Phase II – Strategy Recommendations

Summary Report

September 2019

Executive Summary

In late 2018, ABCx2 was engaged by the Town of Superior to help identify solutions to the growing impact of aircraft noise attributed to operations at the Rocky Mountain Metropolitan Airport (RMMA). ABCx2 initiated work in November of 2018 and the City of Louisville joined the effort in early 2019.

The consulting team's approach was broken into three phases. Phase I focused on assessing existing conditions including airspace, flight procedures, airport fleet mix, operation levels, etc. This also involved researching community issues and concerns, complaint records, and community input provided to the Airport, Superior, and Louisville. The baseline assessment also included direct community and industry engagement efforts.

Phase II of this effort involved developing a portfolio of strategy recommendations to be implemented by the key stakeholders. These include the Town of Superior, City of Louisville, Jefferson County, Boulder County, the Airport, Airport Tenants, and the Federal Aviation Administration (FAA). While these recommendations will not silence the aircraft operating in and out of RMMA, nor are they expected to eliminate 100% of the community concerns over aircraft operations, they are intended to help both the airport and the surrounding communities co-exist, and to help maintain the quality of life within the region. At the same time, these efforts are intended to help the airport operate in a sustainable and community-friendly way.

The strategic recommendations are broken down into five individual, but interdependent functional areas:

- Flight Procedures, Practices, and Policies
- Community Outreach and Engagement
- Industry Outreach and Engagement
- Land-Use Planning and Development
- Regional Collaboration

Each functional area is described in detail in the report, as are the specific recommendations identified by the consulting team. The multifaceted and comprehensive strategies contained in this document should not be construed to be all encompassing. Rather, this document should be viewed as a starting point for discussions among local and regional stakeholders representing both aviation and community stakeholders as they will be ultimately responsible for acceptance and implementation of the strategies selected and approved. Additionally, this report is intended to be considered a "living" document allowing for new strategies and concepts as well as modifications to those presented, as conditions change, and new technologies and other opportunities arise.

Noise abatement takes dedication, patience, the desire to collaborate and a willingness to compromise in an effort to find solutions to very complex issues. These initial steps and the willingness of so many stakeholders and stakeholder groups to support the effort can serve as a catalyst for future progress toward a more positive quality of life for the citizens of Superior and Louisville.

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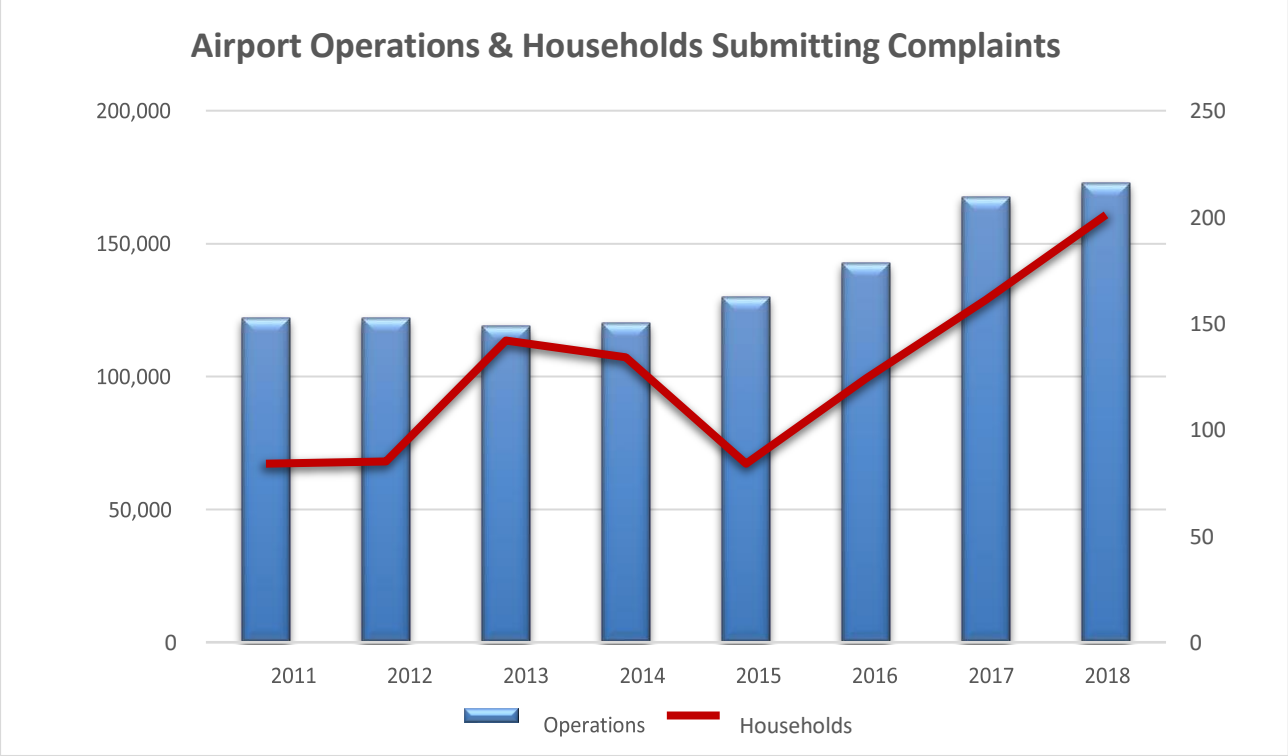
Introduction

The Rocky Mountain Metropolitan Airport (RMMA) has been experiencing significant growth in operations over the last several years. Federal Aviation Administration (FAA) and industry forecasts suggest this growth will continue both locally and nationwide.

RMMA serves as a reliever airport to Denver International Airport (DEN), hosting much of the general aviation within the region. DEN is simply too busy with large, commercial traffic to efficiently accommodate all the general aviation activity in the area. RMMA is one of several airports in the area serving general aviation activity including business aviation, transient military, flight training, etc.

As operations at RMMA increase, so too are residents' concerns resulting in a growing number of complaints. The Town of Superior reached out to the consulting firm ABCx2, to help address these issues.



This project kicked-off in November of 2018 with three initial objectives:

- Identify ways to reduce the aircraft noise impacts associated with Rocky Mountain Metropolitan Airport
- Help the Town establish collaborative relations with the Airport
- Help the Town more effectively engage the community regarding aviation operations and aircraft noise

The process was broken down into three phases. Phase I (Baseline Assessment) involved assessing the historical and existing conditions to gain a better understanding of the operational conditions, community impacts, and community concerns. Phase II (Strategy Development) consisted of the development of recommendations to help reduce community impacts. Finally, Phase III (Implementation) involves the implementation of recommendations by the responsible stakeholder or organization (i.e. Town of Superior, City of Superior, Jefferson County, Boulder County, the Airport, the Airport Authority (Jefferson County), and the FAA.

Both Phase I and Phase II involved extensive collaboration among the community and industry stakeholders. Activity details are provided within this report. The information collected was essential in the development of recommendations that are feasible (have a high likelihood of implementation) and effective (will address the communities' concerns).

