PLAN #6

SAMPLE (MUST BE REVISED FOR EACH PROJECT)

PROJECT AIR OPERATIONS SAFETY PLAN

Prescribed Fire Project: Dadd Bennett / Lower Flowers and Sand Creek

Arapaho and Roosevelt National Forests

Reviewed by:	_____	_____
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Contents

I. **Introduction and Operation Objectives**

The purpose of this air operation is to support the Dadd Bennett / Lower Flowers and Sand Creek Prescribed Fires, including reconnaissance, personnel transport, aerial ignition, and, if needed, bucket drops for fire control. This document delineates safety practices and job responsibilities related to air operations, so that prescribed fire and related activities can be accomplished without incident or accident.

Dadd Bennett / Lower Flowers is a multi-year prescribed burn project near Rustic Colorado. Elevations within the project area range from 6900' to 8700'. Fuels are mostly open mixed ponderosa, Douglas-fir, and lodgepole, with smaller areas of pure lodgepole and of open grass and shrubs. Approximately 2500 acres is planned for aerial ignition, probably on a single day. Aerial ignition is most likely to occur in late September or early October, 1999 but may occur at any time through December 31, 2001.

Sand Creek is a less elaborate and less extensive burn near Four Corners in the Laramie River Valley of northern Colorado. The dominant fuel is .5 - 2' sage with grass and forbs. There are some internal aspen groves whose individual size ranges to several hundred acres. Elevations are 8400' to 9800'. The maximum area likely to be ignited aerially on one day is 700 acres.

Any portion(s) of either project may be ignited aerially under this plan. What is expected to be financially sound is to conduct one day of aerial ignition, and possibly use a helicopter for reconnaissance the following morning. On the anticipated ignition day, the priority order for ignition is expected to be the eastern portion of Dadd Bennett, then aspen stands interior to the north half of Sand Creek, then any other units. While it may be possible to ignite and hold both Dadd Bennett and Sand Creek on the same day, it also may not. The Burn Boss will make that decision after considering available staffing, expected weather, and other factors. It is not expected that a second day of aerial ignition would necessarily be considered, and Sand Creek (and any other units) may be handlit or not treated instead. It is anticipated that all units to be ignited by helicopter would be blacklined in advance, but this is not required.

Details of both projects, including maps, are in the burn plans. The pilot and the Helicopter Manager will review and become familiar with the burn plans prior to starting project operations.

II. **Justification**

Aerial ignition was compared with not completing the burn projects, and with doing the internal ignition by hand with ground-based firefighters. The two major drawbacks of using aircraft for this project and that make a justification analysis important, are the safety exposure, and the cost.

In general, both projects are judged to be worth undertaking from a safety perspective. They must be implemented professionally with highest regard for safety, but if this is done, the benefits of improved ecosystem health and of meeting other project objectives is sufficient.

Hand ignition is probably slightly less expensive. A gross estimate is that one day of aerial ignition will require the same number of firefighters in addition to the helicopter module as one day of hand ignition. Hand lighting, however, could take approximately six days in Dadd Bennett plus two days in Sand Creek, versus one day of aerial ignition for both. Using an estimate of eight firefighters per day[1], each five extra days would cost about $11,200.

From a safety perspective, there is a trade-off that seems comparable, between the hazards of helicopter operations versus more person-days in the fire environment if only hand lighting is used. On the other hand, there are two benefits that make the likely higher cost of the helicopter worthwhile.

Most importantly, aerial ignition is expected to reduce smoke impacts, especially from Dadd Bennett. At least some nighttime smoke drainage into the heavily used recreation corridor of the Poudre is likely during project implementation. The Forest is trying hard to minimize number of nights and severity that people are asked to tolerate smoke. In addition to good public outreach, the best apparent tool is to burn as large a portion of the fuel as possible when its smoke can be lofted into a tall column. That requires lighting a large area on fire quickly. Even if many experienced lighters were available, it is unlikely they could be coordinated safely to burn more than a thousand acres a day in the crenulated terrain of Dadd Bennett.

The secondary benefit is to allow the Forest to accomplish a large amount of burning during weather windows that may be quite short.

III. **Project Resources**

This project requires, at a minimum, one Type 3 helicopter with pilot, fuel truck, module, and one each fully-qualified Helicopter Manager and Plastic Sphere Dispenser Operator. The aircraft and pilot must be carded for plastic sphere dispenser ignition. Both the dispenser and a helicopter water bucket must be available on site. The aircraft must be able to perform well at the project altitudes.

