Control Complex. A Mission Control Complex (MCC) or Satellite Operations Center (SOPC) is the personnel and equipment that carry out the day to day activities involved with operational control of a particular satellite system. Satellite programs are grouped together in MCCs. Programs with similar support requirements and functions are usually located in the same MCC. Each MCC is responsible for determining the support requirements for its satellites. A MCC will provide the following information to the RCC for each requested support: Greenwich Mean Time (GMT) and tolerance in which the support can be scheduled, length of time required for the support, RTS visibility, RTS set-up time (called RTS turn-around time), and special requests for equipment. The period of time the satellite is visible to a RTS is commonly called a pass. Because of the short visibilities associated with low altitude satellites, the entire time the low altitude satellites are visible to a RTS is scheduled for each support. This is an important differentiation between low altitude satellites and all other satellites. No scheduling tolerance is provided by the MCC to the RCC for scheduling of low altitude satellites while the MCC does provide a scheduling tolerance for other satellites.

Remote Tracking Station. Remote tracking stations (RTSs) are located around the world and consist of one to four antennas and the equipment required to communicate with satellites. Each antenna-equipment package is termed a RTS side. Each antenna can communicate with at most one satellite at a time. The total number of antenna sides is the limiting factor of the AFSCN. Because the antenna must track the satellite in order to communicate, satellites must be visible to the RTS for a support to be scheduled. Communicating with a satellite includes down-linking satellite status telemetry, tracking the satellite, and sending commands to the satellite.

Currently, there are sixteen RTS sides which can perform these three general functions in the AFSCN. There are several additional antennas which are called data-link-terminal (DLT) stations. These stations support satellite program specific data-processing and display (DPAD) supports. A DPAD support is relatively lengthy and is routinely handled by a DLT station; however, a DPAD support can be handled by the sixteen general antennas when necessary.

RTSs periodically schedule downtime for maintenance. Some of these downtimes are important enough to be considered "protected", indicating no flexibility in scheduling the downtime. Satellite supports and RTS down-times cannot be done simultaneously.

Resource Control Complex. The Resource Control Complex contains the equipment and schedulers needed to match satellite support requests from a MCC to a particular RTS side. Conflicts exist when two support requests compete for the same resource or RTS side and cannot be scheduled at some other available RTS side. When conflicts cannot be avoided, schedulers notify the appropriate MCCs to de-conflict the support requests among themselves. This process involves one or more MCCs changing one of the following: the time or tolerance for a support when RTS visibility allows, the length of a support, or, when both the RTS and MCC agree, the RTS setup time before a support .

Satellite Range Scheduling Process. Schedules for each day are started about two weeks before implementation. The requests for supports generated by a MCC for each satellite are listed on a program action plan (PAP) and received by the schedulers at the RCC. The requests allow the schedulers to begin building a feasible schedule and identifying problem requests. As they become available, RTS personnel will provide downtime information and MCCs controlling low altitude satellites will provide support requests. MCCs controlling low altitude satellite programs generally do not submit PAPs because visibilities change too much to predict support times accurately until

approximately 24 hours prior to the required support, so for low altitude satellite programs, MCCs submit support requests anytime during the 24 hours prior to the requested support time.

In general, the schedulers tentatively schedule the relatively flexible PAP requests first, and insert the more restrictive low altitude satellite supports and protected RTS downtimes into the schedule as they become available. The low altitude satellite supports and protected downtimes almost always take priority over the medium and high altitude satellite support requests and unprotected downtimes. The schedule does not become firm until these low altitude satellite requests are received and scheduled by the RCC schedulers.

The schedule generation process can be divided into four separate phases: 1) generation of a "seven day" schedule, 2) generation of an initial 24 hour schedule, 3) conflict resolution, and 4) real-time scheduling.

The first phase in generating a daily schedule is collecting all the support requests for the week-long period starting two weeks later. These requests are received via PAPs from the MCCs supporting high and medium altitude satellites. These relatively long-range requests are randomly scheduled around the RTS-requested downtimes creating a tentative schedule which is distributed back through the AFSCN one week in advance. This schedule is called a seven day schedule and is not firm because the more restrictive low altitude satellite supports are not included. The schedule is used by AFSCN components to ensure all requests have been received and acknowledged by the RCC.

After the seven day schedule has been published, the schedule will be updated iteratively as requests for low altitude satellite supports and RTS downtimes are received to produce an initial 24 hour schedule. Scheduling priority generally reflects the flexibility associated with each request. The more restrictive low altitude satellite support requests usually take precedence over the more flexible medium and high altitude satellite support

requests. However, a medium or high altitude satellite support request can take scheduling priority if the satellite support is critical to the satellite's mission.

RTS downtimes can be classified as 1) routine maintenance, or 2) major maintenance/modification. Routine maintenance is generally quite flexible and the requirements are known in advance. These downtimes are handled much like a high altitude satellite request and are often re-scheduled in order to schedule a more restrictive, higher priority request. Major maintenance or modification includes equipment malfunction and often is short notice with little flexibility. The scheduling of this latter downtime type ranges from low altitude satellite-like scheduling to real-time schedule changes. As these downtimes are realized, they are incorporated into the schedule.

The conflict resolution phase is the 24 hour period prior to real-time and begins with the process of de-conflicting the initial 24 hour schedule. All support and downtime requests have been scheduled and conflicts have been identified in the initial 24 hour schedule. The schedulers call the MCC personnel and/or RTS personnel involved in each conflict; options may be identified and the personnel will be expected to resolve the conflict by changing one of the following: the time or tolerance for a support if RTS visibility allows, the length of a support, or the RTS setup time before a support if the RTS and MCC agree. If the conflict cannot be resolved in this manner, a support request will be canceled. In any conflict situation, all involved personnel will be notified and expected to resolve the conflict.

Real-time scheduling occurs after a conflict-free 24 hour schedule is published and becomes the official schedule for the present day. Changes to this schedule would include satellite vehicle problems, RTS problems, changing mission requirements, incorrect requests by a MCC, or incorrect processing of a request by the schedulers. Changes to the published 24 hour schedule can affect up to one third of the scheduled requests during this phase. Changes to the schedule follow a formal priority system. By following this

system, schedulers can quickly and efficiently determine which support request takes priority when a real-time change occurs and causes a conflict.

Research Objective

The objective of this research is to develop a computer-based, automated scheduling algorithm that generates a feasible, conflict-free schedule. This algorithm should schedule an amount of requests comparable to the current RCC process. Maximizing the number of conflict free supports is analogous to minimizing the number of conflicts in the schedule. Schedulers presently consider all conflicts as equal because, from the scheduler's viewpoint, the same amount of effort is needed for resolving any conflict.

Assumptions

The first assumption is that the satellite range scheduling problem is a static problem. This implies all required data is present in time for the algorithm to be executed before the schedule is needed. Because care has been taken to ensure the algorithm can be accomplished in a reasonable amount of time, this assumption is fairly valid. Limited experience indicates the algorithm needs around two hours to complete a schedule.

The second assumption is that a clear scheduling hierarchy can be established so that requests can be grouped into appropriately sized problems which can be easily solved with current computer resources. Dividing the requests by the restrictivity of each request mirrors the current process.

The third assumption is that all lengthy DPAD supports can be supported by the program specific DLT RTSs. This assumption is made to avoid addressing the process of dividing long supports into smaller, easier to schedule, time periods. This may be an area where further research is warranted and is addressed in the recommendations section of Chapter V.

The fourth assumption is that every visible RTS side is a candidate to fulfill a support request. This assumption simplifies the testing of the algorithm but is not a limitation of the developed algorithm.

The final assumption is that all RTS set-up times or "turn-around" times are standard for low altitude satellites and all other satellites. Twenty minutes was used for low altitude satellites and fifteen minutes was used for all others. These values were used for simplicity and are generally accurate representations. The algorithm can easily handle fluctuations in these times if a look-up table routine is developed to incorporate different times in the support requests.

II. LITERATURE REVIEW

Overview

This chapter outlines information on the satellite range scheduling (SRS) problem. Specifically, an outline of the work done by Captain Tim Gooley in his thesis study titled *Automating the Satellite Range Scheduling Process* is presented followed by a discussion of mixed integer programming (MIP).

Captain Gooley's Formulation

Captain Gooley developed an algorithm for the SRS problem that successfully scheduled around 90 percent of the support requests for a six day period (5:5-2). His algorithm (see Figure 2.1) used a MIP linking procedure for low altitude satellite support requests and an insertion procedure for the medium and high altitude satellite support requests. After each scheduling procedure, a schedule improvement procedure involving interchanging supports was implemented. The MIP formulation Captain Gooley developed was the basis for developing the SRS algorithm in this study.

Mixed Integer Programming

A MIP problem is a linear programming (LP) problem in which some of the variables are required to be non-negative integers (7:446). A generalized branch and bound method for solving MIP problems finds an optimal solution by solving a series of LP relaxations of the MIP problem. The LP relaxation of a MIP problem contains the same problem formulation used in the MIP problem with the elimination of all integer constraints on the variables (7:446). Additional linear constraints are subsequently introduced to bound the variables that were previously required to be integers. Each solution of a LP relaxation of the MIP provides a bound on the best solution possible for the particular MIP problem.

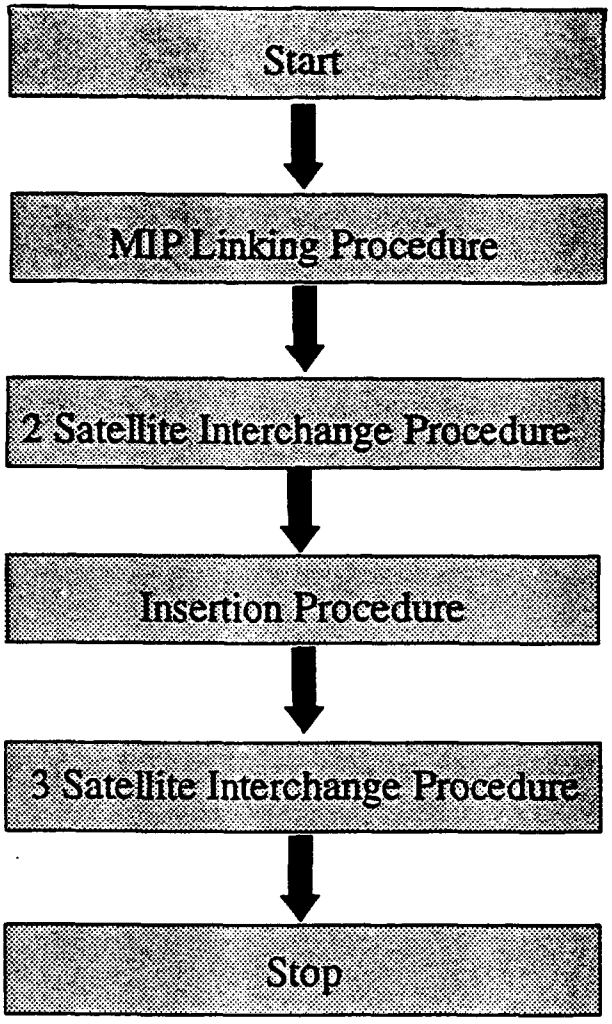

Figure 2.1 Captain Gooley's Algorithm

Solving a MIP problem on a computer can take a long time. Often, terminating criteria are established making computer run times considerably shorter for very complex problems. One method terminates the generalized branch and bound process when a solution within a fixed percentage of the best bound generated in the LP relaxation is reached. This method generally reduces computer run times, but cannot be used to **manage** MIP problem solution computer run times.

III. APPROACH

This chapter includes an overview of the satellite range scheduling (SRS) problem, the formulation of a mixed integer program (MIP) for the SRS problem, an analysis of the MIP formulation, a heuristic approach to the SRS problem, and an outline of the automated SRS algorithm.

Satellite Range Scheduling Problem

The SRS problem involves the scheduling of a large number of time dependent requests for a limited number of resources. A best or optimal schedule is one that schedules the maximum number of requests. Ideally, an automation of the SRS problem will provide an optimal schedule. Therefore, optimization routines are a logical starting point for investigation when developing an algorithm for the SRS problem. When solving scheduling problems where a decision variable can be represented as a binary variable, a mixed integer program approach is often used. In the SRS problem, the scheduling of a support request at a particular RTS side is represented as a binary decision variable and the start time of a scheduled support is a continuous variable.

Mixed Integer Programming Formulation

The objective of the scheduling problem is to maximize the number of supports scheduled. This is the same as minimizing the number of conflicts the scheduler has to resolve. Constraints include: 1) the number of RTS sides, 2) each support must be scheduled only once and within its visibility window, 3) for medium and high altitude satellites, each support must be scheduled within its tolerance window, and 4) no overlapping supports may be scheduled at the same RTS side. Overlapping supports are defined as two support requests scheduled at the same RTS side with any portion of the support times intersecting. Support time includes the RTS turn-around-time or pre-pass time associated

with a support as well as the actual support duration. The balance of this section will detail a MIP formulation of this problem.

Input Parameters. Input parameters are the known constants which are used to define and constrain the decision variables. In the following definitions, the index *i* refers to a particular support request, the index *h* refers to a particular support request that is not *i*, the index *j* refers to a particular RTS side, and the value *n* refers to the number of support requests in a MIP formulation. Using these indices, the input parameters for the SRS MIP formulation are defined as:

$\mathbf{BV_{ij}}$ - Beginning of low altitude satellite visibility window or medium or high altitude satellite tolerance window for support *i* at RTS *j*.

$\mathbf{EV_{ij}}$ - Ending of low altitude satellite visibility window or medium or high altitude satellite tolerance window for support *i* at RTS *j*.

$\mathbf{R_{ij}}$ - Length of requested support *i* at RTS *j*.

$\mathbf{TO_i}$ - RTS set-up or turn-around time for support *i*.

$\mathbf{RTS_i}$ - set of RTS sides where support *i* is feasible.

M - large positive constant value.

The following sets are defined so that for every pair of supports *i* and *h* that can overlap at an RTS side *j*, the *ihj* combination will be a member of exactly one set.

D12 - set of overlapping support request combinations at a particular RTS side *j* where both requests can be feasibly scheduled only with support *i* before support *h* at *j* (see Figure 3-1).

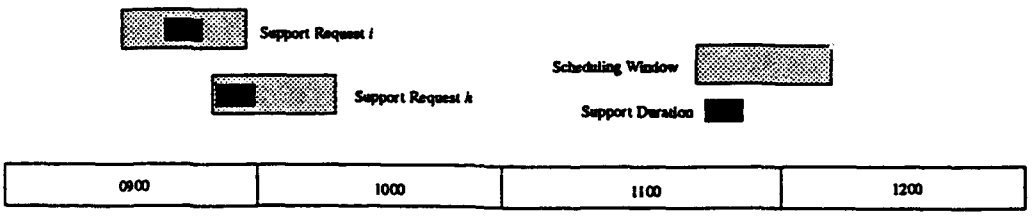

Figure 3.1 Support Request Combinations in D12

D21 - set of overlapping support requests combinations at a particular RTS side *j* where both requests can be feasibly scheduled only with support *h* before support *i* at *j* (see Figure 3-2).

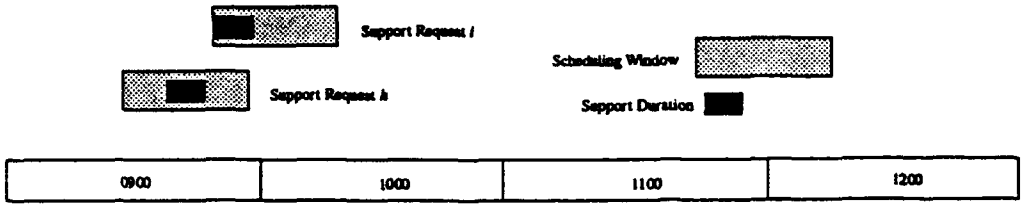

Figure 3.2 Support Request Combinations in D21

DE - set of overlapping support requests combinations at a particular RTS side *j* where both requests can be feasibly scheduled in either order at *j* (see Figure 3-3).

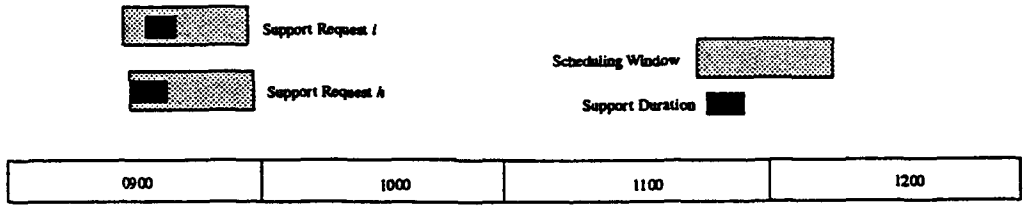

Figure 3.3 Support Request Combinations in DE

DN - set of overlapping support requests combinations at a particular RTS side *j* where **both** requests cannot be feasibly scheduled at *j* (see Figure 3-4).

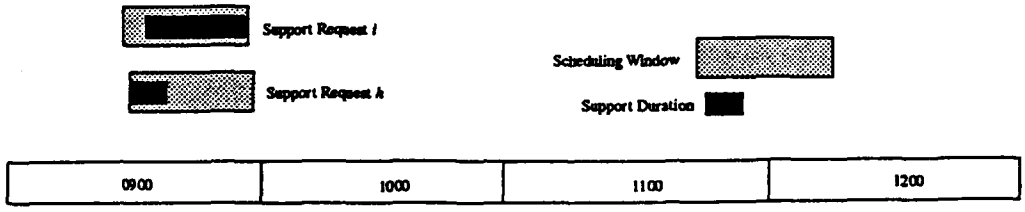

Figure 3.4 Support Request Combinations in DN

Decision Variables. There are three sets of decision variables. Two of the sets of decision variables are used to generate the schedule and the third set is used to ensure feasibility of the schedule.

The first set of decision variables, X_{ij}, are the binary variables which are set to one if support i is scheduled at RTS side j, otherwise they are set to zero.

$$X_{ij} = \begin{cases} 1 & \text{if support } i \text{ at RTS side } j \quad \forall i,\ j \in RTS_i \\ 0 & \text{otherwise} \end{cases}$$

For each i there can be at most one X_{ij} equal to one.

The second set of decision variables used in determining the schedule, ST_{ij}, indicates the start time for support i at RTS side j. This decision variable is constrained by the visibility or tolerance window along with the availability of RTS side j. ST_{ij} is a continuous, non-negative variable.

The third set of decision variables, y_{ihj}, is used to determine the order of supports i and j which are scheduled at RTS side j. It is used when supports i and j can both be feasibly scheduled with either one occurring before the other. In this case, constraints can be developed to ensure the scheduled supports do not overlap. This decision variable, y_{ihj}, is a binary variable which is set to one if support h starts before support i at RTS side j. If support i starts before support h at RTS side j, then y_{ihj} is set to zero.

$$y_{ihj} = \begin{cases} 1 & \text{if } ST_{hj} < ST_{ij} \quad i \neq h \\ 0 & \text{if } ST_{hj} \geq ST_{ij} \end{cases}$$

SRS MIP Formulation. Using the indices, input parameters, and decision variables explained above, the SRS MIP problem can be formulated as:

Objective Function:

$$Maximize \sum_{i=1}^{n} \sum_{j \in RTS_i} X_{ij} \quad \textbf{(3-1)}$$

Subject to:

$$\sum_{j \in RTS_i} X_{ij} \leq 1 \quad i = 1 \cdots n \quad \textbf{(3-2)}$$

$$ST_{ij} \geq BV_{ij} * X_{ij} \quad i = 1 \cdots n, \quad \forall j \in RTS_i \quad \textbf{(3-3)}$$

$$ST_{ij} \leq (EV_{ij} - R_{ij}) * X_{ij} \quad i = 1 \cdots n, \quad \forall j \in RTS_i \quad \textbf{(3-4)}$$

$$ST_{hj} - ST_{ij} + .5 \leq M(1 - y_{ihj}) \quad \forall (i,h,j) \in DE \quad \textbf{(3-5)}$$

$$ST_{ij} - ST_{hj} \leq M * y_{ihj} \quad \forall (i,h,j) \in DE \quad \textbf{(3-6)}$$

$$ST_{ij} + R_{ij} + TO_k \leq ST_{hj} + M * y_{ihj} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in DE \quad \textbf{(3-7)}$$

$$ST_{hj} + R_{hj} + TO_i \leq ST_{ij} + M(1 - y_{ihj}) + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in DE \quad \textbf{(3-8)}$$

$$ST_{ij} + R_{ij} + TO_k \leq ST_{hj} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in D12 \quad \textbf{(3-9)}$$

$$ST_{hj} + R_{hj} + TO_i \leq ST_{ij} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in D21 \quad \textbf{(3-10)}$$

$$X_{ij} + X_{hj} \leq 1 \quad \forall (i,h,j) \in DN \quad \textbf{(3-11)}$$

$$X_{ij} \in \{0,1\}$$

$$y_{ihj} \in \{0,1\}$$

$$ST_{ij} \geq 0 \quad \forall i, \quad j \in RTS_i$$

MIP Analysis

The objective function maximizes the number of supports scheduled:

$$Maximize \sum_{i=1}^{n} \sum_{j \in RTS_i} X_{ij} \quad \textbf{(3-1)}$$

Equation (3-1) has a X_{ij} variable for every possible RTS side-request combination.

Subject to:

Schedule each support request at most once. Constraint (3-2) insures a support request is not scheduled at more than one RTS side. One constraint is generated for each support request i and a X_{ij} decision variable is created for every feasible RTS side j.

$$\sum_{j \in RTS_i} X_{ij} \leq 1 \quad i = 1 \cdots n \tag{3-2}$$

Schedule each support request in its visibility or tolerance window. Each support request has a time window in which the support can be scheduled. For a low altitude satellite, the window is determined by the RTS visibility. For medium and high altitude satellites, a MCC requested time and tolerance along with RTS side availability will determine the window in which a support can be scheduled. A scheduled support must start after the beginning of the window and conclude before the end of the window. Two constraints are active for each scheduled request.

$$ST_{ij} \geq BV_{ij} * X_{ij} \quad i = 1 \cdots n, \quad \forall j \in RTS_i \tag{3-3}$$

$$ST_{ij} \leq (EV_{ij} - R_{ij}) * X_{ij} \; i = 1 \cdots n, \; \forall j \in RTS_i \tag{3-4}$$

Schedule no overlapping supports. RTS sides can support only one satellite at a time. Therefore, if two support requests are scheduled at the same RTS side, the following constraints ensure no portion of their service times overlap. Service time includes the RTS set-up time or turn-around time and the actual support time. When overlapping support requests are constrained to a particular scheduling order or to only support i or support h scheduled at RTS side j, by their support scheduling windows, y_{ihj} variables will not be generated. When more y_{ihj} variables are introduced into the MIP formulation than necessary, these binary variables exponentially increase the problem complexity and computer run time. By using all the information in the support requests, the number of y_{ihj} variables can be kept to a minimum. Equations (3-5) and (3-6) are

used to define the y_{ihj} variables when appropriate. Equation (3-5) sets y_{ihj} to zero when ST_{hj} is greater than (after) ST_{ij}. Equation (3-6) sets y_{ihj} to one when ST_{hj} is less than (before) ST_{ij}.

$$ST_{hj} - ST_{ij} + .5 \leq M(1 - y_{ihj}) \quad \forall (i,h,j) \in DE \tag{3-5}$$

$$ST_{ij} - ST_{hj} \leq M * y_{ihj} \quad \forall (i,h,j) \in DE \tag{3-6}$$

Equations (3-7) and (3-8) are required under the same conditions as Equations (3-5) and (3-6) and ensure scheduled supports do not overlap. One of the two constraints is active, depending on the value of y_{ihj}, when both supports are scheduled at RTS_j.

$$ST_{ij} + R_{ij} + TO_h \leq ST_{hj} + M * y_{ihj} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in DE \tag{3-7}$$

$$ST_{hj} + R_{hj} + TO_i \leq ST_{ij} + M(1 - y_{ihj}) + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in DE \tag{3-8}$$

Equations (3-5), (3-6), (3-7), and (3-8) are generated for every overlapping support request-RTS side visibility combination where the order of the scheduled supports is not constrained by the scheduling windows

. If two support requests at a particular RTS side overlap and the two supports can be scheduled in only one order, that is, one support must be scheduled before the other in order for both supports to be scheduled at the same RTS side j, one of the following constraints is active:

$$ST_{ij} + R_{ij} + TO_h \leq ST_{hj} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in D12 \tag{3-9}$$

$$ST_{hj} + R_{hj} + TO_i \leq ST_{ij} + M(1 - X_{ij}) + M(1 - X_{hj}) \quad \forall (i,h,j) \in D21 \tag{3-10}$$

These equations ensure no overlap of scheduled supports occur given the set order in which the supports must occur if they are both scheduled at the same RTS side.

The only remaining case is when both supports cannot be feasibly scheduled at the same RTS side. When this condition is met, the following constraint is generated:

$$X_{ij} + X_{hj} \leq 1 \quad \forall (i,h,j) \in DN \tag{3-11}$$

This constraint allows at most one of the two support requests to be scheduled at a particular RTS side.

The y_{ihj} variable is not used if $ihj \in$ DN. Overlapping low altitude satellite reques ; are members of the set DN and cannot be feasibly scheduled at a particular RTS side j, so the y_{ihj} variable is not required in the scheduling of low altitude satellites.

The SRS problem is too large for a MIP formulation containing all the support requests for a single day to be practical. When solving MIP formulations which included all the support requests for a 24 hour period, it routinely took days to reach an acceptable solution. For the purposes of this study, one hour of computer processing time was considered reasonable for generating a 24 hour schedule. Therefore, a heuristic method is used to solve the SRS problem.

SRS Heuristic

Because computer run times make a MIP formulation with all the support requests for an entire day impractical, a heuristic approach was developed to limit computer run time and find an acceptable schedule. Figure 3.5 outlines the heuristic approach used. The first step in the process is to separate the requests into smaller problems with fewer requests. The smaller problems are solved iteratively one at a time, ensuring subsequent iterations do not change the schedule developed by earlier iterations. The smaller problems are solved with a MIP formulation approach. Finally, the blocks of scheduled requests are combined into a 24 hour schedule. Implementing this approach requires a logical criteria for dividing the similar support requests into blocks.

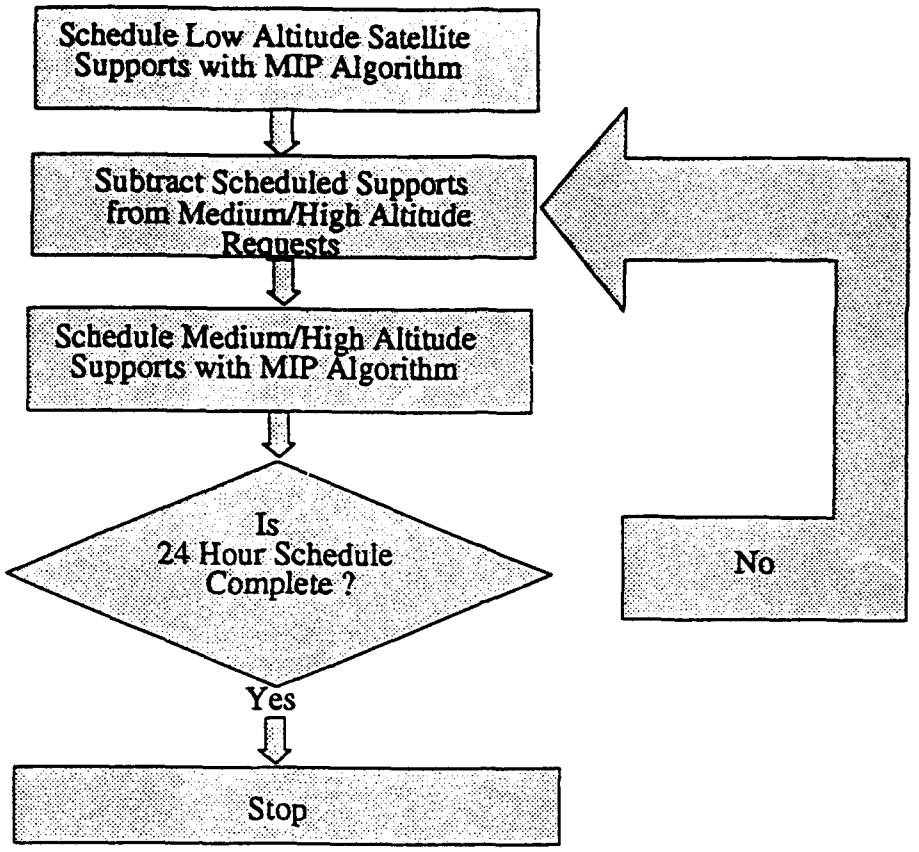

Figure 3.5 SRS Scheduling Algorithm

Altitude Division. Because low altitude satellite support requests take precedence over medium and high altitude satellite support requests, a natural division of the requests exists. By dividing the SRS problem between the low altitude satellite support requests and all other satellite support requests and scheduling the low altitude satellite supports first, the opportunity to optimally schedule as many low altitude satellite support requests as possible is maintained. Subsequent scheduling of the medium and high altitude satellites using an optimization routine cannot guarantee scheduling as many of these as possible.

Time Division. No known precedence criteria exists for dividing the remaining medium and high altitude satellite support requests. This remaining block of support requests, when introduced into the MIP formulation, generate enough discrete variables to make solution time unreasonable. To overcome this problem, the requests are sorted by start time and divided into blocks of less than 24 hours. Testing shows splitting the medium and high altitude requests into 12 hour blocks resulted in reasonable computation times.

MIP Termination. A branch and bound process is used to solve each MIP problem. Complex problems take a long time to solve when every branch in the problem is required to be explored. Termination conditions are used to shorten MIP solution times by allowing the solution process to stop when a condition is satisfied. A terminating condition can be the number of iterations the solver completes, the amount of resources implemented in a problem, or a solution within some percentage of the upper bound for the MIP problem determined by solving the linear programming (LP) relaxation of the MIP problem.

For this study, a tolerance of five percent from the upper bound was used in terminating the MIP solution process. This value was used to limit the solution time of the MIP problem. Any solution within five percent of the best possible solution for the MIP terminates the MIP solver. When the tolerance was reduced, the possibility of excessively long solution times increased. Results obtained when this tolerance is varied are discussed in Chapter IV. The merits of this and other means of terminating the solution process are discussed in Chapter V.

SRS Algorithm

The basic flow of the scheduling process developed in this study mirrors the process followed by the schedulers at the RCCs. The most restrictive requests with the highest priorities are scheduled first, followed by blocks of similar requests with progressively

higher flexibility and lower priority. Hard schedule requirements with high priority and no flexibility can be inserted into the schedule at the start of the process.

Scheduled supports or activities have an associated time, duration, and RTS side. All previously scheduled time blocks are subtracted from a particular RTS side's available times for the next block of requests. This process is used to maintain schedule integrity when scheduling iteratively over the same time period. Previously scheduled activities must be avoided in later MIP scheduling formulations. This process of subtracting higher priority, previously scheduled activity times from a particular RTS side's available times for the next block of requests and then subsequently scheduling that block of requests using a MIP formulation can be repeated as often as required to generate a schedule.

IV. RESULTS

Overview

This chapter includes: 1) a summary of the SRS algorithm scheduling performance results, 2) a summary of the SRS algorithm computational results, 3) the impact of changing RTS turn-around times and MIP problem computational time limiting constants on the performance of the SRS algorithm, 4) a comparison of our results with those of Captain Gooley's algorithm and the RCC schedulers, 5) details on unscheduled support requests, and 6) a discussion of algorithm limitations. Scheduling performance is a measure of the number of supports requested and the number of supports scheduled. Computational performance is determined by the solution timeliness of the algorithm.

Scheduling Performance

This section details the results of test runs using actual AFSCN data for two one-week periods. The first week of data covers the week of 12 October 1992 to 18 October 1992 and is the same data Captain Gooley used in his research. The second week of data covers 12 July 1993 to 18 July 1993. Both sets of data were provided by Ken Chambers, technical advisor, 21 SOPS, Onizuka AFB, CA. [The data is in an ASCII file from the ASTRO general list database and is called a DEFT file.]

The first set of data contained the support requests, the satellite visibilities, and the RTS down-times in one large file. The second week of data was sent in four individual files: 1) low altitude satellite support requests, 2) all other satellite requests, 3) RTS down-times, and 4) satellite RTS visibilities. The format of the second week of data was slightly different from that of the first week of data . This required several minor modifications to the Pascal programs used for data processing.

Scheduling Results. The statistics for the daily scheduled satellite support requests were calculated by summing the low altitude satellite support schedule results and the two 12 hour blocks of medium and high altitude satellite support schedule results for each corresponding day. Table 4.1 contains the statistics for the daily schedules produced.

Table 4.1 Summary of Results, Daily Satellite Support Requests.

Day	# Requested	# Scheduled	% Scheduled
1	322	312	96.9
2	302	296	98.0
3	311	303	97.4
4	318	311	97.8
5	305	296	97.0
6	299	292	97.7
7	297	291	98.0
8	293	288	98.3
9	308	306	99.4
10	328	319	97.3
11	322	318	98.8
12	312	303	97.1
13	296	295	99.7
14	264	257	97.3

As discussed earlier, these results do not include RTS downtimes or DPAD requests. Low altitude satellite support scheduling performance and medium and high altitude satellite support scheduling performance are presented separately. Scheduling

performance may be less than optimal in some cases in order to increase solution timeliness. This is discussed in the next section. A complete listing of all the requests for Day 1, a detailed explanation of the complete algorithm, and the final schedule for Day 1 are provided in Appendix A.

Break-down of Results. The test results for the low altitude satellite support requests include a RTS turn-around or set-up time of 20 minutes. The test results for the medium and high altitude satellite support requests include a RTS turn-around or set-up time of 15 minutes. Table 4.2 contains the scheduling results for the low altitude satellite supports and the medium and high altitude satellite supports for the 14 days of data.

Day 1 to Day 7 results should not be compared with Day 8 to Day 14 results because there is a nine month time difference between the two data sets. The number of satellites in the AFSCN have likely changed during this time and would change the number of requests per week. Day 14 has substantially fewer low altitude satellite support requests than the other days. The variance in support request data illustrates the need for some standard test data that can be used in the future for testing an AFSCN scheduling model. This point is discussed in Chapter V.

Table 4.2 Scheduling Performance by Altitude.

	Low Altitude Performance			Medium and High Altitude Performance		
Day	# Requested	# Scheduled	% Scheduled	# Requested	# Scheduled	% Scheduled
1	153	149	97.4	169	163	96.4
2	137	134	97.8	165	162	98.8
3	146	143	98.0	165	160	97.0
4	142	140	98.6	176	171	97.2
5	142	136	95.8	163	160	98.2
6	144	138	95.8	155	154	99.4
7	142	138	97.2	155	153	98.7
8	118	115	97.5	175	173	98.9
9	127	126	99.2	181	180	99.4
10	132	130	98.5	196	189	96.4
11	122	120	98.4	200	198	99.0
12	134	132	98.5	178	171	96.1
13	120	120	100	176	175	99.4
14	91	87	95.6	173	170	98.3

Computational Performance

The computational performance of the heuristic is presented separately for low altitude satellite supports and the medium and high altitude satellite supports. Computational performance is a measure of how well the scheduling algorithm performs with respect to algorithm run-time. Several days of computer time can be required to solve a MIP problem. The SRS problem requires a more timely response.

Two approaches for limiting computer run times were implemented in the algorithm. The first approach involves limiting the number of discrete variables in each MIP problem. Limiting the number of variables per MIP problem was accomplished by dividing the requests for a 24 hour period into smaller groups based on altitude and time blocks. The second way to limit computer run times is to introduce a MIP solver termination criteria. For most computer runs in this study, the MIP solver terminates when a solution better than 95 percent of a calculated value was found. This calculated value is an upper bound calculated by solving the linear programming (LP) relaxation of the MIP problem. The percentage of the upper bound value that terminates the MIP solver can be 1) raised, to possibly increase scheduling performance at the risk of increasing computer run times, or 2) lowered, to possibly decrease computer run times at the risk of decreasing scheduling performance.

For this study, one hour of computer time was considered acceptable for generating a 24 hour schedule. Therefore, 20 minutes was set as a flexible limit for each MIP solution time. The MIP computer run-times for the 24 hour low altitude request blocks averaged less than 10 minutes and for the 12 hour medium and high altitude blocks remained generally below 20 minutes. Because computer run time can be linked to the number of discrete variables in each MIP problem, the number of discrete variables in each MIP formulation were recorded.

The summary of computational results for low altitude satellites in Table 4.3 include the number of discrete variables for each MIP formulation, the amount of central processing unit (CPU) time required for each MIP formulation, and the percentage of requests scheduled. CPU time is a better metric for measuring computational performance than real elapsed time because it is not effected by the computer loading at the time of the MIP solution. A VAX 6420 computer was used.

Table 4.3 Computational Results, Low Altitude Satellites.

Day	# Variables	% Scheduled	CPU Time
1	339	97.4	7:23
2	290	97.8	5:36
3	311	98.0	6:39
4	319	98.6	7:06
5	318	95.8	2:13
6	326	95.8	9:48
7	303	97.2	6:19
8	260	97.5	1:32
9	287	99.2	2:13
10	296	98.5	11:54
11	277	98.4	10:18
12	300	98.5	11:54
13	270	100	1:53
14	209	95.6	5:01

Table 4.4 presents the results of three MIP runs for each day for the medium and high altitude satellite support requests. The first two entries for each day are for the 12 hour blocks of requests and the third entry is for the 24 hour block. The third entry generally shows the non-linear relationship between the number of discrete variables and the CPU time.

