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PROFESSIONAL HELICOPTER PILOT GUIDE

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February 1996

Prepared by:

San Dimas Technology & Development Center

In cooperation with:

Helicopter Operation Specialists
Helicopter Pilot Inspectors
and Bureau of Land Management

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INTRODUCTION

The Professional Helicopter Pilot Guide is organized into a topic format style. Each chapter provides a complete discussion of the topic. As such, there exists some duplicate discussion or description of material from chapter to chapter. This was done such that as a reference source, the reader can consult any given topic and receive all of the pertinent information, rather than be referred back and forth to other chapters for needed information to fully understand the topic in question.

This document is an introduction to the arena of wildland firefighting, as it applies to the helicopter pilot. For the helicopter to be a fully effective tool in fire suppression it is essential that pilots work closely with the individuals involved in management and use of helicopters. These people are primarily the helicopter manager and the crew, but may include any member of the firefighting team.

A helicopter is a valuable and efficient fire fighting resource available to the wildland fire service. To attain the highest efficiency, close cooperation must take place between the pilot and incident management personnel.

Many responsibilities for helicopter operations are assumed or shared by the helitack organization. However, it is clearly recognized that the pilot is a "professional" aviator and that final responsibility and authority for safe operation of the helicopter rests there. Items of pilot responsibility include, but are not limited to:

1. Safety of aircraft, occupants and cargo.

2. Ensuring that crew members and passengers understand proper use of restraint devices including seat belts and shoulder harnesses.

3. Briefing passengers on emergency crash landing and exit procedures.

4. Postponing, changing or canceling flights when he/she believes existing or impending conditions make them unsafe.

5. Complying with orders of authorized officials when in the pilot's judgment compliance will not violate any safe practices or endanger the aircraft, occupants, or cargo.

6. Familiarization with operating area and special hazards.

7. Reviewing the plan of operation with air and ground personnel.

8. Proper loading of aircraft.

The purpose of this guide is to increase the mutual understanding between pilot and incident helicopter managers.

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CHAPTER 1

ATTITUDE—
AN OUTLINE FOR SAFETY

NOTES

INTRODUCTION

The thoughts outlined in this document are not original but extracted from some of the best known aviation writers and psychologists in the industry. Their thoughts and findings have been combined in a format that will be useful to the casual user of aviation resources, as well as the professional pilot who daily must make decisions regarding safety in the demanding and complex operations we call resource aviation. Some of the sources of these combined thoughts will be listed at the end of this commentary.

In today's modern vocabulary the word **"Attitude"** usually strikes a negative cord. When you hear: "He has an **attitude**" it is assumed to be negative. Webster defines **attitude** as: the manner of acting, feeling, or thinking that shows one's disposition, opinion, etc.; as a threatening attitude, an attitude of entreaty. Today's connotation of attitude is suffering a modern malady known as 'bad press'!

Personality traits and attitudes have a fundamental influence on the way our lives are conducted at home and at work. They determine the way we are judged by others and we often become identified by them. Personality traits are acquired very early in life. They are deep-seated characteristics which are stable and very resistant to change. They may be reflected in aggression, ambition, dominance or creativity and are often situation related. These traits should not be confused with attitudes. The selection of a profession is usually driven by personality traits. How one adapts to that selection is highly influenced by attitudes which are developed and changed through life experiences.

Attitudes describe likes and dislikes. An attitude can be seen as a learned tendency to respond favorably or unfavorably to people, decisions and situations. It is a predisposition to respond in a certain way. An opinion is a verbal expression of an attitude or belief, and is one means by which others may become aware of your "attitude".

It has been established that those involved in most accidents attributable to inadequate human performance probably, at the time of the accident, had the capacity to have performed effectively, yet did not do so. Their personal performance was influenced by factors other than the possession of technical skills. It could have been that the person involved, felt so confident that they could short-cut a standard procedure or avoid consistent use of a checklist—or that **their** interpretation of leadership was dominance—or that in difficult situations they should assume most of the tasks themselves—or that the urgency of the mission justified by-passing established procedures. The pilot and the users of Resource Aviation must combine their skills, knowledge, and experiences to form a positive working machine with a combined and demonstrated **attitude of safety**.

Hazardous Attitudes (example of bad press) and corresponding Antidotes are outlined on the following page.

HAZARDOUS ATTITUDES vs CURATIVE ANTIDOTES

ATTITUDE	ANTIDOTE
ANTI-AUTHORITY "Regulations are for someone else."	"Follow the rules. They are usually right"
IMPULSIVELY "I must act now, there's no time!"	"Not so fast. Think first."
INVULNERABLIITY "It won't happen to me.	"It could happen to me."
MACHO "I'll show you. I can do it."	"Taking chances is foolish."
RESIGNATION "What's the use?"	"I'm not helpless, I can make a difference."

So much for negative attitudes, let's focus on how to embrace **positive** attitudes. While both positive and negative attitudes are considered "highly contagious" we are far more receptive to good vibes than to those that afford us discomfort. We are in a highly specialized, one of a kind environment. Our daily survival depends upon how we respond to situations that are constantly changing. We live on the edge of the next challenge, and our lives are filled with anxieties. We are an entire organization of mission driven personalities complexly interwoven and inter-dependent upon each other for our survival. The decisions we make, and the way in which we make them, have a trickle down effect on everyone assigned to the mission. One of the basic human needs we have is the need to be accepted by our peers. Each of you is important beyond measure. Each is an integral part of the mission and as such, each has a responsibility toward the success and safety of that mission. We must abide by the rules laid down through experience and probability. We must follow procedures which are sometimes boring and repetitive and, if we are to achieve success, we must do it through an attitude and demonstration of safety. Equal to, if not above the "Book Rules", are the rules by which we conduct our daily activities with each other. This daily association when tempered with a **positive attitude** can produce more pro-active aviation safety results than any other effort.

A trendy little book authored by Robert Fulghum is titled: *All I Really Need to Know, I Learned in Kindergarten*. He simplifies our daily efforts with such statements as "Don't throw sand.—share your toys, play fair, say your sorry when you hurt somebody, eat your vegetables, get your rest, enjoy your friends—enjoy your solitude—laugh a lot—continue to listen—continue to learn—" All simple little one liners that outline a positive attitude. It is highly infectious, very effective and most refreshing reading. Fulghum tells us that all the important things in life are attainable, and the first step towards acquiring them is to maintain a **positive attitude.** It has been proven that this positive attitude reflects itself vividly in the safety records of organizations that promote **individual responsibility knit tightly with group concern.** All members function as a team, and each assumes personal responsibility for their own performance. In a helicopter

operation, the pilot and the Helitack personnel function as a single unit. Through **Communication, Motivation, Reinforcement and Example,** each becomes part of the whole and the mission is completed successfully and safely.

Thoughts to consider in any aviation operation:

1. You are now in charge of a sacred trust, the safety of human lives.

2. You must not let undue pressure (expressed or implied) influence your judgment during the performance of this sacred trust.

3. You must be able to develop a team in which members must participate and contribute to the safety of the operation.

4. You must delete "false pride, calculated risk, real world, and good enough for Government work" from your professional vocabulary.

5. You will not be criticized or stigmatized for any decision you make which will ensure added safety to an operation.

6. You must not let your actions instill the attitude of competition between co-workers. This attitude may hinder performance and may compromise the safety of the mission.

If you can view this very serious business to which you are currently dedicating your lives as though each person within the organization is dependent upon the decision **you** make, then you will become the corner stone of the Aviation Safety Program. This is, without question, the greatest contribution you can make towards evoking **an attitude of safety!**

HUMAN FACTORS

Human Factors is about people. It is about people in their working and living environments. It is about their relationship with machines, equipment, procedures, standardization, and the environment in which we live in. Human Factors is also the "bottomless pit" into which 80% of aviation accidents fall. Human Factors is about our lives and how we choose to live them. The concern of this document is to identify, in terms of safety, how this most important condition can be made to work to our benefit. In doing so, we will also be made aware of its snares and warning signals.

There are many factors which may influence a person's overall attitude to the job. These include, amongst others, financial rewards, work colleagues, working environment,and the nature of the task itself. The extent to which these factors apply an influence depend on each person's own preference and values.

Studies done in recent years placed JOB SATISFACTION second only to family. The Forest Service has always viewed its members as family. Further, each discipline within the Forest Service is somewhat clannish and protective of its extended family. Those of us who have chosen to be part of Fire and Aviation live in a "perceived" very small world. We are the only ones there! This is the choice we have made, and once made, we rarely challenge our decision. This is most important work, every aspect, every detail, every decision. There is no margin for error, yet error does happen. It is a fact of life.

For the purpose of this document and its message of Aviation Safety, each reader is to be considered a leader. **Everyone** must assume **leadership** in matters of safety.

CHARACTERISTICS OF A "LEADER" AS RELATED TO SAFETY

There are four important characteristics which a leader appears to possess: motivation, reinforcement, example, and communication.

Motivation

One of the primary tasks is motivating the members of the group. This can be done by emphasizing the objectives of the operation or activity and clarifying the targets or goals which should be achieved. For instance, a helicopter manager, in briefing passengers prior to a flight can make this routine and often rote requirement come alive by pointing out the rewards verses the consequences. Whoever is doing that briefing is at that time, a leader! The passengers can be motivated to want to hear the entire briefing and to abide by the checklist items to the letter.

Reinforcement

A second way leadership can be applied is by modifying habits and behavior by reinforcement. This same crewmember could apply positive reinforcement by making a favorable comment about the passengers conduct at the end of the flight.

Example

The third principle which the leader should apply is the demonstration of the desired goals and behaviors by example. Each day those of us in aviation interface with people who are not experienced at being in and around our environment. A good leader should be able to demonstrate by example the optimum behavior and precautions necessary to outsiders and those unfamiliar with aircraft operations. A common aspect of behavior in which influence by example of a leader is effective, is in connection with uniform or clothing standards and demeanor. If someone on the flight crew is without the proper clothing, it must be expected that others will follow the demonstrated behavior if the problem is not corrected at once.

Communication

The fourth and probably the most important quality is communication. One must be willing and able to communicate and do it at all levels.

While safety is everyone's business and as such, becomes everyone's responsibility, the point of emphasizing these four principles to you is that pilots are placed in a natural leadership role as aircraft commanders. Understanding this, you are in a unique position to influence the behavior of others. Finally, human factors are as varied as the individuals being affected by them, we try to minimize the effects by establishing guidelines compatible with the mission. The goal of all Aviation Accident Prevention Programs is an axiom.

Goal: To reduce Aviation Accident occurrences.

Purpose: To preserve human and material resources through identification and prevention of hazards. Hazards are defined as the causes of damage and injury.

Objective: To minimize human exposure to hazards and implement effective management techniques.

CHAPTER 2

CONTRACT INTERPRETATION AND ADMINISTRATION

NOTES

INTRODUCTION

All the fun and excitement associated with fighting fires with helicopters comes with a price. That price can often be measured in the additional effort it takes to do that job while operating within the confines of a contract. Aircraft, pilot, fuel tender and driver services are contracted by the government to accomplish fire fighting and other missions. The government and the helicopter company are bound in a written document to meet specific performance and fiscal obligations. In field operations the pilot represents the helicopter company and an agency employee (usually the Helitack Foreman) represents the government. Success in fulfilling the contract provisions and completing required paperwork is dependent upon the joint efforts of these two people. This task, though time consuming and a source of avoidable friction, is so important that the following information is devoted to it.

TYPES OF CONTRACTS

Each contract is unique. Forest Service and Department of the Interior aviation contracts are generally similar, but differ in format and the way they are administered. Helicopter contracts within the same agency can differ dramatically when it comes to specifics. Even a three year contract may be modified so that provisions and specifications will change from year to year. The pilot and manager must discuss their specific contract thoroughly prior to commencement and then refer to it many times during the contract period.

Exclusive Use

This is by far the most common type of contract for fire suppression. The aircraft is contracted for the exclusive use of the government, for a specific activity (fire suppression), and for a specified time period (usually 90 - 120 days). During the contract period the aircraft must be available and at the government's disposal 24 hours a day. The vendor is guaranteed a certain number of flight hours or is paid for being available each day. These contracts are usually awarded to a company for three years. This is a binding agreement for both parties; the company is obligated to provide the service and the government is obligated to pay them. After three years a new contract is drawn up and put out for competitive bid. This method is used to procure recurrent services at a location where organized Helitack or Rappel crews are stationed.

Call-When-Needed

The Call-When-Needed (CWN) program is used to procure aircraft for short periods of time during heavy initial attack activity, project fires or for short term resource projects when exclusive use contract helicopter are all committed or otherwise unavailable. Companies with light, medium, and/or heavy helicopters enter into written agreements with the government on an annual basis to provide aviation services at set rates. As the need arises, agencies call vendors and activate this pre-arranged short term contract. The aircraft are usually managed by minimally trained helicopter "modules". These contracts are **not** binding. The vendor is under no obligation to provide services at the time of order. The vendor receives a daily guarantee.

Basic Ordering Agreement (BOA)

The BOA (or Rental Agreement) is very similar to the CWN contract. Vendors place their aircraft on a list at set rates and then agencies can "rent" them for short duration projects. Non-binding agreements.

On-Call

This contract is actually a cross between the exclusive use and CWN. During a specified time period (e.g. 60 days) the government may request a helicopter from the contracted vendor. The vendor must have the aircraft at the desired location within a short time (e.g. 2-4 hrs). After using the aircraft for a time the government may release it back to the home base. This scenario may repeat itself several times during the contract period. In this way the agency gets a helicopter when it needs one and the vendor may use the aircraft for other purposes when the government is not using it. This agreement is binding and the vendor is guaranteed a set number of flight hours each year.

DAILY AVAILABILITY vs. HOURLY GUARANTEE

When vendors secure exclusive use contracts they must have some assurance that they can pay their operating expenses even if the aircraft sits all summer without turning a rotor. This is accomplished via the contract in one of two ways: Daily Availability or Hourly Guarantee. Each contract uses one or the other of these methods.

Daily Availability

The vendor receives a substantial amount for each day that the aircraft is available for service during the contract period (e.g. $700 for 100 days). In addition, the vendor receives a set rate for each hour that the helicopter flies (e.g $200/hr), but is not guaranteed any flight hours. If the aircraft is unavailable for all or part of the day, then the daily availability rate is adjusted accordingly.

Hourly Guarantee

The vendor is guaranteed to be compensated for a set number of flight hours, at a set rate, during the contract period (e.g. 200 flight hrs @ $500/hr, 100 day period). If, at the end of the contract period, the aircraft has only flown 150 hrs, the company still gets paid for 200 hrs. If the aircraft is unavailable for all or part of a day, then either the contract period is extended one day or the guarantee is reduced by two hours.

The whole idea of having exclusive use contracts is to have a helicopter available for the government's use each day. It is in the best interest of both parties for this to happen. When an aircraft becomes unavailable (or it is uncertain if it is available or not) conflict and disputes occur. The dialogue in the contract concerning availability is subject to interpretation and often a third party (the Contracting Officer) must make the final interpretation.

EXCLUSIVE USE CONTRACT (Example)

Format

All federal government contracts follow the same general format. The format and language will vary from agency to agency.

Bid Items

Most contracts are intended to secure several aircraft at the same time for use in different geographical areas but perform similar services (example: a contract to secure rappel helicopters for the Siskiyou and Malheur National Forests). Each location requiring services is listed in the contract as a separate Bid Item. Aviation companies may bid on any or all of the bid items. Each location may have slightly different requirements and therefore each bid item may have unique or additional specifications. Also, each bid item awarded may have different payment rates. It is important to only refer to the information regarding the bid item that your helicopter and company are fulfilling.

Flight and Duty Limitations

The limitations for pilot, driver and mechanic are different. These limitations can only be exceeded in emergency life threatening circumstances. Some contracts allow the pilot to function as mechanic if they are qualified. When doing so, the time counts toward duty time and any mechanic work in excess of a specified amount (usually two hours) will apply to flight limitations for the day.

Equipment and Avionics Requirements

All avionics and equipment requirements are specified in the contract. The contractor is in non-compliance if any one of these requirements is not met at any time. Malfunctions of equipment, especially radios, may render the aircraft unavailable, depending on contract requirements.

Maintenance

Inspections at industry intervals are required (50 or 100 hr). The government must be informed when and where the inspections or maintenance occurs. Logbooks or records may be requested by the Contracting Officer. Maintenance test flights may be required, at the contractor's expense, following any replacement or overhaul of the engine, power train, rotor system or flight control component. The pilot is responsible for conducting and documenting periodic turbine power checks and updating/analyzing turbine power trend charts.

Fuel and Servicing

Generally, contractors provide all fuel in the lower 48 states. Approved types and grades of fuel as outlined in the contract must be used. All fueling operations will conform to government regulations or handbooks. The fuel tender must meet contract requirements at all times. The importance of the fuel tender and its operator must never be overlooked regarding both contract compliance and successful helicopter operations.

Designated Base

The designated base is specified in the contract and is normally the Helitack or Rappel base of operations. Any overnight operations away from the designated base may generate payment rates such as per diem (overnight allowance) and transportation cost for relief personnel.

Exclusive Use Period

This period (60-120 days) is identified in the contract with start dates and ending dates. During this period the aircraft will be made available to the government for 24 hours/day, seven days a week. The exclusive use period may be extended at the mutual consent of contractor and government.

Availability

The minimum number of hours each day that the helicopter is required is usually 8, 9, or 10 hours. The government may request daily availability up to 14 hours and will specify the start and stop of the period on a daily basis. In many contracts, the aircraft and pilot are required to be in "one hour call back" status for 14 hours each day. This greatly influences their personal activities before and after the minimum daily availability period.

Any time over the specified minimum requires the government to pay extended availability. Lunch breaks are usually absorbed by the

contractor. The daily availability period is a source of misinterpretation as it relates to duty time and extended availability. Be sure to discuss how this will be handled at the pre-work conference or before commencing activities.

During the availability period, the aircraft is required to be airborne within a specified time after dispatch orders are given (usually 10 or 15 minutes). Sometimes the government, because of poor weather or no planned flights, may authorize the pilot and fuel tender attendant to leave the standby area for maintenance or other reasons. If the aircraft is suddenly needed during this absence the contractor has 60 minutes from the time of contact to be airborne-ready. At the government's option, the contractor may be granted permission to perform scheduled or unscheduled maintenance during the daily availability period. If the aircraft is needed, the contractor has 60 minutes to become airborne-ready. If this maintenance is pre-approved, the aircraft will remain in available status.

One Hour Call-Back or Return-to-Standby Status

At the end of a daily availability period the pilot and attendant may be released from the base of operation and placed on One Hour Call-back status if the likelihood of additional services is great. They would have 60 minutes from time of contact to be airborne-ready. If the pilot and attendant are released, and not placed in this status, they are not required to respond. Also, if they are kept at the base of operation beyond the daily minimum period they must be paid extended standby. The initiation and management of Return-to-Standby status must be made clear to all parties involved.

Unavailability

The aircraft is unavailable whenever the aircraft or personnel are not in a condition to perform or fail to perform within the requirements of the contract. Unavailability will continue until the failure is corrected and the pilot has informed the government that it is available again. A multitude of situations can render the aircraft unavailable, including mechanical problems and accessory failures to absent pilots and incapacitated fuel tenders. Unavailability can be controversial as the contractor may lose revenue and the government may lose the aviation services (depending on the contract requirements).

Measurement and Payment

How availability, hourly guarantee, extended availability, per diem, mileage, etc., are measured and paid differs from one contract to another. Know your contract.

The pilot and foreman must both keep accurate records. Close communication is essential to maintaining a working relationship and avoiding unpleasant discrepancies. The completion of the agency flight invoice is a joint effort where records are compared and entries are agreed upon. (see OAS 23 and USFS 122 exhibits).

Security of the Aircraft

Security is the responsibility of the contractor. However, the government may assist the contractor in reducing security risks when the assistance will benefit the government. This is especially true when operating away from the designated base (field situation).

Accidents/Incidents/Hazards

It is the pilot's responsibility to notify the government representative immediately of any aviation hazards, mechanical problems, incidents, or accidents. Appropriate documentation, discussions and/or actions will then take place.

Suspension of Personnel

The pilot or other contractor personnel may be suspended for unsatisfactory performance or conduct detrimental to the purpose contracted. Actual suspension can be ordered **only** by the Contracting Officer. Also, operations may be temporarily shut down for safety reasons.

Relief Personnel

Providing relief pilots and drivers to the designated base or field site is the contractor's responsibility. Relief personnel often rotate from one contract site to another and are on a tight schedule. The

transition to and from relief personnel often causes disputes about duty time, one hour call back and the daily availability period. Each pilot and driver must be treated separately. Each day, the government must have the helicopter available for 14 hours. During personnel transition, either the regular pilot and driver must remain available until released, or the relief pilot and driver must continue duty or otherwise be available. There must **never** be a time during daylight hours when no pilots or drivers are available, otherwise the aircraft is considered unavailable. Tracking relief personnel flight and duty time can be challenging, but is a necessity.

HELPFUL HINTS

1 The pilot and manager are the contractual representatives at the operational level. The pilot is working for the company, and the Helicopter Manager is working for a Fire Management Officer (FMO) and the Contracting Officer. Don't ruin the relationship over a contract dispute. If problems can't be resolved at the field level, let the company's designated representative and the Contracting Officer settle the issue while the tasks at hand continue.

2.Get things straight at the Pre-work Conference. Often the chief pilot or company representative, FMO, Helicopter Manager, Contracting Officer, Contracting Officer's Representative (COR), and other technical specialists are all present at this meeting. Talk specifically about how certain situations will be handled.

3.Later, the pilot and helicopter manager should discuss the contract page by page.

4.Keep a copy of the contract in the aircraft or fuel tender at all times. (Contract Requirement)

5.Document daily activities completely and accurately (Hobbs hour meter readings each flight, exact time of mechanical problems or incidents, duty time, type of activities, discussion, actions, people involved, etc.). The manager will be keeping their records, also.

6.Be totally honest and up front with the Helitack Foreman or Helicopter Manager. Communicate!

7.Take an active role in all required paperwork: load calculations, turbine power checks, flight invoices, etc. Don't get behind in paperwork.

8.The Helicopter Manager/Helitack Foreman supervises the crew and directs the use of the helicopter. Suggestions are O.K.; it is a team effort. But don't undermine the manager's/ foreman's authority.

FUEL TENDER AND DRIVER PROCEDURES AND SAFETY

Introduction

The fuel tender driver works for the pilot. The fueling operation is ultimately the pilots responsibility. The fuel tender and attendant are obviously a very important part of any helicopter operation. There is nothing more frustrating and embarrassing than having an air worthy helicopter, willing and capable pilot, motivated fire fighters available and have everything held up because fuel is not available. It can happen. The success of any fueling operation is dependent upon many factors that are discussed below. Never take the fuel tender or driver for granted.

Fuel Tender Requirements

Inspections

All fuel tenders on contract must be inspected by a government representative in the same manner that the aircraft is inspected. If the truck meets all contract requirements, an approval card is issued and must be carried in the vehicle at all times. Fuel cannot be dispensed until the tender is approved and if, for any reason during the contract period the fuel tender fails to meet specifications, the aircraft may be placed in unavailable status.

Requirements

Fuel tender requirements are specified in the contract. These differ slightly from agency to agency. All aviation fuels carried and dispensed must be of the type and grade recommended by the manufacturer of the specific aircraft. Fuel dispensed into the aircraft must first pass through an approved filtering system and nozzle screen. The service tender will be conspicuously marked identifying the type of fuel carried, and NO SMOKING signs will be displayed. Portable fire extinguishers will be mounted to be readily visible and accessible; their capacity will be commensurate with the fuel tank capacity. The tender will have a reel mounted grounding cable with clip and a nozzle grounding cable. The fuel tank capacity will be sufficient to sustain the contract helicopter for eight flight hours. The tank and dispensing system will be clean, tight and operable at all times. A 10-gallon per minute fuel dispensing pump is the minimum required. The tender itself must be properly maintained, clean and reliable.

Other Requirements

Each base of operation may have additional requirements written into the contract. Vendor supplied FM mobile radios may also be specified. FM radios are mandatory in the fuel tender, whether supplied by the vendor or the government. Programmable radios are optimal.

Local frequencies and assignments will be posted in the vehicle at all times. In some states the service vehicle may need special permits for transporting hazardous materials. This is a vendor responsibility.

Driver Requirements

Duty Limitations

Duty limitations are described in the contract. These limitations receive the same scrutiny as pilot duty and flight limitations. When the fuel tender is driven long distances, limitations (especially the driving limitation) come into play. Drivers may be required to stop and remain overnight when traveling cross country to avoid exceeding the limitations. Also, duty time must be monitored closely as it affects extended availability for the tender. This extended availability may differ from pilot extended availability from day to day.

Readiness

The driver must remain at the base of operations or with the fuel tender during duty periods just like everyone else. They must be ready for immediate dispatch including having the fuel tender in a clean/organized/ reliable condition, keeping a personal gear bag for long off-district dispatches, maintaining adequate fuel quantities, storing supplies of filters, parts, tools, cleaning materials, etc. The driver is also usually responsible for keeping food, water, and creature comforts for himself and the pilot.

Communications

Communication with the fuel tender is essential. The driver must thoroughly understand the operation of the radio. They must also understand the local frequencies and repeater systems. A short training and orientation session is appropriate here; basic radio procedures and etiquette should be covered too. The frequency/assignment list should be conspicuously posted in the vehicle. When dispatched, the driver will be given travel and radio instructions. The driver should check-in with the pilot when they reach the assigned destination or at set intervals during long trips. Radio traffic gets very congested during fire operations. Drivers should make only necessary transmissions, and they should be brief and concise.

Logistics

Fuel tenders assigned on fire contracts are frequently dispatched to remote sites. Often, the service truck will accompany the Helitack support vehicle. However, there are instances where the fuel tender must reach a destination on its own. Therefore, a complete map kit of the District, Forest and adjacent areas is essential. The driver should be given an orientation to the area showing major mountains, rivers, lakes, roads, etc., and then spend some time studying maps and asking questions.

The driver needs to know where appropriate fuel is available in the local area (for both the helicopter and the fuel tender). Some fuel vendors in sparsely populated areas operate on a limited basis or during specific/limited times.

Fueling Procedures

All fueling will be accomplished as outlined in the contract and government aviation manuals and handbooks. Generally, the following apply: only the pilot or qualified fueler will dispense fuel into the aircraft; helicopter engines and rotors will come to a complete stop prior to the fuel tender approaching; the cabin of the aircraft will be empty of all passengers, and non-essential personnel should remain 100' away during fueling operations; the fuel tender will be grounded and the aircraft and tender will be bonded during fueling. Fuel spills will be reported to the pilot and Helicopter Manager. At the base of operations or at project helibases there will be guidelines for fuel tenders: where to park; access to ramps and landing areas; traffic patterns; etc.

Refueling the aircraft is potentially dangerous. A good fueler takes pride in these high points of their day while following efficient, safe procedures. Fuel tender drivers need exact, clear instructions on how much fuel to put in the aircraft and this amount depends on the helicopter's next mission.

Record Keeping

Any fuel tender mileage incurred while operating away from the designated base will be paid as specified in the contract (this does not include miscellaneous trips for the benefit of the pilot or company). The driver should keep a logbook and record dates, times, beginning and ending mileage, departure points and destinations, etc. The pilot or helicopter manager will be asking for this information almost daily. A record of aircraft fuel purchases, price paid, and amounts dispensed from the fuel tender is also encouraged.

The driver needs to keep a record of the duty and driving time. Their duty time is frequently different than the pilot's.

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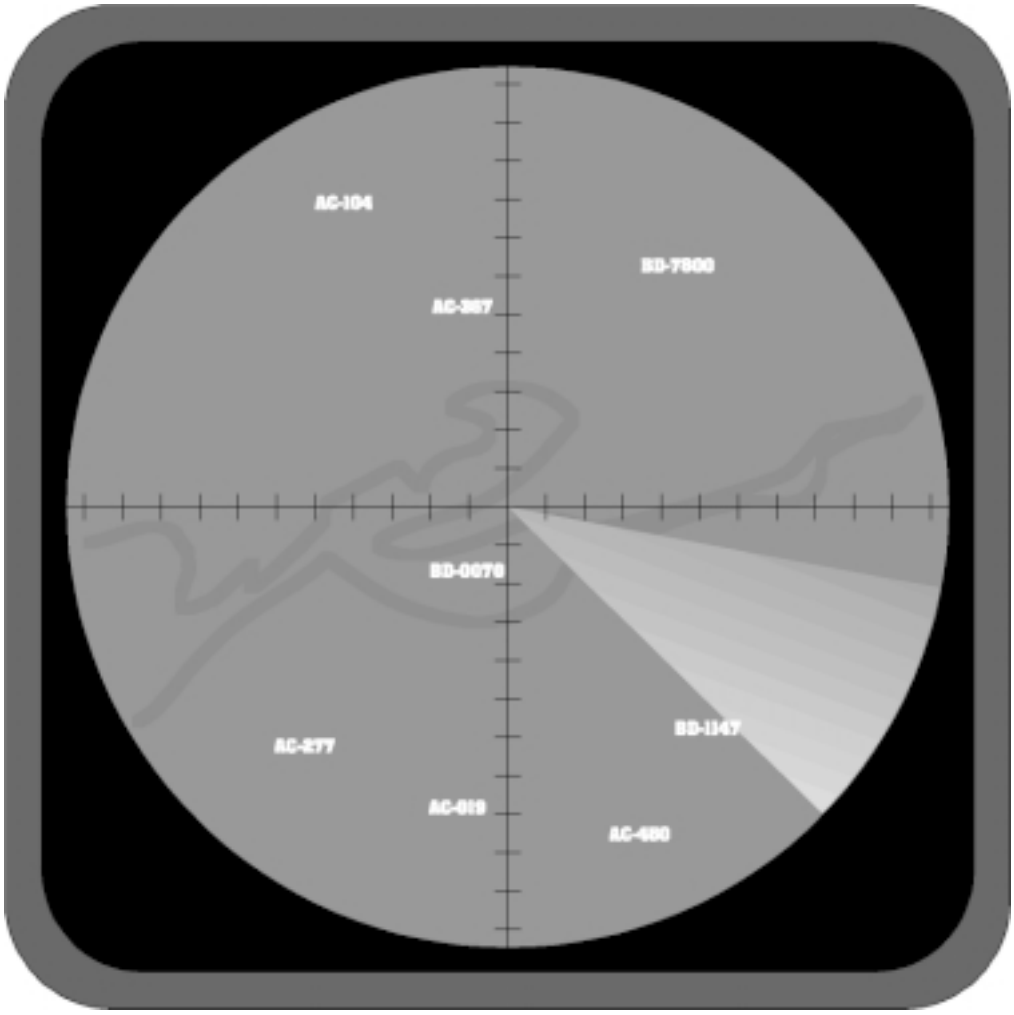


CHAPTER 3

FLIGHT FOLLOWING

NOTES

INTRODUCTION

"Flight following" procedures are designed for the safety of pilot, passengers and aircraft. Flight following is a proven method of tracking aircraft location, making aircraft easier to locate if forced to land or an incident occurs. This gives emergency forces a position to start from and reduces search time looking for a downed aircraft to a minimum.

PROCEDURES

Ten to fifteen minute check-ins are fairly standard throughout most agencies. Deviation from these standards require prior approval and all concerned parties will be informed of the situation.

