National Interagency Aviation Council (NIAC)

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Interagency Aviation Strategy

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NIAC Interagency Aviation Strategy

Introduction

The National Interagency Aviation Council has been assigned the task of developing an aviation strategy for the federal wildland fire agencies. This document presents a three part effort and displays a national strategy for the organization, procurement and management of aviation resources utilized in federal wildland firefighting. Recommendations to the Secretaries of Agriculture and Interior are provided that will ensure a safe, efficient and sustainable national aviation program.

Phase I of the comprehensive national strategy focuses on the acquisition and use of wildland fire aviation resources by federal wildland firefighting agencies, and was delivered to the Departments on August 15, 2006. Agencies involved in this effort include the United States Forest Service (USFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), National Park Service (NPS), United States Fish and Wildlife Service (FWS), National Business Center (NBC), Aviation Management Directorate (AMD) and the National Association of State Foresters (NASF).

Phase II focused on refinement of the initial broad strategy. It includes a more specific definition of the issues facing federal wildland firefighting agencies and recommendations to improve organization, procurement and management of aviation resources across all of the agencies. Recommendations developed during Phase II include: increased standardization of business practices, policies, and procedures; improved command and control systems; simplified contracting; and evaluation of the number, location and types of air tanker bases to be maintained in the future. Phase II was accepted by the National Fire and Aviation Executive Board in the summer of 2007.

Phase III of the effort focuses on guidance for development and deployment of agency implementation plans for the national strategy. Responsible agencies will further refine implementation guidance and develop detailed plans including funding as appropriate.

Phase I

Phase I defines the broad strategy that will guide the acquisition and use of aviation resources in supporting the wildland fire operations requirements of the federal wildland fire agencies for the next 15-20 years.

Subsequent phases of this strategy will identify organizational, procurement and management options, and a detailed implementation strategy.

Doctrine

The following is the doctrine that will guide the acquisition and management of aviation resources for wildland fire operations:

- Aviation resources are one of a number of tools available to accomplish fire related land management objectives. Their use has value only if that use serves to accomplish the mission.

- In order to maximize effectiveness and efficiency, aviation resources must be centrally controlled and de-centrally executed.

- Aviation resources very seldom work independently of ground based resources. When aviation and ground resources are jointly engaged, the effect must be complimentary and serve as a force multiplier.

- The effect of aviation resources on a fire is directly proportional to the speed at which the resource(s) can initially engage the fire, and the effective capacity of the aircraft. These factors are magnified by flexibility in prioritization, mobility, positioning and utilization of the versatility of many types of aircraft.

- Aviation use must be prioritized based on management objectives and probability of success.

- Risk management is a necessary requirement for the use of any aviation resource. That risk management process must include the risk to ground resources, and the risk of not performing the mission, as well as the risk to the aircrew.

Aviation Mission Requirements

Aviation performs services in support of the wildland fire management program. All of these missions can be performed by non-aviation assets. However, in many situations aviation provides the most effective, most efficient and safest method to complete the mission.

- Intelligence Gathering

This mission includes: fire detection, ongoing fire assessment, fuels assessment, resource location and placement and safety lookout.

- Supply Delivery

This includes delivery of food, water, pumps, hose, gas, etc. by helicopter and fixed wing.

- Personnel Movement

This includes helicopter movement of crews, overhead, helitack and rapellers, as well as smokejumpers from fixed wing.

- Suppressant/Retardant Delivery

Fixed wing (Large Airtankers (LATS)), Single Engine Airtankers (SEATS), water scoopers and helicopters can deliver water, water with foam or other water enhancers and water with retardant to the fire line. These products are intended to either extinguish the fire or retard fire growth.

- Command and Control

This mission utilizes Lead Planes, Aerial supervision Modules (ASM) and Air Tactical Group Supervisors (ATGS) to provide command and control of aerial resources assigned to the fire, as well as coordination and direction of ground forces engaged in suppression operations.

- Aerial Ignition

Using Plastic Sphere Dispensers (PSDs) or helitorches, helicopters conduct aerial ignitions in both suppression and prescribed fire operations.

Sources

The current federal fleet is a mix of government owned/government operated and vendor owned/vendor operated aircraft. This fleet is often supplemented by state operated aircraft.

There are relatively few government owned/government operated aircraft in the agency's fleet. These are most often special use aircraft such as smokejumper and lead planes. Having a small number of government owned aircraft aids contracting officers in contract negotiations with private vendors.

There are currently a few aircraft operated as vendor owned/government operated, and there are no government owned/vendor operated aircraft in the federal fleet.

Vendor owned and operated aircraft provide the bulk of the aviation resources. These are procured through a variety of contracting methods with the major categories being exclusive use and call when needed (CWN). Exclusive use aircraft are the base organization, with CWN being used for surge capability. Generally exclusive use aircraft contract availability and flight rates are less expensive than those for the same make/model CWN aircraft. The vendor fleet is provided by a variety of companies, ranging from a vendor with one aircraft to vendors that supply multiple aircraft. This situation makes contract administration, inspections, carding and monitoring of operations more labor and time intensive than contracting with one entity to provide all aircraft. The diversity of vendors does allow for more flexibility in acquiring aircraft that are a better fit for the geography, fire behavior, topography and length of season than would a single vendor.

Diversity of Aircraft Types

Diversity of the fleet means a mix of types of aircraft with specific mission strengths that provide a toolbox for fire managers to use with specific fire situations. Factors which determine with aviation resources are utilized on a particular fire include: speed, range, capacity, suitability for the terrain, operating altitude and suitability for the mission. The diversity model allows managers to apply the "right tool to the job."

- Large Airtankers (LATS), including C-130s equipped with Modular Airborne Fire Fighting Systems (MAFFS), have the advantage of speed and capacity to the target. Their range allows for rapid deployment over long distances enabling them to reinforce operations across geographic boundaries. They also deliver large amounts of water/retardant in one mission, often in locations where other options are unavailable.

- Single Engine Airtankers (SEATs) have the advantage of mobility and maneuverability. The infrastructure required to fuel and load SEATs is relatively minimal in terms of size and cost. This allows SEATs to operate close to the fire, shortening turn-around times and thereby increasing effectiveness. Due to their small size and aerodynamics, SEATs are capable of great accuracy in rough terrain.

- Water scoopers have the advantage of speed and capacity, when there are appropriate water sources close to the fire site.

- Smokejumper aircraft have the advantage of range, mobility and accuracy and are able to be easily positioned close to known or expected fire activity. They deliver firefighters and supplies quickly, especially to remote fires. Their mobility allows for rapid reinforcement of emerging fires.

- Helicopters have the advantage of large and sustained capacity for personnel and cargo movement. Helicopter delivery of firefighters, either helitack or rappellers, and supplies has the advantage of speed and accuracy. Helicopters have the versatility for multiple missions including personnel and cargo movement, command and control and aerial ignition operations.

- Helicopter delivery of water/retardant has the advantage of accuracy, speed and capacity if water resources are close to the fire site.

- Recon/Aerial Supervision aircraft have the advantage of speed, range, flight time and accuracy.

Diversity of Make/Model

In acquiring aircraft, through purchase and/or exclusive use contracting, diversity of make and model is critical. Allowing any single element of the aviation resource list to be dominated by one make and model of aircraft puts that entire element at danger of shutdown when and if an airworthiness issue is raised with that particular make and model of aircraft. Reliance on one make/model aircraft also limits the leverage the government has in managing contract costs with vendors. The maintenance, parts supply and other efficiencies that private enterprise might gain from operating on make and model of aircraft are unlikely to be achieved in a fleet of the size and composition of the one that wildland agencies manage.

Role of the Federal Government

Given the amount and distribution of federally managed land nationwide that is susceptible to wildland fires, and the need to efficiently move resources across state lines in response to actual and predicted fire occurrence, acquiring, organizing and managing aviation resources on a national basis under leadership of the federal government is the most effective and efficient method. A more thoughtful division of labor between the various agencies (Forest Service, BLM, BIA, NPS, FWS and DOI-National Business Center (NBC)) as well as State and Military partners in contracting, inspection, carding, administration and program management will result in greater efficiency for all agencies. An example of this efficiency is the current system whereby the Forest Service performs all these functions for large airtankers, and DOI performs all these functions for SEATs.

Role of State Governments

State governments are autonomous, and therefore will always be constrained to some degree by state policies, law and political realities that affect their ability to fully integrate with a national system. However, standardization of necessary interagency agreements, inspection procedures and requirements, pilot and aircraft requirements, funding arrangements and operational procedures will result in greater effectiveness and efficiency of state resources when a state is willing and able to make them available. Federal hurdles to maximum standardization must be quickly addressed and resolved to the extent possible.

Utilization of Aviation Resources

The nature of aviation resources (speed and mobility) makes local control of these resources a less than optimal model. Organizing under the doctrinal principle that aviation should be centrally controlled and decentrally executed will yield maximum flexibility, effectiveness and efficiency. A centrally controlled process relies on intelligence monitoring of the numbers and types of aircraft operating, the make-up of the surge capability, the observed fire occurrence and fire behavior, and the predicted fire occurrence in order to allocate resources on a reasoned priority basis. Once assigned to an area or incident, the tactical application of those resources will be decentrally executed. However, to maintain the flexibility necessary to respond to changes in the fire environment and related priorities, central control must have the ability to re-assign resources as necessary. Current command and control organizations (including dispatch systems), philosophy and procedures will be modified to maximize this efficiency.

Aviation resources are utilized on all types of incidents, from small two person smokejumper fires to mega-fires. As with all suppression resources, aviation resources have their most effect and are most efficient while engaged in initial attack (I.A.) operations. The effect of their speed to target and mobility is maximized in these IA operations. The cost/benefit ratio is much less clear when aircraft are engaged in extended attack and large fire operations. Current operating procedures allow these fires to order and receive essentially unlimited aviation resources until such time as few or no such resources are available. Few tools exist to adequately analyze those cost/benefit relationships. These relationships are further complicated by the different roles aircraft play on large incidents. Helicopters are used for both personnel/equipment movement and bucket work. Analyzing the trade-offs between moving personnel/equipment by ground versus air is relatively easy. Assessing the relative value of helicopter bucket work, LATs and SEAT retardant delivery is much more difficult. Analytic tools capable of focusing on this particular issue need to be developed.

Infrastructure

The infrastructure necessary to support any of the aviation elements must be included in any decision as to the numbers, location and utilization of that particular resource. Aviation resources that require significant capital investment, software, analysis and training to be fully functional are by nature less flexible than those that require little or no investment. Analysis of the optimum mix and number of aircraft will include these costs. Adopting the model that maximizes mobility and flexibility has a direct impact on the necessary infrastructure. In this model, air tanker bases and helibases become less permanent homes and more temporary filling stations that may not see an aviation resource for long portions of the fire season, if at all. Capital improvements and staffing will be designed based on this reality.

Emerging Technology

Opportunities exist to improve effectiveness and efficiency of aviation operations through aggressively pursuing new technology.

Unmanned Aviation Vehicles (UAVs) and systems hold potential for use in fire detection, perimeter mapping, fire behavior assessment and command and control operations. A unified interagency effort to define the needs, integrate with technology providers and evaluate proposals should be initiated as soon as possible.

The current system for evaluating and qualifying retardant/foam/water enhancers needs review. The current process to obtain certification for any particular product is viewed by some as unacceptably slow and cumbersome. Processes to evaluate and review new products must be simple, responsive and not redundant to studies done by other governmental agencies. The goal is to provide safe, effective chemicals for delivery from aerial platforms as soon as is practical.

Effective centralized control is predicated on timely and accurate intelligence. Current methods do a poor job of providing such intelligence. Knowledge of how many hours each aircraft is flying is central to the ability to prioritize use of each aircraft. Automated reporting of flight time is a necessary tool for both command and control and contract administration.

Additional improvements in automated load calculations for helicopters and automatic helicopter ordering tools are currently underway and need to be brought to fruition.

Summary

Aviation will remain a critical element of fire operations for the foreseeable future. When exercised within established doctrine, the use of aviation resources complements the actions of ground resources, multiplies the effect of those resources on the suppression action, provides a critical margin of safety and lowers total suppression costs.

Phase II

Phase II of the strategy provides recommendations to the Secretaries of Agriculture and Interior for the long-term strategic direction which will guide how federal aviation resources will be procured, operated, and managed over the next 15 to 20 years. This strategy will ensure a safe, efficient, and sustainable national aviation program. The strategy addresses the findings of the Blue Ribbon Panel and will assist the federal agencies, with assistance from their state/local partners, in successfully meeting the challenges of a rapidly changing wildland fire environment.

While these recommendations primarily focus on federal aviation assets, this phase of the effort includes strategies for better incorporating available state aviation assets into the national picture. Elements of the second phase of the comprehensive national strategy effort are presented in the following sections of this document.

This phase two document has been reviewed by the National Fire and Aviation Executive Board (NFAEB). Additional review was solicited and received from agency personnel and contractor/vendors represented at the initial workshop held in August, 2006.

Current Environment

Accumulation of wildland fuels, widespread drought, and measurable climatic changes have combined to increase the number and severity of wildfires occurring annually. Rapid population growth and infrastructural development in rural areas, and the associated risk to populations and property, have significantly increased the complexity of these wildfires. Costs for all suppression operations, including those that are aviation related, are accelerating rapidly due to operational tactics. Current models for the acquisition and management of aircraft, aircraft and pilot certification, command and control, aviation infrastructure management, and tactical utilization were all developed decades ago in a much different and more benign atmosphere then we currently face.

A number of positive developments have already occurred that will lead to some mitigation of several of these issues. Efforts to mitigate the challenges associated with the current operational environment are on-going. There has also been a shift in the overall approach to wildland fire suppression in realizing that there are a range of responses available to meet land management objectives (appropriate management response). For example, it is now recognized as a valid course of action to permit wildland fire ignitions to burn (termed Wildland Fire Use or WFU), within established parameters. WFU is an economical and effective means of reducing hazardous fuel loadings, as well as providing other resource management benefits.

Aviation Role in Wildland Fire Operations

Aviation resources are critically important to national wildland fire operations because they can be deployed rapidly and can fulfill a variety of mission requirements. Aviation resources are comprised of the aircraft, pilots, support personnel, and air attack bases utilized by federal and state firefighters and resource managers. Delivery of suppressants and retardants by large air tankers, single engine air tankers, water scoopers, and helicopters, and delivery of firefighters by fixed and rotor wing aircraft are essential tools for fire managers. Availability of a wide variety of aircraft types is indispensable to successful fire suppression in different terrain, fuels, and site conditions. Aircraft provide speed of delivery, capacity in terms of volume, and flexibility that cannot be matched by ground based suppression resources.

Aviation resources are currently performing exceptionally well during field operations despite the lack of standardized aviation business management practices among federal agencies. However, improvements are still needed to ensure a high level of performance in the future.

Aviation resources are available nationwide as a mix of different aircraft that may include large fixed-wing air tankers (LATs), smaller single engine fixed wing air tankers

(SEATs), large and small helicopters, smaller fixed wing aircraft, and smokejumper aircraft. The Government owns a relatively small number of aircraft that are predominantly smokejumper and lead plane type. The relative mix of these aircraft on any given fire will be determined by several factors including the type, location, and duration of incidents.

With the exception of LATs and SEATs, current practice is for each agency to contract its own aviation resources utilizing contracts that often limit the use of assets to a particular geographic area. The USFS manages procurement of LATs and the DOI manages procurement of the SEATs. Aircraft are procured using one of two forms of aircraft contracts. These are an Exclusive Use type contract in which the Government contracts for the aircraft and crew for a specified period of time with the exclusive use of the aircraft reserved for the Government. The other form of contract is termed a Call When Needed (CWN for the USFS) or Aircraft Rental Agreement (ARA for DOI) type contract that makes aircraft available to the Government at predetermined rates, if the aircraft is available for service.

Current Status

Air Tankers

The Incident Command System (ICS) identifies four types of air tankers, categorized by retardant/water capacity in gallons. Type 1 tankers have a minimum capacity of 3000 gallons, Type 2s have a minimum requirement of 1800 gallons, Type 3s have a minimum of 800 gallons and Type 4s have a minimum of 100 gallons. Type 1 and Type 2 air tankers are commonly referred to as Large Air Tankers (LATS). Currently available LATs include P-3s (Type 1) and P-2Vs (Type 2). Currently available Type 3 Air Tankers include CL-215s, CL-415s, S-2s and Air Tractor 802s. Currently available Type 4 Air Tankers include Air Tractor 602s, Thrushes and Dromaders.

Large Air Tankers

Large airtankers are addressed in Appendix 12.

Single Engine Air Tankers

SEATs represent a resource with increasing numbers available and in use. A diversity of aircraft are currently utilized in the SEAT role including the AT-802 (Type 3), and the AT-602, Turbine Thrush, and Dromader, all Type 4 air tankers. Significant growth in SEAT use has occurred since 2002 and the present number of these aircraft is expected to remain relatively constant for the foreseeable future. In general, turbine SEATs with the highest load capacity are preferred The AT-802 aircraft is certificated as an air tanker. Other SEATs do not currently hold certificates for the air tanker role.

Helicopters

Helicopters have historically been available in sufficient numbers in all type classes used for aerial firefighting. However, in 2006 availability of CWN/ARA Type 1 and Type 2 helicopters decreased due to a number of factors, including availability of long-term contracts with the logging and oil/gas industries that reduced the number of available aircraft for firefighting assignments. It is difficult to predict whether this decreased availability in the CWN/ARA fleet will persist, increase, or decrease.

The helicopter industry continuously improves and updates helicopter designs. Combined with their widespread use for other applications, there has been an adequate supply of sufficiently modern helicopters available for use in the aerial firefighting fleet. The utility of helicopters for fire suppression and other wildfire missions is well documented. When water is available nearby, Type 1 helicopters can place more suppressant/retardant onto a wildfire quicker and with greater accuracy than any other type of aircraft. Type 1 helicopters are exceptionally effective in support of large fire operations and they are more easily used at local, temporary air attack bases than LATs.

Aerial Supervision Aircraft

Aerial supervision aircraft are currently meeting their mission requirements. There are adequate numbers of suitable aircraft available for both Exclusive Use and CWN/ARA contracts. Preliminary efforts are underway to assess any potential airworthiness issues with this type of aircraft.