Table 4.4 Computational Results, Medium and High Altitude Satellites.

Day	Run #	# Variables	% Scheduled	CPU Time hr:mn:sec
1	1	568	95.3	9:00
1	2	654	97.6	10:37
1	3	1233	94.7	47:37
2	1	756	97.6	18:23
2	2	652	98.8	11:18
2	3	1415	98.8	1:23:13
3	1	708	94.3	18:46
3	2	635	100.0	13:06
3	3	1345	97.6	1:11:28
4	1	92	97.8	25:07
4	2	660	96.4	15:31
4	3	1581	96.6	1:48:03
5	1	852	97.8	21:42
5	2	583	98.6	10:27
5	3	1443	99.4	1:10:42
6	1	689	98.7	14:25
6	2	683	100	13:53
6	3	1380	99.4	4:47:52
7	1	699	97.5	14:40
7	2	741	100	14:19
7	3	1441	98.7	1:21:02
8	1	719	98.9	17:42

8	2	733	98.8	16:26
8	3	1493	97.7	1:21:02
9	1	881	100	26:16
9	2	678	98.8	18:47
9	3	1592	99.4	2:02:25
10	1	920	96.2	35:26
10	2	804	96.7	25:58
10	3	1749	98.0	2:55:40
11	1	1042	98.3	48:50
11	2	654	100	15:32
11	3	1719	99.5	2:43:02
12	1	746	96.9	19:38
12	2	677	95.1	16:22
12	3	1456	97.8	6:47:16
13	1	980	100	31:57
13	2	657	98.6	13:55
13	3	1493	97.7	55:16:5
14	1	847	97.9	23:42
14	2	801	98.7	18:31
14	3	1676	100	8:41:57

Again, the results from week one should not be directly compared with week two. The value for "% Scheduled" is based on the number of requests submitted to the RCC and should not be confused with the upper bound value calculated by the LP relaxation of the MIP formulation and used to terminate the MIP when a solution within 95 percent of

the bound is found. The number of requests included in the MIP formulation for each time period for medium and high altitude satellites can be lower than the number of requests submitted to the RCC. Recall, medium and high altitude satellite support requests are divided into 12 hour blocks in order to develop schedules in a timely manner. Because overlapping requests occur at this break and the division between the low and the medium and high altitude requests, a discontinuity exists for the blocks of requests. Any support request that gets scheduled at a RTS side when solving a MIP formulation becomes part of a fixed schedule and a RTS side becomes unavailable for the scheduled time period. When a scheduled support or activity overlaps a request from the next block of requests to be scheduled, the scheduled supports must be subtracted from the available RTS side-support request combinations for the next block of requests to ensure scheduled supports do not overlap at a RTS side. This subtracting process can decrease the number of requests included in a MIP formulation or shorten the scheduling window for a request.

Changing MIP Parameters

This section presents the effects of changing 1) the turn-around times or RTS set-up times and 2) the percentage of a bound on the optimal solution that terminates the MIP solver. These constants were altered in order to explore how they affect the MIP performance.

As explained earlier, the turn-around times for the low and the medium and high altitude satellite supports were standardized for simplicity in this study. Times of 20 minutes for the low altitude satellite supports and 15 minutes for the medium and high altitude satellite supports were used. These numbers were used for representation purposes and could be changed to more accurate values if needed.

If the resources of the AFSCN remain constant and the demands on these resources increase to a point where an acceptable schedule cannot be developed, it may be necessary in the future to increase or better utilize RTS resources. One way of better

utilizing RTS sides is to lower turn-around times. Currently, the turn-around times for supports are routinely lowered by schedulers in order to schedule a support request. In order to determine how the MIP algorithm would respond, these values were reduced and test runs were re-accomplished for a portion of data. To insure satisfactory scheduling performance, the termination criteria was also raised from 95 percent to 97 percent for the low altitude satellite support requests. The effects on scheduling performance and computational performance of the algorithm are presented in Table 4.5. The table contains results for test runs for low altitude satellite requests for days one through five with a turn-around time of zero.

Table 4.5 Low Altitude Support Requests

(0 minute turn-around times, 97% MIP termination value).

Day	Variables	# Requested	# Scheduled	CPU
Day 1	339	153	153	1:26
Day 2	291	137	137	4:44
Day 3	311	146	146	5:49
Day 4	319	142	142	1:18
Day 5	318	142	142	1:17

When the turn-around times for the low altitude satellites were lowered to zero, the CPU times dropped and the percentage of requests scheduled increased as shown in Table 4.5. The number of variables remained constant because the overlap variable, y_{ihj}, is not used for the low altitude satellite requests. Because the low altitude support is scheduled for the entire request window, the order in which supports are scheduled is

determined by the start of the visibility windows. If one support request window starts before another request window, then the request with the earlier beginning of visibility (BV) time must be scheduled earlier than the latter request. When requests overlap, they cannot both be scheduled at a particular RTS side.

The turn-around times for the medium and high altitude satellites were arbitrarily lowered to eight and zero minutes. The CPU times increased and the percentage of requests-scheduled increased. The number of variables increased because, by shortening the total support time within a constant scheduling tolerance window, the order in which overlapping support requests can be scheduled becomes less restrictive. In other words, more supports can feasibly be scheduled in any order. This increases the number of y_{ihj} variables. A MIP termination criteria value of 95 percent was used for these runs to avoid excessive solution times caused by the increase in variables. Table 4.6 contains the results of runs for Days eight and nine with turn-around times (TAT) of zero and eight minutes.

Table 4.6 Medium and High Altitude Requests (0 and 8 minute turn-around times).

Day	Run #	TAT	# Variables	# Requested	# Scheduled	CPU Time
8	1	0	858	91	91	1:51:18
8	1	8	799	91	91	4:35:07
8	2	0	916	84	84	19:04
8	2	8	916	84	83	19:10
9	1	0	1122	96	96	3:26:29
9	1	8	1015	96	96	28:30
9	2	0	871	85	84	21:10
9	2	8	782	85	83	19:29

When the turn-around times were lowered for the low altitude satellite support requests, a lower than expected result was obtained for Day 2. The percentage of requests-scheduled results for Day 2, with a turn-around time of zero, were unexpectedly lower than the run with a turn-around time of 20 minutes. Therefore, the termination value was raised to 97 percent of the upper bound value to force the MIP algorithm to find a better solution before stopping. Table 4.7 shows the results when the MIP termination tolerance value is changed with everything else held constant.

Table 4.7 MIP Termination Value Comparison (0 minute turn-around).

Day	MIP termination value	Variables	# Requested	# Scheduled	CPU Time
2	95%	291	137	131	1:49
2	97%	291	137	137	4:44

Comparison of Results

There is a difference in the processing of requests between Captain Gooley's study and this study. The number of requests and the scheduling tolerance windows for the medium and high altitude satellite support requests are different. Based on personal experience and with the help of the schedulers at the RCC, the requests in this study were processed to obtain a more accurate representation of the actual requests from the MCCs. The tolerance windows for the requests Captain Gooley used are larger than the actual

tolerances submitted from the MCC and are closer to the visibility windows for the satellites.

Captain Gooley's support requests for medium and high altitude satellites could not be scheduled using the MIP algorithm in this study. The lengthening of the support tolerance window increases the number of combinations for the MIP solver to check. This increases the number of y_{ihj} variables which greatly increases the time required to solve the MIP problem.

The results of this study are encouraging and are in-line with results obtained by Captain Gooley, IBM, and RCC schedulers. Captain Gooley's algorithm scheduled 90 to 95 percent of the supports requested. IBM tested their algorithm with completely different data and scheduled around 98 percent of the supports requested. RCC schedulers routinely schedule 95 to 98 percent of the requested supports. The absence of a common, well defined set of test data makes any comparison of scheduling algorithms difficult. Captain Gooley and this research used the same data, but the difference in the data processing produces different support requests. This makes a direct comparison of results between Captain Gooley's study and this study impossible. The omission of RTS down-times does not invalidate this study. Neither Captain Gooley's study nor this study included RTS down-times in the scheduling process. RTS down-times are addressed in the next section and in Chapter V.

One major difference between Captain Gooley's algorithm and this study's algorithm is the effect the flexibility of the support requests has on the performance of the algorithm. Captain Gooley's insertion and interchange procedure is not adversely effected by requests with long scheduling tolerance windows where request overlaps occur frequently. The MIP algorithm's solution time can become excessive if many requests overlap and generally terminates quickly when the requests are less flexible. This is illustrated by the superior computational results obtained by the MIP algorithm for the low

altitude support requests in comparison to the medium and high altitude support requests. The case for some mix of these two algorithms is presented in Chapter V.

Unscheduled Support Requests

Unscheduled support requests usually occur because of a conflict with a previously scheduled, higher priority support request or with another support request which is scheduled. Occasionally, an unscheduled support could be scheduled if the MIP algorithm's termination criteria is increased. This results in increased solution time. Trade-offs between CPU time and the best schedule obtained were made for this study when the percentage of the upper bound value that terminated the MIP solver was set at 95 percent. Operationally, some other termination criteria, possibly based directly on CPU time, may make sense.

Algorithm Limitations

This study only addresses satellite support requests. RTS down-times and long DPAD supports were not included in the schedules. RTS down-time tolerances could not be readily discerned from the available data. If this data can be provided or processed into a format like that of the support requests and if a scheduling priority is defined, these requests could easily be included in the scheduling process.

The assumption that all DPAD supports are scheduled entirely at DLT stations is not entirely realistic (3), but those supports that are scheduled on the sixteen common RTS sides are usually divided into shorter supports and inserted in the schedule where possible. These requests have special rules for when they can be divided and a priority associated with each requested time period. Generation of a program to process and determine these parameters is beyond the scope of this study.

Long support requests, over 100 minutes in duration, are routinely deleted in the pre-processing subtraction of previously scheduled, fixed supports from the requests to be submitted to the MIP problem. Requests covering long time periods will likely overlap a

support scheduled by a previous MIP run. When this occurs in this algorithm, the request is deleted because the previously scheduled support takes precedence and is fixed. Operationally, these supports are often divided into smaller supports and scheduled at several RTS sides. This resembles the scheduling of DPAD supports and was not addressed in this study.

Medium and high altitude satellite support requests that could possibly be scheduled before or after a previously scheduled support at a particular RTS side are constrained by the algorithm to either before or after the scheduled support. The pre-processing program limits the support request window to the side with the larger time period. Captain Gooley's insertion and interchange algorithm could be used when these requests are not scheduled, to possibly schedule these support requests at available RTS sides during the shorter request schedule window.

The main drawback to this algorithm is the large increase in computational time required when the problem becomes less constrained. By introducing requests with larger time windows, the problem becomes more complex and the CPU time increases. This result is counterintuitive. In other algorithms, like Captain Gooley's insertion and interchange algorithm, making a request less restrictive in where or when it is scheduled makes the scheduling process easier. For the algorithm in this study, CPU times can become unacceptable when requests become more flexible.

V. CONCLUSION AND RECOMMENDATIONS

Conclusion

Satellite Range Scheduling (SRS) involves the matching of a large number of time-specific, resource-particular requests to a limited number of resources. The objective of this research was to develop an automated algorithm to schedule a maximum number of support requests following the priority criteria currently used by RCC schedulers. Scheduling the maximum number of these requests minimizes the amount of time required by schedulers to resolve schedule conflicts. The complexity of the problem makes a mixed integer program (MIP) for all the support requests over a 24 hour period impractical. Currently, there is no known way to solve this problem optimally in a timely manner.

By dividing the requests for a 24 hour period into smaller groups of requests and solving smaller MIP problems, good solutions were obtained in a timely manner. Low altitude satellite support requests usually take precedence over the other requests. Therefore, these support requests are scheduled first. These scheduled support time-RTS side combinations reduce the time available to schedule medium and high altitude satellite supports. There are too many medium and high altitude satellite support requests in a 24 hour period to expect a MIP problem to be solved in a timely manner. These requests were split into two 12 hour blocks. Each time a 12 hour block of requests gets scheduled, the scheduled supports are integrated into the updated fixed schedule and the utilized RTS side times must be subtracted from the next block of support requests to be scheduled.

Schedules were developed for fourteen days of support requests. The algorithm successfully scheduled between 96 and 99 percent of the requested supports. These results do not include RTS down-times or overflow DPAD supports in the schedule.

Because of the flexibility of the algorithm, any time block for a protected RTS down-time or special satellite support can be set aside before a particular problem is solved.

When the RTS turn-around times for the low altitude satellites were lowered from a standard of 20 minutes to zero, the MIP algorithm scheduled more supports. Better scheduling results are expected because the amount of requested RTS time is reduced by more than half. When the RTS turn-around times for the medium and high altitude satellites were lowered from a standard of 15 minutes to eight and zero minutes, the MIP algorithm also generally scheduled more supports.

The SRS algorithm generally completed a 24 hour schedule in under one hour of CPU time. The number of discrete variables in the MIP formulation for the low altitude satellite support requests averaged around 300, with solution times usually lower than ten minutes. The number of discrete variables in the MIP formulation for the 12 hour blocks of medium and high altitude satellite support requests averaged around 800, with solution times usually below 20 minutes.

When the RTS turn-around times were lowered, computational performance improved for the low altitude satellite support requests as solution times dropped and the number of discrete variables remained constant. When the RTS turn-around times were lowered for the medium and high altitude satellite support requests, the solution times generally increased with the number of discrete variables increasing by 5 to 15 percent with each drop in RTS turn-around times.

The MIP solution times can be shortened by lowering the percentage-of-upper bound-solution tolerance that will terminate the MIP solver. Lowering this value may sacrifice a better solution for a shorter CPU time. For most of the MIP models, this value was set at 95 percent of the best known bound on the optimal solution.

Recommendations

The following recommendations are presented in two categories. The first category of recommendations involve improving the scheduling algorithm presented in this study. The second category of recommendations suggests this algorithm be incorporated in different areas of research.

SRS Algorithm Upgrades. As stated earlier, this algorithm does not guarantee a schedule in a reasonable amount of time. Any given block of requests may exhibit sufficient complexity to make required CPU time unacceptable. For the limited data available for this study, the algorithm, as presented, generates promising results. Because of the flexibility of the algorithm, the number of requests considered in one MIP model can be altered by changing the number of hours used to group the requests. This study used a VAX 6420 computer to execute the MIP algorithm in a shared processor configuration. The General Algebraic Modeling System (GAMS) is the software package used as a front-end processor for the software used to solve the MIP problem. The MIP solution process is known as the Zero/One Optimization Method (ZOOM). Using a faster, dedicated processor may allow more requests per MIP model to be scheduled in a timely manner.

Splitting the medium and high altitude satellite support requests where a minimum number of satellite support request overlaps per RTS side occurs could increase scheduling performance. Dividing the medium and high altitude support requests into 12 hour blocks limits the number of variables in each MIP model, but also creates a boundary discontinuity. Any time two overlapping requests are divided into two separate MIP formulations the opportunity to optimally schedule the support requests is lost. The request that is placed in the MIP formulation to be done later is not considered when the first request is scheduled. Without some scheduling improvement algorithm, such as Captain Gooley's insertion and interchange algorithm, a request scheduled by a previous

MIP formulation cannot be altered to possibly schedule a latter unscheduled request. This improves the computational performance of the algorithm possibly at the expense of scheduling performance. A discontinuity does not exist if the blocks of requests are split where no overlapping requests exist because every scheduling combination can be considered.

RTS downtimes and scheduling priorities should be determined and included in the scheduling algorithm where appropriate.

A procedure needs to be developed for requests that can be divided into shorter requests such as unprotected RTS downtimes, DPAD overflow supports and long unscheduled requests. An adaptation of Captain Gooley's insertion and interchange algorithm may work well for this problem.

Because RTS turn-around times are often reduced by schedulers in order to schedule a request, the MIP formulation can be changed to schedule as many supports as possible ignoring RTS turn-around times. RTS turn-around times can be added in where possible, up to the nominal requested value. This schedule could be used to identify to schedulers candidate requests for shortened RTS turn-around times.

Alternate SRS Algorithm Functions. This algorithm can be used as a loading model for the AFSCN. Distributions can be developed for low altitude and medium and high altitude satellite support requests at each RTS side. This will allow an analyst to increase the number of requests to determine the number of satellites required to saturate the AFSCN. These distributions would be useful as a test database for testing and validating this and future scheduling algorithms. By varying the number of satellites and RTS sides for a particular situation, a better understanding of the capabilities of the AFSCN may be realized. The effects of losing or adding RTS sides on the AFSCN can be determined as well as the impact of changing the number and type of satellite supports.

RTS utilization was not addressed in this algorithm. This method does not attempt to level RTS utilities across RTS sides or RTSs. Altering the MIP formulation to perform this function is a possible area of additional research.

APPENDIX A

This appendix details the SRS algorithm programs with the outputs used to generate a single day's 24 hour schedule. Many of the programs are revisions of Captain Gooley's work.

SRS Algorithm and Outputs

LREQ.PAS. Low altitude request. This PASCAL program builds a file called REQLF.DAT containing the low altitude satellite support requests for a day. The file containing all the requests and visibilities for a seven day period was called FINLDATA.DFT.

```
program lreq.pas;
  Type
 Var
I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday,a : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,atmehrn,atmeminn,bvn,evn  :integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm,aminn : integer;
ident,lfident,hfident,smon,stme,amon,atme,alen,chk,dur : string[4];
slen : string[4];
gts : string[5];
rev : string[7];
id,ib,sch,line,sp,s1,s2,s3,s4 : STRING[1];
scnt,sbv,sev,sailen,nsctot :string[4];
aday,tat,ahr,amin,atmehr,atmemin,d1,d2,d3,a1,a2 : string[2];
last : string[3];
fill : string[32];
Infile,Infile1,OutFile1,outfile,outfile3,outfile4 : Text;
 Begin  {Main Program}
   cnt:=0;
   Writeln('Begin Reading Fin.dft');
   Assign(Infile,'a:\finldata.dft');
   Reset(Infile);
     Assign(Outfile,'C:\reqlf.dat');
   Rewrite(Outfile);
      Writeln('Reading Data');
       while NOT EOF(Infile) do
    Begin
     Read (Infile,id,ident,gts,s4,sch,rev,s1,s2,s3,d1,d2,d3,slen,
           amon,atmehr,atmemin,aday,ahr,amin,tat,fill);
                 if(s1='*') and (id='P')and (d1='13') and(sch=' ') then
```

```
begin
                        cnt:=cnt+1;
              val(d2,atmehrn,error);
              val(d3,atmeminn,error);
              val(tat,aminn,error);
              bvn:=atmehrn*60+atmeminn;
              evn:=bvn+aminn;
                        writeln (outfile,cnt:4,' ',gts,'A',bvn:5,evn:5,aminn:5,' 20 ',ident,rev);
              writeln (outfile,cnt:4,' ',gts,'B',bvn:5,evn:5,aminn:5,' 20 ',ident,rev);
               if gts='POGO-' then  writeln (outfile,cnt:4,' ',gts,'C',bvn:5,evn:5,aminn:5,' 20 ',ident,rev);
               end;
                  end;
         reset(outfile);
repeat
readln(outfile);
until EOF (outfile);
 reset(outfile1);
repeat
readln(outfile1);
until EOF (outfile1);
 end.•
```

IPLINK.FOR This FORTRAN program is executed on the VAX 6420. It completes the pre-processing required for input into the GAMS program. The file REQLF.DAT is input and the file NTABLE.DAT is output to the program SRS.GMS.

```
    PROGRAM IPLINK
    INTEGER I,J,K,REQ,NUM,INDEX,IREV,INREV,SNUM
    CHARACTER*1 sc,d
    CHARACTER*3 GGTS(18)
    CHARACTER*6 GTS,crev,AGS(18)
    CHARACTER*4 CBV1,CEV2,CREQ
    INTEGER TA,BV,EV,BST,EST,ID,IDENT,csum
    INTEGER TO(400),D1,NWI(400)
    REAL REV,W(400)
    INTEGER R(400,18), X(400,18),ABV(400,18),AEV(400,18)
    INTEGER CNT, CNT1
    IREV=0.0
    OPEN(UNIT=10,FILE='sup2.DAT',STATUS='UNKNOWN')
    OPEN(UNIT=21,FILE='re214.DAT',STATUS='UNKNOWN')
    OPEN(UNIT=12,FILE='NTABLE2.DAT',STATUS='UNKNOWN')
    OPEN(UNIT=22,FILE='avg2.DAT',STATUS='UNKNOWN')
    OPEN(UNIT=9,FILE='HOLD2.DAT',STATUS='UNKNOWN')


    I=0
    IDENT=0
    AGS(1)='POGO-A'
    AGS(2)='POGO-B'
    AGS(3)='POGO-C'
```

```
      AGS(4)='POGO-D'
      AGS(5)='HULA-A'
      AGS(6)='HULA-B'
      AGS(7)='COOK-A'
      AGS(8)='COOK-B'
      AGS(9)='INDI-A'
      AGS(10)='INDI-B'
      AGS(11)='BOSS-A'
      AGS(12)='BOSS-B'
      AGS(13)='LION-A'
      AGS(14)='LION-B'
      AGS(15)='GUAM-A'
      AGS(16)='GUAM-B'
      AGS(17)='PIKE-A'
      AGS(18)='REEF-A'
      GGTS(1)='P-A'
      GGTS(2)='P-B'
      GGTS(3)='P-C'
      GGTS(4)='P-D'
      GGTS(5)='H-A'
      GGTS(6)='H-B'
      GGTS(7)='C-A'
      GGTS(8)='C-B'
      GGTS(9)='I-A'
      GGTS(10)='I-B'
      GGTS(11)='B-A'
      GGTS(12)='B-B'
      GGTS(13)='L-A'
      GGTS(14)='L-B'
      GGTS(15)='G-A'
      GGTS(16)='G-B'
      GGTS(17)=' PI'
      GGTS(18)='REF'
      DO 11 J=1,400
      DO 12 K=1,18
        NWI(J)=0
        X(J,K)=0
        ABV(J,K)=0
        AEV(J,K)=0
        W(J)=0
        R(J,K)=0
        TO(J)=0
   12 CONTINUE
   11 CONTINUE
C
C  READ IN DATA FROM ASCII FILE
C

   10   READ(21,FMT=98,ERR=200,END=200) SNUM,GTS,bv,ev,req,
     * TA,IDENT,REV
   98   FORMAT(I4,1X,A6,1X,I5,I5,I5,1X,I2,1X,I4,1X,F6.1)

        PRINT *, 'SNUM = ',SNUM,' I = ',I
```

```
      K=0
      DO 35 J = 1,18
       IF (GTS .EQ. AGS(J)) THEN
        K=J
       ENDIF
 35    CONTINUE
      IF (K .EQ. 0) GOTO 10
C     IF (REQ .lt. 10) GOTO 10

      FLAG=0
      cnt=1
      cnt1=1
      DO 23 J = 1,400
       IF (NWI(J) .GT. 0) CNT1=CNT1+1

       IF (SNUM .EQ. NWI(J)) THEN
          CNT=J
          FLAG=1
       ENDIF
 23    CONTINUE

       IF ( FLAG .EQ. 1) THEN
         I=CNT
       ELSE
          I=CNT1
          NWI(I)=SNUM
        ENDIF

      WRITE(10,99) SNUM,I,GTS
 99    FORMAT(I6,2X,I6,1X,A6)
      K=0
      DO 25 J = 1,18
       IF (GTS .EQ. AGS(J)) THEN
        K=J
       ENDIF
 25    CONTINUE
      IF (K .EQ. 0) GOTO 10
      X(I,K)=1
      ABV(I,K)=BV
      AEV(I,K)=EV
      TO(I)=15
      R(I,K)=REQ

      IF (I .GE. 85) THEN
         WRITE(9,FMT=98) SNUM,GTS,bv,ev,req,
     * TA,IDENT,REV
      GOTO 10

      ENDIF

C
```

```
C READ NEXT RECORD
C
    GOTO 10
C
C CLOSE FILES
C
C
C DETERMINE WEIGHT OF VARIABLE
 200  Csum=0
     DO 22 J= 1,I
     SUM=0
     DO 21 K=1,18
     SUM=SUM+X(J,K)
 21   CONTINUE
     IF (SUM .GT. 0) THEN
      W(J)=1/sum
     ENDIF
     csum=csum+sum
 22   CONTINUE
      write(22,97)  i,csum
 97    FORMAT(I5,2X, I8)

C
C     WRITE TABLES TO FILE
C     CREATE GTS HEADING
C

     WRITE(12,102)
 102  FORMAT(5X,'SETS')
 103  FORMAT(' I  supports  /1*',I4,'/')
     WRITE(12,103) I
     WRITE (12,900)
 900  FORMAT('                ')
     WRITE (12,105)
 105  FORMAT(7X,'J GTS')
     DO 19 J = 1,18
     IF (J .EQ. 1) THEN
      WRITE(12,106) GGTS(1)
 106   FORMAT(8X,'/',A3)
     ENDIF
     IF (J .EQ. 18) THEN
      WRITE(12,110) GGTS(18)
 110   FORMAT(10X,A3,'/;')
     ENDIF
     IF (J .GT. 1 .AND. J .LT. 18) THEN
       WRITE(12,107)  GGTS(J)
 107     FORMAT(10X,A3)
     ENDIF
 19  CONTINUE
     WRITE (12,900)
     WRITE(12,104)
 104  FORMAT(2X,'ALIAS(I,H);')
     WRITE(12,900)
```

```
      WRITE(12,991)
  991 FORMAT('SET OFFDIAG(I,H);')
      WRITE(12,992)
  992 FORMAT('OFFDIAG(I,H)=YES$(ORD(I) ne ORD(H))$(ORD(I) LT ORD(H));')
      WRITE(12,900)
      WRITE(12,997)
  997 FORMAT('SCALAR M large positive constant /5000/;')
      WRITE (12,900)
      WRITE (12,201)
  201 FORMAT('PARAMETERS')
      WRITE (12,900)
      WRITE(12,202)
  202 FORMAT('  W(I) weight of a support')
      DO 49 J = 1 ,I
       IF (J .EQ. 1) THEN
        WRITE (12,203) J, W(J)
  203    FORMAT(4X,'/',I4,2X,F4.2)
       ENDIF
       IF (J .GT. 1 .AND. J .LT. I) THEN
        WRITE (12,204) J, W(J)
  204    FORMAT(5X,I4,2X,F4.2)
       ENDIF
       IF (J .EQ. I) THEN
        WRITE (12,205) J, W(J)
  205    FORMAT(5X,I4,2X,F4.2,' /')
       ENDIF
   49 CONTINUE
      WRITE (12,900)
      WRITE(12,302)
  302 FORMAT('  TO(I) turnaround time of a support')
      DO 59 J = 1 ,I
       IF (J .EQ. 1) THEN
        WRITE (12,303) J, TO(J)
  303    FORMAT(4X,'/',I4,2X,I3)
       ENDIF
       IF (J .GT. 1 .AND. J .LT. I) THEN
        WRITE (12,304) J,TO(J)
  304    FORMAT(5X,I4,2X,I3)
       ENDIF
       IF (J .EQ. I) THEN
        WRITE (12,305) J,TO(J)
  305    FORMAT(5X,I4,2X,I3,' /;')
       ENDIF
   59 CONTINUE
      WRITE(12,900)
      WRITE(12,900)
      WRITE(12,402)
  402 FORMAT('TABLE R(I,J) request length supports of i and j')
      WRITE(12,900)
      DO 48 K=1,1
       WRITE(12,411) (GGTS(J),J=1,11)
  411   FORMAT(5X,11A6)
   48 CONTINUE
```

```
   DO 45 J = 1, I
    WRITE(12,409) J,(R(J,K),K=1,11)
 45 CONTINUE
409 FORMAT(I4,1X,11I6)
   DO 46 K=1,1
    WRITE(12,421) (GGTS(J),J=12,18)
421   FORMAT(3X,'+',1X,7A6)
 46 CONTINUE
   DO 47 J = 1, I
    WRITE(12,419) J,(R(J,K),K=12,18)
 47 CONTINUE
419 FORMAT(I4,1X,7I6)
   WRITE (12,401)
401 FORMAT(2X,';')
   WRITE(12,900)
   WRITE(12,108)
108 FORMAT('TABLE N(I,J) feasible supports of i and j')
   WRITE(12,900)
   DO 28 K=1,1
    WRITE(12,111) (GGTS(J),J=1,11)
111   FORMAT(5X,11A6)
 28 CONTINUE
   DO 29 J = 1, I
    WRITE(12,109) J,(X(J,K),K=1,11)
 29 CONTINUE
109 FORMAT(I4,1X,11I6)
   DO 38 K=1,1
    WRITE(12,121) (GGTS(J),J=12,18)
121   FORMAT(3X,'+',1X,7A6)
 38 CONTINUE
   DO 39 J = 1, I
    WRITE(12,119) J,(X(J,K),K=12,18)
 39 CONTINUE
119 FORMAT(I4,1X,7I6)
   WRITE (12,901)
901 FORMAT(2X,';')
   WRITE(12,900)
   WRITE(12,508)
508 FORMAT('TABLE BV(I,J) begining of  visibility')
   WRITE(12,900)
   DO 52 K=1,1
    WRITE(12,511) (GGTS(J),J=1,11)
511   FORMAT(5X,11A6)
 52 CONTINUE
   DO 53 J = 1, I
    WRITE(12,509) J,(ABV(J,K),K=1,11)
 53 CONTINUE
509 FORMAT(I4,1X,11I6)
   WRITE(12,900)
   DO 62 K=1,1
    WRITE(12,521) (GGTS(J),J=12,18)
521   FORMAT(3X,'+',1X,7A6)
 62 CONTINUE
```

```
      DO 63 J = 1, I
       WRITE(12,519) J,(ABV(J,K),K=12,18)
   63 CONTINUE
  519 FORMAT(I4,1X,7I6)
      WRITE (12,901)
      WRITE (12,900)
      WRITE(12,608)
  608 FORMAT('TABLE EV(I,J) ending of  visibility')
      WRITE(12,900)
      DO 78 K=1,1
       WRITE(12,611) (GGTS(J),J=1,11)
  611   FORMAT(5X,11A6)
   78 CONTINUE
      DO 79 J = 1, I
       WRITE(12,709) J,(AEV(J,K),K=1,11)
   79 CONTINUE
  709 FORMAT(I4,1X,11I6)
      WRITE(12,900)
      DO 88 K=1,1
       WRITE(12,721) (GGTS(J),J=12,18)
  721   FORMAT(3X,'+',1X,7A6)
   88 CONTINUE
      DO 89 J = 1, I
       WRITE(12,719) J,(AEV(J,K),K=12,18)
   89 CONTINUE
  719 FORMAT(I4,1X,7I6)
      WRITE (12,901)
      write(12,900)
      WRITE(12,994)
  994 FORMAT('SET D(I,H,J);')
      WRITE(12,995)
  995 FORMAT('D(I,H,J)=YES$N(H,J)$N(I,J)$OFFDIAG(I,H)$(EV(I,J) GT
     *(BV(H,J)-TO(H)));')
  412  FORMAT('SET D4(I,H,J);')
  415  FORMAT('SET D5(I,H,J);')
  410  FORMAT('SET D6(I,H,J);')
  416  FORMAT('D4(I,H,J)=YES$D1(I,H,J)$(NOT(D2(I,H,J)));')
  408  FORMAT('D5(I,H,J)=YES$(NOT(D1(I,H,J)))$D2(I,H,J);')
  407  FORMAT('D6(I,H,J)=YES$D1(I,H,J)$D2(I,H,J);')
  999  FORMAT('SET D1(I,H,J);')
  993  FORMAT('SET D2(I,H,J);')
  413  FORMAT('SET D3(I,H,J);')
  996  FORMAT('D1(I,H,J)=YES$D(I,H,J)$((BV(H,J)+R(H,J)+TO(I)+R(I,J))
     *LT(EV(I,J)));')
  414  FORMAT('D2(I,H,J)=YES$D(I,H,J)$((BV(I,J)+R(I,J)+TO(H)+R(H,J))
     *LT(EV(H,J)));')
  998  FORMAT('D3(I,H,J)=YES$D(I,H,J)$(NOT(D1(I,H,J)))$(NOT(D2(I,H,J)));')
      WRITE(12,999)
      WRITE(12,996)
      WRITE(12,993)
      WRITE(12,414)
      WRITE(12,413)
      WRITE(12,998)
```

```
   WRITE(12,412)
   WRITE(12,416)
   WRITE(12,415)
   WRITE(12,408)
   WRITE(12,410)
   WRITE(12,407)
   WRITE(12,900)
   CLOSE(12)
   CLOSE(10)
   CLOSE(21)

300  PRINT *,' NUMBER OF SUPPORT IS',I
   END
```

SRS.GMS. This is the GAMS program which models the mixed integer program (MIP) formulation and calls the MIP solver. The output will be two files called STRT.DAT and SCH.DAT which will be used with the file SUP.DAT generated by **IPLINK.FOR** to build a schedule using **SCHUP.PAS.**

```
$include "ntable2.dat"
sets jj(j) dynamic subset of i to hold columns for subtable
   cc(j) dynamic subset of i to hold unprinted columns
   s    subtables / 1*12 /;
scalar maxcol;
VARIABLES

ST(I,J)  start time for support i at GTS j
X(I,J)   support i and GTS j 1 if support occurs 0 otherwise
Y(H,I,J)  relax or enforce constraint for supports h i and GTS j
Z        total weighted number of supports scheduled
;

POSITIVE VARIABLE ST;
BINARY VARIABLES X,Y;

EQUATIONS

SCH  obj function - weighted number of supports scheduled
SUPONE(I)  schedule support only once
BEGSUP(I,J)  schedule support after its beginning visibility
ENDSUP(I,J)  schedule support before its end of visibility
NCCSUP1(J,I,H)  no concurrent supports on a GTS j ST_i lt ST_j
RELAX1(J,I,H)  relax or enforce no concurrent support constraints
RELAX2(J,I,H)  relax or enforce no concurrent support constraints
NCCSUP2(J,I,H) no concurrent supports ST i GT ST h
SUP12(J,I,H)
SUP21(J,I,H)
NSUP(J,I,H)
;
```

```
SCH.. Z =E= SUM((I,J)$N(I,J), X(I,J));

SUPONE(I).. SUM(J$N(I,J), X(I,J)) =L= 1;

BEGSUP(I,J)$N(I,J).. ST(I,J) =G= BV(I,J);

ENDSUP(I,J)$N(I,J).. ST(I,J) =L= EV(I,J)-R(I,J);

SUP21(J,I,H)$D4(I,H,J).. ST(I,J) =G= ST(H,J)+R(H,J)
          +TO(I)-M*(1-X(I,J))-M*(1-X(H,J));

SUP12(J,I,H)$D5(I,H,J).. ST(I,J)+R(I,J)+TO(H)
            =L= ST(H,J) +M*(1-X(I,J))+M*(1-X(H,J));

NCCSUP1(J,I,H)$D6(I,H,J).. ST(I,J) + R(I,J)
          + TO(H) =L= ST(H,J) +M*Y(H,I,J) + M*(1-X(I,J))
            + M*(1-X(H,J));

RELAX1(J,I,H)$D6(I,H,J).. ST(I,J) - ST(H,J) =L= M*Y(H,I,J);


RELAX2(J,I,H)$D6(I,H,J).. ST(H,J) - ST(I,J)
              + .5=L= M*(1-Y(H,I,J));

NCCSUP2(J,I,H)$D6(I,H,J).. ST(I,J) =G= ST(H,J) + R(H,J)
          + TO(I)-M*(1-Y(H,I,J))-M*(1-X(I,J))-M*(1-X(H,J));

NSUP(J,I,H)$D3(I,H,J).. X(I,J)+X(H,J) =L= 1;
MODEL SCHEDULE  SRS Scheduling Solution /ALL/;

OPTION ITERLIM=5000000;

OPTION RESLIM=100000;

OPTION OPTCR=0.05;

SOLVE SCHEDULE USING MIP MAXIMIZING Z;

DISPLAY ST.L, X.L;

file res /sch2.dat/;

res.pw = 78;
put res '  table x(i,j) this is a table of scheduled supports'/;
jj(j) = no;
cc(j) = yes;
loop(s$card(cc),
  maxcol=floor(res.pw/7-1);
  loop(cc$maxcol,
    jj(cc) = yes;
    maxcol=maxcol-1);
  if((card(cc) ne card(j)), put // '+':6);
```

```
  if((not(card(cc) ne card(j))), put // ' ':6 );
  loop(jj, put jj.tl:>5); put /;
  loop(i,
    put / i.tl:5;
    loop(jj, put x.L(i,jj):5:1) );
  cc(jj) = no;
  jj(jj) = no );
put$card(cc) // '**** more than ' card(s):0:0 ' subtables'
        / '**** ' card(cc):0:0 ' columns not written';
abort$card(cc) 'not all columns were printed' , cc;

file res1 /strt2.dat/;

res1.pw = 78;

put res1 '  table st(i,j) this is a table of support start times'/;
jj(j) = no;
cc(j) = yes;
loop(s$card(cc),
  maxcol=floor(res1.pw/7-1);
  loop(cc$maxcol,
    jj(cc) = yes;
    maxcol=maxcol-1);
  if((card(cc) ne card(j)), put // '+':6);
  if((not(card(cc) ne card(j))), put // ' ':6 );
  loop(jj, put jj.tl:>5); put /;
  loop(i,
    put / i.tl:5;
    loop(jj, put st.L(i,jj):5:0) );
  cc(jj) = no;
  jj(jj) = no );
put$card(cc) // '**** more than ' card(s):0:0 ' subtables'
        / '**** ' card(cc):0:0 ' columns not written';
abort$card(cc) 'not all columns were printed' , cc;


file res2 /req2.dat/;

res2.pw = 78;

put res2 '  table r(i,j) this is a table of support request times'/;
jj(j) = no;
cc(j) = yes;
loop(s$card(cc),
  maxcol=floor(res2.pw/7-1);
  loop(cc$maxcol,
    jj(cc) = yes;
    maxcol=maxcol-1);
  if((card(cc) ne card(j)), put // '+':6);
  if((not(card(cc) ne card(j))), put // ' ':6 );
  loop(jj, put jj.tl:>5); put /;
  loop(i,
    put / i.tl:5;
```

```
    loop(jj, put R(i,jj):5:0) );
  cc(jj) = no;
  jj(jj) = no );
put$card(cc) // '**** more than ' card(s):0:0 ' subtables'
        / '**** ' card(cc):0:0 ' columns not written';
abort$card(cc) 'not all columns were printed' , cc;
```