The most desirable method of check-in is to provide your Lat/Long and direction of travel. Common geographical landmarks along with township/range/sections and direction of travel are other ways to determine position. Remember, if geographical names are to be used they are often duplicated in any given area or may not be on the map.

The helitack manager/observer on board the aircraft is responsible for flight following and assuring check-ins are made at the required time intervals. The pilot will assure that check-ins are adhered to in the absence of helitack/observers being on board.

When working an active fire situation or large project, ground personnel may be established as the flight following contact point. This procedure works only as long as flight following is adhered to and communications are still maintained with dispatch by the ground contact.

Frequency management is established in advance of the flight.

NO CONTACT MADE

Communication will be made with the dispatch center immediately after take-off. If contact is not made within a reasonable amount of time the mission will be aborted and the aircraft will return to the base of operations. At this point communications will be re-established with the dispatcher.

If communications are lost during a flight, the mission will be called off. All attempts will be made by helitack/observer and pilot to re-establish communications. Alternate frequencies with other agencies, Federal Aviation Administration (FAA) or any other methods will be employed to re-establish communications as quickly as possible—even so far as to land the aircraft and call on a telephone.

Aircraft will be considered "overdue" when it is has not completed a required check-in with in the time frames established. Search and rescue operations will then be implemented according to agency guidelines. Agency guidelines spell out that this will begin 30 minutes after last contact was made.

PRIORITIES

Remember, dispatchers may have a number of activities or distractions going on at the same time. Flight following remains the #1 priority in the overall scheme of events! If for any reason communications are compromised with you, you will be the primary focus until the situation is resolved.

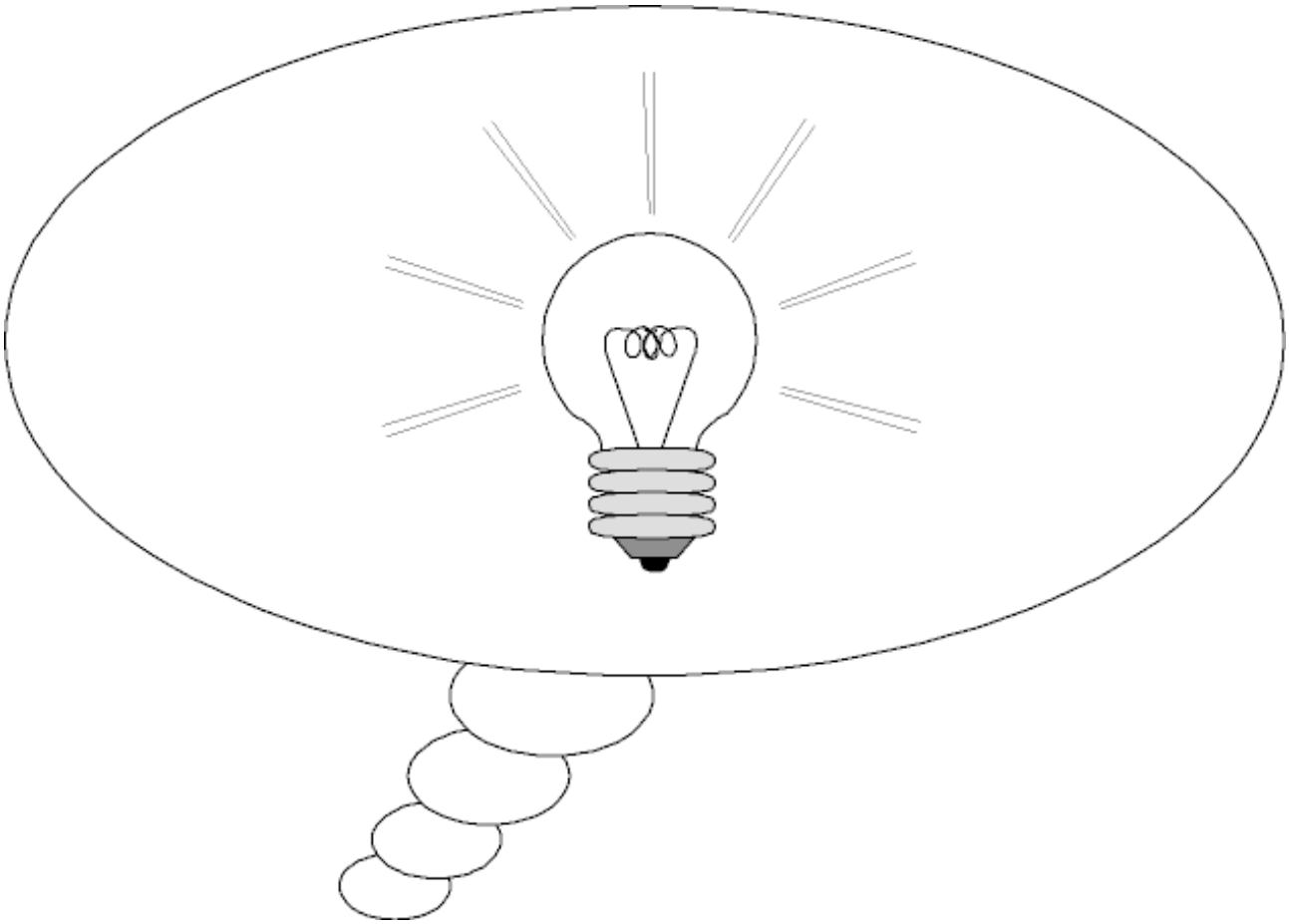
Flight following is not taken lightly, it is an important part of everyone's responsibility.

OTHER HELPFUL HINTS

Military Training Route (MTR) information can change. Keep heads up as usual. Once military pilots have entered the flight route radio contact is broken off with them.

Pass on any other aircraft sightings to dispatch so they may notify others.

Changing priorities may pre-empt your current assignment.



CHAPTER 4

COMMUNICATIONS

NOTES

INTRODUCTION

Good communications are essential to safe and efficient mission accomplishment. As a helicopter pilot new to firefighting, you will need to become familiar with procedures and terminology associated with fire communications. The following information is intended to be used as an introduction to fire communications.

PILOT RESPONSIBILITIES

Helicopters contracted by USDA Forest Service and Department of Interior agencies are required to have a 9600 channel VHF-FM radio with air guard frequency, a tone encoder, and a VHF-AM radio. Become familiar with the operation and programming features of the radio equipment installed in the aircraft, including the tone encoder.

When dispatched to a fire, the requesting agency will provide a radio frequency (usually FM) for the dispatching office of the agency responsible for the fire or project. The dispatching agency will ask for a flight plan including EDT, time enroute, fuel stops, and ETA.

The dispatchers take their "flight following" **very seriously**. It is required to call in with a position report every ten to fifteen minutes. If the assignment is to a fire at a distant location, ask for frequencies of other dispatch offices along the route for flight following, or file a VFR flight plan with the FAA. If a flight plan is filed with the FAA, still contact the destination dispatch office upon arrival.

The dispatcher at the destination agency will provide instructions regarding the landing area. This may be the local airport or the fire helibase. If instructed to proceed to the fire helibase, the frequencies for the traffic over the fire and for the helibase will be provided. Work closely with the helicopter manager, this person will be a valuable source of help and information.

HELICOPTER MANAGER RESPONSIBILITIES

The helicopter manager will:

1. Provide the pilot with all necessary information such as radio frequencies, contacts, maps, and other information necessary for the pilot to communicate on the fire.

2. Assist the new pilot in learning unfamiliar terminology and procedures.

3. Keep the pilot informed on changing priorities and additional information.

FREQUENCIES

Air Guard

The national air guard frequency is 168.625. The use of this frequency is limited to the following (listed in priority order):

1. Air to air initial contract—non-emergency.

2. Ground to air/air to ground—emergency only.

3. Flight re-direction by a dispatching office.

It is important to note that presently there is no requirement for ground stations to monitor air guard on a priority channel basis, although most dispatch offices do monitor air guard.

Tactical

Air tactical frequencies are assigned by the communications unit on the air operations section of the incident.

Air-to-Ground

Air to ground frequencies are used by ground people to direct water drops, placement of external loads, and for helicopter to helibase/helispot communications. An air to ground frequency will be assigned to the air operations section by the communications unit.

INCIDENT COMMAND SYSTEM (ICS) TERMINOLOGY

All radio communications in federal firefighting agencies are in clear text. There will be terms that are unfamiliar. The following are some terms that are not included in this guide's glossary. Please see the description of ICS positions included in the appendix of this guide for more detailed information.

Air Tactical Group Supervisor
This person will be in a fixed wing or a helicopter over the fire and directs retardant drops from air tankers and bucket drops from helicopters. The air tactical group supervisor is partially responsible for aircraft separation and it is imperative that communication with this person be constantly maintained while working in the vicinity of air tactical activities. The radio call sign is 'Air Tactics.'

Air Operations Director
This person is in charge of the entire air operations section of the fire and works for the operations sections chief. They travel between fire camp (incident base), helibase, and tanker base.

Air Support Group Supervisor
This person oversees the air support functions on the fire. This includes cargo delivery, personnel transportation, recon flights for overhead, and supervises the helibase manager.

Deck Manager
This person works for the helibase manager and coordinates activities on the 'deck.' The deck manager oversees the cargo area, personnel transportation area, fuel tender parking, marking of landing pads, etc. The call sign is 'deck.'

Division
Large fires are divided into divisions, each with a division supervisor. Division breaks are marked on the map that is included in the incident action plan, and are designated 'A', 'B', 'C', and so on. You will be communicating with division supervisors as you provide water drops and other support on a division of the fire. The call sign for the division supervisor on Division A would be 'Division A.'

Helibase
Helicopters and helicopter crews assigned to the fire work from the helibase. On large fires the helibase can be a very complex organization. Each helibase has a helibase manager, and according to its complexity may also have a deck manager, radio desk, pilot and crew rest area, fuel tender parking area, etc. The call sign for the helibase on the 'Cold Creek Fire' would be 'Cold Creek Helibase.'

Helispot
Helispots are temporary landing areas in close proximity to the fire and are used for personnel transport and cargo delivery/pick-up. Helispots usually have no vehicle access and can vary greatly in size and ease of take-off and landing. Helispots are numbered according to their geographic location on the fire (North to South, and East to West). Each active helispot will have a helispot manager assigned. Good radio communications are essential when working in and out of helispots. The call sign would be 'Helispot 1', etc.

Helicopter Coordinator
Sometimes on a large, complex fire there will be a helicopter coordinator. This person will be in a helicopter over the fire, above the other helicopters, and will manage the airspace the helicopters are working in. This person can be a great help in coordinating activities over the fire. The call sign for the helicopter coordinator is usually the tail number of the helicopter utilized.

Radio Operator
Each helibase has a radio operator. This is a person to contact for departure, flight following, mission instructions, and landing. The radio operator will provide a helibase advisory when ready for take-off and when inbound for landing. The radio operator is not an air traffic controller and cannot 'clear' for take-off or landing, but will provide information and record your activities on a helibase radio log. The radio operator will flight follow you for most missions (an exception would be if you are working for air tactics, in which case you are in communications with someone that has visual contact with you.) The call sign for the radio operator is the same as the helibase.

Communications Functions

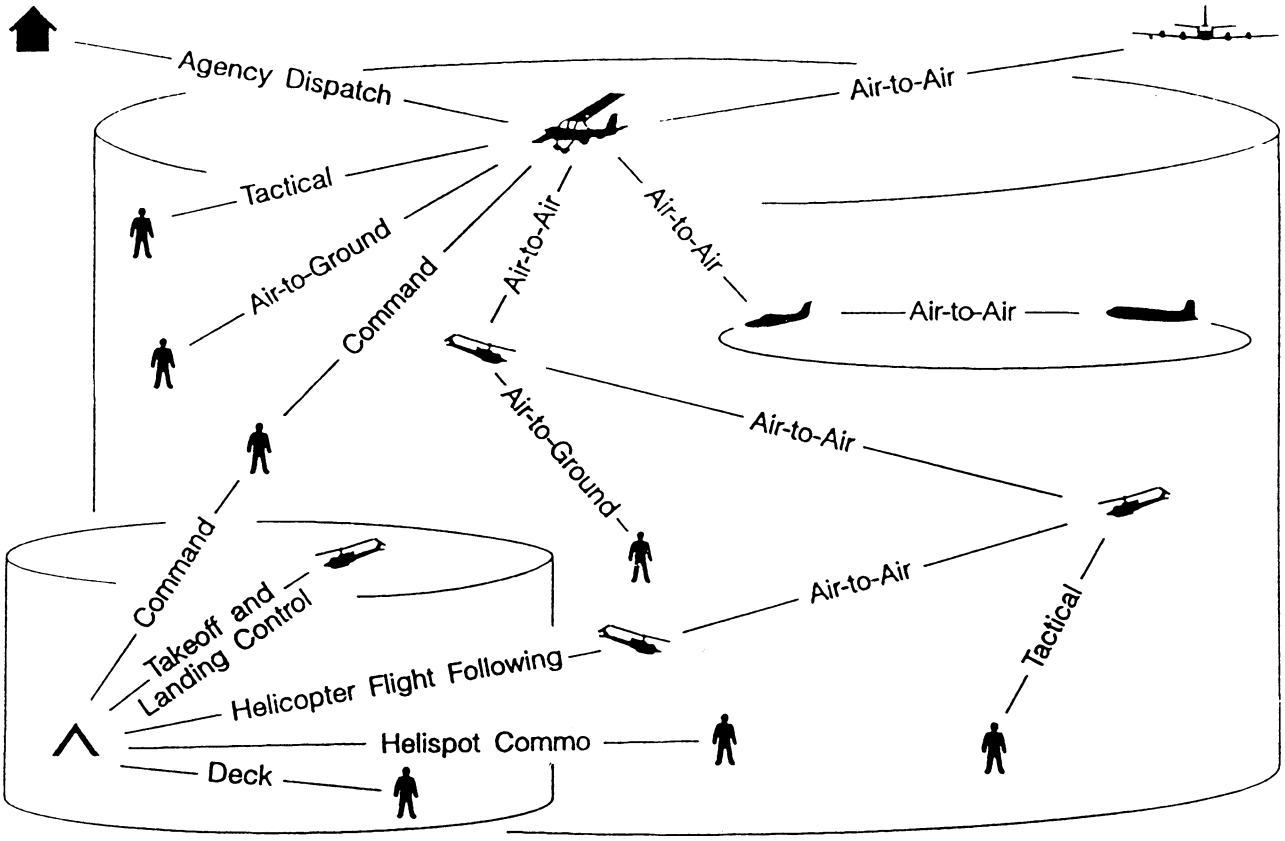


Figure 1. Incident Radio Communications Plan.

Take-off and Landing Coordinator
This position may be activated when a helibase operation becomes very complex. This person is more experienced than a radio operator and will take over communication with incoming and outgoing aircraft, and provide landing instructions. The call sign is the same as the helibase.

Figure 1 provides a sample incident communications plan. It is the standard form used by the communications unit to list radio frequencies for the command section, division/ground units, and the air operations. **Always be sure to program in the Command Frequency. If you are assigned to respond to a medical evacuation this is the frequency you will normally use.** The Communications Unit will clear the Command frequency of all other traffic for the medivac operation. Hospital frequencies are listed in the emergency plan that is posted on the helibase bulletin board. The Medical Unit will be on the Command channel to provide all other necessary information for the medivac operation.

Exhibit 2 provides important additional information regarding incident aviation communications, functions, and frequencies.

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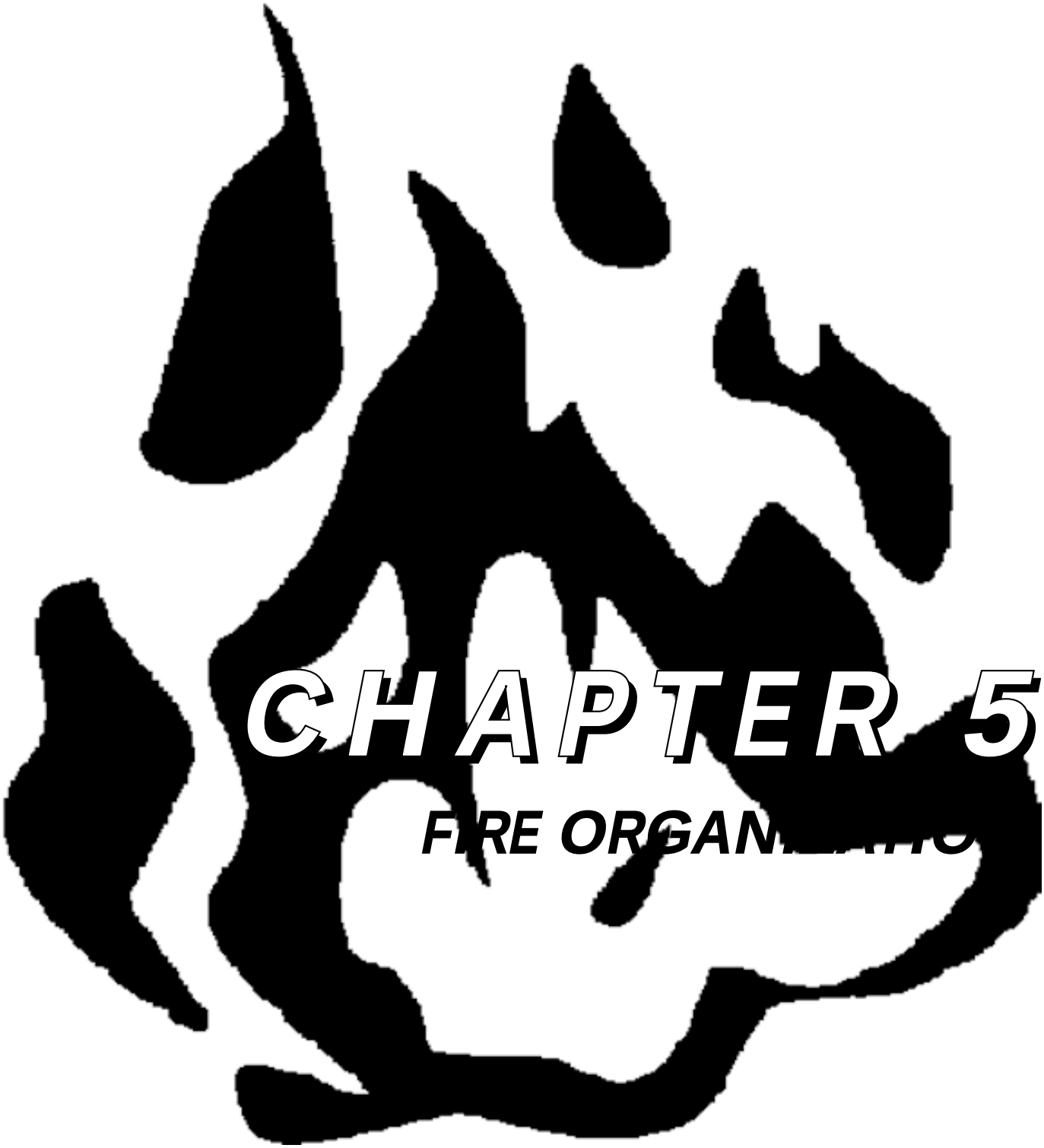


CHAPTER 5

FIRE ORGANIZATIONS

NOTES

LOCAL LEVEL ORGANIZATION

The helitack crew is but one entity in the overall picture—engines, hotshot crews, smokejumpers, etc., all play an important role in the effort to fight wildland fires. Dispatchers, incident management, and various support roles are essential to orchestrating and planning fire suppression efforts. At the local level, fire management officers and fire control officers are the key players in overall fire management directives. Let us look at various positions, their roles, and how they affect you as a pilot:

Fire Management Officer (FMO)

The FMO is typically the helitack manager's supervisor. Establishes type of aircraft used in the local area, dictates size of helitack crew, location of helitack base, funding of helitack crew and helicopter. Establishes standards of operations, responsible for overall fire operations within the local district or forest.

Fire Control Officer (FCO)

The FCO can also act as the helitack manager's supervisor and plays an active role in the field. You will be working for this individual at times. The FCO is in charge of the operational aspects of local fire-fighting activities.

Dispatcher

This is your local "Control Tower". Dispatch provides flight following services, establishes priorities on various fires, redirects your activities according to priorities, and consolidates information gathered from field units such as yourself. Dispatchers are under a lot of stress during high fire activity. Multiple agencies operating out of small inadequate facilities compound communication problems. New inexperienced dispatchers are routinely used during fire seasons. If you do not receive the response you are anticipating, give some thought to the above mentioned limiting factors. Most dispatch centers provide an excellent service and are improving every year. The shear volume of information given to them via various telephones, radios, computers during high fire activity is considerable. The contacts which must be made with various military organizations, state, federal and local agencies is at times overwhelming. The volume of paperwork, and tracking various resources is staggering. The bottom line is a dispatchers life is extremely hectic, and they are doing a commendable job. They are also the first link in dispatching "your aircraft". Treat them well! Dispatch is required to flight follow all aircraft operating within their jurisdiction. Dispatch is your life-link should you be forced to land prior to your destination. You will be conversing via the FM radio on a regular basis. Make it a point to meet the dispatcher, in person, and establish a good rapport.

Guard Stations/Work Centers

Most forests and districts have designated bases in outlying areas. Due to the distances involved, it would not be feasible for an Initial Attack force to be based in one central location. Guard stations/work centers are temporary living quarters for fire crews and fire engine modules. These bases remain in operation for the duration of the fire season.

You may be dispatched to a guard station for standby during high fire danger (lightning storms). A few items to keep in mind:

1. The living area's provided by the government are basically the designated crews home for the summer. Treat it as you would if you were to visit someone's home.

2. Bring your own food (lunch).

3. Most guard stations have a basic heliport. They may not have water or electricity available.

Helpful Hints

1. Ask for an organization chart of the local unit.

2. Ask for a telephone list.

3. Ask for maps of the district/assigned area.

4. Get to know everyone you will be working in the field with.

5. Visit dispatch, orient yourself.

FIRE LINE PERSONNEL

As a pilot, you need to be familiar with the basic job titles, their function and authority.

Incident Commander (IC)
Responsible for all fire activities. On small fires this individual determines where various forces will work on the fire, as the fire expands this individual can be replaced with a more experienced IC.

Division Supervisor (DIVS)
As a fire expands into a large incident, the perimeter is divided into divisions. Each division is controlled by a division supervisor. This individual may be in charge of hand crews, engines, and coordinating or requesting air support. You may be directed or given an assignment by the Division Supervisor; however these requests must be cleared through the Air Operations Branch Director or the helibase prior to redirection. This is an essential step so that priorities are maintained and also to eliminate various line positions from redirecting your activity whenever they decide to. This applies to all positions except air tactical supervisor or when you are initially assigned to a particular individual.

Crew Boss
In charge of a hand crew of 20. Can be a Type 1 crew (Hotshot) or a Type 2 crew (Native American or Project Crew). You will be communicating with this individual concerning water drops, fire behavior, routes into the incident, weather, safety zones, air operations.

Squad Boss
A leader within the ranks of a hand crew. The Squad Boss usually has at least one year fire experience and is familiar with basic air operations. You may be communicating with this individual regarding water dropping, fire behavior, routes into the incident, weather, safety zones, air operations, etc.

Strike Team Leader
A person in charge of a specified combination of the same kind and type of resources with common communications. (Can be a crew of 36 firefighters, 5 engines, etc.)

Engine Operator
You may be communicating with this individual regarding water drops, fire behavior, routes into the incident, weather, safety zones, air operations, etc.

Safety Officer, Paramedic's, EMT's
If requested to assist in the transportation of an injured firefighter, you may need to communicate with any of these individuals.

Incident Medical Plan
An ICS form which is part of the Incident Action Plan and provides useful information for medical emergencies.

Helpful Hints
Wild fire is not an emergency! Not everyone working in fire has figured that one out. About 95% of the firefighters you will deal with are very capable and knowledgeable. The remaining 5% are easy to deal with. You are in control of the aircraft and should not feel pressured to do anything that makes you feel uncomfortable. At times, especially if structures are threatened, the need to expedite suppression efforts will increase pressure on everyone involved, including you. Your expertise, skills and knowledge are relied upon, and if the situation regarding aircraft needs to change for whatever reason, inform the individual you are working for of the changes needed so that you can continue the suppression of the fire at a level you are comfortable with. Approach the situation in a positive manner and you should receive an appropriate response. Remember, the view from the air and the view from the ground are two entirely different scenes. An individual on the ground breathing smoke and straining to operate a piece of equipment has a limited view, limited objective and a limited amount of information available. If you can't get an immediate, knowledgeable answer, keep these factors in mind (including noise at ground level). You have a SPH-4 helmet to facilitate audio reception. However, if the person you are conversing with has a chainsaw or pump operating close by, they may not hear their hand-held radio.

This is information to help you understand the other side of the picture. Firefighter's are being trained to be aware of factor's which effect you in an adverse way also. If all parties are aware of each other's "problems", we can work towards a common goal in an effective manner.

LARGE INCIDENT ORGANIZATIONS

Air Operations Branch Director

The Air Operations Branch Director, who is ground based, is primarily responsible for preparing the air operations portion of the Incident Action Plan. The plan reflects agency restrictions that have an impact on the operational capability and utilization of resources (e.g., hours per pilot). After the plan is approved, the Air Operations Branch Director is responsible for implementing its strategic aspects - those that relate to the overall incident strategy as opposed to those that pertain to tactical operations (specific target selection). Additionally, the Air Operations Branch Manager is responsible for providing logistical support to aircraft operation on the incident. Specific tactical activities (target selection, suggested modifications to specific tactical actions in the Incident Action Plan) are normally performed by the Air Attack Group Supervisor working with ground and air resources.

Air Support Group Supervisor

The Air Support Group Supervisor is primarily responsible for supporting and managing helibase and helispot operations and maintaining liaison with fixed-wing bases. This includes providing: 1) fuel and other supplies, 2) maintenance and repair of aircraft, 3) retardant mixing and loading, 4) maintaining records of helicopter and fixed-wing activity, and 5) providing enforcement of safety regulations. These major functions are performed by the Air Support Group's Helibase or Helispot Managers. The Air Support Group Supervisor reports to the Air Operations Branch Director.

Helibase Manager

The Helibase Manager's primary function is to coordinate the support of fire suppression activities using helicopters as a tool to accomplish transport of troops, supplies, support, and/or reconnaissance.

Helispot Manager

The Helispot Manager is responsible for the safe and efficient operation of a helispot. As a pilot you will be dealing with this individual frequently.

Deck Coordinator

The Deck Coordinator is responsible for providing coordination at an aircraft landing area for personnel and cargo movement. The Deck Coordinator reports to the Helibase or Fixed-Wing Base Manager.

Loadmaster (Personnel/Cargo)

The Loadmaster is responsible for the safe operation of loading and unloading of cargo and personnel. The Loadmaster reports to the Deck Coordinator.

Mixmaster

The Mixmaster is responsible for providing fire retardant to helicopters and air tankers at the rate specified and for the expected duration of job. The Mixmaster reports to the Helibase Manager or Fixed-Wing Base Manager.

Takeoff and Landing Controller

The Takeoff and Landing Controller is responsible for providing coordination of arriving and departing helicopters at a helibase and all helicopter movement on and around the helibase. The Takeoff and Landing Controller reports to the Helibase Manager.

Aircraft Base Radio Operator

The Aircraft Base Radio Operator is responsible for establishing communication between incident assigned aircraft and airbases, Air Tactical Group Supervisor, Air Operations Branch Director and Takeoff and Landing Controller. The Aircraft Base Manager reports to the Helibase or Fixed-Wing Base Manager.

Aircraft Timekeeper

The Aircraft Timekeeper is responsible for keeping time on all aircraft assigned. Timekeeper reports to the Base Manager.

Parking Tender

The Parking Tender is responsible for parking aircraft and reports to the Deck Coordinator.

Air Tactical Group Supervisor
The Air Tactical Group Supervisor reports to the Air Operations Branch Director and is responsible for the coordination of fixed and/or rotary-wing aircraft operations over an incident.

Air Tanker/Fixed Wing Coordinator(ATCO)
The ATCO reports to the Air Tactical Group Supervisor and is responsible for coordinating assigned air tanker operations at the incident. The Air Tanker Coordinator is always airborne.

Helicopter Coordinator
The Helicopter Coordinator reports to the Air Tactical Group Supervisor and is responsible for coordinating tactical or logistical helicopter mission(s) at the incident.

HELITACK CREWS

History

The first helitack crew was activated in 1957 on the Angeles National Forest. Helitack crews were developed out of the need to have firefighters trained in the use of helicopters in the initial attack phase of wildland fires. These crews were also trained in aircraft use to support an on-going fire, in areas such as personnel transport, cargo hauling, medivac services, etc. The original concepts which lead to the development of helitack crews are still in place and are still the driving forces.

As a pilot, you need to understand the hierarchy of helitack crews. Each individual has a role and none are more important than the other. For a helitack crew to function on a day in day out basis, for days, weeks or months on end, a good working relationship must be established between the helitack crew and the pilot.

Positions

Crewperson
All should have one season fire experience and have demonstrated the ability to function around hazardous equipment without endangering themselves or others. Most are college age and working summers. *Helpful Hints:* Realize these individuals are not the same as professional, full-time career types. They may not be completely familiar with aviation, terminology, or aircraft performance.

Lead Crewperson
Should have at least one season on a helitack crew. Demonstrates basic knowledge of helicopter operations. *Helpful Hints:* This position will be more active in roles of responsibility, but requires a supervisor present. Be aware of inexperience in some areas.

Assistant Foreman
Usually has at least two seasons on a helitack crew. Demonstrates good leadership abilities. Has a good understanding of overall aviation operations. Demonstrates good fire-fighting skills. Should be able to operate independent of the foreman. Understands most of the contract, but has no authority to authorize or settle disputes. *Helpful Hints*: This position is the turning point from a position of no authority to a position of some authority and a lot of responsibility. It is very stressful at times and there is pressure to perform at an acceptable level. You as a pilot can help this individual in many ways including navigation and legal description.

Foreman (Manager)
Responsible for the overall Helicopter/Helitack operation. Establishes flight-crew, tools on board, and decides if the bucket is appropriate to the mission. Acquires fire information from dispatch and formulates the appropriate plan of action (where to send the fuel tender and helitack chase truck), informs the pilot of the basic plan, distance to incident, other aircraft in route, known hazards, etc. Acts as the navigator or guide. This is an area where the pilot and foreman should work together. Many times one or the other is familiar with the area. The use of latitude, longitude coordinates have standardized navigation, but this method is not foolproof. Units break and dispatch receives erroneous information. Good map reading skills and flight following are essential. *Helpful Hints*: Most foreman are aware of the degree of stress created operating a helicopter in fire situations.

Most foreman will try to make your life as easy as possible, just keep in mind that fire fighting is not a 9 to 5 job. Fire situations change at a moments notice and plans change. Most foreman try to anticipate and inform the pilot of changes, but remember, there are many players involved in decisions made regarding aircraft usage.

Call When Needed Crews (CWN Crews)

Just as the title suggests, whenever the need arises for a crew to work with a particular aircraft, a CWN crew is assembled for the duration of an incident. CWN crews were created when budget constraints limited the number of designated helitack crews. CWN crews are not full time professional helitack crews. As such their training, familiarity and skills may be different than others you have worked with. As a pilot, you need to be aware of the inherent limitations of most CWN crews.