The step in this effort requires selection and prioritization of the recommendations presented. Many of the recommendations can be deployed within the short-term (1-6 months) or medium term (6-12 months). A small number of the recommendations will require much more time and significant funding. As an example, this would include the development of instrument approach or departure procedures to be flown by business aviation aircraft. While these strategies may be effective, the project team suggests an initial focus on the short- and medium-term recommendations which can be implemented more quickly and at a significantly lower cost.

Project Overview and Process

The consulting team proposed a 3-phased approach for addressing the needs of Superior and Louisville. See Figure 1 below. Phase I focused on assessing the current and historical conditions to help the team understand the community impacts and priorities, and to understand the operational conditions and constraints. This included a review of community input and public comments, review of flight operations (aircraft types, flight patterns, local and regional airspace, flight procedures, etc.), and a review of land-use and zoning both on and off the airport. Phase I helped identify focus areas for strategy development in Phase II.

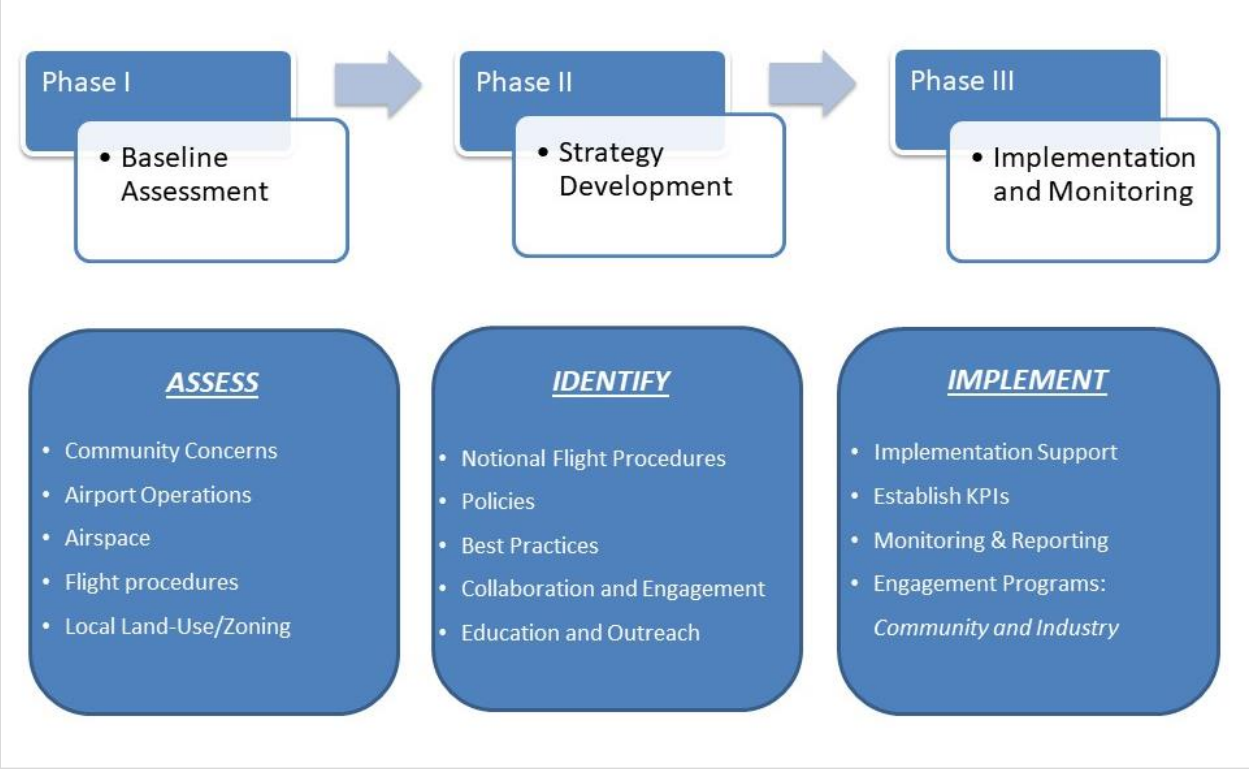


Figure 1 - Project Approach (Three-Phases)

Phase II – Strategy Development focused on identifying specific policies, practices, and procedures intended to reduce the community impacts associated with flight operations

at RMMA. A portfolio of strategies was developed and broken down into five strategic areas. The strategies identified, evaluated, and recommended, are based on the current conditions (i.e. existing community concerns, flight operations, land-uses, etc.).

- Flight Operations and Procedures
- Community Outreach and Engagement
- Industry Outreach and Engagement
- Local Land-Use Planning and Development
- Regional Collaboration and Planning

Identification of strategy recommendations was conducted using a multistep process. Initial brainstorming was led by the ABCx2 team based on input from Superior staff and the Board of Trustees, community input, and the findings in the baseline assessment. Phase I included the facilitation of a Flight Training Workshop which included representation from RMMA management, the RMMA Air Traffic Control Tower, RMMA flight schools, flying clubs, and other airport businesses, and the Aircraft Owners and Pilots Association (AOPA). The workshop included a brainstorming session which resulted in a number of strategies included in this report. Many of the strategies were developed including new and revised operational procedures, recommended practices and policies, and enhanced pilot education and outreach. Strategies identified through the initial brainstorming sessions were then compiled in a list for further analysis and consideration.

The final step in the compilation of strategies was based on a global inventory of airport noise programs and noise abatement best practices. This included a review of noise programs focusing primarily on general aviation airports (similar to RMMA) but did include larger, commercial service airports as well. Noise programs at more than 75 airports were reviewed for this analysis. Program elements with potential benefits and applicability to RMMA were added to the list of potential strategies for further review.

Primary recommendations from each focus area are discussed below. It is understood that conditions change over time. FAA forecasts suggest continued growth in operations nationwide and ABCx2, expects this to apply to RMMA. Changes in total operations, fleet mix, operation types (i.e. flight training, charter operations, etc.), and land-uses and development on and around the airport, may lead to new opportunities to further expand or enhance the strategies employed to improve compatibility between the airport and surrounding communities.

What We Heard – Community and Industry Engagement

Community Engagement

- **There are too many operations and too much noise.**
    - Aircraft are too low.
    - The aircraft are too loud.
    - There are too many flights.
    - The number of operations is rapidly growing.
    - There are too many training flights.
    - There should be limits on operations (i.e. when aircraft fly (curfews), where aircraft fly, total operations, aircraft types and sizes, limits on growth, etc.).
    - There are concerns about the safety of aircraft flying low over homes.
- **Not enough is being done to reduce airport noise impacts.**
    - Most of the flights are over "my" neighborhood. They avoid overflights of Jefferson County.
    - The airport is not doing anything to reduce community noise impacts.
    - The town/city/county needs to do more.
    - There needs to be more community involvement.
    - Nothing is done with complaints to the airport/town/city/county.
    - The flight schools/pilots aren't even aware of the noise program.
    - No one told us there would be airplanes flying over our home.

