

INTERAGENCY HELICOPTER OPERATIONS GUIDE
Chapter 8 - Helicopter Landing Areas

CHAPTER 8: HELICOPTER LANDING AREAS.

- I. **Introduction.** The proper selection and construction of landing areas is essential to both the safety and efficiency of helicopter operations. Landing areas that are poorly located or constructed may contribute to or be the cause of an accident. At a minimum, inadequate areas heighten risk, increase Pilot workload, and result in inefficient operations.

Prior to reading this chapter, consult the Glossary for definitions of terms commonly used with reference to helicopter landing areas. These include:

- | | |
|-----------------------------------|---------------------------|
| ■ Permanent helibase ¹ | ■ Temporary helibase |
| ■ Helispot | ■ Unimproved landing site |
| ■ Safety circle | ■ Touchdown pad |
| ■ Approach-departure path | |

This chapter establishes the requirements and specifications for helibases, helispots, and unimproved landing sites. As clarification for when a helispot should be staffed, managed, and operated as a helibase, the general rule, as applied elsewhere in this guide, is that when a site is used for more than one day as an operational base for two or more helicopters, it should be classified and operated as a helibase.

- II. **Planning.** The selection of an area or areas on which to land the helicopter(s) is an important planning activity. When possible, the Pilot(s) should have input. The following general requirements should always be considered.
- The types of activity and volume of traffic will affect selection, as well as initial and later development of the landing area(s).
 - The site should lend itself to economic and environmentally-sensitive development to the size which will accommodate the type of helicopters and volume of traffic expected in both the short- and long-term. Anticipate future needs.
 - Weather (potential for smoke or fog inversions, winds) also plays a significant role in location of facilities, both long- and short-term.
 - Site planning and construction of all sites, both permanent and temporary, shall be in accordance with local agency land management policy.
- A. **Permanent Helibase.** A careful study should be made of local, state, and federal laws, rules and regulations relating to construction of a permanent helibase. Site selection should provide for adequate approach and departure paths which avoid

¹ FAA terminology for a helibase is a heliport.

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housing areas, schools, churches, and any other facilities that might be disturbed by low-flying helicopters.

1. **Accommodation for Different Helicopter Types (Sizes).** All permanent facilities should, at a minimum, be built to accommodate one Type 2 (medium) helicopter.
2. **Planning and Construction Specifications.** The planning and construction of permanent helibases shall be according to agency-specific and/or FAA policy and specifications, as well as applicable local, state, and federal regulations.



NOTE: Agency guidance usually incorporates FAA standards. It is local and state policy and procedures that are usually of concern.

- B. **Temporary Helibases and Helispots.** Helibase or helispot construction, especially in wilderness or similar sensitive areas, can cause a double impact -- the impact of an abrupt or an unnatural-appearing opening in a vegetation-covered landscape, and the impact resulting from cut-faces of stumps and boles of trees or shrubs.



IMPORTANT NOTE: Remember that safety shall not be compromised. The area should not be considered as a landing site if it cannot be built to safe standards, or negative environmental impacts cannot be mitigated. Minimum Impact Suppression Technique (MIST) guidelines may be established and should be reviewed prior to wilderness or sensitive area construction.

The following issues should be addressed and actions performed during the planning stage for helibases and helispots.

1. **Initial Planning Actions at an Incident or Project.** Project helibases and helispots can be adequately planned well in advance of the project start. Incident helibases and helispots, on the other hand, are established and become operational in a very short time frame. The rapidity of incident response does not, however, relieve the Helibase or Helispot Manager from performing basic planning actions.
 - Upon arrival, the Helibase Manager should gather intelligence by obtaining maps from the dispatch office, talking to local inhabitants, flying a reconnaissance, etc.

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- Check with the local Resource Advisor to ensure that the sites for the helibase(s) and helispots are acceptable from an environmental standpoint. Factors to consider include but are not limited to:
 - Impact of construction and aerial activity on threatened and endangered species or on wilderness or similar values;
 - Hazardous materials (fuel) handling.
- The Helibase Manager should reference Appendix H, Helibase Manager's Reminders List, Section I (Helibase Site Selection and Layout) and Section II (Helispot Site Selection and Layout) for factors to consider. These sections include one-time items for both the Helibase Manager and Helispot Manager to review when initially selecting sites. Even though they should be initially considered, a review at timely intervals (for example, every 5-7 days) is also appropriate.
- Good planning for project operations should preclude poor site selection. However, the rapidity with which incidents occur sometimes results in a poor site being used initially. If a poor site for either the helibase or a helispot has been selected by the initial attack or extended attack helicopter crew(s), or by a project manager, do not hesitate to relocate if a better site can be established. Do this immediately during the initial stages of the transition from initial or extended attack, or prior to the start of the project. Otherwise, unacceptable delays in operational and logistical support, as well as safety hazards, may result.
- Perform an aerial reconnaissance to locate desired helispots. Individuals on this reconnaissance should include the local Resource Advisor, Operations Section Chief (or designee) or Project Aviation Manager, Air Operations Branch Director (or a designee such as the Air Support Group Supervisor or Helibase Manager), and, if possible, the Helispot Manager who will be responsible for constructing the spot. Consider the following:
 - What will be the primary function of a helispot (crew shuttle, cargo transport, or both)? If for cargo transport only, consider designating the spot for longline/remote hook operations only in lieu of constructing a helispot.
 - Discuss construction standards relative to the type of helicopters which will be utilizing the helispot. Provide specific instructions (if possible, in writing) for the Helispot Manager assigned. Remember that construction standards shall not be compromised.
 - Where possible, identify natural openings which could be utilized as a helibase or helispot with little or no improvement.
 - Avoid high visitor use areas, especially if construction is necessary.

