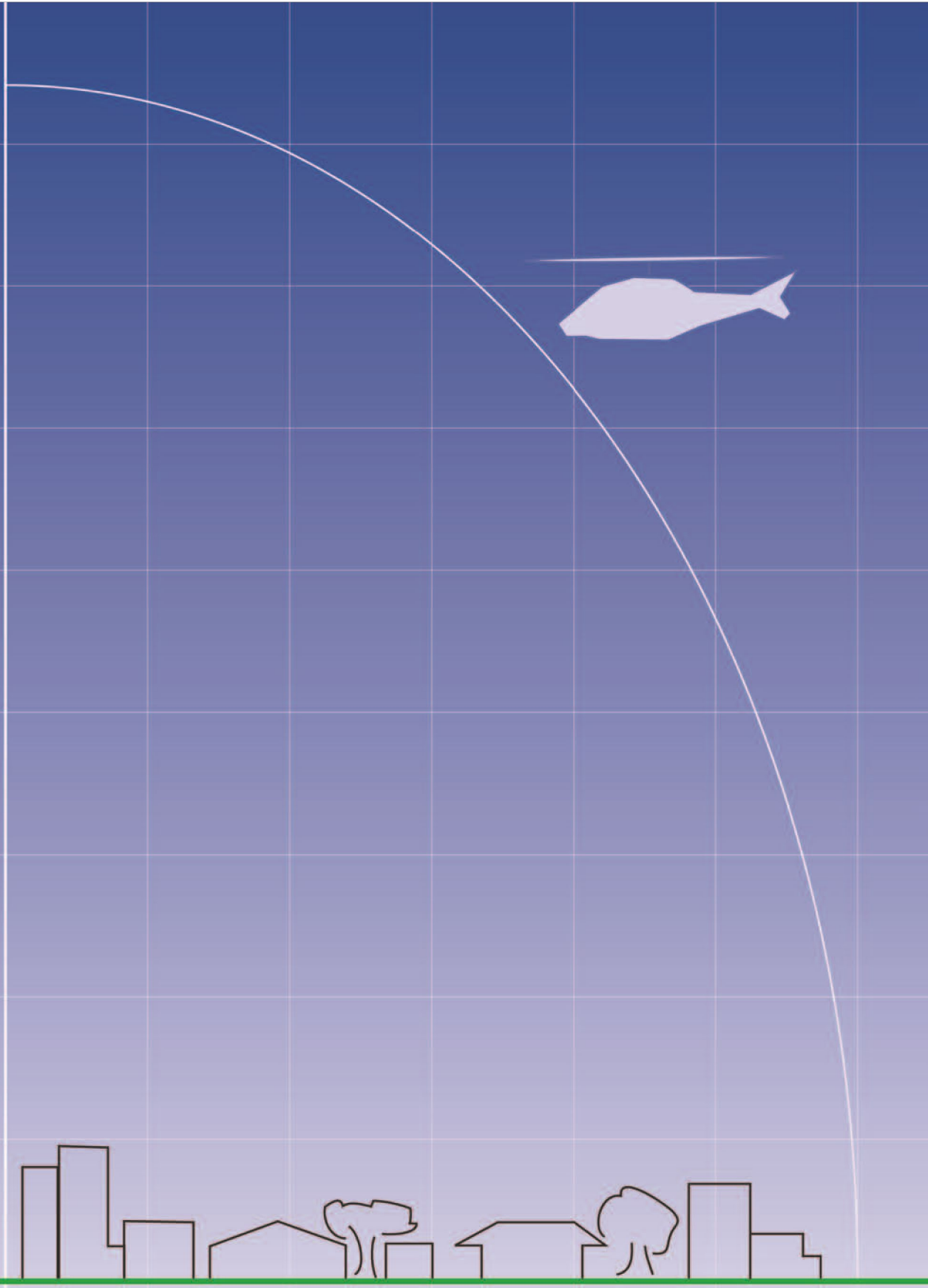

Fly Neighborly Guide

produced by the

Vertical Aviation International

Fly Neighborly / Environmental Working Group

Preface

The Fly Neighborly Program is a voluntary noise abatement program developed by the Fly Neighborly / Environmental Working Group (formerly the Fly Neighborly Committee) of Vertical Aviation International (VAI), formerly Helicopter Association International (HAI). The program is designed to be implemented worldwide by large and small individual helicopter operators, and applies to all types of civil, military, and governmental helicopter operations.

This is the fourth edition of the VAI Fly Neighborly Guide. The initial guide was issued in 1981 and again with a change to the title page in 1983. A second edition was issued in 1993 and a third edition, edited and revised by Charles Cox and Dr. John Leverton, was issued in 200x. This fourth edition is based on the third edition and was edited and revised by Eric Jacobs and Dr. John Leverton on behalf of the Fly Neighborly / Environmental Working Group.

Individuals, operators, or agencies desiring additional information should contact the VAI Fly Neighborly Program staff liaison at:

Vertical Aviation International
1920 Ballenger Avenue, 4th Floor
Alexandria, VA 22314 USA
Phone: 703-683-4646
Email: Info@verticalavi.org
Website: verticalavi.org

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Foreword

In the late 1970s, concern was being expressed about helicopter noise by the general public and national authorities in a number of nations, including the USA. As a result, a number of Helicopter Association International (HAI) committees, including the Heliport and Airways Committee (now known as the Flight Operations Working Group and Vertical Flight Infrastructure Sub-Working Group), started to research how this concern should be addressed. At the same time, the International Civil Aviation Organization (ICAO), with active support of the United States Federal Aviation Administration (FAA) and most European nations, established a working group to develop helicopter noise certification standards. In addition, the FAA issued a Notice of Proposed Rulemaking (NPRM) outlining proposed noise certification procedures and limits.

The industry, and HAI in particular, felt that a better approach would be for the industry to develop voluntary guidelines to control the noise impact by operational means. After a number of FAA/industry meetings, the FAA, in the fall of 1981, agreed to withdraw its initial NPRM related to helicopter noise certification while additional technical data were acquired. This was done with the understanding that the helicopter industry would develop new technology - creating quieter, more advanced equipment, and implement a voluntary noise abatement program. This resulted in the establishment of the HAI Fly Neighborly Program based on an earlier program developed by Bell Helicopter Textron.

ICAO issued international noise standards adopted in 1985, as a part of the International Standards and Recommended Practices, “Environmental Protection,” Annex 16 to the Convention on International Civil Aviation. Since that time, the standards have been amended a number of times. The FAA subsequently issued helicopter noise certification standards in 1988. These are defined in 14 CFR Part 36 and have also been amended over the years. They are defined in 14 CFR Part 36. The Fly Neighborly Program offers the technical information necessary for helicopter operators to fly both current and new advanced helicopters as quietly as practical, and to make helicopter operations compatible with nearly all land uses. The program also discusses how to communicate to the public the gains from using such procedures. In addition, the program provides general information related to helicopter noise and public acceptance.

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1. General Information

1.1 Background

HAI's former Heliports and Airways Committee originally organized the Fly Neighborly Program through its Fly Neighborly Steering Committee. This committee was composed of members of HAI and governmental representatives, including the FAA, members of the military and other associations. Officially launched by HAI in February 1982, the program gained U.S. and international acceptance. Subsequently, the work related to the Fly Neighborly Program was considered sufficiently important by HAI that a separate Fly Neighborly Committee (later known as the Fly Neighborly / Environmental Working Group) was formed to promote the program and ensure that the *Fly Neighborly Guide* and associated material are updated as appropriate. These efforts have continued through the transition of the Helicopter Association International to the Vertical Aviation International (VAI).

In the U.S., the program has gained the full support of helicopter operators, regional associations, manufacturers, pilots and communities throughout the country. Federal, state and local government agencies have embraced the program, and taken an active part in sponsoring Fly Neighborly presentations in conjunction with safety seminars and other activities. Worldwide, the helicopter industry and its related communities are kept informed on the Fly Neighborly Program. Companion programs have been developed in a number of countries including Germany, France, and the United Kingdom.

1.2 Objectives

The Fly Neighborly Program addresses noise abatement and public acceptance objectives with guidelines in the following areas:

- Pilot and operator awareness
- Pilot training and education
- Flight operations planning
- Public acceptance and safety
- Sensitivity to the concerns of the community.

1.3 About This Guide

The *Fly Neighborly Guide* is published under the auspices of VAI to promote helicopter noise abatement operations. It addresses general issues only and is, by no means, comprehensive.

1.4 Purpose

These guidelines are intended to assist pilots, operators, managers, and designated Fly Neighborly coordinators to establish an effective Fly Neighborly Program. The concepts and flight operations outlined herein must be further tailored to suit local needs, and to ensure local or regional organizations cooperate to develop a strong, well-organized and disciplined approach to achieving Fly Neighborly objectives.

1.5 Organization

This guide is divided into seven main sections. Section One covers general information. Section Two addresses helicopter sound generation. Section Three gives guidance for noise abatement operations. Section Four discusses how to operate helicopters quietly. Section Five covers pilot training. Section Six describes the operator program which provides a broad outline of the possible actions helicopter operators can take, including flight operations planning. Section Seven deals with community concerns and issues of public acceptance and Section Eight answers the question of what the Fly Neighborly Program can achieve. Three appendices present a comparison of sounds, the Advisory Circular (AC) 91.36D, and an example of a public heliport noise abatement program. In addition, a glossary is provided to help define the acronyms used or referred to in this Guide.

1.6 Administration

VAI solicits new ideas, comments, and recommendations to improve the program. HAI's Working Groups are focal points for the development of new technical material in their respective areas.

The Fly Neighborly / Environmental Working Group monitors the Fly Neighborly Program and distributes new information to participants. Individuals, operators, or agencies desiring additional information should contact the VAI Fly Neighborly Program staff liaison at:

Vertical Aviation International
1920 Ballenger Avenue, 4th Floor
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2. Introduction to Fly Neighborly

When operating a helicopter, another and sometimes new spectrum of sound is added to the usual noise environment and thousands of people may hear the new sounds and know a helicopter is operating. How they react depends not only on the noise you generate but upon physical, economic, and psychological factors. One thing is certain: they will react strongly, adversely, and actively if the sound is too irritating, if it represents something that seems to threaten their safety and well-being, or if they cannot see how the noisemaker (the helicopter) benefits them. Although it is up to operators to educate the public about the safety and usefulness of the helicopter, operators and their pilots can make the public less hostile to the helicopter (and to the operators' arguments about its safety and community service) by flying in such a way as to make the sound of the aircraft as non-intrusive as possible.

The Fly Neighborly Program attacks the problem of helicopter noise on three fronts: pilot training, flight operations planning, and public education and acceptance. These three areas are interrelated. Planning flight operations with an eye to noise abatement can have a major positive impact on both the pilot training program and public acceptance.

The information presented in this section provides only a broad outline of the possible actions helicopter operators can take. Operators are encouraged to expand this outline by applying knowledge of their own geographical area of operations, the nature of their businesses, and the local climate of opinion about helicopter operations.

3. Helicopter Sound Generation

3.1 The Source of the Sound

The external sound produced by a helicopter is made up of acoustical sources from the main rotor, the anti-torque system (tail rotor), the engine(s), and drive systems. For turbine-powered helicopters, the main rotor and anti-torque system dominate the acoustical signature. Engine and gearing noise are generally of significance only when up close to the helicopter. The same is true for piston-powered helicopters, although muffling of the engine is usually necessary.

Often the most noticeable acoustical characteristic of a helicopter is a modulation of the sound emitted by the relatively low RPM main rotor. This modulation attracts attention, much as a flashing light is more conspicuous than a steady one. In some flight conditions, this main rotor noise can become quite impulsive in character, which can increase the annoyance to people on the ground.

One type of impulsive helicopter noise occurs during high-speed forward flight. It is a function of blade thickness and compressible flow on the advancing blade, resulting in shock waves that can propagate forward as what is known as High Speed Impulsive (HSI) noise. High tip-speed rotor designs flown at high airspeeds and/or low air temperatures are the worst offenders. Design changes to reduce this noise include lower rotor speeds and/or advanced blade tip designs, while operational avoidance of HSI noise is primarily achieved by reducing airspeed as needed.

At lower airspeeds, and typically during a descent, rotor impulsive noise can occur when a blade intersects a vortex shed by another blade. This type of noise is known as Blade Vortex Interaction (BVI) noise and also has been referred to as Blade Slap. When this happens, the blade experiences locally high velocities and rapid angle-of-attack changes, producing sound emissions that are loud and very annoying in character. The specific operational conditions (e.g., airspeeds and rates of descent) at which a particular helicopter design produces BVI noise can be a function of several design parameters including number of main rotor blades, blade planform, rotor tip design and rotor speed. BVI noise levels also trend upward with increasing maximum design gross weight, but not necessarily with operational gross weight for a given helicopter model.

BVI noise generation is characteristically a strong function of descent condition (airspeed, rate of descent, and/or acceleration/deceleration rate), leading to effective mitigation by changes to descent conditions. Because changing descent conditions can be so effective in reducing noise emissions and resulting community noise impacts, identifying and implementing noise abatement approach procedures has long been a prime focus of Fly Neighborly.

The three basic types of anti-torque systems used in current helicopters are: the conventional open tail rotor, the ducted tail rotor/fan (e.g., the Fenestron®), and the Coanda-effect/ blown-air system (e.g., the NOTAR®). Each system has its own unique acoustical characteristics. Typically, a conventional open tail rotor generates a fluctuating low pitch whine or buzz, a

ducted tail rotor/fan produces a higher pitch shrill that sometimes fluctuates, and a blown-air, directional-vane system generates a broadband, ‘compressed-air’ hissing.

The noise of both the open tail rotor and the ducted tail rotor/fan increases in high-rate climbs and turns. Also, aerodynamic interactions between the main rotor and either type of anti-torque system can, and often do, exacerbate the anti-torque system’s sound output. In addition, open tail rotor sound output is influenced by the proximity of the vertical fin and tail boom. Somewhat similarly, the presence of vanes/stators and support struts, plus inflow/outflow turbulence, can increase the sound output of ducted tail rotor/fan systems. Turbulent flows off the pylon and fuselage also tend to increase the level and the sound fluctuations of both these types of anti-torque systems.

On some helicopters, a primary source of noise heard at distance, particularly if a high tip-speed tail rotor is used, is associated with the tail rotor blade thickness. ‘Quiet open tail rotors’ tend, therefore, to use lower tip speeds, thinner blade sections and, to provide adequate thrust, an increased number of blades.

