Chapter Four
NOISE ABATEMENT ALTERNATIVES

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 outline the framework needed to assure a coordinated approach to tackling the difficult task of aircraft noise abatement and mitigation of aircraft noise impacts. Responsibilities are shared among the airport users, aircraft manufacturers, airport proprietors, federal, state, and local governments, and residents of communities near the airport. The following is a brief outline of each participant's unique role and responsibility in this effort.

- The federal government has the authority and responsibility to control aircraft noise sources, implement and enforce flight operational procedures, and manage the air traffic control system.

- The aircraft manufacturers have the responsibility for incorporating quiet engine technology into new aircraft designs in order to meet federal noise standards.

- Airport proprietors are responsible for planning and implementing airport development actions designed to reduce noise. These include noise abatement ground procedures and improvements in airport design. These may also involve restrictions on airport use 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 government and planning agencies have the responsibility for providing land use planning, zoning, and housing regulation that will encourage development or redevelopment of land that is compatible with present and projected airport operations.

- General aviation operators have the responsibility to use proper aircraft maintenance and good neighbor flying techniques to minimize their noise output.

- Air travelers and shippers generally should bear the cost of noise reduction, consistent with 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 and prospective residents in 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 noise should be aware of the effect of noise on their quality of life and make their locational decisions with that in mind.

The development of a noise abatement program has three primary objectives:

1. To reduce the noise in the study area, within practical cost constraints.

2. To minimize, where practical, the exposure of the local population to noise events of very high levels. These high levels, which are often manifested by single event noise levels outside of the DNL contours, can be an annoyance to airport neighbors and warrant attention.

3. To insure maximum compatibility of existing and future land uses with noise generated by aircraft using the airport.

This chapter is concerned with measures which would alter the use or configuration of air space, flight tracks, and airport facilities so as to reduce or shift the location of noise. These potential measures are listed in **Exhibit 4A**. The techniques tend to either reduce the overall size of the noise contours or to move the noise to other areas.

To reduce the overall noise levels around the airport, it is necessary to reduce the total sound energy emitted by the aircraft. This can be accomplished through either the modification of aircraft operating procedures or the imposition of restrictions on the number or type of aircraft allowed to operate at the airport. Special aircraft operating procedures are often difficult to implement and enforce as they can erode aircraft operational safety margins. Airport operating restrictions are also difficult to implement given the formidable analytical requirements of F.A.R. Part 161 and the need to avoid conflicts with FAA grant assurances and the constitutional bans on unjust discrimination and undue interference with interstate commerce.

Consequently, it is often more effective and less disruptive to try to move the noise to areas that are either compatible or contain a minimum of noise-sensitive areas. This opportunity is usually realized through runway use and flight routing techniques or airport facility development.

The subsequent sections of this chapter will review and evaluate a variety of potential noise abatement techniques. In order to judge the effectiveness and appropriateness of a particular technique, it is important to consider the magnitude of the noise impacts around the Williams Gateway Airport.

Chapter Three of the Noise Exposure Maps document evaluated the impact of noise on the population around the airport. Based on the current conditions, 94 persons are exposed to aircraft noise above 60 DNL. No one is exposed to aircraft noise above 65 DNL or greater. In the future, the population exposed to noise is expected to increase. This is partially due to anticipated increases in operations at Williams Gateway Airport, and partially to the residential growth potential around the airport. When considering this future growth, the population exposed to noise above 60 DNL could increase to as many as 10,608 persons in the year 2004. As many as 2,758 of these individuals would be impacted at the significant noise levels of 65 DNL and higher. These increases are largely due to the potential for residential growth around the airport, as the five-year noise contours are only slightly larger than the current contours. In 2020, due to a shifting of large aircraft operations to Runway 12L/30R, the number of persons affected by noise above 60 DNL decreases to 8,726, however the number of persons exposed to noise above 65 DNL increases to 2,833.

The FAA is most concerned with noise impacts at the 65 DNL level and higher in evaluating the acceptability of any proposed noise abatement measures. The FAA only considers the current and five-year noise contours when evaluating noise abatement recommendations.

The current noise exposure around Williams Gateway Airport indicates a need for concern and proper planning. Although no one is currently impacted by noise above 65 DNL, the five-year forecast shows the potential for a significant number of individuals that could be impacted by high levels of aircraft noise.

POTENTIAL NOISE ABATEMENT MEASURES

A variety of measures for noise abatement merit investigation and should be reviewed for possible application at Williams Gateway Airport. As part of the analysis leading to the preparation of this chapter, the consultant held a technical conference to brainstorm potential noise abatement measures and troubleshoot preliminary ideas identified by the Consultant. The conference was on November 17, 1999. Those attending the conference included aviation professionals responsible for the administration, control, and operation of aircraft and facilities at the airport. They included professional pilots, representatives of airlines and flight departments of companies using the airport, air traffic controllers, representatives from aviation organizations, and airport admini-strators. The insights from this discussion have been incorporated into the subsequent alternatives analysis.

This discussion provides a comprehensive evaluation of all reasonable noise abatement techniques which deserve consideration. The extent to which these measures might apply at Williams Gateway depends on the probable noise reduction over developed or developing areas, the extent to which the measures would likely compromise safety margins and the ability of the airport to perform its intended function, and their apparent ability to be implemented considering the legal, political and financial climate of the area.

If a measure fails to be viable for one of the above reasons, its inclusion in a final program at Williams Gateway would not be warranted.

All analyses of noise abatement alternatives are conducted for the year 2004 to provide a consistency of evaluation and a look at the worst case future conditions within the FAA's five-year planning scope for a Part 150 document.

Noise abatement measures considered in this study are procedures which have the potential to reduce the noise exposure for persons living in the airport environs. The evaluation of most of these alternatives is required under F.A.R. Part 150, even though they may have little utility for local application. These measures fall into four categories:

- Runway Use and Flight Routing
- Airport Regulations
- Aircraft Operating Procedures
- Airport Facilities Development

Measures in the first three categories generally may be implemented within a relatively short period of time, while those in the last category usually require a longer time to implement due to environmental assessment and construction activities.

RUNWAY USE AND FLIGHT ROUTING

The pattern of land use around the airport provides clues to the design of arrival and departure patterns for noise abatement. By redirecting air traffic over areas with more compatible land uses, noise effects may often be significantly reduced.