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- Avoid use of schoolyards, parking lots, local parks, etc. unless absolutely necessary and then only if strict security by local authorities can be provided.
- If a high environmental impact is anticipated, examine other potential sites some distance away from the ideal location which would result in less impact and still accomplish intended incident or project strategy and objectives.
- Discuss mitigating measures to restore the helispot to as natural a condition as possible (see rehabilitation guidelines later in this chapter).



IMPORTANT NOTE Hand crews should not be allowed to construct helispots unless prior approval and specifications have been provided according to the procedures detailed above.

2. **Site Ownership And Approval**². One cannot simply assume that any suitable piece of property can be utilized for a helibase over an extended period of time without first determining ownership. This is often overlooked in the rush to establish a helibase on incidents. It should not happen with the advance planning time available for projects. During the site selection and planning process, site approval concerns must be addressed.

Check that the land under consideration, whether it be a meadow, field, airport, or airstrip, is owned by an individual or entity that supports the operation being conducted. Do not assume that the land immediately adjacent to an incident or project area is owned by a government agency.

- a. **Private Ownership.** If the land is owned by an individual or corporation, contact must be established as soon as possible to request permission to continue to use the land. This is assuming that initial attack crews have chosen the site as optimum from an operational standpoint and have already established initial helibase operations. Consideration must be given to the following:
 - There may be restrictions to its use that the landowner desires. These might include not using certain parts of the land, such as those the landowner planned to irrigate or plow.
 - There also may be rental costs involved. Refer to the section on Finance Section Chief or local Administrative Officer involvement. A Helicopter Manager, Helibase

² If an Air Support Group Supervisor and/or Air Operations Branch Director is assigned, the Helibase Manager should coordinate on site use.

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Manager, or other air operations staff member usually does not have the authority to negotiate rental costs.

- Rehabilitation of the land is also frequently an issue.

- b. **Public Ownership.** If the land is owned by a federal, state, or local land management agency, the Helibase Manager must still coordinate with the owning agency's Resource Advisor to determine if use of the site is appropriate, and any mitigation measures that must be taken.

If the site is owned by a local municipality, contact the local manager or public official.

- c. **Role of the Finance Section or Local Agency Administrative Officer.** The Helibase Manager should immediately coordinate with the Finance Section Chief on incidents or the local administrative officer responsible for the project. The Finance Chief or local agency should establish an agreement with the landowner, covering at a minimum the following:

- Cost (if any) for use of the land;
- Any restrictions on use of the land (keeping fuel trucks away from certain areas such as water sources or crops, use of soil stabilizers, etc.);
- Rehabilitation requirements after the incident has ended or project completed.

- d. **Use of Airports and Airstrips.** Use of airports or airstrips requires the permission of the Airport Manager or a responsible agency such as the state Aeronautics Division. In some cases, closure of the airport or airstrip may be necessary. In this case, prior and continued coordination and communication with the applicable authority is essential.

Helibase sites located on airports or airstrips should be located such that both landing areas and approach-departure paths are segregated from airplane operations. It is recommended that a Fixed-Wing Base Manager be ordered to perform coordination.

3. **Helispots.** To a somewhat lesser extent, the same considerations addressed above apply to the use of helispots, especially those that will require improvement. The helispot site selection and approval process is addressed at length elsewhere in this chapter.
4. **Water Sources.** The same considerations addressed above apply to the location and use of water sources for dipping or bucket/tank fill operations. Do not assume that each pond or lake is owned by the government. Provisions for replenishment of water sources can be made if use of water is an issue. Use of buckets in conjunction with foam is also an issue with agency Resource Advisors or private landowners.

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III. Selection of and Specifications for Temporary Helibases, Helispots, and Unimproved Landing Sites.

- A. Landings at An Unimproved Landing Site. The Pilot is responsible for making the decision to utilize unimproved landing sites. The government representative on board may make a recommendation, but must defer to the Pilot's judgment, even if the Pilot's preferred site is at a distance from that desired. Conversely, the government representative has the option to advise the Pilot that he or she does not feel comfortable landing at a site selected by the Pilot, and may decline to land at the site.

Prior to landing for the first time at an unimproved site, the Pilot shall make a high-level reconnaissance of the area to determine the location of any aerial hazards in the approach or departure path and to determine wind conditions, slope, ground stability, rotor clearances, ground hazards, and size of pad.

 **IMPORTANT NOTE:** If an unimproved landing area will be used on a recurring but limited basis, improvements will be made. The appropriate authority (agency determined) will identify the level of improvement and approve the extended use. Recommendation: 1) Resource users should prepare a Project Aviation Safety Plan. 2) For large fire operations, extended use will be approved by the Air Operations Branch Director. 3) For Initial Attack operations, the Helicopter Manager must make this determination.

Use of unimproved landing sites on a recurring basis is discouraged. When logistical and environmental concerns allow, the site should be brought up to IHOG Helispot standards.

- B. Construction and Improvement. Construction of approach-departure paths for helibases and helispots should conform as closely as possible to the specifications in Exhibit 8-1 and as discussed later in this chapter. (It is recognized that the use of a one-way helispot as depicted in Exhibit 8-2 is sometimes unavoidable.) Safety circles and touchdown pads should conform to the requirements in Chart 8-1. Exhibit 8-4 provides an example of a standard helibase layout. The best landing sites are obviously those that require no construction of landing pads and safety circles, or removal of ground or aerial hazards.

