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Managing Helicopter Noise

Business & Commercial Aviation

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It's key to keeping access to urban areas

While the sound of spinning rotors may mean lifesaving, safety or profit to members of the rotary-wing community, to most in the general population, the sound is just noise. Too often, unwelcome noise. And that's a problem for everyone.

According to "Noise Management in Mixed-Use Urban Environments," presented by the New Zealand Planning Institute, "Noise is an unwanted sound. The effects of noise vary, starting at the lowest end with being an annoyance. The next level occurs when the noise is loud enough to make normal speech difficult to hear. Above that, even louder noise can make concentration difficult and interfere with important mental tasks such as learning, reviewing documents, doing math or where focus on the meaning of words is critical."

"Noise has even more serious effects when it leads to stress-related mental health decline," it continued, "and of course, if the noise occurs during sleep periods, then fatigue and disrupted sleep patterns can cause irritability, changes in behavior, and reduced ability to work or perform tasks."

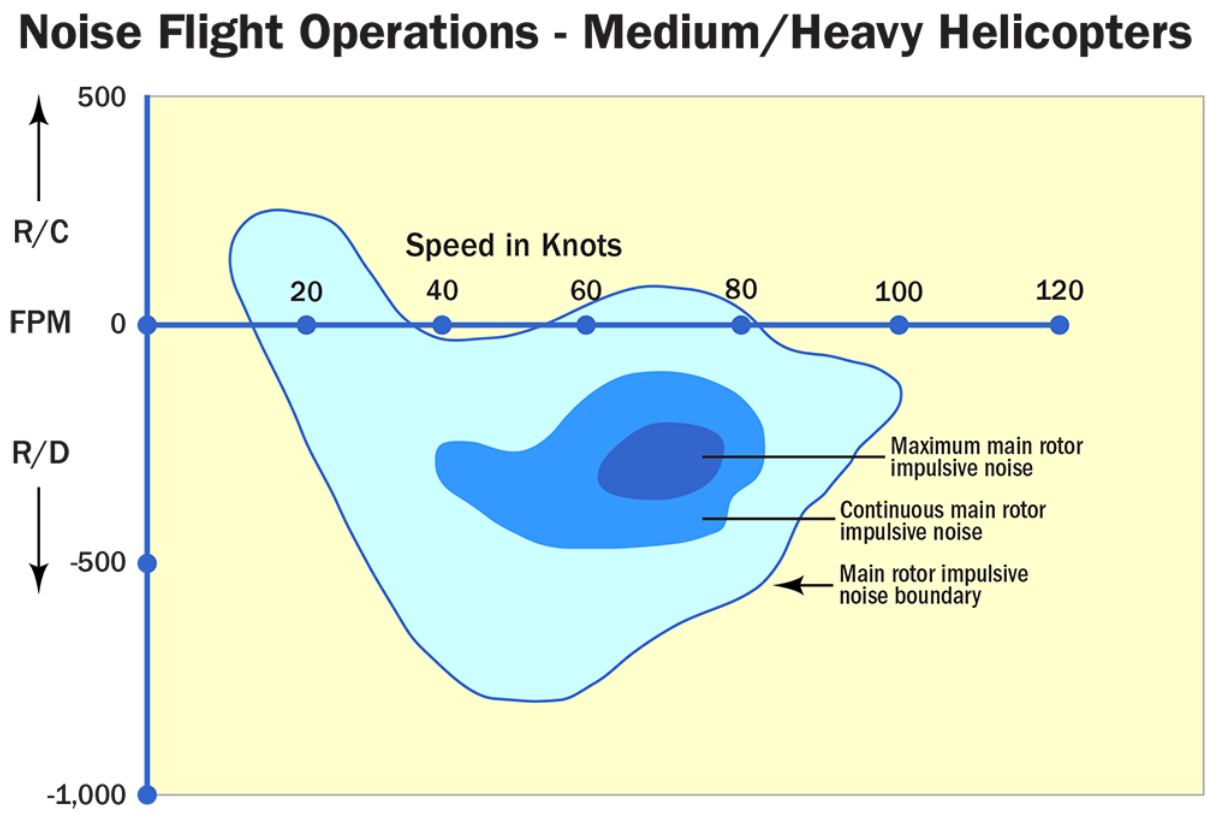
There are numerous characteristics of helicopter sound that cause it to be objectionable to many within earshot. To begin with, noises with a beat or pulsating qualities tend to be more annoying. The main-rotor and anti-torque systems in turbine helicopters tend to dominate the acoustical signature.