Industry Engagement

"Industry" engagement focused on key groups within the aviation industry. Represented groups included: Airport management and staff, RMMA Airport Advisory Board, RMMA Air Traffic Control Tower, airport-based businesses including flight schools, fixed-based operators, aircraft maintenance and service providers, and local pilots.

The purpose of the industry engagement included these objectives:

1) To better understand the history and future of RMMA with a focus on operations and community impacts.
2) Discuss community impacts and resident concerns attributed to aircraft operations.
3) Identify the existing noise abatement program measures; both operational and outreach elements.
4) Initiate identification of new/expanded strategies for reducing aircraft noise impacts based on existing and future conditions.
5) Encourage collaboration among industry stakeholders.

Engagement with industry continued throughout the process and remained positive and productive. The Airport, Airport Advisory Board, and the FAA Air Traffic Control Tower were particularly supportive. The Airport has since developed a Technical Advisory Group including most participants from the Flight Training Forum. This group has already initiated work toward development and implementation of operational procedures and practices which will reduce noise impacts for nearby residents.

Overview of Strategic Areas

The mitigation strategies identified were organized into five strategic areas: Flight Operations and Procedures, Community Outreach and Engagement, Industry Outreach and Engagement, Local Land-Use Planning and Development, and Regional Planning and Collaboration. While flight operations and procedural changes are the most direct approach to reducing noise exposure, long-term resolution of the issues identified will require a more holistic and comprehensive approach. The recommendations contained

herein represent those remaining after multiple rounds of screening. Screening criteria included regulatory review (is this consistent with current federal, state, and local regulations), will it negatively impact safety, effectiveness, and cost (is it cost-effective?). Recommendations from each strategic area are described in detail in the following sections. Screening of the recommendations included input from the appropriate stakeholder groups to ensue acceptability to those ultimately responsible for implementation. As an example, flight procedures under consideration were reviewed with FAA air traffic control (ATC). Acceptance by ATC would be required as ATC is ultimately responsible for directing aircraft in flight and the overall management of the airspace. Recommendations that conflicted with ATC's mandate would ultimately not be used, therefore, these were rejected from the final recommendations.

Flight Operations and Procedures

Flight procedures and operational practices make up the majority of the recommendations identified by the project team. A specific focus was placed on training operations as this class of operation was identified as a primary source of community noise impacts and subsequent concerns. The ultimate goal of the operational procedures is to reduce noise-exposure for airport-adjacent and nearby communities. In general, these strategies focus on:

- Routing aircraft away from residential areas when possible
- Increasing altitudes when overflying noise-sensitive/residential areas
- Reducing nighttime operations

Operations, regulatory requirements, and noise impacts vary by aircraft category. General recommendations were developed as well as recommendations based on specific aircraft categories (single-engine piston, multi-engine and turboprops, jets, and helicopters). Most operations and community concerns were attributed to flight-training operations, most of which involve single-engine piston aircraft.

Figure 2. Aircraft Categories. (Source of Photos: Wikipedia)

Strategies – General

- Noise-abatement arrival and departure routes (lateral paths)
- Noise-abatement profiles for approaches and departures (vertical paths)
- Design and implement noise-optimized arrival and departure procedures
- Design and implement noise-optimized profiles for approaches and departures
- Preferential runway use (daytime / nighttime)
- Discourage nighttime operations
- Early turns to avoid residential areas
- Design and implement "local" procedures for operations to and from the primary training areas, north of RMMA
- Design and implement "local" procedures for operations to the east, west, and south
- Design and implement preferential ingress/egress routes for RMMA (piston & turboprops)
- Establish "reporting points" for arrivals not utilizing "local" procedures

- Voluntary restraint from flying during late-night an early morning hours
- Avoid overflight of noise sensitive areas when possible (consistent with ATC instructions and safety)
- Approaches: Intercept approach path (i.e. PAPI or ILS) at highest altitude practicable
- Approaches: Remain at or above runway approach path (i.e. PAPI or ILS)
- Assess effectiveness of changes to preferential/calm wind runway use program

Single Engine Piston

- Encourage close-in (tight) patterns for touch-and-go operations
- Implement optimized "departure" profiles: Best angle of climb – climb to 400'-500' then initiate crosswind turn
- Expedite crosswind turn when operating within airport traffic pattern
- On takeoff, climb at best angle of climb until you cross the airport threshold, then switch to best-rate climb
- Depart from the runway end, rather than intersections, to give you the greatest altitude when leaving the airport threshold and flying over surrounding communities
- When possible, use low-energy, high profile descents. (AOPA recommendation - Low Power / Low Drag)
- Encourage close-in (tight) patterns for touch-and-go operations
- Encourage awareness and application of Aircraft Owners and Pilots Association's (AOPA) Noise Awareness Steps which can reduce community noise impacts (See Appendix I)

Multi-Engine / Turboprops / Jets

- Follow Fly Quiet procedures provided by aircraft manufacturer
- When aircraft-specific procedures are unavailable, utilize **NBAA Noise Abatement Recommendations.** (See Appendix II)
- Use minimum reverse thrust consistent with safety for runway conditions and available length

Helicopters

- Minimize overflight of residential areas when possible
- When overflying residential areas, maintain as much altitude as possible
- Utilize existing preferential routes for helicopters
- Avoid low-altitude overflight of residential areas to the extent practicable (consistent with ATC instructions and safety)
- Follow Fly Neighborly Guidelines established by HAI and endorsed by FAA and FAA Safety Team (See Appendix III)

Community Outreach and Engagement

Working more effectively with the community and concerned residents was one of the initial goals of the project. While effective engagement does not reduce aircraft noise exposure, understanding the residents' concerns is critical to effectively addressing them. Effective community outreach and engagement requires bi-directional communication. There must be opportunities for residents to express concerns and to get information about the efforts to address their concerns. It is also important to provide general information about aviation operations, regulations, stakeholder roles and authority, etc., in order to establish realistic expectations about what can and cannot be done to address concerns.

RMMA maintains a website with information geared toward the general public and local residents in particular. While there is some information available, the depth and scope of the information provided (for the community) is limited. Recommendations may be

presented to the Airport about opportunities to expand information available on their website focused on community interests. In addition to expanding the Airport's website, the Town of Superior and City of Louisville can also leverage their websites, social media, and other online resources to provide more information of interest to residents.

Goals

- Provide additional and more meaningful opportunities for residents to express concerns and to get information.
- Increase public understanding of airport operations, regulations, stakeholder roles, and what can and cannot be done and why. What is being done to reduce noise impacts?
- Seek input from the community regarding which strategies which are working, and which are not, and recommendations on how to improve.

Strategies

- Expand Superior and Louisville web content concerning:
    - The airport
    - Aviation stakeholder responsibilities and authority
    - Aircraft noise impact mitigation project (ongoing)
    - Contact information for Town/City and airport
    - Content should include Frequently Asked Questions (FAQ) to address common topics

- In addition to expanding the content on Superior and Louisville's websites, expand the Airport's website to include more community-focused information including information about the noise program, information about the Airport Influence Area and Airport Critical Zones, basic flight information, aviation stakeholder roles and responsibilities, and complaint process information. Airport flight patterns (closed-traffic) and typical arrival and departure corridors should be clearly depicted. This should include contact information for the appropriate agencies for concerns related to aircraft noise, aviation safety, etc.