The Fenestron® has some advantages over an open rotor at distance since, in addition to shielding of the shrouded tail rotor noise directly beneath the helicopter, it generates a higher frequency sound which is more easily attenuated by the atmosphere.

The NOTAR® has a noise generation advantage as, unlike the other two types of antitorque systems, it does not emit noise forward of the aircraft. The NOTAR® is, however, only available at the current time on designs manufactured by one company.

3.2 Non-Acoustical Aspects of Helicopter Annoyance

Past studies have indicated that noise levels may be responsible for no more than approximately 1/3 of helicopter noise complaints with the other 2/3 of noise complaints attributable to other acoustic characteristics and non-acoustical factors. These non-acoustical factors can include safety, usage (e.g., tourism), passenger types (e.g., rich people) and other non-acoustical concerns and often come into play for operations at significant distances from the observer on the ground. These non-acoustical factors have also been referred to as Virtual Noise as they can cause noise complaint levels in excess of what would be anticipated based only on the measured noise levels.

Non-acoustical factors often require a Fly Neighborly program to address issues beyond simply instituting noise abatement operations. Noise abatement/low noise is a critical component of Fly Neighborly, but in many cases a more comprehensive Fly Neighborly program may be needed using community outreach as well as further adjusting operations/routing to achieve the desired Fly Neighborly results.

3.3 Noise Impacts of Operations

For most helicopters, the most annoying noise mechanism is BVI impulsive noise occurring during partial power descents and in sharp high-rate turns. For some helicopters, BVI occurs

over relatively compact airspeed and rate of descent ranges. An example of this is given in Figure 1, depicting what has come to known as a “fried egg plot of BVI noise vs. airspeed and rate of descent, with the most intense BVI conditions indicated by the center contour. A more current variation of this plot, known as an Operational Noise Plot, is shown later in Figure 6. The location of airspeed and descent conditions that generate intense BVI noise is dependent on the design of a given helicopter and greatly impacts noise abatement approach procedures.

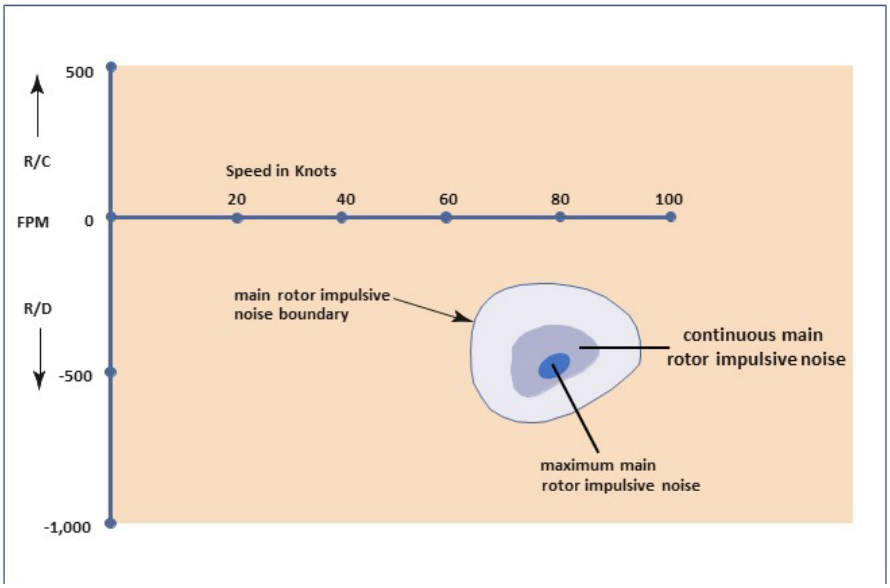


Figure 1
High-Noise Flight Operations – Compact BVI Range (Example Case)

For some helicopters, the range of airspeed and/or rate of descent with BVI noise can be more extensive, including if the main rotor experiences multiple blade vortex interactions that can create more than one region of BVI noise. In some cases, BVI noise conditions may extend as far as level flight at lower airspeeds. An example of a possible extended fried egg plot with BVI conditions extending into level flight is shown in Figure 2. The impulsive noise boundary for your helicopter may be somewhat larger than that shown in Figure 1 and likely smaller than that shown in Figure 2, and in some cases more than one region of intense BVI noise region can occur.

Airspeed and rate of descent set aircraft pitch attitude which is a determining factor for incurring or not incurring blade vortex interactions. Acceleration or deceleration produces an additional trim force that changes pitch attitude down or up, respectively, which can affect BVI noise generation or avoidance. In particular, deceleration has been shown to be an effective tool in mitigating BVI noise when combined with higher descent rates.

BVI noise can sometimes be heard in the cockpit, but in many cases, it will not be discernable by the pilot but be very evident to people on the ground. Because of this, ground-based evaluations of noise and annoyance levels may be required in gauging Fly Neighborly effectiveness for approach operations.

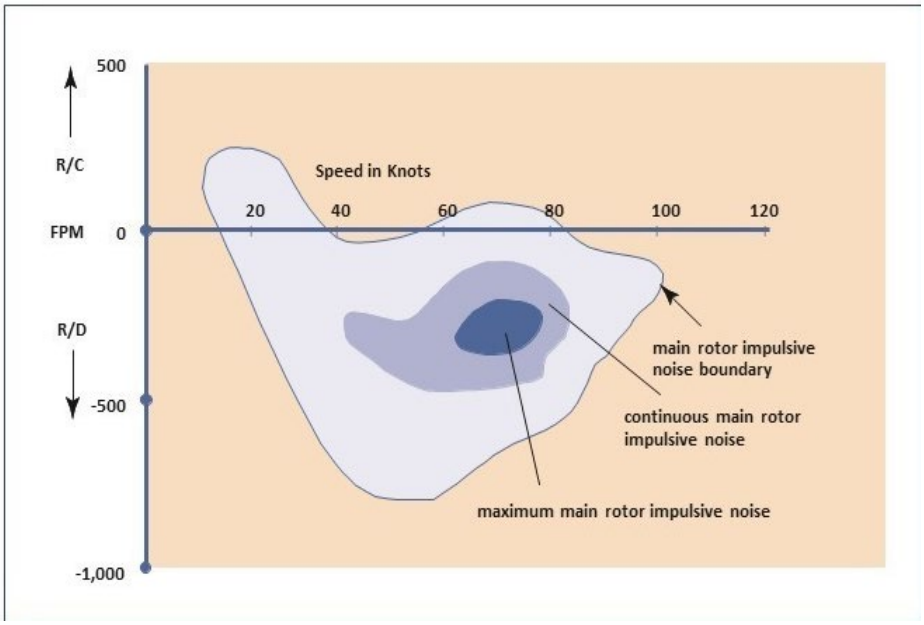


Figure 2
High-Noise Flight Operations – Extended BVI Range (Example Case)

Main rotor impulsive noise caused by blade-wake interactions also occurs during maneuvers, e.g., turns and changes in descent rate, in much the same manner as for partial power descents. These noise emissions are transient but can be a noise annoyance issue, particularly for turns. BVI noise intensity during turns is affected by the direction of the turn, climb/descent rate during the turn and acceleration/ or deceleration rate during the turn. Significant flight testing has been performed in the past several years to better understand and characterize turning noise and provide guidance for quieter turn conditions.

General turn guidance derived from this testing includes:

- Turning away from the advancing side of the main rotor will be quieter than turning into it (this also applies to descending and decelerating turns and
- Level turns will typically be quieter than descending turns.

In addition to the general characteristics discussed above, it should be noted that the various sound sources exhibit specific directivity characteristics. These are not discussed in detail in this document, but it is worth noting that, in general, main rotor sound is focused to the front and on the advancing blade side of the helicopter. The tail rotor noise is similarly focused forward and it is also radiated both downward under and laterally from the helicopter. As a result, the sound – in particular, from the main rotor impulsive sources - is generally detected well in advance of sighting the helicopter. Fortunately, these aspects are normally considered when noise abatement procedures are developed, but they should not be ignored when planning flight operations.

4. General Guidelines for Noise Abatement Operations

This section offers a number of noise abatement techniques for use in daily operations. Many of the general tips developed through both flight test programs and operational experience are provided in the VAI Flyer shown in Figure 3.

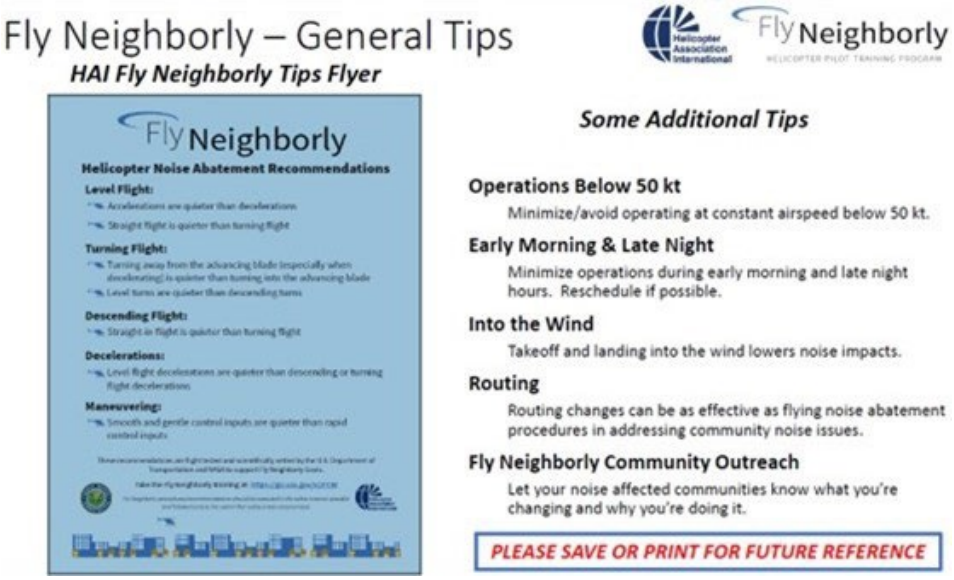


Figure 3
Fly Neighborly General Tips

Additional guidelines that supplement these general tips are given below.

Avoid noise-sensitive areas altogether, when possible. Follow:

- High ambient noise routes such as highways, or
- Less populated or unpopulated routes such as industrial areas or waterways.

If it is necessary to fly near noise-sensitive areas, whenever possible:

- Use a steep takeoff profile, then
- Maintain an altitude as high as possible in line with the VAI *Fly Higher Chart* (Figure 4) and consistent with flight safety, ATC and other environmental and operational constraints/requirements,
- Fly normal cruising speed or slower,
- Minimize/avoid constant airspeed operations below 50 kt,
- Avoid sharp and aggressive maneuvers,
- Vary the route, since repetition contributes to annoyance, and
- Land using a low-noise speed and descent profile in accordance with available model-specific noise abatement guidance.

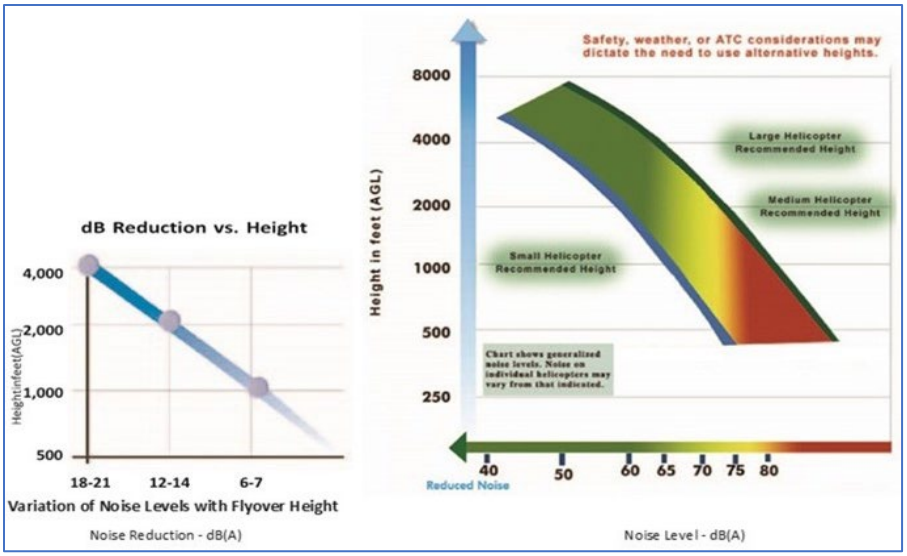


Figure 4
Fly Higher Chart

Flights conducted over roads (particularly highways or motorways), railways and rivers in noise sensitive areas are less likely to generate complaints than routes that acoustically and visually intrude on peoples' privacy, such as those that cross, or can be heard from, residential backyards.

If a model-specific low-noise speed and descent profile is not available, a steeper descent condition will generally, but not always, be more effective.

4.1 Flyover Height

Although flyover height can be constrained limited by restricted airspace or other operational constraints, increasing flight altitude when practical and consistent with flight safety, ATC constraints and operational requirements can be beneficial in minimizing noise impacts on the ground. Height and distance have a major impact in reducing noise levels on the ground under the helicopter, as notionally illustrated in the VAI *Fly Higher Chart*, shown in Figure 4. This chart shows the general relationship between flyover height and noise beneath a helicopter. A doubling of height or distance reduces the level by six to seven dB(A). If the height/distance is increased by a factor of three, the maximum level is decreased by approximately 10 dB(A), which can reduce the perceived loudness by half. When using the *Fly Higher Chart*, note that, in general, flyover noise levels increase with maximum design gross weight, so higher altitudes may be needed for heavier helicopters to achieve results comparable to lighter helicopters.

Increased attenuation of flyover noise before it reaches the ground can be achieved by increasing flyover height, but the increased height can also expand the ground area subject to the primary directivities of flyover noise as depicted in Figure 5. Although noise levels on the ground are reduced by increasing height as indicated by the lighter red color in Figure 5, the higher noise contour area can be larger, potentially impacting previously unaffected residences, etc. In establishing a Fly Neighborly flyover height when routing over highways, railways,

waterways, industrial, or other less or unpopulated areas, take into consideration the trade-off between noise level reduction due to increased height with the larger land area subject to the primary noise directivity.