Williams Gateway Airport is surrounded by residential and other noise-sensitive development to the north, west, and south. Additional residential and noise-sensitive development is proposed on nearly all sides of the airport including significant in-fill development north, west and south 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: informal and formal. A formal program must be defined and acknowledged in a Letter of Understanding 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 Letter of Understanding. 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.

Currently Williams Gateway Airport utilizes an informal preferential runway use program that designates Runways 30 L/C/R as the calm wind runways. The airport operates in a northwest flow configuration approximatley70 percent of the time. This program allows lower and slower approaching aircraft arrive over less concentrated noise-sensitive areas southeast of the airport. However, this configuration does cause aircraft to depart in the direction of large concentrations of noise-sensitive land uses northwest of the airport.

Conclusion: The current informal preferential calm wind runway program reduces the number of approaching aircraft over residential and noise-sensitive areas northwest of the airport. However, the effectiveness of this program in reducing overall noise impacts versus informally designating Runways 12 L/C/R as the calm wind runways should be analyzed.

Aircraft approaching the airport for landing are confined over a narrower corridor as they line up on the runway. This causes the concentration of aircraft overflights on finite areas in line with the runway centerline. Departing aircraft however, establish a pattern of irregular flight tracks after takeoff due to their varied destinations. Although aircraft departure noise is often seen as the more disruptive, the effects and overall impacts are less concentrated.

Williams Gateway Airport also uses a program by which heavy and turbojet aircraft are kept on the eastern two runways (Runways 12C/L and 30C/R) whenever possible. Runway 12R/30L is primarily reserved for light piston powered aircraft. This configuration of runway use provides relief from aircraft arrival and departure noise for noise-sensitive areas west of the airport including the Williams Campus. In addition, Runway 12C/30C is the only runway offering instrument approaches and is therefore often used by jet aircraft operating under IFR or conducting instrument flight training. Runway 12L/30R is the best use option for large aircraft since it possesses the greatest runway load bearing strength of all three runways.

The use of the eastern two runways for louder aircraft will aid in distancing these aircraft operations from the greater concentration of noise-sensitive development west of the airport. The use of Runway 12C/30C and 12L/30R by large aircraft should be continued and does not require additional evaluation.

Departure Turns

The turning of departing aircraft to avoid populated areas is an accepted method of noise abatement which has been implemented in numerous areas. At Williams Gateway Airport, with noise-sensitive development areas located to the north, west, and south, noise abatement departure turns away from populated areas might be beneficial for noise impact reduction.

In order for any flight routing procedures to be effective at reducing noise impacts, there must be a noise compatible corridor for aircraft to fly over. While conditions that constitute noise compatibility vary, generally an area with little or no noise-sensitive development can be used as an effective overflight corridor. The value of such a corridor largely depends on three factors: (1) the likelihood of future noise-sensitive development; (2) the size of the corridor ; and (3) the location of the corridor relative to the airport.

Williams Gateway is fortunate to have areas of undeveloped land immediately northeast, east, and southeast of the airport. In addition, a new freeway is planned north of the airport. These areas hold potential as overflight corridors since they contain minimal amounts of noise-sensitive development.

A set of power lines traverse east-west approximately three miles north of the airport. The area between the power lines and the airport has remained relatively free from dense residential development and is largely undeveloped or agricultural. This area continues into an area east of the airport containing the General Motors Proving Grounds and a largely undeveloped area of rural Pinal County. Although there is a small amount of noise-sensitive development between the proving grounds and Pinal County, this area may be viable as a noise abatement corridor for eastern and southern departures turning east from the airport.

The area southeast of the airport currently contains a significant amount of agricultural land in addition to some industrial and commercial development. Development pressure has foreseen the possibility for future nodes of residential development in this area. However, this area still holds promise as a viable noise abatement corridor.

Currently, Williams Gateway Airport utilizes many of these aforementioned noise abatement corridors as part of an informal noise abatement program. As part of this program, heavy aircraft (greater than 12,500 lbs.) departing Runways 30C/R are requested to turn right prior to the power lines ½mile north of Elliot Road. This procedure helps prevent overflights of residential and noise-sensitive areas north of the airport by departing aircraft. KC-135 aircraft from the Arizona Air National Guard 161st Air Refueling Wing have successfully used this departure turn procedure to remain south of residential areas.

While smaller jet and most military aircraft are able to complete requested departure turns prior to overflights of noise-sensitive areas, large transport category aircraft are unable to turn steep enough. The excessive angle between the runways and the present noise compatible corridors would require turns in excess of 150-degrees and the use of steep bank angles. In addition, typical airline departure policy limits turns in excess of 120-degrees and bank angles in excess of 15-degrees until the aircraft is in a "clean" configuration (landing gear and flaps retracted). Therefore, departure turns needed to avoid noise-sensitive areas north and northeast of the airport would often exceed FAA standards or airline policy.

The location of Williams Gateway Airport in relation to the Phoenix Class B airspace limits the area in which unrestricted VFR flights can operate. Class B airspace is designed to regulate the flow of uncontrolled traffic above, below, and around the arrival and departure airspace used by passenger aircraft at major airports. The Class B airspace surrounding Williams Gateway has a ceiling of 5,000 feet MSL (Mean Sea Level) over the airport and steps down to 4,000 feet MSL less than two miles northwest of the airport. This configuration greatly restricts departures to the northwest. A chart depicting the airspace around Williams Gateway is depicted on Exhibit 1E, following page 1-14, in Chapter One of the Nose Exposure Maps document.

Conclusion: Areas containing limited amounts of noise-sensitive development located north, east, and southeast of the airport could prove valuable as potential noise abatement corridors. The current informal procedure requesting departing aircraft on Runways 30C/R to follow a portion of this corridor should reduce the number of overflights north of the airport. Given the limited distance between the airport and noise-sensitive areas north of the airport, some larger commercial aircraft will be unable to comply with northeast departure turns due to aircraft operating limitations. Informal letters of agreement between specific aircraft operators such as the Arizona Air National Guard 161st Air Refueling Wing and the air traffic control tower could be an effective method for establishing this noise abatement procedure.

