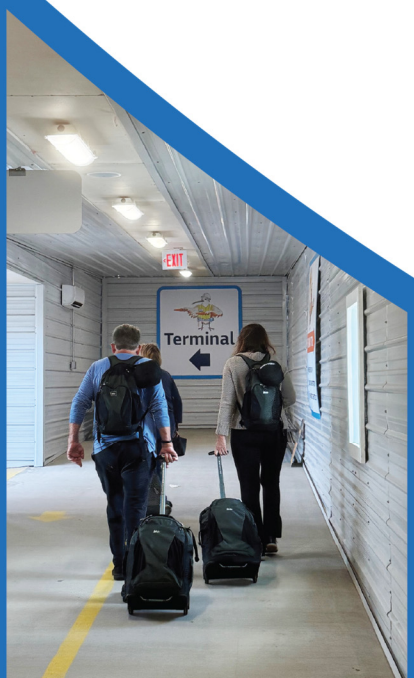
Chapter 5
Noise Abatement Alternatives

This chapter evaluates noise abatement alternatives that may be used to decrease noise exposure on noise-sensitive land uses. The Federal Aviation Administration's (FAA) primary criterion for evaluating the effectiveness of alternatives is the reduction of residents and/or noise-sensitive institutions (e.g., schools, places of worship, etc.) within the 65-decibel (dB) day-night average sound level (DNL) noise exposure contour.

The purpose of this chapter is to identify noise abatement alternatives that reduce the number of people and noise-sensitive land uses within the 65 DNL noise contour at Wilmington International Airport (ILM). Before noise abatement alternatives can be analyzed, it is important to understand the implementation status and success of the current noise abatement measures. It is also important to understand the scope of the aircraft noise impacts on noise-sensitive land uses.

The FAA's primary criterion for approval of a noise abatement measure is the reduction of noise-sensitive land uses within the 65 DNL noise exposure contours. As discussed in Chapter Four, 14 residential dwelling units and one place of worship are located within the 2023 65 DNL contours and two dwelling units and one place of worship are located in the 2028 65 DNL contours.



Two public meetings during the course of the Noise Exposure Map (NEM) document preparation indicate that residents outside the 65 DNL contour find noise associated with the airport disruptive to day-to-day life, especially when utilizing outdoor space and during night and evening hours; therefore, a coordinated approach to effective noise abatement and mitigation of noise impacts is critical. Responsibility for this task is shared among airport users; aircraft manufacturers; airport proprietors; military operators; federal, state, and local governments; and residents of communities near the airport.

An airport proprietor may voluntarily undertake a Part 150 noise compatibility study to evaluate and prepare a noise abatement program, which has three primary objectives:

1. Reduce the noise-impacted population, as defined by the FAA, within the 65 DNL contour within practical cost and legal constraints.
2. Minimize the exposure of the local population to loud noise events, where practical. These loud single events, which can occur outside the DNL contours, potentially affect airport neighbors.
3. Ensure maximum compatibility, according to FAA guidelines, for existing and future land uses with aircraft noise at the airport.

The full range of potential noise abatement measures for possible use at Wilmington International Airport is evaluated in this chapter. Evaluation criteria include (1) the probable noise reduction over noise-sensitive areas, (2) the potential for compromising safety margins and the ability of the airport to perform its intended function, and (3) the potential for implementation, considering the legal, political, and financial climate of the area. When necessary, additional analysis and modeling will be used to demonstrate the benefits of potential noise abatement measures.

If a noise abatement measure is found to have benefits based on the above criteria and analysis, an assessment of the feasibility of each measure and the strategies required for its implementation are presented. At the end of each section, a recommendation is presented regarding whether the measure deserves additional consideration.

POTENTIAL NOISE ABATEMENT MEASURES

Title 14 Code of Federal Regulations (CFR) Part 150 (14 CFR Part 150 or Part 150) provides a comprehensive list of potential noise abatement measures that must be analyzed as part of this study. These techniques either (1) reduce the sizes of the noise contours or (2) move the noise to other areas in which there are fewer noise-sensitive land uses.

To reduce the sizes of the noise contours, the total sound energy emitted by aircraft must be reduced. This may be achieved by modifying aircraft operating procedures. Measures that can be used to shift the location of noise include runway use programs, special flight routes, and airport facility development. Potential noise abatement measures can be assigned to the following four categories:

- Runway use and flight routing
- Airport facilities
- Aircraft operational procedures
- Airport regulations

A technical conference was held on March 12, 2026, to discuss the feasibility of suggestions that were posed during the community listening session. Attendees at the technical conference included professionals who are responsible for the administration, control, and operation of aircraft and facilities at and around Wilmington International Airport, including airport staff and local airport users. Following the conference, further investigation regarding the effectiveness of each measure was conducted by the consultant.

RUNWAY USE AND FLIGHT ROUTING

The land use pattern around an airport provides clues to the design of arrival and departure corridors for noise abatement. By redirecting air traffic over compatible land uses, noise impacts may be significantly reduced in incompatible areas. Runway use and flight route alternatives are depicted on **Exhibit 5A** and discussed as follows.

Preferential and Rotational Runway Use

Preferential runway use programs are intended to direct as much noise as possible over the least noise-sensitive areas. They accomplish this by favoring the runway or runways that lead traffic over compatibly developed areas.

Rotational runway use is intended to distribute aircraft noise equally off all runway ends. At best, a rotational runway use program can only provide temporary relief for one group at the expense of another.

FAA Order 8400.9, *National Safety and Operational Criteria for Runway Use Programs*, provides criteria for establishing runway use programs. It defines two classes of programs: *formal* and *informal*.

- A formal program must be defined and acknowledged in a Letter of Understanding between the FAA's Flight Standards Division and Air Traffic Organization, the airport operator, and the airport users. Once the program is established, participation by aircraft operators is mandatory. Formal programs can be difficult to establish, especially at airports with many different users.

- An informal program is an approved runway use program that does not require a Letter of Understanding. Informal programs are typically implemented through a Letter of Agreement with the tower and publication of the procedure in the airport/facility directory. Participation in an informal program is voluntary.