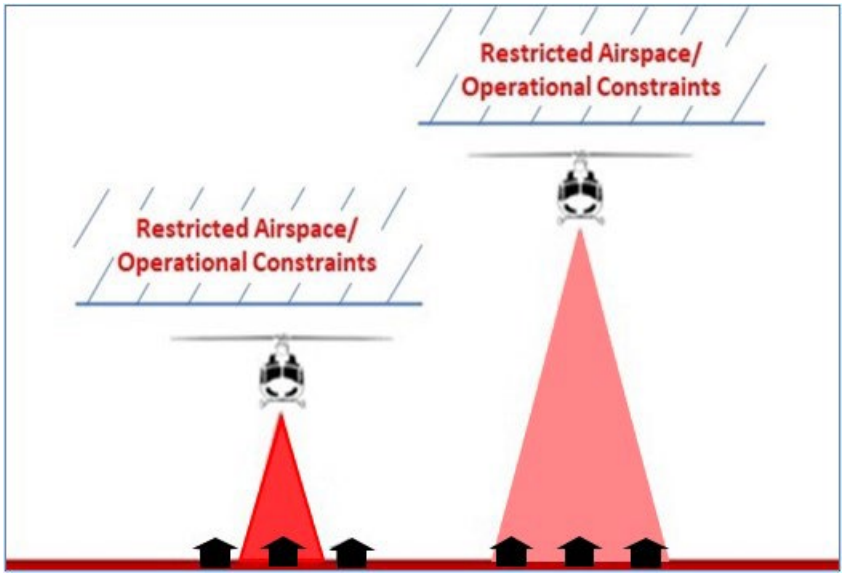


Figure 5
Flyover Noise Levels & Exposure Area vs. Height

The discussion above illustrates an important concept in achieving Fly Neighborly operations. Guidelines such as these can provide useful guidance for flight operations but can incur some trades between reducing noise emissions at the helicopter versus reducing noise annoyance levels on the ground as noise levels are typically not the only factor in annoyance levels. Fly Neighborly guidelines are not hard and fast rules, but rather potential ways of reducing noise and annoyance levels. The goal of a Fly Neighborly operation is not purely low noise levels but achieving operations that reduce and minimize noise impacts and annoyance levels within the community. Only guidelines that are productive in achieving this goal should be applied to a specific flight operation.

4.2 Ambient/Background Noise Conditions

The sound environment on the ground can have much to do with how offensively helicopter sound is perceived, and both time of day and season of the year car nnoyance levels. It is recommended that operations be minimized if not avoided between late evening and early morning as ambient/background noise levels of residential and other noise sensitive areas are lowest during that time period. In warm weather, people are apt to be active outdoors in the evening and on weekends. At these times, they are most conscious and resentful of noise intrusion and flight over or near residential areas should be avoided, if possible.

4.3 Weather Conditions

Although the weather cannot be controlled, it may be possible to adapt the planned flight schedule to take advantage of meteorological conditions to help minimize noise. The two

weather factors most useful in this respect are wind and temperature. They are helpful because they affect the propagation of sound, and vary throughout the day, in a more or less predictable manner.

Wind carries sound in the direction towards which it is blowing and slows sound in the direction against which it is blowing. Hence conducting operations into the wind – in particular for takeoff and landing – lowers noise impacts. Wind also makes a background noise of its own that, in high winds, tends to reduce the intrusion of helicopter sound. In inland areas, surface winds are generally stronger during the day and weaker at night, often reaching a maximum in mid-afternoon. In coastal regions, land and sea breezes give a different diurnal pattern, beginning to blow shortly after sunrise (sea breeze) and sunset (land breeze). These winds can be used to increase the acceptability of the helicopter by flying downwind of densely populated areas and by scheduling flights after noon near noise-sensitive areas.

Ambient temperatures have two effects upon sound. One is the direct impact of temperature on advancing main rotor and tail rotor tip Mach numbers. Lower temperatures lead to higher advancing tip Mach numbers which increase the magnitude of the impulsive noise emissions. Low or very low ambient temperatures can be of particular concern for high airspeed operations when an additional impulsive noise source known as High Speed Impulsive (HSI) noise occurs for some helicopter models. If annoyance levels or auditory evaluations indicate the presence of HSI noise, reducing airspeed when flying toward/over noise sensitive areas and/or scheduling flights during the warmer part of the day are recommended.

The second effect of temperature is the tendency of warm air to be more turbulent than cold air, and, therefore, to disperse sound and decrease its nuisance effect. This also means that it is of some value to schedule flights to and from noise-sensitive areas during the warmer parts of the day.

Atmospheric temperature gradients – the change in temperature with altitude – can modify how sound is propagated from the aircraft to the ground with sometimes significant impacts on noise and annoyance levels. The normal gradient is negative – temperature decreasing with altitude – that helps bend the sound emitted from the aircraft upwards. Normal, negative gradients typically reach a maximum in the late morning or just after noon and are more intense during summer months. At certain times, however, there may be an inversion in the atmosphere - a layer of air above the ground from approximately a hundred to a few thousand feet thick in which the temperature increases with altitude. The inversion reverses the normal curvature of sound propagation, turning an abnormally high portion of the sound energy back toward the ground. The sharper the reversal from the positive gradient of the inversion to the normal negative gradient, the greater the impact on sound propagation and noise and annoyance levels. The most severe inversions usually occur at night and in the early morning, times when the sound of the helicopter can have the most adverse effects upon people on the ground.

In terms of helicopter noise, the worst possible combination of atmospheric conditions is a windless, cold, overcast morning. At such times, it is important that even more emphasis is placed on using noise abatement procedures.

4.4 FAA Guidance - VFR Flight Near Noise Sensitive Areas

The FAA has published guidance when flying near noise-sensitive areas issued as Advisory Circular AC91.36D (2004). Although this guidance is directed to airplane operations, much of the guidance can be applicable to helicopter operations. A copy of this document is reproduced in Appendix 1. This voluntary practice recommends:

- Avoiding flights over noise sensitive areas, if practical.
- VFR flights over noise-sensitive areas at not less than 2,000 feet above the surface, weather permitting, even though flight at a lower level may be consistent with the provisions of FAR 91.79, Minimum Safe Altitudes.

Typical noise-sensitive areas in this Advisory Circular are defined as: outdoor assemblies of persons, churches, hospitals, schools, nursing homes, residential areas designated as noise-sensitive by airports *[heliports]* or by an airport noise compatibility plan or program, and National Park Areas (including Parks, Forest, Primitive Areas, Wilderness Areas, Recreation Areas, National Seashores, National Monuments, National Lakeshores, and National Wildlife Refuge and Range Areas).

The FAA guidance also recommends that, during departure from, or arrival at an airport [heliport/helipad], climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitudes near noise sensitive areas. It should be mentioned, however, that such procedures should not apply where it would conflict with ATC clearances or instructions, or where an altitude of less than 2,000 feet is considered necessary by a pilot in order to adequately exercise his or her primary responsibility for safe flight.

It should be noted that FAA guidance recommends a height of 2,000 ft AGL be used for general over flight of noise-sensitive areas. This is somewhat different than the guidance developed by VAI's Fly Neighborly Committee, discussed previously and illustrated in Figure 4, which recommends 1,000 ft for small helicopters. For medium helicopters, VAI recommends 2,000 ft, the same as the FAA, but for large helicopters, VAI recommends 4,000 ft. Although FAA guidance should be followed when practical, VAI considers that use of the heights in Figure 4 will help in achieving acceptable noise disturbance levels for persons on the ground.

5. How to Operate Helicopters Quietly

In this section, general information is presented on how to fly a helicopter more quietly. Such information applies to the operation of all helicopters. The flight techniques given in this section are also general in nature and vary somewhat according to the actual helicopter being flown. Manufacturers have developed recommended noise abatement procedures for specific models and, when available, these should be followed. In the past few years, the manufacturer recommendations have been supplemented by noise abatement procedures developed under joint FAA-NASA test programs. Available information on noise abatement procedures for specific helicopter models can be found on VAI's Web site, https://verticalavi.org/initiatives/fly-neighborly. As new data becomes available, VAI will periodically update the Web site. In some cases, noise abatement information is also available in the *Rotorcraft Flight Manual (RFM)* for specific helicopter models. When model-specific noise abatement information is not available for your helicopter model, the flight techniques in the following sections should be followed. This information is also helpful to supplement the information supplied by a manufacturer.

5.1 General

Increasing the separation distance from noise-sensitive areas is an effective means of noise abatement.

5.2 Ground Operations

Although startup and shutdown procedures are relatively quiet and are often shielded from noise-sensitive areas, it is good practice to reduce the amount of time spent on the ground with the rotor turning. This reduces the noise exposure to ground handling crews and heliport/airport personnel in addition to any adjacent residential or other potentially noise sensitive areas.

Minimize the duration of warm-up or cool-down periods (typically two to three minutes, although, on some engines it can be as short as 30 seconds). Do not idle at the heliport for extended periods of time.

When feasible, park with the rotors running with the nose of the helicopter directed into the wind to minimize noise. If the wind speed is above 5 knots, avoid parking with the nose 15 degrees or more from the approaching wind. This will minimize tail rotor noise.

5.3 Hover / Hover Taxi /Ground Taxi

When hover turning, make the turn in the direction of the main rotor rotation. This minimizes the anti-torque thrust required and, therefore, minimizes the level of noise generated by the anti-torque system. Avoid sharp turns, keeping the turn rate as low and as smooth as practical.

5.4 Takeoff and Climb (Departure)

Takeoffs and climb outs inherently require high rotor loads that produce higher rotor loading noise, but you can limit the total ground area exposed to helicopter sound by using a high rate-

of-climb and making a smooth transition to forward flight. To further reduce noise impacts on the ground, climb angle can be maximized by setting airspeed to slightly below best rate of climb airspeed and/or climbing into the wind when possible. The departure route should ideally be over areas that are the least sensitive to noise.

5.5 Enroute and Cruise Flyover

Enroute and cruise flyover noise impacts on the ground are affected by aircraft height and speed as well as flight routing. General flyover height and routing guidance includes:

- Whenever practical and permitted, fly at least at the heights indicated in the *Fly Higher Chart* (Figure 4), keeping in mind any potential tradeoffs between height and exposure area as discussed previously and indicated in Figure 5.
- Fly at the highest practical altitude when approaching metropolitan areas.
- Select a route to the landing area over the least populated area.
- Follow major thoroughfares or railway tracks.
- Avoid flying low over residential and other densely populated areas.
- Avoid flying directly over hospitals, nursing homes, schools, and other highly noise-sensitive facilities.

The airspeed of the helicopter has important effects on both the noise emitted and the noise exposure impacts of your helicopter. High airspeed cruise operations can dramatically increase the level and impulsive character of your helicopter's noise emissions to the extent that flying higher may not prove sufficient to avoid adverse noise impacts. Reducing cruise speed for these operations is an effective way to minimize noise impacts on the ground. For low airspeed cruise operations, increased noise duration effects can outweigh sound level reductions and result in higher sound exposure and annoyance levels on the ground. Hence, reducing cruise airspeed can have noise benefits for many but not all flight operations as discussed further below.

Figure 6 shows the measured increases in sound exposure level versus airspeed for two different helicopter models. In general, a minimum noise airspeed ($V_{Min\ Noise}$) occurs somewhere between the best rate of climb airspeed ($V_{BR/C}$) and the best range airspeed (V_{BR}) for each helicopter model. Figure 6 illustrates the strong benefit of reducing cruise speed for higher speed operations, how minimum noise airspeeds can differ between helicopter models, and the potential for increased sound exposure and annoyance levels when reducing airspeed for low-speed operations. Variations in minimum noise airspeed of 20+ kt have been observed between helicopter models with most helicopter models having a minimum noise airspeed between 80 and 100 kts.

A notional plot of both perceived helicopter noise (defined as sound exposure level) and helicopter range versus airspeed is presented in Figure 7. In addition to the maximum airspeed (maximum horizontal airspeed V_H or the never exceed airspeed V_{ne}, whichever is less), two airspeeds at which 99% of the best range is achieved are also shown in the figure. The higher of these two airspeeds is referred to as the Long Range Cruise Speed (V_{LRC}) that is included in helicopter specifications. Using the range curve and these airspeed definitions, helicopter cruise

operations can then be split into three general cruise speed categories for Fly Neighborly purposes – time driven, range driven, and mission driven as shown in Figure 7.

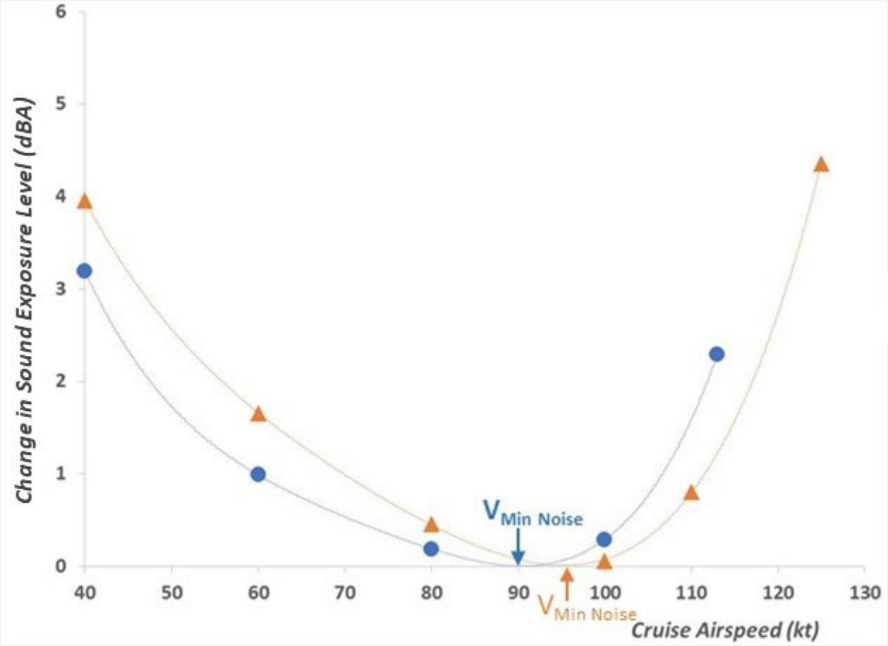


Figure 6
Example Sound Exposure Levels vs. Cruise Speed for Two Helicopter Models

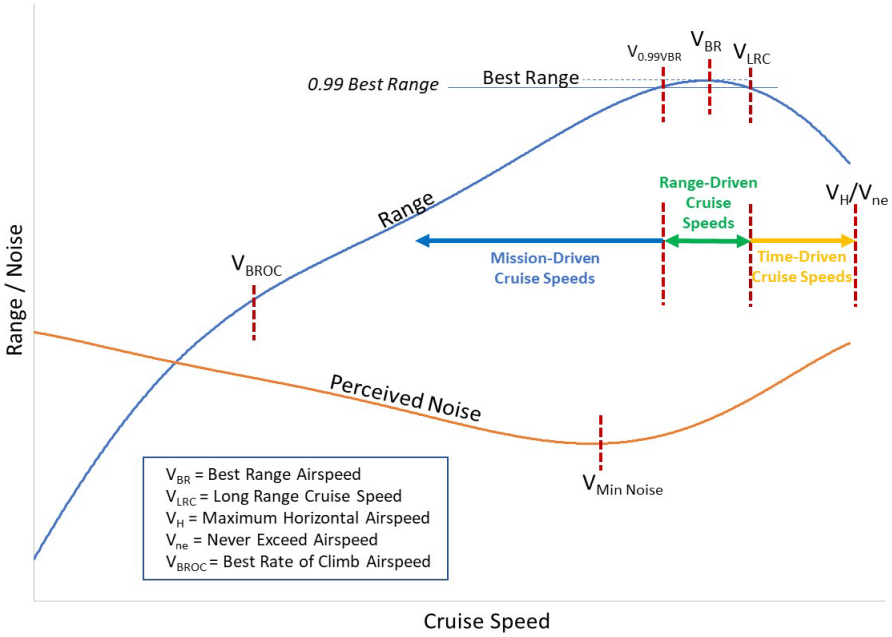


Figure 7
Helicopter Range & Sound Exposure Levels vs. Cruise Speed

Time-driven flight operations occur above V_{BR} and V_{LRC}, minimizing time by maximizing airspeed. These operations can include executive transport missions and EMS missions where time is critical. Reducing airspeed to V_{LRC} or V_{BR} can reduce noise impacts for these operations and should be considered, when flying over noise sensitive areas.