Special Considerations

1.There are a few experienced helitack types leading these crews. These crews would benefit from additional comprehensive training that would not only enhance their expertise but also their value to the unit.

2. Most CWN crews have little if any required gear with them when they arrive at the incident. They must order equipment through the fire cache system and this takes an average of three days.

3.Very few CWN crews have a vehicle assigned to them to haul gear.

4. Most CWN crews do not possess sufficient radios. This is a major safety concern.

Helpful Hints:

If you are working with a CWN crew, ask questions and provide positive feedback prior to beginning actual work. If you do not feel comfortable with a situation, it will only compound itself in the field. If you have any concerns, with any operation, **STOP!!** Talk to the parties involved. Most are more than willing to correct any situation once they understand the problem. There is enormous pressure to acquire aircraft and have it functioning on the fire as soon as possible. This is understandable; but you, as the pilot, have the right to stop and verify any aspect of an operation which concerns your aircraft. If it takes as extra hour or two to train the crew, establish methods of operation, whatever, **DO IT!** If you are not comfortable, do not proceed.

More Helpful Information

1. Treat **all** employees with respect.

2. Realize that most crewmembers are college age and do not possess an aviation background. What is old hat to you, may be new and confusing to the crew.

3.Try to function as part of the crew, not as a separate entity.

4. Realize, that while you are eating a steak at a restaurant and sleeping on a bed in a motel, the crew may be working through the night and into the next day. Be considerate and keep in mind the fatigue factor.

5. If you have a concern with the performance of a member of the crew, especially in the area of safety, speak to the individual (if appropriate at the time), or contact their supervisor. Positive input will prevent a problem from manifesting itself.

6. If you have a positive outlook, life will be easy for the crew. If you are negative, the overall attitude of the crew will suffer.

7. The contract can be a source of friction and sometimes your frustration may be directed at the crew. You will be working with these individuals, most if not all of the season. Everyone at one time or another, becomes frustrated with a situation and makes comments or in some way states their feelings. You as a pilot are in a position to be heard by the whole fire organization. Be aware of the ramifications of discussions via the radio.

8. Do not try to run a helitack operation. Flying the aircraft is your job. In actuality, knowledge of fire is essential to you and aircraft performance is essential to the helitack crew. If a mutual understanding is obtained by both, without crossing into someone's turf, the season will progress smoothly. Your input is important to the programs and your expertise is relied on. As the pilot, you are a key figure in the organization.

NOTES

CHAPTER 6

AIR OPERATIONS

NOTES

INTRODUCTION

"No job is so important that it cannot be done safely." As a pilot you are often in the best position to ensure this basic policy is followed. Pilots have the authority, responsibility and the obligation to see that helicopter operations are operated safely and in accordance with Civil Air Regulations, Federal Aviation Regulations and Government Policies.

Safety Inspections

Government policy requires that safety be integrated into all phases of aerial support to minimize or eliminate risks and hazards. Because of the potential hazards, there are intensive and regular inspections of air personnel, equipment and operation. The frequency depends on the volume of activity and changes of equipment. The following inspections are done by the pilot and contract personnel:

1. Pre/post flight inspections.

2. Weekly battery inspection done .

3. Turbine engine power checks kept by the contractor and trend analysis kept in graphic form. Power checks shall be performed. Forms for recording these checks will be furnished by the administering government agency.

4. Test flights are made at contractor's expense following overhaul, repair and replacement of any powertrain or control equipment before the helicopter resumes service under the contract.

GENERAL SAFETY REQUIREMENTS

1. Pilots are required to wear personal protective clothing which includes a flight suit, gloves, leather boots and a helmet. All of these items must conform to contract specifications.

2. Flight limitations are a safety consideration. A pilot may not exceed eight hours per day.

3. Pilots are required to have 2 days off in any 14 consecutive day period and may not remain on duty for more than 14 hours per day, and must have a minimum of 10 hours off between duty periods. Travel to/from lodging outside the duty period will not exceed 30 minutes.

4. You are responsible for the safety of others. The "8 hours bottle to throttle" rule shall be observed.

SUMMARY

No air operation is so important that it cannot be done safely. A pilot is responsible for the safety of the aircraft, its occupants and cargo. The pilot shall comply with the directions of the Government except when, in their judgment, such compliance will be a violation of regulations, contract provisions or endanger the aircraft and its contents. The pilot **shall** refuse any flight or landing which is considered hazardous or unsafe.

To do the job of running a safe helicopter operation the pilot and Government management must fully have a mutual understanding and cooperate with one another.

NOTES

CHAPTER 7

HELICOPTER LANDING AREAS

NOTES

INTRODUCTION

As a professional pilot your capabilities and the capabilities of your helicopter are well understood and known to you. Your judgment in selecting landing areas is critical to successful operation. If at any time you feel a landing in a particular area does not provide an acceptable margin of safety you are obligated to refuse the landing. Although it is unlikely, if there is a conflict between government management and the pilot as to the acceptability of a landing site, the most conservative opinion will prevail.

Situations can and do arise when a pilot feels obligated to land at a spot simply because others have done so or it will save a crew from a long hike. Doing something foolish because others have is no justification. If warranted, crews should expect to travel on foot. **One skid landings are against government policy! No job is so important that it cannot be done safely!**

TERMINOLOGY

Helispot

A helispot is a landing area, which may not have road access, used on a temporary basis to deliver personnel and cargo. The helispot may have a number designation and a wind indicator in place on larger incidents.

Helibase

A helibase is a landing area that has road access and is furnished with communications, fueling facilities, wind indicator and other support equipment.

Temporary Helibase

A temporary helibase is a helibase used as a base of operations during an incident. It is large enough to accommodate multiple helicopters, as needed. It is also capable of handling a large number of crews, support equipment, and cargo.

Permanent Helibase

A permanent helibase is a helibase that is furnished with permanent pads and facilities. A contracted helicopter is normally based at this facility for the term of the contract.

INITIAL ATTACK LANDING AREAS

Selecting an initial landing site near a fire is a major concern of the pilot and helitack manager. Prior to dispatch a load calculation will be completed for the destination altitude and temperature. Factor in fuel burnoff and assume the landing zone is hover out of ground effect (HOGE).

When a pilot is uncertain that a landing spot is suitable because of clearances, landing surface, wind conditions, power requirements, etc., part or all of his load should be unloaded at an intermediate spot and then make a simulated or actual approach to the spot with sufficient power to climb out if the spot proves unsuitable. The pilot may elect to progressively increase the load during successive landings and takeoffs into a spot as the spot becomes more familiar.

Criteria and Considerations

1. Slope.
2. Lateral clearance on main rotors.
3. Vertical clearance on main rotors.
4. Lateral clearance on tail rotor.
5. Vertical clearance on tail rotor.
6. Suitable placement for skids.
7. Vertical clearance under body of helicopter.
8. Landing route.
9. Take off route.
10. Power required.

LANDING AREAS USED AFTER INITIAL LANDING

Many guidelines and procedures used in an initial landing also apply to subsequent landings. Requirements are outlined in the Interagency Helicopter Operations Guide (IHOG).

Traffic control both on the ground and in the air becomes an important consideration after the initial stages of a fire. It is a primary job of the helitack organization to control and coordinate this traffic and you, as a pilot, should not hesitate to point out needed control.

Pilots have both air-to-air and air-to-ground communications and frequently help in traffic coordination. If a landing area needs improvement on such things as approach and departure routes or dust abatement make these needs known. Landing areas should be managed by trained personnel. A helicopter should not land where there is an uphill path under the rotor blades, and untrained unsupervised personnel are in the area.

In selecting landing areas and particularly a base heliport the following items are to be considered.

Location in Relation to the Fire

1. Not In path of fire.

2. Smoke conditions—prevailing winds.

3. Round trip flight time—efficiency, personnel exposure.

4. Flight routes away from areas of population and hazards.

Location in Relation to Incident Base/Fire Camp

1. Easy access for personnel and cargo.

2. Noise affect on incident base/fire camp.

3. Communications with fire camp—radio, phone.

4. Flight routes away from fire camp.

5. Road access for support equipment.

6. Area large enough for expansion of operation.

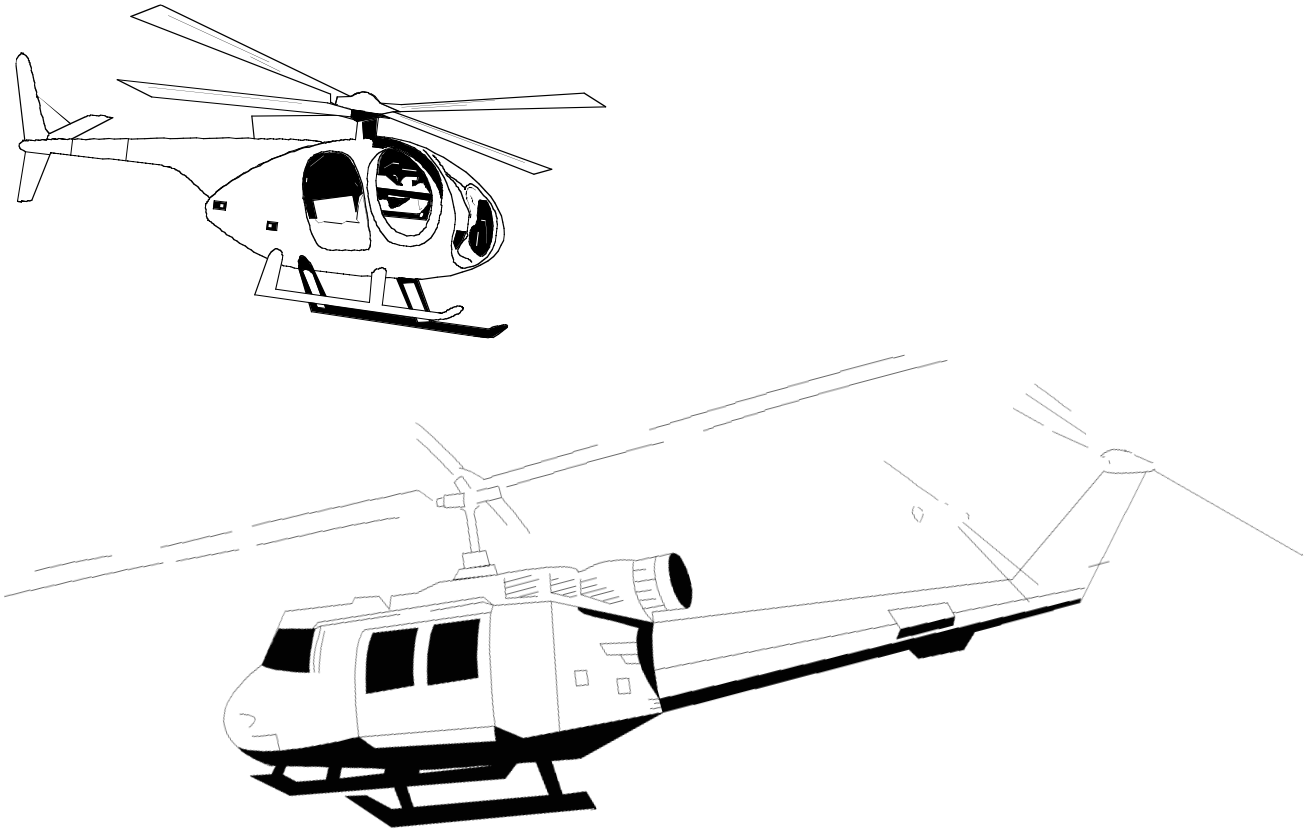
7. Availability of water.

As a pilot you should be consulted and have input on the selection of all landing areas.

SUMMARY

As a pilot, you have the obligation to refuse any landing that you feel does not provide an acceptable margin of safety. Pilots should advise management of any deficiencies in landing areas and request that appropriate corrections be made. Your advice on selection of landing areas is valuable information.

Your capabilities and the capabilities of your helicopter are well known to you. **Simply because other pilots and aircraft elect to land at a particular location you are not obligated to do likewise!** If it is warranted a crew should be expected to walk rather than fly to an area. **One skid landings are against government policy! No job is so important that it cannot be done safely!**



CHAPTER 8

TACTICAL USE OF HELICOPTERS

NOTES

INTRODUCTION

Tactical use of rotor-wing aircraft is vital in todays fire suppression job. The helicopter represents fast initial attack to many areas. Due to a helicopters capabilities, chances for a successful initial attack are greatly improved. Initial attack with helicopters can often be accomplished in minutes instead of hours.

Tactical use of helicopters usually involves four primary functions:

1. Delivery of initial attack crews.
2. Delivery of aerial retardant or water.
3. Performing as an aerial observer.
4. Backfiring with aerial ignition devices.

During initial evaluation of the fire, the pilot and the helicopter manager need to consider the following items:

1. Strategic plan of attack.
2. Aerial hazards. *
3. Landing areas. *
4. Water sources. *
5. People or vehicles in the area.

* Primary concerns of the pilot

In selecting an initial helispot or a water source the area should be mutually agreeable to the manager and pilot. If it is not, the most conservative opinion must prevail. A trial approach should be flown to inspect the area for suitability and hazards. Minimum standards for landing areas are discussed Chapter 7.

Item 5 is also important because the helicopter may be in a position to identify the origin of the fire. A description of a vehicle leaving the scene could lead to the party responsible for starting the fire.

Once a helicopter has delivered its initial attack crew it will probably be used to transport additional personnel/resources or begin retardant/water dropping. The helicopter may also serve as a lookout for crews committed to the fire.

INITIAL ATTACK

History

The first initial attack on a wild fire using a helishot crew and a helicopter occurred on the Bryant Fire on the Angeles National Forest. The aircraft type used was a Bell 47 and two firefighters accompanied the pilot. Resource management agencies have refined the use of helicopters over the years and the following outline is designed to familiarize you as the pilot with initial attack operations.

Purpose

The purpose of the initial attack is to provide a rapid response team of airborne firefighters to the scene of a wildfire. Most helitack crews establish flight-crews who are ready at a moments notice.

Pilots Responsibilities

Readiness

The pilot will remain at the designated base, be it the helibase or project location, to provide quick response to wildfire starts. Some base operating locations may be in the field with no established facilities. **Be prepared.**

Load calculations

The pilot is responsible for preparing the load calculation. Prior to flight, find out who is on the flight-crew, what cargo is onboard, their weights, the bucket, if used, etc. Work with the helicopter manager to establish a standard fuel load for your location. Consider the mission criteria.

Fuel

Should be brought back to initial attack level whenever a mission has been completed and you are back at the helibase. The next initial attack flight should not be held up due to an aircraft not having fuel.

Pre-flight
This must be completed each day, prior to flight. Most units allow 15 to 20 minutes of established duty time to accomplish this task. Individuals on each crew may observe you performing a pre-flight to learn what you inspect. Generally, the more information you are willing to share, the more you will be accepted as "part of the crew".

The Helitack Crew
Crews trained in airborne initial attack are assembled each season to suppress wildfires. Most crews consist of a Helicopter Manager, an Assistant, and several crewmembers. There are variations, but as a general rule, most crews are similar.

Fire Size-Up
As previously discussed, an essential aspect of initial attack is fire size-up. This may seem like a time consuming event and not as effective as going direct into attack on the fire, but the events that follow are based on the initial size-up. Information such as the best access route for ground forces is essential and can save hours of time for ground based firefighting units. The helicopter is in an unique position to quickly gather information as well as fight the fire. The following is a sequence of information that should be gathered prior to taking action on the incident.

Checklist
Legal description
Township, Range, Section; latitude, longitude; or, location by landmark. Some lands require immediate action or no action.

Fuels
Types, Values; Safety of crews.

Direction of spread
What values are at risk in front of the fire; safety of crews; type of terrain the incident will encounter.

Rate of spread
How will it affect tactics; time frames in regards to objectives; safety of crews.

Terrain
Plays a big part in anticipating fire behavior, i.e. mountains, valleys, canyons, rangelands, etc.; Factor in type of resource ordered and the safety of crews when choosing method of attack.

Slope
What is the percent; how it effects the fire behavior (steep vs. flat); dictates the type of equipment used.

Aspect
Orientation to the sun's rays, i.e. - north, south, east, west effects fire behavior.

Resources threatened
Man-made structures; timber versus rangeland; wilderness; watershed; wildlife habitat; other sensitive areas.

Firefighting resources required
Type (people/equipment); amount; estimated times of arrival.

Water sources
Buckets or pumps.

Fuel tender relocation
A consideration for continuing air operations

If the decision is to take action the process is as follows:

1. Determine an appropriate landing area that is **not** in the fire's path or downwind from the fire.

2. Determine if the landing site is hover out of ground effect (HOGE) or hover in ground effect (HIGE).

3. Determine if the aircraft load calculation is current and valid for this elevation and temperature.

4. Choose an alternate site if not appropriate.

5. Off load crew.

6. Off load tools.

7. Hook up bucket if directed.

8. Formulate plan with helicopter manager on method of attack. Establish radio frequencies and contacts. Act as a communications link with dispatchers, if necessary.

9. Begin firefighting efforts.

If the fire progresses into extended attack, the pilot's role will change. You may become an aerial observation post for an I.C. or you could start transporting personnel and cargo. The helitack crew's role will change from I.A. to support and organizing helicopter operations. As a pilot your role can change at any time. Firefighting can be taxing to the pilot and crew because of the stressful conditions. The key is to be flexible and realize the firefighting efforts are dictated by the fire, which can be unpredictable and varied in behavior.

AERIAL LOOKOUT

Remember that ground forces often do not have a clear picture of what a fire is doing. For this reason you must have an understanding of fire behavior and be able to recognize critical situations. If the helicopter is specifically assigned as a lookout the manager will normally occupy the observer's seat. If the helicopter is used for transporting personnel you will usually be assisted by helitack personnel. On a retardant/water dropping mission or with external cargo you will fly alone. Even if the primary mission is other than that of a lookout, you will often be in a position to serve as one.

RETARDANT/WATER DROPPING

The helicopter logs much of its flight time in this capacity. During this operation a pilot must be knowledgeable of fire tactics. There are several methods and tactics involved in retardant/water dropping. An understanding of what constitutes effective drops is a topic that we will deal with in depth. Pilot technique is an individual characteristic and the purpose of this lesson is not to teach a professional pilot how to fly.

Agency policy prohibits personnel from riding with external loads unless it is essential for the safety of the mission and then only on the initial trip. Often drops you make must be based on your knowledge. If you are dropping in close support of ground forces you may be receiving directions from the line. Occasionally, you are in a position to have a clearer perspective, enabling you to better select the target. However, the pilot should, if possible do the job as requested by the line. An on-the-ground firefighter's needs can often be immediate and localized. Pilots should advise people requesting drops of things that might change target priorities, such as undetected spot fires, but **pilots should not** change priorities on their own.

For a ground crew to work safely and effectively, aerial support is a very beneficial asset. It is easy to underestimate a fire from the air. A good rule to consider is that ground crews working alone can usually only deal with flames no higher than two feet and be successful.

At times, usually on large fires, retardant/water dropping is directed from an aircraft designated for this purpose, the Air Tactical Supervisor. The fire organization and the air operations organization are discussed in Chapters 5 and 6. It is important that pilots understand from whom they take direction and not be diverted from a list of established priorities. For example, a Division Supervisor does not have authority to directly request a helicopter from the Helibase. The request must go through the proper channels.

Retardant

As the name implies, retardant slows the rate of spread of a fire by reducing the combustion process. Retardants do not put the fire out. They buy time for the ground forces to construct or strengthen control lines. Water, as a retardant, is much less effective than if mixed with a chemical because chemicals continue to retard a fire after the fuels have dried. These chemicals are basically fertilizers. Retardants can be used effectively in the following ways:

1. Initial attack (first suppression action).

2. Close support of ground forces (direct and indirect attack).

3. Fireline construction.

4. Delaying or holding action.

5. Spot fire control.

6. Direct suppression of flames.

7. Mop up.

The expense of the retardant and the cost of delivery necessitates the wise and judicious use of this firefighting tool.

Factors to be Considered in Retardant Dropping

1. Type of fuel; grass, brush or tall timber.

2. Wind conditions—not over 30 mph.

3. Terrain—can the aircraft be maneuvered to make an effective drop.

4. Visibility—can the pilot see target.

5. Will drop contribute to control.

6. Safety of ground personnel.

7. Resource value—cost/benefit.

Methods of Attack for Ground Forces

Direct

Retardant dropped directly on the fire or burning material in close support of ground forces. The usual method is half in half out. Half the drop is on the fire itself and half is outside cooling and pretreating at the same time. Direct attack is utilized in the following situations:

Flank Attack

Must have an anchor point to prevent fire from out-flanking the line being built.

Frontal (Head) Attack.

Used when the fire is not burning with great intensity. Caution and judgment is needed with a frontal attack. Remember, if a fire is advancing with any degree of speed, the chances of being effective are slim. It is also possible to split the head of a fire with retardant drops and thus compound control problems.

Spot fires

Hold spots ahead of the fire in check until ground forces arrive.

Flare-ups

Cool flare-ups along the line to lessen intensity.

Indirect attack

Dropping retardant on unburned fuel ahead of the fire. This would apply mainly to dropping chemical retardant as a fire break to strengthen an existing break. This is primarily the job of fixed wing aircraft or air tankers, but many of the principles and considerations apply to helitankers. Line construction and location consideration involves the following factors to decide when, where, and how to build a retardant line.

Topography attack

Ridgetops are usually more accessible to aircraft and generally more open. Natural barriers can serve as anchor points and can be utilized as part of the line. It is very important for a pilot working on their own to recognize and use breaks in topography and fuel. This greatly increases the chances of success. Simply because a fire is active at a particular point doesn't mean that a drop is called for. Consider topography and fuels so you can identify times and locations when you will be the most effective and not expend efforts uselessly.

Rate of spread of the fire. Weather, primarily the wind, is a major concern. Take advantage of open areas, shorter canopies, or lighter areas of fuel concentration. Even species of fuel will cause a change in rate of spread.

Progress of ground crews compared to fire spread.

Retardant delivery rate. Turn around time is a primary concern. To be effective, you must be able to maintain an effective delivery rate. Pilots must fully recognize capabilities and limitations.

SUCCESSFUL RETARDANT/WATER DROPS

Factors That Determine Effective Retardant/ Water Use

The following factors help determine drop effectiveness:

1. Effect on the rate of spread of the fire.

2. Penetration of the forest canopy.

3. Drop height too high (retardant/water dissipates before getting to the ground).
   a. Terrain

   b. Fire intensity

   c. Winds

   c. Poor visibility

   e. Aircraft too high (pilot oriented)

4. Drop height too low (rotor down wash spreads fire).

5. Inappropriate drop speed: too fast = too little coverage

6. Accuracy of the drop.

7. Turn around time for aircraft (allows continuous dropping without long delays causing loss of line).

8. Ground forces available to take advantage of drops.

SUMMARY

Helicopters serve four basic tactical functions:

- Initial attack crew transport.
- Air tanker.
- Aerial observer or Air Tactical Supervisor platform.
- Backfiring with aerial ignition devices.

These jobs require a pilot to be a knowledgeable fire-person as well as an aviator. You will often be guided or directed in these jobs from the ground or air, but situations will arise when suppression decisions based on fire knowledge are the pilot's alone. A pilot must be able to recognize what action will be effective and respond accordingly. When working as the water or retardant aircraft, the pilot needs to recognize capabilities and select targets and tactics that afford the best chance of success.

NOTES

CHAPTER 9

LOGISTICAL USE OF HELICOPTERS

NOTES

INTRODUCTION

Logistical use of helicopters in firefighting is simply using the aircraft in a support or service capacity. Objectives of natural resource air operations center around safe, efficient and effective use. Logistics are primarily concerned with two operations, transportation of personnel and transportation of freight/cargo.

TRANSPORTATION OF PERSONNEL

Crews

When crews are transported to and from a location the pilot will be assisted by the helitack organization. There should be helitack personnel at both departure and destination points. These people are responsible for landing area security, safety during loading/unloading passengers, and assisting the pilot in loading the aircraft. Large numbers of personnel are transported; some may be highly trained in helicopter operations and some may never have been exposed to a helicopter. Trained personnel who can ensure safety rules are followed must be part of the crew on larger helicopters and/or be in charge at each landing site. Some of the policies and procedures to be followed are:

1. Only one person will be in charge of helispot operations (Helispot Manager), provide standard visual hand signals, and operate the radio.

2.The person in charge of the Helibase (Helibase Manager) will coordinate with the pilots to establish traffic patterns and the general flow of traffic to and from the fire and the Helibase.

3. All persons must keep clear of the helicopter by at least 100'. Only people with specific assignments will be an exception.

4. Personnel working at landing areas must wear eye protection.

5. Helmets secured with a chin strap will be worn when working near helicopters.

6. Personnel will not approach any helicopter unless signaled by the pilot or parking tender.

7. All personnel will approach the helicopter from the front in full view of the pilot.

8. If personnel must walk around the helicopter, they must go around the front only, not around the tail, and only upon command of the pilot or qualified assigned helibase/helispot manager.

9. Helicopters with external loads will be routed away from ground personnel and structures to avoid flight directly over them.

10. Air Traffic control will be regulated with hand signals (parking tender) and radios (Take-off and Landing Control).

11. Load calculations will be completed for each flight destination, temperature, and elevation.

12. Flight following procedures will be established. Every 15 minutes each helicopter will check in with the helibase/dispatch giving its location and heading. When possible all the helicopters should advise other air traffic of their activities.

13. Flight routes will be selected so a safe auto-rotation is possible in the event of engine failure or any other emergency.

Reconnaissance Flights

Often a helicopter is used for reconnaissance missions. This allows those responsible to better formulate plans for control or to grasp the scope of a particular assignment. In most cases a reconnaissance helicopter should be a Type III (light) helicopter such as a Bell 206. It is very important to remember that no passenger will be carried unless there is a legitimate need.

TRANSPORTATION OF FREIGHT

Transportation of freight is governed by many of the same regulations that are used for transporting personnel. The pilot is responsible for supervising the loading and being aware of all items put on the aircraft. They are also responsible for assuring that a load calculation is completed and approved.

Internal Freight

Internal freight transport is governed by FAA regulations, common sense, and standard policy.

External Freight

When possible, large quantities of freight will be transported by sling load. This is often the most efficient and economical method. Equipment used must be approved by the assigned agencies and most is furnished by the Government. An approved cargo hook (both electrical and manual) should be checked prior to beginning the sling operations. When possible, loads will be prepackaged and delays will be avoided. Helicopters transport a variety of items and if a pilot has any doubts concerning a load, or its preparation, it should be checked personally.

Preparation of sling loads will be accomplished by trained helitack personnel.

When flying with a sling load avoid areas of population or flight routes over ground forces. In the event a malfunction, or a situation that calls for the jettisoning of a load, it must not be a hazard to personnel on the ground.

When it is warranted (a judgment of management) hover hookups may be done. This will only be done by trained personnel using a prearranged and rehearsed system.

Mixed loads, personnel and sling, will not be allowed. The only exception to this is if it is deemed necessary to the safety of the mission; then a member of the crew will be allowed to go along on the initial flight.

If cargo is carried externally in racks, pilots will make sure that all items are secured.

SUMMARY

Logistical use of helicopters involves using the aircraft as a tool for support or service missions. Helicopters are largely used for logistics on large incidents. The primary logistical uses include transportation of personnel, either by troop movement or reconnaissance; and transportation of freight, both internally and externally.

A well organized helicopter unit should furnish logistical support with a smooth, efficient operation. Thorough training and mutual understanding of the jobs to be done help ensure the rotor-wing aircraft will be invaluable as a logistical tool.

CHAPTER 10

BASIC FIRE SUPPRESSION

NOTES

INTRODUCTION

Fire can not exist in the absence of heat, fuel, and oxygen. We must decide how these can be removed or their effects reduced in the quickest and most effective manner. After this decision is made, it is necessary to determine what tools and methods should be used and how they should be applied. These decisions are part of the plan of attack. The stages of fire suppression are:

Containment and Control—stopping the spread of fire; **Mop up**—Extinguishing the fire; and **Patrol and Inspect**—looking for and extinguishing all danger spots during and after mop up.

These three steps should closely follow each other. The first objective is to stop the spread; however on a fire mopping up and patrol and inspection may be taking place in one section while control work is just beginning in another.

SIZE-UP AND FIRST ATTACK

Factors to Consider

Topography

Consider the percent or steepness of slope; the position of fire on the slope; and the direction the slope faces (aspect).

Fuels

What is the current character of fire (i.e. smoldering, creeping, running, crowning, spotting, erratic fire behavior, etc.); the main fuel type currently burning (timber, brush, grass, etc.); the main fuel types adjacent to and ahead of the fire; the flame lengths at head of fire; and the natural breaks in fuels (rock slides, cliffs, etc.).

Weather

What is the wind direction (N, E, SW, etc.); estimated wind speed; topographic wind direction (upslope, down canyon, etc.); general conditions in area (thunder storms, lightning, virga, heavy rain, snow, etc.); and percent of cloud cover

Safety

Of people; of animals; of improvements; etc.

Resources

On scene or required.

Decide Where Fire Will Spread.

Heavy fuels or steep slope are things that will result in increases of heat and rapid spread. Also, keep the standards of survival **F-I-R-E O-R-D-E-R-S**, and **"WATCH OUT"** situations. Consider buildings, power and telephone lines, bridges, grain fields and other improvements in the probable path of the fire.

Universal Rules

1. Take prompt action on vital points.

2. Stay with the fire.

3. Take most effective action with available forces.

4. Inform dispatcher of situation by radio.

5. Continue work day or night if work can be done safely.

Good practices

1. Use water or dirt for cooling and extinguishing hot spots.

2. Follow up temporary checking effort by completing in a permanent clean fire line to mineral soil.

3. Anchor initial point of line to a road or natural barrier to minimize chances of being flanked by fire.

4. Cut fire off from most dangerous fuels at first effort and prevent fire from becoming established in explosive types of fuel.

5. Confine fire to one major area rather then let it develop into two heads.

6. Locate and construct control lines so materials cannot roll across, (logs, pine cones, yucca).

7. Utilize existing barriers to full extent.

ATTACK METHODS

Direct attack

Any treatment of burning fuel, e.g., by wetting smothering, or chemically quenching the fire or by physically separating the burning from unburned fuel.

Indirect attack

The fire line is built away from the edge of the fire. The line is constructed using favorable breaks in the topography and all natural fuel breaks. The area between the fire and the control line is backfired or burned out when conditions are favorable and all assigned suppression personnel are notified. Many times it is impossible to make a direct attack on a fire when it is burning rapidly, crowning in heavy fuels, burning on very steep slopes or where rolling materials sometimes make control difficult.

Guidelines

Use direct methods immediately and completely around small or slow burning fires.

Start at the rear of fast moving fires with a direct attack and continue the action on the flanks until the opportunity arises to cut across the head of the fire safely and effectively.

Use direct attack where natural breaks can be utilized to good advantage.

Use indirect attack with a back fire only when guided by experienced and expert leadership.

CONTROL

Preventing Spread

Mop up has been considered one of the dirtiest jobs of fire suppression. Still it is the most important part of fire suppression. Until a fire is dead out the potential or threat for the fire to escape and become another major fire still exists.