SCHUP.PAS. Schedule update. This program takes the output from **SRS.GMS** (SCH.DAT and STRT.DAT) and an output from **IPLINK.FOR** (SUP.DAT) and adds it to previously scheduled activities to generate an updated schedule. **SCHUP.PAS** can be ran as many times as required to build a final schedule.

```
program test;

  VAR  sch: ARRAY [1..18]  of string[5];
     strt: ARRAY [1..18]  of string[5];

     strn: ARRAY [1..18]  of integer;

     SN: ARRAY [1..85] OF INTEGER;
     I,j,CNT,supn,holdn,ACTN,lo1n,lo2n,act1n,stnn,strtnn,strtn,endn,stn, NUM: integer;
     hfn,bvn,evn,durn,tatn,hfn1,bvn1,evn1,durn1,tatn1 : integer;
     waste: string[80];
     GTS,gts1: STRING[7];
     fill: string[11];
     sup: string[6];
     fill1: string[11];
     hold:  string[8];
     lo2,lo1,b : string[2];
     act,bs : string[3];
     act1: string[4];
     INFILE,infile2,outfile,outfile1,outfile3,srsfile,outfile2,infile1 : TEXT;
  TYPE
    GRND= STRING[6];
    SRS= RECORD
      GTS : GRND;
      BV  : INTEGER;
      EV  : INTEGER;
      REQ : INTEGER;
      TOT : INTEGER;
      IRON: INTEGER;
      REV : REAL;
    END;
  VAR
     ABV,AEV,TA,RE,ID,SU : INTEGER;
     REVV : REAL;
     TGTS: GRND;
     CH: STRING[1];
```

```
BEGIN
WRITELN('WHERE IS OPT FILE FROM IE NDAYLF');
  CNT:=0;
 ASSIGN(SRSFILE,'a:\SCH2.DAT');
 RESET(SRSFILE);
 ASSIGN(INFILE,'a:\STRT2.DAT');
 RESET(INFILE);
  assign(infile1,'a:\re114.dat');
 reset(infile1);
  assign(outfile1,'c:\fs14.dat');
 reset(outfile1);
 assign(outfile3,'c:\fs14.dat');
  assign(infile2,'a:\sup2.dat');
  reset(infile2);
 assign(outfile2,'c:\trash1.dat');
 rewrite(outfile2);
 assign(outfile,'c:\trash2.dat');
 rewrite(outfile);
 WHILE NOT EOF(SRSFILE) DO
  BEGIN
  for i:= 1 to 16 do
  READ(SRSFILE,sch[i]);
  for i:= 1 to 16 do
   READ(inFILE,strt[i]);
  readln(srsfile,sch[17]);
   readln(infile,strt[17]);
   for i:= 1 to 16 do
      val(strt[i],strn[i],j);
  IF sch[1]='1   ' THEN cnt:=cnt+1;

  IF CNT=1 THEN
  BEGIN
  FOR i:=2 TO 11 DO
   if sch[i]=' 1.0'then writeln(outfile,sch[1],i-1,strn[i]:5);
   end;
   if cnt=2 then
   begin
  for i:=2 TO 11 DO
if sch[i]=' 1.0'then writeln(outfile,sch[1],(i+9),strn[i]:5);
  end;

  end;

  for cnt:=1 to 200 do
  begin
  reset(infile2);
    repeat
  readln(infile2,sup,hold,fill);
       val(hold,holdn,j);
       val(sup,supn,j);
  until (holdn>=cnt)or(eof(infile2));
```

```
reset(outfile);
repeat
readln(outfile,strn[2],fill1);

    if cnt=strn[2] then writeln(outfile2,supn:5,fill1);
    until eof(outfile);
    end;

    rewrite(outfile);
     cnt:=0;
    reset(outfile2);
    repeat
   readln(outfile2,actn,stn,strtn);

      if(cnt=0) or (cnt<actn) then cnt:=actn;

   reset(infile1);
     repeat
   readln(infile1,act1,gts,strn[1],strn[2],strn[3],fill);

    val(act1,act1n,i);
    until (actn=act1n) or eof(infile1);


   if stn=1 then gts:=' POGO-A ';
    if stn=2 then gts:=' POGO-B ';
       if stn=3 then gts:=' POGO-C ';
    if stn=5 then gts:=' HULA-A ';
      if stn=6 then gts:=' HULA-B ';
    if stn=7 then gts:=' COOK-A ';
       if stn=8 then gts:=' COOK-B ';
    if stn=9 then gts:=' INDI-A ';
      if stn=10 then gts:=' INDI-B ';
    if stn=11 then gts:=' BOSS-A ';
       if stn=12 then gts:=' BOSS-B ';
    if stn=13 then gts:=' LION-A ';
      if stn=14 then gts:=' LION-B ';
    if stn=15 then gts:=' GUAM-A ';
       if stn=16 then gts:=' GUAM-B ';
    if stn=17 then gts:=' PIKE-A ';
     if stn=18 then gts:=' REEF-A ';
     if cnt=actn then
       BEGIN

       endn:=strtn+strn[3];
       WRITELN(OUTFILE,actn:3,gts,strtn:5,endn:5,strn[3]:5,FILL);

        CNT:=actn+1;
        END;

        until eof(outfile2);
        reset(outfile);
       rewrite(outfile2);
```

```
repeat
readln(outfile,hfn,gts,bvn,evn,durn,tatn,fill);
   writeln(outfile2,hfn:4,gts,bvn:5,evn:5,durn:5,tatn:3,fill);
   until eof(outfile);
   repeat
 readln(outfile1,hfn1,gts1,bvn1,evn1,durn1,tatn1,fill1);
writeln(outfile2,hfn1:4,gts1,bvn1:5,evn1:5,durn1:5,tatn1:3,fill1);
until eof(outfile1);
rewrite(outfile3);
reset(outfile2);
  for i:=-60 to 1500 do
begin
reset(outfile2);
 repeat
readln(outfile2,hfn,gts,bvn,evn,durn,tatn,fill);

if bvn=i then writeln(outfile3,hfn:4,gts,bvn:5,evn:5,durn:5,tatn:3,fill);

 until eof(outfile2);
 end;
reset(outfile);
repeat
readln(outfile);
until eof(outfile);
 reset(outfile2);
repeat
readln(outfile2);
until eof(outfile2);
  reset(outfile3);
repeat
readln(outfile3);
until eof(outfile3);
end.
```

SCHUP.PAS Output (Low Altitude Satellite Schedule).

```
 1 INDI-A  13  28  15 15 6553055
 2 POGO-A  26  42  16 15 2532097
 3 BOSS-A  39  55  16 15 9757024
 4 POGO-B  51  64  13 15 1056014
 5 COOK-A  54  67  13 15 4774042
 6 COOK-B  54  68  14 15 6553055
 7 REEF-A  81  93  12 15 9757024
 8 GUAM-A 108 123  15 15 7050006
 9 BOSS-A 117 133  16 15 2532097
10 POGO-B 138 152  14 15 6553055
11 PIKE-A 138 154  16 15 9757024
12 HULA-A 139 153  14 15 0286045
13 POGO-C 150 163  13 15 1056014
14 BOSS-A 163 175  12 15 5821064
15 POGO-A 169 179  10 15 4774042
16 GUAM-A 173 187  14 15 1056014
17 INDI-A 179 195  16 15 9757024
18 REEF-A 193 207  14 15 1132085
19 POGO-A 217 233  16 15 9845009
20 LION-A 225 239  14 15 6553055
21 POGO-B 226 242  16 15 3187074
22 POGO-C 234 248  14 15 6553055
23 PIKE-A 238 253  15 15 7050006
24 HULA-A 238 254  16 15 0286045
25 LION-B 244 257  13 15 1056014
27 POGO-A 268 279  11 15 4774042
28 LION-A 271 284  13 15 1132085
29 LION-A 325 336  11 15 6553055
30 POGO-A 326 342  16 15 3187074
31 POGO-B 331 345  14 15 6553055
32 HULA-A 335 351  16 15 9757024
33 HULA-B 335 351  16 15 9757024
```

34 BOSS-A 340 355 15 15 1056014
35 COOK-A 349 364 15 15 1132085
36 GUAM-A 355 369 14 15 6553055
37 POGO-A 364 376 12 15 0286045
38 LION-A 365 381 16 15 9757024
39 POGO-B 367 379 12 15 4774042
40 HULA-A 413 430 17 15 2532097
41 BOSS-A 421 434 13 15 6553055
42 POGO-A 426 443 17 15 3187074
43 PIKE-A 440 454 14 15 1056014
44 COOK-A 441 452 11 15 7050006
45 POGO-B 449 466 17 15 1056014
46 LION-A 466 482 16 15 9757024
47 POGO-A 466 480 14 15 0286045
48 BOSS-A 475 487 12 15 4774042
49 REEF-A 480 496 16 15 1056014
50 HULA-A 515 527 12 15 2532097
51 POGO-C 527 543 16 15 3187074
52 GUAM-A 535 550 15 15 9757024
53 PIKE-A 539 556 17 15 1056014
54 POGO-A 551 567 16 15 1056014
55 HULA-A 551 561 10 15 6790043
56 POGO-B 559 575 16 15 9757024
57 POGO-C 567 583 16 15 0286045
58 BOSS-B 571 586 15 15 4774042
59 REEF-A 582 596 14 15 1056014
60 PIKE-A 614 629 15 15 6553055
61 BOSS-A 619 635 16 15 3187074
62 POGO-A 625 639 14 15 6553055
63 REEF-A 632 644 12 15 4774042
64 GUAM-A 636 651 15 15 9757024
65 POGO-B 638 651 13 15 2532097
66 POGO-C 653 669 16 15 1056014
67 POGO-A 660 674 14 15 4774042
68 LION-A 665 678 13 15 1056014
69 BOSS-B 668 683 15 15 1132085
71 BOSS-A 670 686 16 15 9757024
72 REEF-A 728 742 14 15 4774042
73 HULA-A 736 752 16 15 1056014
74 HULA-B 736 752 16 15 1056014
75 POGO-A 739 753 14 15 2532097
76 POGO-B 756 772 16 15 1056014
77 POGO-C 757 771 14 15 4774042
78 BOSS-A 769 783 14 15 1132085
79 BOSS-B 771 786 15 15 9757024
80 HULA-A 807 820 13 15 6553055
81 HULA-B 807 820 13 15 6553055
82 REEF-A 831 847 16 15 9757024
83 POGO-B 834 848 14 15 3187074
84 LION-B 845 857 12 15 4774042
85 BOSS-A 848 863 15 15 2532097
86 POGO-A 854 868 14 15 4774042
87 LION-A 867 882 15 15 1056014
88 COOK-A 874 890 16 15 9757024
89 HULA-A 904 917 13 15 6553055
90 LION-A 907 922 15 15 7050007
91 LION-B 933 947 14 15 6553055
92 REEF-A 933 946 13 15 9757024
93 GUAM-A 935 951 16 15 1056014
94 POGO-A 939 950 11 15 3187074
96 BOSS-A 970 983 13 15 1056014
97 HULA-A 970 981 11 15 4774042
98 HULA-B 970 981 11 15 4774042
99 POGO-A 971 987 16 15 0286045
100 COOK-A 975 989 14 15 9757024
101 LION-B 1010 1025 15 15 7050007
102 HULA-A 1020 1036 16 15 3187074
103 POGO-A 1024 1036 12 15 6553055
104 INDI-A 1025 1039 14 15 1132085
105 GUAM-B 1039 1050 11 15 1056014
106 LION-A 1039 1052 13 15 4774042
107 POGO-C 1047 1061 14 15 4774042
108 LION-B 1052 1063 11 15 9757024
109 POGO-B 1062 1074 12 15 9757024
110 BOSS-A 1070 1086 16 15 1056014
111 POGO-A 1071 1087 16 15 0286045
112 HULA-A 1079 1095 16 15 9757024
113 HULA-B 1079 1095 16 15 9757024
114 GUAM-A 1098 1112 14 15 6553055
115 BOSS-B 1099 1114 15 15 7050007
116 POGO-A 1123 1136 13 15 6553055
117 LION-B 1129 1138 9 15 6553055
118 BOSS-A 1138 1149 11 15 4774042
119 POGO-B 1145 1158 13 15 3187074
120 LION-A 1150 1166 16 15 9757024
121 POGO-A 1161 1174 13 15 9757024
122 GUAM-A 1168 1181 13 15 4774042
123 HULA-A 1169 1181 12 15 1132085
124 POGO-C 1171 1188 17 15 0286045
125 PIKE-A 1172 1188 16 15 1056014
126 COOK-A 1192 1206 14 15 7050007
127 POGO-B 1221 1235 14 15 6553055
128 HULA-A 1222 1234 12 15 6790043
129 REEF-A 1231 1248 17 15 1056014
130 BOSS-A 1232 1247 15 15 4774042
131 POGO-A 1247 1262 15 15 3187074
132 LION-A 1252 1267 15 15 9757024
133 HULA-A 1257 1268 11 15 2532097
134 POGO-B 1260 1274 14 15 9757024
135 BOSS-B 1264 1280 16 15 0286045
136 COOK-A 1274 1290 16 15 1056014
137 GUAM-A 1283 1299 16 15 9757024
138 COOK-B 1293 1308 15 15 7050007
139 POGO-A 1318 1333 15 15 6553055
140 BOSS-A 1327 1340 13 15 6553055
141 INDI-A 1333 1349 16 15 1056014

```
142 POGO-B 1335 1351  16 15 2532097
143 POGO-C 1349 1365  16 15 3187074
144 BOSS-B 1352 1364  12 15 9757024
145 POGO-A 1359 1375  16 15 9757024
147 GUAM-A 1366 1380  14 15 1132085
148 BOSS-A 1366 1380  14 15 0286045
149 REEF-A 1370 1384  14 15 4774043
150 INDI-A 1389 1401  12 15 6553055
151 COOK-B 1426 1441  15 15 4774043
152 COOK-A 1428 1443  15 15 6553055
153 BOSS-A 1428 1442  14 15 2532097
```

HREQ.PAS. High request. This program will build two files containing 1) the high altitude requests for a day (REQHF.DAT), and 2) the visibilities for the high altitude requests for a day (D1V.DAT).

```
program hreq;
  Type
 mat = array[1..80] of string[1];
  Var
 I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday,a : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,atmehrn,atmeminn,bvn,evn  :integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm,aminn : integer;
ident,lfident,hfident,smon,stme,amon,atme,alen,chk,dur : string[4];
slen : string[4];
gts : string[5];
rev : string[7];
id,ib,sch,line,sp,s1,s2,s3,s4 : STRING[1];
scnt,sbv,sev,sailen,nsctot :string[4];
aday,tat,ahr,amin,atmehr,atmemin,d1,d2,d3,a1,a2 : string[2];
last : string[3];
fill : string[32];
  Infile,Infile1,OutFile1,outfile,outfile3,outfile4 : Text;
  stats : mat;
Match  :boolean;
Begin  {Main Program}
       cnt:=0;
    Writeln('Begin Reading Fin.dft');
        Assign(Outfile1,'c:\reqhf.dat');
    Rewrite(Outfile1);
       Assign(Outfile4,'C:\d1v.dat');
    Rewrite(Outfile4);
     Assign(Infile1,'a:\finldata.dft');
    Reset(Infile1);
    Writeln('Reading Data');
      Writeln('Reading Data');
    While NOT EOF(Infile1) do
      Begin
      for i:=1 to 80do  Read(Infile1,stats[i]);
      s1:='1';
      s2:='3';
   if (stats[1]='P')and((stats[24]=s2)or(stats[24]='2')) then for i:=1 to 80do write(outfile4,stats[i]);
while ((stats[1] = 'P') and (stats[23]=s1)and (stats[24]=s2)) and
 (stats[12]=' ') do
```

```
                begin
    if (stats[20]<>'*')then for i:=1to 48do write (outfile1,stats[i]);
   for i:=1to 80do  Read(infile1,stats[i]);
                                repeat
                            begin
       if stats[1]='L' then for i:=1to 12do write (outfile1,stats[i]);
if((stats[6]='D')and(stats[7]='P'))or((stats[11]='D')and(stats[12]='P'))or((stats[16]='D')and
(stats[17]='P'))or((stats[21]='D')and(stats[22]='P'))or((stats[26]='D')and(stats[27]='P'))or
((stats[31]='D')and(stats[32]='P')) then  write (outfile1,'DPAD');
                    for i:=1to 80do  Read(Infile1,stats[i]);
                       end;
      until stats[1]='P';
      writeln (outfile1,'new');
end;
end;
reset(outfile1);
 repeat
 readln(outfile1);
 until EOF (outfile1);
  end.
```

HREQ.PAS Output (High Altitude Requirements).

```
P5329REEF-A 00001.0 10120835000020101111150100501 TS       new
P5329INDI-A 00001.0 10120325000020101111150100501 0325-0410 new
P9445HULA-A 00000.0 10120000000035101111500100351 00+/-15  new
P9445HULA-A 00000.0 10120610000025101111500100351 06+/-15  new
P7310COOK-B 00397.0 10120015000010101114150011101 0015+/-10 new
P2567REEF-A 00001.0 10120030000015101116550011141 00+30-00  new
P7506POGO-B 05624.0 10120225000015101117000010201 0235+/-10 new
P7225GUAM-B 08403.0 10120335000015101117170011251 0335+/-10 new
P7225POGO-D 08403.0 10120010000205101118090009451DPADnew
P0470POGO-B 00001.0 10120100000015101120250005231 0045+30-00new
P7304BOSS-B 06743.0 10120645000015101121130010091 0645+00-10new
P6142HULA-B 00001.0 10120300000025101122040009011 03+30-00  new
P3055REEF-A 00001.0 10120625000015101122310010001 06+30-00  new
P8639COOK-A 00001.0 10120145000015101122510005581 0145-0230 new
P8639PIKE-A 00001.0 10120030000045101123090005131 TS       new
P1920BOSS-A 00001.0 10120400000015101123130007291 04+30-00  new
P6012HULA-A 03718.0 10120915000025101123250011191 0915+00-10new
P6012HULA-B 03718.0 10120100000055101123250011191DPADnew
P6012COOK-B 03718.0 10120155000255101123460010421DPADL TS       new
P9521POGO-B 00001.0 10120120000015101123510004171 0105-0150 new
P6280BOSS-A 00000.0 10121530000005101200000100001 1530+/-30 new
P7314COOK-B 00000.0 10122020000015101200000100001 2020+/-30 new
P9366LION-A 00000.0 10121030000005101200000100001 1015+/-15 new
P9366LION-A 00000.0 10122030000005101200000100001 2045+/-30 new
P6453COOK-A 00000.0 10120215000015101200000100001 02+/-30  new
P9446REEF-A 00000.0 10121700000005101200000100001 17+/-30  new
P8275BOSS-A 00000.0 10121415000015101200000100001 1415+/-30 new
P5775GUAM-A 00001.0 10121630000020101200000100001 1630-1730 new
P5775GUAM-A 00001.0 10122330000020101200000100001 2330-0000 new
P2124BOSS-A 00001.0 10120430000020101200000100001 0430-0615 new
```

P2124LION-A 00001.0 10120930000020101200000010000L 0930-1115 new
P2124BOSS-B 00001.0 10121700000020101200000010000L 1700-1800 new
P3160REEF-A 00001.0 10120530000020101200000010000L 0530-0630 new
P3160GUAM-B 00001.0 10121430000020101200000010000L 1430-1530 new
P3160REEF-A 00001.0 10122140000020101200000010000L 2100-2200 new
P3160GUAM-A 00001.0 10122230000020101200000010000L 2230-2330 new
P5953GUAM-B 00001.0 10120035000020101200000010000L 0030-0130 new
P5953COOK-B 00001.0 10121645000020101200000010000L 1630-1730 new
P5329INDI-A 00001.0 10121800000020101200000010000L TS new
P6392BOSS-B 00000.0 10120330000005101200000010000L 0330+/-30 new
P6392INDI-A 00000.0 10121615000010101200000010000L 1635+/-30 new
P8275COOK-A 00000.0 10120025000005101200000010000L 0030+/-30 new
P6071BOSS-B 00000.0 10121215000005101200000010000L 1235+/-30 new
P6071HULA-B 00000.0 10122235000010101200000010000L 2235+/-30 new
P6280INDI-A 00000.0 10120500000010101200000010000L 0520+/-30 new
P6394COOK-B 00000.0 10121750000005101200000010000L 1745+/-30 new
P6391INDI-A 00000.0 10120705000130101200000010000L TS new
P9364LION-A 00000.0 10121215000030101200000010000L TS new
P9364COOK-B 00000.0 10121815000015101200000010000L 1830+/-30 new
P9366BOSS-A 00000.0 10121445000005101200000010000L 1445+/-30 new
P0712BOSS-B 00000.0 10120310000010101200000010000L 0315+/-30 new
P0712LION-A 00000.0 10120910000005101200000010000L 0915+/-30 new
P9443GUAM-A 00000.0 10121355000015101200000010000L 14+/-30 new
P9442INDI-A 00000.0 10120200000010101200000010000L 02+/-30 new
P9444REEF-A 00000.0 10121440000035101200000010000L 1440+/-15 new
P5037LION-A 00000.0 10120045000715101200000010000new
P5037LION-A 00000.0 10120100000500101200000010000L TS new
P5037LION-A 00000.0 10121100000010101200000010000new
P5037LION-A 00000.0 10121430000010101200000010000L 15+/-30 new
P5037LION-A 00000.0 10121930000010101200000010000L 19+/-30 new
P5037LION-A 00000.0 10122335000020101200000010000new
P4845INDI-A 00000.0 10120540000005101200000010000L 06+/-30 new
P4845LION-A 00000.0 10121800000005101200000010000L 18+/-30 new
P4955LION-B 00000.0 10121320000010101200000010000L TS new
P4955INDI-A 00000.0 10120054000010101200000010000L TS new
P4035BOSS-A 00000.0 10120530000010101200000010000L 0530+/-10 new
P4035LION-A 00000.0 10122130000010101200000010000L 2130+/-10 new
P4845INDI-A 00000.0 10122345000010101200000010000L 2345+/-30 new
P9363HULA-B 00000.0 10121000000010101200000010000L 10+/-1 new
P4035BOSS-B 00000.0 10120100000025101200000010000L TS new
P4035BOSS-B 00000.0 10120925000010101200000010000L 0930+/-10 new
P6280BOSS-B 00000.0 10120000000005101200000010000new
P5329INDI-A 00001.0 10121540000020101200000010000L 1535-1610 new
P5953COOK-A 00001.0 10120900000020101200000010000L 0830-0930 new
P6394COOK-A 00000.0 10120835000010101200000010000new
P6451COOK-A 00000.0 10121125000015101200000010000L 1130+/-30 new
P9445GUAM-A 00000.0 10121200000025101200000010000L 12+/-15 new
P5775REEF-A 00001.0 10121130000020101200000010000L 1130-1200 new
P5775GUAM-B 00001.0 10121350000020101200000010000L TS new
P4832REEF-A 00000.0 10120910000010101200000010000L 0930+/-30 new
P9446LION-B 00000.0 10120950000015101200000010000L 10+/-30 new
P4845LION-B 00000.0 10121211000010101200000010000L 1211+/-30 new
P4035LION-A 00000.0 10121340000010101200000010000L 1330+/-10 new

P4524BOSS-B 00000.0 10120430000015101200000010000L 0420+/-30 new
P9366PIKE-A 00000.0 10120151000015101200000010000L TS new
P5775REEF-A 00001.0 10120700000015101200000010000L TS new
P9441BOSS-B 00000.0 10120400000015101200000010000L 04+/-30 new
P6071PIKE-A 00000.0 10120558000057101200000010000L TS new
P5775GUAM-A 00001.0 10120810000020101200000010000L TS new
P7314COOK-B 00000.0 10121310000005101200000010000L 1310+/-30 new
P6453HULA-B 00000.0 10121025000005101200000010000L 1020+/-30 new
P6451HULA-B 00000.0 10120430000005101200000010000L 0415+/-30 new
P5775REEF-A 00001.0 10120200000020101200000010000L 0130-0230 new
P5775GUAM-A 00001.0 10120425000020101200000010000L TS new
P4035LION-B 00000.0 10120245000005101200000010000new
P9364BOSS-A 00000.0 10120900000010101200000010000L 09+30-15 new
P2124LION-B 00001.0 10121240000020101200000010000L 1230-1330 new
P9443HULA-A 00000.0 10121830000010101200000010000new
P7314BOSS-A 00000.0 10120620000005101200000010000L 0615+/-30 new
P6391BOSS-B 00000.0 10120010000010101200000010000new
P6391LION-A 00000.0 10121300000005101200000010000new
P4524LION-B 00000.0 10121145000010101200000010000L 12+/-30 new
P4035INDI-A 00000.0 10121735000010101200000010000L 1730+/-10 new
P2124BOSS-B 00001.0 10122315000020101200000010000L 2300-0000 new
P9434COOK-B 00000.0 10121845000015101200000010000L 19+/-30 new
P0712LION-A 00000.0 10122200000015101200000010000L 22+/-30 new
P7641PIKE-A 00001.0 10121800000020101200000010000L 1800-1900 new
P6453GUAM-B 00000.0 10121715000005101200000010000L 1715+/-30 new
P5775GUAM-A 00001.0 10121825000140101200000010000L TS new
P4832INDI-A 00000.0 10122010000010101200000010000L TS new
P9444REEF-A 00000.0 10122100000025101200000010000L 21+/-15 new
P4524BOSS-B 00000.0 10121925000005101200000010000L 1915+/-30 new
P6391INDI-A 00000.0 10121910000010101200000010000L 1920+/-30 new
P8275COOK-B 00000.0 10122315000005101200000010000L 2315+/-30 new
P6451COOK-B 00000.0 10121945000005101200000010000L 1945+/-30 new
P5329LION-A 00001.0 10122235000035101200000010000new
P3160GUAM-B 00001.0 10120250000020101200000010000new
P6012POGO-A 03718.0 10120450000410101200050000948DPADL TS new
new
new
new
P6374INDI-A 00001.0 10120850000015101200430011104new
new
new
new
P7837GUAM-B 02004.0 10120110000035101201060011281 TS new
new
new
new
new
new
new
new
P4373REEF-A 00001.0 10120605000015101202320011101 0600-0645 new
new
P7310POGO-B 00398.0 10121205000010101202440010051 1215+/-10 new

P7310POGO-B 00398.0 10120255000020101202440010O5L 0245+/-10 new
new
new
new
P7310BOSS-B 00398.0 101207200001010120310000915L 0735+/-45 new
new
P3028PIKE-A 00001.0 10120500000045101203210006 42new
new
P8896REEF-A 00001.0 10120345000040101203420011 09L 0325+30-00new
L S3O new
new
P3726INDI-A 03010.9 10120355000045101203500011 36new
new
P3726INDI-A 03010.9 10121210000315101203570011 29new
new
new
new
new
P3726GUAM-B 03010.9 10120425000800101204200008 28new
P7506HULA-B 05625.0 10120500000010101204220011 26L 05+/-10 new
new
new
P7506SUN3-A 05625.0 10120625000710101204330011 09DPADL TS new
P7506POGO-B 05625.0 10121420000015101205000010 17L 1430+/-10 new
L S3O new
new
P2524PIKE-A 00001.0 10121100000045101205280007 16L TS new
new
P7225BOSS-B 08404.0 10120610000010101205340010 42L 06+/-10 new
P7225BOSS-B 08404.0 10120835000010101205340010 42L 0835+/-10 new
P7225BOSS-C 08404.0 10120720000255101205340010 42DPADnew
P7225BOSS-C 08404.0 10121100000310101205340010 42DPADnew
P7225BOSS-B 08404.0 10121540000015101205340010 42L 1530+/-10 new
new
new
new
new
new
new
new
new
P2272LION-B 00001.0 10120700000015101206370003 34L 07+30-00 new
P2567PIKE-A 00001.0 10120755000045101206400007 53new
new
P7225COOK-A 08404.0 10121015000045101206550007 55DPADnew
L SEND L SEND new
new
new
new
new
P8896POGO-B 00001.0 10120950000040101207320004 07L 0935+30-00new
new
new

new
new
P7304INDI-A 06744.0 10121945000007101208220011331 TS new
P7304INDI-A 06744.0 10121140000010101208220011331 1140+/-10 new
new
P7304LION-A 06744.0 10121005000010101208380010551 TS new
P7304LION-B 06744.0 10120920000015101208380010551 TS new
new
new
new
new
new
P7304POGO-D 06744.0 10121025000225101209120009581DPADL TS new
P7304POGO-B 06744.0 10121845000015101209120009581 1845+00-10new
new
new
new
P7304BOSS-C 06744.0 10121445000250101209360009111DPADnew
new
new
new
new
new
new
P9783POGO-B 00001.0 10121130000015101210370004421 11+30-00 new
new
new
new
new
new
new
new
P5329REEF-A 00001.0 10122310000055101211180100441new
P3310HULA-B 00001.0 10121400000015101211280008421 14+30-00 new
P6012LION-A 03719.0 10121130000035101211290011011 1140+0/-10new
P5681PIKE-A 00001.0 10121415000045101211410007161 TS new
P6012INDI-A 03719.0 10122235000013101211440011051 TS new
P6012POGO-D 03719.0 10121300000800101211490010141DPADL TS new
P6012POGO-B 03719.0 10122115000025101211490010141 2115+00-10new
new
new
new
new
P7304COOK-A 06744.0 10121250000155101212200004331DPADnew
new
new
new
new
P7837BOSS-A 02005.0 10121320000035101213140011041 TS new
new
new
P3028BOSS-B 00001.0 10121500000015101213480004211 15+30-00 new
new

new
P3310PIKE-A 00001.0 10121515000045101213580000540L TS new
P6738COOK-B 00001.0 10121720000015101213590000546L 1700-1745 new
new
new
new
new
P5681LION-B 00001.0 10121615000015101214330000532L 1615+30-00new
new
P7310POGO-B 00399.0 10121450000020101214390001013L 1440+/-10 new
P7310BOSS-B 00399.0 10121945000010101214400001015L 1935+/-45 new
P2941GUAM-B 00001.0 10121900000015101214550000912L 19+30-00 new
P3726GUAM-B 03011.2 10121510000045101215020000058new
new
new
new
new
new
new
new
P3726BOSS-A 03012.0 10121640001100101216000100000new
P3726PIKE-A 03012.0 10122200000245101216000100000new
P8896HULA-B 00001.0 10122130000040101216010000636L 2130+30-00new
new
new
new
new
new
P4373PIKE-A 00001.0 10121645000045101216170000739L TS new
new
P7506POGO-B 05626.0 10121710000010101216560001020L 17+/-10 new
P7506POGO-B 05626.0 10121935000010101216560001020L 1935+/-10 new
new
new
new
P7506BOSS-C 05626.0 10121825000640101217080000958DPADL TS new
P7225GUAM-A 08405.0 10121800000010101217130001124L 18+/-10 new
new
new
new
P8896PIKE-A 00001.0 10121825000045101217290000750new
new
new
P2524POGO-B 00001.0 10121800000015101217430000428L 1800-1845 new
P7225SUN3-A 08405.0 10121920000255101217490001027DPADL TS new
new
new
P7225COOK-C 08405.0 10122215000355101217510001024DPADL TS new
new
new
new
new
new

```
new
new
P0470PIKE-A 00001.0 10122000000045101219010007 47L TS      new
new
new
new
new
new
new
new
P9794POGO-A 00001.0 10122130000015101219490004 35L 2130-2215 new
new
new
new
new
new
P7304GUAM-A 06745.0 10122100000025101220320010 42new
P7304GUAM-A 06745.0 10122200000010101220320010 42L TS      new
P7304SUN3-A 06745.0 10122225000710101220330011 07DPADL TS      new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
new
P6012HULA-B 03720.0 10122345000035101223210011 19L 2345+/-10 new
new
new
```

HREQ.PAS Output (High Altitude Visibilities not included because of large file size).

