

**I**nteragency  
**S**mokejumper  
**P**ilots  
**O**perations  
**G**uide



Bureau of Land Management and the United States Forest Service



2008 edition: Valid until replaced by a subsequently published edition.



## Office of Fire and Aviation

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- This document supersedes the 2007 ISPOG and is valid until replaced by a subsequently published edition.
- The primary distribution of this Interagency Guide is electronic and can be found at <http://aviation.blm.gov> or <http://amd.nbc.gov/>
- For comments and questions please contact the BLM or USFS:

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**February 22, 2008**

**To: Pilots, Aviation Managers, Dispatchers and Incident Personnel**

**From: National Interagency Aviation Council (NIAC)**  
Bureau of Land Management  
Bureau of Indian Affairs  
National Park Service  
U.S. Fish and Wildlife Service  
Forest Service  
National Association of State Foresters

**Subject: *Interagency Smokejumper Pilot Operations Guide***

The Bureau of Land Management and US Forest Service annually revise, publish and distribute the *Interagency Smokejumper Pilot Operations Guide*.

The 2008 edition has been reviewed and is approved by the NIAC. Operations will be conducted as reflected in this guide.

A handwritten signature in black ink, appearing to read "Neal Hitchcock".

Neal Hitchcock  
NIAC Chair

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## Chapter 1.0

### 1.1 Introduction

This is a Bureau of Land Management and United States Forest Service (BLM/USDA) operational document and is developed to provide information and guidance for their employees and contractors.

The use of trade, firm, or corporation names, or illustrations of any particular product in this publication, is for the information and convenience of the reader and does not constitute an endorsement by the agency of any product, service, or aircraft make and model to the exclusion of others that may be suitable.

The Guide is reviewed and approved by the National Interagency Aviation Council (NIAC).

This guide is, to a large extent, a compilation of handbooks and guides from various Forest Service regions and BLM bases dating back several years, and that expertise is acknowledged and appreciated. For the BLM, this guide replaces the following: DOI Smokejumper Pilots Operations Guide (1999, 2000 and 2001), the BLM New Smokejumper Pilot Orientation Program (1989), the Alaska Smokejumper Project Pilot Handbook (1994), the BLM Fixed Wing Aviation Standard Operations Procedures, the Pilot's Handbook for Smokejumper and Mountain Flying with the U.S. Forest Service (1986, 1988), USFS 5709.11-22.31 exhibit 1, 5709.11-22.32, exhibit 1, 5709.11-45, 5709.11-43, 44, USFS Smokejumper Pilot Training Guide (1987), and the original OAS Flight Check Guide (Smokejumping/Paracargo). For the USFS this guide supplements pertinent sections of the following Handbooks: 5709.16 Fixed Wing Operations Handbook. 5709.14 Smokejumper/Paracargo Handbook.

A smokejumper aircraft assigned to support wildland fire activity will be utilized in a variety of operations. These may consist of transportation, reconnaissance, airdrop, or jumper retrieval. These operations for the most part will be short-range missions from a main operations base. It is common practice to assign an aircraft to an airport that is adjacent to the area to be covered. Many of these airfields and the communities they serve have been long established as seasonal operating bases by the USFS or BLM.

Many of these airports in the Western United States and are located near high, rugged terrain, radio navigation aids in these areas are often very limited. Good working knowledge of the terrain is helpful. GPS, INS, and other sophisticated navigational equipment may be used routinely and fire dispatches normally include latitude/longitude coordinates.

Flight crews are required to have a good working knowledge of the required navigation systems in their aircraft. On most flights there will be a spotter on board who is usually very familiar with the particular Forest or District. However, flight crews still need a working knowledge and understanding of radio communications and frequencies to efficiently complete the mission.

### 1.2 Reviews and Revision

Users are encouraged to recommend changes to this document through their respective aviation program manager. The Approving Authority will review this document annually. At that time, appropriate changes will be made. Interim revisions may be issued at any time through the National Aviation Office, and every effort will be made by that office to ensure that these revisions are issued in a timely and coordinated manner.

The guide and revisions are available for ordering through the National Aviation office in Boise, Idaho. The target group for distribution includes users and managers of smokejumper aircraft, smokejumper bases, and smokejumper aircraft contractors

# INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

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Primary distribution of this document is **electronic** but copies of this publication may be requested from either the BLM or USFS Aviation.

## 1.3 objectives

This guide has been prepared to familiarize pilots with the recommended procedures for operating aircraft in the smokejumper and paracargo mission in Alaska and the lower 48 states. This includes mountain flying and backcountry airstrip techniques; although general in nature some recommended parameters and configurations for specific aircraft are included. Also included is an initial and recurrent pilot training syllabus, including training, practical test standards and forms.

## Chapter 2.0 Smokejumper Operations

### 2.1 General

One of the Smokejumper's primary missions and greatest strengths is the ability to respond very quickly to suppress wildland fires, remote or otherwise, before they grow to destructive proportions. Once dispatched, the smokejumpers travel to the fire in one of the various fixed-wing Smokejumper aircraft. Upon arrival at the fire, the aircrew (pilot(s) and spotter) identify and assess hazards associated with the fire, the terrain, the wind, the weather, available light, and ground obstacles. If the decision is made to staff the fire, the smokejumpers and their equipment are delivered by parachute. When the fire has been extinguished, the smokejumpers proceed on foot to the nearest road, helispot, or airstrip to obtain transportation home. In many cases, the same airplane they parachuted from will return to a nearby airfield several days later to bring them back. Smokejumpers are usually dispatched in multiples of two, rarely singly. The size of the fire, its growth potential, location, and resource reserves are factors that determine how many jumpers are to be dropped on a fire. This consequently dictates the aircraft dispatched to that specific fire. If the fire has been staffed in the meantime, or if it cannot be located, the aircraft is often diverted to another location. This subsequent action will be coordinated by radio with the dispatcher.

A similar situation often arises when multiple fires are spotted or suspected in a given area. Larger aircraft (or several aircraft) loaded to capacity to accomplish multiple drops to several fires will be dispatched. The location of each fire is normally reported to the dispatcher by the spotter on board the aircraft and a determination made as to the order and method in which they are to be handled. Frequently, when multiple fires occur and more severe burning conditions exist, an aerial observer in another aircraft establishes the priority in which the smokejumpers will be utilized. While the spotter on board the aircraft is in control of the mission the pilot is in charge of safely handling the aircraft, therefore there is a continuing need for coordination and communication between the spotter and pilot throughout the flight. As the missions become more complex, it is necessary to share the communications workload in a preplanned manner that allows the fires to be staffed rapidly and efficiently, and provides adequate air traffic separation with other aircraft in the area.

### 2.2 Spotting

Spotting consists of the effective and efficient management of the fire portion of all smokejumper missions to include communication with firefighters and land managers and the safe deployment of smokejumpers and paracargo. This entails determining wind direction and wind velocity by dropping a set of crepe paper "drift streamers" weighted to drift and descend at the same rate as a round parachute. With this technique, a spotter can determine the correct "exit point" over which the jumpers should exit the aircraft to compensate for wind drift so they can land on a preselected jump spot; then guide the pilot to that exit point.

On the first streamer pass, the spotter releases the streamers directly above the desired jump spot. The streamers land downwind, establishing wind drift and direction. The spotter reads the drift and selects the jumper exit point upwind from the jump spot equal distance to the streamer drift. A set of check streamers may be dropped over the exit point, and they should drift back and land close to the jump spot. The jump run pass will normally be made flying into the wind in line over the streamers to the jump spot, then to the exit point.

### 2.3 Responsibilities

#### 2.3.1 Spotter

- I. Selects the jump spot, analyzes the conditions, orients the jumpers, and directs the pilot over the point of exit.
- II. Coordinates with the pilot to drop the cargo in a selected spot.
- III. Discharges the cargo on the pilot's command.
- IV. Ascertain the welfare of the jumpers and equipment.

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- V. May, based on observations of the behavior of the fire, take additional or alternative action.
- VI. May be assigned duties as loadmaster/attendant for passenger hauls per USFS or BLM NAO guidelines.
- VII. Takes requests from dispatch.
- VIII. Aids in Navigation to the fire using aeronautical or local maps and GPS.
- IX. Updates fire coordinates.
- X. May be responsible for control of air traffic when Air Attack, Lead or ASM is not in the area.
- XI. Gives fire size up/fire behavior to responsible agency fire management personnel.
- XII. Coordinates with other resources on the ground. (i.e. IC, Smokejumpers, crews, etc.)

### 2.3.2 Pilot

- I. Pre Flights the aircraft accomplishing as much of the first flight of the day items as possible.
- II. Has primary responsibility in all matters of flight safety.
- III. Ensures that all firefighters and cargo are properly loaded.
- IV. Analyzes NOTAMS (including TFR's), weather and flight conditions.
- V. Monitors all navigation and activities performed by other crewmembers.
- VI. Determines if all requested operations can be safely accomplished.
- VII. Makes the final decision on all drop patterns and cargo placement after consulting with the spotter and/or other resources on the ground.
- VIII. Selects the cargo drop pattern and gives the kick command.

### 2.4 Dropping Smokejumpers

Aerial delivery of personnel and equipment into small, open spots in steep, forested terrain requires pinpoint accuracy. Excellent crew coordination and sound judgment must be used if these activities are to be accomplished safely and effectively.

The flight crew should ready the aircraft as soon as possible after reporting for duty. Pre-flight and First Flight of Day checklists should be completed. Quick turn checklists should be used whenever authorized.

#### 2.4.1 Loading and unloading Smokejumpers

Smokejumpers may be loaded or unloaded from a jump airplane with the right engine running (multiengine aircraft only). The following procedures must be followed:

- It must be daylight.
- One pilot must remain in the left seat at all times.
- The spotter directs the loading of the smokejumpers, but may delegate the responsibility to ground personnel. The spotter should never leave the aircraft with jumpers on board or engines running without first informing the pilot.
- If specific agency policy conflicts with the above that agency policy must be followed.

#### 2.4.2 Enroute

Flight crews should use the most direct route possible while never compromising safety. A radio call to the Incident Commander (IC) or other aircraft and pulse lights on are required at least 12 miles from the fire (See Fire Traffic Area Chapter 5.2), as well as completion of mission checklists prior to reaching the fire. Aircraft responding to or operating over wildland fire operations should use the 1255 transponder code while engaged in or traveling to a fire mission unless otherwise instructed by ATC.

#### 2.4.3 Maneuvering

The pilot must maneuver the aircraft in a manner to provide the spotter and smokejumpers with an unobstructed view of the fire and the surrounding area. This is usually best accomplished by establishing a left hand orbit approximately 1500 feet above

the fire and the jump spot. After selecting the area in which jumpers will be dropped, the spotter will identify it to the pilot. The pilot can plan the final approach into the direction of the wind unless terrain features or visibility restrictions make this unsafe, and should make all turns toward the exit side of the aircraft. Any change from a standard into the wind pattern should be agreed on by the pilot and spotter. This allows the spotter to observe the intended jump spot and the behavior of streamers and jumpers during their exit, descent, and landing. Such a pattern also helps to orient the jumpers in the aircraft as to the location of the fire in relation to the jump spot and general lay of the country. Drift streamers are used to test the wind for direction, velocity, updrafts, and downdrafts.

**2.4.4 Low Pass**

While it may be omitted, at the discretion of the spotter, in some situations, a low pass (200-500' AGL) may be made at moderate airspeed over the selected jump spot. A low pass will be accomplished only after a high recon has been completed and a safe escape route has been determined and briefed.

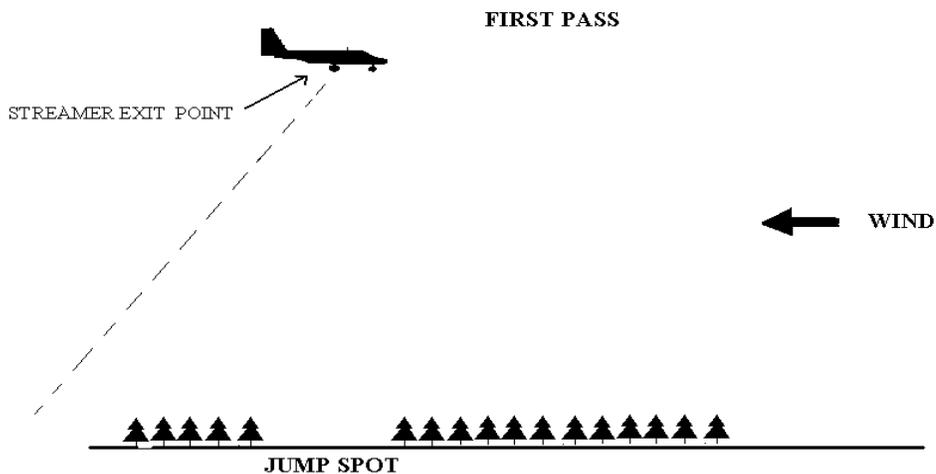
The low pass allows good size up of the fire, jump spot, hazards, and wind conditions as well as a confirmation of altitude with radar altimeter.