The distinctive aerodynamic rotor blade slap noise generated by helicopter rotors is difficult to disguise. Blade slap (technically “Blade Vortex Interaction,” or simply BVI) noise occurs during descent for landing and results from interaction of a main-rotor blade with previously shed tip vortices. These interactions generate a complex unsteady pressure field that propagates below the rotor as high impulsive noise. High-Speed Impulsive (HSI) noise is caused by transonic flow shock formation on the advancing main-rotor blade, primarily near the blade’s tip. This noise tends to propagate forward of the helicopter.

Meanwhile, tail-rotor noise is annoying to humans because its higher frequency (as compared to that of the main rotor’s noise) occurs directly in the hearing spectrum to which human ears are the most sensitive.

The loudness of a helicopter’s noise signature is an obvious factor. The Effective Perceived Noise Level (EPNL) generated by helicopters is measured in units of EPNdBs (Effective Perceived Noise Decibels), a methodology that closely weights the frequencies that a normal human ear can hear, and tends to disregard the frequencies that the typical human cannot perceive. Using the test

methods outlined in FAR Part 36 Appendix H, the EPNdB of the Bell 412HP at flyover, for example, is measured at 93.4, according to the manufacturer, which is equivalent to a Boeing 777-200 at takeoff.



According to the American Planning Society, "Sound frequency must also be taken into consideration. A sound spectrum analysis of helicopter noise shows that most of the energies are confined to the low frequencies which, although more acceptable than high-frequency sounds, are more apt to produce speech interference." Speech interference is just one of many important considerations that must be proactively managed in noise management.

Keith Hayward, head of research at the Royal Aeronautical Society, was called upon by London authorities to provide expert testimony on the issue of helicopter noise. According to Hayward, non-acoustic characteristics such as the frequency of noise and purpose of flight operations tend to be more important than the actual sound in determining the public's acceptance of helicopter activity.

Frequent rotary flight operations over a noise-sensitive location are almost guaranteed to annoy citizens and often result in legislative and regulatory restriction. For nearly a decade, Long Island, New York, residents have inundated public officials with complaints about helicopter noise. In response, in 2011, Sen. Charles Schumer (D-N.Y.) sponsored legislation that would have heavily restricted helicopter operations over the heavily populated island. The legislation was blocked by the Republican-controlled House, but Schumer subsequently teamed with Rep. Tim Bishop, a fellow Democrat from Long Island, to get the Department of Transportation to mandate an overwater route for helicopters transiting the island. The "North Shore Route" required helicopters to fly 1 mi. off the island's north shore for the purpose of noise abatement.

Of course, moving traffic from one place simply shifts it and thereby assaults the calm elsewhere. In 2013, the Eastern Region Helicopter Council received and processed 1,848 complaints from 94 distinct households, with the majority of those from residents on Long Island's North Fork. (A graphic of the concentration of noise complaints is available at **http://**www.planenoise.com/case-studies.php.) Hundreds of irritated residents from Southold, Shelter Island and Southampton packed public meetings in August 2014 to protest the increased helicopter approaches and departures at neighboring East Hampton Airport, where it is estimated that 65% of summertime helicopter traffic lands.

Helicopter activities located close to residential areas generate more noise issues than those frequenting commercial or industrial zones. According to the Royal Aeronautical Society's Hayward, "Prevailing ambient noise levels affect perceptions, and a quieter setting will accentuate airborne noise, especially if radiated from above. This is particularly important when locating heliports and defining the flight paths for arriving and departing helicopters."