TOL.PAS. Tolerance. This PASCAL program is used for the medium and high altitude support requests only. This program takes tolerance data presented in different formats for each request from HREQ.PAS and standardizes the tolerance window data.

```
program tol;
Type
 mat = array[1..40, 1..3] of Integer;
Var
f15,f16,f110,f111,d12,d14,f17,f112,hfn : integer;
I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,time1,time2,f13,f14,f18,f19 :integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm,d13,d16 : integer;
ident,lfident,hfident,smon,stme,atme,alen,chk,dur,t1,t2 : string[4];
rev,gts : string[6];
id,ib,sch,line,sp,s1,s2,s3,s4,f1,f2,f3,f4,f5,f6,f7,f8,f9,f10,f11,f12 : STRING[1];
scnt,sbv,sev,sailen,nsctot,slen :string[4];
aday,tat,ahr,amin,atmehr,atmemin,d1,d2,d3,d4,d5,d6,d7 : string[2];
last,hf : string[3];
fill : string[32];
fill2 : string[24];
revv,revlf,revhf  :real;
dum:STRING[9];
Infile,Infile1,OutFile1,outfile2,outfile3,outfile : Text;
stats : mat;
Match  :boolean;
Begin  {Main Program}
    hfn:=0;
    sp:=' ';
    chk:='   ';
    cnt:=0;
    snumlf:=1;
    snumhf:=300;
    irevlf:=0;
    irevhf:=9999;
    lfident:='   ';
    hfident:='   ';
    Writeln('Begin Reading Fin.dft');
    Assign(Infile,'c:\reqhf.dat');
    Reset(Infile);
    Assign(outfile1,'c:\d12lf.dat');
    Rewrite(outfile1);
    Assign(Outfile2,'C:\hf12.dat');
    Rewrite(Outfile2);
    Assign(Outfile3,'C:\dpad.dat');
    Rewrite(Outfile3);
    Assign(Outfile,'C:\raw12.dat');
    Rewrite(Outfile);
    Writeln('Reading Data');
    while NOT EOF(Infile) do
     Begin
          readln (infile,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,d2,d4,d5,
            d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,f1,f2,
            f3,f4,f5,f6,f7,f8,f9,f10,f11,f12);
                        val(f3,f13,error);
             val(f4,f14,error);
```

```
val(f8,f18,error);
val(f9,f19,error);
val(f7,f17,error);
 val(f5,f15,error);
val(f6,f16,error);
val(f10,f110,error);
val(f11,f111,error);
val(d2,d12,error);
val(d4,d14,error);
val(f12,f112,error);
val(d3,d13,error);
val(d6,d16,error);
if f1='D' then writeln (outfile3,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4);
if (f3='T') or (f1='n') then
 begin
time1:=d12*60+d14;
 time2:=time1+d13*60+d16;
 cnt:=cnt+1;
 if s2<>' ' then
writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4);
 if s2=' ' then
 begin
 hfn:=hfn+1;
   if time2<time1 then time2:=time2+1440;
 writeln (outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:5,time2:5,hfn:4);
 end;
 end;
 if (f5='+') and (f6='/') then
 begin
 cnt:=cnt+1;
time1:=(10*f13+f14)*60-10*f18-f19;
time2:=(10*f13+f14)*60+10*f18+f19+d13*60+d16;
              if s2<>' ' then
 writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4,time2:4);
 if s2=' ' then
 begin
  hfn:=hfn+1;
    if time2<time1 then time2:=time2+1440;
 writeln (outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:5,time2:5,hfn:4);
  end;
 end;
 if (f7='-') and (f6<>'/') then
 begin
 cnt:=cnt+1;
time1:=(10*f13+f14)*60+10*f15+f16;
time2:=(10*f18+f19)*60+10*f110+f111+60*d13+d16;
 if s2<>' ' then
  writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
```

```
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4,time2:4);
 if s2=' ' then
 begin
  hfn:=hfn+1;
    if time2<time1 then time2:=time2+1440;
 writeln (outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:5,time2:5,hfn:4);
  end;
end;
if (f7='+') and (f8='/') then
begin
 cnt:=cnt+1;
 time1:=(10*f13+f14)*60+10*f15+f16-10*f110-f111;
time2:=(10*f13+f14)*60+10*f15+f16+10*f110+f111+60*d13+d16;
 if s2<>' ' then
  writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4,time2:4);
 if s2=' ' then
 begin
  hfn:=hfn+1;
     if time2<time1 then time2:=time2+1440;
 writeln (outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:5,time2:5,hfn:4);
 end;
end;
if (f5='+') and (f8='-') then
 begin
  cnt:=cnt+1;
time2:=(10*f13+f14)*60+10*f16+f17+60*d13+d16;
time1:=(10*f13+f14)*60-10*f19-f110;
 if s2<>' ' then
 writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4,time2:4);
 if s2=' ' then
 begin
  hfn:=hfn+1;
    if time2<time1 then time2:=time2+1440;
 writeln (outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:5,time2:5,hfn:4);
 end;
end;
if (f7='+') and (f10='-') then
 begin
  cnt:=cnt+1;
 time1:=(10*f13+f14)*60+10*f15+f16-10*f111-f112;
time2:=(10*f13+f14)*60+10*f15+f16+10*f18+f19+60*d13+d16;
 if s2<>' ' then
 writeln (outfile1,cnt,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
 d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,' ',time1:4,time2:4);
 if s2=' ' then
 begin
  hfn:=hfn+1;
    if time2<time1 then time2:=time2+1440;
```

```
                end;
               end;
               end;
    for i:=-100 to 1440 do
    begin
     reset(outfile2);
     repeat
 readln(outfile2,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,d2,d4,d5,d3,d6,d7,
 atmehr,atmemin,aday,ahr,amin,tat,time1,time2,hfn);
   if i=time1 then  writeln (outfile,id,ident,gts,sch,rev,s1,s2,s3,s4,d1,
              d2,d4,d5,d3,d6,d7,atmehr,atmemin,aday,ahr,amin,tat,time1:5,time2:5,hfn:4);
until eof(outfile2);
end;
reset(outfile);
repeat
readln(outfile);
 until EOF (outfile);
  reset(outfile3);
repeat
readln(outfile3);
 until EOF (outfile3);
                  end.
```

TOL.PAS Output (High Altitude Scheduling Tolerances).

```
P9445HULA-A 00000.0 10120000000035101111500100 35 -15  50  3
P2567REEF-A 00001.0 10120030000015101116550011 14  0  45  6
P8275COOK-A 00000.0 10120025000005101200000100 00  0  65 39
P6280BOSS-B 00000.0 10120000000005101200000100 00  0   5 69
P7310COOK-B 00397.0 10120015000010101114150011 10  5  35  5
P6391BOSS-B 00000.0 10120010000010101200000100 00 10  20 97
P8639PIKE-A 00001.0 10120030000045101123090005 13 30  75 14
P5953GUAM-B 00001.0 10120035000020101200000100 00 30 110 34
P0470POGO-B 00001.0 10120100000015101120250005 23 45  90  9
P5037LION-A 00000.0 10120045000715101200000100 00 45 480 53
P4955INDI-A 00000.0 10120054000010101200000100 00 54  64 62
P5037LION-A 00000.0 10120100000500101200000100 00 60 360 54
P4035BOSS-B 00000.0 10120100000025101200000100 00 60  85 67
P9521POGO-B 00001.0 10120120000015101123510004 17 65 125 17
P7837GUAM-B 02004.0 10120110000035101201060011 28 70 105 116
P6453COOK-A 00000.0 10120215000015101200000100 00 90 165 22
P9442INDI-A 00000.0 10120200000010101200000100 00 90 160 51
P5775REEF-A 00001.0 10120200000020101200000100 00 90 170 90
P8639COOK-A 00001.0 10120145000015101122510005 58 105 165 13
P9366PIKE-A 00000.0 10120151000015101200000100 00 111 126 82
P7506POGO-B 05624.0 10120225000015101117000010 20 145 180  7
P7310POGO-B 00398.0 10120255000020101202440010 05 155 195 119
P0712BOSS-B 00000.0 10120310000010101200000100 00 165 235 48
P4035LION-B 00000.0 10120245000005101200000100 00 165 170 92
P3160GUAM-B 00001.0 10120250000020101200000100 00 170 190 114
P6142HULA-B 00001.0 10120300000025101122040009 01 180 235 11
P6392BOSS-B 00000.0 10120330000005101200000100 00 180 245 37
```

P6142HULA-B 00001.0 10120300000025101122040009O1 180 235 11
P6392BOSS-B 00000.0 10120330000005101200000100000 180 245 37
P5329INDI-A 00001.0 10120325000020101111150100S0 205 270 2
P7225GUAM-B 08403.0 10120335000015101117170011125 205 240 8
P8896REEF-A 00001.0 10120345000040101203420011O9 205 275 122
P9441BOSS-B 00000.0 10120400000015101200000100000 210 285 84
P6451HULA-B 00000.0 10120430000005101200000100000 225 290 89
P4524BOSS-B 00000.0 1012043000001510120000010000 230 305 81
P3726INDI-A 03010.9 10120355000045101203500011136 235 280 123
P1920BOSS-A 00001.0 10120400000015101123130007291 240 285 15
P5775GUAM-A 00001.0 10120425000020101200000100000 265 285 91
P3726GUAM-B 03010.9 10120425000800101204200008281 265 745 125
P2124BOSS-A 00001.0 10120430000020101200000100000 270 395 27
P6280INDI-A 00000.0 10120500000010101200000100000 290 360 42
P7506HULA-B 05625.0 10120500000010101204220011261 290 320 126
P3028PIKE-A 00001.0 10120500000045101203210006421 300 345 121
P4035BOSS-A 00000.0 10120530000010101200000100000 320 350 63
P3160REEF-A 00001.0 10120530000020101200000100000 330 410 30
P4845INDI-A 00000.0 10120540000005101200000100000 330 395 59
P9445HULA-A 00000.0 10120610000025101111500100351 345 400 4
P7314BOSS-A 00000.0 10120620000005101200000100000 345 410 96
P7225BOSS-B 08404.0 10120610000010101205340010421 350 380 129
P6071PIKE-A 00000.0 10120558000057101200000100000 358 415 85
P3055REEF-A 00001.0 10120625000015101122310010001 360 405 12
P4373REEF-A 00001.0 10120605000015101202320011101 360 420 117
P7304BOSS-B 06743.0 10120645000015101121130010091 395 420 10
P7310BOSS-B 00398.0 10120720000010101203100009151 410 510 120
P5775REEF-A 00001.0 10120700000015101200000100000 420 435 83
P2272LION-B 00001.0 10120700000015101206370003341 420 465 132
P6391INDI-A 00000.0 10120705000130101200000100000 425 515 44
P2567PIKE-A 00001.0 10120755000045101206400007531 475 520 133
P5775GUAM-A 00001.0 10120810000020101200000100000 490 510 86
P7225BOSS-B 08404.0 10120835000010101205340010421 505 535 130
P5953COOK-A 00001.0 10120900000020101200000100000 510 590 71
P5329REEF-A 00001.0 10120835000020101111150100501 515 535 1
P6394COOK-A 00000.0 10120835000010101200000100000 515 525 72
P0712LION-A 00000.0 10120910000005101200000100000 525 590 49
P9364BOSS-A 00000.0 10120900000010101200000100000 525 580 93
P6374INDI-A 00001.0 10120850000015101200430011041 530 545 115
P4832REEF-A 00000.0 10120910000010101200000100000 540 610 77
P6012HULA-A 03718.0 10120915000025101123250011191 545 580 16
P4035BOSS-B 00000.0 10120925000010101200000100000 560 590 68
P7304LION-B 06744.0 10120920000015101208380010551 560 575 138
P2124LION-A 00001.0 10120930000020101200000100000 570 695 28
P9446LION-B 00000.0 10120950000015101200000100000 570 645 78
P8896POGO-B 00001.0 10120950000040101207320004071 575 645 134
P9363HULA-B 00000.0 10121000000010101200000100000 590 620 66
P6453HULA-B 00000.0 10121025000005101200000100000 590 655 88
P9366LION-A 00000.0 10121030000005101200000100000 600 635 20
P7304LION-A 06744.0 10121005000010101208380010551 605 615 137
P5037LION-A 00000.0 10121100000010101200000100000 660 670 55
P6451COOK-A 00000.0 10121125000015101200000100000 660 735 73
P2524PIKE-A 00001.0 10121100000045101205280007161 660 705 128

P9783POGO-B 00001.0 10121130000015101210370004 42 660 705 140
P5775REEF-A 00001.0 10121130000020101200000100 00 690 740 75
P4524LION-B 00000.0 10121145000010101200000100 00 690 760 99
P7304INDI-A 06744.0 10121140000010101208220011 33 690 720 136
P6012LION-A 03719.0 10121130000035101211290011 01 690 735 143
P4845LION-B 00000.0 10121211000010101200000100 00 701 771 79
P9445GUAM-A 00000.0 10121200000025101200000100 00 705 760 74
P6071BOSS-B 00000.0 10121215000005101200000100 00 725 790 40
P7310POGO-B 00398.0 10121205000010101202440010 05 725 755 118
P3726INDI-A 03010.9 10121210000315101203570011 29 730 925 124
P9364LION-A 00000.0 10121215000030101200000100 00 735 765 45
P2124LION-B 00001.0 10121240000020101200000100 00 750 830 94
P7314COOK-B 00000.0 10121310000005101200000100 00 760 825 87
P6391LION-A 00000.0 10121300000005101200000100 00 780 785 98
P4955LION-B 00000.0 10121320000010101200000100 00 800 810 61
P4035LION-A 00000.0 10121340000010101200000100 00 800 830 80
P7837BOSS-A 02005.0 10121320000035101213140011 04 800 835 147
P9443GUAM-A 00000.0 10121355000015101200000100 00 810 885 50
P8275BOSS-A 00000.0 10121415000015101200000100 00 825 900 24
P5775GUAM-B 00001.0 10121350000020101200000100 00 830 850 76
P3310HULA-B 00001.0 10121400000015101211280008 42 840 885 142
P9366BOSS-A 00000.0 10121445000005101200000100 00 855 920 47
P5681PIKE-A 00001.0 10121415000045101211410007 16 855 900 144
P7506POGO-B 05625.0 10121420000015101205000010 17 860 895 127
P9444REEF-A 00000.0 10121440000035101200000100 00 865 930 52
P3160GUAM-B 00001.0 10121430000020101200000100 00 870 950 31
P5037LION-A 00000.0 10121430000010101200000100 00 870 940 56
P7310POGO-B 00399.0 10121450000020101214390010 13 870 910 152
P6280BOSS-A 00000.0 10121530000005101200000100 00 900 965 18
P3028BOSS-B 00001.0 10121500000015101213480004 21 900 945 148
P3726GUAM-B 03011.2 10121510000045101215020000 58 910 955 155
P3310PIKE-A 00001.0 10121515000045101213580005 40 915 960 149
P7225BOSS-B 08404.0 10121540000015101205340010 42 920 955 131
P5329INDI-A 00001.0 10121540000020101200000100 00 935 990 70
P6392INDI-A 00000.0 10121615000010101200000100 00 965 1035 38
P5681LION-B 00001.0 10121615000015101214330005 32 975 1020 151
P9446REEF-A 00000.0 10121700000005101200000100 00 990 1055 23
P5775GUAM-A 00001.0 10121630000020101200000100 00 990 1070 25
P5953COOK-B 00001.0 10121645000020101200000100 00 990 1070 35
P3726BOSS-A 03012.0 10121640001100101216000100 00 1000 1660 156
P6453GUAM-B 00000.0 10121715000005101200000100 00 1005 1070 105
P4373PIKE-A 00001.0 10121645000045101216170007 39 1005 1050 159
P7506POGO-B 05626.0 10121710000010101216560010 20 1010 1040 160
P2124BOSS-B 00001.0 10121700000020101200000100 00 1020 1100 29
P6738COOK-B 00001.0 10121720000015101213590005 46 1020 1080 150
P6394COOK-B 00000.0 10121750000005101200000100 00 1035 1100 43
P4035INDI-A 00000.0 10121735000010101200000100 00 1040 1070 100
P4845LION-A 00000.0 10121800000005101200000100 00 1050 1115 60
P7225GUAM-A 08405.0 10121800000010101217130011 24 1070 1100 162
P5329INDI-A 00001.0 10121800000020101200000100 00 1080 1100 36
P9364COOK-B 00000.0 10121815000015101200000100 00 1080 1155 46
P7641PIKE-A 00001.0 10121800000020101200000100 00 1080 1160 104
P2524POGO-B 00001.0 10121800000015101217430004 28 1080 1140 164

P5037LION-A 00000.0 10121930000010101200000 10000 1110 1180 57
P9443HULA-A 00000.0 10121830000010101200000 10000 1110 1120 95
P9434COOK-B 00000.0 10121845000015101200000 10000 1110 1185 102
P7304POGO-B 06744.0 10121845000015101209120 00958 1115 1140 139
P4524BOSS-B 00000.0 10121925000005101200000 10000 1125 1190 109
P6391INDI-A 00000.0 10121910000010101200000 10000 1130 1200 110
P7310BOSS-B 00399.0 10121945000010101214400G 1015 1130 1230 153
P2941GUAM-B 00001.0 10121900000015101214550 00912 1140 1185 154
P6451COOK-B 00000.0 10121945000005101200000 10000 1155 1220 112
P7506POGO-B 05626.0 10121935000010101216560 01020 1165 1195 161
P7304INDI-A 06744.0 10121945000007101208220 01133 1185 1192 135
P7314COOK-B 00000.0 10122020000015101200000 10000 1190 1265 19
P0470PIKE-A 00001.0 10122000000045101219010 00747 1200 1245 165
P4832INDI-A 00000.0 10122010000010101200000 10000 1210 1220 107
P9366LION-A 00000.0 10122030000005101200000 10000 1215 1280 21
P9444REEF-A 00000.0 10122100000025101200000 10000 1245 1300 108
P3160REEF-A 00001.0 10122140000020101200000 10000 1260 1340 32
P7304GUAM-A 06745.0 10122100000025101220320 01042 1260 1285 167
P6012POGO-B 03719.0 10122115000025101211490 01014 1265 1300 146
P4035LION-A 00000.0 10122130000010101200000 10000 1280 1310 64
P0712LION-A 00000.0 10122200000015101200000 10000 1290 1365 103
P8896HULA-B 00001.0 10122130000040101216010 00636 1290 1360 158
P9794POGO-A 00001.0 10122130000015101219490 00435 1290 1350 166
P3726PIKE-A 03012.0 10122200000245101216000 10000 1320 1485 157
P7304GUAM-A 06745.0 10122200000010101220320 01042 1320 1330 168
P6071HULA-B 00000.0 10122235000010101200000 10000 1325 1395 41
P3160GUAM-A 00001.0 10122230000020101200000 10000 1350 1430 33
P5329LION-A 00001.0 10122235000035101200000 10000 1355 1390 113
P6012INDI-A 03719.0 10122235000013101211440 01105 1355 1368 145
P8275COOK-B 00000.0 10122315000005101200000 10000 1365 1430 111
P2124BOSS-B 00001.0 10122315000020101200000 10000 1380 1460 101
P5329REEF-A 00001.0 10122310000055101211180 10044 1390 1445 141
P4845INDI-A 00000.0 10122345000010101200000 10000 1395 1465 65
P5775GUAM-A 00001.0 10122330000020101200000 10000 1410 1460 26
P5037LION-A 00000.0 10122335000020101200000 10000 1415 1435 58
P6012HULA-B 03720.0 10122345000035101223210 01119 1415 1470 169

CROSSRV.PAS. Cross check request and visibility. This PASCAL program is used for the medium and high altitude support requests only. This program cross references the visibility file created in **HREQ.PAS** and the above output from **TOL.PAS** to determine all the RTSs that can satisfy each medium or high altitude support request from **TOL.PAS**. If visibility at a RTS side will support only a portion of the tolerance window, the tolerance window reflects the smaller scheduling window.

```
program CROSSRV;
Type
```

```
 mat = array[1..40, 1..3] of Integer;
Var
I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,d1n  :integer;
bthn,btmn,etmn,ethn,adn,ahn,aminn,addn,adhn,adminn,time,time1,etime,
etime1,dh1n,dmin1n,dur,vis,tol,hfnn : integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm : integer;
ident,lfident,hfident,smon,stme,amon,atme,alen,chk,ident1,amon1,
atme1,hfn : string[4];
slen,gts,gts1,slen1 : string[6];
rev,rev1 : string[7];
id,id1,sch,line,sp,s1,s2,s3,s4,s11,s21,s31,s41,sch1,hl1,hl : STRING[1];
scnt,sbv,sev,sailen,nsctot,bth,bth2,eth,eth2 :string[4];
aday,tat,ahr,atmehr,atmemin,d2,aday1,tat1,ahr1 : string[2];
atmehr1,atmemin1,d11,d21,m1,d1,h1,min1,dd1,dh1,dmin1,m,d,h,min,dd,dh,dmin,
am,ad,ah,amin,add,adh,admin,am1,ad1,ah1,amin1,add1,adh1,admin1 : string[2];
last : string[3];
fill : string[30];
fill1 : string[16];
revv,revlf,revhf  :real;
dum:STRING[9];
Infile,Infile1,OutFile1,outfile2,outfile3,outfile4 : Text;
stats : mat;
Match  :boolean;
Begin  {Main Program}
    sp:=' ';
    chk:='    ';
    cnt:=0;
    snumlf:=1;
    snumhf:=300;
    irevlf:=0;
    irevhf:=9999;
    lfident:='    ';
    hfident:='    ';
    Writeln('Begin Reading Fin.dft');
    Assign(Infile1,'c:\raw18.dat');
    Reset(Infile1);
    Assign(infile,'c:\d18v.dat');
    Reset(infile);
    Assign(Outfile1,'C:\rv18.dat');
    Rewrite(Outfile1);
    Writeln('Reading Data');
              while not eof(infile1) do
                begin
  Readln (Infile1,id1,ident1,gts1,sch1,rev1,hl1,m1,d1,h1,min1,dd1,dh1,dmin1,
              am1,ad1,ah1,amin1,add1,adh1,admin1,s1,bthn,ethn,hfnn);
              cnt:=cnt+1;
              Reset(infile);
      while not eof(infile) do
                  begin
              read (infile,id,ident,gts,sch,rev,hl,m,d,h,min,dd,dh,dmin,
              am,ad,ah,amin,add,adh,admin,tat,fill);
              if bthn<0 then bthn:=0;
```

```
                if (ident=ident1) then
               begin
                  str(bthn,bth);
              str(ethn,eth);
              str(hfnn,hfn);
               val(bth,bthn,error);
               val(eth,ethn,error);
               val(ad,adn,error);
               val(ah,ahn,error);
               val(amin,aminn,error);
               val(add,addn,error);
               val(adh,adhn,error);
               val(admin,adminn,error);
               val(d1,d1n,error);
               val(dmin1,dmin1n,error);
                val(dh1,dh1n,error);
              time1:=bthn+d1n*1440;
              time:=adn*1440+ahn*60+aminn;
              etime1:=ethn+time1-bthn;
              etime:=time+addn*1440+adhn*60+adminn;
              dur:=dh1n*60+dmin1n;
              vis:=etime - time;
              tol:=ethn-bthn;
              if tol<0 then tol:=tol+1440;
               if (eth='    ') then  ethn:=bthn+dur;
               if (time<=time1)and((time+dur)<=etime)then
               begin
                    val(hfn,hfnn,error);
                 val(eth,ethn,error);
                  val(bth,bthn,error);
   if dur<=(ethn-bthn) then writeln (outfile1,ident,gts,' ',bthn:4,' ',ethn:4,' ',cnt:4,dur:4);
               end;
              if ((time1<etime) or (time<etime1))and(vis>=dur)and(eth<>'    ')then
              begin
              if (time<time1)and(etime1<etime) then
              begin
                val(hfn,hfnn,error);
                val(eth,ethn,error);
                 val(bth,bthn,error);
    if dur<=(ethn-bthn) then  writeln (outfile1,ident,gts,' ',bthn:4,' ',ethn:4,' ',cnt:4,dur:4);
             end;
             if (time>time1)and(etime1>etime) then
             begin
              ahn:=ahn*60+aminn;
              ethn:=ahn+adhn*60+adminn;
               val(hfn,hfnn,error);
if dur<=(ethn-ahn) then writeln (outfile1,ident,gts,' ',ahn:4,' ',ethn:4,' ',cnt:4,dur:4);
             end;
            if(time>time1)and(etime1<etime)and(etime1>time) then
             begin
              ahn:=ahn*60+aminn;
              val(eth,ethn,error);
               val(hfn,hfnn,error);
```

```
 if dur<=(ethn-ahn) then writeln (outfile1,ident,gts,' ',ahn:4,' ',ethn:4,' ',cnt:4,dur:4);
                end;
                if(time<time1)and(etime1>etime)and(etime>time1) then
                begin
                 ethn:=bthn+etime-time1;
                 if (ethn-bthn)>dur then
                 begin
                 ethn:=ethn-dur;
                 val(bth,bthn,error);
                 val(hfn,hfnn,error);
 if dur<=(ethn-bthn) then writeln (outfile1,ident,gts,' ',bthn:4,' ',ethn:4,' ',cnt:4,dur:4);
                end;
                end;
end;
end;
end;
end;
 reset(outfile1);
 repeat
 readln(outfile1);
 until EOF (outfile1);
end.
```

CROSSRV.PAS Output (Requests and Visibility Combinations).

```
9445HULA-A  0 50  1 35
9445HULA-A  0 50  1 35
9445HULA-A  0 50  1 35
9445HULA-A  0 50  1 35
9445REEF-A  0 50  1 35
9445GUAM-A  0 50  1 35
9445HULA-B  0 50  1 35
2567INDI-A  0 45  2 15
2567INDI-A  0 45  2 15
2567REEF-A  0 45  2 15
2567REEF-A  0 45  2 15
2567REEF-A  0 45  2 15
2567REEF-A  0 45  2 15
2567LION-A  0 45  2 15
8275COOK-B  0 65  3 5
8275PIKE-A  0 65  3 5
8275BOSS-A  0 65  3 5
8275LION-A  0 65  3 5
6280INDI-A  0 5  4 5
6280BOSS-A  0 5  4 5
6280LION-A  0 5  4 5
6280BOSS-A  0 5  4 5
6280BOSS-B  0 5  4 5
7310HULA-B  5 35  5 10
7310HULA-B  5 35  5 10
7310COOK-B  5 35  5 10
7310COOK-B  5 35  5 10
7310SUN3-A  5 35  5 10
7310SUN3-A  5 35  5 10
7310HAWK-A  5 35  5 10
7310HAWK-A  5 35  5 10
7310COOK-B  5 35  5 10
7310COOK-B  5 35  5 10
7310PIKE-A  5 35  5 10
7310PIKE-A  5 35  5 10
7310POGO-B  5 35  5 10
7310POGO-B  5 35  5 10
7310BOSS-A  5 35  5 10
7310BOSS-A  5 35  5 10
6391INDI-A  10 20  6 10
6391INDI-A  10 20  6 10
6391BOSS-A  10 20  6 10
6391BOSS-A  10 20  6 10
6391LION-A  10 20  6 10
6391LION-A  10 20  6 10
8639GUAM-B  30 75  7 45
8639GUAM-B  30 75  7 45
8639HULA-B  30 75  7 45
8639HULA-B  30 75  7 45
8639POGO-B  30 75  7 45
8639POGO-B  30 75  7 45
8639COOK-B  30 75  7 45
8639COOK-B  30 75  7 45
8639COOK-A  30 75  7 45
8639COOK-A  30 75  7 45
8639PIKE-A  30 75  7 45
8639PIKE-A  30 75  7 45
8639PIKE-A  30 75  7 45
8639PIKE-A  30 75  7 45
8639LION-A  30 75  7 45
5953GUAM-B  30 110  8 20
5953GUAM-B  30 110  8 20
5953HULA-B  30 110  8 20
5953HULA-B  30 110  8 20
5953COOK-B  30 110  8 20
5953COOK-B  30 110  8 20
5953PIKE-A  30 110  8 20
5953PIKE-A  30 110  8 20
0470COOK-B  45 90  9 15
0470COOK-B  45 90  9 15
0470PIKE-A  45 90  9 15
0470PIKE-A  45 90  9 15
0470BOSS-A  45 90  9 15
0470BOSS-A  45 90  9 15
0470POGO-B  45 90  9 15
0470POGO-B  45 90  9 15
0470POGO-B  45 90  9 15
0470POGO-B  45 90  9 15
0470LION-A  45 90  9 15
0470LION-A  45 90  9 15
5037BOSS-A  45 480  10 435
```

5037BOSS-A 45 480 10 435
5037LION-A 45 480 10 435
5037LION-A 45 480 10 435
5037LION-A 45 480 10 435
5037LION-A 45 480 10 435
4955INDI-A 54 64 11 10
4955INDI-A 54 64 11 10
4955BOSS-A 54 64 11 10
4955BOSS-A 54 64 11 10
4955LION-A 54 64 11 10
4955LION-A 54 64 11 10
4955INDI-A 54 64 11 10
4955INDI-A 54 64 11 10
5037BOSS-A 60 360 12 300
5037BOSS-A 60 360 12 300
5037LION-A 60 360 12 300
5037LION-A 60 360 12 300
5037LION-A 60 360 12 300
5037LION-A 60 360 12 300
4035BOSS-A 60 85 13 25
4035BOSS-A 60 85 13 25
4035LION-A 60 85 13 25
4035LION-A 60 85 13 25
4035LION-A 60 85 13 25
9521INDI-A 65 125 14 15
9521INDI-A 65 125 14 15
9521REEF-A 65 125 14 15
9521REEF-A 65 125 14 15
9521LION-A 65 125 14 15
9521LION-A 65 125 14 15
9521POGO-B 65 125 14 15
9521POGO-B 65 125 14 15
9521POGO-B 65 125 14 15
9521POGO-B 65 125 14 15
9521GUAM-B 65 125 14 15
9521GUAM-B 65 125 14 15
9521BOSS-A 72 125 14 15
7837LION-A 70 105 15 35
7837PIKE-A 70 105 15 35
7837POGO-B 70 105 15 35
7837GUAM-A 70 105 15 35
7837GUAM-A 70 105 15 35
7837GUAM-B 70 105 15 35
7837GUAM-B 70 105 15 35
6453GUAM-A 90 165 16 15
6453GUAM-A 90 165 16 15
6453HULA-B 90 165 16 15
6453HULA-B 90 165 16 15
6453COOK-B 90 165 16 15
6453COOK-B 90 165 16 15
9442INDI-A 90 160 17 10
9442INDI-A 90 160 17 10
9442COOK-B 90 160 17 10
9442COOK-B 90 160 17 10
9442PIKE-A 90 160 17 10
9442PIKE-A 90 160 17 10
9442BOSS-A 90 160 17 10
9442BOSS-A 90 160 17 10
9442LION-A 90 160 17 10
9442LION-A 90 160 17 10
9442POGO-B 90 160 17 10
9442POGO-B 90 160 17 10
5775INDI-A 90 170 18 20
5775INDI-A 90 170 18 20
5775REEF-A 90 170 18 20
5775REEF-A 90 170 18 20
5775GUAM-B 90 170 18 20
5775GUAM-B 90 170 18 20
5775LION-A 90 170 18 20
5775LION-A 90 170 18 20
5775INDI-A 90 170 18 20
5775INDI-A 90 170 18 20
5775GUAM-A 90 170 18 20
5775GUAM-A 90 170 18 20
8639GUAM-B 105 165 19 15
8639GUAM-B 105 165 19 15
8639HULA-B 105 165 19 15
8639HULA-B 105 165 19 15
8639POGO-B 105 165 19 15
8639POGO-B 105 143 19 15
8639COOK-B 105 143 19 15
8639COOK-B 105 143 19 15
8639COOK-A 105 143 19 15
8639COOK-A 105 143 19 15
8639PIKE-A 105 143 19 15
8639PIKE-A 105 143 19 15
8639PIKE-A 105 143 19 15
8639PIKE-A 105 143 19 15
8639LION-A 105 143 19 15
8639BOSS-A 105 143 19 15
8639BOSS-A 105 143 19 15
9366PIKE-A 111 126 20 15
9366PIKE-A 111 126 20 15
9366BOSS-A 111 126 20 15
9366BOSS-A 111 126 20 15
9366LION-A 111 126 20 15
9366LION-A 111 126 20 15
7506INDI-A 145 180 21 15
7506INDI-A 145 180 21 15
7506LION-A 145 180 21 15
7506LION-A 145 180 21 15
7506POGO-B 145 180 21 15
7506POGO-B 145 180 21 15
7506BOSS-A 145 180 21 15
7506BOSS-A 145 180 21 15
7506BOSS-C 145 180 21 15
7506BOSS-C 145 180 21 15
7506PIKE-A 145 180 21 15
7506HAWK-A 145 180 21 15
7506SUN3-A 145 180 21 15
7506COOK-B 145 180 21 15
7310HULA-B 155 195 22 20
7310COOK-B 155 195 22 20
7310SUN3-A 155 195 22 20
7310HAWK-A 155 195 22 20
7310COOK-B 155 195 22 20
7310PIKE-A 155 195 22 20
7310POGO-B 155 195 22 20
7310BOSS-A 155 195 22 20
7310INDI-A 155 195 22 20
7310INDI-A 155 195 22 20
7310REEF-A 155 195 22 20
7310REEF-A 155 195 22 20
7310LION-A 155 195 22 20
7310LION-A 155 195 22 20
7310POGO-B 164 195 22 20
7310POGO-B 164 195 22 20
0712PIKE-A 165 235 23 10
0712PIKE-A 165 235 23 10
0712BOSS-A 165 235 23 10
0712BOSS-A 165 235 23 10
0712LION-A 165 235 23 10
0712LION-A 165 235 23 10
4035BOSS-A 165 170 24 5
4035BOSS-A 165 170 24 5
4035LION-A 165 170 24 5
4035LION-A 165 170 24 5
4035LION-A 165 170 24 5
4035LION-A 165 170 24 5
3160INDI-A 170 190 25 20
3160INDI-A 170 190 25 20
3160REEF-A 170 190 25 20
3160REEF-A 170 190 25 20
3160GUAM-B 170 190 25 20
3160GUAM-B 170 190 25 20
6142GUAM-B 180 235 26 25
6392INDI-A 180 245 27 5
6392INDI-A 180 245 27 5
6392PIKE-A 180 245 27 5
6392PIKE-A 180 245 27 5
6392BOSS-A 180 245 27 5
6392BOSS-A 180 245 27 5
6392LION-A 180 245 27 5
6392LION-A 180 245 27 5
6392POGO-B 180 245 27 5
6392POGO-B 180 245 27 5
6392INDI-A 180 245 27 5
6392INDI-A 180 245 27 5

5329REEF-A 205 270 28 20
5329REEF-A 205 270 28 20
5329REEF-A 205 270 28 20
5329REEF-A 205 270 28 20
5329INDI-A 205 270 28 20
5329INDI-A 205 270 28 20
5329REEF-A 205 270 28 20
5329REEF-A 205 270 28 20
5329LION-A 205 270 28 20
5329LION-A 205 270 28 20
7225GUAM-A 205 240 29 15
7225GUAM-A 205 240 29 15
7225GUAM-B 205 240 29 15
7225GUAM-B 205 240 29 15
7225HULA-B 205 240 29 15
7225HULA-B 205 240 29 15
7225SUN3-A 205 240 29 15
7225SUN3-A 205 240 29 15
7225HAWK-A 205 240 29 15
7225HAWK-A 205 240 29 15
7225COOK-B 205 240 29 15
7225COOK-B 205 240 29 15
7225COOK-A 205 240 29 15
7225COOK-A 205 240 29 15
7225POGO-B 205 240 29 15
8896PIKE-A 205 275 30 40
8896BOSS-A 205 275 30 40
8896POGO-B 205 275 30 40
8896LION-A 205 275 30 40
8896INDI-A 205 275 30 40
8896INDI-A 205 275 30 40
8896REEF-A 222 275 30 40
8896REEF-A 222 275 30 40
9441HULA-B 210 285 31 15
9441HULA-B 210 285 31 15
9441COOK-B 210 285 31 15
9441COOK-B 210 285 31 15
9441PIKE-A 210 285 31 15
9441PIKE-A 210 285 31 15
9441BOSS-A 210 285 31 15
9441BOSS-A 210 285 31 15
9441BOSS-B 210 285 31 15
9441BOSS-B 210 285 31 15
6451HULA-B 225 290 32 5
6451HULA-B 225 290 32 5
6451COOK-B 225 290 32 5
6451COOK-B 225 290 32 5
6451PIKE-A 225 290 32 5
6451PIKE-A 225 290 32 5
6451BOSS-A 225 290 32 5
6451BOSS-A 225 290 32 5
4524INDI-A 230 305 33 15
4524INDI-A 230 305 33 15
4524BOSS-A 230 305 33 15
4524BOSS-A 230 305 33 15
4524LION-A 230 305 33 15
4524LION-A 230 305 33 15
3726BOSS-A 235 280 34 45
1920COOK-B 240 285 35 15
1920COOK-B 240 269 35 15
1920PIKE-A 240 269 35 15
1920PIKE-A 240 269 35 15
1920BOSS-A 240 269 35 15
1920BOSS-A 240 269 35 15
1920POGO-B 240 269 35 15
1920POGO-B 240 269 35 15
1920LION-A 240 269 35 15
1920LION-A 240 269 35 15
5775INDI-A 265 285 36 20
5775INDI-A 265 285 36 20
5775REEF-A 265 285 36 20
5775REEF-A 265 285 36 20
5775GUAM-B 265 285 36 20
5775GUAM-B 265 285 36 20
5775LION-A 265 285 36 20
5775LION-A 265 285 36 20
5775INDI-A 265 285 36 20
5775INDI-A 265 285 36 20
5775GUAM-A 265 285 36 20
5775GUAM-A 265 285 36 20
3726BOSS-A 265 745 37 480
3726BOSS-A 265 745 37 480
3726PIKE-A 265 745 37 480
3726PIKE-A 265 745 37 480
3726BOSS-A 265 745 37 480
3726BOSS-A 265 745 37 480
3726COOK-B 265 745 37 480
3726INDI-A 265 745 37 480
3726INDI-A 265 745 37 480
3726INDI-A 265 745 37 480
3726INDI-A 265 745 37 480
3726INDI-A 265 745 37 480
3726GUAM-B 265 745 37 480
3726GUAM-B 265 745 37 480
2124PIKE-A 270 395 38 20
2124PIKE-A 270 395 38 20
2124BOSS-A 270 395 38 20
2124BOSS-A 270 395 38 20
2124LION-A 270 395 38 20
2124LION-A 270 395 38 20
6280INDI-A 290 360 39 10
6280INDI-A 290 360 39 10
6280BOSS-A 290 360 39 10
6280BOSS-A 290 360 39 10
6280LION-A 290 360 39 10
6280LION-A 290 360 39 10
6280BOSS-A 290 360 39 10
6280BOSS-A 290 360 39 10
6280BOSS-B 290 360 39 10
6280BOSS-B 290 360 39 10
7506INDI-A 290 320 40 10
7506LION-A 290 320 40 10
7506POGO-B 290 320 40 10
7506BOSS-A 290 320 40 10
7506BOSS-C 290 320 40 10
7506PIKE-A 290 320 40 10
7506HAWK-A 290 320 40 10
7506SUN3-A 290 320 40 10
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7304REEF-A 1115 1140 137 15
7304LION-A 1115 1140 137 15
7304LION-A 1115 1140 137 15
7304LION-A 1115 1140 137 15
7304LION-A 1115 1140 137 15
7304POGO-D 1115 1140 137 15
7304POGO-D 1115 1140 137 15
7304BOSS-A 1115 1140 137 15
4524INDI-A 1125 1190 138 5
4524INDI-A 1125 1190 138 5
4524BOSS-A 1125 1190 138 5
4524BOSS-A 1125 1190 138 5
4524LION-A 1125 1190 138 5
4524LION-A 1125 1190 138 5
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6391INDI-A 1130 1200 139 10
6391BOSS-A 1130 1200 139 10
6391BOSS-A 1130 1200 139 10
6391LION-A 1130 1200 139 10
6391LION-A 1130 1200 139 10
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7310COOK-B 1130 1230 140 10
7310SUN3-A 1130 1230 140 10
7310HAWK-A 1130 1230 140 10
7310COOK-B 1130 1230 140 10
7310PIKE-A 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310BOSS-A 1130 1230 140 10
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7310REEF-A 1130 1230 140 10
7310LION-A 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310POGO-B 1130 1230 140 10
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7310BOSS-B 1130 1230 140 10
7310PIKE-A 1130 1230 140 10
7310SUN3-A 1130 1230 140 10
7310COOK-B 1130 1230 140 10
7310COOK-B 1130 1230 140 10
7310COOK-B 1130 1230 140 10
7310SUN3-A 1130 1230 140 10
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7310HAWK-A 1130 1230 140 10
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7310GUAM-A 1130 1230 140 10
7310PIKE-A 1130 1230 140 10
7310PIKE-A 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310POGO-B 1130 1230 140 10
7310BOSS-B 1130 1230 140 10
7310BOSS-B 1130 1230 140 10
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7310LION-A 1130 1230 140 10
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2941HULA-B 1140 1185 141 15
2941COOK-B 1140 1185 141 15
2941PIKE-A 1140 1185 141 15
2941BOSS-A 1140 1185 141 15
2941PIKE-A 1140 1185 141 15
2941COOK-B 1140 1185 141 15
2941LION-A 1140 1185 141 15
2941POGO-B 1140 1185 141 15
2941REEF-A 1140 1185 141 15
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6451HULA-B 1155 1220 142 5