**2.4.5 Streamer Line Up**

The pilot should plan the turns so that the aircraft will be lined up on a wings level final at 1500' AGL optimally 10-15 seconds from drop. The pilot verbally informs the spotter “XXXAGL<sup>1</sup>→” at the spotters “streamers away” call. The spotter gives voice commands to the pilot to correct either to the left or right. These direction changes will be coordinated standard rate turns, and are normally 5 degrees unless specified by the spotter. The pilot should use terrain as the primary reference for direction of flight. The directional gyro is a secondary reference. Altitude must be held constant. The spotter or pilot may request altitude changes, however, based on rising terrain at the exit point or beyond. Such changes are usually voiced as “up 200”, etc. Two streamer passes are generally made (see Figure 2-1).

**2.4.6 Dropping Streamers**

Figure 2-1.

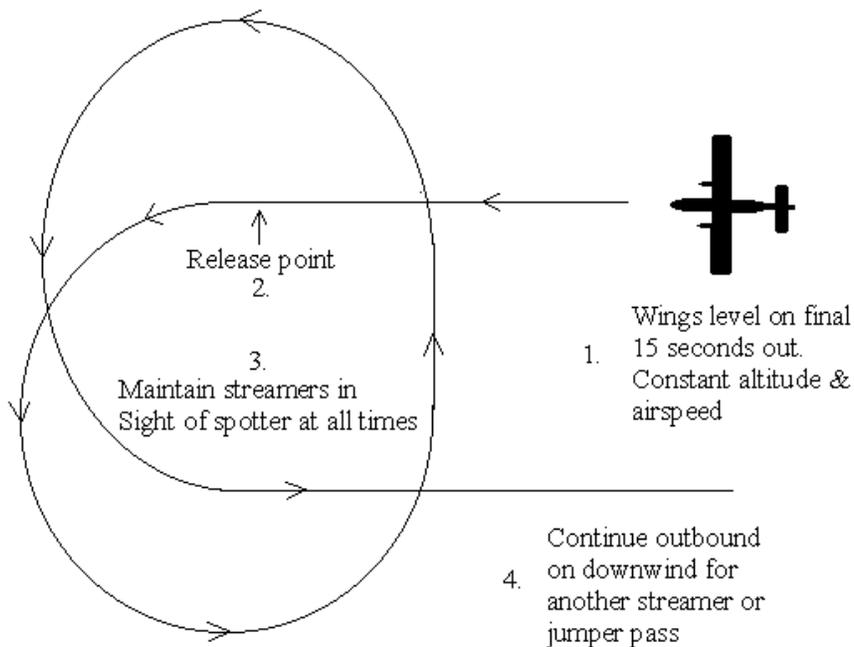


<sup>1</sup> → Standard Call Altitude from the Radar Altimeter “XXXAGL”

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Upon the call from the spotter, “streamers away”, the pilot shall respond with the altitude shown on the radar altimeter and begin a turn into the direction of the open door at a bank angle commensurate with the type and speed of the aircraft (approximately 30 degrees, not to exceed 45 degrees). Transport Category aircraft should not routinely exceed 30 degrees of bank. Bank angles approaching 45 degrees are “situations that call watch out”. It is of primary importance that the spotter be able to observe the streamers at all times while he is determining wind drift, vertical air currents, ground winds, and exit point. If the view is blanked out by the wing or fuselage for longer than a few seconds it may be impossible to relocate them. The Pilot must be able to locate the streamers for subsequent streamer and jump passes (see Figure 202).

Figure 2-2.



Steep turns may cause the wing to blank out the streamers to the smokejumpers as well. If their exact point of impact cannot be determined, a “pass” is wasted. Under normal conditions, at least two streamer passes are made (the second being a “check set”). A change in final approach direction may be requested if the spotter deems it necessary.

The spotter will be timing the descent of the streamers to measure vertical and horizontal air movement (Usually 65-70 seconds in vertically calm air). Short descents may indicate dangerous downdrafts which may preclude dropping jumpers or necessitate changing jump spots.

**2.4.7 Dropping Jumpers**

When the spotter is satisfied that all conditions are satisfactory, the spotter informs the pilot that jumpers will be dropped on the next pass. The procedure is the same as that used for dropping streamers, (except that a climb to 3000 feet AGL is necessary for ram air chutes), with the same airspeed as used on the streamer pass, except for slowing on final to achieve a minimum of 1.3 V<sub>so</sub> or 90 KIAS, which ever is greater, at the exit point for the jumpers. A standard pattern can be established as illustrated on the next page. Occasionally, topographical hazards, such as a large river, make it desirable to deviate from a normal into-the-wind pattern when dropping jumpers. In some cases a crosswind, downwind, or right-hand pattern may be requested (nonstandard). See Figure 2-3.

**Figure 2-3. Standard Pattern:**

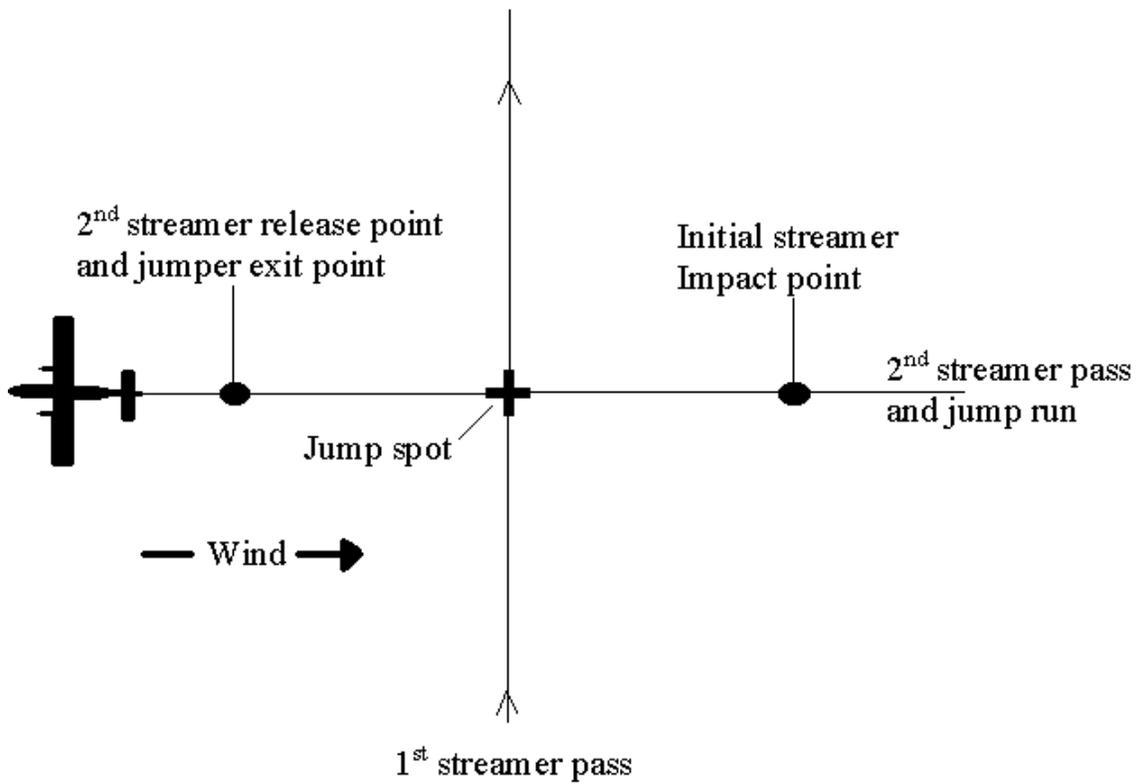
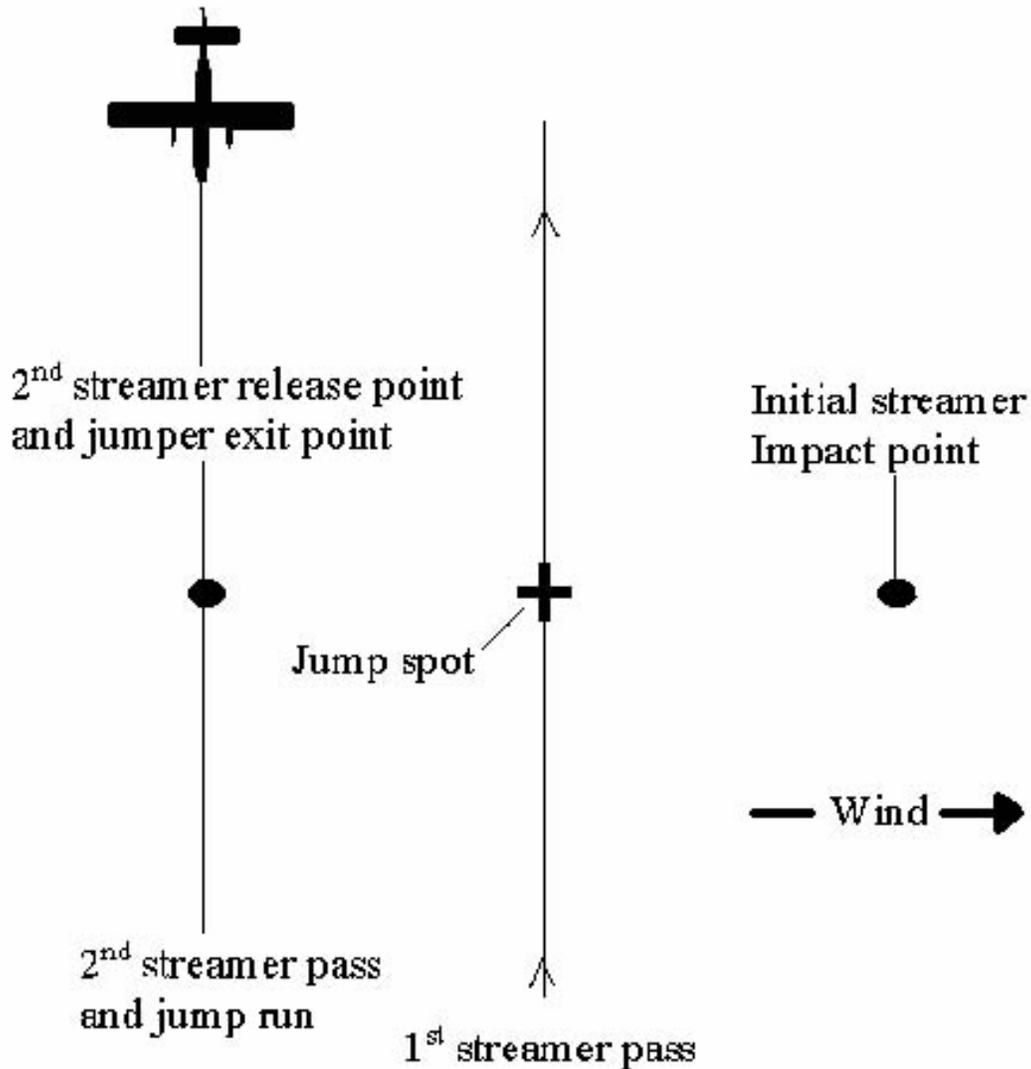


Figure 2-4. Non Standard Crosswind Pattern:



### 2.4.8 Signaling

The spotter calls “jumper away” after each jumper or stick of jumpers has cleared the aircraft. The pilot maintains aircraft heading and airspeed until receiving this command. A turn is then begun (standard pattern) in the direction of the jump door (20 to 30 degree’s bank) to the downwind heading. The ideal pattern should allow for no more that a 30 degree bank with enough time on final for the spotter to determine the correct line up and give corrections. The pilot should call downwind<sup>2</sup>→ and turning base<sup>3</sup>→. When established on final the pilot will call “on final<sup>4</sup>→, 1500 feet or 3000 feet AGL rounds or ram airs/squares<sup>5</sup>→”. The spotter may not acknowledge the standard callouts because they might be briefing the smokejumper stick.

2 → Standard Call “Downwind”  
 3 → Standard Call “Turning Base”  
 4 → Standard Call “On Final”  
 5 → Standard Call “on final 1500 rounds” for round canopies.  
 “on final 3000 squares” for ram air canopies.

## 2.4.9 Communications

Spotter technique varies with the individual. One person may be satisfied with a long final approach and another may request the pilot to shorten the pattern.