Range-driven flight operations look to maximize fuel efficiency and range and can include passenger and offshore oil operations. In most cases, reducing airspeed to the lower long range cruise speed ($V_{0.99VBR}$ in Figure 7) will reduce noise impacts when flying over noise sensitive areas. For offshore oil operations, airspeed reductions, even if only for the small portions of these flights over noise sensitive areas, will yield noise benefits.

Mission-driven flight operations are constrained to airspeeds below the best long-range airspeed as shown in Figure 7. These operations may include helicopter tour operations, news operations, power-line monitoring, etc. Cruise speed guidance can be more complicated for these operations as many may be near or potentially below the minimum noise cruise speed. Cruise speed reductions (or increases) need to be evaluated on more of a trial-and-error basis for these situations.

Although mission-driven operations often occur at lower cruise speeds, segments of these operations may be performed at much higher airspeeds. Examples include transiting between locations for news operations and transiting between segments of tour operations. If higher speed segments are flown over noise sensitive areas, the guidance above is relevant, and cruise speed reductions should be considered as appropriate.

Note: Aircraft specifications for V_{BR}, V_{LRC} and V_H are typically provided for sea level standard conditions, and the guidance herein is provided within the context of these values. Although the guidance should typically extend to other temperature and altitude conditions, any adjustments to cruise speeds based on values for these other conditions should be implemented on a trial-and-error basis to verify intended benefits.

5.6 Turns (Maneuvers)

Avoid rapid, ‘high g’/high bank angle turns. When the flight operation requires turns, perform control movements smoothly. Additional test-based general guidance on turns (maneuvers) includes:

- Turning away from the advancing side is quieter than turning into it, especially when decelerating. (Left turn for advancing blade on the right and right turn for advancing blade on the left.)
- Don’t decelerate during a turn, if possible, over noise-sensitive areas. If it is practical, maintain a steady-state speed during maneuvering.
- Climbing turns are quieter than level and/or descending turns.
- Level turns are generally quieter than descending turns.
- Descending, decelerating turns away from the advancing side are quieter than turns into the advancing side.

5.7 Descent/Approach and Landing

Select the final approach route with due regard to the type of neighborhood surrounding the landing area, and the neighborhood's sensitivity to noise. Assess this sensitivity beforehand for each landing area. Some guidelines are:

- Keep the landing area between the helicopter and the most noise-sensitive area or building(s) on approach.
- If the landing area is surrounded by noise-sensitive areas, approach using the recommended noise abatement approach procedure.

The approach techniques presented below are designed to avoid the impulsive (BVI) noise generated by the main rotor. These techniques typically use a glideslope that may be a few degrees steeper than a normal approach. In addition to avoiding high BVI regimes, steep approaches ensure a greater height over the noise-sensitive area. Once the transition from cruise to the approach glideslope has been made, the airspeed and rate of descent (R/D) can be 'tailored' to fit local conditions, avoid unsafe regimes, and still address minimizing noise.

Follow the general noise abatement flight techniques given below and illustrated in Figure 8. Note that the location and extent of the main rotor impulsive (BVI) noise region may be different than as used for illustrative purposes in the figure.

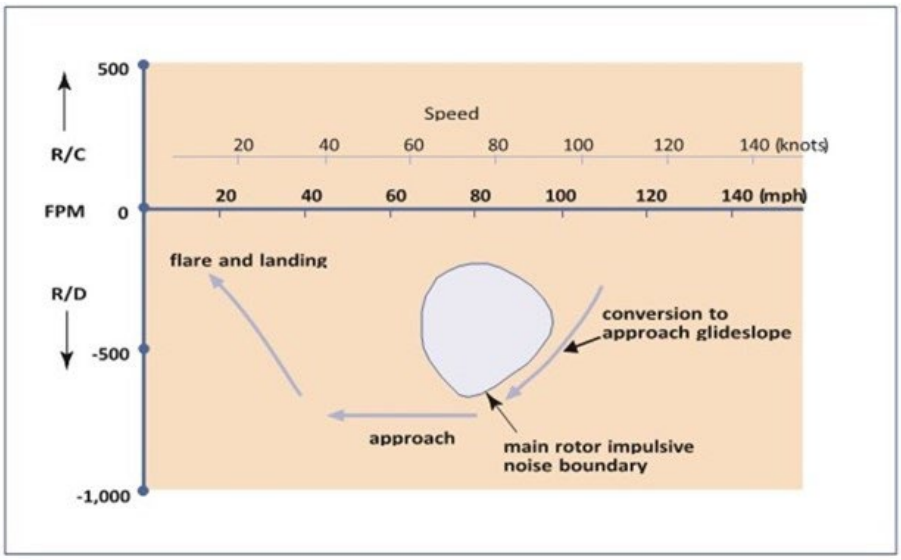


Figure 8
General Noise Abatement Approach

Example BVI noise data shown in Figure 9 were acquired in a joint FAA-NASA flight test for a specific helicopter model. This plot illustrates several general concepts in avoiding BVI noise:

- BVI noise happens during specific descent rate and flight speed combinations as illustrated in the plot of BVI noise characteristics in Figure 9, with an avoid region denoted by the gray and white ovals.

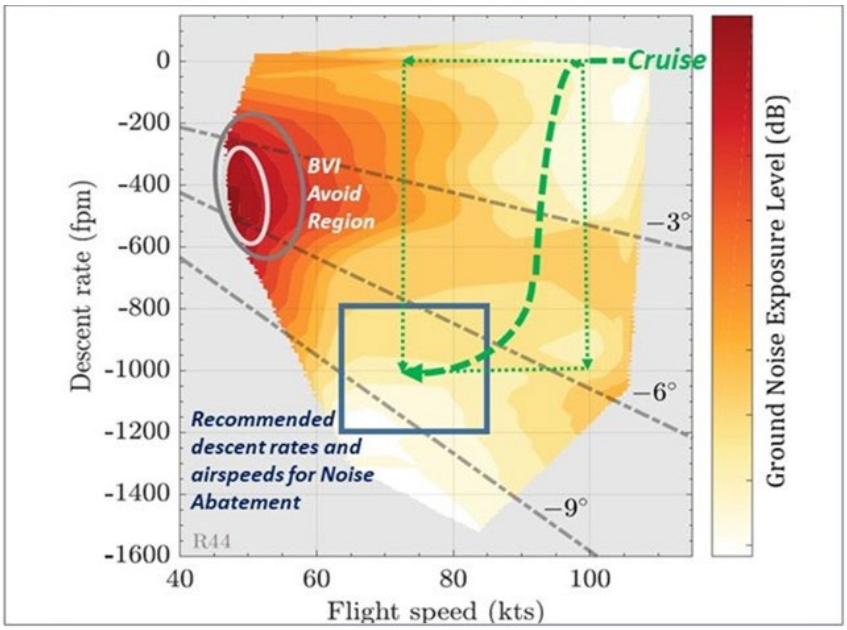


Figure 9
Example Noise Abatement Approach Procedure

- A region of airspeed-descent rate combinations providing effective BVI avoidance was identified from the test data as shown by the dark blue rectangle or box in Figure 8. Note that definition of this region was not simply finding the lowest noise region on the plot, but rather an evaluation of the ground noise levels, onsite observations, and other considerations addressing desirable operational characteristics, annoyance triggers such as low flight levels, etc.
- The basic approach noise procedure using these results is to establish a descent rate at a steady speed in the blue box in Figure 9 that avoids BVI, then decelerate as quickly and closely to landing as possible. From cruise, the pilot needs to increase rate of descent and decrease airspeed until the desired descent condition is attained, and how this is done can sometimes impact the overall effectiveness of a noise abatement procedure. Piloting techniques for establishing a descent condition within the blue box can range from decelerating in level flight to the target airspeed then establishing the target rate of descent to establishing the target rate of descent then decelerating to the target airspeed. For the example in Figure 9, decelerating to approximately 100 kt then establishing the target rate of descent prior to completing deceleration to the target airspeed would likely be more effective for reducing noise than fully decelerating to the target airspeed prior to increasing rate of descent.
- Once in the low BVI noise operational state, a constant airspeed and descent rate should be established and maintained as long as is possible before decelerating as quickly as practical and safe for landing the aircraft. Delaying the deceleration to landing as long as practical and safe will minimize the duration of the landing operation.
- Note that deceleration forces on the aircraft make the effective flight path angle experienced by the main rotor steeper, with a 1 kt/sec deceleration being aerodynamically equivalent to a 3 degree increase in glide slope. Typically, the steeper

the noise abatement descent condition and the more rapid the deceleration to landing are executed, the greater the BVI noise benefits. Past research has even demonstrated that, with sufficient deceleration, a helicopter can transit through its peak BVI region while avoiding BVI noise emissions.

- Although not strictly necessary, deceleration typically will be performed while maintaining descent between the constant noise abatement descent rate and a constant glide slope. For the example in Figure 9, deceleration at a nearly constant rate of descent should be more effective, but with sufficient deceleration, maintaining more of a constant glide slope during deceleration should also be effective.
- Typically, target deceleration rate should be 1 kt/sec at a minimum and may need to be closer to 2 kt/sec, when decelerating through the peak BVI region.

The exact location of and descent procedures to avoid the peak BVI region are helicopter-model specific, and the information in Figure 9 is only applicable for that specific helicopter model. Information for your helicopter model(s) may be attainable from the manufacturer, the Rotorcraft Flight Manual, FAA-NASA or other test data, or other sources including VAI published guidance that provides Fly Neighborly Printable Resources/Help Sheets, VAI guidance on Establishing Helicopter Approach Noise Abatement Procedures for Heliports and Airports and other Fly Neighborly guidance/training available at the VAI website, https://verticalavi.org/initiatives/fly-neighborly. Examples of available helicopter model-specific Fly Neighborly and noise abatement info are provided in Appendix 2. In the absence of such information, field observations in noise sensitive areas during flight operations may be needed to define high and low BVI descent conditions for a specific operation.

The approach noise abatement flight techniques discussed above reduce the ground area exposed to a given noise level by as much as 80 percent. Figure 10 illustrates the potential noise benefits when compared to a normal approach.

NOTE: *The noise abatement flight techniques described above and detailed on the VAI Website permit flight crews to fly helicopters in the quietest manner possible. They are to be construed as advisory guidelines only. If flying according to these noise abatement flight techniques conflicts with operating the aircraft in a safe manner, then all safety-related procedures take precedence.*

5.8 Additional Fly Neighborly and Noise Abatement Information Resources

A more comprehensive listing of available Fly Neighborly and noise abatement information and training is provided in Appendix 3, including the specific sources, resources and web links. In recent years, the joint iFlyQuiet initiative of the U.S. Federal Aviation Administration (FAA), VAI, and Vertical Flight Society (VFS) has produced additional Fly Neighborly information and training programs. Links to these resources are shown in Figure 11.

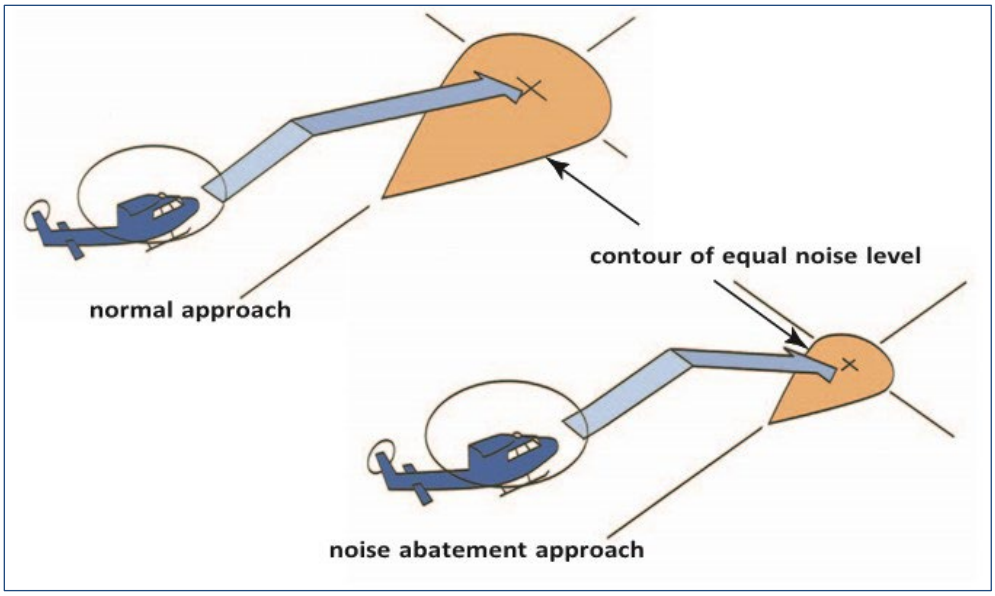


Figure 10
Ground Noise Exposure Footprint

Figure 11
iFlyQuiet Fly Neighborly Resources

6. Pilot Training

An outline of the requirements for a recommended Fly Neighborly pilot training program is provided in this section. The basic scope of a Fly Neighborly pilot training program should look to successfully incorporate the information embodied in this Guide into everyday operations.

The guidance provided in this section is only intended to be an overview of the key facets needed for an effective pilot training program. Additional guidance is available from resources provided in Appendix 2 of this Guide.