Smokejumper Aircraft

Current smokejumper aircraft are adequate in type and numbers, and are currently well maintained. These aircraft fit the smokejumper mission as designed. Preliminary efforts are underway to assess any potential airworthiness issues with this type of aircraft.

Aircraft Type and Fleet Composition

The current federal aircraft fleet is appropriate in terms of numbers and types of aircraft with the exception of suppressant/retardant delivery systems. The total suppressant/retardant delivery capability has decreased by approximately 10% since the end of the 2002 fire season. This includes a decrease in the Exclusive Use fleet of approximately 29% and an increase in the CWN/ARA fleet of approximately 10% (largely due to a significant increase in the number of available 800 gallon SEATs). The increased reliance on helicopters and SEATs has some benefits including greater accuracy and quicker turn around times assuming these resources are located close to the fire site. However, the reduced availability of LATs decreases the ability to quickly respond to fires located over 75 miles from a SEAT or helicopter location, and also reduces the overall capacity to build/support fire line in heavy fuels and closed canopy fires.

In addition to federally acquired aircraft, many states own and operate aircraft assets. Despite improvement in some geographic areas, there are often multiple USFS regional and AMD processes required to assess and certify state owned aircraft, state operated aircraft, and state flight crews. States have difficulty finding a single point of contact that can clarify these issues and effect solutions.

Future Environment

Over the next two decades we expect to see a general increase in fire occurrence, size, and severity. These wildland fires will be more complex, with more fuels, and present a higher risk to the public and firefighters. This increase is largely due to historic accumulations of fuel, apparent trends in weather patterns, and increasing human development in fire-prone wildlands. This last source, increasing human development, has already converged with weather patterns to result in many more fires having to be fought at the wildland-urban interface.

Role of Aviation in Wildland Fire Suppression

Aviation, as a supporting function, will continue to be a critical element of safe, effective, and efficient fire suppression operations. No other available resource type has the range, speed, or capacity that aviation provides.

Method of Accomplishment

An overarching goal of this strategy is to have the national aerial firefighting community, including all participating agencies and industry, work together more seamlessly and therefore more efficiently. The following subsections of this document describe specific changes in policies, procedures, and fleet composition that are necessary to yield this more efficient aviation component of interagency wildland fire suppression operations.

Policy and Procedures Standardization

A major first step will be better coordination, to the maximum extent possible, across federal and state agencies to promote interoperability of administrative and contracting systems. A standardized process between USFS and DOI-AMD regarding the assessment, carding, approvals, and payment for state and vendor owned/operated resources is required as a means of furthering this coordination. Policies and procedures are the foundation upon which safe and effective wildland firefighting operations are achieved. However, higher levels of safety and efficiency could be achieved through integration and standardization of USFS, DOI, and state policies and procedures related to utilization of aviation resources.

Authorization for the use of state-owned aviation resources by federal agencies needs to be consistent regardless of the particular federal agency responding to a fire or the geographic location of the fire. Rules for operating in the fire environment should be the same for both federal-owned and state-owned aviation resources. Under current procedures, less stringent approval and maintenance standards are sometimes applied to state-owned assets on federal land in cases where the assets remain under state control. However, if control of the same state-owned assets is transferred to a federal agency, more stringent standards may be applied. Policies and procedures regarding pilot training, minimum pilot qualifications, and aircraft field inspection requirements also should be integrated and standardized where possible.

In order to address policy and procedure inconsistencies, state and federal agencies will work together to review current standards and requirements, define critical elements, and identify opportunities to begin aligning state and federal standards. The long-term goal of this effort will be to work toward development of a single national standard for interagency aviation policies which can be implemented over time in conjunction with federal and state budget cycles.

Continued emphasis on the use of a national level organization like the National Interagency Aviation Council to facilitate policy and procedure standardization across federal/state lines is critical to achieving maximum state/federal integration. Other means to improve coordination lie in the acceptance of the recommendations that are presented within this strategic plan, the development and communication of common standards, and standardization of aircraft and pilot/aircrew technical requirements.

Command and Control

In order to maximize the effectiveness and efficiency of the entire aviation component of the national wildland fire suppression force, command and control responsibility will be re-defined at the local, geographic, and national levels. Geographic Coordination Centers, working under the direction of the Geographic Area Coordinating Groups, must have the authority to allocate all federal aviation resources within their geographic area, based on established Area and National priorities. Similarly, the National Interagency Coordination Center, working under the direction of the National Multiagency Coordinating Group must have the same authority at the national level. Declaring all federal aviation resources as “national” resources and therefore ensuring their maximum allocation to priority fires is a critical first step. Improvements are also needed in the intelligence system to heighten the reliability and timeliness of aircraft locations and status information. This will aid in more accurate and appropriate setting of priorities and resource allocation.

The Incident Command System continues to be an effective process for the integration and management of all dispatched resources (including aviation) during wildfire suppression regardless of the particular affiliation of the assets (i.e., USFS, DOI, contracted). Change to the “on incident” command and control model is neither needed, nor contemplated.

Contracting

There are a number of administrative or contracting support changes that will lead to the achievement of maximum effectiveness, flexibility, and cost efficiency. The first of these will involve procurement standardization among federal agencies to increase transparency among systems. This standardization effort might be extended to include the states provided that they elect to participate. Longer duration contracts, possibly of an interagency nature, that include moving aircraft from locations in the “south” to locations in the “north” as the fire season progresses will have both financial and operational advantages. Although the geographic movement of aircraft does currently occur in some instances, expansion and better coordination will result in greater benefits. Current practices do not adequately integrate aircraft procurement with the concept that aircraft are a national asset. Second, a desirable change will be to have one standard interagency helicopter contract, and one standard interagency small fixed wing contract. This improvement would simplify acquisition of these assets, reduce administrative costs, and reduce confusion and inefficiency in the field.

Third, specific strategic improvements include the elimination of helicopter acquisition by type. A shift to specifying aircraft performance requirements into comprehensive national contracts will provide advantages to the Government. The expected results of using national contracts are utilization of the proposed helicopter performance dispatch tool at all dispatch organizations. This program will result in greater alignment of environmental requirements, aircraft performance capability, and cost efficiency. Standard contract specifications, which would be more outcome based and less prescriptive, will place greater responsibility on aircraft vendors.

Fourth, changes in contracting for aircraft will produce a balance between safety and cost effectiveness. Other changes will involve teaming with private industry to pursue alternatives to full reliance upon the CWN/ARA program as the sole contingency fleet. One example of this will be a modified pricing structure where hourly guarantees are awarded, but the aircraft would not be exclusively used by the Government during the term of a vendor’s contract.

Contracting of aviation resources from vendors by the USFS and DOI is generally accomplished through Exclusive Use or CWN/ARA contracts. However, each agency implements its own contracting vehicles that vary in type, language, and format depending upon the type of aviation resource being procured. Both Exclusive Use and CWN/ARA contracts have historically presented problems to vendors because the number and types of aviation resources requested by the USFS and DOI change each time a new contract is awarded. Therefore, vendors cannot make capital investments in new aircraft with the assurance that they will be required and utilized under future contracts.

Furthermore, CWN/ARA contracts are problematic because the agencies do not guarantee vendors a specific number of aircraft or operating hours to be utilized during a given fire season. Based on this situation, a vendor with a CWN/ARA contract will deploy an asset for other business use (for example logging operations) if it has not been ordered for firefighting, or may deploy an asset for other business use in situations where a higher price can be obtained compared to that approved under the CWN/ARA contract.

This scenario has resulted in a reduced number of CWN/ARA aviation resources being available for firefighting when needed.

Agencies have not developed acquisition models that address the short-term and long-term needs for the contracting of aircraft and purchase of suppressants/retardants. Agencies also do not reward vendors for value engineering improvements, attainment of contract performance metrics, or improvement of operational safety. Acquisition strategies need to be developed with the understanding that vendors cannot support aviation firefighting for significantly less cost than that incurred by the Government for the same effort.

In order to improve acquisition efficiency and effectiveness, we will accomplish the following:

- Develop a single interagency contracting approach for acquisition of aviation resources and suppressants/retardants that employs the use of national contracts.

- Develop a national acquisition model that defines short-term and long-term aviation resource needs for all aircraft types.

- Award +10 year contracts for acquisition of vendor-owned aviation resources.

- Develop hybrid contracts that incorporate the elements of both Exclusive Use and CWN/ARA contract vehicles.

- Include incentives within vendor contracts for value engineering improvements, attainment of contract performance metrics, improvement of operational safety, and acceptable past performance.

Aviation Resources

Type 3 Air Tankers

Type 3 Air Tankers such as CL-215s, CL-415s and Air Tractor 802s will continue to be utilized where available and appropriate. Air Tractor is reportedly interested in developing an AT-1002, but at this time information on performance, price, and development and delivery timeframes is not available. Tactically the mix of CL-215/415s and the larger SEATs that currently exist are satisfying the requirements of fire operations personnel. While improvements in the number and models of Type 3 Tankers would be a positive step; Type 3 Tankers cannot replace the advantages of the capacity, speed and range of Type 1 and Type 2 Tankers.

Single Engine Air Tankers

The SEAT fleet, including the Type 3 Air Tractor 802, is seen as adequate for the needs of the next two decades. Currently, most vendors are moving to larger capacity, turbine driven SEATs, and this is supported by the users in the field. The major improvements available in the SEAT program are continued training of operational personnel in the appropriate use of SEATs, and in decoupling the SEAT support truck component from the current contract. When and if, a SEAT manufacturer produces a larger capacity aircraft, that aircraft will also be evaluated for fire suppression operational effectiveness and cost.

Smokejumper Aircraft

While the current smokejumper fleet is considered to be adequate for the foreseeable future, consideration should be given to evaluating future platforms. The interagency Smokejumper Aircraft Screening and Evaluation Board (SASEB), continues this evaluation, examining potential future platforms for safety and mission effectiveness. As the current fleet ages, efforts are underway to identify, evaluate, and contract for newer smokejumper aircraft. Part of the evaluation will be an assessment of the size and speed characteristics needed to fulfill the smokejumper mission.

Aerial Supervision Aircraft

An equipment replacement program is underway by the USFS and is expected to refresh their fleet over a five-year period. Adequate numbers of appropriate aircraft are expected to be available for the next 15 to 20 years to fulfill Exclusive Use and CWN/ARA needs. This includes detection and reconnaissance aircraft. No significant changes in types are currently identified.

Helicopters

Adequate numbers of helicopters of appropriate capability are anticipated to be available in the next 15-20 years with the possible exceptions of Type 1, and to a lesser extent, Type 2 helicopters. Non-fire operations market demand for this type of helicopter is foreseen to continue and thus may limit the availability of these aircraft under CWN/ARA type agreements. Vendors for these types of helicopters have not significantly reduced their participation in the CWN contract program. However, their availability when called under the CWN contract is expected to be reduced because long-term contracts in the oil and gas, logging, and other industries are available.

Federal Excess Property Program (FEPP)

States will continue to have access to FEPP aircraft, when available. FEPP aircraft can provide a fundamental initial attack capability to states, and support for large fires as well. Guidance and assistance in the management of the state agency aviation program will be provided when requested.

Aviation Support Infrastructure

Acquisition of larger LATs (i.e., 747, DC-10 and others) may not be supportable by some existing Air Tanker Bases (ATBs). If these types of aircraft become part of the fleet, their support needs will need to be addressed in their contracts. The current number, location, and types of ATBs will be evaluated and adjusted after the long-term plan for LATs acquisition is finalized, including numbers and types of LATS.

The need for support infrastructure for other types of aircraft such as SEATs, helicopters and Aerial Supervision Aircraft will be consolidated with that needed for LATs. This effort will yield the total number, location and type of combined air operations infrastructure necessary to support the proposed fleet.

A critical element to be addressed is the continued development of adequate numbers of qualified aviation managers, pilots and aircrews necessary to manage the future fleet and its operations.

Suppressants/Retardants

Suppressants/retardants are an important element of wildland firefighting because the extinguishing capabilities of these products are greater than that of water alone. New suppressants/retardants proposed for firefighting use must undergo testing to evaluate toxicity, corrosion, stability, and other factors for potential impacts on the environment, equipment, and personnel upon which the product is used, and overall effectiveness in the fire environment.

A single USFS entity is responsible for the testing of new suppressants/retardants and for issuing approval for use. At the present time, laboratory testing of new suppressants/retardants must be completed before they are approved for field testing and subsequent long-term use. Reasonable adjustments in evaluation process and criteria may compress timeframes necessary to make new products available to the field.
In order to address the suppressant/retardant issues discussed above, the following improvements are recommended:

- Identify interagency test and evaluation requirements that are specific to the aircraft type and mission profile.

- Perform laboratory and field testing of each new product concurrently; where and when appropriate, followed by approval or disapproval of the product for long-term use.

- Provide agencies with autonomy to decide which products to use for a given fire.

- Identify personnel that require training regarding the preparation and use of products to ensure proper and effective use.

- Develop and issue manufacturer technical data packages to field personnel regarding the use of each product.

Emerging Technology

New technology related to avionics, data gathering, and data synthesis continues to be developed by manufacturers and offered to the general aviation community. However, these technological advances tend to be designed for non-fire environment applications and in many cases increase rather than decrease pilot workload in single pilot systems. Furthermore, the process for approval of new technology for use in the wildfire environment varies between federal and state agencies.

In order to improve the approval and use of new technology in the wildfire environment, the following is recommended:

- Develop a comprehensive interagency process for approval of new technology for use in aviation resources.
- Standardize the use of current and newly approved technology across the aviation firefighting community.
- Develop an approach to more effectively share vendor technical services between the USFS and DOI.
- Ensure that integration of new technology does not increase the complexity of operations.
- Continue to evaluate the usefulness of remote sensing technology and unmanned aerial systems in the wildfire environment.

Phase III

Phase III include specific reports by each aviation program area and an aviation management section. The intent is to provide a strategy that directs the course to the future but does not lock down every specific detail. It is the first consolidated look at federal and state aviation programs. While there are some distinctions between federal programs, all the federal resources are shown as one total in terms of numbers and costs. Where possible, NIAC has derived information from recent aviation program studies or work accomplished as part of the Forest Service aviation feasibility studies. If detailed analysis is not available, simple demand analysis or current program totals have been utilized.

Costs are derived from agency program sources and cost estimation software (Conklin & de Decker Aviation Information). All costs are displayed in 2007 dollars. As agencies develop implementation plans, more detailed cost analysis and further consideration of program workload adjustments may be necessary to achieve optimized savings and efficiency. Agencies may determine more cost effective ways to implement changes than this report currently reflects. Timing of implementation may also adjust. As implementation plans are developed, NIAC's role as this report moves forward is to provide oversight and coordination as agencies move into implementation planning. NIAC is responsible for tracking progress and results.

Phase III addresses the following:

- Number of aircraft needed by type (Single Engine Air Tankers, Smokejumper Aircraft, Aerial Supervision Aircraft, Helicopters)
- Annual funding requirements for the identified fleet
- Numbers of Large Air Tanker Bases necessary to support the identified fleet
- Design and rollout of command and control model
- Design and rollout of coordinated acquisition plan
- Coordinated pilot and aircraft inspection and certification process
- Timelines for implementation of changes in the specific aviation program
- Parties/agencies responsible for specific implementation items
- Performance measures that will allow evaluation of this strategy's effect on efficiency and effectiveness

Although the strategy is primarily focused on federal agencies, coordination with state aviation programs is on-going, as their support significantly contributes to the ability of federal wildland firefighting agencies to successfully suppress wildfires. This coordination is demonstrated through joint programs, joint contracts and seamless mobilization of resources. Continued emphasis by Geographic Area Coordinating groups will help ensure the future success of these programs where they are possible and make sense. Because program functions may move from state to federal responsibility (or vise versa), transitions should be planned to minimize impacts to operational effectiveness.

New technologies present new opportunities for the agencies. It is important to continue emphasis on developing a comprehensive interagency process for approval of new technology for use in aviation resources. Agencies must also standardize the use of current and newly approved technology across the aviation firefighting community. Additional benefits can be gained by developing an approach to more effectively share vendor technical services between the USFS and DOI. Agencies must ensure that integration of any new technology does not increase the complexity of operations.

Over the next two decades a general increase in fire occurrence, size and severity is expected. These wildland fires will be more complex and present higher risks to the public and firefighters. This increase is largely due to historic accumulations of fuel, apparent trends in climate and weather patterns and increasing human development in fire-prone wildlands. Increasing human development has already converged with weather patterns, resulting in many more fires in the wildland-urban interface. While aviation is just one part of the response to wildland fire, a robust aviation capability is essential to meet this challenge. This strategy focuses on increasing helitack module size, establishing a national air attack program, adjusting the Aerial Supervision Module program from lease-based to government-owned and re-energizing the Infrared program. Other functional aviation programs show modest increases or essentially flat programs over time. All programs require intensive, and in some cases centralized management in to provide a safe and effective result.

Initial attack will remain the priority use for aviation resources. However, support to large fire operations will be common.

Aircraft that can perform multiple missions (retardant delivery, smokejumping, passenger transport) should be given strong consideration when purchasing new aircraft. These multi-purpose aircraft can increase efficiency and lower cost by eliminating the need for separate platforms.

Generally, contracting aviation resources on an exclusive use basis will result in greater savings than acquiring on a call-when-needed basis. This is because the vendor has a guarantee of work and a defined period of time over which to amortize costs under exclusive use contracts. In some cases, money is saved by having the government own aircraft. This can be evaluated by the OMB Exhibit 300, Capital Asset Plan and Business Case process or other analysis tools.

The following table summarizes the aviation program numbers and associated estimated costs for the next 10 years.

Table 1: FEDERAL FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY-NO CWN

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Airtankers*	19	19	21	22	23	24	25	26	27	30	32
Water Scooper	2	3	3	3	3	3	3	3	3	3	3
SEAT	21	21	27	28	34	35	35	35	35	35	35
ASM	15	17	20	20	20	20	20	20	20	20	20
ATGS	20	20	22	22	23	23	24	24	25	25	25
Smokejumper	19	19	19	19	19	19	19	19	19	19	19
Helicopter T1	34	34	34	34	34	34	34	34	34	34	34
Helicopter T2	42	44	45	46	47	47	47	47	47	47	47
Helicopter T3	100	101	100	100	100	100	100	100	100	100	100
Infra-Red	2	2	2	2	2						
Large Transport	1	1	1	1	1						
Total Aircraft/YR	272	278	291	294	303	302	304	305	307	310	312

*****The number of LAT's includes residual aircraft currently in the fleet and the procurement of new aircraft. These numbers are estimated based on expected retirements of current aircraft.