Good communication and coordination (CRM) is essential between pilot and spotter if a mission is to be accomplished effectively. The operation will always run more smoothly if intentions and problems are thoroughly discussed and understood by both parties before, during, and after the drop.

## 2.4.10 Checking Jumpers

When the drop has been completed and all personnel are on the ground, the spotter ascertains, via radio with the smokejumper in charge, that there are no injuries. Occasionally radios may be damaged in the drop, but it is rare that voice communication cannot be established. If necessary, visual signals may be used. In any case, communications must be established before starting the paracargo drop.

The spotter may choose to establish communication with the first stick of jumpers before dropping more personnel. This is to verify the exit point and selection of jump spot.

## 2.4.11 Altitudes

- I. Absolute minimum altitudes are 1500' AGL for round chutes and 3000' AGL for squares. Jump Altitude is the altitude above the exit point, not the altitude above the jump spot. In many cases the exit point upwind of the jump spot will be higher or lower terrain than the jump spot. This difference in terrain elevation must be taken into account when establishing drop pattern altitude. Exit point altitude is usually never lower than the minimum drop altitudes over the DZ. Pilots should look ahead and anticipate this factor when selecting an altitude prior to streamer dropping. Spotters should point out high terrain upwind of the jump spot to the pilot and request extra altitude. Lower terrain upwind does NOT imply that jump altitude must also be lower than 1500' or 3000' above the jumpspot.
- II. Radar altimeters should be used whenever possible to determine altitude. This readout should be communicated to the spotter after the call "streamers away". Since some radar altimeters don't register to 3000' AGL, simple math must be used to calculate the proper barometric altimeter readout. All altitude callouts to the spotter are in AGL, not MSL.

## 2.4.12 Jump Altitudes

Operational smokejumping altitudes are a compromise between best accuracy and maximizing time available for reserve procedures. Anti-inversion nets were attached to the skirts of round parachutes in 1978. Their malfunction rate since is near a zero. The US military routinely drops paratroopers on such canopies at 500 feet AGL. These are combat simulation jumps. Their rationale - avoidance of lethal unfriendly gunfire is more critical to troop survival than having sufficient altitude to accomplish reserve procedures.

Hitting a small jumpspot in rugged terrain often is a primary concern of smokejumpers. The ability to deploy a reserve parachute in the event of a malfunctioned main is of primary importance. Our standard operational altitudes were derived from analysis of actual reserve parachute deployments in sport, military, and smokejumping events or operations. On either canopy system, jumpers could depart the aircraft at any higher-than-standard altitude and have even more time available for reserve procedures in the event of a malfunction or failure to hook up. We normally do not because:

- More time spent under canopy would delay action on fire.
- Other air traffic near the fire could be confused, and

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- Jumpers could land scattered over a larger area delaying fire action.
- Safety is not compromised.

### 2.4.13 Minimum Pull Altitude

For either type of reserve, 500 ft (AGL) is the absolutely lowest altitude at which a jumper may reasonably expect the result of reserve activation to cause both deployment and deceleration prior to impact. A round jumper who fails to hook up will fall from 1500 ft to 400 ft in about 10 seconds. A ram air jumper who fails to hook up (or fails to pull the drogue release handle) will drop from 3000 ft to 400 ft in about 19 seconds.

### 2.4.14 Drop Altitude

Drop altitude is measured from the aircraft to the ground directly below WHEN & WHERE the jumpers exit. It could be substantially different than the elevation above the jumpspot.

### 2.4.15 Practice and demonstration jumps

There is no protection under public aircraft law for practice or demonstration jumps. The PIC is responsible under FAR part 91 and 105. Please refer to the FARS and Advisory Circular 105.2C for proper guidance. You may also use this BLM adaptation of Advisory Circular 105.2C.

<b>Table 2-1.</b>				
<b>Practice – Demonstration Jump Airspace NOTAM Flow Chart</b>				
Location of Jump	Kind of Authorization Required	When to Apply or Notify	Where to Apply and Notify	FAR Section Reference
Over or into a congested area or open air assembly of persons	FAA Form 7711-2	Apply at least 4 working days before the jump.	FSDO having jurisdiction over the area where jump is to be made	105.21
Over or onto an airport with or without a US operated control tower.	Prior Approval	Apply before the jump. **	Airport Management	105.23
In airspace with a US. Operated control tower or into Class E extensions for instrument approaches.	Authorization (verbal can be used)	Apply before the jump. **	ATC Tower having jurisdiction over the Control Tower/Class E airspace.	105
In or onto an airport with a radar service area	Authorization (verbal can be used)	Apply before the jump. **	ATC tower at the airport for which the airport radar service area is designated.	105
Into or within a positive control area or Class B airspace.	Authorization (verbal can be used)	Apply before the jump. See Below ↓	Nearest FAA ATC facility or FSS. *	105
In or into other controlled airspace.	None	1 hour before the jump is made but not more than 24 hours before jumping is to be completed.	Nearest FAA ATC facility or FSS.	105.25
Jump over or with restricted or prohibited areas.	Authorization (verbal can be used)	Apply before the jump. **	The agency in charge of the area.	105.25
* Communication is required with the nearest FAA ATC facility or FSS 5 minutes before the jump.				

## Chapter 3.0 Paracargo

### 3.1 Normal

Normally, cargo dropping operations will not begin until all jumpers are known to be safely on the ground in known positions.

After the last jumper has exited, the spotter readies the cargo for dropping and should confer with the pilot and the jumper in charge on the ground as to the desired and most practical place to drop the bundles. The spotter will normally inform the pilot of cargo type and number of pallets/bundles to be dropped and the size of the canopy. The pilot shall carefully analyze the terrain and conditions in relation to the desired impact area, and make a dry run in all but the easiest drop areas. Airspeed will be at the discretion of the captain but cannot exceed the limitations of the parachute.

The pilot should notify the spotter when on each pattern leg, i.e. downwind, base, and final<sup>6</sup>→. Five to ten seconds from the release point the pilot will state “short final<sup>7</sup>→” followed by “standby<sup>8</sup>→” and “kick<sup>9</sup>→” when over the release point. The pilot should make the pattern size commensurate with spotters ability to access and move cargo into position.

The spotter may request that the pass be made at a higher altitude in order to give the parachute more time to deploy. In most cases, the pilot will need to devote full attention to flying the aircraft in order to clear obstructions and will be unable to observe the parachute until on the downwind or final portion of the pattern.

Cargo drops will be made no lower than an altitude of 150’ AGL and usually at 200 to 250 AGL’ (radar altimeters will not account for tree height). The chutes need time to fully open and to decelerate. At the discretion of the pilot, the cargo may be dropped at a higher altitude.

### 3.2 Extra heavy bundles

Specially rigged parachutes, turbulence, restricted visibility, timberlines or other terrain features and other considerations may dictate such change. In steep topography patterns are often flown down the ridge (or parallel) to prevent cargo that is released long or short from floating down into canyon bottoms.

The importance of carefully and accurately analyzing the terrain, other obstructions and wind effect before committing yourself on a low-altitude cargo pass cannot be over-emphasized. This size up should be ongoing from the initial pass over the fire. There are very few occasions on an actual fire drop where conditions will be ideal, and each mission will vary in some respects. A low-altitude cargo pass should never be made into the face of a mountain or up a canyon where maximum power or a very steep turn will be required to clear obstructions (no uphill finals) . The pilot shall plan the pattern so that the ground level falls away after the bundle has been dispatched, so that a minimum of maneuvering is necessary to put the aircraft over lower terrain.

### 3.3 Cargo Drops

Cargo drops are often required in the very bottom of steep and winding canyons where a turn into the wrong drainage could result in a dead end. Always leave yourself a way to turn out in case of down drafts, turbulence, engine failure, or the off chance of a bundle hanging up on the tail of the aircraft. Consideration should be given to impact points on bundles being cut away.

If the cargo is hung in the trees climbing spurs will be deployed by free fall. Free fall items are sometimes attached to small stabilizing parachutes that slightly affect the trajectory. They may include sleeping bags and various hand tools, but most often

6 → Standard Calls “downwind, base, and final”

7 → Standard Call “ Short Final”

8 → Standard Call “Standby”

9 → Standard Call “Kick”

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climbers. The technique is basically the same as paracargo deployment, except the dissimilar trajectory must be taken into account, plus the fact that there may be considerable ground travel of the spurs after impact.

### **3.4 Free-falling Cargo**

Free-falling cargo is also extremely hazardous to ground personnel; it is therefore incumbent upon the pilot making such drops to suspend the operation if anything looks unsafe, and notify the ground personnel by radio of the free fall cargo. Climbing spurs are dangerous due to the possibility of ricochet in a heavy timber area. If the cargo does not have a small stabilizing parachute, it is good technique to drop from a slightly higher altitude to dissipate some of the horizontal trajectory vector.

It is important for a pilot to use all their skill and talent to develop cargo accuracy. Terrain can be very difficult to walk in and major exertion is required to pack a 90-135 lb. cargo bundle. Remember that at 90-100 KIAS, you are traveling about 50 yards per second (multiplying true airspeed in knots by 1.69 will give velocity in feet per second). One second too soon or too late can easily put cargo in the trees.

## Chapter 4.0 Reconnaissance and Survey

### 4.1 Reconnaissance or Detection

Reconnaissance or detection flights may be requested on the basis of lightning forecasts and thunderstorm cell development provided by radar and other detection equipment. Reconnaissance missions require competence and judgment on the part of the pilot and the observers. A knowledge of windage, proper mountain flying techniques and terrain flying are necessary. Familiarity with the country is very helpful.

The airplane should be flown to provide the observers with the best possible visibility. Flying should be as smooth as possible to relieve the observers from unnecessary physical strain. The pilot should anticipate the observer's needs and maneuver the airplane rather than forcing the observers to constantly shift position.

Proposed routes should be laid out on a map for each of the foreseeable conditions that may occur. Systematic profiling of critical points along the proposed route is essential. This permits easier determination of alternate flight routes. Flight routes should be planned to position the observer for best ground observation.

The flight altitude is determined by: Intensity of patrol, amount and altitude of haze, width of observation strip, topography type, amount of cloud and hill shadow, sun angle and direction, background, and minimum altitude for safe flight. Under normal circumstances most flights are conducted at an intermediate altitude because of terrain and fire reconnaissance responsibilities (1500-5000' AGL). Flights shall not be conducted at less than 500 feet above the ground or canopy. Regulations may require flights above 2000' AGL.

If an altitude is selected that will clear all terrain over the path of flight with a minimum of maneuvering to avoid the higher isolated mountain peaks, the pilot and observer obtain optimum visual coverage of the surrounding area. Again, knowledge of the country is important in order to determine the best route in relation to drainage, passes, and higher peaks. Above 3000' AGL, standard FAA cruise altitudes should be used. Slow cruise speed (economy cruise) is best. Under certain conditions, slower speeds may be necessary to adequately observe specific areas. Both high and low speeds have advantages depending on conditions and observation objectives.

The pilot should make every effort to maneuver the airplane to provide the best possible view of the terrain. The observers should direct the pilot regarding flight path and will probably request frequent altitude and pattern changes.

Each area should be thoroughly investigated. The flight pattern should be worked out from maps, profiles, and actual flights so all important areas directly visible are fairly close range to the observers.

## **Chapter 5.0 Communications, Fire Traffic, Resource Tracking And Flight Following**

### **5.1 Communications**

The FM transceiver is the primary communications link for all fire activity. It may also be utilized to communicate with other agencies and aircraft. Instructions and frequency assignments are contained in the agencies radio users guide and Wildland Firefighter Frequency Guide which should be kept in the cockpit of each aircraft in which this unit is installed. Some specific regional frequencies may be included in an appendix to this guide. It is essential that pilots be very familiar with operation of this radio. No aircraft, be it contract, cooperater, news media, or military, will be allowed to operate (or continue to operate) over any fire without an operational radio capable of maintaining clear communication on the assigned frequencies.

All aircraft will identify themselves by make and aircraft "N" number except for air tankers, ASM modules (Helicopter or Fixed Wing) and lead planes who will use their assigned number, and smokejumper aircraft who may use, for example, "Jumper 49". Some regions and agencies assign special numbers to their contract helicopters which can be expected to appear on the scene of any large incident. Other exceptions would be incident overhead who may be airborne in the performance of their duties. They should, in plain language, identify the fact that they are in the air and in what type of aircraft. Examples would be: "This is Sheep Creek Fire Air Attack over the fire at niner thousand in Cessna "42B" or "this is Sheep Creek Fire Command. We have just departed base heliport in helicopter 320 for reconnaissance of the south flank".