The expected cost of aviation for this project is approximately $17,000, as follows:

ignition day, 5 hours flight time for 1 Llama @ $1414 /h	7,070
following day, 2 hour minimum flight time	2,828

[1] Additional assumptions are that all days are days of base pay rather than weekends or days off; shifts are 12 hours; and the average cost per person per day is $200.

fuel truck, $1.40 / mile, 60 miles one way	168
ping pong balls, 10 / ac, 2800 ac, $152.94/ 1000 balls NFES 3411	4,282
2 off-forest module members, 1 day travel each way plus per diem. Lodging in bunkhouse.	560
4 module members, ignition day, 12-hour day, average $220/pers/day	880
4 module members, day following, 10-hour day, avg. $180/p/d	720
TOTAL	16,508

This is a high estimate. Efforts will be made to spend less than the total shown.

Expenses incurred in Fiscal Year 1999 will be charged to 009916, which is cooperative funding from the Rocky Mountain Elk Foundation for habitat improvement. Funding in future years will be determined when income is known.

IV. **Project Activities**

Air operations include:

- aerial reconnaissance flights for supervisory fire personnel both before and after aerial ignition
- transport of firefighters and related gear to overlook or control points within or near the project areas before aerial ignition starts and/or after it is completed.
- transport and operation of a plastic sphere dispenser for aerial ignition, including transport of supervisory personnel and possibly a trainee device operator
- as needed, bucket drops on fire hot spots as requested by the Burn Boss or designee
- as needed, transport of firefighters to helispots near fire hot spots

An initial orientation flight with at least the Plastic Sphere Dispenser Operator and the Ignition Specialist will include:

- the projected burn area(s)
- flight routes, and planned ignition patterns and speeds
- local hazards
- personnel and equipment locations
- locations of project and alternate helispots, including for dispenser malfunction emergencies

V. **Personnel Duties and Responsibilities**

The Burn Boss is responsible for the overall administration of this project including planning, supervising, implementation, and project evaluation. The Burn Boss must maintain close contact with the Helicopter Manager to ensure that safe air operations procedures are being followed.

A fully-qualified Helicopter Manager is responsible for all air operations including support facilities, air safety, overseeing helispot operations, ensuring that load calculations are prepared and accurate, measuring needed weather data, loading and unloading passengers and cargo, and assisting other personnel to assure a safe project.

The pilot is responsible for safe and effective operation of the aircraft. The pilot will make final decisions on all flight operations. The pilot must be qualified and carded to fly the aircraft for any missions for which it is used.

The Plastic Sphere Dispenser Operator is responsible for safe and effective operation of the ignition device. The Burn Boss, either directly or through a designee who may or may not ride in the helicopter, will provide general direction to the Operator about ignition pattern, schedule, and desired fire behavior.

Passengers are responsible for following safety steps as briefed. They will wear the required protective clothing and follow instructions from qualified air operations personnel. Flight helmets and not hard hats are required for all passengers, except firefighters during point-to-point ferry trips.

VI. **General Helicopter and Pilot Safety**

- All helicopter operations, including support operations, will conform to the Interagency Helicopter Operations Guide (IHOG), the Interagency Aerial Ignition Guide, and Forest Service Manual 5700.
- The helicopter and pilot will be approved and carded for helicopter operations, including for plastic sphere dispenser ignition.
- The pilot will be briefed to be alert to rock outcroppings, strong gusty winds, unexpected hikers, and other recognized hazards. Known flight hazards at fixed locations within ten miles of the project areas are:
    - a military training route northeast of both project areas, which connects T9N R71W section 2 in a straight line with T12N R74W section 22
    - a landing strip near Four Corners, in T11N R76W section 29
    - a power transmission line, which runs approximately 3 miles due south from the town of Redfeather Lakes, then approximately follows the road to Rustic
    - between Sand Creek and Dadd Bennett, the Deadman radio tower at T10N R75W section 13
    - a power distribution line within Dadd Bennett and barely west of the aerial

ignition block, that is shown on the burn plan map
No Temporary Flight Restriction is planned to be requested.

