FLIGHT SAFETY FOUNDATION
HELICOPTER SAFETY
Vol. 18 No. 1 *For Everyone Concerned with the Safety of Flight* January/February 1992

Operating Safely at Airports — Pointers for Pilots and Safety Managers

Helicopter pilots share a unique responsibility, not only to develop safety awareness, but to educate airport officials and safety managers on helicopter operations, and to actively promote dissemination of safe practices.

by
Glenn A. Leister
Aviation Systems Consultant

The flexibility and safety features of the helicopter lend it the ability to operate efficiently at any airport and to land almost anywhere within the airport boundaries. This capability sometimes raises concerns for its influence on the safety of other aircraft, personnel or equipment on airport and heliport facilities. The helicopter pilot or operator can aid airport management in the development of designated helicopter landing areas and operating procedures that enhance the safety and harmony of operations.

Where Should Helicopters Land?

Each airport will have its own site-specific procedures for mixing helicopters and airplanes. One of the most fundamental safety points — often overlooked — is the need for local and transient pilots to be aware of traffic patterns and procedures at the airport. This information is included in flight publications such as airport/facility directories. Some aircraft Loran C receivers include in their databases the location of heliports, but they may not provide procedural information. Also, locally established procedures can be disseminated via posters at fixed-base operator locations (FBOs) and at all flight planning areas.

When new helicopter landing areas are being developed, pilots should help planners and managers to be aware of common arrival and departure routes for both fixed-wing and rotary-wing aircraft. These will help determine runway traffic patterns. The route requirements can be analyzed to establish non-interference helicopter routings — if needed — to avoid potential conflicts with instrument flight rules (IFR) or visual flight rules (VFR) aircraft using the runways. Helicopter routes may take advantage of non-noise-sensitive areas, and traffic patterns can be brought close to the airport, using vertical separation 500 feet below fixed-wing routes and traffic patterns to enhance safety. This is especially beneficial at controlled airports, but should be used with caution at uncontrolled airports.

ATC Needs Must Be Considered

Establishment of non-interference routes can help sustain continuous helicopter access to both controlled and uncontrolled airports during special VFR and IFR operations, if routes are identifiable through prominent landmarks or through the use of discrete transponder codes when radar service is available. At major airports, routes can be designed so that an arriving helicopter can proceed directly to a helicopter landing area, provided the routes are below the fixed-wing minimum altitude, or if appropriate separation can be maintained by air traffic control (ATC) until visual contact is established.

ATC separation is routinely facilitated by helicopter use of inactive runways, taxiways or other open areas either for landing or as an "initial" aiming point from which the helicopter proceeds to its parking location. Such initial points also can be used as overflight points for departures. These points could be runway/taxiway markings easily seen by pilots, and they can help facilitate ATC movements or help direct low-altitude traffic away from personnel and facilities. Designated landing areas may also be used by ATC to guide inbound helicopters away from fixed-wing approaches to runways by using a "sidestep" maneuver to finish their approach and land on adjacent taxiways, and then direct them to parking areas. The latter technique works well at both controlled and uncontrolled airports for transient pilots who are not familiar with the airport or its noise-sensitive areas.

Rotorcraft Terminology Defined

Helicopter pilots who operate at controlled airports in the United States are aware of the terminology and procedures established through the Federal Aviation Administration's *Air Traffic Controller Handbook* and the *Airman's Information Manual*. The following information about specific helicopter terminology can help pilots explain why helicopter ground operations are distinctly different from those for airplanes.

ATC controllers use the terminology "ground taxi," "hover taxi" or "air taxi" when directing helicopter ground movement. Certain sections of the airport, such as taxiways and ramps, are referred to as "movement" areas (normally under ATC control), and certain taxiways or portions of ramps may be identified as "non-movement" areas (not normally under ATC control). ATC instructions to pilots regarding the latter may be preceded with precautions such as "proceed at your own risk," intended to warn pilots that the operation is at pilot risk and discretion.

