



ABEA

AIR TANKER BASE EFFICIENCY ANALYSIS



USDA FOREST SERVICE
REGION 5 FIRE & AVIATION MANAGEMENT



Air Tanker Base Efficiency Analysis (ABEA)

Introduction

Inconsistent and fragmented direction has left the Forest Service facing an aging fleet of agency owned and contracted aircraft. The modernization of existing facilities to support Air Tankers has become very costly and continues to increase at an alarming rate. The agency has reduced the number of Air Tankers from 47 to 17 due to safety and compliance issues. The management of the remaining Air Tankers has shifted from permanent basing to a virtual approach.

The agency's limited aviation assets and rising suppression costs are forcing fire managers to better utilize aviation to accomplish cost effective suppression goals. This requires re-focused training and culture changes within the suppression community, as well as developing new perceptions of the public and politicians on the safe and effective use of aviation resources. In response to these changes, the Region has developed an in-depth analysis to help plan for the future and determine the most cost effective method of suppressing fires with Air Tankers. It is important to note, Air Tanker Bases (ATBs) managed by other agencies were not considered in this analysis. The goal was to analyze Forest Service resources independently.

Objectives

There are three primary objectives for this paper. The first objective is to establish whether a subset of the current ATBs in the Region could support Initial Attack without degrading the current on site arrival time, and to ascertain the efficiency of the chosen configuration of ATBs and reload bases for Large Fire Support. The second objective is to project the number of aircraft required for initial attack during critical months of the year by performing a workload analysis. The third and final objective is to build on the previously mentioned workload analysis to project the future role of reload bases for large fire support.

Methods

Air Tanker Base Configuration

Initial Attack

Initial Attack efficiency was addressed by examining the location and area of influence of the current nine ATBs in the Region. This analysis is primarily spatial in nature in that the physical location of the bases determines the minimum response time to reach all Forest Service lands in the Region. The current nine ATB configuration was used to calculate the current minimum response time. The maximum distance from the closest ATB to all Forest Service lands was calculated in a Geographic Information System (GIS) and converted to travel time using the cruising speed of a P3 aircraft, which is 250 mph. The current minimum response time was then used as the requirement to determine the most efficient configuration of ATBs.

Large Fire Support

The number of runs an air tanker can make from an ATB to each Forest determines how effectively the ATBs can support large fires. The number of runs were calculated for both P2 and P3 aircraft. The maximum distance from each forest to the nearest ATB was used to calculate the number of runs. It was assumed that 13 hours of allowable flight time were available in an operational day and a 25 minute preparation time was required between each run to service the aircraft. Additionally, the number of runs from each reload base was calculated to determine whether utilizing the reload bases would increase the total number of runs possible to each Forest.

Workload Assessment

The workload analysis was performed using historical fire records from the NFMID/PCHA database. Records from the ten year period 1995 through 2004 were chosen for this analysis. While this ten year period may not be long enough to represent long term trends in fire occurrence, it was felt that these records were the most accurate since they have been reviewed and corrected by Forests. The inference was made that air tankers would have been used for suppressing fires with an intensity level of three or greater (flame lengths greater than 4 feet), therefore, fires with an intensity level of two or less were not considered in this analysis. Fire occurrences outside the peak fire season of May 15 through November 15 were also eliminated from the analysis. The fire occurrence data were used to determine the number of fires each ATB would be responsible for within the 34 minute range of a P3 aircraft. The maximum number of fires that occurred each day within the area of responsibility for each ATB, was calculated. The maximum number of fires divided by the possible number of runs (Table 1) was used to estimate the number of air tankers and the time period they may be required to support initial attack in the future. In addition, the number of large fires (> 300 acres) each reload base could be required to support was estimated.

Results and Discussion

Air Tanker Base Configuration

Initial Attack

The current ATB locations appear to be somewhat evenly distributed throughout the state, and adjacent to, or physically located, on National Forests (Figure 1). Calculating the maximum distance between each of the existing nine ATBs and all Forest Service lands in California, resulted in a maximum arrival time of 34 minutes, using the 250 mph cruising speed of a P3 (Figure 1). Using GIS, multiple combinations of bases were analyzed to determine if the same level of efficiency of 34 minutes to reach all FS land in CA could be maintained with fewer ATBs. The analysis concluded that only five of the nine air tanker bases were needed to maintain the same efficiency of 34 minutes (Figure 2). There were several different combinations of bases that were able to meet the 34 minute criteria, but only six combinations reduced the number of ATBs to five. It was determined that Redding, Chester, and Fresno air tanker bases were necessary to meet the 34 minute efficiency. Redding ATB was needed to maintain the 34 minute response for the northern portion of the Six Rivers National Forest; Chester ATB was needed for the northeastern portion of the Modoc National Forest; and Fresno ATB was needed for the northern portion of the Stanislaus National Forest and the southern portion of the Eldorado National Forest (Figure 2).

