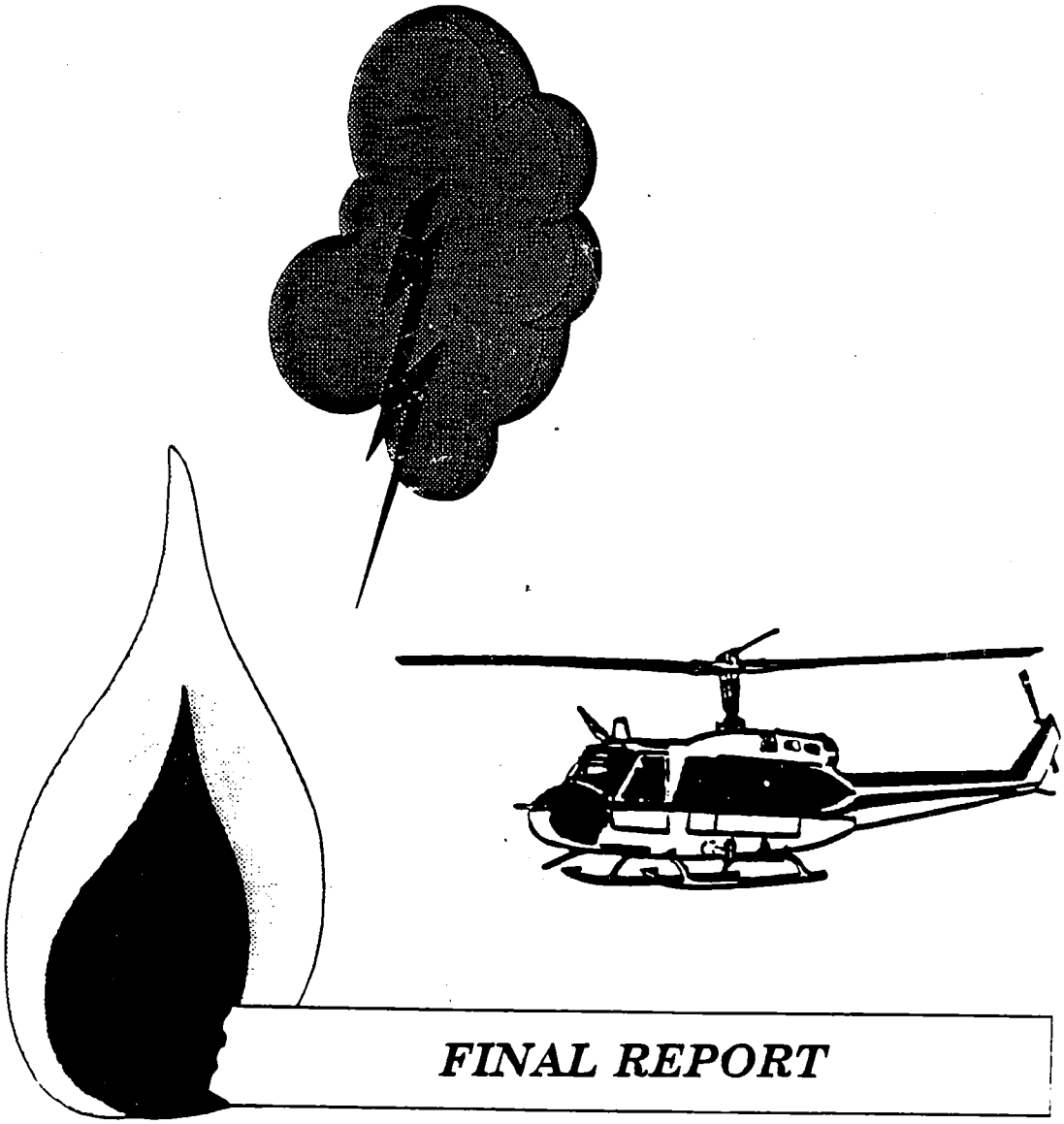
# *NATIONAL STUDY OF TYPE I AND II HELICOPTERS TO SUPPORT LARGE FIRE SUPPRESSION*

USDA FOREST SERVICE
1992



## *FINAL REPORT*

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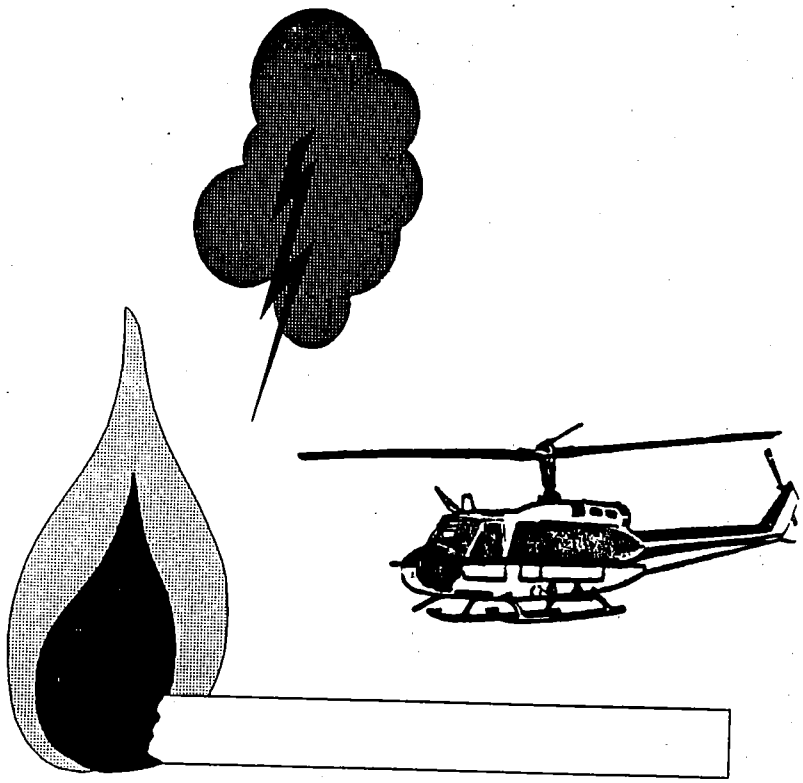


# EXECUTIVE SUMMARY

## BACKGROUND

In 1991, the National Shared Forces Task Force Report was completed by a team composed of Forest Service managers. This Report recommended a schedule for completion of studies to determine the most efficient level to staff and procure National Shared Forces. This study is the first chartered by this Report. This study examines and recommends the most efficient number and staffing of ICS Type I and II helicopters to support extended attack and large fire suppression.

## GOALS/OBJECTIVES OF THE STUDY

Three goals/objectives were established for this study by the National Shared Forces Task Force Oversight Committee. They are: 1) To examine the historical use (five year) and trends of Type I and Type II helicopters for extended initial attack and large fire support; 2) To identify current (1-3 years) and future (4-10 years) Type I and II helicopter needs nationally for extended attack suppression of escaped wildfires; and 3) To determine the most cost effective method of procurement and deployment of Type I and II helicopters to meet a range of anticipated fire needs other that initial attack.

## HISTORICAL DEMAND FOR TYPE I AND II HELICOPTERS

The demand for Type I and II helicopters on incidents has remained steady in the past 5 years. For the most part, this resource has been available through a call-when-needed (CWN) contracting method although some areas, primarily California and Alaska, have maintained exclusive use contracts. Helicopters procured using exclusive use contracts have primary initial attack responsibilities and are validated in the NFMAS process.

By far, the primary need for these type of helicopters is in large fire support. Records for the past three years, show extensive use on size class "C" fires or greater. Peak utilization occurs at the time when large fires are most likely to occur, generally June through September in the western United States. The primary user is the Forest Service, although other federal and state agencies have also n requested them. Based on total days of use for the Lower 48 states during 1989-1991, the USDA Forest Service use was 73% of the total, the USDI Agencies use was 23%, the use by States was 3%, and the use by the National Interagency Coordination Center was 1% For the State of Alaska during the same period, the Alaska Fire Service use and Alaska State DNR use were basicly equal.

## ANALYSIS PROCESS

Some innovative operations research and statistical analysis techniques where developed and used to examine the most efficient combination of CWN and exclusive use helicopters. Two techniques were needed. One technique was used to perform statistical analysis on the demand profile produced for the past three year's reports. Reference will be made to this "demand simulation model." A second

technique then was used to examine the tradeoff in costs to fill this demand with CWN and exclusive use contracts. Reference will be made to this "cost efficiency model."

Demand

Demand for helicopters of either type can be described with two parameters, daily number of helicopters in use and number of days duration. Each of these parameters can vary. To simulate this variance, the demand simulation model was built utilizing Triangular Probability Distributions and random simulation theory.

Committee members and managers where asked to use the demand documented for 1989, 1990 and 1991 and their experience to determine the minimum, most frequent and maximum values for these two demand parameters. Graphs shown in the report and in Appendix C where used to estimate an the aggravate demand for all Regions in the lower 48 states. Alaska was analyzed separately and it's results follow the analysis for the lower 48 states. The model can be used to simulate ANY demand. The period 1989-91 was simply used as a starting point to model.

The demand parameter "sideboards" were then used to do 2000 random simulations of this demand. The result of the demand simulation model was a probability distribution of demand including the mean. The mean was examined by the committee and experts comparing the results to the 1989-1991 demand. Adjustments were made in the minimum, most frequent and maximum values until the committee was satisfied that these values were valid. Demand simulation model results modified by committee consensus resulted in agreement to use the following annual helicopters days in the study: Lower 48 Type I - 313; Lower 38 Type II - 1285; Alaska Fire Service Type II - 251; Alaska State DNR Type II - 258, and All of Alaska Type II - 446. Appendix D contains model results for demands of 90%, 80%, 70%, 60%, and 50% of the 1989-91 simulated demand.

## COST EFFICIENCY ANALYSIS

To examine the optimum mix of CWN and exclusive use Type I and II helicopters, the demand parameters were assumed to occur in a triangular fashion. A computer program was written to allow for determination of the total program cost if the demand was filled with 0, 1, 2, ... 20 Type II helicopters on exclusive-use contracts. At each level, the remaining use was filled by Call-When-Needed helicopters.

Lower 48 States - Type I

For Type I helicopters in the lower 48 states, analysis was done using three cost categories. Each category was run against the total demand. The categories are as follows:

Category 1: Standard - Super Puma AS 332L
Category 2: Limited - BV-234 and S-64
Category 3: Limited - BV-107 and S-61

Three Type I exclusive contracts would allow filling of the National demand 25% of the time with exclusive use helicopters and 25% of the time with CWN helicopters. The savings from staffing with 2 exclusive use Type I would vary based on the category since each category was run against the total National demand. The annual saving to the government averages around $537,000.

Lower 48 States - Type II

Thirteen Type II EU contracts would allow filling of the National demand 52% of the time with EU helicopters and 48% of the time with CWN helicopters. Staffing with 13 exclusive use Type II versus filling the demand 100% with CWN Type II helicopters would save the government an average of $3,200,000 annually.

Alaska - Type II

Analysis was done with lumped demand data and for the Alaska Fire Service (AFS) and State of Alaska DNR separately. Seven Type II exclusive use contracts would allow filling of the Alaska demand 58% of the time with exclusive use helicopters and 42% of the time with CWN helicopters. Staffing with 7 exclusive use Type II versus filling the demand 100% with CWN Type II helicopters would save the Federal and State governments of an average of $867,000 annually. The demand for each the AFS and DNR is about equal but the Alaska DNR exclusive use contracts are cheaper per day than the AFS contracts hence the optimum is 4 DNR and 3 AFS contracts. In all cases, the cost efficiency model showed economic efficiency in staffing with a certain number of exclusive contracts, even at 50% of the last three year's demand.

## RECOMMENDATIONS

The mission of National Shared Type I and II helicopters will be the support of extended attack and escaped fire suppression. Local initial attack missions may be undertaken but full consideration will be given to higher priority requests and appropriate protocol notifications. These National Shared Type I and II helicopters should be nationally predesignated and shared by all Agencies and Regions. These forces must meet national standards and provide cost efficient reinforcement of local and area forces in wildfire emergencies. The committee recommends the following which would collectively save the Federal and Alaska State governments an estimated $4,604,000 annually. In the first year of implementation, the net saving to ALL the governments will be $4,604,000 - $793,500 (One-Time Costs) = $3,801,500.

Lower 48 States: Type I

The committee recommends one Super Puma (Standard) and one BV-234/S-64 (Limited) based at BIFC. Though the cost efficiency model indicates three is the most efficient, two are recommended because the committee felt caution was needed due to the lack of data on the cost of Type I exclusive use contracts. The saving to the government averages $537,000 per year. The projected one-time costs for the Federal and State Agencies in the Lower 48 States for the Type I program is $54,000, the annual Helitack Staff cost is $80,100, and the annual helicopter cost is $1,785,800.

Lower 48 States: Type II

The committee recommends thirteen standard helicopters maximum with a base program of 7 helicopters. This base program is the core which the other helicopter increments can be added to and provides the recommended optimum cost efficient results at 50% of the 1989-91 demand.

Funding of daily availability is recommended using the following formula which is developed using the information previously presented.

USFS - 73.7% BLM - 11.2% NPS - 4.9% FWS - 6.7% BIA - 0.2% STATES - 3.3%

The projected one-time costs for the Federal and State Agencies in the Lower 48 States for the Type II program is $533,000, the annual Helitack Staff cost is $783,900, and the annual helicopter cost is $3,198,000.

Alaska-Combined: Type II

The committee recommends seven exclusive use helicopters maximum with a base program of three helicopters. This base program is the core which the other helicopter increments can be added to and provides the recommended optimum cost efficient results at 50% of the 1989-91 demand. Of the seven recommended, it is further recommended that the State of Alaska staff four and the Alaska Fire Service staff three.

Funding of daily availability is recommended using the following formula which is developed using the information previously presented.

AFS - 49.9% DNR - 50.1%

The projected one-time cost for the Alaska DNR is $118,000, the annual Helitak Staff costs is $43,200, and the annual helicopter cost is $835,200. The projected one-time costs for the AFS is $88,500, the annual Helitak Staff costs is $34,500, and the annual helicopter cost is $621,000.

The committee further recommends that:

1. Management modules should be the responsibility of Geographic Areas to staff and manage. Even if no exclusive use helicopters are procured, there is a need to fund the management-module for CWN ships. This is a very needed emphasis item.

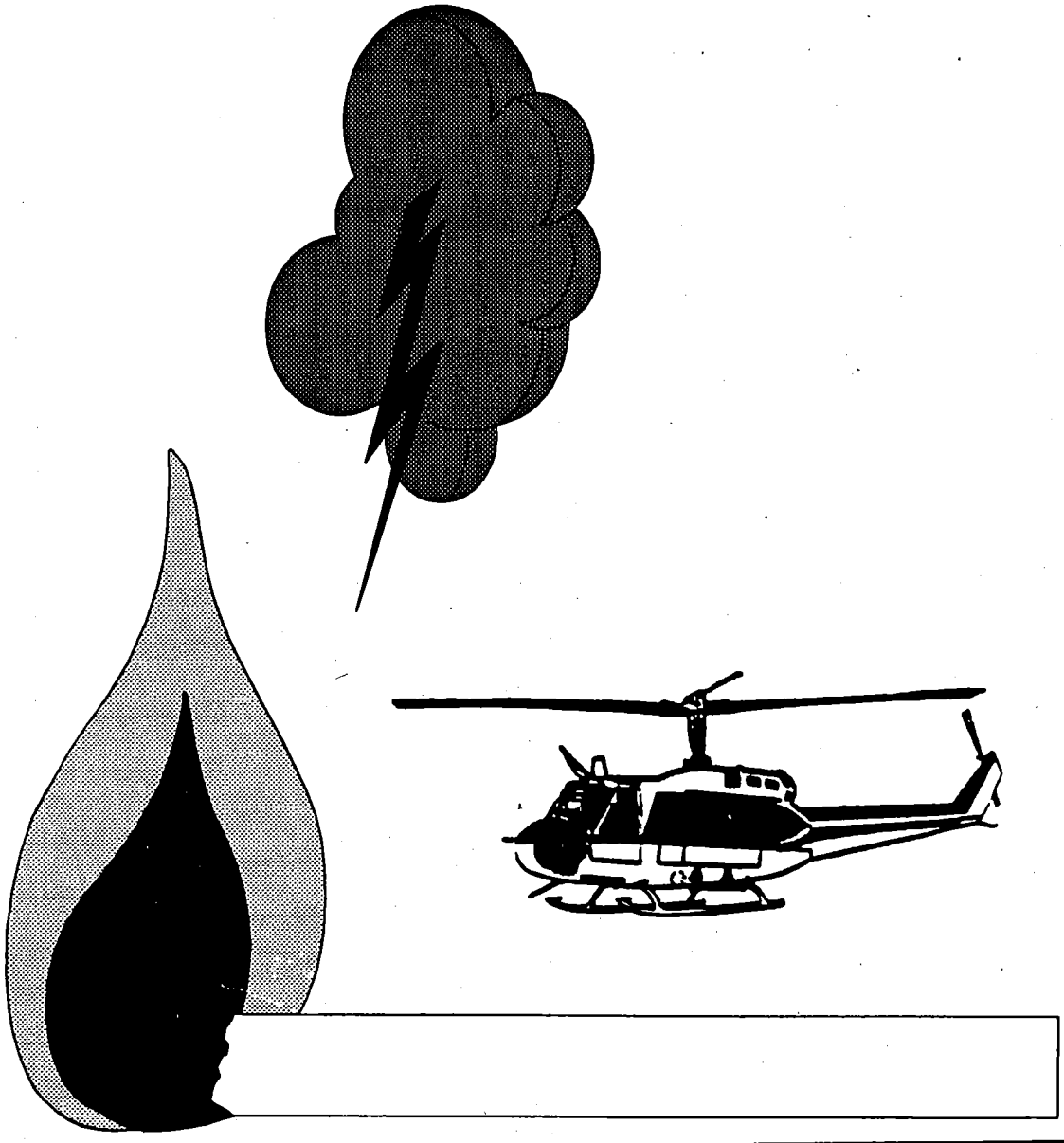
2. The exclusive use helicopters are National resources and should be managed using the same guidelines as for Type I crews.

3. Information contained in this study report be included in training courses as appropriate.

4. Annually create a roster of helicopters available on contract. Make this roster specific to aircraft number. Display the equipped weight of each helicopter and allowable payloads under standard conditions. Provide this roster to dispatchers. (See example in Appendix B)

5. When resource orders for helicopters are placed, incident personnel should provide the following information: ICS type, standard or limited, operating elevation of the incident or project, and an expression of the intended use. Have National Helicopter Operations Specialists, NICC and Geographic Area Coordinator select a work group to develop a simple format for this information. Include this format in Support Dispatcher (D-310) training and Air Operations training courses.

6. The National Shared Forces Task Force market the final committee report to important target audiences. The information in the study report needs to be transferred to effected publics.



# NATIONAL STUDY OF TYPE I AND II HELICOPTERS TO SUPPORT LARGE FIRE SUPPRESSION

## BACKGROUND

In 1991, the National Shared Forces Task Force Report was completed by a team composed of Forest Service managers. This Report recommended a schedule for completion of studies to determine the most efficient level to staff and procure National Shared Forces. This study is the first chartered by this Report. This study examines and recommends the most efficient number and staffing of ICS Type I and II helicopters to support extended attack and large fire suppression.

From 1987-1991, wildland firefighting agencies have used Type I and II helicopters for an average of 10,900 hours of flight time per year. Hours flown per year vary from a low of 6,800 hours in 1987 to a high of 12,000 hours in 1988. The average yearly expenditure to procure the services for this period was about $24,000,000. Procurement of these fire fighting resources must be done in the most cost efficient manner.

Type I and II helicopters that are used for initial attack of wildland fires are analyzed and justified using the National Fire Management Analysis System (NFMAS). This system does not analyze the need or efficient procurement of Type I and II helicopters used to support wildfires which escape initial attack. This study is designed to fill this need to analyze the most cost efficient method to procure Type I and II for large fire suppression.

A study team was assembled in January, 1992, to complete this study in Calendar Year 1992. At the initial meeting, a study plan was developed and future meetings scheduled. Information needed to complete the analysis was identified and a plan developed to gather this information. Committee meetings in March and June, 1992, provided an opportunity to organize and analyze information and data gathered. A subcommittee met in September to do specific demand and supply analysis which provided the basis for the committee's recommendations. A final committee meeting was held in October, 1992, to develop the recommendations and draft report. The committee's findings are contained in this report as presented to the National Shared Forces Task Force in December, 1992.

## GOALS/OBJECTIVES OF THE STUDY

1. To examine the historical use (five year) and trends of Type I and Type II helicopters for extended initial attack and large fire support.

2. To identify current (1-3 years) and future (4-10 years) Type I and II helicopter needs nationally for extended attack suppression of escaped wildfires.

3. To determine the most cost effective method of procurement and deployment of Type I and II helicopters to meet a range of anticipated fire needs other that initial attack.

## ASSUMPTIONS TO BE USED IN THE STUDY

1. NFMAS initial attack mode considers initial attack support. It is not the absolute answer in terms of total fire support to current and projected escaped wildfire activity.

2. Generally the overall information currently available is adequate for this study.

3. The study will provide for interagency participation even though the Forest Service is providing the leadership in conducting the study. Other agency personnel will have the opportunity to review and comment on the study. Interagency information will be included when appropriate.

4. There will continue to be a need for both exclusive use and CWN helicopters.

5. This study will not critique helicopter operational effectiveness and efficiency at the incident.

## STUDY PLAN

1. Examine historical uses and trends on an interagency basis.

2. Examine current and predicted needs including the number, location, and season of use to meet extended attack and escaped wildfire needs.

3. Display options for procurement and deployment.
   A. Advantages and disadvantages
   B. Costs
   C. Analysis

4. Develop Recommended Alternative

5. Concerns generated by the study and comments for future analysis

## STUDY PROCESS

The diagram on the next page helps one to understand the flow. The scope of this study is to determine the most efficient mix of Call-When-Needed (CWN) and Exclusive-Use (EU) Type I and II to support extended attack and large fire suppression. The use of the active military when demand reaches the 90th or greater percentile of supply is not considered.

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|<---IA--->|<-----Large Fire Suppression------>|<--Military-->|
|  Type II |    Study Scope for Type I and II   |  90th %-ile  |
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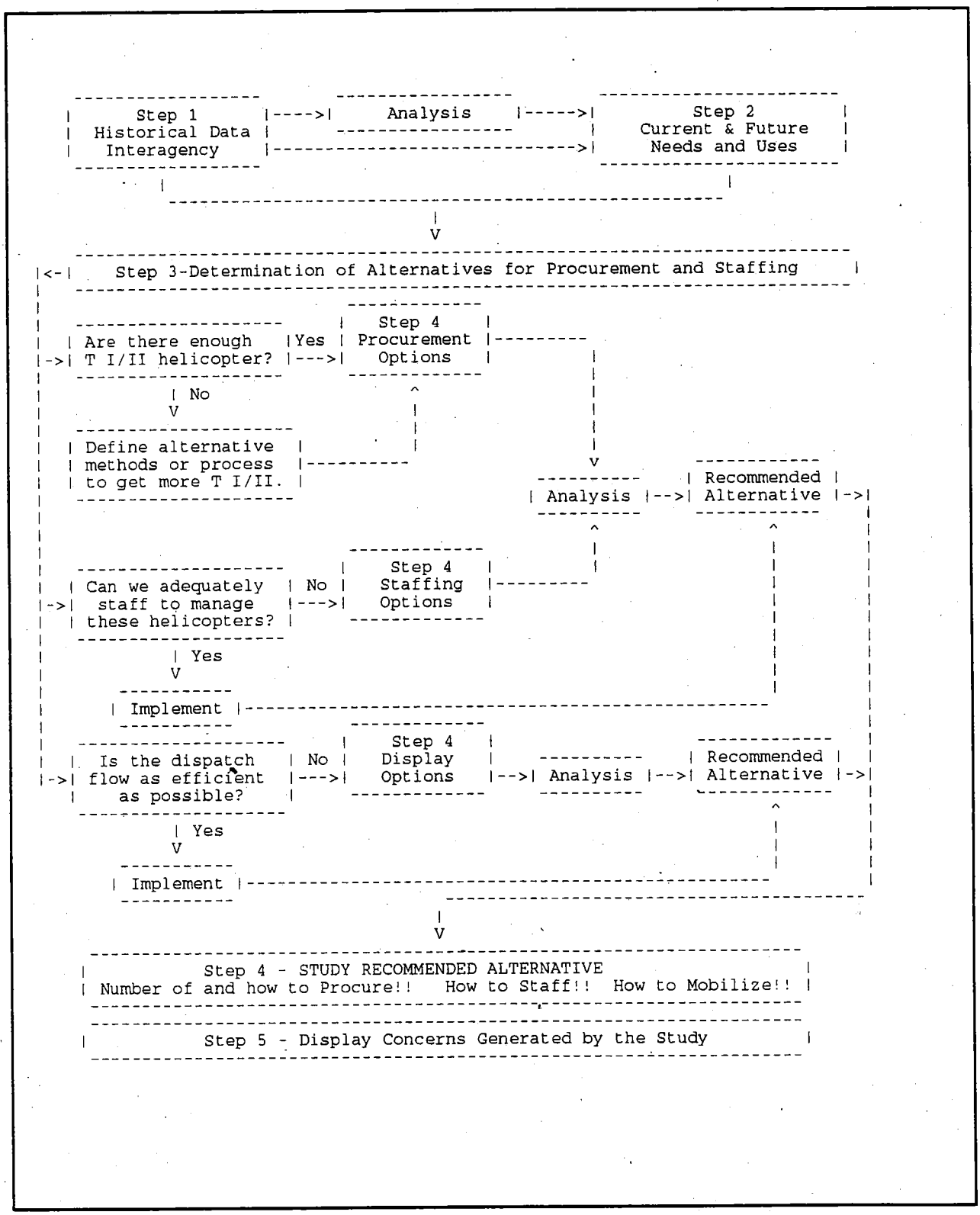
## STUDY PROCESS AND FLOW



Steps 1 and 2: Historical Data and Current and Future Needs and Uses

Ten areas were identified where data needed to be collected to support analysis. For each area, the purpose, data needed, data sources, and responsible person was identified. The historical period is defined as 1989-1991, current as within the next 3 years, and the future beyond that.

Step 3: Determination of Alternatives for Procurement and Staffing

The end product of this analysis will be the number and locations of Type I and II helicopters needed to support extended attack and escaped wildfires Nationally. The number may be stratified by sub-category of these type helicopters. Specifics will include time-length of staffing, agency most benefitting based on protection responsibility and historic use, and support needs. Information will be in enough detail to support step 4.

Step 4: Display and Analyze Options for Procurement, Staffing and Deployment As Well As Develop Recommended Alternative

Four basic methods of procurement of helicopters were identified:

1a. Contract with the active military.
1b. Contract with the National Guard.
2. Procure and use agency-owned aircraft.
3. Contract with private industry for exclusive-use aircraft.
4. Contract with private industry for Call-When-Needed aircraft.

An almost infinite combination of these four basic methods could also be developed.

After considering political issues, unknown and unobtainable costs and availability status of military

Staffing Alternatives

| Alternative | Helicopter | Helicopter Crew | Management Module Helitak Crew |
|---|---|---|---|
| A. | Agency | Agency | Agency |
| B. | Agency | Contract | Agency |
| C. | Contract-EU | Contract-EU | Contract |
| D. | Contract-CWN | Contract-CWN | Agency |
| E. | Contract-EU | Contract-EU | Agency |
| F. | Contract-EU | Agency | Agency |

and National Guard resources, the group agreed not to consider the military option. It is understood that military assets may, and probably will, be used in "overload" situations (90th percentile plus). However, to study or plan on using these assets on a regular and planned basis is not realistic. Six basic staffing alternatives were identified to pursue (Box on Page 4).

Consultation with the study oversight allowed the study committee to focus analysis on Alternatives C-F.

## *HELICOPTER PROCUREMENT OPTIONS*

Contract - CWN

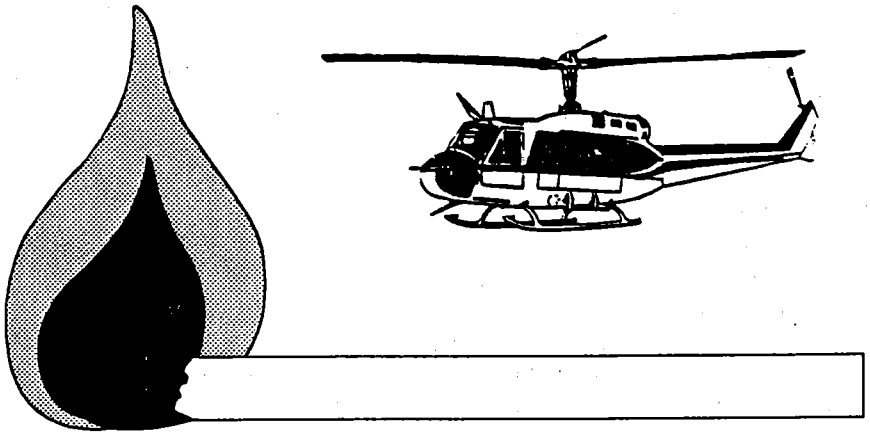
Procurement is done by soliciting bids from contractors. The contractor offers services to the Government but is not required to respond when ordered. For Type I helicopters, bids are on an hourly rate with a specified minimum hours per day. Fir Type II helicopters, bids are for a daily availability with a Government fixed hourly flight rate with no minimum hours flown guarantee.

Contract - EU

Procurement is done by soliciting bids from contractors to provide services exclusively (Exclusive Use) to the Government during a specified period of time.

## *TYPE II CATEGORY BREAKDOWN*

Analysis of helicopter payload capability and different altitudes indicated that a wide variation existed within the Type II category. The following categories, A-D, were defined to assist in the completion of study objectives. The Type II categories defined, II-A through II-D, are for this study only. Calculations assumed a pilot weighing 200 pounds and 1.5 hrs. of fuel. The A category has the most capability and the C the least. Category D is for a restricted use Type II helicopter.



TYPE II - A

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 8,000 ft and 25 degrees C: HIGE 1450#, HOGE 1500#
4. Capable of landing, flat pitch, on 20 ft. X 20 ft. pad (S-58 too big for this).

Note: Helicopters that will probably meet this standard, may be others:
- Bell 214 and 412
- Bell 212 with equipped weights of 6500 lbs or less.
- Bell 205 (super) with both 212 blades and -17 engine)
- Bell 204 (super) with -13 engine.

TYPE II - B

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 8,000 ft and 25 degrees C: HIGE 1200#, HOGE 1500#
4. Payload at 5,000 ft and 30 degrees C: HIGE 2800#, HOGE 2000#

Note: Helicopters that will probably meet this standard:
-Bell 212 with equipped weight of 6800# or less.
-S-58T
-BK 117
-Bell 412 (light ones)

TYPE II - C

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 5,000 ft and 30 degrees C: HIGE 1400#, HOGE 1200#

Note: Helicopters that will probably meet this standard:
-Bell 204
-Bell 205 A1

TYPE II - D

These aircraft would be used primarily for external load work (bucket and sling).

AIRCRAFT:
1. Limited category
2. Payload at 8,000 ft and 25 degrees C: HOGE 1500#
3. Payload at 5,000 ft and 30 degrees C: HOGE 2200#

Based on historic demand and need, typical elevations of fires, and professional judgement, the following table documents the minimum recommendations of the committee. Note Type II-D is a restricted category aircraft.

| REGIONS | A | B | C | D |
|---|---|---|---|---|
| Alaska | | | XX | XX |
| Intermountain | XX | | | XX |
| Northern | | XX | | XX |
| Pacific Northwest | | XX | | XX |
| Pacific Southwest | | XX | | XX |
| Southwest | XX | | | XX |
| Rocky Mountain | XX | | | XX |
| Southern | | | XX | XX |

*STAFFING OPTIONS - TYPE II AIRCRAFT*

The committee developed five options which could be used to staff the helitack crew.

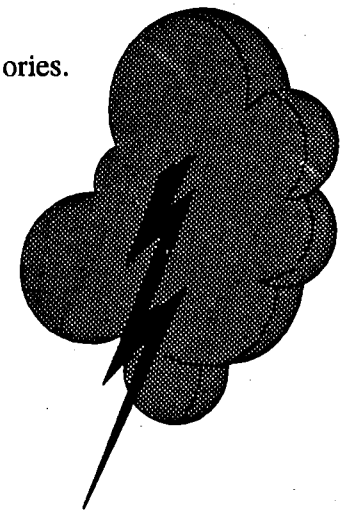
A CREW

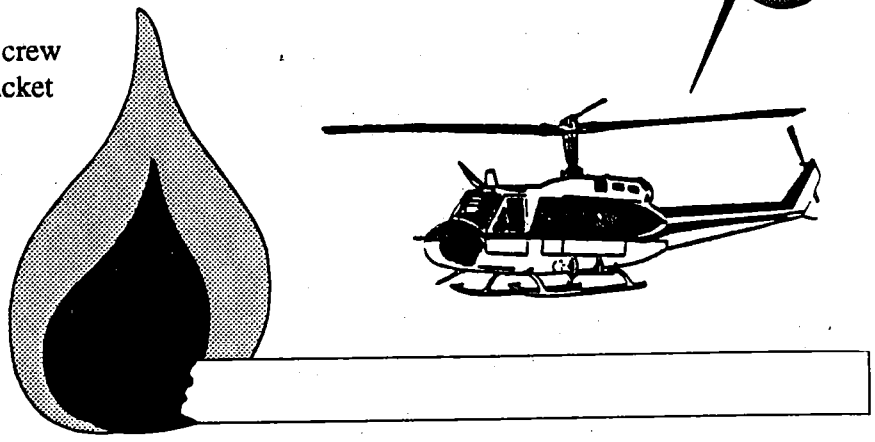
This crew is a ten person helitack crew consisting of a helicopter manager, an assistant crew supervisor, two lead crew members and six crew members.

Equipment: Helitack truck stocked with standard helitack equipment and accessories.

Special capabilities:

-Provide coverage of seven people per day.
-Ability to provide a high level of helicopter management capability.
-Ability to provide additional personnel needs for large incident air operations or other helicopter projects.
-Ability to crew an additional aircraft with a fully qualified module.
-Long line with remote hook
-Repelling capability
-Aerial ignition trained crew
-Foam capability for bucket





B CREW

This crew is a six person helitack crew consisting of a helicopter manager, an assistant crew supervisor, and four crew members.

Equipment: Helitack Vehicle with minimum equipment.

Special capabilities:

- Long line with remote hook
- Repelling capability and aerial ignition (optional)
- Limited initial attack capability

C CREW

This crew is a four person helitack crew consisting of a crew supervisor or manager and three crew members.

Equipment: Ordered by user through dispatch at time of call up.

Special capabilities: As ordered.

D CREW

One Crew Supervisor/manager

Equipment: Ordered by user through dispatch at time of call up.

Special Capabilities: None

E CREW

Contractor provided helitack crew. The contractor will provide same capability as shown in Alternative C).

Step 5: Display concerns generated by the study.

These will be covered in the recommendations section.

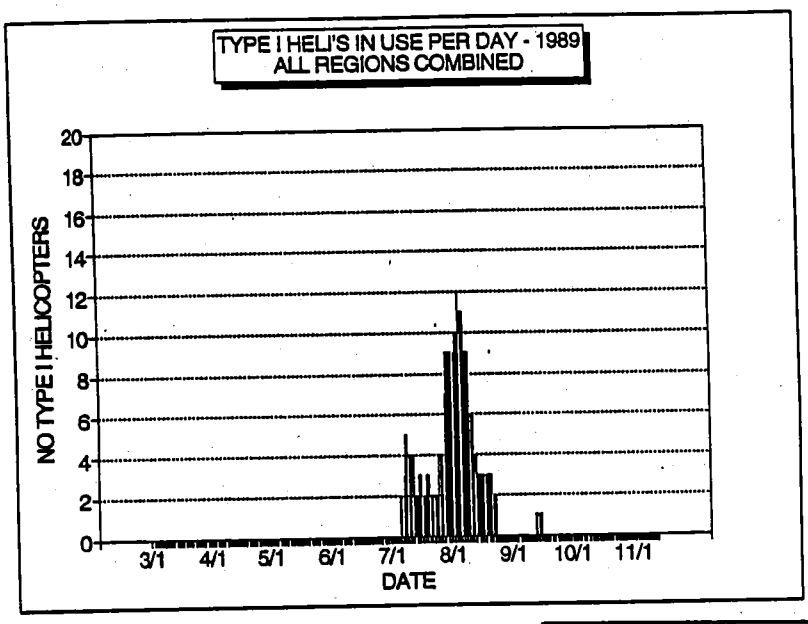
## HISTORICAL DEMAND FOR TYPE I AND II HELICOPTERS

The demand for Type I and II helicopters on incidents has remained steady in the past 5 years. For the most part, this resource has been available through a call-when-needed contracting method although some areas, primarily California and Alaska, have maintained exclusive use contracts. Helicopters procured using exclusive use contracts have primary initial attack responsibilities and are validated in the NFMAS process.

By far, the primary need for these type of helicopters is in large fire support. Records for the past three years, show extensive use on size class "C" and larger fires. Peak utilization occurs at the time when large fires are most likely to occur, generally June through September in the western United States. The primary user is the Forest Service, although other federal and state agencies have also requested this capability. The following table was developed using dispatch information from Appendix F.

| | AGENCY | NO DISP'S | NO DAYS | PERCENT DAYS | PERCENT DAYS |
|---|---|---|---|---|---|
| LOWER 48 FEDERAL | USDA-FS | 430 | 2955 | 72.86% | 72.86% |
| | USDI-BLM | 68 | 456 | 11.24% | |
| | USDI-NPS | 35 | 198 | 4.88% | |
| | USDI-FWS | 23 | 270 | 6.66% | |
| | USDI-BIA | 4 | 8 | 0.20% | |
| | USDI-SUBTOTAL | 130 | 932 | | 22.98% |
| | NICC | 12 | 36 | 0.89% | 0.89% |
| LOWER 48 STATES | IDAHO | 3 | 18 | 0.44% | |
| | MONTANA | 4 | 23 | 0.57% | |
| | OREGON | 4 | 20 | 0.49% | |
| | UTAH | 2 | 8 | 0.20% | |
| | CALIFORNIA | 21 | 64 | 1.58% | |
| | STATE-SUBTOTALS | 34 | 133 | 3.28% | 3.28% |
| LOWER 48 TOTALS | | 572 | 4056 | 100.00% | 100.00% |

| | AGENCY | NO DISP'S | NO DAYS | AGENCY PERCENT DAYS |
|---|---|---|---|---|
| ALASKA | AFS | 36 | 393 | 49.87% |
| | DNR | 29 | 395 | 50.13% |
| ALASKA TOTALS | | 65 | 788 | 100.00% |




# *Type I Helicopter Demand Graphs Lower 48 States*

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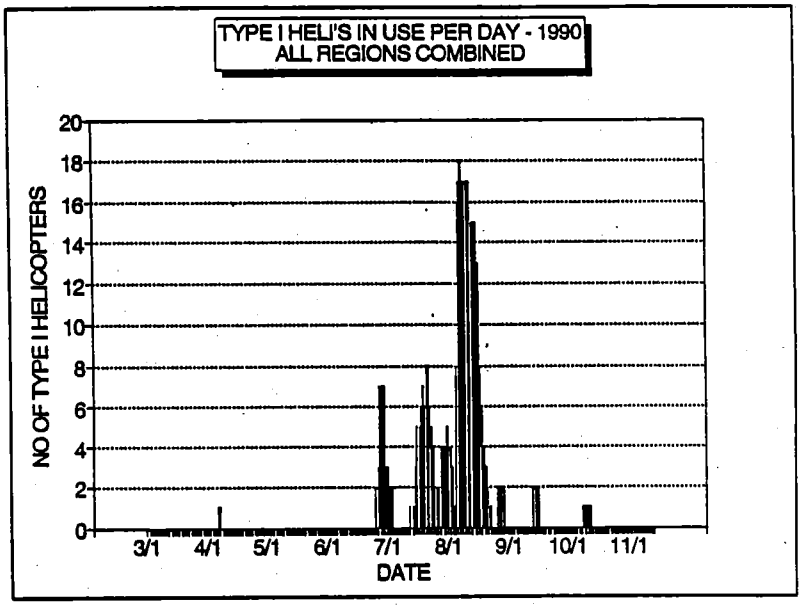


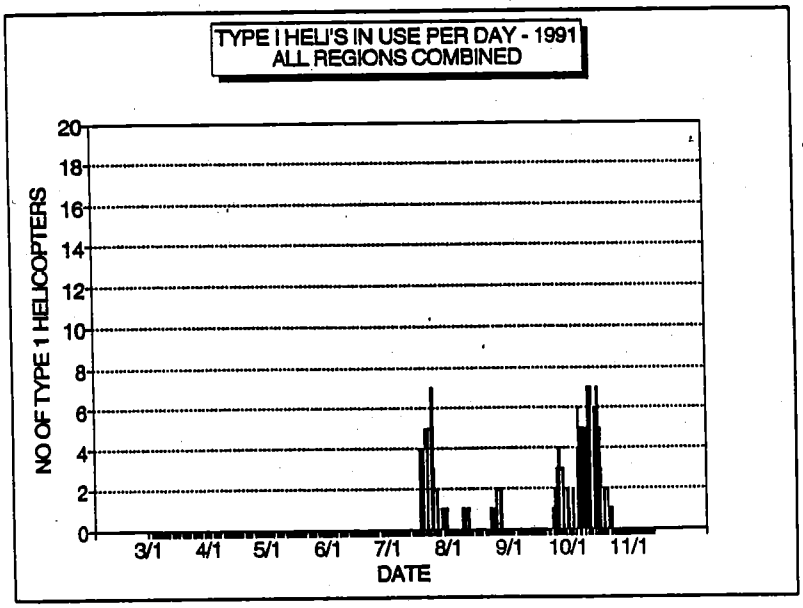


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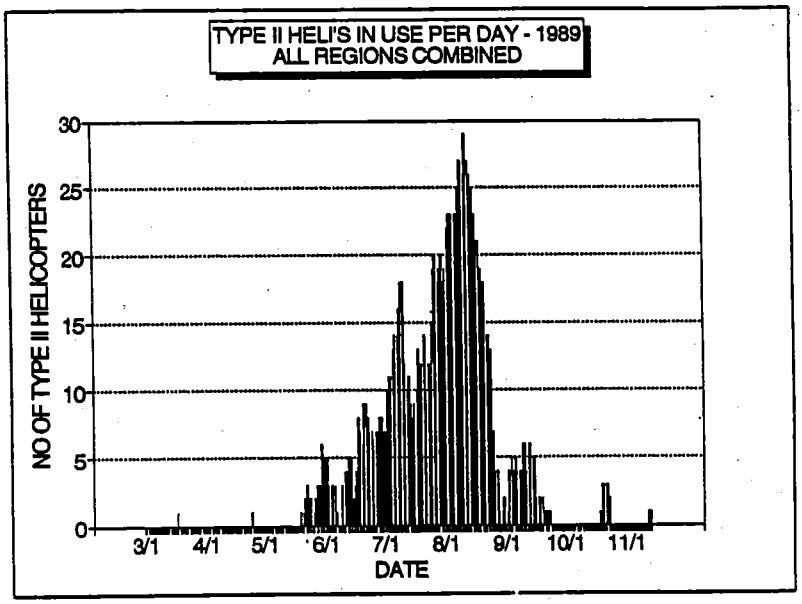


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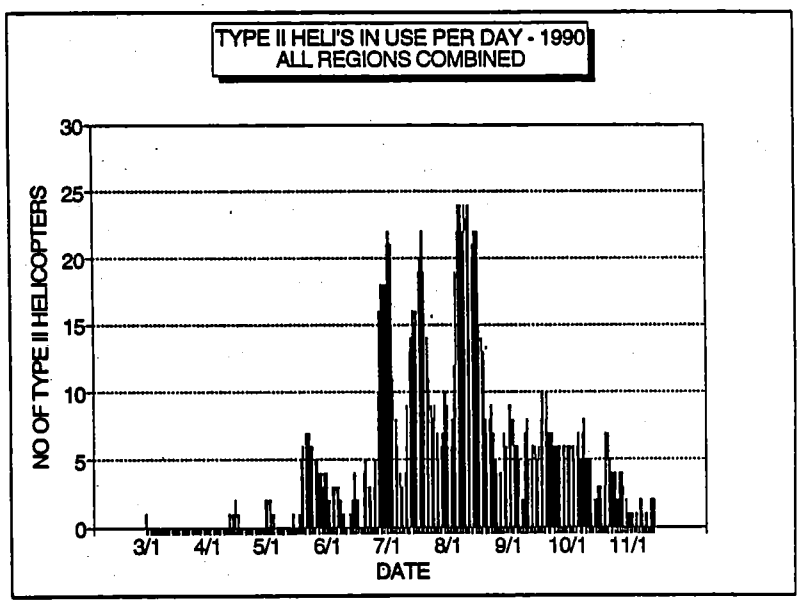


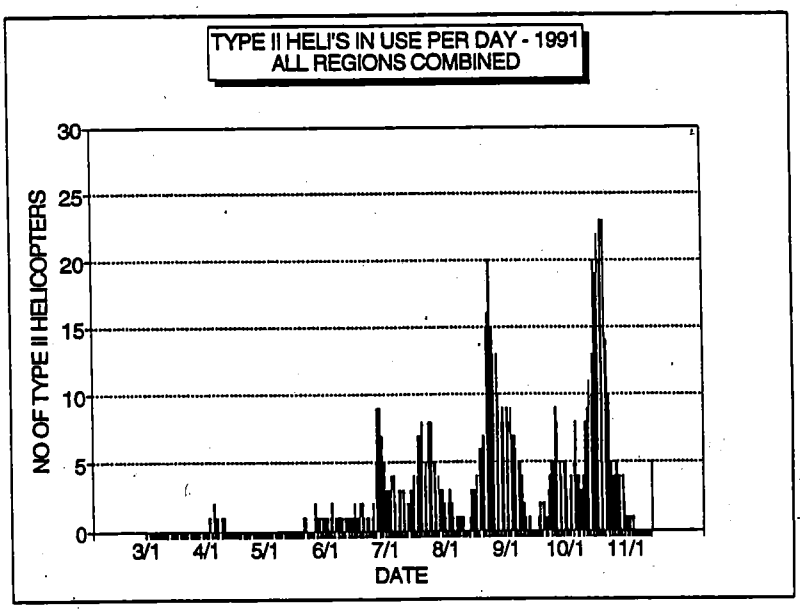


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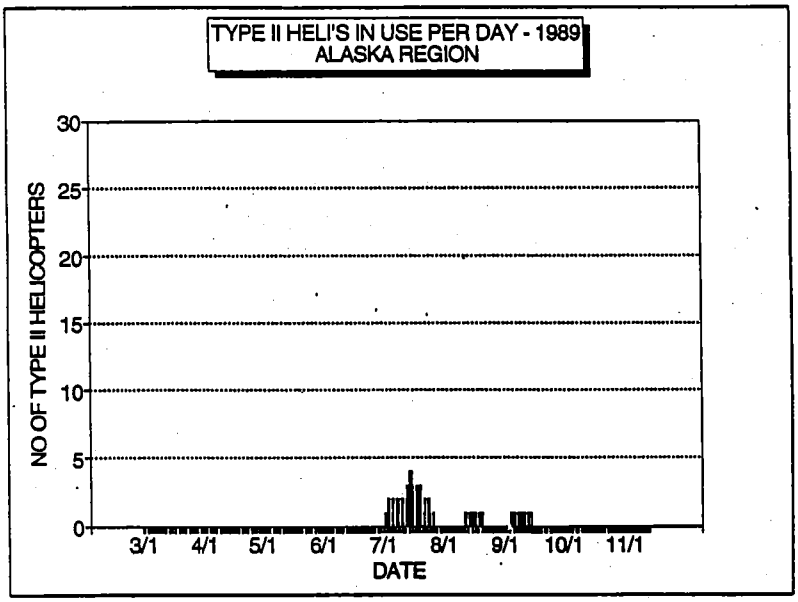


# *Type II Helicopter Demand Graphs All Of Alaska*

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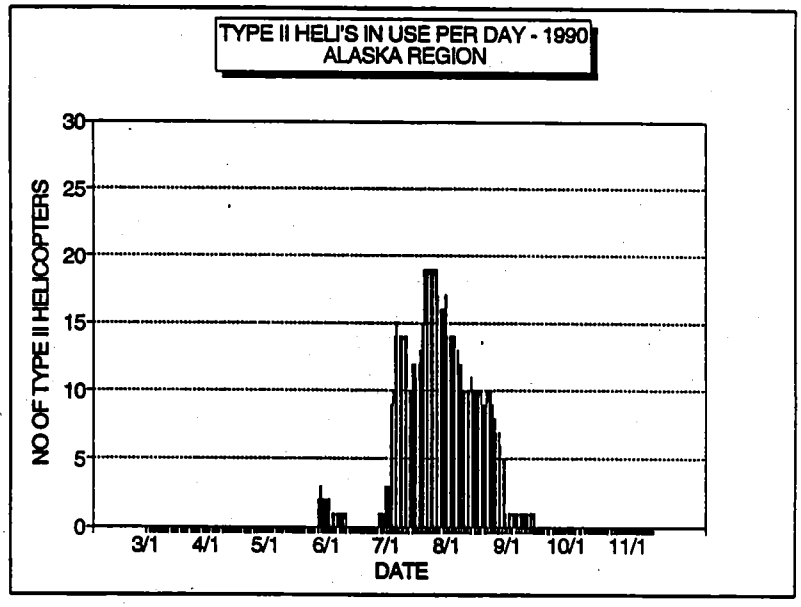
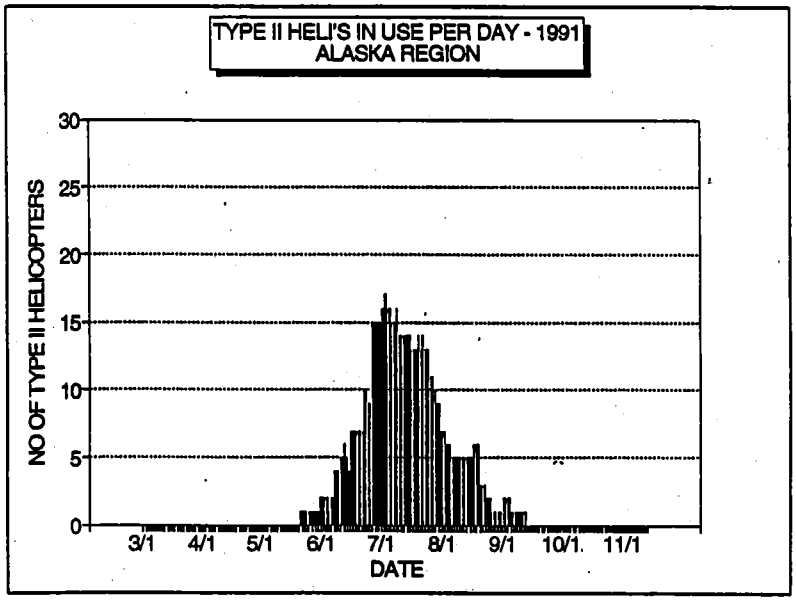



***<---1991***

The data in Appendix F shows demand that was documented at the National Interagency Coordination Center (NICC) at BIFC and Regional Coordination Centers. NICC is the ordering dispatch for call-when-needed Type I & II helicopters. The dispatch record shows initial requests and demobilization dates, but not other assignments that might have occurred in the area where the helicopter was assigned. Geographic areas may utilize helicopter resources without notifying NIFC when the helicopter is under the area's control. Based on the time available, the data is complete.

Demand for Type I & II helicopters will continue to be common in large fire support operations. This is particularly true in Alaska where all support is essentially aviation dependent. Availability has been fairly good over the past five years, although on occasion the wildland fire community has been forced to request military equipment. In the past three years, the Federal agencies have used exclusive use contracts to staff Type II helicopters in the western states. The major benefit of these contracts was shortened mobilization times. Typical duration of use fluctuates from single days to greater than 30 days. This fluctuation makes the investment in a large number of formal contracts a bit more risky, especially during slow seasons.

## HISTORICAL USE OF TYPE I AND II HELICOPTERS

### HISTORICAL HELICOPTER USE BY ACTIVITY ON FIRES

Hours of Use for Type I Helicopters By Activity
For Selected Fires In The Lower 48 States - 1989-91

| REC ON | PERS TRAN | WATER DROP | FOAM DROP | RETARD DROP | INT CARGO | EXT CARGO | TOTAL | AVG HR/ DAY | ECON HR/ DAY |
|---|---|---|---|---|---|---|---|---|---|
| <-Hours of Use-> | | | | | | | | | |
| 0.0 | 0.0 | 761.8 | 12.6 | 220.5 | 0.0 | 5.0 | 999.9 | 5.3 | 5.4 |

Hours of Use for Type II Helicopters By Activity
For Selected Fires In Alaska - 1989-91

| REC ON | PERS TRAN | WATER DROP | FOAM DROP | RETARD DROP | INT CARGO | EXT CARGO | TOTAL | AVG HR/ DAY | ECON HR/ DAY |
|---|---|---|---|---|---|---|---|---|---|
| <-Hours of Use-> | | | | | | | | | |
| 1.4 | 287.4 | 42.5 | 0 | 0 | 80 | 171 | 582.3 | 4.9 | 5.2 |

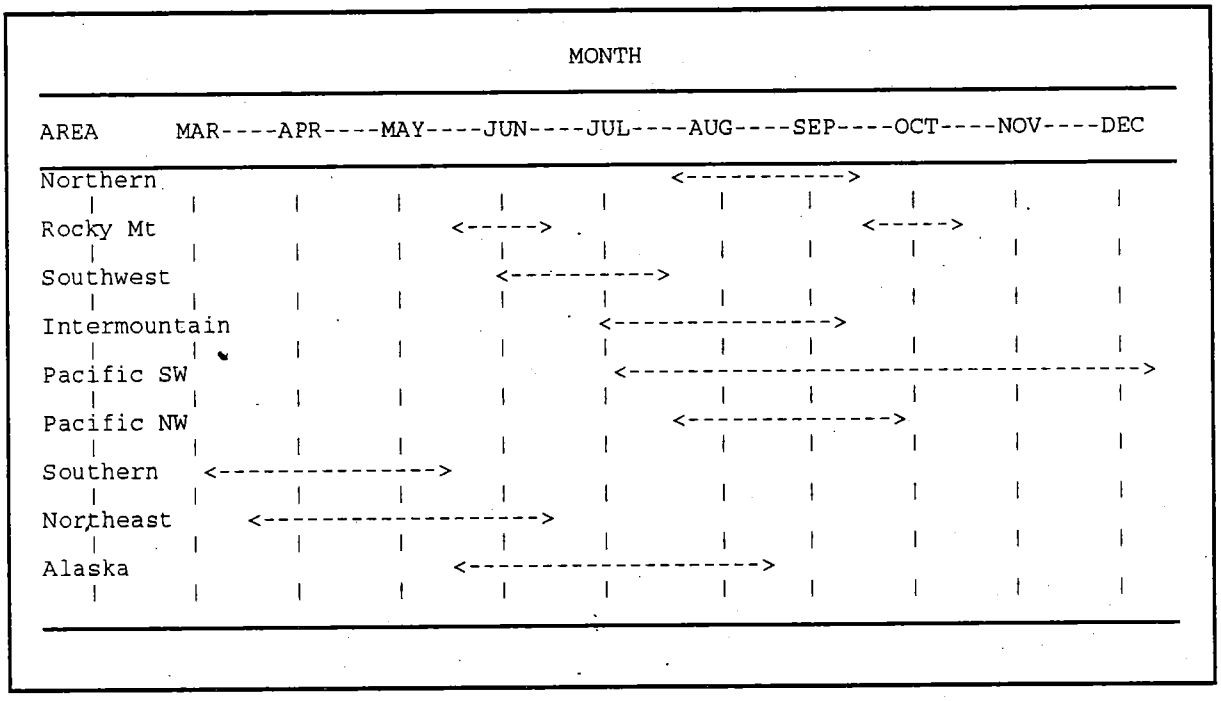
Hours of Use for Type II Helicopters By Activity
For Selected Fires In The Lower 48 States - 1989-91

| REC ON | PERS TRAN | WATER DROP | FOAM DROP | RETARD DROP | INT CARGO | EXT CARGO | TOTAL | AVG HR/ DAY | ECON HR/ DAY |
|---|---|---|---|---|---|---|---|---|---|
| <-Hours of Use-> | | | | | | | | | |
| 9.5 | 469.2 | 585.3 | 29 | 3 | 89.6 | 65.4 | 1251 | 3.6 | 3.7 |

To determine how Type I and II helicopters were being used on fires and to determine the average hours of use per day, ten fires from all Regions were studied. The results are summarized in the table on Page 13. A detailed listing of the findings is in Appendix B. Contracts require a minimum payment of 4.0 hours of flight time per day for Type I helicopters and a minimum of 3.0 hours for Type II helicopters. The economic average was obtained by substituting a 4.0 hours per day for Type I helicopters and a 3.0 hours per day for Type II helicopters on those days when less then these hours flown were recorded.

The following diagram shows the critical time periods by Region when Type I and II helicopters are needed in extended attack and escaped fire suppression.

CRITICAL TIME PERIOD TO STAFF TYPE I/II HELICOPTERS




## DISPATCH FLOW

Five key situations can effect the dispatch flow.

### Exclusive Use Contracts Versus Call-When-Needed

Dispatch procedures for Type I & II helicopters varies based on how the helicopter is procured. Helicopters working under exclusive use contracts are staffed with employees assigned to that helicopter for the entire contract period. These crews are equipped for helicopter operations and have ground support capability. They have trained and worked with the contractor and are familiar with operational styles. The helicopter and crew can be ordered as a single entity within the dispatch

system.

Helicopters contracted as a call-when-needed resource are mobilized in a different fashion. The helicopter is acquired from a contractor. A management module from an agency is mobilized to a location to marry with the helicopter. These crew members may have to be mobilized from more than one location; ie. two National Forests, a BLM district, or a National Park. Once the helicopter and the crew have been identified and confirmed, a plan is devised to move both units to a location for a pre-use inspection and meeting. This meeting allows the crew and pilot to become acquainted, to verify contract requirements, and to discuss operating procedures. Most areas conduct a preliminary inspection to determine the current condition of the helicopter as well as a verification of records. Helicopter support gear needs to be acquired as well as a vehicle for the crew in many cases. Thus other adjunctive equipment and supplies result in more supply (S) and equipment (E) requests to initialize the operation. The helicopter is ordered as an "A" request and the crew as individual overhead "O" requests. This more "complicated" process, while providing a good documentation on specific components of the resource, is more time consuming and requires additional training and performance requirements within the dispatch community.

There is some efficiency gained when dealing with the exclusive use contracted helicopter. The unit is mobilized more easily and is able to proceed directly to the incident. In theory, the crew also performs more efficiently being familiar with the helicopter and pilot. They have trained and worked together before.

## Contracting and Inspection Timeframes

The dependence upon the CWN contracted helicopters is more risky. In some years, its been difficult to ghet inspections completed on the CWN fleet since operators don't always have equipment available when we have time to inspect. Lacking any guaranteed work, they often aren't available at all. Increased availability of contracting and performance/maintenance inspectors would mitigate this situation though.

## Location of Helicopters

Location of available helicopters, typically the Northwest, California and the Southwest, has a bearing on delivery to incidents within the Great Basin, Rocky Mountains, and Northern Rockies. Typically users with a high dependence on this kind of helicopter, these areas often see mobilization times exceeding twelve hours. Positioning helicopters closer to high use areas would improve mobilization efficiency.

## Statusing

Improved statusing capability would improve dispatch performance. Presently much time is wasted checking for resources which are not available. NIFC has implemented processes to encourage

helicopter vendors to tell them where they will have helicopters working and their status. This will improve mobilization times.

### Tools to Aid the Dispatcher

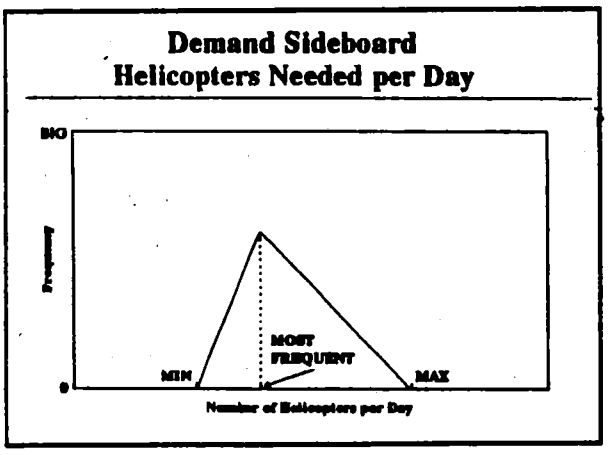
The development of cost and performance data to aid dispatchers in selecting helicopters best suited for a mission should occur. Lacking this data, any Type I or II helicopter is dispatched without full consideration of performance capability. While the mobilization may be cost effective, performance at the incident is not. Such a tool is displayed in Appendix B.

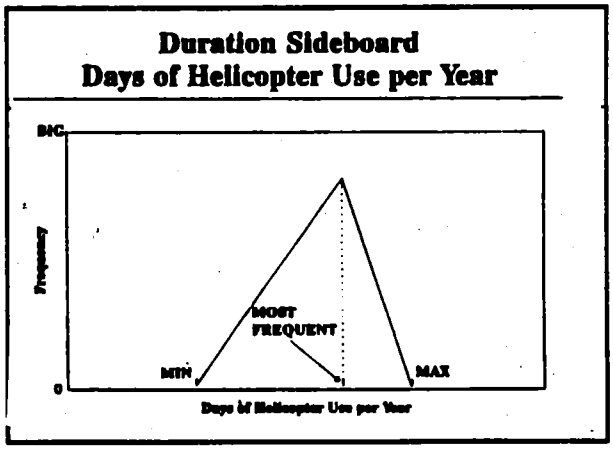
## ANALYSIS PROCESS

Some innovative operations research and statistical analysis techniques where developed and used to examine the most efficient combination of CWN and exclusive use helicopters. Two techniques were needed. One technique was used to perform statistical analysis on the demand profile produced for the past three year's reports. Reference will be made to this "demand simulation model." A second technique then was used to examine the tradeoff in costs to fill this demand with CWN and exclusive use contracts. Reference will be made to this "cost efficiency model."

### Demand

Demand for helicopters of either type can be described with two parameters, daily number of helicopters in use and number of days duration. Each of these parameters can vary. To simulate this variance, the demand simulation model was built utilizing Triangular Probability Distributions and random simulation theory.



Committee members and managers where asked to use the demand documented for 1989, 1990 and 1991 and their experience to determine the minimum, most frequent and maximum values for these two demand parameters. The graphs shown earlier in the report and in Appendix C where used to estimate the aggravate demand for all Regions in the lower 48 states. Alaska was analyzed separately and it's results will follow the analysis for the lower 48 states. The model can be use to simulate ANY demand. The period 1989-91 was simply used as a starting point to model.

The demand parameter "sideboards" were then used to do 2000 random simulations of this demand. The result of the demand simulation model was a probability distribution of demand including the mean. The mean was examined by the committee and experts comparing the results to the 1989-1991 demand. Adjustments were made in the minimum, most frequent and maximum values until the committee was satisfied that these values were valid. Demand simulation model results are summarized below and documented in Appendix D. Appendix D also contains model results for demands of 90%, 80%, 70%, 60%, and 50% of the 1989-91 simulated demand.

DEMAND SIMULATION MODEL RESULTS

| | <----------Helicopter Days/Year----------> | | | | |
|---|---|---|---|---|---|
| | 1989 | 1990 | 1991 | Average | Used In Study |
| Lower 48 TI | 245 | 360 | 180 | 262 | 313 |
| Lower 48 TII | 1253 | 1348 | 793 | 1131 | 1285 |
| AK-All TII | 79 | 781 | 779 | 546 | 446 |
| AK-AFS TII | -- | -- | -- | -- | 251 |
| AK-DNR TII | -- | -- | -- | -- | 258 |

## COST DEVELOPMENT ASSUMPTIONS

### General Assumptions

- All cost figures used are based on actual contract costs.

- All dollar figures used reflect seven days/week coverage for both exclusive use and CWN contracts.

- Helitack crew costs are based on actual cost figures for a 10 person helitack crew based in the Intermountain Region. However, six person crews are used in the alternatives for a more accurate comparison of CWN versus Exclusive Use. The 6 person crew would be needed to provide 7 day coverage. Four person modules are used in CWN options with overtime costs for 6th and 7th day coverage included in the alternatives.

- The alternatives modelled are for the most part pure economic analysis. The actual budgetary costs would be different. The actual cost would be slightly higher for exclusive use crews due to the costs associated with having crews in pay status beyond what is directly associated with the helicopter need. However, in running sensitivity analysis using the budgetary costs, the outcome changed very little when using budgetary rather than economic figures.

Assumptions Specific to Call-When-Needed Helicopters

- Call-When-Needed (CWN) helitack modules were funded for two pay periods per year (salary), $2,000 per year for travel and training ($500 each for 4 person module), and $2,894/year for equipment, supplies and indirect costs. This allows compliance with the charge-as-worked concept. These costs are reflected in the alternatives.

- In all the CWN alternatives, assumption is made that each module will be used an average of 15 days per year. This would mean that 4 of the 15 days would be overtime days for the module. These overtime costs are included in the alternatives. The 15 day period assumption for CWN aircraft and modules is based on the committee's analysis of actual use data from 1989-91 for Type I and II helicopters. The data in Appendix B indicates that the average number of days assigned per incident is 8.1 for Type II helicopters and 7.0 for Type I helicopters. The 50th percentile is 6.3 days for Type II helicopters and 5.0 days for Type I helicopters. The assumption is that each CWN aircraft and module would be assigned on an average of two times per year.

- CWN salary costs while assigned to fires is also included in options.

- In the lower 48 states, it is assumed there is a 10% efficiency loss when using CWN helicopters versus exclusive use helicopters. This is reflected in the economic efficiency model alternatives. Items that contribute to the 10% efficiency loss when using CWN aircraft and modules are listed below:

  - There is a greater workload (time/$$) each time a CWN aircraft is ordered and used on dispatchers, helicopter specialist, maintenance and pilot inspectors.

  - The mobilization time is usually longer between CWN helicopters and modules as the "marriage" must occur prior to putting the ship to work.

  - The modules are usually not as well trained, experienced, or efficient as exclusive use crews.

  - The pilots and crews must spend time working together before becoming an efficient team.

- In Alaska, a 5% efficiency loss was assumed for the CWN helicopters and modules because Alaska only uses a one person module. Most of the personnel involved in Alaska are also much more accustom to using all types of aircraft on a regular basis. Mobilization is done in a much more centralized fashion than in the lower 48 states.

- There are several associated costs with the CWN program that are included in the alternatives. They are shown as "administrative/support costs" and include additional aircraft and pilot inspections, additional contract administration support, additional management time and dollars associated with the CWN program, and additional dispatcher time in the mobilization and demobilization of the CWN resource.

Assumptions Specific to Type I Helicopters

- For the Type I helicopter options, there are three different categories that were analyzed using the cost efficiency model. This is due to a very clear and logical category breakdown for Type I helicopters based both on performance and cost. The BV-234 and S-64 helicopters in a limited mode are in one category, the BV-107 and S-61 helicopters in a limited mode are another and the Super Puma AS 332L in an standard mode is the third category. The Super Puma was chosen over the BV-

234 for analysis in the standard mode due to its smaller landing area requirements based on it single rotor system.

- All Type I options in the Lower 48 states are based on 5.4 hours of flight per day which is the average economic historic use per day for Type I helicopters.

- The committee used professional judgement based on CWN costs and discussions with contractors to develop costs to use in the cost efficiency model since not exclusive use contracting experience exists.

Assumptions Specific to Type II Helicopters

- All Type II options in the Lower 48 states are based on 3.7 hours of flight per day which is the average economic historic use for this type of helicopter. Cost data on the Type II helicopter contracts, both CWN and Exclusive Use, is excellent.

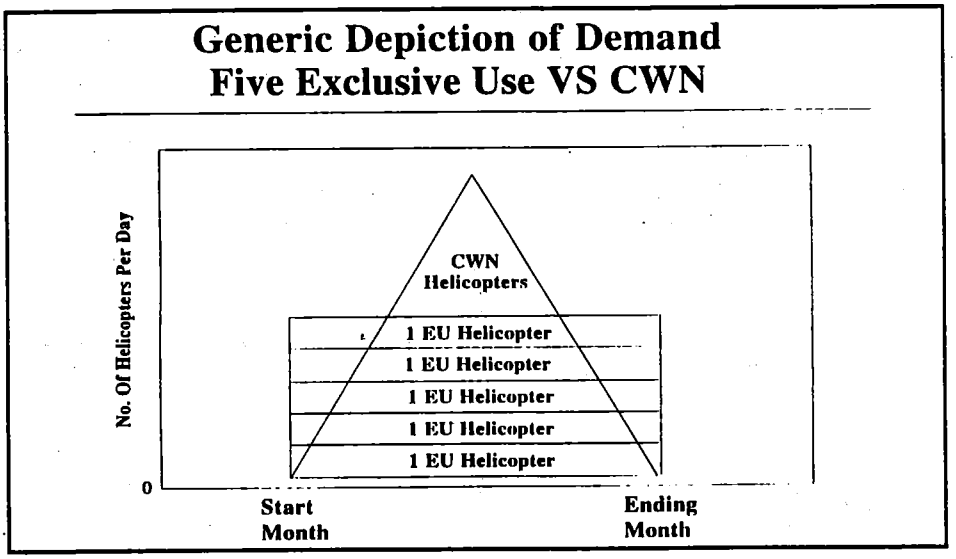
- All Type II options in Alaska are based on 5.2 hours of flight per day which is the average economic historic use for this type of helicopter. Cost data on the Type II helicopter contracts, both CWN and Exclusive Use, is excellent.

Details on specific costs follow in the cost efficiency analysis section. Worksheet detailing cost for alternatives and options are contained in Appendix E.

## COST EFFICIENCY ANALYSIS

To examine the optimum mix of CWN and exclusive use Type I and II helicopters, the demand parameters were assumed to occur in a triangular fashion.

A computer program was written to allow for determination of the total program cost if the demand was filled with 0, 1, 2, ... 20 Type II helicopters on EU contracts. At each level, the remaining use was filled by CWN helicopters.



## Lower 48 States - Type I

For Type I helicopters in the lower 48 states, analysis was done using three cost categories. Each category was run against the total demand. The categories are as follows:

Category 1: Standard - Super Puma AS 332L
Category 2: Limited - BV-234 and S-64
Category 3: Limited - BV-107 and S-61.

RESULTS OF LOWER 48 TYPE I ANALYSIS

**Type I For Lower 48 States**

| Cat | EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost |
|---|---|---|---|---|---|---|---|
| 1 | 45 | 5.4 | $19400 | $4850 | $15520 | $1850 | $ 753328 |
| 2 | 45 | 5.4 | $28672 | $7168 | $22938 | $2867 | $1032618 |
| 3 | 45 | 5.4 | $12464 | $3116 | $ 9972 | $1246 | $ 480148 |

**Optimum Number of Exclusive Use Helicopters for Various Demands**

| Cat | 100% of 89-91 | 90% of 89-91 | 80% of 89-91 | 70% of 89-91 | 60% of 89-91 | 53% of 89-91 |
|---|---|---|---|---|---|---|
| 1 | 3 | 3 | 3 | 2 | 2 | 2 |
| 2 | 3 | - | - | - | - | - |
| 3 | 3 | - | - | - | - | - |

Three Type I exclusive use contracts would allow filling of the National demand 25% of the time with exclusive use helicopters and 75% of the time with CWN helicopters. The savings from staffing with three exclusive use contracts would vary based on the category since each category was run against the total National demand. The annual saving to the government averages around $537,000. If the 10% efficiency loss was not assumed for CWN helicopters, then the most efficient numbers was reduced by 1 helicopter at all demands and the annual saving to the government is reduced to $172,000.

## Lower 48 States - Type II

For Type II helicopters in the lower 48 states, analysis was done collectively for Type II-A, II-B, and II-C as there was no significant cost difference between the sub-categories. The assumptions are documented on Worksheets in Appendix E and results are summarized in the following table.

RESULTS OF LOWER 48 TYPE II ANALYSIS

**Type II For Lower 48 States**

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost |
|---|---|---|---|---|---|---|
| 90 | 3.7 | $4624 | $677 | $2634 | $612 | $300426 |

**Optimum Number of Exclusive Use Helicopters for Various Demands**

| 100% of 89-91 | 90% of 89-91 | 80% of 89-91 | 70% of 89-91 | 60% of 89-91 | 50% of 89-91 |
|---|---|---|---|---|---|
| 13 | 12 | 11 | 9 | 8 | 7 |

Thirteen Type II exclusive use contracts would allow filling of the National demand 52% of the time with exclusive use helicopters and 48% of the time with CWN helicopters. Staffing with 13 exclusive use Type II helicopters versus filling the demand 100% with CWN Type II helicopters would save the government an average of $3,200,000 annually. If the 10% efficiency loss was not assumed for CWN helicopters, then the most efficient numbers was reduced by 1 helicopter at all demands and the annual saving to the government is reduced to $2,366,000.

## Alaska - Type II

For Type II helicopters in Alaska, analysis was done for Type II-C. Analysis was done with lumped demand data and for the Alaska Fire Service (AFS) and State of Alaska DNR separately. The results are summarized in the following tables.

RESULTS OF ALASKA TYPE II ANALYSIS

**Type II For AFS Demand Only**

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | $4504 | $750 | $2981 | $750 | $211023 | 3 |
| | | <---$9830/day---> | | | | | |

**Type II For Alaska DNR Demand Only**

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | $ 0 | $1870 | $3164 | $500 | $206640 | 5 |
| | | <---$11200/day---> | | | | | |

**Type II For Alaska DNR and AFS With Lumped Demand**

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | <---$10515/day---> | | $3250 | $625 | $208832 | 7 |

**Optimum Number of Exclusive Use Helicopters for Various Demands**

| 100% of 89-91 | 90% of 89-91 | 80% of 89-91 | 70% of 89-91 | 60% of 89-91 | 50% of 89-91 |
|---|---|---|---|---|---|
| 7 | 6 | 6 | 5 | 4 | 3 |

Seven Type II exclusive use contracts would allow filling of the Alaska demand 58% of the time with exclusive use helicopters and 42% of the time with CWN helicopters. Staffing with 7 exclusive use Type II versus filling the demand 100% with CWN Type II helicopters would save the Federal and State governments of an average of $867,000 annually. If the 5% efficiency loss was not assumed for CWN helicopters, then the most efficient numbers was reduced by 1 helicopter at the 100% and 80% demand levels only. Otherwise, it was unchanged. At the 100% level, the annual savings to the governments is reduced to $708,000.

For the Alaska lumped analysis, an average was used for each of the exclusive use fixed cost, exclusive use variable cost, and CWN variable costs. For the Alaska DNR only analysis, the CWN daily rate is $ 0 as the contractor only bids the hourly rate with a daily guarantee of 4 hours. The demand for each the AFS and DNR is about equal but the Alaska DNR exclusive use contracts are cheaper per day than the AFS contracts. Since the demand is equal, the Alaska DNR contracts collectively are cheaper, the optimum of 4 DNR and 3 AFS Contracts is the most cost efficient.