Given the relatively large amount of undeveloped land southeast of the airport, the establishment of an informal nose abatement procedure for aircraft departing Runways 12C/L should also be evaluated. This would help reduce overflights, hence noise impacts, of current noise-sensitive development south of the airport. Such a procedure is discussed later in this chapter and merits further study.

Visual Approach Procedures

Approaches involving turns relatively close to the airport can sometimes be defined over noise-compatible corridors. These approaches would be used by aircraft operating under VFR (visual flight rules). In designing special noise abatement approach routes, a straight-in final approach of at least one mile should be provided. If large and fast aircraft are involved, a longer straight-in final approach of two to three miles is required.

At Williams Gateway, the dense residential development north and northwest of the airport provides no viable noise abatement corridor long enough for a stable two or three mile final approach. Although the primary areas of residential development north of the airport are approximately three miles from the runway threshold, the relative angle of Runways 12 L/C/R to these developed areas would require aircraft to turn steeply in order to establish a final approach. This type of maneuver is not practical from an operational or safety perspective.

Approaches made from the southeast would affect less noise-sensitive development. The closest concentration of residential development is nearly five miles from the threshold of Runways 30C/R and three miles from Runway 30L. This provides more opportunity for straight-in visual final approaches without affecting large areas of noise-sensitive development.

Although not a major source of noise at Williams Gateway, several helicopters are based at the airport in addition to occasional itinerant operations. Currently, rotor wing aircraft are requested to approach/depart in a southwest corridor to avoid overflight of the Williams Campus and residential development. A number of additional potential noise abatement corridors exist for helicopters including the Roosevelt Canal, Southern Pacific Railroad, and the General Motors Proving Grounds. In addition, visual check points could be established to assist both pilots and the air traffic control tower in following noise abatement corridors.

Large military helicopters create large amounts of down-wash turbulence disturbing large amounts of dust. Therefore, these aircraft fly a straight-in visual approach to Runways 30L. Consideration should be given to maintaining this procedure. Potential helicopter arrival/departure routes with corresponding checkpoints are depicted on **Exhibit 4B.**

Conclusion: Visual approach procedures would provide little benefit for arrivals to Runways 12L/C due to the lack of a viable noise abatement corridor and therefore do not merit further study. A viable noise abatement corridor exists southeast of the airport and merits further study. In addition, a number of potential noise abatement corridors and corresponding checkpoints for rotor wing aircraft merits additional consideration.

Instrument Approach Procedures

Williams Gateway Airport has one precision and two non-precision approach procedures. All instrument approaches are designated for Runway 30C. The only precision approach, ILS Runway 30C, is straight-in with a 3.0 degree glide slope (realigned from 2.5-degrees in November 1999). The two non–precision approaches are also straight-in and utilize either the Willie very-high frequency omnidirectional range tactical air navigation (VOR/TAC) station or global positioning system (GPS) technology.

These approaches cause aircraft to arrive over or near current and proposed residential and non-compatible development areas southeast of the airport. Although these areas are situated between three and five miles from the runway thresholds, it may be beneficial to move arriving aircraft farther east, away from developed areas. This could be done through the relocation of instrument approaches to Runway 30R.

Conclusion: Relocating the ILS from Runway 30C to Runway 30R would be effective in moving aircraft approaches further east. This should reduce aircraft noise over non-compatible uses southeast of the airport and therefore deserves further study.

Traffic Pattern Changes

The current traffic pattern altitude is 1,213 feet above field level (AFL) for all fixed wing aircraft. This is 213 feet higher than a standard traffic pattern altitude (a standard traffic pattern altitude is 1,000 feet AFL). This additional altitude offers greater distance between aircraft and noise-sensitive development which may experience traffic pattern overflights.

Raising the traffic pattern altitude results in a larger pattern due to the increased distance needed to climb and descend form the designated altitude. The net result of raising the traffic pattern altitude would be to extend the pattern over noise-sensitive areas. Therefore increasing the traffic pattern altitude is not suggested.

Conclusion: Given that the traffic pattern altitude at Williams Gateway is higher than a standard traffic pattern altitude and raising the pattern altitude would increase the size of the traffic pattern, adjustment to the traffic pattern altitude at Williams Gateway need not be discussed further.

In order to reduce overflights of residential areas west of the airport aircraft using the western

Current noise abatement procedures have established Runway 12L-30R for use by light propeller powered aircraft performing pattern operations. So as not to conflict with operations on Runways 12C-30C and Runway 12L-30R, the light aircraft traffic pattern is flown to the west of the airfield. This pattern does not create aircraft overflights of current noise-sensitive areas other than the Williams Campus. The majority of noise-sensitive development is situated west of the Southern Pacific Rail Road, essentially paralleling the traffic pattern. Aircraft using the western traffic pattern could be requested to remain east of the Southern Pacific Railroad during the “downwind leg”, therefore avoiding residential overflights.

Heavy and turbojet aircraft primarily use the two eastern runways. A majority of large aircraft using Williams Gateway Airport are performing flight training operations requiring an instrument approach (ILS, VORTAC, or GPS). These are currently available for Runway 30C. As a means to establish these aircraft on subsequent approaches, they must fly an extended traffic pattern. Due to the large amount of undeveloped land east of the airport, these flights are routed in an eastern traffic pattern. Similar types of aircraft performing standard touch-and-go operations utilize a traffic pattern over the General Motors Proving Grounds. This pattern keeps the loudest aircraft away from high concentrations of noise-sensitive development west of the airport.

traffic pattern could be requested to remain east of the Southern Pacific Railroad during the “downwind leg”. This option deserves additional consideration.

The airport’s current procedure of establishing the heavy and turbojet aircraft traffic pattern east of the airport works well by keeping these aircraft away from populated areas west of the airport and should be maintained.

AIRPORT REGULATIONS

The courts traditionally have recognized the right of airport proprietors to reduce their liability for aircraft noise by imposing restrictions that are reasonable, nondiscriminatory, and do not interfere with interstate commerce or violate a contractual agreement with the FAA made as a condition of receiving federal aid.