- Flight paths to and from all helispots will be known to all helicopter module members and the pilot. Any known flight hazards will be discussed with the pilot.
- The helicopter will not be refueled when the engine is running. The helicopter and fuel truck will be bonded prior to the start of refueling.
- A helicopter load calculation will be completed each time either (a) the temperature or (b) the landing elevation changes from the ranges used for the previous calculation. A manifest will be filled out for each passenger flight listing people's names and weights, or, for each cargo flight, cargo description and weights. Total weight must be under the amount allowed for the aircraft under the flight's conditions.
- At least the following documents will be posted at the helibase:
  - organizational chart
  - radio frequencies list
  - emergency plan
  - load calculations
  - maps of project areas
- Ignition operations will commence only after positive communications have been established with ground personnel, and the Burn Boss or Holding Specialist confirms that all ground personnel are ready to begin.
- The pilot will wear a flight helmet and flame-resistant clothing.
- The Helicopter Manager will ensure that Materials Safety Data Sheets for both glycol and potassium permanganate are available at the helibase.
- The pilot is responsible for proper loading of the aircraft to meet limitations on gross weight and center of gravity.
- No project personnel will ride in the helicopter when a sling load or bucket is being carried.
- Only essential personnel will ride in the helicopter.
- Flight operations for a Type 2 helicopter will be not be initiated and will be terminated when winds exceed 30 knots or when the maximum gust speed is 15 knots or more higher. Limitations for any Type 2 helicopter will conform to the Interagency Helicopter Operations Guide. Regardless of wind speed, if the pilot or manager determines, based on anyone's observations, that wilds are erratic, operations will be suspended.
- Special attention will be paid to unexpected hikers in the project area. Landing sites will be checked from the air for hikers nearby before use. A reconnaissance flight that specifically includes looking for recreationists will be completed before aerial ignition starts.
- The pilot may not make exploratory side trips without filing a flight plan with the Helicopter Manager.

- The helicopter will be flown only when weather conditions meet FAA Visual Flight Regulations.
- The pilot will stop air operations if he or she judges conditions to be too hazardous.
- The pilot will abide by the flight and duty time limitations in the contract for the helicopter.
- No flights will be made more than 30 minutes after official sunset or earlier than 30 minutes before sunrise.

VII. **Helibase and Helispot Safety**

Salt Cabin Park in the southwest corner of Dadd Bennett area will be the helibase. Its location is:

in T8N, R73W, Section 15
Lat: 40° 39' 45" N, Long: 105° 33' 53" N
from DEN VOR, 66 nautical miles (nm) @ 310°
from CYS VOR, 49 nm @ 217°

A helispot that may be used in Sand Creek is at the base of the drainage, on the south side of the road and northeast of the bog:

in T11N, R75W, Section 31, NW
Lat: 40° 53.02' N, Long: 105° 51.26' N
from DEN VOR, 84 nm @ 309.5°
from CYS VOR, 53 nm @ 237.7°

At the helibase and at any helispots,

- Unauthorized personnel must stay at least 100' from the helicopter and related equipment.
- People who do not have duties while the helibase or a helispot is in operation should not remain there. The Helicopter Manager is authorized and responsible to enforce this. If visitors are not burn personnel, the Manager may request that the Burn Boss provide assistance from the incident Public Information Officer.
- No one may smoke within 100' of the helicopter or fuel truck.
- People approaching the helicopter will be advised of the common hazards related to the tail rotor, main rotor, and hot exhaust stacks. People approaching the helicopter must have the pilot's permission, be fully within the pilot's view, and be assisted by a qualified Helicopter Crewmember. All persons working under or near the rotor blades will walk in a stoop.
- Hard hats worn around the helicopter must have a secured chin strap.
- Ear and eye protection will be worn by all people working within 50' of the helicopter.

- Only trained helicopter staff will make hover hook-ups.
- The Parking Tender working at the helibase will wear a safety-colored vest.
- A wind indicator will be mounted at the helibase and each helispot in repeated use to help the pilot determine wind direction and speed.
- A fire extinguisher that meets IHOG specifications will be available at the helibase and at each designated helispot within the project area(s) being ignited. If Sand Creek is being ignited, then a helispot with fire extinguisher will be designated. All personnel working at the helibase and any helispot will be briefed on the extinguisher's use and location.
- Additional safety equipment that must be available at the helibase includes a crash/rescue kit, an evacuation kit, a seat belt knife, a handheld radio, and a 10-person first-aid kit. A Stokes litter may be placed at the helibase at the Manager's discretion.
- If there is an injury that requires medivac, the helicopter may be requested to assist. The burn plan includes an emergency medical plan. The locations of the most likely medivac destinations are:

  Poudre Valley Hospital, Fort Collins
  40 34 17.936 N 105 03 22.918 W
  University Hospital, Denver
  34 43.93 N 104 56.34 W

VIII. **Briefing**

All personnel involved with this project will be informed of safety concerns. They include strong gusty winds, helicopter operations, cargo, personnel responsibilities, visibility limitations, and the need to pay attention to rapid weather deterioration.