## Conclusion

In all cases, the cost efficiency model showed economic efficiency in staffing with a certain number of exclusive contracts, even at 50% of the last three year's demand. Total cost savings to all governments could be as high as $4,604,000.

## RECOMMENDATIONS

The committee recommends the following which would collectively save the Federal and Alaska State governments an estimated $4,604,000 annually First year start-up costs with be $793,500.

### Lower 48 States: Type I

The committee recommends one Super Puma (Standard) and one BV-234/S-64 (Limited) based at BIFC. Though the cost efficiency model indicates three is the most efficient, two are recommended because the committee felt caution was needed due to the lack of data on the cost of Type I exclusive use contracts. The saving to the government averages $537,000 per year. The projected one-time costs for the Federal and State Agencies in the Lower 48 States for the Type I program is $54,000, the annual Helitack Staff cost is $80,100, and the annual helicopter cost is $1,785,000.

### Lower 48 States: Type II

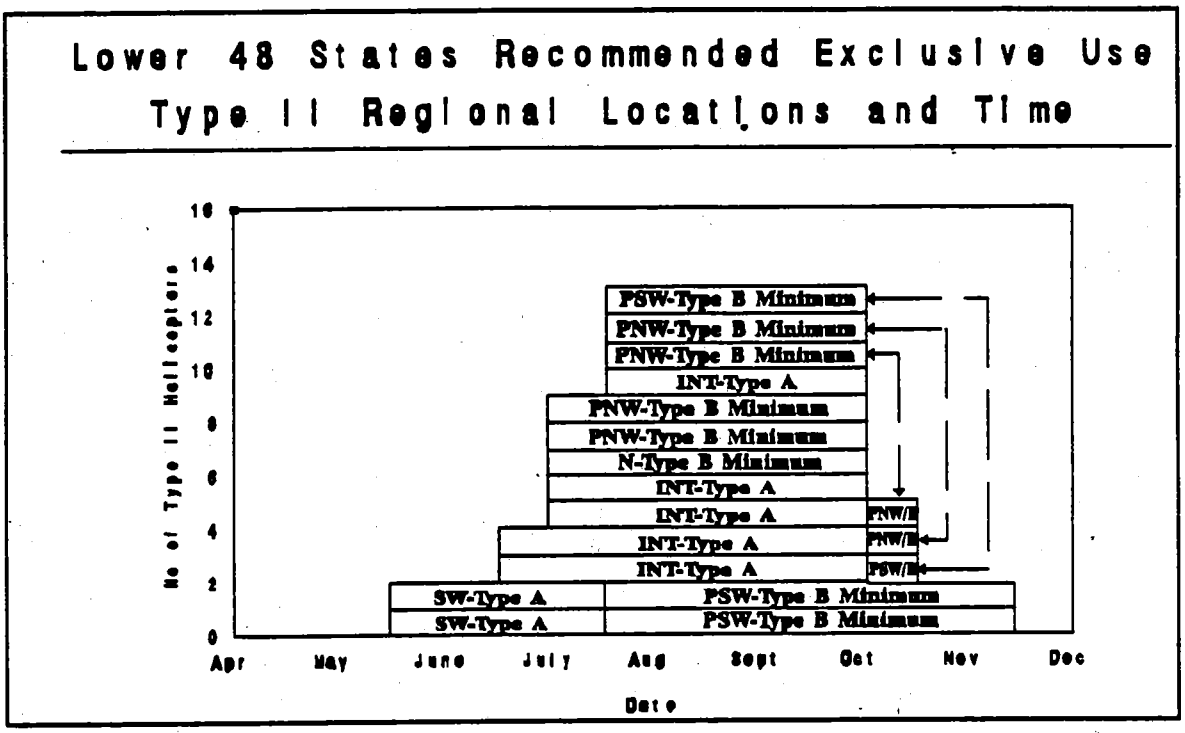
The committee recommend thirteen Standard helicopters with a base program of seven helicopters. This base program is the core which the other helicopter increments can be added to and provides the recommended optimum cost efficient results at 50% of the 1989-91 demand. The saving to the government averages $3,200,000 per year. The projected one-time costs for the Federal and State Agencies in the Lower 48 States for the Type II program is $533,000, the annual Helitack Staff cost is $783,900, and the annual helicopter cost is $3,198,000.

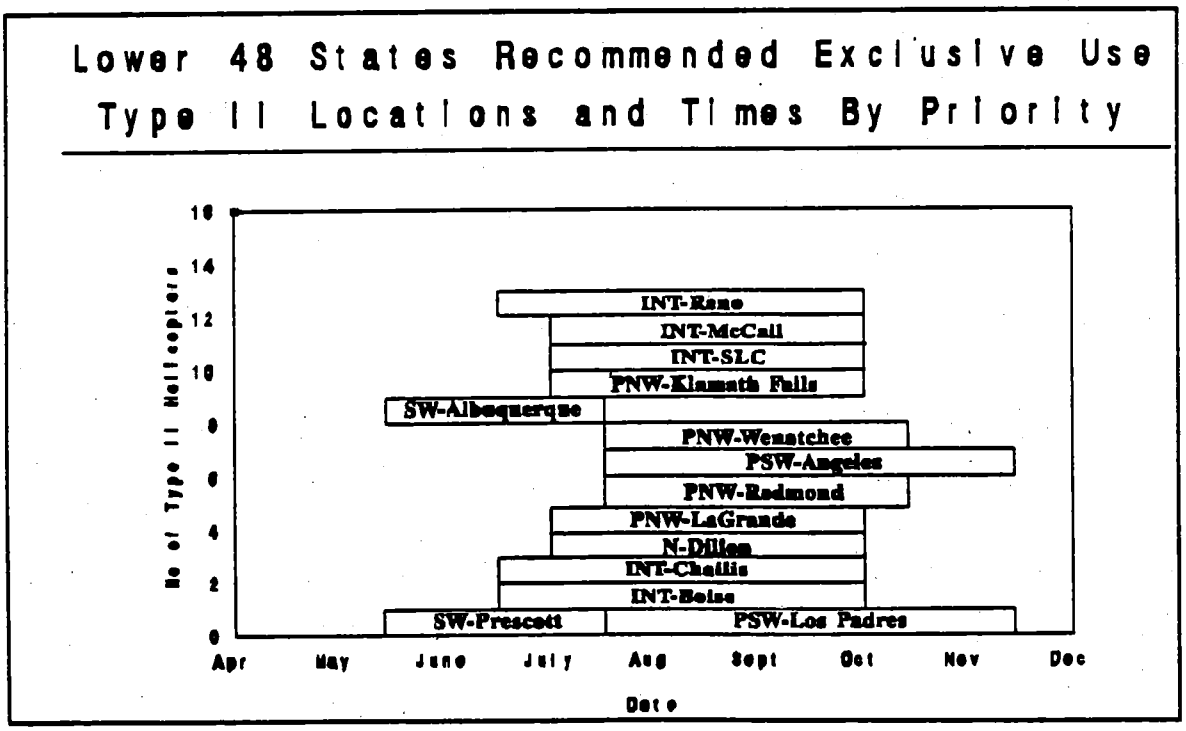
LOWER 48 TYPE II RECOMMENDATIONS

| Priority | Region | Location | Dates | Contract Length |
|---|---|---|---|---|
| 10 | Southwest | Albuquerque | 5/15-7/14 | 60 days |
| Base Prog | Pacific Southwest | Angeles NF | 7/15-11/15 | 120 days |
| Base Prog | Southwest | Prescott | 5/15-7/14 | 60 days |
| Base Prog | Pacific Southwest | Los Padres NF | 7/15-11/15 | 120 days |
| Base Prog | Intermountain | Boise | 6/16-10/1 | 105 days |
| Base Prog | Intermountain | Challis | 6/16-10/1 | 105 days |
| 14 | Intermountain | Reno | 6/16-10/1 | 105 days |
| 12 | Intermountain | Salt lake | 7/01-10/1 | 90 days |
| 13 | Intermountain | McCall | 7/01-10/1 | 90 days |
| Base Prog | Northern | Dillon | 7/01-10/1 | 90 days |
| Base Prog | Pacific Northwest | LaGrande | 7/01-10/1 | 90 days |
| 11 | Pacific Northwest | Klamath Falls | 7/01-10/1 | 90 days |
| 9 | Pacific Northwest | Wenatchee | 7/15-10/15 | 90 days |
| Base Prog | Pacific Northwest | Redmond | 7/15-10/15 | 90 days |
| 15 | Pacific Southwest | Sacramento | 7/15-10/15 | 90 days |

Funding of daily availability for both Type I and II helicopters in the lower 48 states is recommended using the following formula which was developed previously.

USFS - 73.7% BLM - 11.2% NPS - 4.9% FWS - 6.7% BIA - 0.2% STATES - 3.3%



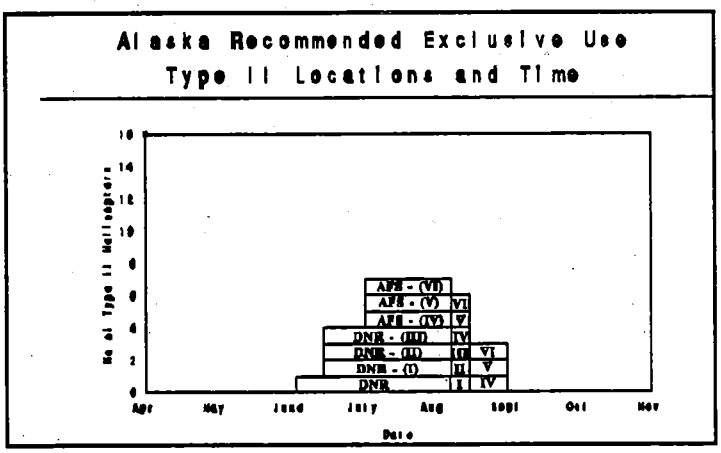
## Alaska-Combined: Type II

The committee recommends seven exclusive use helicopters maximum with a base program of three helicopters. This base program is the core which the other helicopter increments can be added to and provides the recommended optimum cost efficient results at 50% of the 1989-91 demand. Of the seven recommended, it is further recomended that the State of Alaska DNR staff four and the Alaska Fire Service staff three. The saving to the governments averages $867,000 per year.

### ALASKA COMBINED TYPE II PROGRAM RECOMMENDATION

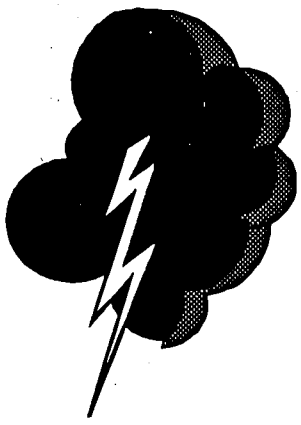
| Priority | Region | Location | Dates | Contract Length |
|---|---|---|---|---|
| 6 | Alaska-DNR | Palmer | 6/07-8/07 | 60 days |
| Base Prog | Alaska-DNR | Ft. Wainwright | 6/15-8/15 | 60 days |
| 5 | Alaska-DNR | Tok | 6/15-8/15 | 60 days |
| Base Prog | Alaska-DNR | McGrath | 6/15-8/15 | 60 days |
| 4 | Alaska-AFS | Ft. Yukon | 7/01-9/01 | 60 days |
| 7 | Alaska-AFS | Tanana | 7/01-9/01 | 60 days |
| Base Prog | Alaska-AFS | Galena | 7/01-9/01 | 60 days |

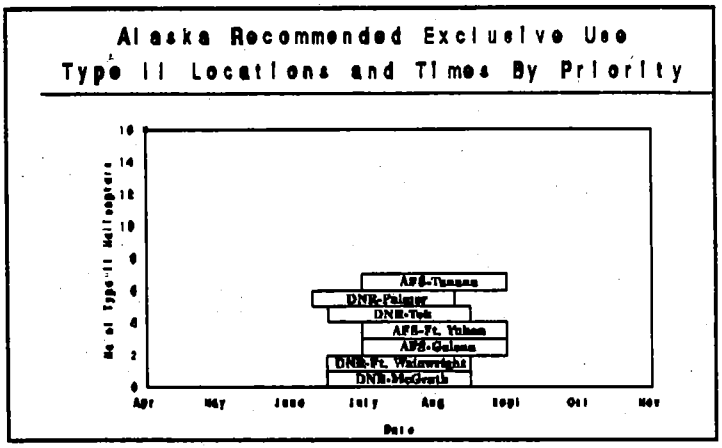
The projected one-time cost for the Alaska DNR is $118,000, the annual Helitack Staff costs is $43,200, and the annual helicopter cost is $930,560. The projected one-time costs for the AFS is $88,500, the annual Helitack Staff costs is $34,500, and the annual helicopter cost is $750,069.




Funding of daily availability is recommended using the following formula which is developed using the information previously presented.

AFS - 49.9% DNR - 50.1%





Costs to implement the recommendations include one-time costs for helibase improvements, one-time costs for equipment and supplies, staffing costs and helicopter contract costs.

LOWER 48 TYPE I AND II RECOMMENDATIONS

| LOWER 48 - TYPE I Region | Location | ----One-Time---- Base | Equip/Supp. | Helicopter Contract | Helitak Staff |
|---|---|---|---|---|---|
| National | Boise (AS 332L) | $ 0 | $27,000 | $720,900 | $51,800 |
| National | Boise (BV-234) | $ 0 | $27,000 | $1,064,900 | $28,300 |

| LOWER 48 - TYPE II Region | Location | ----One-Time---- Base | Equip/Supp. | Helicopter Contract | Helitak Staff |
|---|---|---|---|---|---|
| Southwest | Albuquerque | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific SW | Angeles NF | $ 3,500 | $27,000 | $246,000 | $60,300 |
| Southwest | Prescott | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific SW | Los Padres NF | $18,500 | $27,000 | $246,000 | $60,300 |
| Inter | Boise | $10,000 | $27,000 | $246,000 | $60,300 |
| Inter | Challis | $10,000 | $27,000 | $246,000 | $60,300 |
| Inter | Reno | $10,000 | $27,000 | $246,000 | $60,300 |
| Inter | Salt lake | $25,000 | $27,000 | $246,000 | $60,300 |
| Inter | McCall | $10,000 | $27,000 | $246,000 | $60,300 |
| Northern | Dillon | $25,000 | $27,000 | $246,000 | $60,300 |
| Pacific NW | LaGrande | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific NW | Klamath Falls | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific NW | Wenatchee | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific NW | Redmond | $10,000 | $27,000 | $246,000 | $60,300 |
| Pacific SW | Sacramento | $10,000 | $27,000 | $246,000 | $60,300 |

ALASKA TYPE II RECOMMENDATIONS

| ALASKA - TYPE II Region | Location | ----One-Time---- Base | Equip/Supp. | Helicopter Contract | Helitak Staff |
|---|---|---|---|---|---|
| Alaska-DNR | Palmer | $ 2,500 | $27,000 | $232,640 | $10,800 |
| Alaska-AFS | Ft. Yukon | $ 2,500 | $27,000 | $250,023 | $11,500 |
| Alaska-AFS | Tanana | $ 2,500 | $27,000 | $250,023 | $11,500 |
| Alaska-DNR | McGrath | $ 2,500 | $27,000 | $232,640 | $10,800 |
| Alaska-DNR | Ft. Wainwright | $ 2,500 | $27,000 | $232,640 | $10,800 |
| Alaska-DNR | Tok | $ 2,500 | $27,000 | $232,640 | $10,800 |
| Alaska-AFS | Galena | $ 2,500 | $27,000 | $250,023 | $11,500 |

## All Governments

In the first year of implementation, the net saving to all governments will be $4,604,000 - $793,500 (One-Time Costs) = $3,801,500. Each year after the first, the annual net savings will be $4,604.000.

The committee further recommends that:

1. The mission of National Shared Type I and II helicopters will be the support of extended attack and escaped fire suppression. Local initial attack missions may be undertaken but full consideration will be given to higher priority requests and appropriate protocol notifications. These National Shared Type I and II helicopters should be nationally predesignated and shared by all Agencies and Regions. These forces must meet national standards and provide cost efficient reinforcement of local and area forces in wildfire emergencies.

2. Management modules should be the responsibility of Geographic Areas to staff and manage. Even if no exclusive use helicopters are procured, there is a need to fund the management-module for CWN ships. This is a very needed emphasis item.

3. The exclusive use helicopters are National resources and should be managed using the same guidelines as for Type I crews.

4. Information contained in this study report be included in training courses as appropriate.

5. Annually create a roster of helicopters available on contract. Make this roster specific to aircraft number. Display the equipped weight of each helicopter and allowable payloads under standard conditions. Provide this roster to dispatchers. (See example in Appendix B)

6. When resource orders for helicopters are placed, incident personnel should provide the following information: ICS type, standard or limited, operating elevation of the incident or project, and an expression of the intended use. Have National Helicopter Operations Specialists, NICC and Geographic Area Coordinator select a work group to develop a simple format for this information. Include this format in Support Dispatcher (D-310) training and Air Operations training courses.

7. The National Shared Forces Task Force market the final report to important target audiences. The information in the study report needs to be transferred to effected publics. The target audiences are as follows:

| | |
|---|---|
| Forest Service | - National Shared Forces Task Force<br>- National Fire and Aviation Directors<br>- Geographic Area Coordinators<br>- Regional Fire Planners<br>- Regional Budget Coordinators<br>- National and Area Incident Commanders<br>- National and Area Operations Section Chiefs<br>- Fire Training Courses - National (SLAM, FMAA), Regional<br>- Regional and Forest Fire Operations Leaders<br>- National Contracting |
| Alaska | - Alaska Multi-Agency Coordinating Group |
| Other Federal | - National Fire Directors (BIFC)<br>- Regional (State) Fire Directors<br>- National and Regional Meetings<br>- National Contracting<br>- Office of Aircraft Services |

| | |
|---|---|
| States | - Western States Fire Management Council<br>- Local contacts by Federal Regional personnel |
| Industry | - Helicopter Association International Annual Meeting<br>- BIFC brief interest individuals |

## FUTURE STUDIES

The main product provided from this study are two computer models to simulate demand and evaluate cost efficiency. All model require data input. The ease by which these models can process information makes it easy to test assumptions and rerun the analysis when assumptions change. The manager is encouraged to play the "what-if" game. The committee feels that future studies can utilize these two models with updated information. In fact, this can be an ongoing management tool to aid in the decision to advertise for exclusive use helicopters. It could even be used at contract evaluation to determine if the solicited bids still support the advertised number of helicopters.

This study only studied the use of Type I and II helicopters for extended attack and support of escaped wildfires. If a total interdisclipinary use of Type I/II helicopters occurred within the Forest Service and/or on an interagency basis, a different recommended alternative might result. This type of analysis should occur.

Some data needed is not available, is not precise enough, or is not easily available. This should be corrected to benefit future studies. Better record keeping is critical in the resource tracking area. Cost information was readily available for activities contracted for in the past.

## TECHNOLOGICAL CHANGES EXPECTED NOW AND IN THE FUTURE

There will continue to be a need to evaluate new technology relating to helicopters. The helicopter industry is currently working on several ideas that have potential to affect wildland fire applications.

A 2,000 gallon, snorkel fill, belly mounted water/foam/retardant tank has been developed by that Erikson for the S-64. This could have significant impacts on the air tanker program. Large helicopters are much more accurate and can deliver retardant, water and/or foam much more efficiently and economically than air tankers as long as a water/retardant source is reasonably close.

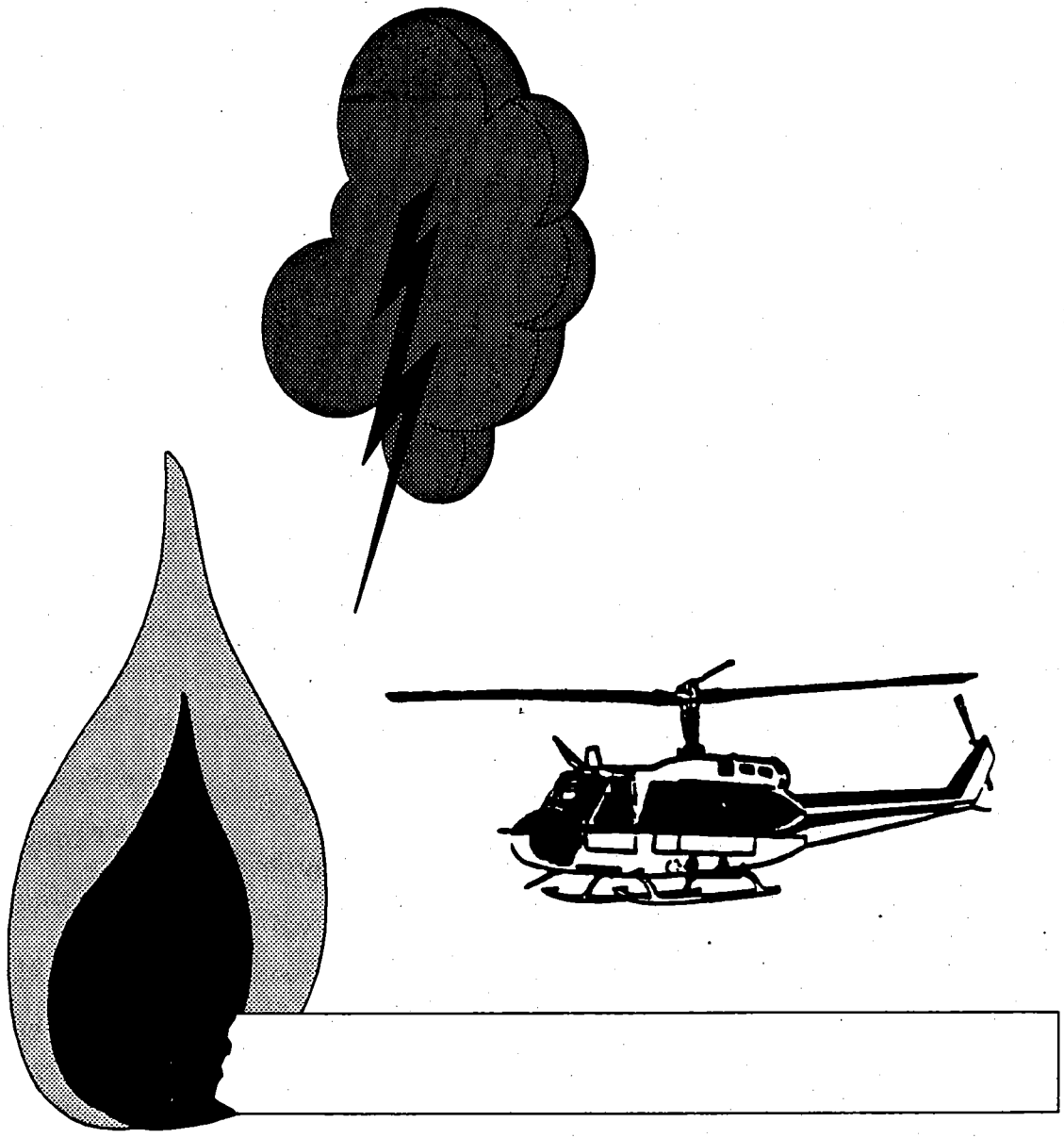
Bell Helicopters is in the final stages of certifying the 206L-4 helicopter which is an upgraded 206L-3, giving additional capability to this aircraft. The added capability may allow this Type III aircraft to fill all six seats at higher density altitudes, outperforming some of the less powerful Type II helicopters.

The Kaman Helicopter Company has developed a new helicopter, the "K-MAX Airtruck". It is a single pilot with no passenger seats but a heavy lift, utility helicopter. This appears to be an excellent high altitude performer that has some real application for a external load helicopter. Certification should be forthcoming soon.

Some helicopter contractors have FAA approved modifications installed on their aircraft that have improved their performance. Larger engines, transmissions, rotor systems, etc. This type of "after market" innovation will most likely continue, benefiting our program.

These types of improvements and innovations will undoubtedly continue. The Forest Service aviation community stays abreast of most new technology through periodicals, the Helicopter Association Internationals annual convention and direct contact with contractors who supply helicopters. A Helicopter Delivery Systems Performance workshop was held in Salt Lake City in May of 1992. The objective of the workshop was to develop a research and development plan and evaluation of water/foam/retardant helicopter delivery systems. Outputs from this program could affect helicopter use in the future.

A valuable source of technology is the military. This technology is mainly in the form of new aircraft development than "bells and whistles" that apply to wildland fire fighting. A primary military helicopter application is personnel and equipment movement to remote locations. This is very similar to wildland firefighting's primary missions. An example is the "Huey" helicopter series that was developed as a troop transport helicopter during the Viet Nam War. This is still one of the most common utility helicopters in the world today, and one that wildland fire agencies use on a regular basis, (Bell 204, 205, 212, 412). The next generation military utility helicopter is the UH-60 (black hawk). This twin engine 14 passenger helicopter could make an excellent wildland fire helicopter. The current expense and lack of civilian availability has made access poor, however, in the future, wildland firefighting agencies most likely will be using the UH-60 for natural resource work.



# APPENDIX

# *Appendix A*

# *Committee Membership*

Appendix A - Committee Membership List
National Shared Services Type I/II Helicopter Study
Committee Membership
April 24, 1992

Pete Buenau
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National Shared Services Type I/II Helicopter Study
Committee Membership

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# *Appendix B*

# *Information Gathered and Replys from Regions*

Letter to Regions Requesting Information

**United States Department of Agriculture** | **Forest Service** | **Washington Office** | **12th & Independence SW P.O. Box 96090 Washington, DC 20090-6090**

**Reply to:** 5100 **Date:** February 6, 1992

**Subject:** National Type I/II Helicopter Study

**To:** Regional Foresters, Station Directors, and Area Director

**REPLY DUE BY MARCH 9**

Since 1986, Type I and II helicopters have been used at an increasing rate on escaped wildfires. The number of filled resource orders has varied from 54 to 198. Currently, the trend indicates an expected average of 120-130 filled resource requests per year with an annual increase of 5-10 percent. In 1990, a National Task Force on Shared Resources recommended that a National study be conducted to address this need. On November 21, 1991, a 5100 letter was sent to you from the WO documenting the initiation of this study. The study team met in Boise, Idaho, on January 14-16, 1992, with the primary objective being to develop a study methodology and to identify information needed to conduct analysis. I am requesting information needed by the study team.

The study team identified ten areas where data needed to be collected to support analysis. For each area, the purpose, data needed, data sources, and responsible committee person was identified. In many cases, information can be gathered from National data bases and reports. For four of the areas, information is best obtained regionally using data bases, reports, and professional judgment. Please respond with information requested in the following areas. The study is interagency in nature. The committee has requested that each Region solicit information from other Federal and State agencies within your regional boundaries. The study team realizes this places an additional impact on existing workloads and wishes to thank you in advance for your efforts.

Please respond to the following four items by March 9, 1992:

1. Deployment of Type I/II Helicopters on Incidents

The purpose is to determine how Type I/II helicopters are used on escaped fire incidents. Please identify 2-4 fires, size class D or larger, which have occurred within the last 2 years where helicopter use is representative of escaped fire use regionally. It would be very beneficial if 1-2 of these representative incidents are non-Forest Service including State. Region 10 only needs to report Forest Service data, if available, as Bud Graham, State of Alaska, will gather information for the rest of Alaska. The study team wishes to study in depth, 15-20 incidents nationally. These results will be applied nationally using an appropriate scaling factor based on the total number of large fire incidents nationally. For each incident identified, please provide the following for each Type I/II helicopter assigned to the incident.

Data:
a) Incident fire report (5100-29 or equivalent)
b) Helicopter N number, make, model and contractor
c) Duration of commitment
d) Hours of unavailability
e) Mobilization time from incident order to arrival at incident for both helicopters and the management module
f) Utilization (Percent of time actually used)
g) Cost and economic effect of use on incident
h) Name and phone of Air Operations Director on the incident
i) Hours of use by type of work below

| Wildfire Tactical Use | Wildfire Logistical Use |
|---|---|
| Aerial intelligence | Internal |
| Aerial ignition | External-longline |
| Crew movement | External-shortline |
| Assigned IA support | Medivac |
| Repelling | Spike camp support |
| Bucket use - water | Radio/RAWS support |
| Bucket use - foam | |
| Bucket use - retardant | |
| Infrared | |

Data Sources:
a) Resource orders for representative sample of incidents using Type I/II helicopters
b) Form 6500-122's for actual fire assignments
c) ICS-209 forms and air operations plans for individual incidents
d) Air Operations Director and other personnel on the incident

Responsible Committee Member: Joe Stutler, Lower 48, and Bud Graham for Alaska including National Guard.

2. Personnel Qualified to Support Helicopter Operations

The purpose is to determine the number and location by Region of personnel qualified and reasonably available to support Type I/II helicopters in wildfire assignments. Please respond with the following data for all agencies/States within your Region.

Data:
a) Number of qualified Type I/II helicopters managers and support personnel by Region
b) Number of qualified Type I/II helicopters managers and support personnel identified in a) that are reasonably available.
c) Number of individuals hired currently on WAE or greater appointments whose main job is to manage CWN helicopters

Data Sources:
a) Fire qualifications system
b) Regional helicopter specialists by agency

Responsible Committee Members: Joe Stutler and Roy Johnson

3. Fire Season Severity and Determination of the Time-Length of Season to Staff

The purpose is to determine historic patterns of fire season severity by Region for staffing, season time and length estimation as well as a possible predicative model to determine most likely location for seasonal pre-positioning of Type I/II helicopters. Please respond with the following data for all agencies/States within your Region.

Data: a) Historical season timing and length for critical period when Type I/II helicopter support of extended attack and escaped wildfires is needed

Data Sources:
a) National Fire Weather Data Library in KC
b) National Fire Occurrence Data Library
c) NIFC and Regional fire reports
d) Professional Judgment

Responsible Committee Member: Larry Hindman

4. Locations of Potential Home Bases

The purpose is to determine current logistical support capability as well as Regional preference on the location of Type II helicopters. Please respond with the following data for all agencies/States within your Region.

Data:
a) Regional preference in priority order for location of Type II helicopters to support extended attack and escaped wildfires.
b) Regional preference in priority order for location of Type I helicopters to support extended attack and escaped wildfires.
b) Reasons for the information gathered in a) and b).
c) Capital investment costs needed to bring physical plants to a standard to support a Type I/II helicopters

Data Sources: Regional data sources and professional judgment

Responsible Committee Member: Larry Hindman

If you have questions on a particular item, please feel free to contact the committee member responsible for that area. Enclosed is a list of current committee members. Please also feel free to contact any committee member to express information and/or concerns you wish considered in the study. All information requests are an impact, and we have carefully weighed the information needed against this impact, minimizing it as much as possible. Please send your reply to Don Carlton, PNW Regional Office, by **March 9, 1992.**

/s/ L. A. Amicarella

L. A. AMICARELLA, Director
Fire and Aviation Management

Enclosures

cc: Steve Pedigo
Dick Stauber, BIFC
Don Carlton, R6

Following is a summary of the FINDINGS from the request to Regions for information as well as information gathers as assigned by committee members.

I. Scope of Use

Purpose: Determine the extent that Type I/II helicopters have been used to support escaped wildfire suppression including simultaneous use.

Data:
a) Number of Type I/II helicopters used on incidents
b) Dates of Use
c) State where used
d) Size class of incident using helicopter
e) Who was the requesting agency

Data Sources:
a) NIFC annual reports for 1986-89
b) NIFC master helicopter listing (FES data base) for 1989-91
c) Severity-funded helicopter use records

Responsibility: Neil Hitchcock with initial assistance from Jim Brain

FINDINGS:

The utilization of Type I & II helicopters on incidents has remained steady in the past 5 years. For the most part, this resource has been available through a call-when-needed contracting method although some areas, primarily California, have maintained exclusive use contracts. Helicopters procured using exclusive use contracts have primary initial attack responsibilities and are validated in the NFMAS process.

By far, the primary need for these type of helicopters is in large fire support. Records for the past three years, show extensive exclusive use on size class "C" fires or greater. Peak utilization occurs at the time when large fires are most likely to occur, generally June through September in the western United States. The primary user is the Forest Service, although other federal and state agencies have also requested this capability. The following table was developed using dispatch information from Appendix F.

| | AGENCY | NO DISP'S | NO DAYS | AGENCY PERCENT DAYS | STATE OR DEPARTMENT PERCENT DAYS |
|---|---|---|---|---|---|
| LOWER 48 FEDERAL | USDA-FS | 430 | 2955 | 72.86% | 72.86% |
| | USDI-BLM | 68 | 456 | 11.24% | |
| | USDI-NPS | 35 | 198 | 4.88% | |
| | USDI-FWS | 23 | 270 | 6.66% | |
| | USDI-BIA | 4 | 8 | 0.20% | |
| | USDI-SUBTOTAL | 130 | 932 | | 22.98% |
| | NICC | 12 | 36 | 0.89% | 0.89% |
| LOWER 48 STATES | IDAHO | 3 | 18 | 0.44% | |
| | MONTANA | 4 | 23 | 0.57% | |
| | OREGON | 4 | 20 | 0.49% | |
| | UTAH | 2 | 8 | 0.20% | |
| | CALIFORNIA | 21 | 64 | 1.58% | |
| | STATE-SUBTOTALS | 34 | 133 | 3.28% | 3.28% |
| LOWER 48 TOTALS | | 572 | 4056 | 100.00% | 100.00% |

| | AGENCY | NO DISP'S | NO DAYS | AGENCY PERCENT DAYS |
|---|---|---|---|---|
| ALASKA | AFS | 36 | 393 | 49.87% |
| | DNR | 29 | 395 | 50.13% |
| ALASKA | TOTALS | 65 | 788 | 100.00% |

The data in Appendix F shows utilization that was documented at the National Interagency Coordination Center (NICC) at BIFC and Regional Coordination Centers. NICC is the ordering dispatch for call-when-needed type I & II helicopters. (Helicopters normally based in Alaska are mobilized directly by agencies there. Should the agencies require resources from outside Alaska, they order them from NICC.) The dispatch record shows initial requests and demobilization dates, but not other assignments that might have occurred in the area where the helicopter was assigned. Geographic areas may utilize resources without notifying BIFC when it is under the area's control. The data is as complete as time permitted during the study.

Utilization of type I & II helicopters will continue to be common practice in large fire support operations. This is particularly true in Alaska where all support is essentially aviation dependent. Availability has been fairly good over the past five years, although on occasion the wildland fire community has been forced to request military equipment. In the past three years, the Federal agencies have used exclusive use contracts to staff Type II helicopters in the western states. The major benefit of these contracts was improved mobilization times. Typical duration of use fluctuates from single days to greater than 30 days. This fluctuation makes the investment in a large number of formal contracts a bit more risky, especially during slow seasons.

A detailed listing of resource orders for 1989, 1990, and 1991 are in Appendix F. Graphs of this use are contained in the main body of the report and Appendix C.

## II. Deployment of Type I/II Helicopters on an Incident

Purpose: Determine how Type I/II helicopters are used on escaped fire incidents.

Data:
a) Duration of commitment
b) Mobilization time from incident order to arrival at incident for both helicopters and the management module
c) Utilization (Percent of time actually used)
d) Cost and economic effect of use on incident
e) Hours of use by type of work below

| Wildfire Tactical Use | Wildfire Logistical Use | Non-Wildfire Administrative Use |
|---|---|---|
| Aerial intelligence | Internal | VIP flights |
| Aerial ignition | External-longline | Search and Rescue |
| Crew movement | External-shortline | Law enforcement |
| Assigned IA support | Medivac | Natural disasters |
| Repelling | Spike camp support | Other resource work |
| Bucket use - water | Radio/RAWS support | Other non-fire |
| Bucket use - foam | | |
| Bucket use - retardant | | |
| Infrared | | |

Data Sources:
a) Resource orders for representative sample of incidents using Type I/II helicopters
b) Form 6500-122's for actual fire assignments
c) ICS-209 forms and air operations plans for individual incidents
d) National data bases and Regional data request

Responsibility: Jerry Vice, Lower 48, and Pete Buenau for Alaska including National Guard

FINDINGS:

Analyzing data from Regional responses yielded the information documented in the following tables for how helicopters were used on fires.

Hours of Use for Type I Helicopters By Activity
For Selected Fires In The Lower 48 States - 1989-1991

| REG | INCIDENT | START | DAYS | MODEL | REC PERS ON | TRAN | WATER DROP | FOAM DROP | RETARD DROP | INTR CARGO | EXT CARGO | TOTAL | HR/ DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N | GIRD | 7/16 | 8 | BV107 | | | 54.2 | | | | | 54.2 | 6.8 |
| N | SAND | 8/8 | 4 | S64 | | | 16.0 | | | | | 16.0 | 4.0 |
| N | THOMPSON | 7/18 | 7 | S64 | | | 31.0 | | 12.1 | | | 43.1 | 6.2 |
| N | THOMPSON | 7/19 | 7 | BV107 | | | 5.4 | | 38.8 | | | 44.2 | 6.3 |
| N | THOMPSON | 7/18 | 7 | BV107 | | | 39.8 | | 4.4 | | | 44.2 | 6.3 |
| N | THOMPSON | 7/19 | 18 | BV107 | | | 53.2 | | 21.8 | | | 75.0 | 4.2 |
| N | THOMPSON | 7/21 | 6 | BV107 | | | 28.5 | | 5.3 | | | 33.8 | 5.6 |
| PNW | FALLS | 10/10 | 5 | BV107 | | | 33.6 | | | | 0.4 | 34.0 | 6.8 |
| PNW | FALLS | 10/10 | 4 | BV107 | | | 26.8 | | | | | 26.8 | 6.7 |
| PNW | FALLS | 10/10 | 4 | BV234 | | | 33.8 | | | | | 33.8 | 8.5 |
| PNW | WARNER | 10/15 | 5 | BV107 | | | 14.8 | | | | | 14.8 | 3.0 |
| PNW | WARNER | 10/12 | 10 | BV107 | | | 50.4 | | 6.7 | | 0.5 | 57.6 | 5.8 |
| PNW | WARNER | 10/12 | 7 | BV234 | | | 28.7 | | | | | 28.7 | 4.1 |
| PNW | WAUNA | 10/6 | 3 | BV234 | | | 16.6 | | | | | 16.6 | 5.5 |
| PNW | WAUNA | 10/7 | 3 | BV107 | | | 21.0 | | | | | 21.0 | 7.0 |
| PSW | BALCH | 7/31 | 7 | S61 | | | 37.4 | | | | | 37.4 | 5.3 |
| PSW | STEAMBOAT | 8/11 | 2 | S61 | | | 11.2 | | | | | 11.2 | 5.6 |
| PSW | STEAMBOAT | 8/10 | 13 | S61 | | | 101.7 | | | | 3.7 | 105.4 | 8.1 |
| PSW | STORMEY | 8/8 | 11 | BV234 | | | 7.3 | | 62.4 | | | 69.7 | 6.3 |
| PSW | STORMEY | 8/8 | 11 | S61 | | | 50.3 | | | | | 50.3 | 4.6 |
| PSW | WALKER | 8/7 | 2 | BV234 | | | | | 7.4 | | | 7.4 | 3.7 |
| PSW | WALKER | 8/7 | 4 | BV107 | | | | | 28.9 | | | 28.9 | 7.2 |
| PSW | WALKER | 8/7 | 10 | S64 | | | 7.8 | | 9.9 | | 0.4 | 18.1 | 1.8 |
| RM | SWEDLAND | 9/13 | 3 | BV107 | | | 21.2 | | | | | 21.2 | 7.1 |
| SW | DUDE | 6/26 | 6 | S-64 | | | 10.9 | | | | | 10.9 | 1.8 |
| SW | DUDE | 6/27 | 11 | BV107 | | | 30.0 | 2.8 | 22.8 | | | 55.6 | 5.1 |
| SW | DUDE | 6/29 | 5 | S61 | | | | 9.8 | | | | 9.8 | 2.0 |
| SW | DUDE | 6/30 | 2 | S61 | | | 6.0 | | | | | 6.0 | 3.0 |
| SW | DUDE | 7/1 | 3 | BV107 | | | 24.2 | | | | | 24.2 | 8.1 |
| | TOTAL | | 188 | | 0.0 | 0.0 | 761.8 | 12.6 | 220.5 | 0.0 | 5.0 | 999.9 | 5.3 |
| | | | | | | | | | | | | Economic Average = | 5.4 |

Contacts require a minimum payment of 4.0 hours of flight time per day. The economic average of 5.4 hours of pay per day was obtained by substituting a 4.0 hours for those days when less than 4.0 hours were flown and computing a new average.

## Hours of Use for Type II Helicopters By Activity
## For Selected Fires In Alaska and the Lower 48 States - 1989-1991

| REG | INCIDENT | START | DAYS | MODEL | REC ON | PERS TRAN | WATER DROP | FOAM DROP | RETARD DROP | INTR CARGO | EXT CARGO | TOTAL | HR/ DAY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AKAFSB-460 | | 7/2 | 5 | 212 | | 10.0 | | | | 3.0 | | 13.0 | 2.6 |
| AKAFSB-460 | | 7/4 | 23 | 212 | | 64.0 | 20.0 | | | 18.0 | 63.0 | 165.0 | 7.2 |
| AKAFSB-460 | | 7/4 | 21 | 212 | | 50.0 | 15.0 | | | 18.0 | 21.0 | 104.0 | 5.0 |
| AKAFSB-460 | | 7/4 | 11 | 212 | | 13.0 | | | | 7.0 | 8.0 | 28.0 | 2.5 |
| AKAFSB-460 | | 7/10 | 1 | 212 | | 5.0 | | | | 1.0 | 1.0 | 7.0 | 7.0 |
| AKAFSB-460 | | 7/11 | 12 | 212 | | 51.0 | 3.0 | | | 19.0 | 11.0 | 84.0 | 7.0 |
| AKAFSB-460 | | 7/23 | 7 | 212 | | 16.0 | | | | 4.0 | 5.0 | 25.0 | 3.6 |
| AKAFSB-460 | | 7/25 | 5 | 212 | | 8.0 | | | | 4.0 | 2.0 | 14.0 | 2.8 |
| AKDNR011050 | | 5/26 | 11 | 212 | 0.5 | 25.9 | 3.0 | | | 2.0 | 19.0 | 50.4 | 4.6 |
| AKDNR011050 | | 5/28 | 16 | 212 | | 29.5 | 1.5 | | | 3.0 | 23.0 | 57.0 | 3.6 |
| AKDNR011050 | | 5/29 | 8 | 212 | 0.9 | 15.0 | | | | 1.0 | 18.0 | 34.9 | 4.4 |
| ALASKA TOTALS | | | 120 | | 1.4 | 287.4 | 42.5 | 0 | 0 | 80 | 171 | 582.3 | 4.9 |
| | | | | | | | | | | | | Alaska Economic Average = | 5.2 |
| INT | ABC | 8/17 | 1 | S58T | | 0.6 | | | | | | 0.6 | 0.6 |
| INT | BADGER | 8/16 | 5 | 212 | | 6.7 | 17.2 | | | 0.2 | | 24.1 | 4.8 |
| INT | KITCHEN | 8/14 | 14 | 205A-1 | | 23.0 | 29.7 | | | 5.0 | 4.6 | 62.3 | 4.5 |
| INT | KITCHEN | 8/14 | 6 | S58T | | | 20.6 | | | 0.9 | 5.4 | 26.9 | 4.5 |
| INT | KITCHEN | 8/14 | 6 | 212 | 0.6 | 14.6 | 6.2 | | | 0.5 | 0.5 | 22.4 | 3.7 |
| INT | KITCHEN | 8/15 | 5 | 412 | | 6.3 | 13.9 | | | | 3.0 | 23.2 | 4.6 |
| INT | MCKIM | 8/26 | 4 | 212 | | 11.1 | 9.2 | | | 0.9 | 1.1 | 22.3 | 5.6 |
| INT | MCKIM | 8/25 | 15 | 212 | | 25.7 | 32.6 | | | | 18.2 | 76.5 | 5.1 |
| INT | MCKIM | 8/25 | 6 | 212 | | 14.9 | 2.1 | | | | 15.6 | 32.6 | 5.4 |
| INT | YELLOW | 8/13 | 3 | S58T | | 5.8 | 4.7 | | | 5.1 | | 15.6 | 5.2 |
| INT | YELLOW | 8/10 | 11 | 212 | | 15.4 | | | | 5.9 | | 21.3 | 1.9 |
| N | GAME | 10/13 | 5 | KAMAN | | | 20.4 | | | | | 20.4 | 4.1 |
| N | GAME | 10/13 | 4 | 212 | | 1.0 | 17.6 | | | | | 18.6 | 4.7 |
| N | GAME | 10/12 | 3 | 212 | | | 4.6 | | | | | 4.6 | 1.5 |
| N | GIRD | 7/18 | 9 | 212 | | 13.6 | 18.8 | | | | 5.4 | 37.8 | 4.2 |
| N | GIRD | 7/16 | 9 | 204 | | 9.1 | 20.2 | | | | | 29.3 | 3.3 |
| N | SAND | 8/8 | 5 | S58T | | 7.5 | | | | | | 7.5 | 1.5 |
| N | SAND | 8/13 | 1 | S58T | | 1.3 | | | | | | 1.3 | 1.3 |
| N | THOMPSON | 7/18 | 9 | 204 | | 20.1 | 2.7 | | | 10.7 | | 33.5 | 3.7 |
| N | THOMPSON | 7/17 | 19 | 412 | | 58.4 | 14.8 | | | 2.4 | | 75.6 | 4.0 |
| N | THOMPSON | 7/18 | 9 | S58T | | 26.7 | 3.4 | | 3.0 | 7.7 | | 40.8 | 4.5 |
| N | THOMPSON | 7/18 | 57 | 204 | | 100.3 | 30.9 | | | 32.7 | | 163.9 | 2.9 |
| N | THOMPSON | 7/18 | 8 | 212 | | 37.5 | 8.3 | | | | 5.0 | 50.8 | 6.4 |
| N | THOMPSON | 7/24 | 2 | 212 | | 5.5 | | | | | | 5.5 | 2.8 |
| PNW | FALLS | 10/10 | 8 | 212 | 1.2 | | 29.8 | | | | | 31.0 | 3.9 |
| PNW | FALLS | 10/10 | 5 | 205 | | | 23.9 | | | | | 23.9 | 4.8 |
| PNW | WARNER | 10/16 | 1 | 205 | | | 3.1 | | | | | 3.1 | 3.1 |
| PNW | WARNER | 10/11 | 4 | 205 | | | 26.4 | | | | 0.6 | 27.0 | 6.8 |
| PNW | WAUNA | 10/6 | 3 | 205 | | 1.5 | 18.9 | | | | | 20.4 | 6.8 |
| PNW | WAUNA | 10/8 | 1 | 205 | | | 1.1 | | | 1.2 | | 2.3 | 2.3 |
| PNW | WAUNA | 10/6 | 9 | 205 | | 0.9 | 32.5 | | | | 1.6 | 35.0 | 3.9 |
| PSW | AROCK | 8/7 | 7 | 212 | | 10.2 | 18.1 | | | 3.2 | | 31.5 | 4.5 |
| PSW | BALCH | 8/3 | 7 | S55T | | 10.4 | 7.0 | | | 8.0 | | 25.4 | 3.6 |
| PSW | PIUTE | 8/15 | 9 | 212 | | 14.1 | 10.3 | | | 4.1 | | 28.5 | 3.2 |
| RM | SWEDLAND | 9/13 | 4 | 212 | | | 21.9 | | | | | 21.9 | 5.5 |
| S | MITCHELL | 7/9 | 9 | S58T | | 23.4 | 11.8 | | | | | 35.2 | 3.9 |
| S | MITCHELL | 7/11 | 11 | 204 | 1.1 | 1.1 | 6.6 | 6.7 | | 1.1 | 4.4 | 21.0 | 1.9 |
| S | POL HOW | 10/26 | 16 | S58T | 2.2 | | 23.9 | 11.4 | | | | 37.5 | 2.3 |
| S | POL HOW | 10/28 | 8 | S58T | 3.9 | | 9.6 | 1.1 | | | | 14.6 | 1.8 |
| S | REDBIRD | 10/25 | 11 | 212 | 0.5 | | 1.5 | 1.0 | | | | 3.0 | 0.3 |
| S | UNAKA | 10/26 | 12 | S58T | | | 13.2 | 8.8 | | | | 22.0 | 1.8 |
| SW | DUDE | 6/26 | 6 | 212 | | 2.5 | 47.8 | | | | | 50.3 | 8.4 |
| LOWER 48 TOTALS | | | 347 | | 9.5 | 469.2 | 585.3 | 29 | 3 | 89.6 | 65.4 | 1251 | 3.6 |
| | | | | | | | | | | | | Lower 28 Economic Average = | 3.7 |

Analyzing data from Appendix F and from Regional responses yielded the information documented in the following tables on the duration of commitment for a helicopter when dispatched to an incident.

TYPE I HELICOPTERS
DAYS OF USE

| Fire Size Class--> | C | D | E | F | G | AVERAGE |
|---|---|---|---|---|---|---|
| Average--> | 6.3 | 3.8 | 6.6 | 7.4 | 8.5 | 7.0 |
| 50th Percentile--> | 4.0 | 2.5 | 5.0 | 4.5 | 6.3 | 5.0 |

TYPE II HELICOPTERS
DAYS OF USE

| Fire Size Class--> | C | D | E | F | G | AVERAGE |
|---|---|---|---|---|---|---|
| Average--> | 10.1 | 6.3 | 7.3 | 7.6 | 11.4 | 8.1 |
| 50th Percentile--> | 5.3 | 5.3 | 4.8 | 6.1 | 9.1 | 6.3 |

With both Type I and II helicopters, the average was skewed to the right of the 50th percentile due to a low frequency of days with a long commitment. For Type I helicopters, 15 dispatches had a commitment of 10 days for more and 2 were for 23 days. For Type II, 18 dispatches had a commitment for more than 20 days with 3 individual commitments for 32, 35 and 37 days.

## Helicopter Mobilization Time

### TYPE I HELICOPTERS

Northern---------17 hours average mobilization time per request.
Rocky Mt.--------17 hours average mobilization time per request.
Intermountain----21 hours average mobilization time per request.
Pacific SW-------14 hours average mobilization time per request.
Pacific NW------- 7 3/4 hours average mobilization time per request.

### TYPE II HELICOPTERS

Northern---------16.8 hours average mobilization time per request.
Rocky Mt.--------24.6 hours average mobilization time per request.
Intermountain----14.8 hours average mobilization time per request.
Pacific SW-------14 hours average mobilization time per request.
Pacific NW------- 5.1 hours average mobilization time per request.
Southern--------- 9.5 hours average mobilization time per request.

## Helicopter Module Mobilization Time

### TYPE 1 MODULE(S)

Northern---------17.1 hours average mobilization time per request
Intermountain----21 hours mobilization time per request
Pacific NW------- 7 3/4 hours mobilization time per request

### TYPE II MODULES

Northern---------18.5 hours mobilization time per request
Intermountain----14.8 hours mobilization time per request
Southern---------12.6 hours mobilization time per request

## Hours Of Unavailability

Because of the structure of the National CWN contracts,unavailability is not tracked. CWN National helicopters have a guaranteed daily availability rate equal to 2-3 hours of their flight rate. If they are unavailable for flight because of mechanical or contractor related reasons they simply receive no revenue for the period they are unavailable.

III. Personnel Qualified to Support Helicopter Operations

Purpose: Determine number and location by Region of personnel qualified and reasonably availability to support Type I/II helicopters in wildfire assignments.

Data:
a) Number of red-carded Type I/II helicopters managers and support personnel by Region
b) Number of individuals hired currently on WAE or greater appointments whose main job is to manage CWN helicopters

Data Sources:
a) Fire qualifications system
b) Regional helicopter specialists by agency (through data request)

Responsibility: Roy Johnson

FINDINGS:

National Type I/II Helicopter Study
Personnel Qualified

| Region | Manager (HEM1 & HEM2) Qualified | Available | Support (HECM) Qualified | Available | Remarks |
|---|---|---|---|---|---|
| 1 | 58 | 17 | 132 | 33 | 4 primary (25% Avail.) |
| 2 | 15 | 15 | 0 | 0 | |
| 3 | No Report | | | | |
| 4 | 44 | 6 | 120 | 20 | 1 primary |
| 5 | 35 | 17 | 35 | 17 | |
| 6 | 90 | 45 | 190 | 90 | |
| 8 | 20 | 10 | 60 | 30 | |
| 9 | 27 | 27 | 27 | 27 | |
| 10 | 8 | 8 | 0 | 0 | |
| AFS | 41 | 15 | 0 | 0 | |
| Alaska DNR | 58 | 15 | 0 | 0 | |
| NE Area | 10 | 3 | 0 | 0 | |
| Total | 406 | 192 | 570 | 193 | 5 primary |
| Percent | 47% | | 34% | 1.5% | |

Interviews with the NIFC Aircraft Desk personnel indicate that they have 150 Type I/II helicopters on contract. However, experience indicates that only 50 Type I/II can be placed in the field at one time. The limiting factors contributing to this situation include aircraft proximity to the incident, vendor's being committed to other jobs, vendor's having many ships under contract for the purpose of ability to exchange with no intent of committing all contacted ships at one time, pilot unavailability, and equipment maintenance.

The availability of helicopter managers and support personnel has not been a significant problem. During times of low activity, only approximately 40-50% of the qualified personnel listed the table above are available. However, when the activity reaches National Preparedness Levels 3, 4 and 5, the availability drops to less than 10%. At the 10% availability level, there are not enough qualified personnel to adequately staff and manage the highest

levels of demand for CWN Type I and II helicopters. The qualified personnel identified are qualified for many positions on a fire. They may be available in the early stages of a fire situation but not within 24-48 hours as they have filled other fire suppression positions.

The safety, efficiency and effectiveness of Type I/II helicopters is directly related to the quality of the helicopter manager and support personnel as they work closely with the aircraft crew. The equipment and support that accompanies the aircraft is also critical.

## IV. NFMAS Generated Shared Resource Needs

Purpose: Identify the extent that Type I/II helicopters are identified in unit NFMAS analysis and currently funded.

Data:
a) Numbers/locations of Type I/II helicopters in MEL program mix and currently funded by agency.
b) Acres burned annually at current funding and at MEL

Data Sources:
a) Washington Office and Regional data requests
b) Regional data request for other agency information
c) FIREBUDGET data base as updated (2/92)

Responsibility: Edy Petrick

FINDINGS:

There were several findings in association with the data collection. They are as follows:

It was decided that 1991 would be used as a benchmark for the data needed. This worked well since numbers of helicopters which were under contract at that time was readily available, as well as cost and use information which is used elsewhere in this study.

Also, data was complete on the numbers of acres actually burned for the time period. A Forest Data base called FIREBUDGET provided numbers of acres anticipated to burn under MEL staffing for the USFS, and BLM had this data as well. Acre burned data for actual 1991 and for NFMAS is found in Table 2. It was decided that the combination of USFS and BLM data would be an adequate sample of expected acres to burn at Most Efficient Level funding.

Collection of data started at the Washington Office, U.S. Forest Service. All available records of shared resources and Type I/II helicopter documentation was requested, as well as summaries of NFMAS database information found in the FIREBUDGET program or in hard copy.

The most helpful information provided was the responses by regions to "5190, Shared Resources, FY 1991, (W.O. Ltr 11/8/91)". This information provided a picture of how many helicopters by type, crew and cost were provided by the regions during FY 91 with presuppression funding. In FY 91, national funding level was at 88% of MEL.

FIREBUDGET printouts provided acres burned anticipated at MEL and total dollars needed by Region at MEL, but did not distinguish dollars or number of helicopters by type for the regional programs. This is because FIREBUDGET is a budget allocation model and tracks only dollars rather than resources.

In order to determine the quantity and type of helicopters that would be provided at MEL, the team decided to canvas the geographical coordination areas. This was, also, an opportunity to request interagency information on all carded ships that would be in the pool of potential resources available.

In order to determine the quantity and type of helicopters that would be provided at MEL, the team decided to canvas the geographical coordination areas. This was, also, an opportunity to request interagency information on all carded ships that would be in the pool of potential resources available. The following questions were asked and the responses were used in Table 1:

1) If you were funded at MEL, how many Type I or II Helicopters would you add to your current level in your Region? This would be the number justified in your NFMAS Database at Forest or Regional levels to be available at MEL.

2) Where would these helicopters be located?

3) What would you consider the drawdown level for sharing these helicopters in a national need situation?

4) How many Type I/II helicopters in your coordination area are interagency carded and available for use on extended attack fires? This would include State, National Guard and other agency ships besides Forest Service. Please indicate by ship if they are restricted in some way, such as can only be used in home state, etc.

Responses as related to NFMAS reflected the latest analyses available. The committee felt this was the best information to use since several Regions had just completed updates in the last six to twelve months. Also, it should be understood that some of the MEL projected needs may be intuitively arrived at by combining operational concerns and experience with NFMAS data available to arrive at the level of implementation needed.

Another source of data added to the table following was information provided by BIFC on the Exclusive Use, CWN and Severity helicopters that were available for 1991.

**TABLE 1.** **SURVEY OF TYPE I/II INTERAGENCY HELICOPTERS AVAIL FY 1992; ALL NUMBERS BELOW REPRESENT TYPE II SHIPS UNLESS OTHERWISE IDENTIFIED.**

| | (1) | | (2) | | (3) | (4) | | |
|---|---|---|---|---|---|---|---|---|
| Geographic Coordination Areas | Presup. & Sever Funded Program | | Program Needs Most Eff Level | | Other Agency Helis Avail (Local Use) | CWN Helicopters TI | TII | |
| | USFS | DOI | USFS | DOI | | | Std. | Ltd. |
| Alaska | 0 | 4 | 0 | 4 | 4-(St of AK) Contract<br>4-(AK Ntl Gd) | 2 | 22 | 0 |
| Subtotal Alaska | 0 | 4 | 0 | 4 | 8 | 2 | 22 | 0 |
| Eastern | 0 | 0 | 1 | 0 | 2-(ME DOF) | 1 | 2 | 0 |
| Intermountn. | 3(S) | 1 | 3 | 1 | 0 | 0 | 3 | 0 |
| Northern | 2(S) | 0 | 0 | 0 | 2-(St of MT)<br>2-(MT Ntl Gd) | 0 | 1 | 0 |
| Pacific NW | 3(S) | 1 | 2 | 1 | 2-(St of WA) | 4 | 3 | 6 |
| Pacific SW | 6(P)<br>3(S) | 2 | 9 | 2 | 11-(CDF)<br>10-(CA Ntl Gd)<br>5- TI (CA Ntl Gd Chinooks)<br>4-(LA County)<br>2-(San Bd Co)<br>4-(Ventura Co | 1 | 6 | 6 |
| Rocky Mtn | 0 | 0 | 1 | 0 | 12-(WY Ntl Gd)<br>6-(SD Ntl Gd)<br>4-(CO Ntl Gd) | 0 | 1 | 0 |
| Southern | 1(P) | 0 | 3 | 0 | 3-(St of NC)<br>2-(St of FL) | 0 | 2 | 1 |
| Southwest | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Subtotal Lower 48 | 7(P)<br>11(S)<br>18 All | 4 | 19 | 4 | 75 | 6 | 18 | 14 |
| Grand Total | 18 | 8 | 19 | 8 | 75 | 8 | 40 | 14 |

1) This data derived from BIFC contract records; (P) Presuppression; (S) Severity.

2) This data derived from Area responses and reflect current needs as determined by NFMAS and/or Operational concerns and expectations. Additional Type II's in Pacific SW, Rocky Mountain, Intermountain and Southern Areas will replace existing Type III's.

3) Availability of State & National Guard helicopters was limited in scope of location and duration of use. State ships were used for initial attack and are critical resources in their local areas. Availability of National Guard was typically limited to periods of emergency declaration.

4) This info taken from 1992 National Helicopter Contract listing per NICC.

TABLE 2-NUMBER OF FIRES & ACRES BURNED CY 91 BY AGENCY AS PER BIFC RECORDS (1)

| Geographic Coordinatn Area | BIA # AC | BLM # AC | FWS # AC | NPS # AC | USFS # AC | STATES # AC | TOTAL # AC |
|---|---|---|---|---|---|---|---|
| Eastern | | | | | 441<br>11006 | 12054<br>458191 | 12495<br>469197 |
| Southern | | | 114<br>9459 | 107<br>7437 | 1203<br>34154 | 38741<br>398125 | 40165<br>449175 |
| Southwest | 958<br>5594 | 192<br>7358 | 11<br>8036 | 157<br>2219 | 1603<br>13446 | 911<br>21041 | 3832<br>57694 |
| Rocky Mtn. | | | | | 521<br>11397 | 1200<br>24926 | 1721<br>36323 |
| Northern | | | | | 1329<br>38181 | 877<br>224388 | 2206<br>262569 |
| Alaska | | | | | 6<br>12 | 446<br>157443 | 452<br>157455 |
| Northwest | 348<br>7516 | 385<br>13636 | 7<br>704 | 36<br>7 | 2051<br>23419 | 2283<br>43487 | 5110<br>88769 |
| California | | | | | 2385<br>10526 | 6529<br>24617 | 8914<br>35143 |
| Intermntn. | | 279<br>82387 | | | 1338<br>31065 | 138<br>7289 | 1755<br>120741 |
| AGENCY (2) | BIA | BLM | FWS | NPS | USFS | STATES | ALL (3) |
| National #- | 2904 | 2037 | 403 | 803 | 10877 | 63179 | 80203 |
| Totals AC- | 107600 | 595234(4) | 783615 | 107540 | 173206(5) | 1359507 | 3126702 |

(1) This information is based on available records for CY 1991 as of 3/25/92, and were provided by BIFC personnel.

(2) Total figures for DOI agencies includes acres that are not shown by geographical area. The additional acres are documented in the national computer database at BIFC and are included here to reflect national program.

(3) This total reflects the additional acres for DOI not shown by Geographical Coordination Area.

(4) Acre Burned Expectations at Most Efficient Level for BLM as per NFMAS is 660 000 total for info available.

(5) Acre Burned Expectations at Most Efficient Level for USFS as per 1991 NFMAS database was 230,000 acres for the national total.

## V. Fire Season Severity and Determination of the Time-Length of Season to Staff

Purpose: Determine historic pattern of fire season severity by Region to be used for staffing season time and length as well as a predictive model to determine most likely location for seasonal pre-positioning of Type I/II helicopters.

Data: a) Seasonal severity pattern (last five years) for each Region using NFDRS outputs, Palmer Drought and large wildfire (size class D or larger) occurrence.

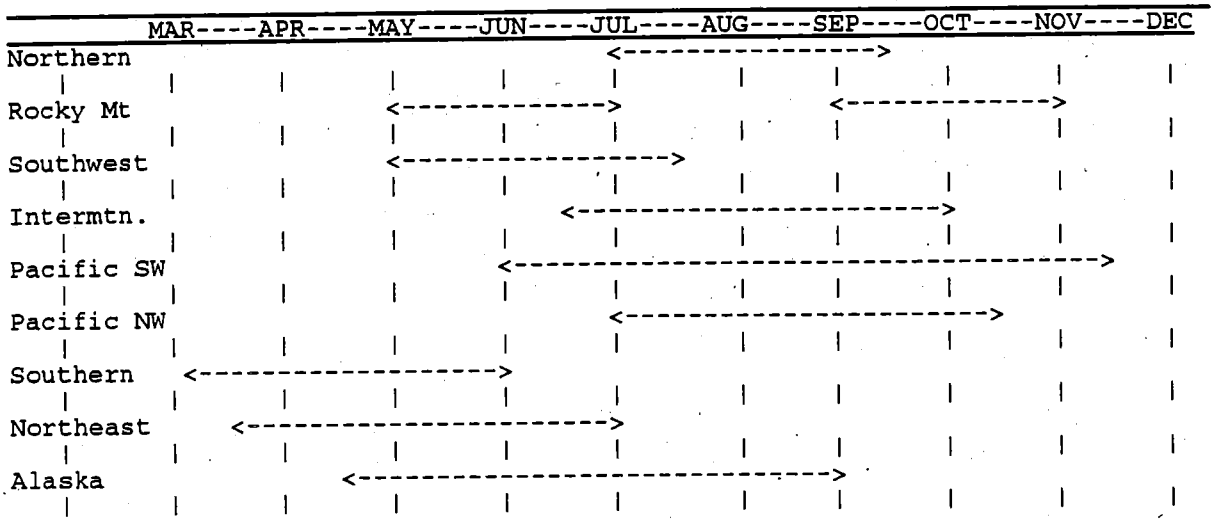
b) Historic season timing and length for critical period when Type I/II helicopter support of extended attack and escaped wildfires is needed

Data Sources:
a) National Fire Weather Data Library in KC
b) National Fire Occurrence Data Library
c) National and Regional fire reports
d) Regional data request

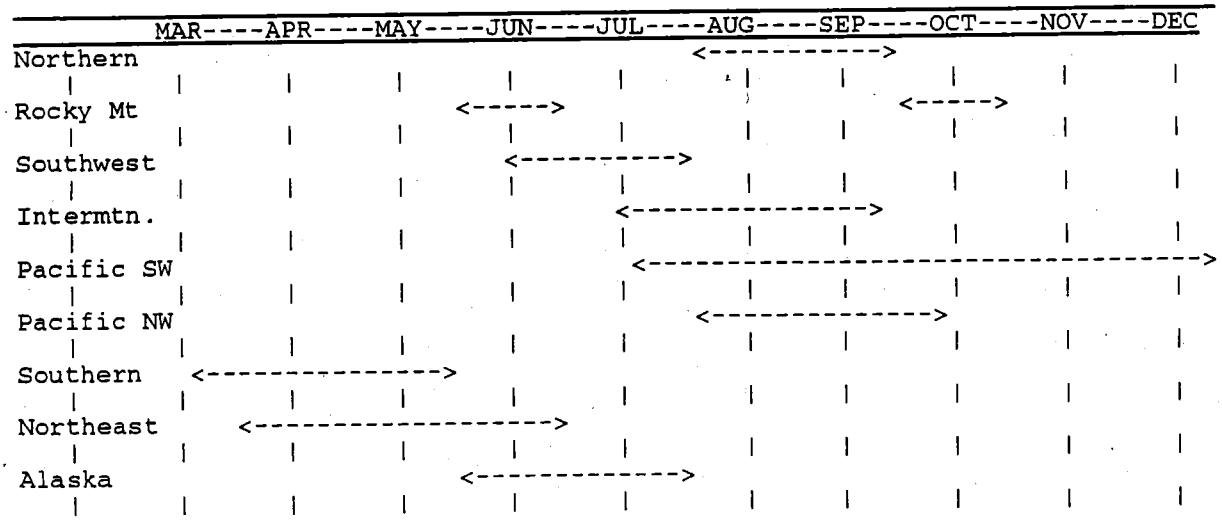
Responsibility: Don Carlton

FINDINGS:

NORMAL PERIOD TO STAFF TYPE I/II HELICOPTERS




CRITICAL TIME PERIOD TO STAFF TYPE I/II HELICOPTERS



## VI. Total Program Costs

Purpose: Determine the costs to acquire, maintain, staff and contract Type I/II helicopters. Data gathered needs to be complete to support all identified procurement and staffing options. It is understood that the following outline will need additional definition provided by the responsible committee members.

Data:
a) Total cost to support individual helicopters by type
b) Overhead costs (inspections, contracting, facilities, etc.)
c) Historic number of Type I/II helicopters contracted and dollars paid
d) Obtain active military MOU and any local National Guard MOU's

Data Sources:
a) Financial records at BIFC
b) Past studies including work done in R-5, states with FEP Type I/II helicopters (CDF, WA., MT.)
c) Other agency National helicopter program officers

Responsibility: Rick Willis, Larry Hindman, and Ty Sindon

FINDINGS:

To fully determine and project program costs for the Type I and Type II helicopter program it is necessary to review historical data in order to determine traditional usage and historic cost data associated with the program. Once historical data has been analyzed and representative costs have been obtained the costs can be extrapolated to predict future costs and to also determine the most cost effective method of obtaining the services.

Type I and Type II helicopters have been used at an increasing rate on escaped wild fires in recent years. Since 1986, the number of filled resource orders have varied from 54 to 198 for the year. Currently, the trend line indicates an expected average of 120 -130 filled resource requests per year with an annual increase of 5 - 10%.

Currently BIFC Contracting (Forest Service and OAS) maintain agreements for over 150 Type I and Type II helicopters. These helicopters are located nationwide, however a majority of the operators are located in the western part of the United States. There are also a few Call-When-Needed Contracts with a number of Canadian firms, however this resource has not received much utilization and foreign registered aircraft are only called when all American based resources have been exhausted.

In addition to aircraft under contract, additional aircraft are available from the various states who operate Federal Excess Property Type I and II helicopters. Some of these cooperators include California Department of Forestry and the States of Washington and Montana. There are also various Memorandum of Understandings (MOU's) with active military and local National Guard units. Current historical cost data or hours of utilization for these additional aircraft are not available and therefore are not a part of this study.

The following Exhibit details contract costs and hours of use for Type I and Type II aircraft under BIFC contract for the past five years:

FLIGHT HOURS

| | 1987 | 1988 | 1989 | 1990 | 1991 | TOTAL |
|---|---|---|---|---|---|---|
| Call-When-Needed* | 4019.3 | 11113.0 | 6678.6 | 7224.0 | 2549.1 | 31584.0 |
| Exclusive Use | 2820.6 | 3867.5 | 4822.1 | 3491.1 | 4674.3 | 19675.6 |
| Severity (CWN) | | | 537.3 | 988.7 | 1538.6 | 3064.1 |
| Total | 6839.9 | 17980.5 | 12038.0 | 11703.8 | 8762.0 | 54342.2 |

DOLLARS SPENT 1987 - 1991 (FLIGHT/AVAILABILITY)

| | 1987 | 1988 | 1989 | 1990 | 1991 | TOTAL |
|---|---|---|---|---|---|---|
| Call-When-Needed | 9034928 | 30271973 | 17040662 | 22722196 | 7138753 | 86208512 |
| Exclusive Use | 3442112 | 4628269 | 7010612 | 5298484 | 7537874 | 27917351 |
| Severity (CWN) | | | 863617 | 1893109 | 3246493 | 6003219 |
| Total | 122472040 | 34900242 | 24914891 | 29913789 | 17923443 | 120129405 |

*Includes Type I and Type II Aircraft

## ONE TIME START UP COSTS FOR AN AGENCY RUN HELITACK CREW

For facilities (land acquisition, engineering and design costs, construction costs) an estimate of **$0 TO $400,000**, depending on site location and facilities already in place is possible. Some locations have existing facilities and organizations in place to deal with an additional helicopter and crew. Other locations with partial or nonexistant facilities and support would have to start from scratch.

Example:

R-1 developed the following costs to construct a permanent helibase at the aerial fire depot in Missoula:

-Earthwork fill and regrading of site---$10,000
-Security fencing and site development--$ 6,000
-Helipad/vehicle access --$12,300 (one pad)
-On site area for support trailer --$40,000
Total $68,300

Administrative support costs are included in the options used in the modeling and shown on the helitack crew cost information sheets.

HELITACK VEHICLE - **$25,000 to $50,000** (This is addition to fleet cost, FOR and mileage are included in vehicle and equipment costs on helitack cost sheets).

EQUIPMENT AND SUPPLIES - _

RADIOS - $3,000
FLIGHT HELMETS - $4,000
EXTERNAL LOAD EQT.(INCLUDING REMOTE HOOK LONG LINE) - $4,000
FIRE FIGHTING EQT. - $4,000
RAPPEL GEAR - $4,000 (optional)
RAPPEL TOWER AT BASE - $6,000 (optional)
MISC. - $2,000

**TOTAL - $17,000 to $27,000**

### ANNUAL HELITACK CREW COSTS AGENCY RUN, 1992 $$

| POSITION | GRADE | TOUR | COST TO GOVERNMENT | SUPPORT COSTS (TVL,TRAINING,ETC) |
|---|---|---|---|---|
| Crew Supervisor | GS-7 | PFT | $30,700 ($1,176/PP) | $1,500 |
| Ast. Crew Super. | GS-6 | WAE 15 PP | $15,600 ($1,040/PP) | $1,000 |
| Lead Crewperson | GS-5 | WAE 13 PP | $13,300 ($1,023/PP) | $ 800 |
| Lead Crewperson | GS-5 | WAE 10 PP | $ 9,900 ($1,000/PP) | $ 800 |
| Crewperson | GS-4 | TEMP 10 PP | $ 6,500 ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 10 PP | $ 6,500 ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 10 PP | $ 6,500 ($ 650/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 10 PP | $ 5,800 ($ 580/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 10 PP | $ 5,800 ($ 580/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 10 PP | $ 5,800 ($ 580/PP) | $ 600 |
| | | TOTAL--> | $106,400 | $7,700 |

VEHICLES AND EQUIPMENT: $8,000

TOTAL INDIRECT COSTS: $30,000

**GRAND TOTAL = $152,150**

These figures were used to establish costs for other staffing options as follows.

**Actual Budgetary Costs For 10 Person Crew for 90 day contract**

| POSITION | GRADE | TOUR | COST TO GOVERNMENT | SUPPORT COSTS (TVL,TRAINING,ETC) |
|---|---|---|---|---|
| Crew Supervisor | GS-7 | WAE 18 PP | $21,175 ($1,176/PP) | $1,500 |
| Ast. Crew Super. | GS-6 | WAE 13 PP | $13,520 ($1,040/PP) | $1,000 |
| Lead Crewperson | GS-5 | WAE 13 PP | $12,870 ($ 990/PP) | $ 800 |
| Lead Crewperson | GS-5 | TEMP 10 PP | $ 9,000 ($1,000/PP) | $ 800 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 ($ 650/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 7 PP | $ 4,060 ($ 580/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 7 PP | $ 4,060 ($ 580/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 7 PP | $ 4,060 ($ 580/PP) | $ 600 |
| | | TOTAL--> | $82,395 | $7,700 |
| | | | VEHICLES AND EQUIPMENT: | $8,000 |
| | | | TOTAL INDIRECT COSTS : | $27,467 |
| | | | **GRAND TOTAL = $125,562** | |

Actual Budgetary Costs For 6 Person Crew For 90 DAY Contract

| POSITION | GRADE | TOUR | COST TO GOVERNMENT | SUPPORT COSTS (TVL,TRAINING,ETC) |
|---|---|---|---|---|
| Crew Supervisor/ Manager | GS-7 | WAE 18/8 | $21,175 ($1,176/PP) | $1,500 |
| Ast. Crew Super. | GS-6 | WAE 13 PP | $13,520 ($1,040/PP) | $1,000 |
| Lead Crewperson | GS-5 | WAE 13 PP | $12,870 ($ 990/PP) | $ 800 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 ($ 650/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 7 PP | $ 4,060 ($ 580/PP) | $ 600 |
| | | TOTAL--> | $60,718 | $5,100 |
| | | | VEHICLES AND EQUIPMENT: | $6,000 |
| | | | TOTAL INDIRECT COSTS : | $20,110 |
| | | | **GRAND TOTAL = $ 91,928** | |

Calculations used to compute costs for CWN module while on fire assignments

1 GS-7 for one PP @ $1,116/PP
1 GS_6 for one PP @ $1,040/PP
2 GS-4 for one PP @ $ 650/PP

Total = $3,516/PP (this represents 10 days of regular time for the 4 persons)

$3,516 diveded by 10 = $351.60/day

Assuming a 15 day assignment each year, there would be 11 regular work days and 4 overtime days.