6.1 Scope

The scope of a pilot training program should include:

- Initial and recurrent flight training for pilots
- Preparing and distributing recommended noise abatement procedures
- Organizing and holding operator and manufacturer seminars
- Providing environmental and supervisory personnel training courses

6.2 Basic Guidelines for Pilot Training

Public acceptance for helicopter operations typically requires a multi-faceted approach from flight operations to community outreach. One key element is defining and implementing effective noise abatement flight operations. Crew training to ensure that pilots are fully familiar with the noise abatement procedures is, therefore, vital. The following guidelines for noise abatement training are suggested:

- Select training teams for ground and flight training, usually two or three people who have extensive relevant operational experience.
- Standardize presentations.
- Maintain complete files of all persons trained.
- Circulate comment sheets at all meetings or training sessions, and stress that all suggestions, ideas and comments will be taken into consideration.
- Make the necessary changes in training and publications that result from the feedback.
- Maintain an open-door policy to all participants, flight crews and the public.
- Determine the effect of this training on the public. Has it been positive or negative?
- Emphasize the importance of public contacts, and the necessity of good community relations.
- Expand the guidelines given in this document to cover local needs.

6.3 Additional Training and Follow Up

An additional guideline suggested for noise abatement training is to conduct ongoing training with sessions at six-month intervals to maintain pilot proficiency. This can be supplemented by

dissemination of relevant noise abatement information via flyers and other media to reach out to the helicopter pilot community. An example of a noise abatement flyer that was developed by the Professional Helicopter Pilot Association (PHPA) for the Los Angeles area is shown in Appendix 4.

7. Operator Program

When operating a helicopter in a new area, a new spectrum of sound is added to the usual noise environment. How they react depends not only on the noise you generate but upon physical, economic, and psychological factors. One thing is certain: they will react strongly, adversely, and actively if the sound is too irritating, if it represents something that seems to threaten their safety and well-being, or if they cannot see how the noisemaker (the helicopter) benefits them. Although it is up to operators to educate the public about the safety and usefulness of the helicopter, pilots can make the public less hostile to the helicopter (and to the operator's arguments about its safety and community service) by flying in such a way as to make the sound of the aircraft as non-intrusive as possible.

7.1 Introduction

The Fly Neighborly Program addresses the problem of helicopter noise on three fronts: pilot training, flight operations planning, and public education and acceptance. These three areas are interrelated. Planning flight operations with an eye to noise abatement can have a major positive impact on both the pilot training program and public acceptance.

The information presented in this section provides only a broad outline of the possible actions helicopter operators can take. Operators are encouraged to expand this outline by applying knowledge of their own geographical area of operations, the nature of their businesses, and the local climate of opinion with regard to helicopter operations. Additional information can also be found in the resources provided in Figure 11 and Appendix 3.

7.2 Company Policy

Implement a company policy aimed at reducing the sound levels produced by the operation of your aircraft or other equipment. As part of this policy, implement a broad-based complaint prevention program. Such a voluntary program is necessary to preclude the eventual implementation of restrictive and mandatory federal, state or local laws, regulations, or ordinances.

To formulate this policy, identify and evaluate current and anticipated problems. To assure its acceptance and success, make your commitment to your policy clear, in order to generate such change as may be necessary in the attitudes of pilots and other personnel. In order for company policy to have any meaning, companies should formulate and implement specific guidelines.

7.2.1 Formulate Guidelines

Guidelines are intended to assist flight crews and flight operations personnel to formulate responsible mission profiles without infringing on operational realities or safety. They are not, however, provided as a substitute for good judgment on the part of the pilot. They must also not conflict with federal aviation regulations, air traffic control instructions, or aircraft operating limitations. The noise abatement procedures outlined by these guidelines should be used when

consistent with prudent and necessary mission requirements. The safe conduct of flight and ground operations remains the primary responsibility.

Enroute operations:

- Maintain a height above the ground consistent with the VAI *Fly Higher Chart* (see Figure 4), or higher, when possible. Complaints are often significantly reduced when operating above these altitudes. The reverse is also true.
- Vary routes in order to disperse the aircraft sound.

Heliport (Terminal) operations:

- Restrict hours or frequency of operations as appropriate. Minimize early or late flights, especially on holidays and weekends.
- Limit ground idling in noise-sensitive areas.
- Minimize flashing landing lights in residential areas at night.

Establish procedures for each sensitive route or terminal:

- Provide flight crews with noise abatement procedures for each model of aircraft.

7.2.2 Implement Guidelines

- Publish all guidelines and procedures in a flight operations manual or similar document.
- Train flight crews and flight operations personnel as appropriate:
  - Educate regarding basic attitudes in ground school.
  - Train in noise abatement procedures for each model of aircraft to be flown.
  - Emphasize awareness and recognition of sensitive routes and terminals.
  - Establish a requirement that noise abatement procedures must be considered in recurrent company flight checks.
- Assign responsibility and authority for the company program to an appropriate person.

7.2.3 Review and Revise

- Record all complaints and include all relevant details, such as the time, date, location, altitude, and weather.
- Establish periodic reviews of company policy and programs to respond to changes in noise complaints, the regulatory climate or operational conditions.
- Revise your policy and programs as necessary.

8. Community Outreach and Public Acceptance

8.1 Scope

The scope of the public acceptance program includes:

- Engendering media support
- Promoting positive public relations
- Enacting a program to prevent or resolve complaints from the public.

8.2 Media Support

The purposes of engendering media support are to:

- Develop favorable and active helicopter-related media coverage.
- Provide valid information concerning helicopter operations as necessary.

Media that covers news of helicopter-related activities include general circulation newspapers, television and radio news, trade journals, and the magazines or newsletters of international, national, state, and regional helicopter associations.

To engender awareness, accuracy and support in these media, a number of actions can be taken:

- Provide press releases to trade journals and local newspaper, radio, and television news editors concerning any Fly Neighborly seminars that may be sponsored by the local helicopter operator association.
- Support a continuing campaign with the trade journals to keep the rotary-wing community aware of the Fly Neighborly Program.
- Support a continuing campaign with the general press to make the public aware of the Fly Neighborly Program, and the benefits of helicopter transport.
- Stage demonstrations and press conferences addressing specific local issues such as heliports, high-rise evacuation, police services, search and rescue services, emergency medical evacuation, firefighting, and the benefits of helicopter transportation to the general public.

8.3 Public Relations

The purposes of engaging in public relations activities are to:

- Develop awareness in the community of the benefits of helicopter transportation.
- Develop awareness of the Fly Neighborly Program.
- Develop support for the voluntary Fly Neighborly Program, as administered by the helicopter community, in lieu of governmental regulation.

In order of their general importance and effectiveness, public relations activities can include working with:

- Governmental agencies concerned with aviation such as federal, state, or local agencies, the FAA, or state aeronautics commissions.
- Other governmental agencies not particularly concerned with aviation, such as regional planning commissions, economic development commissions, the National League of Cities, or the U.S. Council of Mayors
- Local civic and professional organizations such as Rotary or Kiwanis Clubs, the National Association of Aviation Officials, the Airport Operators Council International, or the National Fire Protection Association, including providing speakers for their local meetings and soliciting their support of heliports based on the Fly Neighborly Program to promote public service.
- Nongovernmental economic development agencies such as chambers of commerce, regional economic development councils, or merchant associations to demonstrate to economic development agencies how helicopter transportation benefits the community, and present data to show the economic viability of helicopter transportation.
- The public to establish contacts.
- Environmental organizations such as Greenpeace, the Sierra Club, or federal or state environmental protection agencies to provide accurate information.

Do not immediately assume that any of these entities are hostile to the planned operations. Instead, emphasize the positive environmental aspects of helicopter operations, such as the fact that they are involved in search and rescue operations for hikers or workers injured in remote areas, and that they provide access to such areas without the need to pave over ground for roads or landing strips.

Public relations can be improved by influencing government agencies concerned with aviation in the following ways:

- Participate in public hearings
- Provide professional testimony as appropriate
- Conduct flight demonstrations
- Conduct one-on-one campaigns
- Submit petitions and letters.

8.4 Preventing and Responding to Complaints

Helicopter operations are undeniably noisy, and this guide is concerned with a program designed to minimize the problem. Figure 12 shows the relationship between the amount of noise people are exposed to, and how annoyed they are likely to get. In the figure, the amount of noise exposure is expressed as the day-night noise level (DNL). DNL is a noise metric commonly used for airport noise studies that integrates the noise of multiple aircraft operations using different weightings of day and night noise levels to generate a noise exposure level over the long term such as a year.

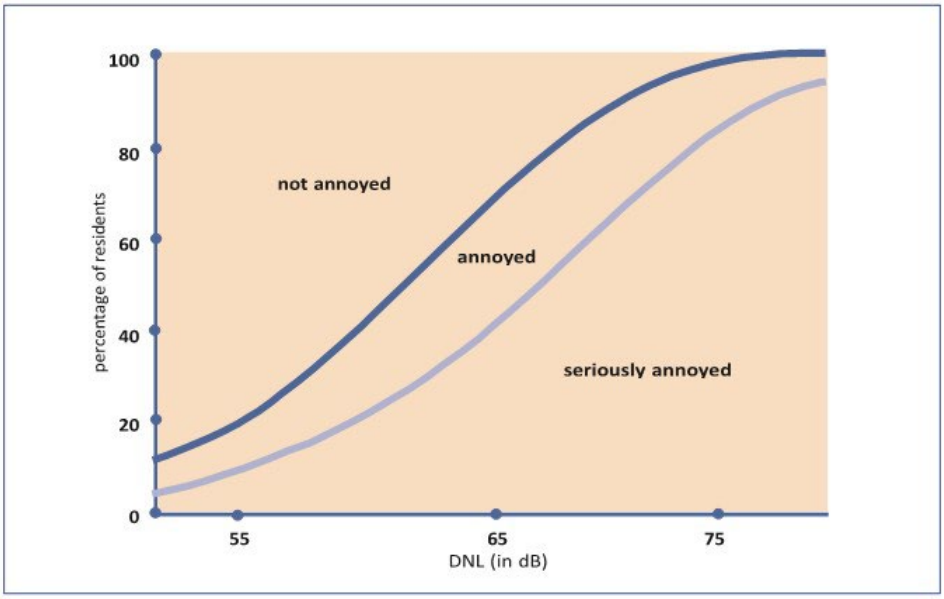


Figure 12
Relationship between Noise Exposure and Annoyance

8.4.1 Complaint Prevention

A significant number of noise-related complaints can be prevented in the first place, given a certain degree of sensitivity, foresight, and commitment. Prevent complaints by assessing the environmental compatibility of potential landing facilities. Select those most suitable from a safety, operational, and environmental point of view.

Implement a public acceptance program.

- When contemplating site licensing, identify, contact, and try to positively influence potential sources of opposition before the hearing.
- Initiate or support presentations, seminars, or displays to educate the public about the value of helicopter transport.

Educate customers about noise abatement procedures to help prevent or minimize conflicts between their expectations and company policy.

Coordinate operations personnel and flight crews, so that flights that would unnecessarily violate company policy are not assigned.

8.4.2 Handling Noise Complaints

Although earlier sections of this guide offer information concerning noise abatement techniques, it is unlikely all noise complaints can be avoided. Since some complaints are inevitable, how they are handled is also important to the success of the Fly Neighborly Program.

The resulting problem is not simple. A helicopter can annoy people simply by being over, or too near, certain noise-sensitive areas. If someone calls the FAA, or a state agency, and offers

routine information such as the aircraft registration number, colors, or type, it is likely that he or she will be told the aircraft was not in violation of any regulation, and that, therefore, nothing can be done. The result can be an angry, frustrated member of the community who will probably not be particularly supportive of any current or future helicopter or heliport related issue.

The helicopter user community has a real interest in assuring all complaints are appropriately addressed. Conventional channels for complaints are demonstrably insufficient. A number of regional helicopter associations have started to operate their own complaint lines. These lines offer state, federal and local agencies another option when they receive complaint calls about legal and proper operations. The agencies can pass the complaint along to the regional association or provide the complainant with the telephone number of the complaint line.

Such programs offer multiple benefits:

- Regional associations can often identify an aircraft with much less information than other agencies require.
- Associations can ensure that each issue is addressed and, when possible, satisfy the complainant.

When a complaint is received, how should it be addressed?

- The most effective way to deal with the complaint is to contact the complaining party personally. When you do, avoid being defensive, argumentative, or opinionated. Sincerely try to understand the other person's point of view and avoid hostile confrontations. Sometimes merely listening politely can improve the situation.
- Furthermore, evaluate the problem thoroughly, and follow through. Was the pilot aware of the problem? Was there something the pilot could have done to avoid it? Is it likely to recur? Contact the pilot or the operator to determine the facts. Consult this guide, and other sources of noise abatement information, to determine how to improve the situation.
- Finally, respond to the caller. Tell him or her what has been learned, and what is being done to prevent the situation from recurring.

Of course, the best way to handle complaints is to avoid them in the first place. If a problem with a certain operation can be anticipated, contact the likely complainant, or members of the public to be impacted, before the operation begins. Explain to him or her the purpose, timing, and duration of the operation, and its likely impact upon the area. People like to feel they have some control over their lives. Often, just a simple courtesy call in the beginning can save hours of trouble and nuisance later.

An example is given in Appendix 5 of a noise abatement program established at a heliport in a downtown area. Appendix 6 provides information on the efforts to address helicopter noise issues in the Los Angeles area, including an effective noise complaint recording system and community outreach efforts.

9. The Fly Neighborly Program – What Can Be Achieved

The Fly Neighborly Program outlined in this guide provides the basis for lowering the noise generated by helicopters in day-to-day operations. In addition, the noise abatement procedures offer a way of reducing the impulsive noise characteristic of helicopters which occur during normal operations and often cause complaints. By adopting and following the Fly Neighborly Program, a high level of public acceptance may be obtained.

It should also be noted that current public acceptance of helicopters is, in general, poor and, unless the program outlined in this guide is adopted, further international, national, and local regulations could be enacted to limit helicopter operations. Therefore, VAI strongly recommends that its members introduce a Fly Neighborly Program as outlined in this guide.

If the procedures given in this guide are followed, public acceptance can be improved and the rotorcraft segment of the aviation industry will be able to flourish and grow, without being restricted by the burden of new noise regulations and operational restrictions.