Mop-Up

Mopping up consists of making a fire safe by extinguishing or removing burning and hazardous material including snags along or near the fire line.

The tasks used to accomplish the mop-up stage are:

1. Extinguish all smoldering material along the fire edge after the spread of the fire has been stopped.

2. Put all rolling fuel into such a position (or trench below it), that it cannot roll across the line.

3. Spread out rather than bury smoldering fuel that cannot be extinguished.

4. Bury burning fuels only when it is the fastest way of stopping the spread of the fire or there is a possibility of sparks being blown across the line. Make sure the fuels are uncovered and there are no hot spots left in them before leaving the fire.

5. Allow fuel to burn completely to a white ash if it will do so promptly and safely. If not take steps to either extinguish or remove it.

6. Eliminate both inside and outside the line all special threats such as snags, rotten logs, stumps, singed brush, and low hanging tree limbs.

7. Look for and remove all burning roots near the line.

8. Search for smoldering spot fires across the line.

9. Mop-up enough of the material adjacent to the line on large fires to be certain the fire cannot blow-up, spot or escape the fire line.

10. Mop-up small fires completely.

11. Chop fire out of heavy fuels and either scatter the small burning fragments or extinguish them with water or dirt.

Patrol And Inspection

Patrol and inspection is necessary on all fires until the last spark is dead out. It is usually performed in two ways:

Line Patrol and Inspection

Line patrol and inspection is the act of working back and forth over a length of control line during and after line construction. The crews are equipped with the proper tools to prevent breaks, discover and control spot fires and mop-up when necessary.

Lookout Patrol and Inspection

Lookout patrol and inspection consists of continuous monitoring of burned and unburned areas from a vantage point to detect and report hazardous flare-ups and spot fires.

SUMMARY

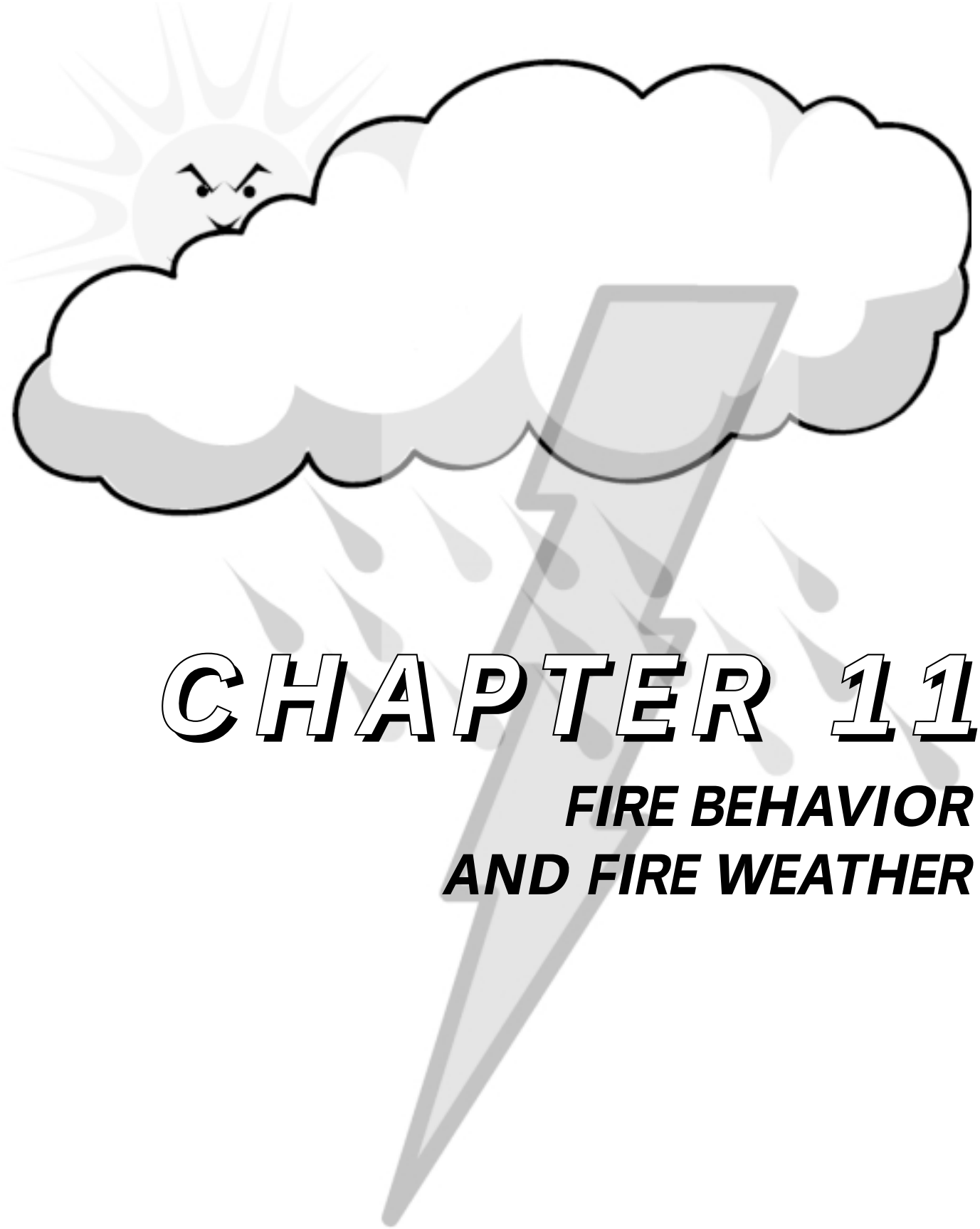
Fire suppression is composed of several elements.

1. Size-up. Formulate a plan of attack that will allow for safe effective fire fighting. Slope, fuels, potential for spread, weather and safety are primary considerations.

2. Attack. Basically two types of attack are used. Direct which is immediately next to the fire's edge and indirect which is action removed from the fire's edge.

3. Control. There are three stages of control: preventing spread, mopping up and patrolling.

NOTES



CHAPTER 11

FIRE BEHAVIOR AND FIRE WEATHER

NOTES

INTRODUCTION

To be fully effective with a helicopter used for firefighting, a pilot must also be firefighter oriented. The materials presented in this chapter are intended to acquaint you with basic fire behavior and enable you, as a pilot, to do a more effective fire support job. The major factors that determine fire behavior are combustion, fuels, topography (slope), and weather. Each of these factors are discussed below, including how they serve as indicators of critical situations and extreme fire behavior.

COMBUSTION

Combustion is defined as rapid chemical process involving fuel, heat and oxygen.

Fire Triangle

Heat, oxygen, and fuel are the fire triangle. All three parts of the triangle are required to support a fire. Remove any leg of the triangle and the fire goes out. Break the triangle (remove a leg) in the following ways:

Smothering—dirt (not a primary tactic).
Cooling—Water or dirt (this allows us to contain the fire and work in close which is most effective).
Remove fuel—fire line (this is the primary method of controlling a wildland fire).

Ignition Temperatures. Obviously some fuels ignite more readily than others, but the following information is generally valid. For rapid ignition fuels must be 500-600 degrees Fahrenheit. If a longer period of time is permitted for heating, 450 degrees Fahrenheit will cause ignition. Factors causing variation in ignition:

1. Size of fuel (fine fuels ignite more readily).

2. Shape and arrangements of fuel (e.g., texture and arrangement).

3. Density of fuel.

4. Moisture content of fuel.

5. Oxygen available.

6. Solar exposure—a firefighter needs to recognize that fuels exposed to direct sunlight can be as much as 100 degrees hotter than fuels that are shaded. The position of the sun is an important factor in fire behavior and ignition.

Ignition Sources

The following are the most common ignition sources: chemical (matches); electrical (powerlines, lightning); mechanical (friction, exhaust); radiant (magnifying glass).

How Fires Spread

Fires spread by convection (heat rises vertically); conduction (direct transfer of heat through material); and radiation (heat from the fire).

FUELS

Types

Fuels are broken down into groups in the fireline handbook.

Quantity

Continuity and arrangement are the major consideration. Continuity deals with horizontal uniformity, while arrangement deals with vertical placement of fuels. With continuity one considers concentrations or breaks in fuels. With arrangement considerations include fuels that furnish a fire ladder and allow a fire to travel above ground. This would contribute high potential for a crown fire.

Characteristics

Size (diameter) and moisture content are the two characteristics of fuels. The following are fuelbed characteristics: Fuel arrangement—horizontal and vertical; Composition: Large rocks—fuels heat up faster due to reflection of sun's heat; Exposed ground—heat of sun reflects off bare earth and into fuel, thus heating faster. Topographic aspects of fuels. South aspect—facing sun; drier. North aspect—shadier; dries slowly.

TOPOGRAPHIC FACTORS

Aspect

The direction in which a slope faces effects the amount of sunshine received; fire occurrence is greater on south and southwest slopes; and higher rate of spread is on south and southwest slopes.

Elevation

Factors that are altered by elevation increases are: temperature (cooler); precipitation (more); snow melting (slower); time of vegetation curing (later); and types of fuels.

Position of fire on slope

Fire on bottom of slope spreads easier uphill; and fire on upper slope is influenced by gradient winds.

Steepness of slope

Fire spreads easier and faster up-slope due to more radiant heat transfer and convection heat transfer.

Shape of country

Fires spot easily across narrow canyons caused by erratic winds and radiant heat transfer. Box canyons produce a chimney effect and may cause combustible gases to be trapped. This may create extremely dangerous conditions when "flash-overs" occur. Side canyons cause erratic fire behavior and tend to produce additional fire heads. Fires burning along lateral ridges may travel with whirling motion and change direction as they reach the high point on the canyon rim.

ELEMENTS OF WEATHER

Temperature

The sun heats the ground, the heat from the ground in turn heats the air.

Humidity

Moisture in the air determines the amount of moisture in the fuel.

Wind

Local winds are primarily created by topography or thunderstorms. Wind currents are comparable to a flow of water. Eddies are created by obstacles such as ridges and deep canyons.

WARNING SIGNS

Fuels

Heavy volumes of fine fuel means a hot, fast moving fire. Mixed fuels have the ability of kindling fuels and vertical arrangements conducive to crowning. Fuels alone can generate a high intensity fire under moderate or even low fire danger conditions.

Fuel Dryness

Fuel dryness determines ease of ignition and is especially critical when the humidity reaches 20% or lower.

Topography

Steep slopes greatly speed up the burning rate and the rate of spread of a small fire. Moisture content of fuels on steep north and east slopes are higher than on south and west slopes. Turbulence of the air flow through ridge saddles at forks in canyons with corresponding erratic fire behavior are also to be expected.

Early Spotting

If the fire is spotting considerable distances at the early stages the fire is capable of developing extreme fire behavior. A pilot can see this best.

Convection Column

By the time you see the convection column the blow up condition has probably already occured or it is well under way, but some observations can be made from a safety standpoint.

Color changes

Darker smoke with a dense, solid appearance indicates an increased burning rate and a resultant drop in combustion efficiency.

Motion

Motion or pronounced movement of the convection column gases is an immediate indicator of high fire intensity.

FIRE SITUATIONS THAT SHOUT "WATCH OUT"

The following are only a few of the danger signals which are instilled in the firefighter. These were selected because they are particularly obvious from the air and are therefore situations the pilot should keep close watch on so they may warn those concerned to take immediate appropriate action.

Downhill Fireline

Building a fireline downhill toward a fire. A fireline should never be constructed downhill. This is a very hazardous because of the danger of the fire crossing the slope below a crew and sweeping uphill to trap them.

Hillside Firefighting

Fighting fire on a hillside where rolling material can ignite fuel below you.

Away from Burned Areas

Away from burned areas where terrain and/or cover makes travel difficult and slow.

In Heavy Cover

On a line in heavy cover with unburned fuel between you and the fire.

Spot Fires

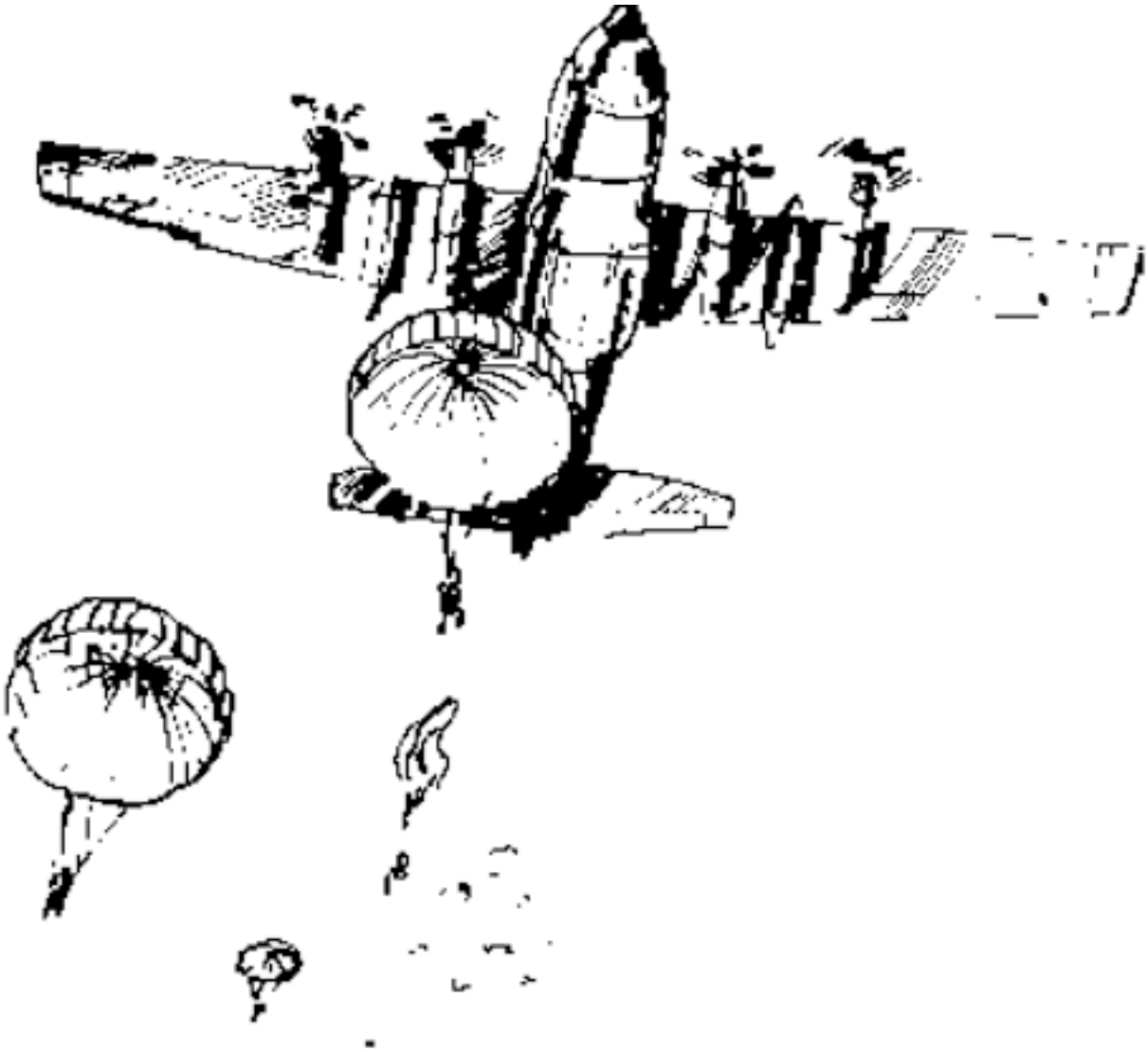
There are frequent spot fires or slop-overs across your line.

Cannot See Main Fire

The main fire cannot be seen, and there is no communication with anyone who can.

SUMMARY

Often a pilot is the only individual on a fire that has a comprehensive view of the fire's behavior. You can identify spot fires and the development of critical situations long before they are known to ground forces. A pilot is in a position to give needed information that ground personnel are unable to see. With an understanding of fire behavior, its components and their interrelationships, a pilot should be able to relay this information. A warning to ground personnel of critical developments could save lives. With a basic understanding of fire behavior a pilot is in a much better position to provide effective support. For example, if you recognize that dropping water on a rapidly moving front is futile and you drop on an area that can be controlled you are doing the job that needs to be done along with saving valuable time and resources.



CHAPTER 12

SMOKEJUMPER AIRCRAFT

NOTES

INTRODUCTION

Smokejumpers are firefighters delivered to fires by fixed wing aircraft and parachutes. Primary use is initial attack and reinforcement of fires in remote areas. Smokejumpers are used in non-wilderness situations when rapid delivery is a consideration or other resources are unavailable.

Logistical use of smokejumpers is limited to paracargo resupply, medivacs and helispot construction. Paracargo resupply is more common in Alaska than in the lower forty-eight states.

AIRCRAFT TYPES

A number of different aircraft have been used to deliver smokejumpers and paracargo. The most common aircraft currently in use are the C23-A (Sherpa), the De Havilland Twin Otter, the Casa 212 and the Turbine DC-3 (TDC-3).

1. C23-A—Seven C23-A's are in use as smokejumper platforms and crew haulers. These were acquired from the Air Force and have been modified and painted to the point where they look more like the civilian version of the C23-A, the Sherpa. The aircraft cruises at 180 kts. and payloads 4800 pounds or 12 jumpers. All are agency owned.

2. Twin Otter—Otters have long been common in the smokejumper fleet. Cruise is 140 kts. and payload is 2800 pounds or 8-10 jumpers. Otters are STOL capable and are agency owned or contracted.

3. Casa 212—The Casa 212 is used primarily in Alaska. It cruises at 170 kts. and carries 8 jumpers. These aircraft are agency contracted.

4. TDC-3—The USFS owns two DC-3's that have been extensively rebuilt and modified. Modifications include turbine engines. Cruise is 195 kts. Standard payload is 12 jumpers however the load can be reconfigured to allow 16 jumpers. The TDC-3 is approved for dirt strips.

Aircraft in jumper configuration carry a minimum of two hours fuel.

EQUIPMENT AND PARACARGO

Jump Equipment

Smokejumpers wear protective suits consisting of a jacket and pants made from kevlar fabric extensively padded with a high density foam. Motorcycle type helmets modified with the addition of a face screen provide protection to the jumper during takeoffs, landings and jumps. A personal gear bag is attached to the jumper's harness below the reserve and converts to a line pack.

Parachute System

A parachute system consists of a harness, actuation device, container, deployment bag, risers, canopy, pilot chute (on some systems) and reserve parachute. Two systems are currently in use.

1. FS-12—Forest Service jumpers use a static line actuated 32 ft. diameter round main canopy matched to a 24 ft. round reserve. The main canopy has a forward speed of 10 m.p.h. and a 10 m.p.h. rate of descent yielding a glide angle of 1:1. The reserve is manually activated and pilot chute deployed.

2. Ram Air—Bureau of Land Management jumpers use a ram air type parachute that is manually actuated, pilot chute deployed and matched to a similar reserve. The main and reserve both can reach speeds of 20 m.p.h. depending on jumper weight. Glide angle is 2.5:1.

Paracargo

Smokejumper initial attack paracargo consists of fire fighting equipment and first aid materials. Paracargo generally is made up in cardboard boxes with a packed weight of less than 100 pounds. Some items may be free fall (i.e., tree climbers). On logistical missions paracargo can reach greater sizes. In Alaska fuel bladders containing several hundred gallons of fuel can be dropped. Except for freefall items, paracargo is dropped under static line actuated canopies.

SMOKEJUMPER MISSIONS

Smokejumper missions are staffed by pilots, jumpers and spotters. The spotters function as mission coordinators and cargo kickers. They also select the jump spot and release point for the jumpers. On arrival at the fire a jump spot is selected. The spotter then releases drift streamers 1500 ft. above the jump spot. Most wind conditions require a second set of streamers. This is the check set and it is released up wind of the spot. This second set confirms the release point for the jumpers. Jumpers are next. When the jump runs are complete, paracargo is dropped from a lower elevation.

JUMP SPOTS

Several criteria are used to select jump spots.

1. Proximity to the fire is the first selection criteria.

2. Observed fire behavior may influence the selection of a jump spot.

3. Weather may cause a delay in dropping jumpers. Lee sides of hills are seldom used for jump spots because of turbulence.

4. Cover type—Open timber and small timber may be used as jump spots. Open meadows are preferred. Rocky areas are avoided.

5. Terrain may limit safe access by the aircraft on jumper and cargo runs.

It is not unusual for an alternate jump spot to be selected for safety reasons that is further from the fire.

AIRSPACE REQUIREMENTS

Drift streamers and Forest Service jumpers are dropped at 1500 ft. above the release point. Note that the release point may be at a higher altitude than where the initial streamers were dropped due to higher terrain and the need to maintain a 1500 ft. AGL for the jump. BLM jumpers are dropped from 3000 ft. above the release point because the ram air parachute is manually actuated requiring more deployment time (altitude). Cargo is released from much lower elevations. Smokejumper aircraft rotate counter clockwise if the terrain permits this pattern. Slow moving aircraft like the Twin Otter require as little as 1/2 mile diameter for jump runs. Larger aircraft like the C23-A and TDC-3 may require as much as a 2 mile radius. A single load of jumpers may contain both round and ram air jumpers. Communication between aircraft is the best way to determine air space requirements for a specific mission.

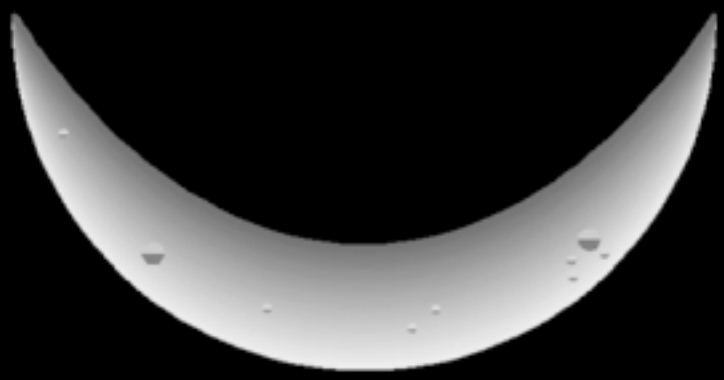
TIME FRAMES

A small fire can be staffed in as little as 10 minutes of incident air space time. Twelve jumpers and their cargo can be delivered in as little as 30 minutes air space time. Once the release point has been determined the jumpers are arriving two every two minutes. This process should not be interrupted except for emergencies.

SHARED INCIDENT AIR SPACE AND LANDING SITES

Fires are often served by helicopter based crews and smokejumpers. These forces have similar missions and backgrounds in suppression. A high percentage of jumpers are carded for long line work and many have prior experience on helitack crews. Many smokejumpers are E.M.T.' s. For these reasons jumpers and helitack may be working the same incident at the same time. Communication between pilots is the best safety tool. The I.C. or Air Attack may become involved with setting air space priorities for staffing and supplying the fire. Jumpers and helicopters cannot share the same air space at the same time. Each mission should be completed and the air space verified as clear before another aircraft moves in. This verification should occur between pilots of all aircraft involved.

A good helispot is also a good jump spot. If the helispot is (or becomes) a jump spot, the helicopter pilot should avoid any loose jump gear, especially canopies, until the gear is secured.



CHAPTER 13

NOTES

INTRODUCTION

As a pilot, you are aware that our nation's airspace is a limited resource with many diverse user groups vying for access to accommodate their specific needs. Our nation's airspace is the busiest and most complex in the world with unprecedented demands on this system through the end of this century. Airspace has a finite capacity. This means that airspace has a saturation point beyond which it can not accept any additional aircraft without sacrificing safety.

Most natural resource lands are in fairly remote access areas with complex military airspace overhead. Many of our aviation activities occur in Special Use Airspace, Military Training Routes or Local Flying Area's utilized by the Department of Defense. A concern for safety exists when our missions are located within the perimeters of airspace identified for military training missions.

Military and FAA reports indicate that if two aircraft are aware of each others presence, that it can significantly reduce the risk of a midair collision. For instance, suppose you were involved on a water bucket operation during initial attack at a fire. If dispatch called with the information that in the next 20 minutes you could expect three flights of three F-16's at 10 minute intervals—you might change your flying tactics! And your heightened awareness may save your life.

Our primary focus in airspace coordination is midair collision avoidance. We recognize that a pilot's primary function is to see and avoid. In considering most resource agency aviation tasks, we realize that our pilots attention is diverted out of the cockpit to the ground. For instance, long line operations, water bucket operations, telemetry work, reconnaissance flights, etc. often divert the pilot's attention to the ground. This can reduce our see and avoid capability and increase our risk of a midair collision.

It is the pilots responsibility to be acquainted with the airspace they fly in. However in a quick response situation (initial attack, helitack, rappelling), often the decision is made to "load and go". Did you have the time to ask the FSS specialist about special-use airspace (SUA) activity along your route? Did you even notice whether your route takes you through any SUA or across Military Training Routes (MTR)?

Sometimes the FAA has only the "scheduled" info (or worse yet, the hours of the MOA from the Sectional) and could be uninformed about whether the area is "hot" with military traffic. When your route of traffic takes you into a MTR, your dispatch organization should be able to contact the scheduling activity and provide you with "real time" information as to scheduled activity on the route.

There is no "one call = solves all" place to go in airspace coordination. A dispatcher might have numerous scheduling activities to contact when de-conflicting multiple MTR's. Be advised that it will take time for the military to stop the flow of traffic on the route. Military aircraft already on the route might not know of your aviation activity. It could take several hours to clear a route in use.

The Department of the Interior and the USDA Forest Service have published an Interagency Airspace Coordination Guide. This document covers in depth the complexities of the airspace you work in. It's objective is to promote aviation safety through an educational process that will contribute to a clear understanding of the complex nature of the airspace we work in.

It is essential that all personnel involved in flight planning and operations read, understand and implement the procedures contained in the guide. However, pilots, aircraft chief-of-parties and field aviation managers should remember that the final assurance of collision avoidance rests with the pilot-in-command to "see and avoid".

Through the Airspace Guide, training sessions and safety briefings, we hope that we can avoid the terrible disaster of a midair collision.

SPECIAL USE AIRSPACE

Special Use Airspace (SUA) was initiated in the early 1970's after a series of collisions and near-collisions between military and general aviation. There are six different kinds of SUA in the United States. Many of our land management areas are covered by SUA and this can create a real problem.

There are six different kind of SUA's:

1. PA—Prohibited Areas
2. RA— Restricted Areas
3. MOA—Military Operations Areas
4. AA —Alert Areas
5. WA —Warning Areas
6. CFA —Controlled Firing Areas

Prohibited Areas

A great description of a Prohibited Area (PA) is "unless you have the President flying in the right seat with you, don't attempt to fly through a prohibited area". According to the Airman's Information Manual they are established for "security or other reasons associated with the national welfare". PAs keep aircraft from flying over the White House and other parts of Washington, DC, ex-president's homes (the Nixon's, the Carter's, etc.). One interesting PA is the Boundary Waters Canoe Area in Minnesota. The reason it is "interesting" is that Theodore Roosevelt felt so strongly about protecting the environment at Boundary Waters, that he created a prohibited flying area to protect it.

PAs are published in the Federal Register and are depicted on aeronautical charts.

Restricted Areas

A Restricted Area (RA) is designated when it is necessary to confine or segregate activities considered hazardous to nonparticipating aircraft. They may contain hazards to flying such as artillery firing, aerial gunnery, or guided missiles. You do not want to fly in restricted areas without permission from the using or controlling agency. Such flying could be hazardous to you and your aircraft's health and well being. If you find yourself requested to fly within restricted areas, make sure you have permission and clearance prior to entry.

RAs are depicted on the En Route Chart and aeronautical charts.

Military Operations Areas

Military Operations Areas (MOA) were established to contain certain military activities such as air combat maneuvers, intercepts, acrobatics, etc. There are many MOAs over resource area's in the United States. It will not be uncommon to find yourself flying within one. Civilian flights within MOA are not prohibited (even when the area is "HOT" but you may encounter high-speed flight training, acrobatic or abrupt flight maneuvers (under 250 KIA's).

Altitudes for MOA's will vary, but they run from ground surface to 18,000 feet. The status of MOA's can change frequently. You should contact the Flight Service Station (FSS) within 100 miles of the area to obtain information concerning the MOAs hours of operation. FSS will only provide information on MOAs WHEN SPECIFICALLY REQUESTED. Exercise extreme caution when flying within a MOA. Also, have your lights on for better visibility.

MOAs are depicted on Sectional, VFR Terminal, Area and Low Altitude En Route Charts.

Alert Areas

An Alert Areas (AA) may contain a high volume of pilot training or an unusual type of aerial activity. A high volume of activity is considered as 250,000 operations a year (such as the Gulf Coast off shore operations). It is an airspace where you should be particularly "alert" when flying. All activities are conducted in accordance with FAR's. It might be an area for military activity, aircraft manufacturers or a high concentration of aviation activity, i.e. helicopters operating near oil rigs.

AAs are depicted on aeronautical charts.

Warning Areas

A Warning Area (WA) could contain the same kind of hazardous flight activity as a RA, however, they are located over international waters. This means artillery firing, aerial gunnery, or guided missiles. The reason it is called a WA (instead of a RA) is because it is located over International waters. Until recently, International waters started at three miles from the U.S. coastline. However, the FAA recently extended airspace authority to 12 miles and made ALL AIRSPACE between three and 12 miles a WA.

You can fly VFR through a WA and chance it. If you choose to fly IFR, ATC will not permit it unless separation is guaranteed.

WAs are depicted on aeronautical charts.

Controlled Firing Areas

The most unusual aspect of CFAs are they are not charted anywhere! It is not on your sectional. It is an airspace that contains activities (such as artillery firing) that, if not contained, could be hazardous to "non participating" aircraft. The distinguishing feature of a CFA is that it utilizes a spotter or ground lookout positions that indicate when an aircraft might be approaching the area. All activities are then suspended. The FAA does not chart the CFA's because they don't require a nonparticipating aircraft to change it's flight path.

CFAs must have 5 miles visibility or radar. A safety officer is in contact with an observer. Activities include EOD, artillery, small arms, static rocket tests and chemical disposals.

CFAs are the only category of SUA that is uncharted.

ROLES AND RESPONSIBILITIES

Pilot

The pilot exercises the responsibility and authority of the Pilot In Command (PIC).

1. The PIC of an aircraft is directly responsible for and is the final authority as to the operation of the aircraft.

2. Before commencing a flight, each PIC should become familiar with all available information concerning the flight, including that pertaining to the airspace involved in the area of operations. It is highly recommended that agencies conduct pre-contract and pre-use briefings concerning unit airspace procedures and problems.

3. If the SUA Controlling or Scheduling Agency can be contacted on VHF-AM frequency (as indicated on NOAA Aeronautical Sectional), then the pilot is responsible for making this contact prior to entry in order to receive real-time information on SUA activity. If direct contact cannot be achieved, the pilot must receive a briefing from a dispatch or other facility that can provide an activity briefing.

LIGHTS ON FOR SAFETY. SEE AND BE SEEN!!!!

On Scene Personnel

Aerial Observers, Aircraft Managers (Chiefs-of-Party, both fire and non -fire), Project Aviation Managers, Air Attack Supervisors/Air Tanker Coordinators, and Initial Attack Incident Commanders are included in this category. They are responsible for:

1. Obtaining information concerning and maintaining awareness of the airspace in which they are operating.

2. Obtaining the information necessary for local dispatchers or aviation managers to institute a comprehensive Temporary Flight Restriction (TFR) that will promote the safety of agency aviation operations.