Residents of Torrance, California, have complained loudly about the increase in flight operations there over the years and object particularly to low-flying helicopters. As it happens, Robinson Helicopter Co. employs 1,300 people in its factory and headquarters, located at Zamperini Field, a busy, public-use general aviation airport located just 3 mi. from Torrance's central business district.

In response to those and other complaints from the region, the FAA issued its "Report on the Los Angeles Helicopter Noise Initiative" in May 2013, which suggested, among other things, raising helicopter traffic altitudes and moving flight paths around Torrance to lessen their noise impact on those below. The agency is working with the city to test community-recommended arrival and departure routes located over the Pacific Coast Highway and Crenshaw Boulevard to mask helicopter noise with that of the road traffic.

A similar tactic has been proposed in the "Windy City" by Chicago Helicopter Express CEO Trevor Heffernan. The helicopter tour operation wants to utilize flight routes over expressways and train tracks when conducting tours.

Heffernan is also proposing a 2,000-ft. AGL flight path to further lessen the noise impact. The FAA's "Report to Congress: Nonmilitary Helicopter Urban Noise Study," published in 2004, cites numerous studies in which noise reduction benefits could be achieved with higher altitude flight. This is a policy mandated by pilots utilizing the London Heliport where the pattern altitude is 1,000 ft. MSL and flown over the river.

According to data published in the HAI's *Fly Neighborly Guide,* a doubling of height or distance reduces noise by 6 to 7 dBA. In order for a light/small helicopter to meet the generally accepted criteria of 65 dBA over a noise-sensitive area, it should fly at altitudes no less than 1,000 ft. AGL, and for medium helicopters, the recommended height is 2,000 ft. AGL. If those noise targets seem ambitious, consider that a quiet bedroom has a noise level just under 40 dBA, and a busy office is around 60 dBA. Voice communications start to become difficult around 65 dBA.

Even though flying higher results in substantial noise reduction, doing so can have safety implications. For instance, requiring helicopters to fly at higher altitudes in the Los Angeles Basin could create traffic conflicts with the fixed-wing aircraft operating in that already congested airspace. (Incidentally, according to the FAA's report on Los Angeles helicopter noise, there are 138 heliports in the LA Basin.)

Night helicopter operations are a particular problem in the urban environment. The absence of daytime road traffic to mask helicopter noise can make the latter all the more noticeable and bothersome. Furthermore, temperature inversions turn an abnormally high portion of the sound energy back toward the ground and the most severe inversions usually occur at night and in the early morning hours, times when helicopter noise has the most adverse effect upon people.

"Have Your Say On Helicopter Noise" is a website frequented by Londoners bothered by rotary-wing operations there. Of the 240 posts found recently at the site, the large majority of the complaints centered on helicopters circling for prolonged periods of time at around 2 a.m. "I find it very distressing getting up every night for this reason," one resident, who lives near the London Heliport, wrote. "I also sleep with earplugs, but the noise is too loud."

Limiting the number of helicopter operations at night can significantly reduce noise complaints. Unfortunately it's hard for the public to distinguish civil from police, medevac or military helicopters, particularly at night, and thus commercial operators might be blamed for noise not of their making.

That ambiguity raises the matter of perceived usage, and its impact on public attitudes toward helicopters. According to the FAA's study of nonmilitary helicopter noise in cities, helicopters used in public service operations, such as law enforcement, medical transport and firefighting are regarded more benignly than those carrying sightseers or executives. The former were regarded as "time critical and provide a 'noise excusable' public service," the study found. Conversely, local communities aren't as forgiving when the helicopters creating the noise are carrying Wall Streeters to weekends at the beach or reporters gathering news video.

Daily coverage of traffic reports, accidents, fires and police pursuits are standard fare for helicopters engaged in electronic news gathering (ENG). But for all the public benefit they provide, they, too, can become part of the noise problem.

When a 10-mi. section of Los Angeles's infamous Interstate 405 was closed over one weekend in July 2011 as part of a highway improvement project, local media predicted a "carmageddon" would result. It didn't, but the news helicopters covering the non-event were so numerous and their flights so incessant that those below exposed to the din demanded action from the authorities.