Two additional locations were needed to complete the most efficient five air tanker base configuration. The possible combinations were: Santa Barbara/Ramona, Fox/San Bernardino, Fox/Ramona, Porterville/Ramona, Santa Barbara/San Bernardino, and Porterville/San Bernardino. The combination Porterville/San Bernardino was selected; Porterville because of the new facilities constructed under the National Fire Plan and San Bernardino because of monetary investments made to its infrastructure. The five ATBs selected were: Redding, Chester, Fresno, Porterville, and San Bernardino (Figure 2).

The four remaining bases not selected: Santa Barbara, William J. Fox, Ramona, and Chico, along with the already existing reload bases: Siskiyou, Stockton, Bishop, and proposed reload base Santa Maria, comprise the eight reload bases used in the large fire support portion of this analysis. Although Chico and Ramona are considered reload bases, it must be noted that they will evolve to full service CDF managed bases similar to what exists now with Paso Robles, Hollister, and Rhonerville.

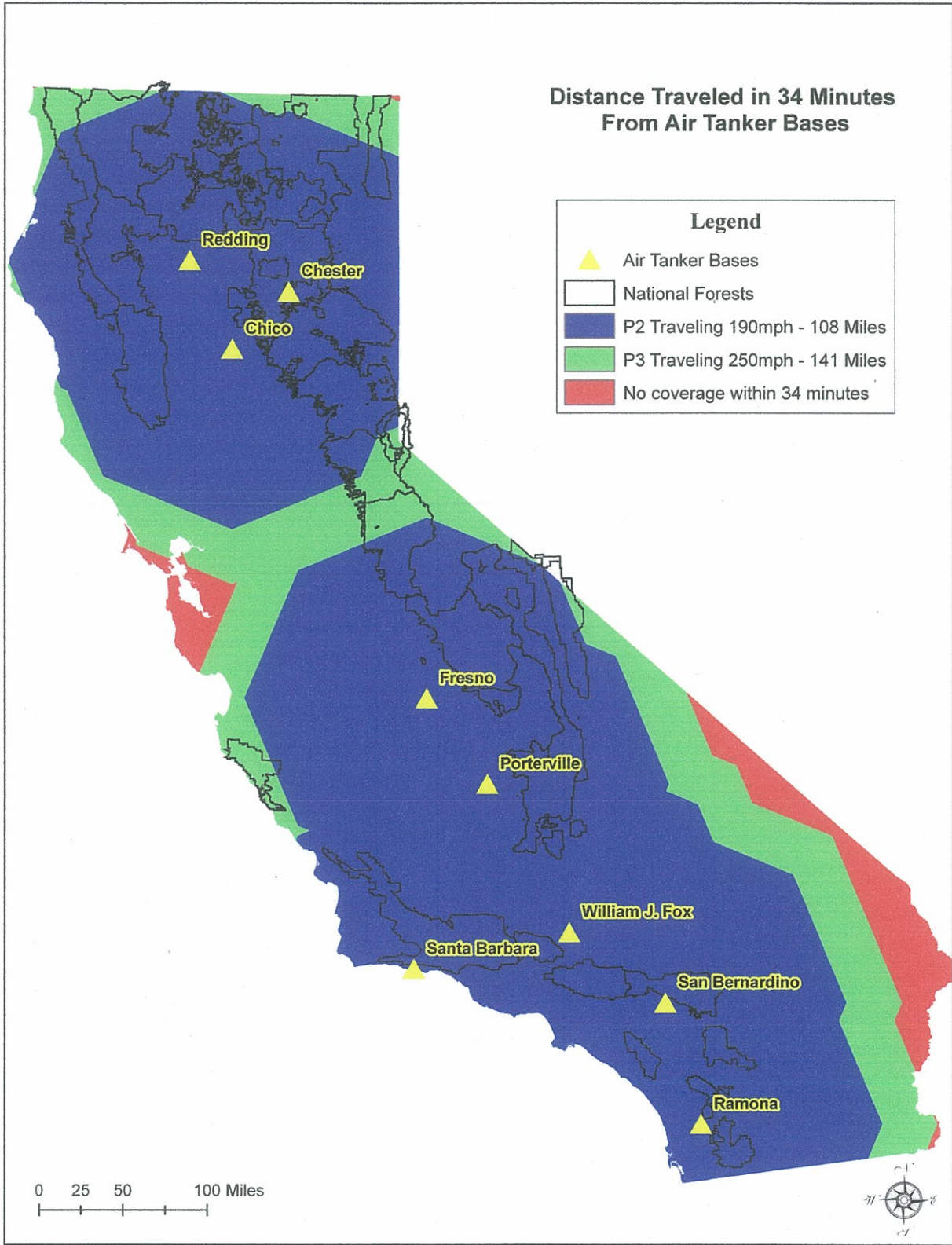


Figure 1. Coverage using a maximum 34 minute flight time from existing nine air tanker bases. This does not include response times for existing CDF Air Tanker Bases.