3. After the initial restriction is placed in effect, the project aviation manager or the Incident commander (or designee, i.e. Air Attack) share responsibility for determining if the TFR needs modification as incident or project size changes.

4. Upon encountering a situation in which airspace conflicts arise, i.e., intrusions by nonparticipating aircraft, it is the responsibility of the individual observing the hazard to ensure operations are temporarily suspended until such time as safe separation of aircraft can be achieved.

5. Documenting all airspace conflicts, with immediate contact to the local dispatcher and/or aviation manager if problems are encountered (i.e., intrusions, near mid-air collision). Immediately taken by on-scene personnel to ensure adequate documentation and prevention of a reoccurrence of the incident.

6. Notifying the appropriate local dispatch office or aviation manager once the agency flight operations have ceased. If a Temporary Flight Restriction was in effect, the on-scene official-in-charge (i.e. Incident Commander) must be consulted prior to requesting the cancellation.

CHAPTER 14

GLOSSARY OF TERMS

Anchor Point – An advantageous location or point, usually a barrier to fire spread, from which to start constructing fireline. It is used to minimize the chance of being flanked by the fire while the line is bring constructed.

Backfiring – When attack is indirect, intentionally setting fire to fuels inside the control line to contain a fire. Backfiring provides a wide defense perimeter. Backfiring is a tactic which makes possible a strategy of locating control lines at places advantageous to the firefighter.

Barrier – Any obstacle to the spread of fire; typically an area or strip devoid of flammable fuels.

Base (of a fire) – The perimeter opposite the head (also, see "origin").

Blackline Concept – The space between the main fire and a fireline are burned out to insure safety of control forces and security of control lines.

Blow-up – Sudden increase in fire intensity or spread sufficient to preclude direct control or to upset existing control plans. Often accompanied by or may have other characteristics of a firestorm.

Break/Left or Right – Means "turn" left or right. Implies a prompt compliance. Usually on the drop run and when given as a command to the pilot. Implies a prompt compliance. Tanker 75, break left, small plane is crossing the target".

Burning Out – When attack is direct, or positionally setting the control line tied at the fire and the fire to fuels inside the control line to strengthen the control line. Burning out is eliminating fuels unless there is a fire. Crew Boss as a part of line construction, the control line is constructed to burn rapidly. Typically, this is from the line.

Burning Period – That part of each 24-hour period when fires will spread rapidly. Typically, this is from mid-morning to about sundown or late afternoon.

Canopy – The uppermost spreading, branch layer of vegetation.

Cardinal Points – The four chief points of the compass: North, South, East, West.

Clock Method – A means of establishing a target or point by reference to clock directions where the nose of aircraft is 12 o'clock, moving clockwise to the tail at 6 o'clock. "The target is now at your 9 o'clock position".

Cold Trailing – A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand to detect any fire, digging out every live spot, and trenching any live edge.

Configuration – How a helicopter is equipped.

Control Line – An inclusive term for all constructed or natural fire barriers and treated fire edge

NOTES

Every pilot should understand the following terms:

Anchor Point—An advantageous location or point, usually a barrier to fire spread, from which to start constructing fireline. It is used to minimize the chance of being flanked by the fire while the line is bring constructed.

Backfiring— When attack is indirect, intentionally setting fire to fuels inside the control line to contain a fire. Backfiring provides a wide defense perimeter. Backfiring is a tactic which makes possible a strategy of locating control lines at places advantageous to the firefighter.

Barrier—Any obstruction to the spread of fire; typically an area or strip devoid of flammable fuels.

Base (of a fire)—The part of the fire perimeter opposite the head (also, see "origin").

Blackline Concept—Fuels that remain between the main fire and a fireline are burned out to insure safety of control forces and security of control lines.

Blow-up—Sudden increase in fire intensity or rate of spread sufficient to preclude direct control or to upset existing control plans. Often accompanied by violent convection and may have other characteristics of a firestorm.

Break/Left or Right—Means "turn" left or right. Applies to aircraft in flight, usually on the drop run and when given as a command to the pilot. Implies a prompt compliance. "Tanker 75, break right - a small plane is crossing the target".

Burning Out—When attack is direct, or parallel with the control line tied at points of the fire, intentionally setting fire to fuels inside the control line to strengthen the line. Burning out is almost always done by the Crew Boss as a part of line construction; the control line is considered incomplete unless there is no fuel between the fire and the line.

Burning Period—That part of each 24-hour period when fires will spread more rapidly. Typically, this is from about mid-morning to about sundown or late afternoon.

Canopy—The uppermost spreading, branch layer of vegetation.

Cardinal Points—The four chief points of the compass: North, South, East, West.

Clock Method—A means of establishing a target or point by reference to clock directions where the nose of the aircraft is 12 o'clock, moving clockwise to the tail at 6 o'clock. "The target is now at your 9 o'clock position".

Cold Trailing—A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand to detect any fire, digging out every live spot, and trenching any live edge.

Configuration—How a helicopter is equipped.

Control Line—An inclusive term for all constructed or natural fire barriers and treated fire edge used to control a fire.

Convection—Transfer of heat by flow of liquids or gases. In meteorology, atmospheric motions that are predominantly vertical.

Convection Column—The thermally-produced rising column of gases, smoke and debris.

Creeping—Fire burning with a low flame and spreading slowly.

Crew Boss—An individual assigned to be in charge of a crew of firefighters and responsible for their safety and firefighting activities.

Crown Fire—A fire that advances from top to top of trees or shrubs more or less independently of the surface fire. Sometimes crown fires are classed as either running or dependent, to distinguish the degree of independence from the surface fire.

Direct Attack—A method of suppression that treats the fire as a whole, or all its burning edge, by wetting, cooling, smothering, or chemically quenching the fire or by mechanically separating the fire from unburned fuel.

Dispatch Center— A facility from which resources are directly assigned to an incident.

Divert— Change in aircraft assignment from one target to another or to a new fire.

Dozer Line—Fireline constructed by a bulldozer.

Drainage— Area drained by a river or stream. Usually includes at least one main canyon and several side canyons.

Drop—That which is dropped in a cargo dropping or retardant dropping operation.

Drop Configuration—The type of drop selected to cover the target, based on the tanker release strategy described in USFS Airtanker Performance Guides. Example: "1x4". These are general terms that are familiar to the ground personnel and are sometimes useful in clarifying the type of load to be dropped:

> **Salvo**— Dropping the entire load of retardant at one time, or dropping a combination of tanks simultaneously.
>
> **Trail**— To drop tanks in sequence causing a long unbroken line.
>
> **Split Load—**The dropping of a partial load.

Drop Zone— The area around and immediately above the target to be dropped on.

Dry Lightning Storm—A lightning storm with negligible precipitation reaching the ground.

Early—Indicating drop was early or short of the target. "You were early on the last drop."

Exit—A command used to indicate the direction air tactics wants the tanker pilot to fly after a given maneuver. "Exit southbound over the lake."

Extend—To drop retardant in such a way that the load slightly overlaps and lengthens a previous drop. "Extend your last drop".

Fine Fuels—Fuels such as grass, leaves, draped pine needles, fern, tree moss, and some kinds of slash which, when dry, ignite readily and are consumed rapidly. Also called flash fuels.

Fingers (of a fire)—The long narrow elongated portion of a fire projecting from the main body.

Firebreak—A natural or constructed barrier utilized to stop or check fires that may occur or to provide a control line from which to work. Sometimes called a firelane.

Fireline—The part of a control line that is scraped or dug to mineral soil, sometimes called a firetrail.

Fire Perimeter—The outer edge or boundary of a fire.

Fire Retardant—Any substance that by chemical or physical action reduces the burning intensity of a fire.

Firewhirl—A spinning, moving column of ascending air rising from a vortex and carrying aloft smoke, debris, and flames. These range from a foot or two in diameter to small tornadoes in size and intensity.

Flaming Front—That zone of a moving fire within which the combustion is primarily flaming. Behind this flaming zone combustion is primarily glowing. Light fuels typically have a shallow flaming front, whereas heavy fuels have a deeper front.

Flanking—Attacking a fire by working along the flanks either simultaneously or successively from a less active or anchor point and endeavoring to connect the two lines at the head.

Flanks of the Fire—The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

Flare-up—Any sudden acceleration of fire spread or intensification of the fire. Unlike blowup, a flare-up is of relatively short duration and does not radically change existing control plans.

Fuelbreak—A wide strip or block of land on which the native vegetation has been permanently modified so that fires burning into it can be more readily extinguished. It may or may not have firelines constructed in it prior to fire occurrence.

Fuel Type—An identifiable association of fuel elements of distinctive species, form, size, arrangement, or other characteristics that will cause a predictable rate of fire spread or difficulty of control under specified weather conditions.

Ground Fire—Fire that consumes the organic material beneath the surface litter of the forest floor, such as peat fire.

Head of a Fire—The most rapidly spreading portion of a fire's perimeter, usually to the leeward or upslope.

Helitack—The initial attack phase of fire suppression using helicopters and trained airborne teams to achieve immediate control of wildfires.

Hotspot— A particularly active part of a fire.

Hotspotting—Checking the spread of fire at points of most rapid spread or special threat. Is usually the initial step in prompt control with emphasis on first priorities.

Humidity—The measure of water vapor content in the air.

Incident— An occurrence or event, either human-caused or natural phenomena, that requires caution by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources.

Incident Commander (IC)—The individual responsible for the management of all incident operations.

Indirect Attack— A method of suppression in which the control line is located along natural firebreaks, favorable breaks in topography, or at considerable distance from the fire and the intervening fuel is backfired or burned out.

Initial Attack—The control efforts taken by resources which are the first to arrive at an incident.

Knock Down— To reduce flame or head in a specified target. Indicates the retardant load should fall directly on the burning perimeter or object.

Late— Indicating drop was late or overshot the target. "You were late on the last drop."

Long Term Retardant— A formulation that has the ability to reduce or inhibit combustion (burning) after the water it originally contained has evaporated.

Low Pass— Low altitude run over the target area. May be used by air attack to get a close look at the target or to show a tanker pilot a target which is difficult to describe. May be used by tanker pilot to get a better look at the target or to warn ground personnel of an impending drop.

Main Ridge—Prominent ridgeline separating river or creek drainage. Usually has numerous smaller ridges (spur ridges) extending outward from both sides.

On Target— Acknowledgment to a pilot that his/her drop was well placed.

Origin (of a fire)— Point on the ground where the fire first started (also, see "Base").

Parts of a Fire—On typical free-burning fires the spread is uneven, with the main spread moving with the wind or upslope. The most rapidly moving portion is designated the head of the fire, the adjoining portions of the perimeter at right angles to the head are known as the flanks, and the slowest moving portions are known as the base.

Pre-Treat— Laying a retardant line in advance of the fire where ground cover or terrain is best for fire control action or to reinforce a control line.

Project Fire— Usually refers to a fire requiring personnel and equipment beyond the resources of the protection unit on which it originates.

Rate of Spread—The activity of a fire in extending its horizontal dimensions. Usually it is expressed in chains per hour or acres per hour for a specific period in the fire's history.

Reinforced Attack— Those resources requested in addition to the initial attack resources.

Relative Humidity— The ratio of the amount of moisture in the air to the amount which the air could hold at the same temperature if it were saturated; usually expressed in percent.

Retardant Coverage— Area of fuel covered by a retardant. Also, degree of coverage of fuel.

Routes—The paths aircraft take from departure pattern to arrival pattern at destination.

Running—Behavior of a fire spreading rapidly with a well-defined head.

Saddle— Depression or pass in a ridgeline.

Safety Island— An area used for escape in the event the line is outflanked or in case a spot fire causes fuels outside the control line to render the line unsafe. In firing operations crews progress so as to maintain a safety island close at hand by allowing the fuels inside the control line to be consumed before going ahead. **During an emergency, tankers may be asked to construct a safety island using retardant drops.**

Scratch Line—A preliminary control line hastily built with hand tools as an emergency measure to check the spread of a fire.

Secondary Line—A fireline built some distance away from the primary control line, used as a backup against slop overs and spot fires.

Short-term Retardant—A formulation that relies on the moisture it contains to reduce or inhibit combustion and is ineffective after its moisture has evaporated.

Slop Over— The extension of a fire across a control line.

Smoldering— Behavior of a fire burning without flame and barely spreading.

Snag—A standing dead tree or part of a dead tree from which at least the leaves and smaller branches have fallen.

Spot Fire— A fire caused by the transfer of burning material through the air into flammable material beyond the perimeter of the main fire.

Spotting— Behavior of a fire producing sparks or embers that are carried by the wind and start new fires outside the perimeter of the main fire.

Spur Ridge—A small ridge which extends finger-like, from a main ridge.

Strike Team—Specified combinations of the same kind and type of resources, with common communications and a leader.

Surface Fire—Fire that burns surface litter. Other loose debris of the forest floor, and small vegetation.

Target—The area or object you want a retardant drop to cover. "Your target is the right flank."

Task Force—Any combination of resources with common communications and a leader.

Tie-In— To connect a retardant drop with a specified point (road, stream, previous drop, etc.). "Tie-in tanker 78's drop with the road."

Traffic Pattern—The path aircraft traffic flow takes when landing or taking off.

VHF— Very High Frequency radio. The standard aircraft radio that all civil and most military aircraft have to communicate with Federal Aviation Administration (FAA) facilities.

> Eight VHF frequencies are assigned for fire use. This allows for common frequencies amongst aircraft on incidents therefore bypassing some multi-agency radio compatibility problems.

Water Tender— Any ground vehicle capable of transporting large quantities of water. Usually 1,500 to 4,000 gallons.

Wetting Agent— A formulation which, when added to plain water in proper amounts, will materially reduce the surface tension of the water and increase penetration and spreading abilities.

Wildfire— (1) A fire requiring suppression action, as contrasted with a prescribed fire burning with prepared lines enclosing a designated area, under prescribed conditions. (2) A free burning fire unaffected by fire suppression measures.

EXHIBIT 1

HELICOPTER FIRE FIGHTING AND SAFETY

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PREFACE

This paper was written primarily to provide the helicopter pilot new to firefighting with a basic introduction to the fundamentals of a line of work which is interesting, exciting, and gratifying, though hazardous. For the veterans in this field, perhaps it will be a beneficial review of the subject.

The limitations of space have allowed for only the basic elements of fire behavior, firefighting tactics and techniques to be covered. Only with experience and additional study in these subjects, will you be able to consider yourself an effective professional firefighting helicopter pilot.

The emphasis throughout is on safety (the real bottom line) in hopes that something you may learn here will prevent a mistake that could cost you your life or that of those with whom you will be working. Like firefighting itself, the key is prevention.

The character of wildland fires varies with the differences in climate, terrain, and vegetation types. Consequently, tactics and the general approach to fighting fire may differ with geographic location. This paper was written from the Southern California wildland firefighting perspective.

Some of the terminology is common to the Incident Command System (I.C.S.) which standardizes terminology and organization for the management of multi-agency emergency incidents and is being adopted by most fire and other emergency service agencies across the country. Only the basics of a few key Air Operations positions are briefly discussed.

I.C.S. charts are included as appendices to provide a basic understanding of how the helicopter pilot fits into the Air Operations Branch of the Incident Command System, should he find himself in an emergency operation where I.C.S. is being utilized.

Understand that only that level of staffing is implemented which is necessary to effect a successful conclusion to the incident.

INTRODUCTION

The use of helicopters in the initial attack phase of wildland firefighting has been credited with a very significant reduction in the number of large acreage fires. It is the versatility of the helicopter that makes it a highly effective specialized piece of fire fighting equipment. There are, however, certain essentials required to transform its potential to reality.

A. Helicopter models and accessory equipment must be carefully selected for their suitability to the special applications of firefighting.

B. The quality of maintenance on both the helicopters and their accessories must be of the highest standard.

C. The best possible pilot, maintenance, and ground support personnel are required to meet the demands of the work. All personnel must be alert, thoroughly conversant with all helicopter ground safety precautions, and well trained in the attachment, operation, and use of all accessory equipment.

D. Pilot personnel should have mountain operations experience under conditions of high winds, turbulence and high density altitudes. They must have a good feel and understanding of wind flow patterns in mountainous terrain. Throughout this article, mountain experience shall be an assumed prerequisite for this type of work, as most wildland helicopter firefighting is done in inaccessible mountain areas.

E. All pilots must acquire a good working knowledge of fire behavior and basic fire fighting tactics, both air and ground. Most agencies directly involved in firefighting have excellent manuals on the subject. (Example: U.S.F.S. Fireman's Handbook)

F. A recognition by all concerned that the pilot of the helicopter, who is ultimately responsible for the safety of his crew, passengers and aircraft, will have the final authority in denying or complying with requests.

G. A thorough knowledge on the part of the firefighting agency of the capabilities, applications and limitations of the helicopter in firefighting operations. This knowledge is acquired through a process of education and experience. Pilots can be helpful in this regard.

FIREFIGHTING USES

General Uses

Operational supervision, reconnaissance, transportation of personnel and the hauling of both internal and external cargo are among the most frequent uses of helicopters in firefighting. The knowledge, training, experience and safety precautions for these applications are essentially the same as in similar operations, such as construction work.

Special Uses

All other uses of helicopters in firefighting are peculiar to these operations and require special training and strict adherence to the appropriate safety precautions associated with each of these applications.

Water or fire retardant dropping

For an in-depth discussion on dropping, including safety considerations, see "Water or Retardant Dropping Tactics" and "Drop Techniques" under "Firefighting Tactics."

Aerial Ignition Systems

Aerial ignition systems are utilized for prescribed burning in vegetative management programs, slash burning, and for backfiring or burn-out operations on large scale fires. See **AERIAL IGNITION SYSTEMS** chapter for operational guidelines and safety considerations.

SAFETY AND RADIO COMMUNICATIONS

Flight Safety

Firefighting air operations are often in steep canyons and mountain terrain under conditions of reduced visibility due to smoke. In this environment the danger of a wire strike or a mid-air collision is always present.

Air to Air Communications

Whether there are two, or two dozen aircraft working on a fire, the safe and efficient coordination of air operations demands dependable radio equipment and the use of a common VHF frequency by **all** aircraft on the fire. This is usually in addition to other frequencies on agency radios.

Helicopter pilots should make the following radio calls to aid in maintaining a mental picture of each others whereabouts:

Examples: "15 Lifting" (Helicopter-15 lifting off helibase); "15 Final for drop" (Helicopter-15 on final for a drop); "15 Clear" (Helicopter-15 clear for target area); "15 Final for Pad 1" (Helicopter-15 on final for pad 1 at the helibase)

Wires

Working in deep canyons and close to the ground in dropping operations automatically places the helicopter in what must be assumed to be a hostile wire infested environment. Therefore, it is incumbent upon the pilot to be as familiar as possible with the location of all wires and other flight hazards in the areas of anticipated operations. But regardless of familiarity, **always** conduct a thorough search for wires in the entire area of each fire prior to commencing operations. An approved wire cutting system is a highly recommended aircraft accessory in this line of work.

Other Aircraft

In addition to good radio communications and frequent position reporting it is an absolute necessity to keep your head and eyeballs on a constant swivel.

Smoke

Do not fly through smoke unless you can see through it and you are certain as to what lies on the other side.

Landing in the Burn

When landing at helispots within the burned area, anticipate a "gray-out" from flying ash. Reduce hover time to a minimum and maintain ground reference directly under and next to the helicopter. The principles are the same as for "white-out" due to snow. Putting one or two water drops on the helispot prior to initial use goes a long way toward alleviating this problem.

Escape Routes

The planning for each water drop should always include an escape route in the event of a loss of power, misjudged wind or smoke, failure of the tank or bucket to open, a last minute change of plans, sighting of personnel on the ground in the drop zone, or other unforeseen circumstances that could cause serious problems. If the approach to the drop is properly planned to include an escape route, the pilot can usually elect to:

- Fly away from the fire, hillside, smoke, or obstacle.

- Dump the water to lighten the load, thereby increasing the performance of the helicopter, and fly away from the problem.

- As a last resort with a water bucket, jettison the bucket electrically or manually to avoid damage to the aircraft or avert an accident.

Pull-ups, etc.

Whether upslope, cross-slope or downslope, all maneuvers throughout a drop run, such as banked turns, pull-ups, etc., must be planned **with the load** so that in the event of a drop mechanism malfunction, ample ground clearance will have been allowed for.

Pilot Fatigue

Although somewhat controlled by maximum time limits established by most agencies, all pilots must monitor and heed their own fatigue symptoms as well as all other aspects of their physical and mental well being.

Ground Safety on the Fireline — The Helicopter Pilot's Concern

The helicopter pilot must be concerned with ground safety on the fireline for two reasons: (1) The techniques used in helicopter fire suppression activities may have a very direct impact on both the positive and the negative aspects of the safety of ground crews, and (2) the helicopter pilot, being in a mobile elevated observation platform, has the unique advantage of being able to observe changes in the fire's behavior or the development of a situation which may be potentially dangerous, but which may be beyond the field of view of ground crews.

Air to Ground Communication

- Air to ground communications will usually be via the fire agency's radio frequencies. Radio communications with the ground is necessary:

- To receive detailed instructions so that the pilot may accurately provide the service requested when it is needed most.

- To provide command personnel with valuable updates on fire conditions and behavior as seen from the air.

- To warn ground crews of impending danger, perhaps unseen from the ground.

- To receive warning information regarding wires, other flight hazards, or other aircraft, perhaps unnoticed by the pilot.

- Ground Personnel should never assume that approaching aircraft are aware of flight hazards observed by personnel on the ground. Inform the pilot. Pilots would rather hear it again, than not at all and suffer the consequences. And then, how would you feel if you could have warned them?

Drop Hazards to Ground Personnel

- Be aware of the danger of loosening rocks, dead branches or other debris when dropping above or upslope from ground personnel and equipment.

- One of the characteristics of retardants is that they are very slippery. Consider the hazards to driving or ground crews when dropping on steep slopes or near roads.

- Avoid low direct hits on personnel, especially on steep slopes, and especially with larger helicopters having greater drop capability, as the same possibility of injury or death exists as with fixed-wing air tanker drops.

Rotor Downwash Effects on the Fire

All pilots must be constantly aware of the fanning effect of rotorwash on the fire and the subsequent danger to ground crews. (1) Basically,

the lower and slower the flying, and the higher the disc-loading, the greater the downwash. Rotorwash in strong gusty winds will generally be broken up to the extent that there will be no effect on the fire, or no more than caused by the wind itself. Cyclic and/or collective pullups increase rotor-loading and therefore produce more rotor downwash. This should be avoided when close enough to have an effect on the fire. When landing at helispots in the "burn", but near the fireline and the unburned area, assess the likelihood of blowing hot embers across the line into the unburned area. In addition to the obvious liability implications, your name could go down in infamy as the name of the new fire.

Fire Situations That Shout "Watch Out!"

The following are only a few of the danger signals which are instilled in the firefighter. These were selected because they are particularly obvious from the air and are therefore situations which the pilot should keep a close watch on so that he may warn those concerned or take initiative action as required:

A crew is building a fireline downhill toward a fire. A fireline should not be built downhill in steep terrain and fast burning fuels, unless there is no suitable alternate for controlling the fire; and then only when certain safety requirements are closely adhered to. This is a hazardous practice because of the danger that the fire may cross the slope below the crew and swing uphill to trap them. Helicopter water drops should definitely support this type of ground attack with extra awareness of rotorwash effects.

- A crew is fighting fire on a hillside where rolling material can ignite fuel below them.

- A crew is on a line in heavy cover with unburned fuel between them and the fire.

- A crew is away from the burned area where terrain and/or cover makes travel difficult and slow.

- A crew is getting frequent spot fires or slop-overs across their line.

- A crew cannot see the main fire and they are not in communication with anyone who can.

AIR OPERATIONS ORGANIZATION—AIRBORNE

Air Tactical Group Supervisor

Provides strategy for accomplishment of Air Operations objectives.

Coordinates all aircraft in incident airspace.

- Knows the number, identification and location of all aircraft in the fire area.

- Controls and coordinates the entrance to, or the exclusion from the area, of private aircraft, as conditions permit.

- Initiates F.A.R. 91.137 as required. All fire agency pilots should be very familiar with this regulation.

- Dovetails fixed-wing and helicopter operations whenever possible, consistent with safety, to provide uninterrupted aerial fire suppression. In some cases, this may require assigning separate sectors, corridors and/or altitudes.

Air Tanker Coordinator (Lead Plane)

The lead plane (radio call sign example: "Lead 51") establishes radio communications with the Air Tactical Supervisor for tactical decisions and drop requests.

The lead plane, as the name implies, serves as a "bird-dog", by pointing out drop targets for fixed-wing air tankers with a dry run or low pass over the target. "Bird dogging" is required to verify the target so that the drop can be delivered where intended. He will also provide information useful in the selection of a safe approach and departure path, and should advise all aircraft of any wires or other hazards.

Because the helicopters are operating lower and slower, they are in the best position to check out wires and other flight hazards and should pass on this important information to the lead plane.

If fixed-wing air tankers arrive at a fire without a lead plane, the Helicopter Coordinator may, after receiving instructions from the Air Tactical Supervisor or ground control, perform that function until relieved by a lead plane.

Helicopter Coordinator
Coordinates tactical and logistical missions and makes assignments for accomplishment of helicopter mission objectives.

Establishes helibase and helispot traffic patterns and routes to and from the target area.

HELIBASE (OR HELISPOT) ORGANIZATION AND SAFETY

Helicopter firefighting operations are usually centered at one or more helibases, sometimes located at or near the main fire base, and perhaps several helispots on, near, or within the perimeter of the fire.

Often, large numbers of personnel are transported, some of whom may be highly trained in helicopter safety and operations, and some who have never been exposed to a helicopter. It is for this reason that trained personnel who can enforce these safety rules must be a part of the crew on larger helicopters and or be in charge at each helispot.

The size of the helibase organization depends on the size of the operation and the availability of qualified manpower. One person may be required to perform the duties of two or more functions. The two key positions are:

Helibase (or Helispot) Manager
The helibase manager is responsible for the overall operation and safety of the helibase (or helispot). This shall include, but not be limited to:

- Logistical support: pumping, hose-lays, fueling, etc.

- Helibase personnel position assignments to include: T.O.L.C. (Takeoff and Landing Controller), radio operator, mixmaster, parking tenders, etc.

- Personnel and vehicle movements on or in the immediate area of the helibase.

- Dust abatement.

- Two helispot evacuation plans in the event of fire overrun. One of these plans for evacuation or protection **shall not** be dependent on the helicopter.

- Wind direction indicator.

- Coordination with Helicopter Coordinator to establish traffic patterns, etc.

Takeoff and Landing Controller (TOLC)
The TOLC is responsible for enhancing safety within helibase (or helispot) airspace by coordinating all aircraft movements through the issuance of takeoff and landing clearances and traffic advisories. Helibase (or helispot) airspace is defined as that airspace within a one mile radius and 1000 feet above the helibase elevation.

- Standardized hand signals are used as much as possible for takeoff clearances to minimize radio traffic.

- When ready for take-off, the pilot will give a “thumbs-up” signal indicating he is ready to go. The T.O.L.C. will-return the “thumbs up” if area around the helicopter and departure path are clear.

Ground Safety at the Helibase
All personnel assigned to helicopter operations are responsible for the enforcement of safety regulations.

1. Authorized personnel and vehicles should keep at least 100 feet clear of the helicopter at all times, unless specific assignment dictates otherwise.

2. Spectators must be kept at least 200 feet away. If crowd or traffic control is required, request law enforcement assistance as necessary.

3. There will be no smoking within 200 feet of any helicopter.

4. Personnel assigned to operations at a helispot shall wear goggles and a helmet secured with a chinstrap when they are near any running helicopter.

5. Soft hats must be left in the wearer's vehicle or may be hand carried by passengers.

6. Bystanders must be warned to protect their eyes from blowing sand and debris.

7. All equipment, tools, clothing, lunches, papers, refuse, etc., must be kept clear of the landing area.

8. Never approach a helicopter unless signaled to do so by the pilot or authorized crewmember.

9. Approach only from the front or downhill side, in a slightly stooped-over position, and in full view of the pilot. If terrain permits, this will be a position about 45 degrees off the nose, to the right side of the helicopter.

10. **NEVER** approach from or circle the rear of the helicopter due to the danger of the tailrotor.

11. **NEVER** go aft of the cabin doors while the helicopter is running, due to the danger of the tailrotor. The only exception to this applies to trained personnel assigned to loading the baggage compartment.

12. **NEVER** carry hand tools or other long objects in a vertical position or over the shoulder, due to the danger of the main rotor. All such objects shall be carried horizontally at or below waist level.

13. **NEVER** throw any object toward or from a helicopter, due to the danger of the main rotor.

14. **NEVER** stand with feet right next to the skid landing gear, especially during loading operations.

15. When it is necessary to wait on a steep slope over the edge of the helispot due to limited flat area adjacent to the landing pad, kneel or lay down and hold on to brush to avoid being blown over by the powerful rotorwash during landings and takeoffs.

16. All personnel, bystanders, and vehicles shall remain clear of the approach and departure paths at all times, due to the possibility of an emergency landing or of a load being jettisoned.

17. When preparing helispot touchdown pads, it should be remembered that some helicopter drop tanks provide very little ground clearance and should, therefore, be well cleared of stumps, rocks, etc.

18. Helispots should be equipped with a wind indicator, if nothing more than streamers on a pole.

19. Traffic control at all helispots should be limited as much as possible to hand signal (except in emergencies) to reduce radio traffic.

20. Landing and refueling areas shall be wet down whenever practical to prevent dust and sand ingestion by the helicopter engine or damage to other parts of the aircraft. Danger to the eyes of personnel and the general unpleasantness is also greatly reduced.

The following rules apply at all fuel storage facilities (fixed or mobile), and during any refueling operations.

- No smoking within 200 feet.
- "No Smoking" signs must be posted.
- Fire extinguishing equipment must be available.

• No fueling with personnel on board. The only exception is the pilot during "hot fueling". **NOTE**: Some agencies only allow hot fueling with a closed connection refueling system such as the Wiggins nozzle and receiver. This eliminates downtime during crucial moments of the fire.

FIREFIGHTING TACTICS

While space will not permit a complete course in firefighting, it is felt that some fundamental knowledge on the subject will better equip the pilot on his first fire contract to perform his job in a professional, safe and efficient manner. A basic understanding of fire behavior will help the pilot to recognize a dangerous situation he might not otherwise become aware of until too late. Early recognition could save the life of a fire fighter or possibly the pilot himself.

The Fire Triangle

The fire triangle consists of three sides: heat, oxygen and fuel. All three ingredients are necessary to sustain combustion. The removal of any one side breaks the triangle and is an effective means of suppressing or extinguishing the fire.

• Remove heat—application of water with aircraft drops or by ground crews with extended hoselines or backpumps.

• Removal of oxygen —application of dirt in a smothering action by ground crews with shovels.

• Removal of fuel— cutting line or firebreaks by bulldozer or handcrews; backfiring.

Initial Attack Crew Placement

The point of initial attack on a small fire should be the head of the fire if it is felt that control can be accomplished successfully, safety being the prime consideration. This depends on several factors such as the type of fuel, burning conditions, wind, terrain features, etc.