$352 x 11 = $3,868 regular time.
$352 x 1.5 x 4 = $1,894 overtime.

## ADDITIONAL COSTS WHEN CONTRACTING FOR ANY HELICOPTER

CONTRACT FORMATION/ADMINISTRATION COSTS - Average contract load for a contracting officer awarding and administering service contracts is approximately 40 contractors. To come up with a "rough" average cost per contract we divided annual salary of a GM-15 contracting officer by the total number of contracts as follows: $50,000 Divided by 40 = $1,250/contract

In addition to the contracting officer we need to add the cost of clerical support. Using the same rational, costs are as follows:
GS-5 $17,586 divided by 40 = $440/contract.

$1,250 + $440 = $1,690 X 25% additional for cost to Govt. = $2,112

Total contract formulation/administration costs per contract = **$2,112/AIRCRAFT**

AIRCRAFT INSPECTIONS, CARDING, TRAVEL COSTS - **$1,000 PER AIRCRAFT**
(For Pilot, Maintenance, Avionics Inspectors and Contracting Officers)

TOTAL ADDITIONAL COSTS ($2,112 + $1,000) **$3,112 PER AIRCRAFT**
(Used in all options in modeling process)

### TYPE I - CWN HELICOPTER CONTRACT COSTS

Average daily availability of type I CWN helicopters (all A/C offered combined) - **$17,763/DAY** (Based on 4 hour minimum/day using rates in 1992 national CWN contract).

RATES FOR TYPE I CWN HELICOPTERS

| A/C Make & Model | Hourly Rate | Minimum Daily Payment | No. of A/C offered |
|---|---|---|---|
| S-61 | $3,063/HR | $12,252 | 11 |
| BV-107 | $3,134/HR | $12,536 | 11 |
| S-64 | $6,650/HR | $26,600 | 5 |
| BV-234 | $7,570/HR | $30,280 | 6 |
| AS 332L | $4,850/HR | $19,400 | 2 |

NOTE: Weighted average costs for type I helicopters used in modeling options are as follows:

BV 234 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x hourly rate) |
|---|---|---|
| 6 | $7,570 | $45,420 |

The average cost for BV-234 helicopters is $45,420 divided by 6 or $7,570/Hr.

S-64 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x Hourly rate) |
|---|---|---|
| 3 | $6,844 | $20,532 |
| 2 | $6,450 | $12,900 |

The average cost for S-64 helicopters is $33,432 divided by 5 or $6,686/Hr.

Weighted average for BV234 and S-64 helicopters is $78,852 divided by 11 or $7,168/Hr.

BV 107 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x hourly rate) |
|---|---|---|
| 11 | $3,134 | $34,474 |

The average cost for BV-107 helicopters is $34,474 divided by 11 or $3,116/Hr.

S-61 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x Hourly rate) |
|---|---|---|
| 3 | $2,875 | $ 8,625 |
| 2 | $3,250 | $ 6,500 |
| 3 | $3,200 | $ 9,600 |

The average cost for S-61 helicopters is $24,725 divided by 8 or $3,091/Hr.

The weighted average for BV 107 and S-61 helicopters is $59,199 divided by 19 or $3,116/Hr.

**TYPE I - EXCLUSIVE USE HELICOPTER CONTRACT COSTS**

The committee using professional judgement assumed the following:

For a 45 day contract for a BV 234 or S-64 helicopter, the daily availability would be $22,938 and the hourly rate would be $2,867 per hour.

For a 45 day contract for a Super Puma AS 332-L-1 helicopter, the daily availability would be $15,520 and the hourly rate would be $1,940 per hour.

**TYPE II - CWN HELICOPTER CONTRACT COSTS**

Data obtained from 1992 national CWN contract.

CWN COSTS

| AIRCRAFT MAKE & MODEL | AVERAGE DAILY AVAILABILITY | NO. OF A/C OFFERED |
|---|---|---|
| Bell 212 | $4,461/day | 49 |
| S 58-T | $4,082/day | 11 |
| Bell 205 A1 | $3,628/day | 8 |
| Bell 204 | $3,907/day | 7 |
| Bell 214 | $6,250/day | 2 |
| Bell 412 | $4,910/day | 7 |

The average cost for these helicopters is $366,734 divided by 84 or $4,366/Hr.

Bell 212 Helicopters

| No. Offered | Daily Availability Rate | Total (No. offered x avail. rate) |
|---|---|---|
| 2 | $4,150 | $ 8,300 |
| 2 | $3,650 | $ 7,300 |
| 1 | $8,245 | $ 8,245 |
| 1 | $3,900 | $ 3,900 |
| 5 | $4,650 | $23,250 |
| 2 | $4,853 | $ 9,706 |
| 14 | $4,710 | $65,940 |
| 10 | $6,677 | $66,770 |
| 1 | $4,485 | $ 4,485 |
| 1 | $2,271 | $ 2,271 |
| 4 | $1,971 | $ 7,884 |
| 1 | $4,450 | $ 4,450 |
| 2 | $4,400 | $ 8,800 |
| 1 | $4,850 | $ 4,850 |
| 2 | $3,660 | $ 7,320 |

The average cost for Bell 212 helicopters is $233,471 divided by 49 or $4,765/Hr.

Bell 205 Helicopters

| No. Offered | Daily Availability Rate | Total (No. offered x avail. rate) |
|---|---|---|
| 2 | $3,230 | $ 6,460 |
| 2 | $4,250 | $ 8,500 |
| 2 | $3,885 | $ 7,770 |
| 1 | $4,235 | $ 4,235 |
| 1 | $3,150 | $ 3,150 |

The average cost for Bell 205 helicopters is $30,115 divided by 8 or $3,764/Hr.

The weighted average for Bell 212 and Bell 205 helicopters is $263,586 divided by 57 or $4,624/Hr.

Type II Helicopter Costs By Category

| Category A Helos. | Average Daily Availability | Flight Rate |
|---|---|---|
| Bell 214 | $6,250/day | $1,097/hr. |
| Bell 212 | $4,461/day | $ 677/hr. |
| Bell 205 (super) | $4,235/day | $ 612/hr. |
| Bell 204 (super) | $3,443/day | $ 608/hr. |
| Average costs--> | $4,597/day | $ 749/hr. |

| Category B Helos. | | |
|---|---|---|
| S 58-T | $4,082/day | $ 912/hr. |
| Bell 412 | $4,910/day | $ 846/hr |
| Bell 212 | $4,461/day | $ 677/hr. |
| Average costs--> | $4,484/day | $ 812/hr. |

| Category C Helos. | | |
|---|---|---|
| Bell 204 | $3,907/day | $ 608/hr. |
| Bell 205 A1 | $3,628/day | $ 612/hr. |
| Bell 212 | $4,461/day | $ 677/hr. |
| Bell 412 | $4,910/day | $ 846/hr. |
| Average costs--> | $4,227/day | $ 686/hr. |

There appears to be no significant cost difference between A, B and C categories. resource order.

**TYPE II - EXCLUSIVE USE HELICOPTER COSTS**

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| Arroyo Grande | Bell 204 | $1,350/day | 139 days | $608/hr |
| Casitas | Bell 204 | $1,350/day | 145 days | $608/hr |
| Chantry Flats | Bell 212 | $1,900/day | 141 days | $612/hr |

**Severity contracts**

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| La Grande | Bell 212 | $1,971/day | 30 days | $677/hr |
| Wenatchee | Bell 212 | $1,971/day | 30 days | $677/hr |
| Bald Mtn. | Bell 204 (super) | $1,243/day | 60 days | $1243/hr |
| Salt Late City | Bell 205 (super) | $3,585/day | 60 days | $ 612/hr |
| Idaho City | Bell 204 (super) | $3,100/day | 60 days | $ 608/hr |
| Challis | Bell 205 (super) | $3,585/day | 60 days | $ 612/hr |
| Redmond | S 58-T | $2,561/day | 30 days | $ 912/hr |
| Dillon | Bell 204 (super) | $2,287/day | 60 days | $ 608/hr |
| Dixie | Bell 204 (super) | $3,100/day | 30 days | $ 608/hr |
| Redding | Bell 212 | $1,850/day | 60 days | $ 677/hr |
| Big Hill | S 58-T | $2,397/day | 30 days | $ 912/hr |

The Bald Mt. contract costs were not used in developing averages as it was bid using different non standard format.

**1992 Alaska Exclusive use contracts (Govt. provides fuel)**

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| AFS | Bell 212 | $2,363/day | 90 days | $750/hr |
| AFS | Bell 212 | $2,363/day | 90 days | $750/hr |
| AFS | Bell 212 | $2,550/day | 90 days | $560/hr |
| AFS | Bell 212 | $2,648/day | 90 days | $750/hr |
| State of Alaska | Bell 212 | $2,365/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,668/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,788/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,838/day | 90 days | $500/hr |

After considering the above data on exclusive use and severity contracts, the committee agreed that the following rates would be used in the modeling process used to develop the Type II contract options.

Daily Availability (Lower 48)- **$2,634/DAY**, PLUS FLIGHT RATE, Based on average of 1992 severity bids. Based on discussions with helicopter operators and professional judgement, no increase in the availability rate was included for lower 48 contracts even though the severity bids were for shorter term contracts than were used in the modeling.

Daily Availability (Alaska) **$2,981/DAY**, PLUS FLIGHT RATE, Based on current Alaska exclusive use contract bids.

For costing used in modeling options for Alaska, assumed a $500 increase in the daily availability rate based on shorter term contract lengths (60 days) and historic greater costs in Alaska for 60 day contracts.

The following seven pages contain 2 tables. The first table is 4 pages long and contains lifting capability for all helicopters on CWN and exclusive use contacts with during 1992.

The second table is 3 pages long and contains a cost comparison index which was computed to compare hauling capability and cost. This table is sorted with the most efficient helicopters first.

Staff work like this can be very valuable in insuring the most cost efficient helicopter which can meet the needs of the incident is sent to filled a

## CWN2S ALLOWABLE PAYLOADS

| OPERATOR | FAA_NO | MAKE_MODEL | EQ_WT | MGI_5000 | MGE_5000 | MGI_8000 | MGE_8000 | 5000 HIGE | 5000 HOGE | 8000 HIGE | 8000 HOGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| COLUMBIA | N237CH | BV-234 | 25859 | | 45400 | | 41600 | 25859- | 19541 | 25859- | 15741 |
| COLUMBIA | N234CH | BV-234 | 25935 | | 45400 | | 41600 | 25935- | 19465 | 25935- | 15665 |
| COLUMBIA | N238CH | BV-234 | 26293 | | 45400 | | 41600 | 26293- | 19107 | 26293- | 15307 |
| COLUMBIA | N239CH | BV-234 | 26355 | | 45400 | | 41600 | 26355- | 19045 | 26355- | 15245 |
| ERICKSON | N164AC | SK-S-64E | 25126 | | 38700 | | 35100 | 25126- | 13574 | 25126- | 9974 |
| ERICKSON | N6962R | S-64-E | 25411 | | 38700 | | 35100 | 25411- | 13289 | 25411- | 9689 |
| ERICKSON | N154AC | SK-S-64E | 25553 | | 38700 | | 35100 | 25553- | 13147 | 25553- | 9547 |
| COLUMBIA | N241CH | BV-234 | 29985 | | 43000 | | 39500 | 29985- | 13015 | 29985- | 9515 |
| COLUMBIA | N6682D | BV-107-II | 12322 | 18800 | 17700 | 17200 | 16300 | 6478 | 5378 | 4878 | 3978 |
| COLUMBIA | N185CH | BV-107-II | 12499 | 18800 | 17700 | 17200 | 16300 | 6301 | 5201 | 4701 | 3801 |
| COLUMBIA | N191CH | BV-107-II | 12521 | 18800 | 17700 | 17200 | 16300 | 6279 | 5179 | 4679 | 3779 |
| COLUMBIA | N192CH | BV-107-II | 12529 | 18800 | 17700 | 17200 | 16300 | 6271 | 5171 | 4671 | 3771 |
| COLUMBIA | N187CH | BV-107-II | 12551 | 18800 | 17700 | 17200 | 16300 | 6249 | 5149 | 4649 | 3749 |
| COLUMBIA | N184CH | BV-107-II | 12619 | 18800 | 17700 | 17200 | 16300 | 6181 | 5081 | 4581 | 3681 |
| COLUMBIA | N6674D | BV-107-II | 12679 | 18800 | 17700 | 17200 | 16300 | 6121 | 5021 | 4521 | 3621 |
| COLUMBIA | N190CH | BV-107-II | 12813 | 18800 | 17700 | 17200 | 16300 | 5987 | 4887 | 4387 | 3487 |
| COLUMBIA | N186CH | BV-107-II | 12964 | 18800 | 17700 | 17200 | 16300 | 5836 | 4736 | 4236 | 3336 |
| COLUMBIA | N188CH | BV-107-II | 13058 | 18800 | 17700 | 17200 | 16300 | 5742 | 4642 | 4142 | 3242 |
| HELI JET | N66HJ | B-205-A++ | 5667 | 8197 | 8647 | 7397 | 8647 | 2530 | 2980 | 1730 | 2980 |
| CARSON HELI | N7011M | S-61N | 12480 | 18150 | 16900 | 16650 | 15400 | 5670 | 4420 | 4170 | 2920 |
| ROCKY MTN | N914RM | B-214-B | 8160 | 11540 | 12020 | 10340 | 11020 | 3380 | 3860 | 2180 | 2860 |
| HELI JET | N58HJ | B-205-A++ | 5812 | 8197 | 8647 | 7397 | 8647 | 2385 | 2835 | 1585 | 2835 |
| CARSON HELI | N4240S | S-61N | 12675 | 18150 | 16900 | 16650 | 15400 | 5475 | 4225 | 3975 | 2725 |
| CRI | N214CR | B-214-B1 | 8241 | 10620 | 11920 | 10240 | 10820 | 2379 | 3679 | 1999 | 2579 |
| ERA | N171EH | AS-332L | 13617 | 18400 | 17500 | 16800 | 15900 | 4783 | 3883 | 3183 | 2283 |
| ERA | N170EH | AS-332L | 13709 | 18400 | 17500 | 16800 | 15900 | 4691 | 3791 | 3091 | 2191 |
| HELI JET | N68HJ | B-205-A+ | 5681 | 7097 | 8497 | 6397 | 7747 | 1416 | 2816 | 716 | 2066 |
| CARSON HELI | N305V | S-61L | 13380 | 18150 | 16900 | 16650 | 15400 | 4770 | 3520 | 3270 | 2020 |
| RIVER CITY | N4580Y | B-204-B+ | 4768 | 7202 | 7552 | 6505 | 6652 | 2434 | 2784 | 1737 | 1884 |
| AIR ONE | N4995G | S-58-T | 7667 | 11145 | 10445 | 10445 | 9445 | 3478 | 2778 | 2778 | 1778 |
| CRANE | N109CH | B-204-B+ | 4886 | 7202 | 7552 | 6502 | 6652 | 2316 | 2666 | 1616 | 1766 |
| HELI JET | N73HJ | B-212 | 6376 | 9609 | 8799 | 8049 | 8049 | 3233 | 2423 | 1673 | 1673 |
| AG ROTORS | N8530B | B-212 | 6379 | 9609 | 8799 | 8049 | 8049 | 3230 | 2420 | 1670 | 1670 |
| DME HELICOPTER | N58ET | S-58-T | 7802 | 11145 | 10445 | 10445 | 9445 | 3343 | 2643 | 2643 | 1643 |
| GLACIER | N1078T | S-58-T | 7802 | 11145 | 10445 | 10445 | 9445 | 3343 | 2643 | 2643 | 1643 |
| IDAHO HELI | N204SB | B-204-B+ | 5017 | 7202 | 7552 | 6502 | 6652 | 2185 | 2535 | 1485 | 1635 |
| IDAHO HELI | N41699 | B-204-B+ | 5022 | 7202 | 7552 | 6502 | 6652 | 2180 | 2530 | 1480 | 1630 |
| AIR ONE | N581BG | S-58-T | 7820 | 11145 | 10445 | 10445 | 9445 | 3325 | 2625 | 2625 | 1625 |
| CRI | N212CR | B-212 | 6437 | 9609 | 8799 | 8049 | 8049 | 3172 | 2362 | 1612 | 1612 |
| ROGERS | N49613 | B-212 | 6460 | 9609 | 8799 | 8049 | 8049 | 3149 | 2339 | 1589 | 1589 |

CWN2S ALLOWABLE PAYLOADS

| OPERATOR | FAA_NO | MAKE_MODEL | EQ_WT | MGI_5000 | MGE_5000 | MGI_8000 | MGE_8000 | 5000 HIGE | 5000 HOGE | 8000 HIGE | 8000 HOGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ARIS | N58AH | S-58-T | 7882 | 11145 | 10445 | 10445 | 9445 | 3263 | 2563 | 2563 | 1563 |
| TEMSCO | N16920 | B-212 | 6542 | 9609 | 8799 | 8049 | 8049 | 3067 | 2257 | 1507 | 1507 |
| TEMSCO | N83230 | B-212 | 6542 | 9609 | 8799 | 8049 | 8049 | 3067 | 2257 | 1507 | 1507 |
| ARIS | N15AH | S-58-T | 7970 | 11145 | 10445 | 10445 | 9445 | 3175 | 2475 | 2475 | 1475 |
| CREW CONCEPTS | N4282Y | B-212 | 6577 | 9609 | 8799 | 8049 | 8049 | 3032 | 2222 | 1472 | 1472 |
| CREW CONCEPTS | N50932 | B-212 | 6596 | 9609 | 8799 | 8049 | 8049 | 3013 | 2203 | 1453 | 1453 |
| ERA | N522EH | B-212 | 6607 | 9609 | 8799 | 8049 | 8049 | 3002 | 2192 | 1442 | 1442 |
| BRAINERD | N58S | S-58-T | 8017 | 11145 | 10445 | 10445 | 9445 | 3128 | 2428 | 2428 | 1428 |
| BRAINARD | N58BH | S-58-T | 8032 | 11145 | 10445 | 10445 | 9445 | 3113 | 2413 | 2413 | 1413 |
| ARIS | N1168U | S-58-T | 8035 | 11145 | 10445 | 10445 | 9445 | 3110 | 2410 | 2410 | 1410 |
| ALASKA | N213AH | B-212 | 6656 | 9609 | 8799 | 8049 | 8049 | 2953 | 2143 | 1393 | 1393 |
| CRI | N554CR | B-212 | 6666 | 9609 | 8799 | 8049 | 8049 | 2943 | 2133 | 1383 | 1383 |
| KENAI AIR AK | N801KA | B-212 | 6668 | 9609 | 8799 | 8049 | 8049 | 2941 | 2131 | 1381 | 1381 |
| ERA | N510EH | B-212 | 6699 | 9609 | 8799 | 8049 | 8049 | 2910 | 2100 | 1350 | 1350 |
| ERA | N511EH | B-212 | 6709 | 9609 | 8799 | 8049 | 8049 | 2900 | 2090 | 1340 | 1340 |
| AIR ONE | N47B | S-58-T | 8105 | 11145 | 10445 | 10445 | 9445 | 3040 | 2340 | 2340 | 1340 |
| ERA | N358EH | B-212 | 6721 | 9609 | 8799 | 8049 | 8049 | 2888 | 2078 | 1328 | 1328 |
| ERA | N507EH | B-212 | 6735 | 9609 | 8799 | 8049 | 8049 | 2874 | 2064 | 1314 | 1314 |
| ERA | N509EH | B-212 | 6737 | 9609 | 8799 | 8049 | 8049 | 2872 | 2062 | 1312 | 1312 |
| ERA | N523EH | B-212 | 6739 | 9609 | 8799 | 8049 | 8049 | 2870 | 2060 | 1310 | 1310 |
| GLACIER | N1099T | S-58-T | 8139 | 11145 | 10445 | 10445 | 9445 | 3006 | 2306 | 2306 | 1306 |
| ERA | N399EH | B-212 | 6750 | 9609 | 8799 | 8049 | 8049 | 2859 | 2049 | 1299 | 1299 |
| HOUSTON | N90222 | B-212 | 6753 | 9609 | 8799 | 8049 | 8049 | 2856 | 2046 | 1296 | 1296 |
| CREW CONCEPTS | N21601 | B-212 | 6756 | 9609 | 8799 | 8049 | 8049 | 2853 | 2043 | 1293 | 1293 |
| ERA | N360EH | B-212 | 6778 | 9609 | 8799 | 8049 | 8049 | 2831 | 2021 | 1271 | 1271 |
| HOUSTON | N49673 | B-212 | 6801 | 9609 | 8799 | 8049 | 8049 | 2808 | 1998 | 1248 | 1248 |
| HOUSTON | N16615 | B-212 | 6830 | 9609 | 8799 | 8049 | 8049 | 2779 | 1969 | 1219 | 1219 |
| ERA | N357EH | B-212 | 6833 | 9609 | 8799 | 8049 | 8049 | 2776 | 1966 | 1216 | 1216 |
| EVERGREEN | N5410N | B-212 | 6843 | 9609 | 8799 | 8049 | 8049 | 2766 | 1956 | 1206 | 1206 |
| EVERGREEN | N16974 | B-212 | 6850 | 9609 | 8799 | 8049 | 8049 | 2759 | 1949 | 1199 | 1199 |
| EVERGREEN | N59633 | B-212 | 6860 | 9609 | 8799 | 8049 | 8049 | 2749 | 1939 | 1189 | 1189 |
| ERA | N508EH | B-212 | 6870 | 9609 | 8799 | 8049 | 8049 | 2739 | 1929 | 1179 | 1179 |
| ERA | N500EH | B-212 | 6884 | 9609 | 8799 | 8049 | 8049 | 2725 | 1915 | 1165 | 1165 |
| EVERGREEN | N1082G | B-212 | 6887 | 9609 | 8799 | 8049 | 8049 | 2722 | 1912 | 1162 | 1162 |
| ERA | N359EH | B-212 | 6903 | 9609 | 8799 | 8049 | 8049 | 2706 | 1896 | 1146 | 1146 |
| ALASKA | N212AH | B-212 | 6936 | 9609 | 8799 | 8049 | 8049 | 2673 | 1863 | 1113 | 1113 |
| EVERGREEN | N81FC | B-212 | 6940 | 9609 | 8799 | 8049 | 8049 | 2669 | 1859 | 1109 | 1109 |
| ERA | N356EH | B-412 | 7130 | 9110 | 9110 | 8060 | 8210 | 1980 | 1980 | 930 | 1080 |
| KENAI AIR AK | N811KA | B-212 | 6971 | 9609 | 8799 | 8049 | 8049 | 2638 | 1828 | 1078 | 1078 |
| EVERGREEN | N27664 | B-212 | 6978 | 9609 | 8799 | 8049 | 8049 | 2631 | 1821 | 1071 | 1071 |

CWN2S ALLOWABLE PAYLOADS

| OPERATOR | FAA_NO | MAKE_MODEL | EQ_WT | MGI_5000 | MGE_5000 | MGI_8000 | MGE_8000 | 5000 HIGE | 5000 HOGE | 8000 HIGE | 8000 HOGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EVERGREEN | N16973 | B-212 | 6990 | 9609 | 8799 | 8049 | 8049 | 2619 | 1809 | 1059 | 1059 |
| ERA | N168EH | B-412 | 7164 | 9110 | 9110 | 8060 | 8210 | 1946 | 1946 | 896 | 1046 |
| EVERGREEN | N398EH | B-212 | 7008 | 9609 | 8799 | 8049 | 8049 | 2601 | 1791 | 1041 | 1041 |
| ERA | N418EH | B-412 | 7200 | 9110 | 9110 | 8060 | 8210 | 1910 | 1910 | 860 | 1010 |
| EVERGREEN | N711EV | B-212 | 7060 | 9609 | 8799 | 8049 | 8049 | 2549 | 1739 | 989 | 989 |
| ERA | N419EH | B-412 | 7238 | 9110 | 9110 | 8060 | 8210 | 1872 | 1872 | 822 | 972 |
| AG ROTORS | N8530F | B-212 | 7088 | 9609 | 8799 | 8049 | 8049 | 2521 | 1711 | 961 | 961 |
| HORIZON | N25AL | B-205-A-1 | 5560 | 7097 | 7097 | 6397 | 6497 | 1537 | 1537 | 837 | 937 |
| ERA | N370EH | B-212 | 7115 | 9609 | 8799 | 8049 | 8049 | 2494 | 1684 | 934 | 934 |
| ERA | N422EH | B-412 | 7316 | 9110 | 9110 | 8060 | 8210 | 1794 | 1794 | 744 | 894 |
| ERA | N416EH | B-412 | 7381 | 9110 | 9110 | 8060 | 8210 | 1729 | 1729 | 679 | 829 |
| ERA | N421EH | B-412 | 7381 | 9110 | 9110 | 8060 | 8210 | 1729 | 1729 | 679 | 829 |
| EVERGREEN | N4750R | B-205-A-1 | 5699 | 7097 | 7097 | 6397 | 6497 | 1398 | 1398 | 698 | 798 |
| ALASKA | N58116 | B-205-A-1 | 5755 | 7097 | 7097 | 6397 | 6497 | 1342 | 1342 | 642 | 742 |
| CRI | N204CR | B-204-B | 4686 | 6702 | 5952 | 6102 | 5402 | 2016 | 1266 | 1416 | 716 |
| ALASKA | N183AH | B-205-A-1 | 5784 | 7097 | 7097 | 6397 | 6497 | 1313 | 1313 | 613 | 713 |
| HORIZON | N911SW | B-204-B | 4744 | 6792 | 5952 | 6102 | 5402 | 2048 | 1208 | 1358 | 658 |
| HISER HELI | N204SH | B-204-B | 4759 | 6702 | 5952 | 6102 | 5402 | 1943 | 1193 | 1343 | 643 |
| CRI | N204AQ | B-204-B | 5150 | 6702 | 5952 | 6102 | 5402 | 1552 | 802 | 952 | 252 |
| CREW CONCEPTS | NCFRUQ | B-205-A-1 | | | | | | 0 | 0 | 0 | 0 |
| EVERGREEN | N58087 | B-205-A-1 | | | | | | 0 | 0 | 0 | 0 |
| BULLDOG | N903BA | B-212 | | | | | | 0 | 0 | 0 | 0 |
| CRESCENT | N2768N | B-212 | | | | | | 0 | 0 | 0 | 0 |
| CREW CONCEPTS | N58121 | B-212 | | | | | | 0 | 0 | 0 | 0 |
| CREW CONCEPTS | N9121Z | B-212 | | | | | | 0 | 0 | 0 | 0 |
| EAGLE AIR | X | B-212 | | | | | | 0 | 0 | 0 | 0 |
| EVERGREEN | N5017H | B-212 | | | | | | 0 | 0 | 0 | 0 |
| HOUSTON | N90704 | B-212 | | | | | | 0 | 0 | 0 | 0 |
| HOUSTON | N9937K | B-212 | | | | | | 0 | 0 | 0 | 0 |
| KACHINA AV | N42434 | B-212 | | | | | | 0 | 0 | 0 | 0 |
| COLUMBIA | N6672D | BV-107-II | | | | | | 0 | 0 | 0 | 0 |
| COLUMBIA | N242CH | BV-234 | | | | | | 0 | 0 | 0 | 0 |
| FAITH FLIGHT | N17F1 | S-58-T | | | | | | 0 | 0 | 0 | 0 |
| MIDWEST | N4247V | S-58-T | | | | | | 0 | 0 | 0 | 0 |
| CROMAN | N1048Y | SK-S-61A | | | | | | 0 | 0 | 0 | 0 |
| ERICKSON | NCGJZK | SK-S-64 | | | | | | 0 | 0 | 0 | 0 |
| SILLER BROS | N45917 | SK-S-61V | 9800 | 19100 | 22000 | | | 9300 | 12200 | 9800- | 9800- |
| CROMAN | N1043T | SK-S-61A | 9817 | | | | | 9817- | 9817- | 9817- | 9817- |
| CROMAN | N318Y | SK-S-61A | 10166 | | | | | 10166- | 10166- | 10166- | 10166- |
| SILLER BROS | N15456 | SK-S-61N | 11560 | | | | | 11560- | 11560- | 11560- | 11560- |

CWN2S ALLOWABLE PAYLOADS

| OPERATOR | FAA_NO | MAKE_MODEL | EQ_WT | MGI_5000 | MGE_5000 | MGI_8000 | MGE_8000 | 5000 HIGE | 5000 HOGE | 8000 HIGE | 8000 HOGE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ROCKY MT | N612RM | SK-S-61L | 13711 | 17500 | 16800 | | | 3789 | 3089 | 13711- | 13711- |
| ROCKY MT | N613RM | SK-S-61L | 14024 | 17500 | 16800 | | | 3476 | 2776 | 14024- | 14024- |
| ROCKY MT | N611RM | SK-S-61L | 14029 | 17500 | 16800 | | | 3471 | 2771 | 14029- | 14029- |
| SILLER BROS | N4035S | SK-S-64E | 19944 | 42000 | 42000 | | | 22056 | 22056 | 19944- | 19944- |
| SILLER BROS | N4037S | SK-S-64E | 20405 | | | | | 20405- | 20405- | 20405- | 20405- |

COST EFFICIENCY USING 4 HOUR COMPARISON AND 8000 INDEX

| OPERATOR | FAA_NO | MAKE_MODEL | FR | DR | 5000 HOGE | 5000 INDEX | 8000 HOGE | 8000 INDEX |
|---|---|---|---|---|---|---|---|---|
| COLUMBIA | N237CH | BV-234 | 7570 | | 19541 | 1.55 | 15741 | 1.92 |
| COLUMBIA | N234CH | BV-234 | 7570 | | 19465 | 1.56 | 15665 | 1.93 |
| COLUMBIA | N238CH | BV-234 | 7570 | | 19107 | 1.58 | 15307 | 1.98 |
| HELI JET | N66HJ | B-205-A++ | 612 | 4235 | 2980 | 2.24 | 2980 | 2.24 |
| HELI JET | N58HJ | B-205-A++ | 612 | 4235 | 2835 | 2.36 | 2835 | 2.36 |
| ERICKSON | N164AC | SK-S-64E | 6844 | | 13574 | 2.02 | 9974 | 2.74 |
| ERICKSON | N6962R | S-64-E | 6844 | | 13289 | 2.06 | 9689 | 2.83 |
| ERICKSON | N154AC | SK-S-64E | 6844 | | 13147 | 2.08 | 9547 | 2.87 |
| HELI JET | N68HJ | B-205-A+ | 612 | 3885 | 2816 | 2.25 | 2066 | 3.07 |
| COLUMBIA | N6682D | BV-107-II | 3134 | | 5378 | 2.33 | 3978 | 3.15 |
| RIVER CITY | N4580Y | B-204-B+ | 608 | 3750 | 2784 | 2.22 | 1884 | 3.28 |
| COLUMBIA | N185CH | BV-107-II | 3134 | | 5201 | 2.41 | 3801 | 3.30 |
| COLUMBIA | N191CH | BV-107-II | 3134 | | 5179 | 2.42 | 3779 | 3.32 |
| COLUMBIA | N192CH | BV-107-II | 3134 | | 5171 | 2.42 | 3771 | 3.32 |
| COLUMBIA | N187CH | BV-107-II | 3134 | | 5149 | 2.43 | 3749 | 3.34 |
| IDAHO HELI | N204SB | B-204-B+ | 608 | 3136 | 2535 | 2.20 | 1635 | 3.41 |
| COLUMBIA | N184CH | BV-107-II | 3134 | | 5081 | 2.47 | 3681 | 3.41 |
| IDAHO HELI | N41699 | B-204-B+ | 608 | 3136 | 2530 | 2.20 | 1630 | 3.42 |
| COLUMBIA | N6674D | BV-107-II | 3134 | | 5021 | 2.50 | 3621 | 3.46 |
| COLUMBIA | N190CH | BV-107-II | 3134 | | 4887 | 2.57 | 3487 | 3.60 |
| ARIS | N58AH | S-58-T | 912 | 1975 | 2563 | 2.19 | 1563 | 3.60 |
| HOUSTON | N90222 | B-212 | 677 | 1971 | 2046 | 2.29 | 1296 | 3.61 |
| CRANE | N109CH | B-204-B+ | 608 | 3989 | 2666 | 2.41 | 1766 | 3.64 |
| HOUSTON | N49673 | B-212 | 677 | 1971 | 1998 | 2.34 | 1248 | 3.75 |
| COLUMBIA | N186CH | BV-107-II | 3134 | | 4736 | 2.65 | 3336 | 3.76 |
| ARIS | N15AH | S-58-T | 912 | 1975 | 2475 | 2.27 | 1475 | 3.81 |
| CRI | N214CR | B-214-B1 | 1097 | 5500 | 3679 | 2.69 | 2579 | 3.83 |
| COLUMBIA | N188CH | BV-107-II | 3134 | | 4642 | 2.70 | 3242 | 3.87 |
| CARSON HELI | N7011M | S-61N | 2875 | | 4420 | 2.60 | 2920 | 3.94 |
| ROCKY MTN | N914RM | B-214-B | 1097 | 7000 | 3860 | 2.95 | 2860 | 3.98 |
| ARIS | N1168U | S-58-T | 912 | 1975 | 2410 | 2.33 | 1410 | 3.99 |
| AIR ONE | N4995G | S-58-T | 912 | 3500 | 2778 | 2.57 | 1778 | 4.02 |
| HOUSTON | N16615 | B-212 | 677 | 2271 | 1969 | 2.53 | 1219 | 4.08 |
| AG ROTORS | N8530B | B-212 | 677 | 4150 | 2420 | 2.83 | 1670 | 4.11 |
| CARSON HELI | N4240S | S-61N | 2875 | | 4225 | 2.72 | 2725 | 4.22 |
| TEMSCO | N16920 | B-212 | 677 | 3660 | 2257 | 2.82 | 1507 | 4.23 |
| TEMSCO | N83230 | B-212 | 677 | 3660 | 2257 | 2.82 | 1507 | 4.23 |
| HELI JET | N73HJ | B-212 | 677 | 4485 | 2423 | 2.97 | 1673 | 4.30 |
| AIR ONE | N581BG | S-58-T | 912 | 3500 | 2625 | 2.72 | 1625 | 4.40 |
| ALASKA | N213AH | B-212 | 677 | 3650 | 2143 | 2.97 | 1393 | 4.56 |
| CRI | N212CR | B-212 | 677 | 4853 | 2362 | 3.20 | 1612 | 4.69 |
| ROGERS | N49613 | B-212 | 677 | 4850 | 2339 | 3.23 | 1589 | 4.76 |
| CREW CONCEPTS | N4282Y | B-212 | 677 | 4650 | 2222 | 3.31 | 1472 | 5.00 |
| BRAINERD | N58S | S-58-T | 912 | 3500 | 2428 | 2.94 | 1428 | 5.01 |
| BRAINARD | N58BH | S-58-T | 912 | 3500 | 2413 | 2.96 | 1413 | 5.06 |
| CREW CONCEPTS | N50932 | B-212 | 677 | 4650 | 2203 | 3.34 | 1453 | 5.06 |
| ERA | N522EH | B-212 | 677 | 4710 | 2192 | 3.38 | 1442 | 5.14 |
| KENAI AIR AK | N801KA | B-212 | 677 | 4400 | 2131 | 3.34 | 1381 | 5.15 |
| AIR ONE | N47B | S-58-T | 912 | 3500 | 2340 | 3.05 | 1340 | 5.33 |
| DME HELICOPTER | N58ET | S-58-T | 912 | 5255 | 2643 | 3.37 | 1643 | 5.42 |

COST EFFICIENCY USING 4 HOUR COMPARISON AND 8000 INDEX

| OPERATOR | FAA_NO | MAKE_MODEL | FR | DR | 5000 HOGE | 5000 INDEX | 8000 HOGE | 8000 INDEX |
|---|---|---|---|---|---|---|---|---|
| CRI | N554CR | B-212 | 677 | 4853 | 2133 | 3.54 | 1383 | 5.47 |
| ERA | N510EH | B-212 | 677 | 4710 | 2100 | 3.53 | 1350 | 5.49 |
| ERA | N511EH | B-212 | 677 | 4710 | 2090 | 3.55 | 1340 | 5.54 |
| ERA | N358EH | B-212 | 677 | 4710 | 2078 | 3.57 | 1328 | 5.59 |
| CARSON HELI | N305V | S-61L | 2845 | | 3520 | 3.23 | 2020 | 5.63 |
| ERA | N507EH | B-212 | 677 | 4710 | 2064 | 3.59 | 1314 | 5.65 |
| ERA | N509EH | B-212 | 677 | 4710 | 2062 | 3.60 | 1312 | 5.65 |
| ERA | N523EH | B-212 | 677 | 4710 | 2060 | 3.60 | 1310 | 5.66 |
| CREW CONCEPTS | N21601 | B-212 | 677 | 4650 | 2043 | 3.60 | 1293 | 5.69 |
| ERA | N399EH | B-212 | 677 | 4710 | 2049 | 3.62 | 1299 | 5.71 |
| ALASKA | N212AH | B-212 | 677 | 3650 | 1863 | 3.41 | 1113 | 5.71 |
| ERA | N360EH | B-212 | 677 | 4710 | 2021 | 3.67 | 1271 | 5.84 |
| HORIZON | N25AL | B-205-A-1 | 612 | 3150 | 1537 | 3.64 | 937 | 5.97 |
| GLACIER | N1078T | S-58-T | 912 | 6181 | 2643 | 3.72 | 1643 | 5.98 |
| ERA | N357EH | B-212 | 677 | 4710 | 1966 | 3.77 | 1216 | 6.10 |
| ERA | N508EH | B-212 | 677 | 4710 | 1929 | 3.85 | 1179 | 6.29 |
| ERA | N500EH | B-212 | 677 | 4710 | 1915 | 3.87 | 1165 | 6.37 |
| ERA | N359EH | B-212 | 677 | 4710 | 1896 | 3.91 | 1146 | 6.47 |
| KENAI AIR AK | N811KA | B-212 | 677 | 4400 | 1828 | 3.89 | 1078 | 6.59 |
| AG ROTORS | N8530F | B-212 | 677 | 4150 | 1711 | 4.01 | 961 | 7.14 |
| GLACIER | N1099T | S-58-T | 912 | 6181 | 2306 | 4.26 | 1306 | 7.53 |
| ERA | N356EH | B-412 | 846 | 4910 | 1980 | 4.19 | 1080 | 7.68 |
| EVERGREEN | N5410N | B-212 | 677 | 6677 | 1956 | 4.80 | 1206 | 7.78 |
| EVERGREEN | N16974 | B-212 | 677 | 6677 | 1949 | 4.82 | 1199 | 7.83 |
| EVERGREEN | N59633 | B-212 | 677 | 6677 | 1939 | 4.84 | 1189 | 7.89 |
| ERA | N168EH | B-412 | 846 | 4910 | 1946 | 4.26 | 1046 | 7.93 |
| ERA | N370EH | B-212 | 677 | 4710 | 1684 | 4.40 | 934 | 7.94 |
| ALASKA | N183AH | B-205-A-1 | 612 | 3230 | 1313 | 4.32 | 713 | 7.96 |
| EVERGREEN | N1082G | B-212 | 677 | 6677 | 1912 | 4.91 | 1162 | 8.08 |
| ERA | N418EH | B-412 | 846 | 4910 | 1910 | 4.34 | 1010 | 8.21 |
| EVERGREEN | N4750R | B-205-A-1 | 612 | 4250 | 1398 | 4.79 | 798 | 8.39 |
| EVERGREEN | N81FC | B-212 | 677 | 6677 | 1859 | 5.05 | 1109 | 8.46 |
| ERA | N171EH | AS-332L | 4850 | | 3883 | 5.00 | 2283 | 8.50 |
| ERA | N419EH | B-412 | 846 | 4910 | 1872 | 4.43 | 972 | 8.53 |
| EVERGREEN | N27664 | B-212 | 677 | 6677 | 1821 | 5.15 | 1071 | 8.76 |
| ERA | N170EH | AS-332L | 4850 | | 3791 | 5.12 | 2191 | 8.85 |
| EVERGREEN | N16973 | B-212 | 677 | 6677 | 1809 | 5.19 | 1059 | 8.86 |
| EVERGREEN | N398EH | B-212 | 677 | 6677 | 1791 | 5.24 | 1041 | 9.02 |
| ERA | N422EH | B-412 | 846 | 4910 | 1794 | 4.62 | 894 | 9.28 |
| EVERGREEN | N711EV | B-212 | 677 | 6677 | 1739 | 5.40 | 989 | 9.49 |
| ERA | N416EH | B-412 | 846 | 4910 | 1729 | 4.80 | 829 | 10.00 |
| ERA | N421EH | B-412 | 846 | 4910 | 1729 | 4.80 | 829 | 10.00 |
| HISER HELI | N204SH | B-204-B | 608 | 4800 | 1193 | 6.06 | 643 | 11.25 |

COST EFFICIENCY USING 4 HOUR COMPARISON AND 8000 INDEX

| OPERATOR | FAA_NO | MAKE_MODEL | FR | DR | 5000 HOGE | 5000 INDEX | 8000 HOGE | 8000 INDEX |
|---|---|---|---|---|---|---|---|---|
| ROCKY MT | N612RM | SK-S-61L | 3200 | | 3089 | 4.14 | 13711- | 0.93- |
| ROCKY MT | N613RM | SK-S-61L | 3200 | | 2776 | 4.61 | 14024- | 0.91- |
| ROCKY MT | N611RM | SK-S-61L | 3200 | | 2771 | 4.62 | 14029- | 0.91- |
| CROMAN | N1043T | SK-S-61A | | | 9817- | 0.00 | 9817- | 0.00 |
| CROMAN | N1048Y | SK-S-61A | | | 0 | 0.00 | 0 | 0.00 |
| SILLER BROS | N15456 | SK-S-61N | | | 11560- | 0.00 | 11560- | 0.00 |
| FAITH FLIGHT | N17F1 | S-58-T | | | 0 | 0.00 | 0 | 0.00 |
| CRI | N204AQ | B-204-B | | | 802 | 0.00 | 252 | 0.00 |
| CRI | N204CR | B-204-B | | | 1266 | 0.00 | 716 | 0.00 |
| COLUMBIA | N239CH | BV-234 | | | 19045 | 0.00 | 15245 | 0.00 |
| COLUMBIA | N241CH | BV-234 | | | 13015 | 0.00 | 9515 | 0.00 |
| COLUMBIA | N242CH | BV-234 | | | 0 | 0.00 | 0 | 0.00 |
| CRESCENT | N2768N | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| CROMAN | N318Y | SK-S-61A | | | 10166- | 0.00 | 10166- | 0.00 |
| SILLER BROS | N4035S | SK-S-64E | | | 22056 | 0.00 | 19944- | 0.00 |
| SILLER BROS | N4037S | SK-S-64E | | | 20405- | 0.00 | 20405- | 0.00 |
| KACHINA AV | N42434 | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| MIDWEST | N4247V | S-58-T | | | 0 | 0.00 | 0 | 0.00 |
| SILLER BROS | N45917 | SK-S-61V | | | 12200 | 0.00 | 9800- | 0.00 |
| EVERGREEN | N5017H | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| EVERGREEN | N58087 | B-205-A-1 | | | 0 | 0.00 | 0 | 0.00 |
| ALASKA | N58116 | B-205-A-1 | | | 1342 | 0.00 | 742 | 0.00 |
| CREW CONCEPTS | N58121 | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| COLUMBIA | N6672D | BV-107-II | | | 0 | 0.00 | 0 | 0.00 |
| BULLDOG | N903BA | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| HOUSTON | N90704 | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| HORIZON | N911SW | B-204-B | | | 1208 | 0.00 | 658 | 0.00 |
| CREW CONCEPTS | N9121Z | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| HOUSTON | N9937K | B-212 | | | 0 | 0.00 | 0 | 0.00 |
| CREW CONCEPTS | NCFRUQ | B-205-A-1 | | | 0 | 0.00 | 0 | 0.00 |
| ERICKSON | NCGJZK | SK-S-64 | | | 0 | 0.00 | 0 | 0.00 |
| EAGLE AIR | X | B-212 | | | 0 | 0.00 | 0 | 0.00 |

VII. Capability of Type I/II Helicopters to Perform

Purpose: To determine an appropriate definition of subcategories for Type I/II helicopters based on their capability to perform. Initial thoughts indicate three categories based on seating capacity, internal payload, external payload, management needs, etc. as effected by altitude, temperature and mechanical structure.

Data: Technical data on individual models of Type I/II helicopters

Data Sources: Manual and handbooks

Responsibility: Larry Hindman and Les Herman

FINDINGS:

**TYPE II CATEGORY BREAKDOWN**

Calculations assume a pilot weighing 200 pounds and 1.5 hrs. of fuel. The A category has the most capability and the C the least.

TYPE II - A

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 8,000 ft and 25 degrees C: HIGE 1450#, HOGE 1500#
4. Capable of landing, flat pitch, on 20 ft. X 20 ft. pad (S-58 too big for this).

Note: Helicopters that will probably meet this standard, may be others:
- Bell 214
- Bell 412
- Bell 212 with equipped weights of 6500 lbs or less.
- Bell 205 (super) with both 212 blades and -17 engine)
- Bell 204 (super) with -13 engine.

TYPE II - B

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 8,000 ft and 25 degrees C: HIGE 1200#, HOGE 1500#
4. Payload at 5,000 ft and 30 degrees C: HIGE 2800#, HOGE 2000#

Note: Helicopters that will probably meet this standard:
-Bell 212 with equipped weight of 6800# or less.
-S-58T
-BK 117
-Bell 412 (light ones)

TYPE II - C

AIRCRAFT:
1. Standard category
2. Passenger seats available: 9
3. Payload at 5,000 ft and 30 degrees C: HIGE 1400#, HOGE 1200#

Note: Helicopters that will probably meet this standard:
-Bell 204
-Bell 205 A1

TYPE II - D

AIRCRAFT:
1. Restricted category
2. Payload at 8,000 ft and 25 degrees C: HOGE 1500#
3. Payload at 5,000 ft and 30 degrees C: HOGE 2200#

Note: These aircraft would be used primarily for external load work (bucket and sling). Could break this category down further if necessary, however, theses A/C have not been used much to date so may not be worth dealing with now.

**MINIMUM CATEGORY AIRCRAFT THAT WILL WORK IN EACH REGION**

TYPE II A/C CATEGORY BY REGION

(based on historic demand and need, typical elevations of fires, and professional judgement)

| REGIONS | A | B | C | D |
|---|---|---|---|---|
| ALASKA | | | XX | XX |
| INTERMOUNTAIN | XX | | | XX |
| NORTHERN | | XX | | XX |
| PNW | | XX | | XX |
| PSW | | XX | | XX |
| SW | XX | | | XX |
| RM | XX | | | XX |
| SOUTHERN | | | XX | XX |

VIII. Technological Changes Expected Now and in the Future

Purpose: To identify current and future improvement in technology which will effect capability and/or cost of Type I/II helicopters. The feeling is that as technology improves, it will affect the number of Type I/II helicopters needed as well as their cost.

Data: Information of airframe and power plant research on improved horsepower and fuel efficiency. Information on GPS, Loran and avionics development.

Data Sources: Aircraft publications and manufacturers

Responsibility: Larry Hindman

FINDINGS:

There will continue to be a need to evaluate new technology relating to helicopters. The helicopter industry is currently working on several "things" that have potential to affect wildland fire applications. Some examples are:

-A 2,000 gallon, snorkel fill, belly mounted water/foam/retardant tank that Erikson sky crane is planning on using and evaluating this season (1992). This could have significant impacts on the airtanker program, as large helicopters are much more accurate and can deliver retardant, water and/or foam much more efficiently and economically than air tankers as long as a water/retardant source is reasonably close.

-Bell Helicopters is in the final stages of certifying the L-4 helicopter which is an upgraded L-3, giving additional capability to this aircraft. The added capability may allow this Type III aircraft to fill all six seats at higher density altitudes, outperforming some of the less powerful Type II helicopters out there.

-The Kaman helicopter co. has developed a new helicopter, the "K-MAX Airtruck" that is a single pilot, (no passenger seats), heavy lift, utility helicopter. This appears to be an excellent high altitude performer that has some real application for a "hook" Helicopter. Certification should be forthcoming soon.

-Some helicopter contractors have FAA approved modifications installed on their aircraft that have improved their performance. Larger engines, transmissions, rotor systems, etc. This type of "after market" innovation will most likely continue, benefiting our program.

These types of improvements and innovations will undoubtedly continue. The Forest Service Aviation community stays abreast of most new technology through periodicals, the Helicopter Association Internationals annual convention and direct contact with contractors who supply helicopters to us.

An example of this is a Helicopter Delivery Systems Performance workshop was held in Salt Lake City in May of 1992. The objective of the workshop was to develop a research and development plan and evaluation of water/foam/retardant helicopter delivery systems. Outputs from this program could affect helicopter use in the future.

Another valuable source of technology is the military. This comes more in the form of new aircraft development than "bells and whistles" that apply to wildland fire fighting. A primary military helicopter application is personnel and equipment movement to remote locations. This is obviously very similar to one of our primary missions. An example is the "Huey" helicopter series that was developed as a troop transport helicopter during the Viet Nam War. This is still one of the most common utility helicopters in the world today, and one that wildland fire agencies use on a regular basis, (Bell 204, 205, 212, 412). The next generation military utility helicopter is the UH-60 (black hawk). this is a twin engine 14 passenger helicopter that would make an excellent wildland fire helicopter. The current expense and lack of civilian availability for this helicopter has made it one that we have not had access to, however, in the future (when the military starts accessing them) we will most likely be using the UH-60 for natural resource work.

## IX. Locations of Potential Home Bases

Purpose: To determine current logistical support capability as well as Regional preference on the location of Type II helicopters.

Data:
a) Regional preference in priority order for location of Type II helicopters to support extended attack and escaped wildfires
b) Reason for the information gathered in a)
c) Capital investment costs needed to bring physical plants to a standard to support a Type II helicopter

Data Sources: Regional data request

Responsibility: Don Carlton

FINDINGS:

BASES FOR TYPE I/II HELICOPTERS

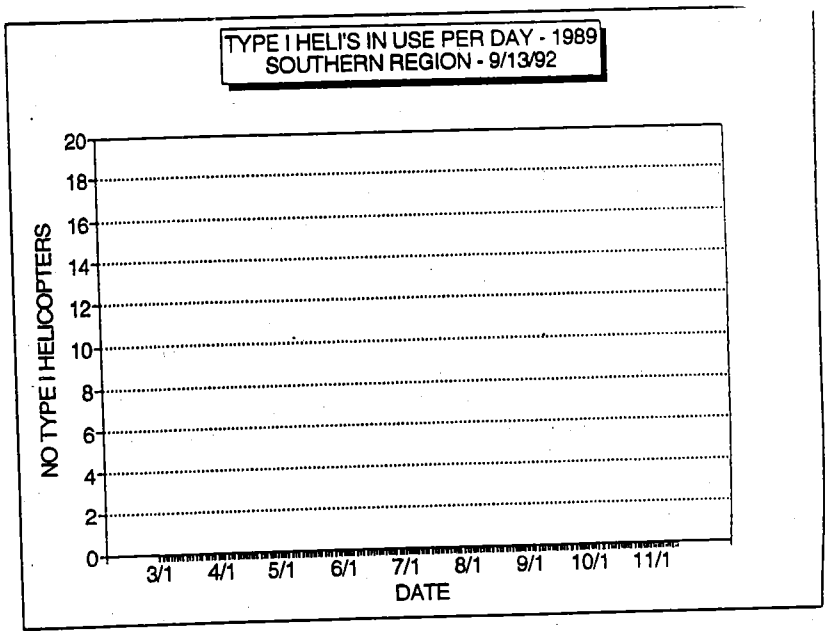
| REGION | PRIORITY | LOCATION | APPROXIMATE COST TO UPGRADE |
|---|---|---|---|
| Northern | 1 | Beaverhead NF, Dillon Mt. | $ 25,000 |
| | 2 | Nez Perce NF, Dixie, ID | $ 15,000 |
| | 3 | Lolo NF, St. Regis, MT | |
| | 4 | Lewis & Clark NF, Whitesulfer Spg | |
| Rocky Mountain | 1 | Jeffco | $ 0 |
| | 2 | Grand Junction | $ 0 |
| Southwest | 1 | Prescott | $ 10,000 |
| | 2 | Albuquerque | $ 10,000 |
| Intermountain | 1 | Boise NF | $ 10,000 |
| | 2 | Challis/Salmon NF | $ 10,000 |
| | 3 | Payette NF (McCall) | $ 10,000 |
| | 4 | Wasatch Cashe NF (Salt Lake) | $ 25,000 |
| | 5 | Reno | $ 10,000 |
| Pacific Southwest | Type I 1 | Fox Field | $ 0 |
| | 2 | Fresno | $ 0 |
| | 3 | Redding | $ 0 |
| Pacific Southwest | Type II 1 | Angeles NF (Arcadia) | $ 3,500 |
| | 2 | Los Padres NF (Goleta) | $ 18,000 |
| | 3 | Los Padres NF | |
| | 4 | San Bernardino NF | |
| | 5 | Sierra NF | |
| | 6 | Shasta-Trinity NF | |
| | 7 | Plumas NF | |

## BASES FOR TYPE I/II HELICOPTERS

| REGION | PRIORITY | LOCATION | APPROXIMATE COST TO UPGRADE |
|---|---|---|---|
| Pacific Northwest | 1 | Redmond Air Center | |
| | 2 | Wenatchee NF, PAG | |
| | 3 | LaGrande | |
| | 4 | Klamath Falls | |
| | 5 | Medford | |
| | 6 | Okanogan | |
| | 7 | Eugene | |
| Southern | Type I 1 | Francis-Marion NF | $ 25,000 |
| | 2 | Monck's Corner, SC | $ 25,000 |
| Southern | Type II 1 | NF Florida, Lake City | $ 25,000 |
| | 2 | Cherokee NF, Ducktown | $ 25,000 |
| | 3 | NF N. Carolina, Ashville | $ 25,000 |
| Alaska | 1 | Fairbanks/Ft. Wainwright | $ 0 |
| | 2 | McGrath | $ 0 |
| | 3 | Galena | $ 0 |
| | 4 | Ft. Yukon | $ 0 |
| | 5 | Tok | $ 0 |
| | 6 | Palmer | $ 0 |
| | 7 | Tanana | $ 0 |