Ground taxi is the only phrase that is synonymous with fixed-wing aircraft. The term is used for wheeled helicopters, especially the light/medium twin-engine models and larger rotorcraft, as a means to move away from other aircraft, personnel or ground facilities which might be damaged during a liftoff. Initial liftoff and hover create great rotor downwash velocities in the immediate area and downwind from the helicopter.

Ground taxiing conserves fuel, but it is not appropriate for extended distances, and may even be unsafe when movement is over rough surfaces. Helicopters with articulating main rotor blades (normally three or more) are subject to ground resonance — a state of dynamic imbalance that can be precipitated during ground taxiing or a hard landing on one landing gear. Such a condition is quite rare, but rapidly increasing severity of vibrations can result in the immediate destruction of the helicopter if the condition is not quickly corrected.

Hover Taxiing Creates Strong Downwash

Hover taxi is used to specify that the helicopter movement will be at slow speeds, normally with the helicopter hovering in ground effect (HIGE) and moving at less than 20 knots. Pilots of light aircraft should be alert if their taxi operation is likely to pass through the helicopter's rotor downwash. With strong winds, rotor downwash moves a considerable distance downwind from a hovering helicopter, and the associated wind velocities can be hazardous to other aircraft.

Air Taxiing Preferred

Air taxi is the preferred and most efficient ATC control technique. It gives the pilot the option to either hover taxi (fly low and slow) or to air taxi, which permits flight up to 100 feet above ground level (agl). It permits the helicopter to be moved at a greater airspeed from one location on the airport to another location than a hover taxi allows. The 100-foot allowance (or higher if requested and approved) is necessary so that the pilot can select the appropriate altitude and airspeed for optimum safety if a power failure occurs during on-airport relocation. Arrival and departure procedures may be integrated so that instead of landing on a fixed-wing runway and delaying other operations, the helicopter will continue, clear of other aircraft and runways, directly to or from the parking area.

Landing Area Safety Demands Paramount Importance

Landing, hovering and parking areas should be free from

hazards such as loose debris or obstructions which can be swirled around by rotor downwash, and endanger the helicopter, personnel, nearby ground vehicles and equipment.

Rotor downwash velocities are greatest during liftoff and hovering, especially if the helicopter is equipped with skid landing gear. Helicopter movements within the parking and loading areas can be minimized through careful planning, the installation of multiple underground or above ground refueling points (at each helipad), or through the use of refueling trucks. Fewer air movements by helicopters will reduce accident exposure (as well as operating costs) in the long term. Lane and parking markings can be designed to help prevent automobiles and service vehicles from driving underneath the main rotor blades of helicopters.

Portable dollies and platforms used to move skid-equipped helicopters can be dangerous if they are too small, unsecured, or are not aligned into the wind, thus requiring a crosswind landing by the rotorcraft using it. Such factors contribute to accidents. When ground surfaces are slippery, or when dollies have unlocked wheels that swivel, torque effects during start-up or power changes can cause unexpected movements or loss of control of the platform.

Passenger Drop-off/Pick-up Sites Must Be Carefully Located

The drop-off/pick-up sites must be located so that passengers can easily transfer to commercial, corporate and general aviation facilities. Ideally, the helicopter landing, parking and passenger loading point would be the same to minimize repositioning. Because these sites at many airports are commonly used by all aircraft, coordination is necessary to establish safe procedures that also minimize delays. Security procedures are serious concerns, and drop-off/pick-up sites near airline gates may require procedures to accomplish security screening checks.

Pre-departure Passenger Control and Briefings Are Critical

Passenger safety is the most critical point to remember with respect to helicopter operations. There are at least three ways to achieve the desired level of safety, and all three are complementary and appropriate. They include: passenger briefings and accompanied assistance to the helicopter, especially if the rotors are turning; conspicuously posted passenger briefing signs; and, passenger briefing cards available in preboarding areas and in the helicopter. Telephone briefings are appropriate when missions are preplanned.

Briefings should include instructions on the use of seat belts and shoulder harnesses; procedures in emergencies such as forced landings or ditchings; guidance on opening or jettisoning doors; and operation of life jackets, rafts and emergency equipment.

