*Chapter 5*

# NOISE ABATEMENT ALTERNATIVES

# NOISE ABATEMENT ALTERNATIVES

Scottsdale Airport has had a long history of noise abatement dating back to the first Part 150 Noise Compatibility Study completed in 1984. The 1984 Noise Compatibility Study was updated in 1997 to reflect changes in the surrounding community as well as the general aviation industry. This chapter takes a fresh look at the current measures and analyzes measures which may potentially abate noise in the Scottsdale Airport area. It begins by screening the full range of potential noise abatement measures for possible use at Scottsdale Airport. The screening criteria includes the probable noise reduction over noise-sensitive areas, the potential for compromising safety margins, the ability of the airport to perform its intended function, and the potential for implementation considering the legal, political, and financial climate of the area. Measures which merit further consideration are analyzed in the following section where detailed noise analyses are presented.

The framework for a coordinated approach to noise abatement and the mitigation of noise impacts is outlined in the DOT/FAA *Aviation Noise Abatement Policy of 1976, the Airport Safety and Noise Abatement Act of 1979,* and the *Airport Noise and Capacity Act of 1990*. Responsibilities are shared among federal, state, and local governments; aircraft manufacturers; airport proprietors; and residents of communities near the airport. The following points identify the roles of the responsible authorities:

- The federal government has the authority and responsibility to control aircraft noise at the source, implement and enforce operational flight procedures, and manage the air traffic control system in ways that minimize noise impacts on populated areas.

- Aircraft manufacturers are responsible for incorporating quiet engine technology into new aircraft designs to meet federal noise standards.

- Airport proprietors are responsible for planning and implementing airport development actions designed to limit noise exposure. These include noise abatement ground procedures and improvements in airport design. Proprietors may also enact restrictions on airport uses that do not unjustly discriminate against any user, impede the federal interest in safety and management of the air navigation system, unreasonably interfere with interstate commerce, or otherwise conflict with federal law.

- Local governments are responsible for land use planning, zoning, and building regulations to encourage development that is compatible with present and projected airport activity and noise levels based on federal guidelines.

- Air carriers, all-cargo carriers, and commuter operators are responsible for retirement, replacement, or retrofitting older aircraft to meet federal noise standards. They are also responsible for operating aircraft in ways that minimize the impact of noise in the community.

  General aviation operators are responsible to use proper aircraft maintenance and flying techniques to minimize noise output in the community.

- Air travelers and shippers generally should bear the cost of noise reduction, consistent with the established federal economic and environmental policy which states that the adverse environmental consequences of a service or product should be reflected in its price.

- Residents of areas surrounding airports should seek to understand the aircraft noise problem and what steps can and cannot be taken to minimize its effect on people.

- Prospective residents of areas impacted by aircraft overflights and/or noise should perform due diligence to determine which areas are impacted by aircraft overflights and/or noise, become aware of the effect that aircraft operations may have on their quality of life, and make their locational decisions with that in mind.

An airport noise abatement program update has three primary objectives:

1. To minimize the noise-impacted population in the study area, within practical cost and legal constraints;

2. To impose legal and practical rules that limit exposure of the local population to very loud noise events. These loud single events can occur even outside the Day-Night-Level (DNL) contours;

3. To work with the surrounding cities towards maximum compatibility of existing and future land uses with aircraft operations and noise.

## *STATUS OF PREVIOUS NOISE COMPATIBILITY PROGRAM*

### AVIATION NOISE ABATEMENT RECOMMENDATIONS

The previous Noise Compatibility Program (NCP) for Scottsdale Airport was completed in March 1997, and approved in January 1998. This study endorsed 12 noise abatement recommendations. Ten of these recommendations were continued from the 1986 NCP. These included:

- Encouragement of aircraft not in compliance with 14 CFR Part 36, Stage 3 to use Runway 21 for landings and Runway 3 for takeoffs;
- Continue right turns as soon as practical when departing Runway 21;
- Request use of National Business Aviation Association (NBAA) standard departure procedures for jets departing Runway 3 or Runway 21;
- Continue to require that engine maintenance run-ups be performed at the north end of the Kilo ramp; prohibit maintenance run-ups between 10:00 p.m. and 7:00 a.m. local time;
- Continue to prohibit stop-and-go operations, intersection takeoffs, formation takeoffs, and simulated single engine takeoffs and go-arounds;
- Continue to discourage straight-out and left turns after departure on Runway 21;
- Continue to discourage right downwind and right base pattern entry, long straight-in approaches, and right turnouts prior to the airport boundary on Runway 3;
- Continue to prohibit touch-and-go and stop-and-go operations between 9:30 p.m. and 6:00 a.m. local time;
- Continue preferential use of Runway 3;
- Continue to discourage descents below 2,500 feet Mean Sea Level (MSL) for practice instrument approaches.

The two new recommendations endorsed by the 1997 NCP include encouraging the use of Aircraft Owners and Pilot's Associations (AOPA) Noise Awareness Steps by light, single-engine aircraft and requesting aircraft on approach to Runway 21 to avoid overflights of residential areas whenever possible. All 12 measures were approved by the Federal Aviation Administration (FAA). A detailed review of the previous 14 CFR Part 150 Study can be found in **Appendix C**.

### NOISE ABATEMENT ALTERNATIVE PREPARATION

As part of the analysis leading to the preparation of this chapter, the consultant held a special technical conference to brainstorm potential noise abatement measures. This conference was held on April 1, 2004. Those attending the conference included aviation professionals responsible for the administration, control, and operation of aircraft and facilities at the airport; professional pilots; representatives of flight departments of companies using the airport; air traffic controllers; representatives of national aviation organizations; and airport administrators.

In order to judge the effectiveness and appropriateness of a particular technique, it is important to consider the magnitude of the noise impacts around Scottsdale Airport. Chapter Four of the *Noise Exposure Maps* (NEM) document evaluated the impact of noise on the population around the airport. Based on the current conditions (2004), 2,808 persons are exposed to aircraft noise above 55 DNL, with no persons exposed to aircraft noise above 65 DNL. By 2009, the existing population exposed to aircraft noise above 55 DNL is expected to increase to 3,213. This is primarily due to a projected increase in aircraft operations. There continues to be no population exposed to aircraft noise above 65 DNL in 2009. Growth in the number of people exposed to noise above 55 DNL could increase by as many as 1,311 (4,524 total) persons by the year 2009, due to the potential for additional residential growth around the airport.

In 2025, the noise contours are slightly smaller than those in 2009, due to the quieter aircraft projected to be in the national general aviation fleet. The total potential population exposed to aircraft noise above 55 DNL would decrease by 162 between 2009 and 2025. There continues to be no population exposed to aircraft noise above 65 DNL in 2025.

It should be noted that the FAA is generally concerned with noise impacts at the 65 DNL level and higher, in evaluating the acceptability of any proposed noise abatement measures. In addition, the FAA only considers the current and five-year noise contours when evaluating noise abatement recommendations.

## *POTENTIAL NOISE ABATEMENT MEASURES*

A comprehensive list of potential noise abatement techniques is shown on **Exhibit 5A**. Title 14 of the Code of Federal Regulations (CFR) Part 150 specifically requires most of these to be considered in noise compatibility studies for possible use at airports undertaking those studies. These techniques either (1) reduce the size of the noise contours or (2) move the noise to other areas where it is less disruptive.

To reduce the size of the noise contours, the total sound energy emitted by the aircraft must be reduced. This can be done by modifying aircraft operating procedures or restricting the number or type of aircraft allowed to operate at the airport. Measures which can be used to shift the location of noise include runway use programs, special flight routes, and airport facility development. In general, potential noise abatement measures can be assigned to the following four categories:

- Runway Use and Flight Routes
- Facilities Development
- Aircraft Operational Procedures
- Airport Restrictions and Regulations

## RUNWAY USE AND FLIGHT ROUTES

The land use pattern around the 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 noncompatible areas.

Scottsdale Airport is surrounded by a mixture of commercial/industrial and residential uses. Additional residential and noise-sensitive development is proposed north of the airport.

### Runway Use Programs

Runway use programs for noise abatement refer to the use of selected runways by aircraft. There are two types of runway use programs: rotational and preferential. Rotational runway use is intended to distribute aircraft noise equally off all runway ends. Preferential runway use programs are intended to direct as much aircraft noise as possible in one direction.

FAA Order 8400.9 describes national safety and operational 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 (LOU) between FAA's Flight Standards Division and Air Traffic Service, the airport proprietor, and the airport users. Once established, participation by aircraft operators is mandatory. Formal programs can be extremely difficult to establish, especially at airports with many different users.

- An informal program is an approved runway use system which does not require the LOU. Informal programs are typically implemented through a Tower Order and publication of the procedure in the Airport/Facility Directory. Participation in the program is voluntary.

- EVALUATION

Scottsdale Airport currently utilizes an informal preferential runway use program that designates Runway 3 as the calm wind runway. The airport operates in a northeast flow approximately 55 percent of the time. This puts a majority of the louder departure operations to the northeast of the airport. In addition to the calm wind runway use program, the airport encourages the louder Stage 2 Aircraft to use Runway 21 for landings and Runway 3 for departures. Based on the existing noise-sensitive development patterns around the airport, large parcels of undeveloped land continue to exist northeast and northwest of the airport. Large residential subdivisions and associated noise-sensitive institutions, however, have continued to develop straight north of the airport.

- CONCLUSION

Given the continued noise-sensitive development north of the airport, the continued effectiveness of the current calm wind runway use program should be tested. A detailed noise analysis will be done at the end of this chapter to show the effects of a wind-directed traffic flow with the calm winds evenly divided between Runways 3 and 21.