# *Appendix C*

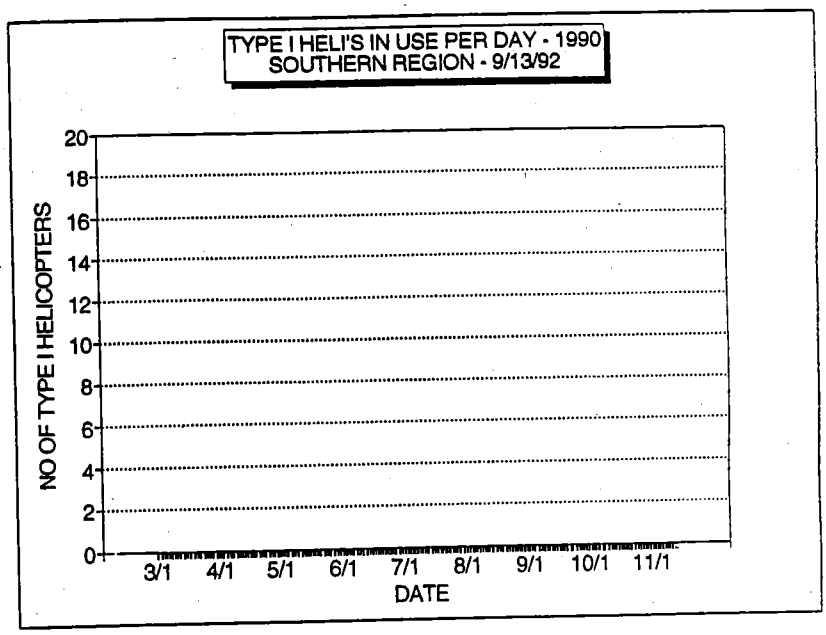
# *Demand Graphs by Region*

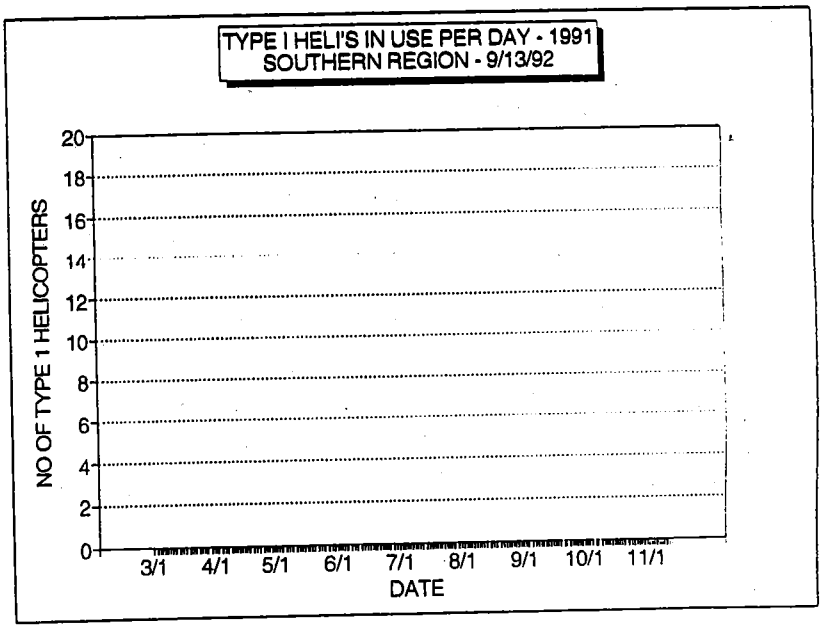



# *Type I Helicopter Demand Graphs - Southern Region*

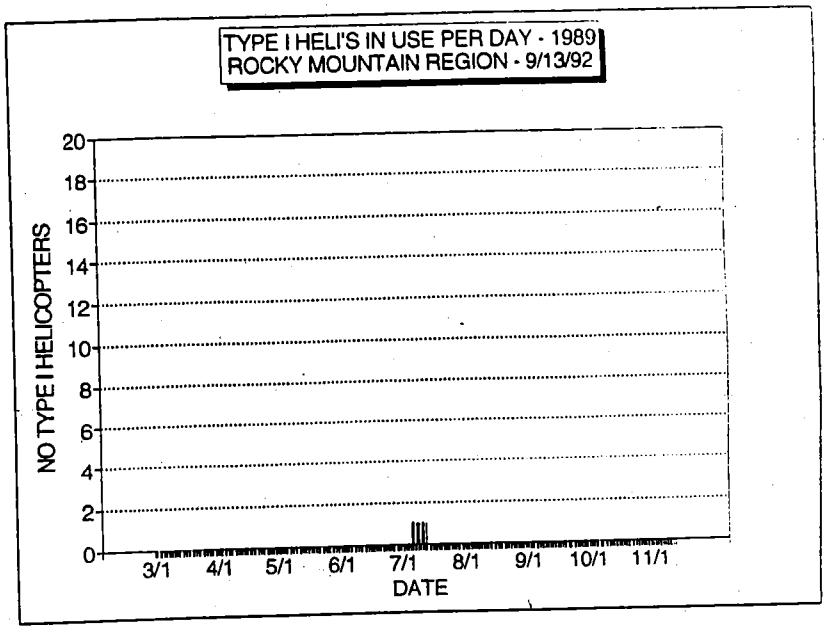
***<---1989***

***1990-->***



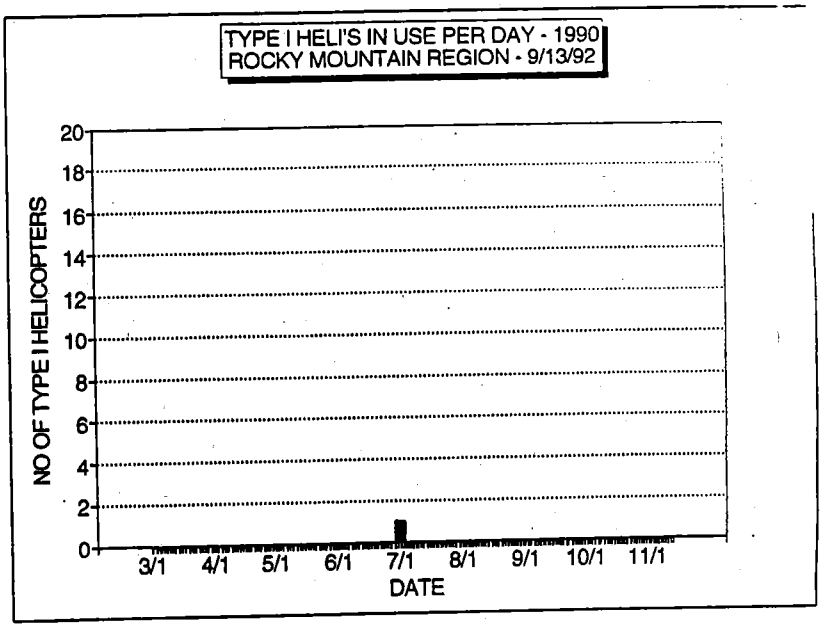

***<---1991***

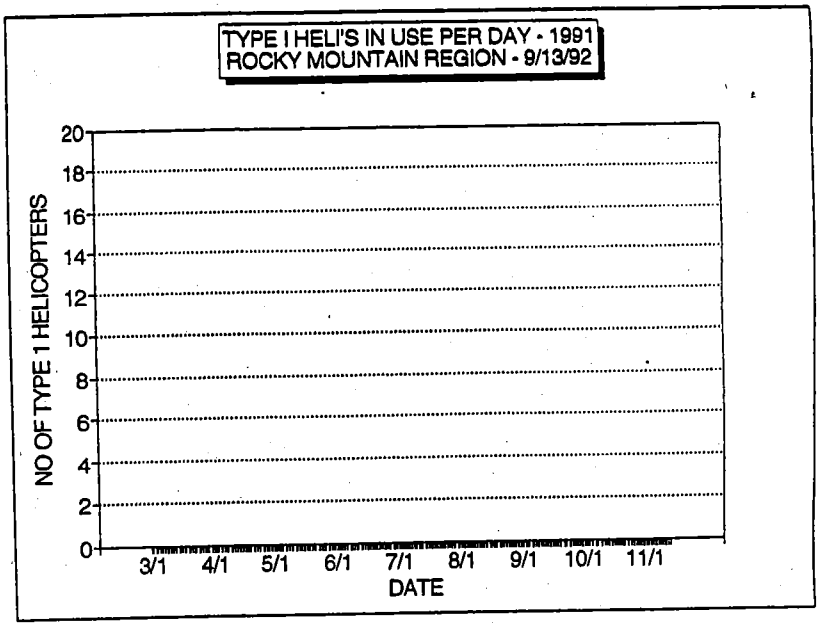



# *Type I Helicopter Demand Graphs - Rocky Mountain Region*

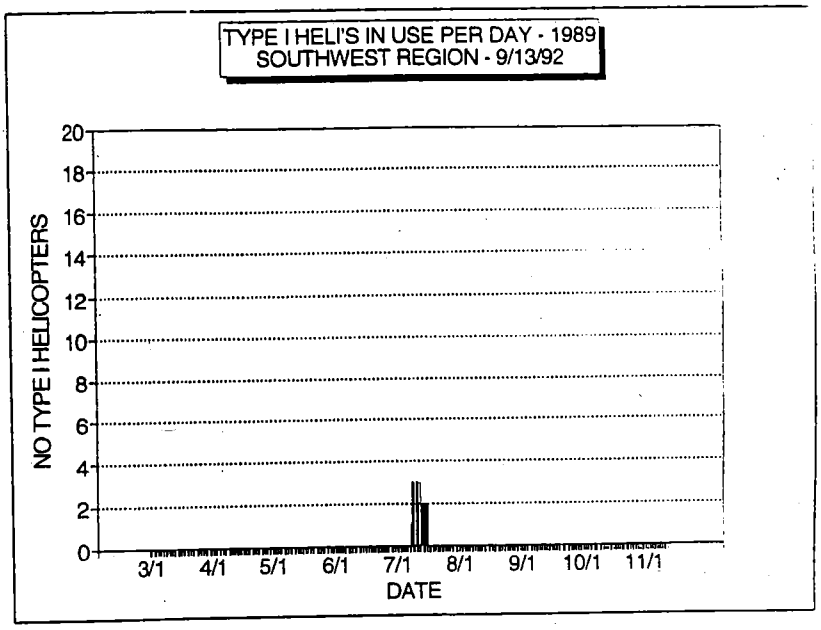
***<---1989***

***1990-->***



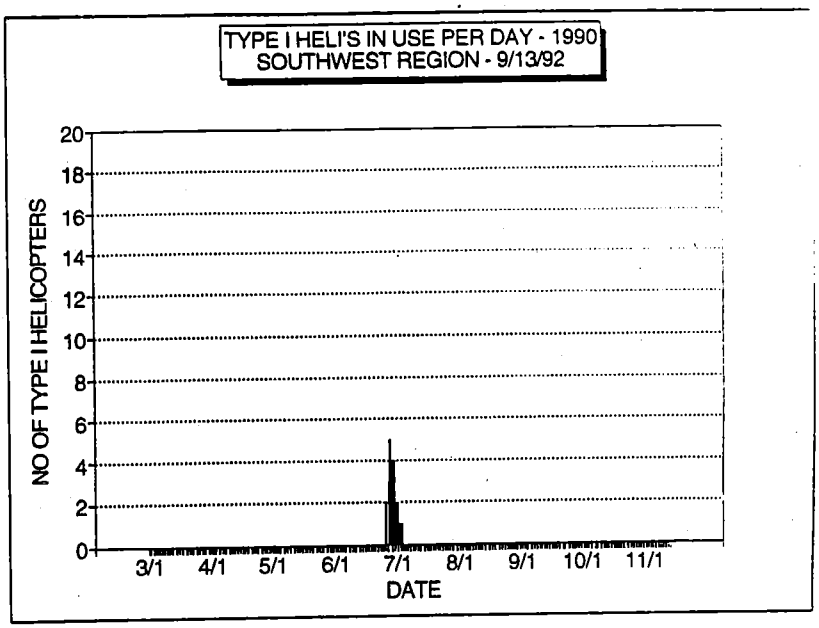




***<---1991***

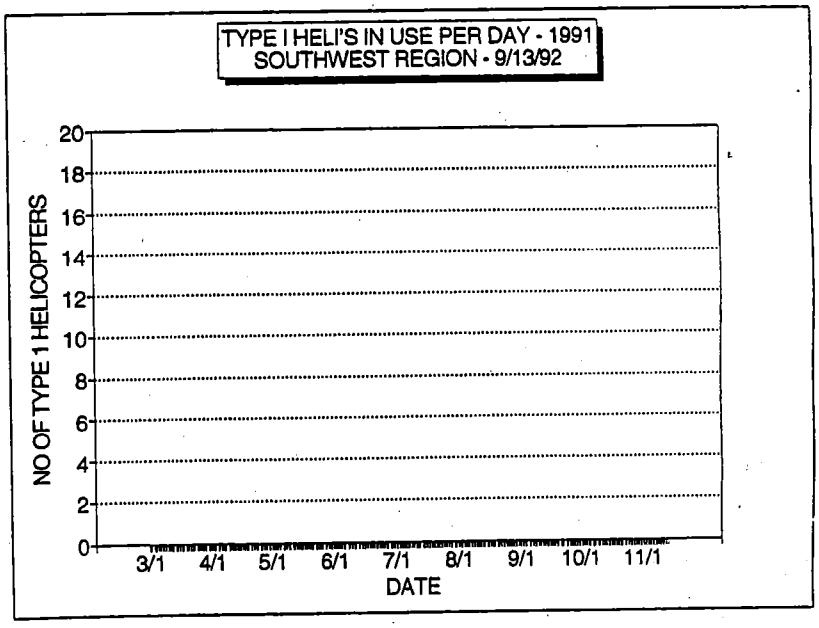



# *Type I Helicopter Demand Graphs - Southwest Region*

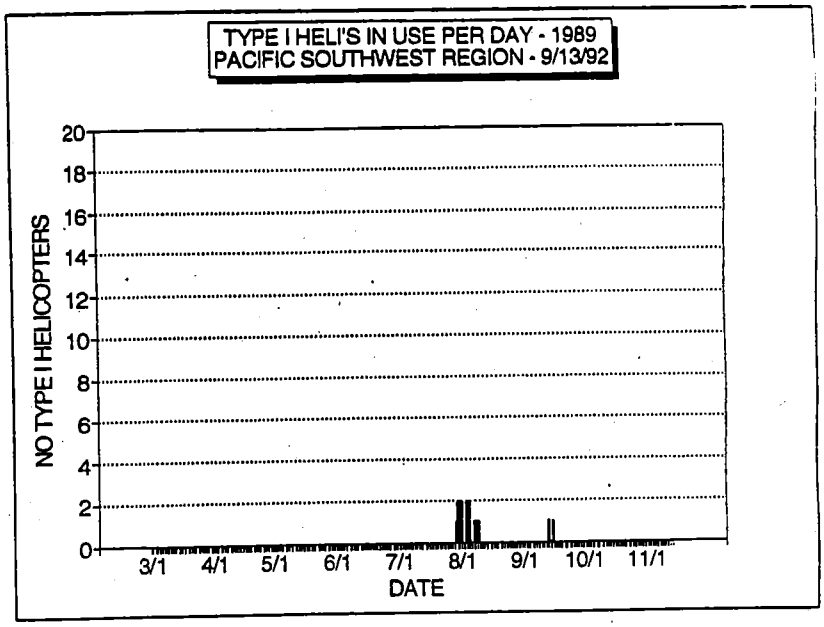
***<---1989***




***1990-->***



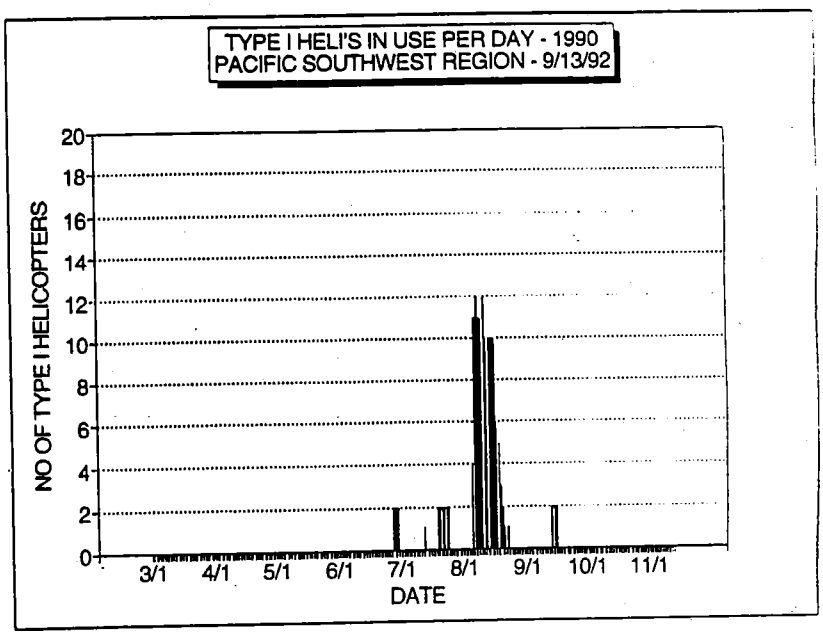

***<---1991***

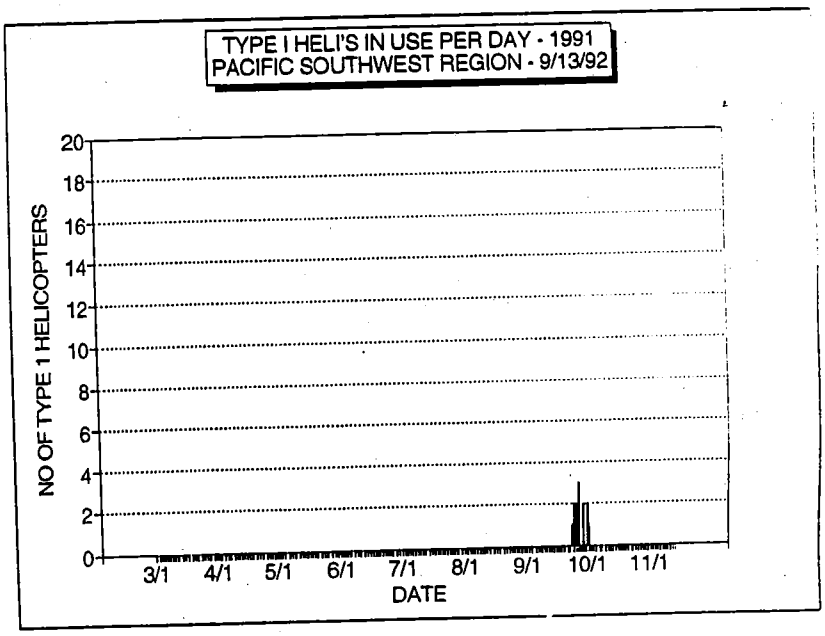



# *Type I Helicopter Demand Graphs - Pacific Southwest Region*

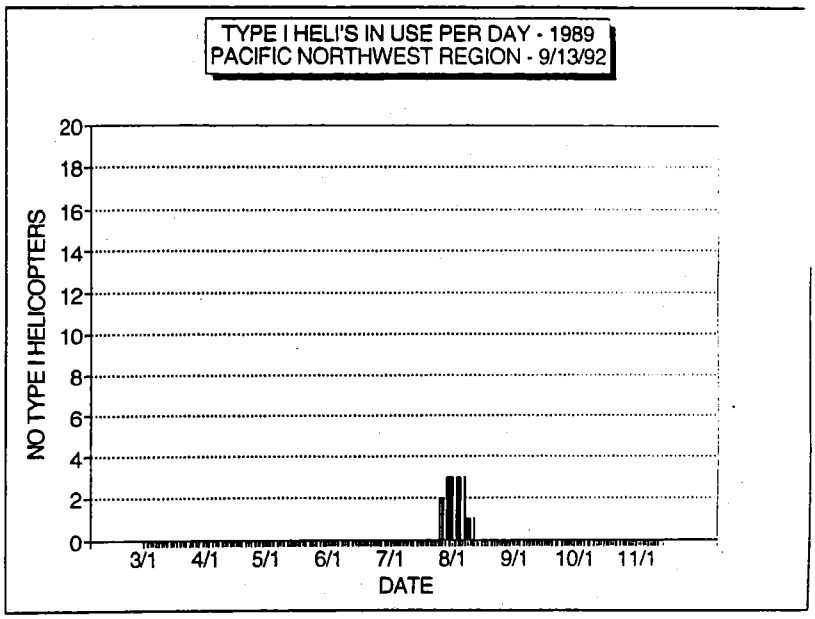
***<---1989***

***1990-->***



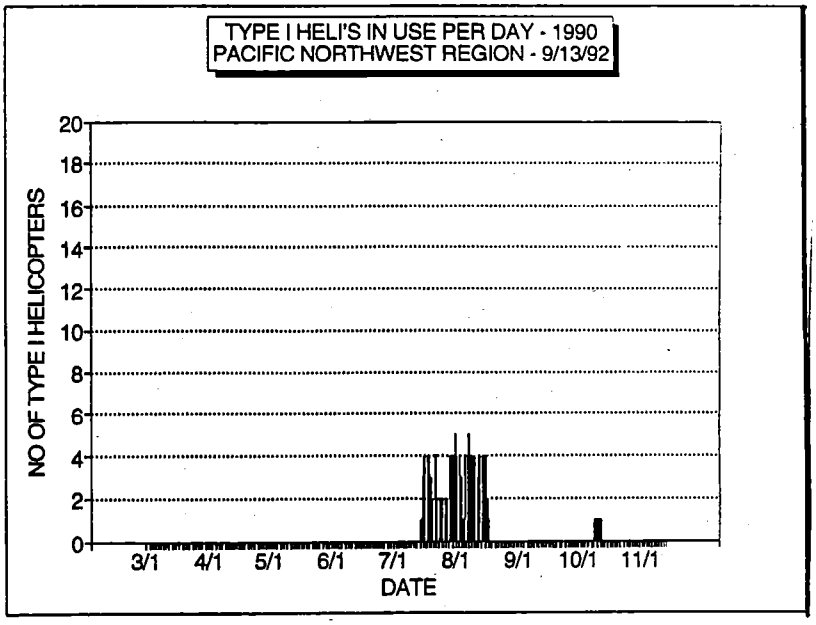




***<---1991***

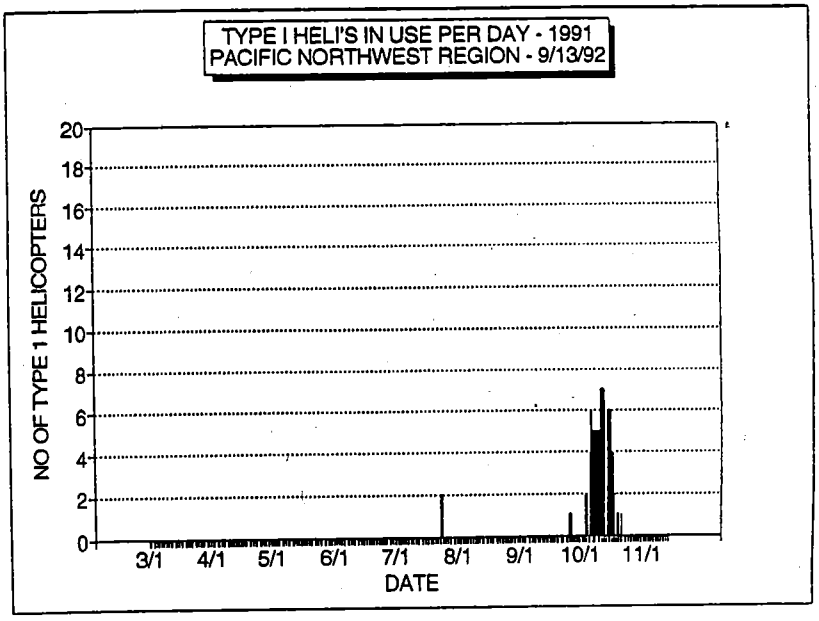



# *Type I Helicopter Demand Graphs - Pacific Northwest Region*

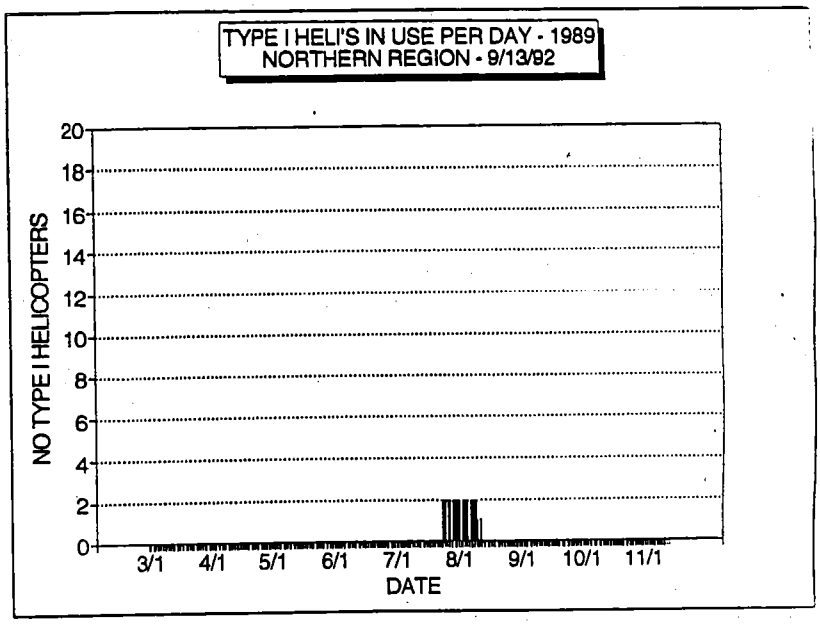
***<---1989***




***1990-->***



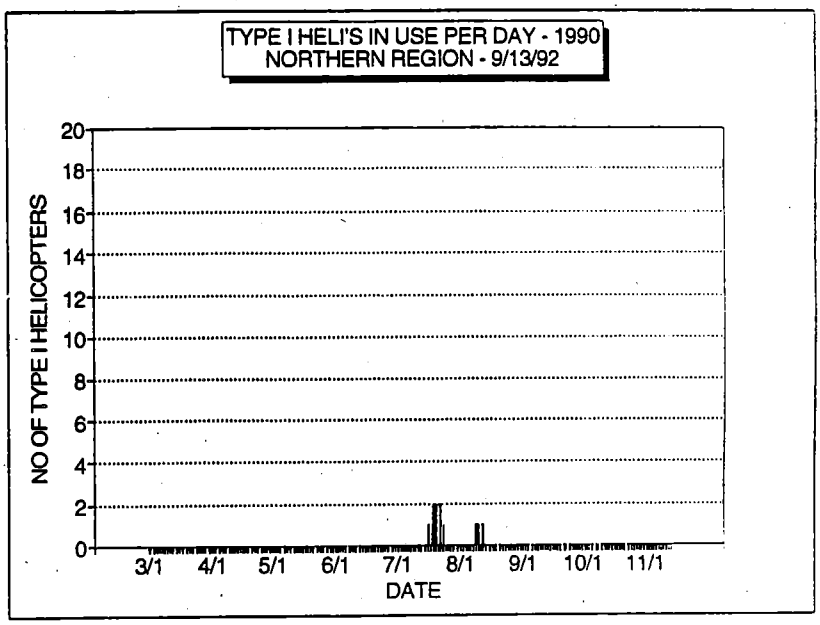

***<---1991***

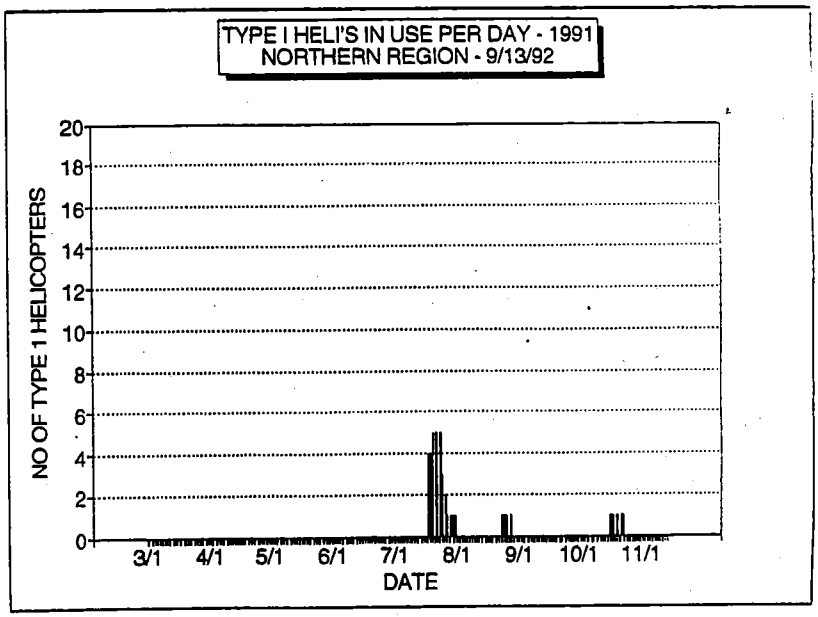



# *Type I Helicopter Demand Graphs - Northern Region*

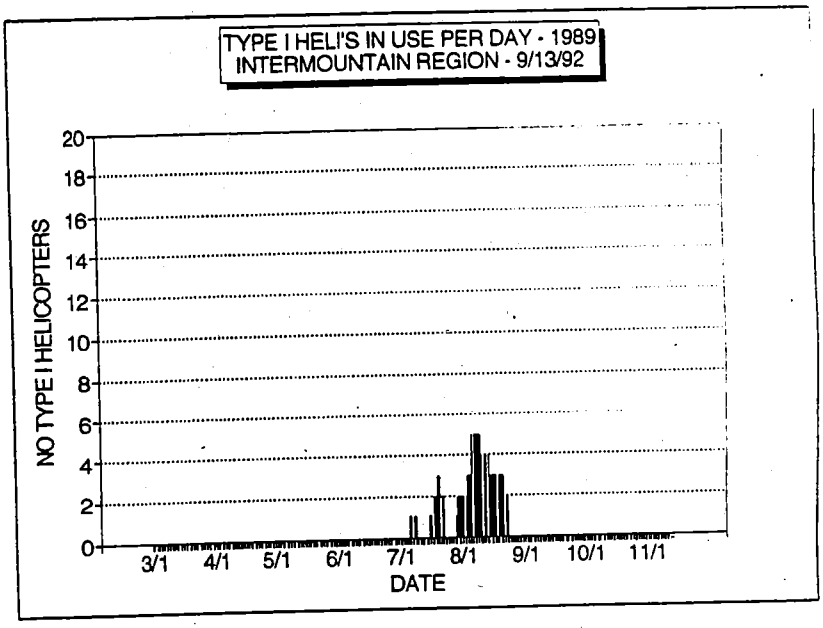
***<---1989***

***1990-->***



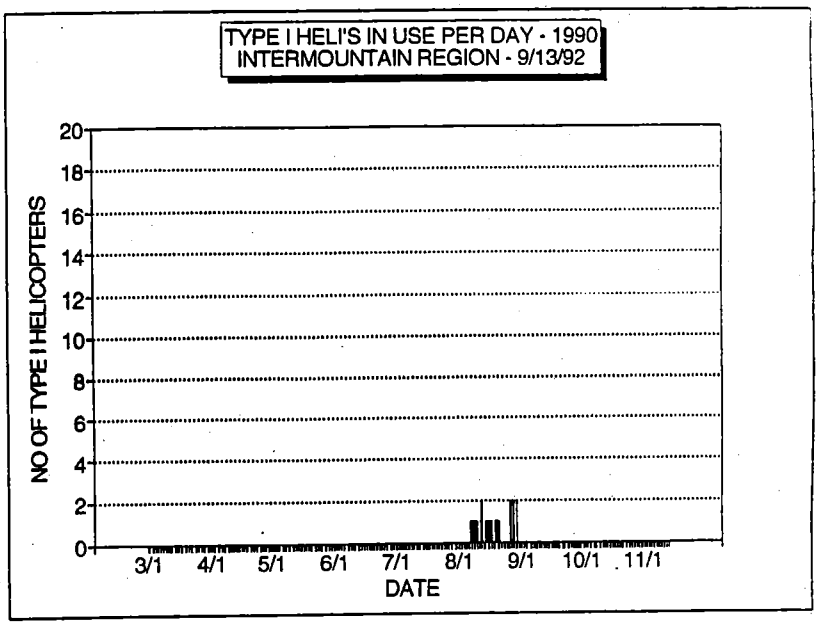

***<---1991***

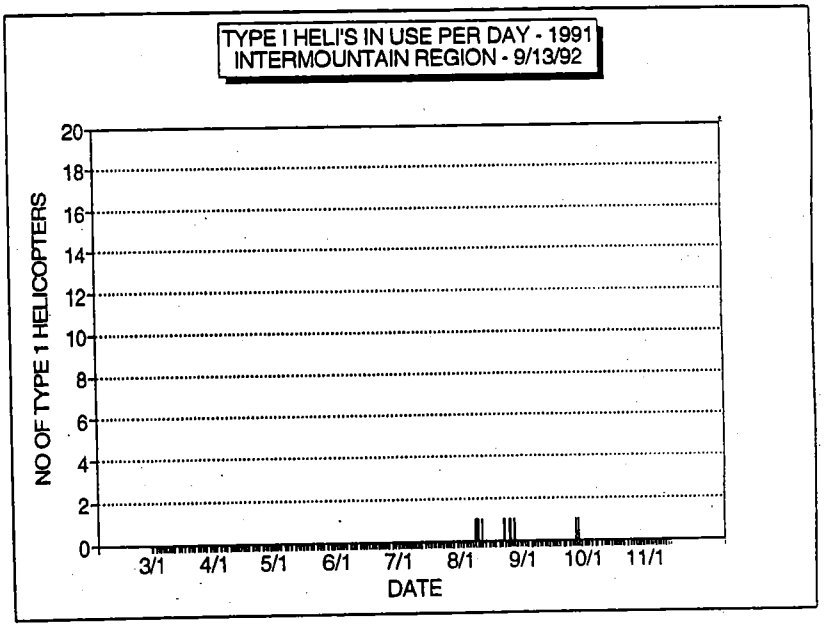



# *Type I Helicopter Demand Graphs - Intermountain Region*

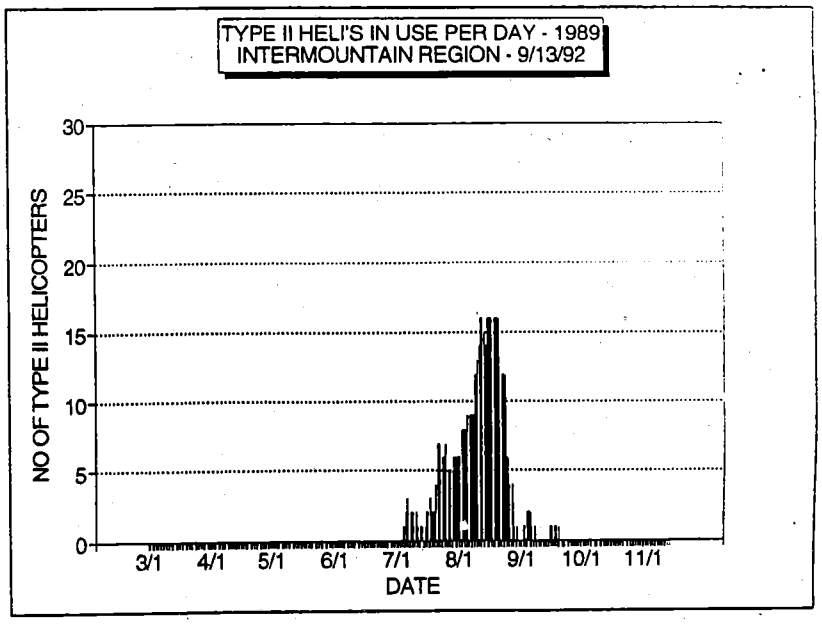
***<---1989***

***1990-->***



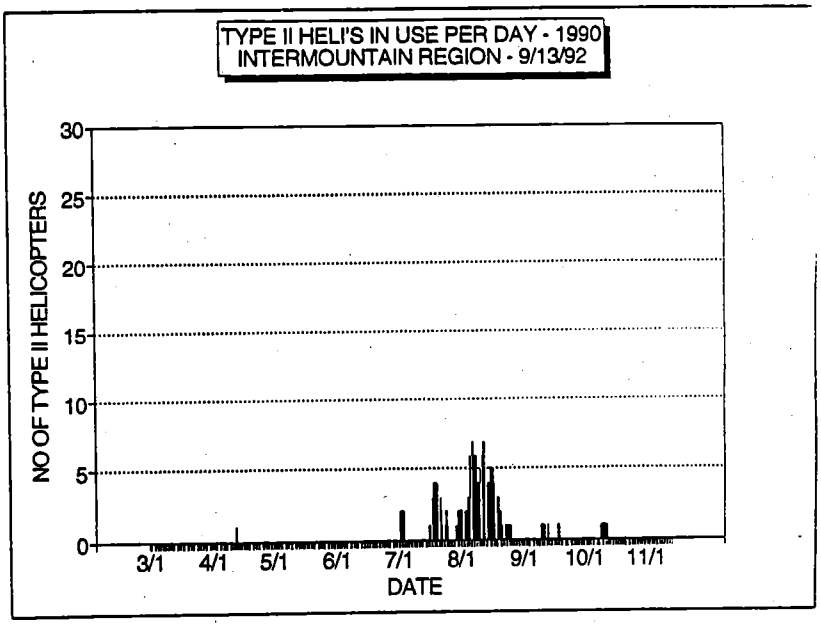

***<---1991***

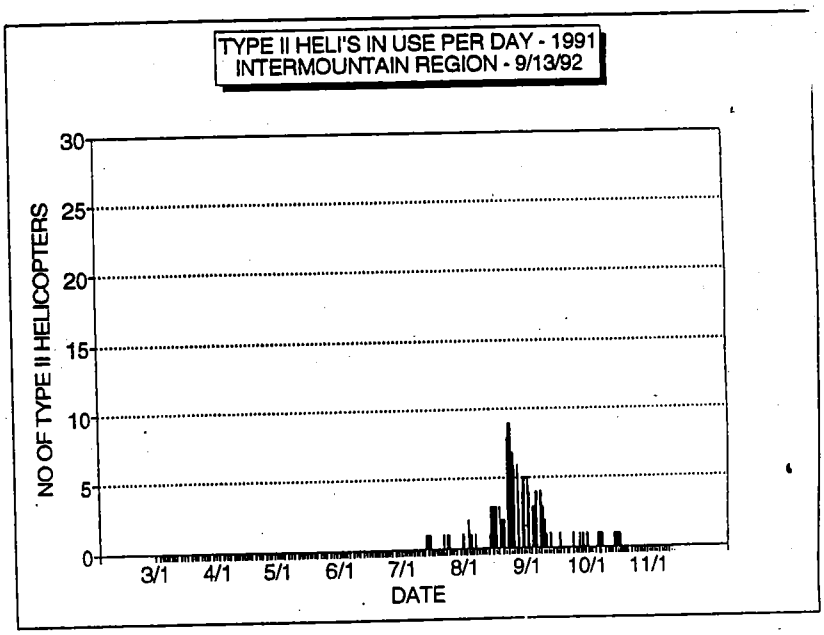



# *Type II Helicopter Demand Graphs - Intermountain Region*

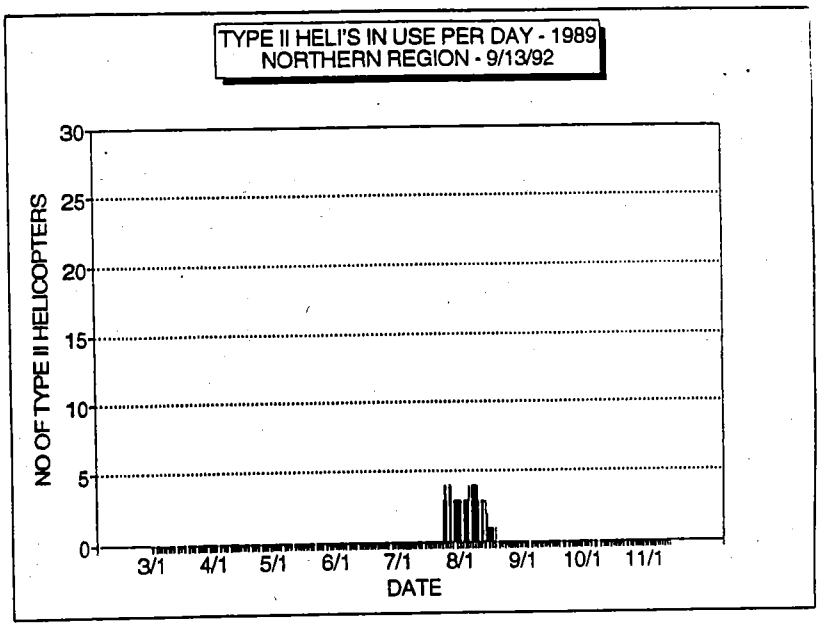
***<---1989***

***1990-->***



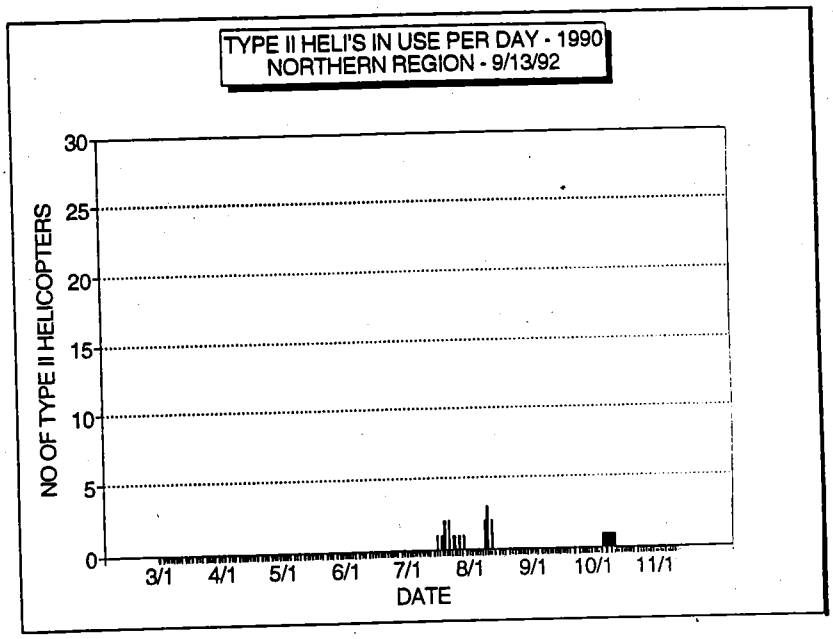

***<---1991***

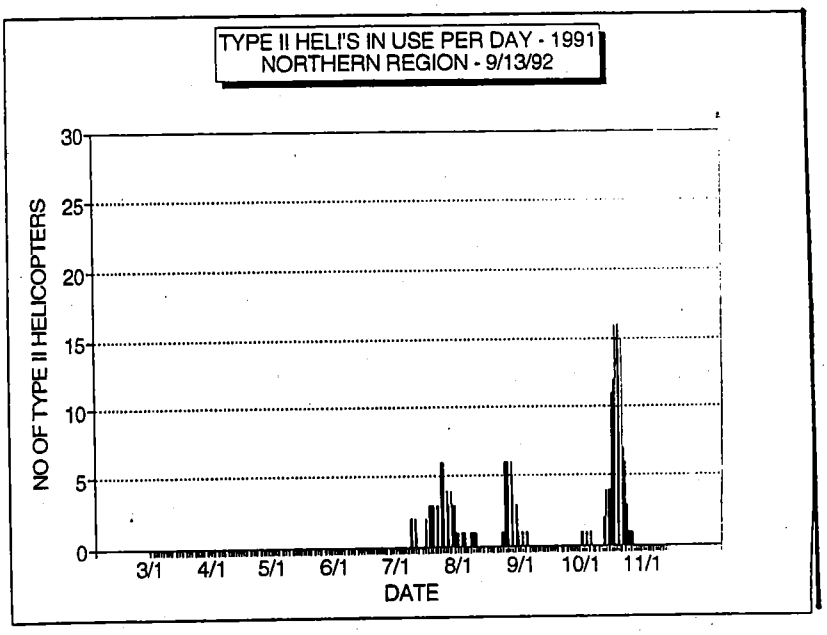



# *Type II Helicopter Demand Graphs - Northern Region*

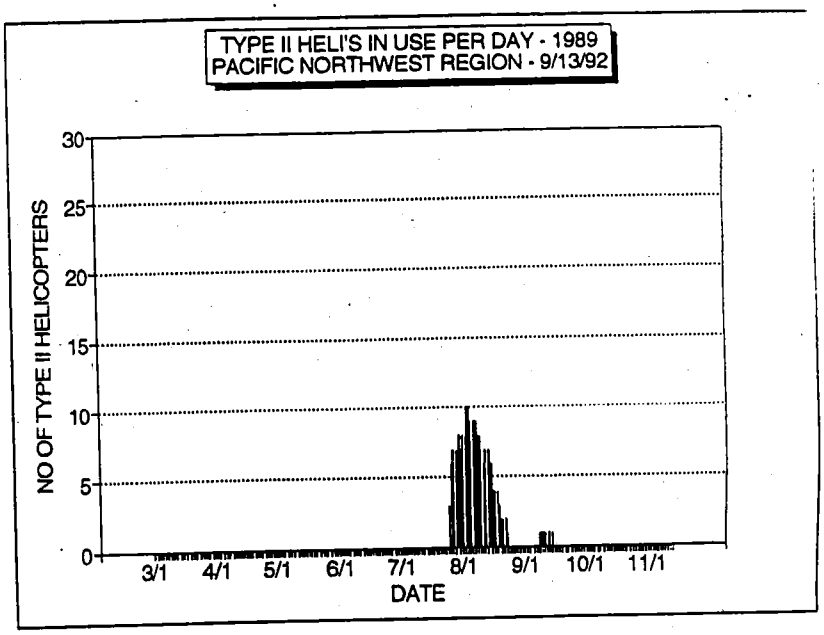
***<---1989***

***1990-->***



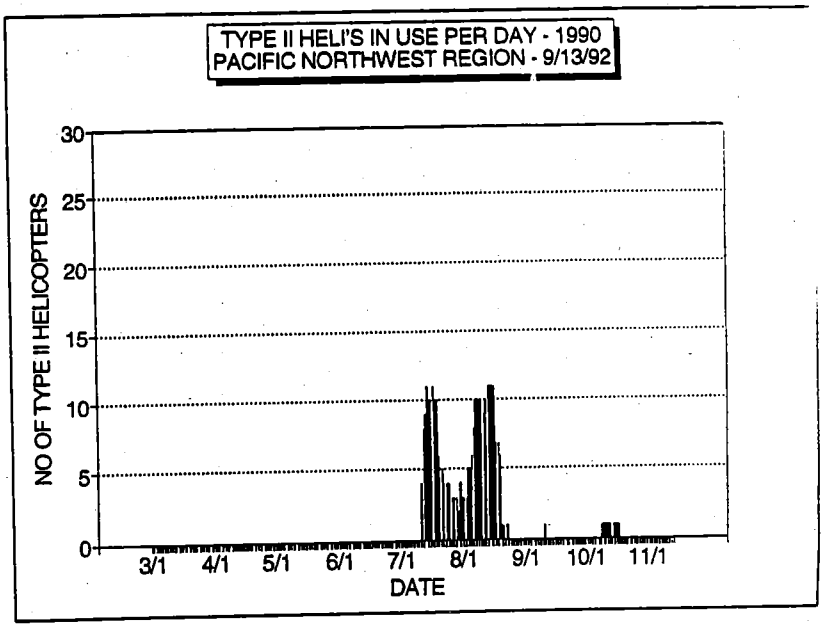

***<---1991***

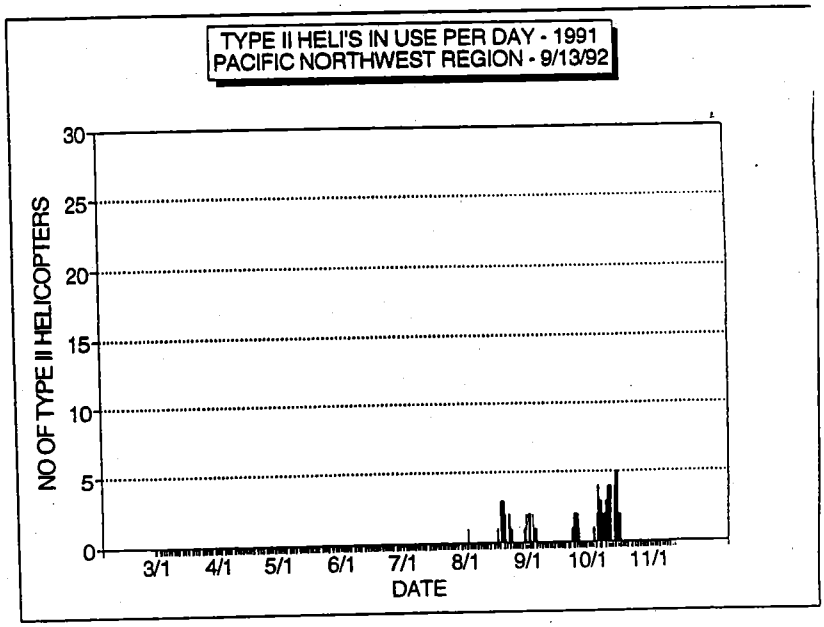



# *Type II Helicopter Demand Graphs - Pacific Northwest Region*

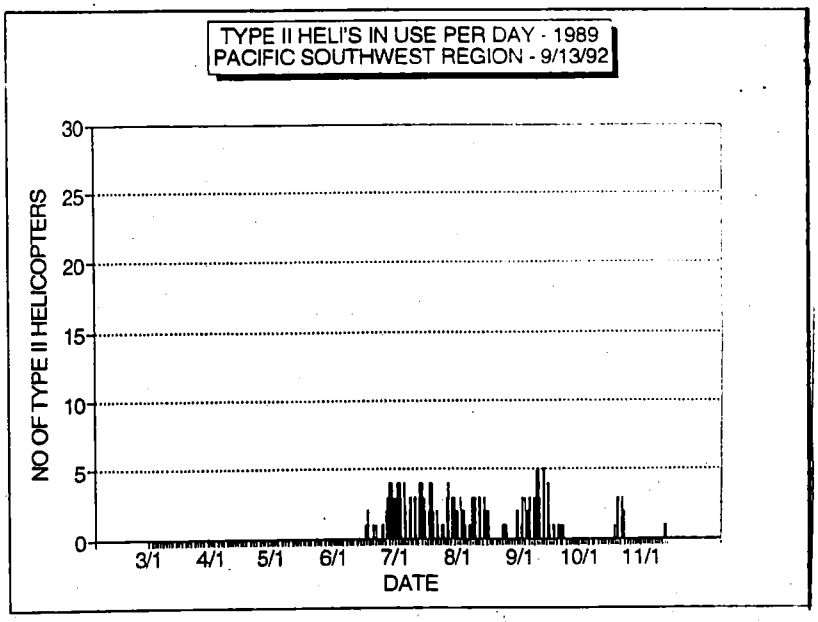
***<---1989***

***1990-->***



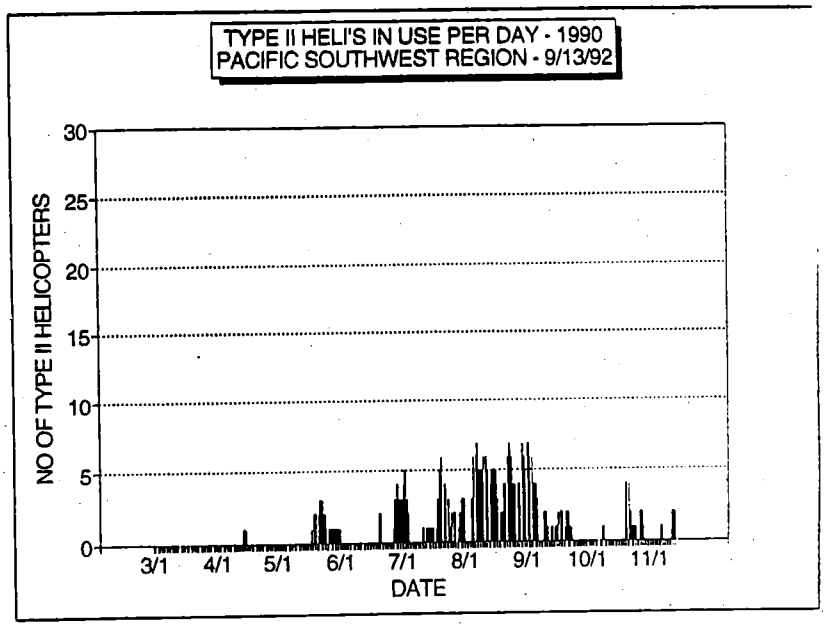

***<---1991***

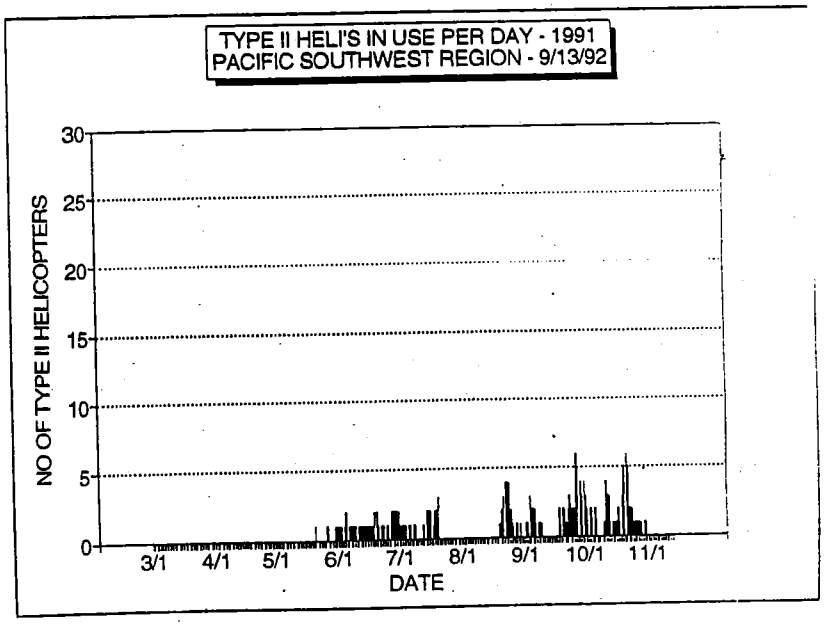



# *Type II Helicopter Demand Graphs - Pacific Southwest Region*

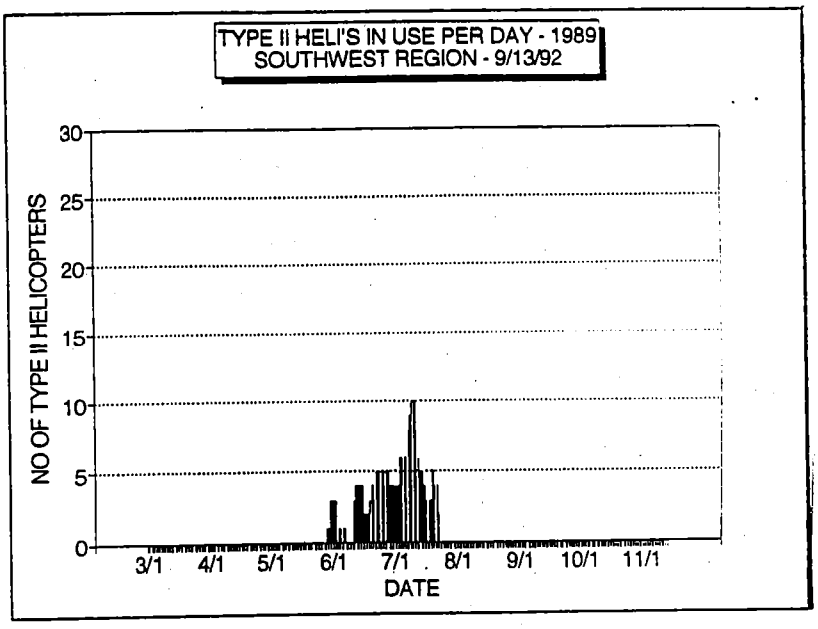
***<---1989***

***1990-->***



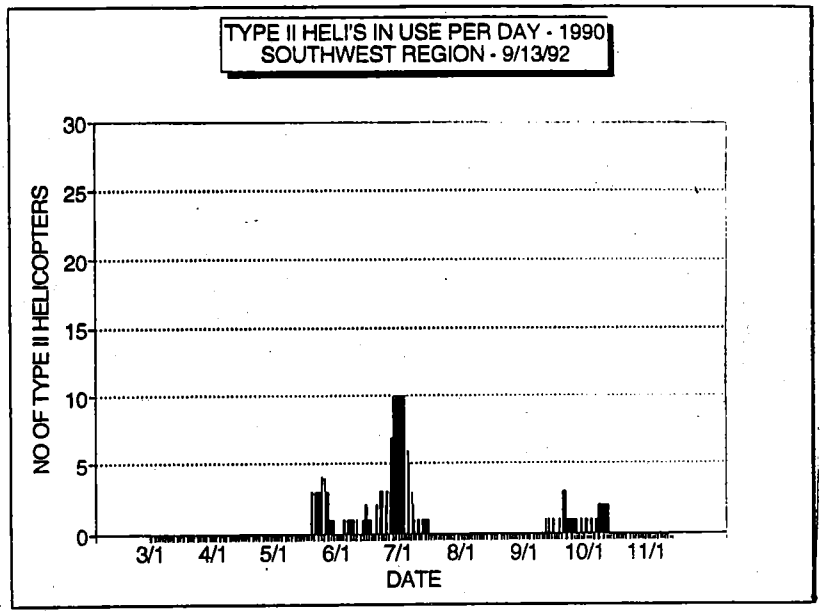

***<---1991***

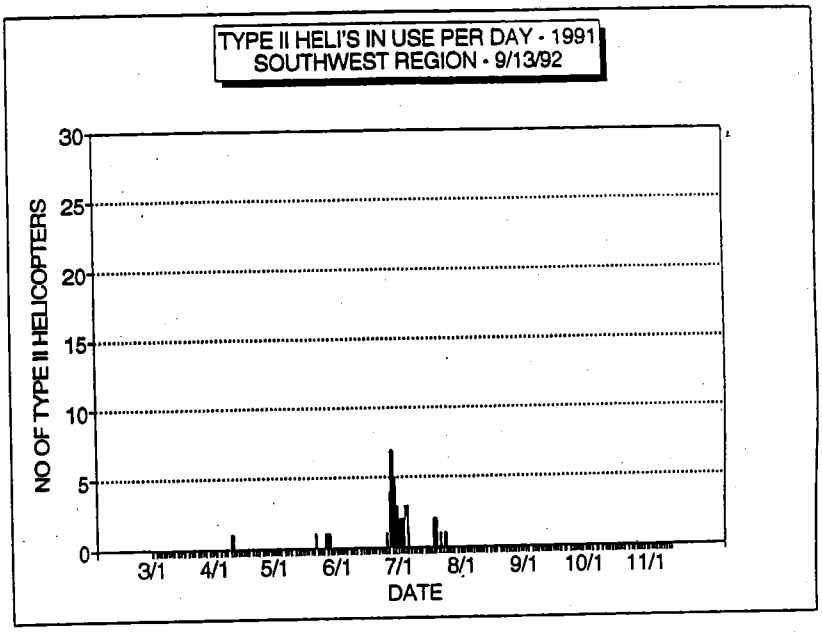



# *Type II Helicopter Demand Graphs - Southwest Region*

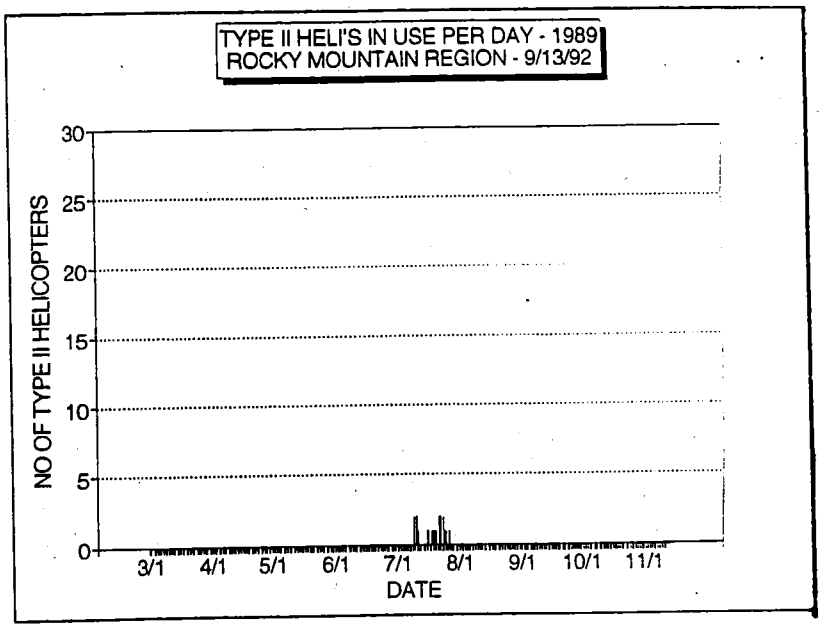
***<---1989***

***1990-->***



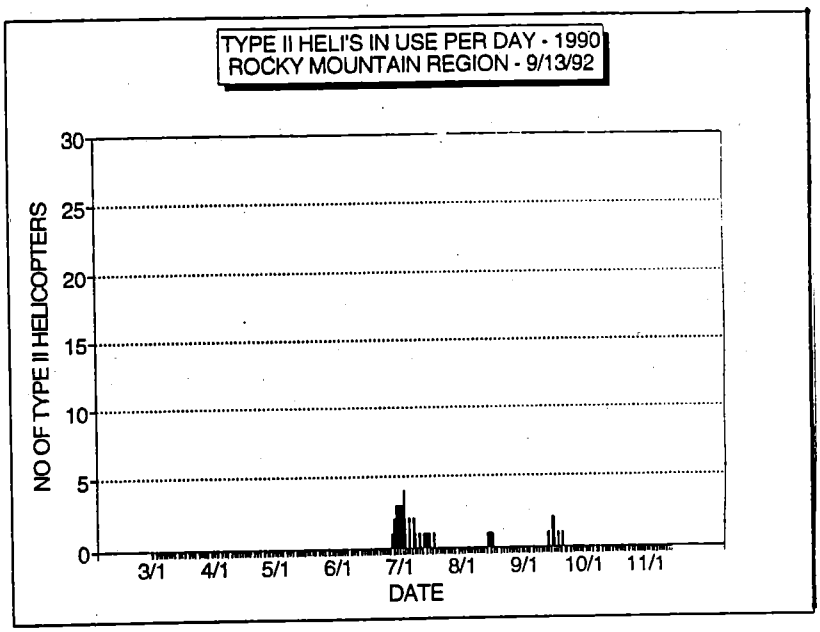

***<---1991***

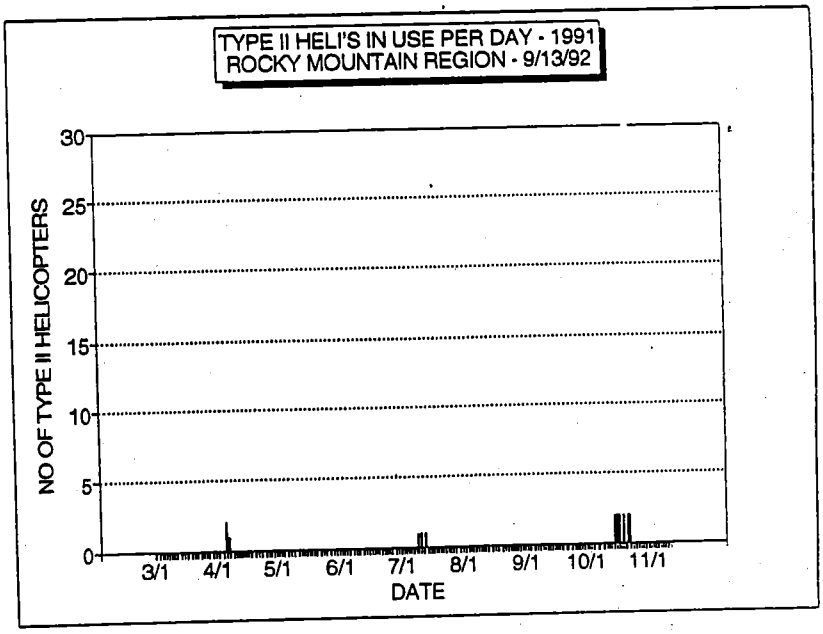



# *Type II Helicopter Demand Graphs - Rocky Mountain Region*

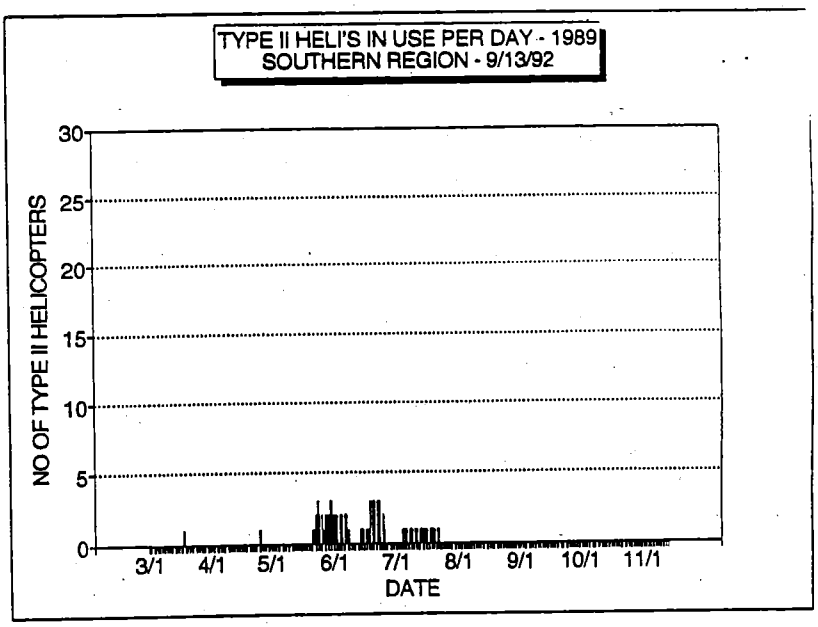
***<---1989***

***1990-->***



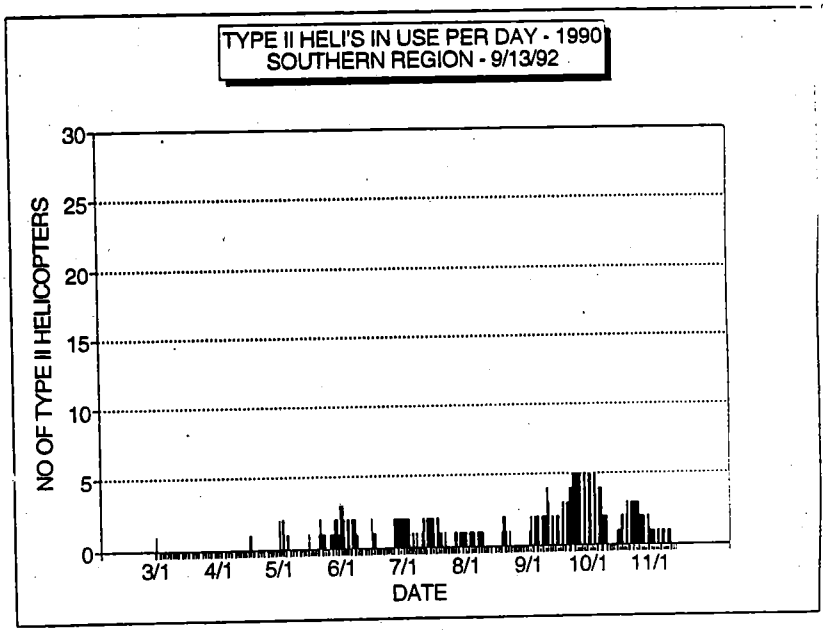

***<---1991***

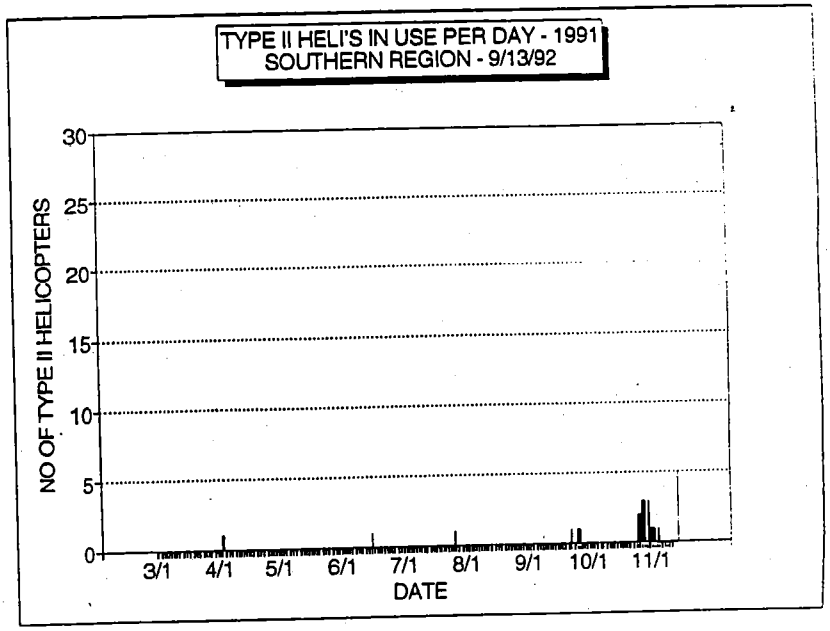



# *Type II Helicopter Demand Graphs - Southern Region*

***<---1989***

***1990-->***




***<---1991***

# *Appendix D*

# *Demand Simulation Model Results*

# A MODEL FOR SIMULATING STOCHASTIC DEMAND PATTERNS FOR TYPE I & TYPE II HELICOPTERS

This MathCad model is designed to help identify the nature of probability distributions of variables giving rise to the periodic demand for medium and heavy helicopters used on large forest fire suppression projects. Both duration and magnitude of helicopter demand are treated as random variables. Total demand, as represented by use days, is a function of these two random variables. Stochastic simulation techniques are combined with Mathcad's plot feature to generate a frequency distribution of total demand consistenct with assumptions about the underlying variability of demand duration and magnitude.

The value in using the model is to help identify the character of the random variables duration and magnitude which describe a time profile of the demand for helicopters. The results of this effort provides data for use by another Mathcad model which is used to determine the most cost efficient number of helicopters to contract for the fire season.

The simulation model is intended to be used interactively. Through iteration the model permits testing how alternative assumptions about the underlying duration and magnitude probability distributions affect the variablility of total helicopter demand. Professional judgement is combined with historical information to arrive at specifications of the duration and magnitude probability distributions. Random draws from these distributions are, in turn, combined to generate a frequency distribution of total demand. This later frequency distribution can be confirmed against historical levels of demand and professional judgement as a test of the assumptions about the underlying duration and magnitude probability models.

## MODEL

Historical data indicates that, when helicopters are needed, the demand profile over any demand period can be represented approximately by an isosceles triangle, where height of the triangle represents peak demand and base of the triangle represents period duration.

Peak demand and duration of demand are assumed to be independent random variables. It is further assumed these random variables can be reasonably approximated by continuous scalene triangular probability distributions.

Total demand over any period is determined from the area formula for a triangle (1/2 base X height). Hence, total demand is a random variable since it is the result of random observations from the two triangular frequency distributions representing peak period demand and demand duration.

PROBABILITY MODEL INPUTS:----------

| | Peak period demand | | Demand period duration (days) |
|---|---|---|---|
| Triangular : | a := 4 | minimum | d := 30 |
| Distribution: | b := 15 | mode | e := 90 |
| Parameters : | c := 30 | maximum | f := 120 |

---

OBS ≡ 1999 Number of random draws to be taken.

---

LOWER 48 STATES - 100% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE I HELICOPTERS

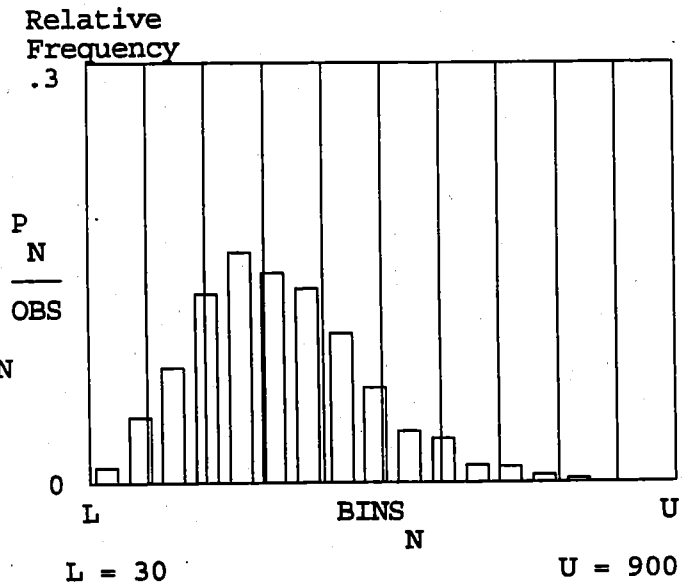
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a | = 2 |
| Mode | b | = 12 |
| Maximum | c | = 20 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d | = 30 |
| Mode | e | = 45 |
| Maximum | f | = 90 |




| P N / OBS | BINS M |
|---|---|
| 0.011 | 55 |
| 0.0465 | 105 |
| 0.082 | 155 |
| 0.1351 | 205 |
| 0.1641 | 255 |
| 0.1496 | 305 |
| 0.1386 | 355 |
| 0.1061 | 405 |
| 0.0675 | 455 |
| 0.0365 | 505 |
| 0.031 | 555 |
| 0.0125 | 605 |
| 0.0115 | 655 |
| 0.0055 | 705 |
| 0.003 | 755 |
| 0 | 805 |
| 0 | 855 |
| | 926 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 312.806

NBIN = 17.4 H = 50 Interval size

LOWER 48 STATES - 90% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE I HELICOPTERS

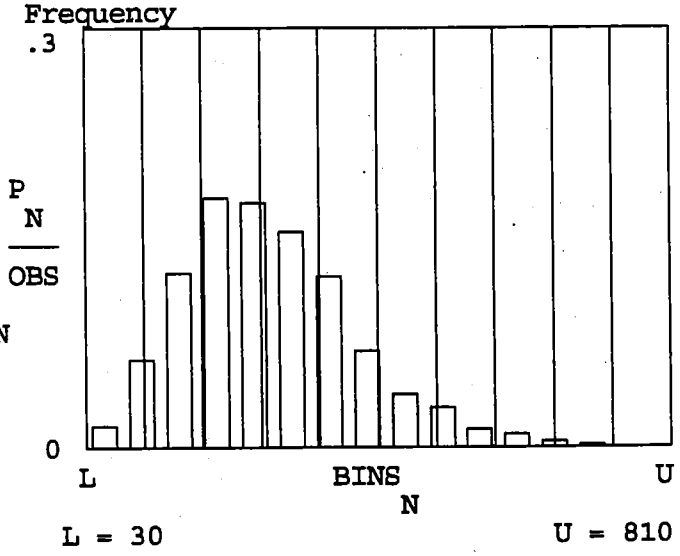
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a | = 2 |
| Mode | b | = 10 |
| Maximum | c | = 18 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d | = 30 |
| Mode | e | = 45 |
| Maximum | f | = 90 |




| P N / OBS | BINS M |
|---|---|
| 0.0155 | 55 |
| 0.0635 | 105 |
| 0.1256 | 155 |
| 0.1791 | 205 |
| 0.1751 | 255 |
| 0.1551 | 305 |
| 0.1231 | 355 |
| 0.069 | 405 |
| 0.038 | 455 |
| 0.0285 | 505 |
| 0.013 | 555 |
| 0.0095 | 605 |
| 0.004 | 655 |
| 0.0015 | 705 |
| 0 | 755 |
| | 836 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 276.031

NBIN = 15.6 H = 50 Interval size

LOWER 48 STATES - 80% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE I HELICOPTERS

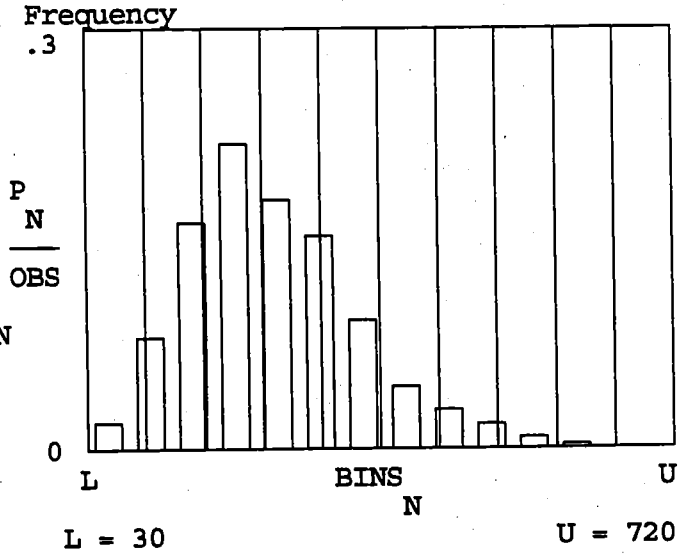
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

| | |
|---|---|
| Minimum | a = 2 |
| Mode | b = 9 |
| Maximum | c = 16 |

DEMAND PERIOD DURATION

| | |
|---|---|
| Minimum | d = 30 |
| Mode | e = 45 |
| Maximum | f = 90 |




| P N / OBS | BINS M |
|---|---|
| 0.019 | 55 |
| 0.0795 | 105 |
| 0.1616 | 155 |
| 0.2181 | 205 |
| 0.1781 | 255 |
| 0.1521 | 305 |
| 0.092 | 355 |
| 0.044 | 405 |
| 0.028 | 455 |
| 0.0175 | 505 |
| 0.0075 | 555 |
| 0.003 | 605 |
| 0 | 655 |
| | 746 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 248.479

NBIN = 13.8 H = 50 Interval size

LOWER 48 STATES - 70% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE I HELICOPTERS

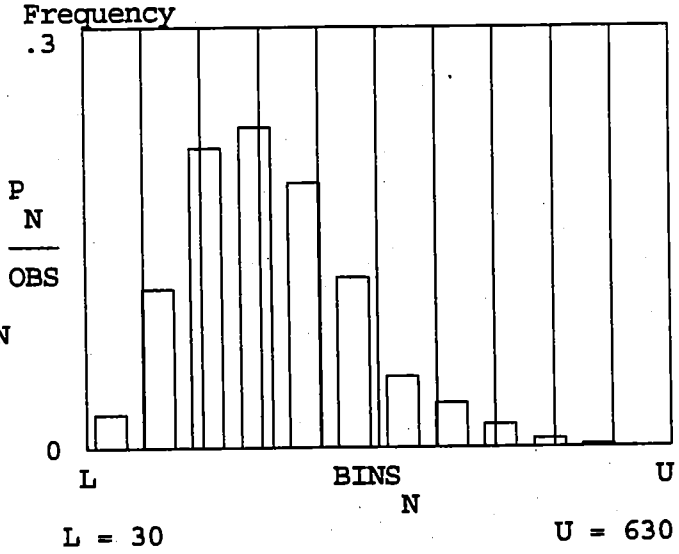
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 2
Mode b = 8
Maximum c = 14

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 45
Maximum f = 90




| P N / OBS | BINS M |
|---|---|
| 0.0245 | 55 |
| 0.1146 | 105 |
| 0.2141 | 155 |
| 0.2291 | 205 |
| 0.1896 | 255 |
| 0.1216 | 305 |
| 0.051 | 355 |
| 0.032 | 405 |
| 0.0165 | 455 |
| 0.006 | 505 |
| 0.0015 | 555 |
| 0 | 605 |
| | 656 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 220.927

NBIN = 12 H = 50 Interval size

LOWER 48 STATES - 60% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE I HELICOPTERS

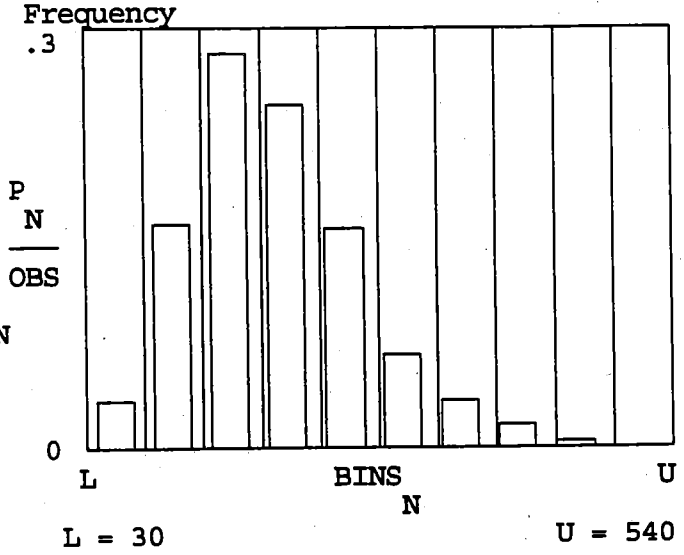
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 2
Mode b = 7
Maximum c = 12

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 45
Maximum f = 90




| P N / OBS | BINS M |
|---|---|
| 0.034 | 55 |
| 0.1611 | 105 |
| 0.2821 | 155 |
| 0.2451 | 205 |
| 0.1576 | 255 |
| 0.0665 | 305 |
| 0.034 | 355 |
| 0.016 | 405 |
| 0.004 | 455 |
| 0 | 505 |
| | 566 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 193.375

NBIN = 10.2

H = 50 Interval size

LOWER 48 STATES - 100% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

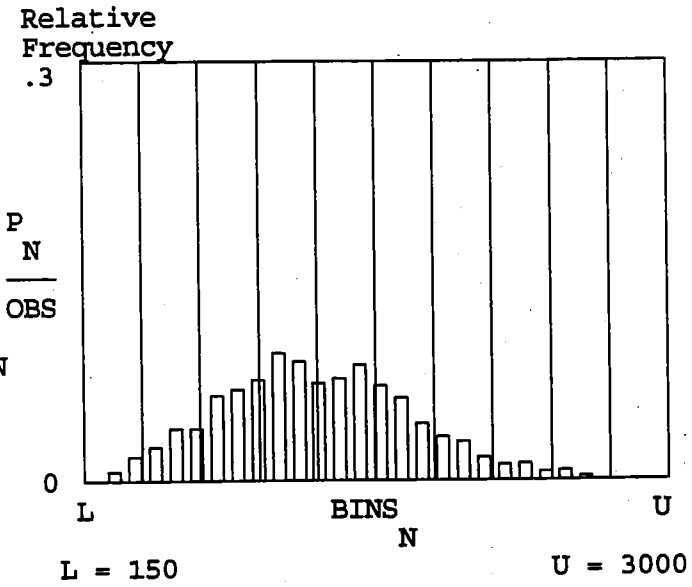
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 5
Mode b = 25
Maximum c = 40

DEMAND PERIOD DURATION

Minimum d = 60
Mode e = 120
Maximum f = 150




L = 150 U = 3000

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 1284.708

NBIN = 28.5 H = 100 Interval size

| P N / OBS | BINS M |
|---|---|
| 0 | 200 |
| 0.0065 | 300 |
| 0.017 | 400 |
| 0.0245 | 500 |
| 0.037 | 600 |
| 0.0375 | 700 |
| 0.0605 | 800 |
| 0.0645 | 900 |
| 0.072 | 1000 |
| 0.0905 | 1100 |
| 0.0845 | 1200 |
| 0.0695 | 1300 |
| 0.073 | 1400 |
| 0.082 | 1500 |
| 0.067 | 1600 |
| 0.0585 | 1700 |
| 0.041 | 1800 |
| 0.0315 | 1900 |
| 0.028 | 2000 |
| 0.016 | 2100 |
| 0.0115 | 2200 |
| 0.012 | 2300 |
| 0.006 | 2400 |
| 0.007 | 2500 |
| 0.0025 | 2600 |
| 0 | 2700 |
| 0 | 2800 |
| 0 | 2900 |
| | 3051 |

LOWER 48 STATES - 90% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

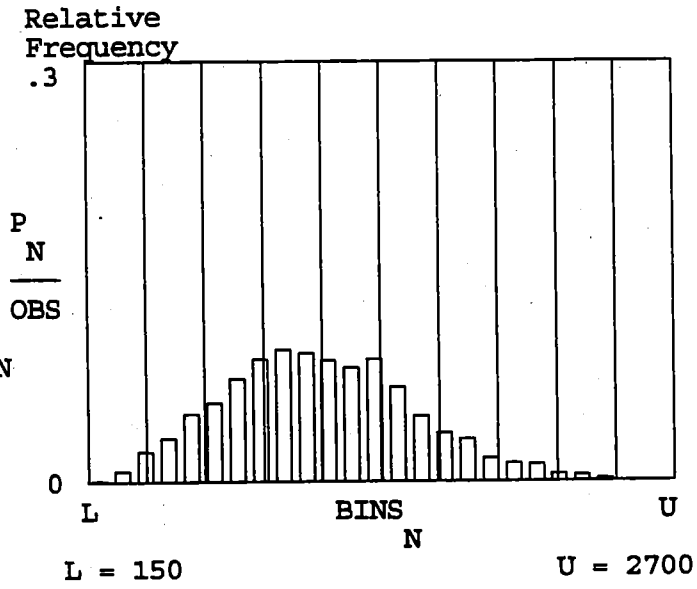
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 5
Mode b = 22
Maximum c = 36

DEMAND PERIOD DURATION

Minimum d = 60
Mode e = 120
Maximum f = 150




| P N / OBS | BINS M |
|---|---|
| 0.001 | 200 |
| 0.008 | 300 |
| 0.022 | 400 |
| 0.031 | 500 |
| 0.0485 | 600 |
| 0.056 | 700 |
| 0.0735 | 800 |
| 0.0875 | 900 |
| 0.0945 | 1000 |
| 0.0915 | 1100 |
| 0.086 | 1200 |
| 0.081 | 1300 |
| 0.087 | 1400 |
| 0.0675 | 1500 |
| 0.047 | 1600 |
| 0.035 | 1700 |
| 0.03 | 1800 |
| 0.0165 | 1900 |
| 0.013 | 2000 |
| 0.012 | 2100 |
| 0.0055 | 2200 |
| 0.0045 | 2300 |
| 0.0015 | 2400 |
| 0 | 2500 |
| 0 | 2600 |
| | 2751 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 1156.435

NBIN = 25.5 H = 100 Interval size

LOWER 48 STATES - 80% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

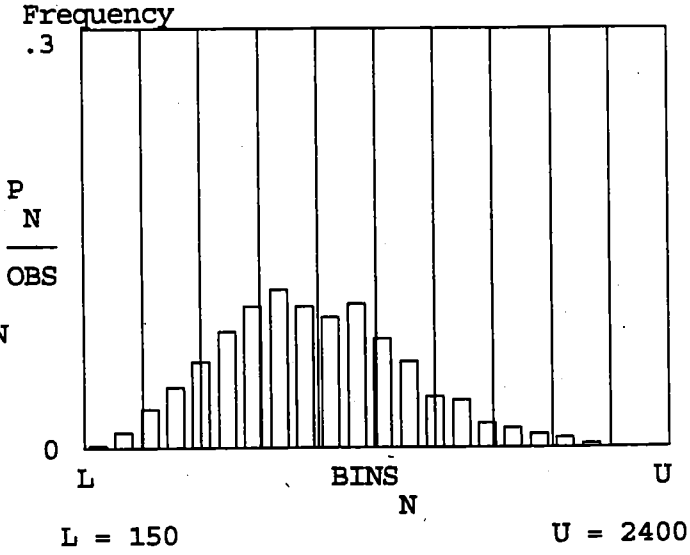
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 5
Mode b = 19
Maximum c = 32

DEMAND PERIOD DURATION

Minimum d = 60
Mode e = 120
Maximum f = 150




| P N / OBS | BINS M |
|---|---|
| 0.002 | 200 |
| 0.0115 | 300 |
| 0.0275 | 400 |
| 0.0435 | 500 |
| 0.0615 | 600 |
| 0.083 | 700 |
| 0.1011 | 800 |
| 0.1131 | 900 |
| 0.1016 | 1000 |
| 0.0935 | 1100 |
| 0.1031 | 1200 |
| 0.078 | 1300 |
| 0.061 | 1400 |
| 0.036 | 1500 |
| 0.034 | 1600 |
| 0.017 | 1700 |
| 0.014 | 1800 |
| 0.0095 | 1900 |
| 0.007 | 2000 |
| 0.0025 | 2100 |
| 0 | 2200 |
| 0 | 2300 |
| | 2451 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 1028.138

NBIN = 22.5

H = 100 Interval size

LOWER 48 STATES - 70% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

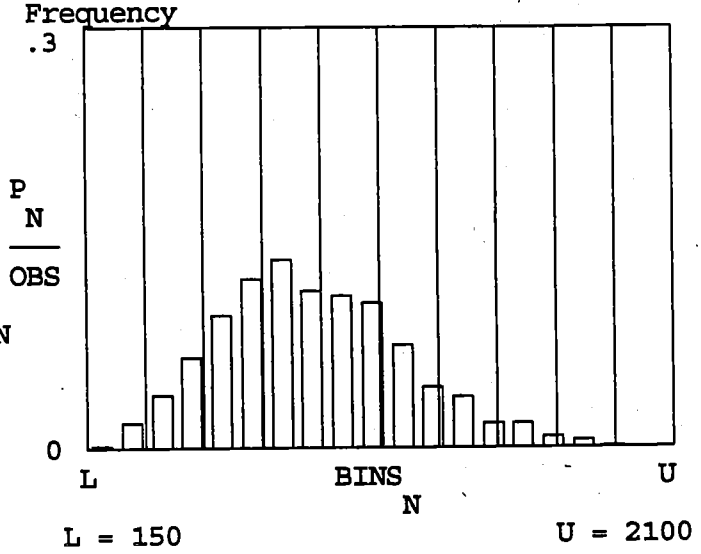
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 5
Mode b = 16
Maximum c = 28

DEMAND PERIOD DURATION

Minimum d = 60
Mode e = 120
Maximum f = 150




| P N / OBS | BINS M |
|---|---|
| 0.002 | 200 |
| 0.018 | 300 |
| 0.038 | 400 |
| 0.065 | 500 |
| 0.095 | 600 |
| 0.1211 | 700 |
| 0.1351 | 800 |
| 0.1121 | 900 |
| 0.1091 | 1000 |
| 0.1041 | 1100 |
| 0.0735 | 1200 |
| 0.043 | 1300 |
| 0.0365 | 1400 |
| 0.0175 | 1500 |
| 0.017 | 1600 |
| 0.008 | 1700 |
| 0.005 | 1800 |
| 0.0005 | 1900 |
| 0 | 2000 |
| | 2151 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 899.821

NBIN = 19.5 H = 100 Interval size

LOWER 48 STATES - 60% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

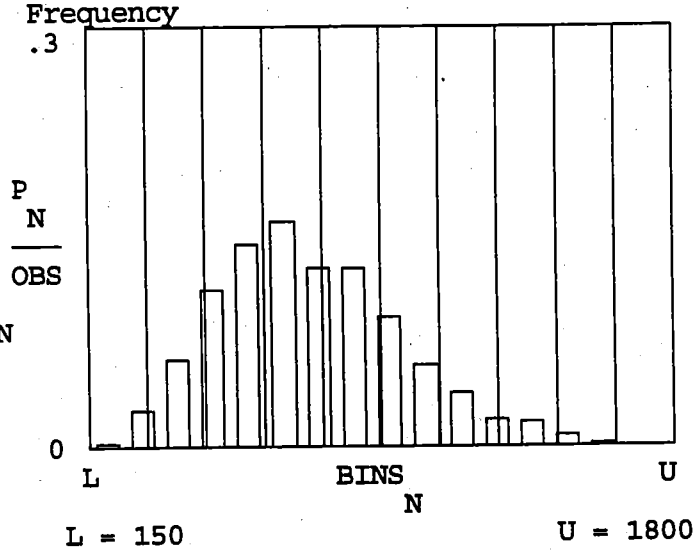
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a | = 5 |
| Mode | b | = 13 |
| Maximum | c | = 24 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d | = 60 |
| Mode | e | = 120 |
| Maximum | f | = 150 |




| P N / OBS | BINS M |
|---|---|
| 0.003 | 200 |
| 0.0255 | 300 |
| 0.062 | 400 |
| 0.1126 | 500 |
| 0.1456 | 600 |
| 0.1621 | 700 |
| 0.1281 | 800 |
| 0.1281 | 900 |
| 0.0925 | 1000 |
| 0.0575 | 1100 |
| 0.038 | 1200 |
| 0.019 | 1300 |
| 0.017 | 1400 |
| 0.008 | 1500 |
| 0.0015 | 1600 |
| 0 | 1700 |
| | 1851 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 771.499

NBIN = 16.5

H = 100 Interval size

ALASKA - AFS - 100% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

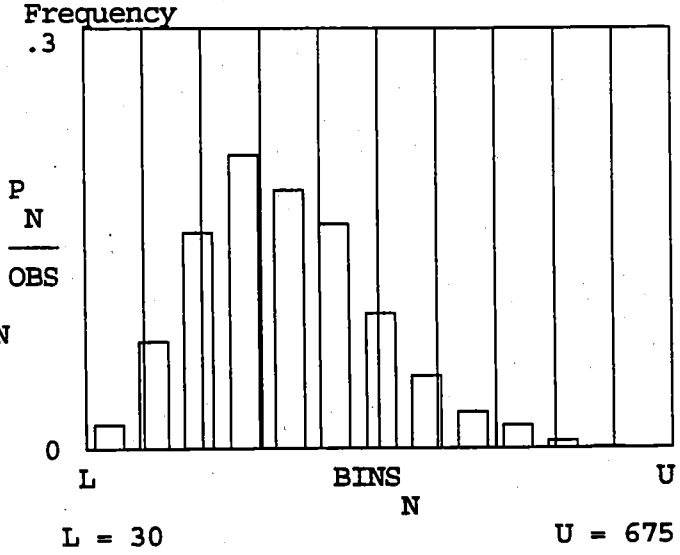
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a | = 2 |
| Mode | b | = 8 |
| Maximum | c | = 15 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d | = 30 |
| Mode | e | = 60 |
| Maximum | f | = 90 |




| P N / OBS | BINS M |
|---|---|
| 0.017 | 55 |
| 0.0765 | 105 |
| 0.1551 | 155 |
| 0.2101 | 205 |
| 0.1851 | 255 |
| 0.1606 | 305 |
| 0.0965 | 355 |
| 0.0515 | 405 |
| 0.0255 | 455 |
| 0.016 | 505 |
| 0.0055 | 555 |
| 0.001 | 605 |
| | 701 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 250.648

NBIN = 12.9 H = 50 Interval size

ALASKA STATE DNR - 100% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

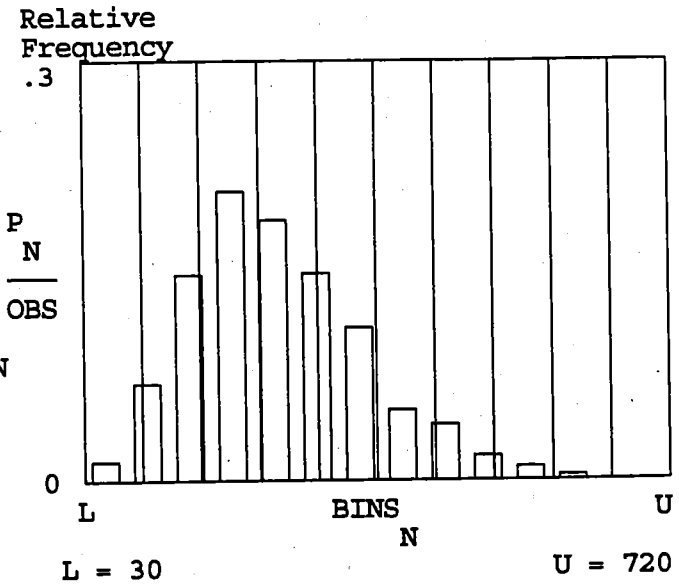
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 2
Mode b = 8
Maximum c = 12