Fire related aviation resources are a small niche in the overall commercial aviation community. While it is a critical need for wildland fire agencies, we often compete against other work opportunities available to aviation contractors. Wildland fire aviation programs are typically costly. Recognizing the characteristics of fire and aviation management budgets, it may not be possible to completely implement these recommendations in the suggested timeframes. NIAC has the following recommendations:

- Priority should be given to the aerial supervision module where it is known there are operational and economic benefits will be realized over time.

- Priority considerations are aviation programs that perform operations in the wildland urban interface. Helicopters, fixed wing aircraft that deliver retardants and aircraft that deliver firefighters are integral to these operations.

- Secondary priorities include the air attack program which will feed the aerial supervision program, infrared for decision support and large transport for delivery of crews and incident management teams.

- Evaluation of tradeoffs across the Fire and Aviation Management program can be guided by continuing to mature the National Wildland Fire Enterprise Architecture. This can allow for a balanced view of all program areas and determination of priority across those programs.

Specific Reports

Single Engine Air Tanker (SEAT)

The Single Engine Air Tanker (SEAT) program is lead by the Bureau of Land Management and supported by other federal and state agencies. It was first developed to meet the demand for rapid retardant and suppressant delivery at the local level. The capability began as agricultural aircraft were temporarily reconfigured for fire suppression and pressed into action on a rental agreement. Today, the program's high level of sophistication is evidenced by high performance, purpose-built aircraft, organized government and industry requirements and policy with dedicated funding and acquisition. Several states also contract for SEAT capability.

Recommended Aircraft Numbers and Cost:
Secure a core federal fleet of **35 SEAT** aircraft annually for 90 day periods.

Aircraft	Personnel	Total/Yr
35 Aircraft @ 90 days X $2500/day = **$7,875,000**	**35 SEAT Mgrs** @ GS-7/5 X $4726 mo X 6 mo = **$992,460**	**$8,867,460**

Recommended Target Aircraft Characteristics:
Target aircraft characteristics include single engine, turboprop, 165-200 mph cruise speed, 700-1000 gallon capacity with constant flow tanking/gating systems. Emphasis will be to acquire purpose-built aircraft with FAA certification for firefighting (currently, the Air Tractor 802 is the only make/model SEAT with such certification).

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with the Department of the Interior. Exclusive use contracts or "variable term contracts" (30, 60 or 90 day guarantee) will be utilized to secure the core SEAT fleet. A Call-When-Needed (CWN) contract will be maintained with all approved vendors/aircraft to provide spontaneous acquisition on a daily basis with no guarantee.

Water Scooping Aircraft

Water scooping aircraft (CL-215 & CL-415) are purpose-built aircraft that provide impressive fire suppression capabilities when proximity to suitable water sources enables quick turnarounds. Alaska, Canada and the Great Lakes region have proven to be viable areas for long term procurement and use of scoopers. In addition, successful applications have occurred in select locations in the mountain west. Currently, the BLM has contracts for two CL-215s in Alaska, Minnesota DNR operates two, and the BIA and North Carolina operate one.

Recommended Aircraft Numbers and Cost:

Aircraft	Personnel	Total/Yr
3 Aircraft @ 90 days X $8000/day/aircraft = **$2,160,000**	**2 Scooper Mgr** @ GS-7/5 X $4726 mo X 6 mo = **$56,712**	**$2,216,712**

Recommended Target Aircraft Characteristics:

CL-215 models provide adequate performance at the lower elevations and where topography doesn't require steep, prolonged climb-outs. The CL-215 cruises at 140 knots, has a capacity of 1200 gallons, two tanks and two doors. The CL-415 is a higher performing turbine version in current production. The CL-415 cruises at 170 knots, has a capacity of 1400 gallons, 4 tanks and four doors. As more CL-415 models and CL-215 turbine conversions become available, they will be targeted for acquisition.

Recommended Acquisition Methods:

Federal acquisition responsibilities shall remain with the Department of the Interior. A Call-When-Needed (CWN) contract is in place with limited CL-215 aircraft available. State and Canadian aircraft are potentially available as cooperators. Currently, only one American company has airplanes. BLM exclusive use contracts in Alaska are preferred to ensure availability and provide Lower-48 service on late season contract extensions.

Notes:

Type 1 and 2 Helicopters

The Type 1 and Type 2 helicopter programs are managed by all federal agencies to varying degrees. Each has the opportunity to contract for these services and does so as needed. The program was first developed to meet the demand for delivery of firefighters, equipment, retardant and suppressants to initial attack and escaped fires. Today, the program is characterized by a high level of competition for the helicopters and an increasing reliance on exclusive use services by some agencies. Total helicopter module staffing and cost is not reflected in the totals for Type 2 helicopters in the table below. Many states also have robust helicopter programs.

Recommended Aircraft Numbers and Cost:

Maintain a core federal fleet (interagency) of **34 type 1 and 47 type 2 helicopters** on an exclusive use basis. Demand above what this capability will deliver will continue to be delivered by call-when-needed resources. Over time, the goal for staffing helicopters is to increase the number of helitack to an interagency standard of 15. This allows for 7 day coverage of 10 firefighters per ship. The Forest Service intends to have all type 2 helicopters rappel capable. Interior agencies do not have that same requirement at this time.

Aircraft	Personnel	$ Total/Yr
34 type 1 helicopters @ either $15,000/day or $13,000/day	**Management Staff 2 GS-9 $244,892/YR**	**$64,763,166**
47 type 2 helicopters@ $4,000/day	**Management Staff 2 GS-9 $244,892/YR (Complete module costs in appendix.)**	**$40,019,848**

Recommended Target Aircraft Characteristics:

Type I helicopters will be a mix of models meeting or exceeding a target lifting capability of 6500 pounds at 8000' elevation and 25 degrees C. Target lifting capability for Type 2 helicopters will be 2000 pounds at 7000' elevation and 20 degrees C.

Recommended Acquisition Methods:

Federal acquisition responsibilities shall remain with Department of Interior and US Forest Service. The Forest Service OMB Exhibit 300, Capital Asset Plan and Business Case study will determine the appropriate operating mode (Contractor owned/operated, government owned/contractor operated, etc.) That outcome will affect annual operating costs. Exclusive use contracts (60, 90, 120, 150, 180 day guarantee) may be utilized to secure the core fleet. A Call-When-Needed (CWN) contract will be maintained with all approved vendors/aircraft to provide spontaneous acquisition on a daily basis with no guarantee.

Notes: Many of the positions are currently funded.

Type 3 Helicopters

The type 3 helicopter programs are managed by all federal agencies to varying degrees. Each agency usually contracts for these services. The program was first developed to meet the demand for delivery of firefighters, equipment, retardant and suppressants to initial attack and escaped fires. Today, the program is characterized as successful in meeting primarily local needs for initial attack. Many states also have robust helicopter programs. Total helicopter module staffing and cost are not reflected in the totals in the table below.

***Recommended Aircraft Numbers and Cost*:**
Maintain a core federal fleet (interagency) of **100 type 3 helicopters** on an exclusive use basis. Demand above what this capability will deliver will continue to be delivered by call-when-needed resources.

Aircraft	Personnel	$ Total/Yr
100 type 3 helicopters @ $3,000/day on 100 day contracts	**Management Staff** **2 GS-9 $244,892/YR**	**$54,489,200**

Recommended Target Aircraft Characteristics:
Target lifting capability for Type 3 helicopters will be 1000 pounds at 5000' elevation and 30 degrees C.

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with the Department of the Interior and US Forest Service. The Forest Service OMB Exhibit 300, Capital Asset Plan and Business Case study will determine the appropriate operating mode (Contractor owned/operated, government owned/contractor operated, etc.) That outcome will affect annual operating costs. Exclusive use contracts (60, 90, 120, 150, 180 day guarantee) may be utilized to secure the core fleet. A Call-When-Needed (CWN) contract will be maintained with all approved vendors/aircraft to provide spontaneous acquisition on a daily basis with no guarantee.

Notes:
Many of the positions are currently funded.

Smokejumper Aircraft

The Bureau of Land Management and the US Forest Service manage the Smokejumper program. It was first developed to meet the demand for initial attack capability in remote areas. Mission capability continues to evolve as new requirements are identified. Today, the program's aircraft is a mix of agency owned and operated and contractor owned and operated. Smokejumper personnel costs to staff the aircraft are not reflected in the table below.

***Recommended Aircraft Numbers and Cost**:*
Maintain a core federal fleet of **19 smokejumper** aircraft annually. The Forest Service plans to phase out the C-23A aircraft and replace them with a combination of large and small multipurpose platforms.

Aircraft	Personnel	Total/Yr
Gov-Owned: **3 ea DHC-6 $394,000/yr** **2 ea DC-3 $415,750/yr** **4 ea C-23A $667,600/yr**	**Pilots**: **15 pilots GS-12/5 @ $100,000 = $1,500,000**	**$2,977,350**
Contracted: **3 ea DO-228 $1,191,000/yr** **4 ea C-212 $1,354,882/yr** **3 ea DHC-6 $854,956/yr**	**(Flight crew costs included in aircraft contract costs)**	**$3,400,838**
19 Total Aircraft		**$6,378,188**

Recommended Target Aircraft Characteristics:
All smokejumper aircraft must meet criteria established by the interagency Smokejumper Aircraft Screening and Evaluation Board (SASEB). Criteria include: appropriate slow speed handling characteristics, exit door size and configuration and interior seating configuration, etc.

Considerations:
The acquisition of a single aircraft model that is capable of meeting multiple missions including smoke jumping, retardant delivery or passenger transport would increase cost effective capability.

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with the US Forest Service and the Department of the Interior. The Forest Service OMB Exhibit 300, Capital Asset Plan and Business Case study will determine the appropriate operating mode (Contractor owned/operated, government owned/contractor operated, etc.) That outcome will affect annual operating costs. Exclusive use contracts of various lengths (90-120-180 day guarantee) will be utilized if appropriate.

Notes:
1) Smokejumper fleet totals need to be continually monitored to ensure that aircraft capability meets total smokejumper numbers and deployment efficiency. Occasionally, CWN smokejumper aircraft are procured.

2) Some SMJ pilot salary costs listed above are included in aircraft Fixed Operating Rate (FOR) costs.

3) The C-27J aircraft should be given strong consideration for the smokejumper role and is a multi purpose platform.

Infrared Capability

The infrared program is managed by the US Forest Service. It was first developed to improve incident operations planning by detecting heat sources. Program components include aircraft, personnel and associated resources involved with Infrared (IR) imaging, photo imaging and fire mapping technology and communications used to identify and manage fires using aviation resources. Currently, the Forest Service operates two government owned fixed wing aircraft – a turbofan Citation jet and a turboprop King Air 200 – each equipped with line scanners to accomplish this mission. The turbofan is the most cost effective platform for dispatches in excess of 300 miles while the turboprop is most effective for shorter range requirements. Two government-owned, contractor operated helicopter platforms (Firewatch) deliver infrared support to local tactical operations.

It is expected that improvements and change will occur frequently in IR systems over the next ten years. Partnerships with NASA and DOD will allow the agencies to evaluate the usefulness of remote sensing technologies and unmanned aerial systems in the wildfire environment. On-going utilization of these additional sources for surge capability is expected.

***Recommended Aircraft Numbers and Cost*:**
Maintain the current core federal fleet of **2 infrared** aircraft annually for the next 5 years. Supplement as needed with call-when-needed infrared sources. During this period, evaluation of systems for inclusion into the air attack and ASM platforms will be determined. If that proves viable, sunset the current program and transition to using air attack and ASM platforms for this mission.

Continued monitoring of improving technologies in sensors and platforms is recommended.

Aircraft	Personnel	Total/Yr
2008 - 2012: Maintain the current government owned IR fleet of one turbofan and one turboprop aircraft. Additional demand met with contract resources.	**Government pilot's salary costs are contained within yearly FOR costs (GS-12/5). IR technicians (3 personnel) cost at GS-12/5.**	**Aircraft costs - Turbofan: $353,000/yr. Turboprop: $166,000/yr. 3 IR techs: $300,000/yr $819,000**
2013– 2018: Evaluate potential transition to utilizing air attack and ASM platforms for this mission.		
Establish IR program Manager and provide	**Leader - Program -**	**$120,000/year $150,000/year**

funding for program research and development		**$270,000**
Upgrade line scanners and provide for communications (Sat COM) to deliver final product directly to end user.	**Scanners -** **Sat COM's –**	**$1,500,000 ea.** **$250,000 ea.**
2 Aircraft		**$4,589,000**

Recommended Target Aircraft Characteristics:
Target aircraft characteristics include a cruise speed of 350 - 400 knots. Payload capacity must be sufficient to accommodate current line scan technology and operator, and be capable of supporting new technology. Aircraft must be pressurized and all-weather capable.

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with US Forest Service.

Air Tactical Group Supervisor Aircraft

The Air Tactical program is characterized by a highly mobile fleet and a nationally managed program can meet the increasing need for rapid and wide ranging response for aerial supervision and intelligence gathering missions for all Bureaus and the USFS. Currently, a significant portion of Air Tactical Group Supervisor (ATGS) missions are conducted utilizing Call When Needed (CWN) aircraft with an Administrative Determined (AD) employee. This model incurs a greater cost to the government and reduces mission effectiveness.

***Recommended Aircraft Numbers and Cost*:**
Secure a core federal fleet of **25 Exclusive Use Air Attack** aircraft annually for 180-day periods and 25 Permanent Full-Time (PFT) federal ATGSs.

Current Average Aircraft Cost
Call When Needed Aircraft= $2100/day availability **Exclusive Use Contracted Aircraft = $900/day availability**

Proposed Program Numbers and Cost		
Aircraft	**Personnel**	**Total/Yr**
25 Aircraft @ 180 days X $1000/day = **$4,500,000**	**25ATGS** @ GS-9 PFT **@ $61,779/year = $1,544,475**	**$6,044,475**

Recommended Target Aircraft Characteristics:
Target aircraft characteristics include high performance, pressurization and all-weather capability with DOI and USFS approved avionics package, Traffic Collision Avoidance System (TCAS) and Automatic Flight Following (AFF).

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with DOI and USFS. Exclusive use contracts will be utilized to secure the core ATGS fleet. A Call-When-Needed (CWN) contract will be maintained with all approved vendors/aircraft to provide spontaneous acquisition and surge capability on a daily basis.

Notes:
The Aerial Supervisor Module (ASM) program requires the position of Air Tactical Supervisor (ATS). These are ATGS qualified personnel who receive additional training to become a certified ATS. Currently, there is a critical shortage of qualified agency personnel available to meet the needs of the ATGS position. This shortage is directly affecting the ASM program requirements.

Aerial Supervision Module

Aerial Supervision Modules (ASM) provide optimal airborne tactical coordination and flexibility for wildfire incidents. They combine two functions that were previously accomplished in separate platforms - leadplane and air tactical group supervisor. The ASM is utilized primarily for initial attack, but can also provide large fire support. The USFS and the BLM each maintains an ASM program area and provides the service to other wildland fire agencies and the states.

Recommended ASM Aircraft Numbers and Cost:
Based on the number of large fixed-wing airtankers and heavy helicopters identified in the strategy and the tactical supervision requirements for large fire support, **20 ASM** platforms are needed. Currently leased aircraft will be eliminated over time as phased purchase occurs. The following table displays years representing the beginning and ending of acquisition phase.

Aircraft	Total/YR
2010 **15 Contracted Aircraft $15,750,000** **5 Gov-Owned Aircraft $18,625,000**	**$38,399,960**
2014 **20 Gov-Owned Aircraft $8,524,960**	**$8,524,960**

Recommended ASM Aircraft Characteristics:
A standardized platform, which includes the same aircraft make, model and equipment, is critical for interoperability and efficiency between agencies. It must be capable of supporting a three person flight crew and one trainee, have a minimum cruise speed of 230 knots and be pressurized and capable of all-weather operations. It must have a Continuing Airworthiness Program (CAP) for operations in the fire environment and should be multi-mission and all-risk capable.

Recommended Acquisition Method:
Aircraft will be government owned and government operated. Government purchase of new aircraft will follow a phased schedule coinciding with the termination of existing leased platforms.

Notes:
The final federal ASM fleet is to consist of 20 government-owned aircraft crewed with government ATP and ATS crewmembers with standardized aircrew qualification requirements, training syllabus, etc. The program will be managed, supervised and supported nationally.

The following documents were used to support decisions: Tactical Resource Management Study (TARMS, 1998), TMOT Report (TARMS Management Options Team), USFS Exhibit 300, contracted market research.

Aerial Supervision Module (ASM) Program									
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Contract/Lease	13	15	15	10	5	-	-	-	-
$/Unit/Yr	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000	1,050,000
Total $/Yr	13,650,000	15,750,000	15,750,000	10,500,000	5,250,000	-	-	-	
Gov Owned									
Currently owned	2	2	-	5	10	15	20	20	20
Fixed Costs	100,000	100,000		225,000	225,000	225,000	225,000	225,000	225,000
Curr Owned Total	200,000	200,000		1,125,000	2,250,000	3,375,000	4,500,000	4,500,000	4,500,000
New Purchase	-	-	5	5	5	5	-	-	-
Purchase $			3,500,000	3,500,000	3,500,000	3,500,000			
Fixed Costs			225,000	225,000	225,000	225,000			
New PurchaseTotal			18,625,000	18,625,000	18,625,000	18,625,000	-	-	-
ASM Module FTE	40	40	40	40	40	40	40	40	40
$/FTE/Yr	100,624	100,624	100,624	100,624	100,624	100,624	100,624	100,624	100,624
Total Pers Costs/Yr	4,024,960	4,024,960	4,024,960	4,024,960	4,024,960	4,024,960	4,024,960	4,024,960	4,024,960
Total ASM Aircraft	15	17	20	20	20	20	20	20	20
Total Cost/Yr	**17,874,960**	**19,974,960**	**38,399,960**	**34,274,960**	**26,125,000**	**26,024,960**	**8,524,960**	**8,524,960**	**8,524,960**

ATP and ATS costs reflect total ASM commitment; personnel performing these functions support other program areas as well. FTE costs cannot be totally attributed to ASM program

Annual contract/lease costs are generally 2.5% of purchase price ($3.5M) = $87,500/mo X 12 mo = $1,050,000/yr

FTE annual costs calculated at GS-12 step 5: $71,874 + $28,750 (40% admin) = $100, 624/yr

Large Transport Aircraft

The Large Transport Aircraft program is managed by the US Forest Service. It was first developed to meet the demand for reliable delivery of fire crews traveling great distances. The capability began as a 40 person capable prop driven aircraft and is now typically a 100 passenger jet aircraft. This program provides a quick strike capability which can keep reduce fire size and cost. It has proven a valuable service in the recent years as commercial air travel has become more cumbersome. Also this capability was instrumental in the wildland fire agencies ability to move Incident Management Teams to assignments immediately after the 9/11 attacks. Should the Forest Service acquire large multipurpose aircraft, this mission may be able to be accomplished with those aircraft. This should be evaluated in implemented if feasible.