The Smokejumper Aircraft Contract requires that audio control panels be installed and operational in the pilot, copilot, and spotters positions. This enables the spotter to communicate directly with the people on the ground or with other aircraft if necessary. Normally the pilots (two pilot crew) will handle all communications with FAA facilities and other aircraft as necessary while the spotter makes routine position reports, ground contact, and other fire related contacts. This does not relieve Flight Following responsibility for DOI pilots.

The spotter may handle communications with other fire related aircraft, particularly in single pilot operations. An intercom system allows the pilot and spotter to communicate while in flight and monitor other frequencies at the same time. Considerable preplanning and coordination is needed to enable the pilot to select the required frequencies during the operation and to give proper position and situation reports when the spotter is occupied dropping jumpers and cargo. There often occurs a mix of out-of-area or new spotters flying with pilots who are very familiar with the geographic area of the mission. This situation is also commonly reversed. If either individual is obviously operating in his home territory and the other is not it will improve the quality of the mission if the position reports are given by or relayed from the person who knows the landmarks. This is just good crew resource management.

### **5.2 Fire Area Traffic**

Aviation activity over a going fire can become a frantic and hazardous experience if not managed properly. Large fires that have had adequate time to set up the incident command organization should have established the order of work, drop priorities, radio procedures and airspace control. Key communication trigger points for the Fire Traffic Area are an initial call at 12 miles and if no communications are received a hold at seven miles.

The most critical situation is during the initial attack phase of an emerging fire when several aircraft arrive over the scene at almost the same time. The order of authority for air traffic control and drop or mission priorities is as follows: 1, ATGS, 2, ASM/LeadPlane 3, Smokejumper Spotter.

All pilots should have received information regarding air or ground contact and radio frequencies with their dispatch instructions. When approaching a fire that is already being worked by other aircraft, the pilot is required to make contact with designated authority over or on the fire and receive permission to enter the fire traffic area and proceed with the mission or instructions

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to hold over a specified location. While the initial contact should be made approximately 12 miles out from the fire, it is good operating practice to monitor the assigned frequency and activity as far out as possible. Never assume there are no other aircraft present.

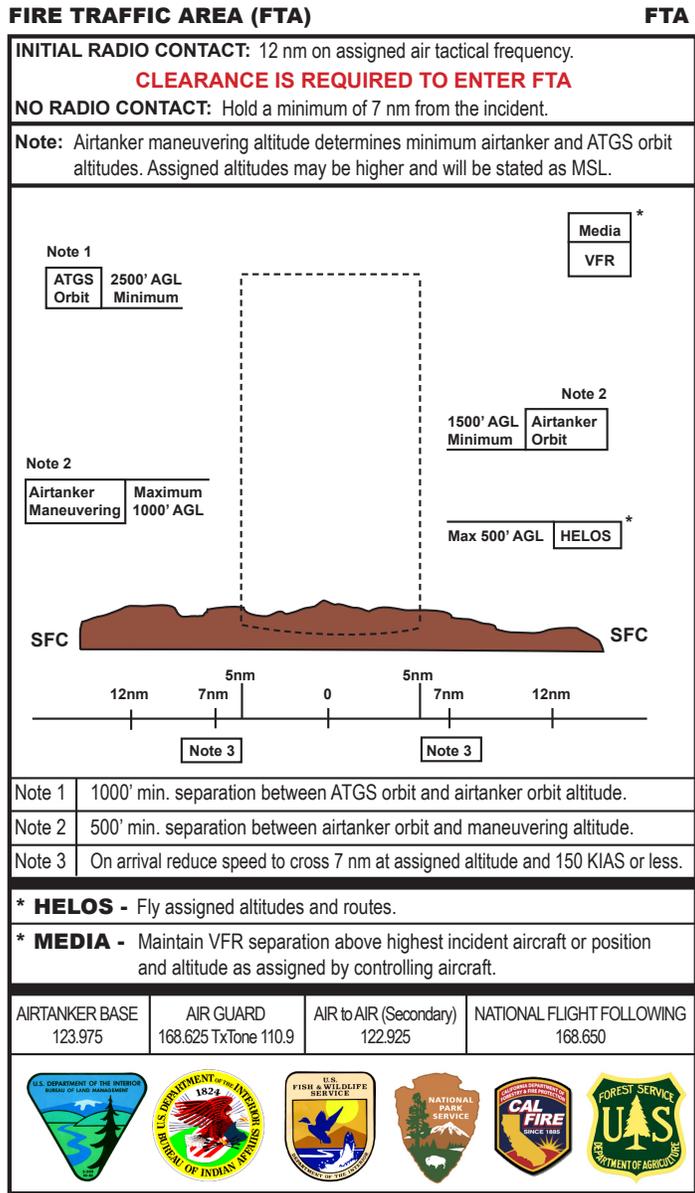
Drop priority is usually given to air tankers if they arrive over the fire at the same time as other aircraft. Smokejumper aircraft may be stacked on top of tankers. If the smokejumper aircraft is in the process of dropping jumpers, it will normally be allowed to continue until the personnel are all on the ground. At that time they may be asked to pull out of the area to allow the retardant aircraft to drop, returning to deliver the cargo after the air tanker is finished. If a jumper is injured in the drop, the jumper aircraft has priority over other aircraft to drop emergency supplies or provide other applicable assistance.

In some situations a combination of air activities can be accomplished safely on the same fire. This situation could occur when air tankers and helicopters are needed on opposite sides of the fire, traffic patterns can be flown well clear of the other activity and that good communication is maintained between all aircraft.

Proper radio procedures and discipline are very important in the fire environment. If you are unable to establish contact with the air attack, lead plane, or other aircraft over the incident, attempt contact on alternate frequencies or reconfirm the correct frequency with the applicable dispatch office. Air guard may be used to make initial contact and confirm working frequencies only as a last resort. It is primarily to be used as an emergency frequency. No aircraft is to enter a fire traffic area without establishing radio contact with other aircraft working on the same fire. Smokejumper aircraft being initial attack aircraft may be the first ones on scene and there will be no other aircraft.

See the National Interagency Aviation Council / Interagency Aerial Supervision Committee approved Fire Traffic Area Diagram and Knee Board profile next page.

5.2.1 FIRE Traffic Area diagram



<http://www.airspace.nifc.gov>

September 2007

5.3 Resource Tracking and Flight Following

See the National Mobilization Guide, <http://www.nifc.gov/nicc/mobguide/index.html> , Chapter 24.3 Flight Management Procedures <http://www.nifc.gov/nicc/mobguide/CHAPTER20.doc>.

## Chapter 6.0 Mountain Flying And Back Country Airstrips

### 6.1 Introduction

Flying missions in mountainous terrain requires special knowledge, experience and techniques to reduce the inherent risk of such operations. Rugged terrain, lack of suitable landing areas in the event of emergency, and adverse weather conditions add to the hazards involved.

### 6.2 DENSITY Altitude

Aircraft operations at altitudes well above sea level and at higher than standard temperatures are commonplace in the Western United States. Such operations always result in drastic reduction of airplane performance due to high density altitudes.

Density altitude is a measure of air density. It is not to be confused with pressure altitude, true altitude, or absolute altitude. It is not to be used as a height reference, but as determining criteria for the performance capability of an aircraft. Air density decreases with increase in altitude. As air density decreases, density altitude increases. The further effects of high temperature and high humidity are cumulative, resulting in an increasingly high density altitude condition. High density altitude reduces all aircraft performance parameters. This means that normal horsepower output is reduced, propeller efficiency is reduced, and a higher true airspeed is required to sustain the airplane throughout its operating range. It means an increase in runway length requirements for takeoff and landing, and a decreased rate of climb. It should be noted that a turbo charged airplane provides some advantage in that it provides sea level horsepower up to a specified altitude above sea level.

Density altitude can be easily computed on most flight computers. Density altitude is pressure altitude corrected for nonstandard temperature. After computing density altitude, consult the manufacturer's performance data for your particular aircraft and do not operate outside the performance parameters.

### 6.3 Mountain Winds

In the mountains, terrain interferes with the steady flow of air, which causes it to lift and sink in somewhat logical patterns. The shape of the terrain in its relation to the wind, the heating of slopes exposed to the sun, and steeply sloping ridges with jagged cuts (i.e. mountain passes), all cause predictable shifts in wind direction and speed. Moving air masses surge up and over terrain causing updraft on the upwind side of a ridge and sometimes extreme downdraft on the lee side as the air mass follows the terrain similar to the way water flows in a riverbed. Terrain influence may cause the air to rise and descend again, taking on the aspect of a wave action for as far as 100 miles on the lee side of a mountain range.

Any abrupt change in angle between the terrain and wind flow can be expected to cause moderate to severe turbulence and wind shears that may be of such intensity that the structural integrity of the aircraft is jeopardized. Generally the strongest wind flow will be found at higher altitudes. The heating of slopes causes thermal convection, with resultant lift over the source and downdraft as the thermal cools and disperses. Mountain passes create a venturi effect as the air is forced through a smaller area and accelerated.

Ridge level winds in excess of 20 knots indicate that the pilot should proceed with caution. When they are 30 knots or more, consider staying on the ground or altering route of flight. A mountain ridge line should be crossed at an angle to allow the pilot to turn away from the ridge with the least amount of turn required should down-drafts be encountered. Winds aloft in the mountain West are predominantly westerly; however, surface winds may tend to flow up canyon from about noon until late in the evening, due to the unequal heating of the sunny slopes and shaded canyons. Early morning and late evening flights will generally be less turbulent and can be made closer to the ridge line than during the heat of the day. During reconnaissance flights in the heat of the day, special care should be taken near ridge tops and extra altitude should be used as needed. (See section on

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reconnaissance). Always know where you are, where the nearest airstrip is, and how to reach the nearest terrain suitable for emergency landing.

Anticipate constantly changing winds. Do not rely on smoke drift or cloud shadows for surface wind direction. Never rely on riding an updraft to obtain sufficient altitude to clear the terrain. It could unexpectedly turn into a downdraft.

### 6.4 General

- I. When flying up a narrow drainage, keep to one side so that you may observe any emergency landing sites in the bottom of the canyon, safely complete a 180 degree turn for an emergency exit, and take advantage of rising air on the upwind side of the canyon.
- II. Generally fly down drainage. When flying up drainage, ALWAYS rate the topography ahead and maintain proper position and sufficient altitude to turn around. The grade of the canyon may climb faster than you can.
- III. Use caution when operating in the vicinity of rainsqualls and low stratus clouds. Never go into any type of cloud while flying at low altitude in the mountains. If IFR is inevitable, a precautionary landing should be seriously considered, even if it may result in damage to the aircraft.
- IV. Proper flight following is extremely important. If you go down it may be a long time before help arrives due to the size of the wilderness.
- V. Do not be lulled into complacency by a weather report giving the ceiling at 1500 to 2000 feet. Mountains may surround the reporting station 2000 to 5000 feet higher than the station. Insist on visibility as well as ceiling when flying in mountainous areas. Snow and rain can quickly reduce forward visibility to zero. Darkness often blends in perfectly with the color of the mountain, which may appear to be just another dark section of the sky.
- VI. Be familiar with the destination airport. In advance of the flight, review available charts for altitude, length of runway, and obstructions.
- VII. Remember that spotting landmarks may be difficult; a mountain shown as 8000 to 9000 feet on the charts may appear as a small knoll if the peak rises out of surrounding terrain having an elevation of 4000 or 5000 feet.
- VIII. Always be on the lookout for wires and cables across canyons.
- IX. Don't operate into or out of high mountain areas with a tight schedule. Give yourself plenty of time; weather must take precedence over any schedule.
- X. Fly equipped with an emergency survival kit. In the event of a forced landing, the general rule is to stay with the airplane.

### 6.5 Back Country Airstrips

- I. General.

Pilots must have a current Category 4 airstrip sign-off on their pilot cards prior to operating on backcountry airstrips. Most of these airstrips are located in central Idaho and the Selway-Bitterroot area of Montana.

Qualified flight crews may be involved in pickup and delivery of personnel and equipment from marginal airstrips located in rugged terrain. These operations can, at times, be classified as hazardous, depending on the capability of the airplane, atmospheric conditions, and condition of the airstrip. The surface of these strips usually is sand, sod, or gravel, or a combination of all three. Pilots should carefully check usage requirements for all strips prior to planning a stop. Some are privately owned, with public use reserved for emergencies. Others are open only when using the resort facilities. Almost all strips can be used for fire-related activity, but this must be arranged through dispatch. For the most part, USFS/BLM maintains or has access to a "current condition" status of all airfields within their area of coverage and will not dispatch an aircraft there unless the airfield is reported to be in good condition. It is also standard practice to stand down on most of these airfields during periods of hot, gusty and turbulent air conditions—normally between 1000 and 1800 hours during the summer.