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 60
Maximum f = 120




| P N / OBS | BINS M |
|---|---|
| 0.014 | 55 |
| 0.0695 | 105 |
| 0.1471 | 155 |
| 0.2066 | 205 |
| 0.1856 | 255 |
| 0.1481 | 305 |
| 0.1091 | 355 |
| 0.0505 | 405 |
| 0.04 | 455 |
| 0.017 | 505 |
| 0.0095 | 555 |
| 0.0035 | 605 |
| 0 | 655 |
| | 746 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 258.212

NBIN = 13.8 H = 50 Interval size

ALL OF ALASKA - 100% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

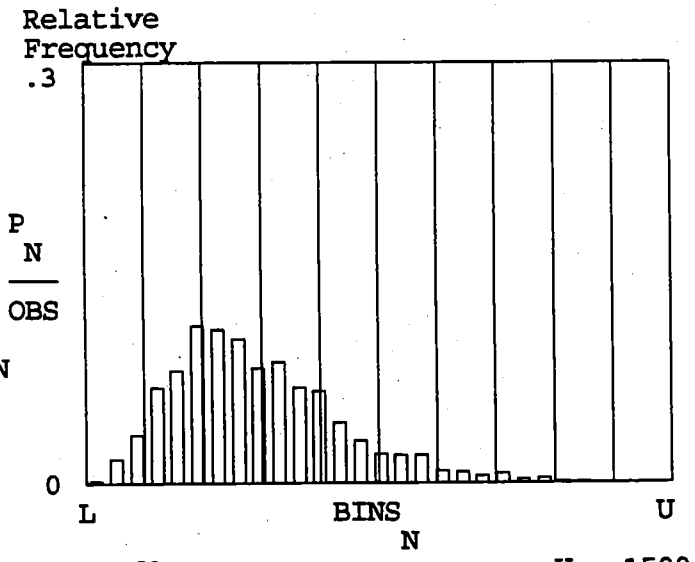
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a = | 4 |
| Mode | b = | 12 |
| Maximum | c = | 25 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d = | 30 |
| Mode | e = | 60 |
| Maximum | f = | 120 |




| P N / OBS | BINS M |
|---|---|
| 0.002 | 85 |
| 0.0175 | 135 |
| 0.035 | 185 |
| 0.068 | 235 |
| 0.08 | 285 |
| 0.1126 | 335 |
| 0.1096 | 385 |
| 0.1031 | 435 |
| 0.082 | 485 |
| 0.0865 | 535 |
| 0.068 | 585 |
| 0.066 | 635 |
| 0.043 | 685 |
| 0.03 | 735 |
| 0.0205 | 785 |
| 0.02 | 835 |
| 0.02 | 885 |
| 0.0085 | 935 |
| 0.008 | 985 |
| 0.0055 | 1035 |
| 0.0065 | 1085 |
| 0.0025 | 1135 |
| 0.0035 | 1185 |
| 0.001 | 1235 |
| 0.001 | 1285 |
| 0 | 1335 |
| 0 | 1385 |
| 0 | 1435 |
| | 1526 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 481.034

NBIN = 28.8

H = 50 Interval size

ALL OF ALASKA - 90% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

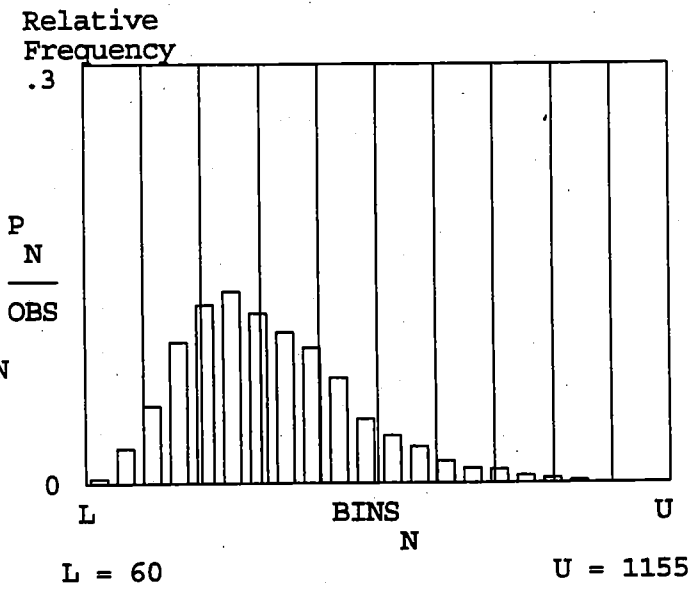
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 4
Mode b = 11
Maximum c = 22

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 60
Maximum f = 105




| P N / OBS | BINS M |
|---|---|
| 0.0035 | 85 |
| 0.025 | 135 |
| 0.055 | 185 |
| 0.1011 | 235 |
| 0.1276 | 285 |
| 0.1371 | 335 |
| 0.1221 | 385 |
| 0.1081 | 435 |
| 0.0965 | 485 |
| 0.075 | 535 |
| 0.0455 | 585 |
| 0.0335 | 635 |
| 0.0255 | 685 |
| 0.0155 | 735 |
| 0.01 | 785 |
| 0.0095 | 835 |
| 0.005 | 885 |
| 0.0035 | 935 |
| 0.0015 | 985 |
| 0 | 1035 |
| 0 | 1085 |
| | 1181 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 402.675

NBIN = 21.9

H = 50 Interval size

ALL OF ALASKA - 80% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

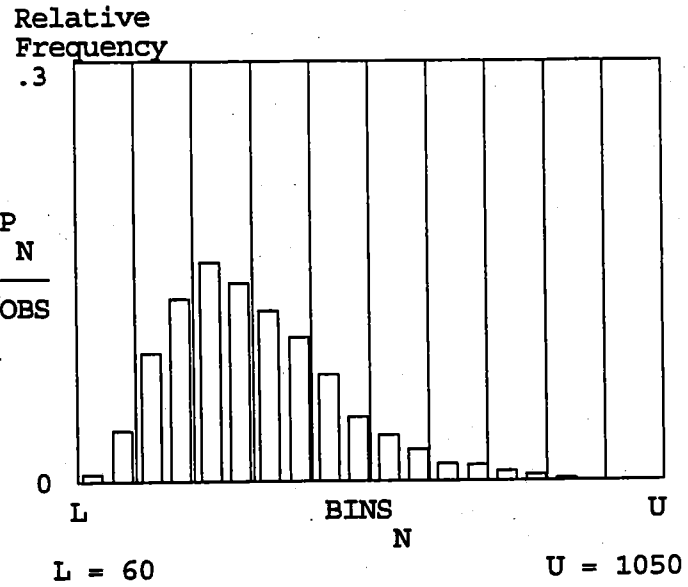
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 4
Mode b = 9
Maximum c = 20

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 60
Maximum f = 105




| P N / OBS | BINS M |
|---|---|
| 0.005 | 85 |
| 0.0365 | 135 |
| 0.092 | 185 |
| 0.1306 | 235 |
| 0.1561 | 285 |
| 0.1421 | 335 |
| 0.1216 | 385 |
| 0.1031 | 435 |
| 0.076 | 485 |
| 0.046 | 535 |
| 0.0325 | 585 |
| 0.0225 | 635 |
| 0.0125 | 685 |
| 0.011 | 735 |
| 0.0065 | 785 |
| 0.0045 | 835 |
| 0.002 | 885 |
| 0 | 935 |
| 0 | 985 |
| | 1076 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 359.177

NBIN = 19.8 H = 50 Interval size

ALL OF ALASKA - 70% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

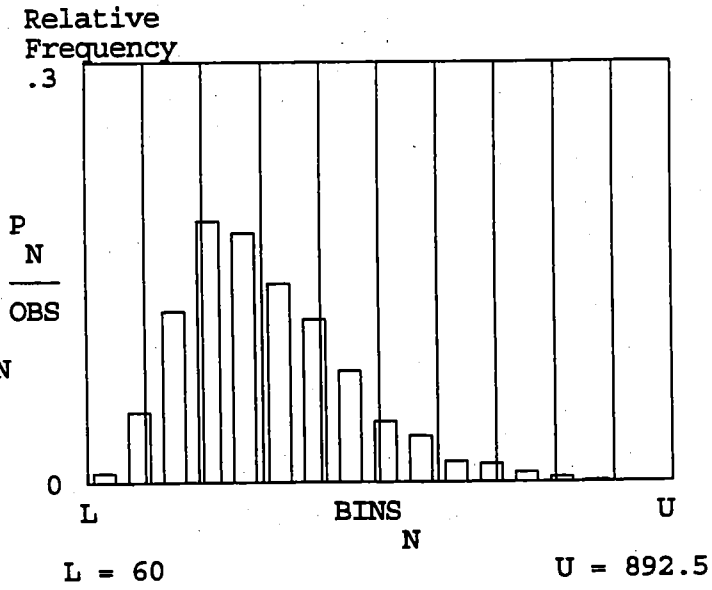
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

| | | |
|---|---|---|
| Minimum | a | = 4 |
| Mode | b | = 8 |
| Maximum | c | = 17 |

DEMAND PERIOD DURATION

| | | |
|---|---|---|
| Minimum | d | = 30 |
| Mode | e | = 60 |
| Maximum | f | = 105 |




| P N / OBS | BINS M |
|---|---|
| 0.0065 | 85 |
| 0.0505 | 135 |
| 0.1231 | 185 |
| 0.1876 | 235 |
| 0.1786 | 285 |
| 0.1431 | 335 |
| 0.1171 | 385 |
| 0.0795 | 435 |
| 0.043 | 485 |
| 0.0325 | 535 |
| 0.015 | 585 |
| 0.013 | 635 |
| 0.007 | 685 |
| 0.0035 | 735 |
| 0.0005 | 785 |
| 0 | 835 |
| | 918.5 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 315.795

NBIN = 16.65 H = 50 Interval size

ALL OF ALASKA - 60% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

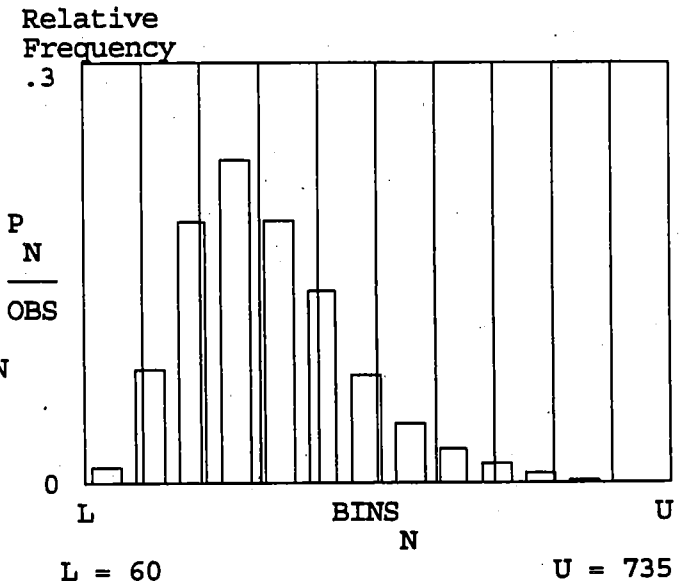
DISTRIBUTION
PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 4
Mode b = 7
Maximum c = 14

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 60
Maximum f = 105




| P N / OBS | BINS M |
|---|---|
| 0.0115 | 85 |
| 0.0815 | 135 |
| 0.1866 | 185 |
| 0.2306 | 235 |
| 0.1876 | 285 |
| 0.1376 | 335 |
| 0.0765 | 385 |
| 0.042 | 435 |
| 0.024 | 485 |
| 0.014 | 535 |
| 0.0065 | 585 |
| 0.002 | 635 |
| 0 | 685 |
| | 761 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 272.414

NBIN = 13.5 H = 50 Interval size

ALL OF ALASKA - 50% OF LAST 3 YEAR'S DEMAND
FREQUENCY OF TOTAL SEASONAL DEMAND
TYPE II HELICOPTERS

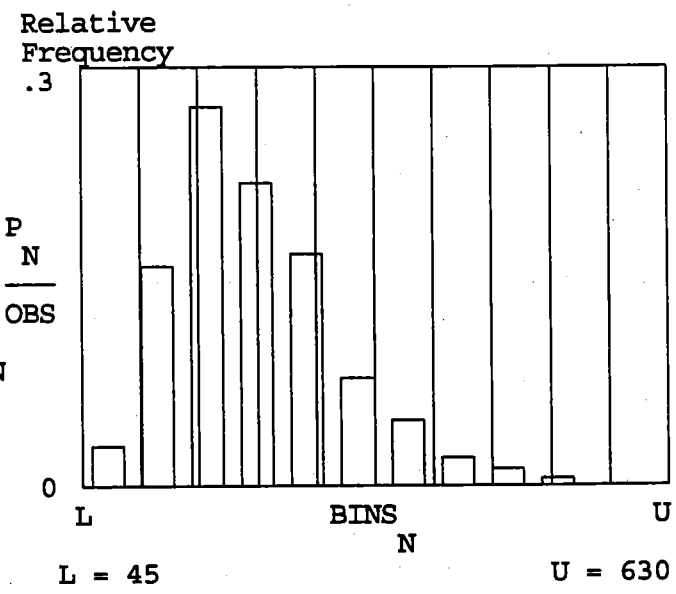
DISTRIBUTION PARAMETERS:

PEAK PERIOD DEMAND

Minimum a = 3
Mode b = 5
Maximum c = 12

DEMAND PERIOD DURATION

Minimum d = 30
Mode e = 60
Maximum f = 105




| P N / OBS | BINS M |
|---|---|
| 0.0285 | 70 |
| 0.1571 | 120 |
| 0.2711 | 170 |
| 0.2171 | 220 |
| 0.1661 | 270 |
| 0.077 | 320 |
| 0.0465 | 370 |
| 0.02 | 420 |
| 0.012 | 470 |
| 0.005 | 520 |
| 0 | 570 |
| | 656 |

TOTAL SEASONAL DEMAND in HELICOPTER DAYS

mean(I) = 217.8

NBIN = 11.7 H = 50 Interval size

# *Appendix E*

# *Costs, Analysis Worksheets and Optimization Model Printouts*

ONE TIME START UP COSTS FOR AN AGENCY RUN HELITACK CREW

For facilities (land acquisition, engineering and design costs, construction costs) an estimate of $0 TO $400,000, depending on site location and facilities already in place is possible. Some locations have existing facilities and organizations in place to deal with an additional helicopter and crew. Other locations with partial or nonexistant facilities and support would have to start from scratch.

Example:

R-1 developed the following costs to construct a permanent helibase at the aerial fire depot in Missoula:

| | | |
|---|---|---|
| -Earthwork fill and regrading of site | --$10,000 | |
| -Security fencing and site development | --$ 6,000 | |
| -Helipad/vehicle access | --$12,300 | (one pad) |
| -On site area for support trailer | --$40,000 | |
| Total | $68,300 | |

Administrative support costs are included in the options used in the modeling and shown on the helitack crew cost information sheets.

HELITACK VEHICLE - **$25,000 to $50,000** (This is addition to fleet cost, FOR and mileage are included in vehicle and equipment costs on helitack cost sheets).

EQUIPMENT AND SUPPLIES -

RADIOS - $3,000
FLIGHT HELMETS - $4,000
EXTERNAL LOAD EQT.(INCLUDING REMOTE HOOK LONG LINE) - $4,000
FIRE FIGHTING EQT. - $4,000
RAPPEL GEAR - $4,000 (optional)
RAPPEL TOWER AT BASE - $6,000 (optional)
MISC. - $2,000

**TOTAL - $17,000 to $27,000**

ACTUAL BUDGETARY COSTS FOR 6 PERSON CREW FOR 90 DAY CONTARCT

| POSITION | GRADE | TOUR | COST TO GOVERNMENT | | SUPPORT COSTS (TVL,TRAINING,ETC) |
|---|---|---|---|---|---|
| Crew Supervisor/ Manager | GS-7 | WAE 18/8 | $21,175 | ($1,176/PP) | $1,500 |
| Ast. Crew Super. | GS-6 | WAE 13 PP | $13,520 | ($1,040/PP) | $1,000 |
| Lead Crewperson | GS-5 | WAE 13 PP | $12,870 | ($ 990/PP) | $ 800 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 | ($ 650/PP) | $ 600 |
| Crewperson | GS-4 | TEMP 7 PP | $ 4,550 | ($ 650/PP) | $ 600 |
| Crewperson | GS-3 | TEMP 7 PP | $ 4,060 | ($ 580/PP) | $ 600 |
| | | TOTAL--> | $60,718 | | $5,100 |

VEHICLES AND EQUIPMENT: $6,000

TOTAL INDIRECT COSTS : $20,110

**GRAND TOTAL = $ 91,928**

Calculations used to compute costs for CWN module while on fire assignments

1 GS-7 for one PP @ $1,116/PP
1 GS_6 for one PP @ $1,040/PP
2 GS-4 for one PP @ $ 650/PP

Total = $3,516/PP (this represents 10 days of regular time for the 4 persons)

$3,516 diveded by 10 = $351.60/day

Assuming a 15 day assignment each year, there would be 11 regular work days and 4 overtime days.

$352 x 11 = $3,868 regular time.
$352 x 1.5 x 4 = $1,894 overtime.

ADDITIONAL COSTS WHEN CONTRACTING FOR ANY HELICOPTER

CONTRACT FORMATION/ADMINISTRATION COSTS - Average contract load for a contracting officer awarding and administering service contracts is approximately 40 contractors. To come up with a "rough" average cost per contract we divided annual salary of a GM-15 contracting officer by the total number of contracts as follows: $50,000 Divided by 40 = $1,250/contract

In addition to the contracting officer we need to add the cost of clerical support. Using the same rational, costs are as follows:
GS-5 $17,586 divided by 40 = $440/contract.

$1,250 + $440 = $1,690 X 25% additional for cost to Govt. = $2,112

Total contract formulation/administration costs per contract = **$2,112/AIRCRAFT**

AIRCRAFT INSPECTIONS, CARDING, TRAVEL COSTS - **$1,000/AIRCRAFT**
(For Pilot, Maintenance, Avionics Inspectors and Contracting Officers)

TOTAL ADDITIONAL COSTS ($2,112 + $1,000) **$3,112/AIRCRAFT**
(Used in all options in modeling process)

TYPE I - CWN HELICOPTER CONTRACT COSTS

Average daily availability of type I CWN helicopters (all A/C offered combined) - **$17,763/DAY** (Based on 4 hour minimum/day using rates in 1992 national CWN contract).

RATES FOR TYPE I CWN HELICOPTERS

| A/C Make & Model | Hourly Rate | Minimum Daily Payment | No. of A/C offered |
|---|---|---|---|
| S-61 | $3,063/HR | $12,252 | 11 |
| BV-107 | $3,134/HR | $12,536 | 11 |
| S-64 | $6,650/HR | $26,600 | 5 |
| BV-234 | $7,570/HR | $30,280 | 6 |
| AS 332L | $4,850/HR | $19,400 | 2 |

Weighted average costs for type I helicopters used in modeling options are as follows:

BV 234 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x hourly rate) |
|---|---|---|
| 6 | $7,570 | $45,420 |

The average cost for BV-234 helicopters is $45,420 divided by 6 or $7,570/Hr.

S-64 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x Hourly rate) |
|---|---|---|
| 3 | $6,844 | $20,532 |
| 2 | $6,450 | $12,900 |

The average cost for S-64 helicopters is $33,432 divided by 5 or $6,686/Hr.

Weighted average for BV234 and S-64 helicopters is $78,852 divided by 11 or $7,168/Hr.

BV 107 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x hourly rate) |
|---|---|---|
| 11 | $3,134 | $34,474 |

The average cost for BV-107 helicopters is $34,474 divided by 11 or $3,116/Hr.

S-61 Helicopters

| No. Offered | Bid Hourly Rate | Total (No. offered x Hourly rate) |
|---|---|---|
| 3 | $2,875 | $ 8,625 |
| 2 | $3,250 | $ 6,500 |
| 3 | $3,200 | $ 9,600 |

The average cost for S-61 helicopters is $24,725 divided by 8 or $3,091/Hr.

The weighted average for BV 107 and S-61 helicopters is $59,199 divided by 19 or $3,116/Hr.

TYPE I - EXCLUSIVE USE HELICOPTER CONTRACT COSTS

The committee using professional judgement assumed the following:

For a 45 day contract for a BV 234 or S-64 helicopter, the daily availability would be $22,938 and the hourly rate would be $2,867 per hour.

For a 45 day contract for a Super Puma AS 332-L-1 helicopter, the daily availability would be $15,520 and the hourly rate would be $1,940 per hour.

TYPE II - CWN HELICOPTER CONTRACT COSTS

Data obtained from 1992 national CWN contract.

CWN COSTS

| AIRCRAFT MAKE & MODEL | AVERAGE DAILY AVAILABILITY | NO. OF A/C OFFERED |
|---|---|---|
| Bell 212 | $4,461/day | 49 |
| S 58-T | $4,082/day | 11 |
| Bell 205 A1 | $3,628/day | 8 |
| Bell 204 | $3,907/day | 7 |
| Bell 214 | $6,250/day | 2 |
| Bell 412 | $4,910/day | 7 |

The average cost for these helicopters is $366,734 divided by 84 or $4,366/Hr.

Bell 212 Helicopters

| No. Offered | Daily Availability Rate | Total (No. offered x avail. rate) |
|---|---|---|
| 2 | $4,150 | $ 8,300 |
| 2 | $3,650 | $ 7,300 |
| 1 | $8,245 | $ 8,245 |
| 1 | $3,900 | $ 3,900 |
| 5 | $4,650 | $23,250 |
| 2 | $4,853 | $ 9,706 |
| 14 | $4,710 | $65,940 |
| 10 | $6,677 | $66,770 |
| 1 | $4,485 | $ 4,485 |
| 1 | $2,271 | $ 2,271 |
| 4 | $1,971 | $ 7,884 |
| 1 | $4,450 | $ 4,450 |
| 2 | $4,400 | $ 8,800 |
| 1 | $4,850 | $ 4,850 |
| 2 | $3,660 | $ 7,320 |

The average cost for Bell 212 helicopters is $233,471 divided by 49 or $4,765/Hr.

Bell 205 Helicopters

| No. Offered | Daily Availability Rate | Total (No. offered x avail. rate) |
|---|---|---|
| 2 | $3,230 | $ 6,460 |
| 2 | $4,250 | $ 8,500 |
| 2 | $3,885 | $ 7,770 |
| 1 | $4,235 | $ 4,235 |
| 1 | $3,150 | $ 3,150 |

The average cost for Bell 205 helicopters is $30,115 divided by 8 or $3,764/Hr.

The weighted average for Bell 212 and Bell 205 helicopters is $263,586 divided by 57 or $4,624/Hr.

Type II Helicopter Costs By Category

| Category A Helos. | Average Daily Availability | Flight Rate |
|---|---|---|
| Bell 214 | $6,250/day | $1,097/hr. |
| Bell 212 | $4,461/day | $ 677/hr. |
| Bell 205 (super) | $4,235/day | $ 612/hr. |
| Bell 204 (super) | $3,443/day | $ 608/hr. |
| Average costs--> | $4,597/day | $ 749/hr. |

| Category B Helos. | | |
|---|---|---|
| S 58-T | $4,082/day | $ 912/hr. |
| Bell 412 | $4,910/day | $ 846/hr |
| Bell 212 | $4,461/day | $ 677/hr. |
| Average costs--> | $4,484/day | $ 812/hr. |

| Category C Helos. | | |
|---|---|---|
| Bell 204 | $3,907/day | $ 608/hr. |
| Bell 205 A1 | $3,628/day | $ 612/hr. |
| Bell 212 | $4,461/day | $ 677/hr. |
| Bell 412 | $4,910/day | $ 846/hr. |
| Average costs--> | $4,227/day | $ 686/hr. |

There appears to be no significant cost difference between A, B and C categories. resource order.

TYPE II - EXCLUSIVE USE HELICOPTER COSTS

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| Arroyo Grande | Bell 204 | $1,350/day | 139 days | $608/hr |
| Casitas | Bell 204 | $1,350/day | 145 days | $608/hr |
| Chantry Flats | Bell 212 | $1,900/day | 141 days | $612/hr |

Severity contracts

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| La Grande | Bell 212 | $1,971/day | 30 days | $677/hr |
| Wenatchee | Bell 212 | $1,971/day | 30 days | $677/hr |
| Bald Mtn. | Bell 204 (super) | $1,243/day | 60 days | $1243/hr |
| Salt Late City | Bell 205 (super) | $3,585/day | 60 days | $ 612/hr |
| Idaho City | Bell 204 (super) | $3,100/day | 60 days | $ 608/hr |
| Challis | Bell 205 (super) | $3,585/day | 60 days | $ 612/hr |
| Redmond | S 58-T | $2,561/day | 30 days | $ 912/hr |
| Dillon | Bell 204 (super) | $2,287/day | 60 days | $ 608/hr |
| Dixie | Bell 204 (super) | $3,100/day | 30 days | $ 608/hr |
| Redding | Bell 212 | $1,850/day | 60 days | $ 677/hr |
| Big Hill | S 58-T | $2,397/day | 30 days | $ 912/hr |

The Bald Mt. contract costs were not used in developing averages as it was bid using different non standard format.

1992 Alaska Exclusive use contracts (Govt. provides fuel)

| Designated Base | A/C Make & Model | Daily Avail. Cost | Contract Length | F/R |
|---|---|---|---|---|
| AFS | Bell 212 | $2,363/day | 90 days | $750/hr |
| AFS | Bell 212 | $2,363/day | 90 days | $750/hr |
| AFS | Bell 212 | $2,550/day | 90 days | $560/hr |
| AFS | Bell 212 | $2,648/day | 90 days | $750/hr |
| State of Alaska | Bell 212 | $2,365/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,668/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,788/day | 90 days | $500/hr |
| State of Alaska | Bell 212 | $2,838/day | 90 days | $500/hr |

After considering the above data on exclusive use and severity contracts, the committee agreed that the following rates would be used in the modeling process used to develop the Type II contract options.

Daily Availability (Lower 48)- **$2,634/DAY**, PLUS FLIGHT RATE, Based on average of 1992 severity bids. Based on discussions with helicopter operators and professional judgement, no increase in the availability rate was included for lower 48 contracts even though the severity bids were for shorter term contracts than were used in the modeling.

Daily Availability (Alaska) **$2,981/DAY**, PLUS FLIGHT RATE, Based on current Alaska exclusive use contract bids.

For costing used in modeling options for Alaska, assumed a $500 increase in the daily availability rate based on shorter term contract lengths (60 days) and historic greater costs in Alaska for 60 day contracts.

**WORKSHEET # 1 - Type II - Lower 48 States CWN**

CONTRACT TYPE: CWN, TYPE II Applies to all subcategories of type IIs, A, B or C, see text-section VII, ie no cost difference between categories.

Helicopter contract costs:

-Daily Availability rate:(based on avg. of 1992 CWN bids for Bell 212 and 205 helicopters) = **$4,624/day**

-Hourly Rate:(used Bell 212 flight rate, used 3.7 hours for this model as this is the average historic number of hours flown per day with type II helicopters) $677/hour X 3.7 hours = **$2,505/day**

-7th day coverage cost for contractor personnel @ $750/day divided by 7 = **$ 107/day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 4 person module/year | =$ 2,000 |
| -Salary (cost to Govt.) for 4 persons for 2 pp | = 7,152 |
| -Salary (cost to Govt.) for 4 person on fires for 15 days | = 3,868 |
| -Overtime cost for module to provide 7 day coverage, based on 15 day assignment | = 1,894 |
| -Indirect costs and other @ 20% | = 2,983 |
| Total | $17,897 |

$17,897 divided by 15 day use period per year = **$ 1,193/day**

Other "administrative support", inspections, contract support, and other management personnel's time = $3,112/year/aircraft.

$3,112 divided by 15 days = **$ 207/day**

Subtotal = **$ 8,636/day**

Ten percent efficiency loss when using CWN helicopters and crews Grand Total = $8,636 X 1.1 = **$ 9,500/day**

**WORKSHEET # 2 - Type II - Lower 48 States EU With 90 Day Contract**

CONTRACT TYPE: EU Contract For 90 Days, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Contract costs: -Daily availability:(from average of existing exclusive use and severity contract bids) $2,634/day X 90 days = **$237,060/yr**

Crew costs:

| | | |
|---|---|---|
| -Foreman/supervisor | GS-7 for 12 pay periods @ $1,176/PP | $ 14,112 |
| -Assistant foreman | GS-6 for 10 pay periods @ $1,040/PP | 10,400 |
| -Crew of 4 | GS-4 for 7 pay periods @ $650/PP X 4 | 18,200 |
| -Training and Travel | | 5,000 |
| -Vehicles | | 2,500 |
| -Indirect costs @ 20% of total | | 10,042 |
| | Total crew costs | **$ 60,254/yr** |

Other "admin. support": $3,112/year/aircraft/yr. (See Wkst.#1) = **$ 3,112/yr**

**Total fixed costs = $300,426/yr**

-Hr. rate $612/hr(10% less than CWN rate)X 3.7 hrs.=**Variable Cost**= **$ 2,265/day**

LOWER 48 STATES - 100% OF LAST 3 YEARS DEMAND

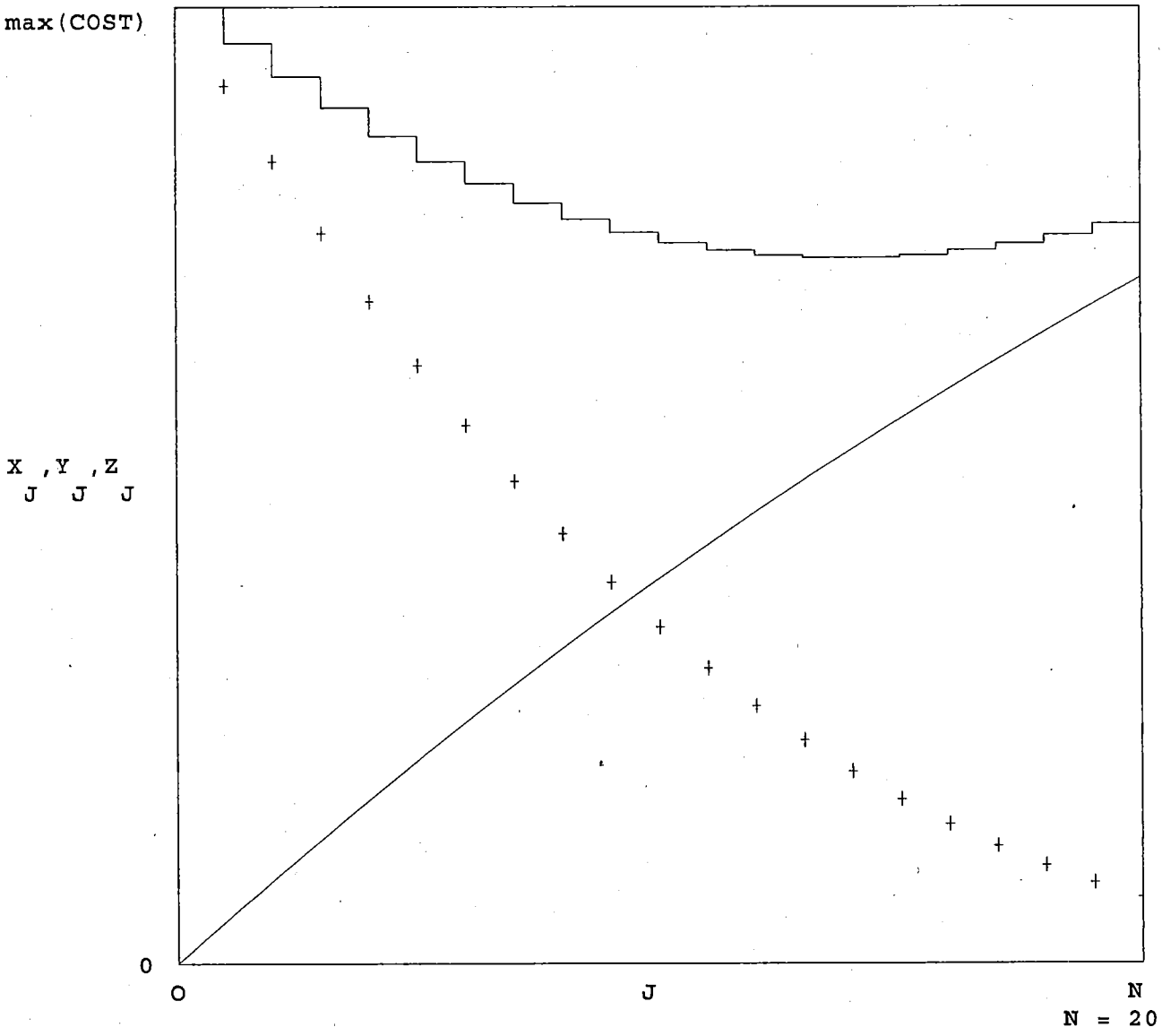
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 40 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 25 | MOST FREQUENCY DEMAND |

FIXED ≡ 300426 CONTRACT COST for EXCLUSIVE USE (90 DAY CONTRACTS)
VC_EX ≡ 2265 EXCLUSIVE USE VARIABLE COST PER DAY (3.7 HOURS PER DAY)
VC_CWN ≡ 9500 CALL-WHEN-NEEDED VARIABLE COST PER DAY (3.7 HOURS PER DAY)

HELICOPTER COSTS

max(COST) = 12167981




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 12167981 | 0 | 7415 | 12160565 |
| 1 | 11707945 | 460036 | 545912 | 11162032 |
| 2 | 11276141 | 431804 | 1075571 | 10200570 |
| 3 | 10879181 | 396960 | 1594322 | 9284859 |
| 4 | 10519552 | 359629 | 2101386 | 8418166 |
| 5 | 10198300 | 321252 | 2596435 | 7601865 |
| 6 | 9915710 | 282590 | 3079381 | 6836329 |
| 7 | 9671593 | 244117 | 3550283 | 6121311 |
| 8 | 9465435 | 206158 | 4009301 | 5456134 |
| 9 | 9296484 | 168951 | 4456671 | 4839813 |
| 10 | 9163809 | 132675 | 4892684 | 4271125 |
| 11 | 9066336 | 97473 | 5317677 | 3748659 |
| 12 | 9002876 | 63459 | 5732021 | 3270855 |
| 13 | 8972147 | 30729 | 6136119 | 2836028 |
| 14 | 8972785 | -638 | 6530397 | 2442388 |
| 15 | 9003360 | -30575 | 6915303 | 2088056 |
| 16 | 9062383 | -59023 | 7291303 | 1771079 |
| 17 | 9148314 | -85931 | 7658880 | 1489434 |
| 18 | 9259569 | -111255 | 8018528 | 1241041 |
| 19 | 9394525 | -134956 | 8370756 | 1023769 |
| 20 | 9551522 | -156997 | 8716084 | 835438 |

LOWER 48 STATES - 90% OF LAST 3 YEARS DEMAND

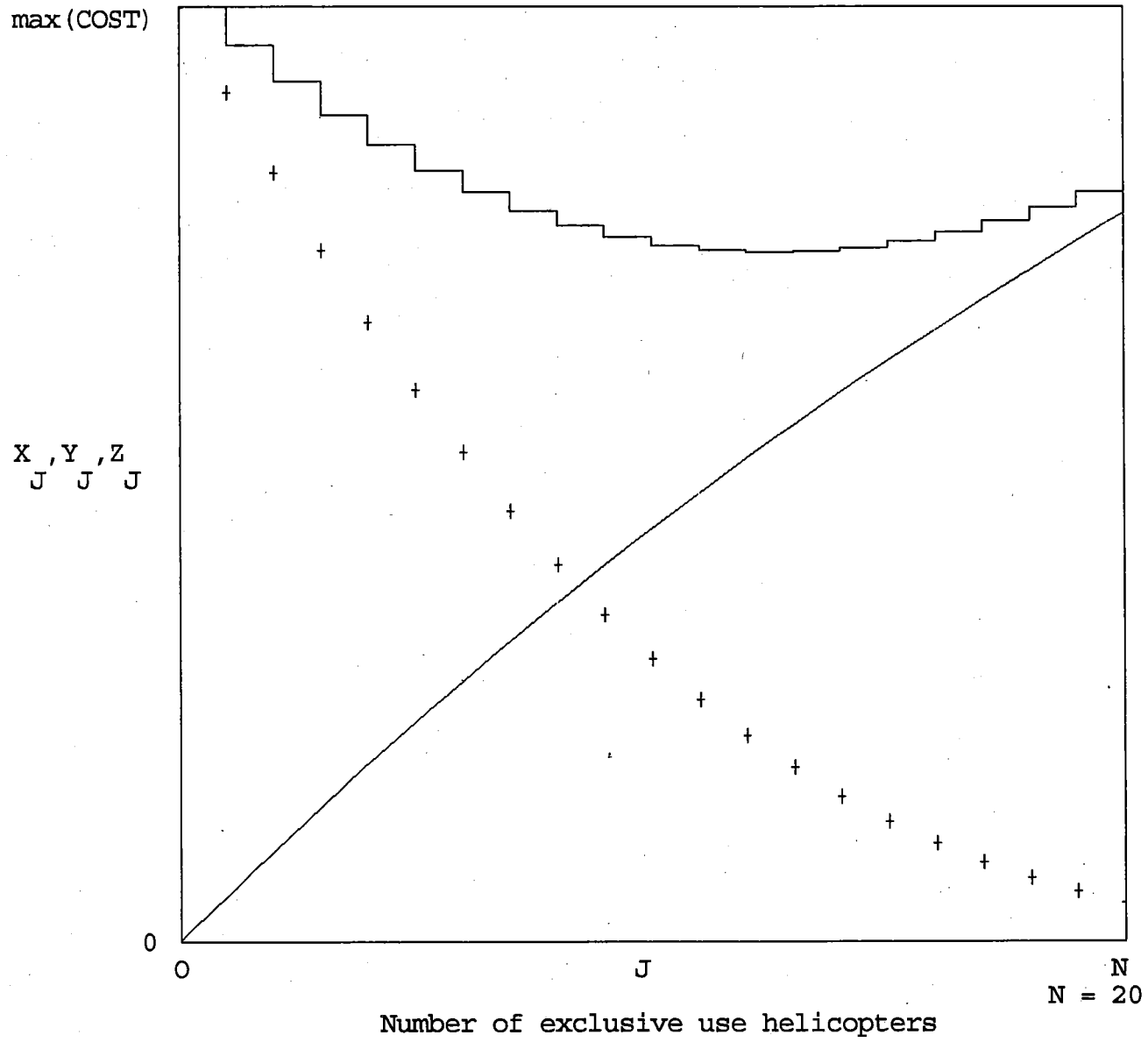
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 36 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 22 | MOST FREQUENCY DEMAND |

FIXED ≡ 300426 CONTRACT COST for EXCLUSIVE USE (90 DAY CONTRACTS)
VC_EX ≡ 2265 EXCLUSIVE USE VARIABLE COST PER DAY (3.7 HOURS PER DAY)
VC_CWN ≡ 9500 CALL-WHEN-NEEDED VARIABLE COST PER DAY (3.7 HOURS PER DAY)

HELICOPTER COSTS

max(COST) = 10941039




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 10941039 | 0 | 9849 | 10931189 |
| 1 | 10488249 | 452789 | 546078 | 9942171 |
| 2 | 10064188 | 424061 | 1073313 | 8990875 |
| 3 | 9677657 | 386531 | 1588799 | 8088858 |
| 4 | 9331956 | 345701 | 2091503 | 7240453 |
| 5 | 9028472 | 303483 | 2580989 | 6447483 |
| 6 | 8767586 | 260887 | 3057141 | 5710445 |
| 7 | 8549044 | 218541 | 3520035 | 5029009 |
| 8 | 8372165 | 176879 | 3969887 | 4402278 |
| 9 | 8235951 | 136215 | 4407009 | 3828942 |
| 10 | 8139163 | 96788 | 4831787 | 3307376 |
| 11 | 8080376 | 58787 | 5244669 | 2835708 |
| 12 | 8058012 | 22365 | 5646148 | 2411864 |
| 13 | 8070365 | -12353 | 6036758 | 2033606 |
| 14 | 8115625 | -45260 | 6417067 | 1698557 |
| 15 | 8191892 | -76267 | 6787669 | 1404223 |
| 16 | 8297188 | -105297 | 7149182 | 1148006 |
| 17 | 8429469 | -132281 | 7502248 | 927221 |
| 18 | 8586630 | -157161 | 7847525 | 739106 |
| 19 | 8766515 | -179885 | 8185687 | 580828 |
| 20 | 8966920 | -200405 | 8517426 | 449494 |

LOWER 48 STATES - 80% OF LAST 3 YEARS DEMAND

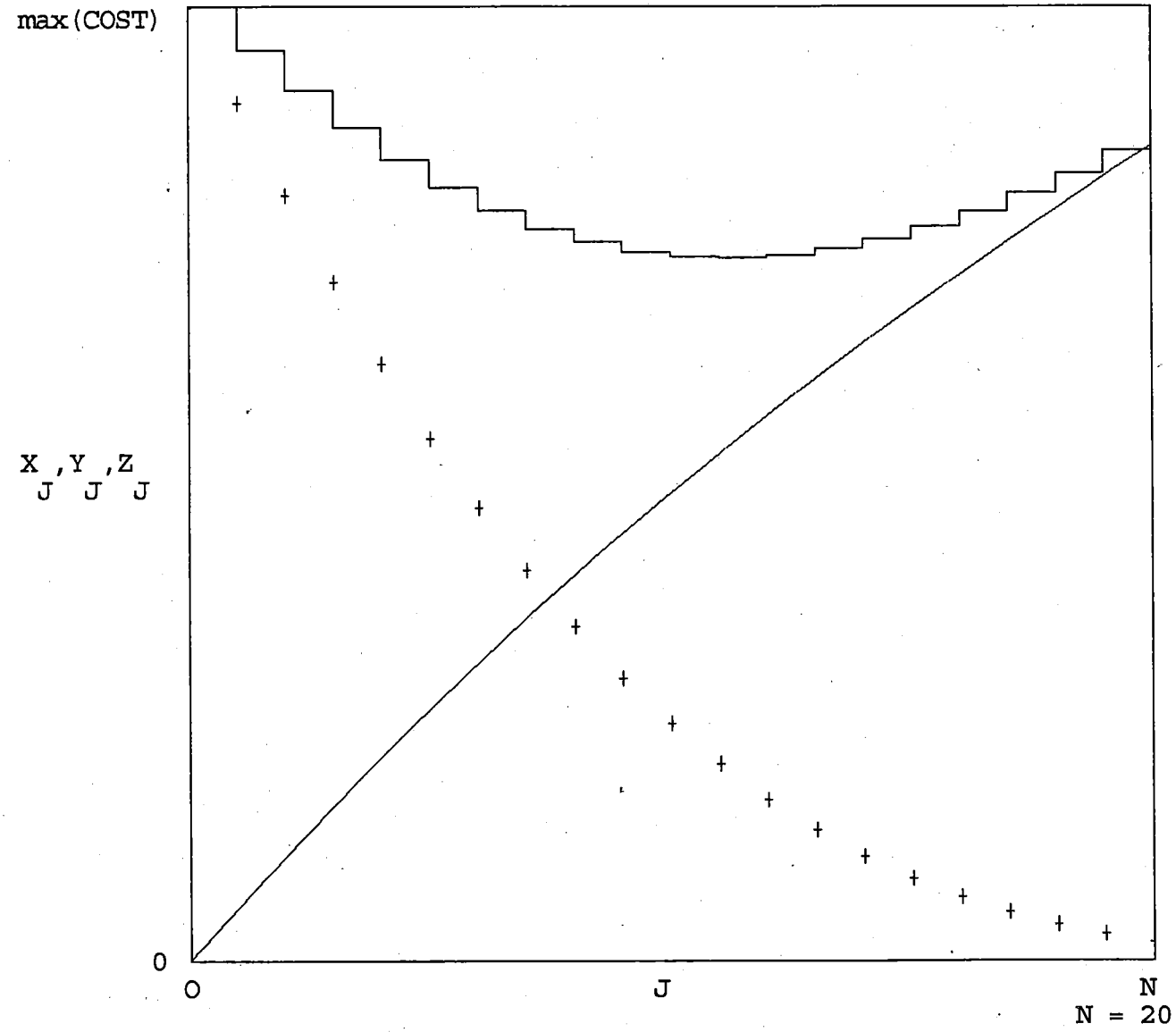
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 32 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 19 | MOST FREQUENCY DEMAND |

| | | |
|---|---|---|
| FIXED ≡ 300426 | CONTRACT COST for EXCLUSIVE USE (90 DAY | CONTRACTS) |
| VC_EX ≡ 2265 | EXCLUSIVE USE VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |
| VC_CWN ≡ 9500 | CALL-WHEN-NEEDED VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |

HELICOPTER COSTS

max(COST) = 9709470




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 9709470 | 0 | 13732 | 9695739 |
| 1 | 9267535 | 441936 | 546563 | 8720972 |
| 2 | 8853719 | 413816 | 1070590 | 7783128 |
| 3 | 8480313 | 373406 | 1581967 | 6898345 |
| 4 | 8151912 | 328400 | 2079255 | 6072658 |
| 5 | 7870453 | 281460 | 2561847 | 5308606 |
| 6 | 7636461 | 233991 | 3029578 | 4606883 |
| 7 | 7449588 | 186873 | 3482559 | 3967029 |
| 8 | 7308881 | 140708 | 3921087 | 3387794 |
| 9 | 7212948 | 95933 | 4345597 | 2867350 |
| 10 | 7160064 | 52884 | 4756631 | 2403433 |
| 11 | 7148242 | 11823 | 5154810 | 1993432 |
| 12 | 7175279 | -27037 | 5540823 | 1634456 |
| 13 | 7238800 | -63521 | 5915415 | 1323384 |
| 14 | 7336280 | -97480 | 6279376 | 1056904 |
| 15 | 7465071 | -128791 | 6633534 | 831536 |
| 16 | 7622415 | -157344 | 6978754 | 643661 |
| 17 | 7805461 | -183046 | 7315927 | 489534 |
| 18 | 8011276 | -205815 | 7645972 | 365304 |
| 19 | 8236852 | -225577 | 7969830 | 267022 |
| 20 | 8479119 | -242266 | 8288464 | 190655 |

LOWER 48 STATES - 70% OF LAST 3 YEAR'S DEMAND

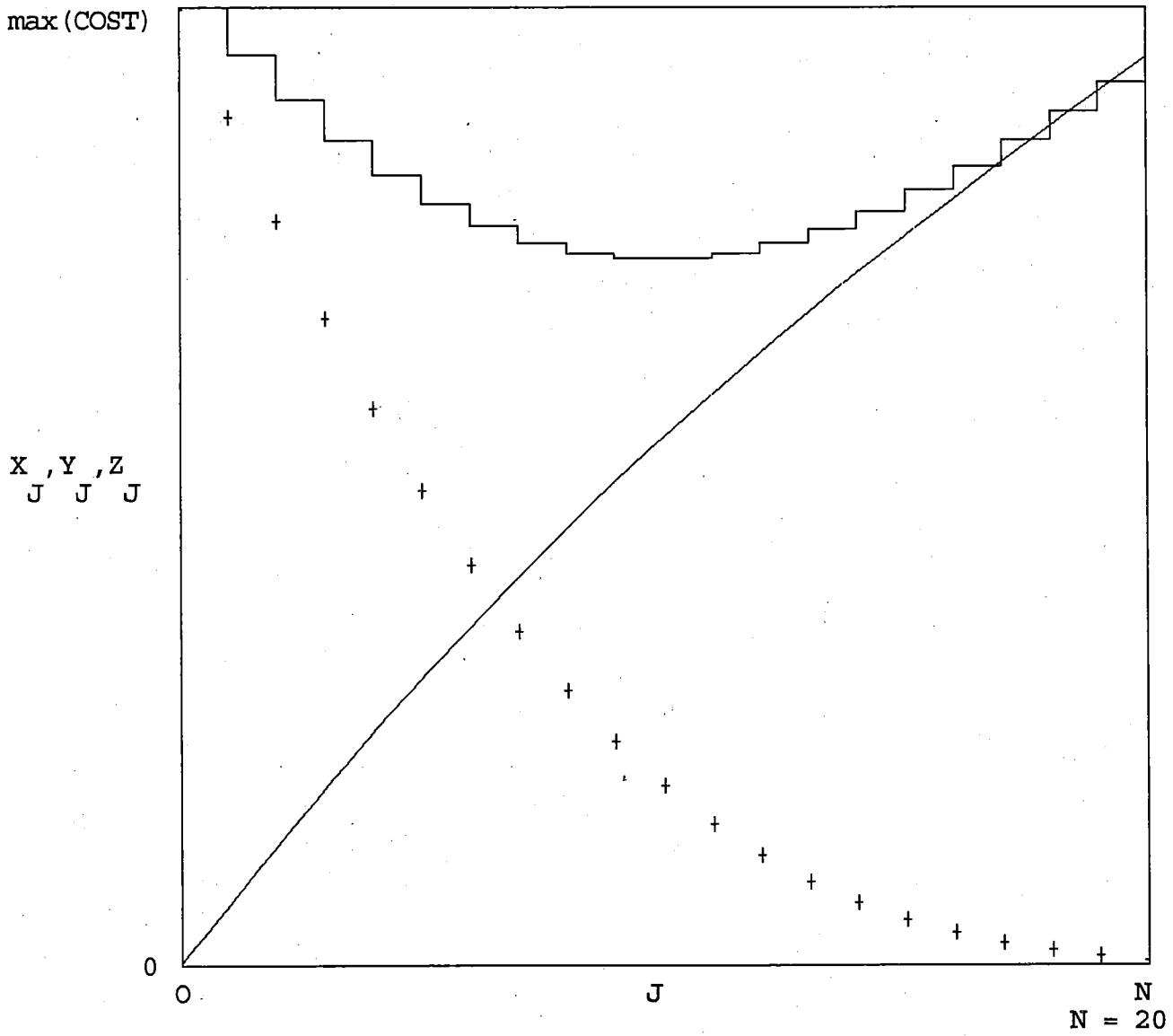
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 28 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 16 | MOST FREQUENCY DEMAND |

| | | |
|---|---|---|
| FIXED ≡ 300426 | CONTRACT COST for EXCLUSIVE USE (90 DAY | CONTRACTS) |
| VC_EX ≡ 2265 | EXCLUSIVE USE VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |
| VC_CWN ≡ 9500 | CALL-WHEN-NEEDED VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |

HELICOPTER COSTS

max(COST) = 8468632




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 8468632 | 0 | 20516 | 8448116 |
| 1 | 8044506 | 424127 | 547772 | 7496734 |
| 2 | 7645127 | 399378 | 1067280 | 6577848 |
| 3 | 7288880 | 356248 | 1573285 | 5715595 |
| 4 | 6982624 | 306256 | 2063640 | 4918984 |
| 5 | 6729250 | 253374 | 2537439 | 4191811 |
| 6 | 6529547 | 199703 | 2994436 | 3535111 |
| 7 | 6382991 | 146556 | 3434795 | 2948196 |
| 8 | 6288160 | 94832 | 3858961 | 2429199 |
| 9 | 6242974 | 45186 | 4267585 | 1975389 |
| 10 | 6244856 | -1883 | 4661473 | 1583383 |
| 11 | 6290836 | -45980 | 5041556 | 1249280 |
| 12 | 6377625 | -86789 | 5408864 | 968761 |
| 13 | 6501672 | -124047 | 5764507 | 737165 |
| 14 | 6659207 | -157534 | 6109667 | 549539 |
| 15 | 6846271 | -187064 | 6445583 | 400688 |
| 16 | 7058745 | -212474 | 6773543 | 285202 |
| 17 | 7292369 | -233624 | 7094882 | 197487 |
| 18 | 7542761 | -250392 | 7410972 | 131789 |
| 19 | 7805427 | -262667 | 7723219 | 82208 |
| 20 | 8075779 | -270352 | 8033060 | 42719 |

LOWER 48 STATES - 60% OF LAST 3 YEAR'S DEMAND

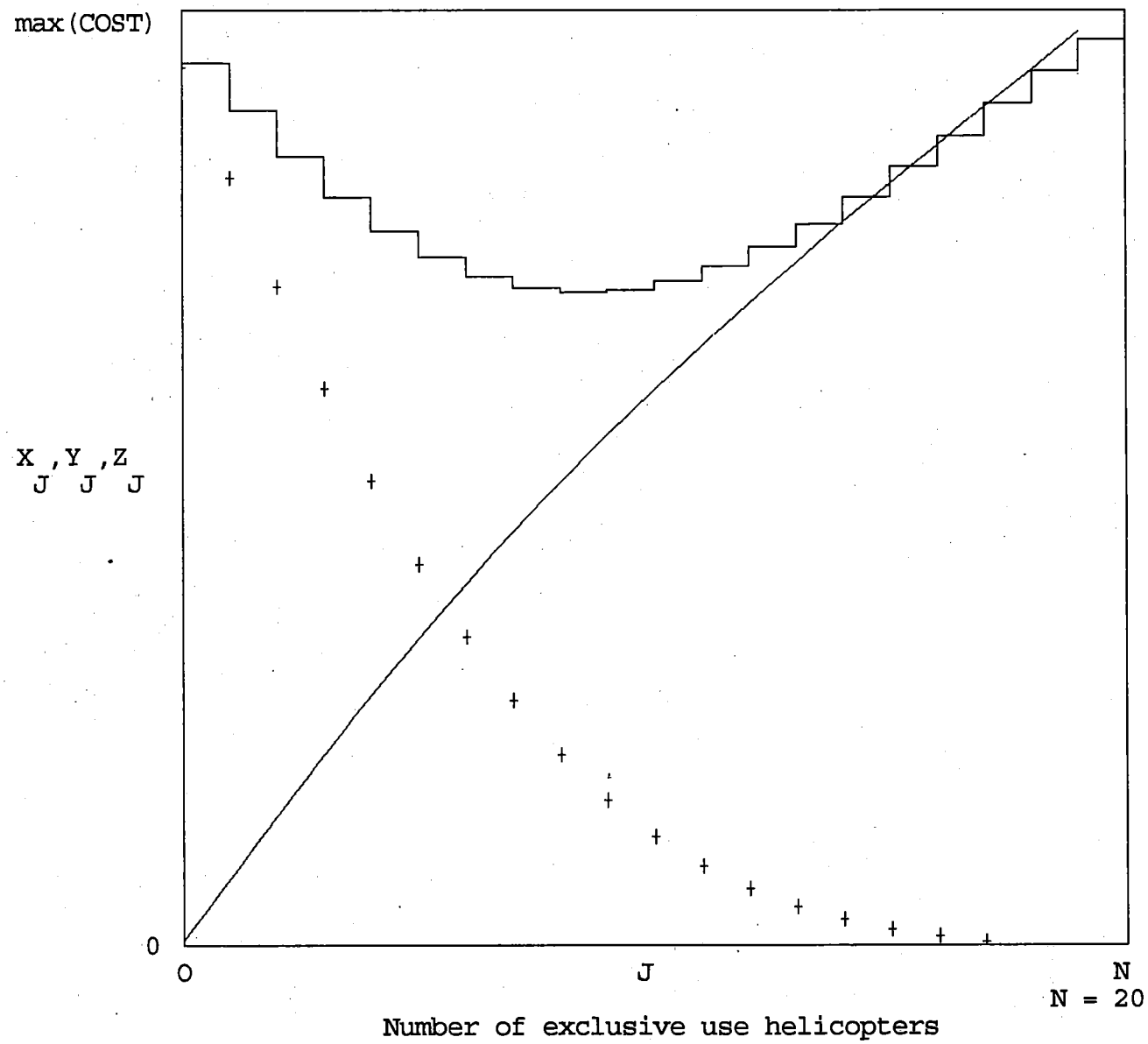
ASSUMPTIONS: TYPE II HELICOPTERS
CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 24 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 13 | MOST FREQUENCY DEMAND |

| | | |
|---|---|---|
| FIXED ≡ 300426 | CONTRACT COST for EXCLUSIVE USE (90 DAY | CONTRACTS) |
| VC_EX ≡ 2265 | EXCLUSIVE USE VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |
| VC_CWN ≡ 9500 | CALL-WHEN-NEEDED VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |

HELICOPTER COSTS

max(COST) = 7640783




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 7205920 | 0 | 34149 | 7171771 |
| 1 | 6815436 | 390483 | 550872 | 6264565 |
| 2 | 6438659 | 376778 | 1063304 | 5375355 |
| 3 | 6106200 | 332459 | 1561862 | 4544338 |
| 4 | 5829476 | 276724 | 2042972 | 3786505 |
| 5 | 5613297 | 216179 | 2505127 | 3108171 |
| 6 | 5458976 | 154321 | 2947917 | 2511060 |
| 7 | 5365641 | 93335 | 3371614 | 1994027 |
| 8 | 5330923 | 34718 | 3776961 | 1553963 |
| 9 | 5351364 | -20441 | 4165039 | 1186325 |
| 10 | 5422673 | -71309 | 4537193 | 885481 |
| 11 | 5539906 | -117233 | 4894970 | 644936 |
| 12 | 5697588 | -157682 | 5240083 | 457505 |
| 13 | 5889809 | -192221 | 5574384 | 315425 |
| 14 | 6110294 | -220484 | 5899837 | 210457 |
| 15 | 6352453 | -242160 | 6218504 | 133950 |
| 16 | 6609431 | -256978 | 6532531 | 76900 |
| 17 | 6874138 | -264707 | 6844140 | 29998 |
| 18 | 7139277 | -265139 | 7155613 | -16335 |
| 19 | 7397372 | -258095 | 7469291 | -71919 |
| 20 | 7640783 | -243411 | 7787566 | -146783 |

LOWER 48 STATES - 50% OF LAST 3 YEAR'S DEMAND

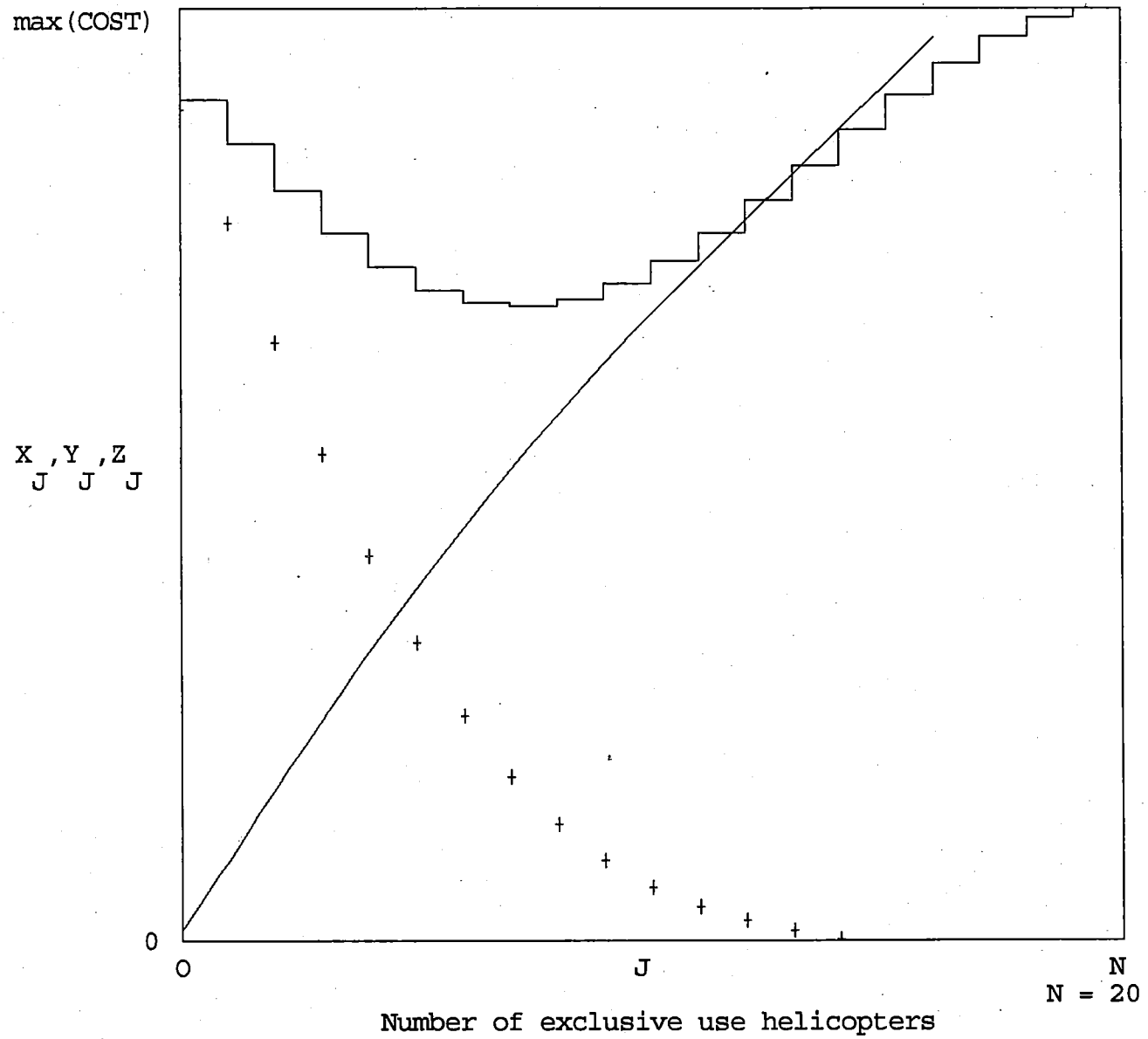
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 10 | MOST FREQUENCY DEMAND |

FIXED ≡ 300426 CONTRACT COST for EXCLUSIVE USE (90 DAY CONTRACTS)
VC_EX ≡ 2265 EXCLUSIVE USE VARIABLE COST PER DAY (3.7 HOURS PER DAY)
VC_CWN ≡ 9500 CALL-WHEN-NEEDED VARIABLE COST PER DAY (3.7 HOURS PER DAY)

HELICOPTER COSTS

max(COST) = 6510367




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 5874764 | 0 | 69208 | 5805556 |
| 1 | 5565941 | 308823 | 560367 | 5005574 |
| 2 | 5232715 | 333226 | 1059165 | 4173551 |
| 3 | 4937145 | 295570 | 1546174 | 3390971 |
| 4 | 4702362 | 234783 | 2014154 | 2688208 |
| 5 | 4538115 | 164247 | 2460051 | 2078065 |
| 6 | 4447064 | 91051 | 2883033 | 1564031 |
| 7 | 4427442 | 19622 | 3283654 | 1143789 |
| 8 | 4474450 | -47008 | 3663415 | 811035 |
| 9 | 4581077 | -106627 | 4024512 | 556565 |
| 10 | 4738629 | -157551 | 4369667 | 368962 |
| 11 | 4937082 | -198454 | 4702016 | 235066 |
| 12 | 5165344 | -228262 | 5025034 | 140310 |
| 13 | 5411438 | -246093 | 5342470 | 68968 |
| 14 | 5662642 | -251204 | 5658305 | 4337 |
| 15 | 5905605 | -242964 | 5976720 | -71115 |
| 16 | 6126433 | -220827 | 6302066 | -175633 |
| 17 | 6310754 | -184321 | 6638840 | -328086 |
| 18 | 6443783 | -133030 | 6991671 | -547888 |
| 19 | 6510367 | -66584 | 7365304 | -854937 |
| 20 | 6495023 | 15344 | 7764585 | -1269562 |

LOWER 48 STATES - 100% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

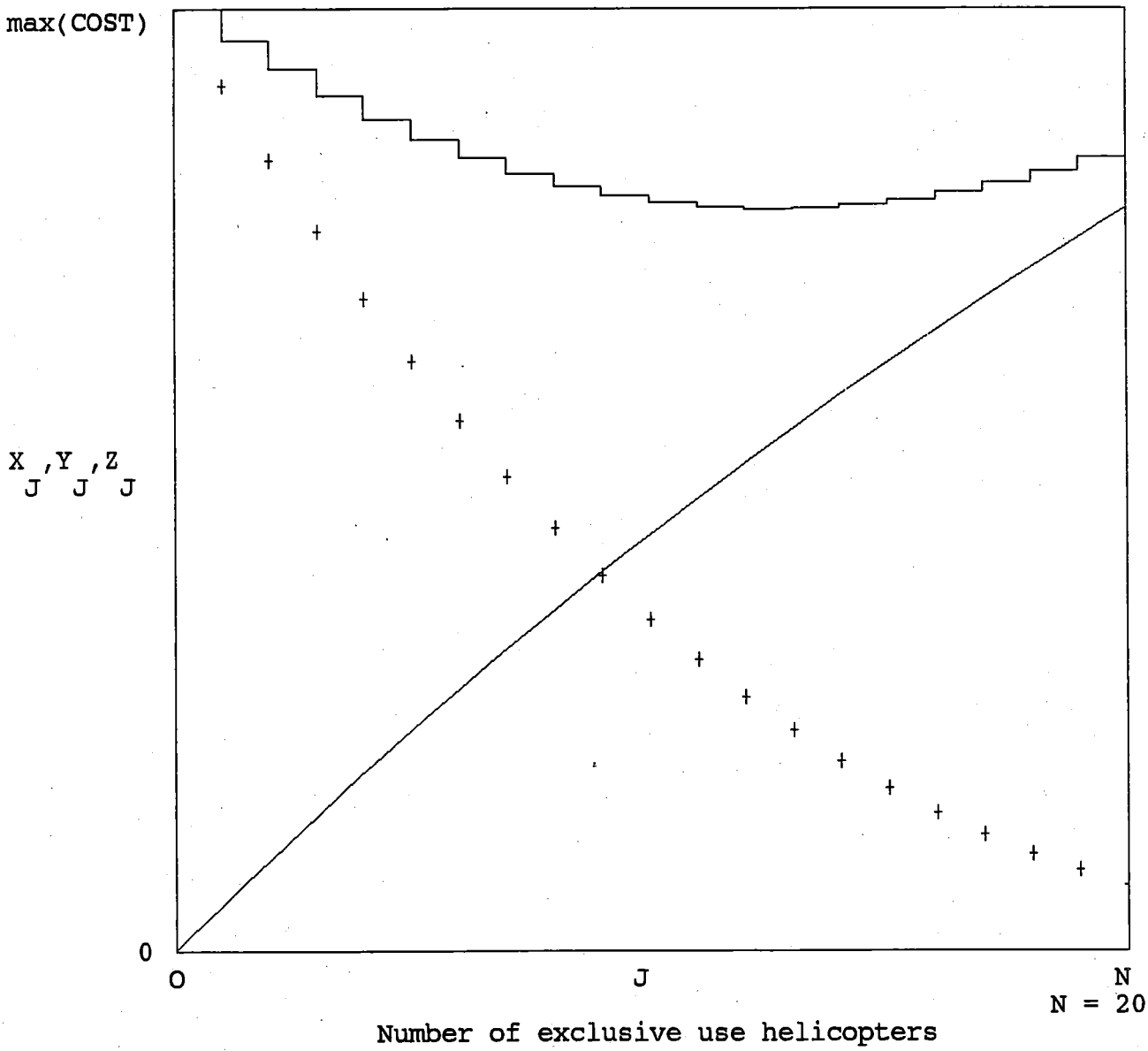
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 40 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 25 | MOST FREQUENCY DEMAND |

| | | |
|---|---|---|
| FIXED ≡ 300426 | CONTRACT COST for EXCLUSIVE USE (90 DAY | CONTRACTS) |
| VC_EX ≡ 2265 | EXCLUSIVE USE VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |
| VC_CWN ≡ 8646 | CALL-WHEN-NEEDED VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |

HELICOPTER COSTS

max(COST) = 11074810




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 11074810 | 0 | 7415 | 11067395 |
| 1 | 10704537 | 370273 | 545912 | 10158625 |
| 2 | 10359164 | 345373 | 1075571 | 9283592 |
| 3 | 10044521 | 314642 | 1594322 | 8450199 |
| 4 | 9762803 | 281718 | 2101386 | 7661418 |
| 5 | 9514933 | 247871 | 2596435 | 6918497 |
| 6 | 9301160 | 213772 | 3079381 | 6221779 |
| 7 | 9121320 | 179841 | 3550283 | 5571037 |
| 8 | 8974957 | 146363 | 4009301 | 4965656 |
| 9 | 8861410 | 113547 | 4456671 | 4404740 |
| 10 | 8779857 | 81553 | 4892684 | 3887173 |
| 11 | 8729351 | 50506 | 5317677 | 3411674 |
| 12 | 8708844 | 20507 | 5732021 | 2976822 |
| 13 | 8717203 | -8359 | 6136119 | 2581084 |
| 14 | 8753227 | -36024 | 6530397 | 2222830 |
| 15 | 8815655 | -62427 | 6915303 | 1900351 |
| 16 | 8903172 | -87517 | 7291303 | 1611868 |
| 17 | 9014421 | -111249 | 7658880 | 1355542 |
| 18 | 9148006 | -133584 | 8018528 | 1129478 |
| 19 | 9302493 | -154487 | 8370756 | 931737 |
| 20 | 9476421 | -173927 | 8716084 | 760337 |

LOWER 48 STATES - 50% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

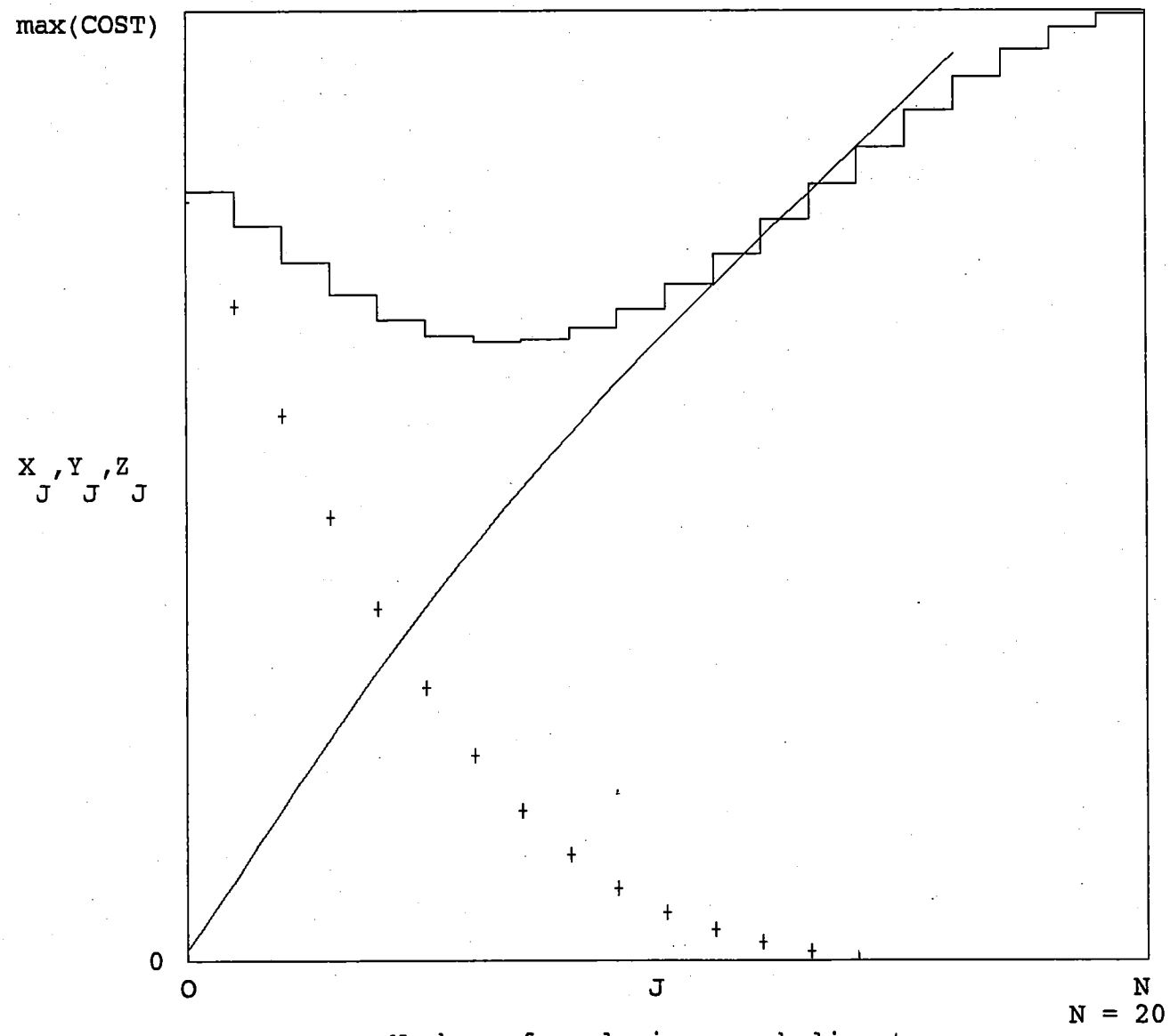
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $677 PER HOUR EXCL = $ 612 PER HR
CWN = $4624 PER DAY EXCL = $2634 PER DAY
AVERAGE DAILY USE = 3.7 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 150 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 60 | MINIMUM DURATION | min_h ≡ 5 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 120 | MOST FREQUENT DURATION | mode_h ≡ 10 | MOST FREQUENCY DEMAND |

| | | |
|---|---|---|
| FIXED ≡ 300426 | CONTRACT COST for EXCLUSIVE USE (90 DAY | CONTRACTS) |
| VC_EX ≡ 2265 | EXCLUSIVE USE VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |
| VC_CWN ≡ 8646 | CALL-WHEN-NEEDED VARIABLE COST PER DAY | (3.7 HOURS PER DAY) |

HELICOPTER COSTS

max(COST) = 6609150




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 5352875 | 0 | 69208 | 5283667 |
| 1 | 5115966 | 236909 | 560367 | 4555599 |
| 2 | 4857535 | 258431 | 1059165 | 3798370 |
| 3 | 4632315 | 225220 | 1546174 | 3086141 |
| 4 | 4460706 | 171609 | 2014154 | 2446553 |
| 5 | 4351308 | 109398 | 2460051 | 1891258 |
| 6 | 4306466 | 44842 | 2883033 | 1423433 |
| 7 | 4324622 | -18156 | 3283654 | 1040968 |
| 8 | 4401542 | -76921 | 3663415 | 738127 |
| 9 | 4531045 | -129503 | 4024512 | 506533 |
| 10 | 4705461 | -174416 | 4369667 | 335794 |
| 11 | 4915951 | -210490 | 4702016 | 213935 |
| 12 | 5152731 | -236780 | 5025034 | 127697 |
| 13 | 5405238 | -252507 | 5342470 | 62768 |
| 14 | 5662252 | -257014 | 5658305 | 3947 |
| 15 | 5911998 | -249746 | 5976720 | -64722 |
| 16 | 6142221 | -230223 | 6302066 | -159845 |
| 17 | 6340247 | -198026 | 6638840 | -298593 |
| 18 | 6493036 | -152789 | 6991671 | -498635 |
| 19 | 6587222 | -94186 | 7365304 | -778082 |
| 20 | 6609150 | -21928 | 7764585 | -1155435 |

**WORKSHEET # 3 - Type I - Lower 48 States CWN, Super Puma AS 332L**

CONTRACT TYPE: CWN, TYPE I Super Puma AS 332L (These CWN costs will be run against both the High and Low cost options under exclusive use.)