**Departure Turns**

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

- EVALUATION

Currently, Scottsdale Airport has two standard instrument departure procedures (DPs): the Banyo Four and the Scottsdale Five Departures. The Banyo Four Departure is used by those aircraft generally departing to the north, northeast, or northwest, while the Scottsdale Four Departure is used by those aircraft departing west, south, or southeast. The primary objective of the DPs is to direct aircraft to an altitude and a point northwest of Scottsdale where the Phoenix Terminal Radar Approach Control (TRACON) can locate them on radar. This allows controllers to safely sequence aircraft from Scottsdale Airport into Phoenix Class B Airspace. Noise abatement was a consideration when these DPs were developed. When departing on Runway 3, most instrument flight rule (IFR) aircraft are able to turn left before the Ironwood Estates neighborhood. In addition, the previous Part 150 Study discourages right departure turns from Runway 3 prior to reaching the airport boundary to avoid low overflights of residential areas to the east. When departing Runway 21, the right turn to 300 degrees routes aircraft away from the heaviest housing concentrations and toward what had been, historically, less densely developed areas and open land. The previous Part 150 Study encourages right turns as soon as practical and discourages straight-out and left turns on departure from Runway 21 to avoid concentrated noise-sensitive land uses to the south and southeast of the airport.

New area navigation (RNAV) departure procedures are also being established for the Scottsdale Airport. Departures from Runway 3 to the north will not change. Aircraft will still be directed to turn to a 260 degree heading until reaching the Banyo intersection (approximately 13 nautical miles northwest of the airport) and, therefore, most IFR aircraft would still be able to turn left before the Ironwood Estates neighborhood. RNAV departures on Runway 21 are generally routed west along Cactus Road until reaching the Small intersection (located just west Highway 51) before either routing north to the Banyo Intersection or to the western part of the metropolitan area. Because these RNAV procedures are already in the process of being established, both procedures were included in the development of the 2009 and 2025 noise exposure contours.

Changing these departure procedures to route aircraft to the east and southeast is very problematic for several reasons. First, aircraft departing from Runway 21 would have to make a climbing left turn to fly back to the Banyo Intersection to be picked up on radar. This climbing left turn from Runway 21 would be toward the McDowell Mountains and likely would cause aircraft to penetrate the Phoenix Sky Harbor Class B airspace to avoid the terrain hazard. Right departure turns would have similar concerns. Second, densely developed residential areas exist east and southeast of the airport. Directing additional aircraft east and southeast would be considered shifting noise from one residential area to another and would likely be disapproved by the FAA. Finally, the FAA would generally consider the benefit of these turn procedures to be measured by a reduction in people exposed to noise above 65 DNL. At Scottsdale, there are no noise-sensitive uses currently (2004) or projected (2009 and 2025) to be exposed by aircraft noise above 65 DNL.

Helicopter departure procedures have also been established for visual flight rule (VFR) departures from Scottsdale Airport via a letter of agreement with the Airport Traffic Control Tower (ATCT) and helicopter operators based at Scottsdale Airport/Airpark. Five departure procedures have been developed (described below and depicted on **Exhibit 5B**) and all route helicopters over major roadways or compatible land uses. In addition, the letter of agreement requests helicopters operating in the vicinity of the airport (defined as Scottsdale's Class D airspace depicted on Exhibit 1G in Chapter One, Inventory) to fly over roadways or sparsely populated areas. All five of these procedures have been included in the development of the 2004, 2009, and 2025 noise exposure contours. The following is a description of each departure procedure:

- <u>JAX Desert Ridge Departure</u>: Proceed northbound from Point JAX to Point BELL, then along Scottsdale Road, until north of the CAP canal, then northwest bound until reaching the practice area or departing the Scottsdale Class Delta Airspace, northwest of Scottsdale Airport. Remain at or below 500 feet above ground level (AGL) until crossing Point BELL, then climb to requested/approved altitude.

- JAX North Departure: Proceed northbound from Point JAX to Point BELL, then along Scottsdale Road, departing the Scottsdale Class Delta Airspace, north of Scottsdale Airport. Remain at or below 500 feet AGL until crossing Point BELL, then climb to requested/approved altitude.

- JAX Greenway Departure: Proceed westbound from Point JAX along Greenway Road, departing the Scottsdale Class Delta Airspace, west of Scottsdale Airport. Remain at or below 500 feet AGL until crossing Point JAX, then climb to requested/approved altitude.

- PIMA East Departure: After receiving specific approval to cross the runway, proceed eastbound from Point TANKS, direct to Point PIMA. Then continue on course, departing the Scottsdale Class Delta Airspace, east of Scottsdale Airport. Remain at or below 500 feet AGL until crossing Point PIMA, then climb to requested/approved altitude.

- PIMA South Departure: After receiving specific approval to cross the runway, proceed eastbound from Point TANKS direct to Point PIMA. Then proceed southbound along Loop 101, departing the Scottsdale Class Delta Airspace, south of Scottsdale Airport. Remain at or below 500 feet AGL until crossing Point PIMA, then climb to requested/approved altitude.

Changing the helicopter routing from Scottsdale Airport would shift helicopter operations away from generally compatible open space, compatible land uses, and major roadways to noise-sensitive land uses. Therefore, helicopter route changes are not considered a viable option. Increasing the altitude helicopters fly is also not a viable option. Currently the pattern altitude for fixed-wing piston aircraft is limited to 990 feet AGL and jet aircraft are limited to 1,490 feet AGL. Increasing the departure route altitudes would eliminate the safety margin between the fixed-wing piston aircraft and helicopter operations. Raising the pattern altitude for the fixed-wing and jet aircraft would eliminate the safety margin between the jet aircraft and the aircraft operating in the Phoenix Sky Harbor Class B airspace.

- CONCLUSION

Scottsdale Airport has established standard departure procedures and is in the process of establishing RNAV departure procedures. These departure procedures were developed to safely direct aircraft flying IFR to a common point were they could be picked up on radar. Noise abatement was also a consideration during the development of these procedures, as these procedures direct aircraft over noise compatible development, open space, and major automobile thoroughfares when possible. Changing these procedures to direct more aircraft to the east or southeast is not a viable option due to high concentration of noise-sensitive development in these areas, the McDowell Mountains, and airspace constraints. Therefore, changes to the current departure procedures will not be considered further. The airport should continue to discourage right departure turns from Runway 3 prior to reaching the airport boundary to limit low overflights above residential areas to the east. The airport should also continue to encourage right turns as soon as practical and discourage straight-out and left turns on departure from Runway 21 to limit overflights of concentrated noise-sensitive land uses to the south and southeast.

The helicopter letter of agreement routes aircraft over noise compatible land uses and major automobile thoroughfares when possible. Increasing the helicopter altitude along these routes is not a viable option due to the fixed wing, jet, and Phoenix Class B operating altitudes located above them. Therefore, changes to the current helicopter routes and altitudes will not be considered further.

**Visual and Offset Instrument Approaches**

Approaches involving turns relatively close to the airport can sometimes be defined over noise-compatible corridors. These can be defined as either VFR approaches or non-precision IFR approaches. For smaller aircraft, 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. In some instances, to be effective for noise abatement, an offset or "side-step" approach must be used by the loudest aircraft, primarily business jets, using the airport.

- EVALUATION

A number of business jet and turboprop aircraft using the southern arrival route over Phoenix Sky Harbor International Airport has increased over the past year. This has resulted in increased aircraft activity east of the Scottsdale Airport when operating in a south flow (Runway 21 is being used). Aircraft approaching Scottsdale Airport from the south are directed to fly east of the airport to avoid aircraft arriving from and departing to the northwest and slower aircraft in the traffic pattern to the west.

The Albuquerque Route Traffic Control Centers (ARTCC) and Phoenix TRACON control aircraft operating under IFR while enroute and in the metropolitan area. The Albuquerque ARTCC and Phoenix TRACON are currently investigating a procedure to reduce the number of IFR aircraft being routed south and over Phoenix Sky Harbor International Airport to Scottsdale Airport. This new routing plan may result in a reduction in turboprop and business jet aircraft operations on the east side of the Scottsdale Airport.

At Scottsdale Airport, IFR approaches from the south lack a viable noise-compatible corridor. Even with the advent of advanced navigational technology, the relative closeness of incompatible land uses to the airport prevents the avoidance of these areas when using an instrument approach. The previous Part 150 Study discourages long straight-in, right base entry, and left downwind approaches to Runway 21 because of the proximity of noise-sensitive land uses to the south and southeast of the airport. IFR approaches with a one nautical mile final from the north over compatible land uses south of Ironwood Village and DC Ranch is not possible. A one nautical mile final is too short for routine use by jet operators which commonly fly IFR.

VFR approaches offer a greater degree of flexibility regarding their final approach courses. Since these approaches follow a "see and avoid" methodology, pilots can visually avoid noise-sensitive areas. This allows for approaches that can be designed to avoid certain areas using visual ground references. Aircraft operating VFR at Scottsdale Airport generally use common visual reporting points in the area to identify their location to the tower personnel. Some of these points include Pinnacle Peak, Rawhide, Fountain Hills, Squaw Peak, Camelback Mountain, Paradise Valley Mall, and Scottsdale Community College. Those aircraft that require a transition of the Phoenix Class B airspace must contact Phoenix TRACON prior to penetrating that airspace. The generalized VFR routes and visual reporting points in the Scottsdale area are depicted on Exhibit 1G in Chapter One of the Noise Exposure Map Update document.

At Scottsdale, the residential development south of the airport provides no viable noise abatement corridor long enough for a stable, one-mile final visual approach. As previously mentioned, approaches with a one nautical mile final from the north over compatible land uses south of Ironwood Village could be possible. Aircraft approaching from the north are generally routed south along Scottsdale Road. Aircraft could turn to the east at the intersection of Scottsdale Road and Pima Freeway (Loop 101) and follow the Pima Freeway until turning on final approach to Runway 21. **Exhibit 5C** depicts this potential visual approach; however, there are two issues with the development of this VFR procedure. The first issue is pilots unfamiliar with Scottsdale will not know where Scottsdale Road and the Pima Freeway are located. Second, the ability to depict this approach procedure on VFR approach plates is not allowed until radar coverage to the ground is available in the Scottsdale area.

Currently, aircraft on approach to Runway 21 are requested to avoid overflights of residential areas whenever possible. This procedure is reflected in the *Scottsdale Airport Pilot Guide*. This procedure should remain in place until radar coverage to the ground in the Scottsdale area is in place (planned for Summer 2006), a visual approach procedure to Runway 21 has been established and is charted on the visual approach plates. An example of a visual approach plate is depicted on **Exhibit 5D**.