Evaluation/Conclusion

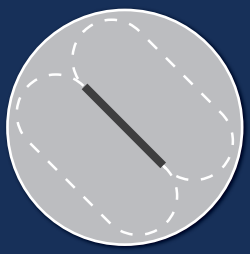
Due to prevailing wind conditions in Wilmington coming from the ocean to the east of the airport, Runway 6-24 is typically the preferred runway for arrival and departure operations, especially for general aviation aircraft. As discussed in Chapter Three and shown in Table 3E, Runway 6 is used 29.16 percent of the time for arrivals and 31.27 percent of the time for departures. Runway 24 is used 39.57 percent of the time for arrivals and 38.85 percent of the time for departures. These use percentages are based on interviews with airport and airport traffic control tower (ATCT) staff and a review of radar flight track information obtained from automatic dependent surveillance–broadcast (ADS–B) data. The result is that

NOISE ABATEMENT ALTERNATIVES

Runway Use and Flight Routes

Preferential Runway Use

Departure Turns/Route



Traffic Pattern Changes

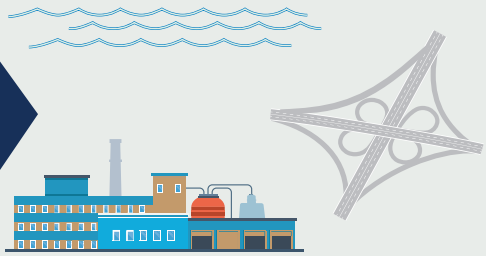
Visual Approach Procedures

Instrument Approach Procedures

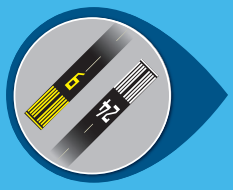
How Do They Help?

Shift noise from noise-sensitive area...

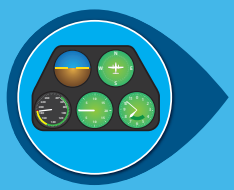
to noise-compatible area



Will These Options Work for ILM?

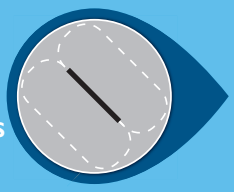


- ✓ Wind conditions favor Runway 6-24
- ? Other Runway use options



- ✓ ILS approach to Runway 6, 24, & 35
- ? New IFR approach/departure procedures

- ? VFR departure offset
- ? New IFR departure turns/routes



- ✓ Left traffic - All Runways
- ? Traffic pattern changes

- ✓ Letter of Agreement with 2d Marine Aircraft Wing for all runways
- ? New visual approach procedures

Wilmington International Airport traffic currently operates to the northeast and southwest the majority of the time across aircraft type and size categories. This is the best operating configuration to promote noise abatement because the relatively equal utilization of both ends of the main runway (Runway 6-24) prevents departure noise from being heavily concentrated on one runway end. Additionally, noise-sensitive land uses and identified impacts are located near the end of Runway 17; therefore, adjusting the preferential runway from Runway 6-24 to Runway 17-35 is not likely to yield beneficial results, as it could potentially increase the number of residences within the 65 DNL noise contour.

Departure Turns

A common noise abatement technique is to route departing aircraft over noise-compatible areas immediately after takeoff. To be fully effective, the compatible corridor must be relatively wide and closely aligned with the runway so turns over the area are practical.

Evaluation/Conclusion

Noise-sensitive areas identified in Chapter Four within the noise contours are located to the north and east of the airport in unincorporated New Hanover County. Land to the south and west of the airport also contains noise-sensitive uses developed within the jurisdiction of the City of Wilmington and is subject to overflights from departures on Runway 24; however, the City of Wilmington land uses that are frequently overflown are not encompassed by the 65 DNL noise contour, so because these areas are not impacted per FAA Part 150 guidelines, additional departure procedures to the south and west from Runway 24 are not likely to be supported by the FAA for Part 150 purposes.

Given the limited number of impacts within the existing (14 dwelling units and one place of worship) and future 65 DNL contour (two residential dwelling units) and the existing noise-sensitive development surrounding the airport, new departure procedures for noise abatement do not merit further consideration at this time.

Visual and Offset Instrument Approaches

Approaches that involve turns relatively close to the airport can sometimes be defined over noise-compatible corridors. These can be defined as either visual flight rules (VFR) approaches or non-precision instrument approaches. A stabilized, straight-in final approach of at least one mile should be provided. If large aircraft are involved, a longer straight-in final approach of two to three miles is needed.

Evaluation

Through evaluation of flight tracks collected through ADS–B, it is apparent that most landings to all four runways at ILM are currently flown with a straight-in approach. The noise contours remain on airport property and over compatible land uses to the south and east, near the ends of Runways 6 and 35, where nearly half of arrival noise is generated. The future 65 DNL contour near Runway 24 does not currently include dwelling units. There are noise-sensitive land uses within the contours for the approach

to Runway 17 (one place of worship and two dwelling units) and the surrounding areas are also developed with noise-sensitive land uses. The area lacks a corridor appropriate for a noise abatement approach; therefore, additional approach procedures for noise abatement do not merit further consideration at this time.

Midfield Departures

Midfield departures refer to aircraft beginning their engine spool-ups and takeoff rolls from a certain point, usually a taxiway intersection (commonly referred to as an intersection takeoff) near midfield. While these operations are usually undertaken to reduce taxi time, such operations can help centralize departure spool-up noise.

Evaluation/Conclusion

Due to the runway lengths (8,016 and 7,754 feet) at ILM, midfield departures could prevent some fixed-wing aircraft from safely departing the airport. In addition, the nearest residents (located near both ends of Runway 6-24) would likely be impacted by greater levels of aircraft noise because most aircraft would not have sufficient distance to gain altitude prior to leaving the airfield. Aircraft that could gain sufficient altitude would be operated at higher thrust levels, which would also generate higher noise levels over noise-sensitive areas near the airport. Additionally, the reduction in available runway length during midfield departures would reduce the margin of error and cause negative implications with regard to safety. Because there are no noise-sensitive land uses that would benefit from midfield departures and due to the safety risks associated with a reduction in available runway length, this measure will not be considered further.

AIRPORT FACILITIES

In some cases, airport facilities can be developed or altered to reduce airport noise in noise-sensitive areas. For example, runways can be built or lengthened to shift aircraft noise to compatible areas. Runway thresholds can be displaced or relocated to shift noise and barriers can be built to shield noise-sensitive areas from aircraft noise on the ground at the airport. The airport facilities alternatives are depicted on **Exhibit 5B** and discussed as follows.