6451COOK-B 1155 1220 142 5
6451COOK-B 1155 1220 142 5
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6451PIKE-A 1155 1220 142 5
6451BOSS-A 1155 1220 142 5
6451BOSS-A 1155 1220 142 5
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7506LION-A 1165 1195 143 10
7506POGO-B 1165 1195 143 10
7506BOSS-A 1165 1195 143 10
7506BOSS-C 1165 1195 143 10
7506PIKE-A 1165 1195 143 10
7506HAWK-A 1165 1195 143 10
7506SUN3-A 1165 1195 143 10
7506COOK-B 1165 1195 143 10
7506HULA-B 1165 1195 143 10
7506HULA-B 1165 1195 143 10
7506GUAM-A 1165 1195 143 10
7506COOK-B 1165 1195 143 10
7506SUN3-A 1165 1195 143 10
7506HAWK-A 1165 1195 143 10
7506SUN3-A 1165 1195 143 10
7506PIKE-A 1165 1195 143 10
7506POGO-B 1165 1195 143 10
7506POGO-B 1165 1195 143 10
7506BOSS-A 1165 1195 143 10
7506LION-A 1165 1195 143 10
7506INDI-A 1165 1195 143 10
7506INDI-A 1165 1195 143 10
7506LION-A 1165 1195 143 10
7506LION-A 1165 1195 143 10
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7506POGO-B 1165 1195 143 10
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7506BOSS-A 1165 1195 143 10
7506BOSS-C 1165 1195 143 10
7506BOSS-C 1165 1195 143 10
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7304COOK-B 1185 1192 144 7
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7304HAWK-A 1185 1192 144 7
7304GUAM-A 1185 1192 144 7
7304SUN3-A 1185 1192 144 7
7304SUN3-A 1185 1192 144 7
7304HAWK-A 1185 1192 144 7
7304PIKE-A 1185 1192 144 7
7304PIKE-A 1185 1192 144 7
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7304POGO-B 1185 1192 144 7
7304BOSS-A 1185 1192 144 7
7304BOSS-A 1185 1192 144 7
7304BOSS-B 1185 1192 144 7
7304LION-A 1185 1192 144 7
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7304INDI-A 1185 1192 144 7
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7304BOSS-C 1185 1192 144 7
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7304SUN3-A 1185 1192 144 7
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7304COOK-B 1185 1192 144 7
7304COOK-A 1185 1192 144 7
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7304REEF-A 1185 1192 144 7
7304REEF-A 1185 1192 144 7
7304REEF-A 1185 1192 144 7
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7314COOK-A 1190 1265 145 15
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7314PIKE-A 1190 1265 145 15
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0470BOSS-A 1200 1245 146 45
0470POGO-B 1200 1245 146 45
0470POGO-B 1200 1245 146 45
0470LION-A 1200 1245 146 45
0470INDI-A 1200 1245 146 45
0470REEF-A 1200 1245 146 45
0470LION-A 1200 1245 146 45
0470POGO-B 1200 1245 146 45
0470BOSS-A 1200 1245 146 45
0470GUAM-B 1200 1245 146 45
0470GUAM-B 1200 1245 146 45
0470HULA-B 1200 1245 146 45
0470HULA-B 1200 1245 146 45
0470COOK-B 1200 1245 146 45
0470COOK-B 1200 1245 146 45
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0470PIKE-A 1200 1245 146 45
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4832REEF-A 1210 1220 147 10
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4832LION-A 1210 1220 147 10
4832REEF-A 1210 1220 147 10
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9366PIKE-A 1215 1280 148 5
9366BOSS-A 1215 1280 148 5
9366BOSS-A 1215 1280 148 5
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9366LION-A 1215 1280 148 5
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9444REEF-A 1245 1300 149 25
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9444GUAM-A 1245 1300 149 25
9444LION-A 1245 1300 149 25
9444LION-A 1245 1300 149 25
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3160REEF-A 1260 1340 150 20
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3160GUAM-B 1260 1340 150 20
3160GUAM-B 1260 1340 150 20
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7304COOK-B 1260 1285 151 25
7304GUAM-A 1260 1285 151 25
7304GUAM-A 1260 1285 151 25
7304COOK-B 1260 1285 151 25
7304SUN3-A 1260 1285 151 25
7304HAWK-A 1260 1285 151 25
7304GUAM-A 1260 1285 151 25
7304SUN3-A 1260 1285 151 25
7304SUN3-A 1260 1285 151 25
7304HAWK-A 1260 1285 151 25
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7304POGO-B 1260 1285 151 25
7304POGO-B 1260 1285 151 25
7304BOSS-A 1260 1285 151 25
7304BOSS-A 1260 1285 151 25
7304BOSS-B 1260 1285 151 25

7304LION-A 1260 1285 151 25
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7304INDI-A 1260 1285 151 25
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7304LION-A 1260 1285 151 25
7304LION-A 1260 1285 151 25
7304POGO-D 1260 1285 151 25
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7304SUN3-A 1260 1285 151 25
7304SUN3-A 1260 1285 151 25
7304COOK-B 1260 1285 151 25
7304COOK-A 1260 1285 151 25
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7304HULA-B 1260 1285 151 25
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7304GUAM-A 1260 1285 151 25
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6012HULA-A 1265 1300 152 25
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6012SUN3-A 1265 1300 152 25
6012COOK-B 1265 1300 152 25
6012COOK-B 1265 1300 152 25
6012PIKE-A 1265 1300 152 25
6012PIKE-A 1265 1300 152 25
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6012POGO-A 1265 1300 152 25
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6012BOSS-A 1265 1300 152 25
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6012BOSS-A 1265 1300 152 25
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6012POGO-B 1265 1300 152 25
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6012POGO-D 1265 1300 152 25
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8896LION-A 1290 1360 155 40
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8896POGO-B 1290 1360 155 40
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9794HULA-B 1290 1350 156 15
9794POGO-B 1290 1350 156 15
9794COOK-B 1290 1350 156 15
9794PIKE-A 1290 1350 156 15
9794PIKE-A 1290 1350 156 15
9794COOK-B 1290 1350 156 15
9794POGO-B 1290 1350 156 15
9794INDI-A 1290 1350 156 15
9794REEF-A 1290 1350 156 15
9794GUAM-B 1290 1350 156 15
9794GUAM-B 1290 1350 156 15
9794HULA-B 1290 1350 156 15
9794HULA-B 1290 1350 156 15
9794POGO-B 1290 1350 156 15
9794POGO-B 1290 1350 156 15
9794POGO-A 1290 1350 156 15
9794POGO-A 1290 1350 156 15
9794LION-A 1290 1350 156 15
9794LION-A 1290 1350 156 15
9794COOK-B 1290 1350 156 15
9794COOK-B 1290 1350 156 15
9794PIKE-A 1290 1350 156 15
9794PIKE-A 1290 1350 156 15
9794BOSS-A 1290 1350 156 15
9794BOSS-A 1290 1350 156 15
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3726BOSS-A 1320 1485 157 165
3726PIKE-A 1320 1485 157 165
3726PIKE-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726COOK-B 1320 1485 157 165
3726HULA-B 1320 1485 157 165
3726POGO-B 1320 1485 157 165
3726INDI-A 1320 1485 157 165
3726INDI-A 1320 1485 157 165
3726INDI-A 1320 1485 157 165
3726GUAM-B 1320 1485 157 165
3726LION-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
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3726PIKE-A 1320 1485 157 165
3726INDI-A 1320 1485 157 165
3726INDI-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726PIKE-A 1320 1485 157 165
3726PIKE-A 1320 1485 157 165
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3726PIKE-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
3726BOSS-A 1320 1485 157 165
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3726COOK-B 1320 1485 157 165
3726HULA-B 1320 1485 157 165
3726HULA-B 1320 1485 157 165
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7304COOK-B 1320 1330 158 10
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7304GUAM-A 1320 1330 158 10
7304COOK-B 1320 1330 158 10
7304SUN3-A 1320 1330 158 10
7304HAWK-A 1320 1330 158 10
7304GUAM-A 1320 1330 158 10
7304SUN3-A 1320 1330 158 10
7304SUN3-A 1320 1330 158 10
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7304PIKE-A 1320 1330 158 10
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7304POGO-B 1320 1330 158 10
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7304BOSS-A 1320 1330 158 10
7304BOSS-B 1320 1330 158 10

7304LION-A 1320 1330 158 10
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7304INDI-A 1320 1330 158 10
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7304LION-A 1320 1330 158 10
7304LION-A 1320 1330 158 10
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7304BOSS-C 1320 1330 158 10
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7304SUN3-A 1320 1330 158 10
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7304COOK-A 1320 1330 158 10
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7304HULA-B 1320 1330 158 10
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7304GUAM-A 1320 1330 158 10
7304GUAM-A 1320 1330 158 10
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7304POGO-B 1320 1330 158 10
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7304BOSS-A 1320 1330 158 10
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6071COOK-B 1325 1395 159 10
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6071BOSS-A 1325 1395 159 10
6071BOSS-B 1325 1395 159 10
6071BOSS-B 1325 1395 159 10
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3160REEF-A 1350 1430 160 20
3160GUAM-B 1350 1430 160 20
3160GUAM-B 1350 1430 160 20
5329REEF-A 1355 1390 161 35
5329REEF-A 1355 1390 161 35
5329INDI-A 1355 1390 161 35
5329INDI-A 1355 1390 161 35
5329REEF-A 1355 1390 161 35
5329REEF-A 1355 1390 161 35
5329LION-A 1355 1390 161 35
5329LION-A 1355 1390 161 35
5329REEF-A 1355 1390 161 35
5329REEF-A 1355 1390 161 35
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6012HULA-B 1355 1368 162 13
6012HULA-A 1355 1368 162 13
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6012HAWK-A 1355 1368 162 13
6012SUN3-A 1355 1368 162 13
6012COOK-B 1355 1368 162 13
6012COOK-B 1355 1368 162 13
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6012PIKE-A 1355 1368 162 13
6012POGO-B 1355 1368 162 13
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6012BOSS-A 1355 1368 162 13
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6012INDI-A 1355 1368 162 13
6012INDI-A 1355 1368 162 13
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8275PIKE-A 1365 1430 163 5
8275BOSS-A 1365 1430 163 5
8275BOSS-A 1365 1430 163 5
8275LION-A 1365 1430 163 5
8275LION-A 1365 1430 163 5
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2124PIKE-A 1380 1420 164 20
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2124BOSS-A 1380 1420 164 20
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5329REEF-A 1390 1445 165 55
5329INDI-A 1390 1445 165 55
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4845INDI-A 1395 1430 166 10
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4845REEF-A 1395 1430 166 10
4845LION-A 1395 1430 166 10
4845LION-A 1395 1430 166 10
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6012HULA-B 1415 1470 169 35
6012HULA-A 1415 1470 169 35
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6012HAWK-A 1415 1470 169 35
6012SUN3-A 1415 1470 169 35
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6012COOK-B 1415 1470 169 35
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6012POGO-A 1415 1470 169 35
6012BOSS-A 1415 1470 169 35
6012BOSS-A 1415 1470 169 35
6012LION-A 1415 1470 169 35
6012LION-A 1415 1470 169 35
6012LION-A 1415 1470 169 35
6012LION-A 1415 1470 169 35
6012BOSS-A 1415 1470 169 35
6012INDI-A 1415 1470 169 35
6012POGO-B 1415 1470 169 35
6012POGO-D 1415 1470 169 35
6012PIKE-A 1415 1470 169 35
6012HAWK-A 1415 1470 169 35
6012SUN3-A 1415 1470 169 35
6012COOK-B 1415 1470 169 35
6012GUAM-B 1415 1470 169 35
6012GUAM-B 1415 1470 169 35
6012GUAM-B 1415 1470 169 35
6012GUAM-B 1415 1470 169 35
6012HULA-B 1415 1470 169 35
6012HULA-B 1415 1470 169 35
6012HULA-B 1415 1470 169 35
6012HULA-B 1415 1470 169 35
6012SUN3-A 1421 1470 169 35
6012HAWK-A 1421 1470 169 35
6012COOK-B 1422 1470 169 35
6012COOK-B 1422 1470 169 35
6012PIKE-A 1435 1470 169 35

RTS.PAS. This PASCAL program is used for the medium and high altitude support requests only. This program ensures all RTS sides are included once and only once for each support request-RTS visibility combination.

```
program rts;
Type
 mat = array[1..40, 1..3] of Integer;
Var
 I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,d1n  :integer;
bt,et,du,et1,bt1,du1,bth1n,eth1n,hfn1n,dur1n : integer;
bthn,btmn,etmn,ethn,adn,ahn,aminn,addn,adhn,adminn,time,time1,etime,
etime1,dh1n,dmin1n,vis,tol,durn,e,e1,hfnn : integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm : integer;
ident,lfident,hfident,smon,stme,amon,atme,alen,chk,ident1,amon1,
atme1,dur,bth1,eth1,hfn1,dur1 : string[4];
slen,gts,gts1,slen1 : string[6];
gts2,bth,eth,hfn,phfn: string[5];
rev,rev1 : string[7];
id,id1,sch,line,sp,s1,s2,s3,s4,s11,s21,s31,s41,sch1,hl1,hl : STRING[1];
scnt,sbv,sev,sailen,nsctot,bth2,eth2 :string[4];
aday,tat,ahr,atmehr,atmemin,d2,aday1,tat1,ahr1 : string[2];
atmehr1,atmemin1,d11,d21,m1,d1,h1,min1,dd1,dh1,dmin1,m,d,h,min,dd,dh,dmin,
am,ad,ah,amin,add,adh,admin,am1,ad1,ah1,amin1,add1,adh1,admin1 : string[2];
last : string[3];
fill : string[40];
fill1 : string[19];
revv,revlf,revhf  :real;
dum:STRING[9];
Infile,Infile1,OutFile1,outfile2,outfile3,outfile4,outfile : Text;
stats : mat;
Match  :boolean;
Begin  {Main Program}
    phfn:='   0';
    sp:=' ';
    chk:='   ';
    cnt:=1;
    snumlf:=1;
    snumhf:=300;
    irevlf:=0;
    irevhf:=9999;
    lfident:='   ';
    hfident:='   ';
    Writeln('Begin Reading Fin.dft');
    Assign(Infile1,'c:\rv.dat');
    Reset(Infile1);
    Assign(infile,'c:\d1v.dat');
    Reset(infile);
```

```
Assign(Outfile1,'C:\d12s.dat');
Rewrite(Outfile1);
assign(outfile,'c:\requp.dat');
rewrite(outfile);
Assign(Outfile4,'C:\d.dat');
Rewrite(Outfile4);
Writeln('Reading Data');
        repeat
        begin
        readln(infile1,ident,gts2,id,bth,eth,hfn,dur);
                if gts2='POGO-' then
        begin
        if hfn<>phfn then
        begin
        val(hfn,hfnn,error);
          writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
          writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
           writeln (outfile1,hfnn:4,' ',gts2,'C',bth,eth,' ',dur,' 15 ',ident,'00000.0');
           cnt:=cnt+1;
          phfn:=hfn;
          end;
          end;
          end;
          until eof(infile1);
          reset(infile1);
            phfn:='  0';
           repeat
                  begin
        readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
        if gts2='HULA-' then
        begin
        if hfn<>phfn then
        begin
         val(hfn,hfnn,error);
         writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
          writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
            cnt:=cnt+1;
          phfn:=hfn;
          end;
          end;
          end;
          until eof(infile1);
            reset(infile1);
             phfn:='  0';
           repeat
                    begin
        readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
        if gts2='COOK-' then
        begin
        if hfn<>phfn then
        begin
         val(hfn,hfnn,error);
         writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
```

```
    writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
      cnt:=cnt+1;
    phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
       phfn:='  0';
     repeat
              begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='INDI-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
    cnt:=cnt+1;
   phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
      phfn:='  0';
     repeat
begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='BOSS-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
    writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
       cnt:=cnt+1;
   phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
      phfn:='  0';
     repeat
              begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='LION-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
```

```
   writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
      cnt:=cnt+1;
   phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
      phfn:='  0';
     repeat
              begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='GUAM-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
   writeln (outfile1,hfnn:4,' ',gts2,'B',bth,eth,' ',dur,' 15 ',ident,'00000.0');
      cnt:=cnt+1;
   phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
        phfn:='  0';
     repeat
              begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='PIKE-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
      cnt:=cnt+1;
   phfn:=hfn;
    end;
    end;
    end;
    until eof(infile1);
      reset(infile1);
        phfn:='  0';
     repeat
begin
readln (infile1,ident,gts2,id,bth,eth,hfn,dur);
if gts2='REEF-' then
begin
if hfn<>phfn then
begin
 val(hfn,hfnn,error);
 writeln (outfile1,hfnn:4,' ',gts2,'A',bth,eth,' ',dur,' 15 ',ident,'00000.0');
```

```
  cnt:=cnt+1;
phfn:=hfn;
end;
end;
end;
until eof(infile1);
                    reset(outfile1);
repeat
readln(outfile1);
until EOF(outfile1);
for i:=1 to 300 do
begin
reset(outfile1);
repeat
readln(outfile1,hfnn,fill);
if hfnn=i then writeln(outfile,hfnn:4,fill);
until eof(outfile1);
end;
reset(outfile);
repeat
readln(outfile);
until eof(outfile);
end.
```

RTS.PAS Output (High Altitude Support Requests).

```
1 HULA-A   0  50  35 15 944500000.0
1 HULA-B   0  50  35 15 944500000.0
1 GUAM-A   0  50  35 15 944500000.0
1 GUAM-B   0  50  35 15 944500000.0
1 REEF-A   0  50  35 15 944500000.0
2 INDI-A   0  45  15 15 256700000.0
2 LION-A   0  45  15 15 256700000.0
2 LION-B   0  45  15 15 256700000.0
2 REEF-A   0  45  15 15 256700000.0
3 COOK-A   0  65   5 15 827500000.0
3 COOK-B   0  65   5 15 827500000.0
3 BOSS-A   0  65   5 15 827500000.0
3 BOSS-B   0  65   5 15 827500000.0
3 LION-A   0  65   5 15 827500000.0
3 LION-B   0  65   5 15 827500000.0
3 PIKE-A   0  65   5 15 827500000.0
4 INDI-A   0   5   5 15 628000000.0
4 BOSS-A   0   5   5 15 628000000.0
4 BOSS-B   0   5   5 15 628000000.0
4 LION-A   0   5   5 15 628000000.0
4 LION-B   0   5   5 15 628000000.0
5 POGO-A   5  35  10 15 731000000.0
5 POGO-B   5  35  10 15 731000000.0
5 POGO-C   5  35  10 15 731000000.0
5 HULA-A   5  35  10 15 731000000.0
5 HULA-B   5  35  10 15 731000000.0
5 COOK-A   5  35  10 15 731000000.0
5 COOK-B   5  35  10 15 731000000.0
5 BOSS-A   5  35  10 15 731000000.0
5 BOSS-B   5  35  10 15 731000000.0
5 PIKE-A   5  35  10 15 731000000.0
6 INDI-A  10  20  10 15 639100000.0
6 BOSS-A  10  20  10 15 639100000.0
6 BOSS-B  10  20  10 15 639100000.0
6 LION-A  10  20  10 15 639100000.0
6 LION-B  10  20  10 15 639100000.0
7 POGO-A  30  75  45 15 863900000.0
7 POGO-B  30  75  45 15 863900000.0
7 POGO-C  30  75  45 15 863900000.0
7 HULA-A  30  75  45 15 863900000.0
7 HULA-B  30  75  45 15 863900000.0
7 COOK-A  30  75  45 15 863900000.0
7 COOK-B  30  75  45 15 863900000.0
7 LION-A  30  75  45 15 863900000.0
7 LION-B  30  75  45 15 863900000.0
7 GUAM-A  30  75  45 15 863900000.0
7 GUAM-B  30  75  45 15 863900000.0
7 PIKE-A  30  75  45 15 863900000.0
8 HULA-A  30 110  20 15 595300000.0
8 HULA-B  30 110  20 15 595300000.0
8 COOK-A  30 110  20 15 595300000.0
8 COOK-B  30 110  20 15 595300000.0
8 GUAM-A  30 110  20 15 595300000.0
8 GUAM-B  30 110  20 15 595300000.0
```

8 PIKE-A 30 110 20 15 595300000.0
9 POGO-A 45 90 15 15 047000000.0
9 POGO-B 45 90 15 15 047000000.0
9 POGO-C 45 90 15 15 047000000.0
9 COOK-A 45 90 15 15 047000000.0
9 COOK-B 45 90 15 15 047000000.0
9 BOSS-A 45 90 15 15 047000000.0
9 BOSS-B 45 90 15 15 047000000.0
9 LION-A 45 90 15 15 047000000.0
9 LION-B 45 90 15 15 047000000.0
9 PIKE-A 45 90 15 15 047000000.0
10 BOSS-A 45 480 435 15 503700000.0
10 BOSS-B 45 480 435 15 503700000.0
10 LION-A 45 480 435 15 503700000.0
10 LION-B 45 480 435 15 503700000.0
11 INDI-A 54 64 10 15 495500000.0
11 BOSS-A 54 64 10 15 495500000.0
11 BOSS-B 54 64 10 15 495500000.0
11 LION-A 54 64 10 15 495500000.0
11 LION-B 54 64 10 15 495500000.0
12 BOSS-A 60 360 300 15 503700000.0
12 BOSS-B 60 360 300 15 503700000.0
12 LION-A 60 360 300 15 503700000.0
12 LION-B 60 360 300 15 503700000.0
13 BOSS-A 60 85 25 15 403500000.0
13 BOSS-B 60 85 25 15 403500000.0
13 LION-A 60 85 25 15 403500000.0
13 LION-B 60 85 25 15 403500000.0
14 POGO-A 65 125 15 15 952100000.0
14 POGO-B 65 125 15 15 952100000.0
14 POGO-C 65 125 15 15 952100000.0
14 INDI-A 65 125 15 15 952100000.0
14 BOSS-A 72 125 15 15 952100000.0
14 BOSS-B 72 125 15 15 952100000.0
14 LION-A 65 125 15 15 952100000.0
14 LION-B 65 125 15 15 952100000.0
14 GUAM-A 65 125 15 15 952100000.0
14 GUAM-B 65 125 15 15 952100000.0
14 REEF-A 65 125 15 15 952100000.0
15 POGO-A 70 105 35 15 783700000.0
15 POGO-B 70 105 35 15 783700000.0
15 POGO-C 70 105 35 15 783700000.0
15 LION-A 70 105 35 15 783700000.0
15 LION-B 70 105 35 15 783700000.0
15 GUAM-A 70 105 35 15 783700000.0
15 GUAM-B 70 105 35 15 783700000.0
15 PIKE-A 70 105 35 15 783700000.0
16 HULA-A 90 165 15 15 645300000.0
16 HULA-B 90 165 15 15 645300000.0
16 COOK-A 90 165 15 15 645300000.0
16 COOK-B 90 165 15 15 645300000.0
16 GUAM-A 90 165 15 15 645300000.0
16 GUAM-B 90 165 15 15 645300000.0
17 POGO-A 90 160 10 15 944200000.0
17 POGO-B 90 160 10 15 944200000.0
17 POGO-C 90 160 10 15 944200000.0
17 COOK-A 90 160 10 15 944200000.0
17 COOK-B 90 160 10 15 944200000.0
17 INDI-A 90 160 10 15 944200000.0
17 BOSS-A 90 160 10 15 944200000.0
17 BOSS-B 90 160 10 15 944200000.0
17 LION-A 90 160 10 15 944200000.0
17 LION-B 90 160 10 15 944200000.0
17 PIKE-A 90 160 10 15 944200000.0
18 INDI-A 90 170 20 15 577500000.0
18 LION-A 90 170 20 15 577500000.0
18 LION-B 90 170 20 15 577500000.0
18 GUAM-A 90 170 20 15 577500000.0
18 GUAM-B 90 170 20 15 577500000.0
18 REEF-A 90 170 20 15 577500000.0
19 POGO-A 105 165 15 15 863900000.0
19 POGO-B 105 165 15 15 863900000.0
19 POGO-C 105 165 15 15 863900000.0
19 HULA-A 105 165 15 15 863900000.0
19 HULA-B 105 165 15 15 863900000.0
19 COOK-A 105 143 15 15 863900000.0
19 COOK-B 105 143 15 15 863900000.0
19 BOSS-A 105 143 15 15 863900000.0
19 BOSS-B 105 143 15 15 863900000.0
19 LION-A 105 143 15 15 863900000.0
19 LION-B 105 143 15 15 863900000.0
19 GUAM-A 105 165 15 15 863900000.0
19 GUAM-B 105 165 15 15 863900000.0
19 PIKE-A 105 143 15 15 863900000.0
20 BOSS-A 111 126 15 15 936600000.0
20 BOSS-B 111 126 15 15 936600000.0
20 LION-A 111 126 15 15 936600000.0
20 LION-B 111 126 15 15 936600000.0
20 PIKE-A 111 126 15 15 936600000.0
21 POGO-A 145 180 15 15 750600000.0
21 POGO-B 145 180 15 15 750600000.0
21 POGO-C 145 180 15 15 750600000.0
21 COOK-A 145 180 15 15 750600000.0
21 COOK-B 145 180 15 15 750600000.0
21 INDI-A 145 180 15 15 750600000.0
21 BOSS-A 145 180 15 15 750600000.0
21 BOSS-B 145 180 15 15 750600000.0
21 LION-A 145 180 15 15 750600000.0
21 LION-B 145 180 15 15 750600000.0
21 PIKE-A 145 180 15 15 750600000.0
22 POGO-A 155 195 20 15 731000000.0
22 POGO-B 155 195 20 15 731000000.0
22 POGO-C 155 195 20 15 731000000.0
22 HULA-A 155 195 20 15 731000000.0
22 HULA-B 155 195 20 15 731000000.0
22 COOK-A 155 195 20 15 731000000.0

22 COOK-B 155 195 20 15 731000000.0
22 INDI-A 155 195 20 15 731000000.0
22 BOSS-A 155 195 20 15 731000000.0
22 BOSS-B 155 195 20 15 731000000.0
22 LION-A 155 195 20 15 731000000.0
22 LION-B 155 195 20 15 731000000.0
22 PIKE-A 155 195 20 15 731000000.0
22 REEF-A 155 195 20 15 731000000.0
23 BOSS-A 165 235 10 15 071200000.0
23 BOSS-B 165 235 10 15 071200000.0
23 LION-A 165 235 10 15 071200000.0
23 LION-B 165 235 10 15 071200000.0
23 PIKE-A 165 235 10 15 071200000.0
24 BOSS-A 165 170 5 15 403500000.0
24 BOSS-B 165 170 5 15 403500000.0
24 LION-A 165 170 5 15 403500000.0
24 LION-B 165 170 5 15 403500000.0
25 INDI-A 170 190 20 15 316000000.0
25 GUAM-A 170 190 20 15 316000000.0
25 GUAM-B 170 190 20 15 316000000.0
25 REEF-A 170 190 20 15 316000000.0
26 GUAM-A 180 235 25 15 614200000.0
26 GUAM-B 180 235 25 15 614200000.0
27 POGO-A 180 245 5 15 639200000.0
27 POGO-B 180 245 5 15 639200000.0
27 POGO-C 180 245 5 15 639200000.0
27 INDI-A 180 245 5 15 639200000.0
27 BOSS-A 180 245 5 15 639200000.0
27 BOSS-B 180 245 5 15 639200000.0
27 LION-A 180 245 5 15 639200000.0
27 LION-B 180 245 5 15 639200000.0
27 PIKE-A 180 245 5 15 639200000.0
28 INDI-A 205 270 20 15 532900000.0
28 LION-A 205 270 20 15 532900000.0
28 LION-B 205 270 20 15 532900000.0
28 REEF-A 205 270 20 15 532900000.0
29 POGO-A 205 240 15 15 722500000.0
29 POGO-B 205 240 15 15 722500000.0
29 POGO-C 205 240 15 15 722500000.0
29 HULA-A 205 240 15 15 722500000.0
29 HULA-B 205 240 15 15 722500000.0
29 COOK-A 205 240 15 15 722500000.0
29 COOK-B 205 240 15 15 722500000.0
29 GUAM-A 205 240 15 15 722500000.0
29 GUAM-B 205 240 15 15 722500000.0
30 POGO-A 205 275 40 15 889600000.0
30 POGO-B 205 275 40 15 889600000.0
30 POGO-C 205 275 40 15 889600000.0
30 INDI-A 205 275 40 15 889600000.0
30 BOSS-A 205 275 40 15 889600000.0
30 BOSS-B 205 275 40 15 889600000.0
30 LION-A 205 275 40 15 889600000.0
30 LION-B 205 275 40 15 889600000.0
30 PIKE-A 205 275 40 15 889600000.0
30 REEF-A 222 275 40 15 889600000.0
31 HULA-A 210 285 15 15 944100000.0
31 HULA-B 210 285 15 15 944100000.0
31 COOK-A 210 285 15 15 944100000.0
31 COOK-B 210 285 15 15 944100000.0
31 BOSS-A 210 285 15 15 944100000.0
31 BOSS-B 210 285 15 15 944100000.0
31 PIKE-A 210 285 15 15 944100000.0
32 HULA-A 225 290 5 15 645100000.0
32 HULA-B 225 290 5 15 645100000.0
32 COOK-A 225 290 5 15 645100000.0
32 COOK-B 225 290 5 15 645100000.0
32 BOSS-A 225 290 5 15 645100000.0
32 BOSS-B 225 290 5 15 645100000.0
32 PIKE-A 225 290 5 15 645100000.0
33 INDI-A 230 305 15 15 452400000.0
33 BOSS-A 230 305 15 15 452400000.0
33 BOSS-B 230 305 15 15 452400000.0
33 LION-A 230 305 15 15 452400000.0
33 LION-B 230 305 15 15 452400000.0
34 BOSS-A 235 280 45 15 372600000.0
34 BOSS-B 235 280 45 15 372600000.0
35 POGO-A 240 269 15 15 192000000.0
35 POGO-B 240 269 15 15 192000000.0
35 POGO-C 240 269 15 15 192000000.0
35 COOK-A 240 285 15 15 192000000.0
35 COOK-B 240 285 15 15 192000000.0
35 BOSS-A 240 269 15 15 192000000.0
35 BOSS-B 240 269 15 15 192000000.0
35 LION-A 240 269 15 15 192000000.0
35 LION-B 240 269 15 15 192000000.0
35 PIKE-A 240 269 15 15 192000000.0
36 INDI-A 265 285 20 15 577500000.0
36 LION-A 265 285 20 15 577500000.0
36 LION-B 265 285 20 15 577500000.0
36 GUAM-A 265 285 20 15 577500000.0
36 GUAM-B 265 285 20 15 577500000.0
36 REEF-A 265 285 20 15 577500000.0
37 COOK-A 265 745 480 15 372600000.0
37 COOK-B 265 745 480 15 372600000.0
37 INDI-A 265 745 480 15 372600000.0
37 BOSS-A 265 745 480 15 372600000.0
37 BOSS-B 265 745 480 15 372600000.0
37 GUAM-A 265 745 480 15 372600000.0
37 GUAM-B 265 745 480 15 372600000.0
37 PIKE-A 265 745 480 15 372600000.0
38 BOSS-A 270 395 20 15 212400000.0
38 BOSS-B 270 395 20 15 212400000.0
38 LION-A 270 395 20 15 212400000.0
38 LION-B 270 395 20 15 212400000.0
38 PIKE-A 270 395 20 15 212400000.0
39 INDI-A 290 360 10 15 628000000.0

39 BOSS-A 290 360 10 15 628000000.0
39 BOSS-B 290 360 10 15 628000000.0
39 LION-A 290 360 10 15 628000000.0
39 LION-B 290 360 10 15 628000000.0
40 POGO-A 290 320 10 15 750600000.0
40 POGO-B 290 320 10 15 750600000.0
40 POGO-C 290 320 10 15 750600000.0
40 HULA-A 290 320 10 15 750600000.0
40 HULA-B 290 320 10 15 750600000.0
40 COOK-A 290 320 10 15 750600000.0
40 COOK-B 290 320 10 15 750600000.0
40 INDI-A 290 320 10 15 750600000.0
40 BOSS-A 290 320 10 15 750600000.0
40 BOSS-B 290 320 10 15 750600000.0
40 LION-A 290 320 10 15 750600000.0
40 LION-B 290 320 10 15 750600000.0
40 GUAM-A 290 320 10 15 750600000.0
40 GUAM-B 290 320 10 15 750600000.0
40 PIKE-A 290 320 10 15 750600000.0
41 COOK-A 300 345 45 15 302800000.0
41 COOK-B 300 345 45 15 302800000.0
41 BOSS-A 300 345 45 15 302800000.0
41 BOSS-B 300 345 45 15 302800000.0
41 LION-A 300 345 45 15 302800000.0
41 LION-B 300 345 45 15 302800000.0
41 GUAM-A 300 345 45 15 302800000.0
41 GUAM-B 300 345 45 15 302800000.0
41 PIKE-A 300 345 45 15 302800000.0
41 REEF-A 300 345 45 15 302800000.0
42 BOSS-A 320 350 10 15 403500000.0
42 BOSS-B 320 350 10 15 403500000.0
42 LION-A 320 350 10 15 403500000.0
42 LION-B 320 350 10 15 403500000.0
43 INDI-A 330 410 20 15 316000000.0
43 GUAM-A 330 410 20 15 316000000.0
43 GUAM-B 330 410 20 15 316000000.0
43 REEF-A 330 410 20 15 316000000.0
44 INDI-A 330 395 5 15 484500000.0
44 LION-A 330 395 5 15 484500000.0
44 LION-B 330 395 5 15 484500000.0
44 REEF-A 330 395 5 15 484500000.0
45 HULA-A 345 400 25 15 944500000.0
45 HULA-B 345 400 25 15 944500000.0
45 GUAM-A 345 400 25 15 944500000.0
45 GUAM-B 345 400 25 15 944500000.0
45 REEF-A 345 400 25 15 944500000.0
46 HULA-A 345 410 5 15 731400000.0
46 HULA-B 345 410 5 15 731400000.0
46 COOK-A 345 410 5 15 731400000.0
46 COOK-B 345 410 5 15 731400000.0
46 BOSS-A 345 410 5 15 731400000.0
46 BOSS-B 345 410 5 15 731400000.0
46 PIKE-A 345 410 5 15 731400000.0
47 POGO-A 350 380 10 15 722500000.0
47 POGO-B 350 380 10 15 722500000.0
47 POGO-C 350 380 10 15 722500000.0
47 HULA-A 350 380 10 15 722500000.0
47 HULA-B 350 380 10 15 722500000.0
47 COOK-A 350 380 10 15 722500000.0
47 COOK-B 350 380 10 15 722500000.0
47 BOSS-A 350 380 10 15 722500000.0
47 BOSS-B 350 380 10 15 722500000.0
47 LION-A 350 380 10 15 722500000.0
47 LION-B 350 380 10 15 722500000.0
47 GUAM-A 350 380 10 15 722500000.0
47 GUAM-B 350 380 10 15 722500000.0
47 PIKE-A 370 380 10 15 722500000.0
48 HULA-A 358 415 57 15 607100000.0
48 HULA-B 358 415 57 15 607100000.0
48 COOK-A 358 415 57 15 607100000.0
48 COOK-B 358 415 57 15 607100000.0
48 BOSS-A 358 415 57 15 607100000.0
48 BOSS-B 358 415 57 15 607100000.0
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116 GUAM-A 990 1070 20 15 577500000.0
116 GUAM-B 990 1070 20 15 577500000.0
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117 HULA-B 990 1070 20 15 595300000.0
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127 COOK-B 1070 1100 10 15 722500000.0
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127 GUAM-B 1070 1100 10 15 722500000.0
127 PIKE-A 1070 1100 10 15 722500000.0