Helicopter contract costs:
-Daily Availability rate = 4 hours of flight @ $4,850/hr. = **$ 19,400/day**
(Based on 1992 CWN contract bid rate)

Variable costs:

-Hourly Rate: The average use rate for type I helicopters is 5.4 hours/day based on historic average. Four hrs. daily minimum plus 1.5 hrs = 5.4 hrs.)
$4,850/hr X 1.4 hrs = **$ 6,790/day**

-7th day coverage cost for contractor personnel
@ $750/day divided by 7 = **$ 107/day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 4 person module/year | =$ 2,000 |
| -Salary (cost to Govt.) for 4 persons for 2 pp | = 7,152 |
| -Salary (cost to Govt.) for 4 person on fires for 15 days | = 3,868 |
| -Overtime cost for module to provide 7 day coverage, based on 15 day assignment | = 1,894 |
| -Indirect costs and other @ 20% | = 2,983 |
| Total | $17,897 |

$17,897 divided by 15 day use period per year = **$ 1,193/day**

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = $3,112/year/aircraft.

$3,112 divided by 15 days = **$ 207/day**

Subtotal = **$27,697/day**

Ten percent efficiency loss when using CWN helicopters and crews
Grand Total = $27,697 X 1.1 = **$ 30,467/day**

**WORKSHEET # 4 - Type I - Lower 48 States EU, Super Puma AS 332L**

CONTRACT TYPE: EU Contract for 45 Days, TYPE I Super Puma AS 332L

Contract costs:
-Daily availability: Helicopter cost data developed by taking 80% of CWN daily minimum rate of $19,400.
$15,520/day X 45 days = **$ 698,400/yr**

Crew costs:

| | | | |
|---|---|---|---|
| -Foreman/supervisor | GS-7 for 10 pay periods @ $1,176/PP | $ 11,760 | |
| -Assistant foreman | GS-6 for 8 pay periods @ $1,040/PP | 8,320 | |
| -Crew of 4 | GS-4 for 6 pay periods @ $650/PP * 4 | 15,600 | |
| -Training and Travel | | 5,000 | |
| -Vehicles | | 2,500 | |
| -Indirect costs @ 20% of total | | 8,636 | |
| | Total crew costs | | = **$ 51,816/yr** |

Other "admin. support": $3,112/year/aircraft/yr. (See Wkst.#3) = **$ 3,112/yr**

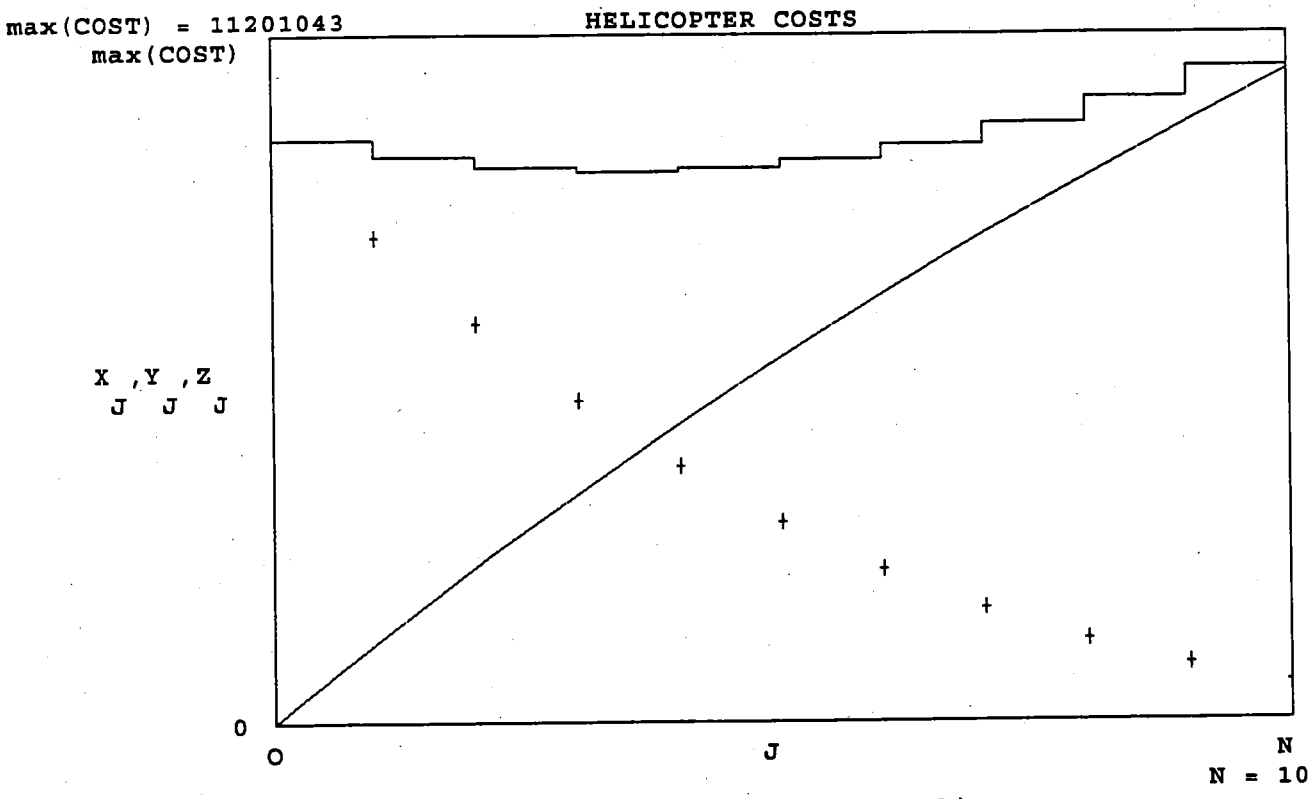
**Total fixed costs = $ 753,328/yr**

-40% of CWN hourly rate $1,850/hr. X 5.4 hours = **Variable Cost = $ 9,990/day**

LOWER 48 STATES - SUPER PUMA - 100% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)



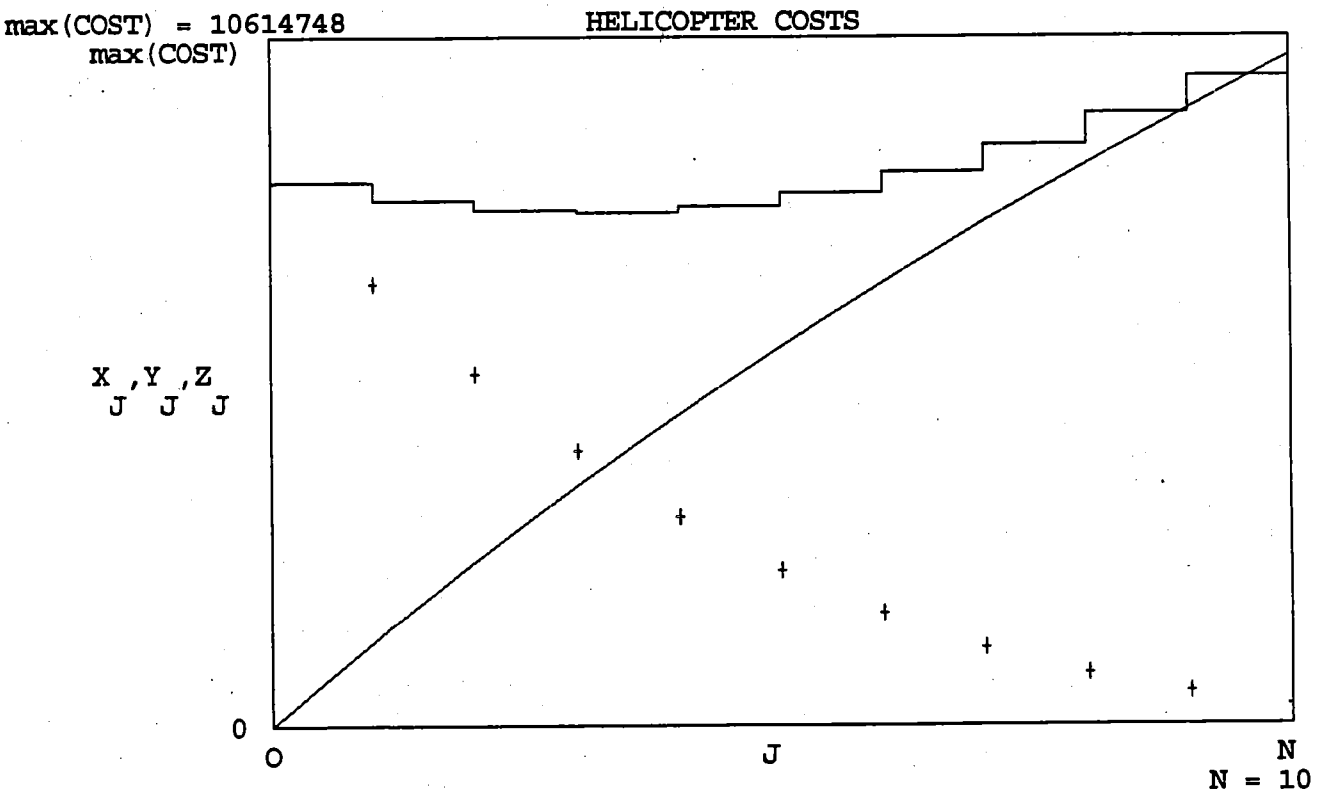

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 9487404 | 0 | 4268 | 9483136 |
| 1 | 9205165 | 282239 | 1300270 | 7904895 |
| 2 | 9027667 | 177498 | 2541384 | 6486283 |
| 3 | 8961868 | 65799 | 3723964 | 5237904 |
| 4 | 9005764 | -43896 | 4849060 | 4156704 |
| 5 | 9154270 | -148506 | 5919336 | 3234934 |
| 6 | 9400669 | -246398 | 6938313 | 2462355 |
| 7 | 9737223 | -336554 | 7910046 | 1827177 |
| 8 | 10155497 | -418275 | 8838954 | 1316543 |
| 9 | 10646548 | -491051 | 9729725 | 916824 |
| 10 | 11201043 | -554495 | 10587248 | 613795 |

LOWER 48 STATES - SUPER PUMA - 90% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 18 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 10 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)



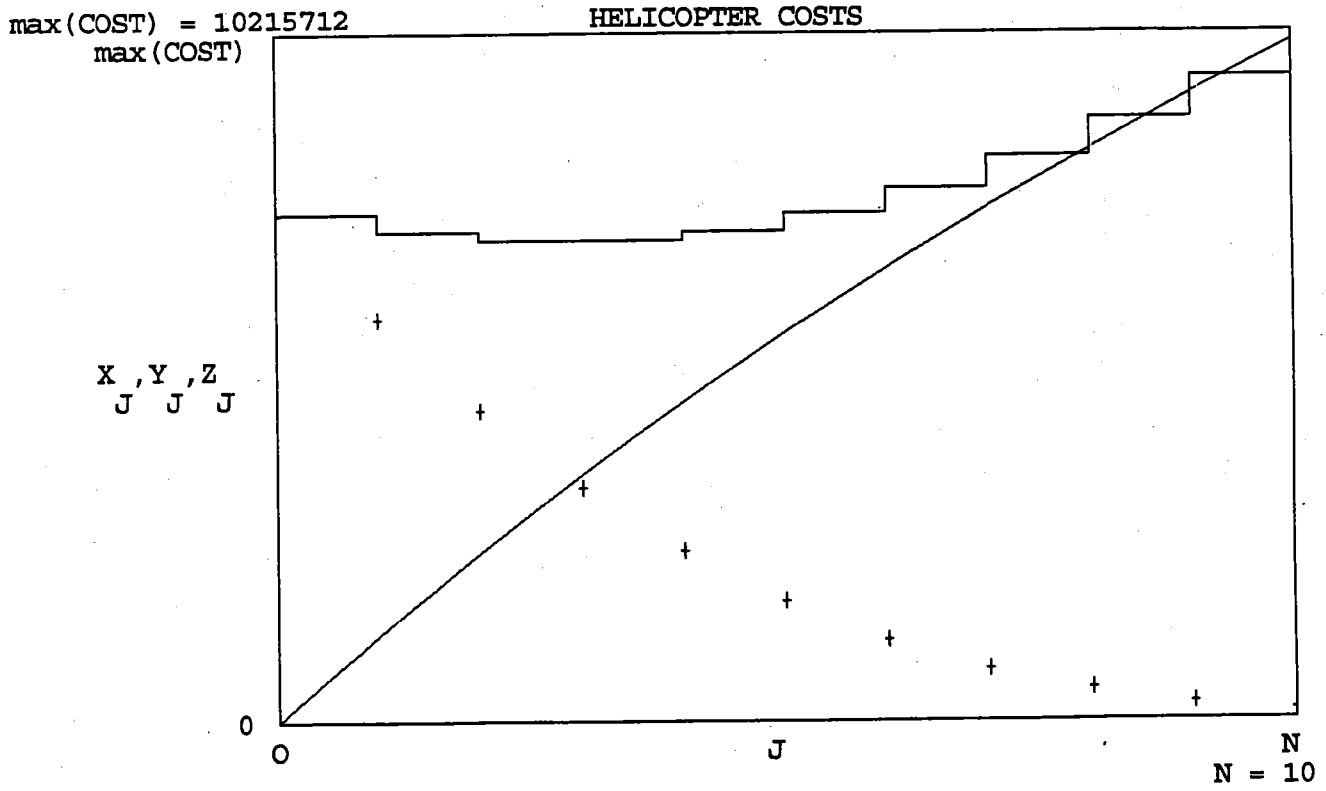

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 8366972 | 0 | 6002 | 8360970 |
| 1 | 8095025 | 271947 | 1296611 | 6798415 |
| 2 | 7939001 | 156024 | 2526471 | 5412530 |
| 3 | 7908687 | 30314 | 3690456 | 4218231 |
| 4 | 8001264 | -92577 | 4790041 | 3211222 |
| 5 | 8209581 | -208318 | 5828974 | 2380607 |
| 6 | 8524193 | -314611 | 6812206 | 1711987 |
| 7 | 8934218 | -410025 | 7745437 | 1188781 |
| 8 | 9427795 | -493577 | 8634883 | 792911 |
| 9 | 9992346 | -564551 | 9487137 | 505209 |
| 10 | 10614748 | -622402 | 10309075 | 305673 |

LOWER 48 STATES - SUPER PUMA - 80% OF LAST 3 YEAR'S DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 16 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 9 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)



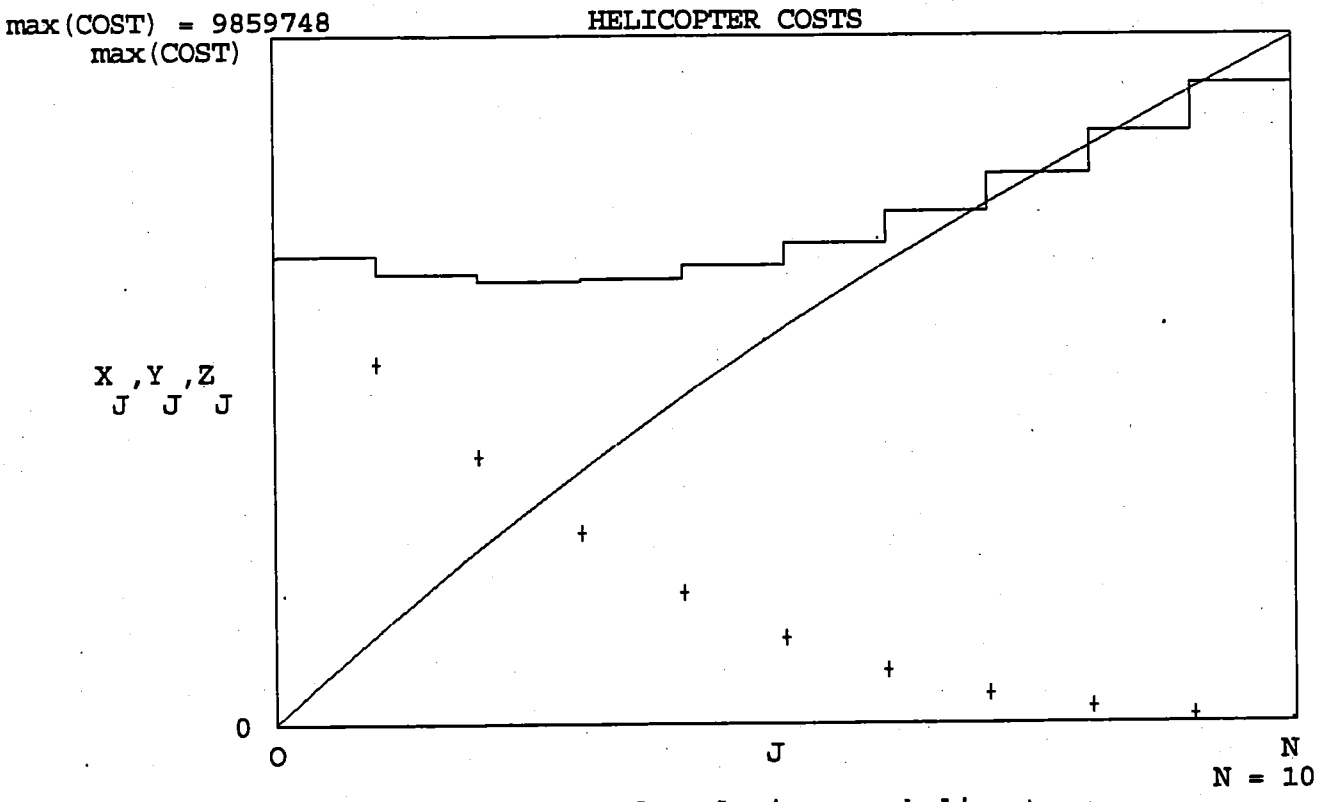

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 7525623 | 0 | 7839 | 7517784 |
| 1 | 7263345 | 262278 | 1293381 | 5969964 |
| 2 | 7126366 | 136979 | 2513262 | 4613104 |
| 3 | 7127469 | -1103 | 3660783 | 3466686 |
| 4 | 7262973 | -135504 | 4737873 | 2525100 |
| 5 | 7523538 | -260565 | 5749426 | 1774111 |
| 6 | 7896825 | -373287 | 6701909 | 1194916 |
| 7 | 8368625 | -471800 | 7602768 | 765857 |
| 8 | 8923443 | -554819 | 8460122 | 463321 |
| 9 | 9544852 | -621409 | 9282580 | 262272 |
| 10 | 10215712 | -670859 | 10079125 | 136587 |

LOWER 48 STATES - SUPER PUMA - 70% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 14 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 8 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)



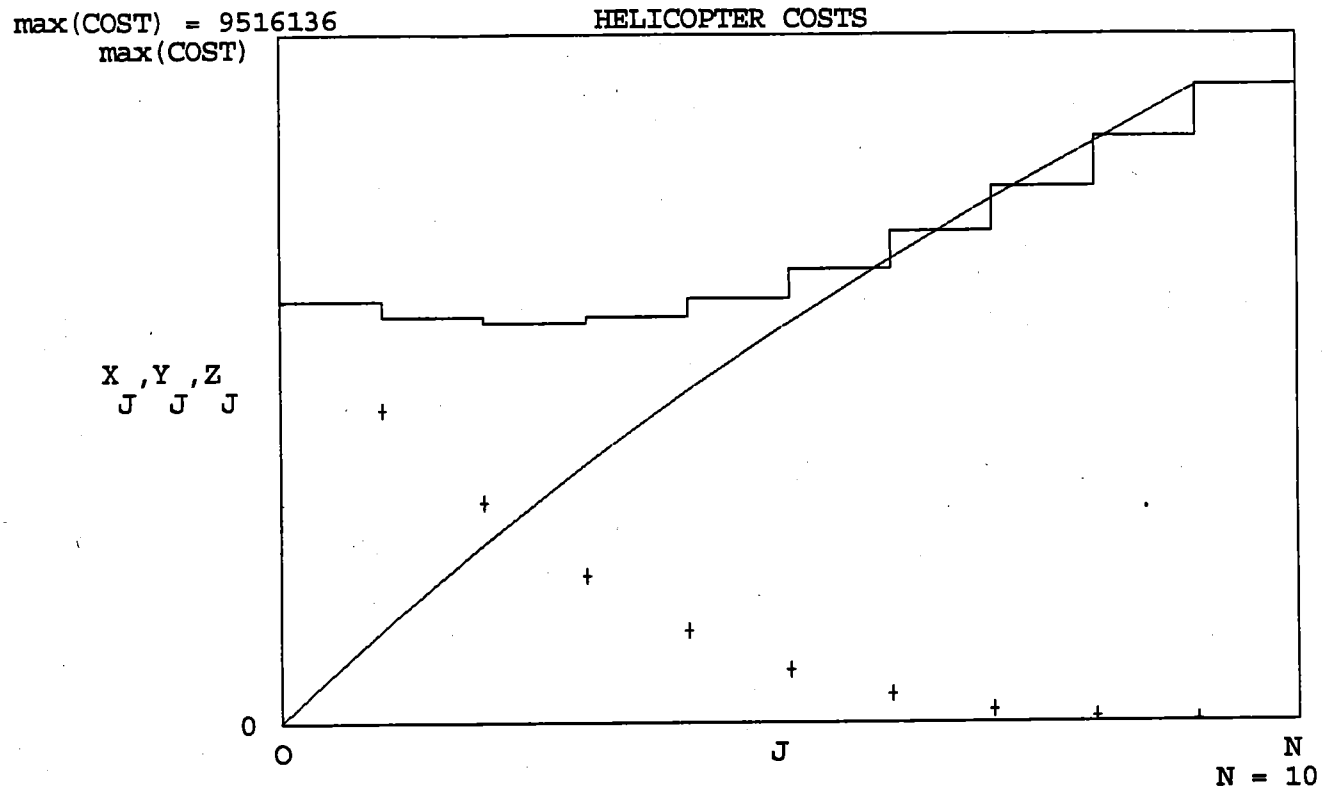

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 6682379 | 0 | 10670 | 6671709 |
| 1 | 6433056 | 249323 | 1289423 | 5143633 |
| 2 | 6319593 | 113463 | 2496980 | 3822613 |
| 3 | 6359391 | -39798 | 3624224 | 2735168 |
| 4 | 6547440 | -188049 | 4673778 | 1873662 |
| 5 | 6871026 | -323586 | 5652306 | 1218720 |
| 6 | 7313356 | -442330 | 6568609 | 744747 |
| 7 | 7855086 | -541731 | 7432821 | 422265 |
| 8 | 8475131 | -620044 | 8255994 | 219136 |
| 9 | 9151128 | -675997 | 9049847 | 101282 |
| 10 | 9859748 | -708620 | 9826603 | 33145 |

LOWER 48 STATES - SUPER PUMA - 60% OF LAST 3 YEAR'S DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 12 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 7 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)



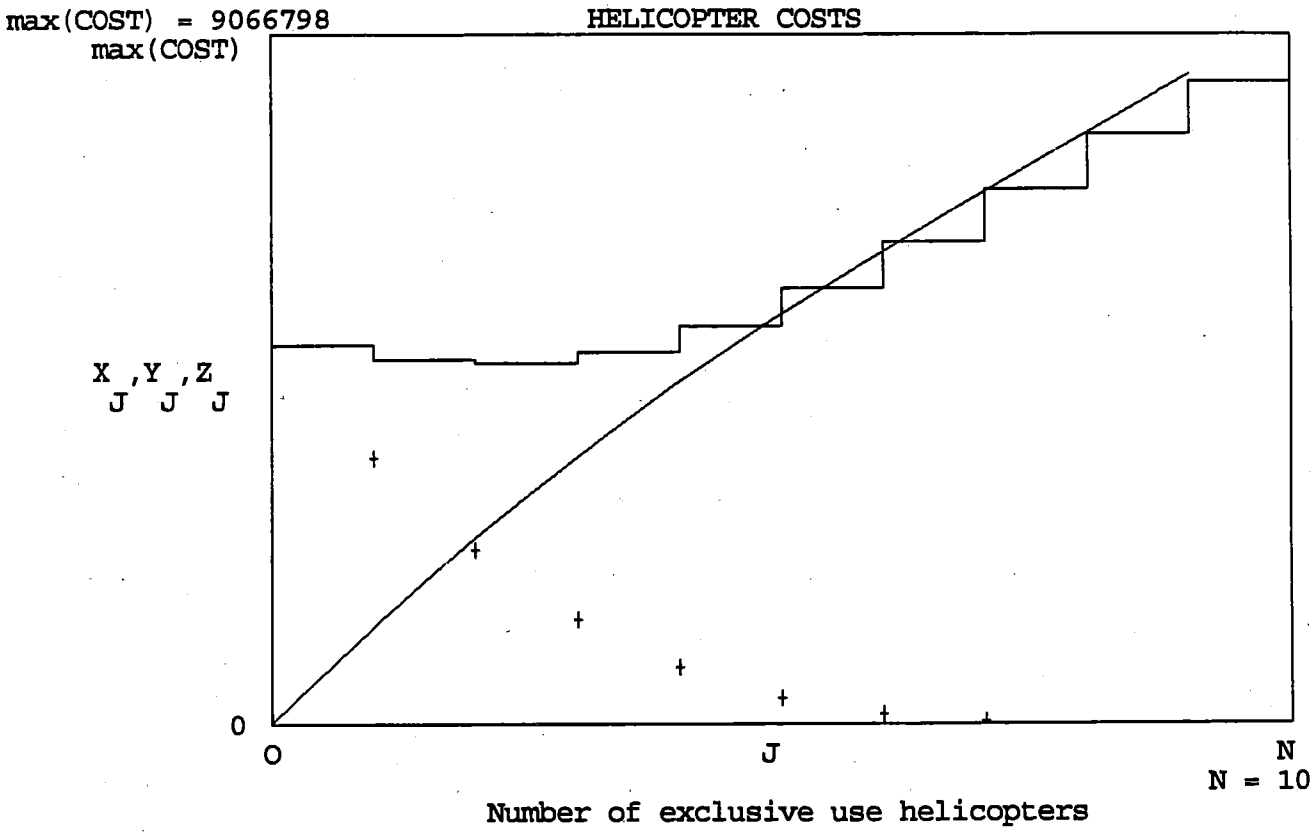

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 5835577 | 0 | 15365 | 5820213 |
| 1 | 5604690 | 230887 | 1284457 | 4320233 |
| 2 | 5521081 | 83609 | 2476370 | 3044711 |
| 3 | 5609806 | -88726 | 3577974 | 2031833 |
| 4 | 5863652 | -253846 | 4593048 | 1270603 |
| 5 | 6264311 | -400659 | 5531187 | 733124 |
| 6 | 6787600 | -523289 | 6405064 | 382536 |
| 7 | 7405666 | -618066 | 7229274 | 176392 |
| 8 | 8088143 | -682477 | 8019731 | 68413 |
| 9 | 8802832 | -714689 | 8793307 | 9525 |
| 10 | 9516136 | -713304 | 9567609 | -51473 |

LOWER 48 STATES - SUPER PUMA - 53% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 10 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 6 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 30467 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

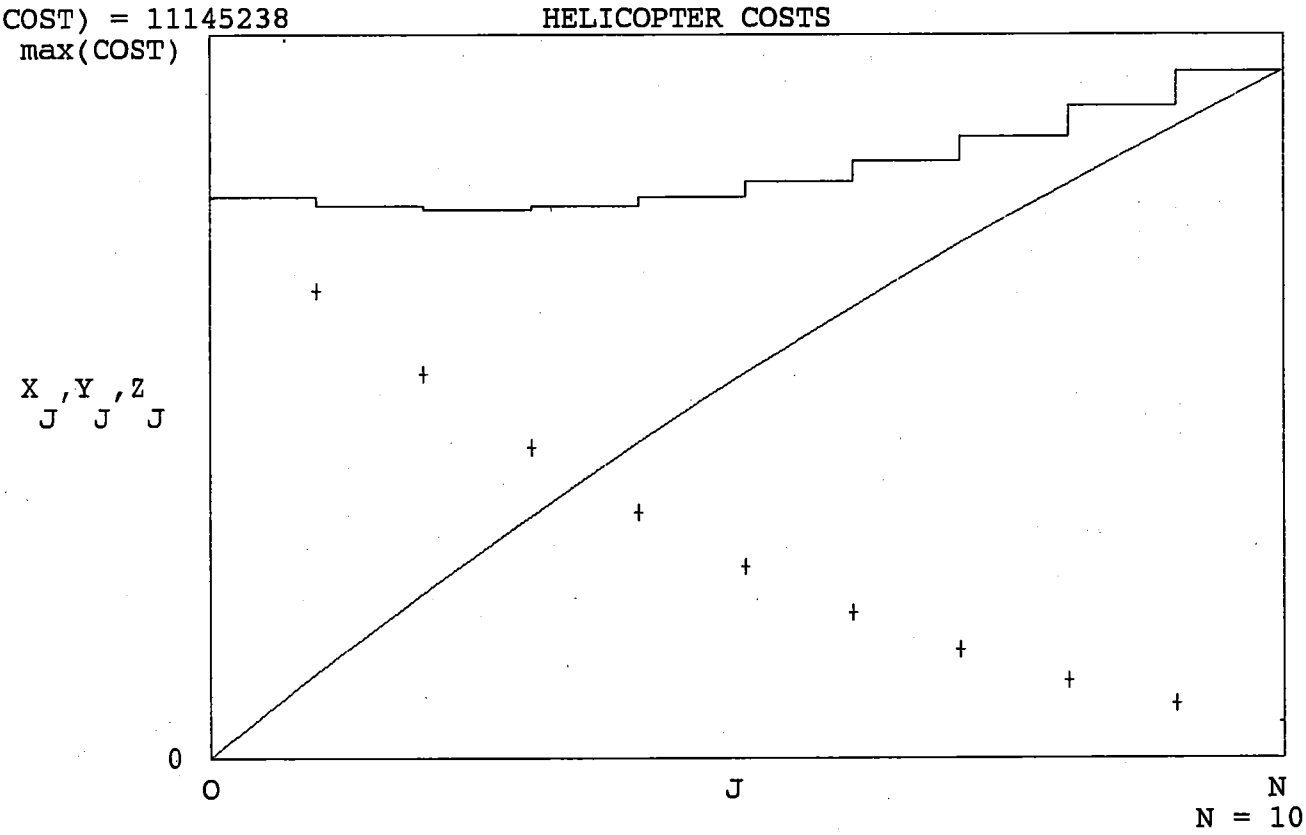
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 4981242 | 0 | 24008 | 4957235 |
| 1 | 4779080 | 202162 | 1278047 | 3501033 |
| 2 | 4734788 | 44292 | 2449356 | 2285432 |
| 3 | 4887518 | -152730 | 3517419 | 1370099 |
| 4 | 5225997 | -338479 | 4488143 | 737854 |
| 5 | 5721621 | -495624 | 5376517 | 345104 |
| 6 | 6336602 | -614982 | 6202344 | 134259 |
| 7 | 7027422 | -690820 | 6988428 | 38994 |
| 8 | 7746633 | -719211 | 7759635 | -13002 |
| 9 | 8443923 | -697290 | 8542329 | -98406 |
| 10 | 9066798 | -622876 | 9364018 | -297220 |

LOWER 48 STATES - SUPER PUMA - 100% OF LAST 3 YEARS DEMAND - NO EFF. LOSS
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 4850 PER HOUR EXCL = $ 1940 PER HR
CWN = $19400 PER DAY EXCL = $15520 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 753328 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 10476 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 27697 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 11145238




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF. | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 8625216 | 0 | 4268 | 8620948 |
| 1 | 8486467 | 138748 | 1300270 | 7186197 |
| 2 | 8437947 | 48520 | 2541384 | 5896563 |
| 3 | 8485648 | -47701 | 3723964 | 4761684 |
| 4 | 8627845 | -142197 | 4849060 | 3778785 |
| 5 | 8860156 | -232312 | 5919336 | 2940820 |
| 6 | 9176796 | -316640 | 6938313 | 2238483 |
| 7 | 9571099 | -394303 | 7910046 | 1661054 |
| 8 | 10035800 | -464700 | 8838954 | 1196846 |
| 9 | 10563192 | -527393 | 9729725 | 833468 |
| 10 | 11145238 | -582046 | 10587248 | 557990 |

**WORKSHEET # 5 - Type I - Lower 48 States CWN, BV-234/S-64**

CONTRACT TYPE: CWN, TYPE I BV-234/S-64 The BV-234 and the S-64 are roughly the same in terms of cost and performance.

Helicopter contract costs:
-Daily Availability rate = 4 hours of flight @ $7,168/hr. = **$ 28,672/day**
(based on 1992 CWN contract bid rate)

Variable costs:
-Hourly Rate: (the average use rate for type I helicopters is 5.4 hours/day based on historic average. Four hrs. daily minimum plus 1.4 hrs = 5.4 hrs.)
$7,168/hr X 1.4 hrs = **$ 10,035/day**

-7th day coverage cost for contractor personnel
@ $750/day divided by 7 = **$ 107/day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 1 person module leader | = 500 |
| -Salary (cost to Govt.) for 1 person for 2 pp | = 2,400 |
| -Salary (cost to Govt.) for 4 person on fires for 15 days | = 1,320 |
| -Overtime cost for Manager to provide 7 day coverage, based on 15 day assignment | = 720 |
| -Indirect costs and other @ 20% of total | = 988 |
| Total | $ 5,928 |

$ 5,928 divided by 15 day use period per year = **$ 395/day**

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = $3,112/year/aircraft.
$3,112 divided by 15 days = **$ 207/day**

Subtotal = **$ 39,416/day**

Ten Percent efficiency loss when using CWN helicopters and crews
Grand Total = $39,416 X 1.1 = **$ 43,358/day**

**WORKSHEET # 6 - Type I - Lower 48 States EU, BV234/S-64**

CONTRACT TYPE: EU Contract for 45 Days, TYPE I BV234/S-64 The BV-234 and the S-64 are roughly the same in terms of cost and performance.

Contract costs:
-Daily availability: Helicopter cost data developed by taking 80% of CWN daily minimum rate of$28,672)
$22,938/day X 45 days = **$ 1,032,210/yr**

Crew costs:

| | | |
|---|---|---|
| -Foreman/supervisor | GS-7 for 10 pay periods @ $1,176/PP | $ 11,760 |
| -Assistant foreman | GS-6 for 8 pay periods @ $1,040/PP | 8,320 |
| -Training and Travel | | 2,000 |
| -Vehicles | | 1,500 |
| -Indirect costs @ 20% of total | | 4,716 |
| | Total crew costs | = **$ 28,296/yr** |

Other "admin. support": $3,112/year/aircraft/yr. (See Wkst.#5) = **$ 3,112/yr**

**Total fixed costs = $ 1,063,618/yr**

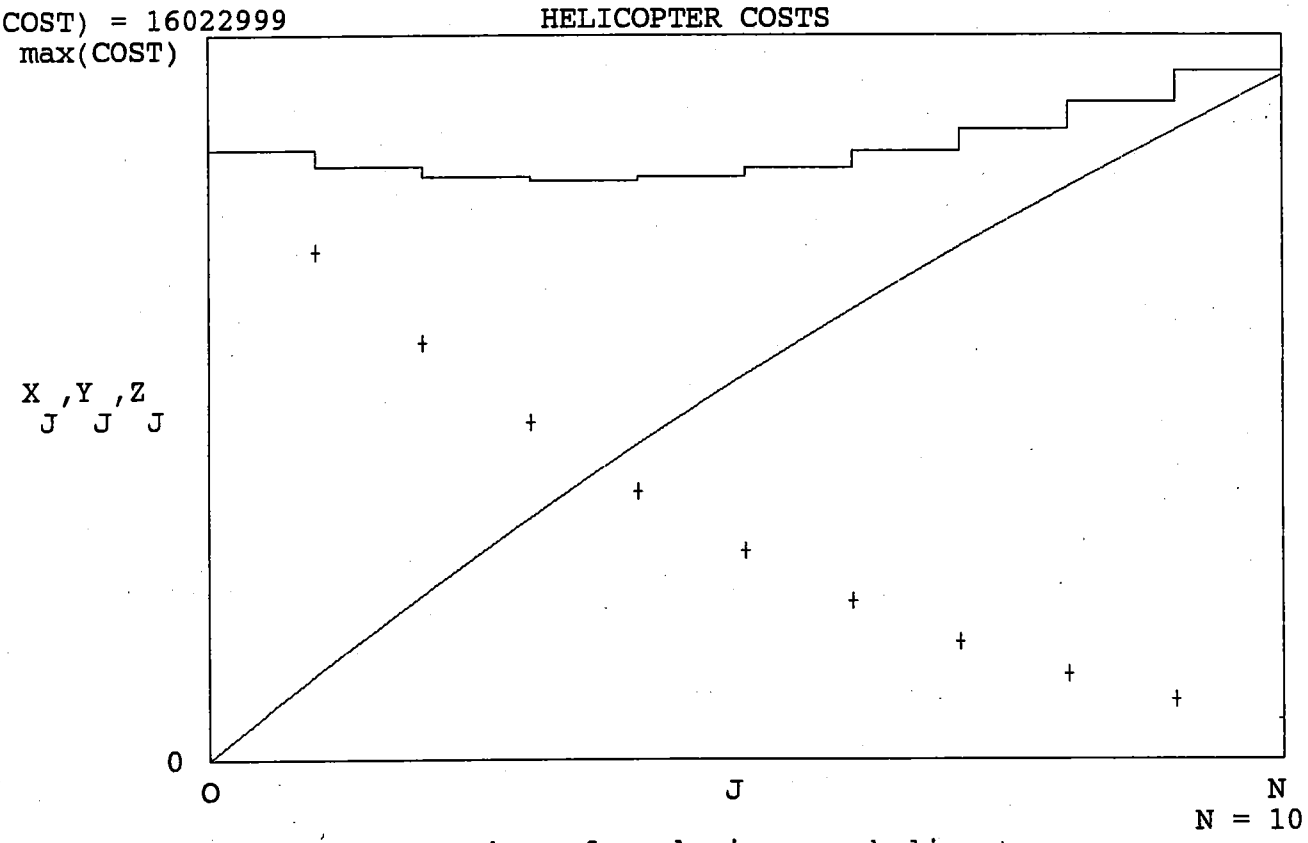
-40% of CWN hourly rate $2,867/hr. X 5.4 hours = Variable Cost = **$ 15,482/day**

LOWER 48 STATES - BV-234/S-64 RESTRICTED - 100% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 7168 PER HOUR EXCL = $ 2867 PER HR
CWN = $28672 PER DAY EXCL = $22738 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 1063618 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 15482 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 43358 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 16022999




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

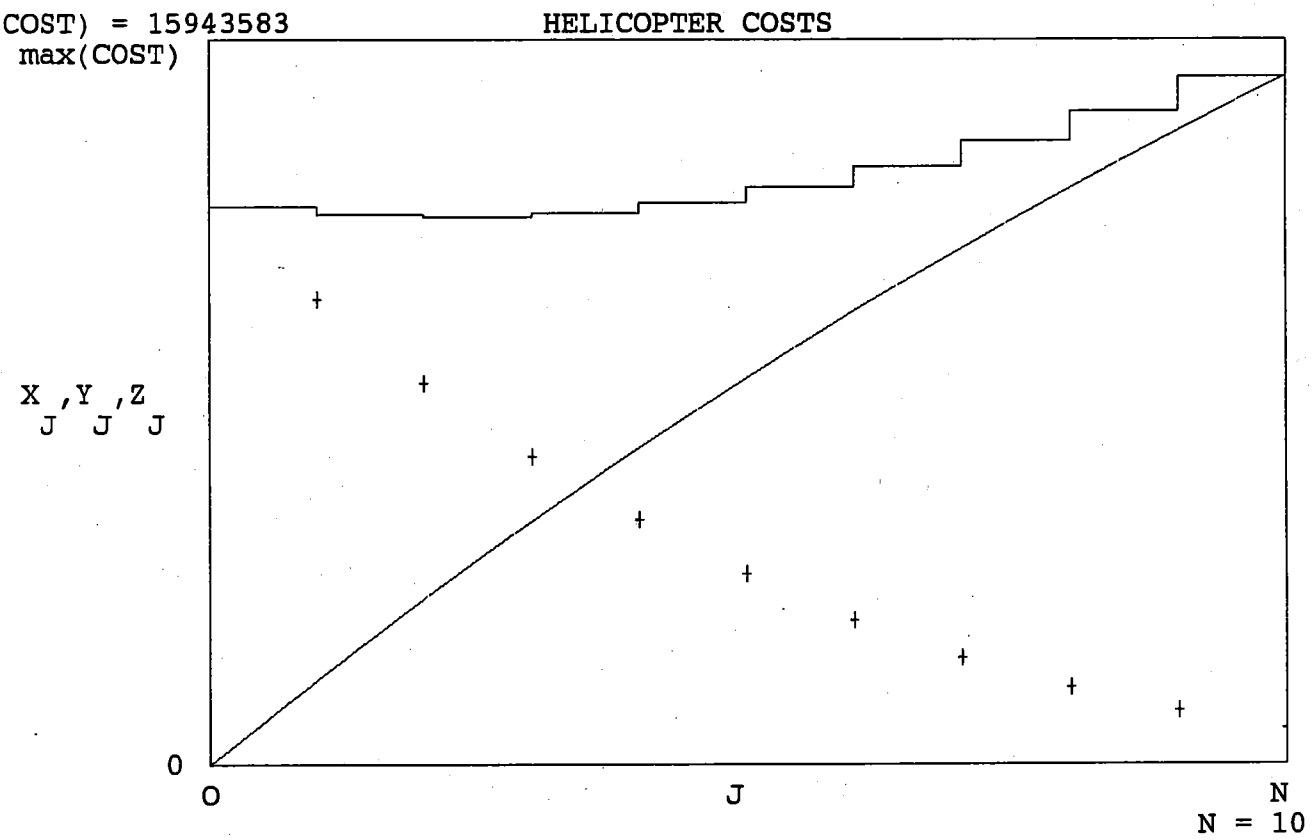
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 13501886 | 0 | 6307 | 13495579 |
| 1 | 13121482 | 380405 | 1871919 | 11249563 |
| 2 | 12887131 | 234351 | 3656413 | 9230717 |
| 3 | 12808535 | 78596 | 5354403 | 7454132 |
| 4 | 12882902 | -74366 | 6967440 | 5915462 |
| 5 | 13103139 | -220238 | 8499461 | 4603678 |
| 6 | 13459881 | -356742 | 9955670 | 3504211 |
| 7 | 13942338 | -482457 | 11342058 | 2600280 |
| 8 | 14538748 | -596410 | 12665157 | 1873591 |
| 9 | 15236640 | -697891 | 13931896 | 1304744 |
| 10 | 16022999 | -786360 | 15149500 | 873500 |

LOWER 48 STATES-BV-234/S-64 RESTRICTED-100% OF LAST 3 YEARS DEMAND-NO EFF. LOSS
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 7168 PER HOUR EXCL = $ 2867 PER HR
CWN = $28672 PER DAY EXCL = $22738 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 1063618 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 15482 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 39416 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 15943583




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

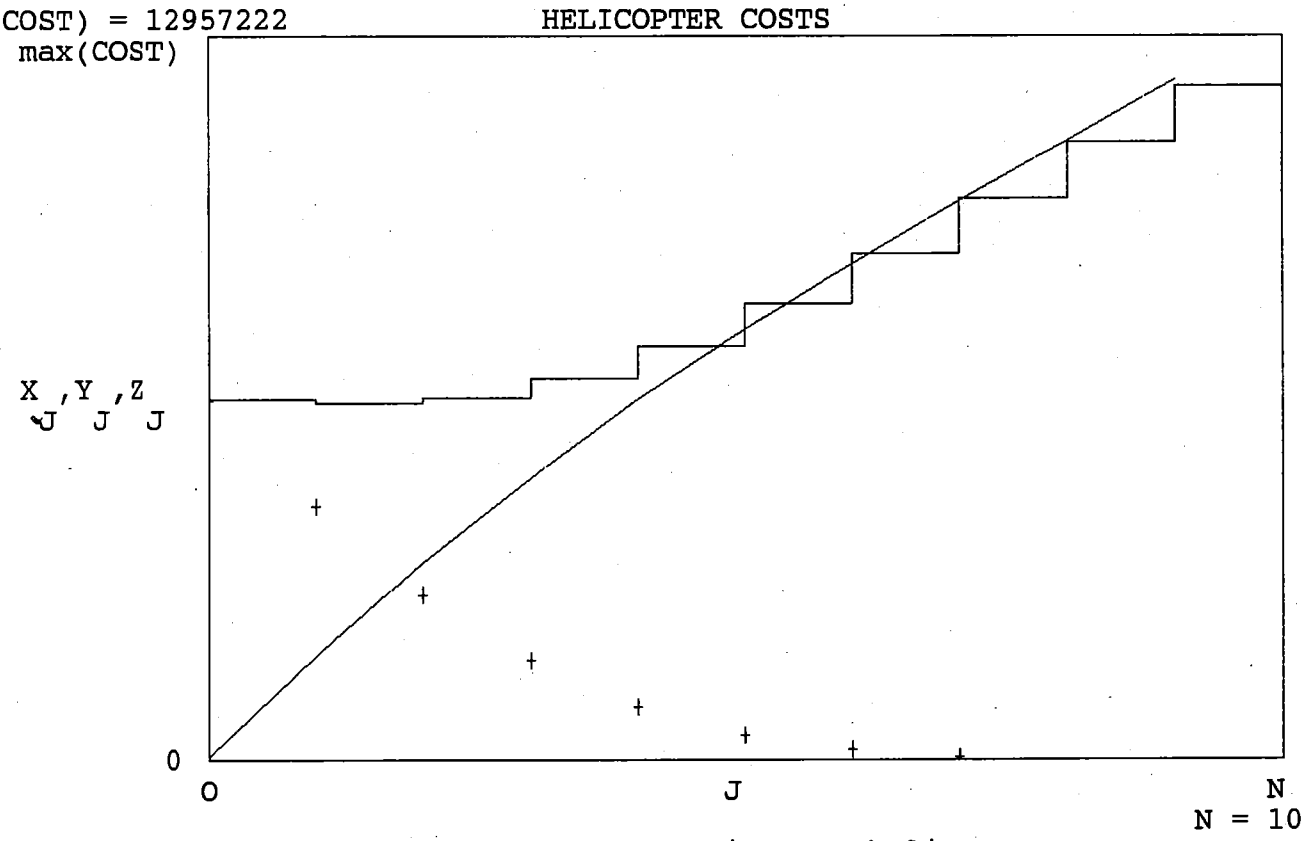
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 12274902 | 0 | 6307 | 12268595 |
| 1 | 12098700 | 176203 | 1871919 | 10226781 |
| 2 | 12047897 | 50803 | 3656413 | 8391484 |
| 3 | 12130824 | -82927 | 5354403 | 6776421 |
| 4 | 12345083 | -214258 | 6967440 | 5377643 |
| 5 | 12684584 | -339502 | 8499461 | 4185123 |
| 6 | 13141287 | -456702 | 9955670 | 3185617 |
| 7 | 13705927 | -564640 | 11342058 | 2363869 |
| 8 | 14368406 | -662479 | 12665157 | 1703249 |
| 9 | 15118016 | -749610 | 13931896 | 1186120 |
| 10 | 15943583 | -825567 | 15149500 | 794083 |

LOWER 48 STATES-BV-234/S-64 RESTRICTED-53% OF LAST 3 YEARS DEMAND-NO EFF. LOSS
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 7168 PER HOUR EXCL = $ 2867 PER HR
CWN = $28672 PER DAY EXCL = $22738 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 10 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 6 | MOST FREQUENCY DEMAND |

FIXED ≡ 1063618 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 15482 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 39416 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 12957222




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 6448791 | 0 | 35480 | 6413312 |
| 1 | 6368459 | 80332 | 1839076 | 4529383 |
| 2 | 6477135 | -108676 | 3520409 | 2956726 |
| 3 | 6821694 | -344559 | 5049160 | 1772535 |
| 4 | 7388639 | -566944 | 6434057 | 954582 |
| 5 | 8143723 | -755085 | 7697253 | 446470 |
| 6 | 9041708 | -897984 | 8868014 | 173694 |
| 7 | 10030489 | -988781 | 9980041 | 50448 |
| 8 | 11053260 | -1022771 | 11070081 | -16821 |
| 9 | 12049787 | -996527 | 12177098 | -127311 |
| 10 | 12957222 | -907435 | 13341744 | -384522 |

**WORKSHEET # 7 - Type I - Lower 48 States CWN, BV-107/S-61**

CONTRACT TYPE: CWN, TYPE I BV-107/S-61 The BV-107 and the S-61 are roughly the same in terms of cost and performance.

Helicopter contract costs:
-Daily Availability rate = 4 hours of flight @ $3,116/hr. = **$ 12,464/day**
Based on 1992 CWN contract bid rate.

Variable costs:
-Hourly Rate: (the average use rate for type I helicopters is 5.4 hours/day based on historic average. 4 hrs. daily minimum plus 1.4 hrs = 5.4 hrs.)
$3,116/hr X 1.4 hrs = **$ 4,343/day**

-7th day coverage cost for contractor personnel
@ $750/day divided by 7 = **$ 107/day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 1 person module leader | = 500 |
| -Salary (cost to Govt.) for 1 person for 2 pp | = 2,400 |
| -Salary (cost to Govt.) for 4 person on fires for 15 days | = 1,320 |
| -Overtime cost for Manager to provide 7 day coverage, based on 15 day assignment | = 720 |
| -Indirect costs and other @ 20% of total | = 988 |
| Total | $ 5,928 |

$ 5,928 divided by 15 day use period per year = **$ 395/day**

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = $3,112/year/aircraft.
$3,112 divided by 15 days = **$ 207/day**

Subtotal = **$ 17,536/day**
Ten Percent efficiency loss when using CWN helicopters and crews
Grand Total = $17,536 X 1.1 = **$ 19,290/day**

**WORKSHEET # 8 - Type I - Lower 48 States EU, BV107/S-61**

CONTRACT TYPE: EU Contract for 45 Days, TYPE I BV107/S-61 The BV-107 and the S-61 are roughly the same in terms of cost and performance.

Contract costs:
-Daily availability: Helicopter cost data developed by taking 80% of CWN daily minimum rate of $12,307.
$ 9,972/day X 45 days = **$ 448,740/yr**

Crew costs:

| | | |
|---|---|---|
| -Foreman/supervisor | GS-7 for 10 pay periods @ $1,176/PP | $ 11,760 |
| -Assistant foreman | GS-6 for 8 pay periods @ $1,040/PP | 8,320 |
| -Training and Travel | | 2,000 |
| -Vehicles | | 1,500 |
| -Indirect costs @ 20% of total | | 4,716 |
| | Total crew costs | = **$ 28,296/yr** |

Other "admin. support": $3,112/year/aircraft/yr. (See Wkst.#7) = **$ 3,112/yr**

**Total fixed costs = $ 480,148/yr**

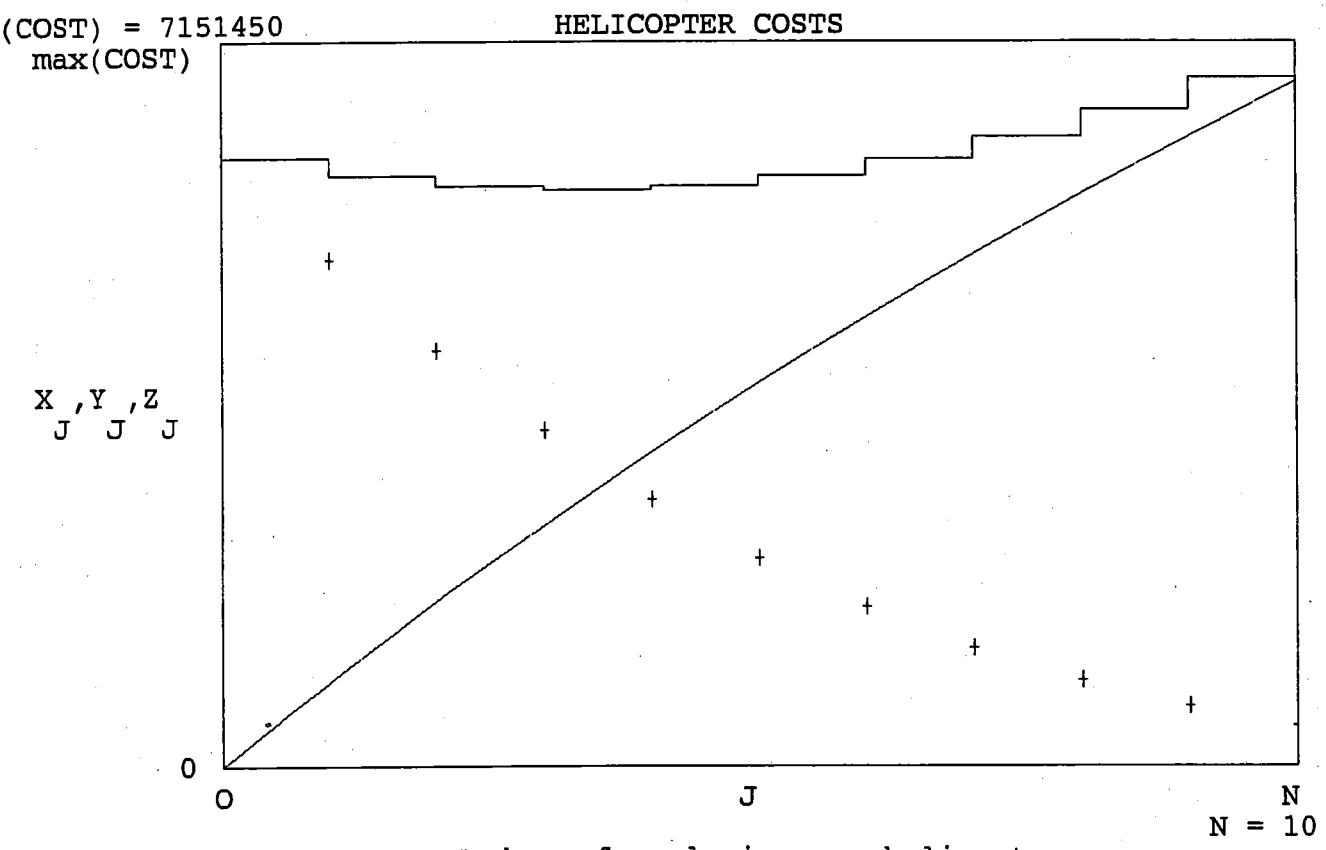
-40% of CWN hourly rate is $1,246/hr. X 5.4 hours=Variable Cost = **$ 6,728/day**

LOWER 48 STATES - BV-107/S-61 RESTRICTED - 100% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 3116 PER HOUR EXCL = $ 1246 PER HR
CWN = $12646 PER DAY EXCL = $ 9972 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 480148 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 6728 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 19290 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 7151450




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

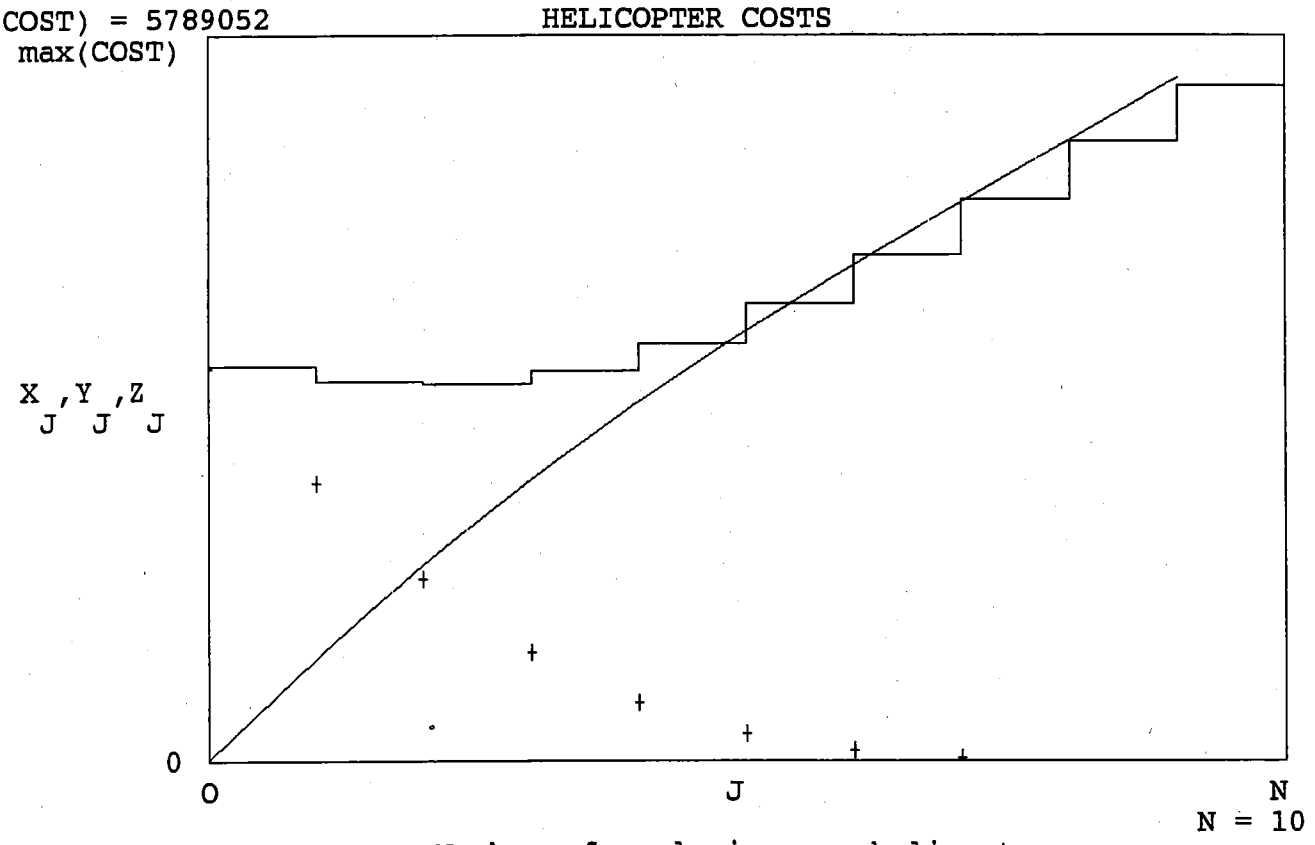
| excl | TOTAL_COST excl | MARG_DIFF excl | COST_EXCL excl | COST_CWN excl |
|---|---|---|---|---|
| 0 | 6006932 | 0 | 2741 | 6004191 |
| 1 | 5836348 | 170584 | 831411 | 5004937 |
| 2 | 5731581 | 104767 | 1624829 | 4106752 |
| 3 | 5697004 | 34577 | 2380656 | 3316348 |
| 4 | 5731357 | -34353 | 3099564 | 2631793 |
| 5 | 5831445 | -100088 | 3783266 | 2048179 |
| 6 | 5993047 | -161602 | 4434022 | 1559026 |
| 7 | 6211302 | -218254 | 5054436 | 1156866 |
| 8 | 6480908 | -269606 | 5647346 | 833562 |
| 9 | 6796245 | -315338 | 6215764 | 580481 |
| 10 | 7151450 | -355205 | 6762830 | 388621 |

LOWER 48 STATES - BV-107/S-61 RESTRICTED - 53% OF LAST 3 YEARS DEMAND
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 3116 PER HOUR EXCL = $ 1246 PER HR
CWN = $12646 PER DAY EXCL = $ 9972 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 10 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 6 | MOST FREQUENCY DEMAND |

FIXED ≡ 480148 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 6728 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 19290 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 5789052




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

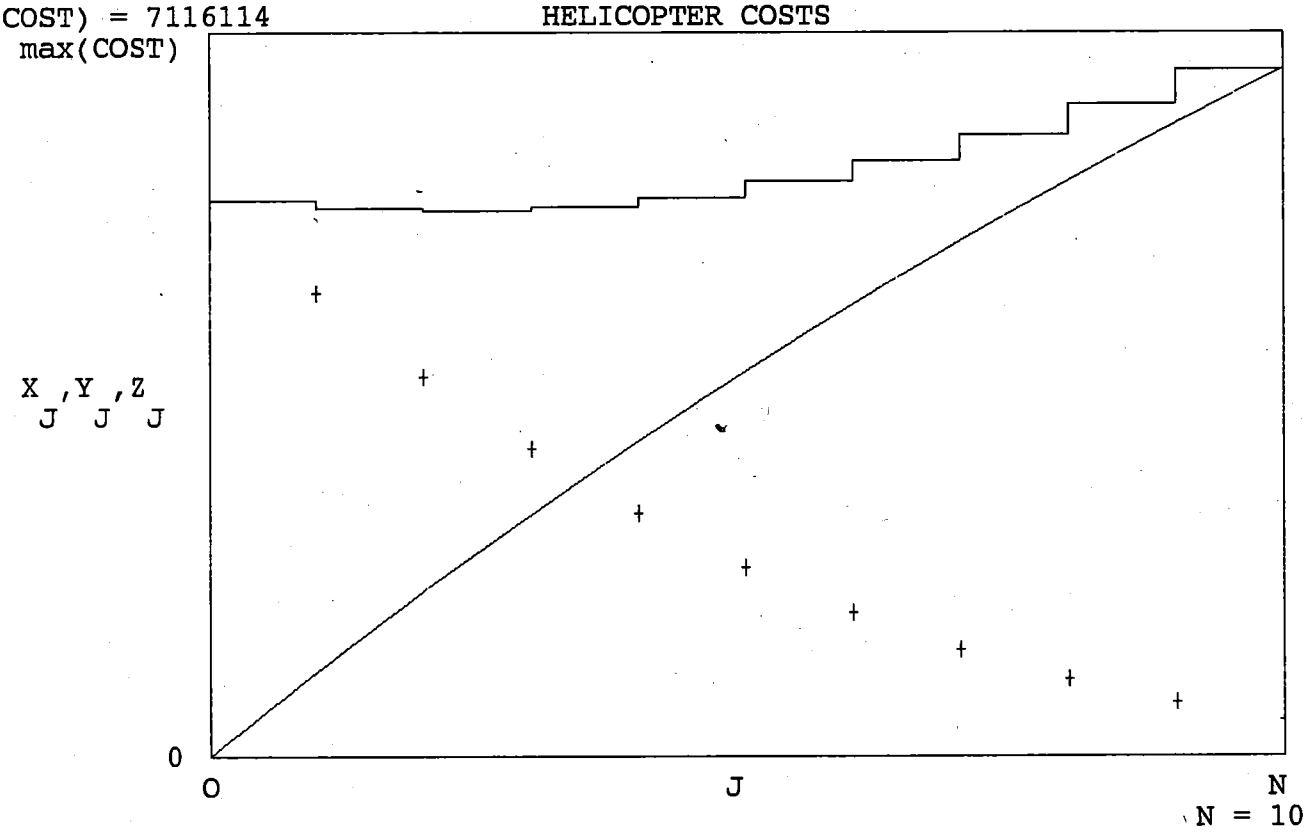
| excl | TOTAL_COST excl | MARG_DIFF excl | COST_EXCL excl | COST_CWN excl |
|---|---|---|---|---|
| 0 | 3154062 | 0 | 15418 | 3138644 |
| 1 | 3033796 | 120266 | 817138 | 2216658 |
| 2 | 3012734 | 21063 | 1565726 | 1447007 |
| 3 | 3115476 | -102743 | 2248006 | 867470 |
| 4 | 3334940 | -219464 | 2867772 | 467168 |
| 5 | 3653151 | -318211 | 3434651 | 218500 |
| 6 | 4046365 | -393213 | 3961360 | 85005 |
| 7 | 4487234 | -440869 | 4462545 | 24689 |
| 8 | 4945943 | -458709 | 4954175 | -8232 |
| 9 | 5390878 | -444935 | 5453183 | -62305 |
| 10 | 5789052 | -398174 | 5977235 | -188183 |

LOWER 48 STATES-BV-107/S-61 RESTRICTED-100% OF LAST 3 YEARS DEMAND-NO EFF. LOSS
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 3116 PER HOUR EXCL = $ 1246 PER HR
CWN = $12646 PER DAY EXCL = $ 9972 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 480148 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 6728 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 17536 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 7116114




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

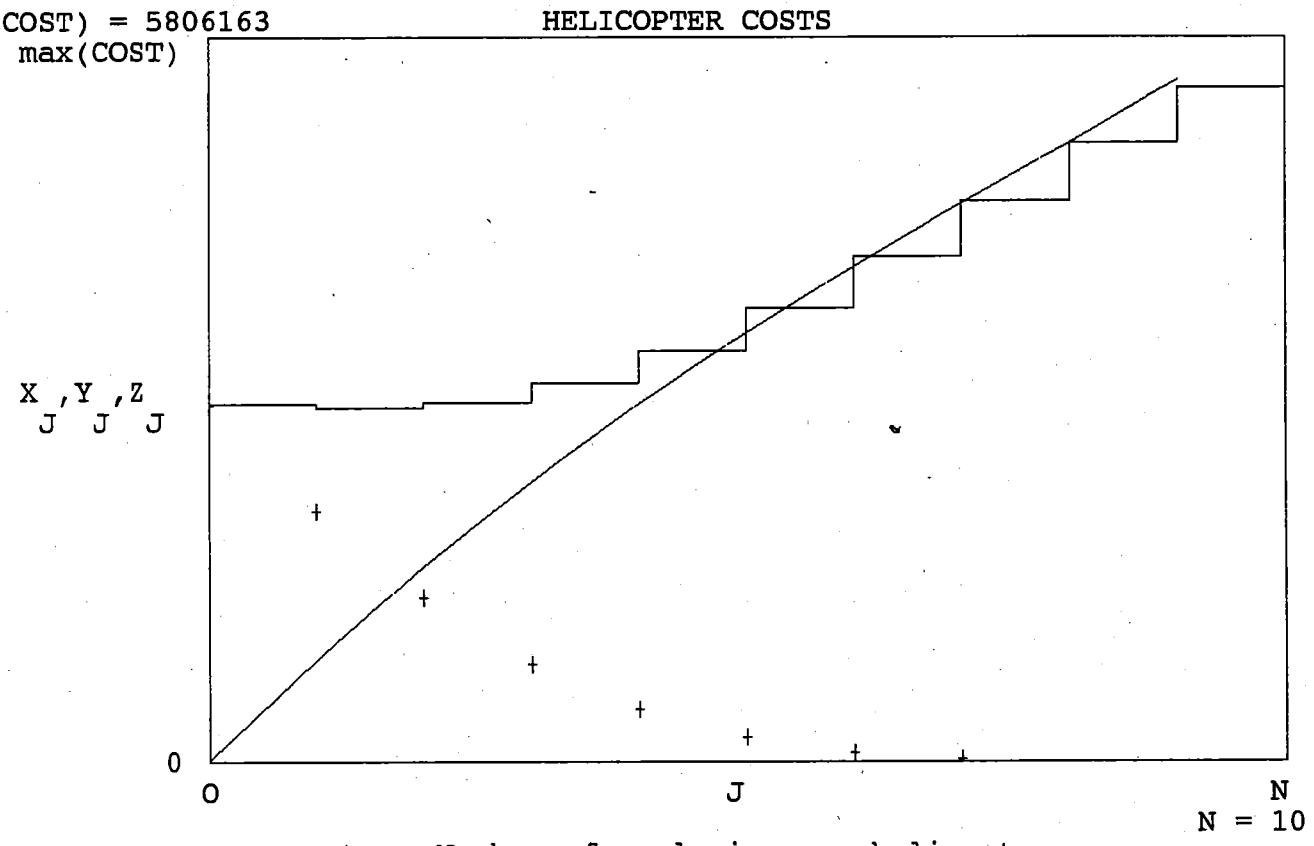
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 5460983 | 0 | 2741 | 5458242 |
| 1 | 5381259 | 79724 | 831411 | 4549849 |
| 2 | 5358162 | 23097 | 1624829 | 3733333 |
| 3 | 5395455 | -37292 | 2380656 | 3014799 |
| 4 | 5492053 | -96598 | 3099564 | 2392489 |
| 5 | 5645208 | -153155 | 3783266 | 1861942 |
| 6 | 5851288 | -206080 | 4434022 | 1417267 |
| 7 | 6106110 | -254822 | 5054436 | 1051675 |
| 8 | 6405114 | -299004 | 5647346 | 757768 |
| 9 | 6743463 | -338350 | 6215764 | 527699 |
| 10 | 7116114 | -372650 | 6762830 | 353284 |

LOWER 48 STATES-BV-107/S-61 RESTRICTED-53% OF LAST 3 YEARS DEMAND-NO EFF. LOSS
ASSUMPTIONS: TYPE I HELICOPTERS CWN = $ 3116 PER HOUR EXCL = $ 1246 PER HR
CWN = $12646 PER DAY EXCL = $ 9972 PER DAY
AVERAGE DAILY USE = 5.4 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 10 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 45 | MOST FREQUENT DURATION | mode_h ≡ 6 | MOST FREQUENCY DEMAND |

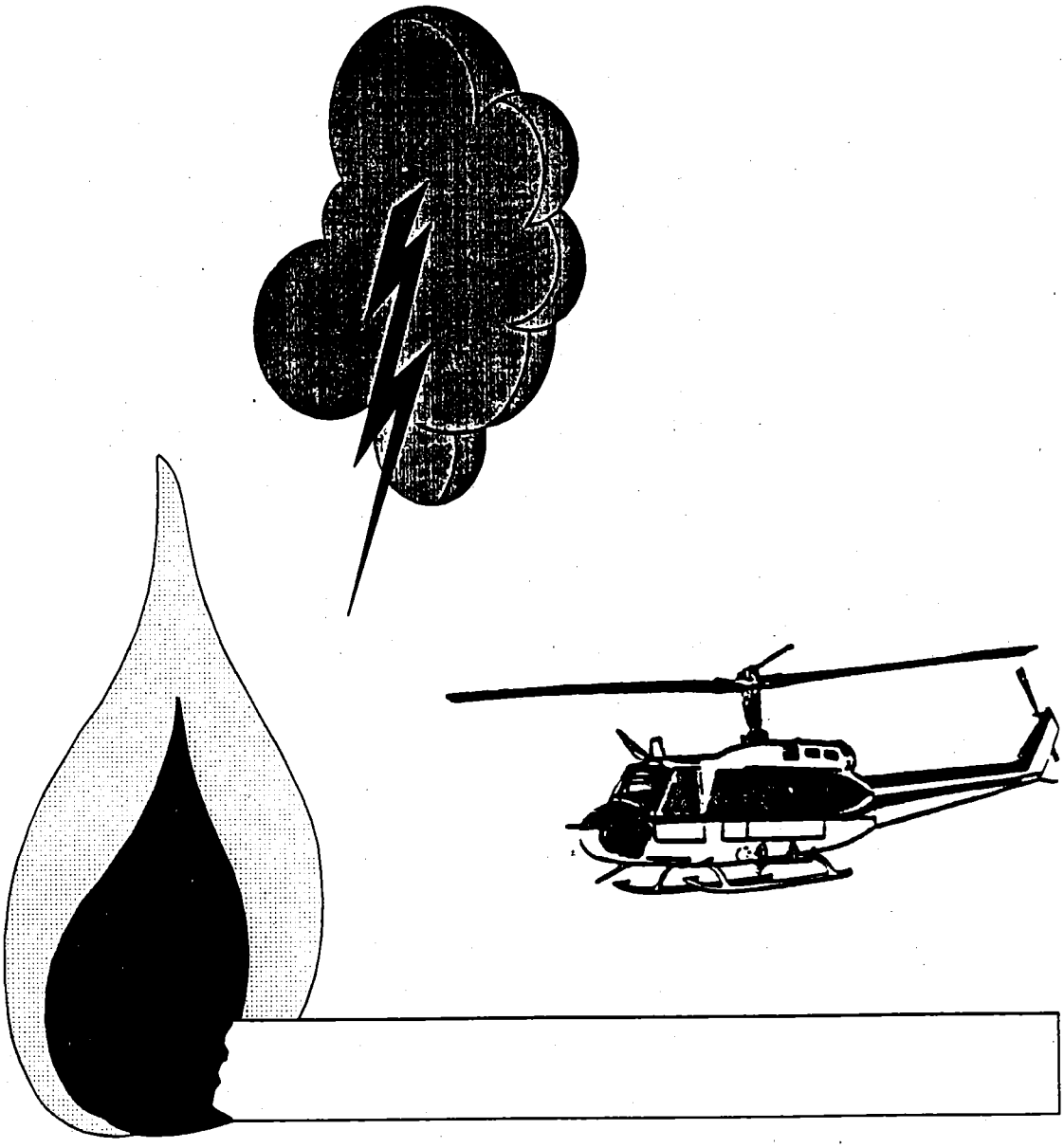
FIXED ≡ 480148 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 6728 EXCLUSIVE USE VARIABLE COST PER DAY (5.4 HOURS PER DAY)
VC_CWN ≡ 17536 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.4 HOURS PER DAY)

max(COST) = 5806163




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2868672 | 0 | 15418 | 2853253 |
| 1 | 2832240 | 36431 | 817138 | 2015102 |
| 2 | 2881160 | -48920 | 1565726 | 1315434 |
| 3 | 3036599 | -155439 | 2248006 | 788593 |
| 4 | 3292462 | -255863 | 2867772 | 424689 |
| 5 | 3633284 | -340822 | 3434651 | 198632 |
| 6 | 4038635 | -405352 | 3961360 | 77276 |
| 7 | 4484989 | -446353 | 4462545 | 22444 |
| 8 | 4946692 | -461703 | 4954175 | -7484 |
| 9 | 5396543 | -449851 | 5453183 | -56640 |
| 10 | 5806163 | -409620 | 5977235 | -171072 |



For Type II helicopters in Alaska, analysis was done collectively for Type II-A, II-B, and II-C as there was no significant cost difference between the sub-categories. Analysis was done with lumped demand data and for the Alaska Fire service (AFS) and State of Alaska DNR separately. The results are summarized in the following tables. The column with the * indicates the optimum number of EU 90 contracts to minimize the cost.

Type II For AFS Demand Only

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | $4504 | $750 | $2981 | $750 | $211023 | 3 |
| | | <---$9830/day---> | | | | | |

Type II For Alaska DNR Demand Only

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | $ 0 | $1870 | $3164 | $500 | $206640 | 5 |
| | | <---$11200/day---> | | | | | |

Type II For Alaska DNR and AFS With Lumped Demand

| EU Contract Days | Average Daily Use in Hours | CWN Rate per Day | CWN Rate per Hour | EU Rate per Day | EU Rate per Hour | EU Total Fixed Cost | EU* No. |
|---|---|---|---|---|---|---|---|
| 60 | 5.2 | <---$10515/day---> | | $3250 | $625 | $208832 | 7 |

For the Alaska lumped analysis, an average was used for each of the EU fixed cost, EU variable cost, and CWN variable costs. For the Alaska DNR Only analysis, the CWN daily rate is $ 0 was the contractor only bids the hourly rate with a daily guarantee of 4 hours. The demand for each the AFS and DNR is about equal but the Alaska DNR EU contracts are cheaper per day than the AFS contracts. Since the demand is equal, the Alaska DNR contracts collectively are cheaper, the optimum of 4 DNR and 3 AFS contracts.