New Runways and Runway Extensions

New runways aligned with compatible land development or runway extensions that shift aircraft operations farther away from residential areas are proven means of noise abatement. New runways are most effective where there are large compatible areas near an airport and existing runways are aligned with residential areas.

Evaluation/Conclusion

ILM is surrounded by developed areas from all directions and both runways are currently utilized in a manner that balances noise. The prospect of constructing a new runway or runway extension for noise abatement is not feasible due to high construction costs and the high cost of moving existing primary roads; therefore, runway extensions and new runways will not be considered further.

NOISE ABATEMENT ALTERNATIVES

Facilities Development

Runway Lengthening

New Runways

Displaced/Relocated Thresholds

Acoustic Shielding

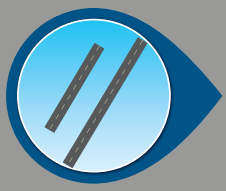
How Do They Help?

Shift noise from noise-sensitive area...

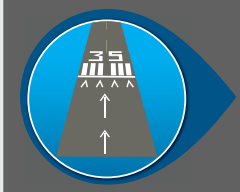
to noise-compatible area

Will These Options Work for ILM?

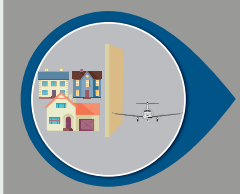
✗ ILM runway length is limited on Runways 17 (roadways and buildings), 6 and 35 (Smith Creek).



✗ New runway for noise abatement unlikely to be supported or approved by FAA.



? Existing displaced thresholds of 350' - Runway 17 and 400' - Runway 35.



? Nearest noise-sensitive areas are located near Runways 17 and 24.

Displaced and Relocated Thresholds

A displaced threshold involves the shifting of the touchdown zone for landings farther down the runway. A relocated threshold involves shifting both the touchdown point and the takeoff initiation point; the original runway end is completely relocated. These techniques can promote noise abatement by effectively increasing the altitude of aircraft at any given point beneath the approach. The amount of noise reduction depends on the increased altitude, which is dependent on the length of the displacement. Another potential noise abatement benefit of runway displacement may be the increased distance between the aircraft and noise-sensitive uses adjacent to the runway from the point at which reverse thrust is applied after touchdown.

Evaluation/Conclusion

Runway 17 currently has an existing 350-foot displaced threshold and Runway 35 currently has an existing 400-foot displaced threshold. Additional threshold displacements would decrease the runway length available for landings, which would increase the need for thrust reversal and potentially increase aircraft brake wear and reduce safety margins.

The determination of the amount of additional threshold displacement must consider the runway length required for landing, in addition to the amount of noise reduction provided by the displacement. A considerable displacement is needed to produce a significant reduction in noise. (For example, if a runway threshold is displaced 1,000 feet, the altitude of an aircraft along the approach path would increase by 50 feet.)

Unlike threshold displacement, threshold relocation increases noise off the runway end opposite the relocation because of the shift in the point of takeoff. Aircraft would be at lower altitudes at any given down-range location after takeoff than they would be without the relocation. Any reductions in arrival noise caused by threshold relocations would be offset by increases in departure noise off the opposite runway end.

Any measure that would reduce Wilmington International Airport's runway length would reduce the safety margins of aircraft currently operating at the airport. Additionally, there are no noise-sensitive land uses within the 65 DNL contours near the ends of Runway 6-24 that would benefit from additional threshold displacement or relocation; therefore, these techniques do not merit further consideration.

Acoustical Barriers

Acoustical barriers, such as noise walls or berms, are intended to shield areas from ground-based noise emissions from aircraft powering up for takeoff and rolling down the runway. It is also possible to use the orientation of buildings on the airport to provide a noise barrier to protect nearby residential areas from noise. Noise walls work best over relatively short distances and their benefits are affected by surface topography and wind conditions. The effectiveness of a barrier is directly related to the distance of the noise source from the receiver and the distance of the noise source from the barrier, as well as the angle between the ends of the berm and the receiver.

While noise walls and berms can attenuate noise, they are sometimes criticized by airport neighbors because they obstruct views. Another common complaint is that airport noise can become more alarming, particularly noise from unusual events, because people are unable to see the cause of the noise.

Evaluation/Conclusion

There are a limited number of impacts with the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition) that may benefit from a noise wall or berm as a potential mitigation measure. This measure should be considered for inclusion in the Noise Compatibility Program to reduce impacts to residents within the 65 DNL noise contour near Runway 17; however, it is important to note that noise walls and berms are not effective for aircraft overflight noise by approaching aircraft, which is the primary concern for residents identified in this study.

Aircraft Run-up Location and Enclosures

Engine run-ups are a necessary part of aircraft service and maintenance. Run-ups are necessary to diagnose problems and test the effectiveness of maintenance work. Run-up noise can be especially disturbing because of its unpredictable nature. While noise from takeoffs and landings is relatively brief and has a particular pattern to which a person can adjust, the duration of a run-up can vary from 30 seconds to several minutes and the listener has no way of knowing how long any given run-up will be. If the run-up is at or near full power, the resulting noise level can be extremely high.

The location of aircraft run-ups can vary depending on the number of maintenance businesses on the airport and available ramp area for these testing procedures to occur. Designating an area for maintenance run-ups away from noise-sensitive land uses can be an effective way to reduce noise impacts from these operations.

An engine run-up enclosure is a special kind of noise barrier that can be appropriate at airports with aircraft engine maintenance operations. Run-up enclosures are designed so that aircraft can taxi or be towed into them to perform run-up procedures while shielding the surrounding areas from noise. These structures are designed to absorb and deflect the noise from run-ups, thus reducing noise levels off the airport.

Evaluation/Conclusion

The current run-up areas are buffered from noise-sensitive land uses by an expansive amount of airport property, a large apron, and several buildings. Maintenance and pre-flight run ups are also not correlated with noise complaints or comments received during this study; therefore, this measure does not merit further consideration.

AIRCRAFT OPERATIONAL PROCEDURES

Aircraft operating procedures are measures a pilot can take to reduce noise an aircraft makes during takeoff and landing, as well as in flight. It is important to note that safety is the first and foremost deciding factor for a pilot when flying; therefore, although there may be recommended operational procedures that reduce noise, it may not always be safe to use them.