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133 POGO-C 1105 1150 45 15 889600000.0
133 HULA-A 1105 1150 45 15 889600000.0
133 HULA-B 1105 1150 45 15 889600000.0
133 INDI-A 1105 1150 45 15 889600000.0
133 BOSS-A 1105 1150 45 15 889600000.0
133 BOSS-B 1105 1150 45 15 889600000.0
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133 LION-B 1105 1150 45 15 889600000.0
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136 POGO-C 1110 1185 15 15 943400000.0
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137 POGO-B 1115 1140 15 15 730400000.0
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144 POGO-C 1185 1192 7 15 730400000.0
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144 HULA-B 1185 1192 7 15 730400000.0
144 COOK-A 1185 1192 7 15 730400000.0
144 COOK-B 1185 1192 7 15 730400000.0
144 INDI-A 1185 1192 7 15 730400000.0
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144 BOSS-B 1185 1192 7 15 730400000.0
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144 LION-B 1185 1192 7 15 730400000.0
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146 POGO-C 1200 1245 45 15 047000000.0
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146 HULA-B 1200 1245 45 15 047000000.0
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146 COOK-B 1200 1245 45 15 047000000.0
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146 BOSS-A 1200 1245 45 15 047000000.0
146 BOSS-B 1200 1245 45 15 047000000.0
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146 LION-B 1200 1245 45 15 047000000.0
146 GUAM-A 1200 1245 45 15 047000000.0
146 GUAM-B 1200 1245 45 15 047000000.0
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151 GUAM-A 1260 1285 25 15 730400000.0
151 GUAM-B 1260 1285 25 15 730400000.0
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155 LION-B 1290 1360 40 15 889600000.0
155 GUAM-A 1290 1360 40 15 889600000.0
155 GUAM-B 1290 1360 40 15 889600000.0
155 PIKE-A 1290 1360 40 15 889600000.0
155 REEF-A 1290 1360 40 15 889600000.0
156 POGO-A 1290 1350 15 15 979400000.0
156 POGO-B 1290 1350 15 15 979400000.0
156 POGO-C 1290 1350 15 15 979400000.0
156 HULA-A 1290 1350 15 15 979400000.0
156 HULA-B 1290 1350 15 15 979400000.0
156 COOK-A 1290 1350 15 15 979400000.0
156 COOK-B 1290 1350 15 15 979400000.0
156 INDI-A 1290 1350 15 15 979400000.0
156 BOSS-A 1290 1350 15 15 979400000.0
156 BOSS-B 1290 1350 15 15 979400000.0
156 LION-A 1290 1350 15 15 979400000.0
156 LION-B 1290 1350 15 15 979400000.0
156 GUAM-A 1290 1350 15 15 979400000.0
156 GUAM-B 1290 1350 15 15 979400000.0
156 PIKE-A 1290 1350 15 15 979400000.0
156 REEF-A 1290 1350 15 15 979400000.0
157 POGO-A 1320 1485 165 15 372600000.0
157 POGO-B 1320 1485 165 15 372600000.0
157 POGO-C 1320 1485 165 15 372600000.0
157 HULA-A 1320 1485 165 15 372600000.0
157 HULA-B 1320 1485 165 15 372600000.0
157 COOK-A 1320 1485 165 15 372600000.0
157 COOK-B 1320 1485 165 15 372600000.0
157 INDI-A 1320 1485 165 15 372600000.0
157 BOSS-A 1320 1485 165 15 372600000.0
157 BOSS-B 1320 1485 165 15 372600000.0
157 LION-A 1320 1485 165 15 372600000.0
157 LION-B 1320 1485 165 15 372600000.0
157 GUAM-A 1320 1485 165 15 372600000.0
157 GUAM-B 1320 1485 165 15 372600000.0
157 PIKE-A 1320 1485 165 15 372600000.0
158 POGO-A 1320 1330 10 15 730400000.0
158 POGO-B 1320 1330 10 15 730400000.0
158 POGO-C 1320 1330 10 15 730400000.0
158 HULA-A 1320 1330 10 15 730400000.0
158 HULA-B 1320 1330 10 15 730400000.0
158 COOK-A 1320 1330 10 15 730400000.0
158 COOK-B 1320 1330 10 15 730400000.0
158 INDI-A 1320 1330 10 15 730400000.0
158 BOSS-A 1320 1330 10 15 730400000.0
158 BOSS-B 1320 1330 10 15 730400000.0
158 LION-A 1320 1330 10 15 730400000.0
158 LION-B 1320 1330 10 15 730400000.0
158 GUAM-A 1320 1330 10 15 730400000.0
158 GUAM-B 1320 1330 10 15 730400000.0
158 PIKE-A 1320 1330 10 15 730400000.0
158 REEF-A 1320 1330 10 15 730400000.0
159 HULA-A 1325 1395 10 15 607100000.0
159 HULA-B 1325 1395 10 15 607100000.0
159 COOK-A 1325 1395 10 15 607100000.0
159 COOK-B 1325 1395 10 15 607100000.0
159 BOSS-A 1325 1395 10 15 607100000.0
159 BOSS-B 1325 1395 10 15 607100000.0
159 PIKE-A 1325 1395 10 15 607100000.0
160 INDI-A 1350 1430 20 15 316000000.0

```
160 GUAM-A 1350 1430  20 15 316000000.0
160 GUAM-B 1350 1430  20 15 316000000.0
160 REEF-A 1350 1430  20 15 316000000.0
161 INDI-A 1355 1390  35 15 532900000.0
161 LION-A 1355 1390  35 15 532900000.0
161 LION-B 1355 1390  35 15 532900000.0
161 REEF-A 1355 1390  35 15 532900000.0
162 POGO-A 1355 1368  13 15 601200000.0
162 POGO-B 1355 1368  13 15 601200000.0
162 POGO-C 1355 1368  13 15 601200000.0
162 HULA-A 1355 1368  13 15 601200000.0
162 HULA-B 1355 1368  13 15 601200000.0
162 COOK-A 1355 1368  13 15 601200000.0
162 COOK-B 1355 1368  13 15 601200000.0
162 INDI-A 1355 1368  13 15 601200000.0
162 BOSS-A 1355 1368  13 15 601200000.0
162 BOSS-B 1355 1368  13 15 601200000.0
162 LION-A 1355 1368  13 15 601200000.0
162 LION-B 1355 1368  13 15 601200000.0
162 GUAM-A 1355 1368  13 15 601200000.0
162 GUAM-B 1355 1368  13 15 601200000.0
162 PIKE-A 1355 1368  13 15 601200000.0
163 COOK-A 1365 1430   5 15 827500000.0
163 COOK-B 1365 1430   5 15 827500000.0
163 BOSS-A 1365 1430   5 15 827500000.0
163 BOSS-B 1365 1430   5 15 827500000.0
163 LION-A 1365 1430   5 15 827500000.0
163 LION-B 1365 1430   5 15 827500000.0
163 PIKE-A 1365 1430   5 15 827500000.0
164 BOSS-A 1380 1420  20 15 212400000.0
164 BOSS-B 1380 1420  20 15 212400000.0
164 LION-A 1380 1420  20 15 212400000.0
164 LION-B 1380 1420  20 15 212400000.0
164 PIKE-A 1380 1460  20 15 212400000.0
165 INDI-A 1390 1445  55 15 532900000.0
165 REEF-A 1390 1445  55 15 532900000.0
166 INDI-A 1395 1465  10 15 484500000.0
166 LION-A 1395 1430  10 15 484500000.0
166 LION-B 1395 1430  10 15 484500000.0
166 REEF-A 1395 1430  10 15 484500000.0
167 INDI-A 1410 1460  20 15 577500000.0
168 BOSS-A 1415 1435  20 15 503700000.0
168 BOSS-B 1415 1435  20 15 503700000.0
168 LION-A 1415 1435  20 15 503700000.0
168 LION-B 1415 1435  20 15 503700000.0
169 POGO-A 1415 1470  35 15 601200000.0
169 POGO-B 1415 1470  35 15 601200000.0
169 POGO-C 1415 1470  35 15 601200000.0
169 HULA-A 1415 1470  35 15 601200000.0
169 HULA-B 1415 1470  35 15 601200000.0
169 COOK-A 1415 1470  35 15 601200000.0
169 COOK-B 1415 1470  35 15 601200000.0
169 INDI-A 1415 1470  35 15 601200000.0
169 BOSS-A 1415 1470  35 15 601200000.0
169 BOSS-B 1415 1470  35 15 601200000.0
169 LION-A 1415 1470  35 15 601200000.0
169 LION-B 1415 1470  35 15 601200000.0
169 GUAM-A 1415 1470  35 15 601200000.0
169 GUAM-B 1415 1470  35 15 601200000.0
169 PIKE-A 1415 1470  35 15 601200000.0
```

SUBSCH.PAS. Subtract schedule. This PASCAL program takes scheduled activities and subtracts the scheduled time block from that particular RTS side's support request possibilities in the block of requests about to be scheduled. If the scheduled activity intersects a portion of a request and the support can be scheduled in that portion of the tolerance window that remains, the request's tolerance will be altered. If a tolerance window remains on either side of the subtracted scheduled activity, the larger of the two windows will be returned. If the subtraction of the scheduled activity leaves a tolerance window smaller than the requested support duration, that RTS side scheduling window will not be returned.

```
program subsch;
Type
```

```
Var
  hfn,flg,bvn,evn,durn,tatn,hfn1,bvn1,bsn1,evn1,bvnh,evnh,durn1,tatn1: integer;
                gts,gts1: string[7];
              fill : string[10];
 fill1 : string[10];
 revv,revlf,revhf  :real;
 dum:STRING[9];
 Infile,Infile1,OutFile1,outfile2,infile3,outfile3,outfile4,outfile,infile2 : Text;
 Begin  {Main Program}
               Assign(Infile1,'c:\requp.dat');
    Reset(Infile1);
    Assign(infile,'c:schup.dat');
    Reset(infile);
    Assign(Outfile,'C:\trash.dat');
    Rewrite(Outfile);
     Assign(Outfile1,'C:\req.dat');
    Rewrite(Outfile1);
     Assign(infile2,'c:sch19.dat');
    Reset(infile2);
      Assign(infile3,'c:fsch17.dat');
    Reset(infile3);
    Writeln('Reading Data');
    repeat
      Readln (Infile1,hfn,gts,bvn,evn,durn,tatn,fill);
              reset(infile);
              flg:=0;
                bvnh:=0;
                  evnh:=10000;
                            repeat
                            readln (infile,hfn1,gts1,bvn1,evn1,durn1,tatn1,fill1);
               if gts=gts1 then
                             begin
               bsn1:=bvn1-20;
               if (bvn>bsn1)and(bvn<evn1)and((durn+15)<(evn-evn1)) then bvn:=evn1+15;
  if (bvn>bsn1)and(bvn<evn1)and((durn+15)>(evn-evn1)) then flg:=1;
   if (evn>bsn1)and(evn<evn1)and(durn<(bsn1-bvn)) then evn:=bsn1;
    if (evn>bsn1)and(evn<evn1)and(durn>(bsn1-bvn)) then flg:=1;
    if(bvn1>bvn)and(evn1<evn)and((durn<(bsn1-bvn))or(durn<(evn-evn1))) then
    begin
    if(bsn1-bvn)>(evn-evn1-15) then evn:=bsn1;
     if(bsn1-bvn)<(evn-evn1-15) then bvn:=evn1+15;
     end;
if(bvn1>bvn)and(evn1<evn)and((durn>(bsn1-bvn))and((durn+15)>(evn-evn1))) then flg:=1;
    if ((bvn-evn1)>0)and((bvn-evn1)<15) then bvn:=evn1+15;
    if bvn>bvnh then bvnh:=bvn;
    if evn<evnh then evnh:=evn;
               end;
               until eof(infile);
                 if bvnh=0 then bvnh:=bvn;
               if evnh=10000 then evnh:=evn;
               if (evnh-bvnh)<durn then flg:=1;
if flg=0 then writeln(outfile1,hfn:4,gts,bvnh:5,evnh:5,durn:5,tatn:3,fill);
                bvnh:=0;
```

```
                evnh:=10000;
                        until EOF (infile1);
        reset(outfile1);
        repeat
        readln(outfile1);
        until eof(outfile1);
         reset(outfile1);
              repeat
  Readln (outfile1,hfn,gts,bvn,evn,durn,tatn,fill);
             reset(infile2);
             flg:=0;
              bvnh:=0;
               evnh:=10000;
                        repeat
             readln (infile2,hfn1,gts1,bvn1,evn1,durn1,tatn1,fill1);
             if gts=gts1 then
             begin
             bvn1:=bvn1+1440;
             evn1:=evn1+1440;
             bsn1:=bvn1-20;
   if (bvn>bsn1)and(bvn<evn1)and((durn+15)<(evn-evn1)) then bvn:=evn1+15;
  if (bvn>bsn1)and(bvn<evn1)and((durn+15)>(evn-evn1)) then flg:=1;
   if (evn>bsn1)and(evn<evn1)and(durn<(bsn1-bvn)) then evn:=bsn1;
    if (evn>bsn1)and(evn<evn1)and(durn>(bsn1-bvn)) then flg:=1;
    if(bvn1>bvn)and(evn1<evn)and((durn<(bsn1-bvn))or(durn<(evn-evn1))) then
    begin
    if(bsn1-bvn)>(evn-evn1-15) then evn:=bsn1;
     if(bsn1-bvn)<(evn-evn1-15) then bvn:=evn1+15;
     end;
if(bvn1>bvn)and(evn1<evn)and((durn>(bsn1-bvn))and((durn+15)>(evn-evn1))) then flg:=1;
    if ((bvn-evn1)>0)and((bvn-evn1)<15) then bvn:=evn1+15;
    if bvn>bvnh then bvnh:=bvn;
    if evn<evnh then evnh:=evn;
                              end;
              until eof(infile2);
              if bvnh=0 then bvnh:=bvn;
              if evnh=10000 then evnh:=evn;
              if (evnh-bvnh)<durn then flg:=1;
if flg=0 then writeln(outfile,hfn:4,gts,bvnh:5,evnh:5,durn:5,tatn:3,fill);
               bvnh:=0;
               evnh:=10000;
              until EOF (outfile1);
        reset(outfile);
        repeat
        readln(outfile);
        until eof(outfile);
              reset(outfile);
              rewrite(outfile1);
               repeat
  Readln (outfile,hfn,gts,bvn,evn,durn,tatn,fill);
            reset(infile3);
         flg:=0;
          bvnh:=0;
```

```
            evnh:=10000;
                        repeat
             readln (infile3,hfn1,gts1,bvn1,evn1,durn1,tatn1,fill1);
             if gts=gts1 then
             begin
             bvn1:=bvn1-1440;
             evn1:=evn1-1440;
             bsn1:=bvn1-20;
   if (bvn>bsn1)and(bvn<evn1)and((durn+15)<(evn-evn1)) then bvn:=evn1+15;
  if (bvn>bsn1)and(bvn<evn1)and((durn+15)>(evn-evn1)) then flg:=1;
   if (evn>bsn1)and(evn<evn1)and(durn<(bsn1-bvn)) then evn:=bsn1;
    if (evn>bsn1)and(evn<evn1)and(durn>(bsn1-bvn)) then flg:=1;
    if(bvn1>bvn)and(evn1<evn)and((durn<(bsn1-bvn))or(durn<(evn-evn1))) then
    begin
    if(bsn1-bvn)>(evn-evn1-15) then evn:=bsn1;
     if(bsn1-bvn)<(evn-evn1-15) then bvn:=evn1+15;
     end;
if(bvn1>bvn)and(evn1<evn)and((durn>(bsn1-bvn))and((durn+15)>(evn-evn1))) then flg:=1;
    if ((bvn-evn1)>0)and((bvn-evn1)<15) then bvn:=evn1+15;
    if bvn>bvnh then bvnh:=bvn;
    if evn<evnh then evnh:=evn;
                            end;
              until eof(infile3);
              if bvnh=0 then bvnh:=bvn;
              if evnh=10000 then evnh:=evn;
              if (evnh-bvnh)<durn then flg:=1;
if flg=0 then writeln(outfile1,hfn:4,gts,bvnh:5,evnh:5,durn:5,tatn:3,fill);
               bvnh:=0;
               evnh:=10000;
             until EOF (outfile);
        reset(outfile1);
        repeat
        readln(outfile1);
        until eof(outfile1);
             end.
```

RTS.PAS Output (Medium and high altitude satellite support requests).

```
1 HULA-A   0  50  35 15 944500000
1 HULA-B   0  50  35 15 944500000
1 GUAM-A   0  50  35 15 944500000
1 GUAM-B   0  50  35 15 944500000
1 REEF-A   0  50  35 15 944500000
2 LION-A   0  45  15 15 256700000
2 LION-B   0  45  15 15 256700000
2 REEF-A   0  45  15 15 256700000
3 COOK-A   0  34   5 15 827500000
3 COOK-B   0  34   5 15 827500000
3 BOSS-A   0  19   5 15 827500000
3 BOSS-B   0  65   5 15 827500000
3 LION-A   0  65   5 15 827500000
3 LION-B   0  65   5 15 827500000
3 PIKE-A   0  65   5 15 827500000
4 BOSS-A   0   5   5 15 628000000
4 BOSS-B   0   5   5 15 628000000
4 LION-A   0   5   5 15 628000000
4 LION-B   0   5   5 15 628000000
5 POGO-B   5  31  10 15 731000000
5 POGO-C   5  35  10 15 731000000
5 HULA-A   5  35  10 15 731000000
5 HULA-B   5  35  10 15 731000000
5 COOK-A   5  34  10 15 731000000
5 COOK-B   5  34  10 15 731000000
5 BOSS-A   5  19  10 15 731000000
5 BOSS-B   5  35  10 15 731000000
5 PIKE-A   5  35  10 15 731000000
```

6 BOSS-B 10 20 10 15 639100000
6 LION-A 10 20 10 15 639100000
6 LION-B 10 20 10 15 639100000
7 POGO-C 30 75 45 15 863900000
7 HULA-A 30 75 45 15 863900000
7 HULA-B 30 75 45 15 863900000
7 LION-A 30 75 45 15 863900000
7 LION-B 30 75 45 15 863900000
7 GUAM-A 30 75 45 15 863900000
7 GUAM-B 30 75 45 15 863900000
7 PIKE-A 30 75 45 15 863900000
8 HULA-A 30 110 20 15 595300000
8 HULA-B 30 110 20 15 595300000
8 COOK-A 82 110 20 15 595300000
8 COOK-B 83 110 20 15 595300000
8 GUAM-A 30 88 20 15 595300000
8 GUAM-B 30 110 20 15 595300000
8 PIKE-A 30 110 20 15 595300000
9 POGO-A 57 90 15 15 047000000
9 POGO-C 45 90 15 15 047000000
9 BOSS-A 70 90 15 15 047000000
9 BOSS-B 45 90 15 15 047000000
9 LION-A 45 90 15 15 047000000
9 LION-B 45 90 15 15 047000000
9 PIKE-A 45 90 15 15 047000000
10 BOSS-B 45 480 435 15 503700000
11 INDI-A 54 64 10 15 495500000
11 BOSS-B 54 64 10 15 495500000
11 LION-A 54 64 10 15 495500000
11 LION-B 54 64 10 15 495500000
12 BOSS-B 60 360 300 15 503700000
13 BOSS-B 60 85 25 15 403500000
13 LION-A 60 85 25 15 403500000
13 LION-B 60 85 25 15 403500000
14 POGO-A 65 125 15 15 952100000
14 POGO-B 79 118 15 15 952100000
14 POGO-C 65 125 15 15 952100000
14 INDI-A 65 125 15 15 952100000
14 BOSS-A 72 97 15 15 952100000
14 BOSS-B 72 125 15 15 952100000
14 LION-A 65 125 15 15 952100000
14 LION-B 65 125 15 15 952100000
14 GUAM-A 65 88 15 15 952100000
14 GUAM-B 65 125 15 15 952100000
14 REEF-A 108 125 15 15 952100000
15 POGO-A 70 105 35 15 783700000
15 POGO-C 70 105 35 15 783700000
15 LION-A 70 105 35 15 783700000
15 LION-B 70 105 35 15 783700000
15 GUAM-B 70 105 35 15 783700000
15 PIKE-A 70 105 35 15 783700000
16 HULA-A 90 119 15 15 645300000
16 HULA-B 90 165 15 15 645300000
16 COOK-A 90 165 15 15 645300000
16 COOK-B 90 165 15 15 645300000
16 GUAM-A 138 165 15 15 645300000
16 GUAM-B 90 165 15 15 645300000
17 POGO-A 90 149 10 15 944200000
17 POGO-B 90 118 10 15 944200000
17 POGO-C 90 130 10 15 944200000
17 COOK-A 90 160 10 15 944200000
17 COOK-B 90 160 10 15 944200000
17 INDI-A 90 159 10 15 944200000
17 BOSS-B 90 160 10 15 944200000
17 LION-A 90 160 10 15 944200000
17 LION-B 90 160 10 15 944200000
17 PIKE-A 90 118 10 15 944200000
18 INDI-A 90 159 20 15 577500000
18 LION-A 90 170 20 15 577500000
18 LION-B 90 170 20 15 577500000
18 GUAM-B 90 170 20 15 577500000
18 REEF-A 108 170 20 15 577500000
19 POGO-A 105 149 15 15 863900000
19 POGO-C 105 130 15 15 863900000
19 HULA-B 105 165 15 15 863900000
19 COOK-A 105 143 15 15 863900000
19 COOK-B 105 143 15 15 863900000
19 BOSS-B 105 143 15 15 863900000
19 LION-A 105 143 15 15 863900000
19 LION-B 105 143 15 15 863900000
19 GUAM-A 138 165 15 15 863900000
19 GUAM-B 105 165 15 15 863900000
20 BOSS-B 111 126 15 15 936600000
20 LION-A 111 126 15 15 936600000
20 LION-B 111 126 15 15 936600000
21 COOK-A 145 180 15 15 750600000
21 COOK-B 145 180 15 15 750600000
21 BOSS-B 145 180 15 15 750600000
21 LION-A 145 180 15 15 750600000
21 LION-B 145 180 15 15 750600000
22 POGO-B 167 195 20 15 731000000
22 HULA-A 168 195 20 15 731000000
22 HULA-B 155 195 20 15 731000000
22 COOK-A 155 195 20 15 731000000
22 COOK-B 155 195 20 15 731000000
22 INDI-A 155 195 20 15 731000000
22 BOSS-B 155 195 20 15 731000000
22 LION-A 155 195 20 15 731000000
22 LION-B 155 195 20 15 731000000
22 PIKE-A 169 195 20 15 731000000
23 BOSS-A 190 235 10 15 071200000
23 BOSS-B 165 235 10 15 071200000
23 LION-A 165 205 10 15 071200000
23 LION-B 165 224 10 15 071200000
23 PIKE-A 169 218 10 15 071200000
24 BOSS-B 165 170 5 15 403500000

24 LION-A 165 170 5 15 403500000
24 LION-B 165 170 5 15 403500000
25 GUAM-B 170 190 20 15 316000000
26 GUAM-A 202 235 25 15 614200000
26 GUAM-B 180 235 25 15 614200000
27 POGO-B 180 206 5 15 639200000
27 POGO-C 180 214 5 15 639200000
27 INDI-A 210 245 5 15 639200000
27 BOSS-A 190 245 5 15 639200000
27 BOSS-B 180 245 5 15 639200000
27 LION-A 180 205 5 15 639200000
27 LION-B 180 224 5 15 639200000
27 PIKE-A 180 218 5 15 639200000
28 INDI-A 210 270 20 15 532900000
28 REEF-A 222 270 20 15 532900000
29 HULA-B 205 240 15 15 722500000
29 COOK-A 205 240 15 15 722500000
29 COOK-B 205 240 15 15 722500000
29 GUAM-A 205 240 15 15 722500000
29 GUAM-B 205 240 15 15 722500000
30 INDI-A 210 275 40 15 889600000
30 BOSS-A 205 275 40 15 889600000
30 BOSS-B 205 275 40 15 889600000
30 REEF-A 222 275 40 15 889600000
31 HULA-A 269 285 15 15 944100000
31 HULA-B 210 285 15 15 944100000
31 COOK-A 210 285 15 15 944100000
31 COOK-B 210 285 15 15 944100000
31 BOSS-A 210 285 15 15 944100000
31 BOSS-B 210 285 15 15 944100000
31 PIKE-A 268 285 15 15 944100000
32 HULA-A 269 290 5 15 645100000
32 HULA-B 225 290 5 15 645100000
32 COOK-A 225 290 5 15 645100000
32 COOK-B 225 290 5 15 645100000
32 BOSS-A 225 290 5 15 645100000
32 BOSS-B 225 290 5 15 645100000
32 PIKE-A 268 290 5 15 645100000
33 INDI-A 230 305 15 15 452400000
33 BOSS-A 230 305 15 15 452400000
33 BOSS-B 230 305 15 15 452400000
33 LION-B 272 305 15 15 452400000
34 BOSS-A 235 280 45 15 372600000
34 BOSS-B 235 280 45 15 372600000
35 COOK-A 240 285 15 15 192000000
35 COOK-B 240 285 15 15 192000000
35 BOSS-A 240 269 15 15 192000000
35 BOSS-B 240 269 15 15 192000000
36 INDI-A 265 285 20 15 577500000
36 GUAM-A 265 285 20 15 577500000
36 GUAM-B 265 285 20 15 577500000
36 REEF-A 265 285 20 15 577500000
37 COOK-B 265 745 480 15 372600000
37 INDI-A 265 745 480 15 372600000
37 GUAM-B 265 745 480 15 372600000
38 BOSS-A 270 320 20 15 212400000
38 BOSS-B 270 395 20 15 212400000
38 LION-B 272 395 20 15 212400000
38 PIKE-A 270 395 20 15 212400000
39 INDI-A 290 360 10 15 628000000
39 BOSS-A 290 320 10 15 628000000
39 BOSS-B 290 360 10 15 628000000
39 LION-B 290 360 10 15 628000000
40 POGO-A 294 306 10 15 750600000
40 POGO-B 290 311 10 15 750600000
40 POGO-C 290 320 10 15 750600000
40 HULA-A 290 315 10 15 750600000
40 HULA-B 290 315 10 15 750600000
40 COOK-A 290 320 10 15 750600000
40 COOK-B 290 320 10 15 750600000
40 INDI-A 290 320 10 15 750600000
40 BOSS-A 290 320 10 15 750600000
40 BOSS-B 290 320 10 15 750600000
40 LION-B 290 320 10 15 750600000
40 GUAM-A 290 320 10 15 750600000
40 GUAM-B 290 320 10 15 750600000
40 PIKE-A 290 320 10 15 750600000
41 COOK-B 300 345 45 15 302800000
41 BOSS-B 300 345 45 15 302800000
41 LION-B 300 345 45 15 302800000
41 GUAM-B 300 345 45 15 302800000
41 PIKE-A 300 345 45 15 302800000
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129 LION-A 1080 1130 15 15 936400000
129 LION-B 1080 1109 15 15 936400000
129 PIKE-A 1080 1152 15 15 936400000
130 COOK-A 1080 1160 20 15 764100000
130 COOK-B 1080 1160 20 15 764100000
130 BOSS-B 1129 1160 20 15 764100000
130 PIKE-A 1080 1152 20 15 764100000
131 POGO-B 1089 1125 15 15 252400000
131 POGO-C 1080 1140 15 15 252400000
131 COOK-A 1080 1140 15 15 252400000
131 COOK-B 1080 1140 15 15 252400000
131 INDI-A 1080 1140 15 15 252400000
131 BOSS-A 1101 1118 15 15 252400000
131 LION-A 1080 1130 15 15 252400000
131 LION-B 1080 1109 15 15 252400000
131 GUAM-B 1080 1140 15 15 252400000
131 PIKE-A 1080 1140 15 15 252400000
131 REEF-A 1080 1140 15 15 252400000
132 INDI-A 1105 1205 100 15 577500000
132 GUAM-B 1105 1205 100 15 577500000
132 REEF-A 1105 1205 100 15 577500000
133 POGO-C 1105 1150 45 15 889600000
133 INDI-A 1105 1150 45 15 889600000

133 GUAM-B 1105 1150 45 15 889600000
133 PIKE-A 1105 1150 45 15 889600000
133 REEF-A 1105 1150 45 15 889600000
134 BOSS-A 1164 1180 10 15 503700000
134 BOSS-B 1129 1180 10 15 503700000
134 LION-A 1110 1130 10 15 503700000
134 LION-B 1153 1180 10 15 503700000
135 HULA-A 1110 1120 10 15 944300000
135 HULA-B 1110 1120 10 15 944300000
135 COOK-A 1110 1120 10 15 944300000
135 COOK-B 1110 1120 10 15 944300000
135 GUAM-B 1110 1120 10 15 944300000
135 PIKE-A 1110 1120 10 15 944300000
136 POGO-B 1110 1125 15 15 943400000
136 POGO-C 1110 1151 15 15 943400000
136 COOK-A 1110 1172 15 15 943400000
136 COOK-B 1110 1185 15 15 943400000
136 BOSS-A 1164 1185 15 15 943400000
136 BOSS-B 1129 1185 15 15 943400000
136 LION-A 1110 1130 15 15 943400000
136 LION-B 1153 1185 15 15 943400000
136 PIKE-A 1110 1152 15 15 943400000
137 POGO-C 1115 1140 15 15 730400000
137 HULA-A 1115 1140 15 15 730400000
137 HULA-B 1115 1140 15 15 730400000
137 COOK-A 1115 1140 15 15 730400000
137 COOK-B 1115 1140 15 15 730400000
137 INDI-A 1115 1140 15 15 730400000
137 LION-A 1115 1140 15 15 730400000
137 GUAM-B 1115 1140 15 15 730400000
137 PIKE-A 1115 1140 15 15 730400000
137 REEF-A 1115 1140 15 15 730400000
138 INDI-A 1125 1190 5 15 452400000
138 BOSS-A 1164 1190 5 15 452400000
138 BOSS-B 1129 1190 5 15 452400000
138 LION-A 1181 1190 5 15 452400000
138 LION-B 1153 1190 5 15 452400000
139 INDI-A 1130 1200 10 15 639100000
139 BOSS-A 1164 1200 10 15 639100000
139 BOSS-B 1130 1200 10 15 639100000
139 LION-A 1181 1200 10 15 639100000
139 LION-B 1153 1200 10 15 639100000
140 POGO-A 1189 1227 10 15 731000000
140 POGO-B 1173 1201 10 15 731000000
140 POGO-C 1203 1230 10 15 731000000
140 HULA-B 1130 1230 10 15 731000000
140 COOK-A 1130 1172 10 15 731000000
140 COOK-B 1130 1230 10 15 731000000
140 INDI-A 1130 1230 10 15 731000000
140 BOSS-A 1164 1212 10 15 731000000
140 BOSS-B 1130 1230 10 15 731000000
140 LION-A 1181 1230 10 15 731000000
140 LION-B 1153 1230 10 15 731000000
140 GUAM-A 1196 1230 10 15 731000000
140 GUAM-B 1130 1230 10 15 731000000
140 PIKE-A 1203 1230 10 15 731000000
140 REEF-A 1130 1211 10 15 731000000
141 HULA-B 1140 1185 15 15 294100000
141 COOK-A 1140 1172 15 15 294100000
141 COOK-B 1140 1185 15 15 294100000
141 BOSS-A 1164 1185 15 15 294100000
141 BOSS-B 1140 1185 15 15 294100000
141 LION-B 1153 1185 15 15 294100000
141 GUAM-B 1140 1185 15 15 294100000
141 REEF-A 1140 1185 15 15 294100000
142 HULA-A 1196 1202 5 15 645100000
142 HULA-B 1155 1220 5 15 645100000
142 COOK-A 1155 1172 5 15 645100000
142 COOK-B 1155 1220 5 15 645100000
142 BOSS-A 1164 1212 5 15 645100000
142 BOSS-B 1155 1220 5 15 645100000
142 PIKE-A 1203 1220 5 15 645100000
143 POGO-B 1173 1195 10 15 750600000
143 HULA-B 1165 1195 10 15 750600000
143 COOK-B 1165 1195 10 15 750600000
143 INDI-A 1165 1195 10 15 750600000
143 BOSS-A 1165 1195 10 15 750600000
143 BOSS-B 1165 1195 10 15 750600000
143 LION-A 1181 1195 10 15 750600000
143 LION-B 1165 1195 10 15 750600000
143 GUAM-B 1165 1195 10 15 750600000
143 REEF-A 1165 1195 10 15 750600000
144 POGO-B 1185 1192 7 15 730400000
144 HULA-B 1185 1192 7 15 730400000
144 COOK-B 1185 1192 7 15 730400000
144 INDI-A 1185 1192 7 15 730400000
144 BOSS-A 1185 1192 7 15 730400000
144 BOSS-B 1185 1192 7 15 730400000
144 LION-A 1185 1192 7 15 730400000
144 LION-B 1185 1192 7 15 730400000
144 GUAM-B 1185 1192 7 15 730400000
144 REEF-A 1185 1192 7 15 730400000
145 HULA-B 1190 1265 15 15 731400000
145 COOK-A 1221 1254 15 15 731400000
145 COOK-B 1190 1265 15 15 731400000
145 BOSS-A 1190 1212 15 15 731400000
145 BOSS-B 1190 1244 15 15 731400000
145 PIKE-A 1203 1265 15 15 731400000
146 HULA-B 1200 1245 45 15 047000000
146 COOK-B 1200 1245 45 15 047000000
146 INDI-A 1200 1245 45 15 047000000
146 LION-B 1200 1245 45 15 047000000
146 GUAM-A 1200 1245 45 15 047000000
146 GUAM-B 1200 1245 45 15 047000000
147 INDI-A 1210 1220 10 15 483200000
147 LION-A 1210 1220 10 15 483200000

147 LION-B 1210 1220 10 15 483200000
148 BOSS-A 1262 1280 5 15 936600000
148 BOSS-B 1215 1280 5 15 936600000
148 LION-A 1215 1232 5 15 936600000
148 LION-B 1215 1280 5 15 936600000
148 PIKE-A 1215 1280 5 15 936600000
149 INDI-A 1245 1300 25 15 944400000
149 LION-B 1245 1300 25 15 944400000
149 GUAM-B 1245 1300 25 15 944400000
149 REEF-A 1263 1300 25 15 944400000
150 INDI-A 1260 1313 20 15 316000000
150 GUAM-A 1314 1340 20 15 316000000
150 GUAM-B 1260 1340 20 15 316000000
150 REEF-A 1263 1340 20 15 316000000
151 POGO-C 1260 1285 25 15 730400000
151 HULA-B 1260 1285 25 15 730400000
151 INDI-A 1260 1285 25 15 730400000
151 LION-B 1260 1285 25 15 730400000
151 GUAM-B 1260 1285 25 15 730400000
151 PIKE-A 1260 1285 25 15 730400000
152 POGO-C 1265 1300 25 15 601200000
152 HULA-B 1265 1300 25 15 601200000
152 INDI-A 1265 1300 25 15 601200000
152 BOSS-A 1265 1300 25 15 601200000
152 LION-B 1265 1300 25 15 601200000
152 GUAM-B 1265 1300 25 15 601200000
152 PIKE-A 1265 1300 25 15 601200000
153 BOSS-A 1280 1307 10 15 403500000
153 BOSS-B 1280 1310 10 15 403500000
153 LION-A 1282 1310 10 15 403500000
153 LION-B 1280 1310 10 15 403500000
154 BOSS-A 1290 1307 15 15 071200000
154 BOSS-B 1295 1332 15 15 071200000
154 LION-A 1290 1365 15 15 071200000
154 LION-B 1290 1365 15 15 071200000
154 PIKE-A 1290 1365 15 15 071200000
155 HULA-A 1290 1360 40 15 889600000
155 HULA-B 1290 1360 40 15 889600000
155 LION-A 1290 1360 40 15 889600000
155 LION-B 1290 1360 40 15 889600000
155 GUAM-B 1290 1360 40 15 889600000
155 PIKE-A 1290 1360 40 15 889600000
155 REEF-A 1290 1350 40 15 889600000
156 POGO-B 1290 1315 15 15 979400000
156 POGO-C 1290 1329 15 15 979400000
156 HULA-A 1290 1350 15 15 979400000
156 HULA-B 1290 1350 15 15 979400000
156 COOK-A 1290 1350 15 15 979400000
156 COOK-B 1323 1350 15 15 979400000
156 INDI-A 1290 1313 15 15 979400000
156 BOSS-A 1290 1307 15 15 979400000
156 BOSS-B 1295 1332 15 15 979400000
156 LION-A 1290 1350 15 15 979400000
156 LION-B 1290 1350 15 15 979400000
156 GUAM-A 1314 1346 15 15 979400000
156 GUAM-B 1290 1350 15 15 979400000
156 PIKE-A 1290 1350 15 15 979400000
156 REEF-A 1290 1350 15 15 979400000
157 HULA-A 1320 1485 165 15 372600000
157 HULA-B 1320 1485 165 15 372600000
157 LION-A 1320 1485 165 15 372600000
157 LION-B 1320 1485 165 15 372600000
157 GUAM-B 1320 1485 165 15 372600000
157 PIKE-A 1320 1485 165 15 372600000
158 HULA-A 1320 1330 10 15 730400000
158 HULA-B 1320 1330 10 15 730400000
158 COOK-A 1320 1330 10 15 730400000
158 BOSS-B 1320 1330 10 15 730400000
158 LION-A 1320 1330 10 15 730400000
158 LION-B 1320 1330 10 15 730400000
158 GUAM-A 1320 1330 10 15 730400000
158 GUAM-B 1320 1330 10 15 730400000
158 PIKE-A 132^ 1330 10 15 730400000
158 REEF-A 1[illegible] 1330 10 15 730400000
159 HULA-A 1325 1395 10 15 607100000
159 HULA-B 1325 1395 10 15 607100000
159 COOK-A 1325 1395 10 15 607100000
159 COOK-B 1325 1395 10 15 607100000
159 BOSS-B 1379 1395 10 15 607100000
159 PIKE-A 1325 1395 10 15 607100000
160 GUAM-A 1395 1430 20 15 316000000
160 GUAM-B 1350 1430 20 15 316000000
160 REEF-A 1399 1430 20 15 316000000
161 LION-A 1355 1390 35 15 532900000
161 LION-B 1355 1390 35 15 532900000
162 HULA-A 1355 1368 13 15 601200000
162 HULA-B 1355 1368 13 15 601200000
162 COOK-A 1355 1368 13 15 601200000
162 COOK-B 1355 1368 13 15 601200000
162 LION-A 1355 1368 13 15 601200000
162 LION-B 1355 1368 13 15 601200000
162 GUAM-B 1355 1368 13 15 601200000
162 PIKE-A 1355 1368 13 15 601200000
163 COOK-A 1365 1408 5 15 827500000
163 COOK-B 1365 1406 5 15 827500000
163 BOSS-A 1395 1408 5 15 827500000
163 BOSS-B 1379 1430 5 15 827500000
163 LION-A 1365 1430 5 15 827500000
163 LION-B 1365 1430 5 15 827500000
163 PIKE-A 1365 1430 5 15 827500000
164 BOSS-A 1380 1408 20 15 212400000
164 BOSS-B 1380 1420 20 15 212400000
164 LION-A 1380 1420 20 15 212400000
164 LION-B 1380 1420 20 15 212400000
164 PIKE-A 1380 1460 20 15 212400000
166 INDI-A 1416 1465 10 15 484500000

166 LION-A 1395 1430 10 15 484500000
166 LION-B 1395 1430 10 15 484500000
166 REEF-A 1399 1430 10 15 484500000
167 INDI-A 1416 1460 20 15 577500000
168 BOSS-B 1415 1435 20 15 503700000
168 LION-A 1415 1435 20 15 503700000
168 LION-B 1415 1435 20 15 503700000
169 POGO-A 1415 1470 35 15 601200000
169 POGO-B 1415 1470 35 15 601200000
169 POGO-C 1415 1470 35 15 601200000
169 HULA-A 1415 1470 35 15 601200000
169 HULA-B 1415 1470 35 15 601200000
169 INDI-A 1416 1470 35 15 601200000
169 BOSS-B 1415 1470 35 15 601200000
169 LION-A 1415 1470 35 15 601200000
169 LION-B 1415 1470 35 15 601200000
169 GUAM-A 1415 1470 35 15 601200000
169 GUAM-B 1415 1470 35 15 601200000
169 PIKE-A 1415 1470 35 15 601200000

Like the low altitiude satellite support requests, the above medium and high altitude satellite support requests are ported to the VAX 6420 and submitted to **IPLINK.FOR.** The output from **IPLINK.FOR** is submitted to **SRS.GMS** where the schedule variables are found. These files are submitted to **SCHUP.PAS** where the scheduled requests are added to the previous schedule.