Charting visual procedures provides a pilot visual reference points as well as recommended aircraft altitudes along the approach route. This would reduce potentially low aircraft overflights on approach to the airport by providing pilots altitude information along the approach route. Therefore, charting visual procedures should be pursued as aircraft radar coverage becomes available in the Scottsdale Area.

Helicopter arrival procedures for Scottsdale Airport have also been established for VFR arrivals that mirror the departure procedures. These arrival procedures have been established via a letter of agreement with airport traffic control tower and helicopter operators based at Scottsdale Airport/Airpark. Five arrival procedures have been developed and are described below and depicted on **Exhibit 5B.** Similar to the departure procedures, all route helicopters over roadways or compatible land uses and request helicopters operating in the vicinity of the airport to fly over roadways or sparsely populated areas. All five of these procedures have been included in the development of 2004, 2009, and 2025 noise exposure contours. The following is a description of helicopter arrival procedures:

- <u>JAX Desert Ridge Arrival</u>: Enter the Scottsdale Class Delta Airspace in the vicinity of the Sky-Hi practice area, northwest of the Scottsdale Airport. Proceed southeast bound north of the CAP canal to Scottsdale Road, then southbound to, and report over, Point BELL. At Point BELL, direct Point JAX direct destination. Cross Point BELL at or below 500 feet AGL.

- <u>JAX North Arrival</u>: Enter the Scottsdale Class Delta Airspace north of Scottsdale Airport. Proceed southbound along Scottsdale Road to, and report over, Point BELL. At Point BELL, proceed direct Point JAX direct destination. Cross Point BELL at or below 500 feet AGL.

- <u>JAX Greenway Arrival</u>: Enter the Scottsdale Class Delta Airspace west of Scottsdale Airport. Proceed eastbound along Greenway Road to, and report over, Point JAX. At Point JAX, proceed direct to destination. Cross Point JAX at or below 500 feet AGL.

- <u>PIMA East Arrival</u>: Enter the Scottsdale Class Delta Airspace east of Scottsdale Airport. Proceed directly to, and report over, Point PIMA. After receiving specific approval to cross the runway, proceed direct to Point TANKS, then direct destination. Cross Point PIMA at 500 feet AGL.

- <u>PIMA South Arrival</u>: Enter the Scottsdale Class Delta Airspace south of Scottsdale Airport. Proceed northbound along Loop 101 to, and report over, Point PIMA. After receiving specific approval to cross the runway, proceed direct to Point TANKS, then direct destination. Cross Point PIMA at 500 feet AGL.

Similar to the helicopter departure routing, changing the helicopter arrival routing from Scottsdale Airport would shift helicopter operations over non-compatible land uses. Raising the helicopter arrival route altitude would eliminate the safety margin for the fixed-wing, jet aircraft, and aircraft operating the Phoenix Class B airspace. Therefore, helicopter arrival route or altitude changes are not considered viable options.

- CONCLUSION

The Albuquerque ARTCC and Phoenix TRACON are developing a plan to reduce the number of aircraft being routed from the south to Scottsdale Airport. Reducing the number of turboprop and business jet aircraft approaching the airport vicinity from the south will reduce the use of east side pattern approaches by these aircraft.

Due to the proximity of noise-sensitive development to the south of Runway 3-21 at Scottsdale Airport, adjusted or new IFR or VFR approach procedures would not provide noise reduction benefits. The current policy of encouraging published approach patterns to Runway 21 should be continued because of the proximity of noise-sensitive land uses to the south and southeast of the airport.

A noise compatible corridor exists to the north of the airport. The close proximity of Ironwood Village and DC Ranch, as well as proposed development to the north, prevents the two-to-three mile final approach course necessary for establishing IFR approach to Runway 21 for noise abatement. A new visual route to Runway 21 for noise abatement deserves further consideration and will be studied in detail at the end of this chapter. However, the lack of radar coverage to the ground in the Scottsdale area prevents a VFR procedure over this area from being charted on VFR approach plates. Until a VFR procedure can be established and charted, the current procedure of requesting aircraft on approach to Runway 21 to avoid overflights of residential areas whenever possible should remain in place and be depicted on the *Scottsdale Airport Pilot Guide*. Charting visual procedures could also be pursued in general for Scottsdale Airport to provide pilots with minimum safe flying altitudes when on approach to the Scottsdale Airport. This would reduce the potential of low overflights.

The helicopter letter of agreement routes aircraft over noise compatible land uses and major roadways when possible. Increasing the helicopter altitude along these routes is not a viable option due to the fixed wing, jet, and Phoenix Class B operating altitudes located above them. Therefore, changes to the current helicopter routes and altitudes will not be considered further.

## Midfield Departures

Midfield departures refer to aircraft beginning their engine spool-up and takeoff role from a point, usually a taxiway intersection (intersection takeoffs) near midfield. While these operations are usually undertaken to reduce taxi time, such operations can help centralize departure spool-up noise on the airfield.

- EVALUATION

At Scottsdale Airport, due to the relatively short runway length, midfield departures would inhibit nearly all aircraft from safely departing the airport. These operations are further jeopardized by the hot weather experienced in the region from late spring to early fall. In addition, residents located off the departure end of the airport would likely be impacted by greater levels of aircraft noise, since aircraft would not have sufficient distance in which to gain altitude prior to leaving the airfield. Scottsdale City Ordinance 1341 currently prohibits intersection and midfield takeoffs.

- CONCLUSION

While midfield takeoffs work well at some airports, factors such as the short runway and seasonal climate conditions present serious safety implications for their use at Scottsdale Airport. In addition, given that such procedures are prohibited by City ordinance and would likely increase noise impacts by reducing the distance aircraft have to gain altitude before leaving the airport, their use at Scottsdale Airport is not advised and will not be given additional consideration.

**Runway Extensions And New Runways**

New runways aligned with compatible land development or runway extensions shifting aircraft operations further away from residential areas are a 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

Scottsdale Airport is surrounded by development on all sides. This makes the prospect of constructing a new runway or runway extension for noise abatement unfeasible due to the high cost of moving primary roads and purchasing property that is already developed. In addition, construction of additional runways at Scottsdale Airport is prohibited by City policy. Therefore, runway extensions and new runways will not be considered further.

**Displaced and Relocated Thresholds**

A displaced threshold involves the shifting of the touchdown zone for landings further down the runway. A relocated threshold involves shifting both the touchdown point and the takeoff initiation point. (In other words, 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 increase in altitude which, in turn, depends 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.

The determination of the amount of 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 only 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.

- EVALUATION/CONCLUSION

Currently, Runway 3-21 has displaced thresholds located at each end of the runway. These are necessary to meet runway safety area and obstacle clearance requirements. Additional threshold displacement/relocation generally offer only small noise reduction benefits. Any reduction in arrival noise caused by threshold relocations would be offset by increases in departure noise off the opposite runway end. Additionally, any measure that would reduce runway lengths would reduce safety margins of aircraft currently operating at Scottsdale Airport. Threshold adjustment will not receive additional consideration for analysis at Scottsdale Airport.

**Acoustical Barriers**

Acoustical barriers, such as noise walls or berms, are intended to shield areas from the noise of 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 act best over relatively short distances, and their benefits are greatly 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, the distance from the barrier itself, 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

At Scottsdale Airport, noise walls or berms could, in theory, provide noise attenuation benefits to the individuals residing on the south side of the airport, near the departure end of Runway 3. Such a structure would attenuate noise from aircraft pre-flight run-ups and engine spool-up noise from aircraft departing to the north on Runway 3. However, the noise wall would have to be continuous without any gaps to be effective, and would measure approximately 2,500 feet in length. **Exhibit 5E** depicts the potential noise wall location. The noise wall would have to run inside the runway object free area (OFA) due to the location of Thunderbird Road, and would be a penetration to the Part 77 approach surfaces. Such a barrier would also not be an effective method of attenuating noise once the aircraft is airborne.

- CONCLUSION

For the noise wall to be effective in reducing departure spool-up noise, it would have to run along Thunderbird Road. This would result in the noise wall being located inside the runway OFA, and it also would be a penetration to the Part 77 approach surfaces. In addition, a noise wall would not be an effective method of attenuating noise once the aircraft is airborne. Therefore, a noise wall south of the airport will not receive additional consideration.

**Run-up Enclosures**

An engine run-up enclosure is a special kind of noise barrier which can be appropriate at airports with aircraft engine maintenance operations. Engine run-ups are a necessary part of aircraft service and maintenance. They are necessary to diagnose problems and test the effectiveness of maintenance work. Run-up enclosures are designed so that aircraft can taxi or be towed into them. The structures are designed to absorb and deflect the noise from the run-up, thus reducing noise levels off the airport.

Run-up noise can be especially disturbing because it is unpredictable. While the noise from takeoffs and landings is relatively brief and has a particular pattern to which a person can adjust, the noise from a run-up is completely unpredictable. The duration of the 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 noise level can be extremely high. Other important characteristics are the direction and frequency of run-up noise. Under full engine power, the noise levels toward the rear of the aircraft at angles of approximately 150 and 210 degrees are generally greater. The frequency characteristics of noise are also not equal in all directions.

The noise from the front of the aircraft is generally dominated by high-frequency fan and gear noise. The noise from the rear part of the aircraft is dominated by low-frequency combustion and turbulence mixing. Low-frequency noise attenuates more slowly than high-frequency noise. At distances greater than one mile from the aircraft, there is very little high-frequency noise and, essentially, all that remains at this distance is the low-frequency component of noise. Therefore, high-frequency noise from the front of the aircraft attenuates much quicker and noise generated from the rear of the aircraft attenuates much slower. This is important because low-frequency noise is able to more easily penetrate the interior of building structures.

- EVALUATION

There are currently several businesses performing aircraft maintenance at Scottsdale Airport. These operations involve both jet and propeller-driven aircraft, last up to 30 minutes, and range from partial to maximum power, several times per week. Maintenance run-ups are only permitted at the blast fence located at the north end of the Kilo Ramp adjacent to Runway 21.