Aircraft operational procedures that may reduce noise impacts are shown on **Exhibit 5C** and include:

- Reduced thrust takeoffs;
- Thrust cutbacks after takeoff;
- Maximum climb departures;
- Minimum approach altitudes;
- Use of minimum flaps during approaches;
- Steeper approach angles; and
- Limitations on the use of reverse thrust during landings.

Reduced Thrust Takeoffs

A reduced thrust takeoff for jet aircraft involves takeoff with less than full thrust. A reduced power setting is used throughout takeoff roll and climb. Use of the procedure depends on aircraft weight, weather and wind conditions, pavement conditions, and runway length. Because these conditions vary, it is not possible to safely mandate the use of reduced thrust departures.

Evaluation/Conclusion

In practice, business jet operators use reduced thrust departures to conserve fuel, reduce engine wear, and abate noise. Additional efforts to encourage the use of deeper reduced thrust takeoffs could reduce the operational control and safety of an aircraft and are unlikely to yield noise abatement benefits.

Because of the safety implications of these procedures, they are best left to the discretion of pilots and aircraft operators; therefore, reduced thrust takeoffs do not merit further consideration.

Thrust Cutbacks for Jets

Standardized thrust cutback departure procedures have been established by each aircraft manufacturer to promote safe, efficient use of aircraft, as well as for noise abatement. While the procedures of each aircraft manufacturer differ, they all involve thrust reduction soon after takeoff and initial acceleration. This reduction normally occurs between 1,000 and 3,000 feet above the ground.

The amount of thrust reduction depends on aircraft weight, temperature, and flap setting. A significant but safe reduction in thrust can often reduce noise within the 65 and 70 DNL noise contours but can also increase noise down-range from the airport.

NOISE ABATEMENT ALTERNATIVES

Aircraft Operating Procedures

Reduced Thrust Takeoffs | Thrust Cutbacks After Takeoff | Maximum Climb Departures | Minimum Approach Altitudes | Approach Profiles | Limitations on Reverse Thrust on Landing

How Do They Help?

Reduce overall noise energy from the airport

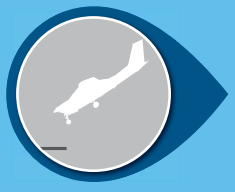
Will These Options Work for ILM?

☒ Reduces safety margin

? Utilize low energy approaches

✓ Manufacturers provide suggested thrust cutbacks after takeoff to reduce noise and fuel consumption

☒ Mandated thrust cutbacks are problematic to get approved and enforce



☒ Non-standard approach procedures reduce safety margins.

? Use best rate of climb when departing any runway

? Implement turning altitude

☒ Fixed runway lengths eliminates this measures

Evaluation/Conclusion

While some airports have defined special thrust cutback departure procedures, approval and implementation of these procedures is problematic for several reasons. First, a proliferation of airport-specific procedures may cause difficulty for pilots. Second, mandating the use of thrust cutbacks would require verification and oversight. As a critical flight operation, the use of thrust cutbacks in any given situation should be left to the discretion of the pilot to avoid eroding safety margins.

Jet operations account for approximately 28 percent of operations for the future condition at ILM and the limited noise impacts (two dwelling units and one place of worship) are located near only Runway 17; therefore, mandating thrust cutbacks for jets does not merit further consideration.

Maximum Climb Departures

Maximum climb departures can reduce noise exposure over populated areas some distance from an airport. This type of procedure requires the use of maximum thrust with no cutback on departure. Consequently, the potential noise reductions in the outlying areas are achieved at the expense of significant noise increases closer to the airport.

Evaluation/Conclusion

The identified noise impacts are near the end of Runway 17; however, noise complaints that correlate with overflight activity come from residential areas surrounding the airport to the west and south. Most of the noise complaints are associated with military aircraft departing from Runway 24. Benefits of maximum climb departures on Runway 24 would be to the downtown Wilmington area, where overflights occur over noise-sensitive residential neighborhoods. This type of procedure is likely to inadvertently cause greater noise impacts closer to the airport, particularly near Runway 6 and Runway 17 where impacts have already been identified, due to the initial increased departure noise.

Many voluntary noise abatement programs recommend that pilots use the best rate of climb when departing any runway, which is consistent with this measure; however, there are noise-sensitive land uses near the end of Runway 6 that are just outside the 65 DNL contours. The greater departure noise closer to the airport associated with this measure is likely to increase noise impacts near the runway ends; therefore, mandating thrust cutbacks for jets does not merit further consideration.

Minimum Approach Altitudes

These procedures entail an air traffic control (ATC) requirement that all positively controlled aircraft approaches be conducted at a specified minimum altitude until an aircraft must begin its descent to land. This would only affect aircraft a considerable distance from the airport and well outside the noise contours. Because aircraft on approach use little power, they tend to be relatively quiet. Accordingly, increases in approach altitudes result in only small reductions in single-event noise.

Evaluation/Conclusion

The pattern altitude at Wilmington International Airport is currently 1,000 feet above ground level (AGL) for reciprocating engine aircraft and 1,500 feet AGL for jet aircraft. Minimum altitudes would apply to aircraft some distance from the airport, well outside the noise exposure contour area. Increases in approach altitude can yield only small reductions in noise. Even doubling the altitude of aircraft within the traffic pattern or circling approach would only achieve a noise reduction of four to six dB. Raising the pattern altitude may also create potential airspace conflicts. Additionally, raising the pattern altitude would enlarge the touch-and-go pattern, as aircraft would have to extend each leg of the traffic pattern to climb to or descend from the increased altitude.

Raising approach altitudes into Wilmington International Airport would produce only small noise reductions well outside the 65 DNL noise contour. In addition, raising the traffic pattern altitude could expose additional individuals to overflight noise due to an elongated traffic pattern. Because raising the minimum approach altitude would shift overflight noise in all directions due to an elongated pattern, and because there are limited noise-sensitive land uses within the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition), this measure will not be considered further at Wilmington International Airport.

Use of Minimum Flaps During Approach and Two-Stage Descent Profiles

Approach procedures including the minimal use of flaps to reduce power settings and airframe noise and the use of two-stage descent profiles were attempted in the early days of noise abatement at other airports; however, both techniques are no longer favorably received.

Evaluation/Conclusion

These techniques raise safety concerns because they are nonstandard and require an aircraft to be operated outside its optimal safe operating configuration. The associated higher descent rates and faster speeds reduce pilot reaction time and erode safety margins. They also increase stopping distances on the runway. Some of these procedures have actually been found to increase noise because of power applications needed to arrest high sink rates.