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Each airfield has its own peculiarity and on the marginal strips pilots should be thoroughly checked out before being approved for or accepting a mission. Many strips are laid out, by necessity, in terrain where there is only one way in and one way out. Very few have been constructed on completely level ground and many have a series of humps, swells, and side slopes. They are often unattended; therefore, hazards such as wild or domestic animals, washouts, and overgrowth may be encountered. Know your airplane and understand its capabilities and limitations, as well as your own. Make every effort to maintain your proficiency in short field techniques and slow flight. Plan trips in the early morning whenever possible. Air instability begins around 1000 and grows worse until evening. Keep your airplane as light as possible. Carry only what you know will permit a safe operation. Know the field you are going into—the length, temperature, and hazards. Check field conditions with other pilots when possible. Many of these fields have one-way approaches with no go-around.

### A. Approach

Look the strip over thoroughly before you commit to a landing. There may be some obstructions that were not present before, if necessary, conduct a low-level pass of the airstrip before landing, terrain permitting. Keep a sharp lookout for other traffic both in the air and on the field. To meet another aircraft taking off in the opposite direction while you are coming down the canyon “slow and dirty” could be disastrous, Announce intentions on 122.9 or other appropriate frequency. Plan your approach carefully. In some cases, terrain will hide the field until you are on short final. Look both the approach and departure over while you are at a safe altitude. If you feel doubtful about the approach, go around while you are still high. DO NOT commit yourself to an approach until you feel comfortable with its parameters. Many approaches do not allow a go around after final.

Use a stabilized power approach whenever possible. Low, slow approaches leave you behind the power curve and at the mercy of downdrafts. The minimum airspeed for a power approach is approximately 1.3 times  $V_{so}$  plus 50 percent of the gust factor. Higher speed (1.5  $V_{so}$ ) should be used in the event of a power off approach, although use of full flaps is normally recommended for routine landings, the drag could overcome the power available at high-density altitudes, making a go around difficult or impossible. A slightly higher than normal approach path is desirable for improved visibility of the intended landing spot and will require smaller power changes to control glide path This should be kept in mind during approaches to back country airstrips, particularly in the “low, slow” environment. If wind conditions are causing gusts, wind shifts, or whirlwinds (dust devils), the approach and landing should not be made. These winds can be turbulent, shearing, and put the aircraft out of control.

#### 1. Landing

- a. Fly throughout the approach and landing with controlled airspeed and pitch. Most backcountry pilots agree that pitch primarily controls airspeed and power primarily controls altitude during visual approaches to back country airstrips.
- b. Plan the touchdown as near the approach end of the runway as practical for that given airstrip, giving consideration to slope and moving air surrounding terrain features, and keep in mind that downdrafts may be present.
- c. Give particular attention to drift correction and directional control after landing.
- d. Proper use of controls during the landing roll is very important. Crosswind should not generally be a concern during backcountry operations because much wind is not acceptable for operations. However, slope, side slope, and surface conditions may very much be of concern. Maintain directional control using whatever control deflection and power is necessary.
- e. If braking is desired, raising the flaps immediately after touchdown will increase the effectiveness. In turboprop aircraft, beta and reverse will generally be much more effective than wheel braking.
- f. Use caution when taxiing off the runway. There may be holes, rocks, or other hazards under the grass. If in doubt, stop and walk the area first. Move the airplane off the runway for parking. The next person to land may need the entire runway available.

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- g. Take care to keep animals away from the airplane. Cattle and horses like to scratch themselves by rubbing against wing struts and other surfaces. Dogs often find whirling propellers fascinating.

### 2. Takeoff

- a. The mountain runway environment requires a thorough pre-flight analysis and careful consideration of at least the following for takeoff:
- b. Analyze the takeoff conditions carefully. If the air is bad or a tail wind is blowing, WAIT IT OUT. Don't load more weight than you are sure the airplane can handle. If you have any doubt, split the load and arrange to pick it up later. Is the runway long enough, or is the slope prohibitive? A 1 percent down slope is generally equivalent to 10 percent more runway and generally takes precedence over wind direction in deciding which way to go. If the surface is sod, is it stable, spongy, or rough? Early spring thaws or rains may result in unstable, slick, or sticky surface conditions.
- c. Use the proper short, soft field technique for the particular aircraft. Either pulling the aircraft off early or leaving it on the ground too long can significantly decrease performance.
- d. Wind conditions are critical. Are the wind conditions within the capabilities of both the airplane and pilot? Strong downdrafts and wind shear encountered at lift-off are very critical.
- e. What is the density altitude and how is it going to affect the performance of the airplane? Can a lower gross weight compensate for the loss of performances? Is it necessary to wait for more favorable conditions regarding density altitude and/or wind?
- f. The pilot, having considered these factors in the decision to go, should observe the manufacturer's recommendation regarding the use of flaps. On takeoff, accelerate the airplane smoothly, rotating to the pitch attitude at which it will lift off and fly, using full power and best mixture for the density altitude.

### 3. Climb out

Once the aircraft is airborne, can it stay airborne and clear the intervening obstructions? Can it out climb the surrounding terrain?

When airborne, a pitch attitude should be established that will produce  $V_x$  until obstacles are cleared, then  $V_y$ . As altitude increases,  $V_x$  and  $V_y$  converge until they meet at the service ceiling. Most experienced mountain pilots consider airspeed more important than altitude after liftoff, and will obtain extra airspeed for marginal wind conditions.

During the climb out, the use of precise airspeed, attitude, and power control is essential, and any inclination to be influenced by the false horizon effect of local terrain must be avoided. The pilot should attempt to fly in areas of possible or observed lift, and be alert to the position of the sun and its possible blinding effect during lift off and climb out. In piston aircraft it may be necessary to level off during climb-out to prevent engine overheat.

## Chapter 7.0 Low Level Operations

### 7.1 Low Level Operations

#### 7.1.1 Objectives

The objectives are to outline proficiency requirements and operational recommendations for the BLM and USFS low level flight operations. To promote operational safety the following guidelines for low level operations and pilot proficiency requirements have been established.

#### 7.1.2 Definitions

Low level operations: Any planned flight at less than 500 feet from the surface. (Not including takeoff or landing or Enroute weather considerations).

Personal Protective Equipment (PPE): Flash fire protection, and the Occupational Safety and Health Administration (OSHA) requirements for hearing conservation and eye protection. Flight crews and passengers engaged in special use activities are required to wear the appropriate aviation life support equipment.

Special Use Activities (USDI): Operations involving the utilization of airplanes and helicopters in support of Agency programs which are not point-to-point flight activities and which require special considerations due to their functional use. Special pilot qualifications and techniques, special aircraft equipment, and PPE are required to enhance the safe transportation of personnel and property.

Special Mission (USFS): Aviation resource mission in direct support of incidents, such as Leadplane and aerial supervision module flights, smokejumper / Paracargo flights, reconnaissance, infrared, aerial photo / survey, and other missions requiring special training and / or equipment.

#### 7.1.3 Regulations

14 CFR Part 91.3	Responsibility and authority of the pilot in command.
14 CFR Part 91.13	Careless or reckless operation.
14 CFR Part 91.15	Dropping objects.
14 CFR Part 91.119	Minimum safe altitudes: General.
14 CFR Part 135.117	Passenger briefing.

#### 7.1.4 Deviations and Waivers/Exemptions

Deviations: Life-threatening emergencies may require deviation from Departmental Manual, Federal Aviation Regulations, and Forest Service policy. For in-flight emergencies, the pilot shall take appropriate action to assure safety of flight. Deviations shall be reported as soon as possible to the appropriate authority and documented on a SAFECOM.

Waivers/Exemptions: The Department of the Interior and USFS has obtained low level waivers from the Department of Transportation, FAA. The waivers are specific in nature and should be reviewed prior to operational use. There is no Service-wide waiver or exemption. To review current waivers and exemptions for your agency go to <http://aes.faa.gov> or your agencies directives.

### 7.1.5 Low Level Operations Requirements

Pilot Qualifications and Experience: A pilot shall meet the requirements as outlined in 351 DM 3.2B or FSM 5700. Vendor PIC qualifications are listed in 350 DM 3.3A., FSM 5700 and this document. In addition to the basic pilot qualifications the pilot must have 200 hours PIC in category, in low level operations (agriculture applications, power/pipeline patrol, refuge survey, game counting, where extended operations below 500 feet AGL are conducted. Operations that do not qualify are traffic watch, banner towing, aerial photography, and flight instruction).

Aircraft Requirements (DOI): Only aircraft that have been carded by AMD specifically for low level operations may be used. The aircraft must have a strobe light visible from above, fire extinguisher, first aid kit, and survival kit.

Carrying Passengers: Only designated observers and flight crew members, who have been trained and designated as necessary to the mission may be carried during low level operations.

Personal Protective Equipment: All personnel on board aircraft participating in low level operations shall wear PPE:

- I. Fire resistant clothing (Nomex flight suit).
- II. All-leather, or leather and Nomex gloves.
- III. Leather boots, above the ankle. (ALSE Handbook Page 4 Paragraph E) DOI only.

Observer/Air crewmember Briefing: The observers/air crewmembers will be briefed before the first takeoff of the day by the PIC in accordance with 14 CFR 135.

Mission Briefing: The observer/crew member will brief the PIC on the mission. Discussion will follow as to expected route, potential hazards, and expected responsibilities of the observer/crew member during the flight and during an emergency.

Regulations: 14 CFR Part 91.119 states that airplanes cannot operate closer than 500 feet to any person, vessel, vehicle, or structure. This regulation must be followed, unless specifically exempted by the FAA.

Grants of exemptions: The United States Forest Service has a grant of exemption for operations in congested areas. Review the latest revision for the latest version.

### 7.1.6 Low Level Recommended Procedures And Techniques For Airplanes

Aircraft Maneuvering and Configuration: The observer can usually get a good look at the area of interest by flying in a comfortable slow-flight@ speed (1.3 V<sub>so</sub>) and one notch of flaps or the manufacturer's recommended settings, remembering stall speed increases with angle of bank.

- I. Pilots should review and be proficient in slow flight and around pylon type maneuvers.
  - A. Optimum pivotal altitude above the ground, angle of bank, and lateral distance from the target area must be considered while keeping the observer in proper position throughout the turn, being sure not to block the target with the wing.
  - B.
  - C. The pilot should plan the approach path carefully having the airspeed, altitude, and attitude stabilized prior to arrival over the observation point. Approaches with excessively high rates of descent should be avoided.
  - D.
  - E. If a return to the target is required after a low pass, a climb of at least 200 feet should be made prior to making the turn back to the target if necessary enter a racetrack type pattern.

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**Terrain:** Pilots should not fly an extended observation track up-slope or into a box canyon where the aircraft would be unable to turn around. Escape routes should always be considered, turning away from rising terrain.

**Wind and Weather Considerations:** Upwind low level observation passes should be made whenever possible. An extra margin of airspeed should be carried in downwind situations. Avoid operations close to terrain when windy conditions exist. During adverse wind and weather conditions a stop to the flight should be considered opting for more favorable conditions.

**Flight Hazards:** While conducting low level operations the following hazards should be considered:

1. **Structures.** Man-made structures such as power or communication lines and associated towers require careful consideration, especially when flying near canyons, rivers, and over unfamiliar terrain. When possible a high level pass or reconnaissance should be made of the area noting potential hazards for future reference. The pilot and observer should work as a team. Even more than normal the pilot should concentrate on piloting duties and allow the observer to make the observations.
2. **Birds.** Pilots should avoid birds whenever possible but violent evasive maneuvers should not be taken. Birds will usually dive from the aircraft flight path but a bird strike is much less eventful than a stall at low level.
3. **Density altitude.** Operating at medium and high elevations on hot days will decrease aircraft performance. Pilots should refer to the aircraft performance charts and carry an extra margin when operating in high density altitudes.
4. **Lighting.** The lighting is a consideration when working around water or a low sun condition. While observing the sun should be kept behind or to the non-target side to avoid sun blinding.
5. **Flat turns.** Flat turns should only be used when following terrain or rivers to assist the observer, but should not be considered during turns. Climbing, coordinated turns are to be made when changing direction or circling a target.

## Chapter 8.0 Training And Evaluation

### 8.1 Advanced Smokejumper Operations

#### Smokejumper Pilot - Syllabus

Text:

- Interagency Smokejumper Pilots Operations Guide
- Departmental Manual (BLM)
- FSM 5700 (USFS)
- Aircraft specific Flight Manual.
- Spotter Training Manual (USFS or BLM)

Video:

- Professional Smokejumper Pilot Video
- Smokejumper Spotter Video

Description:

- This course is designed as a structured and standardized training program of ground and flight training for both agency and contract smokejumper pilot candidates.