With the passage of the Airport Noise and Capacity Act of 1990, Congress not only established a national phase-out policy for large Stage 2 aircraft over 75,000 pounds, but it also set forth the analytical requirements that must be met in order for an airport to establish noise or access restrictions on Stage 2 or Stage 3 aircraft beyond the national policy. Although the act does not require the phase-out of Stage 2 aircraft under 75,000 pounds it does specifically require special analysis for any measure that restricts these aircraft. The requirements that must be met by an individual airport to further restrict these aircraft are set forth in F.A.R. Part 161.

The actions required by F.A.R. Part 161 in order to establish a local restriction on Stage 2 aircraft include the following:

- The restriction does not conflict with any existing federal statute or regulation.

- The restriction does not create an undue burden on the national aviation system.

These requirements clearly indicate that restrictions on either Stage 2 or Stage 3 aircraft are considered as methods of last resort for noise abatement. The analytical requirements alone ensure that all other noise abatement alternatives should be exhausted before pursuing these types of restrictions. Since virtually any regulatory

- A technical analysis that evaluates costs and benefits of the proposed restriction, alternative restrictions, and alternative measures that do not include restrictions.

- Notice of the proposed restriction and 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 and notification have been conducted.

In order to establish a local restriction on Stage 3 aircraft, Part 161 requires a much more rigorous analysis as well as final FAA approval of the restriction. The conditions for approval of a Stage 3 restriction require that the analysis provide evidence of the following:

- The restriction is reasonable, nonarbitrary, and nondiscrim-inatory.

- The restriction does not create an undue burden on interstate or foreign commerce.

- The restriction maintains safe and efficient use of navigable airspace.

alternative at Williams Gateway Airport would result in limiting either Stage 2 or Stage 3 aircraft access, it is certain that the requirements in Part 161 would have to be met.

The relationship of F.A.R. Part 150 to Part 161 deserves some explanation. Part 150 specifically requires that airport operators discuss the potential use of operating restrictions for noise abatement purposes in noise compatibility studies. If, through the Part 150 process, an airport operator decides to pursue an airport operating restriction, the proper procedure is to describe it as a proposed noise abatement measure, noting that a Part 161 study would have to be undertaken before the restriction could be implemented. The FAA will then review the final noise compatibility plan, which includes the proposed restriction. If the FAA decides that adequate documentation is provided to show that the proposed restriction has merit, it may approve the proposed restriction for purposes of Part 150. A Part 150 approval is not sufficient to implement the restriction. It merely represents the clearing of the first hurdle. Completion of a Part 161 study then becomes the next step.

The FAA has made it clear that the approval of an operating restriction in an F.A.R. Part 150 document would be predicated on the noise abatement benefit of the restriction at noise levels of 65 DNL or higher. These benefits would have to be demonstrated for the current or five-year conditions that are officially required in the document. Since no persons are currently exposed to noise levels of 65 DNL or higher, and the significant number of individuals exposed in the five-year contours are due to encroaching development, not an increase in size or shifting of the contours, operating restrictions are unlikely to be approved by the FAA at Williams Gateway Airport.

Despite the extremely remote possibility that operating restrictions at Williams Gateway could be approved by the FAA, F.A.R. Part 150 requires that restrictions be discussed in noise compatibility studies. Types of operating restrictions include the following:

- Nighttime curfews.
- Landing fees based on noise or time of arrival.
- Airport capacity limitations based on relative loudness.
- Restriction of aircraft based on F.A.R. Part 36 noise levels.
- Restrictions on engine run-ups.
- Restrictions on training activity.

Curfews

FAA Advisory Circular 150/5020-1 indicates that curfews may be an effective though potentially costly method of controlling airport noise. Since unwanted noise intrusions are most pronounced in the late evening or early morning hours, curfews are usually implemented to restrict operations during those periods.

Curfews are not without costs. They can have economic impacts upon airport users, upon those providing airport-related services, and upon the community as a whole.

A blanket prohibition on air traffic during the noise-sensitive hours can place undue constraints on users of the airport who are not major contributors to the noise contours. Not only would the loudest operations be prohibited, but operations by quiet aircraft also would be banned.

Commercial airliners performing training are the predominate nighttime user of Williams Gateway Airport. The training operations of these aircraft are restricted to nighttime hours due to daytime scheduling conflicts of pilots and aircraft. Flight crew training is necessary to maintain the integrity of the national aviation system.

Conclusion: Noise impact reductions in the 65 DNL noise contour or higher would be the measure of acceptability by the FAA for this restriction. Given that there are no impacts within the 65 DNL contour and higher, approval of a restriction would be questionable. Therefore, this restriction should not be considered further.

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 arrivals 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.

While Williams Gateway does not impose landing fees on general aviation aircraft, it has established a hierarchal landing fee schedule based on weight, beginning with aircraft in excess of 12,500 pounds. The majority of these aircraft operate at night and are involved in airline training. The administration of additional landing fees based upon noise would be futile since these aircraft consist of quieter Stage3 jet aircraft. In addition, it would be difficult to monitor nighttime airport activity without nighttime air traffic control tower hours or the establishment of a permanent noise monitoring system.

Although the loudest aircraft utilizing Williams Gateway are military and other government aircraft, these aircraft are not assessed landing fees. Legally, the airport authority can only charge "reasonable" landing fees "proportional to use" to United States Government aircraft when aircraft operational levels exceed "substantial" levels. These fees are levied to offset "costs of operating and maintaining facilities" In addition, military aircraft only utilize Williams Gateway during daytime hours when noise levels have a less significant impact.

Conclusion: While aircraft in excess of 12,500 pounds are charged a landing fee, this fee is based on weight as apposed to noise levels. Since the majority of nighttime operations are done by quieter Stage 3 aircraft, landing fees based on noise would provide limited benefits. In addition, without a permanent noise monitoring system and nighttime air traffic control tower hours, a noise based landing fee would be difficult to administer. Landing fees imposed on military aircraft are limited to aircraft operational volume for the support of airport maintenance and operating costs, and are not slated to act as a deterrent or to finance noise abatement activities. Given these factors, and a lack of impacts within the 65 DNL contour, a differential landing fee schedule is unlikely to be implemented and therefore does not warrant further consideration.

Capacity Limitations

Capacity limits based on either total operations or the relative loudness of aircraft have been used by severely impacted airports as a method of controlling the total cumulative noise exposure. Since all operations at Williams Gateway are unscheduled, the airport could not enforce a capacity limit to control noise.