Recommended Aircraft Numbers and Cost:
Maintain a core federal fleet of **1 large transport** aircraft annually for 90 day periods.

Aircraft	Personnel	Total/Yr
1 Aircraft @ 108 days X $9,000/day = **$972,000**	**NA**	**$972,000**

Recommended Target Aircraft Characteristics:
Target aircraft characteristics include 101 seats in addition to the required crew seats, self contained APU permanently installed and FAA approved engine starting, ground air conditioning and electrical power, air stairs, pressure refueling, two lavatories, cruising airspeed of not less than 320 knots and in accordance to 14 CFR Part 121 SUBPART 1.

Recommended Acquisition Methods:
Federal acquisition responsibilities shall remain with the Department of the Interior, which provides this service for the US Forest Service. Exclusive use contracts will be utilized to secure the core fleet.

Notes:

Aviation Management

Issues to Address

Issue #1: Command and Control of Fire and Aviation Resources

Aviation resource management principles are contained in the National Multi-Agency Coordinating Group (NMAC) strategy document, which is updated on an annual basis. One of these principles is the increased centralization of control over federal resources as wildfire incidents become more critical and complex. Increased centralization allows prioritized, strategic allocation of resources as determined by national and geographic area MAC groups.

The National Multi-Agency Coordination (NMAC) group consists of one representative from each of the following agencies: Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), National Park Service (NPS), Bureau of Indian Affairs (BIA), Forest Service (FS), National Association of State Foresters (NASF) and the Federal Emergency Management Agency – United States Fire Administration (FEMA-USFA). These representatives have delegated authority by their respective agency directors to manage wildland fire operations and support to the National Response Plan on a national scale when competition for resources is probable. The delegated authorities include:

- Providing oversight of general business practices between the NMAC group and the Geographic Area Multi-Agency Coordination (GMAC) groups
- Establishing priorities among geographic areas
- Directing, controlling, allocating and reallocating resources among or between Geographic Areas to meet national priorities
- Implementing decisions of the NMAC

The primary responsibility of the wildland fire agencies is to provide a coordinated, interagency response to wildland fire across the nation. When competition for the use of wildland fire resources occurs among geographic areas, the NMAC will establish national priorities. When competition for wildland fire resources occurs between wildland fire and non-wildland fire incidents, the NMAC will recommend priorities to national leadership in Washington, DC for the appropriate allocation of those resources.

The single, overriding priority in all actions is the protection of human life.

In setting national priorities and developing drawdown plans, the NMAC will consider these criteria:

- Maintain Geographic Area initial attack capability

- Protect communities and community infrastructure, other property and improvements, and natural and cultural resources
- Limit costs without compromising safety
- Meet local agency objectives
- Support to National Response Plan (NRP) tasking

The NMAC will issue direction based on:

- **Predictive Models:** Predictive Services units provide a general prognosis of expected fire weather, fuel conditions**,** and potential fire behavior including specific state-by-state evaluations that assist NMAC in anticipating critical fire situations.

- **Prioritization Criteria:** These criteria are developed by the NMAC to guide decision-making in setting national priorities for allocating critical resources to Geographic Areas with wildland fire activity or other emergencies.

- **Strategic Decision Points:** Strategic decision points will be established to emphasize critical needs and concerns. They will be based on time of year, overall level of activity (both current and predicted), overall level of resource commitment (both current and predicted) and drawdown levels established for critical resources.

There is a need to continue to refine these practices by further developing the strategic command and control model which will be consistently applied throughout the federal agencies. NIAC believes this model will exhibit the following characteristics:

- **Centrally Managed:** Aerial resources must be *centrally managed* with decentralized tactical execution.

- **Broad Directives:** Under a model of centralized command and control, detailed policy and/or direction inhibits tactical leaders from taking action in a changing fire environment. Management should only give *broad directives* (Leaders Intent/Doctrine) to tactical groups to enable them to respond to a dynamic fire environment.

- **Unity of Command:** *Unity of command* is vital toward employing aerial fire fighting resources.

Single Cohesive Line of Command: Placing a wide range of agencies together in a command structure is insufficient to cope with the dynamic demands of wildland fire. A single cohesive command and control model is the goal. This model requires ***trust*** among participating agencies that resources will be available when needed. This model must have clear line of command with leaders having delegated authority of all aerial resources at each appropriate level.

- **Key Requirements**
  - Aerial resources that are prepared for national mobilization.

- Aerial resources that are supported administratively and logistically for long term deployment.
- Robust aircraft intelligence and utilization reporting.

Aerial Fire Fighting: Operational Tenets
The following principles shall be employed by Aviation Supervisors at all levels of the Command and Control Model:

- Optimize overall aviation capability
- Maximize operational flexibility and mobility
- Apply effective management controls to suppression costs
- Ensure aviation assets are assigned to areas of greatest risk and/or highest probability of success
- Contribute to meeting interagency partner needs

The development and refinement of this strategic command and control model should be assigned to the NMAC who will work in coordination with geographic area MAC groups. Completion of this model will provide a more consistent and effective response by aviation resources. It will also reduce confusion in the highly dynamic wildland fire incident management environment.

Issue # 2: Airtanker Bases

There are currently 73 airtanker bases within the continental United States and Alaska. Evaluation of these bases and locations occurs periodically. A separate report will be prepared at a later date.

Issue #3: Coordination between Forest Service and National Business Center – Aviation Management Directorate

While a number of positive efforts are and have been underway, Phase II of the NIAC Strategy recommended better coordination, to the maximum extent possible, across federal and state agencies to promote interoperability of administrative and contracting systems. Standardized processes between USFS and DOI-AMD regarding the assessment, carding, approvals, and payment for state and vendor owned/operated resources are required to further coordination. Policies and procedures are the foundation upon which safe and effective wildland firefighting operations are achieved. However, higher levels of safety and efficiency could be achieved through integration and standardization of USFS, DOI and state policies and procedures related to utilization of aviation resources. Authorization for the use of state-owned aviation resources by federal agencies needs to be consistent regardless of the particular federal agency responding to a fire or the geographic location of the fire. Rules for operating in the fire environment should be the same for both federal-owned and state-owned aviation resources. Under current procedures, less stringent approval and maintenance standards are sometimes applied to state-owned assets operating on federal land in cases where the assets remain under state control. However, if control of the same state-owned assets is transferred to a federal agency, more stringent standards may be applied. Policies and procedures regarding pilot training, minimum pilot qualifications, and aircraft field inspection requirements should be integrated and standardized where possible.

In order to address policy and procedure inconsistencies, state and federal agencies must work together to review current standards and requirements, define critical elements, and identify opportunities to begin aligning state and federal standards. Inconsistent policy interpretation by regions in some of the federal agencies who favor a decentralized management style should also be resolved. The long-term goal of this effort should be to work toward development of a single national standard for interagency aviation policies which can be implemented over time in conjunction with federal and state budget cycles.

Continued emphasis on the use of a national level organization like the National Interagency Aviation Council to facilitate policy and procedure standardization across federal/state lines is critical to achieving maximum state/federal integration. Other means to improve coordination lie in the acceptance of the recommendations that are presented within this strategic plan, the development and communication of common standards, and standardization of aircraft and pilot/aircrew technical requirements.

The following is an analysis of Forest Service and NBC-AMD inspection systems.

USFS
The Washington Office, Assistant Director of Aviation, Fire and Aviation Management (FAM), is responsible to the Director of Fire and Aviation Management for national aviation program administration. Responsibilities may be delegated to the National Aviation Operations Officer for Operations (NAOO-O) (FSM 5704.22) and the National Aviation Operations Officer for Airworthiness and Logistics (NAOO-A&L) (FSM 5704.23) for leadership and management of the Forest Service aviation program, including coordination of aviation activities and aviation security policies and procedures with other staffs, agencies, and groups.

DOI, National Business Center, Aviation Management Directorate (AMD)
AMD provides a variety of administrative and technical services for the bureau's aviation management program. The Directorate is responsible for the development, implementation and continued oversight of Departmental policy for aviation activities within DOI. The Directorate's primary goals are "...to raise the safety standards, increase the efficiency, and promote the economical operation of aircraft activities in the Department of the Interior."

Analysis
While the USFS and DOI agencies differ in overall mission responsibilities, the aviation programs are very similar. Where possible, the agencies accept each other's inspections, share inspectors and schedule joint inspections. This provides overall cost savings to the Government and eliminates duplication. Following is a table of comparison for the two agencies:

Table 4: INSPECTION COMPARISON BETWEEN USFS AND DOI

SUBJECT	AMD	USFS FAM
Pilot Inspector Qualification	Certified Flight Instructor (CFI) in category and class of aircraft	Commercial Pilot in category and class of aircraft
Maintenance Inspector Qualification	Aircraft and Powerplant (A&P) with FAA Inspector Authorization	Aircraft and Powerplant (A&P)
Agency Organization	3 Regions	10 Regions
Primary inspection cycle	Sep thru May (9 months)	Mar thru May (3 months)
Number of approved inspectors	33 Total	72 not including retired or State approved inspectors.
Retirement System	Standard FERS	Primary or Secondary Fire Retirement Program
Overtime	Exempt	Non-Exempt
OPM Position Classification	GS 1801, Aviation Safety Compliance Specialist	GS 2181- Pilot GS 1825 Aviation Safety Inspector (Airworthiness)
Inspection Duty	Primary	Pilot-Secondary, Maintenance-Primary
Aviation Services Contracts	Centralized at AMD Headquarters	Regional responsibility except National assets which are FAM responsibility
Joint agency inspections	Whenever and wherever possible	Whenever and wherever possible
Inspector Standardization Workshops	Joint	Joint

NIAC recommends the Forest Service and the AMD continue to pursue coordination and sharing of services. A joint systematic review by both parties to determine efficiencies should be undertaken within the next 24 months and focus on acquisition, standards, and inspections.

Performance Measures

1. Aircraft capabilities are appropriate in terms of speed and capacity and are located at efficient and effective bases for staging aircraft and crews.

2. Utilize multipurpose platform and interoperability with interagency missions whenever possible.

3. Provide real time data and download capabilities of sensing technology to decision makers.

4. Increase IR and Detection coverage capacity measured by acres or fires mapped.

5. Reduce agency overlap in contracting platforms and resources.

6. Acquire a newer heavy airtanker fleet consisting of 20-32 fixed wing and 15-25 large helicopters.

7. Primary and reload airtanker base locations should optimize efficiency, cost and initial attack effectiveness.

8. Explore IR and Remote Sensing technology and opportunities for expansion to other agency and interagency program areas and interoperability for non-fire season use.

Appendices

Appendix 1: Phase II Strategy Development Participants

The organizations and individuals listed below participated in a workshop held in Boise, Idaho on August 8th and 9th, 2006 regarding the comprehensive national strategy for use of aviation resources in wildland fire management. Their contributions form the basis of the information, issues, and strategic recommendations that comprise the comprehensive national strategy.

Federal Participants

Dave Dash - Bureau of Land Management
John Selkirk - Bureau of Land Management
Robert McAlpin - Bureau of Land Management
Leonard Wehking - Bureau of Land Management
Darren Mathis - Bureau of Land Management
Helen Graham - Bureau of Land Management
Robert Knutson - Bureau of Land Management
Kevin Hamilton - Bureau of Land Management
Grant Beebe - Bureau of Land Management
Sean Cross - Bureau of Land Management
Eric Walker - Bureau of Land Management
Joel Kerley - Bureau of Indian Affairs

Vendor Participants

Janet Parker - Minden Air Corporation
Rich Denker - Minden Air Corporation
Leonard Parker - Minden Air Corporation
Harold Summers - Helicopter Assoc. Intl.
Todd Petersen - Columbia Helicopters
Christian Holm - Neptune Aviation Services
Kristen Schloemer - Neptune Aviation Services
Ron Hunter - Aero Union Corporation
Terry Unsworth - Aero Union Corporation
Travis Garnick - Butler Aircraft Company
Nan Garnick - Butler Aircraft Company
Ron Raley - Phos-Chek

Lyle Carlile - Bureau of Indian Affairs
Harlan Johnson - National Business Center
Harry Kieling - National Business Center
Applicators
Al Rice - National Business Center
Pat Norbury - U.S. Forest Service
Chuck Taylor - U.S. Forest Service
Scott Curtis - U.S. Forest Service
Sue Prentiss - U.S. Forest Service
Scott Fisher - U.S. Forest Service
Kathy Allred - U.S. Forest Service
Neal Hitchcock - U.S. Forest Service

George Roby - Phos-Chek
Beryl Shears - Western Pilot Service
John Wakefield - Aerial Timber

Dennis Lamun - Airtanker Consultant
Dave Johnson - Mid-Valley Helicopters
Jill Johnson - RAM Systems

State Participants

Jim Ziobro - Oregon Department of Forestry
William (Tony) Pate - North Carolina Division of Forest Resources
Ron Hollifield - North Carolina Division of Forest Resources
Donald Artley - National Association of State Foresters

Appendix 2: National Aviation Doctrine

- Aviation resources are one of a number of tools available to accomplish fire related land management objectives. Use of aviation resources has value only if it serves to accomplish these objectives.

- In order to maximize effectiveness and efficiency, aviation resources must be centrally controlled and aviation operations must be locally executed.

- Aviation resources very seldom work independently of ground based resources. When aviation and ground resources are jointly engaged, the effect will be complementary and serve as a force multiplier.

- The effect of an aviation resource on a fire is directly proportional to its capacity and to the speed with which it engages the fire. Effects of speed and capacity are magnified by proper prioritization, mobilization, positioning, and utilization.

- Aviation use must be prioritized based on strategic management objectives and probability of success.

- Risk mitigation is a necessary requirement for the use of any aviation resource. The risk management process must consider the risks to ground resources and the public, and the risks of not performing the mission, as well as the risks to the aircrew.

Appendix 3: Blue Ribbon Panel Recommendations

The recommendations presented in this document have been developed to address the various findings presented in the Blue Ribbon Panel report published in December of 2002 that addressed the assessment of safety and effectiveness related to federal aerial firefighting. These findings are summarized as follows:

FINDING 1–SAFETY

The safety record of fixed-wing aircraft and helicopters used in federal wildland fire management is unacceptable.

FINDING 2–NEW ENVIRONMENT, NEW RISKS

Because the wildland environment has changed significantly, controlling wildland fires cannot be considered an auxiliary mission second to land management. Wildland firefighting has grown to a level of importance that warrants the attention of national leaders.

FINDING 3–AIRCRAFT

Under the current system of aircraft certification, contracting, and operation, key elements of the aerial wildland firefighting fleet are unsustainable.

FINDING 4–MISSION

The variety of missions, philosophies, and unclear standards of federal land management agencies creates a "mission muddle" that seriously compromises the safety and effectiveness of aviation in wildland fire management.

FINDING 5–CULTURE, ORGANIZATIONAL STRUCTURE AND MANAGEMENT

The culture, organizational structure and management of federal wildland fire management agencies are ill suited to conduct safe and effective aviation operations in the current environment.

FINDING 6–CERTIFICATION

The Federal Aviation Administration (FAA) has abrogated any responsibility to ensure the continued airworthiness of "public-use" aircraft, including ex-military aircraft converted to firefighting air tankers. Although these aircraft are awarded FAA type certificates, the associated certification processes do not require testing and inspection to ensure that the aircraft are airworthy to perform their intended missions.

FINDING 7–CONTRACTS

Government contracts for air tanker and helicopter fire management services do not adequately recognize business and operational realities or aircraft limitations. As a result, contract provisions contain disincentives to flight safety.

FINDING 8–TRAINING

Training is under funded and inadequately specified for helicopters, large air tankers, and other fixed-wing operations.

Appendix 4: Strategy Foundation Elements

- Nationally standardized aviation business practices, including all aspects of contracting, acquisition, and management, that are applicable to all participants (contractors, federal agencies, and state agencies) are critical to a comprehensive and effective national aviation management strategy.

- Possible expansions of the role of aviation in wildland fire suppression could include a greater capacity and increased accuracy in the use of aviation in aerial firing operations, greater capability in fire mapping, assessment of fire behavior and potential, and in suppression resource location.

- The table presented on the following page summarizes the 2006 fire season's aerial firefighting fleet by type and procuring entity.

Aircraft Type	**Exclusive Use**		**CWN**	**Total**
	USFS	***DOI***		
Large Air Tankers (Contract)	21			**21**
MAFFS (Military)	8			**8**
Water Scoopers		2	1	**3**
Single Engine Air Tankers	2	20	53	**75**
Large Helicopters/Helitankers (Type 1)	19		59	**78**
Medium Helicopters (Type 2)	28	8	49	**85**
Light Helicopters (Type 3)	54	32	229	**315**
Smokejumper Aircraft	12	7	3	**22**
Aerial Supervision Aircraft	11	11	33	**55**
Large Transport	1		5	**6**
Total All Aircraft Types 668				
Note: DOI resources listed in this table represent all bureau and organization assets, and does not include state aviation assets.				

- The current number and location of ATBs is based largely on the requirements of the pre-2003 LAT fleet. Most ATBs were primarily designed to support the LAT fleet, and secondarily to support other types of aircraft. LATs and Modular Airborne Fire Fighting Systems are tied to fixed support bases and the requirements for runways that can support them (i.e., accommodate their takeoff and landing runway length and weight requirements). While helicopters, SEATs, smokejumper, and aerial supervision aircraft utilize ATBs, these resources do not require the size and capability of an ATB in order to be effective.