Goals:

1. To become an integral part of a crew that safely delivers smokejumpers by either the BLM or USFS parachute delivery systems and subsequently delivers paracargo at low levels in support of that or other missions.
2. Safely plan and perform smokejumper missions.
3. Safely plan and perform paracargo missions
4. Standardize smokejumper pilot training and operations
5. Receive an Interagency smokejumper captain's card.

Requirements:

- Annual Equipment Ground School
- Annual Equipment Check Ride
- 6-Month IFR Check Ride
- Initial Operating Experience (25 hours IOE for aircraft requiring a type rating)
- 25 Hours in Make and Model (DOI only)

Evaluation:

- Designated Inspector (DOI) or Checkairman (USFS)

Phase Training:

- Each phase of the training syllabus may encompass multiple ground and flight sessions.

### 8.2 Phase 1

The program calls for a smokejumper instructor pilot (IP) and a spotter to work as a team in training the pilot candidate.

Optimally, the same IP and spotter should work with the candidate throughout the course of the program.

Primarily, the spotter: does spot determinations, patterns, and altitudes pertaining to equipment used. Primarily, the IP: monitors power, configuration, airspeed, altitude, attitude, safety, and cargo patterns and drops.

Each ground training session will be conducted by the IP and the Spotter and will include an in depth briefing of the upcoming flight. The objectives for each lesson will be clearly defined and discussed with the candidate.

### 8.2.1 Phase 1 Ground- Introduction to Basic Smokejumper Operations

- I. Phase 1 Indoctrination:
  - A. Professional Smokejumper Pilot video
  - B. Professional Smokejumper Spotter video
  
- III. Smokejumper mission
  - A. Initial attack, varied duties
  - B. Additional jobs - resupply, heavy cargo, back country retrieval
  - C. High training standards for jumpers and pilots
  - D. Safety standards and concerns regarding the mission
  
- V. Smokejumper equipment
  - A. Tour of the loft
  - B. Basic smokejumper equipment
    1. Jump gear and parachute—rounds and squares
      1. Fire packs
      2. Cubies
      3. Saws
      4. Spurs
      5. Radiosc. Cargo delivery system
      6. High and low impact
      7. Different size chutes
  - C. Spotting
    1. What is a spotter - expertise required
    2. Spotter responsibilities—picking the spot, etc.
    3. Pilot/spotter relationship
  - D. Operational Procedures
    1. Jump ship patterns (standard and downwind, crosswind, turns and banks)
      - a. Corrections (standard/non-standard)
      - b. Pattern call-outs
    2. Streamer patterns
      - a. Determining jump spot, pattern direction
      - b. Initial, standard, crosswind, downwind
      - c. Altitude/airspeed
      - d. Streamers away
      - e. Streamer visibility - spotter and pilot
      - f. Selecting exit point
      - g. Streamer check set—why
      - h. Check set final (i.e., streamers to spot)
      - i. Common errors
    3. Jumper drop pattern
      - a. Altitude/airspeed/flap settings/power application (rounds and squares)
      - b. When and how to abort
      - c. Pilot to spotter communication of conditions
      - d. Jumpers away
      - e. 5. Climb to 3000, AGL for ram airs

4. Cargo
  - a. DZ selection
  - b. Altitude/airspeed
  - c. Dry run
  - d. Calls
  - e. Lead/drift
  - f. Commands - "on final, standby, kick "
  - g. Aborting cargo run - why, call-outs
  - h. Accuracy - communication with ground and kicker
  - i. Accuracy is always sacrificed for safety
  
5. Emergency Procedures

### 8.2.2 Phase 1 Flight - Basic Smokejumper Mission Flight Procedures

Objective: To introduce the pilot candidate to the basic mission flight maneuvers and operational procedures and to develop the skills necessary to effectively accomplish these. The IP will be in the right seat, spotter in the door. The initial lesson is conducted over flat, open terrain with easily identified spots. The candidate should be able to fly streamer observation and jump patterns from any direction without having to concentrate on terrain avoidance at this point. Emphasis should be on understanding the purpose of each maneuver, a clear understanding of what the spotter requires to do his job, clear and concise communication and good operational coordination with the spotter. Emphasize smooth, coordinated maneuvering and consistent altitude, airspeed and heading control.

- I. Spotter calls for straight flight along a road, power line, etc, with left and right corrections which should result in standard 5 degrees of turn. Turns will be smooth and coordinated, no rudder turns. Watch for a tendency to drift back to the original line after a correction is made. Don't let the candidate rely exclusively on the DG or heading bug to hold their line. Have them make use of ground reference points and a point on the horizon.
  
- II. Streamer patterns
  - A. Proper positioning on observation pattern
    1. Keeping spotter in position
    2. Pilot observation of streamers to the ground (where to look)
    3. Streamers to spot

Bank angle should not exceed 30 degrees. Monitor airspeed and altitude control. Good communication with the spotter is important. Streamer to spot to exit point line should use ground reference points to hold the line. Emphasize pilot awareness of exit point.
  
  - B. Jump patterns
    1. Consistent line on final
    2. Proper size pattern
    3. Proper altitude and airspeed

\*The candidate should be using ground and horizon reference points to turn on line and maintain it along with the directional gyro. Altitude and airspeed control is crucial along with power management at jumper exit. Turn off final should not be made until "jumpers away" call.

- C. Cargo dropping
  - 1. Drop zone selection
    - a. Communication with spotter regarding DZ - may need to be different from jump spot. Type of cargo and chute size.
    - b. Good entry and exit routes
    - c. Down canyon and down sun
    - d. Lead in points
    - e. Dry run
    - f. 6. Commands
    - g. 7. Lead/drift for accuracy
    - h. 8. Aborting a live run
    - i. 9. Safety
    - j. 10. Aircraft configuration: Flaps and Power settings, airspeed control, clean up during exit

### 8.2.3 Phase 2 ground - Advanced Smokejumper Operations

- I. Observation pass
  - A. Low pass at spotters option
    - 1. No pass lower than 200' AGL
  - B. Why the spotter would request a low pass
  - C. Jump spot selection
    - 1. Hazards and terrain considerations in selecting a spot and a jump pattern
    - 2. Alternate spots
  - D. Jump altitude
    - 1. Minimum altitude and why—rounds vs. squares (“on final 3000 or 1500”)
    - 2. Jump altitude is over the exit point not the jump spot
    - 3. Determining altitude
      - a. Timing streamers
      - b. Radar altimeter
      - c. Low pass
  - E. Determining wind drift/velocity
    - 1. Accurate release of streamers over jump spot - why?
    - 2. Selecting exit point
    - 3. Terrain factors
      - a. Needs to see streamers all the way to the ground to determine wind line
      - b. Understand the spotters’ counting method to exit point (effected by wind speed and the need to determine the exit point) and the importance of maintaining the airspeed you will use on the jumprun. The Wind cone concept and parachute performance parameters - spotter.
  - F. Jump patterns
    - 1. Non-standard patterns
      - a. Downwind pattern terrain and ground speed considerations
      - b. Crosswind pattern - same
      - c. Right hand patterns
      - d. Spotter guiding pilot onto proper pattern

## INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

2. Changing line on final
    - a. Offsetting the line left or right to parallel original line
    - b. Pivoting the line left or right with the jump spot as pivot point (clock method).
  3. Emergencies
    - a. Critical (Mass exit, Jumper in tow—spotter/pilot comm.)
    - b. Non-critical
- G. Cargo dropping
1. DZ selection - terrain factors
    - a. Ridge top
    - b. Side hill
    - c. Canyon bottom
  2. Considerations with different bundle weights and chute size
    - a. Free fall delivery
    - b. High altitude dropping
  3. Variations with different kickers
    - a. Pilot makes corrections not the kicker
  4. Importance of smooth maneuvering
    - a. Impact of steep turns and high “G”, maneuvers and pull outs on cargo kickers in the back of the airplane

### 8.2.4 Phase 2 Flight- Advanced Smokejumper Mission Flight Procedures

Objective: To develop the pilot candidates’ skills to the operational level by introducing successively more difficult, steep terrain for jump spots and cargo DZs, non-standard patterns and emergency procedures. Candidate will be able to work effectively and efficiently with the spotter in streamer observation patterns and jump patterns. Cargo dropping will emphasize safety and planing ahead for emergencies in the more difficult terrain. Emphasis will be on situational awareness in typical terrain and technical skills needed to fly the smokejumper mission in mountainous terrain. Smooth, coordinated maneuvering and maintaining correct airspeed, altitude and heading should be developed at this level to where the IP has little need to point out corrections.

- I. Observation pass
- A. Low pass at no less than 200’ AGL
    1. Put spotter in proper position to see jump spot
    2. Communicate pilot observation of atmospheric conditions - wind, turbulence, up and down drafts
  - B. Streamer patterns
    1. Proper observation pattern
    2. Throwing check streamers for non standard patterns downwind and crosswind
      - a. Good communication between spotter and pilot of pattern changes
  - C. Jump patterns
    1. Standard and non-standard
    2. Spotter changing final line
    3. Terrain factors
    4. Emergency procedures
  - D. Cargo dropping
    1. Recon and dry run
    2. Planning entry and exit routes with emergencies in mind
    3. Changing pattern for safety and accuracy
    4. Smooth flying - no hard turns of “G” loading on pull out if possible

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5. Emergencies procedures
6. Test standard for accuracy

Spotter will set up successively more difficult jump scenarios. Spotter will set up jump pattern and corrections, but the pilot candidate will recon the cargo DZ (both on the jump spot and at an alternate spot) and set up the cargo run. Emphasize safety and good judgement in all phases, especially on selecting and flying cargo runs.

### 8.2.5 Phase 3 Ground - Smokejumper Mission Topics

- I. Pilot and spotter responsibilities
  - A. Flight and jumper safety
- II. Radio communications
  - A. Pilot to spotter system in the aircraft
  - B. VHF and FM communications - who is responsible for what
  - C. Current frequency lists
  - D. Flight planning
    1. Navigation - familiarity with long range navigation equipment
    2. Fuel-jumper load with required reserve
    3. Check NOTAMS, TFRs and Hazards maps
  - E. Standby and Dispatch
    1. Daily base operations, including pilot/spotter briefings.
    2. Dispatch procedure - check-ins
    3. Duty limits, flight time limits, mandatory days off
    4. PPE - nomex
    5. Agency regulations, forms and paperwork
    6. Loadmaster/Flight Attendant role
  - F. Other missions
    1. Crew hauls
    2. Paracargo
    3. Jumper retrieval
    4. Point to Point cargo
  - G. Practice jumps
  - H. Fire Protocol
    1. Air Attack roles
    2. Mission priority
    3. Radio communications/ dispatch and required checkins
    4. Multiple aircraft on site
    5. Lights
    6. Fire Traffic Area (FTA)

### 8.2.6 Phase 3 Flight - Prep For Checkride and Live Cargo Drops

This phase will prepare the candidate for the final checkride with an agency inspector. The spotter will simulate a real jump request. The candidate will be familiar with aircraft performance charts and be able to determine if mission can be accomplished under conditions of the simulation. IP input and corrections should be minimal at this point.

- I. Observation pass, streamer passes
- II. Jump run
- III. Cargo run
- IV. Simulated emergencies (deploying jumpers after takeoff, engine loss with jumpers and on cargo runs, cargo hung up, etc.)  
Potential emergency situations requiring smokejumper bailout are varied and detailed procedures for every conceivable situation are not possible. General bailout procedures for non-critical situations (such as landing gear malfunction) and critical emergencies (such as engine failure due to contaminated fuel) will be discussed in classroom training. Smokejumper spotters are trained to respond to all emergency situations with the command to the jumpers of “stay put”, . Appropriate action then gets started with the spotter in control and the pilot free of aft CG problems.

The candidate should be able to perform all operations to mission ready standards. Live cargo drops should be practiced for accuracy. Live drops can be in an area where cargo retrieval will be fairly easy.

### 8.2.7 The Checkride

This guide is the evaluation standard for smokejumper/paracargo checkrides. The proper agency form in Chapter 10 will be used by the check pilot. The candidate will be required to take either a written or oral exam based on this guide and calculate a smokejumper related weight and balance. Should the check airman elect to conduct in-flight simulated emergencies during special use missions, engine failures shall only be simulated by retarding a power lever or throttle. Mission oriented emergencies will be preplanned with the spotter.