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EXHIBIT 8-1: EXAMPLE OF A TWO-WAY HELISPOT

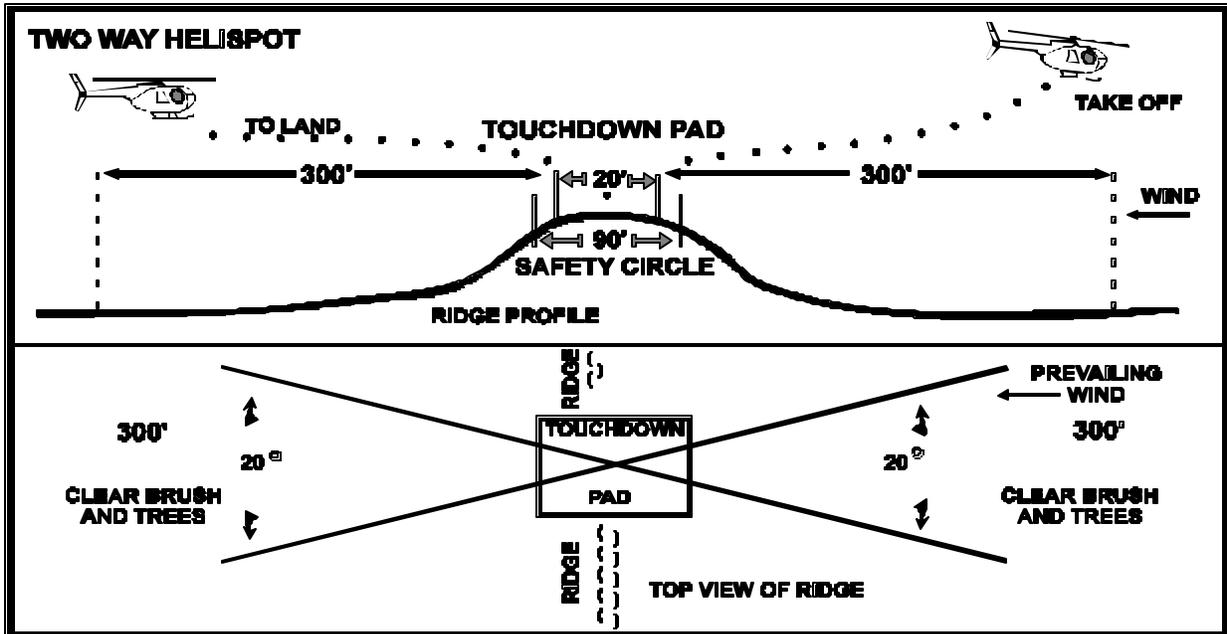
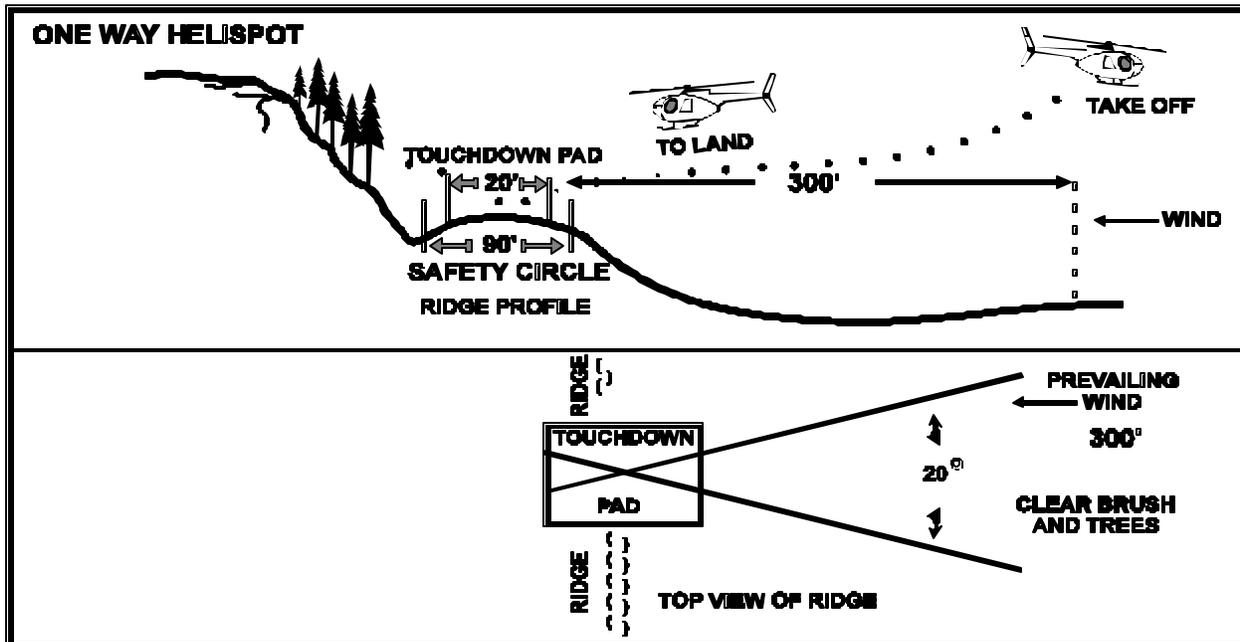
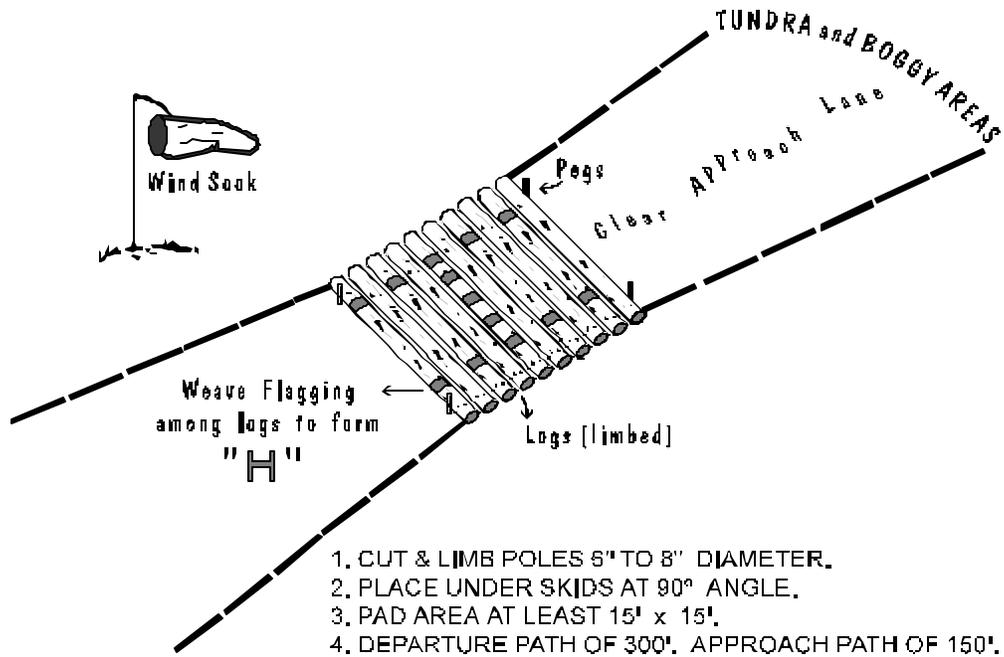