SCHUP.PAS Output (Final 24 Hour Schedule).

1 HULA-A 0 35 35 15 9445000
2 LION-A 0 15 15 15 2567000
3 COOK-A 0 5 5 15 8275000
4 BOSS-A 0 5 5 15 6280000
5 POGO-B 5 15 10 15 7310000
6 BOSS-B 10 20 10 15 6391000
1 INDI-A 13 28 15 15 6553055
2 POGO-A 26 42 16 15 2532097
7 POGO-C 30 75 45 15 8639000
8 HULA-B 30 50 20 15 5953000
3 BOSS-A 39 55 16 15 9757024
10 BOSS-B 45 480 435 15 5037000
4 POGO-B 51 64 13 15 1056014
11 INDI-A 54 64 10 15 4955000
5 COOK-A 54 67 13 15 4774042
6 COOK-B 54 68 14 15 6553055
9 POGO-A 57 72 15 15 0470000
13 LION-A 60 85 25 15 4035000
15 GUAM-B 70 105 35 15 7837000
7 REEF-A 81 93 12 15 9757024
14 POGO-A 87 102 15 15 9521000
16 HULA-A 90 105 15 15 6453000
17 POGO-C 90 100 10 15 9442000
18 INDI-A 90 110 20 15 5775000
19 LION-B 105 120 15 15 8639000
8 GUAM-A 108 123 15 15 7050006
20 LION-A 111 126 15 15 9366000
9 BOSS-A 117 133 16 15 2532097
10 POGO-B 138 152 14 15 6553055
11 PIKE-A 138 154 16 15 9757024
12 HULA-A 139 153 14 15 0286045
21 COOK-A 145 160 15 15 7506000
13 POGO-C 150 163 13 15 1056014
14 BOSS-A 163 175 12 15 5821064
24 LION-A 165 170 5 15 4035000
22 POGO-B 167 187 20 15 7310000
15 POGO-A 169 179 10 15 4774042
25 GUAM-B 170 190 20 15 3160000
16 GUAM-A 173 187 14 15 1056014
17 INDI-A 179 195 16 15 9757024
27 POGO-C 180 185 5 15 6392000
23 BOSS-A 190 200 10 15 0712000
18 REEF-A 193 207 14 15 1132085
26 GUAM-A 202 227 25 15 6142000
29 HULA-B 205 220 15 15 7225000
19 POGO-A 217 233 16 15 9845009
28 REEF-A 222 242 20 15 5329000
20 LION-A 225 239 14 15 6553055
21 POGO-B 226 242 16 15 3187074
33 INDI-A 230 245 15 15 4524000
22 POGO-C 234 248 14 15 6553055
34 BOSS-A 235 280 45 15 3726000
23 PIKE-A 238 253 15 15 7050006
24 HULA-A 238 254 16 15 0286045
35 COOK-A 240 255 15 15 1920000
25 LION-B 244 257 13 15 1056014
36 GUAM-A 265 285 20 15 5775000
37 GUAM-B 265 745 480 15 3726000
32 PIKE-A 268 273 5 15 6451000
27 POGO-A 268 279 11 15 4774042
31 HULA-A 269 284 15 15 9441000
28 LION-A 271 284 13 15 1132085

38 LION-B 290 310 20 15 2124000
39 INDI-A 290 300 10 15 6280000
40 POGO-A 294 304 10 15 7506000
41 COOK-B 300 345 45 15 3028000
29 LION-A 325 336 11 15 6553055
30 POGO-A 326 342 16 15 3187074
43 INDI-A 330 350 20 15 3160000
44 LION-B 330 335 5 15 4845000
31 POGO-B 331 345 14 15 6553055
32 HULA-A 335 351 16 15 9757024
33 HULA-B 335 351 16 15 9757024
34 BOSS-A 340 355 15 15 1056014
35 COOK-A 349 364 15 15 1132085
47 POGO-C 350 360 10 15 7225000
36 GUAM-A 355 369 14 15 6553055
48 PIKE-A 358 415 57 15 6071000
49 LION-B 360 375 15 15 3055000
37 POGO-A 364 376 12 15 0286045
38 LION-A 365 381 16 15 9757024
45 HULA-A 366 391 25 15 9445000
46 HULA-B 366 371 5 15 7314000
39 POGO-B 367 379 12 15 4774042
50 POGO-B 394 409 15 15 4373000
51 POGO-C 395 410 15 15 7304000
40 HULA-A 413 430 17 15 2532097
53 LION-A 420 435 15 15 5775000
54 GUAM-A 420 435 15 15 2272000
41 BOSS-A 421 434 13 15 6553055
55 INDI-A 425 515 90 15 6391000
42 POGO-A 426 443 17 15 3187074
43 PIKE-A 440 454 14 15 1056014
44 COOK-A 441 452 11 15 7050006
52 HULA-A 445 455 10 15 7310000
45 POGO-B 449 466 17 15 1056014
46 LION-A 466 482 16 15 9757024
47 POGO-A 466 480 14 15 0286045
56 COOK-A 475 520 45 15 2567000
48 BOSS-A 475 487 12 15 4774042
49 REEF-A 480 496 16 15 1056014
57 GUAM-A 490 510 20 15 5775000
58 LION-B 505 515 10 15 7225000
59 HULA-B 510 530 20 15 5953000
60 LION-A 515 535 20 15 5329000
61 COOK-B 515 525 10 15 6394000
50 HULA-A 515 527 12 15 2532097
62 BOSS-B 525 530 5 15 0712000
63 BOSS-A 525 535 10 15 9364000
51 POGO-C 527 543 16 15 3187074
64 INDI-A 530 545 15 15 6374000
52 GUAM-A 535 550 15 15 9757024
53 PIKE-A 539 556 17 15 1056014
65 LION-B 540 550 10 15 4832000
66 COOK-A 545 570 25 15 6012000
54 POGO-A 551 567 16 15 1056014
55 HULA-A 551 561 10 15 6790043
56 POGO-B 559 575 16 15 9757024
67 BOSS-A 560 570 10 15 4035000
68 HULA-B 560 575 15 15 7304000
57 POGO-C 567 583 16 15 0286045
69 LION-A 570 590 20 15 2124000
70 INDI-A 570 585 15 15 9446000
58 BOSS-B 571 586 15 15 4774042
59 REEF-A 582 596 14 15 1056014
72 HULA-A 590 600 10 15 9363000
73 HULA-B 590 595 5 15 6453000
74 LION-B 600 605 5 15 9366000
71 BOSS-B 601 641 40 15 8896000
75 POGO-C 605 615 10 15 7304000
60 PIKE-A 614 629 15 15 6553055
61 BOSS-A 619 635 16 15 3187074
62 POGO-A 625 639 14 15 6553055
63 REEF-A 632 644 12 15 4774042
64 GUAM-A 636 651 15 15 9757024
65 POGO-B 638 651 13 15 2532097
66 POGO-C 653 669 16 15 1056014
76 LION-B 660 670 10 15 5037000
77 HULA-A 660 675 15 15 6451000
78 COOK-B 660 705 45 15 2524000
67 POGO-A 660 674 14 15 4774042
68 LION-A 665 678 13 15 1056014
69 BOSS-B 668 683 15 15 1132085
71 BOSS-A 670 686 16 15 9757024
79 POGO-C 684 699 15 15 9783000
80 INDI-A 690 710 20 15 5775000
82 POGO-A 690 700 10 15 7304000
83 POGO-B 690 725 35 15 6012000
81 BOSS-A 701 711 10 15 4524000
84 LION-A 701 711 10 15 4845000
87 POGO-B 725 735 10 15 7310000
72 REEF-A 728 742 14 15 4774042
88 COOK-B 730 925 195 15 3726000
89 COOK-A 735 765 30 15 9364000
73 HULA-A 736 752 16 15 1056014
74 HULA-B 736 752 16 15 1056014
75 POGO-A 739 753 14 15 2532097
76 POGO-B 756 772 16 15 1056014
77 POGO-C 757 771 14 15 4774042
86 HULA-A 767 772 5 15 6071000
91 HULA-B 767 772 5 15 7314000
78 BOSS-A 769 783 14 15 1132085
79 BOSS-B 771 786 15 15 9757024
92 INDI-A 780 785 5 15 6391000
90 BOSS-A 798 818 20 15 2124000
93 INDI-A 800 810 10 15 4955000
95 POGO-C 800 835 35 15 7837000
94 BOSS-B 801 811 10 15 4035000

80 HULA-A 807 820 13 15 6553055
81 HULA-B 807 820 13 15 6553055
96 GUAM-B 810 825 15 15 9443000
97 COOK-A 825 840 15 15 8275000
98 INDI-A 830 850 20 15 5775000
82 REEF-A 831 847 16 15 9757024
83 POGO-B 834 848 14 15 3187074
84 LION-B 845 857 12 15 4774042
85 BOSS-A 848 863 15 15 2532097
86 POGO-A 854 868 14 15 4774042
101 POGO-C 855 900 45 15 5681000
102 HULA-A 860 875 15 15 7506000
99 POGO-B 863 878 15 15 3310000
103 INDI-A 865 900 35 15 9444000
87 LION-A 867 882 15 15 1056014
104 GUAM-A 870 890 20 15 3160000
106 REEF-A 870 890 20 15 7310000
88 COOK-A 874 890 16 15 9757024
100 BOSS-A 878 883 5 15 9366000
105 BOSS-A 898 908 10 15 5037000
89 HULA-A 904 917 13 15 6553055
108 COOK-A 905 920 15 15 3028000
90 LION-A 907 922 15 15 7050007
109 POGO-B 910 955 45 15 3726000
107 INDI-A 915 920 5 15 6280000
110 POGO-C 915 960 45 15 3310000
111 HULA-A 932 947 15 15 7225000
91 LION-B 933 947 14 15 6553055
92 REEF-A 933 946 13 15 9757024
93 GUAM-A 935 951 16 15 1056014
94 POGO-A 939 950 11 15 3187074
112 REEF-A 961 981 20 15 5329000
113 POGO-B 970 980 10 15 6392000
96 BOSS-A 970 983 13 15 1056014
97 HULA-A 970 981 11 15 4774042
98 HULA-B 970 981 11 15 4774042
99 POGO-A 971 987 16 15 0286045
114 POGO-C 975 990 15 15 5681000
100 COOK-A 975 989 14 15 9757024
115 INDI-A 990 995 5 15 9446000
116 LION-A 990 1010 20 15 5775000
117 COOK-A 1005 1025 20 15 5953000
120 HULA-B 1005 1050 45 15 4373000
119 COOK-B 1010 1015 5 15 6453000
121 POGO-B 1010 1020 10 15 7506000
101 LION-B 1010 1025 15 15 7050007
122 BOSS-B 1020 1040 20 15 2124000
123 PIKE-A 1020 1035 15 15 6738000
102 HULA-A 1020 1036 16 15 3187074
103 POGO-A 1024 1036 12 15 6553055
104 INDI-A 1025 1039 14 15 1132085
105 GUAM-B 1039 1050 11 15 1056014
106 LION-A 1039 1052 13 15 4774042
125 BOSS-A 1040 1050 10 15 4035000
107 POGO-C 1047 1061 14 15 4774042
124 HULA-A 1051 1056 5 15 6394000
108 LION-B 1052 1063 11 15 9757024
126 INDI-A 1054 1059 5 15 4845000
109 POGO-B 1062 1074 12 15 9757024
110 BOSS-A 1070 1086 16 15 1056014
111 POGO-A 1071 1087 16 15 0286045
127 POGO-C 1076 1086 10 15 7225000
112 HULA-A 1079 1095 16 15 9757024
113 HULA-B 1079 1095 16 15 9757024
128 LION-A 1080 1100 20 15 5329000
129 COOK-A 1080 1095 15 15 9364000
131 POGO-B 1089 1104 15 15 2524000
114 GUAM-A 1098 1112 14 15 6553055
115 BOSS-B 1099 1114 15 15 7050007
132 INDI-A 1105 1205 100 15 5775000
133 GUAM-B 1105 1150 45 15 8896000
130 COOK-A 1110 1130 20 15 7641000
135 HULA-B 1110 1120 10 15 9443000
136 POGO-C 1110 1125 15 15 9434000
137 HULA-A 1115 1130 15 15 7304000
116 POGO-A 1123 1136 13 15 6553055
138 BOSS-B 1129 1134 5 15 4524000
117 LION-B 1129 1138 9 15 6553055
118 BOSS-A 1138 1149 11 15 4774042
140 REEF-A 1140 1150 10 15 7310000
141 HULA-B 1140 1155 15 15 2941000
119 POGO-B 1145 1158 13 15 3187074
120 LION-A 1150 1166 16 15 9757024
121 POGO-A 1161 1174 13 15 9757024
134 BOSS-A 1164 1174 10 15 5037000
122 GUAM-A 1168 1181 13 15 4774042
123 HULA-A 1169 1181 12 15 1132085
124 POGO-C 1171 1188 17 15 0286045
125 PIKE-A 1172 1188 16 15 1056014
143 POGO-B 1173 1183 10 15 7506000
139 LION-A 1181 1191 10 15 6391000
144 GUAM-B 1185 1192 7 15 7304000
145 HULA-B 1190 1205 15 15 7314000
126 COOK-A 1192 1206 14 15 7050007
142 HULA-A 1196 1201 5 15 6451000
146 COOK-B 1200 1245 45 15 0470000
147 LION-A 1210 1220 10 15 4832000
148 BOSS-B 1215 1220 5 15 9366000
127 POGO-B 1221 1235 14 15 6553055
128 HULA-A 1222 1234 12 15 6790043
129 REEF-A 1231 1248 17 15 1056014
130 BOSS-A 1232 1247 15 15 4774042
149 INDI-A 1245 1270 25 15 9444000
131 POGO-A 1247 1262 15 15 3187074
132 LION-A 1252 1267 15 15 9757024
133 HULA-A 1257 1268 11 15 2532097

151 GUAM-B 1260 1285 25 15 7304000
134 POGO-B 1260 1274 14 15 9757024
135 BOSS-B 1264 1280 16 15 0286045
152 POGO-C 1265 1290 25 15 6012000
136 COOK-A 1274 1290 16 15 1056014
153 BOSS-A 1280 1290 10 15 4035000
137 GUAM-A 1283 1299 16 15 9757024
150 INDI-A 1285 1305 20 15 3160000
154 LION-B 1290 1305 15 15 0712000
155 HULA-B 1290 1330 40 15 8896000
156 LION-A 1290 1305 15 15 9794000
138 COOK-B 1293 1308 15 15 7050007
139 POGO-A 1318 1333 15 15 6553055
157 GUAM-B 1320 1485 165 15 3726000
158 HULA-A 1320 1330 10 15 7304000
140 BOSS-A 1327 1340 13 15 6553055
141 INDI-A 1333 1349 16 15 1056014
142 POGO-B 1335 1351 16 15 2532097
159 HULA-A 1345 1355 10 15 6071000
143 POGO-C 1349 1365 16 15 3187074
144 BOSS-B 1352 1364 12 15 9757024
161 LION-A 1355 1390 35 15 5329000
162 HULA-B 1355 1368 13 15 6012000
145 POGO-A 1359 1375 16 15 9757024
147 GUAM-A 1366 1380 14 15 1132085
148 BOSS-A 1366 1380 14 15 0286045
149 REEF-A 1370 1384 14 15 4774043
163 BOSS-B 1380 1385 5 15 8275000
164 BOSS-A 1380 1400 20 15 2124000
150 INDI-A 1389 1401 12 15 6553055
160 GUAM-A 1395 1415 20 15 3160000
166 LION-A 1405 1415 10 15 4845000
168 LION-B 1415 1435 20 15 5037000
169 POGO-A 1415 1450 35 15 6012000
167 INDI-A 1416 1436 20 15 5775000
151 COOK-B 1426 1441 15 15 4774043
152 COOK-A 1428 1443 15 15 6553055
153 BOSS-A 1428 1442 14 15 2532097

UTIL.PAS RTS Utility. After the final 24 hour schedule has been determined, this program can be used to sort the supports by RTS and time. At the end of each RTS group the RTS utility is given.

```
program DIVIDE;
Type
 mat = array[1..40, 1..3] of Integer;

Var

I,j,N,cnt,bv,ev,ailen,req,snumlf,snumhf,irevlf,irevhf,aiday : Integer;
snumdd,times,durlen,schr,scmin,sctot,sitme,d1n,tatn :integer;
bt,et,du,et1,bt1,du1,bth1n,eth1n,hfn1n,dur1n : integer;
bthn,btmn,etmn,ethn,adn,ahn,aminn,addn,adhn,adminn,time,time1,etime,
etime1,dh1n,dmin1n,vis,tol,durn,e,e1,hfnn : integer;
 error,aihr,sihr,aitmehr,aitmemin,irev,aimin,diff,silen,stm,sum : integer;
lfident,hfident,smon,stme,amon,atme,alen,chk,ident1,amon1,
atme1,bth1,eth1,hfn1,dur1 : string[4];
slen,gts2,gts1,slen1 : string[6];
bth,eth,hfn,phfn,dur,num,ident: string[5];
rev1 : string[7];
tat,rev :string[3];
id,id1,sch,line,sp,s1,s2,s3,s4,s11,s21,s31,s41,sch1,hl1,hl : STRING[1];
scnt,sbv,sev,sailen,nsctot,bth2,eth2 :string[4];
aday,ahr,atmehr,atmemin,d2,aday1,tat1,ahr1 : string[2];
atmehr1,atmemin1,d11,d21,m1,d1,h1,min1,dd1,dh1,dmin1,m,d,h,min,dd,dh,dmin,
am,ad,ah,amin,add,adh,admin,am1,ad1,ah1,amin1,add1,adh1,admin1 : string[2];
last : string[3];
fill : string[40];
fill1 : string[19];
revv,revlf,revhf,util :real;
```

```
dum:STRING[9];
Infile,Infile1,OutFile1,outfile2,outfile3,outfile4,outfile : Text;
stats : mat;
Match :boolean;


Begin {Main Program}
   phfn:='  0';
   sp:=' ';
   chk:='  ';
   cnt:=1;
   snumlf:=1;
   snumhf:=300;
   irevlf:=0;
   irevhf:=9999;
   lfident:='  ';
   hfident:='  ';
   Writeln('Begin Reading Fin.dft');
   Assign(Infile1,'c:\fs13.dat');
   Reset(Infile1);

   Assign(Outfile1,'C:\fss13.dat');
   Rewrite(Outfile1);

     sum:=0;
   Writeln('Reading Data');
            repeat

            readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

            if gts2='POGO-A' then
            begin
            if rev<>'000' then tat:=' 20';
            val(tat,tatn,error);
            val(dur,durn,error);
            sum:=sum+durn+tatn;
             writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
               end;
               until eof(infile1);
                util:=sum/1440;
               writeln(outfile1,sum:5,'  ',util);
               sum:=0;
               reset(infile1);
                repeat

            readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

            if gts2='POGO-B' then
            begin
            if rev<>'000' then tat:=' 20';
              val(tat,tatn,error);
            val(dur,durn,error);
            sum:=sum+durn+tatn;
```

```
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
    util:=sum/1440;
     writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
     repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='POGO-C' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
       util:=sum/1440;
     writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
     repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='HULA-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
     repeat


readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='HULA-B' then
begin
if rev<>'000' then tat:=' 20';
      val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
```

```
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='COOK-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='COOK-B' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='INDI-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
```

```
          util:=sum/1440;
           writeln(outfile1,sum:5,'    ',util);
          sum:=0;
          reset(infile1);
           repeat
readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);
    if gts2='BOSS-A' then
     begin
     if rev<>'000' then tat:=' 20';
      val(tat,tatn,error);
     val(dur,durn,error);
     sum:=sum+durn+tatn;
      writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
        end;
        until eof(infile1);
         util:=sum/1440;
          writeln(outfile1,sum:5,'    ',util);
        sum:=0;
        reset(infile1);
         repeat

     readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

     if gts2='BOSS-B' then
     begin
     if rev<>'000' then tat:=' 20';
      val(tat,tatn,error);
     val(dur,durn,error);
     sum:=sum+durn+tatn;
      writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
        end;
        until eof(infile1);
         util:=sum/1440;
          writeln(outfile1,sum:5,'    ',util);
        sum:=0;
        reset(infile1);
         repeat

     readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

     if gts2='LION-A' then
     begin
     if rev<>'000' then tat:=' 20';
      val(tat,tatn,error);
     val(dur,durn,error);
     sum:=sum+durn+tatn;
      writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
        end;
        until eof(infile1);
         util:=sum/1440;
          writeln(outfile1,sum:5,'    ',util);
        sum:=0;
        reset(infile1);
```

```
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='LION-B' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='GUAM-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='GUAM-B' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
      repeat
```

```
readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='PIKE-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
      writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(infile1);
     repeat

readln(infile1,num,gts2,bth,eth,dur,tat,ident,rev);

if gts2='REEF-A' then
begin
if rev<>'000' then tat:=' 20';
  val(tat,tatn,error);
val(dur,durn,error);
sum:=sum+durn+tatn;
 writeln(outfile1,num,gts2,bth,eth,dur,tat,ident,rev);
    end;
    until eof(infile1);
     util:=sum/1440;
        writeln(outfile1,sum:5,'    ',util);
    sum:=0;
    reset(outfile1);
    repeat
    readln(outfile1);
    until eof(outfile1);
    end.•
```

UTIL.PAS Output (Sorted Final 24 Hour Schedule).

```
 2 POGO-A  26  42  16 20 2532097
 9 POGO-A  57  72  15 15 0470000
14 POGO-A  87 102  15 15 9521000
15 POGO-A 169 179  10 20 4774042
19 POGO-A 217 233  16 20 9845009
27 POGO-A 268 279  11 20 4774042
40 POGO-A 294 304  10 15 7506000
30 POGO-A 326 342  16 20 3187074
37 POGO-A 364 376  12 20 0286045
42 POGO-A 426 443  17 20 3187074
47 POGO-A 466 480  14 20 0286045
54 POGO-A 551 567  16 20 1056014
62 POGO-A 625 639  14 20 6553055
67 POGO-A 660 674  14 20 4774042
82 POGO-A 690 700  10 15 7304000
75 POGO-A 739 753  14 20 2532097
86 POGO-A 854 868  14 20 4774042
94 POGO-A 939 950  11 20 3187074
99 POGO-A 971 987  16 20 0286045
103 POGO-A 1024 1036  12 20 6553055
111 POGO-A 1071 1087  16 20 0286045
116 POGO-A 1123 1136  13 20 6553055
121 POGO-A 1161 1174  13 20 9757024
131 POGO-A 1247 1262  15 20 3187074
139 POGO-A 1318 1333  15 20 6553055
145 POGO-A 1359 1375  16 20 9757024
```

169 POGO-A 1415 1450 35 15 6012000
911 6.3263888889E-01
5 POGO-B 5 15 10 15 7310000
4 POGO-B 51 64 13 20 1056014
10 POGO-B 138 152 14 20 6553055
22 POGO-B 167 187 20 15 7310000
21 POGO-B 226 242 16 20 3187074
31 POGO-B 331 345 14 20 6553055
39 POGO-B 367 379 12 20 4774042
50 POGO-B 394 409 15 15 4373000
45 POGO-B 449 466 17 20 1056014
56 POGO-B 559 575 16 20 9757024
65 POGO-B 638 651 13 20 2532097
83 POGO-B 690 725 35 15 6012000
87 POGO-B 725 735 10 15 7310000
76 POGO-B 756 772 16 20 1056014
83 POGO-B 834 848 14 20 3187074
99 POGO-B 863 878 15 15 3310000
109 POGO-B 910 955 45 15 3726000
113 POGO-B 970 980 10 15 6392000
121 POGO-B 1010 1020 10 15 7506000
109 POGO-B 1062 1074 12 20 9757024
131 POGO-B 1089 1104 15 15 2524000
119 POGO-B 1145 1158 13 20 3187074
143 POGO-B 1173 1183 10 15 7506000
127 POGO-B 1221 1235 14 20 6553055
134 POGO-B 1260 1274 14 20 9757024
142 POGO-B 1335 1351 16 20 2532097
874 6.0694444444E-01
7 POGO-C 30 75 45 15 8639000
17 POGO-C 90 100 10 15 9442000
13 POGO-C 150 163 13 20 1056014
27 POGO-C 180 185 5 15 6392000
22 POGO-C 234 248 14 20 6553055
47 POGO-C 350 360 10 15 7225000
51 POGO-C 395 410 15 15 7304000
51 POGO-C 527 543 16 20 3187074
57 POGO-C 567 583 16 20 0286045
75 POGO-C 605 615 10 15 7304000
66 POGO-C 653 669 16 20 1056014
79 POGO-C 684 699 15 15 9783000
77 POGO-C 757 771 14 20 4774042
95 POGO-C 800 835 35 15 7837000
101 POGO-C 855 900 45 15 5681000
110 POGO-C 915 960 45 15 3310000
114 POGO-C 975 990 15 15 5681000
107 POGO-C 1047 1061 14 20 4774042
127 POGO-C 1076 1086 10 15 7225000
136 POGO-C 1110 1125 15 15 9434000
124 POGO-C 1171 1188 17 20 0286045
152 POGO-C 1265 1290 25 15 6012000
143 POGO-C 1349 1365 16 20 3187074
826 5.7361111111E-01

1 HULA-A 0 35 35 15 9445000
16 HULA-A 90 105 15 15 6453000
12 HULA-A 139 153 14 20 0286045
24 HULA-A 238 254 16 20 0286045
31 HULA-A 269 284 15 15 9441000
32 HULA-A 335 351 16 20 9757024
45 HULA-A 366 391 25 15 9445000
40 HULA-A 413 430 17 20 2532097
52 HULA-A 445 455 10 15 7310000
50 HULA-A 515 527 12 20 2532097
55 HULA-A 551 561 10 20 6790043
72 HULA-A 590 600 10 15 9363000
77 HULA-A 660 675 15 15 6451000
73 HULA-A 736 752 16 20 1056014
86 HULA-A 767 772 5 15 6071000
80 HULA-A 807 820 13 20 6553055
102 HULA-A 860 875 15 15 7506000
89 HULA-A 904 917 13 20 6553055
111 HULA-A 932 947 15 15 7225000
97 HULA-A 970 981 11 20 4774042
102 HULA-A 1020 1036 16 20 3187074
124 HULA-A 1051 1056 5 15 6394000
112 HULA-A 1079 1095 16 20 9757024
137 HULA-A 1115 1130 15 15 7304000
123 HULA-A 1169 1181 12 20 1132085
142 HULA-A 1196 1201 5 15 6451000
128 HULA-A 1222 1234 12 20 6790043
133 HULA-A 1257 1268 11 20 2532097
158 HULA-A 1320 1330 10 15 7304000
159 HULA-A 1345 1355 10 15 6071000
935 6.4930555556E-01
8 HULA-B 30 50 20 15 5953000
29 HULA-B 205 220 15 15 7225000
33 HULA-B 335 351 16 20 9757024
46 HULA-B 366 371 5 15 7314000
59 HULA-B 510 530 20 15 5953000
68 HULA-B 560 575 15 15 7304000
73 HULA-B 590 595 5 15 6453000
74 HULA-B 736 752 16 20 1056014
91 HULA-B 767 772 5 15 7314000
81 HULA-B 807 820 13 20 6553055
98 HULA-B 970 981 11 20 4774042
120 HULA-B 1005 1050 45 15 4373000
113 HULA-B 1079 1095 16 20 9757024
135 HULA-B 1110 1120 10 15 9443000
141 HULA-B 1140 1155 15 15 2941000
145 HULA-B 1190 1205 15 15 7314000
155 HULA-B 1290 1330 40 15 8896000
162 HULA-B 1355 1368 13 15 6012000
590 4.0972222222E-01
3 COOK-A 0 5 5 15 8275000
5 COOK-A 54 67 13 20 4774042
21 COOK-A 145 160 15 15 7506000

35 COOK-A 240 255 15 15 1920000
35 COOK-A 349 364 15 20 1132085
44 COOK-A 441 452 11 20 7050006
56 COOK-A 475 520 45 15 2567000
66 COOK-A 545 570 25 15 6012000
89 COOK-A 735 765 30 15 9364000
97 COOK-A 825 840 15 15 8275000
88 COOK-A 874 890 16 20 9757024
108 COOK-A 905 920 15 15 3028000
100 COOK-A 975 989 14 20 9757024
117 COOK-A 1005 1025 20 15 5953000
129 COOK-A 1080 1095 15 15 9364000
130 COOK-A 1110 1130 20 15 7641000
126 COOK-A 1192 1206 14 20 7050007
136 COOK-A 1274 1290 16 20 1056014
152 COOK-A 1428 1443 15 20 6553055
659 4.5763888889E-01
6 COOK-B 54 68 14 20 6553055
41 COOK-B 300 345 45 15 3028000
61 COOK-B 515 525 10 15 6394000
78 COOK-B 660 705 45 15 2524000
88 COOK-B 730 925 195 15 3726000
119 COOK-B 1010 1015 5 15 6453000
146 COOK-B 1200 1245 45 15 0470000
138 COOK-B 1293 1308 15 20 7050007
151 COOK-B 1426 1441 15 20 4774043
539 3.7430555556E-01
1 INDI-A 13 28 15 20 6553055
11 INDI-A 54 64 10 15 4955000
18 INDI-A 90 110 20 15 5775000
17 INDI-A 179 195 16 20 9757024
33 INDI-A 230 245 15 15 4524000
39 INDI-A 290 300 10 15 6280000
43 INDI-A 330 350 20 15 3160000
55 INDI-A 425 515 90 15 6391000
64 INDI-A 530 545 15 15 6374000
70 INDI-A 570 585 15 15 9446000
80 INDI-A 690 710 20 15 5775000
92 INDI-A 780 785 5 15 6391000
93 INDI-A 800 810 10 15 4955000
98 INDI-A 830 850 20 15 5775000
103 INDI-A 865 900 35 15 9444000
107 INDI-A 915 920 5 15 6280000
115 INDI-A 990 995 5 15 9446000
104 INDI-A 1025 1039 14 20 1132085
126 INDI-A 1054 1059 5 15 4845000
132 INDI-A 1105 1205 100 15 5775000
149 INDI-A 1245 1270 25 15 9444000
150 INDI-A 1285 1305 20 15 3160000
141 INDI-A 1333 1349 16 20 1056014
150 INDI-A 1389 1401 12 20 6553055
167 INDI-A 1416 1436 20 15 5775000
938 6.5138888889E-01
4 BOSS-A 0 5 5 15 6280000
3 BOSS-A 39 55 16 20 9757024
9 BOSS-A 117 133 16 20 2532097
14 BOSS-A 163 175 12 20 5821064
23 BOSS-A 190 200 10 15 0712000
34 BOSS-A 235 280 45 15 3726000
34 BOSS-A 340 355 15 20 1056014
41 BOSS-A 421 434 13 20 6553055
48 BOSS-A 475 487 12 20 4774042
63 BOSS-A 525 535 10 15 9364000
67 BOSS-A 560 570 10 15 4035000
61 BOSS-A 619 635 16 20 3187074
71 BOSS-A 670 686 16 20 9757024
81 BOSS-A 701 711 10 15 4524000
78 BOSS-A 769 783 14 20 1132085
90 BOSS-A 798 818 20 15 2124000
85 BOSS-A 848 863 15 20 2532097
100 BOSS-A 878 883 5 15 9366000
105 BOSS-A 898 908 10 15 5037000
96 BOSS-A 970 983 13 20 1056014
125 BOSS-A 1040 1050 10 15 4035000
110 BOSS-A 1070 1086 16 20 1056014
118 BOSS-A 1138 1149 11 20 4774042
134 BOSS-A 1164 1174 10 15 5037000
130 BOSS-A 1232 1247 15 20 4774042
153 BOSS-A 1280 1290 10 15 4035000
140 BOSS-A 1327 1340 13 20 6553055
148 BOSS-A 1366 1380 14 20 0286045
164 BOSS-A 1380 1400 20 15 2124000
153 BOSS-A 1428 1442 14 20 2532097
951 6.6041666667E-01
6 BOSS-B 10 20 10 15 6391000
10 BOSS-B 45 480 435 15 5037000
62 BOSS-B 525 530 5 15 0712000
58 BOSS-B 571 586 15 20 4774042
71 BOSS-B 601 641 40 15 8896000
69 BOSS-B 668 683 15 20 1132085
79 BOSS-B 771 786 15 20 9757024
94 BOSS-B 801 811 10 15 4035000
122 BOSS-B 1020 1040 20 15 2124000
115 BOSS-B 1099 1114 15 20 7050007
138 BOSS-B 1129 1134 5 15 4524000
148 BOSS-B 1215 1220 5 15 9366000
135 BOSS-B 1264 1280 16 20 0286045
144 BOSS-B 1352 1364 12 20 9757024
163 BOSS-B 1380 1385 5 15 8275000
878 6.0972222222E-01
2 LION-A 0 15 15 15 2567000
13 LION-A 60 85 25 15 4035000
20 LION-A 111 126 15 15 9366000
24 LION-A 165 170 5 15 4035000
20 LION-A 225 239 14 20 6553055
28 LION-A 271 284 13 20 1132085

29 LION-A 325 336 11 20 6553055
38 LION-A 365 381 16 20 9757024
53 LION-A 420 435 15 15 5775000
46 LION-A 466 482 16 20 9757024
60 LION-A 515 535 20 15 5329000
69 LION-A 570 590 20 15 2124000
68 LION-A 665 678 13 20 1056014
84 LION-A 701 711 10 15 4845000
87 LION-A 867 882 15 20 1056014
90 LION-A 907 922 15 20 7050007
116 LION-A 990 1010 20 15 5775000
106 LION-A 1039 1052 13 20 4774042
128 LION-A 1080 1100 20 15 5329000
120 LION-A 1150 1166 16 20 9757024
139 LION-A 1181 1191 10 15 6391000
147 LION-A 121[illegible] 220 10 15 4832000
132 LION-A 125[illegible] 1267 15 20 9757024
156 LION-A 1290 1305 15 15 9794000
161 LION-A 1355 1390 35 15 5329000
166 LION-A 1405 1415 10 15 4845000
847 5.8819444444E-01
19 LION-B 105 120 15 15 8639000
25 LION-B 244 257 13 20 1056014
38 LION-B 290 310 20 15 2124000
44 LION-B 330 335 5 15 4845000
49 LION-B 360 375 15 15 3055000
58 LION-B 505 515 10 15 7225000
65 LION-B 540 550 10 15 4832000
74 LION-B 600 605 5 15 9366000
76 LION-B 660 670 10 15 5037000
84 LION-B 845 857 12 20 4774042
91 LION-B 933 947 14 20 6553055
101 LION-B 1010 1025 15 20 7050007
108 LION-B 1052 1063 11 20 9757024
117 LION-B 1129 1138 9 20 6553055
154 LION-B 1290 1305 15 15 0712000
168 LION-B 1415 1435 20 15 5037000
469 3.2569444444E-01
8 GUAM-A 108 123 15 20 7050006
16 GUAM-A 173 187 14 20 1056014
26 GUAM-A 202 227 25 15 6142000
36 GUAM-A 265 285 20 15 5775000
36 GUAM-A 355 369 14 20 6553055
54 GUAM-A 420 435 15 15 2272000
57 GUAM-A 490 510 20 15 5775000
52 GUAM-A 535 550 15 20 9757024
64 GUAM-A 636 651 15 20 9757024
104 GUAM-A 870 890 20 15 3160000
93 GUAM-A 935 951 16 20 1056014
114 GUAM-A 1098 1112 14 20 6553055
122 GUAM-A 1168 1181 13 20 4774042
137 GUAM-A 1283 1299 16 20 9757024
147 GUAM-A 1366 1380 14 20 1132085
160 GUAM-A 1395 1415 20 15 3160000
556 3.8611111111E-01
15 GUAM-B 70 105 35 15 7837000
25 GUAM-B 170 190 20 15 3160000
37 GUAM-B 265 745 480 15 3726000
96 GUAM-B 810 825 15 15 9443000
105 GUAM-B 1039 1050 11 20 1056014
133 GUAM-B 1105 1150 45 15 8896000
144 GUAM-B 1185 1192 7 15 7304000
151 GUAM-B 1260 1285 25 15 7304000
157 GUAM-B 1320 1485 165 15 3726000
943 6.5486111111E-01
11 PIKE-A 138 154 16 20 9757024
23 PIKE-A 238 253 15 20 7050006
32 PIKE-A 268 273 5 15 6451000
48 PIKE-A 358 415 57 15 6071000
43 PIKE-A 440 454 14 20 1056014
53 PIKE-A 539 556 17 20 1056014
60 PIKE-A 614 629 15 20 6553055
123 PIKE-A 1020 1035 15 15 6738000
125 PIKE-A 1172 1188 16 20 1056014
335 2.3263888889E-01
7 REEF-A 81 93 12 20 9757024
18 REEF-A 193 207 14 20 1132085
28 REEF-A 222 242 20 15 5329000
49 REEF-A 480 496 16 20 1056014
59 REEF-A 582 596 14 20 1056014
63 REEF-A 632 644 12 20 4774042
72 REEF-A 728 742 14 20 4774042
82 REEF-A 831 847 16 20 9757024
106 REEF-A 870 890 20 15 7310000
92 REEF-A 933 946 13 20 9757024
112 REEF-A 961 981 20 15 5329000
140 REEF-A 1140 1150 10 15 7310000
129 REEF-A 1231 1248 17 20 1056014
149 REEF-A 1370 1384 14 20 4774043
472 3.2777777778E-01

APPENDIX B

Daily Schedules

24 hour schedules for first seven days of data. Output from **UTIL.PAS.**

DATA FORMAT

Arbitrary Support #-RTS side-start time-end time-duration-turn around time-IRON-partial REV

Day 1 Schedule.