The Integrated Noise Model (INM), Version 6.1, was used to evaluate the impacts of engine maintenance run-ups. Single event noise patterns ($L_{max}$ noise contours) were prepared for the loudest aircraft maintained by these operators, the Lear 25 business jet aircraft (INM designation LEAR25).

$L_{max}$ represents the peak noise level of the event – the noise level that would actually be heard by the human ear. The noise contours were modeled with this aircraft located at the Kilo Ramp location. The INM does not account for noise attenuation provided by structures when calculating noise exposure; therefore, the noise exposure contours represent a worst case scenario of the run-up noise.

An analysis was conducted for existing run-up site and a potential run-up site located closer to the center of the airport. The results of this analysis are depicted on **Exhibit 5F**. Current airport policy dictates ground run-ups are restricted from 10:00 p.m. to 7:00 a.m. local time; therefore this analysis assesses only daytime impacts. The contours on this exhibit represent the 80 and 85 decibel (dBA) $L_{max}$. The 80 dBA $L_{max}$ is used to assess the daytime impacts of each run-up site on residential areas. According to the Guidelines for the Sound Insulation of Residences Exposed to Aircraft Operations, exterior-to-interior sound attenuation of a typical home of standard construction is 20 to 25 dBA, with windows closed. Therefore, the 80 dBA $L_{max}$ translates into interior levels of about 60 to 65 dBA. This level generally represents the normal conversation level between two individuals approximately three feet apart (see the "Other Annoyances" section in the TIP, *Effects of Noise Exposure*). The 85 dBA $L_{max}$ is used to assess the daytime impacts of each run-up site on office buildings. Structures composed of brick/concrete walls, dual pane windows, and solid core doors typically attenuate exterior-to-interior noise by 22 to 27 dBA. These building materials are commonly used in office buildings in the Scottsdale Airport area.

The existing run-up site on the Kilo Ramp impacts approximately 640 residents within the 80 $L_{max}$ site and 22 office buildings within the 85 $L_{max}$ contour. The potential midfield site, depicted on Exhibit 5F, does not impact existing residential within the 80 $L_{max}$ and 29 office buildings within the 85 $L_{max}$ contour. The office buildings within the $85_{Lmax}$ at both sites are also located within the 2009 65 DNL noise exposure contour.

There would be substantial costs involved in providing sound attenuation to these office buildings (the residential units are outside the 65 DNL noise exposure contour and are not eligible for funding). Based on an estimated $50,000 on average per office building for providing acoustically treated doors and windows, it would cost approximately $1.1 million at the Kilo Ramp location and $1.45 million at the potential midfield site. A typical three sided run-up enclosure located at either site would attenuate noise approximately 12 to 15 dBA at a cost of approximately $900,000. Based on this analysis, a run-up enclosure would be cost effective alternative to reducing run-up noise impacts.

- CONCLUSION

The Kilo Ramp and midfield aircraft run-up sites both create noise impacts. The Kilo Ramp site impact both residential and office building north of the airport. The midfield site only impacts buildings. Based upon the cost of attenuating the run-up noise related impacts within the 65 DNL noise exposure contour, a run-up enclosure appears to be viable alternative and should be considered further.

## AIRCRAFT OPERATIONAL PROCEDURES

Aircraft operating procedures which may reduce noise impacts include:

- Reduced thrust takeoffs
- Thrust cutbacks after takeoff
- Maximum climb departures
- Minimum approach altitudes
- Use of minimum flaps during approaches
- Steeper approach angles
- Limitations on 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 both takeoff roll and climb. Use of the procedure depends on aircraft weight, weather, wind conditions, pavement conditions, and runway length. Since these conditions vary considerably, it is not possible to mandate, safely, the use of reduced thrust takeoffs.

- EVALUATION

Business jet aircraft operating at Scottsdale Airport must use standard departure thrust due to the relatively short runway length and the hot weather experienced in the region from late spring to early fall. Efforts to encourage the use of reduced thrust takeoffs would greatly reduce safety margins and are unlikely to be implemented by pilots and aircraft operators.

- CONCLUSION

The limited runway length and hot weather experienced during the summer months at Scottsdale Airport would greatly limit the ability of aircraft to operate within strict safety margins. Due to obvious safety implications, reduced thrust takeoffs should not be encouraged at Scottsdale Airport.

**Thrust Cutbacks for Jets**

As a service to the general aviation industry, the NBAA prepared noise abatement takeoff and arrival procedures for business jets. Since that time, this program has virtually become an industry standard for operators of business jet aircraft. There are two types of departure procedures: the standard procedure and the close-in procedure. They are illustrated in **Exhibit 5G.**

The NBAA standard departure procedure calls for a thrust cutback at 1,000 AGL and a 1,000 feet-per-minute climb to 3,000 feet altitude during acceleration and flap retraction. The close-in procedure is similar, except that it specifies a thrust cutback at 500 feet AGL. While both procedures are effective in reducing noise, the locations of the reduction vary with each. The standard procedure results in higher altitudes and lower noise levels over down-range locations, while the close-in procedure results in lower noise near the airport. Many aircraft manufacturers have developed their own thrust cutback procedures. Neither NBAA procedure is intended to supplant a procedure recommended by the manufacturer and published in the aircraft operating manual.

- EVALUATION

NBAA noise abatement procedures were assessed in the previous Noise Compatibility Program. This assessment involved a comparison of the NBAA close-in and standard noise abatement departure procedures for the Stage 2 aircraft operating at Scottsdale Airport. The close-in noise abatement departure procedure made the noise exposure contour longer and narrower. This is expected because the thrust cutback occurs at 500 feet AGL and aircraft departure profile is lower, which extends the noise contour out further. The net result was higher population impact with the close-in noise abatement procedure.

The standard noise abatement procedure, however, reduced the overall size of the 55 and 60 DNL noise exposure contour, but did not change the 65 noise exposure contours significantly. This was also expected as the standard noise abatement procedure allows the aircraft to climb much higher before aircraft thrust is reduced. The net result was an overall reduction in the population impacts with the standard departure procedure. Based upon the results of this analysis, Scottsdale encourages the use of the NBAA standard noise abatement departure procedure or comparable procedure from the aircraft manufacturer. Given that the land use pattern in the vicinity of Scottsdale Airport is the same (compatible close-in and non-compatible in the outlining areas), the NBAA standard or manufacturers comparable noise abatement procedure is still the most appropriate procedure.

Some airports have defined special thrust cutback departure procedures; this is frowned upon by the industry. Aircraft operators fear the consequences of a proliferation of airport-specific procedures. As the number of procedures increases, it would become more and more difficult for pilots to become proficient at all of them and still maintain comfortable safety margins. It would be similar to asking motorists to comply with a different set of braking and acceleration procedures at every intersection in the city. In any case, safety requires that the use of thrust cutbacks in any given situation must be left to the discretion of the pilot based on weather and the operational characteristics of the aircraft.

Mandating the use of thrust cutbacks requires some type of verification. In order to ensure the use of these procedures, a permanent system of noise, flight track, and flight profile data acquisition is necessary. A system that could be appropriate at a single-runway airport would cost at least $533,000 and have annual operating and maintenance costs of approximately $85,000. Even with this system, it would be difficult to gage the use of these procedures due to the high temperature extremes Scottsdale receives. In addition to the high cost and reliability issues, the mandated use of thrust cutbacks would require compliance with 14 CFR Part 161.

- CONCLUSION

NBAA standard or manufacturers comparable noise abatement procedures are already encouraged by Scottsdale Airport and used by many business jet operators. Given the land use pattern in the vicinity of Scottsdale Airport, encouragement of this procedure is still the most appropriate for the Scottsdale and Phoenix area. Efforts to develop special thrust cutback procedures or to mandate the use of these procedures, however, are not advised. 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.

**Maximum Climb Departures**

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

- EVALUATION

The use of maximum climb, or best angle departure procedures can, in some cases, help reduce noise exposure over populated areas some distance from the airport. This situation exists to the north of the airport; to the south, noise-sensitive land uses exist close to the airport. Consequently, if this procedure were to be used to the south, the potential noise reductions in the outlying areas are at the expense of dramatic noise increases to residential areas closer to the airport.

Airspace conflicts with Phoenix Class B airspace are a concern to the south when considering maximum climb departures at Scottsdale Airport. The base of Class B airspace over Scottsdale Airport starts at 6,000 feet MSL (4,490 Above Field Level [AFL]) and steps down to 4,000 feet MSL (2,490 AFL) immediately south of the airport. In order to fly through Class B airspace, aircraft must have special radio and navigation equipment and must obtain an air traffic control clearance.

- CONCLUSION

Close-in noise-sensitive development to the south and north over DC Ranch and conflicts with Phoenix Class B airspace air pollution make this procedure impractical. Therefore, maximum climb procedures have been dropped from further consideration.

**Minimum Approach Altitudes**

A minimum approach altitude procedure would entail an air traffic control requirement that all positively-controlled aircraft approaches be conducted at a specified minimum altitude until the aircraft must begin its descent to land. This would affect only aircraft quite some distance from the airport, as well as outside the noise exposure contours. Accordingly, increases in approach altitudes generally result in only very small reductions in single-event noise.

- EVALUATION

Currently, the pattern altitude at Scottsdale Airport is 3,000 feet MSL (1,490 feet AGL) for jets, 2,500 MSL (990 feet AGL) for propeller aircraft, and 2,000 MSL (490 feet AGL) for helicopters. 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 achieve only a noise reduction of four to six decibels. Raising the pattern altitude will also create conflicts with the Phoenix Class B airspace. Additionally, raising the pattern altitude would enlarge the pattern, as aircraft would have to extend each leg of the traffic pattern to climb to, or descend from, the increased altitude.

- CONCLUSION

Raising approach altitudes into Scottsdale Airport would produce only very small noise reductions well outside the 65 DNL noise contour. In addition, raising the traffic pattern altitude would potentially conflict with the Phoenix Class B Airspace and expose additional individuals to overflight noise due to an elongated traffic pattern. Therefore, these measures do not merit further consideration.

## Noise Abatement Approach Procedures

Approach procedures to reduce noise impacts were attempted in the early days of noise abatement, but are no longer favorably received. The procedures include the minimal use of flaps in order to reduce power settings and airframe noise, the use of increased approach angles, and two-stage descent profiles.