EXHIBIT 8-2: EXAMPLE OF A ONE-WAY HELISPOT



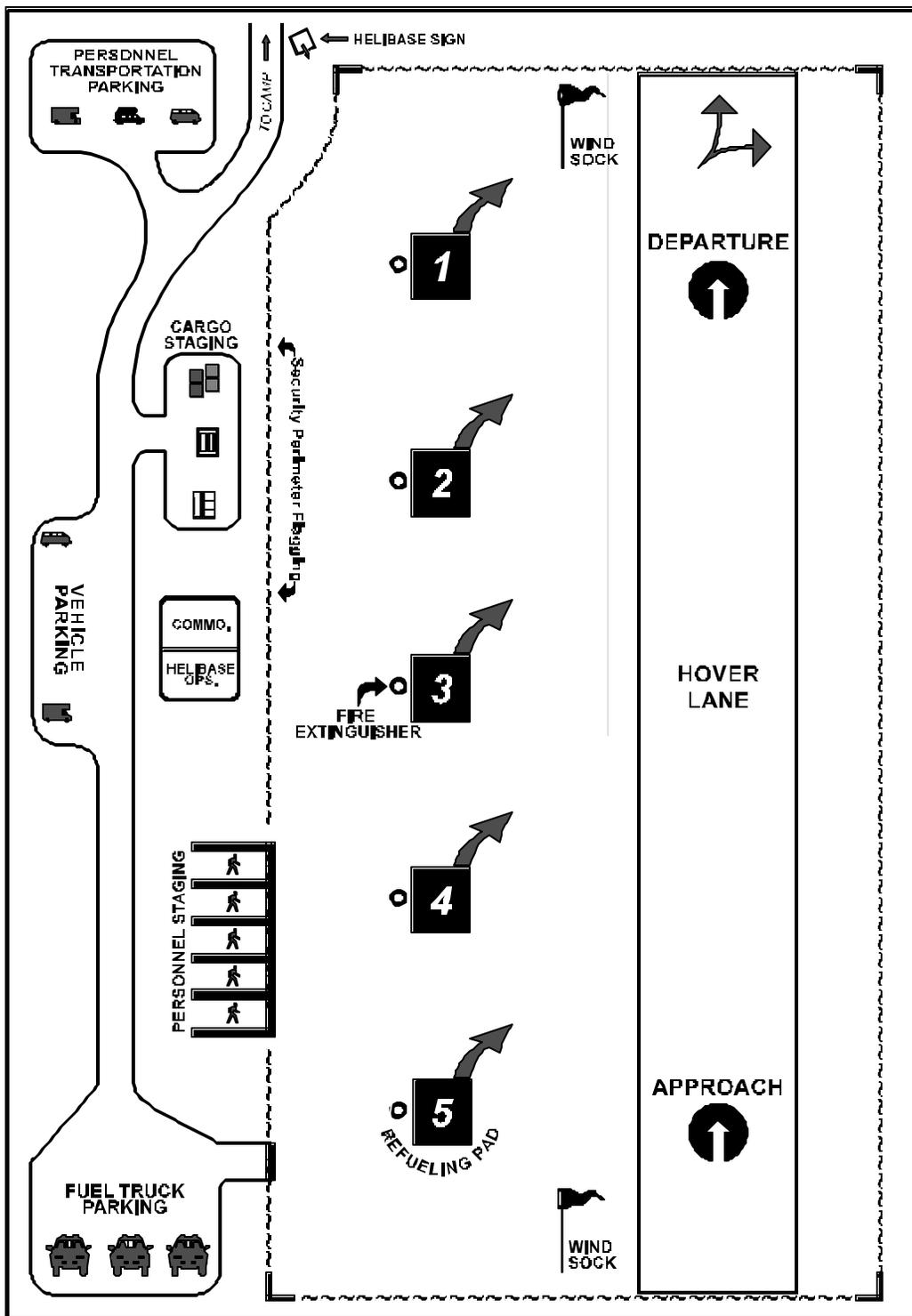
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EXHIBIT 8-3: LOG-DECK LANDING PAD FOR USE IN TUNDRA OR BOGGY AREAS