Conclusion: Given the impracticality of enforcing capacity limits due to unscheduled aircraft operations and the lack of impacts within the 65 DNL contour, capacity limits do not deserve further consideration at Williams Gateway.

Restrictions Based On F.A.R. Part 36

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 F.A.R. 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 F.A.R. Part 161. Any restrictions affecting Stage 3 aircraft would have to receive FAA approval.

Noise limits based on F.A.R. Part 36 certification levels have the virtue of being fixed national standards 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 the installation of noise monitoring equipment and extra administrative effort to design testing procedures, monitor tests, interpret monitoring data, and design the restrictions.

Conclusion: At Williams Gateway Airport, military aircraft only operate during hours when the airport's tower is operational, between the hours of 6 a.m. and 9 p.m. In addition, military aircraft are not subject to F.A.R. Part 36 and their operations can't be restricted per a condition in the airport's deed stating that the airport must "make available all facilities at the property or developed with Federal aid, and all those useable for the landing and taking off of aircraft, to the United States at all times." The majority of nighttime operations at the airport involve Stage-3 commercial aircraft. Restrictions on Stage-3 aircraft would require a F.A.R. Part 161 study and FAA approval. Restrictions of this type would certainly impede on Williams Gateway Airport's attempt to become a viable commercial and cargo service airport. Given the likelihood of FAA disapproval due to the lack of impacts within the 65 DNL contour, restrictions based on Part 36 will not be considered further.

Engine Run-up Restrictions

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

Although there are no large scale aircraft maintenance facilities at Williams Gateway, the Boeing Company performs aircraft systems modifications at two locations on the airfield. These modifications, primarily performed on the military T-38 aircraft and the large transport MD-10 aircraft, occasionally require engine run-ups. This activity is not prevalent enough to warrant restrictions on run-up activity. Currently, T-38 run-ups are performed outside Hanger 1084 on the southwest side of the airfield. MD-10 aircraft modifications are performed on the ramp area outside building 75 where reduced power run-ups are possible. Due to their large size and substantial jet blast, MD-10's are taxied to a runway where a full power run-up procedure is performed.

Conclusion: Maintenance run-up activity has not been prevalent at Williams Gateway and current run-up procedures have not generated a reason for concern. Thus, restrictions on run-ups are not warranted. Maintenance operations should make every effort to perform maintenance run-up activity away from noise-sensitive areas whenever possible.

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-goes are associated with primary pilot training, although this type of operation is also done by licensed pilots practicing approaches.

Touch-and-goes and multiple approaches are frequently done at Williams Gateway Airport. The majority of these operations, are performed by local light single or twin engine general aviation aircraft.

Williams Gateway is also used by the military and commercial airlines for training, usually involving touch-and-go operations. These aircraft are primarily based at other airports in the region and come to Williams Gateway for training purposes. Military aircraft only operate during hours when the airport's tower is operational. Due to scheduling constraints, commercial airline training flights are often performed at night.

Several flight schools are currently based at Williams Gateway. A prohibition on touch-and-go operations could negatively impact the viability of these schools. Touch-and-go operations are an integral part of student flight training. The prohibition of these operations might also have legal ramifications as it could conflict with the terms of local fixed base operator leases. Additionally, as stated earlier, a condition of the deed transferring the airport from the United States Government to the City of Mesa states that the airport must "make available all facilities at the property or developed with Federal aid, all those usable for the landing and taking off of aircraft, to the United States at all times". Therefore, the restriction of military aircraft operations is prohibited.

Conclusion: Given that no individuals are impacted within the 65 DNL contour, the FAA would probably not approve such restrictions. Due to a number of additional factors, including the viability of airport related businesses and deed restrictions, this option will not receive further consideration.

AIRCRAFT OPERATING PROCEDURES

Aircraft operating procedures that may reduce noise impacts may apply to either departures or arrivals. They include:

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

Reduced Thrust Takeoffs

Reduced thrust takeoffs involve the use of a reduced power setting throughout both takeoff roll and climb. Use of the procedure depends upon aircraft weight, weather and wind conditions, pavement conditions and available runway length. Since these conditions vary considerably, it is not possible to safely mandate the use of reduced thrust departures.

In fact, aircraft operators often use reduced thrust departures to conserve fuel, minimize engine wear, and abate noise when the safe use of the procedure is indicated. Additional efforts by airport management to encourage the use of deeper thrust reductions are unlikely to yield significant noise abatement benefits.

Requiring takeoff thrust settings to be reduced beyond the normal settings appropriate for the aircraft type, weight, temperature, etc., not only can erode safety margins but also tend to drag noise out further from the airport.

Conclusion: Because of the safety implications of these procedures, they are best left to the discretion of aircraft operators. An airport policy mandating the use of reduced thrust takeoffs is not considered an effective noise abatement measure for Williams Gateway Airport.

Thrust Cutbacks For Business Jets

As a service to the general aviation industry, the National Business Aviation Association (NBAA) prepared a series of noise abatement takeoff and arrival procedures for its membership in 1967. This program has virtually become an industry standard for operators of business jet aircraft since that time. The departure procedures are of two types: the standard departure procedure and the close-in departure procedure. The selection of the applicable noise abatement departure procedure depends on the proximity of the nearest noise-sensitive area.

The NBAA standard departure procedure calls for a thrust cutback at 1,000 feet above ground level (AGL) and a 1,000 feet per minute climb to 3,000 feet altitude during acceleration and clean-up. The close-in procedure is similar but calls for a thrust cutback at 500 feet AGL. **Exhibit 4C** depicts both standard and close-in departure procedures. While both procedures are effective in reducing noise impacts on surrounding land uses, the locations of the reduction vary with each. The standard procedure will result in lower noise levels over down-range locations, while the close-in procedure will result in lower noise levels near the airport. Since most noise-sensitive development is located one to two miles from the airport, the "standard procedure would be more beneficial. Williams Gateway Airport does currently encourage operators of business aircraft to use NBAA Standard Noise Departure Procedures whenever possible. Neither NBAA procedure is intended to supplant a procedure recommended by the manufacturer, when one is included in the aircraft operating manual.