If, however, the head of the fire is too large and intense, attack should begin at a good anchor point, or at the point of origin, and a flanking action initiated. After the crew is transported close to the selected point of initial attack, the helicopter begins hauling water either by dipping with the water bucket at the closest open water source, or by filling at a water source with pumping equipment or adequate hydrant pressure. These locations should be preplanned and cataloged when practical.

The helicopters then begin a continuous water dropping operation, usually in direct support of the ground crews or attacking the head, hot spots, or spot fires.

Returning to the first phase of this concept, the safety of the initial attack crew must be uppermost in the minds of the pilot and the crew foreman in selecting a landing spot with reference to the fire.

This is usually accomplished by circling the fire once or twice for a size-up of the fire and familiarization with the lay of the land. For this reason, the crew foreman should be seated on the same side as the pilot. The foreman then selects the point at which he feels he can safely attack the fire and so informs the pilot.

The pilot then selects a landing spot as close to that point as possible, then double checks with the foreman to see if his selected landing spot is safe for the crew from the standpoint of the fire. This recon also gives the crew foreman his best opportunity to check out possible escape routes for his crew in the event of a rapid change in fire conditions. This should be communicated to the pilot in the event protective drops or evacuation become necessary.

Water and Retardant Dropping Tactics

Water Dropping Tactics

Water drops are used in direct attack, which means dropping directly on the burning fuel on the active fireline for the purpose of suppression and extinguishment.

Retardant Dropping Tactics

Retardant drops are primarily used in indirect or parallel attack, or in front of the fire for the purpose of retarding the rate of spread and the intensity of burning, especially in areas where ground crews are not expected for some time.

Often a retardant line may be established and the fire will actually burn itself out or at least hold until secured by other means.

Spot Fires

Spot fires, or small new fires which occur outside of the perimeter and usually downwind of the main fire are caused by fire brands which have been carried aloft by the convective heat column, then precipitate out after being carried by the wind. Sometimes they are caused by burning animals fleeing the fire, but spot fires should always take priority over the main fire; otherwise, there will be two large fires which will merge into one still larger fire, and crews may get trapped between the spot fire and the main fire.

Selecting the Attack

Unless it appears that there is a good chance of cutting off the head or front of the fire with drops and holding it with continued drops until ground forces can secure it, attack on the line should begin at the bottom of the hill, at a good anchor point, or at the point of origin of the fire with each successive drop overlapping the previous one and working toward the head in a flanking action. If drops are begun at some other point along the line, or uphill from lower fire, the lower or upwind fire will hook around the section of line extinguished by the drop and wipe out all that had been accomplished.

Fire Ground Orientation

Because everybody on the ground seems to have a different idea of where North, East, South, and West are, the flanks of the fire should be referred to as the left and right flanks as viewed from the point of origin. This eliminates a lot of confusion and radio time for explanation.

Additionally, divisions of the fire **should** be lettered alphabetically clockwise from the point of origin, thus giving the pilot some clue as to where he might be able to find Division "C", for example, when not provided with a fire map. Unfortunately, pilots are seldom provided maps and divisions often seem to be named randomly, rather than in accordance with this system.

Upslope Fire

In most cases, it is better to allow the head of an uphill-burning fire to "ridge out" or hit the top, rather than attempt to stop it on the slope, unless there is a good chance to stop it, or if it is a long way from the top. When the fire is about to ridge out, sometimes a few drops will slow down the speed and intensity with which it hits the top.

Slop-overs

Sometimes it is better to orbit with a load to pick up any spot fires or slop-overs that may occur across the firebreak at the top (if a firebreak exists), or drop on the fireline along the ridgetop after the fire loses some of its momentum.

Hot Spots

Hot spots, not to be confused with spot fires, are the hottest portions of the flanks of the fire. Hot-spotting is the attacking of these portions of the line. If the head of the fire has laid down somewhat and is no longer "making a run", the remaining fire could also be referred to as hot spots.

Backfiring

The principles of backfiring must be understood by the pilot so that he can recognize a backfire before he starts dropping on it — very embarrassing, even if those responsible neglected to inform you of the backfiring operation. Backfiring is a means of removing fuel in the path of a rapidly advancing hot fire under very exacting conditions. When the head of the fire creates a tremendous convective heat column, cooler air rushes in from all sides, including the downwind side, creating a wind toward the head or hottest portion of the fire. When this wind develops to a point of being steady, a line of fire is started ahead of the main fire from an established barrier such as a road, firebreak, dry river wash, etc.

This backfire then burns toward, and is sucked into, the main fire creating a wider fuel break. The use of fusee's (road flares), a drip torch, or of course the helitorch, are easily recognized from the air. However, sometimes nothing but

matches are available and that is when the ability to recognize a backfiring operation is helpful.

Firing-out

Firing-out operations are somewhat similar to backfiring, in that they are intentionally set fires. However, this is more associated with mop-up operations and consists of burning out ragged unburned islands within the perimeter to speed these operations to a conclusion so that these areas do not have the opportunity of taking off again days later and possibly spotting across the line.

Drop Concentration vs. Fuel Loading

Light fuels with no canopy, such as grass and very light brush, require less concentration and, providing the fireline is not too ragged, give the pilot the opportunity to put out more fireline with a single drop.

Medium to heavy brush and timber, however, require heavier concentration to penetrate the canopy and reach the ground fire and heavy fuel masses.

Means of Drop Control By the Pilot

Airspeed and Direction

Drops made into the wind or at slower airspeed increase the concentration of the drop by shortening the swath. Drops made downwind or at higher airspeeds will reduce concentration and increase swath length.

Altitude

Altitude affects concentration in swath width- the lower the drop, the narrower the swath and the heavier the concentration. Conversely, the higher the drop, the more time the water mass has to break up into droplets and be dispersed by wind drift, therefore, the wider the swath and the lighter the concentration. Obviously, high crosswind drops would have too great a swath width and dispersal, so lower drops are made in strong crosswinds.

Drop Techniques

Water (or retardant) dropping probably demands more judgment of the pilot than most other helicopter operations, merely by virtue of the many variables involved. It would be simple to state that, ideally, all drops are made at fifty feet and fifty knots, into the wind, over flat ground, no wires, and clear of the smoke. However, the "ideal drop" is very rare indeed. Equally as rare, we hope, is the drop made under the worst possible set of circumstances, and then only made because it might save the lives of a ground crew. Most drops are made under conditions within the wide range between these two extremes.

For the experienced mountain pilot new to firefighting, training should consist of:

- familiarization with fire behavior and firefighting tactics,
- dual instruction drops on imaginary targets in various terrain features, and
- some dual instruction on at least the first actual fire.

While it is impossible to enumerate all of the possible drop situations, the following will point out some of the inherent dangers and precautions of various types of drops.

Hover Drops

Except on isolated snags or trees, hover drops are strictly taboo on active ground fire unless well inside a burned area, as the rotor downwash will intensify and spread far more fire than the drop will extinguish, possibly endangering a groundcrew.

When attempting to concentrate the bulk of the drop on a single snag or similar target, a modified quick-stop (not recommended with a bucket) or low airspeed drop should be used rather than hovering. The slower the drop, the higher it should be made to preclude the effects of rotor downwash on the fire.

Cross-slope Drops

Cross-slope drops, whether above or below the fire usually present no special problems, but watch your main rotor clearance on the uphill side in steep terrain.

Downslope Drops

Downslope drops, especially if in steep terrain, require planning by picking out objects on top of the ridge above the fire and in the background beyond the fire to line up on, as the downslope drop presents a blind run, that is, the target is not visible to the pilot until he has crossed the ridge above the fire, and then only if not obscured by smoke.

If the slope is very steep it may be advisable to approach the ridgetop at a reduced airspeed, using caution not to get too slow if downwind or too low when on the "lee" side (downdrafts), then drop the nose and make a descending drop off the ridge. Slowing prior to the "Dive"reduces the chance of excessive speed. The pull-out must be planned to provide adequate terrain clearance in the event the drop is aborted for any reason. Downslope drops may be made at a slower airspeed and are more effective, if made into the wind. Downslope drops low on the slope may be approached cross-slope at a reduced airspeed with a 90 degree descending turn to the target. This allows the pilot to better see his target if turning to his side.

Upslope Drops

Although upslope drops afford the pilot a better view of his target than any other type of drop, they should be avoided as much as possible.

This is the drop that shouts "Watch Out." It was stated earlier that building a fire line downhill on a fire is "hazardous," and that it "should not be done in steep terrain and fast burning fuels, unless there is no suitable alternate for controlling the fire; and then only when certain safety requirements are closely adhered to."

Similarly, upslope dropping can be very hazardous, and should only be done in steep terrain when there is no suitable alternative. An extra measure of caution should be taken if attempted with a water bucket.

If the upslope drop is made near the top of the ridge, there is no real problem. This drop can be made up or downslope from level flight at an altitude to safely clear the elevation of the ridgetop.

The drop which requires the most skill, careful judgment, and experience is the upslope drop made at a target low on a steep hillside. This is not a drop for the newcomer to these operations and should be worked up to gradually as more fire experience has been accumulated.

It bears repeating that this drop should be used even by the experienced, only when alternative techniques will not work. Obviously, this drop compromises safety in the event of a mechanical malfunction.

If the upslope drop is on a target low on the slope, the pitch attitude of the helicopter should be rotated well before the target to effect a straight line climb at an angle to safely clear the ridgetop. This drop approach must be entered with considerably more airspeed so that once the rotation for climb has been accomplished, forward momentum alone will sustain the climb to cross the ridgetop at a safe airspeed and altitude with the load to allow for an abort or malfunction and without a requirement for additional power. The departure should be either straight ahead over the ridge, or a normal banked turn without added power. If not approached in this manner, especially if downwind, the pilot will find himself in a situation of low altitude, low airspeed, and insufficient climb, requiring a near zero airspeed 180 degree pedal turn and full power causing the fire to flair up. If a drop mechanism malfunction were to occur as well, settling with power and an accident would be the most probable result.

Smoke

Some of the factors that are weighed in deciding which technique will be used are, wind direction and velocity, direction and intensity of burning, general terrain features, and the steepness of

the slope. The variability of each of these factors presents an infinite number of possible combinations. Another factor, perhaps the most variable of all, is the smoke pattern, and this may indeed be the final determining factor in choosing which technique will be used on a drop.

Example: In considering consecutive drops on the same target, the only constant factor is the terrain, but while the other factors are variable, the extreme variability of the smoke pattern as it eddies in and around rough terrain may very well dictate consecutive drops 180 degrees apart. What might otherwise be a downhill drop, may become an uphill drop because the smoke completely obscures the target when approached from the uphill side.

Water Bucket Operations

The helicopter water bucket is used extensively for dropping water or retardant on grass, brush, and forest fires. The bucket is slung externally below the helicopter. It has an advantage over a fixed tank in that it can easily be removed to enable the helicopter to perform other roles without being encumbered by the weight or bulk of the bucket. It has a lower initial cost, has a simpler installation, is able to be jettisoned, and is compatible with open water filling (lakes, streams, etc.)

It also has disadvantages, the most obvious ones being: it's a sling load, therefore, less maneuverable; the helicopter is either out of ground effect or nearly so, reducing takeoff performance; and it has more drag, thereby reducing enroute and deadhead speeds. Because it is a sling load, it requires increased pilot finesse.

The bucket also increases pilot fatigue due to the intense concentration during dipping (filling), versus actually being able to land and relax during the one minute the tank equipped helicopter is being filled by hose line.

Several companies manufacture water buckets in various sizes and capacities to match the capabilities of most helicopters. Actuation and method of operation may vary (mechanical, electric, hydraulic, or pneumatic) but the purpose is the same—aerial application of water or retardant on or near the fire line. Different fire and fuel situations will dictate the actual drop method.

Bucket Systems Preflight Checks

The following equipment preflight checks should be performed prior to water drop operations:

- Check operation of: cargo arming switch; bucket open and close operating switch; jettison switch; and mechanical jettison.

- Adjust the mirror for the pilot to see the bucket and cables when filling and dropping.

- Check sling cables for security and length. The cables should be long enough to allow the helicopter to land aft or to the side of the bucket while hooked up. This allows the bucket to be hooked up on the ground and the helicopter landed with the bucket hooked up (1) in normal operations, (2) in the case of the bucket's failure to open, or (3) the failure of the cargo hook to release. Cables should be as short as possible to allow takeoff in ground effect.

- Adjust bucket capacity level to coincide with helicopter performance at water pick-up point.

- Bucket should be equipped with flotation collar if operating in open water in case of accidental or intentional release.

Precautions

- When hooking up bucket on ground, check that cables are not crossed or tangled, or over either skid.

- When flying with bucket empty, fly with dump gates open to reduce oscillation and excessive drag.

- When using large bodies of water for filling, dip near shore with constant forward motion. Obtain good shore reference to avoid excessive drift.

• When using small lakes in big timber or in deep depressions, anticipate the power needed to climb out of the "hole" with the bucket loaded.

• Beware of snags or hooking bucket on submerged objects during water pick-up.

• When using fast flowing streams or rivers for filling, face the flow of the stream if sufficient power is available. Although heavier loads can be picked up going downstream, it is more dangerous! The speed and momentum at which problems occur moving down stream is much faster and increases the hazard of snagging submerged objects or allowing drift left or right. The possibility of the bucket passing the helicopter and the pilot applying rear cyclic to stop the bucket's downstream motion could result in the tailrotor striking the water when the slack is taken out of the cables.

• If dipping in a portable tank, use a signal man, or, if one is not available, remove the door and use long line visual techniques.

• Avoid the hazard of flying over people, structures, vehicles, etc., as with any external load. Remember, in the USA, water bucket operations must conform to F.A.R. Part 133, Rotorcraft External Load Operations.

• The sling lift ring must be able to withstand constant twisting. The cargo hook should also be checked frequently. A failure of either would result in dropping a bucket.

• The pilot should wear a life preserver during water bucket operations if filling from open water.

Typical Water Bucket Operation

After completing the previously mentioned bucket systems preflight checks, you are ready to begin water bucket operations.

• Hover vertically, lifting the bucket off the ground, checking continuously to ensure that no cables are crossed, tangled in themselves or their attached control lines, or the skids. This can be done visually by yourself, either in the mirror or out the door, or it can be checked and relayed to you by a ground signal man.

• Fly to the nearest suitable water fill site. Approach the water, making water contact with the bucket with some forward motion to allow the bucket to tip over and fill while slowly continuing to move forward (this eliminates drift). Close the bucket door and apply power, lifting the bucket free of the water as you transition forward into translational lift. A constant smooth motion enables the use of less power and results in less tugging and jerking on the hook and helicopter. With a little practice, your approach, filling process, transition to takeoff and climb-out will be one smooth fluid movement with no actual stopping to hover over the water.

• The bucket water drop is almost identical to a tank drop except a little slower. As with tank drops, various combinations of speed and altitude produce different results and are varied for different fuel types and fire conditions. A little experimenting will help you decide what works best for you and the particular situation.

Fixed Drop Tank Operations

While other fixed drop tank designs for helicopters exist, the L. A. County Tank is probably the most widely used. It is a 360 gallon tank which mounts to the belly of Bell 204, 205, 212, 214 and 412 series helicopters equipped with high skid gear.

Recent modifications provide the pilot yet another means of drop control by offering three drop options: 2 single door drops, a salvo, or a trail drop. This was accomplished by adding a longitudinal bulkhead down the centerline between the two doors. The following are examples of the uses of the 3 drop options:

Single door drops

Single door drops are used for: light or grassy fuels requiring less concentration; jagged fireline with short straight sections of line; and pinching off small spot fires by making two single drops 90 degrees to each other on the head, uphill, or downwind side, each drop being 45 degrees to the direction of fire spread

Salvo (double door drop)

Salvo drops are used with heavy fuels or canopy requiring heavy concentration for penetration or cooling; longer drops of heavy concentration; heavy concentration required to reduce excessive dispersal in very strong winds; or for snags or downed logs

Trail Drop

Trail drops are two single door drops automatically sequenced to provide a single extended drop pattern. **NOTE:** Some installations do not have the automatic sequencing, so the two single drops must be triggered separately by the pilot to get a trail drop. It is primarily used for long drops on light or grassy fuels with a straight fireline.

Tank Systems Preflight Checks

Check proper installation of the following tank-to-aircraft connections:

- four pip pins in landing gear saddle straps
- manual release cable
- compressed air hose quick disconnect
- electric control cable

Check condition of:

- tank
- compressor installation
- compressed air accumulator
- associated wiring and plumbing

Mirror adjusted to see tank doors

Helicopter fill hose on board. This consists of a 15 foot section of 3 inch rubber hose with a 3 inch female Kam-lok fitting on one end (which mates with the male Kam-lok fitting on the right front corner of the tank) and a 2 1/2 inch "D" handle shut-off with swivel on the other end. This is mated to the 2 1/2 inch water supply hose lay from the fire engine or hydrant.

Operational and Inflight Checks

- Tank System circuit breakers—in
- Tank Arming Switch — arm
- Tank System warning lights — press to test
- Doors Open Warning Horn — test

The purpose of the horn is to prevent landings with doors open, as they extend below the skid gear in the open position and serious tank damage is likely to occur.

WARNING: Never open the tank doors electrically while on the ground as damage to the doors and tank is probable, due to the force with which the compressed air system would slam the doors into the ground.

Doors should be opened by means of the **manual release** at the end of each day and left opened to relieve the door seals.

The warning horn should sound approximately 20 seconds after door opening, or after the battery is turned on if the doors were already opened. After the horn sounds, close the doors by pulling down on the "Chinese hat" switch on the cyclic stick (or the door close button on the collective head in some installations.) The horn should stop within several seconds.

At a hover, or in flight, check the operation of the following:

- manual release for ease of operation

- drop selector switch, located on collective head (or the tank control panel on the center console in some installations.)

- Double (salvo)—both doors open simultaneously when activated

- Single — the right door opens on the first activation and the left door on the second activation. The right door may be closed before opening the left or closed together with the left.

- Automatic— (trail) the left door opens automatically at a preset interval following opening of the right door (not available in some installations.)

Drop switch (door open)- the thumb switch on the left side of the cyclic (or the thumb button in the right rear corner of the collective head in some installations) activates the drop option which has been selected with the drop selector switch. Each operation should be checked and door position verified in the mirror.

Door close switch (Chinese hat switch, or the thumb button in the left rear corner of the collective head in some installations) - hold down approximately 2 or 3 seconds or until door lights go out.

Emergency release or panic switch (cargo hook release button) - The "double" position should be re-selected on the drop selector switch following completion of each full drop so that if a problem occurs during the critical takeoff phase, the entire water load may be jettisoned. If, however, the selector switch were inadvertently left in the "single" or "automatic" position, the entire load may still be jettisoned by use of the cargo release button. Its operation should be checked with the drop selector switch in each of the positions.

During fill operations, ensure that helicopter fill hose is disconnected and personnel are clear prior to lift off.

FIXED TANK VS. WATER BUCKET COMPARISON CHART

	TANK	BUCKET
LOWER INVESTMENT		X
SIMPLE INITIAL INSTALLATION		X
JETTISONABLE		X
QUICK CHANGE TO OTHER SLING LOADS		X
SUITABILITY W/ OPEN WATER SOURCES-LAKES/RIVERS		X
HIGH DEGREE OF MANEUVERABILITY	X	
HEAVIER LIFT CAPACITY DUE TO LOW IGE HOVER/TAKEOFF	X	
OSCILLATION FREE	X	
HIGH SPEED DEADHEAD RETURN	X	
ABILITY TO OPERATE IN STRONG, GUSTY WINDS	X	
EASE OF JUDGING HEIGHT ABOVE OBSTACLES	X	
QUICK DUMP FOR PATTERN AND ACCURACY	X	
THREE DROP OPTIONS (2 SINGLES; SALVO; TRAIL)	X	

AERIAL IGNITION SYSTEMS

Aerial ignition systems must be used only within a "window" or prescription of fuel and weather conditions suited for the particular application. Additionally, its use must be closely managed and directed by the "firing boss" who is an experienced firefighter trained in its use. The two most commonly used devices are:

Helitorch

A skid mounted fuel container (usually a 55 gallon drum), an electric fuel pump, an ignition system and associated plumbing and wiring. This unit is slung beneath the helicopter. Some units also have a means of eliminating hang fires, such as a C02 fire extinguisher. A hang fire occurs when a glob of burning fuel mix (alumigel and gasoline) adheres to the valved outlet after valve closure. This may subsequently fall off in an area outside the area to be burned causing an unwanted fire. This potential problem requires assurance that the equipment is functioning properly and very close monitoring by the pilot.

Safety Precautions

Although some of these precautions apply to all aerial ignition systems operations, most pertain specifically to helitorch operations.

The following items are a mixture of safety precautions and operating guidelines. Although many are agency responsibilities, the pilot bears considerable responsibility as a key player. An opportunity for disaster will present itself if these safety precautions are not taken. To avoid any liability and avert a disaster, **all** players should insist on adherence to these rules.

1. Provide adequate flammable liquid fire protection at helitorch helispot and mixing operation.

2. The helicopter landing pad shall be a minimum of 100 feet from the mixing area.

3. Ensure proper grounding of all components in the mixing operation.

4. Provide static free 100% cotton protective clothing for the mixcrew.

5. All personnel shall attend a briefing prior to the burn operation.

6. All personnel involved in any capacity in the helitorch helispot operations shall attend a briefing regarding their duties and responsibilities, safety, and an emergency action plan.

7. Only the minimum required personnel are allowed within 100 feet of the mixing operation.

8. No smoking within 200 feet.

9. The pilot and firing boss shall communicate on a discrete frequency.

10. The pilot shall be provided with a map depicting the burn plan firing sequence.

11. The pilot, burn boss, and firing boss shall make a reconnaissance flight prior to starting the burn to review the plans, define the area to be burned, and ensure that the area is clear and no ground personnel are in positions of jeopardy.

12. The pilot must have fire experience and a clear understanding of fire behavior.

13. Double check cargo hook and all helitorch equipment operations.

14. Generally, fly contour runs at 50 to 200 feet above ground level, flying successive runs from higher elevations to lower elevation. Wind drift, topography, and the ability to keep the fire within the prescribed boundaries when operating near the boundaries, determines the altitude selected.

15. Generally, fly runs 90 degrees to the wind direction, working from the downwind end of the burn block to the upwind end.

16. It is safer to bite off a little less than too much on each run.

17. If uncertain of firing boss's instructions, get clarification and get him to observe a dry run to be certain. **Mistakes can be dangerous and costly!**

18. Maintain a safe minimum speed.

19. Helitorch should be placed in front of the helicopter for on-the-ground hook-up with cables running between the skid landing gear. Land behind the helitorch after setting it on the ground.

20. To lift the helitorch, lift off vertically and move into position over the helitorch until the slack is taken up, ensuring no cable entanglements.

"Ping-Pong Ball Machine"

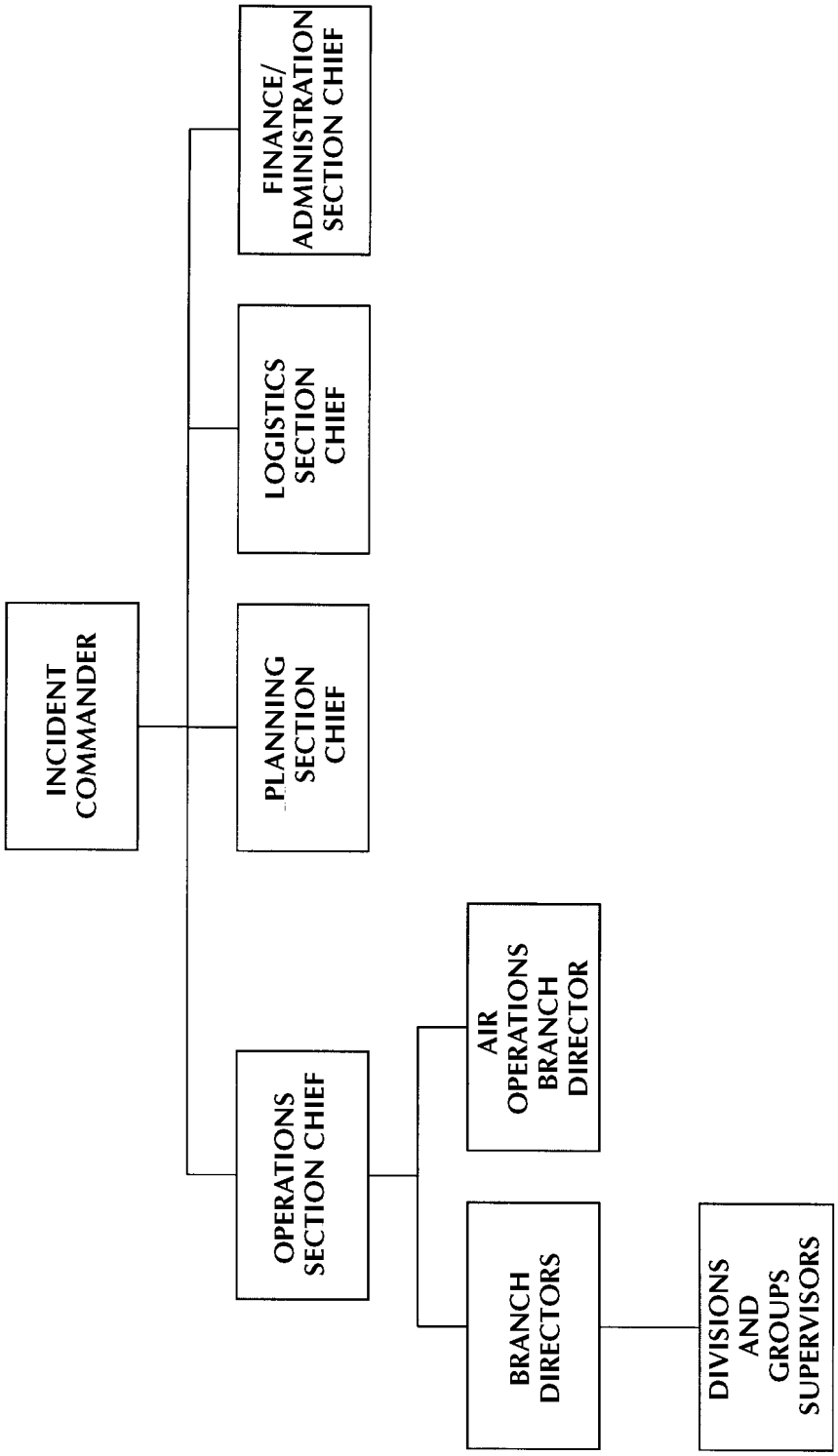
This unit is carried inside the helicopter with an operator who loads and operates the machine. The machine consists of a hopper into which the balls are fed and a cam operated system which controls drop rate and ethylene glycol injection of the ping pong balls which contain potassium permanganate. Each ball is individually injected with the catalyst immediately before it is dropped through a chute that extends outside the helicopter. The chemical reaction takes approximately 30 seconds before ignition occurs, virtually eliminating any chance of inflight fire.

CONCLUSION

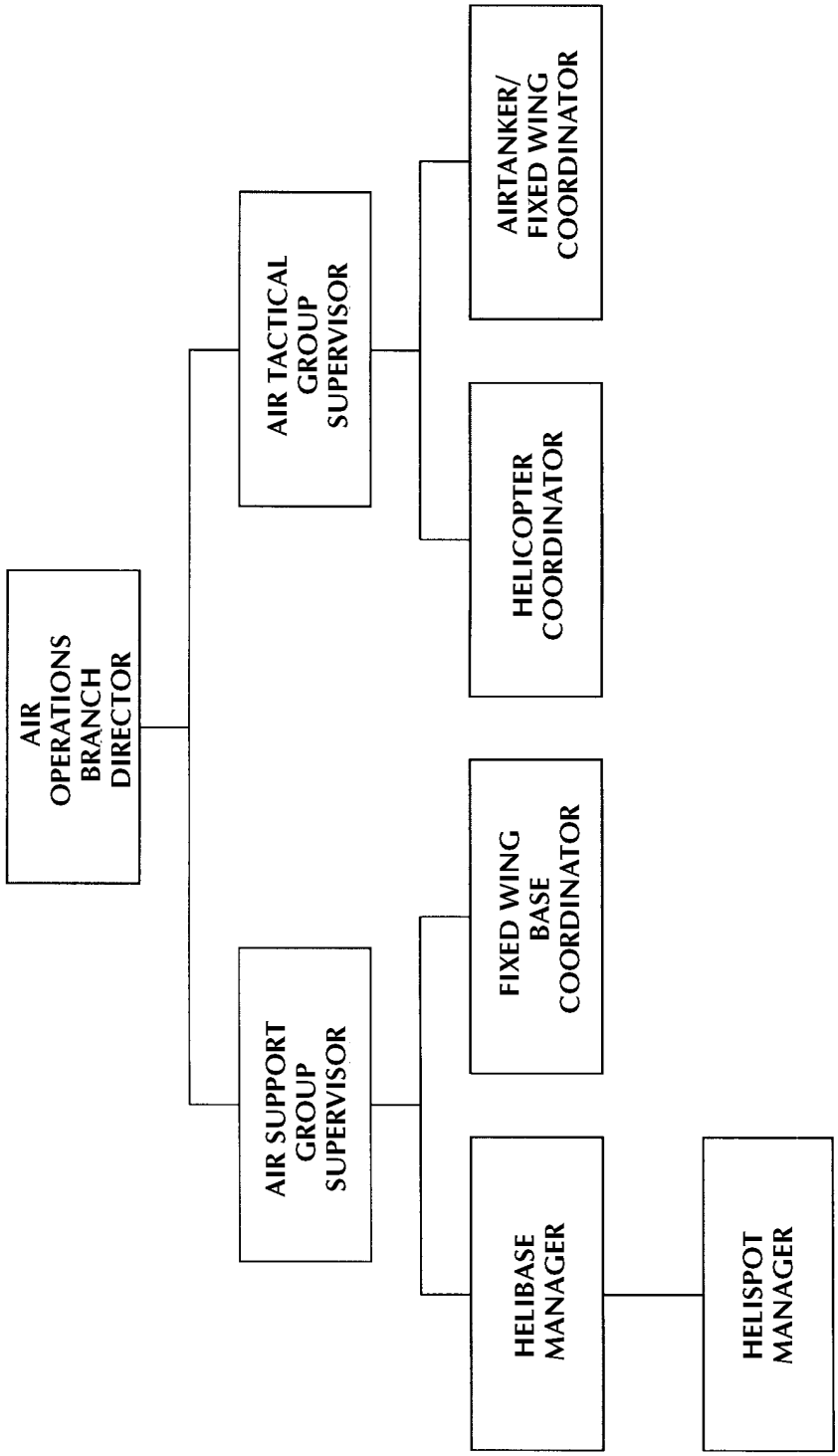
It is only through knowledge, training, alertness, careful judgment, experience, and most of all, adherence to safety practices, that the helicopter pilot may become an effective fire suppression pilot. **NOTE:** It is easy to get tunnel-vision on killing the fire breathing dragon, and it can get exciting. But the best advice this author ever had, came from a highly respected, now retired, brush firefighting chief who said, "Remember, there's not a stick of brush or a house out there that is worth a man's life."