Seven Type II EU contracts would allow filling of the Alaska demand 58% of the time with EU helicopters and 42% of the time with CWN helicopters. Staffing with 7 EU Type II versus filling the demand 100% with CWN Type II helicopters would save the Federal and State governments of an average of $867,000 annually.

Details of each analysis follow:

**WORKSHEET # 9 - Type II - Alaska-AFS CWN**

CONTRACT TYPE: CWN, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Helicopter contract costs:

-Daily Availability rate: Based on average of 1992 Alaska On-Call Bids = **$ 4,504/day**

-Hourly Rate: $750/hour X 5.2 hours = **$ 3,900/day**

-7th day coverage cost for contractor personnel @ $750/day divided by 7 = **$ 107/day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 1 person module leader | = 500 |
| -Salary (cost to Govt.) for 1 person for 2 pp* | = 2,600 |
| -Salary (cost to Govt.) for 1 person on fires* for 15 days | = 1,430 |
| -Overtime cost for Manager to provide 7 day coverage, based on 15 day assignment | = 780 |
| -Indirect costs and other @ 20% of total | = 1,062 |
| Total | $ 6,372 |

* Includes Alaska Cost Of Living Allowance

$ 6,372 divided by 15 day use period per year = **$ 426/day**

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = 5% of costs above which each total $4,504, $3,900, and $107/day. = **$ 426/day**

Subtotal = **$ 9,362/day**

Five percent efficiency loss when using CWN helicopters and crews
Grand Total = $9,362 X 1.05 = **$ 9,830/day**

**WORKSHEET # 10 - Type II - Alaska-AFS EU With 60 Day Contract**

CONTRACT TYPE: EU Contract For 60 Days, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Contract costs: -Daily availability:(from average of historical 60 and 90 day exclusive use contract bids)
$2,981/day X 60 days = **$178,860/yr**

Crew costs:

| | |
|---|---|
| -Foreman/supervisor GS-7 for 7 pay periods @ $1,300/PP | $ 9,100 |
| -Training and Travel | 500 |
| -Indirect costs @ 20% of total | 1,920 |
| Total crew costs | **$ 11,520/yr** |

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = 5% of costs above which each total $2,981 and $3,900 per day * 60 days. = **$ 20643/yr**

**Total fixed costs = $211,023/yr**

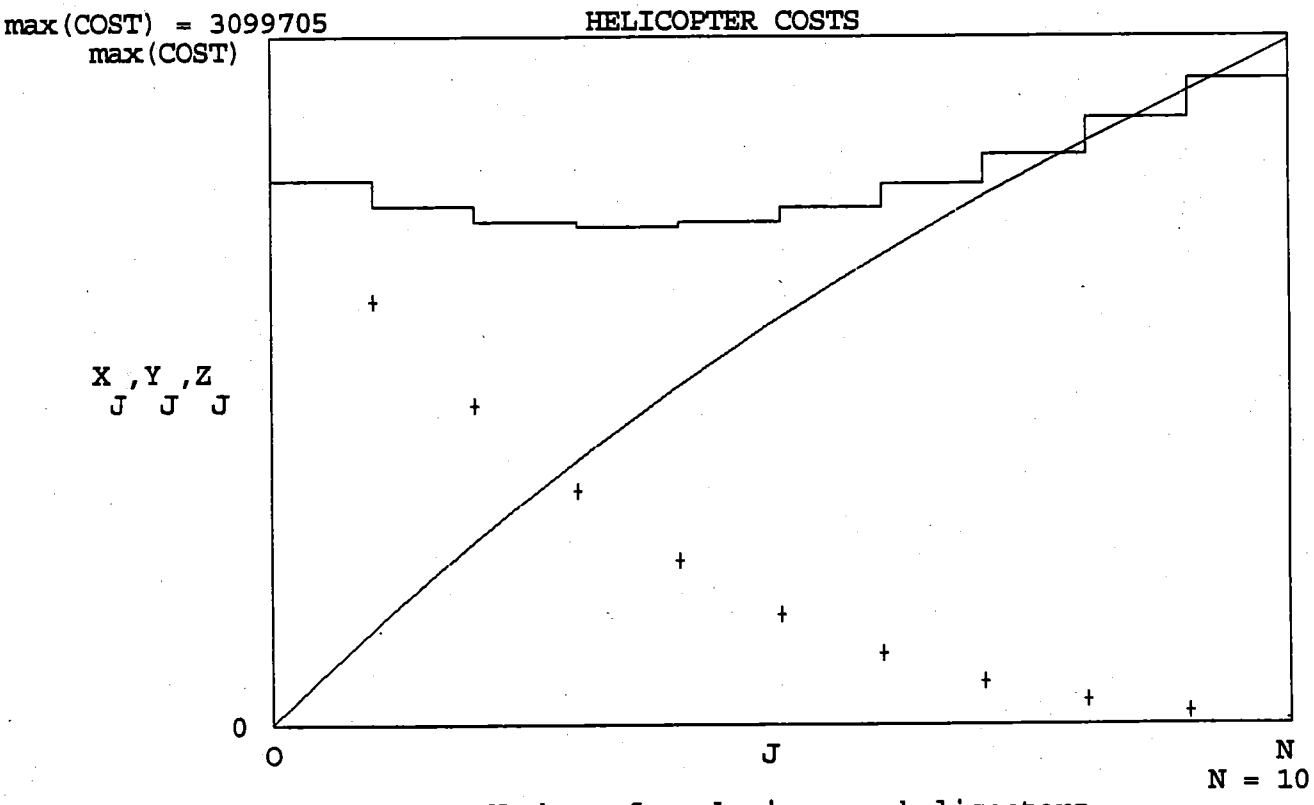
-Hourly rate $750/hr X 5.2hrs.= **Variable Cost= $ 3,900/day**

ALASKA - AFS ONLY - 100% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ 750 PER HOUR EXCL = $ 750 PER HR
CWN = $ 4504 PER DAY EXCL = $ 2981 PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 90 | MAXIMUM DURATION | max_h ≡ 15 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 8 | MOST FREQUENCY DEMAND |

FIXED ≡ 211023 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3900 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 9830 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2451418 | 0 | 4000 | 2447418 |
| 1 | 2336701 | 114717 | 429253 | 1907448 |
| 2 | 2264824 | 71877 | 826332 | 1438493 |
| 3 | 2240986 | 23839 | 1191817 | 1049169 |
| 4 | 2263689 | -22703 | 1526693 | 736996 |
| 5 | 2329136 | -65447 | 1833457 | 495679 |
| 6 | 2432310 | -103174 | 2115409 | 316901 |
| 7 | 2567434 | -135124 | 2376349 | 191085 |
| 8 | 2728209 | -160775 | 2620419 | 107791 |
| 9 | 2907956 | -179746 | 2852011 | 55944 |
| 10 | 3099705 | -191749 | 3075710 | 23994 |

**WORKSHEET # 11 - Type II - Alaska-DNR CWN**

CONTRACT TYPE: CWN, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Helicopter contract costs:

-Daily Availability rate: Contracts bid on hourly rate only. = **$ 0 /day**

-Hourly rate asuming a 4 hour guarentee - $1870/hour X 5.2 hours = **$ 9,724/day**

-7th day coverage cost for contractor personnel
@ $000/day divided by seven = **$ 0 /day**

-CWN module costs/module/year:

| | |
|---|---|
| -Travel and training for 1 person module leader | = 500 |
| -Salary (cost to Govt.) for 1 person for 2 pp* | = 3,400 |
| -Salary (cost to Govt.) for 1 person on fires* for 15 days = 1,870 | |
| -Overtime cost for Manager to provide 7 day coverage, based on 15 day assignment | = 1,020 |
| -Indirect costs and other | = 1,358 |
| Total | $ 8,148 |

* Includes Alaska Cost Of Living Allowance

$ 8,148 divided by 15 day use period per year = **$ 543/day**

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = $6,000/year/ aircraft.

$6,000 divided by 15 days = **$ 400/day**

Subtotal = **$ 10,667/day**

Five percent efficiency loss when using CWN helicopters and crews
Grand Total = $10,667 X 1.05 = **$11,200/day**

**WORKSHEET # 12 - Type II - Alaska-DNR EU With 60 Day Contract**

CONTRACT TYPE: EU Contract For 60 Days, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Contract costs: -Daily availability:(from average of existing exclusive use and severity contract bids)

$3,164/day X 60 days = **$189,840/yr**

Crew costs:

| | |
|---|---|
| -Foreman/supervisor (For. Tech. III for 4 months) | $ 8,500 |
| -Training and Travel | 500 |
| -Indirect costs and other | = 1,800 |
| Total crew costs | = **$ 10,800/yr** |

Other "administrative support", inspections, contract support, dispatcher and other management personnel's time = $6,000/year/ aircraft. = **$ 6000/yr**

**Total fixed costs = $206,640/yr**

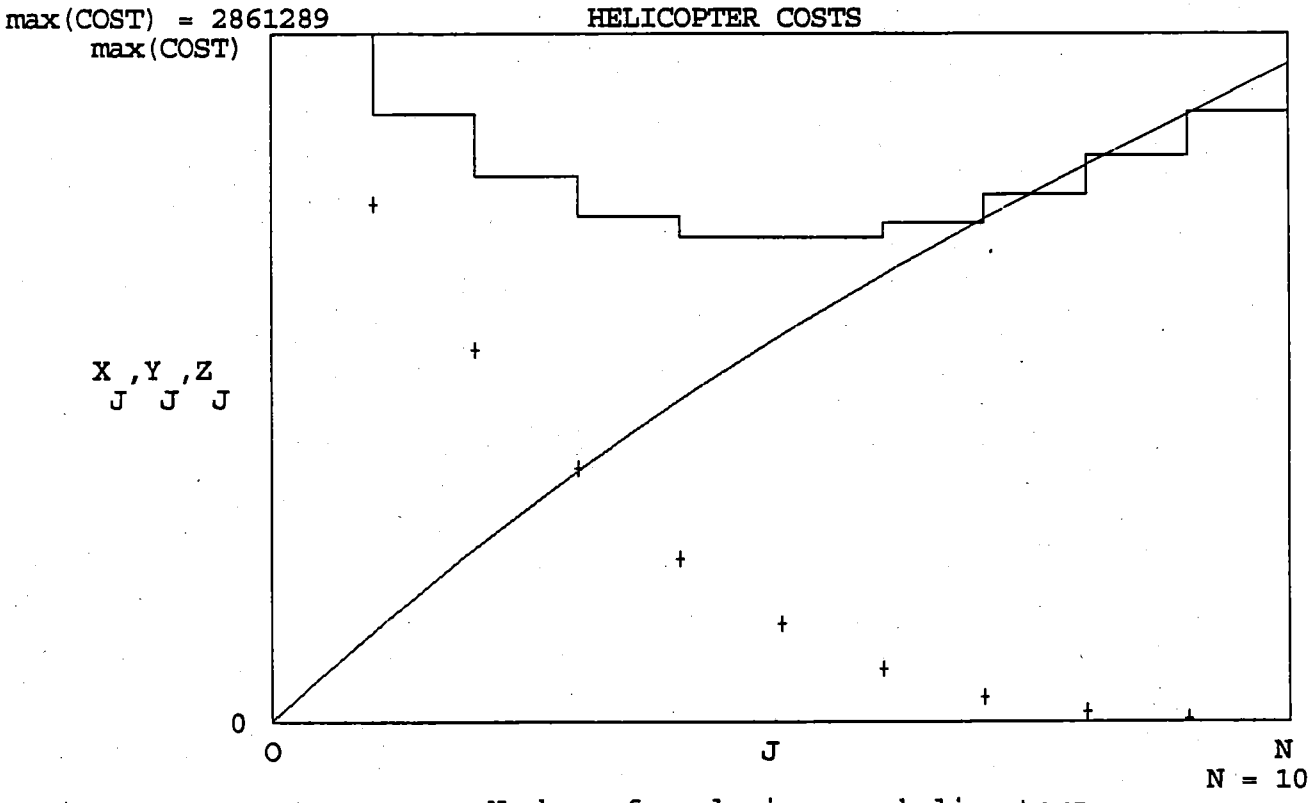
-Hourly rate $500/hr X 5.2 hrs.= **Variable Cost = $ 2,600/day**

ALASKA - DNR ONLY - 100% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ 1870 PER HOUR EXCL = $ 500 PER HR
CWN = $ 9724 PER DAY EXCL = $ 3164 PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 120 | MAXIMUM DURATION | max_h ≡ 12 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 2 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 8 | MOST FREQUENCY DEMAND |

FIXED ≡ 206640 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 2600 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 11200 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2861289 | 0 | 4044 | 2857244 |
| 1 | 2524184 | 337105 | 375072 | 2149111 |
| 2 | 2265581 | 258602 | 722367 | 1543214 |
| 3 | 2096914 | 168667 | 1042472 | 1054442 |
| 4 | 2014890 | 82024 | 1336383 | 678507 |
| 5 | 2011156 | 3733 | 1606624 | 404532 |
| 6 | 2074679 | -63523 | 1856532 | 218147 |
| 7 | 2192750 | -118071 | 2089949 | 102802 |
| 8 | 2351515 | -158764 | 2311063 | 40452 |
| 9 | 2536280 | -184766 | 2524316 | 11964 |
| 10 | 2731719 | -195439 | 2734342 | -2623 |

**WORKSHEET # 13 - Type II - Alaska-Combined CWN**

CONTRACT TYPE: CWN, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

($11,300 + $9,830)/2 = **$10,515/day**

**WORKSHEET # 14 - Type II - Alaska-Combined EU With 60 Day Contract**

CONTRACT TYPE: EU Contract For 60 Days, TYPE II Applies to all subcategories of Type IIs (A, B or C) as there is no cost difference between categories.

Contract costs: -Daily availability:(from average of historical 60 and 90 day exclusive use contract bids)

($211,023 + $206,640)/2 = **Total fixed costs = $208,832/yr**

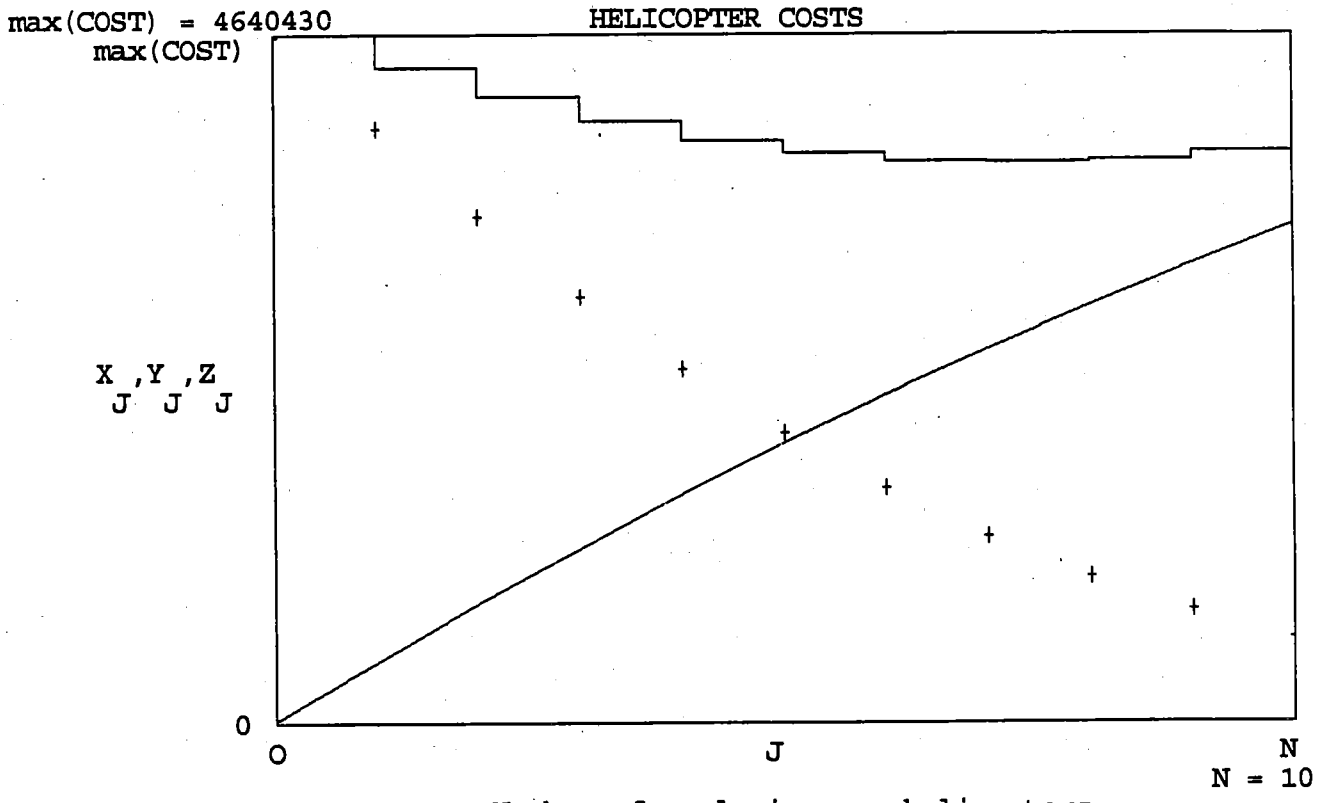
($3,900 + $2,600)/2 = **Variable Cost = $ 3,250/day**

ALL OF ALASKA - 100% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 25 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

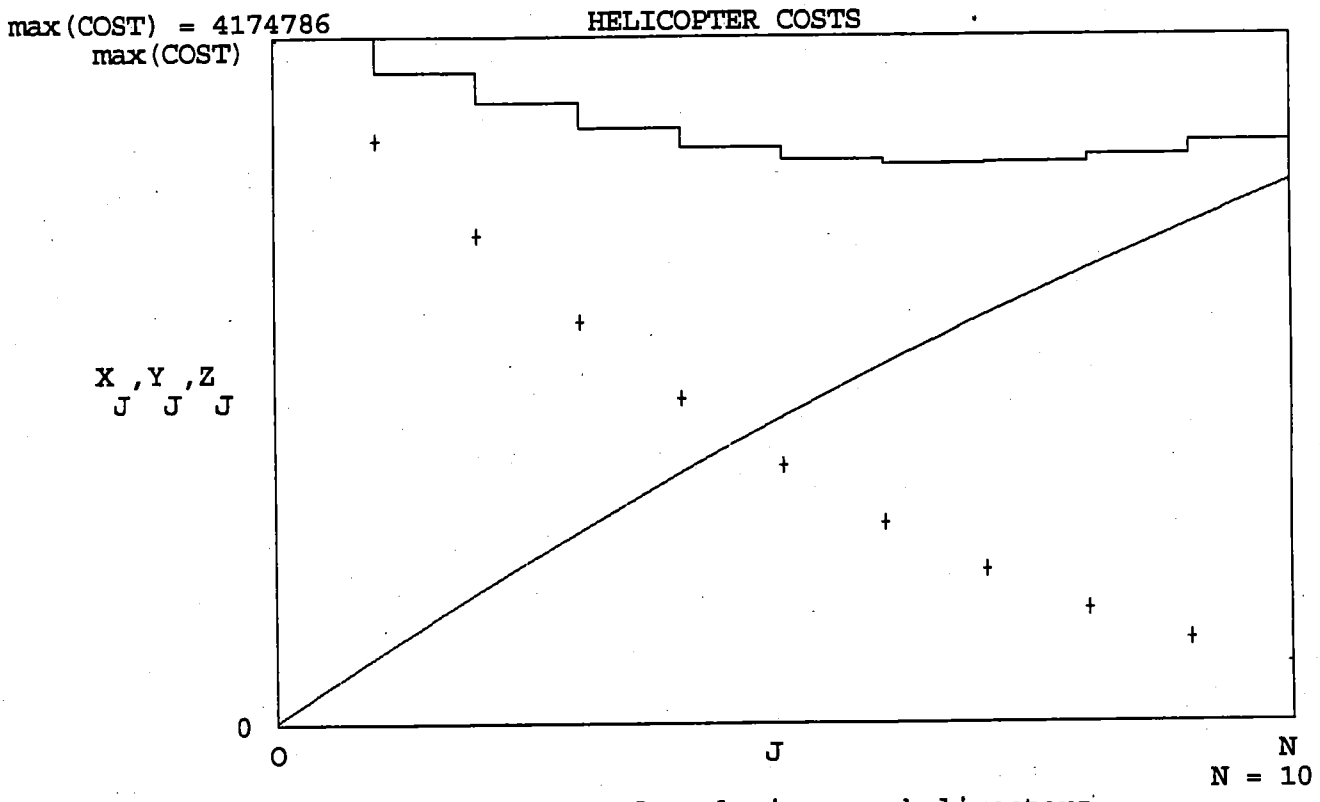
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 4640430 | 0 | 13413 | 4627017 |
| 1 | 4419252 | 221178 | 414610 | 4004642 |
| 2 | 4219986 | 199266 | 806005 | 3413981 |
| 3 | 4054657 | 165329 | 1182218 | 2872439 |
| 4 | 3927042 | 127615 | 1541559 | 2385483 |
| 5 | 3838084 | 88958 | 1883608 | 1954477 |
| 6 | 3787222 | 50862 | 2208614 | 1578608 |
| 7 | 3772957 | 14265 | 2517248 | 1255708 |
| 8 | 3793147 | -20191 | 2810469 | 982678 |
| 9 | 3845184 | -52036 | 3089444 | 755740 |
| 10 | 3926098 | -80915 | 3355500 | 570599 |

ALL OF ALASKA - 90% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 22 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 11 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

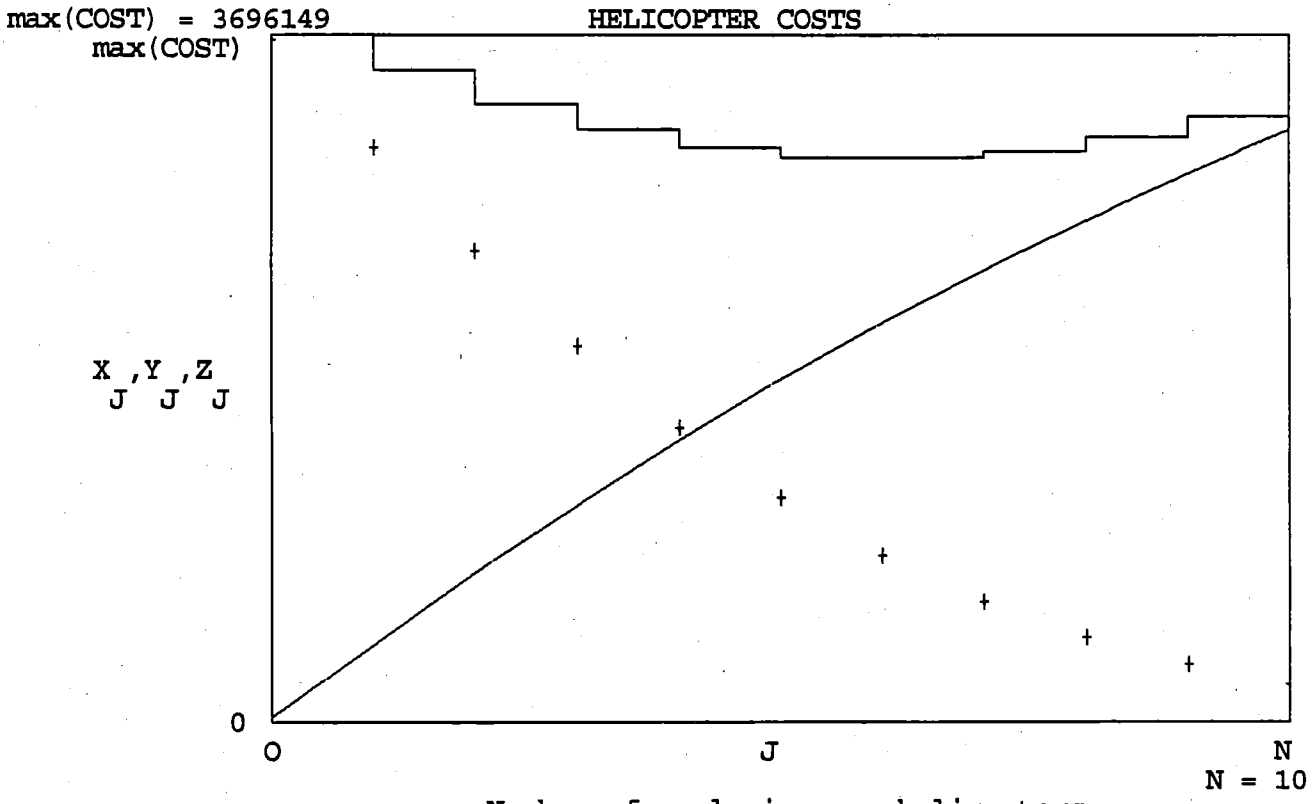
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 4174786 | 0 | 17884 | 4156902 |
| 1 | 3963034 | 211752 | 414864 | 3548170 |
| 2 | 3771204 | 191830 | 802932 | 2968272 |
| 3 | 3615331 | 155873 | 1174915 | 2440416 |
| 4 | 3500452 | 114879 | 1528559 | 1971893 |
| 5 | 3427823 | 72629 | 1863303 | 1564520 |
| 6 | 3396695 | 31128 | 2179481 | 1217214 |
| 7 | 3405071 | -8376 | 2477987 | 927084 |
| 8 | 3450096 | -45024 | 2760098 | 689997 |
| 9 | 3528288 | -78193 | 3027372 | 500916 |
| 10 | 3635693 | -107405 | 3281577 | 354116 |

ALL OF ALASKA - 80% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 9 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

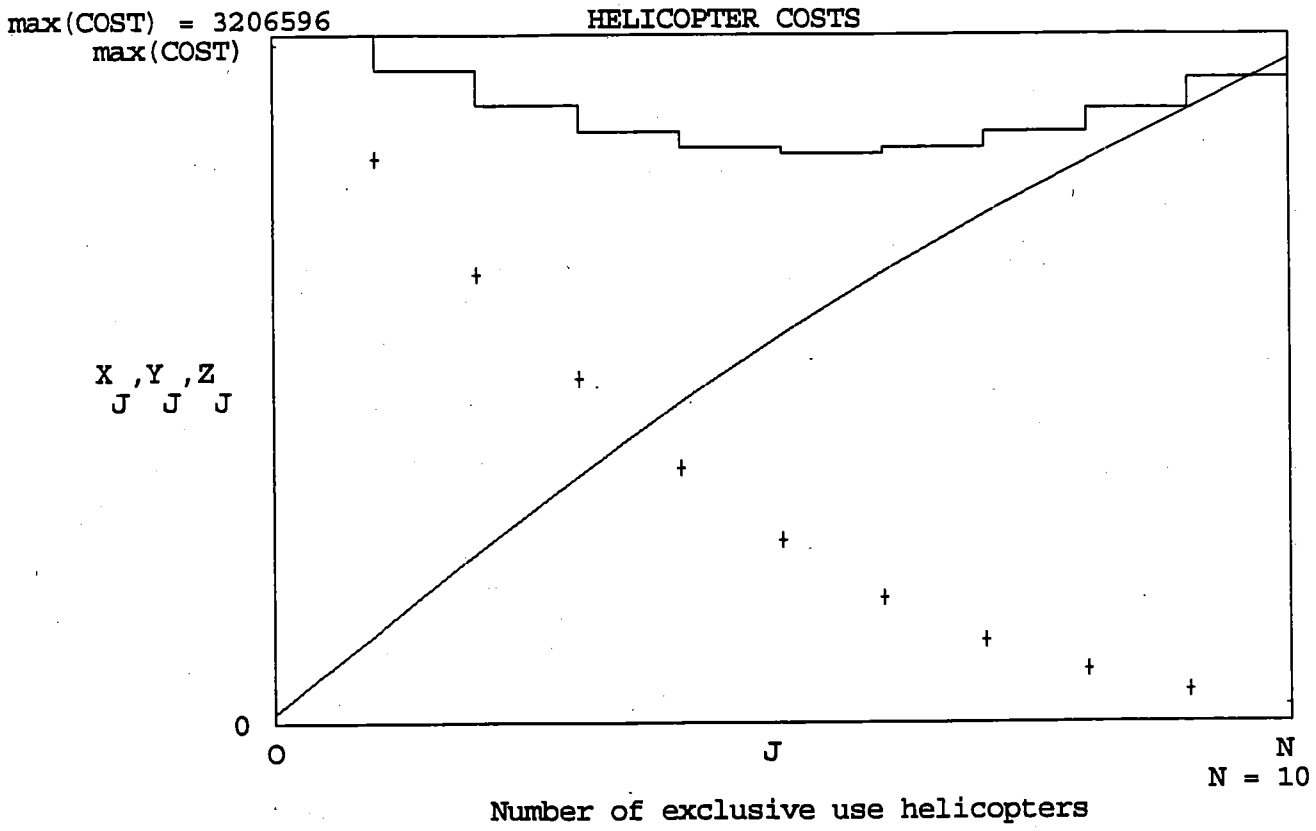
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 3696149 | 0 | 28167 | 3667983 |
| 1 | 3504398 | 191751 | 416200 | 3088198 |
| 2 | 3324635 | 179763 | 798870 | 2525765 |
| 3 | 3182118 | 142517 | 1164878 | 2017240 |
| 4 | 3084779 | 97339 | 1510676 | 1574103 |
| 5 | 3034595 | 50184 | 1835378 | 1199217 |
| 6 | 3030390 | 4206 | 2139513 | 890877 |
| 7 | 3069015 | -38625 | 2424487 | 644528 |
| 8 | 3145973 | -76959 | 2692312 | 453661 |
| 9 | 3255785 | -109811 | 2945441 | 310343 |
| 10 | 3392218 | -136434 | 3186661 | 205558 |

ALL OF ALASKA - 70% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 17 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 8 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 3206596 | 0 | 43333 | 3163263 |
| 1 | 3043496 | 163099 | 418549 | 2624948 |
| 2 | 2878991 | 164505 | 794393 | 2084598 |
| 3 | 2751938 | 127053 | 1153484 | 1598455 |
| 4 | 2674541 | 77398 | 1490361 | 1184180 |
| 5 | 2649841 | 24700 | 1803663 | 846178 |
| 6 | 2676028 | -26186 | 2094202 | 581826 |
| 7 | 2748258 | -72231 | 2364142 | 384116 |
| 8 | 2859615 | -111357 | 2616580 | 243035 |
| 9 | 3001665 | -142050 | 2855287 | 146378 |
| 10 | 3164823 | -163158 | 3084551 | 80272 |

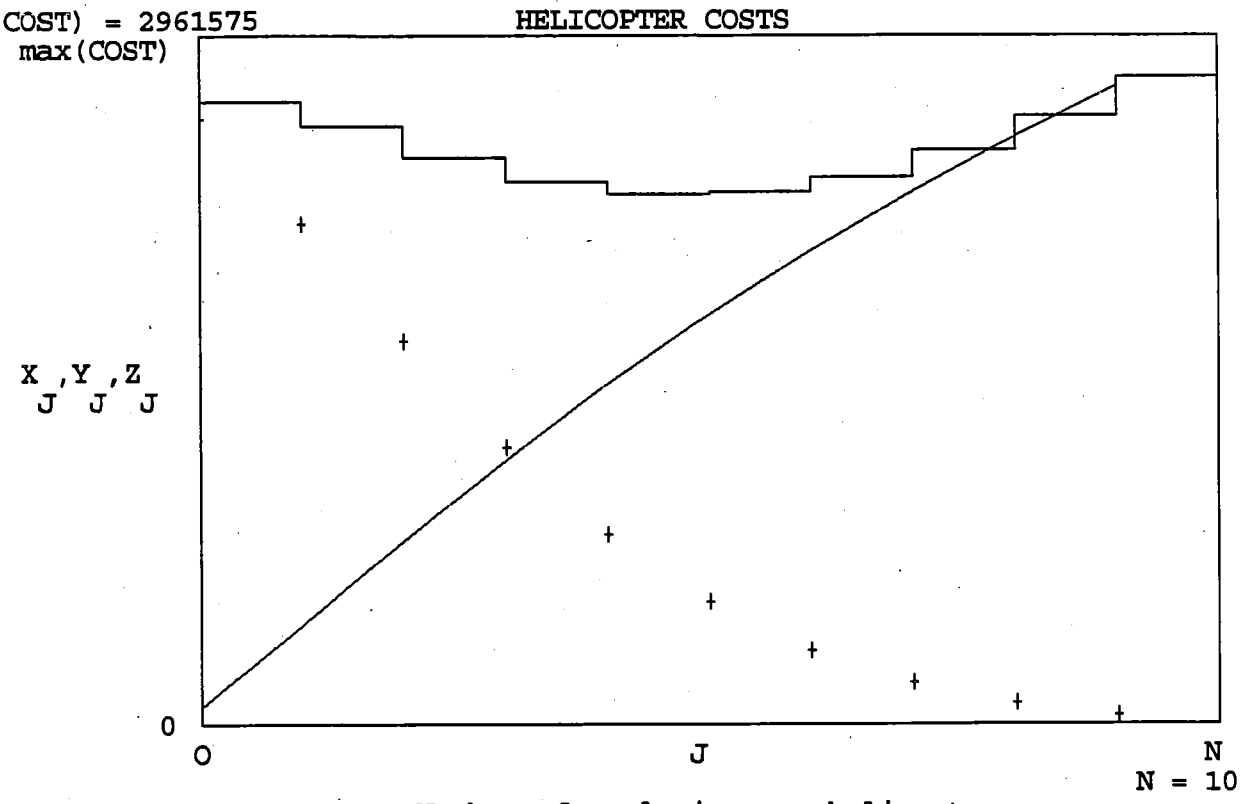
ALL OF ALASKA - 60% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 14 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 7 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)

max(COST) = 2961575




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

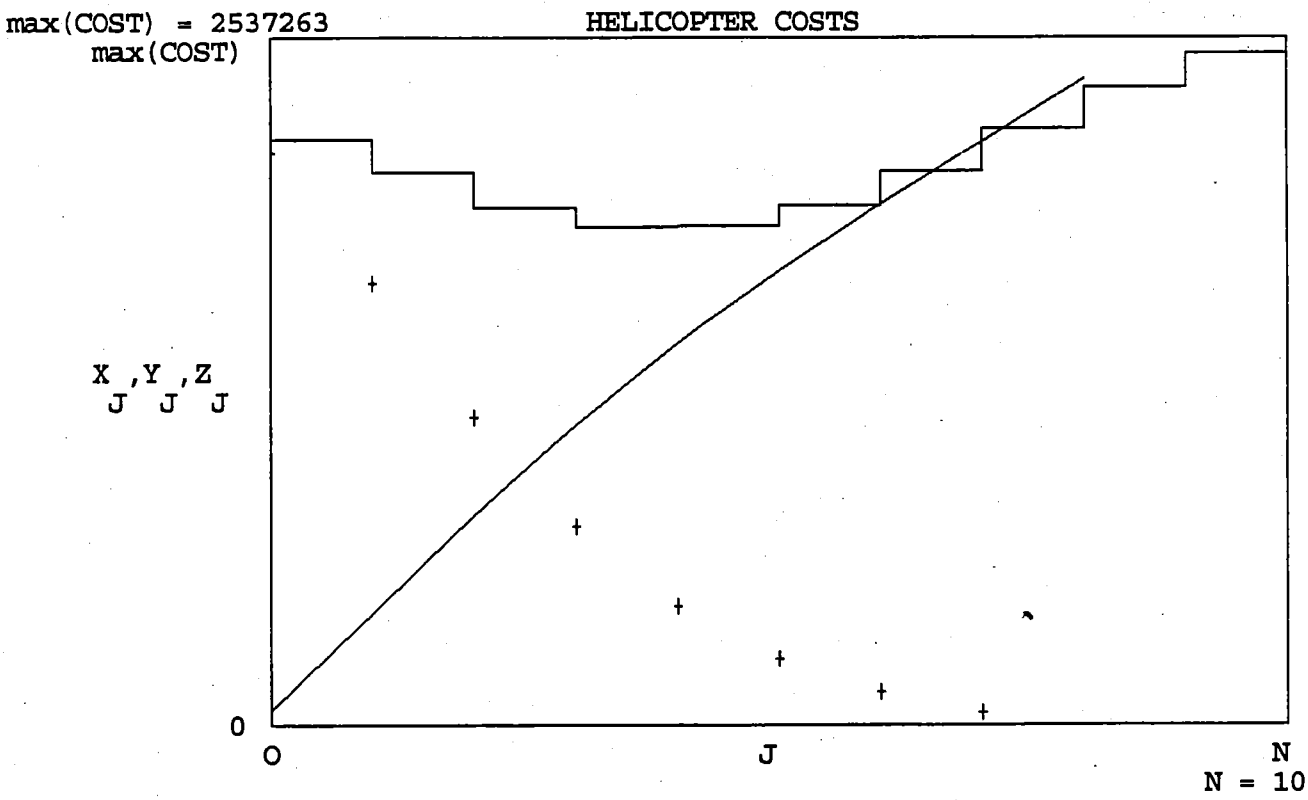
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2679910 | 0 | 75111 | 2604799 |
| 1 | 2574585 | 105325 | 424481 | 2150104 |
| 2 | 2435273 | 139312 | 789056 | 1646218 |
| 3 | 2329329 | 105944 | 1138703 | 1190626 |
| 4 | 2277905 | 51424 | 1463961 | 813944 |
| 5 | 2286274 | -8369 | 1762470 | 523804 |
| 6 | 2351296 | -65022 | 2035635 | 315661 |
| 7 | 2464579 | -113283 | 2287211 | 177368 |
| 8 | 2614130 | -149551 | 2522562 | 91568 |
| 9 | 2785334 | -171204 | 2748227 | 37107 |
| 10 | 2961575 | -176241 | 2971639 | -10063 |

ALL OF ALASKA - 50% OF LAST 3 YEARS DEMAND

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 12 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 3 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 5 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10515 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2160194 | 0 | 52813 | 2107381 |
| 1 | 2036893 | 123301 | 410224 | 1626669 |
| 2 | 1904787 | 132106 | 771575 | 1133212 |
| 3 | 1834951 | 69836 | 1105069 | 729882 |
| 4 | 1840708 | -5757 | 1404747 | 435962 |
| 5 | 1915534 | -74826 | 1673526 | 242008 |
| 6 | 2042384 | -126850 | 1919033 | 123351 |
| 7 | 2197652 | -155267 | 2151827 | 45824 |
| 8 | 2353228 | -155577 | 2384483 | -31254 |
| 9 | 2477728 | -124499 | 2631041 | -153314 |
| 10 | 2537263 | -59535 | 2906661 | -369398 |

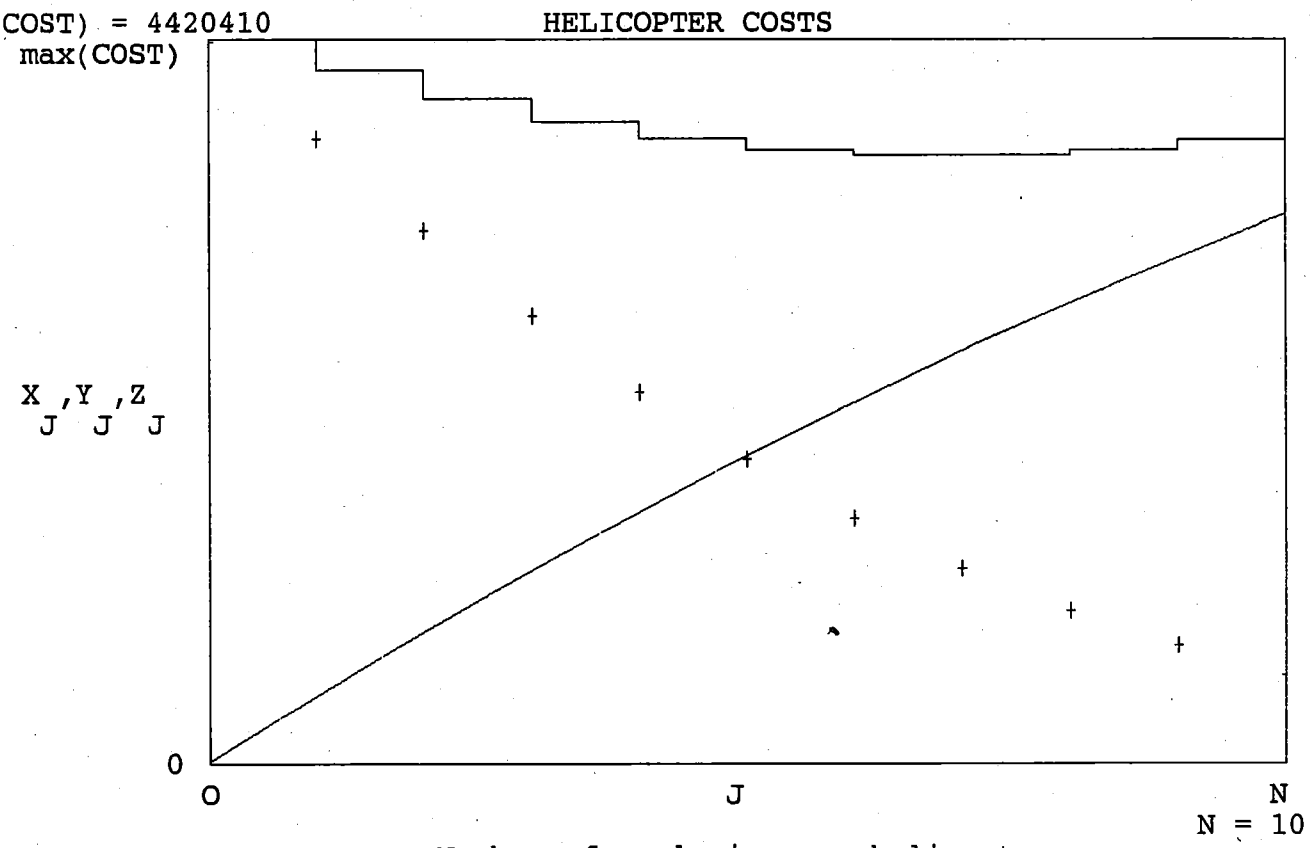
ALL OF ALASKA - 100% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 25 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 12 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)

max(COST) = 4420410




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

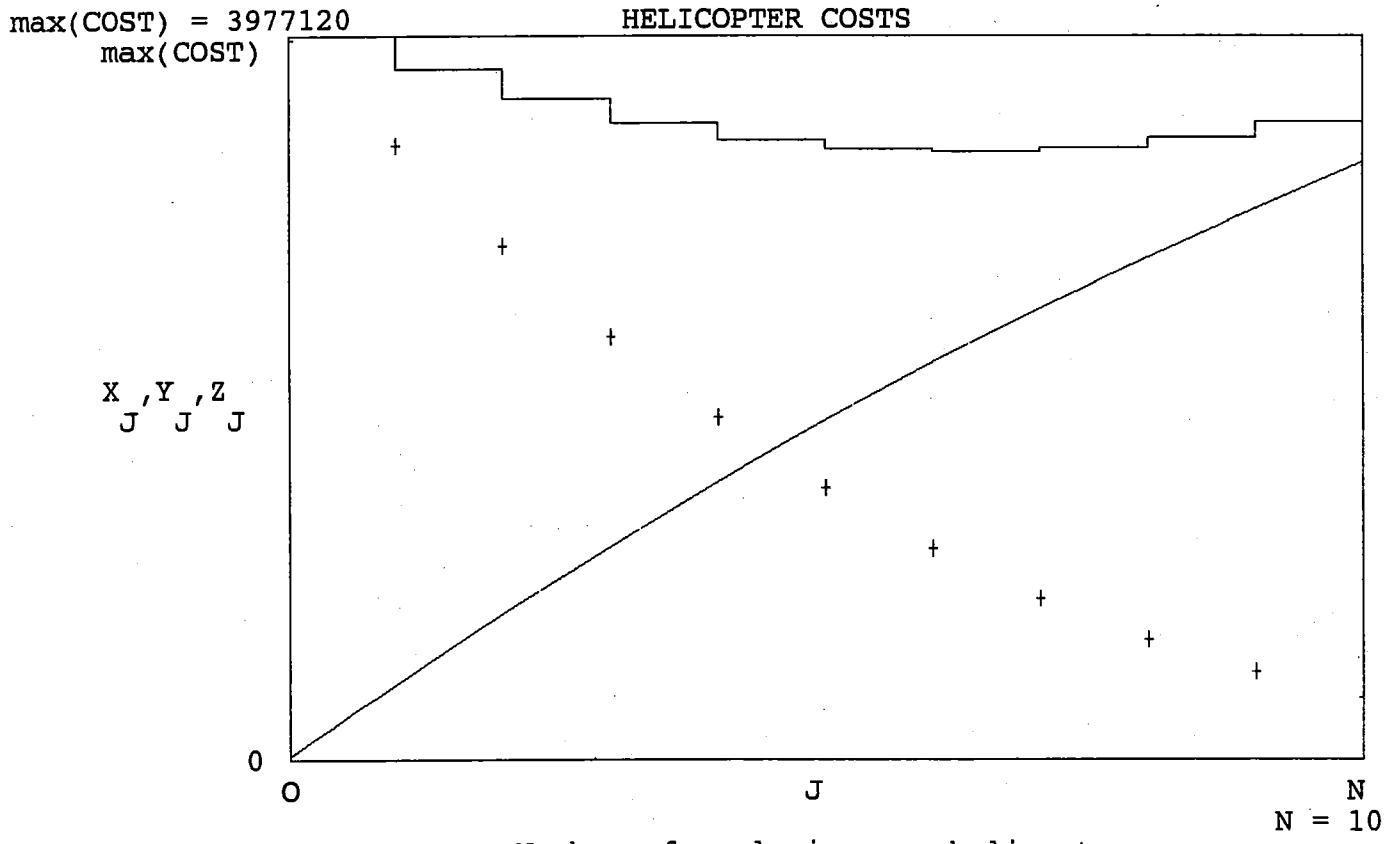
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 4420410 | 0 | 13413 | 4406997 |
| 1 | 4228827 | 191583 | 414610 | 3814217 |
| 2 | 4057647 | 171179 | 806005 | 3251643 |
| 3 | 3918069 | 139578 | 1182218 | 2735851 |
| 4 | 3813610 | 104459 | 1541559 | 2272051 |
| 5 | 3745147 | 68463 | 1883608 | 1861539 |
| 6 | 3712157 | 32989 | 2208614 | 1503544 |
| 7 | 3713247 | -1089 | 2517248 | 1195998 |
| 8 | 3746420 | -33173 | 2810469 | 935951 |
| 9 | 3809247 | -62827 | 3089444 | 719803 |
| 10 | 3898966 | -89719 | 3355500 | 543466 |

ALL OF ALASKA - 90% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 22 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 11 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

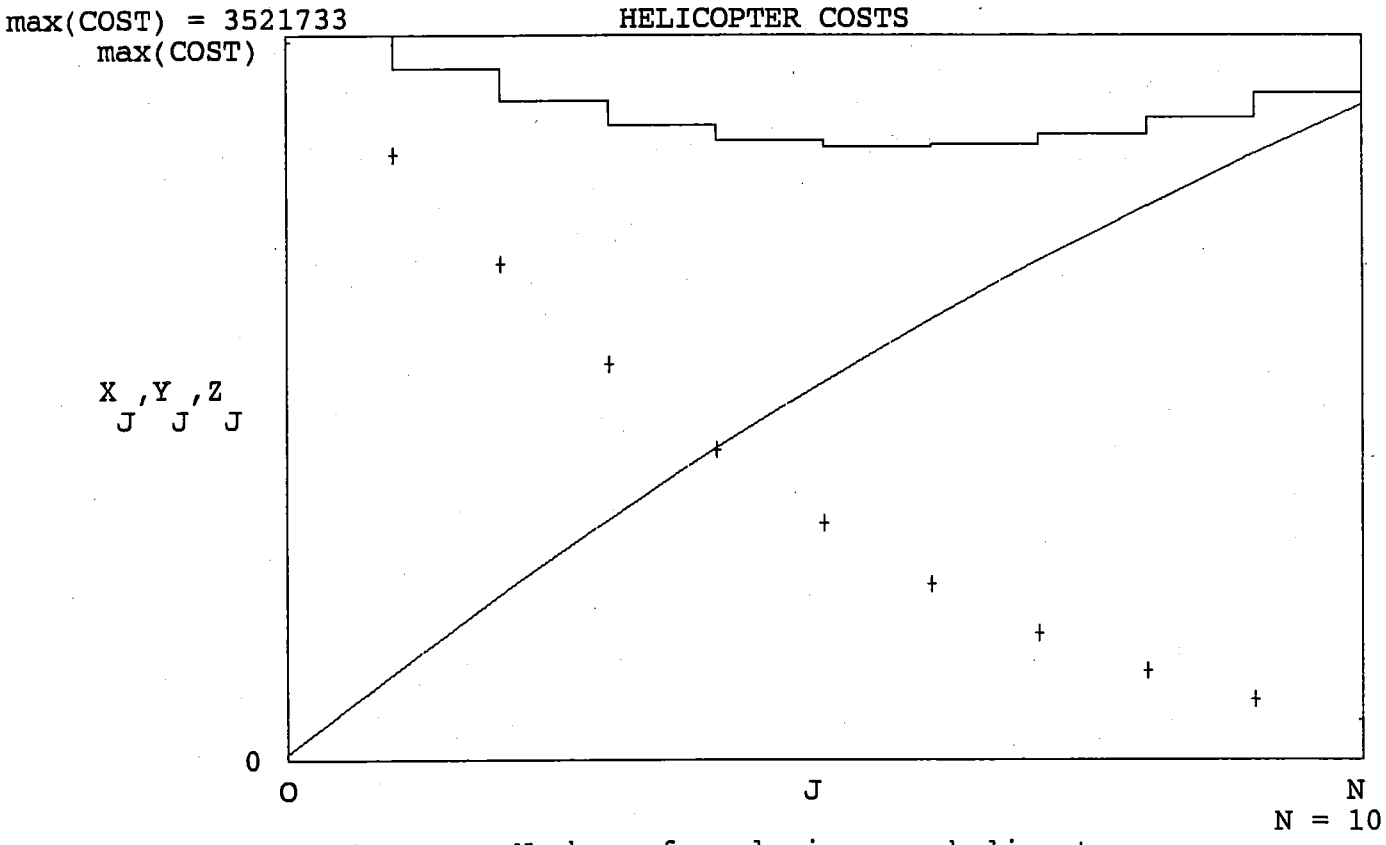
| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 3977120 | 0 | 17884 | 3959237 |
| 1 | 3794314 | 182806 | 414864 | 3379450 |
| 2 | 3630059 | 164255 | 802932 | 2827127 |
| 3 | 3499287 | 130773 | 1174915 | 2324372 |
| 4 | 3406687 | 92600 | 1528559 | 1878128 |
| 5 | 3353428 | 53258 | 1863303 | 1490125 |
| 6 | 3338816 | 14613 | 2179481 | 1159335 |
| 7 | 3360987 | -22172 | 2477987 | 883000 |
| 8 | 3417286 | -56298 | 2760098 | 657187 |
| 9 | 3504469 | -87184 | 3027372 | 477097 |
| 10 | 3618855 | -114386 | 3281577 | 337277 |

ALL OF ALASKA - 80% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 20 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 9 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)



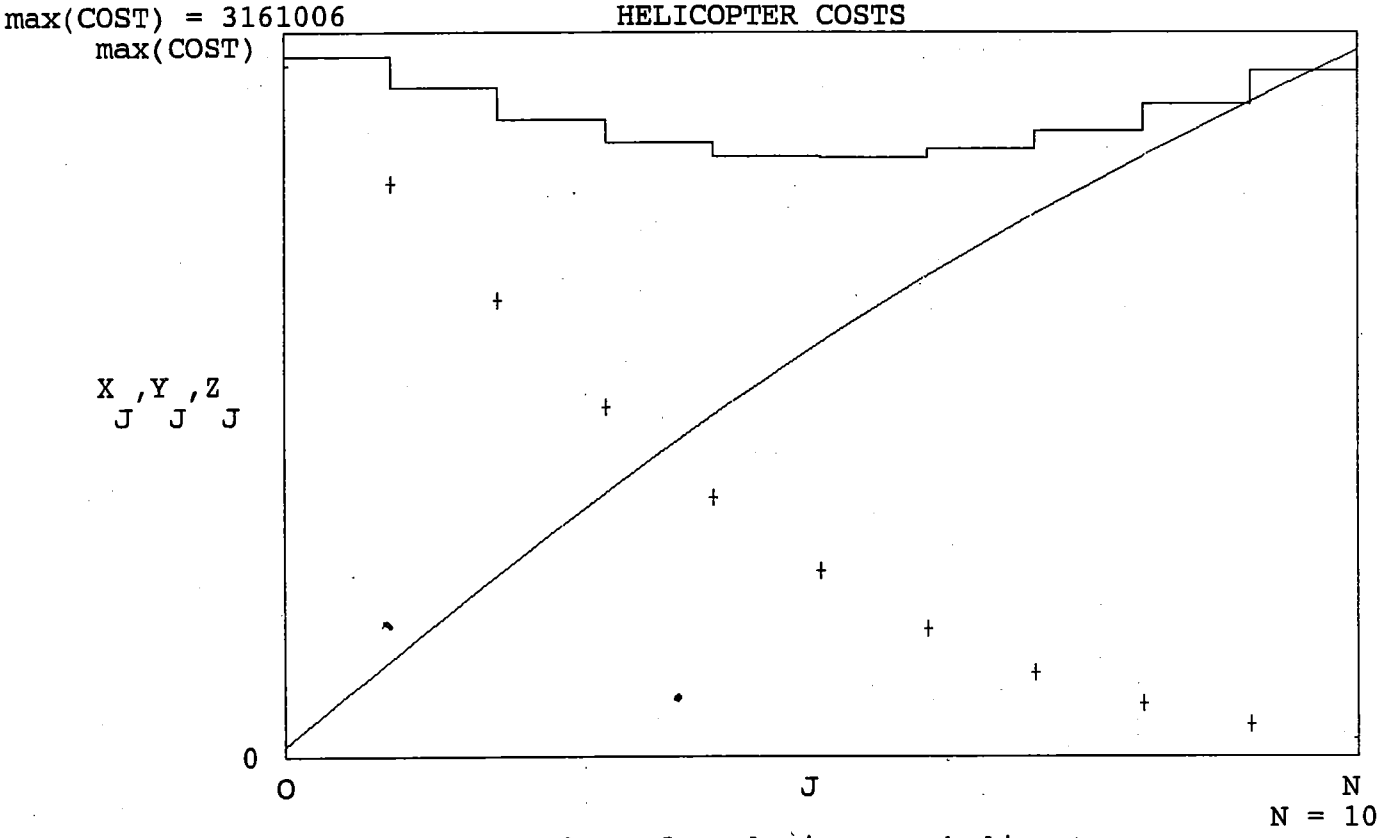

LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 3521733 | 0 | 28167 | 3493566 |
| 1 | 3357551 | 164182 | 416200 | 2941351 |
| 2 | 3204532 | 153018 | 798870 | 2405662 |
| 3 | 3086196 | 118336 | 1164878 | 1921318 |
| 4 | 3009928 | 76268 | 1510676 | 1499253 |
| 5 | 2977571 | 32357 | 1835378 | 1142193 |
| 6 | 2988027 | -10456 | 2139513 | 848515 |
| 7 | 3038367 | -50339 | 2424487 | 613880 |
| 8 | 3124401 | -86035 | 2692312 | 432089 |
| 9 | 3241028 | -116626 | 2945441 | 295586 |
| 10 | 3382444 | -141416 | 3186661 | 195783 |

ALL OF ALASKA - 70% OF LAST 3 YEARS DEMAND - NO EFF. LOSS
ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 17 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 8 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 3056179 | 0 | 43333 | 3012846 |
| 1 | 2918677 | 137502 | 418549 | 2500128 |
| 2 | 2779866 | 138811 | 794393 | 1985473 |
| 3 | 2675930 | 103936 | 1153484 | 1522446 |
| 4 | 2618232 | 57698 | 1490361 | 1127871 |
| 5 | 2609605 | 8627 | 1803663 | 805942 |
| 6 | 2648361 | -38757 | 2094202 | 554160 |
| 7 | 2729993 | -81632 | 2364142 | 365851 |
| 8 | 2848058 | -118065 | 2616580 | 231478 |
| 9 | 2994704 | -146646 | 2855287 | 139418 |
| 10 | 3161006 | -166301 | 3084551 | 76455 |

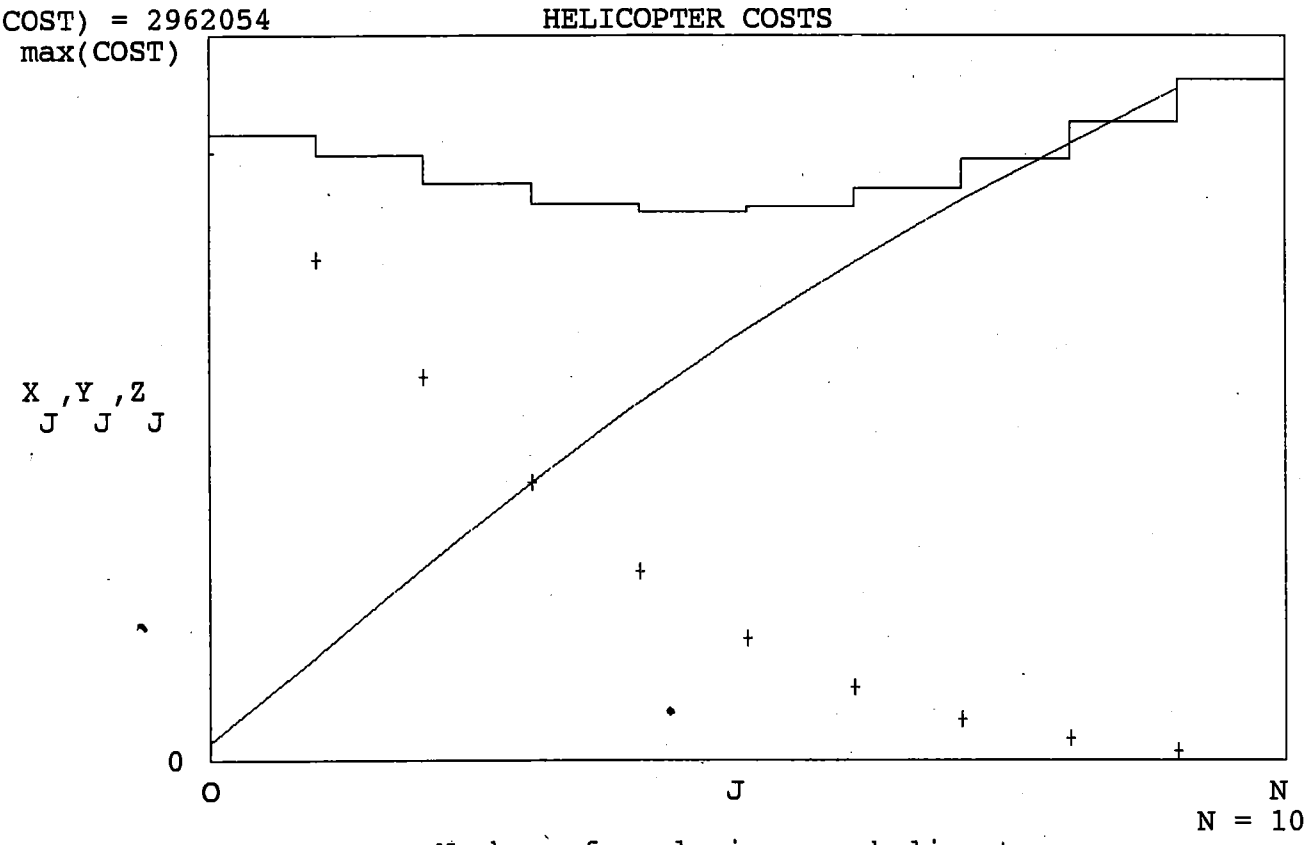
ALL OF ALASKA - 60% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 14 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 4 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 7 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)

max(COST) = 2962054




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2556049 | 0 | 75111 | 2480938 |
| 1 | 2472345 | 83704 | 424481 | 2047864 |
| 2 | 2356994 | 115351 | 789056 | 1567938 |
| 3 | 2272713 | 84280 | 1138703 | 1134011 |
| 4 | 2239201 | 33513 | 1463961 | 775240 |
| 5 | 2261367 | -22166 | 1762470 | 498897 |
| 6 | 2336286 | -74920 | 2035635 | 300651 |
| 7 | 2456145 | -119859 | 2287211 | 168934 |
| 8 | 2609776 | -153631 | 2522562 | 87214 |
| 9 | 2783570 | -173794 | 2748227 | 35342 |
| 10 | 2962054 | -178484 | 2971639 | -9585 |

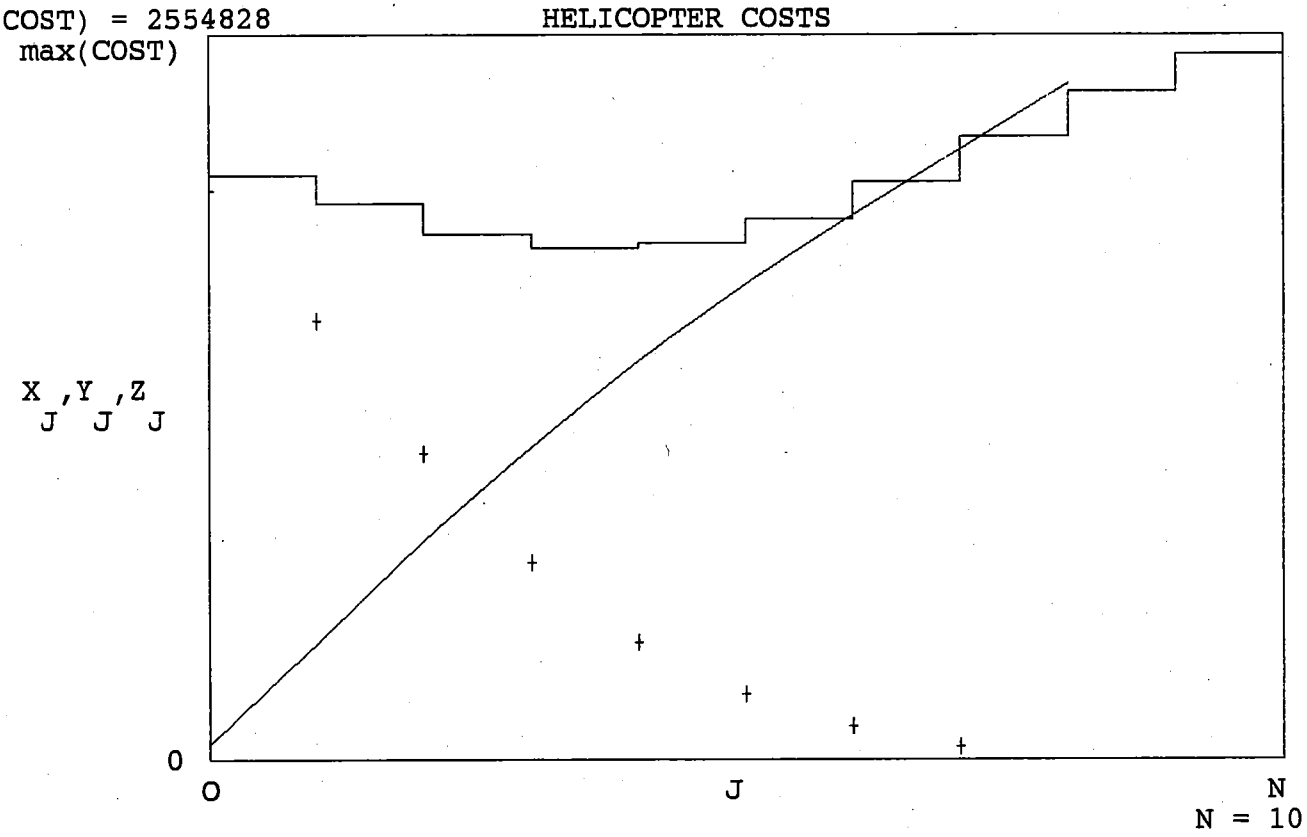
ALL OF ALASKA - 50% OF LAST 3 YEARS DEMAND - NO EFF. LOSS

ASSUMPTIONS: TYPE II HELICOPTERS CWN = $ **** PER HOUR EXCL = $ **** PER HR
CWN = $ **** PER DAY EXCL = $ **** PER DAY
AVERAGE DAILY USE = 5.2 HOURS

| DEMAND DURATION | | DAILY DEMAND | |
|---|---|---|---|
| max_d ≡ 105 | MAXIMUM DURATION | max_h ≡ 12 | MAXIMUM DEMAND LEVEL |
| min_d ≡ 30 | MINIMUM DURATION | min_h ≡ 3 | MINIMUM DEMAND LEVEL |
| mode_d ≡ 60 | MOST FREQUENT DURATION | mode_h ≡ 5 | MOST FREQUENCY DEMAND |

FIXED ≡ 208832 CONTRACT COST for EXCLUSIVE USE (45 DAY CONTRACT)
VC_EX ≡ 3250 EXCLUSIVE USE VARIABLE COST PER DAY (5.2 HOURS PER DAY)
VC_CWN ≡ 10015 CALL-WHEN-NEEDED VARIABLE COST PER DAY (5.2 HOURS PER DAY)

max(COST) = 2554828




LEGEND: STEP = TOTAL COST, LINE = EXCLUSIVE USE COST, PLUS = CWN COST

| excl | TOTAL_COST | MARG_DIFF | COST_EXCL | COST_CWN |
|---|---|---|---|---|
| 0 | 2059985 | 0 | 52813 | 2007173 |
| 1 | 1959543 | 100442 | 410224 | 1549319 |
| 2 | 1850901 | 108642 | 771575 | 1079326 |
| 3 | 1800244 | 50657 | 1105069 | 695175 |
| 4 | 1819978 | -19734 | 1404747 | 415231 |
| 5 | 1904026 | -84048 | 1673526 | 230500 |
| 6 | 2036519 | -132493 | 1919033 | 117486 |
| 7 | 2195473 | -158954 | 2151827 | 43645 |
| 8 | 2354715 | -159242 | 2384483 | -29768 |
| 9 | 2485018 | -130303 | 2631041 | -146023 |
| 10 | 2554828 | -69810 | 2906661 | -351833 |