- Superior or Louisville should train and dedicate staff (or outside contract support) to provide timely, accurate, information to residents with questions and concerns about aircraft and airport noise issues. Individuals tasked with this should have at least a basic knowledge of aviation and airport noise and an ongoing relationship with the airport staff to enable coordination and information sharing.

- Establish a community noise working group, committee, roundtable, etc., to be hosted by the Airport, Town/City/County, or combination. Such a working group should provide a formal channel for reviewing and addressing community concerns. Make up of the roundtable should include representation from the community, local governments, the Airport, Jefferson County (Airport Authority) and airport tenants/users.

- Community forums or informational sessions could be hosted by the airport or the Town/City. Ideally, this would be a collaborative effort involving both the Town/City and the Airport. Public meetings scheduled on a quarterly basis provides the community with the opportunity to express concerns and access to accurate information dispelling myths and addressing misunderstandings which often exacerbate airport/community conflicts. Roundtable meetings are typically more formal and focused on roundtable business with some time for public comment. Forums would be more informal information sharing where the community can express concerns and ask questions, and the Town/City/Airport can provide information.

- The Airport should establish a "Noise Alerts" system to notify the community about conditions or events expected to change operations or noise impacts. Similar programs are deployed at airports across the country as a way to provide advance notice to residents of special conditions or events that may temporarily increase noise impacts.
- Information about the complaint management process should be provided online, describing for residents how complaints are processed and what is done with the information. Confirmation of complaint receipt and follow-up with an explanation of findings is highly recommended.
- Newsletters / Noise Updates would provide another opportunity to inform the community of progress concerning the noise program expansion efforts. Newsletters can be published by the airport electronically with minimal cost. These could also be distributed through the Superior or Louisville websites and other outreach channels (i.e. mailing lists, social media, etc.) to ensure residents are aware of the efforts and progress. Additionally, content could be curated for specific homeowner associations' newsletters and websites reaching residents with information of interest to their community.

Industry Outreach and Engagement

Goals

- Inform flight schools, pilots (local and visiting) air traffic control, etc., about the community impacts associated with aircraft operations and noise.
- Expand awareness of practices and procedures to reduce noise impacts.
- Expand awareness of the airport Fly Quiet Program and encourage participation.
- Involve industry in expansion and improvement of the airport noise program.

Strategies

- Develop/enhance flight training curriculum to include noise abatement and Fly Quiet Program awareness to encourage compliance. Include RMMA-specific information as well as noise abatement information in general.
- Develop training curriculum for flight instructors (i.e. train the trainer) and provide training on at least a quarterly basis. Training should be developed for new flight instructors in addition to refresher training.
- Develop noise abatement awareness training curriculum for air traffic controllers. Training should be developed for new controllers in addition to refresher training - provided annually at a minimum.
- Host pilot forums to promote awareness of the RMMA noise abatement program. Pilot forums should be promoted to encourage both local/RMMA-based pilots as well as regional pilots who frequently visit RMMA. Forums may be hosted by the Airport or airport tenants. Forums could also be paired with FAA Safety Team (FAAST) Workshops.
- Expand information on airport website regarding clarity on noise-sensitive areas around RMMA and the practices and procedures for reducing noise impacts.
- Develop a technical working group to include air traffic control, airport staff, Airport Advisory Board, flight schools, other airport businesses. The technical advisory group will focus on technical review of new and refined noise program measures.

Local Land-Use Planning and Development

Goals

- Enable informed decision-making in local land-use planning, zoning, and development, to encourage development that is compatible with the airport and flight operations.
- Encourage compatible land-use planning, zoning, and development in proximity to the airport and areas exposed to high noise exposure and overflights (i.e. Airport Influence Area and Critical Zones).
- Encourage transparency and informed decision-making for developers, real estate brokers, and homebuyers.

Strategies

- Consider existing and future noise exposure/flight patterns when addressing zoning and land-use planning.
- Review and comment on planned airport development to encourage compatibility between long-term development plans of airport and local communities.
- Coordinate local zoning/development changes with Airport to understand potential impacts.
- Update website to include Airport Influence Area and flight paths and patterns. Include content for prospective homebuyers about the airport, flight patterns, etc., to encourage transparency and informed decision-making.
- Ensure long-term local land-use development is compatible with long-term development plans of airport.
- Revise development and building codes to prohibit or discourage noise-sensitive development within the Airport Critical Zones.

- Revise zoning ordinances to require noise disclosure for home sales within Airport Influence Area.

Regional Collaboration and Planning

Goals

- Encourage a collaborative approach to regional land-use planning to leverage benefits of the airport while minimizing community impacts.
- Encourage collaboration among municipal and county governments, land-use authorities, and the airport.
- Pursue win-win approaches to local land-use and zoning, and airport development that supports economic development within the region and improves the quality of life regionally and locally.

Strategies

- Establish (quarterly) meetings with Superior, Louisville, Boulder and Jefferson Counties and the Airport to discuss development plans, community concerns, etc.
- Coordinate review of airport and local (off-airport) land-use planning to encourage compatibility.
- Establish a Regional Planning Forum to coordinate airport and local land-use planning.
- Elected Officials Working Sessions. These would focus on collaborating on development of high-level strategic direction/vision for local communities and the airport. Representation should include Superior, Louisville, Jefferson County (County administration and Airport Authority), Boulder County, etc. The focus would be on establishing long-term policy, direction, prioritization, etc., and direction to staff. These would be held on a scheduled basis (i.e. quarterly or semi-annually).

- Compatibility Roundtable / Working Group. This group would have a tactical focus, executing or implementing the direction/vision established through the Elected Officials Working Sessions. Representation would be made up of City Managers, Planners, Economic Development, Community Relations, etc., from Superior, Louisville, Jefferson County, Boulder County, and the airport. Meetings should be scheduled on a bi-monthly or quarterly basis. Focuses for this group would be implementing strategies to address the vision established by the Elected Officials through the working sessions. Specific areas may include long and short-term land use planning and development (on and off airport), airport noise program, airport master planning, regional planning and development. Working together will encourage development that encourages compatibility between the airport and airport users and surrounding communities.

- Technical Advisory Committee (Noise Task Force). The Technical Advisory Committee (Noise Task Force) grew out of the Flight Training Forum held at the Airport as part of the baseline assessment. The proposed make-up of this group includes airport staff, air traffic control, flight schools, FBOs, flying clubs, and subject-matter experts (SMEs) advocating on behalf of the community (i.e. ABCx2). The focus of this group would be to develop specific procedures, policies, and other operational noise mitigation program measures. Recommended meeting frequency is monthly or bi-monthly.