APPENDIX I

TYPE I AND II ICS ORGANIZATION



AIR OPERATIONS BRANCH ORGANIZATION



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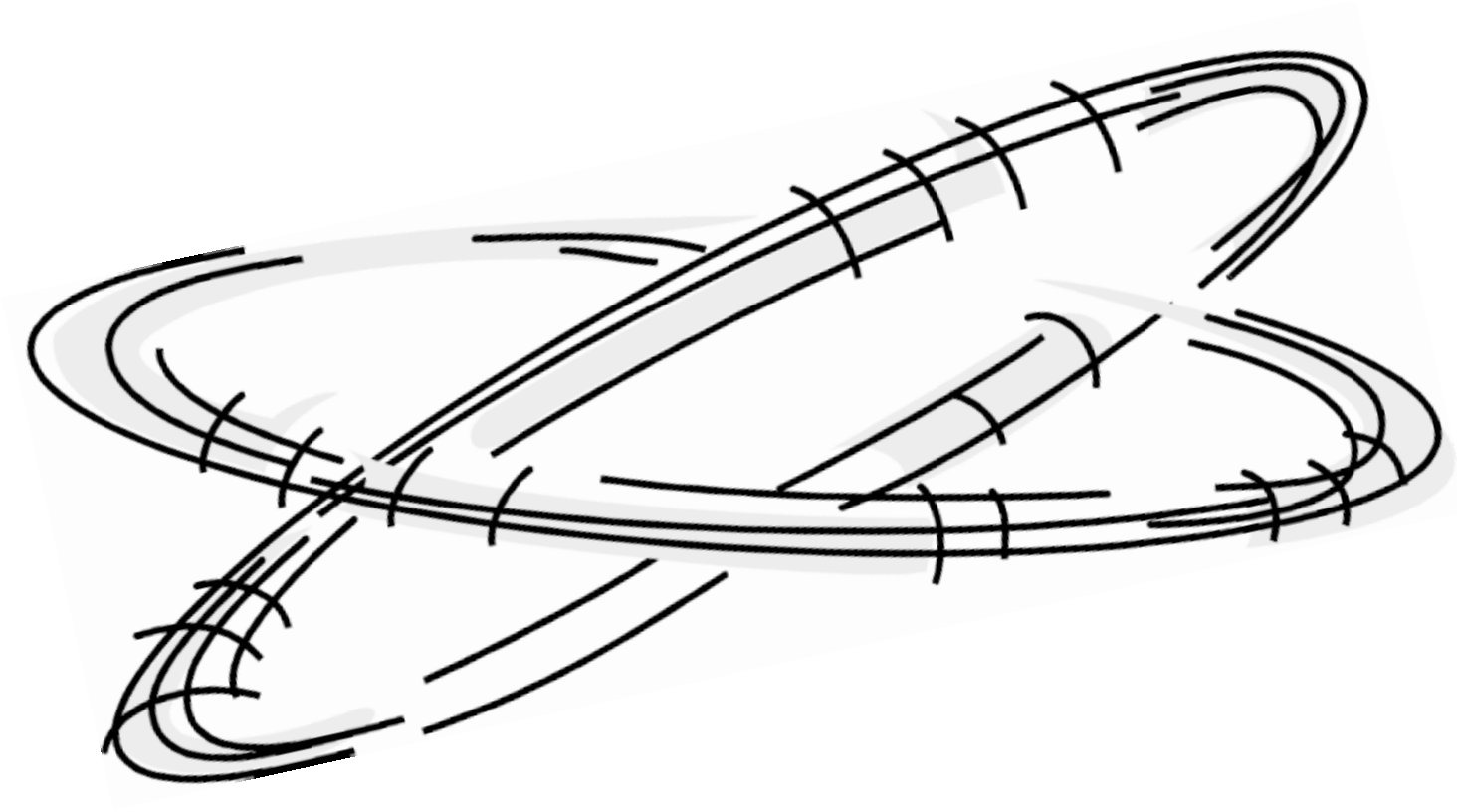

EXHIBIT 2

INCIDENT AVIATION COMMUNICATIONS, FUNCTIONS, AND FREQUENCIES

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Communications Functions

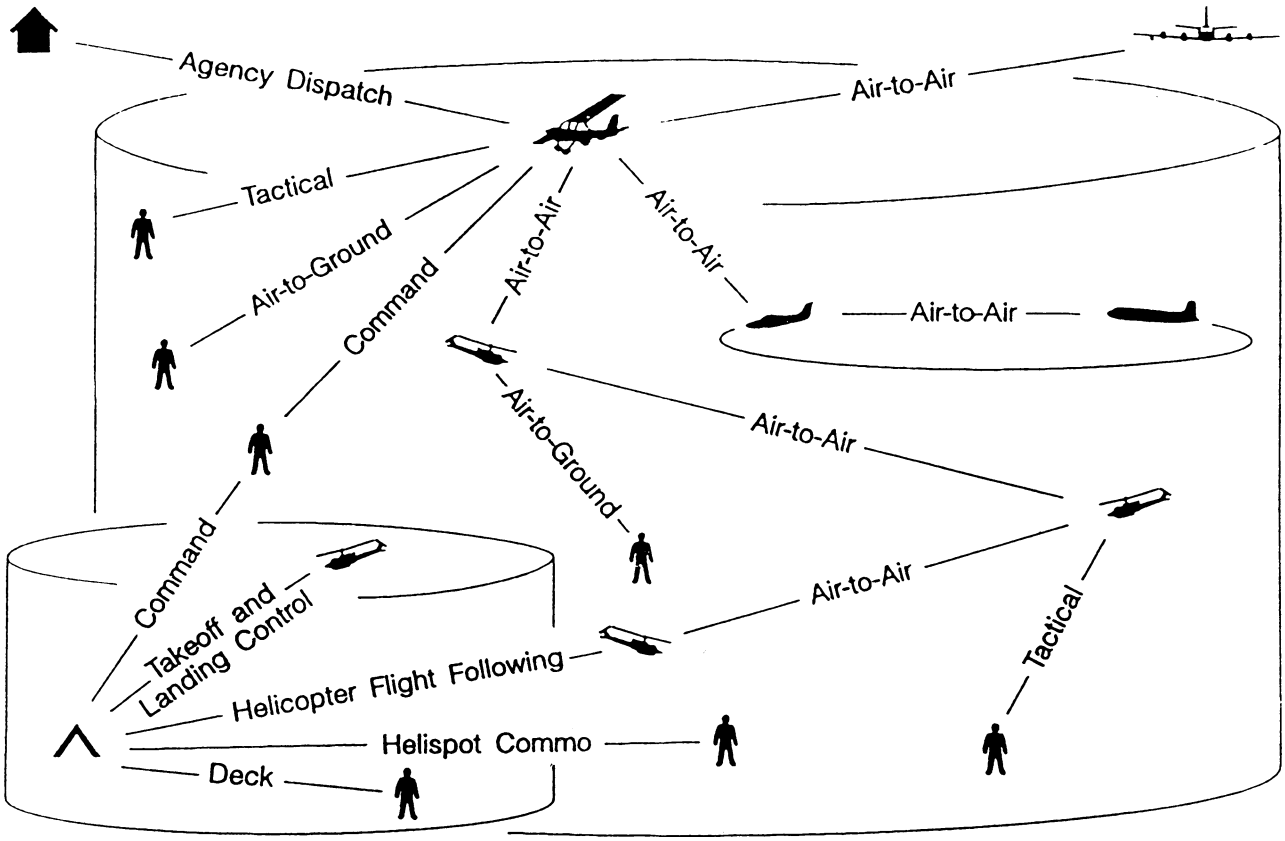


Figure 1. Incident Radio Communications Plan.

Separate functions have been designated for various incident communications. For Communication plans to be effective, radios and frequencies must be compatible. All aircraft must have a 720 channel AM radio. Pilots should not be required to monitor more than two frequencies at once, one AM and one FM. If radio traffic becomes excessive, additional frequencies must be assigned or operations must be curtailed.

Minimum functions are: Air-to-Air, Air-to-Ground, Helicopter Flight Following, Helicopter Take-Off and Landing, Agency Dispatch, Command, Tactical, Helispot Communications, and Helibase Deck.

On simple incidents, more than one function can be combined on one frequency. As incidents grow in complexity, discrete frequencies must be assigned to each function. All personnel must be briefed on frequencies assigned to each function.

Aviation managers, the Communications Unit, and Dispatchers should work together to develop an aviation communications plan for each incident. Input from pilots should be solicited to help develop the plan. Frequencies are assigned only by the Communications Unit or Agency Dispatcher.

RADIO DISCIPLINE

Radio discipline is required to maintain effective radio communications and safety. All messages must be brief and to the point, so that others can access frequencies. When changing to a new frequency, personnel must listen for any communications in progress before transmitting. Common incident terminology should be used whenever appropriate. It is particularly important to keep the Air-to-Air frequency open and available to pilots. After using other frequencies, personnel should return to the frequency assigned to their primary function. To contact other personnel, the primary function for the individual should be tried first. Primary functions for key positions are listed below.

Operations Chief	Command
Division Supervisors	Tactical
Air Operations Director	Command
Air Support Supervisor	Command
Air Tactical Group Supervisor	Air-to-Ground & Air-to-Air
Helicopter Coordinator	Air-to-Ground & Air-to-Air
Helibase	Command & Air-to-Air

VHF-AM, VHF-FM, & UHF-FM

VHF-AM Frequencies

These frequencies are within a band width of 118.000 and 135.975 megahertz. They are used for general aviation communications and are used on incidents. Common terminology and slang for VHF-AM include: AM, VHF, Victor, Comm, and Alpha Mike. VHF-AM frequencies used for incident aviation operations are listed on page 3.

VHF-FM Frequencies

These frequencies are within a band width of 150.00 and 173.975 megahertz. They are used for portable radio and dispatch communications during daily agency operations and on incidents. Common terminology and slang for VHF-FM include: FM and Fox Mike. VHF-FM frequencies used for incident aviation operations are listed on page 4 and 5. The National Radio Support Cache frequencies on page 5 are reserved for incidents.

UHF-FM Frequencies

These frequencies are within a band width above 173.975 megahertz. They are used by the military for aviation communications. On incidents they are used for logistics and aviation communications. Common terminology and slang for UHF-FM include: UHF and Logistics. UHF-FM frequencies used for incident aviation operations are not listed in this publication. They are assigned as needed by the Communications Unit Leader.

AM Frequencies

Helicopter Operations	122.975 122.850 123.025 123.050 123.075 123.925	Available nation wide on a first user basis for any helicopter operation, including private operations. 122.975, 122.850, 123.025 and 123.075 are for air-to-air only. 123.050 is for air-to-ground only. 122.925 is for both. 122.925 is also the Primary Airtanker Frequency. Appropriate frequencies may be used for Helicopter Flight Following, Helicopter Air-to-Air, or Take-Off and Landing Control.
Primary Airtanker	122.925	Air Tankers do not have exclusive ownership of this frequency. The Frequency is authorized for air-to-air or air-to-ground use by all Federal Natural Resource Agencies. On incidents, it may be used by Fixed-wing or Helicopters temporarily, but should be replaced as soon as possible.
Secondary Airtanker	———	Assigned to Air Tanker Base Zones - only during fire season. Obtained from dispatchers. Additional frequencies may be made available for incidents.
Commercial Airports	———	Assigned to Air Traffic Control Towers, Ground Controllers, and Flight Service Stations. Shown on aeronautical charts and other publications.
Unicom Airports	122.800	Used by all pilots to receive advisories at limited control airports.
Multicom Airports	122.900	Used by all pilots for communications in transit and advisories at uncontrolled airstrips. Limited usage in government operations is advised.
ELT	121.500	Emergency Locator Transmitter - sends an audio tone for 48 hours after activation in a crash.
Ramp	———	Some government ramps have frequencies assigned. (BIFC 122.925, MSO 122.900)

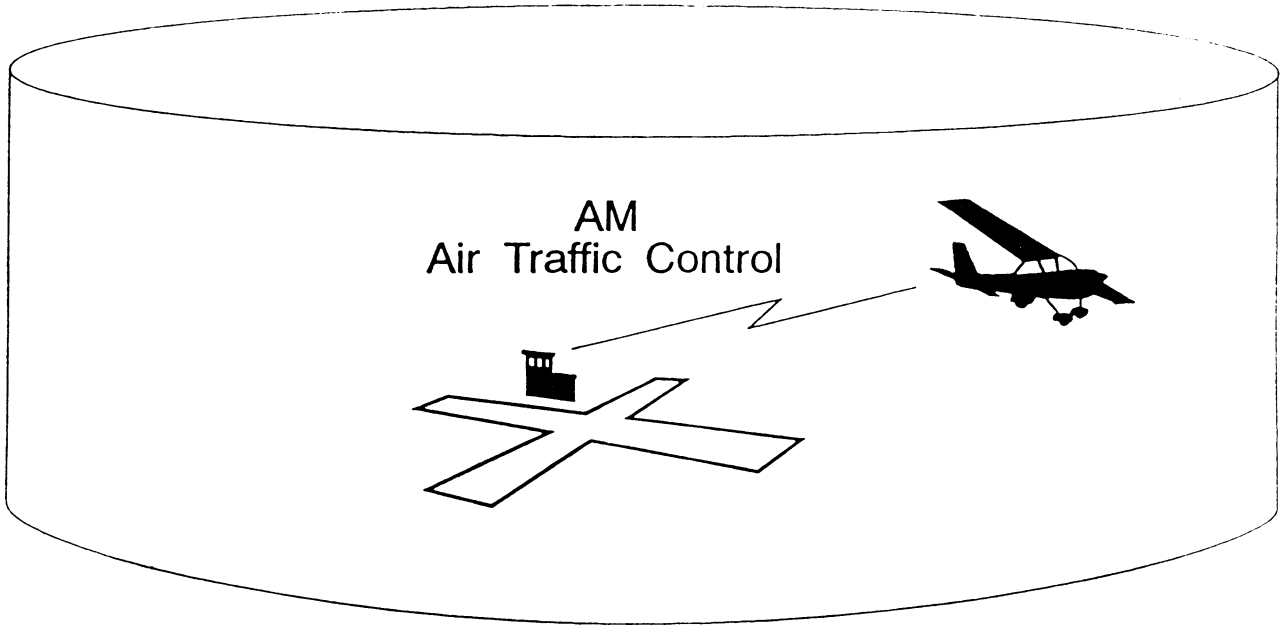
FM Frequencies

Air Guard	168.625	Air Guard is monitored by all pilots flying for the USDA-FS or USDI agencies. It is used for emergencies, long range flight following, and initial contact when the discrete dispatch frequency is unknown. On 9600 channel radios it is designated as Guard 1.
Local Air Dispatch	168.650	If practical, Forest Service dispatch centers use the Forest frequency to dispatch aircraft. If this is not practical, then 168.050 may be assigned for dispatching aircraft.
National Interagency Incident Contact	168.550	This is an initial contact frequency for land-mobile units arriving at incidents. It is not approved for aircraft, base stations, or repeaters.
FCC Common User Frequencies	163.100 168.350	These frequencies are authorized by the FCC for use by any US citizen for ground-to-ground vehicle convoy communications. They are available on a first come first use basis and may be tone encoded.
National Radio Support Cache	———	These frequencies are sent to interagency incidents in radio kits. Kits are programmed with 3 Tactical, 4 Air Tactical, and 1 Command/ Command Repeat frequency. Each kit contains one of six different Command frequencies. Tactical and Air Tactical frequencies are the same in all kits. These frequencies may be tone guarded.
Agency Dispatch	———	Dispatch frequencies for the USDA Forest Service, BLM and various state agencies are listed in the USDA/USDI Aircraft Radio Communications and Frequency Guide.
Emergency Medical Services	———	Various Emergency Medical Center frequencies are listed in the USDA/USDI Aircraft Radio Communications and Frequency Guide.

National Radio Support Cache FM Frequencies

Tactical 1 Tactical 2 Tactical 3	168.050 168.200 168.600	These three frequencies are used for Division and Group tactics. The same three frequencies are in all National Support Cache radios. There are also three USDI Tac frequencies that must be authorized on a case by case basis.
Command 1	168.700/ 170.975	These six sets of frequencies are the Command and Command Repeat frequencies in the National Support Cache Radios. Each incident has one pair of frequencies assigned for Command.
Command 2	168.100/ 170.450	
Command 3	168.075/ 170.425	Command 1, 2, and 3 are USDA Forest Service frequencies, and have been permanently authorized. Command 4, 5, and 6 are USDI frequencies and must be authorized on a case by case basis.
Command 4		
Command 5		
Command 6		
Air Tactical	166.675 169.150 169.200 170.000	These four frequencies are authorized for air tactical use west of Longitude 100 West. All four are included in each National Support Cache radio kit. They can be used for Air-to-Air or Air-to-Ground communications. 170.000 usually does not provide good reception.

AIRPORTS



In the airspace around airports, pilots must be able to monitor transmissions from Air Traffic Controllers and other aircraft. Passengers should refrain from using radios in these areas without the pilot's permission.

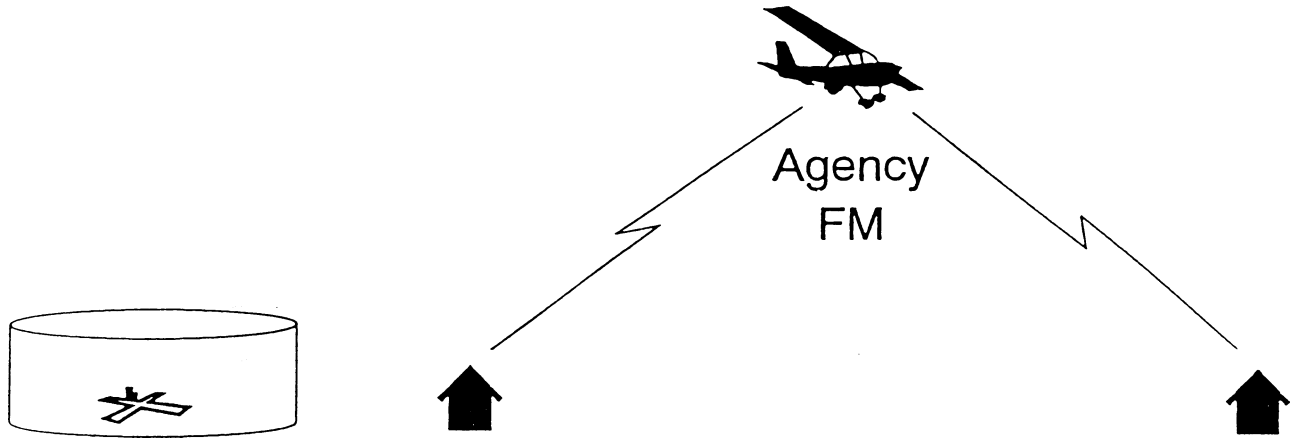
Commercial Airports - Air Traffic Controllers and Ground Controllers use discrete AM frequencies assigned by the FAA. Continuous advisories may be broadcast on a discrete frequency called UNICOM. Advisories are announcements concerning wind speed and direction and other airport conditions are broadcast on ADIS. Airport frequencies are on Sectionals, WAC Charts, and are listed in various aviation publications.

Limited Control Airports - These airports may have a UNICOM radio, usually managed by a Fixed Base Operator. The frequency for limited control airport UNICOM's is 122.800. Advisories at limited control airports are not continuous and usually include information on known air traffic.

Uncontrolled Airports - Pilots transmit advisories in the blind on 122.900. This is the Multicom frequency and is also for air-to-air communications between pilots in transit.

Figure 2. Airports.

FLIGHT FOLLOWING



All aircraft must flight follow with agency dispatchers during flights to any destination. If an FAA approved flight plan has been filed in advance for a point-to-point flight, flight following may be accomplished by phoning dispatchers before departure and after arrival.

Flight following is accomplished by reporting the aircraft's N-number, position, and destination to a dispatcher every 15 minutes.

Expected Time of Departure (ETD) should be reported before take-off and Actual Time of Arrival (ATA) should be confirmed after parking or after arriving at an incident.

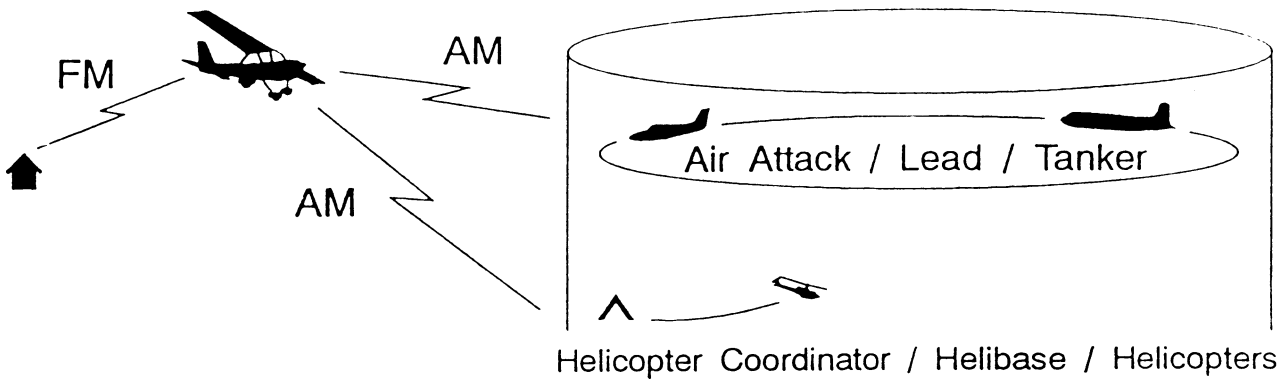
On long flights, where flight following requires checking-in with more than one dispatcher, the air crew should close out with dispatchers after contact with the next dispatcher has been established.
Generally, flight following is done on dispatchers' primary FM frequencies. If contact cannot be established on a primary frequency, the Guard frequency may be used. Guard can also be used to make initial contact with dispatchers if the primary frequency is unknown.

Flight following is a shared responsibility for pilots and agency personnel. Cockpit procedures for flight following should be established prior to take-off.

Agency FM frequencies and dispatch phone numbers are listed in the USDA/USDI Aircraft Radio Communications and Frequency Guide, (NFES #0969).

Figure 3. Flight Following.

FIVE MINUTES OUT



All aircraft must report their position, altitude, altimeter setting, and expected arrival time to the Air Tactical Group Supervisor no less than 5 minutes out from the incident airspace on the AM Air-to-Air frequency assigned to the incident.

If there is no Air Tactical Group Supervisor, one of the following is contacted, listed in order of preference: Lead Plane, and Air Tanker, other Fixed Wing, Helicopter Coordinator, Helibase, any helicopter.

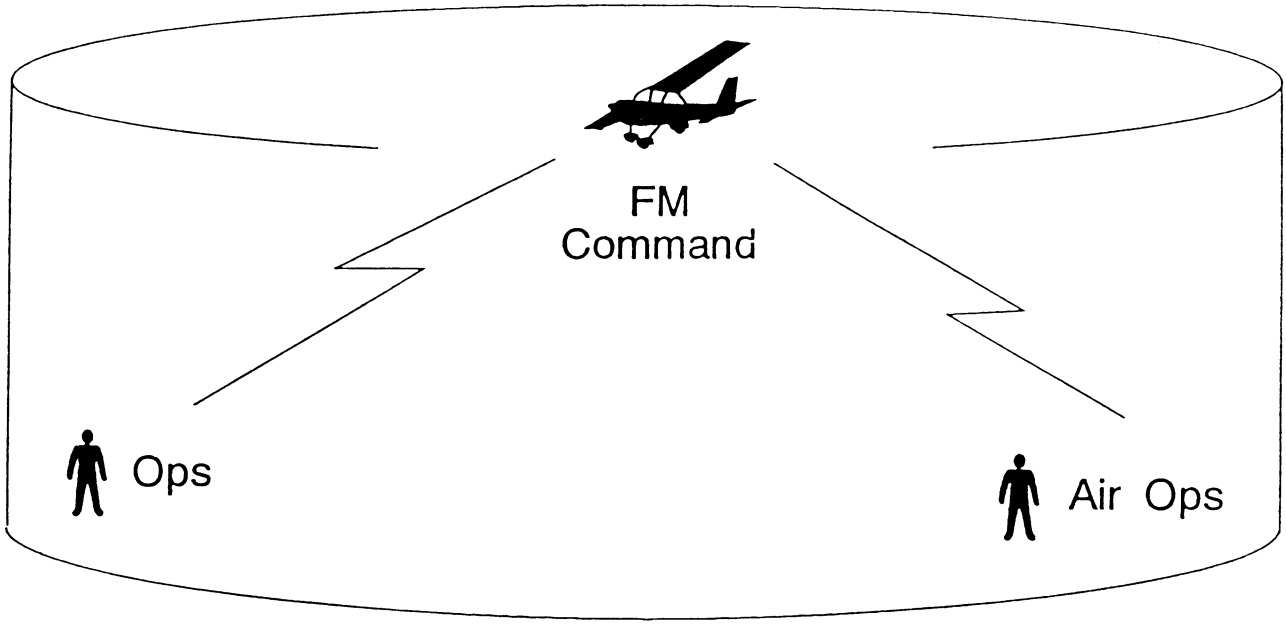
If there are no aviation resources, Air Operations or Operations should be contacted on Command FM.

Do not enter an incident airspace without clearance.

After obtaining clearance, arrival must be reported to the Flight Following dispatcher.

Figure 4.
Five Minutes Out.

ARRIVAL IN INCIDENT AIRSPACE

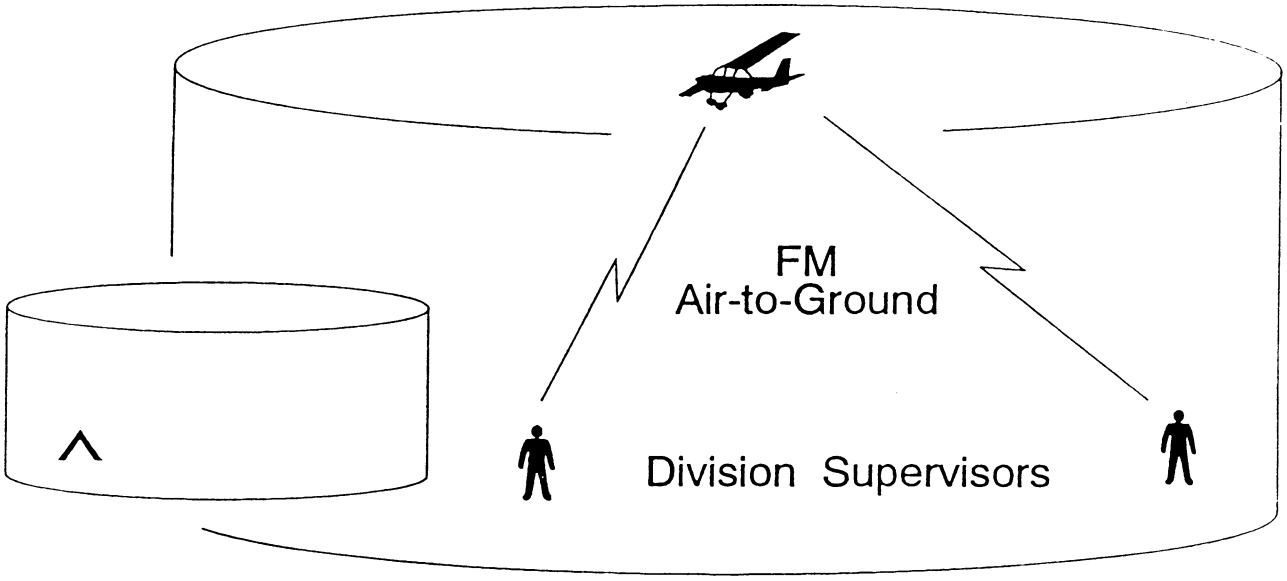


After obtaining clearance to enter the incident airspace, the Air Tactical Group Supervisor should contact Operations for a briefing on the tactical plan.

The Air Operations Director should be contacted for aviation operation details such as: shift length, the need for additional aircraft or personnel, and the method for obtaining daily briefings.

Figure 5. Arriving in Incident Airspace.

PRIORITIZING REQUESTS



Air Tactical Group Supervisors and Helicopter Coordinators should return to Air-to-Ground after using other FM frequencies. Air-to-Ground is their primary FM frequency to monitor. Operations, Division Supervisors, and Group Supervisors contact the Air Tactical Group Supervisor or the Helicopter Coordinator on Air-to-Ground to request tactical and logistical air support.

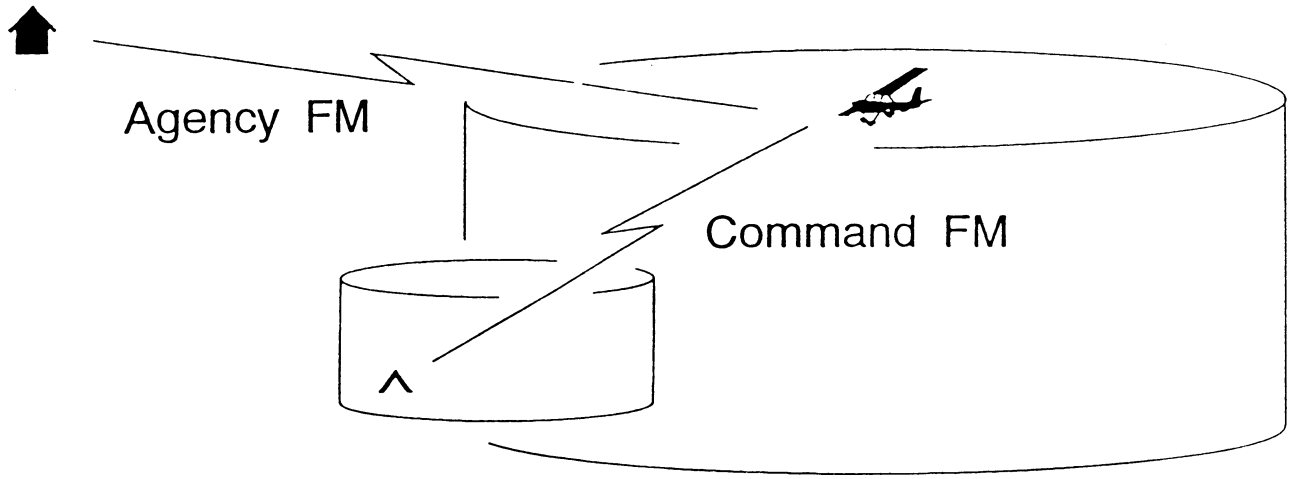
The Air Tactical Group Supervisor or the Helicopter Coordinator must prioritize requests. Priorities are based on the incident objectives, directions from Operations, and personal observation.

Not all requests for helicopter support are made throughout the Air Tactical Group Supervisor or Helicopter Coordinator. Division and Group Supervisors may make requests to the Helibase through the Communications Unit. Operations may also schedule helicopter flights at the Helibase.

National Incident Radio Support Cache radios come with four Air Tactical frequencies. that can be used for Air-to-Ground: 166.675, 169.150, 169.200, and 170.000. These frequencies must be authorized by the Communications Unit or Dispatcher.

Figure 6. Prioritizing Requests.