- Acquiring additional capacity to make up for the 10% short fall vis-à-vis 2002 should be focused on supplementing the LAT fleet through Exclusive Use contracts which generally are less expensive for the Government.

- One step toward the goal of seamless cooperation within the national aerial firefighter community will be the development of an integrated, electronic, automatic cost document to replace the currently used OAS-23 and FS-122.

- The adoption of a command and control model that declares all federal aviation resources (aircraft and flight crews) as "national" resources is another element of the desired seamless cooperation. Resource allocation will then occur successively at the geographic and national level while operations will be locally initiated and managed. Establishing standard procedures and capability at the National Interagency Coordination Center and Geographic Area Coordination Committee level to track aircraft location and use of all aviation resources is a critical step necessary for the command and control model to succeed. The requirement for regular, accurate reporting from field units in a common reporting manner has obvious benefits and will allow for better allocation decisions. It may also be possible to make this reporting electronically and nearly automatic.

- Better coordination between federal and state aviation resources will improve the effectiveness of all aviation resources.

- Due to differences in management models that have evolved between the USFS and DOI bureaus, decentralized command and control models have been developed by each entity. The decentralized nature of these models result in poor planning for the integrated use of interagency aviation resources, unavailability of critical aviation resources required for responding to a particular fire, inefficient use of aviation resources, and inability to realize maximum cost savings when aviation resources are employed. The decentralized command and control models also result in certain federal aviation resources being classified as national assets while other are classified as regional or local assets.

Appendix 5: Type 1 & 2 Helicopters

As a basis for the Phase III recommendations, NIAC reviewed past work analyzing Type 1 and 2 helicopters.

The Forest Service commissioned a study of Type 1 and 2 helicopters in 2005. The study was intended to update the work completed in the 1990s. Fire Program Solutions LLC was selected for this work. Pertinent findings are summarized below.

Summary of Findings and Comments from the 2005 study

Listed below is a summary of finding and comments based on lessons learned as this study was conducted.

1. The ability to locate helibases in close proximity to the large fire incidents and to provide long term retardant at these helibases favors the use of Type 1 and 2 helitankers over Type 1 and 2 fixed-wing airtankers for large fire support.

2. The modified analytical methods used in this study appropriately address the issues raised by reports critical of past National Studies (e.g. NATS1, NATS2, etc.) and provide supportable and confident results.

3. Significant savings in suppression costs for large fires can be achieved by the use of exclusive-use contracts for both Type 1 and Type 2 helicopters. The staffing of these contracts at locations where they can also support initial attack, when available, provides an added benefit.

Findings for Objectives 2-1 and 2-2

The large helicopters have a wide range of payload capacity. This is particularly true for those traditionally classified as Type 1. For this study, helicopters were grouped into three categories as shown in Table ES-5. Table ES-6 contains a summary of the results of modeling for Type 1 helicopters. Savings are approximate as the modeling is stochastic and the exact savings is dependent on specific demand assumptions per run.

Table ES-5

Category	Payload (lbs)
A	< 5,000
B	5,001-15,000
C	> 15,000

Table ES-6 - Summary of the Results of Modeling for Type 1 Helicopters

Helicopter Specs	% Demand*	No. EU Contracts Based on Economically Efficiency	Approximate Net Savings Over 100% CWN Staffing
Limited, Category C	100%	27	$34,932,293
Limited, Category B	100%	17	$6,011,090
Limited, Category C	34%	9	$11,086,398
Limited, Category B	67%	11	$5,376,400
Standard, Category C	100%	26	$36,392,915
Standard, Category B	100%	29	$19,333,064
* - Average annual demand is 2450 helicopter days			

Table ES-7 displays the number of exclusive-use helicopters based on percent of total demand divided between Category B and C, Type 1 helicopters.

Table ES-7 – Summary of Optimum Number Type 1 Limited Exclusive-Use Contracts by Category Based on Economic Efficiency											
Cat.	Demand Level										
	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	3	5	8	11	13	16	18	21	24	27
B	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
	17	15	14	12	10	8	7	5	3	2	0
All	17	18	19	20	21	21	23	23	24	26	27

Table ES-8 displays the number of exclusive-use helicopters based on percent of total demand divided between Category B and C, Standard Type 1 helicopters.

Table ES-8 – Summary of Optimum Number Type 1 Standard Exclusive-Use Contract by Category Based on Economic Efficiency											
Cat.	Demand Level										
C	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	0	2	5	8	10	13	16	18	21	22	26
B	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	0%
	29	26	24	20	17	15	12	9	6	3	0
All	29	28	29	28	27	28	28	27	27	25	26

Table ES-9 contains a summary of the results of modeling for Type 2 helicopters. Savings are approximate as the modeling is stochastic and the exact savings is dependent on specific demand assumptions per run.

Table ES-9 - Summary of the Results of Modeling for Type 2 Helicopters			
Helicopter Specs	% Demand*	No. EU Contracts Based	Approximate Net

		on Economically Efficiency	Savings Over 100% CWN Staffing
Limited, Category A	100%	33	$9,077,228
Standard, Category A	100%	28	$8,347,416
* - Average annual demand is 3433 helicopter days			

Summary of 2005 Study (Forest Service needs only)

Type 1 helicopters (payload + 15000 lbs.) that can be economically contracted:
27
Type 1 helicopters (payload 5001-15000 lbs.) that can be economically contracted:
17
Type 2 standard helicopters that can be economically contracted:
33
Type 2 limited helicopters that can be economically contracted:
28

Models Used in this Study - Overview of the National Fire Management Analysis System (NFMAS)

Forces used for initial attack of wildland fires have been traditionally analyzed and justified using the National Fire Management Analysis System (NFMAS) by the USDA Forest Service and the USDI Bureau of Land Management and Bureau of Indian Affairs. A replacement system called Fire Program Analysis (FPA) is under construction and is not complete. Hence the legacy system, NFMAS, will be one analysis system used in this study.

NFMAS initial attack assessment (IAA) model analyzes initial attack effectiveness and was used to analyze the effectiveness and efficiency of the alternatives. The local initial attack forces remained constant as airtanker staffing and locations were changed. Where use of the IAA model was not current or was unavailable for the area, an equivalent process was allowed as long as consistency was maintained.

Several key assumptions do apply to airtankers. The amount of fireline produced by an aerial drop is based on the use of long term fire retardant and varies by the number of gallons in the drop as well as the National Fire Danger Rating System (NFDRS) fuel model. In the Phase 1 Report, the formula used was:

Chains of line = (Gallons in Drop)/100 * Production Factor

where the production factor is 1.0 for NFDRS fuel models A, L and S; 0.7 for NFDRS fuel models C, H, R, E, P and U; 0.6 for NFDRS fuel models T, N, F and K; 0.5 for NFDRS fuel model G; 0.3 for NFDRS fuel models D and Q; and 0.2 for NFDRS fuel models B, O, J, and I.

For drops of water or foam (short term retardants), it was assumed the number of chains of fireline built was 50% of the number of chains of fireline built using long term fire retardant.

In the IAA, the effectiveness of retardant drops as it relates to rate of fire spread, the amount of fireline produced is reduced linearly from its maximum value described by the formula above. Maximum fireline production is assumed when the rate of fire spread is equal to one chain/hour. The fireline production rate is decreased linearly so that the fireline production rate is zero when the rate of fire spread is equal to eighty chains per hour or greater in NFDRS fuel models A, L, S and T. These fuel models represent grass, Alaska tundra and sagebrush. For the rest of the NFDRS fuel models, there was no change from the forty chains per hour limit.

All dollar amounts displayed in this report are in 2004 dollars unless otherwise stated. The current OMB Price Adjustment Index was used to calculate factors as follows to move all dollars to 2004 dollars (Table 3).

The term <u>Fire Suppression (FFF) Costs</u> is used to describe the sum of the cost to suppress a wildfire. These costs are accounted for in two ways, unit mission costs and average acre (suppression) costs. Unit mission costs are “trip” costs for fire suppression resources. For airtankers, these costs would be the flight costs (flight rate times hours flown) and retardant cost. Retardant cost was assumed to be $0.72 per gallon. Average acre costs include all other fire suppression costs expressed on a per acre basis.

The term <u>Net Value Change (NVC) Costs</u> is used to describe the algebraic sum of the effects of a fire keeping in mind that some effect is negative and some positive. In general, the algebraic sum is a negative number.

The term <u>Fire Program Costs</u> is used to describe the staffing of the airtanker, and is generally the daily availability times the number of staffing days for an exclusive-use contract. It also includes the module staffing costs.

Overview of the Wildfire Initial Response Assessment System (WIRAS)

The Wildfire Initial Response Assessment System (WIRAS) is a simulation model designed to address the importance of wildfire occurrence and suppression response dynamics in planning initial attack organizations. A key feature that distinguishes it from other models is its ability to assess how the ebb and flow of fire occurrence intensity across the landscape and over time affects the economic and physical performance of an initial attack organization. This approach better addresses the value of resource mobility and the consequence of peak demand requirements that are so important in determining the size, location, and composition of an initial attack organization.

WIRAS models the dynamics of fire occurrence as it affects suppression activities by using historically recorded fire times and locations from multiple fire seasons. This approach preserves the spatial and temporal nature of fire occurrence with all its implications for defining initial attack program performance. Programs are tested against a set of historical fire seasons.

On the initial attack side of the equation, WIRAS models resource deployment with a system of rules intended to closely reflect how managers make resource allocation decisions in a multiple fire environment. This set of rules defines a hierarchy of preferred resource responses that recognizes the fire location, behavior, management objectives, and accessibility, among other things, but also takes into account the availability of different kinds of initial resources at any point in time. In general, the dispatch rules in WIRAS favor responding to a fire with local ground resources provided the response times are reasonable given a fire's behavior. When ground resource response times are not reasonable, the model seeks to dispatch helitack, and finding none, will request smokejumpers, if available. Airtanker support is determined by projected fire intensity. If no resources are available, fires just wait and grow until resources returning from earlier responses become available for dispatch. Fires that reach predefined sizes or perimeters either while waiting or during suppression are declared escaped. All resources have the ability to attack several fires on a given day depending on how quickly they can contain fires and prepare for another dispatch.

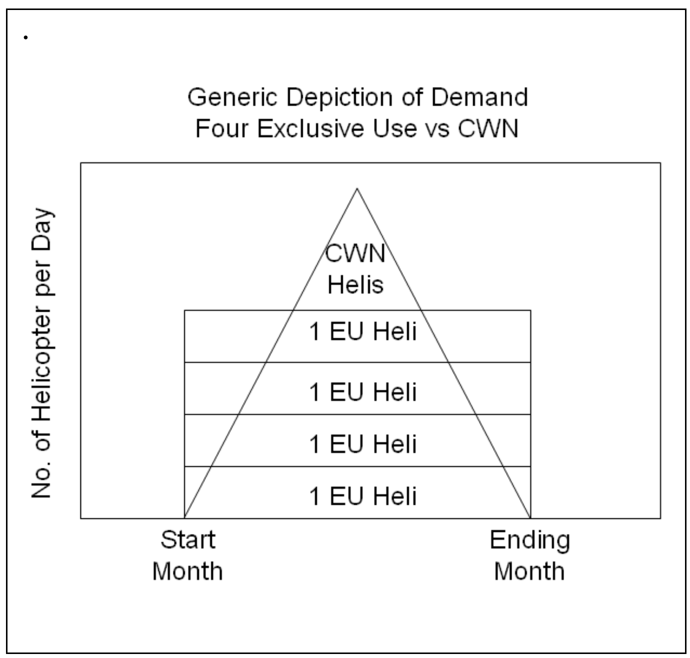
Projected fire behavior and fuel model determines the "might" of the initial attack response. During multiple fire episodes, new fires and those waiting for service are prioritized based on highest fire intensity level (FIL) with a somewhat diminished priority if located in wilderness or roadless areas.

WIRAS currently provides capabilities for evaluating regional and national resources, Type 1 and 2 helicopters, smokejumpers, helitankers, and airtankers. The software has some local program analysis capabilities, but these have not been fully developed.

Helicopter Modeling

The model for Phase 2 is the National Study of Type 1 and 2 Helicopters to Support Large Fire Suppression (1992) (NHeli1) (Figures 19). Initial staffing from the early 1990's through 2002 was for only Type 2 helicopters. Starting in 2003, additional Type 2 helicopters and some Type 1 helicopters were staffed when the large fixed-wing airtanker fleet was not fully operational. Some of this additional staffing was for initial attack purposes, but this additional staffing of exclusive-use helicopters satisfied large fire suppression support requirements.

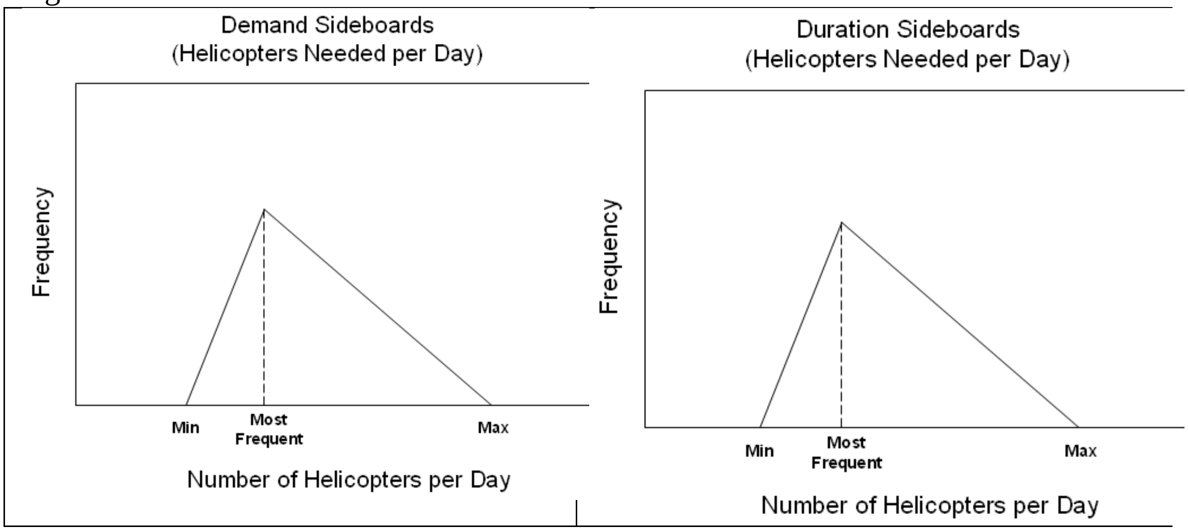
Figure 19



TriSim Analysis Model

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 (Figure 20). One technique was used to perform statistical analysis on the demand profile produced for the past year's reports. Reference will be made to this "demand simulation model." A second technique was then 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."

Figure 20



NIAC Analysis of Previous Study

NIAC found the study useful in helping determine numbers of potential aircraft. Costs were not as useful due to the nature of the models being used at that time.

The current federal airtanker large airtanker fleet is 16 (with 3 additional available) and additional capability contracted by the states of Oregon and Alaska. The Forest Service has 3 additional P3 aircraft which may be converted into airtankers in the future. This project is proving valuable to understand safe conversion of excess military aircraft into airtankers, but may not lead to the best long term program solution as it remains a single purpose aircraft.

Concerns over maintenance and airworthiness programs continue to be a major issue with this firefighting resource. Ability for the wildland fire agencies to evaluate current and future platforms must be determined and a program defined and managed consistently.

The following are considerations for any aircraft being proposed for the future airtanker fleet.

- Regardless of aircraft provenance, the type certificate holder must be ready to provide the necessary engineering support for continued airworthiness

- Although NIAC Phase II recommended transport category aircraft for airtankers, both Military and Commercial Aircraft can be viable for employment in special missions

- Either Military or Commercial Aircraft CANNOT be taken “off-the-shelf” and employed in the special mission roles for which they were not designed

- Employing an aircraft in a special mission role, regardless of its origin, requires agencies review and fully evaluate the vendors continued airworthiness program

- The key general steps are as follows:
  - Establish the basis for its existing maintenance program
  - Determine if the baseline program needs to be updated to latest FARs
  - Re-evaluate baseline program to special mission usage (firefighting)
  - Maintain and update continued airworthiness program as necessary

The current fleet will at some point in the future reach a point where continued maintenance will be no longer economically viable. Newer platforms will need to be identified, evaluated and acquired. A phased in approach of newer aircraft should be scheduled over the next 10 years. Consideration should be given to aircraft and tanking systems that do not require structural modification. This would allow the potential for the aircraft to be multi-mission capable.

Recommended Target Aircraft Characteristics:

- Is turbine-powered
- Desirable cruise speed is 250-350 knots
- Minimum retardant carrying capacity of 2,000 gallons

NIAC recommends a survey potential aircraft, determine the source, select aircraft make/model to pursue. Aircraft to be considered initially are either civilian or military (C-130's, C27J's, S-3, Q400, supertankers, others. Platforms evaluated or proposed will meet the airworthiness goals described above.)

Appendix 6: Smokejumper Aircraft – Forest Service Aerial Delivered Firefighter Update Process

The Forest Service is updating the Aerial Delivered Firefighter study that was completed back in the 90's. Outputs from this work will serve as a baseline for NIAC as it only is analyzing Forest Service needs and not interagency needs.

For the new update, the model incorporates 9 years of historical fire data and 5 years of predicted fire data, utilizes a high-level of cost detail that includes training, salaries, and total time invested in delivery of firefighters, contains cost and performance information for 39 aircraft, both those currently in use and those approved but not yet in use, and considers both current bases and commercial airports for utilization.

The model's purpose is to generate responses to historical and predicted fire incidents to:

- Determine which bases receive the highest annual activity
- Calculate which aircraft are the most economical and efficient options for responses
- Derive annual ADFF costs.

The model's design conducts in-depth calculations for fire response (using hourly, daily, and annual costs) to determine the cost of responding to fires from all available bases, attributes base costs to all flights from each base on a per-flight basis, selects the lowest cost response that meets the needs of the fire, and allows variables to be refined and generates a final list of aircraft and bases after several model runs.