Accordingly, Sen. Diane Feinstein (D-Calif.) teamed with Rep. Adam Schiff (D-Calif.) to enact an amendment mandating the industry find solutions to the helicopter noise problem "or else" Congress would force the FAA to impose severe restrictions.

In response, the FAA delivered its 2013 report on helicopter operations in the Los Angeles area. Among its recommendations was that news helicopter operators embrace voluntary measures to

include limiting hovering times, increasing distance between hovering aircraft, raising operating altitudes and pooling their video coverage. The Professional Helicopter Pilots Association (PHPA) urged the Southern California Radio and Television News Association to consider pooling resources as well. Doing so has reduced noise complaints from the public.

Moreover, the use of improved cameras that can obtain good images from farther away has also helped to lessen the sound congestion near major news events. These successful methods are now included among the best practices on the PHPA's website (**http://www.phpa.org**) to reduce sound complaints.

There are other potential mitigation strategies. Main-rotor impulsive noise increases during maneuvering, thus pilots should avoid abrupt maneuvering and/or rapid initiation of descent, particularly around high usage areas such as heliports. This is a policy in place for pilots operating into the London Heliport. There the pattern altitude is 1,000 ft. MSL and flown over the Thames River. All turns should be made as far as practical over the water above 500 ft. An excellent discussion of the additional noise caused during maneuvering is contained in the HAI's *Fly Neighborly Guide.*

Hayward's noise management recommendations to London officials included requiring approach-to-landing over water or over high ambient noise areas, which would include freeways. Meanwhile, the New Zealand Planning Institute's website points out that noise provisions can normally be more lenient within commercial and industrial zones, and recommends these for consideration in helicopter routings.

While routing helicopters over major transportation corridors can avoid impacting residential areas, the practice has the additional benefit of providing pilots with navigational cues. After all, in densely built-up urban environments, major roadways may be the most readily identifiable surface features for orienting pilots in VFR conditions. Within the L.A. Basin, allowing helicopters to fly the freeways at lower altitudes also allows them to safely pass under the numerous approach and departure paths that exist throughout Southern California's complex airspace.

There are caveats to this methodology, of course. For example, the iconic Hollywood Bowl is just 850 ft. west of the Hollywood Freeway (U.S. 101) and is host to hundreds of musical events each year. A helicopter's beats are unwelcome when attendees there are trying to enjoy a concert. NOTAMs have not been effective in keeping pilots clear of the area during performances. Requests by Hollywood Bowl management to shift helicopter flight routes closer to Interstate 5 met with objections from residential areas under the revised routes. The FAA's Los Angeles study suggested the establishment of a no-fly zone during performance season.

Obviously, optimal helicopter route planning to avoid noise-sensitive areas requires comprehensive evaluation of each specific region of concern, including those tasked with air traffic management.

Distance and the placement of barriers between the helicopter's flight operations and neighbors can be another effective means of controlling unreasonable noise. In its "Noise Management in Mixed-Use Urban Environments," the New Zealand Planning Institute recommends close consideration of the helipad's location, orientation and design; the specification of helicopters that comply with lower noise levels; planning arrival and departure routes as far away as possible from noise sensitive neighborhoods; and employing barriers such as solid walls, fences, insulation, double-glazed windows or even hills, depressions or berms to control or reduce noise. Unfortunately, when close to helipads some noise barriers can create a collision potential. The effects of reflected sound need

to be considered within the design and orientation of barriers as well as the location of the helipad itself.

Since public objection can result in severe limitations on helicopter operations, helicopter operators are wise to proactively manage the noise their aircraft generate. While there is no single remedy that can be implemented on a large-scale basis in urban areas to mitigate helicopter noise, development of noise abatement procedures in cooperation with local authorities and neighborhoods, along with adoption of "*Fly Neighborly*" guidelines, are modern necessities for the rotary-wing community. Time will tell if the voluntary actions taken by Los Angeles helicopter operators comprise an adequate compromise for all involved. Regardless, those kinds of collective actions are necessary to keep the urban helicopter viable. **B&CA**

DOWNLOAD the HAI's *Fly Neighborly Guide* tap here in the digital edition,
or go to AviationWeek.com/Flyguide