- Airport Community Roundtables (Advisory Committees, etc.) are common across the US. Community Roundtables provide a formal platform for community members to address concerns and to get information about airport operations, noise, etc. Community roundtables are typically made up of a mix of community and industry representatives. Community representatives may be elected officials, city/town staff, residents, or a combination. Industry representatives typically include the airport, air traffic control, and airport tenants. Roundtables work closely with the community to understand resident concerns and to help identify solutions.

Logistics

Collaboration among key stakeholders including those representing the industry and the local communities are critical in encouraging compatible development, successful and sustainable growth of the airport, and sustainable growth and development and quality of life for the community. Recognizing the importance of collaboration, many airports across the US and abroad have working groups, committees, roundtables, etc., to facilitate the exchange of information among stakeholder groups. Often there are multiple groups fulfilling distinct roles and leveraging the available resources. One such model is depicted in Appendix IV. This presents a graphical representation of working groups and roundtables that could address the existing local and regional needs based on the input received and observations made during this process.

Though this is one of virtually unlimited options and models, the proposal seeks to leverage stakeholder and individual roles, authority, and interests, while providing the opportunity for synergistic thinking and representation of a broad range of interests. Communication would flow among the groups to inform decision-making at all levels. While this may not be the path taken, it is intended to provide a starting point for discussion with local and regional stakeholders in an effort to find a model that best serves those involved.

Appendices

- Appendix I - Aircraft Owners and Pilots Association - Noise Awareness Steps
- Appendix II - National Aviation Business Association – Noise Abatement Program
- Appendix III - Helicopter Association International – Fly Neighborly Program
- Appendix IV – Community Survey and Workshop Comments & Responses
- Appendix V – FAA Guide to Low Flying Aircraft

Appendix I

Aircraft Owners and Pilots Association - Noise Awareness Steps

- If practical, avoid noise-sensitive areas. Make every effort to fly at or above 2,000 feet over such areas when overflight cannot be avoided.

- Consider using a reduced power setting if flight must be low because of cloud cover, overlying controlled airspace or when approaching the airport of destination. Propellers generate more noise than engines; flying with the lowest practical RPM setting will reduce aircraft noise substantially.

- Perform stalls, spins, and other practice maneuvers over uninhabited terrain.

- Familiarize yourself and comply with airport noise abatement procedures.

- On takeoff, gain altitude as quickly as possible without compromising safety. Begin takeoffs at the start of a runway, not at an intersection.

- Use the Precision Approach Path Indicator (PAPI). This will indicate a safe glide path and allow a smooth, quiet descent.

- Retract the landing gear either as soon as a landing straight ahead on the runway can no longer be accomplished or as soon as the aircraft achieves a positive rate of climb. If practical, maintain best-angle-of-climb airspeed until reaching 50 feet or an altitude that provides clearance from terrain or obstacles. Then accelerate to best-rate-of-climb airspeed. If consistent with safety, make the first power reduction at 500 feet.

- Fly a tight landing pattern to keep noise as close to the airport as possible. Practice descent to the runway at low power settings and with as few power changes as possible.

- If possible, do not adjust the propeller control for flat pitch on the downwind leg; instead, wait until short final. This practice not only provides a quieter approach, but also reduces stress on the engine and propeller governor.

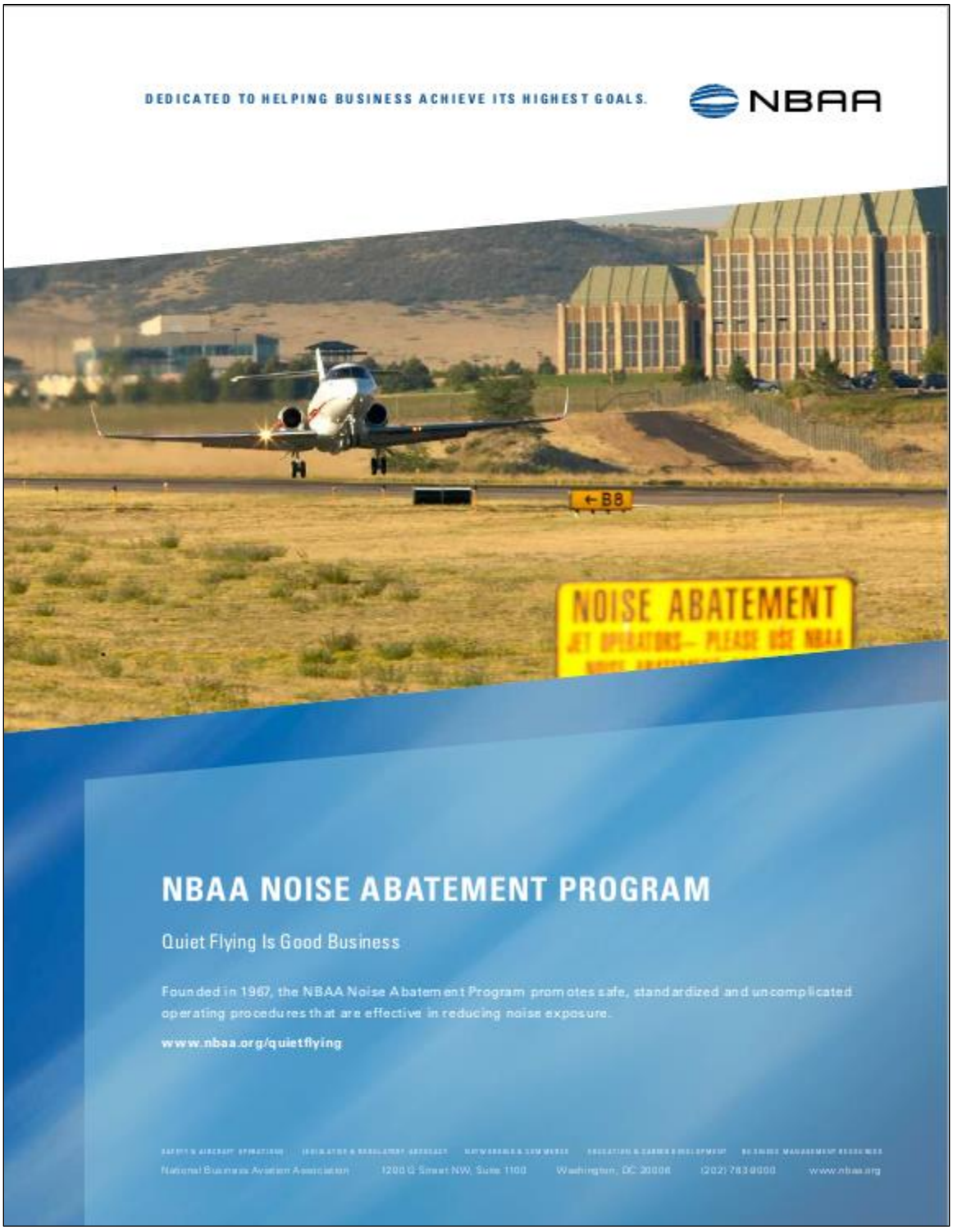
- Avoid low-level, high-powered approaches, which not only create high noise impacts, but also limit options in the event of engine failure.