Key assumptions involved in this effort include;

- Smokejumper facilities operate year-round
- Strategic command of all aerial delivered firefighting resources or assets and personnel will be at the national level
- Data gathered and included in the model is the best available
- No impediment to moving resources across GACC boundaries, states, and regions
- The FS will have a continuing need for aerial delivered firefighters for the foreseeable future
- Aircraft can be acquired through purchase, lease, or contract for use in ADFF activities
- Recommendations for this study are based on the capabilities of the Forest Service
- Current ADFF study will encompass the entire ADFF service area
- Model does not address the specific number of FTE, but will address the optimum crew size and configuration
- ADFF personnel and aircraft will not necessarily return to the home base between fires

The model outputs are;

- Aircraft
    - Models of aircraft with enough responses to merit use of at least one
    - Numbers of each model of aircraft recommended for use by the USDA Forest Service
    - Aircraft recommended for use at each base
- Bases
    - Locations with enough responses to merit permanent/spike use
- Costs
    - Current as well as optimal response costs

Appendix 7: Infrared Aircraft Study – USFS Feasibility Study Work Group

AERIAL DETECTION COMMAND AND CONTROL TASKGROUP
Recommendations

December 7, 2007

BACKGROUND

On May 29, 2007, the Chief signed a letter accepting the recommendations in the *Feasibility of Conducting a Competitive Sourcing Competition on Aviation Activities in the US Forest Service* (Feasibility Study). The Feasibility Study recommended initial actions to reorganize and improve some of the functions that were studied and determine within the coming months whether to proceed with one or more competitive sourcing competitions under OMB Circular
A-76 rules.

The Fire Imaging Business Area includes the personnel and associated resources involved with Infrared (IR) imaging, photo imaging and fire mapping technology and communications used to identify and manage fires using aviation resources. Airplanes and helicopters are utilized. Personnel include pilots, technicians, support personnel, and fire managers.

4.14.1.4- Validate the efficacy of the IR Program with the Primary Customers.
And
Evaluate the Adequacy of the Technology Being Used to Assist Decision Makers

4.14.1.5- Evaluate FIREWATCH Program expansion for Other Agency Programs, Sharing Among Regions and the Interagency Community.

6.14.2.1- Research the feasibility of utilizing Unmanned Aviation Vehicles (UAVs) for data collection.

INTRODUCTION

Fire managers use the perimeter map developed from the infrared image to implement the Appropriate Management Response (AMR) strategies and tactics, assign air and ground resources and evaluate tactical effectiveness. Infrared images are used to develop management actions necessary to minimize the threat to Values to Protect and prioritize Management Action Points. Fire managers monitor Infrared images to identify spots and fire growth outside containment lines. Fire containment and mop-up can be planned, monitored and documented using fire imaging. Fire imaging can be used to aid agency and cooperators in the planning and implementation of evacuations and closures. The Wildland Fire Decision Support System, including Farsite, FlamMap, and FSPro can utilize the fire perimeter maps from the infrared image to begin modeling long term growth maps and probabilities.

Recent fire seasons have placed an increased demand on the two National Infrared Operations (NIROPS) Type 1 IR aircraft owned and operated by the Forest Service. On occasion the demand for IR has exceeded the ability of the program to fly and record heat signatures on all the IR requests. In some cases the incident requests could be refined to optimize the flight time, but in some cases there just isn't enough flight time due to requests, weather, pilot duty day or aircraft mechanical issues. During the 2007 fire season a contract IR aircraft was added, which alleviated some of the Unable to Fill requests. When the NIROPS aircraft is on the ground IR imagery is transferred by recording to a portable drive/CD or uploaded to an .ftp site. The imagery is then available to be used.

The cost of the NIROPS program for aircraft, IR technicians and pilots is approximately $1.3 million.

An intermediate level (Type 2) IR capability exists within the contract community, but is not widely utilized for several reasons. The contracts for the Type 2 service are administered at the geographic area and teams generally are unaware of the contract and the capability. Type 2 IR coverage is approximately 10-25% of the NIROPS aircraft.

Firewatch (Infrared sensors, digital low light color camera, laser range finder, laser illuminator and a geographical referencing inertial navigation system) is operating on two AH-1 Cobras in Region 5. The Firewatch capability is matched with an Air Tactical Group Supervisor in the helicopter, line of sight data link and a contract data recovery van which records and disseminates the data. The air tactical and fire imaging capability show great promise for providing Type 2 fire imaging if the Firewatch technology can be portable and have interoperability with most agency aircraft.

Unmanned Aerial Vehicles (UAV) show promise for the ability to deliver real-time fire imaging data and maps, but the cost of the UAV, flight management support and logistics and airspace issues do not make fire imaging UAVs viable in the near future on a regular basis. The agency should continue to evaluate and research UAVs of all sizes and capabilities for cost efficiencies and applicability to the fire imaging mission.

Fire imaging cooperation with non-traditional agencies (Custom and Border Patrol) is occurring informally. Expansion and formalization of this cooperation would increase capability and release agency fire imaging aircraft for other missions.

The consensus among fire managers is that real-time fire imaging throughout the operational period is more important in decision making than the current once nightly snapshot in time of the fire.

OBJECTIVES

- Utilize current fire imaging, image processing and data transfer technology.
    - Technology upgrades will provide decision makers with real-time fire images to make strategic and tactical decisions.
    - Improve efficiency and reduce the cost of fire imaging missions by using satellite communications and down link data transfer.
    - Utilize an equipment replacement plan to stay current with technology.
- Optimize agency aircraft utilization in multi-mission roles including air tactical, fire imaging, logistical and administrative flights.
    - Portability of the fire imaging technology will eliminate the need for dedicated fire imaging aircraft.
- Reduce fire imaging costs through aircraft multi-mission utilization, real-time wireless data transfer and data utilization and fire imaging surge capability.
- Expand fire imaging capability overall and meet the core fire season surge in Fire Imaging requests
    - Development of a lower cost and weight fire imaging package with Firewatch capability would provide Type 1 (>100,000 acres per hour) and Type 2 (>10,000 acres per hour) fire imaging resources to expand capability and meet the surge.
- Facilitate standardized fire imaging data storage, access and use.
- Utilize applicable fire imaging research.

RECOMMENDATIONS

Short Term (One to Five Years)

- Maintain the National Infrared Operations (NIROPS) program with improvements.
    - Retain current aircraft, pilots and IR technicians.
    - Retain line scanner capability of NIROPS (750,000 acres per hour production rate)
    - Maintain aircraft and pilot duty station in Ogden. Maintain IR technician duty station in Boise.
    - Establish a full-time National Fire Imaging Program Manager with base funding within W.O. FAM for pilots, aircraft, imaging equipment, maintenance and IR technicians.
    - Purchase a satellite communications system to transfer data to a centralized collection point. Cost is estimated to be $400,000 plus usage fees during data transfer. Price includes installation and aircraft Supplemental Type Certificate costs.

    - Upgrade 1 line scanner system with scanner and processing technology.
    - Evaluate the satellite communications data transfer and onboard image processing. Determine how much data is needed real-time for incident decision making and the cost of the data transfer.
    - Evaluate wireless data links for fire imaging data transfer. Determine effectiveness of line of sight data transfer, development of receiving network and what data is most effective to be transferred. Cost is estimated to be $4,000 to $11,000 per installation.
- National Fire Imaging Program Management
    - The National Fire Imaging Program should include:
        - Formally establish a fire imaging steering group to provide oversight to all fire imaging aircraft, technology, research and equipment.
        - Determine fire imaging pilot and other staffing needs and duty station.
        - Create a central password protected, single purpose, point to collect, process, store and distribute fire imaging (single high resolution, geo-corrected image format) data.
        - Coordination of fire imaging pilot and aircraft staffing with the NICC aircraft desk.
        - Contract for Exclusive Use Type 1 and Type 2 fire imaging to meet the surge during the heart of the fire season.
        - Integrate FireMapper into the fire imaging program to meet the surge or gain fire imaging capacity.
        - Pursue new fire imaging technology through research, including FireMapper.
        - Evaluate fire imaging equipment procurement.
        - Track and follow through the recommendations in this report.
    - Procure and/or develop fire imaging equipment that is portable and has multiple control options (in-aircraft, recordable and remote) and has interoperability with agency owned, leased or contracted aircraft. Fire imaging equipment should have a replacement plan. Cost is estimated to be xx for a Type 1 system and xx for a Type 2 system.
    - Include Type 2 fire imaging capability (Firewatch system) on National ASM aircraft (20 interagency aircraft) to add capability and meet the surge.
    - Develop an IR Field Guide to educate end users. The guide should include:
        - IR flight requests based on AMR implementation

        - Request prioritization process at the GACC and NICC
        - How and when satellite are used and their image limitations
        - Satellite, Type 1, Type 2 and Type 3 fire imaging capabilities and limitations, including FireMapper.
        - An incident mission use decision making matrix.
    - Pursue other DoD or intelligence agency satellite systems that may provide fire detection, IR or mapping capability.
    - Pursue Firehawk (or other satellite based) new start detection capability. Security clearance issues should be resolved with appropriate National personnel having the appropriate security clearance to pass on only the pertinent information not the source of the information.
    - Pursue non-traditional interagency cooperation/ coordination. E.g. Customs and Border Patrol aircraft with day and night imaging.
    - Evaluate an End Product contract to provide the Type 1 fire imaging services. If an End Product contract has efficiencies and would provide the required service and products, conduct a beta test for part of the fire imaging program.
- Firewatch
    - Maintain Firewatch with two cobras and current technology.
    - Use a Business Case Analysis on the Firewatch Cobras in the Exhibit 300 process for aircraft cost comparison to plan future aircraft acquisition.
    - Expand the use of Firewatch through the development of portable lower cost & weight Firewatch technology package to utilize in agency and interagency ASM/ATGS aircraft.
- C^4ISR
    - Evaluate the Goggle Earth Enterprise Client Pilot which provides a central point to share fire history, weather, fire projections and current fire perimeters with fire managers through the internet.

Long Term (5+ years)

- Firewatch
    - Expand Firewatch technology and capability to exclusive use ATGS aircraft and helicopters.
- Fire Imaging Program
    - Transfer Ikhana like (12 channel) imagery, data processing and data transfer technology to manned aircraft.
    - Imaging package should be portable and have interoperability with specific agency aircraft.
    - Imaging missions should be capable of both day and night missions.

    - Utilize agency aircraft in multi-mission roles including air tactical, fire imaging and administration. Multi-mission use will require multiple crew(s) to staff missions.
    - Pursue non-traditional interagency cooperation/ coordination. E.g. Customs and Border Patrol aircraft with day and night imaging.
- UAVs/Systems
    - Continue to research and evaluate UAVs. Cost, logistics, airspace restrictions and FAA policy currently preclude investing in UAVs.
    - Micro- UAVs (three foot wingspan and approximately five pounds) may have more immediate potential if the above barriers can be surmounted.
    - Continue to research and evaluate High Altitude Long Endurance (HALE) UAVs. HALE is in its infancy, but could provide a fire imaging and communications platform that would loiter for one month at 60,000-80,000 feet. The issues related to traditional UAVs would not be a factor at the high altitude.
- Develop portable ground based camera and IR systems to monitor remote or long term fires or values to protect.
- C4ISR
    - Evaluate the Goggle Earth Enterprise Client Pilot which provides a central point to share fire history, weather, fire projections and current fire perimeters with fire managers through the internet.

The following people composed the Aerial Detection and Command and Control Task Group:

Mike R. Williams, Forest Supervisor- Kaibab National Forest, Region 3

Paul Strong, Deputy Forest Supervisor- Mark Twain National Forest, Region 9

Robert Roth, Aviation Technology- Missoula Technology & Development Center, Washington Office

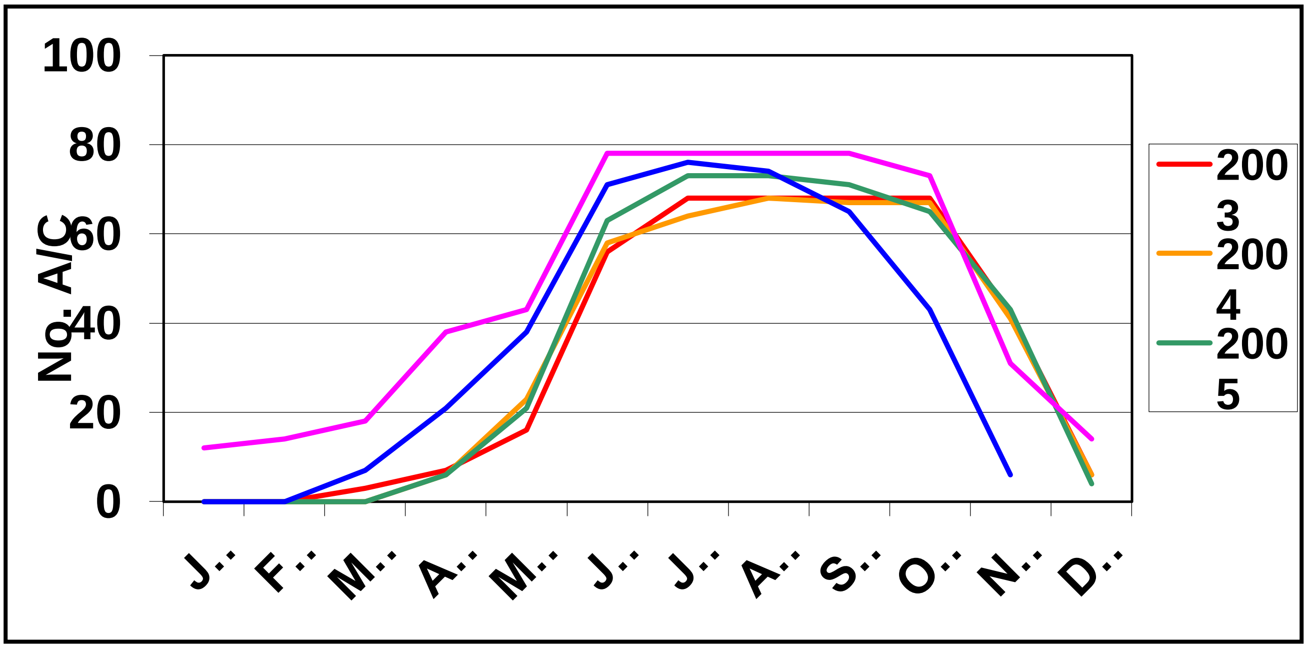
Dennis Hulbert, Regional Aviation Officer, Region 5

Mike Dietrich, Forest Fire Staff Officer- San Bernardino National Forest, Region 5

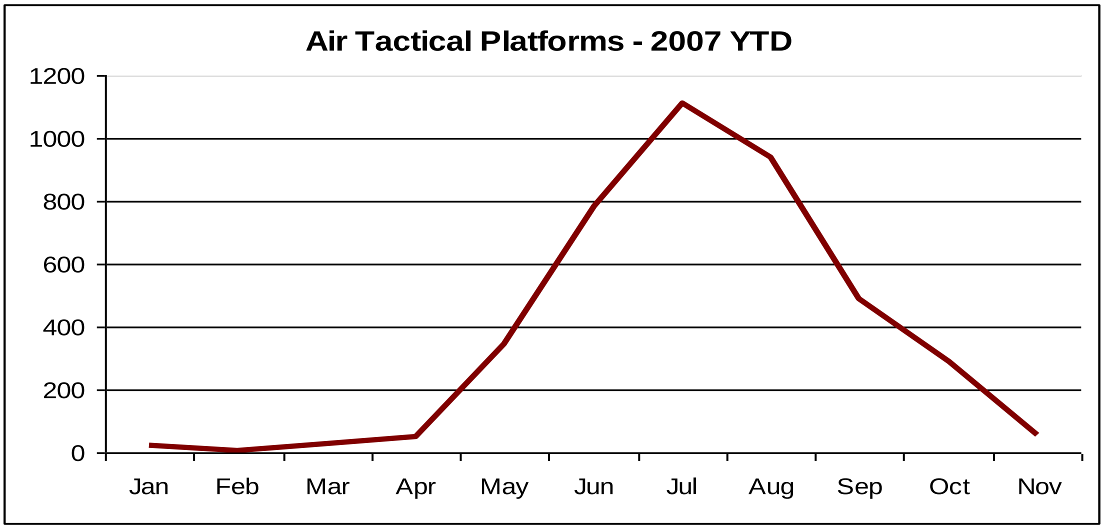
Mike Lohrey, Chair- National Incident Commander/ Area Commander Group, Region 6

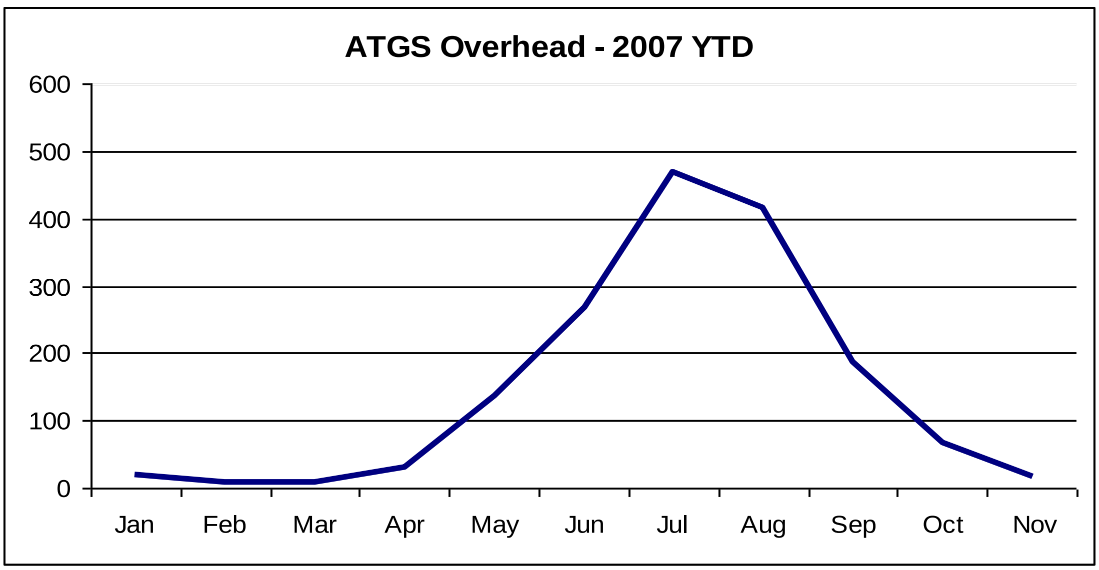
Appendix 8: SEAT and Air Attack Evaluation

The graph below depicts number of SEATs deployed during recent fire seasons; this includes all federal procurement, both exclusive use and Call-When-Needed (CWN). An average of 70 aircraft have been hired for a 90 day period of the core fire season. Since not all of these aircraft actually perform each day, the group recommends that an interagency SEAT fleet consisting of 35 exclusive use aircraft be established and management controls continue to be utilized to use this exclusive use fleet more effectively. It is assumed that CWN aircraft will still be utilized to provide surge capability, but this use will be kept to a minimum.