REQUESTING AIRCRAFT



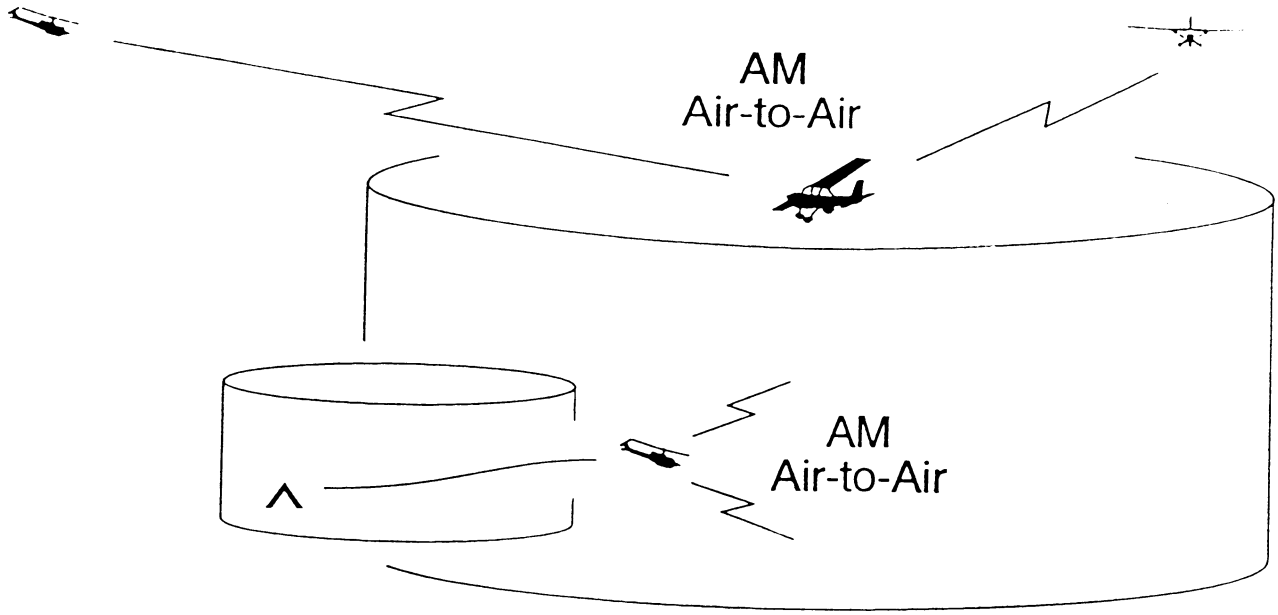
Requests for Air Tankers are made to the Agency Dispatcher on the Agency FM.

Requests for helicopters are made to the Helibase on Command FM.

The Dispatcher or Helibase should provide an Estimated Time of Arrival (ETA) for aircraft.

Figure 7. Requesting Aircraft.

ARRIVING AIRCRAFT



The Air Tactical Group Supervisor must promptly acknowledge aircraft reporting in 5 minutes out from the incident. A reporting location and altitude must be give along with an altimeter setting. The locations, altitude, N-number, and type of other aircraft should also be given. The Lead Plane should be notified if an Air Tanker has arrived.

Helicopters arriving at an incident should be directed to the helibase for a briefing from the Helibase Manager. Briefing should include: the number and types of aircraft, frequencies, location of helispots, established traffic routes and a map.

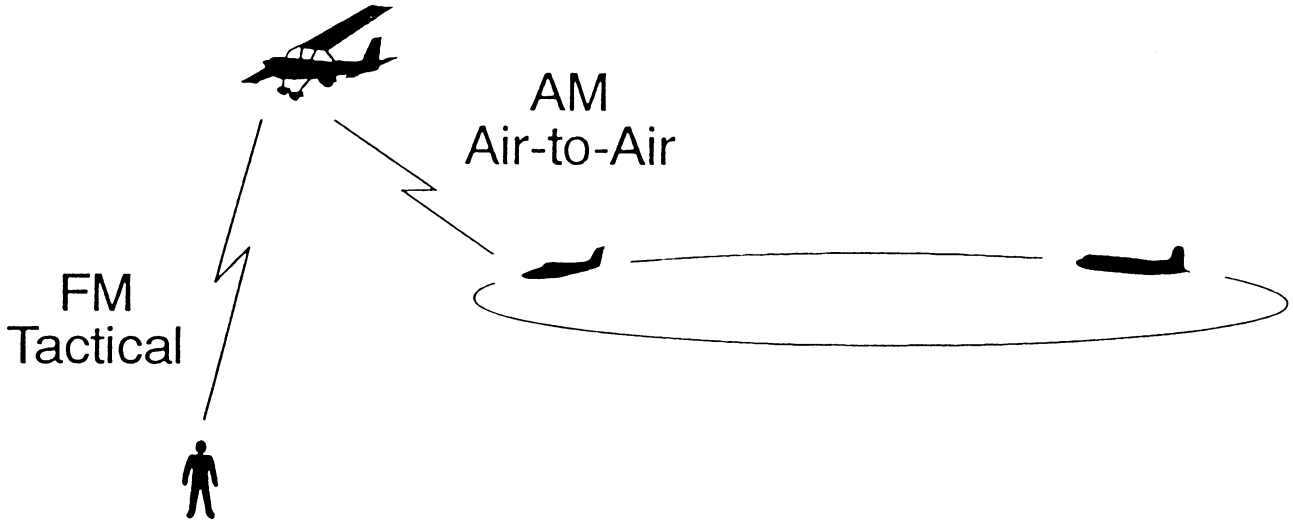
Helicopters departing the Helibase should announce their mission on AM Air-to-Air. Generally this is a "blind call" to all incident aircraft. They should report directly to the Air Tactical Group Supervisor or Helicopter Coordinator if they were requested by one of them.

AM Air-to-Air is monitored by all pilots on the incident. It must be kept open and available to pilots. Pilots must be able to report their position at any time on this frequency in order to maintain safe separation. All transmissions should be brief.

AM Air-to-Air, on simple incidents, is usually the Secondary Airtanker Frequency for the zone the incident is in. If there is a conflict with other incidents, the Communications Unite or Dispatcher can provide a discrete frequency. The Primary Airtanker Frequency, 122.925, can be used temporarily but should be replaced as soon as possible.

Figure 8. Arriving Aircraft.

AIR TANKER TACTICS



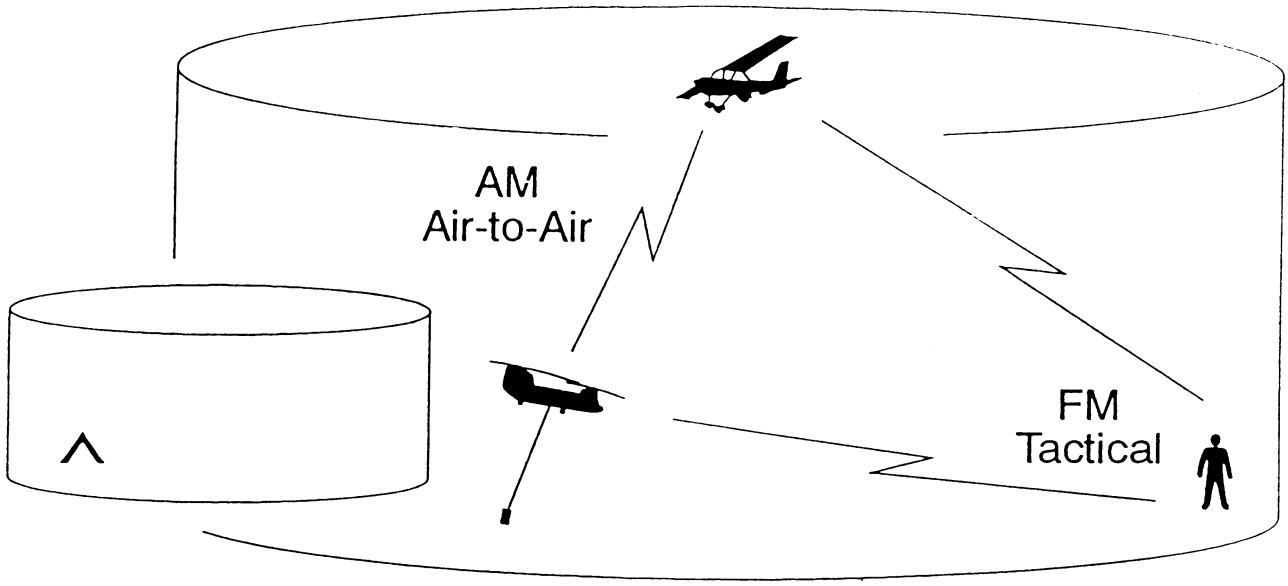
The Air Tactical Group Supervisor and ground personnel are responsible for establishing targets. This is done on FM Tactical frequencies. It may or may not be possible for the Lead Plane and Air Tanker to effectively monitor FM Tactical.

The Air Tactical Group Supervisor relays target location and type of drop to the Lead Plane on AM Air-to-Air. The Lead Plane and Air Tanker determine whether or not the drop is safe and the best approach for it.

The Air Tactical Group Supervisor is responsible for ensuring ground personnel and other aircraft are clear of the target area.

Figure 9. Air Tanker Tactics.

HELICOPTER TACTICS

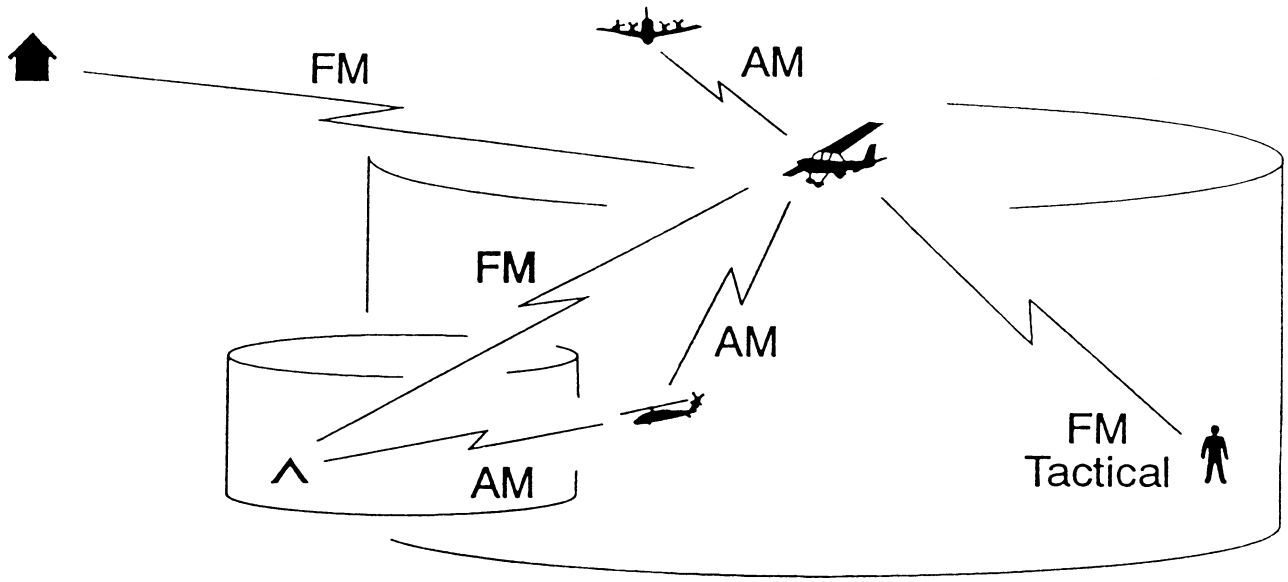


Helicopters are directed by ground personnel on Division Tactical FM frequencies.

The role of the Air Tactical Group Supervisor or the Helicopter Coordinator is to facilitate by establishing communications between pilots and ground personnel, helping to identify targets, and ensuring adequate separation between aircraft is maintained.

Figure 10. Helicopter Tactics.

TACTICS FOLLOW-UP

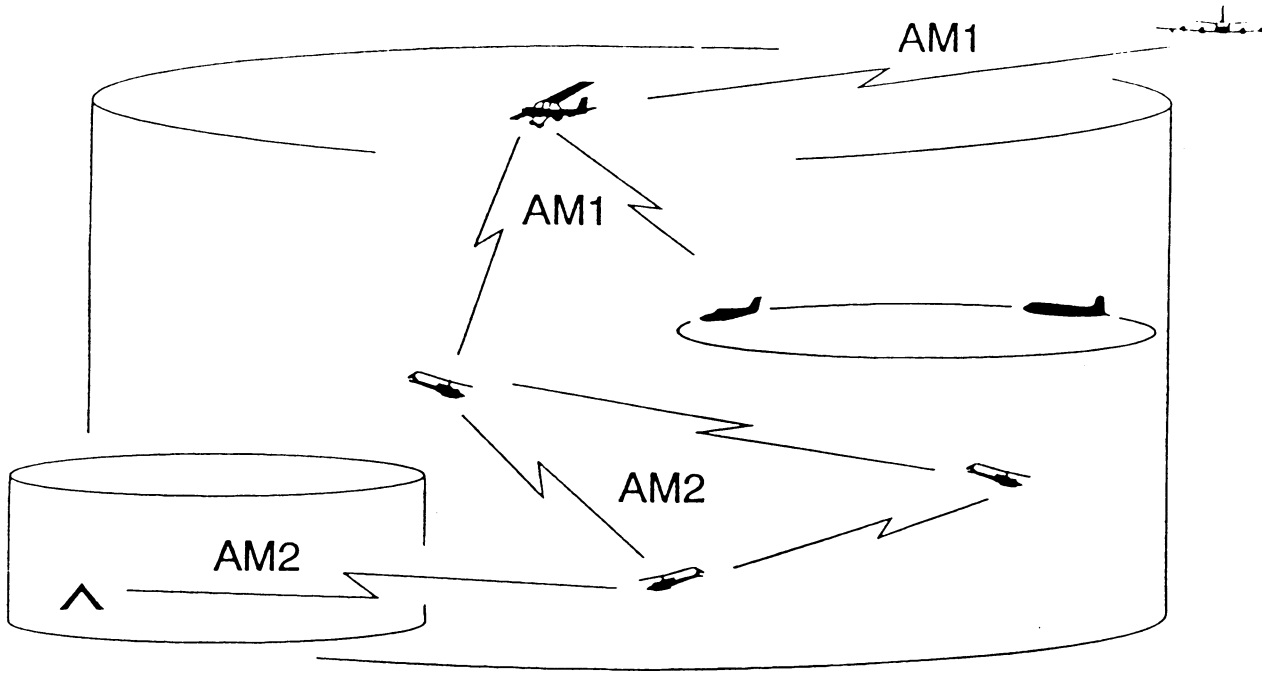


At the completion of retardant drops, the Air Tactical Group Supervisor and ground personnel determine the need for more retardant. The Air Tactical Group Supervisor must tell the retardant pilot to load and return or hold on the ground. The dispatcher must also be notified by the Air Tactical Group Supervisor or the tanker pilot.

After helicopter missions have been completed, the Helibase should be notified the Air Tactical Group Supervisor, Helicopter Coordinator or the helicopter pilot.

Figure 11. Tactics Follow-Up.

AIR-TO-AIR ON COMPLEX INCIDENTS



On complex incidents, Air-to-Air radio traffic will be excessive if only one Air-to-Air frequency is used. It should be split into one for fixed-wing and one for helicopters.

The first AM Air-to-Air frequency that was assigned to the incident by the dispatcher should be used for Fixed-Wing Air-to-Air.

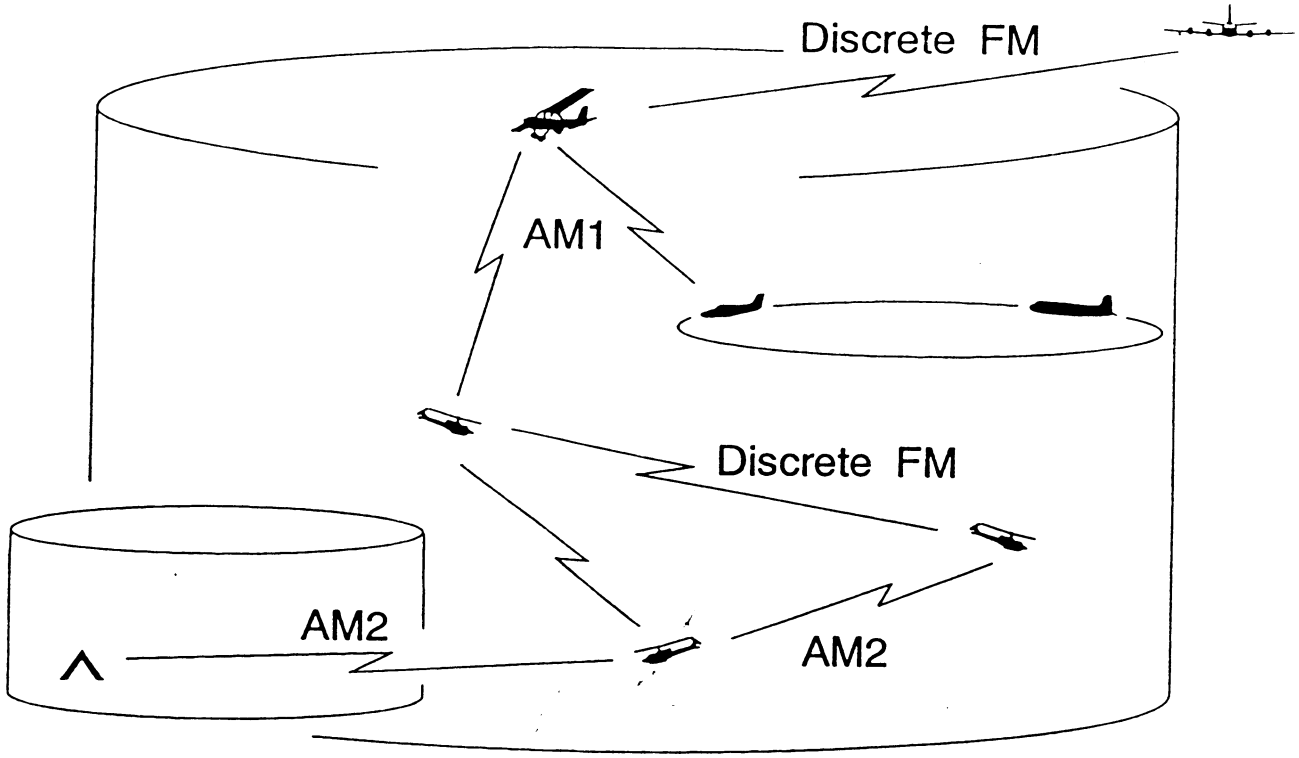
A second AM frequency should be assigned as Helicopter Air-to-Air. This frequency should also be used for Helicopter Flight Following. Using this frequency for both functions reduces radio traffic since flight following helicopters can be done by monitoring this frequency from the Helibase. It also maintains the required number of frequencies monitored by helicopter pilots at two, one AM for Flight Following and Air-to-Air, and one FM for Tactical.

The following frequencies have been approved by the FAA nation wide on a first come first use basis for helicopter Air-to-Air communications: 122.975, 123.025, 123.075, and 122.850. These may or may not be available and must be authorized for use the Agency Dispatcher and/or Communications Unit. If they are not available for immediate use, the Agency Dispatcher will be able to provide an alternative frequency.

The Primary Airtanker Frequency, 122.925, can be used in situations where time is critical. This frequency has been assigned by the FAA nation wide for use by all natural resource agencies. It is not used exclusively by USDA/USDI aircraft. If this frequency is used it should be replaced as soon as possible.

Figure 12. Air-To-Air on Complex Incidents

FM BRIEFING FREQUENCY



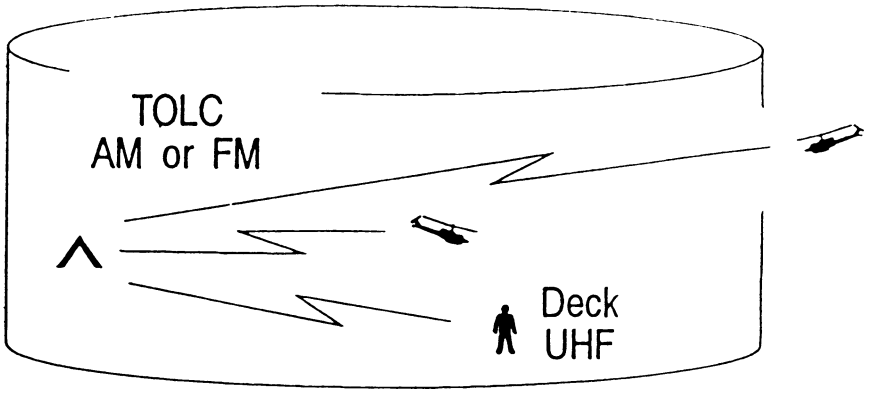
AM Air-to-Air should be kept open as much possible so pilots can report their position at any time to maintain safe operation.

On simple incidents, pilots are briefed on AM Air-to-Air. On complex incidents a discrete FM frequency should be established for briefing pilots.

National Incident Radio Support Cache radios come with four frequencies that can be assigned for his purpose: 166.675, 169.150, 169.200, and 170.000. Frequencies must be authorized by the Communications Unit or Dispatcher.

Figure 13. Incident Radio Communications Plan.

HELIBASE TOLC AND DECK



The Take-Off and Landing Controller, or TOLC, controls all traffic within the Helibase airspace—generally within a radius of one or two miles. Helicopters report to the TOLC prior to take-off and before entering the airspace. The TOLC gives clearance for take-offs and landings, direction for flights within the airspace, altimeter settings, wind speed and direction, advice on the status of other aircraft, and mission information.

On simple incidents, Take-Off and Landing Control is done on the Helicopter Air-to-Air frequency. On complex incidents, it may be done on a discrete frequency, either AM or FM. FM is preferred since the pilot's FM radio is not needed for any other purpose in the Helibase airspace. Using FM allows pilots to continue to monitor the AM Air-to-Air frequency. Since military helicopters do not have FM radios, an AM TOLC is required for these operations.

AM frequency 123.050 has been approved by the FAA nation wide on a first come first use basis for helicopter air-to-ground communications. It may or may not be available and must be obtained by the Communications Unit. If it is not available, the Communication Unit should obtain another discrete frequency.

A discrete UHF Logistics Frequency is preferred for Deck communications. This includes communications between the following: Deck Coordinator, Parking Tenders, Helicopter Managers, Personnel Loadmasters, Cargo Loadmasters, and the Helibase Command Post. The same frequency may also be used for Helispot communications.

Figure 14. Helibase Tolc and Deck.

FLIGHT FOLLOWING ON INCIDENTS

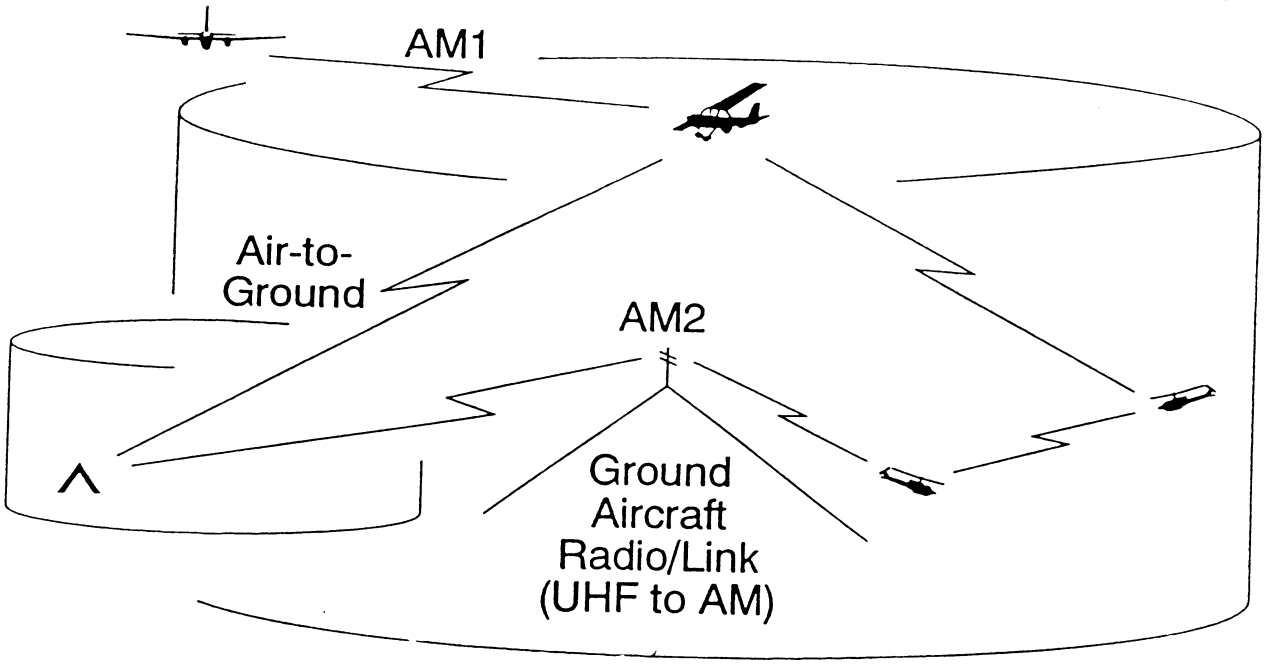


Figure 15. Flight Following on Incidents.

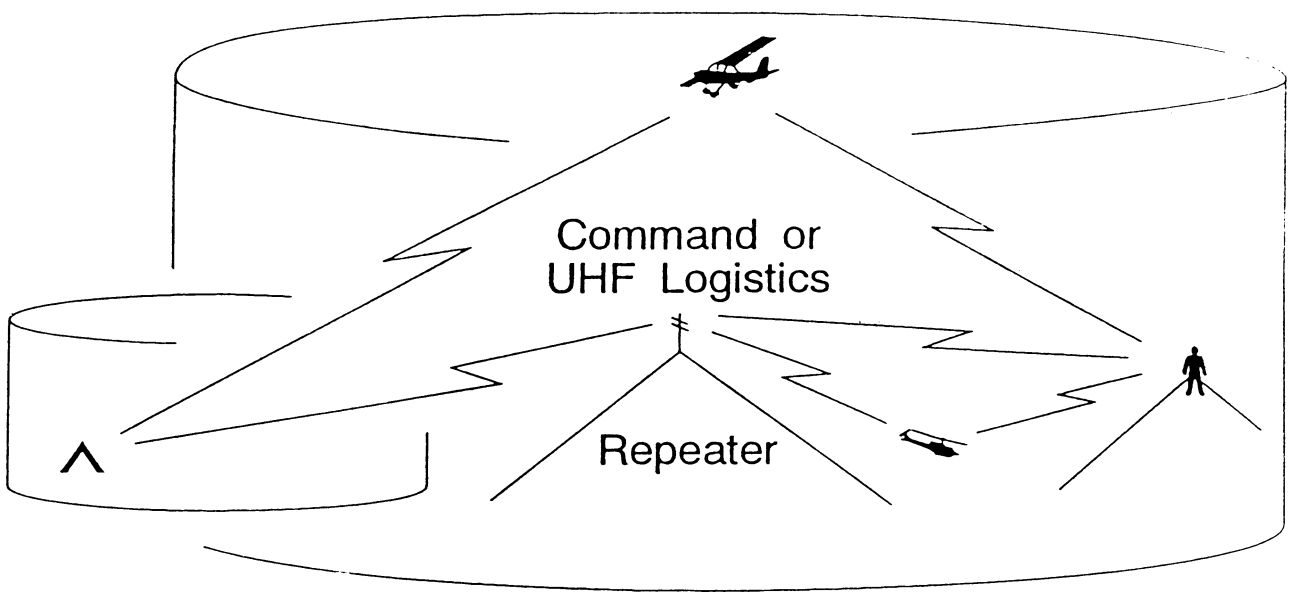
Fixed-wing on incidents are flight followed by the Air Tactical Group Supervisor on AM1 or Air-to-Air. This is usually done on the Secondary Airtanker Frequency assigned to the zone the incident is in. If there are frequency conflicts with other incidents, another frequency should be obtained from the Communications Unit or Dispatcher. 122.925, the Primary Airtanker Frequency, may be used temporarily but should be replaced as soon as possible.

Helicopters and Air Attack are flight followed by the Helibase Radio Operator on AM2 Air-to-Air. This is done by monitoring position reports and maintaining a log. If 15 minutes lapse between transmissions, the Radio Operator prompts the pilot for a position report. If there is no response, the rescue plan is activated.

Frequencies available for Helicopter flight following are 122.925, 122.975, 122.850, 123.025, and 123.075. 122.925 should be avoided since it is also the Primary Airtanker Frequency. If there are frequency conflicts with other incidents, a different frequency should be obtained from the Communications Unit.

Helicopter flight following in rugged terrain requires a repeater. The Ground Aircraft Radio/Link Kit (NFES 4370) is designed for this purpose. The Incident Starter Kit (NFES 4390) includes a Ground Aircraft Radio/ Link Kit. If a radio repeater is not available, flight following can be accomplished by using a human repeater.

HELISPOT COMMUNICATIONS



The Helibase must maintain communications with Helispot personnel. This is done on FM Command or a UHF Logistics frequency. A discrete UHF frequency is recommended on complex incidents in order to reduce radio traffic on the Command channel. A Logistics Repeater Kit (NFES 4248) is required in mountainous terrain.

Communications from Helispot to helicopters is generally done on the Division frequency the Helispot is in. Since Military helicopters do not have FM radios, the only means of communication is with portable AM radios or Logistics radios linked to AM.

The Air Tactical Group Supervisor or the Helicopter Coordinator may relay messages between the Helibase and Helispots.

Figure 16. Helispot Communications.

NON-RADIO COMMUNICATIONS

Helibase Telephone

A telephone at the helibase facilitates the need for pilots to communicate with their company. Pilots are required by contract to make arrangements for service truck drivers, maintenance personnel, and relief pilots. It is also used by helicopter managers to obtain contract administration advice from contracting officers and by helibase managers to obtain service and advice from agency aviation safety teams. A telephone also facilitates communications between the helibase manager, incident dispatcher, air operations director, air support supervisor, air tactical group supervisor, and fixed-wing base manager. These individuals need to communicate daily, especially about personnel assignments and frequency changes. A cellular telephone should be considered for helibase locations where there is no access to phone lines.

Fixed-wing Base Telephone

A telephone is needed at the fixed-wing base to facilitate communications between the fixed-wing manager, local agency dispatcher, and other incident aviation personnel. This phone should be temporarily installed for the incident, separate from the fixed base operator's phone system and any public phone systems. A telephone at the fixed-wing base is especially important during demobilization.

Computers

Computer systems, such as the Data General (DG), can be used to complete incident action plan forms including the air operations summary. Forest Service forms such as the Initial Report, FS-5700-14, can be completed on the DG. Lists of personnel and aircraft and their order numbers can also be made; these are particularly useful during demobilization. Computer systems are also very useful for communications with agency aviation officers, dispatchers, and incident aviation personnel, i.e. the FS-5700-14 can forwarded to agency aviation officers, and air tactical group supervisors can receive incident action plans at fixed-wing bases. A computer at the fixed-wing base is particularly useful for forwarding Passenger/Cargo Manifests, (SF-245) forms, to dispatch and coordination centers.

Fax Machines

Fax machines can be used to send and receive any document. They are useful for the same communications computers are used for, particularly at fixed-wing bases.

Printed on recycled paper