- Flying between 10 p.m. and 6 a.m. should be avoided whenever possible.

Note: *These are general recommendations; some may not be advisable for every aircraft in every situation. No noise reduction procedure should be allowed to compromise flight safety.*

Appendix II

National Aviation Business Association – Noise Abatement Program



NBAA NOISE ABATEMENT PROGRAM

Quiet Flying Is Good Business

NBAA has long believed that quiet flying is good business. NBAA's Noise Abatement Program has been in existence since 1967, establishing objectives and operating procedures that have served the business aviation community well and have proven to be effective in reducing aircraft noise impacts and subsequently, community opposition to business aviation.

NBAA's updated Noise Abatement Program was developed with modern aircraft performance and air traffic control (ATC) requirements in mind. With this revision, NBAA continues to provide operators with guidance to reduce noise impacts that is suited to the current operating environment, as well as new tools for aircraft operators and airports to address the noise concerns of adjacent communities.

The updated program includes:

- Noise abatement best practices for flight crews.
- Updates to NBAA's "close-in" noise abatement departure procedure and approach and landing procedures.
- Noise abatement guidance for other aviation stakeholders, including airports and air traffic control facilities.

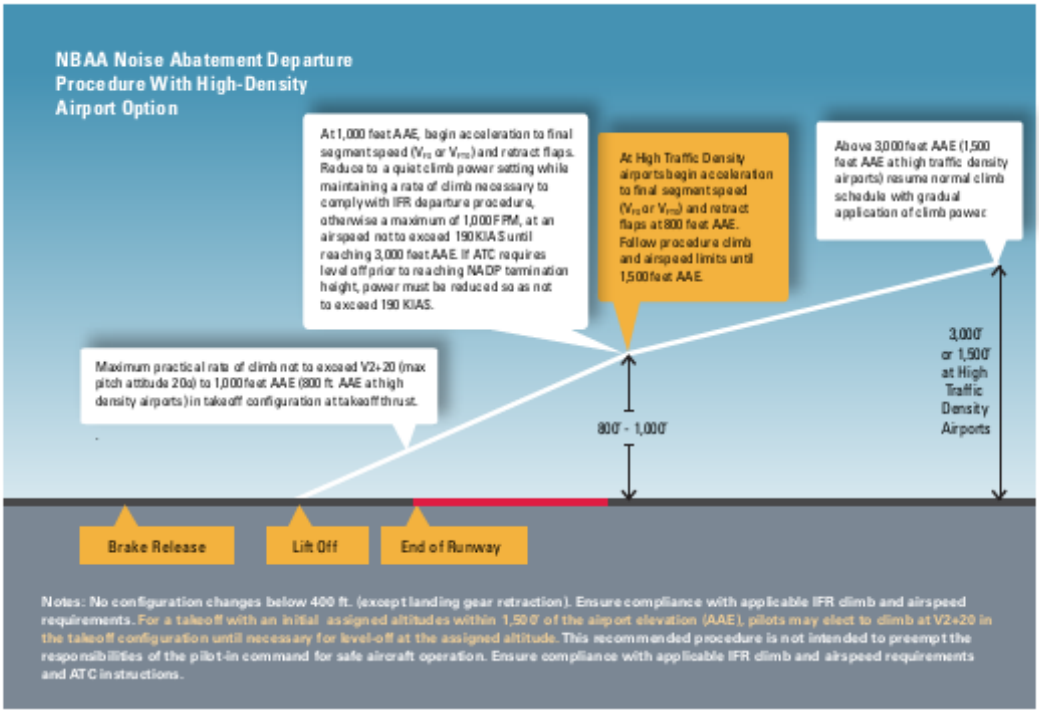
NOISE ABATEMENT BEST PRACTICES FOR FLIGHT CREWS

Pilots should always be mindful of noise impacts at airports. Even the "quietest" modern aircraft may disturb those that live near the airport. Care should be taken to minimize the aircraft's noise profile whenever possible by utilizing noise abatement best practices at *all* airports, especially during night-time and early-morning hours when aircraft operations may be especially disturbing.

- During the flight-planning process, flight crews should familiarize themselves with the airport's noise abatement policies and any applicable noise abatement procedures (NAPs) for the airport they will be using. These may include:
  - Preferential runway use
  - Preferential approach and departure paths
  - Preferred terminal arrival and departure procedures for noise abatement
  - Other noise-related policies (maximum noise limits, curfews, usage of reverse thrust, engine run-up policies, etc.)
- Contact the airport's Noise Management or Operations department for more information on local noise policies and procedures.
- When available, pilots should utilize their company's recommended departure/arrival NAPs or those recommended by the aircraft manufacturer for their specific aircraft.
- Flight safety and ATC instructions and procedures always have priority over any NAP. NAPs should be executed in the safest manner possible and within all FAA-mandated operating requirements.
- Proper pre-departure and pre-arrival crew briefings are essential to ensuring the safe and effective execution of NAPs.
- When airport or aircraft-specific procedures are unavailable, NBAA provides recommended noise abatement procedures suitable for any aircraft type and airport operating environment (see below).

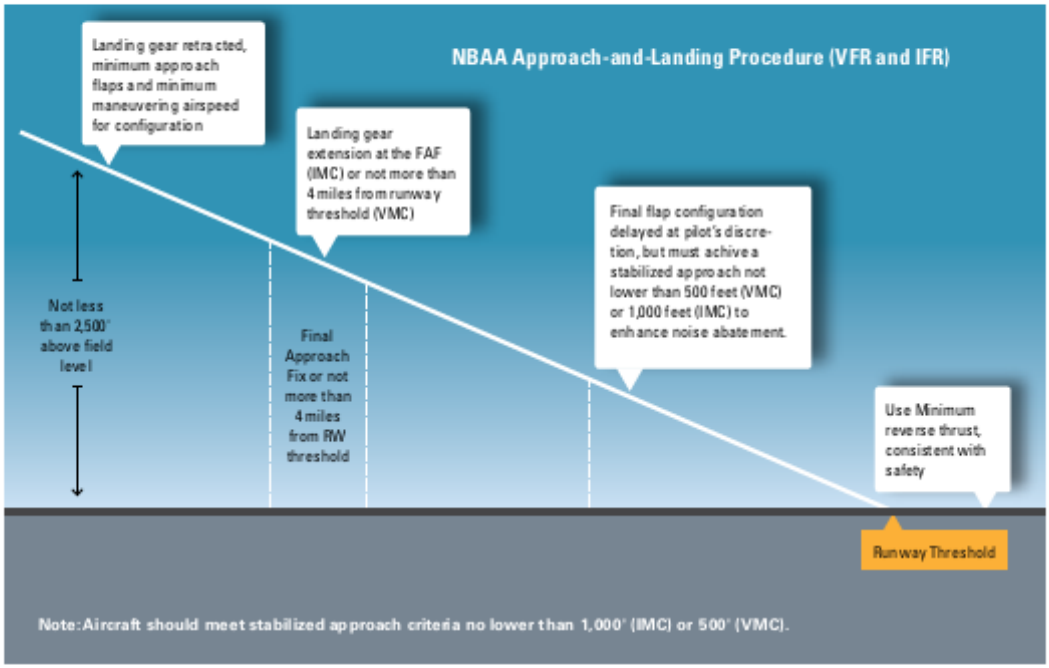
NBAA-RECOMMENDED NOISE ABATEMENT DEPARTURE PROCEDURE WITH HIGH-DENSITY AIRPORT OPTION