The Helicopter Manager or designee will brief all passengers on each flight before they board the helicopter. The briefing will include:

1. Insuring passengers are correctly wearing the proper protective clothing, including flight helmets.
2. Normal procedures for:
   Aircraft entry and exit
   Approaching and departing to the front of the aircraft, and down slope
   Staying in the pilot's field of vision
   Walking in a crouched position when near the aircraft
3. Proper opening and closing of passenger doors
4. Seating in the aircraft:
   No changing of seat location

Seatbelts and shoulder harnesses should be fastened at all times
Unbuckle only when directed by pilot or helitack personnel

5. Emergency procedures, including the location and operation of emergency exits
6. Location and manual activation of the Emergency Locator Transmitter
7. Location of first-aid equipment and fire extinguisher
8. Emergency operation of avionics
9. No smoking regulations

The pilot is expected to exercise experienced good judgment. The pilot shall stop air operations if he or she judges that the risks are excessive.

A meeting will be held before air operations start, in order to address questions concerning safety practices and project assignments. All personnel involved with air operations for this project will verify their understanding of the project.

Upon completion of aerial ignition activities and/or daily project implementation, the Helicopter Manager will ensure that there is a debriefing and critique with at least the pilot, all air operations personnel, and the Burn Boss. This may be done in conjunction with the general operations debriefing.

IX. **Communications and Flight Following**

Project Radio Frequencies

purpose	frequency name	frequency
burn operations (1)	Roosevelt work	168.175
any personnel with Dispatch (1)	Roosevelt net	RX 169.175 TX 169.975 (2)
aircraft with helibase and all burn personnel except Burn Boss	air-to-ground	172.325
Burn Boss with pilot and Plastic Sphere Dispenser Operator	Region 2 tactical	168.350
aircraft emergencies	air guard	168.625
flight following with Dispatch to and from the project area	air net	168.650

(1) Either Roosevelt work (direct) or Roosevelt net (repeated) can be used also for communication between helibase and helispots.
(2) The Buckhorn repeater (tone 123.0) is effective from many locations on Dadd/ Bennett, Lower Flowers.

The Helicopter Manager will monitor both air-to-ground and air guard, and the Burn Boss and holding specialist will monitor at least air-to-ground and Region 2 tactical. If Sand Creek is ignited and no helibase established in the vicinity, at least one firefighter with a radio will be in the vicinity and will monitor air-to-ground.

Fort Collins Dispatch will flight follow to the helibase. After the helibase is operational, flight following will be done by the Helicopter Manager or a designee. Radio checks will be made at the time of each take off or landing at the helibase, and also at least every fifteen minutes. If radio contact is lost, air operations **will** halt until communications are reestablished.

X. **Aerial Ignition Device Safety**

The Plastic Sphere Dispenser Operator will be fully qualified. A trainee may work under the Operator's supervision.

All quick release mechanisms to eject the dispenser from the aircraft in an emergency will be tested before use, and will be made functional prior to takeoff. A knife to cut straps will be readily available to the operator while in the aircraft.

The Operator will wear an approved harness during ignition operations.

The electrical connection to the aircraft's power supply will have a quick-disconnect fitting and an internal fuse.

Required supplies include adequate quantities of plastic spheres and antifreeze to complete planned daily ignition activities, enough water to fill the reservoir on the dispenser, and a one gallon of water in canteen(s) to supplement the reservoir.

As even small amounts of glycol can attract and kill wildlife, a concerted effort will be made to avoid spilling any on site. Spill pads will be available at the helibase, and will be used when transferring glycol between containers.

The pilot, ignition specialist, and dispenser operator will review roles and responsibilities, and communications protocols, prior to the start of aerial ignition.

Prior to starting ignition, the Plastic Sphere Dispenser Operator will review and sign a copy of the PSD Air Operations Safety Checklist that is part of the IHOG. A Job Hazard Analysis for dispenser operation is included as Appendix A of this plan.