The following graphs depict number of air attack aircraft and associated air tactical group supervisor requests for the 2007 fire seasons; this includes all federal procurement, both exclusive use and Call-When-Needed (CWN). Since not all of these aircraft actually perform each day, the group recommends that an interagency fleet consisting of 25 exclusive use aircraft be established and management controls continue to be utilized to use this exclusive use fleet more effectively. It is assumed that CWN aircraft will still be utilized to provide surge capability, but this use will be kept to a minimum.





Appendix 9: State Aviation Assets Available for Interagency Use

The PHASE III strategy considers the contribution that states aviation assets make to the national effort. States have aviation assets of different types and categories that are made available for interagency use at the state and sometimes at the national level. Interagency coordination is critical to maintaining a well-coordinated response to critical needs, which in turn, project seamless operations to the taxpaying public.

Although state agencies have to respond to a different set of laws, mandates, and objectives, which vary from state to state, State agencies aviation resource allocations are maintained locally to insure swift initial attack response when needed. Some of the state aviation assets are made available nationally on a case-by-case basis, but by and large state aviation assets remain locally controlled in their respective states. There are a number of state-to-state wildfire coordination compacts that exist to share state resources. The states also contribute trained and qualified aviation personnel through the national system. The Phase III strategy takes into account state aviation assets. The needs reflected in the strategy are in addition to these state assets.

State-Owned/Exclusive Use Aircraft	
Airtankers	
Large	4
SEAT	39
Helicopters	
Type 2	51
Type 3	30
Airplanes	
All Types*	179
303 Total Aircraft	

**Fixed wing airplanes used for fire related purposes such as air tactical, detection, observation, and fire fighter transport missions, and natural resource surveys.*

Appendix 10: Module Cost Detail

Estimated Associated Personnel Costs for Type 1 Exclusive Use Helicopter Crew as of November 8, 2007:

Personnel Salary						
Employees	**Grade**			**# Days**	**Daily Cost**	**FY Salary Cost**
PFT	9	Step	4	261	$267.38	$69,786.18
WAE	8	Step	3	180	$234.78	$42,261.12
Subtotal: $112,047.30						

Associated Salary			
Holiday Worked	$692.64	Overtime	$1,038.96
Sunday Diff	$0.00	Lump Sum	$0.00
Hazard Pay	$0.00		$0.00
Subtotal: $1,731.60			

Administrative Costs			
Item	Units	Rate Per	FY Cost
Lease	1	$15,000.00	$15,000.00
Phone Lines	2	$85.00	$170.00
Phone Bills	12	$85.00	$1,020.00
Cell Phones	2	$480.00	$960.00
Utilities	12	$250.00	$3,000.00
Uniform Allowance	2	$100.00	$200.00
Unemployment	6	$500.00	$3,000.00
Admin. Overhead	1	$20,000.00	$20,000.00
Training Flight Time	3	$6,370.00	$19,110.00
Subtotal: $62,460.00			

Vehicles					
Rig #	FOR Rate	# Mo	Use Rate	# Miles	FY Cost
Chase	$324.50	12	$0.26	2000	$4,414.00
	$3,894.00		$520.00		
Subtotal: $4,414.00					

Travel and Training			
Perdiem	$1,980.00	POV Mileage Costs	$200.00
Tuition	$600.00	Planned Airfare	$1,000.00
Rental Car Costs	$400.00		$0.00
Subtotal: $4,180.00			

Procurement/Purchases			
Item	Units	Rate Per	FY Cost
Miscellaneous	1	$10,000.00	$10,000.00
Laptop	1	$1,500.00	$1,500.00
Subtotal: $11,500.00			
TOTAL COSTS: $196,332.90			

Estimated Associated Personnel Costs for Type 2 Exclusive Use Helicopter Crew as of November 8, 2007:

Personnel Salary						
Employees	Grade			# Days	Daily Cost	FY Salary Cost
PFT	9	Step	4	261	$267.38	$69,786.18
WAE	8	Step	3	180	$234.78	$42,261.12
WAE	7	Step	3	130	$211.93	$27,551.16
WAE	7	Step	1	130	$198.71	$25,832.04
WAE	6	Step	3	130	$190.70	$24,791.52
WAE	6	Step	1	130	$178.87	$23,253.36
WAE	5	Step	1	130	$160.43	$20,855.64
WAE	5	Step	1	130	$160.43	$20,855.64
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Subtotal: $345,721.19						

Associated Salary			
Holiday Worked	$3,595.68	Overtime	$10,787.04
Sunday Diff	$506.48	Lump Sum	$56,238.00
Hazard Pay	$8,989.20		$0.00
Subtotal: $80,116.40			

Administrative Costs			
Item	Units	Rate Per	FY Cost
Lease	1	$15,000.00	$15,000.00
Phone Lines	2	$85.00	$170.00
Phone Bills	12	$85.00	$1,020.00
Cell Phones	8	$480.00	$3,840.00
Utilities	12	$250.00	$3,000.00
Uniform Allowance	8	$100.00	$800.00
Unemployment	78	$500.00	$39,000.00
OWCP	1	$50,000.00	$50,000.00
Transfer of Station			$0.00
Admin. Overhead	1	$50,000.00	$50,000.00

Training Flight Time			25	$1,600.00	$40,000.00
Subtotal: $202,830.00					
Vehicles					
Rig #	FOR Rate	# Mo	Use Rate	# Miles	FY Cost
Chase	$324.50	12	$0.26	2000	$4,414.00
Chase	$324.50	12	$0.26	3000	$4,674.00
Command	$330.50	12	$20.50	4000	$85,966.00
	$11,754.00		$83,300.00		
Subtotal: $95,054.00					
Travel and Training					
Perdiem	$5,940.00	POV Mileage Costs			$800.00
Tuition	$1,800.00	Planned Airfare			$4,000.00
Rental Car Costs	$1,600.00				$0.00
Subtotal: $14,140.00					
Procurement/Purchases					
Item	Units		Rate Per		FY Cost
Misc	1		$20,000.00		$20,000.00
Laptops	3		$1,500.00		$4,500.00
Subtotal: $24,500.00					
TOTAL COSTS: $762,361.58					

Estimated Associated Personnel Costs for Type 2 Exclusive Use Helicopter Crew as of November 8, 2007:

Personnel Salary						
Employees	Grade			# Days	Daily Cost	FY Salary Cost
PFT	9	Step	4	261	$267.38	$69,786.18
WAE	8	Step	3	180	$234.78	$42,261.12
WAE	7	Step	3	130	$211.93	$27,551.16
WAE	6	Step	1	130	$178.87	$23,253.36
WAE	5	Step	1	130	$160.43	$20,855.64
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Temp	4	Step	1	120	$107.78	$12,933.50
Subtotal: $248,374.98						
Associated Salary						
Holiday Worked	$2,441.76			Overtime		$7,325.28
Sunday Diff	$352.13			Lump Sum		$40,170.00
Hazard Pay	$6,104.40					$0.00
Subtotal: $56,393.57						
Administrative Costs						
Item				Units	Rate Per	FY Cost
Lease				1	$15,000.00	$15,000.00
Phone Lines				2	$85.00	$170.00
Phone Bills				12	$85.00	$1,020.00

Cell Phones	5	$480.00	$2,400.00
Utilities	12	$250.00	$3,000.00
Uniform Allowance	5	$100.00	$500.00
Unemployment	57	$500.00	$28,500.00
OWCP	1	$50,000.00	$50,000.00
Transfer of Station			$0.00
Admin. Overhead	1	$50,000.00	$50,000.00
Training Flight Time	20	$1,600.00	$32,000.00
Subtotal: $182,590.00			

Vehicles

Rig #	FOR Rate	# Mo	Use Rate	# Miles	FY Cost
Chase	$324.50	12	$0.26	3000	$4,674.00
Command	$330.50	12	$0.21	4000	$4,806.00
	$11,754.00		$83,300.00		
Subtotal: $9,220.00					

Travel and Training

Perdiem	$3,960.00	POV Mileage Costs	$500.00
Tuition	$1,200.00	Planned Airfare	$2,500.00
Rental Car Costs	$1,000.00		$0.00
			Subtotal: $9,160.00

Procurement/Purchases

Item	Units	Rate Per	FY Cost
Misc	1	$20,000.00	$20,000.00
Laptops	3	$1,500.00	$4,500.00
Subtotal: $24,500.00			

TOTAL COSTS: $530,238.55

Appendix 11: Agency Specific Detail

BIA FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Air Tanker	0	0	0	0	0	0	0	0	0	0	0
Water Scooper	0	1	1	1	1	1	1	1	1	1	1
		$748,356	$748,356	$748,356	$748,356	$748,356	$748,356	$748,356	$748,356	$748,356	$748,356
SEAT	2	2	5	6	7	8	8	8	8	8	8
	$593,424	$593,424	$1,266,780	$1,520,010	$1,773,345	$2,026,680	$2,026,680	$2,026,680	$2,026,680	$2,026,680	$2,026,680
ASM	0	0	0	0	0	0	0	0	0	0	0
ATGS	1	1	2	2	3	3	4	4	5		
	$173,954	$173,954	$347,908	$347,908	$521,862	$521,682	$695,816	$695,816	$869,770	5	5
Smokejumper	0	0	0	0	0	0	0	0	0	$869,770	$869,770
Helicopter T1	0	0	0	0	0	0	0	0	0	0	0
Helicopter T2	0	0	0	0	0	0	0	0	0		
Helicopter T3	9	9	10	11	12	12	12	12	12	0	0
	$3,802,014	$3,802,014	$4,224,460	$4,646,906	$5,069,352	$5,069,352	$5,069,352	$5,069,352	$5,069,352		
Infra-Red	0	0	0	0	0	0	0	0	0	0	0
Large Transport	0	0	0	0	0	0	0	0	0		
Utility (AFS)	0	0	0	0	0	0	0	0	0	12	12
Total Aircraft/YR	12	13	18	20	23	24	25	25	26	$5,069,352	$5,069,352
Total Cost/YR	$4,569,392	$5,317,748	$6,587,504	$7,263,180	$8,112,915	$8,366,070	$8,540,204	$8,540,204	$8,714,158	0	0

Water Scooper: 90 day contracts @ $8000/day = $720,000/aircraft/yr. Aircraft Manager @ GS-7/5 X $4726 mo X 6 mo = $28,356/yr
SEAT: 90 day contracts @ $2,500/day = $225,000/aircraft/yr. SEAT Manager @ GS-7/5 X 4726/mo = $28,356/yr Total $253,335/aircraft/yr
ASM: 180 day contracts @ $1500/day = $270,000/aircraft/yr. ATP/ATS @ GS-12/7 = $100,624/yr
ATGS: 90 day contracts @ $1000/day = $90,000/aircraft/yr. ATGS personnel @ GS-11/5 = $83,954/yr. Total $173,954/aircraft/yr.
SMJ: 120 day contracts @ $3500/day = $420,000/aircraft/yr.
H2: 100 day contracts @ $4000/day = $400,000/aircraft/yr. H2 mgr costs: 2 GS-09 @ $122,446 = Total $522,446/aircraft/yr
H1: 120 day contracts @ $18,000/day =$2,160,000/aircraft/yr. H1 mgr costs: 2 GS-09 @ $122,446 = Total $2,282,446/aircraft/yr
H3: 100 day contracts @ $3000/day = $300,000/aircraft/yr. H3 mgr costs: 2 GS-09 @ $122,446 = Total $422,446/aircraft/yr
Utility: 120 day contracts @ $2000/day = $240,000/aircraft/yr.

BLM FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LAT	0	0	0	0	0	0	0	0	0	0	0
Scooper	2	2	2	2	2	2	2		2	2	2
	$1,496,712	$1,496,712	$1,496,712	$1,496,712	$1,496,712	$1,496,712	$1,496,712	2	$1,496,712	$1,496,712	$1,496,712
SEAT	17	17	20	20	25	25	25	$1,496,712	25	25	25
	$4,307,052	$4,307,052	$5,067,120	$5,067,120	$6,333,900	$6,333,900	$6,333,900	25	$6,333,900	$6,333,900	$6,333,900
ASM	3	5	5	5	5	5	5	$6,333,900	5	5	5
	$1,163,184	$2,356,240	$2,356,240	$2,356,240	$2,356,240	$2,356,240	$2,356,240	5	$2,356,240	$2,356,240	$2,356,240
ATGS	9	9	10	10	10	10	10	$2,356,240	10	10	10
	$1,384,321	$1,565,586	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	10	$1,739,540	$1,739,540	$1,739,540
SMJ	7	7	7	7	7	7	7	$1,739,540	7	7	7
	$2,518,684	$2,940,000	$2,940,000	$2,940,000	$2,940,000	$2,940,000	$2,940,000	7	$2,940,000	$2,940,000	$2,940,000
Heli T1	0	0	0	0	0	0	0	$2,940,000	0	0	0
Heli T2	6	7	8	9	10	10	10	0	10	10	10
	$2,719,962	$3,657,122	$4,179,568	$4,702,014	$5,524,460	$5,524,460	$5,524,460		$5,524,460	$5,524,460	$5,524,460
Heli T3	18	17	16	15	14	14	14	10	14	14	14
	$6,091,860	$7,181,582	$6,759,136	$6,336,690	$5,914,244	$5,914,244	$5,914,244	$5,524,460	$5,914,244	$5,914,244	$5,914,244
Infra-Red	0	0	0	0	0	0	0	14	0	0	0
Transport	0	0	0	0	0	0	0	$5,914,244	0	0	0
Utility	4	4	4	4	4	4	4	0	4	4	4
	$608,630	$960,000	$960,000	$960,000	$960,000	$960,000	$960,000		$960,000	$960,000	$960,000
	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	0	**2016**	**2017**	**2018**
Aircraft/YR	66	68	72	72	77	77	77		77	77	77
Cost/YR	$20,290,405	$24,464,294	$25,498,316	$25,598,316	$27,265,096	$27,265,096	$27,265,096	4	$27,265,096	$27,265,096	$27,265,096

Notes: All costs include associated personnel. Figures in 2008 column reflect actual known costs; out-year costs are estimated.
Water Scooper: 90 day contracts @ $8000/day = $720,000/aircraft/yr. Aircraft Manager @ GS-7/5 X $4726 mo X 6 mo = $28,356/yr
SEAT: 90 day contracts @ $2,500/day = $225,000/aircraft/yr. SEAT Manager @ GS-7/5 X 4726/mo = $28,356/yr Total $253,3356/aircraft/yr
ASM: 180 day contracts @ $1500/day = $270,000/aircraft/yr. ATP/ATS @ GS-12/7 = $100,624/yr
ATGS: 90 day contracts @ $1000/day = $90,000/aircraft/yr. ATGS personnel @ GS-11/5 = $83,954/yr
SMJ: 120 day contracts @ $3500/day = $420,000/aircraft/yr.
H1: 120 day contracts @ $18,000/day =$2,160,000/aircraft/yr. H1 mgr costs: 2 GS-09 @ $122,446 = Total $2,282,446/aircraft/yr
H2: 100 day contracts @ $4000/day = $400,000/aircraft/yr. H2 mgr costs: 2 GS-09 @ $122,446 = Total $522,446/aircraft/yr
H3: 100 day contracts @ $3000/day = $/aircraft/yr. H3 mgr costs: 2 GS-09 @ $122,446 = Total $422,446/aircraft/yr
Utility: 120 day contracts @ $2000/day = $240,000/aircraft/yr.

FWS FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Air Tanker	0	0	0	0	0	0	0	0	0	0	0
Water Scooper	0	0	0	0	0	0	0	0	0	0	0
SEAT	0	0	0	0	0	0	0	0	0	0	0
ASM	0	0	0	0	0	0	0	0	0	0	0
ATGS	0	0	0	0	0	0	0	0	0	0	0
Smokejumper	0	0	0	0	0	0	0	0	0	0	0
Helicopter T1	0	0	0	0	0	0	0	0	0	0	0
Helicopter T2	0	0	0	0	0	0	0	0	0	0	0
Helicopter T3	3	3	3	3	3	3	3	3	3	3	3
	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338
Infra-Red	0	0	0	0	0	0	0	0	0	0	0
Large Transport	0	0	0	0	0	0	0	0	0	0	0
Utility (AFS)	0	0	0	0	0	0	0	0	0	0	0
Total Aircraft/YR	3	3	3	3	3	3	3	3	3	3	3
Total Cost/YR	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338	$1,267,338

Water Scooper: 90 day contracts @ $8000/day = $720,000/aircraft/yr. Aircraft Manager @ GS-7/5 X $4726 mo X 6 mo = $28,356/yr
SEAT: 90 day contracts @ $2,500/day = $225,000/aircraft/yr. SEAT Manager @ GS-7/5 X 4726/mo = $28,356/yr Total $253,335/aircraft/yr
ASM: 180 day contracts @ $1500/day = $270,000/aircraft/yr. ATP/ATS @ GS-12/7 = $100,624/yr
ATGS: 90 day contracts @ $1000/day = $90,000/aircraft/yr. ATGS personnel @ GS-11/5 = $83,954/yr. Total $173,954/aircraft/yr.
SMJ: 120 day contracts @ $3500/day = $420,000/aircraft/yr.
H1: 120 day contracts @ $18,000/day =$2,160,000/aircraft/yr. H1 mgr costs: 2 GS-09 @ $122,446 = Total $2,282,446/aircraft/yr
H2: 100 day contracts @ $4000/day = $400,000/aircraft/yr. H2 mgr costs: 2 GS-09 @ $122,446 = Total $522,446/aircraft/yr
H3: 100 day contracts @ $3000/day = $300,000/aircraft/yr. H3 mgr costs: 2 GS-09 @ $122,446 = Total $422,446/aircraft/yr
Utility: 120 day contracts @ $2000/day = $240,000/aircraft/yr.