- EVALUATION

All of these techniques raise safety concerns because they are non-standard and require an aircraft to be operated outside its optimal safe operating configuration. Scottsdale Airport's precision approach path indicator lights (PAPIs) on each runway end are already set to the maximum approach slope angle of 4-degrees. Increasing the approach slope angle above 4-degrees would require aircraft to be landed at more than optimal approach speeds. The higher sink rates and faster speeds reduce pilot reaction time and erode safety margins. They also increase stopping distances on the runway and are especially inadvisable on relatively short runways, such as those at Scottsdale Airport. Some of these procedures have actually been found to increase noise because of power applications needed to arrest high sink rates.

- CONCLUSION

Scottsdale Airport's PAPIs are already set to the maximum allowable approach slope of 4-degrees. Minimal use of flaps and two-stage descent profiles erode safety margins and are of little practical noise abatement benefit. Therefore, these techniques do not deserve further consideration at Scottsdale Airport.

## Reverse Thrust Restrictions

Thrust reversal is routinely used to slow jet aircraft immediately after touchdown. This is an important safety procedure which 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 size of the noise contours. Enforced restrictions on the use of reverse thrust, however, are not considered fully safe.

- EVALUATION

Given the location of noise-sensitive uses in the Scottsdale Airport vicinity, a restriction on thrust reversal may produce some benefits. However, reverse thrust restrictions would significantly reduce landing safety margins on Scottsdale Airport's short runway, increase runway occupancy time.

- CONCLUSION

Mandated limitations on the use of reverse thrust are inadvisable at Scottsdale Airport because of reduced safety margins. As an operational flight procedure with a direct effect on safety, decisions about whether to use reverse thrust should be left to the discretion of pilots.

## AIRPORT REGULATIONS

Part 150 requires that, in developing Noise Compatibility Programs, 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 proprietors to reduce their liability for aircraft noise by imposing restrictions which are reasonable and do not violate contractual agreements with the FAA conditioning the receipt of federal aid. (These are known as "grant assurances.") In addition, constitutional prohibitions on unjust discrimination and the imposition of undue burdens on interstate commerce must be respected. The restrictions must also be crafted to avoid infringing on regulatory areas preempted by the federal government. Finally, the regulations must be evaluated under the requirements of 14 CFR Part 161.

Airport noise and access restrictions may be proposed by an airport operator in its Part 150 Noise Compatibility Program. The FAA has made it clear that the approval of a restriction in a Part 150 document would depend on the noise abatement benefit of the restriction at noise levels of 65 DNL or higher. Even if the FAA should accept a noise restriction as part of a Part 150 Noise Compatibility Program, the requirements of Part 161 would still need to be met before the measure could be implemented.

As part of this noise compatibility study update, Harris, Miller, Miller & Hanson, Inc. (HMMH) was contracted to provide an independent assessment of potential for implementing restrictions at Scottsdale Airport. HMMH is the consultant that prepared the Naples, Florida Part 161 study. Their report can be found in **Appendix E**.

## 14 CFR Part 161

In the *Airport Noise and Capacity Act* (ANCA) of 1990, Congress not only established a national phase-out policy for Stage 2 aircraft above 75,000 pounds, but it also established analytical and procedural requirements for airports desiring to establish noise or access restrictions on Stage 2 or Stage 3 aircraft. Regulations implementing these requirements are published in 14 CFR Part 161.

14 CFR Part 161 requires the following actions to establish a local restriction on Stage 2 aircraft:

- An analysis of the costs and benefits of the proposed restriction and alternative measures.

- Publication of a notice of the proposed restriction in the Federal Register and an opportunity for comment on the analysis.

While implementation of a Stage 2 aircraft operating restriction does not require FAA approval, the FAA does determine whether adequate analysis has been done and all notification procedures have been followed.

For restrictions on Stage 3 aircraft, Part 161 requires a much more 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.

Scottsdale Airport has several voluntary procedures for noise abatement. Efforts to mandate or enforce voluntary procedures with fines or penalties would be considered an access restriction and would require an approved 14 CFR Part 161 study.

Based on the FAA's interpretations of 14 CFR Part 161, the regulations do not apply to restrictions proposed only for aircraft under 12,500 pounds. Because these light aircraft, which include small, single-engine aircraft, are not classified under Part 36 as Stage 2 or 3, the FAA has concluded that the *1990 Airport Noise and Capacity Act* was not intended to apply to them. (See *Airport Noise Report*, Vol. 6, No. 18, September 26, 1994, p. 142.)

Very few Part 161 studies have been undertaken since the enactment of ANCA. **Table 5A** summarizes the studies that have been done to date.

## Regulatory Options

Regulatory options discussed in this section 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's or multiple approaches.
- Restrictions on engine maintenance run-ups.

**TABLE 5A**
**Summary of 14 CFR Part 161 Studies**

| Airport | Year | | Cost | Proposal, Status |
|---|---|---|---|---|
| | Started | Ended | | |
| Aspen-Pitkin County Airport<br>Aspen, Colorado | N.A. | N.A. | N.A. | The study has not yet been submitted to FAA. |
| Kahului Airport, Kahului<br>Maui, Hawaii | 1991 | 1994 | $50,000 (est.) | Proposed nighttime prohibition of Stage 2 aircraft pursuant to court stipulation. Cost-benefit and statewide impact analysis found to be deficient by FAA. Airport never submitted a complete Part 161 Study. Suspended consideration of restriction. |
| Minneapolis-St. Paul International Airport<br>Minneapolis, Minnesota | 1992 | 1992 | N.A. | Proposed nighttime prohibition of Stage 2 aircraft. Cost-benefit analysis was deficient. Never submitted complete Part 161 study. Suspended consideration of restriction and entered into negotiations with carriers for voluntary cooperation. |
| Pease International Tradeport<br>Portsmouth, New Hampshire | 1995 | N.A. | N.A. | Have not yet submitted Part 161 study for FAA review. |
| San Francisco International Airport<br>San Francisco, California | 1998 | 1999 | $200,000 | Proposing extension of nighttime curfew on Stage 2 aircraft over 75,000 pounds. Started study in May 1998. Submitted to FAA in early 1999 and subsequently withdrawn. |
| San Jose International Airport<br>San Jose, California | 1994 | 1997 | Phase 1 - $400,000<br>Phase 2 - $5 to $10 million (est.) | Study undertaken as part of a legal settlement agreement. Studied a Stage 2 restriction. Suspended study after Phase 1 report showed costs to airlines at San Jose greater than benefits in San Jose. Never undertook Phase 2, systemwide analysis. Never submitted study for FAA review. |
| Burbank-Glendale-Pasadena Airport | 2000 | Ongoing | Estimated cost is between $2 and $4 million. | Proposed curfew restricting all aircraft operations from 10:00 p.m. to 7 a.m. FAA issued comments on the preliminary Part 161 analysis and the study was stopped. |
| Naples Municipal Airport<br>Naples, Florida | 1999 | 2003 | Estimated cost of $1.0 to $1.5 million for consulting and legal fees due to litigation. | Enactment of a total ban on Stage 2 general aviation jet aircraft under 75,000 pounds. The airport began enforcing the restriction on March 1, 2002. FAA has deemed the Part 161 study complete; however, FAA has ruled that the restriction violated federal grant assurances. Currently going through appeals process. |
| Van Nuys Airport<br>Van Nuys, California | 2004 | Ongoing | N.A. | Proposing to prohibit Stage 2 aircraft from the airport and establish a curfew for Stage 3 aircraft. |
| Los Angeles International Airport<br>Los Angeles, California | N.A. | N.A. | N.A. | The study has not begun. The purpose of the study will be to prohibit east departures from 12:00 a.m. to 6:30 a.m. |

N.A. - Not available.
Sources: Telephone interviews with Federal Aviation Administration officials and staffs of various airports.

## Nighttime Curfews and Operating Restrictions

Nighttime curfews and operating restrictions can often be effective methods for reducing aircraft noise exposure around an airport. Since noise is commonly assumed to be most annoying in the late evening and early morning hours, curfews are usually aimed at restricting nighttime operations. However, curfews have economic impacts on airport users, on those providing airport-related services, and on the community as a whole. Other communities also may be impacted through curtailment of service.

There are essentially three types of curfews or nighttime operating restrictions: (1) closure of the airport to all arrivals and departures (a full curfew); (2) closure to departures only; and (3) closure to arrivals and departures by aircraft exceeding specified noise levels.

- EVALUATION

The time during which nighttime restrictions could be applied varies. The DNL metric applies a 10-decibel penalty to noise occurring between 10:00 p.m. and 7:00 a.m. That period could be defined as a curfew period. A shorter period, corresponding to the very late night hours, 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 quiet 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 attractive for business travelers who wish to reach their destinations with a large part of the workday ahead of them. Not only is this a personal convenience, but it can result in a significant savings in the cost of travel by reducing the need for overnight stays. Accordingly, early morning departures are often very popular. Similarly, late night arrivals are important in allowing travelers to return home without incurring the costs of another night away.

*Prohibition of Nighttime Departures:* The prohibition of nighttime departures would allow aircraft to return home, but would prohibit departures, which are generally louder than arrivals. Although somewhat less restrictive, this would have similar impacts at Scottsdale Airport as a full curfew. It would interfere with corporations in their attempts to schedule early morning departures for the business travel market.

As with a full curfew, a nighttime prohibition on departures would restrict access to the airport by Stage 3 aircraft. This would require a full 14 CFR Part 161 analysis and FAA approval of the restriction before it could be implemented.

*Nighttime Restrictions Based on Aircraft Noise Levels:* Nighttime operating restrictions can be designed to apply to only those aircraft which exceed specified noise levels. If it is to be effective in reducing the size of the DNL noise contours, the restricted noise level would have to be set to restrict the loudest, most commonly used aircraft at the airport. These restrictions would be subject to the special analysis procedures of Part 161. Any restrictions affecting 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-decibel 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 particularly troubling aspect of curfews and nighttime operating restrictions is their potential adverse effects on local general aviation and the region's economy. Additionally, implementation of nighttime restrictions can be costly, problematic, and require the completion, and subsequent FAA approval, of a Part 161 Study. FAA disapproval of a curfew is likely because there are no impacts within the 65 DNL contour. Therefore, curfews need 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 to use quieter aircraft or to operate at less sensitive times. A variable schedule of landing fees would be established based on the relative loudness of the aircraft, with departures by loud aircraft at night being charged the most and arrivals by quiet aircraft during the day being 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 actually discourage use of the airport by the loudest aircraft.