Appendix 1. FAA Advisory Circular AC 91.36D

U.S. Department
Of Transportation

Federal Aviation
Administration

ADVISORY CIRCULAR

Subject: VISUAL FLIGHT RULES (VFR) FLIGHT NEAR NOISE-SENSITIVE AREAS **Date: September 17, 2004** **AC No: 91-36D**

Initiated by: ATO-R

1. **PURPOSE.** This Advisory Circular (AC) encourages pilots making VFR flights near noise sensitive areas to fly at altitudes higher than the minimum permitted by regulation and on flight paths that will reduce aircraft noise in such areas.

2. **EFFECTIVE DATE.** This advisory circular is effective on September 17, 2004.

3. **CANCELLATION.** Advisory Circular 91-36C, Visual Flight Rules (VFR) Flight Near Noise Sensitive Areas, dated October 19, 1984, is cancelled.

4. **AUTHORITY.** The FAA has authority to formulate policy regarding use of the navigable airspace (Title 49 United States Code, Section 40103).

5. **EXPLANATION OF CHANGES.** This AC has been updated to include a definition of "noise sensitive" area and add references to Public Law 100-91; the FAA Noise Policy for Management of Airspace Over Federally Managed Lands, dated November 1996; and the National Parks Air Tour Management Act of 2000, with other minor wording changes.

6. **BACKGROUND**.

a. Excessive aircraft noise can result in annoyance, inconvenience, or interference with the uses and enjoyment of property, and can adversely affect wildlife. It is particularly undesirable in areas where it interferes with normal activities associated with the area's use, including residential, educational, health, and religious structures and sites, and parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites where a quiet setting is a generally recognized feature or attribute. Moreover, the FAA recognizes that there are locations in National Parks and other federally managed areas that have unique noise-sensitive values. The Noise Policy for Management of Airspace Over Federally Managed Areas, issued November 8, 1996, states that it is the policy of the FAA in its management of the navigable airspace over these locations to exercise leadership

in achieving an appropriate balance between efficiency, technological practicability, and environmental concerns, while maintaining the highest level of safety.

b. The Federal Aviation Administration (FAA) receives complaints concerning low flying aircraft over noise sensitive areas such as National Parks, National Wildlife Refuges, Waterfowl Production Areas and Wilderness Areas. Congress addressed aircraft flights over Grand Canyon National Park in Public Law 100-91 and commercial air tour operations over other units of the National Park System (and tribal lands within or abutting such units) in the National Parks Air Tour Management Act of 2000.

c. Increased emphasis on improving the quality of the environment requires a continuing effort to provide relief and protection from low flying aircraft noise.

d. Potential noise impacts to noise-sensitive areas from low altitude aircraft flights can also be addressed through application of the voluntary practices set forth in this AC. Adherence to these practices is a practical indication of pilot concern for the environment, which will build support for aviation and alleviate the need for any additional statutory or regulatory actions.

7. DEFINITION. For the purposes of this AC, an area is "noise-sensitive" if noise interferes with normal activities associated with the area's use. Examples of noise-sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites where a quiet setting is a generally recognized feature or attribute.

8. VOLUNTARY PRACTICES.

a. Avoidance of noise-sensitive areas, if practical, is preferable to overflight at relatively low altitudes.

b. Pilots operating noise producing aircraft (fixed-wing, rotary-wing and hot air balloons) over noise-sensitive areas should make every effort to fly not less than 2,000 feet above ground level (AGL), weather permitting. For the purpose of this AC, the ground level of noise-sensitive areas is defined to include the highest terrain within 2,000 feet AGL laterally of the route of flight, or the uppermost rim of a canyon or valley. The intent of the 2,000 feet AGL recommendation is to reduce potential interference with wildlife and complaints of noise disturbances caused by low flying aircraft over noise-sensitive areas.

c. Departure from or arrival to an airport, climb after take-off, and descent for landing should be made so as to avoid prolonged flight at low altitudes near noise-sensitive areas.

d. This advisory does not apply where it would conflict with Federal Aviation Regulations, air traffic control clearances or instructions, or where an altitude of less than 2,000 feet AGL is considered necessary by a pilot to operate safely.

9. COOPERATIVE ACTIONS. Aircraft operators, aviation associations, airport managers, and others are asked to assist in voluntary compliance with this AC by publicizing it and distributing information regarding known noise-sensitive areas.

Signed

_____

Sabra W. Kaulia
Director of System Operations & Safety

Appendix 2. Examples of Model-Specific Noise Abatement Guidance

Helicopter Association International — Fly Neighborly — HELICOPTER PILOT TRAINING PROGRAM

AS350 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

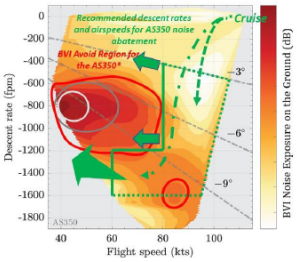
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

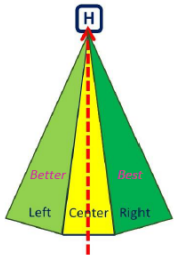
Cruise

Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches





Establish an airspeed and descent rate in the recommended range.

For noise abatement approaches at greater than 1200 fpm, decelerate as late and as quickly as practical and safe.

For noise abatement approaches at less than 1200 fpm, (1) increase descent rate nearer to 1200 fpm before decelerating as late and as quickly as practical or (2) reduce descent rate nearer to 3° before decelerating at 1 kt/sec or less.

Avoid approaches over noise sensitive areas when possible, keeping noise sensitive areas to "far" left or right of the aircraft.

Keeping noise sensitive areas to the right is most effective.

Figure A2-1
Airbus AS350 Fly Neighborly Help Sheet

Helicopter Association International — Fly Neighborly — HELICOPTER PILOT TRAINING PROGRAM

AS365/MH-65 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

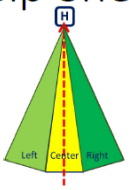
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

Cruise

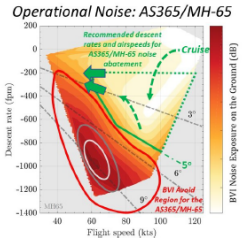
Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches



Operational Noise: AS365/MH-65



Establish a descent condition in the green box on the AS365/ MH-65 Operational Noise Plot.

Maintain airspeed and descent rate in the green box as long as practical.

Decelerate at 1 kt/sec or less to complete the landing.

- Nearer to 200 fpm, can decelerate at constant descent rate.
- At greater than a 3° glideslope, decelerate at constant glideslope.
- Nearer to 5°, may first need to reduce to 3° glideslope or less.

Avoid approaches over noise sensitive areas when possible, keeping noise sensitive areas to "far" left or right of the aircraft.

Keeping noise sensitive areas to your right is most effective.

Figure A2-2
Airbus AS365/MH-65 Fly Neighborly Help Sheet

Helicopter Association International | Fly Neighborly HELICOPTER PILOT TRAINING PROGRAM

206 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

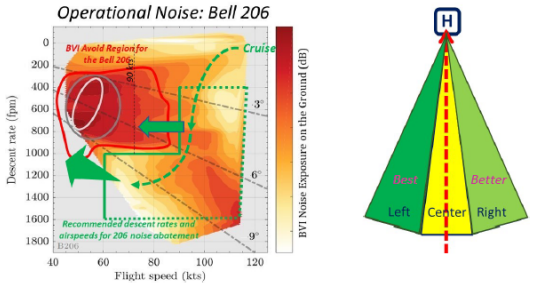
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

Cruise

Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches



Establish an airspeed and descent rate in the recommended range.

Decelerate as late and as quickly as practical and safe to complete the landing.

- Anywhere from constant descent rate to constant glide slope for approaches at greater than 1000 fpm
- At or near constant descent rate for noise abatement approaches at less than 1000 fpm

Avoid approaches over noise sensitive areas when possible, keeping noise sensitive areas to "far" left or right of the aircraft.

Keeping noise sensitive areas to the left is most effective.

Figure A2-3
Bell 206 Fly Neighborly Help Sheet

Helicopter Association International | Fly Neighborly HELICOPTER PILOT TRAINING PROGRAM

407 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

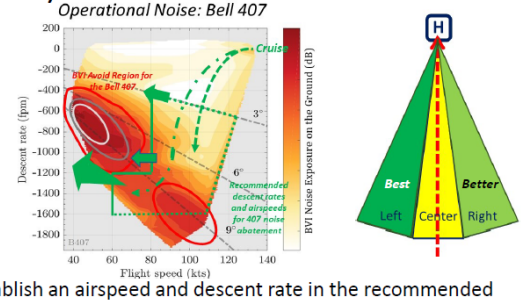
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

Cruise

Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches



Establish an airspeed and descent rate in the recommended range.

For noise abatement approaches at greater than 1200 fpm, decelerate as late and as quickly as practical and safe.

For noise abatement approaches at less than 1200 fpm, (1) increase descent rate nearer to 1200 fpm before decelerating as late and as quickly as practical or (2) reduce descent rate nearer to 3° before decelerating at 1 kt/sec or less.

Avoid approaches over noise sensitive areas when possible, keeping noise sensitive areas to "far" left or right of the aircraft.

Keeping noise sensitive areas to the left is most effective.

Figure A2-4
Bell 407 Fly Neighborly Help Sheet

Helicopter Association International | Fly Neighborly | HELICOPTER PILOT TRAINING PROGRAM

AW139 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

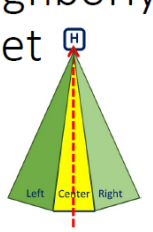
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

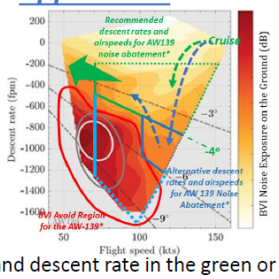
Cruise

Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches





Establish an airspeed and descent rate in the green or dark blue box, decelerating at 1 kt/sec or less to complete the landing

Avoid approaches over noise sensitive areas when possible, keeping noise sensitive areas to "far" left or right of the aircraft

Keeping noise sensitive areas to your left is most effective

Can descend up to a 9+° glideslope above 70 kts (light blue box) if tradeoffs with higher left/right side noise are acceptable (decelerate to complete the landing as late and as quickly as practical and safe)

A shallow approach at a 3° or lower glideslope can be effective if routed over non-sensitive areas such as water, highways or an industrial area.

Figure A2-5.
Leonardo AW139 Fly Neighborly Help Sheet

Helicopter Association International | Fly Neighborly | HELICOPTER PILOT TRAINING PROGRAM

R44 Fly Neighborly Help Sheet

General Tips

Operations Below 50 kt

Minimize/avoid operating at constant airspeed below 50 kt.

Into the Wind

Takeoff and landing into the wind lowers noise impacts.

Turns

Turning away from is quieter than turning into the advancing rotor blade and level turns are quieter than descending turns.

Takeoffs

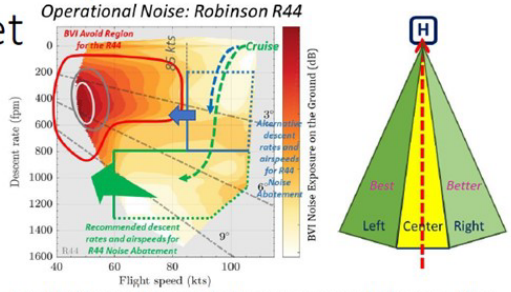
Achieve cruise altitude as early as possible, using maximum climb power at airspeeds slightly below best rate of climb speed. Adjust your route to (1) take off into the wind and (2) avoid noise sensitive areas if possible.

Cruise

Utilize altitude increases, cruise speed reductions and/or routing changes to minimize noise during cruise.

PLEASE SAVE OR PRINT FOR FUTURE REFERENCE

Approaches



- Establish your descent in the recommended range, then decelerate as late and as quickly as practical and safe to complete the landing procedure.
- If constrained to less than an 800 fpm descent rate, establish your descent in the alternate range instead.
- The R44 Pilot's Operating Handbook (POH) noise abatement procedure could also be effective for your flight operation.
- If possible, avoid approaches over noise sensitive areas, keeping noise sensitive areas to the "far" left or right if practical.
- Keeping noise sensitive areas to the left is most effective.

Figure A2-6
Robinson R44 Fly Neighborly Help Sheet

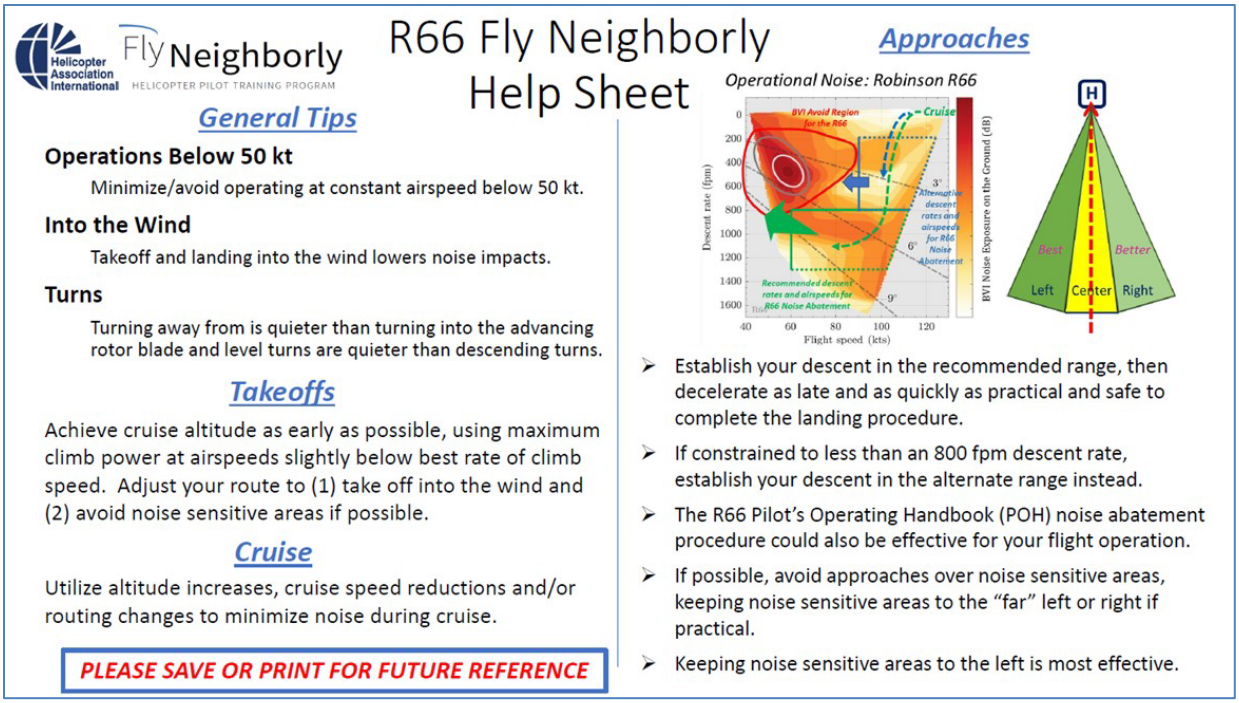


Figure A2-7
Robinson R66 Fly Neighborly Help Sheet

Table A2-1. Past Manufacturer-Provided Noise Abatement Guidance for Approaches

Helicopter Model	Latest Available Guidance	Earlier Guidance
A109A, A109 II, A109C	60 kt @ 12 to 15°	
AS 332	As steeply as possible	
AS 350BA, AS 350B3	60 kt IAS at 1000 fpm (~ 9°)	As steeply as possible
AS 355F1, AS 355F2, AS 355N, AS 355 NP	60 kt IAS at 1000 fpm (~ 9°)	
BK117B1, BK117C1, BK117C2, EC145 (H145)	65 kt IAS at 1000 fpm (~ 8°)	Descend at 12 to 15°
BO105 (all models)	65 kt IAS at 1000 fpm (~ 8°)	Descend at 12 to 15°
EC120 (EC120B, H120)	60 kt IAS at 1000 fpm (~ 9°)	
EC130B4 (EC130T2, H130)	60 kt IAS at 1000 fpm (~ 9°)	
EC135 T1, EC 135 T2, EC 135T2+ (H135)	65 kt IAS at 1000 fpm (~ 8°)	
EC135 P1, EC 135 P2, EC135 P2+ (H135)	65 kt IAS at 1000 fpm (~ 8°)	
EC145 (H145)	65 kt IAS at 1000 fpm (~ 8°)	
MD500N, MD500D, MD500E	At steepest glideslope consistent with passenger comfort and safety	
MD530F		
MD600N		
MD900 / Explorer		