Because these procedures erode safety margins and offer little practical noise abatement benefit, and because there are limited noise-sensitive land uses within the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition), these measures will not be considered further at ILM.

Use of Continuous Descent Profiles

A continuous descent approach (CDA) involves maintaining a constant-angle descent (commonly three degrees) during landing until the airport's established approach procedure is met. CDAs are designed to reduce fuel consumption and noise, compared to conventional approaches that "stair-step" as aircraft descend. Ideally, a continuous descent approach starts from the top of descent (i.e., at cruise altitude) and allows the aircraft to utilize its individual optimal vertical profile down to the runway threshold.

Evaluation/Conclusion

The noise benefits a CDA offers are limited to locations typically around 10 to 25 miles from the runway. There is no difference between a CDA and a conventional approach once an aircraft using the latter approach joins the final glide path, resulting in no change to the noise exposure contours.

Because there are limited noise-sensitive land uses within the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition), continuous descent approaches will not be considered further at Wilmington International Airport.

Reverse Thrust Restrictions

Thrust reversal is routinely used to slow jet aircraft immediately after touchdown. This is an important safety procedure that has the added benefit of reducing brake wear. Limits on the use of thrust reversal can reduce noise impacts off the sides of the runways, although they would not significantly reduce the sizes of the noise contours; however, restrictions on the use of reverse thrust are not considered fully safe.

Evaluation/Conclusion

Because there are limited noise-sensitive land uses within the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition) for Wilmington International Airport, a restriction on thrust reversal on jet aircraft (which comprised approximately 28 percent of the total annual operations at the airport in 2023) would not produce material benefits. Limitations on the use of reverse thrust increase runway occupancy time and brake wear on aircraft. Because reverse thrust is an operational flight procedure with a direct effect on safety, decisions about its usage should be left to the discretion of pilots. This procedure does not merit further consideration.

AIRPORT REGULATIONS

In developing noise compatibility programs, Part 150 requires that airports study the possible implementation of airport use restrictions to abate aircraft noise (see 14 CFR Part 150, B150.7[b][5]). The courts have recognized the rights of airport operators to reduce their liability for aircraft noise by imposing restrictions that are reasonable and do not violate contractual agreements with the FAA, conditioning the receipt of federal aid (known as grant assurances), provided that:

- Constitutional prohibitions on unjust discrimination and the imposition of undue burdens on interstate commerce are respected;
- The restrictions are crafted to avoid infringing on regulatory areas preempted by the federal government; and
- The regulations are evaluated under the requirements of 14 CFR Part 161.

It follows that airport noise and access restrictions may be proposed by an airport operator in its Part 150 noise compatibility program; however, the requirements of Part 161 must be met before a recommended measure in a Part 150 noise compatibility program can be implemented.

It should also be noted that it is FAA policy for airport use restrictions to be considered only as a measure of last resort when other mitigation measures are inadequate to satisfactorily address a noise problem and a restriction is the only remaining option that could provide noise relief (see FAA Order 5190.6B, *Airport Compliance Manual*).

14 CFR Part 161

In the *Airport Noise and Capacity Act of 1990* (ANCA), U.S. Congress established a national phase-out policy for Stage 2 aircraft, as well as analytical and procedural requirements for airports desiring to establish noise or access restrictions on Stage 3 aircraft. Regulations implementing these requirements are published in Part 161. As of December 31, 2015, Stage 2 aircraft are no longer allowed to fly within the contiguous United States.

For restrictions on Stage 3 aircraft, Part 161 requires a rigorous analysis, as well as final FAA approval of the restriction. Before approving a local Stage 3 noise or access restriction, the FAA must make the following findings:

- The restriction is reasonable, non-arbitrary, and non-discriminatory.
- The restriction does not create an undue burden on interstate or foreign commerce.
- The restriction maintains safe and efficient use of navigable airspace.
- The restriction does not conflict with any existing federal statute or regulation.
- The applicant has provided adequate opportunity for public comment on the proposed restriction.
- The restriction does not create an undue burden on the national aviation system.

Additional information regarding Part 161 studies undertaken to date can be found in the **Resource Library** at the end of this document.

Regulatory Options

Regulatory options discussed in this section and shown on **Exhibit 5D** include the following:

- Nighttime curfews and operating restrictions
- Landing fees based on noise or time of arrival
- Airport capacity limitations based on relative noisiness
- Noise budgets
- Restrictions based on aircraft noise levels
- Restrictions on touch-and-go operations or multiple approaches
- Restrictions on engine maintenance run-ups

NOISE ABATEMENT ALTERNATIVES

Airport Restriction and Regulation

Curfews

Noise Based Landing Fees

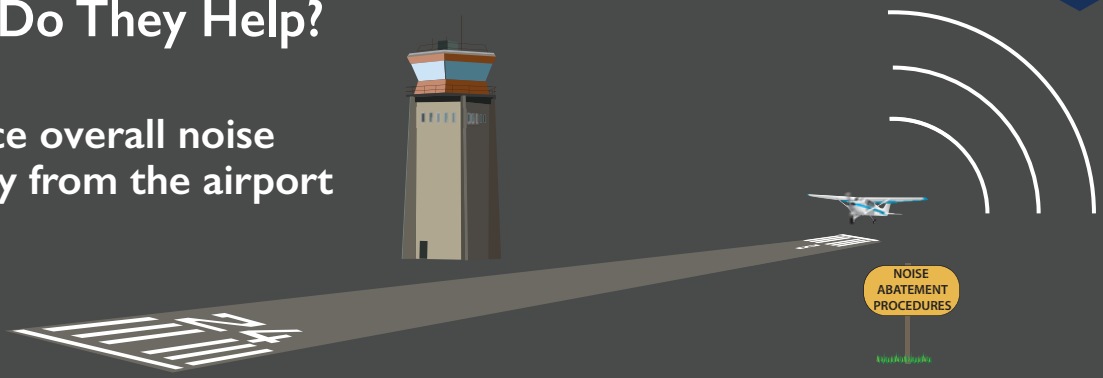
Capacity Limitations

Aircraft Type Restrictions

Ground/ Training Activity Restrictions

How Do They Help?

Reduce overall noise energy from the airport



Will These Options Work for ILM?