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EXHIBIT 8-4: EXAMPLE OF A HELIBASE LAYOUT



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1. **Hand Construction.** Hand construction methods are best since there is less ground disturbance than that created by mechanized construction. There are measures which can be implemented during construction of a helibase or helispot that will lessen the workload during rehabilitation, and help ensure that the objective of restoration to as close to a natural state as possible is achieved. These include:
 - Cut trees or snags close to the ground, leaving stump heights of 0-3 inches. (It is recognized that this may not always be possible during initial construction; follow up flush cutting will be necessary.)
 - If possible, and only if it can be performed safely, fell trees or other vegetation so that some cut trees and snags will be in a crisscrossed or natural appearing arrangement.
 - Buck up only what is necessary to achieve a safe operation in and around the touchdown pad and in the approach-departure path(s). Excessive bucked-up pieces are unnatural. They also increase the workload of camouflaging cutfaces during helispot rehabilitation.
 - Limb only what is necessary to achieve a safe operation in and around the touchdown pad and in the approach-departure path(s). If possible, breaking of limbs is preferred to sawing. Excessive limbing results in additional, smooth-cut spots along the boles. It also creates an increased amount of limbs to either dispose of in the timbered area or to arrange in a fashion that resembles a natural ecosystem floor.
2. **Mechanized Construction.** Basic requirements are the same as those for hand construction. If large rocks are dislodged, they should be removed and placed in an area where they appear to be natural. Hand work is frequently necessary to cut the fringe of brush left by bulldozers. Dozer-constructed landing areas generally have soil that is disturbed, requiring dust abatement procedures. Unless absolutely necessary, mechanized construction or improvement is to be avoided.

C. General Locations For Helispots and Unimproved Landing Site.

1. **Ridge tops.** (See Exhibit 8-1.) An exposed knob on a ridge offers the best location, especially if approach/departure is available from all or several directions. Consider the following:
 - Minimum approach/departure path should be no less than the required safety circle.

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- Avoid cutting timber keyhole helispots visible from scenic roads, towns, scenic rivers etc.
 - Clear brush and trees below the level of the landing area. Jumbled brush and limbs tend to dissipate the ground-effect cushion, resulting in an abrupt transition to out-of-ground-effect flight.
2. **Lakes or Rivers.** Locating a helibase or helispot near a smooth surface such as that furnished by a lake or large river provides an adequate ground-effect cushion. Remember that in a normal takeoff flight configuration, a helicopter needs approximately 300 feet of water over which to gain flying speed. However, depth perception can be a potential problem of flight over water.
 3. **Canyon Bottoms.** If the canyon is deep, the helicopter will need a long forward run to climb out of the canyon, or an extra-wide spot in the canyon within which it can circle to gain altitude.
 4. **Meadows.** Caution should be exercised prior to utilizing meadows with high grass. The grass will tend to dissipate the helicopter's ground-effect cushion. High grass may also hide rocks, logs, and swampy areas which are a hazard to both personnel and the helicopter's skids, wheels, or fuselage. Grassy areas are also a potential fire hazard.
 5. **Snow Areas.** Depth perception on snow and glacial ice is often poor. It is important to clearly mark the landing site with objects of contrasting color. To reduce blowing snow, tramp the area thoroughly inside the safety circle.

If surfaces are icy, avoid locations that are over 6^B (9:1) slope. Choose a site large enough and flat enough to keep main and tail rotors from striking ice pinnacles or pressure ridges. Test the surface and load-bearing capability of the touchdown pad area to avoid snow bridges, thinly covered crevasses, crusts, and cornices.

Helicopters that operate in snow areas are usually equipped with snow pads which function essentially the same as a snowshoe by spreading the weight of the helicopter over a larger load-bearing area (the pad). It is the Pilot's responsibility to determine if a landing can be safely made in snow conditions, with or without snow pads.

6. **Tundra and Boggy Areas.** (See Exhibit 8-3.) Tundra and boggy areas are unstable surfaces. Helicopters that operate in tundra areas are usually equipped with tundra pads that function essentially the same as snow pads.

A log-deck pad may also be used. Cut and limb at least 10 poles, 20 feet long and approximately 6" to 8" in diameter. These are used to build a square touchdown pad. Place at right angles to the helicopter skids. The poles must support largest helicopter to be used. Secure outer logs to prevent rolling or separation from the pad.