### 8.2.8 Smokejumper Pilot Practical Test Standards (PTS)

Interagency Practical Test Standards

- I. Interagency Special Use Evaluations
  - A. Task: Smokejumper Operations - Ground
    - Pilot Operation
      1. Objective. To determine that the applicant:
        - a. Exhibits knowledge by demonstrating Situational Awareness of Weather, TFRs, NOTAM's (Airport Closures, Temporary Towers, No Fuel, Approaches out of Service, etc.) for Applicants Aircraft IA Radius.
        - b. Exhibits knowledge of Agency ramp procedures as they apply to Smokejumper Operations.
        - c. Exhibits knowledge of GPS programming and operation by entering simulated fire coordinates into the aircraft GPS.
        - d. Exhibits knowledge by demonstrating the ability to program coordinates, mark locations, and update Lat/ Longs with the aircraft GPS.
        - e. Exhibits knowledge of installed FM radios by programming simulated frequencies and tones provided by check airman.

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2. Action. The applicant will:
  - a. Explain hazards of operating in fire environments where smoke, terrain, and other meteorological factors compete with Smokejumper mission activities.
  - b. Complete a through preflight briefing.
  - c. Complete the prescribed checklists.
  - d. Completes all first flight of the day run-up items per the Agency, Bureau or AFM.

### B. Task: Smokejumper Operations – Enroute To Incident

#### Pilot Operation

1. Objective. To determine that the applicant:
  - a. Exhibits knowledge of Interagency flight following procedures (AFF satellite tracking equipment, 15 minute check-in, and/or FAA flight following).
  - b. Exhibits knowledge by selecting the proper aircraft configuration, power setting, and flight course to accomplish the flight in a timely fashion.
  - c. Exhibits knowledge by performing the Pilot/Spotter briefing prior to arrival at the fire. (Points of contact for clearance into FTA, expected aircraft over the fire, max time available over the fire).
2. Action. The applicant will:
  - a. Explains and demonstrates knowledge of Interagency flight following procedures.
  - b. Exhibits and demonstrates knowledge of required crewmember briefings and notifications prior to entering the FTA or arrival over the incident.

### C. Task: Smokejumper Operations – Arrival At Incident

#### Pilot Operation

1. Objective. To determine that the applicant:
  - a. Exhibits knowledge of Temporary Flight Restrictions (14 CFR 91.137), Fire Traffic Areas, and communication requirements of both.
  - b. Exhibits the ability to maintain the altitude or geographic location as assigned by aircraft in control of FTA.
  - c. Exhibits the ability to position the aircraft such that the spotter has an adequate view to complete a fire size-up.
  - d. Exhibits the ability to use the GPS to get corrected coordinates if necessary.
  - e. Exhibits knowledge of SMJ operating speeds/limitations and maintains airspeed of 1.3 Vs1 -0+10 90 Knots minimum
  - f. Exhibits knowledge of SMJ operating altitudes.
  - g. Exhibits knowledge by planning escape routes in the event of an engine failure.
2. Action. The applicant will:
  - a. Demonstrate the ability to execute a low pass which provides an adequate view of the jumpspot and/or fire for the smokejumpers and spotter while:
    - Maintaining airspeed of 1.3 Vs1 -0+10
    - Maintaining altitude of approximately 200 AGL -0+300
    - Maintaining awareness of terrain and ground obstacles.
    - Pilot's aircraft in a manner to be able to provide an escape path in the event of an engine failure at any time.
  - b. Exhibits knowledge of by maintaining awareness of terrain and ground obstacles.

## INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

### D. Task: Smokejumper Operations – Streamer Drops

#### Pilot Operation

1. Objective. To determine that the applicant:
  - a. Exhibits the ability to establish and maintain the proper altitude above the jumpspot.
  - b. Exhibits the ability to smoothly maneuver the aircraft with attention divided between flying the aircraft and observing the streamers.
  - c. Exhibits knowledge and correct usage of standard call outs.
  - d. Exhibits the ability to maneuver the aircraft to provide the spotter with an adequate view of the streamers.
  - e. Exhibits the ability to consistently identify the point where the streamers land and identify the wind line.
2. Action. The applicant will:
  - a. Demonstrate the ability to maintain airspeed of 1.3 Vs1 -0+10, 90 knots minimum, 115 knots maximum
  - b. Demonstrate the ability to maintain an altitude of 1500 above the jumpspot -0+100
  - c. Demonstrate the ability to make smooth and timely control corrections to position the aircraft on final as the spotter commands.
  - d. Demonstrate the ability to routinely keep the bank angle 30 degrees or less.

Note: The PIC and/or inspector/checkairman pilot have the discretion to increase reference speeds due to terrain, weather or other factors as long as it is briefed prior to the maneuver and does not exceed aircraft limitations.

### E. Task: Smokejumper Operations – Smokejumper Drops

#### Pilot Operation

1. Objective. To determine that the applicant:
  - a. Exhibits knowledge of standard call outs and correct usage.
  - b. Exhibits the ability to fly the proper drop pattern as requested by the spotter.
  - c. Exhibits awareness of environmental conditions (up air, down air, turbulence, wind shear, wind shifts, etc) and the ability to communicate them to the spotter.
2. Action. The applicant will:
  - a. Demonstrate the ability to maintain proper airspeed of 1.3Vs1, 90 knots minimum, 115 knots maximum
  - b. Demonstrate the ability to maintain specified altitude or 1500 AGL -0 + 100 above the jumpspot or exit point (which ever is higher) for round parachutes.
  - c. Demonstrate the ability to maintain specified altitude of 3000 AGL -0 + 100 above the jumpspot or exit point (which ever is higher) for ram-air parachutes.
  - d. Demonstrate the ability to maintain bank angle routinely less than 30 degrees.

Note: The PIC and/or inspector/checkairman pilot have the discretion to increase reference speeds due to terrain, weather or other factors as long as it is briefed prior to the maneuver and does not exceed aircraft limitations.

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### F. Task: Paracargo Operations

#### Pilot Operation

1. Objective. To determine that the applicant:
  - a. Exhibits awareness of terrain, ground hazards, and weather conditions to safely fly this low level mission.
  - b. Exhibits the ability to plan and execute a flight pattern which will not endanger persons, vehicles, or structures in the event of paracargo malfunctions.
  - c. Exhibits knowledge of paracargo operations, configuration, and the need to set aircraft airspeed for best single engine performance in the event of engine failure (multi-engine aircraft), and pilots aircraft in a manner as to always be able to provide an escape path at any time.
  - d. Exhibits knowledge of optimum drop airspeed of 1.3Vs1 -0+15 (Not to exceed aircraft limitations), 90 knots minimum 115 knots maximum.
  - e. Maintains a bank angles of less than 30 degrees
  - f. Exhibits knowledge of optimum drop altitudes of 150 feet AGL (minimum).
  - g. Exhibits knowledge of standard call outs and correct usage.
  - h. Exhibits knowledge of environmental conditions (up air, down air, turbulence, wind shear, wind shifts, etc) and the ability to communicate them to the spotter.
  
2. Action. The applicant will:
  - a. Explain and demonstrate paracargo procedures and the ability to plan and execute a flight pattern which will not endanger persons, vehicles, or structures in the event of paracargo malfunctions.
  - b. Demonstrate the ability to maintain airspeed of 1.3Vs1 -0+15 (Not to exceed aircraft limitations), 90 knots minimum 115 knots maximum
  - c. Demonstrate the ability to maintain a bank angles of less than 30 degrees
  - d. Exhibits the ability to establish minimum drop altitudes of 150 feet AGL.

Note: The PIC and/or inspector/checkairman pilot have the discretion to increase reference speeds due to terrain, weather or other factors as long as it is briefed prior to the maneuver and does not exceed aircraft limitations.

## Chapter 9.0 Flight Crew Qualifications

### 9.1 Agency Pilots

- I. FAA ATP Pilot Certificate
- II. Current FAA Medical Certificate appropriate to category/class
- III. Type rating for appropriate aircraft.
- IV. 1500 Total time
- V. 1200 PIC in airplanes
- VI. 500 PIC category and class to be flown
- VII. 200 PIC in typical terrain
- VIII. 100 PIC in category preceding 12 months
- IX. 100 Night
- X. 50 Instrument in flight
- XI. 75 Instrument actual/simulated
- XII. 10 PIC in category preceding 60 days
- XIII. 25 PIC make and model or type within 5 years
- XIV. 100 PIC turbine
- XV. 10 PIC make and model preceding 12 months
- XVI. Pilot qualification card with proper sign off
- XVII. DOI Large Aircraft Captains must have 250 hours PIC in aircraft over 12,500 pounds maximum gross weight
- XVIII. USFS Large Aircraft Captains must meet the requirements of the Aircraft Commander Evaluation Board.

### 9.2. Large Aircraft

- I. Agency Pilots: Complete upgrade per Aircraft Commander Evaluation Board found in the 5709.16 (USFS) and the BLM Aviation Standard Operations Procedures.
- II. Contract Pilots must meet the requirements under their respective agencies (DOI/USFS) contract specifications.

9.3. Smokejumper Flight Crewmember Qualifications Table

Requirement	Smokejumper Flight Crewmember Qualifications Table			
	Position	Position	Position	Position
	Second in Command (SIC)	Pilot in Command (PIC)	Instructor	Checkairman / Inspector
Annual Ground School				
Annual Equipment Check Ride				
PIC: Annual Smokejumper mission Checkride and Card issued. SIC: Annual mission Checkride and Card issued. SIC Initial: 5 Practice jumps as SIC.				
Instrument Currency				
Mission Recurrent - 1 refresher flight with paracargo				
Initial Operating Experience (IOE) 25 Hours in Make and Model of large aircraft.				
Initial (one time) Mission Check in each airframe as PIC.				
Large Aircraft Commander Evaluation Board for First Type Rating.(USFS)				
Smokejumper Instructor / Checkairman/Inspector Biennial Standardization Workshop				
Designation by National F/W Standardization Officer or Aviation Management Directorate. For the BLM National Office concurrence.				
100 Hours in Make and Model -Instructor Only				Instructor only
Standardization Checkride and/or National Office designation				
CFI, CFII, MEI.				
100 total PIC missions consisting of: a) at least 50 Fire operations with Smokejumpers and Paracargo and b) up to 50 practice missions which included both Smokejumpers and paracargo (may be simulated).				
3 Years Smokejumper PIC (Agency or Vendor) Experience.				
1 year designation as a Smokejumper Pilot Instructor				
2 years of Instructor qualification.				

#### **9.4 Crew Pilot Qualifications and Carding**

Required flight crewmembers must have a USFS/USDI Smokejumper Pilot Checkride and signed pilot card issued within the previous 12 months authorizing them for smokejumper/paracargo missions.

#### **9.5 Currency Requirements**

- I. All required Flight crewmembers must have an annual checkride
- II. Inspector and Instructor pilots must be current Smokejumper captains in order to perform their tasks as instructors or inspectors and will be designated by the USFS or AMD / BLM National Aviation Office.
- III. All required flight crewmembers and air crewmembers (DOI) must attend an approved CRM course every three years.

## Chapter 10.0 Forms

### 10.1 Interagency Smokejumper Pilot Training Form

<http://aviation.blm.gov> / Aircraft Operations / Smokejumper Aircraft / Scroll down to forms.

- I. Smokejumper Pilot Training Form (Excel)
  
- II. USFS Smokejumper Pilot Checkride Form
  
- III. AMD Forms
  - A. AMD-64A Interagency Airplane Pilot Qualifications and Approval Record (Contractor)
  
  - B. Personnel Data Information and Pilot Carding (Fleet)
  
  - C. AMD 69 Checkride (not available online yet)

## Glossary

AFF - Automated Flight Following.

AGL - Above Ground Level.

AIR TACTICAL GROUP SUPERVISOR ATGS - Specially trained fireman who rides in a chase plane to direct retardant drops over fires. The AAB is responsible for air traffic control and for setting mission priorities. In his absence, the smokejumper spotter assumes the responsibilities of the AAE.

AMD – Aviation Management Directorate. That agency formerly known as the OAS.

AREA - BLM administrative sub division of a District.

ASM - Aerial Supervision Module, consisting of a “ATCO” or Leadplane Pilot and an Air Attack operating as a team.

BLM - Bureau of Land Management. A Bureau of the Department of the Interior, which among other responsibilities, is responsible for suppression of wildfires on most of Alaska’s federal land.

BURNING CONDITIONS - The combined conditions of fuel moisture, temperature, wind, humidity, etc., which effects how intensely wildfires will burn on a given day. Burning conditions, along with lightning forecasts, directly affect the degree of readiness maintained by the smokejumper project, specifically standby assignments.