An attempt to actively enforce a procedure of this nature requires some type of verification by the airport management. In order to ensure the promised changes in noise exposure, a permanent system of noise and flight track data acquisition is necessary. These systems typically cost in the $500,000 to $1,000,000 range and are also expensive to maintain. Additionally, a specialized staff is necessary to analyze and interpret the data, again, a substantial cost.

Conclusion: At Williams Gateway Airport, with no current noise impacts within the 65 DNL level and a relatively low level of business jet operations, aggressive implementation efforts of these thrust cutback procedures is not necessary; however, the airport should continue to encourage and remind pilots to use quiet flying procedures whenever possible.

Thrust Cutbacks For Large Jets

Throughout the 1980's and 1990's the FAA and the airlines did considerable work in studying noise abatement departure procedures. In 1993, the FAA published an advisory circular (91-53A) describing general parameters for two alternate noise abatement departures. Both procedures involve thrust reductions after takeoff, but at an altitude not less than 800 feet AGL. The procedures differ as to when the flaps should be retracted. The "close-in"procedure is used to reduce noise near the runway end and involves a thrust reduction followed by flap retraction. A second "distant" procedure can be instituted to reduce noise effects further from the airport. This involves preceding a reduction in thrust with the retraction of flaps.

The airlines have implemented the AC 91-53A guidelines, although specific details of noise abatement departures vary by airline operating guidelines and system needs. The airlines routinely use noise abatement departure procedures in accordance with AC 91-53A. **Exhibit 4D** shows a typical airline noise abatement departure procedure based on AC 91-53A.

Conclusion: The lack of noise impacts within the 65 DNL level makes aggressive implementation efforts of noise abatement departure procedures for large jets unnecessary. The airport should however, encourage and remind airline pilots performing training operations at Williams Gateway to use quiet flying procedure whenever possible.

Maximum Climb Departures

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. 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 dramatic noise increases closer to the airport. This type of procedure can also be costly to aircraft operators. The use of maximum climb procedures increases fuel usage leading to air pollution and can cause greater wear and tear on engines and equipment.

Airspace conflicts with Phoenix Sky Harbor Class B airspace are also a concern when considering maximum climb departures at Williams Gateway. The Class B airspace starts 5,000 feet MSL (3,618 AFL) and descends to 4,000 feet MSL (2,618 AFL) less than two miles northwest 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. **Exhibit 4E** depicts the relation of Phoenix Class B airspace as it pertains to maximum climb departure procedures.

Conclusion: The increased fuel usage, air pollution, aircraft engine wear, and conflicts with Phoenix Sky Harbor Class B airspace make this procedure impractical. In addition, noise created near the airport by this type of procedure would adversely affect the Williams Campus. 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. Currently the pattern altitude at Williams Gateway Airport is 2,595 feet MSL, about 1,213 (AFL). Minimum altitudes would apply to aircraft some distance from the airport and well outside the noise contour area.

Increases in approach altitude can yield only small reductions in noise. It would require the doubling of the altitude of an aircraft in a downwind or circling approach to achieve a noise reduction of four to six decibels. Raising the pattern altitude would also enlarge the pattern as departing aircraft have to extend their upwind and crosswind legs to achieve the pattern altitude as they turn on the downwind leg of the pattern. Additionally, aircraft altitudes is the vicinity of Williams Gateway are restricted due to the presence of Phoenix Class B airspace. This airspace is located only 3,618 feet AFL over Williams Gateway and steps down to 2,618 feet AFL approximately two miles northwest of the airport. Therefore the option of increasing aircraft approach altitudes is not an available option.

Conclusion: Implementation of minimum approach altitude procedures is difficult to verify and does not significantly reduce cumulative noise levels because takeoff noise normally dominates the situation. In addition, regional airspace conflicts greatly restrict the application of minimum approach altitudes. Thus, the measure is not considered further.

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. Follow-up studies have found that all of these techniques cause concern for safety because they are nonstandard and require an aircraft to be operated outside of its optimal safe operating configurations. Some of these procedures actually were found to increase noise because of power applications required to arrest high sink rates.

Conclusion: The increase of an approach slope angle requires that the aircraft be landed at more than optimal approach speed. These higher sink rates and faster speeds associated with steeper descent approaches can reduce pilot reaction time and erode safety margins. This is particularly a concern with inexperienced student pilots who commonly operate aircraft at Williams Gateway. Noise abatement approach procedures for Williams Gateway Airport are not considered further.

Reverse Thrust Restrictions

Thrust reversal is routinely used to slow jet aircraft immediately after touchdown. This is an important safety procedure that has the added benefit of reducing brake wear. Restrictions 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.

Given the location of noise-sensitive uses in the Williams Gateway Airport vicinity, a restriction on thrust reversal would not result in significant benefits. Reverse thrust restrictions tend to erode landing safety margins, increase runway occupancy time, and increase brake wear on aircraft.

Conclusion: Limitations on the use of reverse thrust are inadvisable at Williams Gateway because of the likelihood for minimal benefits and decreased safety margins.

Additional Aircraft Operating Considerations

Although not a generator of significant levels of aircraft noise, small single and multi-engine piston powered aircraft are frequent users of Williams Gateway Airport. Recognizing this, the airport, as part of it's "Fly Friendly" program, recommends a series of quiet and neighborly aircraft operating procedures established by the Aircraft Owners and Pilots Association (AOPA). These "Noise Awareness Steps", focusing on operations of small piston powered aircraft, contain recommend-ations on how to fly aircraft, and where and when to fly. Most steps provide guidance on pilot technique when maneuvering near noise-sensitive areas.

Conclusion: The airport should continue to encourage and remind pilots of piston powered aircraft operating at Williams Gateway to become familiar with and use AOPA quiet flying procedures whenever possible.

AIRPORT FACILITIES DEVELOPMENT

The development of on-airport facilities to improve off-airport noise levels is an accepted technique in noise abatement. Airport facilities can be constructed or modified to reduce aircraft noise or shift it to compatible areas. Other facility changes which may offer some degree of noise abatement are displaced runway thresholds and acoustical barriers or shielding.

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. Runway extensions are usually beneficial where there is substantial residential development very close to one end of a runway and not the other.