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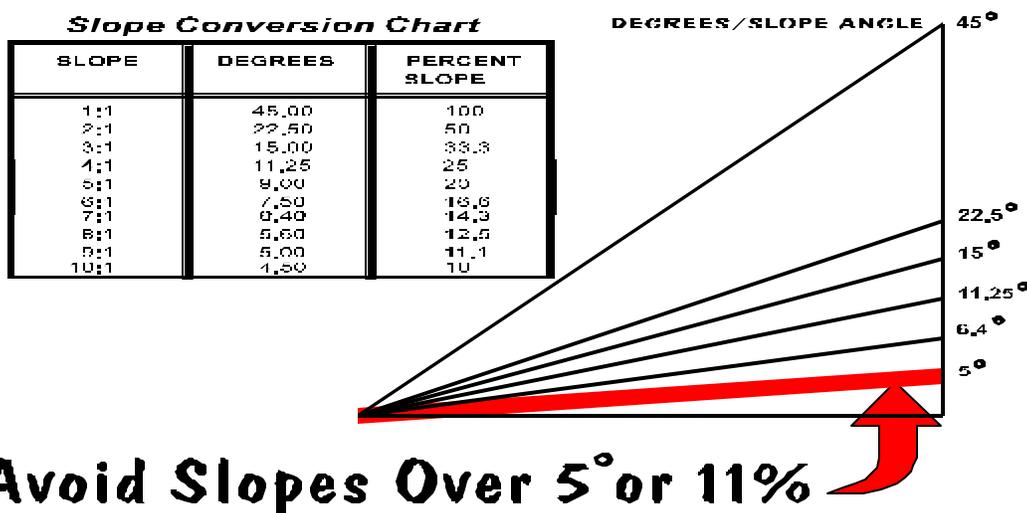
If further strengthening of the pad is needed, another layer of logs may be placed on top of the first layer. The log alignment of the top layer is at right angles to the lower layer.

Even though some helicopters have tundra pads, they may sink into boggy tundra. To ensure adequate clearance of the tail rotor from the ground, there must be enough pad area and log support to carry the weight of the rear end of the skids. Exercise care when landing on and taking off from log-deck landing pads.

D. **Surface Features and Requirements.** (See Exhibits 8-1 and 8-2.) Level or bottom land locations are best. The ideal approach-departure path should be 300' long minimum and slightly downhill.

1. **Slope.** Avoid slopes over 5° or 11% (9:1) slope (see Exhibit 8-5).

Exhibit 8-5 Depiction And Chart of Various Slopes



2. **Specifications for a Safety Circle.** The requirements specified in Chart 8-1 and illustrated in Exhibits 8-1 and 8-2 are minimums for construction. Safety circles should be as level as possible with trees and large brush removed.

Avoid damage to small bushes and grass cover that will help to reduce the dust problem. Limit dozer or other mechanical work as much as possible.

3. **Specifications for a Touchdown Pad.** The requirements in Chart 8-1 and illustrated in Exhibits 8-1 and 8-2 are minimums for construction.

- a. **Fuselage Clearance.** Ensure that the pad is free of brush or other obstructions and large enough to accommodate all wheels or both skids. There must

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be adequate clearance under the fuselage to clear antennas, cargo hook, or externally supported accessories.

- b. **Avoiding Sloped Or Unstable Pads.** Pads must be as level as possible and firm enough to support the type of helicopter being used. These specifications apply to both temporary helibases and helispots.

Where possible, avoid selection or construction of landing pads on a slope. The ground should be as level or as close to the terrain surface as possible without disturbing the small brush and grass cover.

The 8:1 slope limit measured from the edge of the safety circle, may be used as a guideline for obstruction removal when the terrain is relatively flat and level.



EXAMPLE: Approximately 8' Elevation Rise x 100' Length = 8:1 Slope

**CHART 8-1: SPECIFICATIONS FOR PLANNING AND
CONSTRUCTING HELISPOTS³**

Type	1	2	3
Touchdown Pad Dimension	30' x 30'	20' x 20'	15' x 15'
Safety Circle Diameter	110'	90'	75'

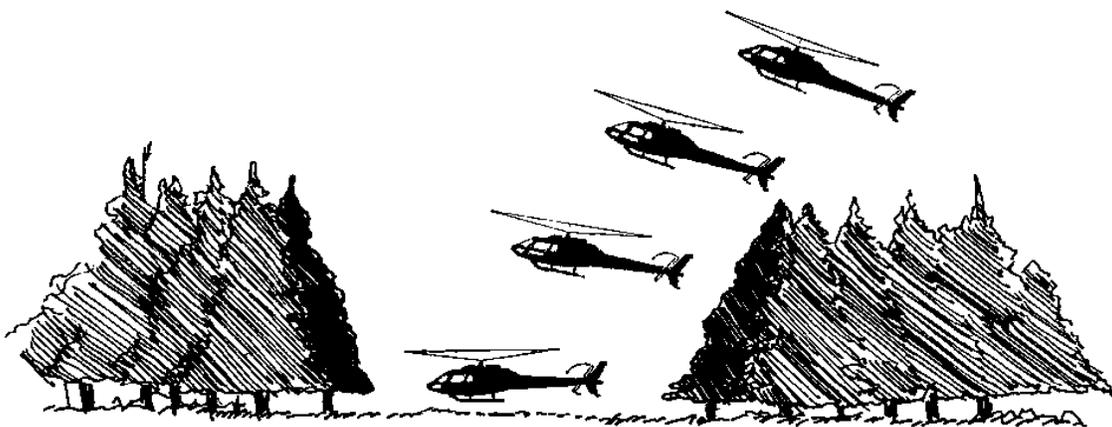
- 4. **Approach-Departure Path.** (See Exhibits 8-1 and 8-2.) Site selection should provide for approaches and departures in several directions. If the site is not located on a ridge top, an approach-departure path aligned with the prevailing wind should be constructed. If possible, avoid one-way helispots, although these landing sites are not inherently unsafe provided correct piloting techniques are followed.
 - a. **Wind Direction.** Always attempt to locate landing areas so that takeoffs and landings may be made into the prevailing winds.

³ See Chart 6-1 in Chapter 6 for performance and seating specifications for Types 1-3 helicopters.

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- b. **Almost-Vertical (Full Performance) Approaches and Takeoffs.** (See Exhibit 8-6.) Almost-vertical approaches and departures are not inherently unsafe, but should be avoided if possible, especially on an extended-use basis. Remember that most small helicopters must be at approximately 400' AGL at zero airspeed to execute a safe autorotation in the event of engine failure.