1. Climb at maximum practical rate not to exceed V2+20 KIAS (maximum pitch, attitude 20 degrees) to 1,000 feet AAE (800 ft. AAE at high-density-traffic airports) in takeoff configuration at takeoff thrust.
2. Between 800 and 1,000 feet AAE, begin acceleration to final segment speed (VFS or VFTO) and retract flaps. Reduce to a quiet climb power setting while maintaining a rate of climb necessary to comply with IFR departure procedure, otherwise a maximum of 1,000 FPM at an airspeed not to exceed 190 KIAS, until reaching 3,000 feet AAE or 1,500 feet AAE at high-density-traffic airports. If ATC requires level off prior to reaching NADP termination height, power must be reduced so as not to exceed 190 KIAS.
3. Above 3,000 feet AAE (1,500 feet at high-density airports) resume normal climb schedule with gradual application of climb power.
4. Ensure compliance with applicable IFR climb and airspeed requirements at all times.



NBAA-RECOMMENDED APPROACH AND LANDING PROCEDURE (VFR AND IFR)

1. Inbound flight path should not require more than a 25 degree bank angle to follow noise abatement track.
2. Observe all airspeed limitations and ATC instructions.
3. Initial inbound altitude for noise abatement areas will be a descending path from 2,500 feet AGL or higher. Maintain minimum maneuvering airspeed with gear retracted and minimum approach flap setting.
4. During IMC, extend landing gear at the final approach fix (FAF), or during VMC no more than 4 miles from runway threshold.
5. Final landing flap configuration should be delayed at the pilot's discretion; however, the pilot must achieve a stabilized approach not lower than 500 feet during VMC or 1,000 feet during IMC. The aircraft should in full landing configuration and at final approach speed by 500 feet AGL to ensure a stable approach.
6. During landing, use minimum reverse thrust consistent with safety for runway conditions and available length.



COLLABORATION, EDUCATION AND OUTREACH

Effective aircraft noise management requires a collaborative effort between aircraft operators, ATC and airport operators. Minimizing noise impacts is in the best interest of all stakeholders.

Aircraft Operators

- The noise abatement best practices recommended by NBAA are suggested as a national standard for business aircraft operators. They are intended for use at any airport and for any aircraft. They should be used when airport-specific or aircraft-specific procedures are unavailable.
- NBAA members should engage their local airport, particularly with regard to noise issues. Where necessary, support should be provided to assist airport management in adopting procedures which meet the objectives of the NBAA Noise Abatement Program as they relate to operational safety and usability. Every effort should be made to tailor procedures to the specifics of each airport in order to provide the maximum noise reduction consistent with safe and efficient operations.
- When applicable, pilots are encouraged to provide feedback on local NAPs to ATC, the airport operator and local pilot groups.
- Pilot training for business aircraft should include the importance of noise abatement and noise abatement procedures in all types of ratings and ATR flight checks.

Airports

- Specific information should be developed by airport management and made available to pilots and controllers through publication of easily attainable flight manuals, NOTAMS, AIMS, letters to airmen, ATIS messages, charts and explanatory pamphlets. This information should include:
  - Approach and departure paths over least noise-sensitive areas
  - Preferential runway usages, if applicable
  - Use of NBAA's noise abatement best practices
  - General map showing surrounding area and marking places of specific sensitivity, such as residential areas, schools and hospitals
- Airports should provide communities with data to demonstrate current and historic airport noise levels and highlight continued efforts by the airport and aviation industry to minimize noise impacts.
- Airport approach and takeoff paths should be designated on all official zoning maps. This should be done for all airports, existing or proposed, in order that land-use zoning, development and real estate activity are conducted with full awareness of the confines of such areas. Additionally, the land use permitted in these areas should be specified in zoning regulations and building codes in order to protect inhabitants.
- Airport management should investigate the optimal use of visual and electronic approach aids, which can aid noise abatement procedures at an airport. Improvements in both approach aids and runway facilities encourage aircraft to approach over the least noise-sensitive areas.
- Jet aircraft run-up areas should be developed for least noise disturbances to airport tenants and local communities. Blast fences, ground run-up enclosures, etc., should be provided and used where necessary.

- Airport management should evaluate the airport's natural terrain and consider ways in which improvements to landscaping might improve noise conditions around the airport.
- Airport management should post signs in pilot information centers, as well as at conspicuous places along airfield entry points (e.g., walk-through and drive-through gates), the taxiways or runway areas, giving the pilots a last reminder that they are in a noise-sensitive area calling for use of noise abatement procedures.
- Airport management should develop education programs to inform pilots and air traffic controllers as to the need for and procedures associated with noise abatement and good community relations. A more thorough understanding by the pilots and the controllers as to what the procedures are, as well as the reasons behind them, is the key to success.
- Preferential runway use systems that are safe and do not unnecessarily restrict the flow of air traffic should be established at all airports having a need for them.

Air Traffic Control

- The airport and ATC management should conduct a procedures review to recommend and implement new airport noise awareness programs. The recommendations should add a statement such as "use noise abatement procedures" to all ATC clearances issued by control tower operators.
- Control tower operators should be permitted to give any needed special attention to jet aircraft that may, for purposes of noise abatement, be required to land or takeoff using a different runway than the one in use by smaller aircraft.
- Control tower operators should develop procedures that will separate high-performance aircraft from low-performance aircraft as much as possible.
- The air traffic control procedures should keep aircraft more than 3,000 feet AGL over noise-sensitive areas to the extent that this can be accomplished without excessive derogation of air traffic flow.
- It is recommended that high-performance aircraft within reasonable operating limits and consistent with noise abatement policies remain at the highest possible altitude as long as possible when arriving and climb to the requested altitude filed by the pilot as soon as possible after departing.
- SIDs should include references to the use of noise abatement procedures.

About NBAA

Founded in 1947 and based in Washington, DC, the National Business Aviation Association (NBAA) is the leading organization for companies that rely on general aviation aircraft to help make their businesses more efficient, productive and successful. Contact NBAA at (800) FYI-NBAA or info@nbaa.org. Not a Member? Join today by visiting www.nbaa.org/join.

Released in 2015, this updated NBAA Noise Abatement Program was developed in conjuction with industry experts on NBAA's Access Committee. Learn more about the NBAA Access Committee at www.nbaa.org/committees/access.