XI. **Accidents or Incidents**

As used in this document, an accident is either (a) destruction or substantial damage to the aircraft or service truck, (b) damage to aircraft components, or (c) minor, serious, or fatal injury to personnel.

An incident is any air or ground mishap, malfunction, or situation involving aircraft or personnel which results in a deviation from standard procedures or has the potential of resulting in an accident, injury, or death.

The pilot and fuel truck operator shall be equipped and trained to take proper action in an emergency. This is the Contractor's responsibility.

Forest Service personnel on the project will be equipped to take proper action in an emergency.

If the aircraft is involved in an accident, no matter how minor, the ship will not be permitted to fly for the project until a complete investigation by the Regional Aviation Officer has been made and the aircraft and pilot recertified.

XII. **Search and Rescue**

Emergency numbers will be posted at Dispatch. If a crash or other injury is reported, medical aid will be dispatched immediately to the site. Requests for Sheriff, ambulance, and/or Flight for Life are all handled by Larimer County Dispatch at 970 498-5141.

A. <u>When a crash is suspected but has not been located:</u>

1. The project personnel will immediately start a search if the helicopter is believed to be down.
2. Fort Collins Dispatch will be notified immediately of the general area of the search.
3. Dispatch will implement the crash-rescue procedures outlined in the Crash / Search and Rescue Plan.
4. If the crash is not located within a reasonable period, the Helicopter Manager will request that qualified aerial observers to join the search.
5. Dispatch will notify the Forest Supervisor, who will notify the Regional Aviation Officer.

B. <u>When a crash is located:</u>

Before the Sheriff assumes administration of the rescue operation:

1. The Helicopter Manager will continue to report to the Burn Boss until relieved by the District or Forest. The Burn Boss will organize the search, ordering emergency personnel and equipment immediately if needed. The Burn Boss will also remain in frequent communications with rescue squads, and start medical and ambulance service to the crash site.
2. As soon as a rescue squad reaches the crash, the Manager will report the condition of the pilot and any other persons involved in the crash to the burn Boss, medical responders and to the helibase. The helibase will relay the information to Forest Dispatch who in turn will inform the District Ranger, Rocky Mountain Coordination Center, the Forest and Regional Air Officers, and the aircraft Contracting Officer.
3. Whatever action is necessary to save the lives of the crash victims will be taken by the medical unit and rescue squad.

After the Sheriff assumes administration of rescue operations, Forest Service personnel will assist by providing, as requested:

· communications through the Forest Service communications center

· guide service to the scene of the emergency

help in arranging transportation

maps, details of Forest organization, etc.

ground personnel at the scene of the accident

as appropriate, assistance with patient care by qualified providers

Appendix A

Job Hazard Analysis for Plastic Sphere Dispenser Operation

Task or Procedure	Hazards	Abatement Actions
Qualifications	Unqualified personnel	- Sphere dispenser operator shall be certified annually. - Pilot and helicopter shall be certified annually for aerial ignition. - Pilot will have two hours of training in fire behavior and be trained in the use of a fire shelter.
Responsi-bilities	Unknown responsibilities	- Prior to each project, operator will review appropriate portions of IHOG and Interagency Aerial Ignition Guide. - The project briefing will cover responsibilities and emergency procedures.
Bench testing	Possible malfunctions	- Bench testing will be done prior to mounting the machine in the helicopter and will be done at a safe distance from the helicopter.
Personal protective equipment (PPE)	Injuries	- Operator and pilot shall have a fire shelter and wear flight helmets, Nomex flight suits and gloves, and leather gloves. - Any additional personnel who ride in the helicopter

		during ignition shall have the same PPE, except that they may wear other Nomex clothing than a flight suit.
Malfunctions	Possible fire in machine. Machine not operating properly.	- Malfunctions will be addressed in the project briefing. - The operator will notify the pilot immediately of a malfunction and take appropriate action to correct it. If the malfunction cannot be corrected in the air, the helicopter will set down. If a fire occurs in the machine that the operator cannot extinguish, the pilot will be notified and the machine will be jettisoned.
Ignition	Firing pattern and fire behavior	- Firing pattern will be determined by the Burn Boss to ensure that objectives are met safely.
Flight following	Loss of communication	- Flight following will be done from the helibase during the project. Upon completion of the project, flight following will be turned over to dispatch.