- EVALUATION

Scottsdale Airport currently has a landing fee for transient aircraft weighing more than 12,500 pounds. Converting the existing landing fee structure to noise-based landing fees would be considered an airport noise restriction under 14 CFR Part 161. A 14 CFR 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 Stage 3 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 to operate during the daytime hours. Converting the existing landing fee structure to a noise-based landing fee is vulnerable to legal challenges, and FAA disapproval is also likely because there are no impacts within the 65 DNL contour. Therefore, noise-based landing fees will not receive additional consideration.

**Capacity Limitations**

Capacity limitations have been used by some severely impacted airports to control cumulative noise exposure. This kind of restriction is used to impose a cap on the number of scheduled operations. Unscheduled operations are very difficult to track and, therefore, a capacity limitation would be difficult to impose.

• EVALUATION

Due to the lack of scheduled air service at Scottsdale Airport, a cap on operations could not be implemented. This type of restriction is only feasible at airports receiving scheduled aircraft operations.

• CONCLUSION

Airport capacity limitations are intended to control noise related to scheduled aircraft activity. Since all operations at Scottsdale Airport are unscheduled, the airport could not enforce a capacity limit to control noise. For this reason, operational capacity limitations will not be discussed further.

**Noise Budgets**

In the late 1980s, noise budgets gained attention as a potential noise abatement tool. After the enactment of ANCA, mandating 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 to shift operations to less noise-sensitive hours. Before ANCA, the intent was to encourage conversion to Stage 3 aircraft and to discourage the use of Stage 2 aircraft.

While noise budgets can be designed in many different ways, six basic steps are involved. First, the airport must set a target level of cumulative noise exposure, usually expressed in DNL, which it intends to achieve by a certain date. Second, it must determine how to express that overall noise level in a way that would permit allocation among airport users. Third, it must design the allocation system. Fourth is the design of a monitoring system to ensure that airport users are complying with the allocations. Fifth is the establishment of sanctions for aircraft operators that fail to operate within their allocations. Sixth, the system should be fine-tuned based on actual experience. The only simple step in this process is the first, setting a goal. From that point, it becomes increasingly complex.

- EVALUATION

Different approaches can be used to define noise in a way which permits allocation. It is possible to use the DNL metric, or a variant, for this purpose. This has some advantages in that the FAA's Integrated Noise Model (INM) can be easily used to derive DNL levels attributable to the average daily operations of the various airport operators. The INM database can be used to establish a basis for noise allocations based on aircraft type. An alternative is to use the effective perceived noise level (EPNL) metric. This is the metric used to certify aircraft noise levels for compliance with 14 CFR Part 36. Noise levels of various aircraft expressed in EPNL are published in FAA *Advisory Circulars 36-1E* and *36-2C*. EPNL values for the aircraft used by each operator on an average day could be summed to define the total noise attributable to the operator.

Two potential methods for allocating operational privileges are through an auction or lottery. However, with the lack of scheduled service at Scottsdale Airport, there is no way to effectively allocate operational privileges to an aircraft operator. It is also important that any allocation system include provisions for the entry of aircraft operators in order to have any chance of being legally permissible.

Another aspect involves monitoring compliance with the noise allocations. Any monitoring system will require extensive bookkeeping. The simplest method would involve the monitoring of aircraft schedules. Total noise contribution by each aircraft operator would be summed for the reporting period based on activity during the reporting period. Noise levels for each flight would be based on the certificated noise level, or the INM database noise level, for each aircraft. While this system would require large amounts of staff time to administer, it would be relatively simple to computerize and would have the advantage of enabling aircraft operators to plan their activities with a clear understanding of the noise implications of their decisions.

A theoretically more precise method of compliance monitoring, but a more expensive and complex method, would be to monitor actual aircraft noise levels. Actual noise from each aircraft operation could be recorded for each operator. The advantage of this approach is that it would be based on actual experience. A significant disadvantage, however, is that many variables influence the noise occurring from any particular aircraft operation, including the weather, pilot technique, and air traffic control instructions. In addition, Scottsdale Airport would have to make a significant investment to purchase a monitoring and flight tracking system.

The final step is to establish a system of fines or other sanctions to levy against aircraft operators who fail to operate within their assigned noise allocations. To be effective, the sanctions should be severe enough to provide a strong incentive to cooperate with the program.

- CONCLUSION

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

At Scottsdale Airport, a noise budget does not appear to be a practical option. The process would be long, expensive, and contentious. FAA disapproval is also likely because there are no impacts within the 65 DNL contour. Therefore, this alternative will not be discussed further.

**Restrictions Based On Aircraft Noise Levels**

Outright restrictions on the use of aircraft exceeding certain noise levels can reduce cumulative noise exposure at an airport. Aircraft producing noise above certain thresholds, as defined in 14 CFR Part 36, could be prohibited from operating at the airport at all or certain times of the day. A variation is to impose a non-addition rule, prohibiting the addition of new flights by aircraft exceeding the threshold level at all or certain times of the day. These restrictions would be subject to the special analysis procedures of Part 161. Any restrictions affecting Stage 3 aircraft would have to receive FAA approval.

Noise limits based on 14 CFR Part 36 certification levels have the virtue of being fixed national standards which are understood by all in the industry. They are average values, however, and do not consider 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 given situation and, in theory, gives aircraft operators increased flexibility to comply with the restrictions by designing special approach and departure procedures to minimize noise. It 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 unjust discrimination and potentially burdensome to interstate commerce.

- CONCLUSION

Restrictions based on noise levels could be viewed as discriminatory and, therefore, be subject to litigation and rejection by the FAA because there are no impacts within the 65 DNL contour. In addition, the requirements of a costly 14 CFR Part 161 Study would have to be met before any restriction on Stage 2 business jets under 75,000 pounds or Stage 3 aircraft could be implemented.

**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, unusually frequent, or occur at very 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 done by licensed pilots practicing approaches.

- EVALUATION

Touch-and-go's and multiple approaches are frequently done at Scottsdale Airport. In 2003, there were 71,121 local general aviation operations (generally involving multiple approaches or touch-and-go's). The touch-and-go operations were done mainly by light, single-engine aircraft.

In 1980, the Scottsdale City Council approved an ordinance prohibiting touch-and-go's between 9:30 p.m. and 6:00 a.m. (See Ordinance 1341, December 16, 1980.) This restriction has been in force ever since. The Council found that touch-and-go's at night were disturbing to residents of nearby housing areas. Since this restriction was adopted before the passage of the Airport Noise and Capacity Act of 1990, it is not subject to the requirements of 14 CFR Part 161.

- CONCLUSION

Scottsdale has prohibited touch-and-go's between 9:30 p.m. and 6:00 a.m. for many years. Since the restriction was enacted in 1980, more housing has been built near the airport. Thus, the continuance of the restriction is justified.

**Engine Run-up Restrictions**

As previously discussed, engine run-ups are a necessary and critical part of aircraft operation and maintenance. Run-ups are required for various aircraft maintenance operations. Engine maintenance run-ups may be restricted by airport operators. These restrictions, when they apply to run-ups as a separate function from the takeoff and landing of the aircraft, do not appear to need special FAA review or approval under 14 CFR Part 161. (See *Airport Noise Report*, Vol. 6, No. 18, September 26, 1994, p. 142.) They are, nevertheless, subject to other legal and constitutional limitations on unjust discrimination, undue interference with interstate commerce, or conflict with FAA grant assurances. As previously discussed, noise impacts due to aircraft maintenance run-up operations occur on office buildings and could be mitigated through the installation of a relocated run-up pad or enclosure. If constructed, it will be essential to establish policies for the use of that facility.

- EVALUATION

Scottsdale Airport only permits aircraft maintenance run-ups at the blast fence north of Kilo ramp (adjacent to Runway 21). The airport has established policies prohibiting run-up operations between 10:00 p.m. and before 7:00 a.m.

- CONCLUSION

Aircraft operational and maintenance run-ups are a necessary part of operations at Scottsdale Airport. The airport has established policies prohibiting run-up operations between 10:00 p.m. and before 7:00 a.m. The implementation of additional restrictions that would significantly curtail aircraft run-ups would hinder airport operators, safety, and would likely facilitate litigation. The additional mitigation of run-up noise would best be addressed through adjusting the current run-up locations or utilization of a run-up enclosure such as a "hush-house" or run-up pen.

## *SELECTION OF MEASURES FOR DETAILED EVALUATION*

Preliminary screening of the complete list of noise abatement techniques indicated that some measures may be potentially effective in the Scottsdale Airport area. These are evaluated in detail in this section.

### EVALUATION CRITERIA

Two operational alternatives have been selected for detailed analysis. The noise analysis for each alternative was based on the 2009 baseline analysis presented in Chapter Four, "Aviation Noise Impacts." The 2009 baseline was chosen to offer a common base of comparison for all alternatives. This timeframe allows time for FAA review and approval of the final Noise Compatibility Program (NCP) and any environmental assessments which may be required prior to implementation of the procedures. The alternatives are evaluated using the following criteria.

**Noise Effects.** The purpose of this evaluation is to reduce aircraft noise on people. A reduction in noise impacts, if any, over noise-sensitive areas are assessed.

**Operational Issues.** The effects of the alternative on the operation of aircraft, the airport, and local airspace are considered. Potential airspace conflicts and air traffic control (ATC) constraints are discussed, and the means by which they could be resolved are evaluated. Potential impacts on operating safety are also addressed. FAA regulations and procedures will not permit aircraft operation and pilot workload to be handled other than in a safe manner, but within this limitation differences in safety margins occur. A significant reduction in safety margins will render an abatement procedure unacceptable.