CANOPY - The material and lines that make up what is usually identified as a parachute. Does not include container, D-bag, and other components of a parachute system.

CARGO DROP AIRSPEED - The airspeed an aircraft must fly to safely drop cargo.

CHARGE CODE - A multi-digit computer number associated with all expenditures of BLM funds which keys the money spent to the program and activity it was spent for.

CHASE PLANE - Same as a lead plane. This term is probably more appropriate in Alaskan style air attack operations.

CONVECTION COLUMN - Towering column of smoke which may rise thousands of feet in the air over a fire.

COORDINATES - Latitude and longitude locations to the nearest minute which is the primary method used to describe the location of fires in Alaska.

CORRECTION - Left or right changes in aircraft heading accomplished with bank turns in 5 degree increments, at the direction of the spotter on final approach to the jump spot or exit point. Corrections of greater magnitude than 5 degrees are accomplished with quick banked turns when requested.

DEMOBE - The retrieval of smokejumpers and other firefighters from a fire.

DETECTION - Activities that focus on locating new fires at the earliest possible moment.

DISTRICT - Administrative sub-division in the BLM organization; in Alaska, there are two Districts: Fairbanks District and Anchorage District.

## INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

DOI - Department of the Interior.

DRIFT - The distance streamers drift down-wind from their release point.

DROGUE - A static line deployed stabilization parachute used with ram air canopies

DROP ZONE (DZ) - Term similar to jump spot, but usually used in reference to cargo drop areas.

DRY RUN Term sometimes used to mean dummy run, though usually used to refer to a smokejumper mission that did not drop jumpers on a fire.

DUMMY PASS - Practice cargo run pattern in which cargo is not dropped for the purpose of letting the pilot determine the suitability of his selected run.

ECON CRUISE - Normal power setting speed used by smokejumper aircraft returning from fire runs, flying point to point, or on patrols (fuel-efficient operations).

EFF CREW - Generally, a crew of 16 drawn from a native village, trained in fire suppression, and hired as needed for a specific fire.

EFF - Emergency Fire Fighters hired day to day to meet a fire emergency.

EMT - Emergency Medical Technician. The smokejumper project maintains approximately 12 EMT's for rescue and emergency medical care of injured firefighters.

EXIT POINT – For round canopies a point equal distance up-wind of the jump spot as the streamers landed down-wind and over which the jumpers must exit the aircraft to compensate for the wind drift in their parachutes. For square parachutes this may be up to twice the distance up wind as determined by the spotter.

EXIT - the procedure used by smokejumpers to jump from an aircraft.

EXTENDED STANDBY-Normally thought as the hours assigned beyond the normal 8 hour day.

FAST CRUISE - Maximum power setting speed used by smokejumper aircraft enroute to initial attack fires with an eye toward speed and not fuel economy.

FIRE PACK - A pre-packed box containing food, shelter, and fire fighting tools for two smokejumpers pre-rigged for cargo drop.

FUEL TYPE - Classification of various types of trees, brush, tundra, etc., in order to describe burning characteristics, or probabilities of a fire.

GO AROUND - An aborted live run.

HARNESS - The webbing strap arrangement that a jumper wears to which his parachute is attached.

HELITACK - Firefighters whose primary means of transportation to fires is by helicopter and who are specifically trained in helicopter procedures.

INITIAL ATTACK - The critical first attack on a new fire with the objective of containing it while it is small.

## INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

**JUMP SPOT** - The area on the ground selected by the spotter as the most desirable area for smokejumpers to land from the standpoint of safety and tactical advantage to attack the fire.

**KICKER** - A smokejumper assigned in charge of para cargo missions to accomplish the actual dropping of cargo bundles out the open door of the aircraft.

**LEAD PLANE** - A fast maneuverable light twin-engine aircraft used by the AAB to make low passes over desired targets for retardant, to lead retardant bombers to a target, and to follow, or chase, retardant bombers while they make their drop and observe the drop effectiveness.

**LIVE RUN** - A flight pattern on which jumpers or cargo will be dropped after streamer runs or dummy runs.

**LOAD** - The crew of smokejumpers carried by smokejumper aircraft with a standard amount of initial attack cargo.

**LOFT** - The facilities used for packing and repairing the parachutes. Consists of packing table room, drying tower, and sewing machines.

**LOW PASS** - A low and slow pass made along side a fire to help the spotter size-up the fire and select a jump spot.

**MAIN** - Primary parachute assembly used for intentional jumps.

**MODIFICATION** - Series of holes cut in the rear of a parachute to give the parachute forward speed and turning ability to allow it to be maneuvered.

**MOP-UP** - The procedure of digging up and putting out a fire after the fire has been contained.

**MSL** - Mean Sea Level.

**OAS 23** - Pay documents which are filled out after each flight and each day with appropriate charge codes from which the basis of payment to contractors for aircraft availability and flight time.

**AMD2A** - Flight log document which is filled out after each flight and each day with appropriate charge codes for finance coding, aircraft maintenance coding, and pilot times are used for fleet aircraft.

**OPERATIONS** - Smokejumper operations is responsible for readiness of smokejumpers and aircraft to respond to fires. Smokejumper pilots and aircraft receive their assignments from operations.

**PROJECT FIRE** - A large fire that has escaped initial attack and which is fought by a force of 80 or more firefighters over an extended period of time.

**RESERVE** - Auxiliary chest mounted parachute for use in the event of a malfunction of the main parachute.

**RETARDANT** - Liquid chemicals dropped from retardant bombers to slow the spread of a fire.

**RIGGER** - An FAA licensed parachute packer and repairman. Selected smokejumpers receive training as riggers.

**SMOKEJUMPER DROP AIRSPEED** - The airspeed the aircraft must fly for safe jumper exits and parachute deployment.

## INTERAGENCY SMOKEJUMPER PILOT OPERATIONS GUIDE

**SMOKEJUMPER DROP ALTITUDE** - The altitude ACL that the aircraft must fly to safely drop jumpers.

**SMOKEJUMPER** - An experienced professional fireman who is trained to parachute into wildfires in remote areas and in rugged terrain.

**SPOTTER** - A senior smokejumper who is trained to be in-charge of smokejumper missions.

**STACK** - The formation of aircraft separated vertically at 500 foot intervals over a fire for the purpose of air traffic control.

**STAFFING** - Term used for both the number of people and aircraft assigned to standby on a given day and for the process of delivering firefighters to a fire.

**STANDBY** - Standby is assigned to pilots by operations at the request of FMOs and is determined by burning conditions and lightning forecasts.

**STATIC LINE** - Line attached from the main parachute to the static line cable in the jump aircraft which activates the parachute as a jumper falls away.

**STREAMERS** - Twenty foot long weighted crepe paper strips that descend at the same rate as a personnel parachute that used by a spotter to help him determine wind drift.

**TAWS** – Terrain Awareness Warning System, a GPS based Ground Proximity Warning System required on all Turbine aircraft by March of 2005.

**TCAS** – Traffic Collision Avoidance System, required on all Smokejumper Aircraft.

**UNIT** - BLM administrative sub-division of an Area.

**WEAK LINK** - A short piece of 500 lb. tensile strength webbing with a ring attached. The weak link breaks in the event a static line cargo bundle becomes entangled in the static line. The purpose of the weak line is to protect the aircraft from excessive forces on the static line cable.

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## Appendix

### I. Large Aircraft Commander Board

#### A. AIRCRAFT Commander Evaluation Board

The purpose of this board is to approve candidates for upgrade to aircraft commander in airplanes with a gross takeoff weight above 12,500 pounds or that require a type rating. This position will hereinafter be referred to as large aircraft commander. The intention is to base the upgrade to large aircraft commander on performance and experience rather than minimum flight hour criteria.

The board will be will consist of five members representing the USFS, BLM and AMD. Board members will be appointed by the respective agencies and will be agency captains with check airman authority and a depth of experience in both operations and management. The board will designate additional captains as a standing cadre to serve as evaluators when requested by the board. Members are identified by letter annually or upon change of membership. Board membership will be comprised of the U.S.F.S. National Fixed Wing Standardization Pilot, the U.S.F.S. National Smokejumper Program Manager, the BLM Flight Standards / Transport Category Pilot, the AMD Fixed Wing Specialist and a U.S.F.S. Regional representative. The board will meet annually and additional meetings may be held when deemed necessary by the board.

The OPM Operating Manual for Qualification Standards for General Schedule Positions (p. IV-B-282) for Aircraft Operation Series states:

“Minimum eligibility requirements for positions in the occupation are based on 1) possession of the appropriate Federal Aviation Administration (FAA) pilot certificates and/or appropriate military ratings, 2) meeting the applicable flight hour requirements, and 3) possession of the knowledge and skills required for the positions.”

In order to meet the letter and intent of the three conditions outlined in the statement above, all USFS and DOI large aircraft commanders must meet the following minimum requirements.

### II. Flight Crew Qualifications

#### A. A current FAA ATP pilot certificate with appropriate type rating.

#### B. The following flight hours:

- 1500 hours Total Time
- 1200 hours Pilot in Command
- 500 hours Multi-engine
- 250 hours multi-engine PIC experience
- 100 hours heavy multi-engine experience (PIC or SIC) USFS only.
- 250 hours heavy multi-engine PIC experience, DOI only.
- 75 hours Instrument – actual or simulated
- 50 hours Instrument – in flight
- 100 hours Night
- 100 hours Turbine Engine Experience (PIC or SIC)
- Annual Smokejumper Pilot Checkride.

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- C. Possession of the required knowledge and skills as evidenced by a designation as aircraft commander from the Aircraft Commander Evaluation Board.

All agency pilots who will be flying as a large aircraft commander, whether new hire or upgrade will go through the board evaluation and designation. If the candidate's large multi-engine airplane experience is in excess of 250 hours as pilot in command, the board may elect to reduce the number of evaluation flights based on performance. If the candidate is a DOI employee, this evaluation process may also serve as the initial flight evaluation required by 351 DM 3.4.

It should be noted that this process is intended to evaluate the candidate's potential as an aircraft commander and is not concerned with a specific mission qualification. This does not apply solely to smokejumper pilot candidates.

For the purposes of this document the following definitions will apply:

- Pilot in Command experience – that flight time logged as defined in FAR Part 1: Definitions and Abbreviations,
- Pilot in command means the person who:
- Has the final authority and responsibility for the operation and safety of flight;
- Has been designated as pilot in command before or during the flight; and
- Holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight.

Large Aircraft – aircraft of more than 12,500 pounds maximum certificated takeoff weight, or requires a type rating to be pilot in command.

Candidates wishing to be considered for upgrade to aircraft commander will submit a recommendation package to the board. The candidate will be type rated prior to the package being submitted. The recommendation package will consist of a written recommendation for upgrade from the candidate's supervisor, training records (including type training), and flight experience records and upgrade recommendations from line captains who have flown with the candidate.

If the candidate is already qualified as a large aircraft commander and this is an additional aircraft to be added to their designation as aircraft commander, the candidate need only submit the upgrade recommendation and the type certificate training records. In this case the board, at their discretion, may approve the additional qualification with no evaluation flights.

If the initial package review is satisfactory, the board will recommend the candidate for evaluation flights. Based on the candidate's experience a plan of action will be developed by the board for each evaluation flight. This will insure that any concerns and or issues board members may have with the applicant will be addressed during the appropriate evaluation flight.

The board may elect to designate the candidate as an aircraft commander with less than three evaluation flights. It should be noted that these are evaluation flights, not checkrides.

- Evaluation Flight 1 – This flight is intended to establish the candidate's general level of proficiency in the aircraft, CRM and ability to command the aircraft and crew. If the candidate satisfactorily completes this flight they will be recommended for Evaluation Flight 2.
- Evaluation Flight 2 – This evaluation may consist of multiple flights and will include actual and/or simulated IFR and Enroute scenarios, aerial fire fighting missions (if appropriate) and back country flight/airport operations (if appropriate). Satisfactory completion will result in recommendation for Evaluation Flight 3.

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- Evaluation Flight 3 – Satisfactory completion of this flight will result in USFS candidates being signed off as aircraft commander and DOI candidates being recommended for their agency qualification check ride.

If mission training has been completed prior to the evaluation flights, Evaluation Flight 2 or 3 can be a mission qualification check ride with concurrence of the board members.

A different board member will conduct each Evaluation Flight. All evaluations will be documented in detail and any deficiencies in skill or judgment will be clearly identified. Remedial training at the unit level will also be well documented.

If any Evaluation Flight is unsatisfactory, the candidate will return to their home unit for additional training. After additional training the candidate will fly that Evaluation Flight again with a different board member.