? None Published

? None Published

FAA approval of airport restrictions and regulations is unlikely because there are minimal noise-sensitive residential land uses within the 65 Day Night Average Sound Level (DNL) noise exposure contours

Nighttime Curfews and Operating Restrictions

There are generally three types of curfews or nighttime operating restrictions:

1. Closure of the airport to all arrivals and departures (full curfew)
2. Closure to departures only
3. Closure to arrivals and departures by aircraft that exceed specified noise levels

Evaluation

The time during which nighttime restrictions could be applied varies. The DNL metric applies a 10-dB penalty to noise occurring between 10:00 p.m. and 7:00 a.m. The 10:00 p.m. to 7:00 a.m. period could be defined as a curfew period. A shorter period that corresponds to very late night hours (e.g., from midnight to 6:00 a.m.) could also be specified.

- Full Curfews: While full curfews can totally resolve concerns about nighttime aircraft noise, they can be indiscriminately harsh. Not only would the loudest operations be prohibited, but quieter operations by light aircraft would also be banned by a full curfew. Full curfews also deprive the community of the services of some potentially important nighttime airport users.

  Important economic reasons drive nighttime airport activity. Early morning departures are often preferred by business travelers who wish to reach their destinations with a large part of the workday ahead of them, resulting in significant savings in the cost of travel by reducing the need for overnight stays. Accordingly, early morning departures are often popular. Late night arrivals are similarly important, as they allow travelers to return home without incurring the costs of another night away.

- Prohibition of Nighttime Departures: The prohibition of nighttime departures would allow aircraft arrivals for those returning home but would prohibit departures, which are generally louder than arrivals. Although somewhat less restrictive, this restriction would have a similar effect as full curfews at Wilmington International Airport because scheduled early morning departures for the business travel market would be limited.

  As with a full curfew, a nighttime prohibition on departures would restrict access to the airport by Stage 3 aircraft. A full Part 161 analysis and FAA approval of the restriction would be required before it could be implemented.

- Nighttime Restrictions Based on Aircraft Noise Levels: Nighttime operating restrictions can be designed to apply to only aircraft that exceed specified noise levels. The restriction noise level would have to include the loudest and/or most commonly used aircraft at the airport in order to be effective in reducing the size of the DNL noise contours. These restrictions would be subject to the special analysis procedures of Part 161. Any restrictions that affect Stage 3 aircraft would have to receive FAA approval.

Conclusion

Curfews and nighttime operating restrictions can be an effective way to reduce the size of DNL noise contours around an airport. Because of the extra 10-dB weight assigned to nighttime noise, removing a single nighttime operation is equivalent to eliminating 10 daytime operations. The effect on the noise contours can be significant.

A voluntary curfew for noise abatement is not currently in place at ILM; however, the airport has invested in radar flight tracking and monitors noise complaints.

Because there are limited noise-sensitive land uses within the 65 DNL noise contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition) that would be reduced through mandatory curfews, FAA disapproval of a curfew is likely. Additionally, implementation of nighttime restrictions can be costly and problematic and could require the completion and subsequent FAA approval of a Part 161 study; therefore, curfews will not be considered further.

Noise-Based Landing Fees

Differential landing fees based on either the noise level or the time of arrival have been used at some airports as incentives for aircraft owners to use quieter aircraft or operate at less sensitive times. A variable schedule of landing fees would be established based on the relative loudness of the aircraft; departures by loud aircraft at night would be charged the most and arrivals by quiet aircraft during the day would be charged the least. To avoid being discriminatory, the fee must relate to both the time of day and certificated approach noise levels. Fees from such a program can finance noise abatement activities. This restriction does not provide a noise abatement benefit unless the fees are high enough to discourage use of the airport by the loudest aircraft.

Evaluation

Wilmington International Airport has not implemented any fixed landing fees to date. Developing a new noise-based landing fee would be considered an airport noise restriction under Part 161; therefore, a Part 161 analysis would be required before such a fee system could be implemented. Any fee structure changes that would place a noise surcharge on aircraft would require FAA approval prior to implementation.

Conclusion

A noise-based landing fee system is intended to provide strong incentives for aircraft owners to convert their fleets to quieter aircraft and operate during daytime hours. Most operations at Wilmington International Airport occur during daytime hours. Converting the existing landing fee structure to a noise-based landing fee is vulnerable to legal challenges and FAA disapproval is likely because there are limited impacts within the 65 DNL contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition); therefore, noise-based landing fees will not receive additional consideration.

Capacity Limitations

Capacity limits are the third airport regulation option and have been used by airports encroached upon by noise-sensitive development to control cumulative noise exposure. This kind of restriction would impose a cap on the number of scheduled operations and is an imprecise way to control aircraft noise, as unscheduled operations would not be subject to the limit. Additionally, the limit on scheduled operations provides no incentive for conversion to quieter aircraft; instead, if passenger demand is increasing, it would encourage airlines to convert to larger aircraft, which tend to be noisier than smaller aircraft in the same Part 36 stage classification.

Evaluation/Conclusion

Airport capacity limitations are intended to control noise related to scheduled aircraft activity. Airlines may be able to utilize quieter aircraft to accommodate this measure despite an increase in passenger demand; however, unscheduled general aviation activity and military activity comprise a significant portion of the annual operations at ILM and do not have aircraft available to adjust accordingly. Additionally, the FAA would require a Part 161 study to accept this measure as part of the NCP. For these reasons, an operational capacity limitations measure is not recommended.

Noise Budgets

In the late 1980s, noise budgets gained attention as a potential noise abatement tool. After the enactment of the ANCA, which mandated the retirement of Stage 2 aircraft over 75,000 pounds, interest in noise budgets waned. Noise budgets are designed to limit airport noise and allocate noise among airport users. The intent is to encourage aircraft operators to convert to quieter aircraft or shift operations to less noise-sensitive hours. Before the ANCA, the intent was to encourage conversion to Stage 3 aircraft and discourage the use of Stage 2 aircraft. As previously mentioned in Chapter One, Stage 2 business jets that weigh less than 75,000 pounds are no longer be able to fly in the contiguous United States, in accordance with Title 49 United States Code (USC) § 47354; therefore, conversion to Stage 3 aircraft is already mandated by U.S. Congress.