At Williams Gateway Airport, with municipalities located on three sides, it would be impossible to align the runways in order avoid overflights of noise-sensitive development. In addition, the limited amount of development southeast of the airport offers an easily accessible noise compatible corridor for aircraft operations with the current runway configuration.

The recently completed Airport Master Plan recommends lengthening Runway 12L/30R from its current length of 9,300 feet to an ultimate length of 12,500 feet in its long term horizon (11-20 years). This would entail extending the runway by 2,650 feet north and 550 feet south. This is proposed to meet the needs of typical air carrier and air cargo aircraft. Any additional noise from this proposed extension would be negligible since noise-sensitive development does not abut airport property.

Conclusion: Residential and noise-sensitive development to the north, west, and south of the airport prevents the alignment of runways in order to reduce noise impacts. The current runway configuration is aligned to allow aircraft to arrive/depart over relatively undeveloped land southeast of the airport. In addition, runway extensions would offer no benefit at Williams Gateway Airport since noise-sensitive land uses do not abut airport property. Therefore, additional runway development for noise abatement does not merit further consideration.

Displaced And Relocated Thresholds

A displaced threshold can provide some measure of noise abatement. To displace a threshold means that the touchdown zone for landing aircraft is moved further down the runway. The determination of the amount of displacement must consider the required runway lengths for landing as well as the amount of noise reduction associated with the displacement. For example, if the threshold of a runway were displaced 1,000 feet, the altitude of an aircraft along the approach path would be increased by only 50 feet. The single event noise levels associated with displaced thresholds would decrease slightly beneath the approach path. These areas, however, are much more impacted by departure noise.

Threshold relocation, where the point of touchdown and the point of takeoff are both shifted, can offer some small additional noise benefits to areas near a runway end by shifting takeoff noise associated with the start of the takeoff roll away from the former runway end.

Because there is no close-in residential development near the runway ends along the centerline, displaced or relocated thresholds would be of little benefit at Williams Gateway.

Conclusion: Threshold displacement and relocation generally offer only small noise reduction benefits. They are most helpful to residential areas located very near the end of the runway. Displaced or relocated runway thresholds would provide little or no benefit at Williams Gateway Airport and are not considered further.

Approach Lighting

Approach lighting is primarily used to aid pilots making the transition from instrument flight conditions to a visual landing. However, these lighting systems can also be used by pilots operating under VFR conditions to maintain an appropriate glide slope on approach for landing during both day and nighttime operations. These lighting systems are available in a host of configurations depending upon there intended application. For most general aviation operations, there are two basic types of approach lighting systems available:

The Visual Approach Slope Indicator (VASI) lighting systems is the most common approach lighting system and offers basic glide slope information to the pilot. This system consist of a series of between two to 12 individual lights set at a predetermined glide slope angle, usually three-degrees. The pilots interpretation of these lights can verify the aircrafts position as either "above", "below", or "on" the designed glide slope. VASI systems are limited in that they do not provide detailed glide slope to aircraft touchdown.

Precision Approach Path Indicator (PAPI) lighting systems are considered the "next generation" of visual approach lighting systems. The PAPI consists of a series of four lights (PAPI-4) relaying detailed information to the approaching pilot. The PAPI system is able to inform a pilot of the aircrafts relation to the glide slope in increments of being "slightly above" or "slightly below" the designed glide slope. (**Exhibit 4F** describes a PAPI-4 approach lighting system, and how it is interpreted by the pilot.) An additional benefit of the PAPI is that it can be utilized by the pilot until aircraft touchdown. The installation of these systems are becoming more commonplace and often replace existing VASI systems.

Approach lighting systems, if properly used by approaching pilots, can aid in the reduction of aircraft noise generated on approach. (**Exhibit 4F** depicts aircraft noise variations by glide slope positioning.) While pilots are trained to visually follow an appropriate decent path on approach, usually approximating three-degrees, variations such as runway length, width, and pilot experience can alter the aircraft's true approach course. Aircraft on final approach for a runway that are "too high" will need to expedite their decent in order to land. This requires slowing the aircraft to the appropriate approach and landing speed often requiring the use of full flaps, and premature lowering of the landing gear. The use of these items causes excessive airframe noise due to the friction created from the slowing aircraft. In addition, aircraft landing at higher speeds will often use engine thrust reversers to reduce brake wear.

Aircraft that approach "below" the glide slope do not have the benefit of excess altitude to maintain aircraft approach speeds. Low approaches often result in numerous engine power fluctuations in order to maintain a proper approach and landing speed. In addition, these approaches result in low altitude overflights which increase noise levels.

The use of visual approach lighting systems allows a pilot to maintain a proper glide slope for landing. Aircraft are often able to follow a three-degree glide slope with little or no power adjustments or excess flap settings. In addition, a pilot receives timely information pertaining to an aircrafts deviation from the glide slope allowing for subtle power and flap adjustments, reducing the overall level of aircraft approach noise.

PAPI-4 lighting systems are installed and available to pilots on Runways 12L/30R and 12C/30C at Williams Gateway. Runway 12R/30L is currently without a visual approach lighting system. Since this runway is often used by inexperienced student pilots, visual approach lighting may prove beneficial in maintaining a proper aircraft approach glide slope from a noise abatement and safety perspective.

Conclusion: The use of visual approach lighting systems, particularly PAPI-4's can help reduce some aircraft approach noise in addition to increasing safety. Consideration should be given to installing a PAPI-4 lighting system on Runway 12R/30L.

Acoustical Barriers

Acoustical barriers include noise walls, berms, and hush houses or run-up pens for containing engine maintenance run-up noise. Acoustical barriers are only useful for attenuating noise from aircraft activity on the ground. They have very limited application in special situations, act best over relatively short distances, and their benefits are greatly affected by surface topography and wind conditions. Furthermore, the effectiveness of a barrier is directly related to the distance of the noise source from the receiver and the distance of each from the barrier itself, as well as the angle between the ends of the berm and the receiver.

While noise berms and noise walls can attenuate noise, they can also be criticized by airport neighbors because they obstruct views. Another
Three alternatives have been selected for detailed noise analysis. The noise analysis for each alternative was based on a 2004 operational forecast. Noise contours for each alternative are compared to contours for a 2004 baseline scenario which assumes the continuation of all

possible 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.