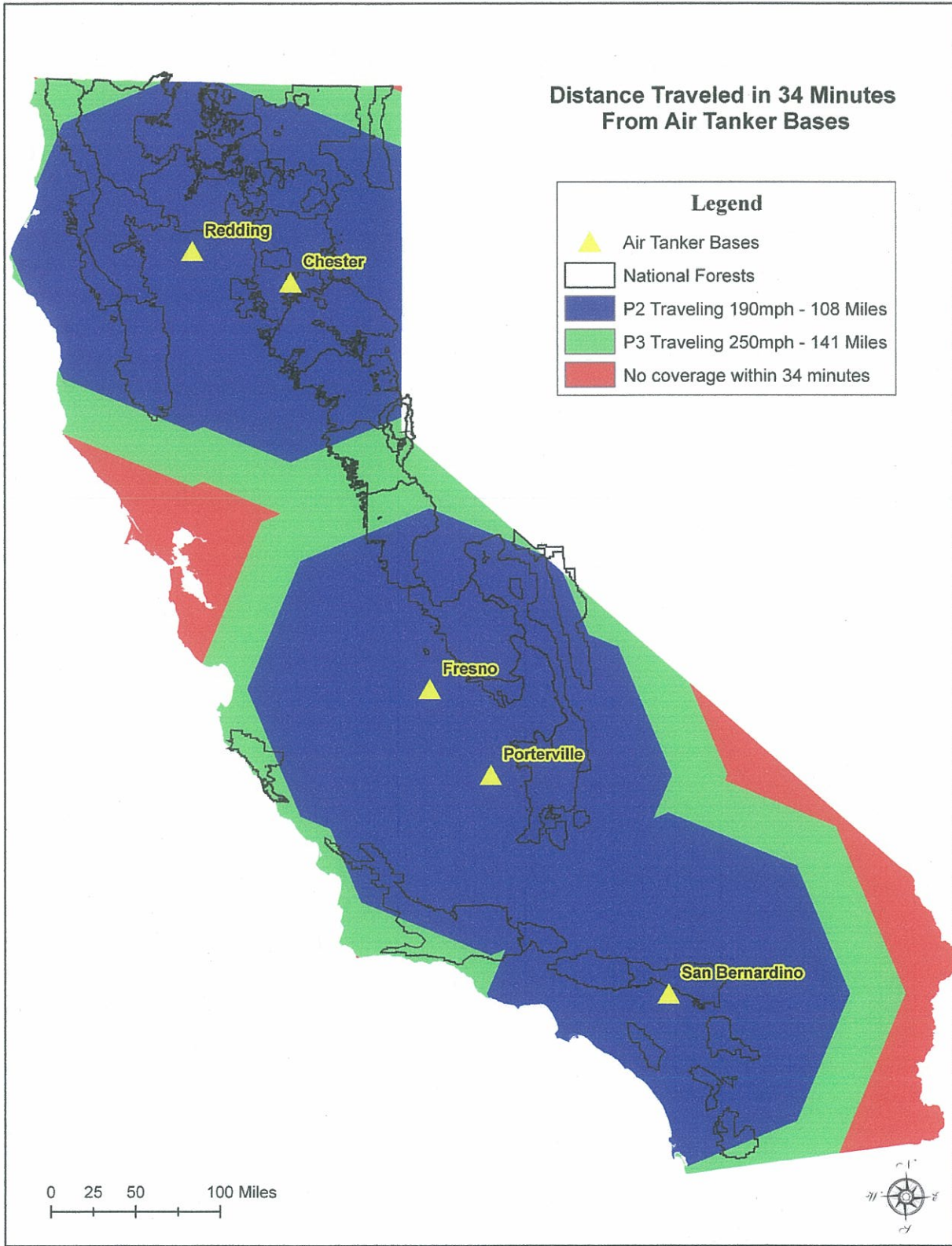


Figure 2. Coverage using a maximum 34 minute flight time from the five selected air tanker bases. This does not include response times for existing CDF Air Tanker Bases.