Conclusion

Noise budgets are complex methods of promoting airport noise reduction. They are particularly vulnerable to criticism on grounds of discrimination and interference with interstate commerce. Noise budgets are difficult to design in a way that will be seen as fair by all airport users and are likely to be expensive to develop. Negotiations on noise budget design and noise allocations could be long and contentious and would require the assistance of noise consultants and attorneys. The costs of administering the system would also be substantial. The documentation requirements are complicated and would require additional administrative staff.

A noise budget does not appear to be a practical option at Wilmington International Airport. The process would be long, expensive, and contentious, requiring a 14 CFR Part 161 study and FAA approval.

FAA disapproval of a curfew is likely because there are limited impacts within the 65 DNL contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition); therefore, this alternative will not be discussed further.

Restrictions Based on Aircraft Noise Levels

Outright restrictions on the use of aircraft that exceed certain noise levels can reduce cumulative noise exposure at an airport. Aircraft that produce noise above certain thresholds, as defined in FAA Part 36, could be prohibited from operating at the airport at all or during certain times of the day. A variation is to impose a non-addition rule that prohibits the addition of new flights by aircraft that exceed the threshold level at all or during certain times of the day. These restrictions would be subject to the special analysis procedures of Part 161. Any restrictions that affect Stage 3 aircraft would have to receive FAA approval.

Noise limits based on Part 36 certification levels have the virtue of being fixed national standards that are understood industry-wide; however, the values are averages and do not represent variations in noise levels based on different methods of operating the aircraft. As an alternative, restrictions could be based on measured noise levels at the airport. This has the advantage of focusing on noise produced in a specific situation and, in theory, gives aircraft operators increased flexibility to comply with the restrictions by designing special approach and departure procedures to minimize noise. This alternative has the disadvantage of requiring extra administrative effort to design testing procedures, monitor tests, interpret monitoring data, and design the restrictions.

Evaluation

Whether threshold noise levels are based on Part 36 or measured results, care must be taken to ensure that the restriction does not fall with undue harshness on any particular operator. The feasibility of complying with the restriction, given existing technologies and equipment, must also be considered. Such a restriction would be subject to legal challenges and rejection by the FAA as unjustly discriminatory and potentially burdensome to interstate commerce.

Conclusion

Mandatory restrictions based on noise levels could be viewed as discriminatory and could be subject to litigation and rejection by the FAA because there are limited impacts within the 65 DNL noise contours (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition). In addition, the requirements of a costly 14 CFR Part 161 study would have to be met before any restriction on Stage 3 aircraft could be implemented (restrictions on Stage 2 aircraft under 75,000 pounds are already mandated, as of December 31, 2015); therefore, this alternative will not receive further consideration.

Touch-and-Go Restrictions

Restrictions on touch-and-go or multiple approach operations can be effective in reducing noise when those operations are extremely noisy or unusually frequent or occur at noise-sensitive times of the day. At many airports, touch-and-go operations are associated with primary pilot training, although this type of operation is also performed by licensed pilots practicing approaches.

Evaluation

Touch-and-go and multiple approach operations are frequently performed at Wilmington International Airport across aircraft types and are the primary source of noise complaints from the community, based on noise complaints and feedback received during the community listening session. Based on the operations count used to develop the 2023 noise exposure contours, there were 23,152 local operations, which account for about a quarter of the total operations at Wilmington International Airport. Generally, these training sessions involve multiple approach or touch-and-go operations, which are mainly performed by light single-engine aircraft.

Restricting touch-and-go operations would have legal ramifications, as this type of restriction would conflict with grant assurances, could conflict with the terms of local fixed base operator leases, and would require FAA approval of a Part 161 study. FAA disapproval of a restriction on training operations is likely because there are limited impacts within the 65 DNL contour (14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition).

Conclusion

Multiple approach and touch-and-go operations are a necessary aspect of maintaining pilot proficiency. The area pilots and flight schools that operate at Wilmington International Airport need to perform such operations as part of pilot training programs. Restrictions on training operations would seriously impact the viability of these businesses and would be a violation of the airport's grant assurances (see **Appendix D** for a list of the grant assurances). FAA disapproval of a restriction on training operations is likely through the Part 161 study process because there are limited impacts within the 65 DNL contour; therefore, restrictions on touch-and-go activity will not be considered further.

Engine Run-up Restrictions

Engine run-ups are a necessary and critical part of aircraft operation and maintenance. Engine run-ups are often more annoying than aircraft overflight noise because they are more unpredictable and usually last longer than overflights.

Evaluation/Conclusion

As previously mentioned, engine maintenance run-up activity at Wilmington International Airport is not correlated with noise complaints or comments received during this study. The airport has facilities that provide aircraft maintenance to a variety of aircraft types and occasional maintenance run-up procedures are performed at a designated area on the airfield that is buffered from noise-sensitive land uses to the south. Run-up activity at Wilmington International Airport does not cause the 65 DNL noise exposure contours to extend over noise-sensitive land use and impacts within the 65 DNL contour are limited to 14 dwelling units and one place of worship in the 2023 existing condition and two dwelling units and one place of worship in the 2028 future condition to the north of the airport, and are located a considerable distance from the airport property boundary and removed from any run-up areas; therefore, maintenance run-up restrictions are not warranted at this time and will not be considered further.

ADDITIONAL CONSIDERATIONS

Evaluate VFR Departures Over Historic Downtown Wilmington

Although outside the 65 DNL contours, the Historic Downtown Wilmington area has been identified as containing a high density of noise-sensitive land uses. Comments collected during the public involvement process and radar flight track data indicate that the Historic Downtown Wilmington area experiences a slightly higher percentage of overflights due to Runway 24 being utilized the most frequently (approximately 40 percent of the time); therefore, a voluntary noise abatement procedure for aircraft departing Runway 24, especially military aircraft and large jets, could help alleviate some of the overflight concerns experienced in this community. The addition of a voluntary VFR departure procedure for aircraft departing Runway 24 and heading southwest over Historic Downtown Wilmington is recommended for consideration as a local measure outside the FAA-funded 14 CFR Part 150 study process.

Evaluate Alternative Visual Approach to Runway 24 Over Cape Fear River

As previously discussed, the Historic Downtown Wilmington area contains a high density of noise-sensitive land uses. In an effort to mitigate arrival overflights and associated aircraft noise over the Historic Downtown Wilmington area, an alternative visual approach to Runway 24 may be considered as a voluntary noise abatement measure for arriving aircraft, including military jets arriving during visual meteorological conditions. The alternative visual approach would direct arrival traffic to delay aligning with Runway 24 west of the downtown area and instead initiate a final turn at the Cape Fear River. This late turn on a visual approach would reduce overflights of the noise-sensitive areas located in Historic Downtown Wilmington and shift arrival traffic to the north over waterways and undeveloped land.