**Air Service Factors.** These factors relate to a decline in the quality of air transportation service which would be expected from adoption of an abatement measure. Declines could possibly result from lowered capacity or rescheduling requirements.

**Costs.** Both the cost of operating aircraft to comply with the noise abatement measure and the cost of construction or operation of noise abatement facilities are considered. Estimated capital costs of implementing the noise abatement alternative, where relevant, are also presented.

**Environmental Issues.** Environmental factors related to noise are of primary concern in a 14 CFR Part 150 Update analysis. Procedures that involve a change in air traffic control procedures or increase noise over residential areas may require separate environmental evaluation and possibly National Environmental Policy Act (NEPA) documentation.

**Implementation Factors.** The agency responsible for implementing the noise abatement procedure is identified. Any difficulties in implementing the procedure are discussed. This is based on the extent to which it departs from accepted standard operating procedures; the need for changes in FAA procedures, regulations, or criteria; the need for changes in airport administrative procedures; and the likelihood of community acceptance.

Upon completion of a review of each measure based on the above criteria, an assessment of the feasibility of each measure and the strategies required for its implementation are presented. At the end of the section, a summary comparison of the noise impacts of each alternative is presented. Recommendations as to alternatives which deserve additional consideration are presented.

## ALTERNATIVE 1 - EVALUATE WIND DIRECTED RUNWAY USE PROGRAM FOR NOISE ABATEMENT

### Goals

This alternative seeks to test the effectiveness of the airport's current calm wind runway use program. This program currently operates with 55 percent of aircraft operations using Runway 3 (departing to the northeast) and 45 percent of aircraft operations using Runway 21 (departing to the southwest). This alternative would seek to test the continued effectiveness of the current calm wind runway use program by implementing a wind directed runway use program.

## Procedure

Based on average annual wind data, Runway 3 would be favored 47 percent of the time if winds were evenly split between Runways 3 and 21. This is an adjustment from the current runway use split, with 55 percent of aircraft operating from Runway 3 and 45 percent from Runway 21.

For noise modeling purposes, the 2009 baseline input was modified to reflect the wind directed runway use percentages.

## Noise Effects

The noise contours presented in **Exhibit 5H** illustrate the effects of this procedure. Northeast of the airport, the 55, 60 and 65 DNL noise contours all increase relative to the 2009 baseline contours. To the southwest, the 55, 60, and 65 DNL noise contours extend slightly.

**Table 5B** presents the population impacts for this alternative. This alternative impacts an additional 467 people above the baseline condition. Approximately 618 additional people are brought into noise levels in the 55 DNL south of the airport, particularly areas of dense single-family residential, located west of Scottsdale Road. The level-weighted population (LWP), an estimate of the number of people actually annoyed by noise, increases from 512 to 558, a net change of 46 with the implementation of a wind-directed runway use program.

A breakdown of the increase or decrease in population from the 2009 baseline and Alternative 1 noise contours is presented in **Table 5C**. Alternative 1 presents a much higher impact on the existing population than on the future potential population. Approximately 572 people have more noise during the existing land use conditions with the use of this alternative. Given the potential for future development, the implementation of Alternative 1 would impact a total of 105 fewer individuals than the 2009 baseline operations. This is because much of the area that could be developed with noise-sensitive land uses is located in areas impacted by the 2009 baseline noise contours north of the airport.

A grid point analysis was performed to provide a direct comparison of the predicted average daily DNL values for Alternative 1 and the 2009 baseline. In addition, this analysis provides predicted DNL noise exposure levels for areas outside the 65 DNL noise contour. As seen on **Table 5D** and **Exhibit 5H**, grid points 1, 7, 11, and 12, located north of the airport, all indicate slight decreases in aircraft noise of 0.1 to 0.5 DNL. Grid points located south and west of the airport (2, 3, 4, 5, 6, 8, and 9) all indicate increases of between 0.1 and 0.5 DNL. The grid point locations in and around the study area are depicted on **Exhibit 5H.**

**TABLE 5B**
**Population Impacted by Noise**
**Alternative 1 - Evaluate Wind Directed Runway Use for Noise Abatement**

| DNL Range | 2009 Baseline | Alternative 1 | Net Change |
|---|---|---|---|
| **Existing Population** | | | |
| 55-60 | 2,921 | 3,539 | 618 |
| 60-65 | 292 | 246 | -46 |
| 65-70 | 0 | 0 | 0 |
| 70-75 | 0 | 0 | 0 |
| 75+ | 0 | 0 | 0 |
| Subtotal | 3,213 | 3,785 | 572 |
| **Potential Population**[1] | | | |
| 55-60 | 1,311 | 1,206 | -105 |
| 60-65 | 0 | 0 | 0 |
| 65-70 | 0 | 0 | 0 |
| 70-75 | 0 | 0 | 0 |
| 75+ | 0 | 0 | 0 |
| Subtotal | 1,311 | 1,206 | -105 |
| Total | 4,524 | 4,991 | 467 |
| LWP | 512 | 558 | 46 |
| **Noise-Sensitive Institutions** | | | |
| Places of Worship | 3 | 4 | 1 |
| Medical Facilities | 3 | 3 | 0 |
| Schools | 1 | 2 | 1 |
| Other (Libraries, Museums, Community Centers, Hospitals, Nursing Homes) | 1 | 1 | 0 |
| Total Noise-Sensitive Institutions | 8 | 10 | 2 |
| Total Historic Resources | 0 | 0 | 0 |

Notes: 1. Based on additional potential new dwelling units in 2009, reflecting current land use plans and zoning.
LWP – level-weighted population – is an estimate of the number of people actually annoyed by aircraft noise. It is computed by multiplying the population in each DNL range by the appropriate LWP response factor: 55-60 DNL = 0.107; 60-65 DNL = 0.205; 65-70 DNL = 0.376; 70-75DNL = 0.644; 75+ DNL = 1.000. See the **Technical Information Paper, *Measuring the Impact of Noise on People***, at the back of the *Noise Exposure Maps* document.

| TABLE 5C<br>Population Increase or Decrease with Alternative 1 | | | | | | |
|---|---|---|---|---|---|---|
| 2009 vs. Alt. 1 | 55-60 | 60-65 | 65-70 | 70-75 | 75+ | Net Impact |
| Existing Land Use | 618 | -46 | 0 | 0 | 0 | 572 |
| Future Potential Land Use | -105 | 0 | 0 | 0 | 0 | -105 |
| Totals | 513 | -46 | 0 | 0 | 0 | 467 |

| TABLE 5D<br>Grid Point Comparison<br>Alternative 1 | | | |
|---|---|---|---|
| | 2009 NOISE LEVELS (DNL) | | |
| Grid Point | 2009 Baseline | Alternative 1 | Difference |
| 1 | 50.6 | 50.2 | -0.4 |
| 2 | 51.4 | 51.5 | 0.1 |
| 3 | 42.0 | 42.2 | 0.2 |
| 4 | 49.5 | 49.6 | 0.1 |
| 5 | 54.9 | 55.4 | 0.5 |
| 6 | 48.9 | 49.1 | 0.2 |
| 7 | 57.3 | 56.8 | -0.5 |
| 8 | 55.5 | 56.0 | 0.5 |
| 9 | 47.8 | 47.9 | 0.1 |
| 10 | 44.9 | 44.9 | 0.0 |
| 11 | 47.7 | 47.1 | 0.6 |
| 12 | 37.6 | 37.5 | -0.1 |
| Source: Coffman Associates analysis. | | | |

## Operational Issues

Pilots have the ultimate decision of which direction to approach or depart an airport. At times, pilots with southern destinations will request to depart south even when the airport is in a northern flow. Pilots deciding to use a runway that is not being utilized by the wind-directed runway program may incur significant delays awaiting the runway of their choice due to traffic separation. Pilots conforming to the directional flow may incur a minimal increase in flight times and operational costs since they are departing or arriving to a runway that is the opposite of their direction of travel.

## Air Service Factors

Some delays are anticipated for some aircraft as they circle to use the runway in conformance with the program.

## Costs

A slight increase in taxi and flight times may occur as aircraft would occasionally be directed to a runway opposite their destination/point of origin and/or a runway further from their assigned gate. There would be no other costs to the airport, FAA, or other airport users.

## Environmental Issues

Since this alternative exposes residential areas to new and/or increased levels of aircraft noise, a preliminary environmental review will be required prior to implementation. Based on the results of the preliminary environmental review, the FAA will determine the level of environmental analysis needed pursuant to the National Environmental Policy Act of 1969 and its implementing regulations.

## Implementation

This procedure would primarily be implemented by ATCT. A Tower Order would describe the direction runway use program and the runway assignments to be issued by controllers. Information regarding the procedure could also be published in a Notice to Airmen (NOTAM).

Implementation of noise abatement measures are subject to additional operational, feasibility, and environmental review by the FAA.

## Conclusion

This procedure places a number of additional individuals within the aircraft noise contours when compared to the existing calm wind runway use policy. It is the policy of the FAA not to approve alternatives that either shift noise from one group to another or impact additional individuals. These impacts would have to be mitigated in order to implement this alternative. Based upon the analysis above, continued use of the airport's current calm wind runway use program appears to be a better alternative.

# ALTERNATIVE 2 - RUNWAY 21 VISUAL APPROACH FOR NOISE ABATEMENT

## Goals

This alternative seeks to reduce overflights of noise-sensitive areas north of the airport by aircraft approaching Runway 21 from the north and west. This VFR procedure would direct aircraft to follow the Loop 101 (Pima Highway) before turning on final approach to Runway 21. By adjusting this portion of this VFR approach, aircraft can utilize the existing corridor of vacant land located north of the airport.

This VFR approach allows for a one nautical mile final. High performance aircraft (turboprop and business jet aircraft) generally require a two-to-three nautical mile final. Therefore, this procedure would be limited to piston propeller aircraft that weigh less than 12,500 pounds.

## Procedure

This procedure is for use by aircraft approaching to land on Runway 21 under VFR conditions. Aircraft approaching from the north or west would proceed along the Loop 101 until turning on final approach to Runway 21. This visual approach allows for a one nautical mile final. High performance aircraft (turboprop and business jet aircraft) generally require a two-to-three nautical mile final. Therefore, this procedure would be limited to piston propeller aircraft that weigh less than 12,500 pounds. This procedure would also be restricted for daytime use only for safety reasons.