Exhibit 8-6: Full Performance Takeoff/Landing



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- c. **Minimum Width.** An adequate minimum width for an approach-departure path is the diameter of the safety circle. Construction starts at the edge of the safety circle and extends in the takeoff direction far enough to permit normal no-wind takeoffs for the expected density altitudes. Safety is increased if the paths can be widened as they leave the circle.
 - d. **Approach.** The approach should be free of obstructions which would prevent a normal approach. If environmental considerations restrict this from being accomplished, the helispot shall not be built.
 - e. **Departure.** There should be enough level running space to permit normal acceleration from hover to translational lift and initial climb. If environmental considerations restrict this from being accomplished, the helispot shall not be built.
 - f. **Downdraft Areas.** Avoid downdraft areas on lee sides of ridges.
- IV. **Required Equipment and Facilities.** Chart 8-2 lists equipment and facility requirements and standards for permanent helibases, temporary helibases, and helispots. Construction should take into account these needs and requirements.

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**CHART 8-2: REQUIRED AND RECOMMENDED FACILITIES
FOR PERMANENT HELIBASES, TEMPORARY HELIBASES, AND
HELISPOTS**

REQUIREMENT	PERMANENT HELIBASE	TEMPORARY HELIBASE	HELISPOT
Operations office or area for communications/administrative purposes	REQUIRED	REQUIRED	NA
Communications equipment, to include, as appropriate, telephone, station-to-station and air-to-ground radios. Where no telephone service is available, a mobile or cellular phone should be installed at the site	REQUIRED	REQUIRED	REQUIRED (Handheld Radio only)
Ready room/rest area for vendor personnel, including cots, toilet, desks, and, if possible, stove and refrigerator	REQUIRED	REQUIRED (rest and sanitation facilities only)	NA
Cache for agency-owned equipment	REQUIRED	NA	NA
Storage area for helicopter equipment and servicing supplies	REQUIRED	RECOMMENDED	NA
Parking and staging areas for vehicles (for ground-accessible sites)	REQUIRED	REQUIRED	NA
Water supply for drinking, utilities, and aircraft maintenance	REQUIRED	RECOMMENDED	NA
Maintenance lights, including electrical outlets if possible at each touchdown pad	REQUIRED	NA	NA
Security fence at least 150' from the center of the touchdown pad on the approach/departure path	RECOMMENDED	NA	NA
"No Smoking" and other safety and warning signs	REQUIRED	REQUIRED	RECOMMENDED
Evacuation and Crash-Rescue Kit	REQUIRED	REQUIRED	RECOMMENDED
Fire extinguisher located at each pad	REQUIRED	REQUIRED	REQUIRED
Scales for weighing passengers/cargo	REQUIRED	REQUIRED	RECOMMENDED
Wind indicators	REQUIRED	REQUIRED	REQUIRED
Dust abatement, if necessary	REQUIRED	REQUIRED	REQUIRED
Fueling capabilities	REQUIRED	REQUIRED	NA
Identifiable, marked touchdown pads	REQUIRED	REQUIRED	REQUIRED
Hazard map	REQUIRED	REQUIRED	NA ¹

¹ Form HBM-2, Helispot Information Summary, identifies helispot hazards.

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V. Markings for Aerial Identification.

- A. **Helibases.** Permanent helibases should use the triangle and "H" marking in accordance with the approved FAA heliport standard. If a smaller area is to bear the marking, the design may be scaled down. The triangle-H design should be placed in the center of the touchdown pad with the solid apex of the triangle pointing to magnetic north. The base name, elevation, and latitude and longitude should also be painted on the pad. Permanent markings for temporary helibases are not required.
- B. **Helispots.** Incident or project helispots used on a recurrent basis (for example, for more than one day) by more than one helicopter should be numbered and identifiable from the air. Markers are available through warehouse caches (see Appendix K for ordering information).
1. **Log-deck Touchdown Pad.** (See Exhibit 8-3.) Wind flagging or other colored cloth strip around the logs to form a letter "H". Ensure cloth strip is secure and cannot unravel.
 2. **Snow Areas.** Depth perception on snow and glaciers is often poor, so it is important to clearly mark helispots with objects of contrasting color. Wands about 3' high with streamers attached, packs, tramping a trench to create shadows, spray painting, colored chalk, and smoke grenades are several methods of marking snow areas.
 3. **Miscellaneous Markings.**
 - Painted rocks or well-secured and weighted signal panels may be used to outline a touchdown pad or landing area.
 - Color marking should provide sufficient contrast with the background area. Reflective material may be used. If paint is to be used, it must be environmentally acceptable (for example, a water-based paint).
 - Known hazards outside the safety circle such as poles, pipes, and high vegetation should be marked with colored ribbon or other means. Known hazards must also be marked on the hazard map at helibases and on Form HBM-2, Helispot Information Summary, that identifies helispot hazards.



CAUTION Do not use ground panels in loose or rocky soil. Rotor wash will easily pull them out of the ground. *If ground panels are used, check the spikes holding down the panels occasionally as they can work loose with extended use.*

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VI. Dust Abatement.

A. **Types and Methods.** The potential for dusty conditions usually exists when not operating from turf or pavement. Dust abatement measures must be accomplished at all helibases and helispots. These measures may be as simple as the application of water by ground equipment or from helicopter buckets or fixed tanks. A more complicated approach involves the application of chemical materials. Their use may be of concern from an environmental standpoint and should be checked with local authorities prior to application.