Continue Noise Abatement Procedures As Agreed Upon With United States Marine Corps

In response to community concerns regarding military jet overflights and as discussed in Chapter One, beginning in January 2022, the FAA and U.S. Department of Defense (DoD) executed a letter of agreement to establish voluntary noise abatement procedures related to military aircraft operations at Wilmington International Airport. A copy of the agreement can be found in **Appendix D**. The DoD has agreed to specific procedures, including avoiding overflights of the Historic Downtown Wilmington area and prohibiting carrier breaks. The agreement is enforced through direction given by ATCT management and through published military flight procedure guidelines.

Since implementation of the Letter of Agreement, the airport has received significantly fewer noise complaints regarding military jet traffic with no observed negative consequences to military training and readiness; therefore, it is recommended that the airport advocate for continued use of the agreed-upon voluntary noise abatement procedures between the FAA and DoD for military jet traffic as part of its voluntary noise abatement program.

Educational Programs

As part of a proactive approach to minimizing noise disturbances in the community that are experienced outside of the 65 DNL contours, below is a list of educational program components that may be implemented. The educational program would aim to reduce noise through pilot education and other methods that are intended to raise the awareness of current and potential residents about the existence of the airport.

- Distribution of a pilot guide with noise-sensitive areas identified;
- Meetings with pilots and students to discuss safety and noise abatement issues at the airport
- A homeowner outreach program to establish communication with the public about noise issues
- A real estate agent outreach program to educate real estate agents and potential home buyers about Wilmington International Airport operations and its presence in the community

SUMMARY

This chapter has analyzed the range of potential noise abatement techniques for use at Wilmington International Airport. **Table 5B** presents the preliminary list of noise abatement alternatives considered and the conclusion for each measure. Because there are limited noise-sensitive impacts (two dwelling units and one place of worship) within the 65 DNL contours, the only viable noise abatement measure is a potential acoustical barrier. The results of this analysis will be reviewed by the planning advisory committee and the general public and final recommendations will be presented in Chapter Seven.

TABLE 5B | Noise Abatement Alternatives Summary

Runway Use and Flight Routing Measure	Description	Conclusion
Preferential and Rotational Runway Use	Favor the runway or runways that lead traffic over compatibly developed areas.	No further consideration.
Departure Turns	Route departing aircraft over noise-compatible areas immediately after takeoff.	No further consideration.
Visual and Offset Instrument Approaches	Modify approaches that involve turns relatively close to the airport.	No further consideration.
Midfield Departures	Begin engine spool-ups and takeoff rolls from a certain point near midfield.	No further consideration.
Airport Facilities Measure	**Description**	**Conclusion**
New Runways and Runway Extensions	Install new runways or runway extensions to shift aircraft operations away from residential areas.	No further consideration.
Displaced and Relocated Thresholds	Shift the touchdown zone and/or the takeoff initiation point, relocating the original runway end.	No further consideration.
Acoustical Barriers	Use walls, berms, or buildings to shield areas from ground-based noise.	No further consideration.
Aircraft Run-up Location and Enclosures	Designate an area for maintenance run-ups away from noise-sensitive land uses and/or install a structure to absorb and deflect the noise from run-ups.	No further consideration.

Continues on next page.

TABLE 5B | Noise Abatement Alternatives Summary (continued)

Reduced Thrust Takeoffs	Require a reduced thrust takeoff for jet aircraft that involves takeoff with less than full thrust.	No further consideration.
Thrust Cutbacks for Jets	Use standardized thrust cutback departure procedures established by each aircraft manufacturer.	No further consideration.
Maximum Climb Departures	Use maximum thrust with no cutback on departure.	No further consideration.
Minimum Approach Altitudes	Enforce the ATC requirement that all positively controlled aircraft approaches be conducted at a specified minimum altitude until an aircraft must begin its descent to land.	No further consideration.
Use of Minimum Flaps During Approach and Two-Stage Descent Profiles	Use flaps to reduce power settings and airframe noise and/or use two-stage descent profiles.	No further consideration.
Use of Continuous Decent Profiles	Maintain a constant-angle descent (commonly three degrees) during landing until the airport's established approach procedure is met.	No further consideration.
Reverse Thrust Restrictions	Limit the use of thrust reversal.	No further consideration.
Airport Regulations	**Description**	**Conclusion**
Nighttime Curfews and Operating Restrictions	Restrict nighttime operations by closing the airport to all arrivals and departures, to departures only, or to arrivals and departures by aircraft that exceed specified noise levels.	No further consideration.
Noise-Based Landing Fees	Charge differential landing fees based on either the noise level or the time of arrival.	No further consideration.
Capacity Limitations	Impose a cap on the number of scheduled operations.	No further consideration.
Noise Budgets	Allocate noise among airport users.	No further consideration.
Restrictions Based on Aircraft Noise Levels	Restrict the use of aircraft that exceed certain noise levels.	No further consideration.
Touch-and-Go Restrictions	Restrict touch-and-go or multiple approach operations.	No further consideration.
Engine Run-up Restrictions	Restrict engine run-up activities.	No further consideration.
Additional Considerations	**Description**	**Conclusion**
Evaluate VFR Departure Procedures	Evaluate VFR departure procedures from Runway 24, especially for military aircraft, to manage overflights.	To be considered.
Evaluate Visual Approach to Runway 24	Evaluate the visual approach to Runway 24 to direct arrival traffic over the Cape Fear River.	To be considered.
Continue Military Noise Abatement Procedures	Support continuation of the terms of the Letter of Agreement between the FAA and DoW for military jet traffic.	To be considered.
Pilot Guide	Distribute program information brochures that identify noise-sensitive land uses to pilots.	To be considered.
Pilot Meetings	Hold meetings with pilots and students to discuss safety and noise abatement issues.	To be considered.
Homeowner Outreach	Establish communication with the public about noise issues; meet with homeowner groups to discuss various noise-related issues.	To be considered.
Real Estate Outreach	Establish a real estate agent outreach program to educate real estate agents and potential home buyers about Wilmington International Airport operations and its presence in the community.	To be considered.