Appendix III

Helicopter Association International – Fly Neighborly Program

Fly Neighborly

Helicopter Noise Abatement Recommendations

Level Flight:

- Accelerations are quieter than decelerations
- Straight flight is quieter than turning flight

Turning Flight:

- Turning away from the advancing blade (especially when decelerating) is quieter than turning into the advancing blade
- Level turns are quieter than descending turns

Descending Flight:

- Straight-in flight is quieter than turning flight
- Steeper approaches are quieter than shallow approaches

Decelerations:

- Level flight decelerations are quieter than descending or turning flight decelerations

Maneuvering:

- Smooth and gentle control inputs are quieter than rapid control inputs

These recommendations are flight tested and scientifically vetted by the U.S. Department of Transportation and NASA to support Fly Neighborly Goals.

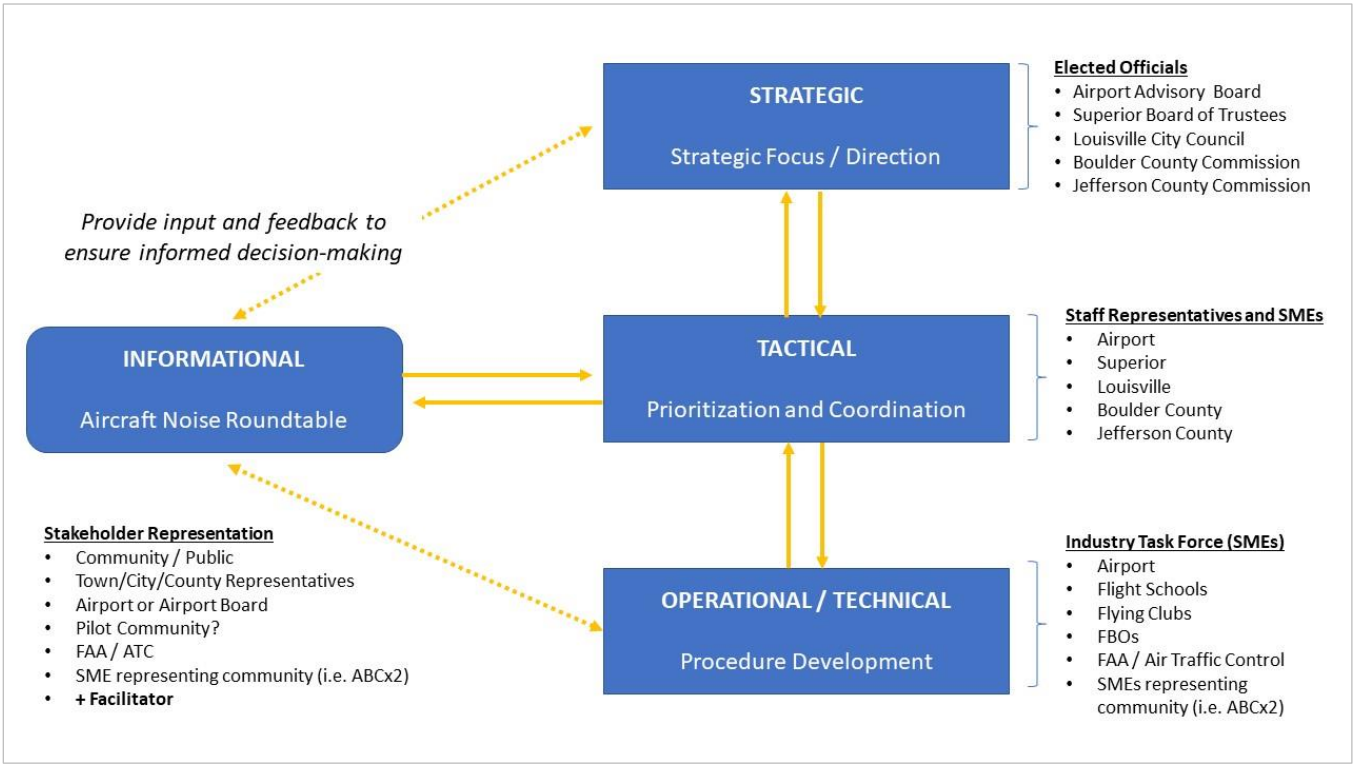
Take the Fly Neighborly training at: https://go.usa.gov/xQPCW

Fly Neighborly procedures/recommendations should be executed in the safest manner possible and followed only to the extent that safety is not compromised.

Helicopter Association International

Appendix IV

Notional Engagement Model



Appendix V

FAA Guide to Low Flying Aircraft

The Federal Aviation Administration (FAA) is the government agency responsible for aviation safety. We welcome information from citizens that will enable us to take corrective measures including legal enforcement action against individuals violating Federal Aviation Regulations (CFR). It is FAA policy to investigate citizen complaints of low-flying aircraft operated in violation of the CFR that might endanger persons or property.

Remember that the FAA is a safety organization with legal enforcement responsibilities. We will need facts before we conduct an investigation. To save time, please have this information ready if you witness another low-flying aircraft. Please keep your notes: we may request a written statement. Here is the type of information we need:

- Identification – Can you identify the aircraft? Was it military or civil? Was it a high or low wing aircraft? What was the color? Did you record the registration number which appears on the fuselage or tail? (On U.S. registered aircraft, that number will be preceded with a capital "N".)
- Time and Place – Exactly when did the incident(s) occur? Where did this happen? What direction was the aircraft flying?
- Altitude – How high or low was the aircraft flying? On what do you base your estimate? Was the aircraft level with or below the elevation of a prominent object such as a tower or building?

Once we have the appropriate facts, personnel from the Flight Standards District Office (FSDO) will attempt to identify the offending aircraft operator. We can do this in several ways. For example, we can check aircraft flight records with our air traffic control information and/or sightings from other observers, such as local law enforcement officers. We may need to trace and contact the registered aircraft owner, since the owner and operator may be two different people.

Following is Title 14 of the Code of Federal Regulations, Section 91.119 of the General Operating and Flight Rules, which specifically prohibits low flying aircraft.

91.119 Minimum safe altitudes; general

Except when necessary for takeoff or landing, no person may operate an aircraft below the following altitudes:

(a) Anywhere – An altitude allowing, if a power unit fails, an emergency landing without undue hazard to persons or property on the surface.

(b) Over congested areas – Over any congested area of a city, town, or settlement, or over any open-air assembly of persons, an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

(c) Over other than congested areas – An altitude of 500 feet above the surface except over open water or sparsely populated areas. In that case, the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure.

(d) Helicopters – Helicopters may be operated at less than the minimums prescribed in paragraph (b) or (c) of this section if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with routes or altitudes specifically prescribed for helicopters by the Administrator.

Helicopter operations may be conducted below the minimum altitudes set for fixed-wing aircraft. The reason: they have unique operating characteristics, the most important of which is their ability to execute pinpoint emergency landings during power-out emergencies. Furthermore, the helicopter's increased use by law enforcement and emergency medical service agencies requires added flexibility.

For more information, or to report a low-flying aircraft, please contact your local FSDO. For a list of FSDO's pertaining to your area, visit: https://www.faa.gov/about/office_org/field_offices/fsdo/