Training, Emergency or ATC Needs May Dictate Landing Sites

At controlled airports, helicopters normally avoid the flow of other traffic except for IFR approaches or when ATC directs a helicopter to make an approach to the runway or taxiway in use by other aircraft. Large helicopter rotor downwash may dictate the use of runways rather than landing areas or heliports which are intended for small or medium helicopters.

Autorotations, landings with partial engine power, and emergency training may require the use of runways to enhance safety and reduce the risk of rollovers in the event of gross control input errors by students or instructors. If a power-off autorotation is made to touchdown with a power recovery, main rotor rpm is reduced to idle rpm, and a certain amount of time will be needed to regain operating rpm to lift off again.

Airport Heliports Need Markings

Heliport markings may be needed at staging points for arrivals and departures or for use as holding points from which to cross busy runways. Likewise, markings for helicopter use on ramps would depend on whether the area was reserved for, or used regularly by, helicopters. In other situations, markings may not be required, or ATC may prefer to use a variety of points on the airport for helicopter departures or arrivals.

As with fixed-wing aircraft, helicopter arrivals and departures into the wind provide the safest operation. Strong tailwinds can result in high sink rates and at the bottom, a demand for more power than may be available to stop the helicopter's forward movement or its descent rate. In the United States, ATC procedures do not permit downwind landing clearance when the tailwind is more than five knots, unless the pilot requests a downwind landing. And, the stronger the wind, the more important that the final approach be into the wind.

Finding Solutions for Multiple Landing Areas

Pavement marking at busy airports may be useful to ATC

to minimize communication and to aid transient pilots in visual identification of helicopter approach points or parking areas. If there are multiple landing or parking areas, there should be some alphabetical or numerical identification system which is obvious to pilots; and the landing areas should also be depicted on airport charts.

One of the simplest methods, and easiest to sight, is the use of a large circle with an "H" for a single point, or an "H-1," "H-2" or letters such as "A" or "B" for multiple sites. Another, and more preferable technique from the ATC-pilot communication viewpoint, is the use of designators which correspond with taxiway or runway designators; orientation may not be a problem for local pilots, but it can be a problem for the transient or the infrequent flyer.

One particularly valuable and painful lesson has been learned from heliport accidents in recent years. No markings are better than markings intended for small helicopters when they are used by larger aircraft. Within days at one public heliport, four helicopters sustained major damage from rotor blade strikes because the pavement markings allowed clearance only for smaller rotor diameters.

Further Guidance Offered

Pilots and managers needing heliport information should consult aeronautical authorities in their areas to assure compliance with various regulations or guidelines. In the United States, *Heliport Design* AC 150/5390-2, dated January 4, 1988, and *Vertiport Design* AC 150/5390-3, dated May 3, 1991, are available from the FAA. A comprehensive heliport planning guide and resource reference is also available from the Helicopter Association International (HAI), and that organization's heliports committees also can offer technical assistance.

Pilots and safety managers can take advantage of these and other technical documents to help improve safety and efficiency at all airports. ♦

About the Author

Glenn A. Leister is an aviation systems consultant and is the principal of Glenn A. Leister & Associates. He was director of safety and flight operations for the Helicopter Association International (HAI) and, earlier, its director of heliports, airways and regulations. Leister also served as an air traffic specialist in the terminal and en route procedures branches in the Air Traffic Service of the U.S. Federal Aviation Administration (FAA).

Leister received a master of science degree from the University of Southern California Institute of Safety and Systems Management in 1971 and serves on the USC Aviation Advisory Board. He is an active pilot with commercial and instrument ratings in both fixed-wing aircraft and rotorcraft. He has logged more than 5,800 hours.

What's Your Input?

Flight Safety Foundation welcomes articles and papers for publication. If you have an article proposal, a completed manuscript or a technical paper that may be appropriate for *Helicopter Safety*, please contact the editor. Submitted materials are evaluated for suitability and a cash stipend is paid upon publication. Request a copy of "Editorial Guidelines for Flight Safety Foundation Writers."

HELICOPTER SAFETY