2 POGO-A 26 42 16 20 2532097
9 POGO-A 57 72 15 15 0470000
14 POGO-A 87 102 15 15 9521000
15 POGO-A 169 179 10 20 4774042
19 POGO-A 217 233 16 20 9845009
27 POGO-A 268 279 11 20 4774042
40 POGO-A 294 304 10 15 7506000
30 POGO-A 326 342 16 20 3187074
37 POGO-A 364 376 12 20 0286045
42 POGO-A 426 443 17 20 3187074
47 POGO-A 466 480 14 20 0286045
54 POGO-A 551 567 16 20 1056014
62 POGO-A 625 639 14 20 6553055
67 POGO-A 660 674 14 20 4774042
82 POGO-A 690 700 10 15 7304000
75 POGO-A 739 753 14 20 2532097
86 POGO-A 854 868 14 20 4774042
94 POGO-A 939 950 11 20 3187074
99 POGO-A 971 987 16 20 0286045
103 POGO-A 1024 1036 12 20 6553055
111 POGO-A 1071 1087 16 20 0286045
116 POGO-A 1123 1136 13 20 6553055
121 POGO-A 1161 1174 13 20 9757024
131 POGO-A 1247 1262 15 20 3187074
139 POGO-A 1318 1333 15 20 6553055
145 POGO-A 1359 1375 16 20 9757024
169 POGO-A 1415 1450 35 15 6012000
911 6.3263888889E-01
5 POGO-B 5 15 10 15 7310000
4 POGO-B 51 64 13 20 1056014
10 POGO-B 138 152 14 20 6553055
22 POGO-B 167 187 20 15 7310000
21 POGO-B 226 242 16 20 3187074
31 POGO-B 331 345 14 20 6553055
39 POGO-B 367 379 12 20 4774042
50 POGO-B 394 409 15 15 4373000
45 POGO-B 449 466 17 20 1056014
56 POGO-B 559 575 16 20 9757024
65 POGO-B 638 651 13 20 2532097
83 POGO-B 690 725 35 15 6012000
87 POGO-B 725 735 10 15 7310000
76 POGO-B 756 772 16 20 1056014
83 POGO-B 834 848 14 20 3187074
99 POGO-B 863 878 15 15 3310000
109 POGO-B 910 955 45 15 3726000
113 POGO-B 970 980 10 15 6392000
121 POGO-B 1010 1020 10 15 7506000
109 POGO-B 1062 1074 12 20 9757024
131 POGO-B 1089 1104 15 15 2524000
119 POGO-B 1145 1158 13 20 3187074
143 POGO-B 1173 1183 10 15 7506000
127 POGO-B 1221 1235 14 20 6553055
134 POGO-B 1260 1274 14 20 9757024
142 POGO-B 1335 1351 16 20 2532097
874 6.0694444444E-01
7 POGO-C 30 75 45 15 8639000
17 POGO-C 90 100 10 15 9442000
13 POGO-C 150 163 13 20 1056014
27 POGO-C 180 185 5 15 6392000
22 POGO-C 234 248 14 20 6553055
47 POGO-C 350 360 10 15 7225000
51 POGO-C 395 410 15 15 7304000
51 POGO-C 527 543 16 20 3187074
57 POGO-C 567 583 16 20 0286045
75 POGO-C 605 615 10 15 7304000
66 POGO-C 653 669 16 20 1056014
79 POGO-C 684 699 15 15 9783000
77 POGO-C 757 771 14 20 4774042
95 POGO-C 800 835 35 15 7837000
101 POGO-C 855 900 45 15 5681000
110 POGO-C 915 960 45 15 3310000
114 POGO-C 975 990 15 15 5681000
107 POGO-C 1047 1061 14 20 4774042
127 POGO-C 1076 1086 10 15 7225000
136 POGO-C 1110 1125 15 15 9434000
124 POGO-C 1171 1188 17 20 0286045
152 POGO-C 1265 1290 25 15 6012000
143 POGO-C 1349 1365 16 20 3187074
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16 HULA-A 90 105 15 15 6453000
12 HULA-A 139 153 14 20 0286045
24 HULA-A 238 254 16 20 0286045
31 HULA-A 269 284 15 15 9441000
32 HULA-A 335 351 16 20 9757024
45 HULA-A 366 391 25 15 9445000
40 HULA-A 413 430 17 20 2532097
52 HULA-A 445 455 10 15 7310000
50 HULA-A 515 527 12 20 2532097
55 HULA-A 551 561 10 20 6790043
72 HULA-A 590 600 10 15 9363000
77 HULA-A 660 675 15 15 6451000
73 HULA-A 736 752 16 20 1056014
86 HULA-A 767 772 5 15 6071000
80 HULA-A 807 820 13 20 6553055
102 HULA-A 860 875 15 15 7506000
89 HULA-A 904 917 13 20 6553055
111 HULA-A 932 947 15 15 7225000
97 HULA-A 970 981 11 20 4774042
102 HULA-A 1020 1036 16 20 3187074
124 HULA-A 1051 1056 5 15 6394000
112 HULA-A 1079 1095 16 20 9757024
137 HULA-A 1115 1130 15 15 7304000
123 HULA-A 1169 1181 12 20 1132085
142 HULA-A 1196 1201 5 15 6451000
128 HULA-A 1222 1234 12 20 6790043
133 HULA-A 1257 1268 11 20 2532097
158 HULA-A 1320 1330 10 15 7304000
159 HULA-A 1345 1355 10 15 6071000
935 6.4930555556E-01
8 HULA-B 30 50 20 15 5953000
29 HULA-B 205 220 15 15 7225000
33 HULA-B 335 351 16 20 9757024
46 HULA-B 366 371 5 15 7314000
59 HULA-B 510 530 20 15 5953000
68 HULA-B 560 575 15 15 7304000
73 HULA-B 590 595 5 15 6453000
74 HULA-B 736 752 16 20 1056014
91 HULA-B 767 772 5 15 7314000
81 HULA-B 807 820 13 20 6553055
98 HULA-B 970 981 11 20 4774042
120 HULA-B 1005 1050 45 15 4373000
113 HULA-B 1079 1095 16 20 9757024
135 HULA-B 1110 1120 10 15 9443000
141 HULA-B 1140 1155 15 15 2941000
145 HULA-B 1190 1205 15 15 7314000
155 HULA-B 1290 1330 40 15 8896000
162 HULA-B 1355 1368 13 15 6012000
590 4.0972222222E-01
3 COOK-A 0 5 5 15 8275000
5 COOK-A 54 67 13 20 4774042
21 COOK-A 145 160 15 15 7506000
35 COOK-A 240 255 15 15 1920000
35 COOK-A 349 364 15 20 1132085
44 COOK-A 441 452 11 20 7050006
56 COOK-A 475 520 45 15 2567000
66 COOK-A 545 570 25 15 6012000
89 COOK-A 735 765 30 15 9364000
97 COOK-A 825 840 15 15 8275000
88 COOK-A 874 890 16 20 9757024
108 COOK-A 905 920 15 15 3028000
100 COOK-A 975 989 14 20 9757024
117 COOK-A 1005 1025 20 15 5953000
129 COOK-A 1080 1095 15 15 9364000
130 COOK-A 1110 1130 20 15 7641000
126 COOK-A 1192 1206 14 20 7050007
136 COOK-A 1274 1290 16 20 1056014
152 COOK-A 1428 1443 15 20 6553055
659 4.5763888889E-01
6 COOK-B 54 68 14 20 6553055
41 COOK-B 300 345 45 15 3028000
61 COOK-B 515 525 10 15 6394000
78 COOK-B 660 705 45 15 2524000
88 COOK-B 730 925 195 15 3726000
119 COOK-B 1010 1015 5 15 6453000
146 COOK-B 1200 1245 45 15 0470000
138 COOK-B 1293 1308 15 20 7050007
151 COOK-B 1426 1441 15 20 4774043
539 3.7430555556E-01
1 INDI-A 13 28 15 20 6553055
11 INDI-A 54 64 10 15 4955000
18 INDI-A 90 110 20 15 5775000
17 INDI-A 179 195 16 20 9757024
33 INDI-A 230 245 15 15 4524000
39 INDI-A 290 300 10 15 6280000
43 INDI-A 330 350 20 15 3160000
55 INDI-A 425 515 90 15 6391000
64 INDI-A 530 545 15 15 6374000
70 INDI-A 570 585 15 15 9446000
80 INDI-A 690 710 20 15 5775000
92 INDI-A 780 785 5 15 6391000
93 INDI-A 800 810 10 15 4955000
98 INDI-A 830 850 20 15 5775000
103 INDI-A 865 900 35 15 9444000
107 INDI-A 915 920 5 15 6280000
115 INDI-A 990 995 5 15 9446000
104 INDI-A 1025 1039 14 20 1132085
126 INDI-A 1054 1059 5 15 4845000
132 INDI-A 1105 1205 100 15 5775000
149 INDI-A 1245 1270 25 15 9444000
150 INDI-A 1285 1305 20 15 3160000
141 INDI-A 1333 1349 16 20 1056014
150 INDI-A 1389 1401 12 20 6553055
167 INDI-A 1416 1436 20 15 5775000

938 6.5138888889E-01
4 BOSS-A 0 5 5 15 6280000
3 BOSS-A 39 55 16 20 9757024
9 BOSS-A 117 133 16 20 2532097
14 BOSS-A 163 175 12 20 5821064
23 BOSS-A 190 200 10 15 0712000
34 BOSS-A 235 280 45 15 3726000
34 BOSS-A 340 355 15 20 1056014
41 BOSS-A 421 434 13 20 6553055
48 BOSS-A 475 487 12 20 4774042
63 BOSS-A 525 535 10 15 9364000
67 BOSS-A 560 570 10 15 4035000
61 BOSS-A 619 635 16 20 3187074
71 BOSS-A 670 686 16 20 9757024
81 BOSS-A 701 711 10 15 4524000
78 BOSS-A 769 783 14 20 1132085
90 BOSS-A 798 818 20 15 2124000
85 BOSS-A 848 863 15 20 2532097
100 BOSS-A 878 883 5 15 9366000
105 BOSS-A 898 908 10 15 5037000
96 BOSS-A 970 983 13 20 1056014
125 BOSS-A 1040 1050 10 15 4035000
110 BOSS-A 1070 1086 16 20 1056014
118 BOSS-A 1138 1149 11 20 4774042
134 BOSS-A 1164 1174 10 15 5037000
130 BOSS-A 1232 1247 15 20 4774042
153 BOSS-A 1280 1290 10 15 4035000
140 BOSS-A 1327 1340 13 20 6553055
148 BOSS-A 1366 1380 14 20 0286045
164 BOSS-A 1380 1400 20 15 2124000
153 BOSS-A 1428 1442 14 20 2532097
951 6.6041666667E-01
6 BOSS-B 10 20 10 15 6391000
10 BOSS-B 45 480 435 15 5037000
62 BOSS-B 525 530 5 15 0712000
58 BOSS-B 571 586 15 20 4774042
71 BOSS-B 601 641 40 15 8896000
69 BOSS-B 668 683 15 20 1132085
79 BOSS-B 771 786 15 20 9757024
94 BOSS-B 801 811 10 15 4035000
122 BOSS-B 1020 1040 20 15 2124000
115 BOSS-B 1099 1114 15 20 7050007
138 BOSS-B 1129 1134 5 15 4524000
148 BOSS-B 1215 1220 5 15 9366000
135 BOSS-B 1264 1280 16 20 0286045
144 BOSS-B 1352 1364 12 20 9757024
163 BOSS-B 1380 1385 5 15 8275000
878 6.0972222222E-01
2 LION-A 0 15 15 15 2567000
13 LION-A 60 85 25 15 4035000
20 LION-A 111 126 15 15 9366000
24 LION-A 165 170 5 15 4035000
20 LION-A 225 239 14 20 6553055
28 LION-A 271 284 13 20 1132085
29 LION-A 325 336 11 20 6553055
38 LION-A 365 381 16 20 9757024
53 LION-A 420 435 15 15 5775000
46 LION-A 466 482 16 20 9757024
60 LION-A 515 535 20 15 5329000
69 LION-A 570 590 20 15 2124000
68 LION-A 665 678 13 20 1056014
84 LION-A 701 711 10 15 4845000
87 LION-A 867 882 15 20 1056014
90 LION-A 907 922 15 20 7050007
116 LION-A 990 1010 20 15 5775000
106 LION-A 1039 1052 13 20 4774042
128 LION-A 1080 1100 20 15 5329000
120 LION-A 1150 1166 16 20 9757024
139 LION-A 1181 1191 10 15 6391000
147 LION-A 1210 1220 10 15 4832000
132 LION-A 1252 1267 15 20 9757024
156 LION-A 1290 1305 15 15 9794000
161 LION-A 1355 1390 35 15 5329000
166 LION-A 1405 1415 10 15 4845000
847 5.8819444444E-01
19 LION-B 105 120 15 15 8639000
25 LION-B 244 257 13 20 1056014
38 LION-B 290 310 20 15 2124000
44 LION-B 330 335 5 15 4845000
49 LION-B 360 375 15 15 3055000
58 LION-B 505 515 10 15 7225000
65 LION-B 540 550 10 15 4832000
74 LION-B 600 605 5 15 9366000
76 LION-B 660 670 10 15 5037000
84 LION-B 845 857 12 20 4774042
91 LION-B 933 947 14 20 6553055
101 LION-B 1010 1025 15 20 7050007
108 LION-B 1052 1063 11 20 9757024
117 LION-B 1129 1138 9 20 6553055
154 LION-B 1290 1305 15 15 0712000
168 LION-B 1415 1435 20 15 5037000
469 3.2569444444E-01
8 GUAM-A 108 123 15 20 7050006
16 GUAM-A 173 187 14 20 1056014
26 GUAM-A 202 227 25 15 6142000
36 GUAM-A 265 285 20 15 5775000
36 GUAM-A 355 369 14 20 6553055
54 GUAM-A 420 435 15 15 2272000
57 GUAM-A 490 510 20 15 5775000
52 GUAM-A 535 550 15 20 9757024
64 GUAM-A 636 651 15 20 9757024
104 GUAM-A 870 890 20 15 3160000
93 GUAM-A 935 951 16 20 1056014
114 GUAM-A 1098 1112 14 20 6553055

122 GUAM-A 1168 1181 13 20 4774042
137 GUAM-A 1283 1299 16 20 9757024
147 GUAM-A 1366 1380 14 20 1132085
160 GUAM-A 1395 1415 20 15 3160000
556 3.8611111111E-01
15 GUAM-B 70 105 35 15 7837000
25 GUAM-B 170 190 20 15 3160000
37 GUAM-B 265 745 480 15 3726000
96 GUAM-B 810 825 15 15 9443000
105 GUAM-B 1039 1050 11 20 1056014
133 GUAM-B 1105 1150 45 15 8896000
144 GUAM-B 1185 1192 7 15 7304000
151 GUAM-B 1260 1285 25 15 7304000
157 GUAM-B 1320 1485 165 15 3726000
943 6.5486111111E-01
11 PIKE-A 138 154 16 20 9757024
23 PIKE-A 238 253 15 20 7050006
32 PIKE-A 268 273 5 15 6451000
48 PIKE-A 358 415 57 15 6071000
43 PIKE-A 440 454 14 20 1056014
53 PIKE-A 539 556 17 20 1056014
60 PIKE-A 614 629 15 20 6553055
123 PIKE-A 1020 1035 15 15 6738000
125 PIKE-A 1172 1188 16 20 1056014
335 2.3263888889E-01
7 REEF-A 81 93 12 20 9757024
18 REEF-A 193 207 14 20 1132085
28 REEF-A 222 242 20 15 5329000
49 REEF-A 480 496 16 20 1056014
59 REEF-A 582 596 14 20 1056014
63 REEF-A 632 644 12 20 4774042
72 REEF-A 728 742 14 20 4774042
82 REEF-A 831 847 16 20 9757024
106 REEF-A 870 890 20 15 7310000
92 REEF-A 933 946 13 20 9757024
112 REEF-A 961 981 20 15 5329000
140 REEF-A 1140 1150 10 15 7310000
129 REEF-A 1231 1248 17 20 1056014
149 REEF-A 1370 1384 14 20 4774043
472 3.2777777778E-01

Day 2 Schedule.

5 POGO-A 25 40 15 15 9794000
12 POGO-A 65 100 35 15 7837000
18 POGO-A 135 150 15 15 8639000
20 POGO-A 165 185 20 15 7310000
25 POGO-A 200 215 15 15 7225000
33 POGO-A 250 255 5 15 6392000
36 POGO-A 270 280 10 15 9434000
44 POGO-A 345 360 15 15 2941000
47 POGO-A 375 390 15 15 6738000
31 POGO-A 419 435 16 20 1056014
36 POGO-A 460 475 15 20 6553055
41 POGO-A 512 529 17 20 3187074
45 POGO-A 554 570 16 20 0286045
52 POGO-A 607 619 12 20 2532097
57 POGO-A 656 672 16 20 0286045
65 POGO-A 707 721 14 20 2532097
69 POGO-A 758 769 11 20 6553055
73 POGO-A 808 823 15 20 2532097
78 POGO-A 858 868 10 20 6553055
85 POGO-A 907 923 16 20 2532097
115 POGO-A 960 985 25 15 8896000
94 POGO-A 1015 1027 12 20 6790043
98 POGO-A 1058 1075 17 20 0286045
128 POGO-A 1090 1105 15 15 6374000
102 POGO-A 1131 1143 12 20 3187074
110 POGO-A 1205 1221 16 20 2532097
117 POGO-A 1260 1276 16 20 0286045
120 POGO-A 1304 1320 16 20 2532097
129 POGO-A 1362 1378 16 20 0286045
133 POGO-A 1404 1420 16 20 2532097
1009 7.0069444444E-01
1 POGO-B 0 10 10 15 7310000
8 POGO-B 45 90 45 15 1920000
23 POGO-B 180 195 15 15 3028000
27 POGO-B 210 240 30 15 8896000
38 POGO-B 290 300 10 15 7506000
43 POGO-B 345 390 45 15 2272000
51 POGO-B 405 415 10 15 7310000
35 POGO-B 453 467 14 20 0286045
59 POGO-B 482 497 15 15 5681000
66 POGO-B 545 570 25 15 6012000
53 POGO-B 623 639 16 20 1056014
74 POGO-B 654 669 15 15 9521000
61 POGO-B 690 705 15 20 4774043
84 POGO-B 720 730 10 15 7310000
71 POGO-B 787 801 14 20 4774043
74 POGO-B 827 843 16 20 1056014
82 POGO-B 884 898 14 20 4774043
86 POGO-B 929 945 16 20 1056014
95 POGO-B 1034 1046 12 20 9757024
103 POGO-B 1132 1147 15 20 1056014
135 POGO-B 1180 1190 10 15 7304000
113 POGO-B 1232 1246 14 20 1056014
123 POGO-B 1323 1336 13 20 6790043

156 POGO-B 1351 1366 15 15 9783000
134 POGO-B 1420 1435 15 20 1748012
864 6.0000000000E-01
2 POGO-C 0 10 10 15 7310000
15 POGO-C 90 105 15 15 3310000
29 POGO-C 230 280 50 15 3726000
40 POGO-C 300 345 45 15 3028000
52 POGO-C 410 455 45 15 6738000
60 POGO-C 500 510 10 15 7225000
67 POGO-C 550 565 15 15 7304000
82 POGO-C 690 725 35 15 6012000
90 POGO-C 750 780 30 15 5681000
93 POGO-C 795 830 35 15 7837000
100 POGO-C 860 875 15 15 7506000
109 POGO-C 915 960 45 15 3310000
120 POGO-C 1005 1015 10 15 7506000
104 POGO-C 1133 1145 12 20 9757024
131 POGO-C 1160 1170 10 15 7310000
114 POGO-C 1233 1247 14 20 3187074
124 POGO-C 1331 1346 15 20 9757024
137 POGO-C 1431 1447 16 20 9757024
717 4.9791666667E-01
4 HULA-A 40 54 14 20 1056014
6 HULA-A 75 80 5 15 6453000
14 HULA-A 95 105 10 15 9443000
17 HULA-A 120 135 15 15 6451000
21 HULA-A 160 165 5 15 7314000
24 HULA-A 180 190 10 15 6394000
15 HULA-A 225 241 16 20 0286045
30 HULA-A 256 276 20 15 5953000
21 HULA-A 307 322 15 20 9757024
27 HULA-A 383 398 15 20 2532097
46 HULA-A 413 418 5 15 6071000
54 HULA-A 435 450 15 15 2524000
37 HULA-A 482 497 15 20 2532097
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146 REEF-A 1431 1445 14 20 4774043
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Day 4 Schedule.

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9 POGO-A 135 149 14 20 6553056
15 POGO-A 182 199 17 20 3187074
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28 POGO-A 324 336 12 20 0286045
33 POGO-A 361 373 12 20 4774043
40 POGO-A 427 441 14 20 0286045
45 POGO-A 483 500 17 20 3187074
49 POGO-A 528 544 16 20 0286045

53 POGO-A 574 591 17 20 9757024
57 POGO-A 623 636 13 20 6553056
62 POGO-A 664 680 16 20 1056014
86 POGO-A 680 695 15 15 7304000
70 POGO-A 731 744 13 20 5821065
73 POGO-A 766 782 16 20 1056014
98 POGO-A 810 825 15 15 6374000
81 POGO-A 845 860 15 20 2532097
87 POGO-A 894 906 12 20 3187074
112 POGO-A 921 931 10 15 6392000
96 POGO-A 977 990 13 20 9757024
127 POGO-A 1005 1015 10 15 7506000

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134 POGO-A 1369 1382 13 20 1748012
138 POGO-A 1406 1423 17 20 3187074
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4 POGO-B 15 25 10 15 7310000
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12 POGO-B 159 173 14 20 1056014
27 POGO-B 190 205 15 15 7225000
22 POGO-B 258 274 16 20 1056014
37 POGO-B 289 299 10 15 7506000
42 POGO-B 315 320 5 15 6392000
32 POGO-B 358 375 17 20 1056014
39 POGO-B 426 441 15 20 6553056
59 POGO-B 480 525 45 15 2567000
52 POGO-B 561 578 17 20 1056014
73 POGO-B 593 603 10 15 9442000
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85 POGO-B 680 690 10 15 7304000
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79 POGO-B 823 834 11 20 6553056
84 POGO-B 866 881 15 20 6790043
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93 POGO-B 945 961 16 20 2532097
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145 POGO-B 1140 1155 15 15 4373000
151 POGO-B 1200 1215 15 15 3055000
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139 POGO-B 1407 1420 13 20 5821065
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13 POGO-C 163 173 10 20 4774043
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24 POGO-C 268 283 15 20 9757024
41 POGO-C 300 345 45 15 3028000
35 POGO-C 383 399 16 20 3187074
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42 POGO C 459 476 17 20 1056014
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147 POGO-C 1155 1180 25 15 7310000
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39 HULA-A 290 295 5 15 7314000
45 HULA-A 340 350 10 15 7225000
49 HULA-A 385 395 10 15 6453000
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156 HULA-A 1255 1280 25 15 6012000
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158 HULA-A 1305 1320 15 15 6071000
136 HULA-A 1377 1390 13 20 7050007
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12 HULA-B 60 105 45 15 1920000
25 HULA-B 190 195 5 15 6451000
30 HULA-B 225 230 5 15 6453000
38 HULA-B 285 305 20 15 6012000
46 HULA-B 345 390 45 15 2272000
38 HULA-B 419 430 11 20 5821064
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74 HULA-B 570 595 25 15 7837000
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98 HULA-B 994 1009 15 20 9757024
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29 COOK-A 349 363 14 20 1132086
51 COOK-A 390 415 25 15 9794000
67 COOK-A 540 550 10 15 6451000
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77 COOK-A 600 615 15 15 8275000
91 COOK-A 720 735 15 15 6451000
86 COOK-A 889 905 16 20 9757024
115 COOK-A 925 955 30 15 5953000
128 COOK-A 1000 1020 20 15 6012000
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31 COOK-B 225 275 50 15 3726000
65 COOK-B 530 545 15 15 7304000
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101 COOK-B 840 1320 480 15 7314000
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2 INDI-A 41 46 5 15 4524000
17 INDI-A 90 110 20 15 5775000
26 INDI-A 180 185 5 15 6280000
29 INDI-A 220 265 45 15 5329000
44 INDI-A 330 350 20 15 3160000
50 INDI-A 390 415 25 15 9446000
55 INDI-A 480 485 5 15 9444000
61 INDI-A 500 505 5 15 4524000
70 INDI-A 560 570 10 15 4035000
80 INDI-A 605 625 20 15 5329000
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68 INDI-A 720 735 15 20 3726030
97 INDI-A 800 810 10 15 4035000
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108 INDI-A 870 890 20 15 3160000
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136 INDI-A 1055 1065 10 15 7225000
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157 INDI-A 1260 1280 20 15 3160000
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15 BOSS-A 65 70 5 15 0712000
8 BOSS-A 124 139 15 20 2532097
21 BOSS-A 252 262 10 20 1056014
35 BOSS-A 277 297 20 15 2124000
30 BOSS-A 349 365 16 20 1056014
47 BOSS-A 380 395 15 15 2941000
36 BOSS-A 419 431 12 20 6553056
43 BOSS-A 469 481 12 20 4774043
62 BOSS-A 510 540 30 15 9366000
55 BOSS-A 584 597 13 20 9757024
59 BOSS-A 639 656 17 20 0286045
67 BOSS-A 685 701 16 20 9757024
89 BOSS-A 720 725 5 15 9434000
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110 BOSS-A 885 890 5 15 0712000
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68 BOSS-B 540 550 10 15 4955000
54 BOSS-B 576 592 16 20 3187074
78 BOSS-B 607 617 10 15 5037000
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81 BOSS-B 697 717 20 15 6280000
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10 LION-A 53 63 10 15 4955000
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18 LION-A 223 237 14 20 6553056
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40 LION-A 300 305 5 15 4845000
34 LION-A 380 396 16 20 9757024
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72 LION-A 570 590 20 15 2124000
88 LION-A 690 710 20 15 5775000
74 LION-A 776 792 16 20 1056014
80 LION-A 839 851 12 20 4774043
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113 LION-A 1165 1181 16 20 9757024
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52 LION-B 420 430 10 15 7310000
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66 LION-B 675 689 14 20 1056014
85 LION-B 878 890 12 20 1056014
91 LION-B 931 945 14 20 6553056
121 LION-B 960 985 25 15 8896000
133 LION-B 1040 1050 10 15 4035000
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153 LION-B 1208 1218 10 15 4832000
171 LION-B 1380 1435 55 15 5329000
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16 GUAM-A 70 80 10 15 7304000
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48 GUAM-A 385 400 15 15 7304000
56 GUAM-A 465 485 20 15 5775000
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126 GUAM-A 1298 1314 16 20 9757024
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33 GUAM-B 245 250 5 15 6394000
27 GUAM-B 285 297 12 20 1056014
31 GUAM-B 352 367 15 20 6553056
84 GUAM-B 660 675 15 15 8639000
105 GUAM-B 850 925 75 15 5953000
92 GUAM-B 945 961 16 20 1056014
125 GUAM-B 990 1655 665 15 3726000
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34 PIKE-A 245 255 10 15 9366000
41 PIKE-A 449 464 15 20 1056014
50 PIKE-A 550 565 15 20 1056014
56 PIKE-A 612 626 14 20 6553056
64 PIKE-A 665 679 14 20 4774043
76 PIKE-A 787 803 16 20 9757024
122 PIKE-A 960 965 5 15 8275000
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144 PIKE-A 1125 1130 5 15 7314000
115 PIKE-A 1182 1198 16 20 1056014
129 PIKE-A 1327 1341 14 20 6553056
140 PIKE-A 1422 1435 13 20 4774043
411 2.8541666667E-01
6 REEF-A 20 40 20 15 7484000
7 REEF-A 94 110 16 20 9757024
16 REEF-A 196 210 14 20 9757024
36 REEF-A 270 290 20 15 5775000
46 REEF-A 490 506 16 20 1056014
58 REEF-A 626 638 12 20 4774043
82 REEF-A 846 862 16 20 9757024
131 REEF-A 1020 1025 5 15 4845000
112 REEF-A 1142 1155 13 20 1056014
148 REEF-A 1170 1190 20 15 5329000
119 REEF-A 1242 1257 15 20 1056014
132 REEF-A 1364 1378 14 20 4774043
173 REEF-A 1410 1420 10 15 4845000
426 2.9583333333E-01

Day 5 Schedule.

1 POGO-A 0 10 10 15 7310000
3 POGO-A 31 43 12 20 1056014
6 POGO-A 67 84 17 20 3187074
14 POGO-A 99 104 5 15 6392000

11 POGO-A 129 143 14 20 1056014
16 POGO-A 167 181 14 20 6553056
20 POGO-A 204 217 13 20 2532097
23 POGO-A 263 278 15 20 6553056
30 POGO-A 328 344 16 20 1056014
36 POGO-A 391 404 13 20 4774043
40 POGO-A 429 445 16 20 1056014
45 POGO-A 469 485 16 20 3187074
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79 POGO-A 620 630 10 15 7837000
68 POGO-A 684 699 15 20 4774043
73 POGO-A 748 764 16 20 9757024
79 POGO-A 814 829 15 20 2532097
86 POGO-A 879 891 12 20 3187074
87 POGO-A 911 922 11 20 1748012
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4 POGO-B 35 51 16 20 9757024
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12 POGO-B 136 153 17 20 9757024
24 POGO-B 185 200 15 15 7225000
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24 POGO-B 268 284 16 20 3187074
32 POGO-B 360 375 15 20 6553056
37 POGO-B 414 427 13 20 0286045
50 POGO-B 442 452 10 15 7310000
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56 POGO-B 587 602 15 20 4774043
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87 POGO-B 675 690 15 15 3055000
70 POGO-B 714 728 14 20 2532097
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39 HULA-A 426 437 11 20 9757024
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142 BOSS-A 1437 1453 16 20 9757025

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38 BOSS-B 320 330 10 15 4035000
44 BOSS-B 350 360 10 15 4955000
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70 BOSS-B 592 602 10 15 6391000
61 BOSS-B 626 643 17 20 0286045
85 BOSS-B 665 700 35 15 6012000
117 BOSS-B 990 1650 660 15 3726000
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16 LION-A 90 95 5 15 9446000
21 LION-A 135 140 5 15 6391000
19 LION-A 203 216 13 20 4774043
22 LION-A 251 262 11 20 9757024
26 LION-A 300 314 14 20 4774043
31 LION-A 351 367 16 20 9757024
39 LION-A 382 387 5 15 4845000
42 LION-A 453 468 15 20 9757024
56 LION-A 483 488 5 15 0712000
75 LION-A 570 590 20 15 2124000
65 LION-A 645 658 13 20 1056014
88 LION-A 690 710 20 15 5775000
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69 LION-B 560 570 10 15 7304000
80 LION-B 620 650 30 15 0712000
83 LION-B 847 861 14 20 1056014
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105 LION-B 1060 1073 13 20 6553056
129 LION-B 1110 1195 85 15 5775000
126 LION-B 1267 1282 15 20 1132086
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32 GUAM-A 265 285 20 15 5775000
33 GUAM-A 367 381 14 20 4774043
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73 GUAM-A 570 580 10 15 9443000
60 GUAM-A 623 637 14 20 9757024
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117 GUAM-A 1194 1204 10 20 4774043
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149 GUAM-A 1320 1485 165 15 3726000
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55 REEF-A 491 511 20 15 5775000
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138 REEF-A 1394 1409 15 20 4774043
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Day 6 Schedule.

6 POGO-A 70 86 16 20 2532098
10 POGO-A 107 124 17 20 9757025
14 POGO-A 153 170 17 20 3187074
18 POGO-A 199 213 14 20 1056014
24 POGO-A 254 270 16 20 3187075
28 POGO-A 295 309 14 20 6553056
35 POGO-A 354 370 16 20 3187075
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41 POGO-A 422 436 14 20 4774043
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49 POGO-A 500 516 16 20 1056014
55 POGO-A 555 572 17 20 3187075
64 POGO-A 620 636 16 20 6790044
70 POGO-A 715 729 14 20 4774043
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82 POGO-A 863 876 13 20 3187075
89 POGO-A 924 938 14 20 6790044
95 POGO-A 988 999 11 20 6553056
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9 POGO-B 102 116 14 20 6553056
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19 POGO-B 210 226 16 20 9757025
29 POGO-B 298 314 16 20 1056014
37 POGO-B 360 375 15 15 3055000
39 POGO-B 401 414 13 20 0286045
44 POGO-B 454 471 17 20 3187075
51 POGO-B 517 533 16 20 9757025
57 POGO-B 581 593 12 20 2532098
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73 POGO-B 719 735 16 20 9757025
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54 POGO-C 485 495 10 15 7225000
52 POGO-C 520 534 14 20 4774043
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80 POGO-C 770 805 35 15 7837000
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90 HULA-A 927 941 14 20 4774043
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102 HULA-A 1048 1063 15 20 3187075
111 HULA-A 1078 1083 5 15 6451000

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25 HULA-B 275 290 15 20 0286045
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38 HULA-B 380 390 10 15 6394000
43 HULA-B 405 430 25 15 9443000
51 HULA-B 470 480 10 15 9363000
55 HULA-B 510 530 20 15 5953000
61 HULA-B 555 575 20 15 7506000
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87 HULA-B 845 865 20 15 7310000
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97 HULA-B 978 993 15 15 6453000
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26 INDI-A 255 260 5 15 4845000
31 INDI-A 320 330 10 15 4035000
41 INDI-A 385 400 15 15 4524000
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57 INDI-A 515 535 20 15 5329000
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66 INDI-A 600 605 5 15 6280000
75 INDI-A 690 710 20 15 5775000
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98 INDI-A 940 960 20 15 5329000
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112 INDI-A 1080 1100 20 15 5329000
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26 BOSS-A 290 304 14 20 1056014
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56 BOSS-A 580 591 11 20 6553056
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124 BOSS-A 1288 1298 10 20 3187075

139 BOSS-A 1335 1345 10 15 9366000
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92 BOSS-B 885 930 45 15 3310000
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17 LION-A 188 203 15 20 6553056
22 LION-A 233 247 14 20 4774043
27 LION-A 265 285 20 15 5775000
32 LION-A 323 338 15 20 9757025
34 LION-A 353 363 10 15 9444000
42 LION-A 424 440 16 20 9757025
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32 GUAM-A 330 350 20 15 3160000
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42 GUAM-A 427 437 10 15 7310000
50 GUAM-A 465 470 5 15 9445000
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67 GUAM-A 624 639 15 15 0470000
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74 PIKE-A 732 747 15 20 1132086
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13 REEF-A 138 154 16 20 9757025
23 REEF-A 246 260 14 20 7050007
36 REEF-A 350 400 50 15 9446000
43 REEF-A 430 445 15 20 1056014
63 REEF-A 619 633 14 20 6553056
70 REEF-A 648 653 5 15 4845000
69 REEF-A 686 700 14 20 4774043
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85 REEF-A 891 905 14 20 9757025
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143 REEF-A 1425 1439 14 20 4774043

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Day 7 Schedule.

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18 POGO-A 120 135 15 15 3310000
22 POGO-A 190 200 10 15 6392000
25 POGO-A 240 255 15 15 6142000
35 POGO-A 325 335 10 15 7225000
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64 POGO-A 603 618 15 15 9434000
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72 POGO-A 721 732 11 20 6553056
83 POGO-A 765 800 35 15 7837000
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93 POGO-A 895 910 15 15 7225000
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39 POGO-B 360 375 15 15 6738000
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22 HULA-A 262 277 15 20 0286045
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32 HULA-A 359 374 15 20 3187075
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Vita

Captain S. Michael Schalck was born on 31 March 1964 in Covington, Kentucky. He graduated from Simon Kenton High School in Independence, Kentucky in 1982 and attended the University of Kentucky, graduating with a Bachelor of Science in Electrical Engineering in May 1986. Upon graduation, he successfully completed Undergraduate Space Training at Lowry AFB, Colorado. His first assignment was at Falcon AFB, Colorado, as a planner/analyst for the Fleet Satellite Communications (FLEETSATCOM) program. Subsequently, he was upgraded to mission commander and Chief FLEETSATCOM standards and evaluations. He entered the Graduate School of Engineering, Air Force Institute of Technology, in May 1992. His follow-on assignment is at Los Angeles AFB, California.

Permanent Address:

c/o Pat Schalck
72 Sylvan Drive
Independence, KY 41051

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13. ABSTRACT *(Maximum 200 words)*

The objective of this study was to develop a computer based satellite range scheduling (SRS) algorithm to create a 24 hour satellite support schedule. The algorithm's goal was to schedule as many satellite support requests as possible.

An iterative heuristic approach was used to schedule satellite support requests in three successive sub problems. The first sub problem involves scheduling low altitude satellite support requests using a mixed integer programming approach. The next two sub problems each involve scheduling 12 hour blocks of medium and high altitude satellite support requests, again using a mixed integer programming approach.

Fourteen 24 hour schedules were generated using actual data with encouraging results. At least 95 percent of the satellite support requests were scheduled for each day. These results are in-line with results obtained by range schedulers and previous studies. Because of the promising results, this algorithm may be used to automate a portion of the satellite range scheduling problem.

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