NPS FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Air Tanker	0	0	0	0	0	0	0	0	0	0	0
Water Scooper	0	0	0	0	0	0	0	0	0	0	0
SEAT	0	0	0	0	0	0	0	0	0	0	0
ASM	0	0	0	0	0	0	0	0	0	0	0
ATGS	0	0	0	0	0	0	0	0	0	0	0
Smokejumper	0	0	0	0	0	0	0	0	0	0	0
Helicopter T1	0	0	0	0	0	0	0	0	0	0	0
Helicopter T2	1	2	2	2	2	2	2	2	2	2	2
	$522,446	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892	$1,044,892
Helicopter T3	10	10	11	11	11	11	11	11	11	11	11
	$4,224,400	$4,224,400	$4,646,906	$4,646,906	$4,646,906	$4,646,906	$4,646,906	$4,646,906	$4,646,906	$4,646,906	$4,646,906
Infra-Red	0	0	0	0	0	0	0	0	0	0	0
Large Transport	0	0	0	0	0	0	0	0	0	0	0
Utility (AFS)	0	0	0	0	0	0	0	0	0	0	0
Total Aircraft/YR	11	12	13	13	13	13	13	13	13	13	13
Total Cost/YR	$4,746,906	$5,269,352	$5,691,798	$5,691,798	$5,691,798	$5,691,798	$5,691,798	$5,691,798	$5,691,798	$5,691,798	$5,691,798

Water Scooper: 90 day contracts @ $8000/day = $720,000/aircraft/yr. Aircraft Manager @ GS-7/5 X $4726 mo X 6 mo = $28,356/yr
SEAT: 90 day contracts @ $2,500/day = $225,000/aircraft/yr. SEAT Manager @ GS-7/5 X 4726/mo = $28,356/yr Total $253,335/aircraft/yr
ASM: 180 day contracts @ $1500/day = $270,000/aircraft/yr. ATP/ATS @ GS-12/7 = $100,624/yr
ATGS: 90 day contracts @ $1000/day = $90,000/aircraft/yr. ATGS personnel @ GS-11/5 = $83,954/yr. Total $173,954/aircraft/yr.
SMJ: 120 day contracts @ $3500/day = $420,000/aircraft/yr.
H1: 120 day contracts @ $18,000/day =$2,160,000/aircraft/yr. H1 mgr costs: 2 GS-09 @ $122,446 = Total $2,282,446/aircraft/yr
H2: 100 day contracts @ $4000/day = $400,000/aircraft/yr. H2 mgr costs: 2 GS-09 @ $122,446 = Total $522,446/aircraft/yr
H3: 100 day contracts @ $3000/day = $300,000/aircraft/yr. H3 mgr costs: 2 GS-09 @ $122,446 = Total $422,446/aircraft/yr
Utility: 120 day contracts @ $2000/day = $240,000/aircraft/yr.

USFS FIREFIGHTING AIRCRAFT FLEET PROJECTION SUMMARY

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Airtankers*	19	19	21	22	23	24	25	26	27	30	32
	$32,749,000	$32,749,000	$36,302,000	$38,078,000	$39,854,000	$41,630,000	$43,407,000	$45,183,000	$46,959,000	$52,288,000	$55,840,000
Water Scooper	0	0	0	0	0	0	0	0	0	0	0
SEAT	2	2	2	2	2	2	2	2	2	2	2
	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712	$506,712
ASM	12	12	15	15	15	15	15	15	15	15	15
	$16,711,776	$17,618,720	$36,043,720	$31,918,720	$23,768,760	$23,668,720	$6,168,720	$6,168,720	$6,168,720	$6,168,720	$6,168,720
ATGS	10	10	10	10	10	10	10	10	10	10	10
	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540	$1,739,540
Smokejumper	12	12	12	12	12	12	12	12	12	12	12
	$3,859,504	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188	$3,438,188
Helicopter T1	34	34	34	34	34	34	34	34	34	34	34
	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166	$64,763,166
Helicopter T2	35	35	35	35	35	35	35	35	35	35	35
	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580	$21,685,580
Helicopter T3	60	60	60	60	60	60	60	60	60	60	60
	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760	$25,346,760
Infra-Red	2	2	2	2	2						
	$819,000	$819,000	$819,000	$819,000	$819,000						
Large Transport	1	1	1	1	1						
	$972,000	$972,000	$972,000	$972,000	$972,000						
Total Aircraft/YR	168	168	171	171	171	168	168	168	168	168	168
Total Cost/YR	$136,404,038	$111,542,906	$129,967,906	$125,842,906	$117,692,946	$115,801,906	$98,301,906	$98,301,906	$98,301,906	$98,301,906	$98,301,906

*The number of LAT's includes residual aircraft currently in the fleet and the procurement of new aircraft. These numbers are estimated based on expected retirement of current aircraft.

LAT: 2008 & 2009 are actual contract costs for 140, 150, 160 and 180 day contracts. 2010 – 2018 are based on average $11,100 per aircraft per day (160 days).

Water Scooper: 90 day contracts @ $8000/day = $720,000/aircraft/yr. Aircraft Manager @ GS-7/5 X $4726 mo X 6 mo = $28,356/yr

SEAT: 90 day contracts @ $2,500/day = $225,000/aircraft/yr. SEAT Manager @ GS-7/5 X 4726/mo = $28,356/yr

ASM: 180 day contracts @ $1500/day = $270,000/aircraft/yr. ATP/ATS @ GS-12/7 = $100,624/yr

ATGS: 90 day contracts @ $1000/day = $90,000/aircraft/yr. ATGS personnel @ GS-11/5 = $83,954/yr = Total $173,954/aircraft/yr

SMJ: 120 day contracts @ $3500/day = $420,000/aircraft/yr.

H1: 90/150/180 day contract @ $15,000/day = $1,782,353/aircraft/yr. H1 Mgr costs: 2 GS-9 @ $122,446 = Total of $1,904,799/aircraft/yr

H2: 120/150/170 day contracts @ $4000/day = $497,143/aircraft/yr. H2 Mgr costs: 2 GS-9 @ $122,446 = Total of $619,588/aircraft/yr

H3: 100 day contracts @ $3000/day = $300,000/aircraft/yr. H3 Mgr costs: 2 GS-9 @ $122,446 = Total of $422,446/aircraft/yr

IR: Amortize $7M purchase cost of aircraft over 9 years

Appendix 12: Wildland Fire Large Airtanker Strategy

Wildland Fire Large Airtanker Strategy

Introduction: A group of interagency wildland fire experts has completed an aviation strategic plan which comprehensively outlines tactical aircraft needs for the federal wildland fire agencies for the next decade. Representatives from all five federal wildfire agencies within the US Forest Service (USFS) and the Department of the Interior (DOI), as well as representatives from the National Association of State Foresters (NASF), participated. Experienced and senior fire managers collectively developed this plan to meet our future aviation needs. In part, the plan calls for the federal government to acquire, over a ten year period, twenty-five (25) new and efficient aircraft to gradually replace the existing large fixed wing airtanker fleet. The aircraft will be operated and maintained by private industry with the federal government retaining ownership.

Background: Large fixed wing airtankers have played an increasingly important role in firefighting since the mid-1950s when aircraft were first used to deliver retardant. Today, privately owned airtankers are leased from private operators from February through November and pre-positioned throughout the country based on the fire threat. The number of airtankers currently available to the Forest Service is nineteen (19), down from the peak of forty-four (44) available at the beginning of 2002.

The prospect for future commercially supplied, privately owned and operated, airtankers is highly unlikely because of strict requirements for safety in the aftermath of tragic accidents in 2002, the high cost of aircraft, the limited availability of suitable commercial aircraft, and the “high time” of surplus military aircraft. The cost of developing a new commercial airtanker is prohibitive because of the limited number of aircraft that could be sold in this “niche” application (the total US market is a couple dozen while the total world-wide market is probably less than four dozen). Moreover, any company attempting to fill this niche would undoubtedly be forced to charge extraordinarily high lease rates to recoup the cost of bringing the aircraft into service.

The wildland fire suppression workload has increased in both severity and complexity, due to increases in forest and rangeland vegetation available to burn, the expanding wildland urban interface and hotter, longer burning seasons.

Now and in the future, the need for rapid response on initial attack for those fires we wish to contain has never been greater. Newer, faster and larger initial attack aircraft will most economically maintain a high initial attack success rate and support the focus on risk-informed fire management strategies.

Recommendation: In order to best serve the needs of the wildland firefighting community a core federal fleet of twenty-five (25) large fixed wing airtankers, operated and maintained by private industry with the federal government purchasing the aircraft and retaining ownership, is recommended. The goal to acquire 25 new aircraft is derived from the 2005 *Wildland Fire Management Aerial Application Study*.

With large air tanker numbers being reduced from the 44 aircraft available at the beginning of 2002 and the 33 aircraft available at the beginning of 2004, this proposal accomplishes the objective of "fewer and newer" aircraft.

The most suitable aircraft for the large fixed wing airtanker mission, based on our investigation, is the Hercules II C-130J manufactured by Lockheed Martin Aeronautics Company. This aircraft fully meets the immediate and future operational requirements. It can perform multiple fire missions, and has a proven track record as a retardant delivery platform. The C-130J could carry up to 4,000 gallons of wildland fire retardant and provides a 35% increase in speed over our fastest airtanker, the P-3. The C-130J is a strong, safe, and fast aircraft designed for military requirements very similar to the firefighting mission.

Cost: Initial acquisition costs are approximately $60 million each, totaling approximately $1.5 billion for 25 aircraft over a ten year replacement period, possibly beginning in 2010. Lower operating costs over the life of the aircraft will offset the initial acquisition costs. Performance measures for the C-130J and other airtankers are listed in the chart below for comparison.

Aircraft Model	Speed	Capacity	Sorties[1]	Average Daily Cost	Cost per gallon	Acres Protected/hour[2]
C-130J	350mph	3600[3] gallons	11	$80,650	$2.03	246 million
P-3	250mph	2550 gallons	8	$74,740	$4.88	126 million
P2V	210mph	2082 gallons	6	$46,100	$4.42	89 million
SEAT AT-802	160mph	800	5	$19,850	$4.96	51 million
Helitanker S-64	115mph	2400 gallons	3	$127,400	$13.27	27 million

(1) The number of initial attack missions of 100 miles possible in 6 hours.
(2) The number of acres that would be covered in a one hour flight.
(3) The current capacity of the MAFFS units for the C-130H is 3,000 gallons. The C-130J is capable of carrying 3,600 gallons of retardant.

The US Air Force is reporting cost saving of up to 45% in C-130J operating expenses compared to previous C-130 models. These savings were due, in part, to reduced maintenance, nearly 20% increase in fuel economy, and smaller crew requirements. Additional wildland fire management program savings will be realized from fewer airtankers bases, fewer large helicopters, and possibly from cost sharing use of the C130J's with other agencies (e.g. NOAA, USCG, Border Patrol, etc) or by allowing the contractors to pay the federal government for private use of the aircraft during the "off" season.

Efficiencies: Increased fire danger and the reduction of the airtanker fleet due to age could adversely influence the initial attack success rate. To maintain the current high level of initial attack success requires improvements in vegetation management and firefighting resources. Based on US Forest Service estimates, every one percent reduction in initial attack success (of those fires the USFS wishes to contain) equates to approximately 100 large fires each costing the agencies an average of $2 million. The increased speed, range, endurance and reliability of the C-130Js will allow the wildland fire agencies to maintain, if not enhance, initial attack success.

Conservative fleet projections show a reduction of 12 large airtankers over the next ten years due to issues associated with aging aircraft. We can mitigate the loss of large fixed wing airtankers with large helicopters. However, this option costs more and slows our overall response time. We will pay more for less – an unsustainable strategy for the long-term. A better option is to replace these aircraft with faster and less expensive C-130J aircraft, as illustrated in the comparison below:

Replace 12 Airtankers with:	Fleet-Cost Increase	Change in Fleet-Speed	Initial Attack Effectiveness
12-Helitankers	13%	20% slower	decreases
12-C-130J Airtankers	5%	14% faster	increases

There are currently 39 large helicopters contracted by the Forest Service which will be reduced to 7 for initial attack with the requested 25 C-130Js. This will provide additional savings of approximately $43 million per year. Further large helicopter reductions could be accomplished on a 2:1 basis; two helicopters for every additional airtanker.

The C-130J is capable of performing other fire related missions beyond delivering retardant. It can also be used for dropping smokejumpers/cargo, transporting firefighters/equipment, and wildfire intelligence gathering.

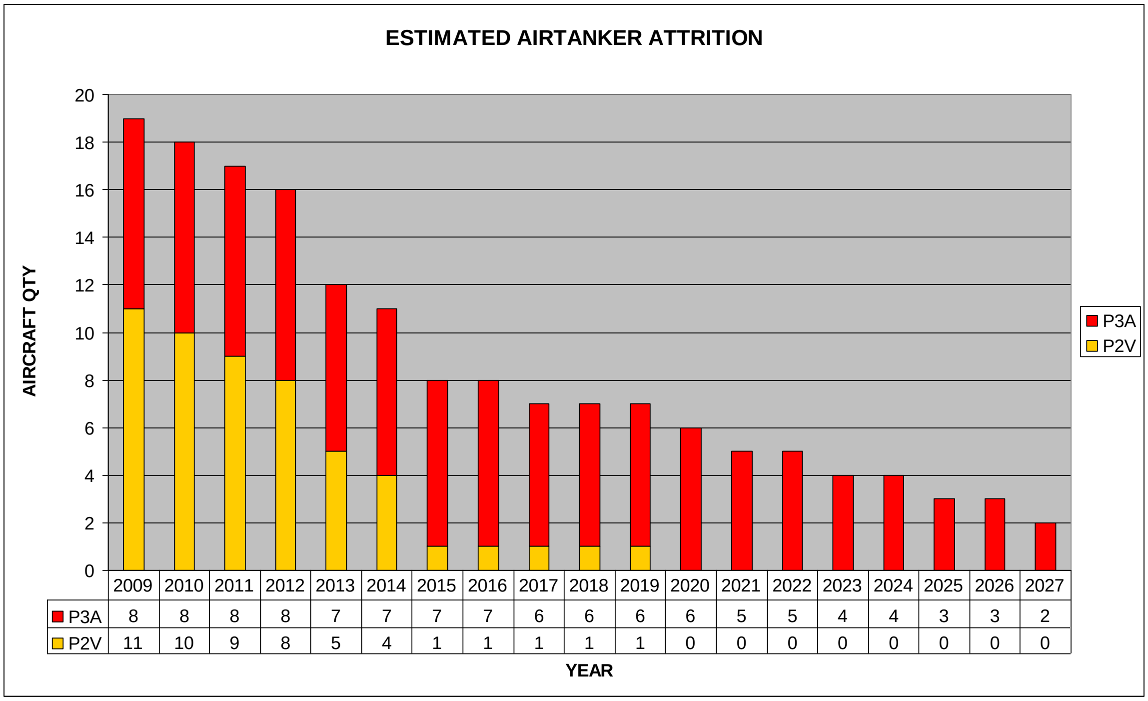
Without replacing large airtankers the helicopter fleet and associated costs will double to maintain current capacity. In addition, the slower helicopter fleet will reduce initial attack efficiency on the fires where helicopters have not been positioned, leading to increases in acres burned, increased fire suppression costs, and the likelihood of greater property and natural resource loss nationally.

Air Tanker Bases: The Forest Service recently completed a feasibility study on airtanker bases and support facilities to align them with our current and future mission requirements. The study recommended a 30% reduction in full service, full time bases. This will produce substantial savings in capital investments and operating costs.

Cost Optimization: Airtankers, because of their combination of greater speed, range, and capacity, are efficient at delivering retardant to support ground firefighter's fireline production on dispersed fires. The C-130J has a significant advantage over helitankers for this critical mission. The C-130J hourly flight cost is approximately 30% less than a helitanker and carries a greater load. This gives the C-130J a distinct advantage for this critical initial attack mission. While large helicopters will continue to be effective for point protection and large fire support, their numbers and program costs could be reduced with the acquisition of the C-130J.

Training, parts supply and other program costs will be shared with the military's Modular Airborne Firefighting System (MAFFS). As noted, large airtanker program costs could be further reduced by allowing contractors to use these aircraft for other purposes during the off-season. However, because these military aircraft are not certified for air commerce by the Federal Aviation Administration, this option would require relief from the applicable requirements in 14 CFR parts 119, 135, and 121.

Summary: The C-130J provides the wildland fire agencies with a large airtanker which improves our capabilities of speed, range, endurance, and maintenance reliability. It will allow federal wildland fire agencies to successfully meet our commitment to the wildfire threatened communities to reduce "the risk of loss from catastrophic wildland fire caused by hazardous fuel buildup."



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
P3A	8	8	8	8	7	7	7	7	6	6	6	6	5	5	4	4	3	3	2
P2V	11	10	9	8	5	4	1	1	1	1	1	0	0	0	0	0	0	0	0

YEAR

* The chart represents attrition due to accidents and airworthiness issues
** Preliminary indications are that the P-3 is not meeting contract requirements and could be unavailable as early as next year

Airtanker Options

The *Options for Airtankers* paper was prepared at the request of the Chief, USDA Forest Service, to provide three unbiased options for airtankers. However, these management options are all based on the analysis which has at its core a requirement to be able to deliver a certain amount of retardant safely, quickly and efficiently for initial attack. The three options are listed below:

- **Option 1-Government-owned, contractor-operated business model.** Under this option the USDA Forest Service (FS) would own the airtankers and offer contracts to private industry for operations and maintenance. Government ownership of these aircraft will result in control over maintenance and safety. The airtanker industry will benefit from having a reduced capital investment and more contracting opportunities.

- **Option 2-Military-owned, military-operated business model.** This option would be an extension of the military C-130 program known as the Modular Airborne Firefighting System or MAFFS. The FS has discussed this option with the U.S. Air Force and Air National Guard and continues a positive dialogue. Outside of the fire season, the Air Force/ Air National Guard would have access to the aircraft for traditional military missions.

  A variation of this model has the FS owning the aircraft with the military operating the aircraft, providing pilots and maintenance.

- **Option 3-Contractor-owned, contractor-operated model.** To maintain current capacity, the FS would be required to substitute other aircraft for airtankers as they are retired, e.g. BAe-146. Specialized aircraft such as helicopters, water-scooping aircraft, single engine airtankers, and very large airtankers, e.g., Boeing 747 and DC-10, are possible candidates.

USDA Forest Service, Date: August 26, 2009