Table A2-2. Nominal Descent Rates in fpm
Needed to Achieve Target Approach Angle – Rounded Values

Approach	Airspeed (kt)												
Angle (°)	60	65	70	75	80	85	90	95	100	105	110	115	120
3	320	350	370	400	425	450	475	500	530	560	580	610	640
4.5	475	520	560	600	640	675	710	750	800	840	875	910	950
6	640	690	740	800	850	900	950	1000	1060	1110	1160	1220	1270
7.5	800	860	930	1000	1060	1120	1200	1260	1320	1400	1460	1520	1600
9	950	1030	1100	1200	1270	1350	1425	1500	1600				
10.5	1100	1200	1300	1400	1500	1600							
12	1250	1370	1475	1600									

Appendix 3. Additional Fly Neighborly Resources

Fly Neighborly information and guidance is available from many industry and governmental sources including those listed below. Helicopter manufacturers can also be a good source of Fly Neighborly information, in particular noise abatement procedures for individual helicopter models.

The list of additional resources below includes information on organizations, resources, and web links.

Organization	***Resource***	***Link***
Vertical Aviation International (VAI)	VAI Fly Neighborly Working Group VAI Fly Neighborly Guide Fly Neighborly Poster Fly Neighborly Tips Flyer Fly Neighborly Presentation FAA iFlyQuiet Community Engagement Guide	https://verticalavi.org/initiatives/fly-neighborly
British Helicopter Association	The Civil Helicopter in the Community	https://www.britishhelicopterassociation.org/wp-content/uploads/Civil-Helicopter-in-the-Community.pdf
U.S. Federal Aviation Administration (FAA)	Fly Neighborly Presentations FAA *WINGS* Training Course ALC-500: Fly Neighborly FAA iFlyQuiet Community Engagement Guide	https://www.faasafety.gov/files/helpcontent/courses/FNC/story_html5.html?lms=1 https://go.usa.gov/xQPCW https://www.rotor.org/wp-content/uploads/2021/07/iFlyQuiet-Community-Engagement-Guide.pdf or https://www.researchgate.net/publication/340482821_iFlyQuiet_Community_Engagement_Guide_DOT-VNTSC-FAA-20-01

Civil Aviation Administration in Argentina (ANAC)	ICAO Assembly 39 Working Paper A39-WP/156 "ENVIRONMENTAL PROGRAMME ON HELICOPTER NOISE MITIGATION BY OPERATIONAL PROCEDURES" Training Course: Helicopter Noise Mitigation by Operational Means	https://www.icao.int/Meetings/a39/Documents/WP/wp_156_en.pdf
Aviation New Zealand	Noise Abatement Training Courses	https://www.aviationnz.co.nz/AIRCARE/Company+Noise+Abatement+Training+Package.html
Contract Aircrew Training (New Zealand)	Training Course: Noise Abatement Awareness - Helicopter	https://www.conair.co.nz/Courses/
Airservices Australia	Helicopter Operations – Fly Neighborly Agreements	https://www.airservicesaustralia.com/about-us/about-our-operations/helicopter-operations/
International Civil Aviation Organization (ICAO)	Manual on Operational Opportunities for Aircraft Noise Reduction	https://store.icao.int/en/manual-on-operational-opportunities-to-reduce-aircraft-noise-doc-10177
International Civil Aviation Organization (ICAO)	ICAO Helicopter Noise Reduction Technology Status Report	https://www.icao.int/environmental-protection/Documents/Helicopter_Noise_Reduction_Technology_Status_Report_April_2015.pdf
International Civil Aviation Organization (ICAO)	ICAO Circular 351 – Community Engagement for Aviation Environmental Management	https://www.icao.int/environmental-protection/Documents/COMMUNITY_ENGAGEMENT_FOR%20AVIATION%20ENVIRONMENTAL_%20MANAGEMENT.EN.pdf

Appendix 4. PHPA Noise Areas Flyer

A reduced-size copy of the Noise Areas Flyer developed by the Professional Helicopter Pilots Association (PHPA) for the Los Angeles and South Bay areas of Southern California in the US is shown in this Appendix. An original copy of this flyer can be obtained at from the faasafety.gov website at https://www.faasafety.gov/files/notices/2015/Aug/PHPA_Noise_Areas_Flyer_FAA-OK-(2_6-6-15.pdf.

The Professional Helicopter Pilots Association is raising awareness about current noise issues in the Los Angeles and South Bay areas. This is in response to recent citizen activism that has gained the attention of members of Congress and has resulted in legislation directing the Secretary of the Department of Transportation to take action to reduce the noise impact of helicopter operations.

This legislation gives the Secretary one year to demonstrate a substantial improvement toward lowering the noise impact of helicopters in Los Angeles County. The helicopter community has until January 2015 to make this happen. If this is not accomplished, then the legislation directs the Secretary to begin the regulatory process to regulate helicopter routes, altitudes, and operations to reduce noise.

PHPA has produced this flyer to inform its members and the southern California helicopter community of this pending threat of regulation, and the detrimental impact to all helicopter operations. No operator, civil or public, is exempted.

PHPA and the FAA are calling on all southern California helicopter pilots and operators to **get involved and get educated.**

- ✔ Chief Pilots, Directors of Operations, and owners are needed to embrace noise sensitivity and make noise abatement an operational policy
- ✔ CFI's are needed to educate their students and lead as role models in noise abatement practices and education
- ✔ Professional and recreational pilots are needed to embrace fly neighborly and noise abatement practices

2

Learn more...

- ✔ Take or review the HAI fly neighborly course
- ✔ Fly Neighborly
- ✔ Attend upcoming Safety and Noise Education Seminars
- ✔ Learn where the noise sensitive areas are located
- ✔ Learn the noise characteristics of the helicopter you fly
- ✔ Get Active in the PHPA!

Coming Soon: Helicopter Noise Training Seminars

PHPA is developing training seminars to bring the helicopter community together toward the twin goals of:

- ✔ Substantially reducing the impact of helicopter noise, and
- ✔ Demonstrate to legislators that we can accomplish this through the proactive and voluntary efforts of the helicopter community at large.

The importance of these goals cannot be overemphasized.

About this flyer

Portions of the Los Angeles Helicopter Chart have been used in this flyer to depict noise sensitive areas. Noise abatement recommendations in those areas are provided for reference and are depicted in yellow, but it should be noted that:

This document is for reference only and should not be interpreted as restrictive in nature.

PHPA advocates the rights of pilots and operators to conduct their flights in accordance with FAA regulations. The association also advocates the responsible application of noise mitigation procedures and practices, to lessen the impact of helicopter noise on the community. To that end, we have a responsibility to Fly Neighborly as much as possible.

- not for navigation -

KVNY - Van Nuys Airport

Six Arrival and Departure Routes

North:	South:	East:
Balboa	Bull Creek	Stagg
Tracks	Basin	
Saticoy		

- ✔ Must use these routes when operating at KVNY
- ✔ Directly overfly streets or tracks
- ✔ Follow the curvature of streets, do not offset or cut corners

Altitudes

Arrivals – 1300 ft. MSL to the airport boundary

Departures – Climb to 1300 ft. MSL prior to departing airport property

Refer to:

Los Angeles Helicopter Route Chart, 11th ed., June 4, 2011 and KVNY Noise Abatement Procedure at *http://www.lawa.org/uploadedFiles/VNY/pdf/VNY%20South%20map%201110.pdf*

- not for navigation -

Getty Center to Griffith Park

Landmarks

1. Getty Center
2. West Hollywood
3. Hollywood Bowl
4. Ford Theater
5. Hollywood Hills
6. Hollywood Sign
7. Griffith Park and Observatory

Hollywood Bowl and Ford Theater

- ✔ White strobe lights mark the area during concerts
- ✔ Depicted on the Los Angeles Helicopter Route Chart 11th Ed.
- ✔ Avoid this area when strobes are flashing
- ✔ Check for Notams
- ✔ Check websites for performance dates and times
- ✔ Hollywood Bowl *http://www.hollywoodbowl.com/tickets/calendar*
- ✔ Ford Theater *http://fordtheatres.org/en/events/eventtypes*

Recommendations:

- ✔ Follow Fly Neighborly guidelines
- ✔ Fly higher
- ✔ Limit hovering
- ✔ Limit orbiting

- not for navigation -

KSMO – Santa Monica Airport

Arrivals

- ✔ All arrivals from North and South over midfield
- ✔ 900 ft. MSL until airport boundary
- ✔ Descend over the airport or business park to the north taxiway

Departures - All departures from the runway

Runway 21

- ✔ Overfly the entire length of the runway to the end
- ✔ Offset to the south, to overfly the Golf Course
- ✔ Maintain heading to the shoreline
- ✔ Make turns at the shoreline

Runway 3

- ✔ Maintain runway heading to the 405 Fwy

Curfew

- ✔ No Engine Starts
  Monday - Friday between 11:00 pm and 7:00 am
  Weekends between 11:00 pm and 8:00 am
- ✔ Arrivals permitted 24 hrs. per day
- ✔ Voluntary Curfew requested during same hours
- ✔ Arrivals between 9:00 pm and 7:00 am are strongly discouraged
- ✔ Flight Training is prohibited

Refer to:

KSMO published Noise Abatement Procedures at *http://www.smgov.net/uploadedFiles/Departments/Airport/Helicopter%20Procedure.pdf*

- not for navigation -

KLAX Industrial Transition

Noise Sensitive Areas:

- ✔ City of El Segundo between Sepulveda Blvd. and the shoreline, south of KLAX and north of the Chevron Refinery.
- ✔ City of Hawthorne and portions of Del Aire from Aviation Blvd. to Inglewood Blvd., south of Imperial Ave. and north of Redondo Beach Blvd.

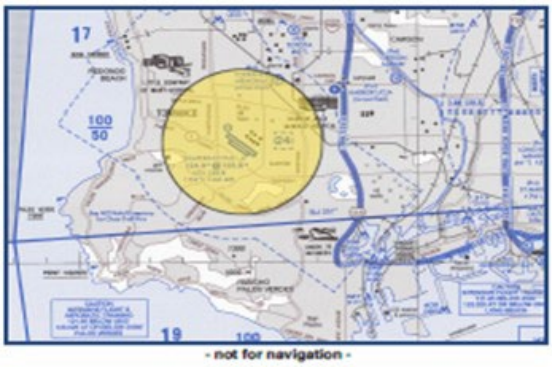
Northbound Transition:

- ✔ Enter abeam the Green Line train station at Redondo Beach Blvd. at 900 ft. MSL
- ✔ Offset west of the tracks and follow the Green Line while climbing to 1500 ft. MSL
- ✔ Offset west to join Sepulveda Blvd. south of the 105 Fwy.

Southbound Transition:

- ✔ Crossing the 105 Fwy at 1500 ft. MSL, offset east to join the Green Line tracks
- ✔ Offset to the west side of the tracks
- ✔ Descend to 900 ft. MSL
- ✔ At the Green Line train station and Redondo Beach Blvd., transition to the 405 Fwy

Refer to:
http://www.phpa.org



- not for navigation -

KTOA – Torrance Airport

Noise Sensitive Areas:

- ✔ Neighborhoods surrounding the airport
- ✔ Palos Verdes peninsula
- ✔ Shoreline from LAX to San Pedro

Recommendations:

- ✔ Follow Fly Neighborly guidelines
- ✔ Maintain noise appropriate altitudes when climbing above and overflying the Palos Verdes peninsula
- ✔ Fly higher
- ✔ Limit hovering
- ✔ Limit orbiting

- not for navigation -

Long Beach Airport

Noise Sensitive Areas:

- ✔ Neighborhoods surrounding the airport
- ✔ Southern neighborhoods between the airport and the beach

Fly Neighborly and Noise Abatement:

- ✔ Try to stay on the published helicopter transition routes when arriving or departing the Airport
- ✔ Stay within the traffic pattern guidelines unless safe flight or Air Traffic Control Tower directs otherwise
- ✔ Gradual and smooth control inputs result in reduced noise impact
- ✔ Avoid rotor blade slap whenever possible (recognize areas in flight and maneuvers that produce this acoustical signature, as the modulated sound attracts attention and complaints)
- ✔ Avoid rapid, steep turns when possible
- ✔ Helicopters are subject to the same restrictions and noise violation enforcement as fixed wing aircraft when using the runways

(continued on next page)

(Long Beach continued)

Inbound and Outbound Routes:

Helicopters shall remain at or below 500 feet MSL within 1½ miles of the Airport, otherwise at or below 700 feet MSL

West or East Traffic Configuration:

Routes used during a West or East Traffic Configuration, unless otherwise approved by ATC:

- ✔ Downey - via Downey Ave. north of the Airport
- ✔ Redondo - via Redondo Ave. south of the Airport
- ✔ East Wardlow - via Wardlow Rd. east of the Airport
- ✔ West Wardlow - via Wardlow Rd. west of the Airport

South or North Traffic Configuration

Routes used during a South or North Traffic Configuration, unless otherwise approved by ATC:

- ✔ South Lakewood - via Lakewood Blvd. south to the traffic circle, then south to the shoreline.
- ✔ South Cherry - via Cherry Ave. south to the shoreline.
- ✔ North Bellflower - via Bellflower Blvd. north of Wardlow Rd.
- ✔ North Atlantic - via Atlantic Ave. north of Wardlow Rd.
- ✔ East Wardlow - via Wardlow Rd. east of the Airport.
- ✔ West Wardlow - via Wardlow Rd. west of the Airport.