# *Appendix F- Summary of Resource Orders For Type I/II Helicopters 1989-91*

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| AKAFS | | 2 | 07/02/89 | 07/19/89 | 18 | | B063 |
| AKDNR | | 2 | 07/04/89 | 07/12/89 | 9 | | 904008 |
| AKDNR | | 2 | 07/13/89 | 07/27/89 | 15 | | 913016 |
| AKDNR | | 2 | 07/14/89 | 07/16/89 | 3 | | 902013 |
| AKDNR | | 2 | 08/12/89 | 08/15/89 | 3 | | 913024 |
| AKDNR | | 2 | 08/16/89 | 08/21/89 | 6 | | 904008 |
| INT | UT-ASF-000022 | 1 | 07/06/89 | 07/10/89 | 5 | F | UINTA CANYON |
| INT | UT-DIF-000032 | 1 | 07/16/89 | 07/21/89 | 6 | G | UINTA FLAT |
| INT | UT-MOD-00R676 | 1 | 07/18/89 | 07/23/89 | 6 | | |
| INT | ID-BOF-000066 | 1 | 07/20/89 | 07/23/89 | 4 | C | ABC MISC |
| INT | ID-NPF-018301 | 1 | 07/24/89 | 08/12/89 | 19 | G | JOHNSON BU |
| INT | ID-NPF-018303 | 1 | 07/24/89 | 08/10/89 | 17 | E | CAPE HORN |
| INT | ID-BOF-000082 | 1 | 07/29/89 | 08/14/89 | 16 | G | WARM LAKE |
| INT | ID-BOF-000084 | 1 | 07/30/89 | 08/22/89 | 23 | F | KING GULCH |
| INT | ID-PAF-000039 | 1 | 08/04/89 | 08/24/89 | 21 | G | STEAMBOAT |
| INT | ID-PAF-000039 | 1 | 08/06/89 | 08/24/89 | 19 | G | STEAMBOAT |
| INT | ID-BOF-000096 | 1 | 08/06/89 | 08/10/89 | 5 | F | RIORDAN LAKE |
| INT | NV-WID-00X377 | 2 | 07/05/89 | 07/07/89 | 3 | | |
| INT | UT-MOD-00R661 | 2 | 07/06/89 | 07/11/89 | 6 | | |
| INT | UT-ASF-000017 | 2 | 07/07/89 | 07/10/89 | 4 | F | ROUGH CANYON |
| INT | UT-MOD-00R675 | 2 | 07/11/89 | 07/14/89 | 4 | | |
| INT | UT-DIF-000032 | 2 | 07/16/89 | 07/26/89 | 11 | G | UINTA FLAT |
| INT | UT-DIF-000031 | 2 | 07/17/89 | 07/18/89 | 2 | E | SANDY PEAK |
| INT | UT-MOD-OOR676 | 2 | 07/18/89 | 07/23/89 | 6 | | |
| INT | ID-BOF-000071 | 2 | 07/21/89 | 08/25/89 | 35 | C | BEAVER CREEK |
| INT | ID-BOF-00F165 | 2 | 07/21/89 | 07/24/89 | 4 | | |
| INT | ID-BOF-00F165 | 2 | 07/22/89 | 07/23/89 | 2 | | |
| INT | ID-BOD-00F16S | 2 | 07/22/89 | 07/24/89 | 3 | | STAR BUTTE |
| INT | ID-PAF-000014 | 2 | 07/22/89 | 08/28/89 | 37 | C | ABC FIRES |
| INT | ID-NPF-018303 | 2 | 07/24/89 | 07/28/89 | 5 | E | CAPE HORN |
| INT | ID-NPF-018303 | 2 | 07/24/89 | 08/19/89 | 26 | E | CAPE HORN |
| INT | ID-NPF-018301 | 2 | 07/25/89 | 08/15/89 | 21 | G | JOHNSON BU |
| INT | ID-LSO-089027 | 2 | 07/25/89 | 07/27/89 | 3 | | |
| INT | ID-LSO-089027 | 2 | 07/25/89 | 07/29/89 | 5 | | |
| INT | ID-PAF-000022 | 2 | 07/26/89 | 08/16/89 | 21 | F | WINDY FIRE |
| INT | ID-PAF-000014 | 2 | 07/27/89 | 08/31/89 | 35 | C | ABC FIRES |
| INT | ID-NPF-018306 | 2 | 07/27/89 | 08/14/89 | 18 | E | SILVERDOME |
| INT | ID-BOF-000082 | 2 | 07/29/89 | 08/30/89 | 32 | G | WARM LAKE |
| INT | ID-BOF-000083 | 2 | 07/30/89 | 08/26/89 | 27 | G | LOWMAN CX |
| INT | ID-BOF-000082 | 2 | 08/01/89 | 08/28/89 | 28 | G | WARM LAKE |
| INT | ID-BOF-000082 | 2 | 08/03/89 | 08/25/89 | 23 | G | WARM LAKE |
| INT | ID-BOF-000082 | 2 | 08/03/89 | 08/28/89 | 26 | G | WARM LAKE |
| INT | ID-BOF-000066 | 2 | 08/04/89 | 09/05/89 | 32 | C | ABC MISC |
| INT | ID-STF-000035 | 2 | 08/06/89 | 08/13/89 | 8 | F | MCPHERSON |
| INT | ID-NPF-018311 | 2 | 08/06/89 | 08/12/89 | 7 | G | CURREN MT |
| INT | ID-PAF-000039 | 2 | 08/10/89 | 08/26/89 | 17 | G | STEAMBOAT |
| INT | ID-PAF-000039 | 2 | 08/10/89 | 08/22/89 | 13 | G | STEAMBOAT |
| INT | ID-PAF-000039 | 2 | 08/10/89 | 08/22/89 | 13 | G | STEAMBOAT |
| INT | ID-LSO-089027 | 2 | 08/11/89 | 08/11/89 | 1 | | |
| INT | ID-PAF-000039 | 2 | 08/12/89 | 08/14/89 | 3 | G | STEAMBOAT |
| INT | ID-PAF-000060 | 2 | 08/12/89 | 08/22/89 | 11 | | FOOLHEN |
| INT | ID-PAF-000027 | 2 | 08/13/89 | 08/22/89 | 10 | G | PARTRIDGE |
| INT | ID-PAF-000027 | 2 | 08/16/89 | 08/26/89 | 11 | G | PARTRIDGE |
| INT | ID-BOF-000083 | 2 | 08/16/89 | 08/25/89 | 10 | G | LOWMAN CX |
| INT | ID-PAF-000039 | 2 | 08/17/89 | 08/26/89 | 10 | G | STEAMBOAT |
| INT | ID-BOF-000083 | 2 | 08/20/89 | 08/25/89 | 6 | G | LOWMAN CX |
| INT | UT-UIF-000033 | 2 | 09/03/89 | 09/08/89 | 6 | E | MIDDLE SLIDE |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| INT | UT-UIF-000033 | 2 | 09/04/89 | 09/06/89 | 3 | E | MIDDLE SLIDE |
| INT | ID-IFD-00F862 | 2 | 09/16/89 | 09/20/89 | 5 | | |
| PNW | WA-OKF-000065 | 1 | 07/26/89 | 08/08/89 | 13 | E | LODGEPOLE |
| PNW | WA-OKF-000065 | 1 | 07/26/89 | 08/18/89 | 23 | E | LODGEPOLE |
| PNW | OR-WWF-000014 | 1 | 07/29/89 | 08/12/89 | 14 | | TANNER GULCH |
| PNW | WA-OKF-000065 | 2 | 07/26/89 | 08/05/89 | 10 | E | LODGEPOLE |
| PNW | WA-OKF-000065 | 2 | 07/26/89 | 08/11/89 | 16 | E | LODGEPOLE |
| PNW | WA-OKF-000065 | 2 | 07/26/89 | 07/31/89 | 6 | | LODGEPOLE |
| PNW | OR-WWF-000011 | 2 | 07/27/89 | 08/24/89 | 28 | B | CARTWHEEL RG |
| PNW | OR-MAF-000108 | 2 | 07/27/89 | 08/23/89 | 27 | G | GLACIER |
| PNW | OR-WWF-000011 | 2 | 07/27/89 | 08/20/89 | 24 | B | CARTWHEEL RG |
| PNW | WA-OKF-000068 | 2 | 07/28/89 | 08/09/89 | 12 | C | ABC MISC |
| PNW | OR-WWF-000017 | 2 | 07/31/89 | 08/16/89 | 16 | G | ENTERPRISE |
| PNW | OR-WWF-000021 | 2 | 08/02/89 | 08/11/89 | 10 | | MONUMENT ROCK |
| PNW | OR-WWF-000015 | 2 | 08/04/89 | 08/16/89 | 13 | G | EMMETT CX |
| PNW | OR-WWF-000015 | 2 | 08/04/89 | 08/19/89 | 16 | G | EMMETT CX |
| PNW | WA-COA-000088 | 2 | 08/13/89 | 08/15/89 | 3 | F | CAMERON LAKE |
| PNW | WA-WEF-000219 | 2 | 09/09/89 | 09/15/89 | 7 | D | LIBERTY |
| PSW | CA-FKU-007812 | 1 | 07/29/89 | 08/10/89 | 12 | | |
| PSW | CA-FKU-007812 | 1 | 07/29/89 | 08/06/89 | 8 | | |
| PSW | CA-SNF-000603 | 1 | 07/30/89 | 08/06/89 | 7 | G | BALCH |
| PSW | CA-SHF-004213 | 1 | 09/13/89 | 09/16/89 | 4 | E | DEE |
| PSW | | 2 | 06/17/89 | 06/18/89 | 2 | | TWIN HARBOR |
| PSW | CA-SLU-001531 | 2 | 06/18/89 | 06/18/89 | 1 | C | RIVER |
| PSW | CA-CDD-002007 | 2 | 06/21/89 | 06/22/89 | 2 | C | BEECHER |
| PSW | | 2 | 06/25/89 | 06/27/89 | 3 | | LILLY |
| PSW | CA-CNF-001068 | 2 | 06/27/89 | 07/07/89 | 11 | | ORTEGA |
| PSW | | 2 | 06/28/89 | 06/30/89 | 3 | | SAN FRAN |
| PSW | CA-CNF-001068 | 2 | 06/28/89 | 07/04/89 | 7 | | ORTEGA |
| PSW | CA-CNF-001068 | 2 | 06/29/89 | 07/03/89 | 5 | E | ORTEGA |
| PSW | | 2 | 07/03/89 | 07/15/89 | 13 | | DIVIDE |
| PSW | CA-FKU-006664 | 2 | 07/04/89 | 07/04/89 | 1 | C | SYCAMORE |
| PSW | CA-BDF-002481 | 2 | 07/05/89 | 07/06/89 | 2 | | DEEP |
| PSW | CA-TNF-000037 | 2 | 07/06/89 | 07/06/89 | 1 | | DEVIL INC. |
| PSW | CA-PNF-000151 | 2 | 07/08/89 | 07/17/89 | 10 | | RACK |
| PSW | CA-PNF-000151 | 2 | 07/09/89 | 07/14/89 | 6 | | RACK |
| PSW | CA-RRU-027086 | 2 | 07/14/89 | 07/16/89 | 3 | | POPPET |
| PSW | CA-FKU-007227 | 2 | 07/15/89 | 07/15/89 | 1 | C | MILLERTON |
| PSW | | 2 | 07/16/89 | 07/20/89 | 5 | | UINTA |
| PSW | CA-GJD-000881 | 2 | 07/18/89 | 07/22/89 | 5 | C | GATEWAY |
| PSW | CA-TNF-000060 | 2 | 07/19/89 | 07/20/89 | 2 | | MILL |
| PSW | CA-BEU-001401 | 2 | 07/19/89 | 07/24/89 | 6 | | MOLERA |
| PSW | CA-FKU-007577 | 2 | 07/25/89 | 07/26/89 | 2 | C | BURROUGH |
| PSW | CA-SNF-000569 | 2 | 07/27/89 | 07/28/89 | 2 | C | NORTH |
| PSW | | 2 | 07/27/89 | 08/05/89 | 9 | | LODGE POLE |
| PSW | CA-SLU-002050 | 2 | 07/27/89 | 07/31/89 | 5 | | CHISPA |
| PSW | CA-FKU-007812 | 2 | 07/28/89 | 08/03/89 | 6 | E | POWERHOUSE |
| PSW | CA-FKU-007812 | 2 | 08/02/89 | 08/04/89 | 3 | | |
| PSW | CA-CNF-001367 | 2 | 08/03/89 | 08/13/89 | 11 | | VAIL |
| PSW | CA-FKU-007812 | 2 | 08/04/89 | 08/04/89 | 1 | | |
| PSW | CA-SNF-000684 | 2 | 08/09/89 | 08/17/89 | 9 | | ABC MISC |
| PSW | | 2 | 08/09/89 | 08/10/89 | 2 | | VER PLANK |
| PSW | CA-SNF-000603 | 2 | 08/11/89 | 08/13/89 | 3 | E | BALCH |
| PSW | CA-BDF-003122 | 2 | 08/14/89 | 08/15/89 | 2 | | SAN MANUEL |
| PSW | | 2 | 08/15/89 | 08/17/89 | 3 | | VAIL |
| PSW | CA-PNF-000102 | 2 | 08/24/89 | 08/25/89 | 2 | | CLEAR |
| PSW | CA-MMU-005553 | 2 | 08/26/89 | 08/26/89 | 1 | C | BEST |
| PSW | CA-ENF-002828 | 2 | 08/31/89 | 09/24/89 | 24 | | SEVERITY |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PSW | CA-STF-000792 | 2 | 08/31/89 | 09/01/90 | 1 | | SEVERITY |
| PSW | CA-SQF-000874 | 2 | 09/03/89 | 09/05/89 | 3 | | CALKINS |
| PSW | | 2 | 09/03/89 | 09/04/89 | 2 | | PINE |
| PSW | CA-PNF-000335 | 2 | 09/06/89 | 09/16/89 | 11 | | LAYMEN |
| PSW | CA-PNF-000335 | 2 | 09/06/89 | 09/14/89 | 9 | F | LAYMAN |
| PSW | | 2 | 09/10/89 | 09/11/89 | 2 | | JACKPOT |
| PSW | CA-SNF-001037 | 2 | 09/10/89 | 09/11/89 | 2 | | JACKPOT |
| PSW | | 2 | 09/13/89 | 09/15/89 | 3 | | ROCKY |
| PSW | CA-SRF-002656 | 2 | 09/16/89 | 09/16/89 | 1 | E | SOUTHFORK |
| PSW | | 2 | 10/19/89 | 10/24/89 | 6 | | MATEO |
| PSW | CA-CNF-001948 | 2 | 10/20/89 | 10/23/89 | 4 | | MATIEO |
| PSW | CA-BDF-004055 | 2 | 10/20/89 | 10/24/89 | 5 | | MATEO |
| PSW | CA-SNF-001192 | 2 | 11/13/89 | 11/14/89 | 2 | B | WORMAN |
| RM | WY-BTF-000004 | 1 | 07/06/89 | 07/13/89 | 8 | F | ANN'S FIRE |
| RM | CO-MVP-008939 | 1 | 07/16/89 | 07/24/89 | 9 | F | LONG MESA |
| RM | CO-ARF-000023 | 2 | 07/10/89 | 07/11/89 | 2 | F | BLACK TIGER |
| RM | CO-ARF-000023 | 2 | 07/10/89 | 07/12/89 | 3 | F | BLACK TIGER |
| RM | CO-GJD-00E881 | 2 | 07/17/89 | 07/24/89 | 8 | D | GATEWAY |
| RM | CO-WSC-000331 | 9 | 07/22/89 | 07/27/89 | 6 | A | BLACK |
| S | FL-EVP-089013 | 2 | 05/20/89 | 05/25/89 | 6 | G | INGRAHAM |
| S | FL-OCF-008901 | 2 | 05/22/89 | 05/23/89 | 2 | C | JUNIPER WILD |
| S | FL-EVP-089013 | 2 | 05/23/89 | 05/29/89 | 7 | G | INGRAHAM |
| S | FL-EVP-089013 | 2 | 05/27/89 | 05/28/89 | 2 | G | INGRAHAM |
| S | FL-NWR-000001 | 2 | 05/29/89 | 05/30/89 | 2 | E | WEST |
| S | GA-OKR-000003 | 2 | 05/30/89 | 06/05/89 | 6 | E | COWARD LAKE |
| S | GA-OKR-000003 | 2 | 05/30/89 | 06/07/89 | 8 | E | COWARD LAKE |
| S | FL-OCF-008901 | 2 | 06/05/89 | 06/09/89 | 5 | C | JUNIPER WILD |
| S | FL-FNF-009003 | 2 | 06/06/89 | 06/06/89 | 1 | C | COLUMBIA |
| S | FL-OCF-000001 | 2 | 06/13/89 | 06/14/89 | 2 | | ABC MISC |
| S | FL-OCF-000001 | 2 | 06/16/89 | 06/23/89 | 8 | | ABC MISC |
| S | FL-EVP-089018 | 2 | 06/18/89 | 06/24/89 | 7 | G | DOF-457 |
| S | FL-BCP-000012 | 2 | 06/18/89 | 06/25/89 | 8 | | PRESUPPRESS |
| S | GA-OKR-000004 | 2 | 07/04/89 | 07/22/89 | 19 | E | MARY ALICE |
| S | | 2 | 03/18/89 | 03/18/89 | 1 | C | BULLDOG |
| S | | 2 | 04/25/89 | 04/25/89 | 1 | C | BEE STING |
| SW | AZ-CNF-000165 | 1 | 07/08/89 | 07/16/89 | 9 | G | CHIVA |
| SW | AZ-CNF-000165 | 1 | 07/08/89 | 07/13/89 | 6 | G | CHIVA |
| SW | AZ-TNF-000192 | 1 | 07/09/89 | 07/17/89 | 9 | E | HORTON |
| SW | AZ-CNF-000079 | 2 | 05/28/89 | 06/06/89 | 9 | D | RATTLESNAKE |
| SW | AZ-UDC-000751 | 2 | 05/30/89 | 06/02/89 | 3 | | LAGUNA |
| SW | AZ-YUD-000751 | 2 | 05/30/89 | 06/02/89 | 3 | E | LUGUANA DAM |
| SW | NM-ROD-00L815 | 2 | 06/10/89 | 06/14/89 | 5 | E | BEAR |
| SW | NM-ROD-00L815 | 2 | 06/10/89 | 06/11/89 | 2 | E | BEAR |
| SW | NM-EMP-000003 | 2 | 06/10/89 | 06/14/89 | 5 | | MALPAIS |
| SW | NM-EMP-000003 | 2 | 06/11/89 | 06/19/89 | 9 | F | MALPAIS |
| SW | NM-LNF-089074 | 2 | 06/12/89 | 06/27/89 | 16 | D | SPRING |
| SW | NM-GNF-000105 | 2 | 06/18/89 | 07/01/89 | 14 | E | MEASON |
| SW | NM-GNF-000105 | 2 | 06/19/89 | 07/14/89 | 26 | E | MEASON |
| SW | NM-ROD-009999 | 2 | 06/21/89 | 07/12/89 | 22 | | ABC MISC |
| SW | NM-GNF-000095 | 2 | 06/21/89 | 07/01/89 | 11 | G | SHELLEY |
| SW | NM-GNF-000116 | 2 | 07/02/89 | 07/15/89 | 14 | G | DIVIDE |
| SW | NM-GNF-000116 | 2 | 07/02/89 | 07/22/89 | 21 | G | DIVIDE |
| SW | NM-GNF-000116 | 2 | 07/03/89 | 07/12/89 | 10 | G | DIVIDE |
| SW | NM-GNF-000116 | 2 | 07/03/89 | 07/12/89 | 10 | G | DIVIDE |
| SW | AZ-CNF-000165 | 2 | 07/07/89 | 07/11/89 | 5 | G | CHIVA |
| SW | AZ-GCP-000037 | 2 | 07/09/89 | 07/13/89 | 5 | F | MAUV |
| SW | AZ-TNF-000203 | 2 | 07/14/89 | 07/19/89 | 6 | D | CHALK |
| SW | NM-EMP-000011 | 2 | 07/18/89 | 07/22/89 | 5 | | OUTLAW |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| SW | NM-EMP-000011 | 2 | 07/19/89 | 07/21/89 | 3 | | OUTLAW |
| SW | NM-EMP-000011 | 2 | 07/19/89 | 07/21/89 | 3 | | OUTLAW |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| AKAFS | | 2 | 05/28/90 | 05/29/90 | 2 | | A013 |
| AKDNR | | 2 | 05/28/90 | 06/11/90 | 15 | | 11050 |
| AKDNR | | 2 | 05/29/90 | 06/03/90 | 6 | | 31008 |
| AKAFS | | 2 | 06/28/90 | 07/22/90 | 25 | | A121 |
| AKDNR | | 2 | 07/01/90 | 07/16/90 | 16 | | 4007 |
| AKDNR | | 2 | 07/01/90 | 07/17/90 | 17 | | 4008 |
| AKAFS | AK-TZD-000039 | 2 | 07/04/90 | 08/25/90 | 52 | | |
| AKDNR | AK-TAS-000009 | 2 | 07/04/90 | 08/09/90 | 36 | | |
| AKDNR | AK-ASO-000123 | 2 | 07/04/90 | 07/14/90 | 11 | | |
| AKAFS | AK-UYD-00A121 | 2 | 07/05/90 | 08/17/90 | 43 | | |
| AKAFS | AK-GAD-000045 | 2 | 07/05/90 | 08/11/90 | 37 | | |
| AKAFS | | 2 | 07/06/90 | 07/09/90 | 4 | | A229 |
| AKAFS | AK-KKS-003030 | 2 | 07/06/90 | 07/12/90 | 7 | | |
| AKDNR | AK-TAS-013021 | 2 | 07/06/90 | 08/12/90 | 37 | | |
| AKAFS | AK-GAD-000044 | 2 | 07/06/90 | CANCELED | 0 | | |
| AKAFS | | 2 | 07/07/90 | 07/12/90 | 6 | | A207 |
| AKAFS | AK-KKS-003030 | 2 | 07/07/90 | CANCELED | 0 | | |
| AKAFS | | 2 | 07/10/90 | 07/23/90 | 14 | | A330 |
| AKAFS | | 2 | 07/15/90 | 07/24/90 | 10 | | A223 |
| AKDNR | AK-TAS-033002 | 2 | 07/18/90 | CANCELED | 0 | | |
| AKDNR | | 2 | 07/18/90 | 07/22/90 | 5 | | 4035 |
| AKDNR | AK-TAS-033002 | 2 | 07/19/90 | CANCELED | 0 | | |
| AKAFS | | 2 | 07/19/90 | 07/27/90 | 9 | | A168 |
| AKDNR | AK-TAS-033002 | 2 | 07/20/90 | 08/09/90 | 20 | | |
| AKDNR | AK-TAS-033002 | 2 | 07/20/90 | 08/12/90 | 23 | | |
| AKDNR | | 2 | 07/20/90 | 08/28/90 | 40 | | 4068 |
| AKAFS | | 2 | 07/23/90 | 08/24/90 | 33 | | A412 |
| AKDNR | | 2 | 07/24/90 | 07/27/90 | 4 | | 4068 |
| AKAFS | | 2 | 07/24/90 | 07/30/90 | 7 | | A421 |
| AKAFS | | 2 | 07/25/90 | 08/03/90 | 13 | | A270 |
| AKAFS | | 2 | 07/31/90 | 08/14/90 | 15 | | A437 |
| AKDNR | | 2 | 08/01/90 | 08/26/90 | 26 | | 13021 |
| AKAFS | | 2 | 08/04/90 | 08/07/90 | 4 | | A414 |
| AKDNR | | 2 | 08/13/90 | 08/19/90 | 7 | | 4056 |
| AKAFS | | 2 | 08/14/90 | 08/29/90 | 16 | | A204 |
| AKAFS | | 2 | 08/18/90 | 08/28/90 | 11 | | A467 |
| AKDNR | | 2 | 08/22/90 | 08/29/90 | 8 | | 4068 |
| AKDNR | | 2 | 08/30/90 | 08/31/90 | 2 | | 33002 |
| INT | ID-NPF-006001 | 1 | 04/07/90 | 04/08/90 | 2 | | |
| INT | ID-BOF-000072 | 1 | 08/06/90 | 08/07/90 | 2 | F | PORTER CREEK |
| INT | ID-PAF-000006 | 1 | 08/09/90 | 08/22/90 | 14 | C | MISC ABC |
| INT | ID-PAF-000015 | 1 | 08/13/90 | CANCELED | 0 | E | YELLOW PINE |
| INT | UT-UTS-000019 | 1 | 08/27/90 | 08/30/90 | 4 | F | WASATCH MTN |
| INT | UT-UTS-000019 | 1 | 08/27/90 | 08/30/90 | 4 | F | WASATCH MTN |
| INT | NV-DFW-000255 | 2 | 04/13/90 | 04/13/90 | 1 | | |
| INT | ID-NIC-090020 | 2 | 06/30/90 | CANCELED | 0 | | |
| INT | ID-NIC-090020 | 2 | 07/02/90 | 07/04/90 | 3 | | |
| INT | ID-NIC-090020 | 2 | 07/02/90 | 07/04/90 | 3 | | SEVERITY |
| INT | ID-BOF-000049 | 2 | 07/17/90 | 07/22/90 | 6 | E | MORMON CREEK |
| INT | ID-CHF-000012 | 2 | 07/18/90 | 07/22/90 | 5 | D | BIG CREEK |
| INT | ID-CHF-000012 | 2 | 07/18/90 | 07/21/90 | 4 | D | BIG CREEK |
| INT | ID-NIC-090020 | 2 | 07/19/90 | 07/25/90 | 7 | | |
| INT | ID-CHF-000001 | 2 | 07/22/90 | CANCELED | 0 | | SEVERITY |
| INT | ID-BOF-000053 | 2 | 07/25/90 | 07/26/90 | 2 | | ABC MISC |
| INT | ID-BOF-000053 | 2 | 07/30/90 | 08/13/90 | 14 | | ABC MISC |
| INT | ID-PAF-000006 | 2 | 07/31/90 | 08/26/90 | 26 | C | MISC ABC |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| INT | NV-TOF-000522 | 2 | 08/05/90 | 08/06/90 | 2 | | |
| INT | ID-NIC-090020 | 2 | 08/06/90 | 08/10/90 | 5 | | |
| INT | ID-BOF-000072 | 2 | 08/06/90 | 08/20/90 | 15 | F | PORTER CREEK |
| INT | ID-NIC-090020 | 2 | 08/06/90 | 08/07/90 | 2 | | |
| INT | ID-NIC-090020 | 2 | 08/07/90 | 08/09/90 | 3 | | |
| INT | ID-NIC-090020 | 2 | 08/07/90 | 08/09/90 | 3 | | |
| INT | ID-PAF-000015 | 2 | 08/11/90 | 08/21/90 | 11 | E | YELLOW PINE |
| INT | ID-PAF-000006 | 2 | 08/11/90 | CANCELED | 0 | C | MISC ABC |
| INT | ID-NIC-090020 | 2 | 08/11/90 | 08/13/90 | 3 | | |
| INT | UT-MOD-00R658 | 2 | 08/12/90 | CANCELED | 0 | | |
| INT | UT-UIF-000006 | 2 | 08/12/90 | CANCELED | 0 | E | HEBER COMPLE |
| INT | UT-SLD-00R185 | 2 | 08/12/90 | CANCELED | 0 | | |
| INT | ID-PAF-000015 | 2 | 08/12/90 | CANCELED | 0 | E | YELLOW PINE |
| INT | ID-BOF-000083 | 2 | 08/13/90 | CANCELED | 0 | E | EAGLE CREEK |
| INT | ID-PAF-000015 | 2 | 08/13/90 | 08/18/90 | 6 | E | YELLOW PINE |
| INT | ID-BOF-000092 | 2 | 08/16/90 | 08/17/90 | 2 | F | BADGER CREEK |
| INT | ID-IDL-065039 | 2 | 09/10/90 | 09/13/90 | 4 | E | COTTONWOOD |
| INT | UT-WCF-000033 | 2 | 09/18/90 | 09/19/90 | 2 | D | STRONGS CYN |
| INT | ID-PAF-000019 | 2 | 10/10/90 | 10/13/90 | 4 | B | WINDY RIDGE |
| N | MT-BRF-000006 | 1 | 07/17/90 | 07/24/90 | 8 | F | GIRD POINT |
| N | MT-BRF-000006 | 1 | 07/19/90 | 07/23/90 | 5 | F | GIRD POINT |
| N | MT-CNF-013303 | 1 | 08/09/90 | 08/13/90 | 5 | E | SAND DUNES |
| N | MT-BRF-000006 | 2 | 07/17/90 | CANCELED | 0 | F | GIRD POINT |
| N | MT-BRF-000006 | 2 | 07/17/90 | 07/30/90 | 14 | F | GIRD POINT |
| N | MT-R01-000027 | 2 | 07/20/90 | 07/23/90 | 4 | | SEVERITY |
| N | MT-LNF-000025 | 2 | 07/23/90 | CANCELED | 0 | | SEVERITY |
| N | MT-CNF-013303 | 2 | 08/09/90 | 08/13/90 | 5 | E | SAND DUNES |
| N | MT-DNF-010302 | 2 | 08/10/90 | CANCELED | 0 | C | PICNIC |
| N | MT-CNF-013303 | 2 | 08/11/90 | CANCELED | 0 | E | SAND DUNES |
| N | MT-GNF-001001 | 2 | 10/06/90 | CANCELED | 0 | F | IRON MOUNT |
| N | MT-GNF-001001 | 2 | 10/06/90 | 10/12/90 | 7 | F | IRON MOUNT |
| N | MT-CES-000087 | 2 | 11/15/90 | | 0 | G | BEARTOOTH CX |
| PNW | WA-WEF-000093 | 1 | 07/15/90 | 07/22/90 | 8 | C | ABC MISC |
| PNW | OR-MAF-000086 | 1 | 07/16/90 | 07/19/90 | 4 | F | CORRAL BASIN |
| PNW | OR-MAF-000086 | 1 | 07/16/90 | 07/21/90 | 6 | F | CORRAL BASIN |
| PNW | WA-WEF-000093 | 1 | 07/17/90 | 07/22/90 | 6 | C | ABC MISC |
| PNW | WA-MSF-000068 | 1 | 07/22/90 | 07/27/90 | 6 | E | BACON CREEK |
| PNW | WA-MSF-000068 | 1 | 07/22/90 | 07/27/90 | 6 | E | BACON CREEK |
| PNW | WA-WEF-000095 | 1 | 07/28/90 | 08/01/90 | 4 | F | CHELAN CX |
| PNW | WA-WEF-000095 | 1 | 07/28/90 | 08/17/90 | 20 | F | CHELAN CX |
| PNW | WA-WEF-000140 | 1 | 07/29/90 | 08/04/90 | 6 | E | CANOE CREEK |
| PNW | WA-WEF-000140 | 1 | 07/29/90 | 08/04/90 | 6 | E | CANOE CREEK |
| PNW | WA-NCP-000025 | 1 | 07/31/90 | CANCELED | 0 | E | MCALLISTER |
| PNW | WA-NCP-000025 | 1 | 08/01/90 | 08/03/90 | 3 | E | MCALLISTER |
| PNW | OR-DEF-000285 | 1 | 08/06/90 | 08/08/90 | 3 | F | FINDLEY BUT |
| PNW | OR-DEF-000285 | 1 | 08/06/90 | 08/17/90 | 12 | F | FINDLEY BUT |
| PNW | WA-OKF-000089 | 1 | 08/06/90 | 08/18/90 | 13 | C | SWAMP CREEK |
| PNW | WA-OKF-000089 | 1 | 08/08/90 | 08/11/90 | 4 | C | SWAMP CREEK |
| PNW | WA-WEF-000195 | 1 | 08/13/90 | 08/16/90 | 4 | F | TOMMY CREEK |
| PNW | OR-SIF-000016 | 1 | 10/09/90 | 10/13/90 | 5 | F | CHROME |
| PNW | WA-GPF-000034 | 2 | 07/12/90 | 07/14/90 | 3 | E | YELLOWJACKET |
| PNW | WA-GPF-000034 | 2 | 07/12/90 | 07/20/90 | 9 | E | YELLOWJACKET |
| PNW | WA-WEF-000093 | 2 | 07/13/90 | 07/25/90 | 13 | C | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/13/90 | 07/23/90 | 11 | | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/13/90 | 07/19/90 | 7 | | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/13/90 | 07/21/90 | 9 | C | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/13/90 | 07/23/90 | 11 | C | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/14/90 | 07/20/90 | 7 | C | ABC MISC |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PNW | WA-OKF-000046 | 2 | 07/14/90 | 07/17/90 | 4 | C | ABC MISC |
| PNW | WA-OKF-000046 | 2 | 07/15/90 | CANCELED | 0 | C | ABC MISC |
| PNW | OR-MAF-000086 | 2 | 07/15/90 | 07/26/90 | 12 | F | CORRAL BASIN |
| PNW | WA-OKF-000046 | 2 | 07/15/90 | CANCELED | 0 | C | ABC MISC |
| PNW | OR-MAF-000086 | 2 | 07/15/90 | 07/20/90 | 6 | F | CORRAL BASIN |
| PNW | WA-OKF-000052 | 2 | 07/16/90 | 07/18/90 | 3 | C | BIGFACE |
| PNW | OR-WWF-000005 | 2 | 07/18/90 | CANCELED | 0 | | |
| PNW | WA-GPF-000034 | 2 | 07/20/90 | 07/24/90 | 5 | | YELLOWJACKET |
| PNW | WA-MSF-000068 | 2 | 07/24/90 | 07/29/90 | 6 | E | BACON CREEK |
| PNW | WA-WEF-000115 | 2 | 07/25/90 | 08/04/90 | 10 | | SEVERITY |
| PNW | WA-MSF-000068 | 2 | 07/26/90 | 07/27/90 | 2 | E | BACON CREEK |
| PNW | WA-WEF-000095 | 2 | 07/28/90 | 08/24/90 | 27 | F | CHELAN CX |
| PNW | WA-NCP-000025 | 2 | 07/31/90 | 08/19/90 | 19 | E | MCALLISTER |
| PNW | WA-NCP-000025 | 2 | 07/31/90 | CANCELED | 0 | E | MCALLISTER |
| PNW | OR-95S-000090 | 2 | 08/04/90 | 08/06/90 | 3 | F | AUBREY HALL |
| PNW | OR-95S-000090 | 2 | 08/04/90 | CANCELED | 0 | F | AUBREY HALL |
| PNW | OR-95S-000090 | 2 | 08/04/90 | 08/06/90 | 3 | F | AUBREY HALL |
| PNW | WA-OKF-000089 | 2 | 08/05/90 | 08/09/90 | 5 | C | SWAMP CREEK |
| PNW | WA-OKF-000091 | 2 | 08/06/90 | 08/20/90 | 15 | B | CADY POINT |
| PNW | OR-95S-000090 | 2 | 08/07/90 | 08/20/90 | 14 | F | AUBREY HALL |
| PNW | OR-MAF-000151 | 2 | 08/07/90 | 08/17/90 | 11 | G | SHEEP MOUNT |
| PNW | OR-OCF-000095 | 2 | 08/07/90 | 08/20/90 | 14 | G | PINE SPRINGS |
| PNW | OR-OCF-000095 | 2 | 08/07/90 | 08/17/90 | 11 | G | PINE SPRINGS |
| PNW | OR-OCF-000097 | 2 | 08/08/90 | 08/20/90 | 13 | G | BUCK SPRINGS |
| PNW | OR-MAF-000151 | 2 | 08/08/90 | CANCELED | 0 | G | SHEEP MOUNT |
| PNW | WA-OKF-000089 | 2 | 08/08/90 | 08/17/90 | 10 | C | SWAMP CREEK |
| PNW | OR-MAF-000156 | 2 | 08/10/90 | CANCELED | 0 | G | SNOWSHOE |
| PNW | OR-MAF-000156 | 2 | 08/10/90 | CANCELED | 0 | G | SNOWSHOE |
| PNW | OR-MAF-000156 | 2 | 08/11/90 | CANCELED | 0 | G | SNOWSHOE |
| PNW | OR-OCF-000095 | 2 | 08/11/90 | CANCELED | 0 | G | PINE SPRINGS |
| PNW | OR-MAF-000156 | 2 | 08/11/90 | CANCELED | 0 | G | SNOWSHOE |
| PNW | WA-WEF-000195 | 2 | 08/11/90 | CANCELED | 0 | F | TOMMY CREEK |
| PNW | WA-WEF-000191 | 2 | 08/13/90 | CANCELED | 0 | D | BLACKJACK |
| PNW | WA-WEF-000195 | 2 | 08/13/90 | CANCELED | 0 | F | TOMMY CREEK |
| PNW | WA-GPF-000069 | 2 | 08/14/90 | 08/17/90 | 4 | D | LOUIE |
| PNW | WA-WEF-000191 | 2 | 08/14/90 | 08/20/90 | 7 | D | BLACKJACK |
| PNW | WA-COA-000174 | 2 | 09/11/90 | 09/11/90 | 1 | E | SILVER CREEK |
| PNW | WA-COA-000174 | 2 | 09/12/90 | 09/15/90 | 4 | E | SILVER CREEK |
| PNW | OR-SIF-000016 | 2 | 10/09/90 | 10/18/90 | 10 | F | CHROME |
| PSW | CA-CNF-000824 | 1 | 06/28/90 | 06/30/90 | 3 | F | BEDFORD |
| PSW | CA-CNF-000824 | 1 | 06/28/90 | 06/30/90 | 3 | F | BEDFORD |
| PSW | CA-PNF-000173 | 1 | 06/30/90 | CANCELED | 0 | E | GREENHORN |
| PSW | CA-PNF-000219 | 1 | 07/13/90 | CANCELED | 0 | B | MURDOCK |
| PSW | CA-SNF-000561 | 1 | 07/20/90 | 07/24/90 | 5 | F | KIRCH |
| PSW | CA-SNF-000561 | 1 | 07/20/90 | 07/24/90 | 5 | F | KIRCH |
| PSW | CA-SQF-000782 | 1 | 08/06/90 | 08/17/90 | 12 | | ABC MISC |
| PSW | CA-SNF-000686 | 1 | 08/06/90 | 08/23/90 | 18 | D | LILY |
| PSW | CA-SQF-000782 | 1 | 08/06/90 | 08/21/90 | 16 | | ABC MISC |
| PSW | CA-SNF-000686 | 1 | 08/06/90 | 08/09/90 | 4 | D | LILY |
| PSW | CA-SQF-000787 | 1 | 08/07/90 | 08/20/90 | 14 | G | STORMY |
| PSW | CA-PNF-000350 | 1 | 08/07/90 | 08/17/90 | 11 | F | WALKER |
| PSW | CA-SQF-000787 | 1 | 08/07/90 | 08/19/90 | 13 | G | STORMY |
| PSW | CA-PNF-000350 | 1 | 08/07/90 | 08/17/90 | 11 | F | WALKER |
| PSW | CA-PNF-000350 | 1 | 08/07/90 | 08/18/90 | 12 | F | WALKER |
| PSW | CA-PNF-000350 | 1 | 08/07/90 | 08/17/90 | 11 | F | WALKER |
| PSW | CA-SQF-000787 | 1 | 08/07/90 | 08/19/90 | 13 | G | STORMY |
| PSW | CA-MDF-000452 | 1 | 08/08/90 | 08/17/90 | 10 | A | ABC MISC |
| PSW | CA-SHF-004312 | 1 | 08/09/90 | CANCELED | 0 | E | BOW |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PSW | CA-YNP-000069 | 1 | 08/09/90 | 08/12/90 | 4 | G | STEAMBOAT |
| PSW | CA-MNF-000263 | 1 | 08/12/90 | CANCELED | 0 | E | ELKHORN |
| PSW | CA-SNF-000896 | 1 | 08/31/90 | 09/02/90 | 2 | F | SAVAGE |
| PSW | CA-STF-001055 | 1 | 09/14/90 | 09/17/90 | 4 | F | COTTONWOOD |
| PSW | CA-STF-001055 | 1 | 09/14/90 | 09/17/90 | 4 | F | COTTONWOOD |
| PSW | CA-LPF-000324 | 2 | 04/14/90 | 04/16/90 | 3 | E | ALAMO |
| PSW | CA-LPF-000324 | 2 | 04/14/90 | CANCELED | 0 | E | ALAMO |
| PSW | CA-CDD-001219 | 2 | 05/18/90 | 06/01/90 | 14 | | ABC MISC - L |
| PSW | | 2 | 05/19/90 | 05/25/90 | 7 | | BIG |
| PSW | CA-SQF-000216 | 2 | 05/22/90 | 05/23/90 | 2 | C | DEER |
| PSW | CA-SLU-001626 | 2 | 06/20/90 | 06/21/90 | 2 | D | 41 |
| PSW | CA-SQF-000401 | 2 | 06/20/90 | 06/21/90 | 2 | D | MILK |
| PSW | | 2 | 06/24/90 | 06/30/90 | 7 | | BEDFORD |
| PSW | | 2 | 06/26/90 | 06/27/90 | 2 | | FOOTHILL |
| PSW | | 2 | 06/28/90 | 06/30/90 | 3 | | PAINT |
| PSW | CA-CNF-000824 | 2 | 06/28/90 | 07/02/90 | 5 | F | BEDFORD |
| PSW | CA-LPF-000555 | 2 | 06/28/90 | 06/29/90 | 2 | | PAINT |
| PSW | CA-LPF-000555 | 2 | 06/29/90 | 07/04/90 | 6 | | PAINT |
| PSW | CA-LPF-000555 | 2 | 06/30/90 | 06/27/90 | -2 | | PAINT |
| PSW | CA-LPF-000555 | 2 | 07/01/90 | 07/05/90 | 5 | | PAINT |
| PSW | CA-LPF-000555 | 2 | 07/01/90 | 07/03/90 | 3 | | PAINT |
| PSW | CA-LPF-000555 | 2 | 07/01/90 | CANCELED | 0 | F | PAINT |
| PSW | CA-PNF-000173 | 2 | 07/02/90 | 07/03/90 | 2 | E | GREENHORN |
| PSW | CA-SNF-000345 | 2 | 07/03/90 | 07/05/90 | 3 | F | REPLACEMENT |
| PSW | | 2 | 07/12/90 | 07/13/90 | 2 | | YORBA |
| PSW | | 2 | 07/14/90 | 07/16/90 | 3 | | BOUQUET |
| PSW | | 2 | 07/17/90 | 07/23/90 | 7 | | MORMAN |
| PSW | CA-LPF-000659 | 2 | 07/19/90 | 07/21/90 | 3 | | PENDOLA |
| PSW | CA-LPF-000659 | 2 | 07/19/90 | 07/24/90 | 6 | | PENDOLA |
| PSW | CA-SNF-000561 | 2 | 07/20/90 | 07/21/90 | 2 | F | KIRCH |
| PSW | CA-SNF-000561 | 2 | 07/20/90 | 07/24/90 | 5 | F | KIRCH |
| PSW | CA-SNF-000561 | 2 | 07/21/90 | 07/27/90 | 7 | D | KIRCH |
| PSW | | 2 | 07/26/90 | 07/27/90 | 2 | | RESERVOIR |
| PSW | | 2 | 07/29/90 | 07/29/90 | 1 | | JEEP |
| PSW | | 2 | 07/30/90 | 08/01/90 | 2 | | YNEZ |
| PSW | | 2 | 07/30/90 | 08/01/90 | 2 | | YNEZ |
| PSW | | 2 | 07/31/90 | 08/01/90 | 1 | | YNEZ |
| PSW | CA-LPF-000739 | 2 | 08/05/90 | 08/12/90 | 8 | | LPF-739 |
| PSW | CA-SNF-000686 | 2 | 08/05/90 | 08/07/90 | 3 | C | LILLY |
| PSW | CA-SNF-000686 | 2 | 08/05/90 | 08/14/90 | 10 | | LILLY |
| PSW | CA-SQF-000781 | 2 | 08/06/90 | 08/13/90 | 8 | G | BLACK |
| PSW | CA-SQF-000787 | 2 | 08/06/90 | CANCELED | 0 | G | STORMY |
| PSW | CA-SQF-000787 | 2 | 08/06/90 | CANCELED | 0 | G | STORMY |
| PSW | CA-SQF-000782 | 2 | 08/06/90 | 08/17/90 | 12 | | ABC MISC |
| PSW | | 2 | 08/06/90 | 08/13/90 | 8 | | LILLY |
| PSW | CA-ANF-003194 | 2 | 08/07/90 | CANCELED | 0 | C | FISH |
| PSW | CA-ANF-003194 | 2 | 08/07/90 | CANCELED | 0 | C | FISH |
| PSW | CA-FKU-007974 | 2 | 08/08/90 | 08/08/90 | 1 | C | SQUAW VALLEY |
| PSW | CA-ANF-003194 | 2 | 08/08/90 | CANCELED | 0 | C | FISH |
| PSW | | 2 | 08/11/90 | 08/13/90 | 3 | | WALKER |
| PSW | CA-LNF-001674 | 2 | 08/12/90 | CANCELED | 0 | | ABC MISC |
| PSW | CA-MMU-005850 | 2 | 08/14/90 | 08/14/90 | 1 | C | WENTON |
| PSW | | 2 | 08/14/90 | 08/24/90 | 11 | | A-ROCK |
| PSW | CA-CDD-002279 | 2 | 08/15/90 | 08/17/90 | 3 | | HUNTER |
| PSW | CA-MNF-000263 | 2 | 08/15/90 | 08/18/90 | 4 | E | ELKHORN |
| PSW | | 2 | 08/15/90 | 08/28/90 | 14 | | STEAMBOAT |
| PSW | CA-YNP-000079 | 2 | 08/21/90 | 08/31/90 | 11 | G | A-ROCK |
| PSW | CA-YNP-000079 | 2 | 08/21/90 | 09/07/90 | 17 | G | A-ROCK |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PSW | CA-MNF-000264 | 2 | 08/22/90 | 09/07/90 | 16 | F | RECER |
| PSW | | 2 | 08/23/90 | 08/25/90 | 3 | | PEAK |
| PSW | CA-YNP-000079 | 2 | 08/24/90 | 08/25/90 | 2 | | A ROCK |
| PSW | CA-BDF-002381 | 2 | 08/29/90 | 08/30/90 | 2 | | SWARTHOUT |
| PSW | CA-SNF-000896 | 2 | 08/30/90 | 09/02/90 | 3 | F | SAVAGE |
| PSW | CA-SNF-000896 | 2 | 08/30/90 | 09/02/90 | 3 | F | SAVAGE |
| PSW | CA-SNF-000896 | 2 | 08/30/90 | 09/06/90 | 7 | | SAVAGE |
| PSW | CA-LPF-000896 | 2 | 09/02/90 | 09/07/90 | 6 | | HARDLUCK |
| PSW | CA-LPF-000896 | 2 | 09/02/90 | 09/04/90 | 3 | | HARDLUCK |
| PSW | CA-TNF-000797 | 2 | 09/03/90 | 09/04/90 | 2 | | LAVEZZOLA |
| PSW | CA-TNF-002514 | 2 | 09/10/90 | 09/11/90 | 2 | | HIXON |
| PSW | CA-BDF-002514 | 2 | 09/10/90 | 09/12/90 | 3 | | HIXON |
| PSW | CA-STF-001055 | 2 | 09/14/90 | 09/15/90 | 2 | | COTTONWOD |
| PSW | CA-YNP-000143 | 2 | 09/16/90 | 09/17/90 | 2 | | PANROMIA |
| PSW | CA-STF-001055 | 2 | 09/17/90 | 09/19/90 | 3 | F | COTTONWOOD |
| PSW | CA-STF-001055 | 2 | 09/18/90 | 09/24/90 | 7 | F | COTTONWOOD |
| PSW | | 2 | 09/21/90 | 09/22/90 | 2 | | RANCH |
| PSW | | 2 | 10/09/90 | 10/10/90 | 2 | | SHIELLS |
| PSW | CA-BDF-002770 | 2 | 10/21/90 | 10/23/90 | 3 | | LYTLE |
| PSW | CA-BDF-002770 | 2 | 10/21/90 | 10/26/90 | 6 | | LYTLE |
| PSW | CA-BDF-002770 | 2 | 10/21/90 | 10/22/90 | 2 | | LYTLE |
| PSW | CA-BDF-002770 | 2 | 10/21/90 | 10/22/90 | 2 | | LYTLE |
| PSW | CA-INF-000797 | 2 | 10/28/90 | 10/30/90 | 3 | | TOWER ROCK |
| PSW | CA-INF-000797 | 2 | 10/28/90 | 10/29/90 | 2 | | TOWER ROCK |
| PSW | | 2 | 11/07/90 | 11/08/90 | 2 | | BRAVO II |
| PSW | CA-BDF-002963 | 2 | 11/13/90 | 11/15/90 | 3 | | LOST |
| PSW | CA-BDF-002963 | 2 | 11/13/90 | 11/15/90 | 3 | | LOST |
| RM | CO-MRD-00V242 | 1 | 06/29/90 | 07/04/90 | 6 | F | MENEFEE |
| RM | CO-MVP-0090-P | 1 | 06/30/90 | CANCELED | 0 | | |
| RM | CO-ARF-021545 | 2 | 06/28/90 | 07/09/90 | 12 | D | GOODELL |
| RM | CO-GMF-020906 | 2 | 06/29/90 | 07/04/90 | 6 | F | HORSEFLY |
| RM | CO-GMF-020906 | 2 | 06/29/90 | CANCELED | 0 | F | HORSEFLY |
| RM | CO-MRD-00V242 | 2 | 06/30/90 | 07/04/90 | 5 | F | MENEFEE |
| RM | CO-MVP-0090-P | 2 | 07/04/90 | 07/06/90 | 3 | | PRESUPPRESS |
| RM | WY-YNP-000010 | 2 | 07/06/90 | CANCELED | 0 | D | WASHBURN |
| RM | WY-YNP-000010 | 2 | 07/07/90 | 07/19/90 | 13 | D | WASHBURN |
| RM | WY-BTF-000030 | 2 | 08/13/90 | CANCELED | 0 | D | HOT FOOT |
| RM | WY-GPF-000069 | 2 | 08/14/90 | 08/17/90 | 4 | | |
| RM | SD-BKF-000126 | 2 | 09/13/90 | 09/17/90 | 5 | G | SWEDLUND |
| RM | SD-BKF-000126 | 2 | 09/13/90 | 09/17/90 | 5 | G | SWEDLUND |
| RM | CO-WRF-000027 | 2 | 09/15/90 | 09/21/90 | 7 | D | UTE CREEK |
| S | FL-OCF-000001 | 2 | 02/25/90 | CANCELED | 0 | B | STARKS FERRY |
| S | FL-OCF-000002 | 2 | 02/27/90 | 02/27/90 | 1 | C | BEAR |
| S | FL-BCP-000011 | 2 | 04/16/90 | 04/17/90 | 2 | E | INDIAN |
| S | FL-EVP-009025 | 2 | 05/01/90 | 05/05/90 | 5 | G | DOF-291 |
| S | FL-OSF-000001 | 2 | 05/15/90 | 05/15/90 | 1 | D | OSCEOLA |
| S | GA-OKR-000001 | 2 | 05/21/90 | 05/23/90 | 3 | E | MOTHERS DAY |
| S | FL-FNF-000001 | 2 | 05/21/90 | 05/21/90 | 1 | D | WHISKEY CREE |
| S | GA-OKR-000001 | 2 | 05/26/90 | 05/29/90 | 4 | E | MOTHERS DAY |
| S | FL-ANF-000001 | 2 | 05/30/90 | 06/08/90 | 9 | | |
| S | GA-OKR-000001 | 2 | 05/31/90 | 06/07/90 | 7 | E | MOTHERS DAY |
| S | FL-OCF-000004 | 2 | 06/15/90 | 06/17/90 | 3 | C | LAKE DOOR |
| S | TX-GNP-009008 | 2 | 06/26/90 | 07/04/90 | 9 | G | FRIJOLE |
| S | TX-GNP-009008 | 2 | 06/26/90 | 07/07/90 | 12 | G | FRIJOLE |
| S | GA-OKR-000010 | 2 | 07/10/90 | 07/18/90 | 9 | F | MITCHELL IS |
| S | GA-OKR-000010 | 2 | 07/11/90 | 07/21/90 | 11 | F | MITCHELL IS |
| S | GA-OKR-000010 | 2 | 07/26/90 | 08/09/90 | 14 | F | MITCHELL IS |
| S | FL-ANF-000003 | 2 | 08/19/90 | 08/22/90 | 4 | E | CLEAR LAKE |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| S | GA-OKR-000011 | 2 | 09/01/90 | 10/07/90 | 37 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 09/02/90 | 09/17/90 | 16 | G | SHORTS |
| S | FL-ANF-000004 | 2 | 09/10/90 | 09/11/90 | 2 | E | COW |
| S | GA-OKR-000011 | 2 | 09/18/90 | 09/23/90 | 6 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 09/18/90 | 10/07/90 | 20 | G | SHORTS |
| S | FL-FNF-000006 | 2 | 09/21/90 | 10/10/90 | 20 | E | HITCHCOCK LK |
| S | GA-OKR-000011 | 2 | 09/23/90 | 10/04/90 | 12 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 09/24/90 | 10/10/90 | 17 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 10/15/90 | 10/22/90 | 8 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 10/17/90 | 10/26/90 | 10 | G | SHORTS |
| S | GA-OKR-000011 | 2 | 10/20/90 | 11/11/90 | 22 | G | SHORTS |
| S | | 2 | 05/01/90 | 05/03/90 | 3 | C | DOF291 |
| S | | 2 | 05/20/90 | 05/20/90 | 1 | C | HARVEY MILL |
| S | | 2 | 05/28/90 | 05/28/90 | 1 | C | WHISKEY CREEK |
| S | | 2 | 05/29/90 | 05/29/90 | 1 | C | JUNIPER |
| S | | 2 | 05/31/90 | 05/31/90 | 1 | C | RARE |
| S | | 2 | 06/01/90 | 06/01/90 | 1 | C | BLACK CREEK |
| S | | 2 | 06/15/90 | 06/15/90 | 1 | C | LAKE DOOR |
| S | | 2 | 08/18/90 | 08/20/90 | 3 | C | CLEAR LAKE |
| S | | 2 | 09/10/90 | 09/10/90 | 1 | C | COW |
| SW | AZ-TNF-000089 | 1 | 06/26/90 | 06/30/90 | 5 | G | DUDE |
| SW | AZ-TNF-000089 | 1 | 06/26/90 | 07/04/90 | 9 | G | DUDE |
| SW | AZ-ASF-000107 | 1 | 06/27/90 | 07/02/90 | 6 | G | DUDE |
| SW | AZ-TNF-000089 | 1 | 06/28/90 | 06/30/90 | 3 | G | DUDE |
| SW | AZ-ASF-000107 | 1 | 06/28/90 | CANCELED | 0 | G | DUDE |
| SW | NM-LNF-090045 | 2 | 05/19/90 | 05/24/90 | 6 | G | BIG |
| SW | NM-LNF-090045 | 2 | 05/19/90 | 05/24/90 | 6 | G | BIG |
| SW | NM-LNF-090045 | 2 | 05/19/90 | 05/25/90 | 7 | | BIG |
| SW | AZ-CNF-000040 | 2 | 05/24/90 | 05/30/90 | 7 | F | BUSTER |
| SW | AZ-CNF-000040 | 2 | 05/25/90 | 05/27/90 | 3 | F | BUSTER |
| SW | AZ-CNF-000040 | 2 | 05/25/90 | 05/27/90 | 3 | | BUSTER |
| SW | AZ-TNF-000043 | 2 | 06/04/90 | 06/10/90 | 7 | E | BRAY |
| SW | AZ-PNF-000138 | 2 | 06/13/90 | 06/17/90 | 5 | E | DOCE |
| SW | AZ-PNF-000138 | 2 | 06/13/90 | CANCELED | 0 | E | DOCE |
| SW | AZ-PNF-000138 | 2 | 06/14/90 | 06/15/90 | 2 | E | DOCE |
| SW | NM-LCD-00L446 | 2 | 06/20/90 | 07/06/90 | 17 | F | DEVILS HILL |
| SW | NM-LCD-00L446 | 2 | 06/20/90 | 07/08/90 | 19 | F | DEVILS HILL |
| SW | NM-SNF-000027 | 2 | 06/21/90 | 06/23/90 | 3 | D | PEDRO |
| SW | AZ-TNF-000089 | 2 | 06/25/90 | CANCELED | 0 | G | DUDE |
| SW | AZ-TNF-000089 | 2 | 06/26/90 | 07/04/90 | 9 | G | DUDE |
| SW | AZ-CNF-000091 | 2 | 06/27/90 | 07/04/90 | 8 | C | BABCOCK |
| SW | AZ-CNF-000091 | 2 | 06/27/90 | 07/07/90 | 11 | C | BABCOCK |
| SW | AZ-PHD-00C420 | 2 | 06/27/90 | 07/05/90 | 9 | E | EMPIRE |
| SW | NM-R03-000099 | 2 | 06/27/90 | 07/04/90 | 8 | | ABC |
| SW | AZ-TNF-000101 | 2 | 06/28/90 | 07/16/90 | 19 | | ABC |
| SW | AZ-ASF-000107 | 2 | 06/28/90 | 07/06/90 | 9 | G | DUDE |
| SW | AZ-AZS-900269 | 2 | 06/28/90 | 07/04/90 | 7 | G | MONTOSA |
| SW | AZ-YUD-00C845 | 2 | 07/05/90 | CANCELED | 0 | C | HAMBURGER |
| SW | AZ-PNF-000351 | 2 | 08/30/90 | CANCELED | 0 | | EAST |
| SW | AZ-GCP-000082 | 2 | 09/11/90 | 09/15/90 | 5 | | BEDIVERE |
| SW | AZ-HAR-002109 | 2 | 09/18/90 | 09/21/90 | 4 | E | B.W. DELTA |
| SW | AZ-HAR-002109 | 2 | 09/19/90 | 09/21/90 | 3 | E | B.W. DELTA |
| SW | AZ-HAR-002109 | 2 | 09/19/90 | 10/13/90 | 25 | | B.W. DELTA |
| SW | AZ-HAR-002109 | 2 | 10/07/90 | 10/13/90 | 7 | E | B.W. DELTA |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| AKAFS | | 2 | 05/22/91 | 06/04/91 | 14 | | B108 |
| AKAFS | | 2 | 06/06/91 | 06/09/91 | 4 | | B203 |
| AKAFS | | 2 | 06/08/91 | 06/24/91 | 17 | | B225 |
| AKAFS | | 2 | 06/10/91 | 06/13/91 | 4 | | B225 |
| AKAFS | | 2 | 06/10/91 | 06/14/91 | 5 | | B242 |
| AKDNR | | 2 | 06/13/91 | 06/17/91 | 5 | | 111278 |
| AKAFS | | 2 | 06/20/91 | 07/16/91 | 17 | | B564 |
| AKAFS | | 2 | 06/22/91 | 07/04/91 | 13 | | B356 |
| AKAFS | | 2 | 06/22/91 | 07/06/91 | 15 | | B376 |
| AKDNR | | 2 | 06/23/91 | 07/04/91 | 12 | | 104402 |
| AKAFS | | 2 | 06/27/91 | 07/03/91 | 7 | | B451 |
| AKDNR | | 2 | 07/02/91 | 07/26/91 | 25 | | 133998 |
| AKAFS | | 2 | 07/04/91 | 07/09/91 | 6 | | B459 |
| AKDNR | | 2 | 07/04/91 | 07/21/91 | 18 | | 104613 |
| AKDNR | | 2 | 07/05/91 | 07/28/91 | 24 | | 104402 |
| AKAFS | | 2 | 07/10/91 | 08/03/91 | 25 | | B460 |
| AKAFS | | 2 | 07/10/91 | 07/26/91 | 17 | | B687 |
| AKAFS | | 2 | 07/11/91 | 07/16/91 | 6 | | B615 |
| AKAFS | | 2 | 07/17/91 | 07/23/91 | 7 | | B460 |
| AKDNR | | 2 | 07/21/91 | 07/26/91 | 6 | | 104544 |
| AKAFS | | 2 | 07/23/91 | 07/29/91 | 7 | | B460 |
| AKAFS | | 2 | 07/27/91 | 08/06/91 | 11 | | B460 |
| AKAFS | | 2 | 08/18/91 | 08/23/91 | 6 | | B349 |
| AKAFS | | 2 | 08/21/91 | 08/26/91 | 6 | | B349 |
| AKAFS | | 2 | 09/02/91 | 09/13/91 | 12 | | B562 |
| INT | ID-SAF-000053 | 1 | 07/23/91 | CANCELED | 0 | C | BERNARD |
| INT | ID-BOF-000060 | 1 | 08/09/91 | 08/12/91 | 4 | C | MISC ABC |
| INT | NV-WID-00X431 | 1 | 08/23/91 | CANCELED | 0 | | |
| INT | ID-NPF-018321 | 1 | 08/24/91 | 08/29/91 | 6 | C | LAKE CREEK |
| INT | ID-SAD-000034 | 1 | 08/26/91 | 08/29/91 | 4 | | |
| INT | ID-PAF-000023 | 1 | 09/28/91 | 09/29/91 | 2 | D | FAWN CREEK |
| INT | ID-PAF-000006 | 2 | 07/14/91 | 07/16/91 | 3 | G | PAYETTE LARE |
| INT | ID-SAF-000053 | 2 | 07/23/91 | 07/27/91 | 5 | C | BERNARD |
| INT | ID-BOD-00F150 | 2 | 08/01/91 | 08/01/91 | 1 | | |
| INT | ID-BOF-000073 | 2 | 08/04/91 | 08/07/91 | 4 | C | EAST FORK #2 |
| INT | ID-SAF-000067 | 2 | 08/04/91 | CANCELED | 0 | D | CABIN FIRE |
| INT | ID-NPF-018300 | 2 | 08/09/91 | 08/12/91 | 4 | C | PETTIBONE #3 |
| INT | ID-SAF-000066 | 2 | 08/14/91 | 08/20/91 | 7 | F | KITCHEN CK |
| INT | ID-SAF-000066 | 2 | 08/14/91 | 08/20/91 | 7 | F | KITCHEN CK |
| INT | ID-PAF-000016 | 2 | 08/15/91 | 08/20/91 | 6 | G | RUSH CREEK |
| INT | ID-PAF-000016 | 2 | 08/15/91 | 08/19/91 | 5 | G | RUSH CREEK |
| INT | ID-SAF-000071 | 2 | 08/21/91 | 08/25/91 | 5 | A | MOORE |
| INT | NV-WID-00X431 | 2 | 08/21/91 | 08/25/91 | 5 | | |
| INT | ID-PAF-000005 | 2 | 08/23/91 | 09/01/91 | 9 | C | PAYETTE ABC |
| INT | ID-BOF-000060 | 2 | 08/23/91 | 09/10/91 | 18 | C | MISC ABC |
| INT | ID-BOD-000046 | 2 | 08/23/91 | 08/28/91 | 6 | | |
| INT | NV-WID-00X431 | 2 | 08/23/91 | 08/28/91 | 6 | | |
| INT | ID-BOD-000047 | 2 | 08/23/91 | 08/25/91 | 3 | | |
| INT | NV-WID-00X431 | 2 | 08/23/91 | 08/25/91 | 3 | | |
| INT | UT-UIF-000044 | 2 | 08/24/91 | CANCELED | 0 | D | WOLVERTON MI |
| INT | UT-SLD-00R027 | 2 | 08/24/91 | 08/26/91 | 3 | | |
| INT | ID-NPF-018321 | 2 | 08/24/91 | 08/31/91 | 8 | C | LAKE CREEK |
| INT | ID-NPF-018321 | 2 | 08/24/91 | 08/29/91 | 6 | C | LAKE CREEK |
| INT | ID-SAD-000034 | 2 | 08/25/91 | CANCELED | 0 | | |
| INT | ID-BOD-00F419 | 2 | 08/25/91 | CANCELED | 0 | | |
| INT | ID-SAD-000034 | 2 | 08/26/91 | 09/09/91 | 14 | | |
| INT | ID-SAD-000034 | 2 | 08/26/91 | 09/03/91 | 8 | | |
| INT | ID-BOD-000046 | 2 | 08/28/91 | 08/31/91 | 4 | | |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| INT | ID-PAF-000016 | 2 | 08/28/91 | 08/31/91 | 4 | G | RUSH CREEK |
| INT | NV-WID-00X442 | 2 | 08/31/91 | 09/02/91 | 2 | | |
| INT | NV-WID-00X442 | 2 | 08/31/91 | CANCELED | 0 | | |
| INT | ID-PAF-000005 | 2 | 09/02/91 | 09/14/91 | 13 | C | PAYETTE ABC |
| INT | ID-PAF-000022 | 2 | 09/06/91 | 09/11/91 | 6 | D | SQUAW LAKE |
| INT | ID-NIC-091002 | 2 | 09/18/91 | 09/18/91 | 1 | | |
| INT | ID-SAD-000034 | 2 | 09/25/91 | 09/25/91 | 1 | | |
| INT | ID-PAF-000023 | 2 | 09/28/91 | 10/02/91 | 5 | D | FAWN CREEK |
| INT | ID-NPF-018324 | 2 | 10/02/91 | 10/07/91 | 6 | F | RACKLIFF |
| INT | NV-WID-00X456 | 2 | 10/07/91 | 10/10/91 | 4 | | |
| INT | UT-CCD-00R209 | 2 | 10/16/91 | 10/19/91 | 4 | | |
| INT | ID-IDL-037020 | 2 | 10/17/91 | 10/24/91 | 8 | D | BENAWAH |
| INT | ID-IDL-027029 | 2 | 10/17/91 | 10/22/91 | 6 | F | HAUSER LK CO |
| N | MT-GNF-001038 | 1 | 07/18/91 | 07/26/91 | 9 | G | THOMPSON CR |
| N | MT-GNF-001038 | 1 | 07/18/91 | 08/01/91 | 14 | G | THOMPSON CR |
| N | MT-GNF-001038 | 1 | 07/18/91 | 07/25/91 | 8 | G | THOMPSON CR |
| N | MT-GNF-001038 | 1 | 07/18/91 | 07/25/91 | 8 | G | THOMPSON CR |
| N | MT-GNF-001038 | 1 | 07/21/91 | 07/27/91 | 7 | G | THOMPSON CR |
| N | ID-IPF-012047 | 1 | 10/17/91 | 10/24/91 | 8 | F | KILROY |
| N | MT-LED-00H529 | 1 | 10/18/91 | 10/22/91 | 5 | G | BURNETTE PK |
| N | MT-LED-00H529 | 1 | 10/18/91 | 10/20/91 | 3 | G | BURNETTE PK |
| N | ID-IPF-012047 | 1 | 10/19/91 | 10/24/91 | 6 | F | KILROY |
| N | MT-KNF-015221 | 1 | 10/21/91 | 10/21/91 | 1 | G | SYLVANITE CX |
| N | MT-GNF-001034 | 2 | 07/09/91 | 07/11/91 | 3 | C | LIMIT CREEK |
| N | MT-GNF-001038 | 2 | 07/17/91 | 08/05/91 | 19 | G | THOMPSON CKE |
| N | MT-GNF-001038 | 2 | 07/17/91 | 07/27/91 | 11 | G | THOMPSON CKE |
| N | MT-GNF-001038 | 2 | 07/18/91 | 07/26/91 | 9 | G | THOMPSON CKE |
| N | MT-GNF-001038 | 2 | 07/24/91 | 07/26/91 | 3 | G | THOMPSON CKE |
| N | MT-BRF-000007 | 2 | 07/29/91 | 07/31/91 | 3 | C | DALY CREEK |
| N | MT-DNF-010424 | 2 | 08/08/91 | 08/11/91 | 4 | B | ROSS |
| N | MT-DNF-010441 | 2 | 08/23/91 | CANCELED | 0 | D | PIGEON CREEK |
| N | MT-BRF-000015 | 2 | 08/24/91 | 08/28/91 | 5 | E | COFFEE GULCH |
| N | MT-GNF-001070 | 2 | 08/25/91 | 08/31/91 | 7 | C | SNOWSLIDE |
| N | MT-GNF-001070 | 2 | 08/25/91 | 08/29/91 | 5 | C | SNOWSLIDE |
| N | MT-LCF-000040 | 2 | 08/25/91 | 09/05/91 | 11 | E | HARRISON |
| N | MT-LCF-000040 | 2 | 08/25/91 | 08/31/91 | 7 | | HARRISON |
| N | MT-LCF-000040 | 2 | 08/25/91 | 08/29/91 | 5 | E | HARRISON |
| N | MT-LWD-00H528 | 2 | 10/13/91 | 10/16/91 | 4 | F | 79 TRAIL |
| N | MT-SWS-000184 | 2 | 10/13/91 | 10/15/91 | 3 | G | GAME RANGE |
| N | MT-SWS-000184 | 2 | 10/13/91 | 10/22/91 | 10 | G | GAME RANGE |
| N | MT-SWS-000184 | 2 | 10/13/91 | 10/22/91 | 10 | G | GAME RANGE |
| N | MT-KNF-015221 | 2 | 10/16/91 | 10/22.91 | 7 | G | SYLVANITE CX |
| N | MT-NRC-000003 | 2 | 10/17/91 | CANCELED | 0 | | MISC ABC |
| N | MT-BRF-000024 | 2 | 10/17/91 | 10/23/91 | 7 | F | OVERWHICH |
| N | MT-NRC-000003 | 2 | 10/17/91 | 10/22/91 | 6 | | MISC ABC |
| N | ID-IPF-012047 | 2 | 10/17/91 | 10/19/91 | 3 | F | KILROY |
| N | MT-BRF-000024 | 2 | 10/17/91 | 10/24/91 | 8 | F | OVERWHICH |
| N | ID-IPF-012047 | 2 | 10/17/91 | 10/24/91 | 8 | F | KILROY X |
| N | MT-LED-00H529 | 2 | 10/18/91 | 10/25/91 | 8 | G | BURNETTE PK |
| N | MT-LED-00H529 | 2 | 10/18/91 | 10/22/91 | 5 | G | BURNETTE PK |
| N | MT-LED-00H529 | 2 | 10/19/91 | 10/25/91 | 7 | G | BURNETTE PK |
| N | MT-KNF-015221 | 2 | 10/19/91 | 10/22/91 | 4 | G | SYLVANITE CX |
| N | MT-KNF-015221 | 2 | 10/19/91 | 10/22/91 | 4 | G | SYLVANITE CX |
| N | MT-LED-00H529 | 2 | 10/19/91 | 10/28/91 | 10 | G | BURNETTE PK |
| PNW | WA-MSF-000040 | 1 | 07/24/91 | 07/25/91 | 2 | E | ILLABOT |
| PNW | WA-MSF-000040 | 1 | 07/24/91 | 07/25/91 | 2 | E | ILLABOT |
| PNW | OR-MHF-000222 | 1 | 09/26/91 | 09/27/91 | 2 | D | BEELINE |
| PNW | WA-WEF-000313 | 1 | 10/04/91 | 10/06/91 | 3 | E | GRADE CREEK |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PNW | WA-WEF-000313 | 1 | 10/04/91 | 10/07/91 | 4 | E | GRADE CREEK |
| PNW | OR-MHF-000243 | 1 | 10/06/91 | 10/14/91 | 9 | D | WAUNA |
| PNW | WA-MSF-000087 | 1 | 10/06/91 | 10/08/91 | 3 | D | GOLD HILL |
| PNW | OR-MHF-000243 | 1 | 10/07/91 | 10/14/91 | 8 | D | WAUNA |
| PNW | OR-MHF-000247 | 1 | 10/10/91 | 10/14/91 | 5 | F | FALLS |
| PNW | OR-WIF-000648 | 1 | 10/12/91 | 10/22/91 | 11 | G | WARNER CREEK |
| PNW | OR-WIF-000648 | 1 | 10/12/91 | 10/18/91 | 7 | G | WARNER CREEK |
| PNW | OR-WIF-000648 | 1 | 10/15/91 | 10/19/91 | 5 | G | WARNER CREEK |
| PNW | WA-GPF-000026 | 2 | 08/03/91 | CANCELED | 0 | | |
| PNW | WA-GPF-000032 | 2 | 08/18/91 | 08/18/91 | 1 | B | MISC ABC |
| PNW | OR-DUD-000048 | 2 | 08/19/91 | 08/21/91 | 3 | | SKULL CREEK |
| PNW | OR-BUD-000048 | 2 | 08/19/91 | 08/25/91 | 7 | | |
| PNW | OR-WWF-000018 | 2 | 08/19/91 | 08/24/91 | 6 | D | BIG SHEEP |
| PNW | OR-WWF-000022 | 2 | 08/31/91 | 09/06/91 | 6 | D | TWIN LAKES |
| PNW | OR-WWF-000022 | 2 | 09/01/91 | 09/04/91 | 4 | D | TWIN LAKES |
| PNW | OR-MHF-000218 | 2 | 09/24/91 | 09/27/91 | 4 | D | WASH |
| PNW | OR-MHF-000222 | 2 | 09/25/91 | 09/28/91 | 4 | D | BEELINE |
| PNW | OR-MHF-000243 | 2 | 10/06/91 | 10/15/91 | 10 | D | WAUNA |
| PNW | OR-MHF-000243 | 2 | 10/06/91 | 10/17/91 | 12 | D | WAUNA |
| PNW | OR-MHF-000243 | 2 | 10/07/91 | 10/09/91 | 3 | D | WAUNA |
| PNW | OR-MHF-000243 | 2 | 10/07/91 | CANCELED | 0 | D | WAUNA |
| PNW | OR-MHF-000247 | 2 | 10/10/91 | 10/18/91 | 9 | F | FALLS |
| PNW | OR-WIF-000648 | 2 | 10/11/91 | 10/19/91 | 9 | G | WARNER CREEK |
| PNW | OR-WIF-000657 | 2 | 10/12/91 | 10/19/91 | 8 | | |
| PNW | OR-WIF-000648 | 2 | 10/16/91 | 10/17/91 | 2 | G | WARNER CREEK |
| PNW | OR-WIF-000690 | 2 | 11/16/91 | 11/17/91 | 2 | | |
| PSW | CA-YNP-000095 | 1 | 09/24/91 | 09/28/91 | 5 | F | FROG 1 |
| PSW | CA-YNP-000097 | 1 | 09/25/91 | 10/03/91 | 9 | F | ILL |
| PSW | CA-YNP-000097 | 1 | 09/27/91 | 09/29/91 | 3 | F | ILL |
| PSW | CA-SHF-005739 | 1 | 09/30/91 | 10/02/91 | 3 | E | PEAK |
| PSW | CA-LPF-000361 | 2 | 05/21/91 | CANCELED | 0 | | SEVERITY |
| PSW | CA-FKU-004850 | 2 | 05/27/91 | 05/27/91 | 1 | C | QUAIL |
| PSW | CA-BBD-000643 | 2 | 05/31/91 | 07/09/91 | 9 | | PRESUPPRESS |
| PSW | CA-FKU-005186 | 2 | 06/05/91 | 06/05/91 | 1 | C | SAMPLE |
| PSW | CA-BDF-000976 | 2 | 06/19/91 | 06/20/91 | 2 | | BAUTISTA |
| PSW | CA-LPF-000027 | 2 | 06/28/91 | 07/01/91 | 4 | C | ABC MISC |
| PSW | CA-MMU-004990 | 2 | 07/13/91 | 07/13/91 | 1 | C | BUZZARD |
| PSW | CA-BDF-001304 | 2 | 07/15/91 | 07/21/91 | 7 | | HOOK |
| PSW | CA-BDF-001304 | 2 | 07/15/91 | 07/17/91 | 3 | | HOOK |
| PSW | | 2 | 07/19/91 | 07/21/91 | 3 | | JAVELINA |
| PSW | CA-SNF-00505 | 2 | 07/21/91 | 07/21/91 | 1 | C | CORAL |
| PSW | | 2 | 08/20/91 | 08/21/91 | 2 | C | CANYON |
| PSW | CA-BDF-001783 | 2 | 08/21/91 | 08/28/91 | 8 | | STOCKTON |
| PSW | CA-BDF-001783 | 2 | 08/22/91 | 08/26/91 | 5 | F | STOCKTEN |
| PSW | CA-BDF-001783 | 2 | 08/22/91 | 08/25/91 | 4 | F | STOCKTEN |
| PSW | CA-LPF-000086 | 2 | 08/23/91 | 08/25/91 | 3 | F | STOCKTON |
| PSW | | 2 | 08/29/91 | 08/30/91 | 2 | | HARMONY |
| PSW | CA-SNF-000852 | 2 | 09/02/91 | 09/02/91 | 1 | C | FORK |
| PSW | CA-SNF-000855 | 2 | 09/03/91 | 09/04/91 | 2 | C | ABC MISC |
| PSW | CA-LMU-002161 | 2 | 09/04/91 | 09/07/91 | 4 | E | WHITEHORSE |
| PSW | CA-SUD-002136 | 2 | 09/04/91 | 09/04/91 | 1 | C | RIMROCK |
| PSW | CA-SNF-000855 | 2 | 09/05/91 | 09/10/91 | 6 | B | MISC LIGHT |
| PSW | CA-SHF-005502 | 2 | 09/19/91 | 09/21/91 | 3 | G | ROCK |
| PSW | CA-SHF-005502 | 2 | 09/19/91 | 09/25/91 | 7 | G | ROCK |
| PSW | CA-LPF-001124 | 2 | 09/23/91 | 09/24/91 | 2 | | MILLER |
| PSW | CA-LPF-000117 | 2 | 09/24/91 | 09/27/91 | 4 | | IRON |
| PSW | | 2 | 09/26/91 | 09/29/91 | 4 | | ILL |
| PSW | CA-LPF-000126 | 2 | 09/27/91 | 09/28/91 | 2 | | WILLOW |

| REG | ORDER NO | TYPE | MOB DATE | DEMOB DATE | DAYS ON FIRE | CLASS | FIRE NAME |
|---|---|---|---|---|---|---|---|
| PSW | CA-MNF-000310 | 2 | 09/27/91 | 10/01/91 | 5 | A | UMBRELLA |
| PSW | CA-SHF-005731 | 2 | 09/27/91 | 10/02/91 | 6 | B | BOBS |
| PSW | CA-SHF-005731 | 2 | 09/27/91 | CANCELED | 0 | B | BOBS |
| PSW | CA-SHF-005739 | 2 | 09/28/91 | 10/07/91 | 10 | | PEAK |
| PSW | | 2 | 10/01/91 | 10/07/91 | 7 | | BADGER |
| PSW | | 2 | 10/11/91 | 10/14/91 | 4 | | BOW |
| PSW | CA-LPF-000155 | 2 | 10/12/91 | 10/18/91 | 7 | | ALDER |
| PSW | CA-ANF-002136 | 2 | 10/12/91 | 10/14/91 | 3 | | KERR |
| PSW | CA-YNP-000120 | 2 | 10/12/91 | 10/12/90 | 1 | C | CRAN |
| PSW | CA-LPF-000167 | 2 | 10/18/91 | 10/23/91 | 6 | | SPRUCE |
| PSW | CA-LPF-000171 | 2 | 10/20/91 | 10/25/91 | 6 | | LION |
| PSW | CA-LPF-000171 | 2 | 10/20/91 | 11/01/91 | 12 | | LION |
| PSW | CA-SRF-003053 | 2 | 10/21/91 | 10/22/91 | 2 | C | LEARY |
| PSW | CA-LPF-001223 | 2 | 10/21/91 | 10/23/91 | 3 | | LION |
| PSW | CA-LPF-001223 | 2 | 10/22/91 | 10/23/91 | 2 | F | LION |
| RM | SD-BKF-000006 | 2 | 04/06/91 | CANCELED | 0 | | |
| RM | SD-BKF-P20254 | 2 | 04/06/91 | CANCELED | 0 | F | SHIRTAIL |
| RM | SD-BKF-P20254 | 2 | 04/06/91 | 04/08/91 | 3 | F | SHIRTAIL |
| RM | WY-YNP-000003 | 2 | 07/10/91 | 07/14/91 | 5 | D | PELICAN |
| RM | WY-BTF-000045 | 2 | 10/16/91 | 10/24/91 | 9 | G | DRY COTTONWD |
| RM | WY-BTF-000045 | 2 | 10/16/91 | 10/24/91 | 9 | G | DRY COTTONWD |
| S | FL-OCF-000005 | 2 | 04/03/91 | 04/04/91 | 2 | F | STATE #1 |
| S | FL-OCF-000007 | 2 | 09/26/91 | 09/28/91 | 3 | F | SHELL #23 |
| S | VA-GWF-005003 | 2 | 10/20/91 | CANCELED | 0 | | |
| S | KY-DBF-000025 | 2 | 10/26/91 | 11/05/91 | 10 | G | REDBIRD |
| S | TN-CNF-000007 | 2 | 10/26/91 | 11/08/91 | 13 | | |
| S | TN-CNF-000012 | 2 | 10/28/91 | 11/04/91 | 7 | | |
| S | WV-NRP-009207 | 2 | 11/04/91 | 11/07/91 | 4 | | |
| S | TN-CNF-000017 | 2 | 11/14/91 | 11/15/91 | 2 | | |
| S | TN-CNF-000018 | 2 | 11/16/91 | 11/20/91 | 5 | | |
| S | | 2 | 06/16/91 | 06/16/91 | 1 | C | MIDNIGHT |
| S | | 2 | 07/27/91 | 07/27/91 | 1 | C | SAVANNAH |
| S | | 2 | 09/23/91 | 09/23/91 | 1 | C | SHELL |
| S | | 2 | 11/17/91 | 11/17/91 | 1 | C | BIG DISMAL |
| SW | AZ-YUD-00C895 | 2 | 04/10/91 | 04/11/91 | 2 | D | PLANTATION |
| SW | AZ-TNF-000012 | 2 | 05/22/91 | CANCELED | 0 | | NEW RVR MESA |
| SW | AZ-TNF-000012 | 2 | 05/22/91 | 05/22/91 | 1 | | NEW RVR MESA |
| SW | AZ-COF-000016 | 2 | 05/27/91 | 05/29/91 | 3 | D | GERONIMO |
| SW | AZ-FTA-000546 | 2 | 05/28/91 | CANCELED | 0 | D | CRADLE |
| SW | NM-ABD-00L180 | 2 | 06/26/91 | 06/28/91 | 3 | | LAVA |
| SW | NM-ABD-00L180 | 2 | 06/27/91 | 06/29/91 | 3 | E | LAVA |
| SW | NM-R03-000130 | 2 | 06/27/91 | 07/06/91 | 10 | | PRESUPPRESS |
| SW | NM-ABD-00L180 | 2 | 06/27/91 | 06/29/91 | 3 | E | LAVA |
| SW | NM-ABD-00L180 | 2 | 06/27/91 | 06/29/91 | 3 | E | LAVA |
| SW | NM-SNF-000060 | 2 | 06/28/91 | 06/30/91 | 3 | E | HENRY |
| SW | NM-SNF-000060 | 2 | 06/28/91 | 06/30/91 | 3 | E | HENRY |
| SW | NM-SNF-000060 | 2 | 06/28/91 | 07/07/91 | 10 | E | HENRY |
| SW | NM-R03-000130 | 2 | 06/29/91 | 07/01/91 | 3 | | PRESUPPRESS |
| SW | AZ-TNF-000130 | 2 | 07/05/91 | 07/06/91 | 2 | C | MISC. ABC |
| SW | AZ-SAD-00C599 | 2 | 07/19/91 | 07/25/91 | 7 | F | JAVELINA |
| SW | AZ-SAD-00C599 | 2 | 07/19/91 | 07/21/91 | 3 | F | JAVELINA |