1. **Water.** Application considerations for water dust abatement include:

- Most commonly used
- Is usually the most economical
- Can be applied via ground or aerial delivery

2. **Chemical Products.** Commercial products are usually more expensive than water, but provide a more long-lasting application. In the end, they may be less expensive since far fewer applications are required.

a. **Lignin Sulphate.** The most commonly used chemical for dust abatement is lignin sulphate. It is a byproduct of the lumber industry, derived from wood pulp in the lumber milling process. The result is a lignin substance, which is mixed with ammonia and calcium bases to enhance its fertilizing characteristics. It has been used successfully on roads for soil stabilization and dust control. The cost, compared to other materials, is reasonable.

Application considerations for lignin sulphate are:

- Approved on an agency-specific basis;
- Not approved for fixed-tank application;
- Local Resource Advisor must be consulted prior to use;
- No ground preparation is necessary;
- Commercial sources who will travel to the site and apply the chemicals are available.

Lignin Sulphate can be applied by nearly any method (helicopter fixed-tank excepted): back-pack pump, pillow tank, rigid tank/pump operation,

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helicopter bucket, ground engine, etc. Do not use potable water containers. Lignin Sulphate is mixed with water in a ratio from 1:1 to 1:3, depending on temperature and soil condition. The lignin sulphate will be ready for use within 15 to 30 minutes, depending on the ambient temperature. It can then be applied to the area by any approved method.

When the site is ready, apply the lignin sulphate/water mixture in an even amount to ensure proper coverage.

If the area becomes churned up during air operations, either apply a light amount of water, or more lignin sulphate/water mixture. The area will then become a workable spot again.

All equipment must be cleaned with water. If the lignin sulphate dries, it breaks down with application of water and will wash out of clothing easily.

- b. **Retardant.** Retardant is the most expensive method of dust abatement and least desirable due to cost and cleanup factors.

- B. **Hazardous Materials and Materials Safety Data Sheets (MSDS).** MSDS sheets on dust abatement materials should be obtained prior to use from the manufacturer or the Missoula Technology and Development Center. These should also be available for the local Resource Advisor to review in determining environmental or ecological impacts.

VII. **Procedures for Landings.** The Pilot and Helicopter Manager are responsible for choosing safe landing sites. The Helicopter Manager or passengers may indicate landing sites that are convenient to their ground work site or drop-off point. However, in no case will safety be compromised for convenience, nor will any passenger implicitly or explicitly attempt to pressure the Pilot into performing a landing, takeoff, or flight maneuver that is unsafe.

- A. **Load Calculations.** Prior to repetitive flights to and from the same helispot, the Helicopter Manager will consult with Pilot(s) and designate sites as either HIGE or HOGE (see Chapter 7). In planning and computing loads for those sites, applicable performance charts will be used.
- B. **High-Level Reconnaissance.** The Pilot shall fly a high-level reconnaissance before descending on the approach path to an unimproved landing site that has not been used before.
- C. **Areas to Avoid.** Avoid dusty landing areas. A low, slow flyby may be necessary to determine dust conditions. Avoid marshy areas and areas with high grass or shrubs where ground hazards and soil stability cannot be determined.

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- D. **Wind Direction.** Ground personnel, if available, should furnish the Pilot with wind direction indication. This can be accomplished by throwing dirt, attaching flagging to vegetation, radio communication, or hand signal.
- E. **Reduction of Power.** Care must be taken to ensure that skids or wheels are down on solid ground before reducing power.
- F. **Pre-Exit Briefing.** The Pilot shall ensure that passengers are briefed on proper exit direction, especially when upward-sloping terrain may cause a hazard to personnel exiting the helicopter.
- G. **One-Skid, Toe-In, or Step-Out Landings.** (See Glossary for definitions.) Except in a life threatening emergency, these types of landings are prohibited unless specifically authorized. Exemptions are agency-specific and should be carried by agency personnel or vendors engaging in these activities.
- H. **Tundra or Boggy Areas.** (See Exhibit 8-3.) Inform Pilot if landing gear or skids begin to sink into tundra or boggy area.
- I. **Snow Landings.** Snow landings may require agency special use approval. Check agency Pilot Qualification Card for snow operations and ensure that the helicopter is equipped with snow pads.
- VIII. **Helibase and Helispot Rehabilitation And Restoration.** The air operations staff is responsible for obtaining desired rehabilitation standards from the local Resource Advisor. It is recommended that these be obtained in writing, or the guidelines outlined below may be utilized.

Before starting the rehabilitation task, walk through adjacent, untouched areas and observe the appearance, arrangement, and color scheme of the vegetation that has naturally evolved. Attempt to duplicate that in the restoration of the helibase or helispot to as close a natural state as possible. Follow these guidelines:

- Flush-cut all remaining stumps to no more than 3" above ground level.
- Flush-cut stumps and camouflage them in a manner that blends with surrounding landscape.
- If bolewood can be moved, place cut end adjacent to or underneath existing down material.
- Place a slant cut (45-60 degree angle) on the bottom side of the larger-size bolewood.
- Use several means to camouflage cut faces of stumps and bolewood. Rocks, dead woody material, fragments of stumps or bolewood, fallen/broken limbs or green branches, and soil may all be utilized effectively.

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- Rearrange smaller cut trees and snags in a criss-crossed or natural-appearing arrangement.
- Minimize any additional bucking or limbing, as this only increases the workload in camouflaging cut-faces and smooth spots.
- Remove wind indicators, pad markers, flagging, litter, etc.
- Where grass cover has been worn off helibases or helispots, consider application of a seed composition acceptable to the resource advisor or land owner. (This may become part of the overall fire rehabilitation plan.)