Refer to:
http://www.lgb.org/civicax/filebank/blobdload.aspx?blobid=2578

Education

Federal Aviation Administration

Los Angeles Helicopter Noise Initiative final report

http://www.faa.gov/regulations_policies/policy_guidance/envir_policy/media/fa_helicopter_noise%20report_final_053113.pdf

Helicopter Association International

Fly Neighborly training

https://www.rotor.org/Resources.aspx

Los Angeles Helicopter Route Chart 11th Ed.

Professional Helicopter Pilots Association

http://www.phpa.org/

Airport and Route Noise Abatement Procedures

Los Angeles Helicopter Route Chart 11th Ed.

Airport Specific Published Procedures

KFUL - Fullerton Airport

http://www.cityoffullerton.com/depts/airport/pilots_guide_n_noise_abatement_procedures.asp

KLGB - Long Beach Airport

http://www.lgb.org/civicax/filebank/blobdload.aspx?blobid=2578

KSMO - Santa Monica Airport

http://www.smgov.net/uploadedFiles/Departments/Airport/Helicopter%20Procedure.pdf

KSNA - John Wayne Airport

http://www.ocair.com/generalaviation/noiseabatement/JWAGANoiseAbatement. pdf

KTOA - Torrance Airport

http://www.torrance.com/torranceairport/noise.htm

KVNY - Van Nuys Airport

http://www.lawa.org/uploadedFiles/VNY/pdf/VNY%20South%20map%201110.pdf

KWHT - Whiteman Airport

http://dpw.lacounty.gov/avi/airports/WhitemanNoiseAbatement.aspx

About Us

The Professional Helicopter Pilots Association is a member oriented organization that has been representing the interests of our membership in California for over 47 years. PHPA represents a diverse and dynamic group of helicopter pilots and operators which range from newly certificated pilots to aviators that earned their wings in the 1960s.

PHPA invites all pilots, professional and recreational, to join our ranks, get involved with issues affecting our industry, network with other pilots, and help us to help you.

Our mission

Promote safety and understanding among helicopter pilots; Coordinate efforts towards improving communications, methods of operation within the airspace system, or any other area that will contribute to the safety and education of all pilots; Provide a forum for identifying and seeking resolution to local problems of interest to the membership; Promote community relations between the public and the helicopter industry.

For more information please go to www.phpa.org

Or contact:

Jim Paules, Membership Committee Chairman

JPaules@socall.rr.com

PHPA Executive Officers

Jim Davidson, President – jim.davidson@phpa.org

Steve Rousell, Vice President – steve.rousell@phpa.org

James Paules, Secretary – jpaules@socal.rr.com

Edward Story, Treasurer – ed.story@phpa.org

Production Team Members:

Tony Byrnes, Producer/Editor – arbyrnes42@hotmail.com

Edward Story, Contributing editor

Pat Carey, Contributing editor

James Paules, Contributing editor

Kat Byrnes, Graphics

Appendix 5. The Portland Public Heliport Noise Abatement Program

In 1989, the city of Portland, Oregon and the Northwest Rotorcraft Association decided to build a heliport to provide direct air access to downtown Portland. During hearings to approve the facility, concern was expressed about the resulting noise increase in the area surrounding the heliport. In response to this concern, the following noise abatement program was put into effect:

Noise Abatement

Pilots are requested to utilize the following noise abatement procedures, whenever possible. Of course, it is the pilot's responsibility on each flight to determine the actual piloting techniques necessary to maintain safe flight operations.

1. *Flight Paths:* Maintain approach and departure paths over rivers and freeways. Avoid residential neighborhoods, the McCormick Pier Apartments, the convention center towers, and the piers for the Steel Bridge. Approach and depart over the Morrison, Broadway, and Grand Avenue bridges. [A map is provided with those features marked.]
2. *Steep Departure:* Depart at Vy (best rate of climb) when possible.
3. *Steep Approach:* Use steep approach angle when possible (PLASI is set for a 10º approach).
4. *Night Operations:* Avoid night approach from the north, as it passes near the McCormick Pier Apartments.
5. *Minimize Ground Operations:* Minimize the duration of warm-up or cool-down periods (typically two to three minutes). Do not idle at the heliport for prolonged periods.
6. *Avoid High Noise Regime:* Most helicopters have a high noise regime near a descent profile of 70 knots at 300 fpm. Pilots can avoid descending through this area by initiating the descent at a higher speed than normal.
7. *Gradual and Smooth Control Inputs:* Gradual and smooth control inputs result in reduced noise impact.
8. *Avoid Steep Turns:* Avoidance of steep turns result in reduced noise impact.
9. *Enroute Altitude:* Whenever possible, maintain 2,000 feet above ground level over residential neighborhoods and other noise-sensitive properties, as per FAAAC 91-36 "VFR Flight Near Noise-Sensitive Areas."
10. *Fly Neighborly:* Refer to the VAI Fly Neighborly Program for additional information on how to minimize helicopter noise impact.

Citizen concerns about helicopter noise emanating from the Portland Heliport should be brought to the attention of the Northwest Rotorcraft Association by calling 503-286-0927. All noise complaint calls will be logged. If the caller can identify the helicopter involved, follow-up calls will be made to the involved helicopter pilot and then back to the concerned citizen.

The Bureau of General Services maintains a Portland Heliport Noise Abatement Committee. When noise issues at the heliport cannot be easily resolved, the committee will be convened to assist in the resolution process, and the logs reviewed for pertinent information.

As concerns noise abatement of helicopter traffic in other parts of the city, it is noted that the Port of Portland has developed a plan of preferred helicopter flight routes for use in the greater Portland metropolitan area, especially as concerns helicopter traffic to and from Portland International Airport and Portland Hillsboro Airport. This program has been very successful, and the heliport is still operating.

Appendix 6. Greater Los Angeles Fly Neighborly Program

The greater Los Angeles area has several noise sensitive areas that has necessitated implementation of a robust Fly Neighborly Program to address community concerns with and opposition to helicopter operations. This has included ongoing noise issues such as near to the Hollywood sign and intermittent noise issues for operations such as news gathering. The Los Angeles helicopter operating industry, including the Los Angeles Helicopter Operators Association and the Professional Helicopter Pilots Association, has been instrumental in developing systems and procedures for achieving a Fly Neighborly program in support of their operations. In addition to promoting Fly Neighborly training and adherence (see the PHPA Noise Areas Flyer Appendix 4), this has included implementation of an Automated Helicopter Noise Complaint System, a joint industry-community Helicopter Noise Complaint Review Committee, and pilot “summits” to foster Fly Neighborly operations. Some lessons learned from the noise complaint system and complaint review committee are presented in this appendix.

The Greater Los Angeles Automated Helicopter Noise Complaint System:

The online greater Los Angeles Automated Helicopter Noise Complaint System went live in April 2015. Although expectations for complaints were as high as 75,000 per month, complaints initially averaged 11,000 per month before fairly quickly dropping to 5,500 per month. Analyses of the noise complaints logged by the system indicated that roughly 400 to 500 individuals generated the complaints with about 80% of the complaints being filed by approximately 50 individuals. Overall, less than 1/10 of one percent of Los Angeles residents were concerned enough about helicopter noise to file a complaint.

Two areas with substantial numbers of complaints were near the Hollywood sign and the section of Los Angeles known as Koreatown. Analyses of the complaints received from these two areas were very illuminating. The Hollywood sign is one of the most popular helicopter tour destinations in the Los Angeles area and, in the area below the Hollywood sign, residents file the most helicopter noise complaints of any single zip code in the Los Angeles area – typically over four times the number filed in the second highest zip code. In April 2018, for example, 1737 complaints were filed by residents living below the Hollywood sign. Deeper analysis of these 1737 complaints showed, however, that 1484 complaints were filed by one individual and 148 complaints were filed by a second individual, representing nearly 94% (85.4% and 8.5%, respectively) of the total number complaints filed in that month. This result was indicative of a strong narrow concern but very much less of a broad concern with helicopter noise in that area.

A similar conclusion was reached in analyses of the noise complaints received from Koreatown in Los Angeles. In December 2015, for example, one individual filed 1037 complaints, or 22% of all complaints logged by the complaint system for that month, while two other individuals in Koreatown filed one complaint each.

Some lessons learned can be derived from the Los Angeles experience, including:

1. The Automated Helicopter Noise Complaint System objectively quantified the scope of helicopter noise issues in the Los Angeles area, providing insight into both the depth of

individual noise concerns and the breadth of community noise concerns. This in turn does allow for some objective comparisons with other community concerns such as public safety, quality of schools, housing affordability, freeway congestion, etc.

2. Without such a robust noise complaint system that documents the when, where and how many of helicopter noise complaints, actions to address complaints can be focused only on total number of complaints which can misconstrue the breadth of community noise concerns and lead to misdirected solutions to helicopter noise issues.

The Greater Los Angeles Helicopter Noise Complaint Review Committee:

To aid in the resolution of helicopter noise complaints and issues, a joint industry-community committee was formed to review helicopter noise complaints in the greater Los Angeles area. This committee is comprised of members from homeowner/community coalitions and the local helicopter operating industry and meets monthly to review complaint data. When homeowners flag “egregious” noise incidents in the complaint data, industry representatives follow up on the complaints to identify the helicopter involved and contact the helicopter operator or private pilot. The facts as understood are shared with the operator/pilot, and often there is a reasonable explanation for the specific operation including a requirement for low flying or extended hovering. In the remaining cases, the operator/pilot involved is encouraged to incorporate Fly Neighborly protocols into their situational awareness. The outcome for each incident is reported back to the committee.

The Los Angeles Noise Complaint Review Committee also provides several lessons learned that can be instructive for dealing with noise issues, including:

1. A noise complaint review committee provides a forum for residents and their community to express their frustration with “egregious” incidents.
2. In addressing these incidents, word gets out among helicopter pilots that they are accountable for the way they fly.
3. Helicopter operators/pilots would rather deal with industry representatives than government agencies such as the FAA which can produce more positive outcomes.
4. Collaborating with homeowner/community groups on helicopter noise complaints and issues helps build positive community relations.
5. The more positive community relations can in turn reduce pressures for imposing political solutions to helicopter noise issues, with elected officials and regulatory agencies such as the FAA recognizing the benefits of the collaborative approach and community members being less likely to seek political redress for their concerns.

Pilot Summits

The Professional Helicopter Pilots Association and the Los Angeles Area Helicopter Operators Association have co-sponsored several pilot meetings focused on the necessity of implementing Fly Neighborly protocols. Both of these organizations recognize the imperative of successfully executing Fly Neighborly for expanding opportunities for growth of the helicopter industry in the

greater Los Angeles area. Expanding pilot operator buy in to Fly Neighborly is a primary objective of these dedicated meetings.

Glossary

The acronyms used in this Guide are defined below.

AGL Above Ground Level

BVI Blade-Vortex Interaction

dB Decibels, the basic unit for measuring the level of sounds.

dB(A) A-weighted sound level. A sound pressure level that has been weighted to approximate human hearing response to sound of different frequencies. Weighted sound pressure levels, such as the “A” weighting, are currently used for noise certification of light helicopters and small propeller-driven aircraft. In FAA Advisory Circular 36-3C, they are used as the basis for airport access restrictions that discriminate solely on the basis of noise level.

DNL Day-night sound level. A single-number measure of community noise exposure (expressed in the unit Ldn), introduced to help predict the effects on a population of the average long-term exposure to environmental noise. DNL uses the same energy equivalent concept as the equivalent sound level (Leq), but corrects for night-time noise intrusion. The specified time integration period is 24 hours with a ten-decibel correction applied to noises heard between 10 P.M. and 7 A.M. to account for the increased annoyance of noises heard at night. For assessing long-term exposure, the yearly average DNL is the specified metric in the FAA 14 CFR Part 150 noise compatibility planning process.

EPNL Effective perceived noise level. A measure of complex aircraft noise, expressed in decibels, that approximates human annoyance responses. It corrects for the duration of the noise event and the presence of audible pure tones and discrete frequencies such as the whine of a jet aircraft. The EPNL is used by the FAA as the noise certification metric for large transport and turbojet airplanes, as well as for helicopters.

Fpm Feet per minute. A measure of speed used for the rate-of-climb or rate-of-descent of an aircraft.

KIAS Knots indicated airspeed. A measure of the speed of an aircraft.
[1 knot = 1.69 ft/sec =101.3 ft/min = 1.15 mile/hour]

Leq Equivalent sound level expressed in decibels. The energy average noise level (usually A-weighted) integrated over some specified time. The purpose of Leq is to provide a single-number measure of noise level averaged over a specific period of time. When used for assessing community noise, Leq is normally defined over a 16- or 24-hour period.

Mph Miles per hour. A measure of speed. [1 mph = 0.87 Knots]

PNL Perceived noise level. A rating of noisiness used in assessing aircraft noise, expressed in decibels. PNL is computed from sound pressure levels measured in octave or one-third octave frequency bands. An increase of ten decibels in PNL is equivalent to doubling the perceived noisiness. Currently, this measure is used by the FAA and foreign governmental agencies in the noise certification process for all turbojet-powered aircraft, and large propeller-driven transports.

R/C Rate of climb. The speed at which an aircraft is ascending.

R/D Rate of descent. The speed at which an aircraft is descending.

RPM Rotor revolutions per minute. The rotational speed at which an aircraft rotor is turning.

SEL Sound exposure level. A measure, expressed in decibels, of the effect of duration and magnitude for a single event. In typical aircraft noise model calculations, SEL is used in computing aircraft acoustical contribution to the equivalent sound level (Leq) and the day-night sound level (DNL).

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Fly Neighborly Guide

Produced by the **Vertical Aviation International**
Fly Neighborly / Environmental Working Group

Vertical Aviation International
1920 Ballenger Avenue, 4th Floor
Alexandria, VA 22314-2898 USA

Phone: 703-683-4646
Website: www.verticalavi.org
Email: Info@verticalavi.org