For noise modeling purposes, the 2009 baseline input was modified to reflect moving aircraft from the original approach configuration to the alternative designated segment.

### Noise Effects

The noise contours presented in **Exhibit 5J** illustrate the effects of this procedure. Northeast of the airport, the 55 and 60 DNL noise contours both increase slightly relative to the 2009 baseline contours. There are no changes to the noise exposure contours to the south and southwest.

**Table 5E** presents the population impacts for this alternative. This alternative impacts 401 more people above the 2009 baseline condition. Additional multi-family homes south of Bell Road are brought into noise levels at between the 55 and 60 DNL noise contour north of the airport. This alternative does not change population impacts above 60 DNL. An additional medical facility is also added to the 55 DNL noise contour. The level-weighted population (LWP), an estimate of the number of people actually annoyed by noise, increases from 512 to 555, a net change of 43 with the implementation VFR approach procedure.

A breakdown of the increase or decrease in population from the 2009 baseline and Alternative 2 noise contours is presented in **Table 5F**. Alternative 2 presents a much higher impact on the existing population than on the future potential population. Approximately 230 people have more noise during the existing land use conditions with the use of this alternative. Given the potential for future development, the implementation of Alternative 2 would impact a total of 171 more individuals than the 2009 baseline operations. This is because much of the area that could be developed with noise-sensitive land uses is located north of the airport.

A grid point analysis was performed to provide a direct comparison of the predicted average daily DNL values for Alternative 2 and the 2009 baseline. As seen on **Table 5G** and **Exhibit 5J**, grid points 1, 4, and 11 located north and northeast of the airport all indicate increases in aircraft noise of 0.1 to 0.2 DNL. The Grid point located northwest of the airport near Scottsdale Road (11) increased by 0.1 DNL. The grid point locations in and around the study area are depicted on **Exhibit 5J.**

### Operational Issues

This procedure should have no effect on airport operations since the adjustment to the approach flight track segment is minimal.

**TABLE 5E**
**Population Impacted by Noise**
**Alternative 2 – Runway 21 Visual Approach for Noise Abatement**

| DNL Range | 2009 Baseline | Alternative 2 | Net Change |
|---|---|---|---|
| **Existing Population** | | | |
| 55-60 | 2,921 | 3,151 | 230 |
| 60-65 | 292 | 292 | 0 |
| 65-70 | 0 | 0 | 0 |
| 70-75 | 0 | 0 | 0 |
| 75+ | 0 | 0 | 0 |
| Subtotal | 3,213 | 3,443 | 230 |
| **Potential Population**[1] | | | |
| 55-60 | 1,311 | 1,482 | 171 |
| 60-65 | 0 | 0 | 0 |
| 65-70 | 0 | 0 | 0 |
| 70-75 | 0 | 0 | 0 |
| 75+ | 0 | 0 | 0 |
| Subtotal | 1,311 | 1,482 | 171 |
| Total | 4,524 | 4,925 | 401 |
| LWP | 512 | 555 | 43 |
| **Noise-Sensitive Institutions** | | | |
| Places of Worship | 3 | 3 | 0 |
| Medical Facilities | 3 | 3 | 0 |
| Schools | 1 | 2 | 1 |
| Other (Libraries, Museums, Community Centers, Hospitals, Nursing Homes) | 1 | 1 | 0 |
| Total Noise-Sensitive Institutions | 8 | 9 | 1 |
| Total Historic Resources | 0 | 0 | 0 |

Notes: 1. Based on additional potential new dwelling units in 2009 reflecting current land use plans and zoning.
LWP – level-weighted population – is an estimate of the number of people actually annoyed by aircraft noise. It is computed by multiplying the population in each DNL range by the appropriate LWP response factor: 55-60 DNL = 0.107; 60-65 DNL = 0.205; 65-70 DNL = 0.376; 70-75DNL = 0.644; 75+ DNL = 1.000. See the **Technical Information Paper, *Measuring the Impact of Noise on People***, at the back of the *Noise Exposure Maps* document.

| TABLE 5F<br>Population Increase or Decrease with Alternative 2 | | | | | | |
|---|---|---|---|---|---|---|
| 2009 vs. Alt. 2 | 55-60 | 60-65 | 65-70 | 70-75 | 75+ | Net Impact |
| Existing Land Use | 230 | 0 | 0 | 0 | 0 | 230 |
| Future Potential Land Use | 171 | 0 | 0 | 0 | 0 | 171 |
| Totals | 401 | 0 | 0 | 0 | 0 | 401 |

| TABLE 5G<br>Grid Point Comparison<br>Alternative 2 | | | |
|---|---|---|---|
| | 2009 NOISE LEVELS (DNL) | | |
| Grid Point | 2009 Baseline | Alternative 2 | Difference |
| 1 | 50.6 | 50.5 | -0.1 |
| 2 | 51.4 | 51.4 | 0.0 |
| 3 | 42.0 | 42.0 | 0.0 |
| 4 | 49.5 | 49.3 | -0.2 |
| 5 | 54.9 | 54.9 | 0.0 |
| 6 | 48.9 | 48.9 | 0.0 |
| 7 | 57.3 | 57.3 | 0.0 |
| 8 | 55.5 | 55.5 | 0.0 |
| 9 | 47.8 | 47.8 | 0.0 |
| 10 | 44.9 | 44.9 | 0.0 |
| 11 | 47.7 | 47.8 | 0.1 |
| 12 | 37.6 | 37.4 | -0.2 |
| Source: Coffman Associates Analysis | | | |

## Air Service Factors

No negative air service factors are anticipated with the use of this alternative.

## Costs

A preliminary environmental review and documentation will be required. This is anticipated to be approximately $10,000.

## Environmental Issues

Based on the results of the preliminary environmental review, the FAA will determine the level of environmental analysis needed pursuant to the National Environmental Policy Act of 1969 and its implementing regulations.

## Implementation

This procedure would primarily be implemented by establishing a visual approach plate after radar flight track information is made available to the ground in the Scottsdale Area. This is to be in the Summer of 2006. Information regarding the procedure could also be published in a Notice to Airmen (NOTAM). Implementation of noise abatement measures are subject to additional operational, feasibility, and environmental review by the FAA.

#### Conclusion

While this alternative would reduce single-event overflights on residential areas north of the Loop 101, this procedure would increase noise on both the existing and potential future populations to noise exposure between 55 and 60 DNL. Given the lack of noise reduction benefits, this alternative should not be considered for implementation.

### ADDITONAL CONSIDERATIONS

During the public process, residents from the Cave Creek/Carefree area expressed concern over low aircraft overflights in their community. This issue was discussed during the Noise Abatement Technical Conference held April 1, 2004. A potential solution to this issue is to make pilots aware of the Cave Creek and Carefree communities by depicting them as areas of concentrated population on the Phoenix Sectional Aeronautical Chart. This would have the added benefit of requiring aircraft to fly higher over these communities. 14 CFR Part 91 outlines general aircraft operation and flight rules. Section 91.119 states that an aircraft flying over areas that are not congested may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. However, Section 91.119 also states that for aircraft flying over any congested area of a city, town, or settlement, an altitude of 1,000 feet is required above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft. Pursuing a change in the Phoenix Sectional Aeronautical Chart depicting Cave Creek and Carefree as areas of concentrated population (depicted in yellow on chart) deserves further consideration.

## *SUMMARY*

This chapter has analyzed the range of potential noise abatement techniques for use at Scottsdale Airport. The alternatives for additional consideration are listed in **Table 5H**. The results of this analysis must be reviewed by the Technical Advisory Team (TAT) and the general public before final recommendations can be made. Final recommendations will be presented in Chapter Seven, the Noise Compatibility Plan.

| TABLE 5H<br>Summary Of Noise Abatement Techniques Deserving Further Consideration | | |
|---|---|---|
| **Noise Abatement Technique** | **Status** | **Cost** |
| 1. Continue informal preferential use of Runway 3. | Ongoing | None |
| 2. Encouragement of aircraft not in compliance with Part 36, Stage 3 to use Runway 21 for landings and Runway 3 for takeoffs | Ongoing | None |
| 3. Continue to discourage right departure turns from Runway 3 prior to reaching the airport boundary, to limit low overflights of residential areas to the east. | Ongoing | None |
| 4. Continue to encourage right turns as soon as practical and discourage straight-out and left turns on departure from Runway 21, to limit overflights of concentrated noise-sensitive land uses to the south and southeast. | Ongoing | None |
| 5. Encourage published approach patterns to Runway 21 should be continued because of the proximity of noise-sensitive land uses to the south and southeast of the airport. | Ongoing | None |
| 6. Charting VFR procedures could be pursued for Scottsdale Airport to provide pilots with minimum safe flying altitudes when on approach to the Scottsdale Airport in order to reduce the potential of low overflights. | New | Administrative |
| 7. Continue to prohibit intersection and midfield takeoffs. | Ongoing | None |
| 8. Continue to discourage descents below 2,500 feet MSL for practice instrument approaches. | Ongoing | None |
| 9. Based upon the cost of attenuating the run-up noise related impacts within the 65 DNL noise exposure contour, a run-up enclosure is a viable alternative and should be considered further. | New | $900,000 |
| 10. Continue to encourage NBAA standard or manufacturers comparable noise abatement procedures. | Ongoing | None |
| 11. Continue to prohibit touch-and-go's between 9:30 p.m. and 6:00 a.m. | Ongoing | None |
| 12. Continue policies prohibiting run-up operations between 10:00 p.m. and before 7:00 a.m. | Ongoing | None |
| 13. Pursuing a change in the Phoenix Sectional Aeronautical Chart depicting Cave Creek and Carefree as populated places (depicted in yellow on chart) | Ongoing | None |
| 14. Continue to encourage use of AOPA Noise Awareness Steps by light single-engine aircraft. | Ongoing | None |
| 15. Continue to prohibit touch-and-go operations, intersection takeoffs, formations and simulated single-engine takeoffs, and training go-arounds by military aircraft. | Ongoing | None |