At Williams Gateway, noise berms or walls would be largely ineffective for the attenuation of aircraft noise. Given the distance and location of residential and most noise-sensitive development around the airport, there are no suitable areas for the effective placement of such a barrier.

Conclusion: Since noise berms and walls do not offer noise reduction benefits to aircraft overflights or noise-sensitive areas not adjacent to the airport, these devices would offer no benefit and will not receive additional consideration.

SELECTION OF MEASURES FOR DETAILED EVALUATION

Preliminary analysis of the complete list of noise abatement techniques indicated that some measures may be potentially effective in the Williams Gateway area. The measures analyzed in more detail in this section involve runway use, departure turns, and visual and instrument approaches. They present real possibilities for noise abatement yet still permit relatively flexible and efficient operation of the airport.

EVALUATION CRITERIA

existing air traffic control and noise abatement procedures at the airport.

The alternatives are evaluated using the following criteria:

Noise Reduction Effects. The purpose of this evaluation is to reduce aircraft noise on people. Whether a reduction in noise impacts over noise-sensitive areas occurred was determined.

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, and the means by which they could be resolved, are discussed. 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.

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. The difference in flight time between the potential noise abatement procedures and current operational procedures is evaluated. Estimated capital costs of implementation of the noise abatement alternative, where relevant, are also presented.

Environmental Issues. Environ-mental factors related to noise are of primary concern in a F.A.R Part 150 analysis. The impacts, if any, of a noise abatement measure on other environmental issues, such as air and water quality, should be considered in the potential for its implementation.

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 serious consideration are finally presented.

ALTERNATIVE 1 - TEST EFFECTIVENESS OF CALM WIND RUNWAY PROGRAM

Goals

This alternative seeks to evaluate the effectiveness of the current noise abatement procedure designating Runway 30 as the calm wind runway (for up to a five knot tailwind).

Procedure

Aircraft noise was modeled with Runway 12 as the designated calm wind runway. Currently, the calm wind runway program uses Runway 30 for approximately 70-percent of airport operations.

For noise modeling purposes, the 2004 baseline input was modified to reflect a 70 percent usage of Runway 12. This usage was based on a wind rose analysis of calm wind conditions and winds favoring Runway 12. This procedure would apply to all single engine and larger aircraft. This would be an informal procedure and would be observed at pilots discretion as not to jeopardize safety.

Noise Reduction Effects

The noise contours presented in **Exhibit 4G** illustrate the effects of this procedure. The size and shape of the alternative noise contours changes moderately when compared to the 2004 baseline contours. The 60 and 65 DNL contours become elongated and constricted northeast of the airport consistent with an increase in approaching aircraft from this direction. The increase in departures to the southeast cause all contour ranges to widen along the departure portion of Runways 12. Fortunately, much of the areas where the alternative contours have experienced expansion have been into areas not currently developed, zoned or planned for noise-sensitive land uses.

Table 4A presents the population impacts for this alternative. This alternative impacts 1,690 fewer people than the 2004 baseline condition. Decreases are experienced in all contour ranges. The Level Weighted Population (LWP), an estimate of the number of people actually annoyed by noise, decreases from 2,874 to 2,171, a decrease of 703 persons, with this procedure.

TABLE 4A
Population Impacted by Noise
Alternative 1 - Calm Wind Runway Use Program

DNL Range	2004 Baseline	Alternative 1
60-65	7,850	6,983
65-70	1,909	1,892
70-75	847	43
75+	2	0
Total	10,608	8,918
LWP*	2,874	2,171

* 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:60-65 DNL = .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.

Costs

No additional costs are anticipated with this alternative.

Operational Issues

Since the airport's instrument approaches all use Runway 30C, the use of Runway 12 as the calm wind runway would reduce the usability of these approaches and potentially reduce airport efficiency during instrument meteorological conditions (IMC).

Environmental Issues

There are no environmental issues associated with this alternative.

Implementation

This procedure would primarily be implemented by ATC. A tower order would designate an aircraft's arrival or departure runway. Pilot's would still retain the option to use which ever runway would best meet safe flying conditions and compliance with traffic avoidance. Information regarding the procedure also could be published in a Notice to Airmen (NOTAM), and local pilots guides.

Preliminary Recommendations

Although the evaluation of this alternative reveals a significant reduction in the number of potential persons impacted by aircraft noise, additional concerns are raised. Aircraft on approach must line up on a runway on a relatively finite approach track. This does not allow for the aircraft dispersion, creating a concentration of aircraft overflights over residential and other noise-sensitive areas northwest of the airport. The absence of a noise compatible corridor along this approach area makes aircraft overflights inevitable. While some smaller aircraft may be able to follow the noise compatible corridor immediately north and northeast of the airport and turn on a short final to Runway 12, large aircraft would be unable to complete such a steep turn and often require a two to three mile final approach.

The majority of aircraft departing using Runway 30 as the current preferential calm wind runway can often turn to avoid noise-sensitive areas north of the airport. Larger aircraft, while not always able to completely avoid these areas can disperse their overall flight tracks so as not to concentrate aircraft overflights over a particular area.

The concentration of approaching aircraft northwest of the airport coupled with the availability of current noise compatible approach corridors southeast of the airfield greatly reduce the perceived benefits of this alternative. In addition, the usability of the airport's instrument approaches would greatly be reduced. While these could potentially be moved to Runway 12, conflicts with Phoenix Class B airspace and costs associated with relocating navigational aids and approach development could exceed any perceived benefits.

ALTERNATIVE 2 - RUNWAY 12L/C DEPARTURE PROCEDURE.

Goals

This alternative seeks to reduce the impact of aircraft noise on noise-sensitive areas south of the airport. By slightly adjusting the departure corridor for Runways 12C/L and delaying on course departure turns, overflights of current and proposed areas of noise-sensitive development south of the airport can be reduced.

Procedure

This alternative would apply to turbojet or large aircraft (in excess of 12,500 pounds) departing Runways 12L/C. Departing aircraft would be requested to turn to a heading of 110-degrees (10-degree left turn) upon reaching the end of the runway. Aircraft with western destinations would turn on course upon reaching Ocotillo Road or five DME from the Willie VORTAC. Aircraft with eastern destinations would turn on course as soon as practicable.

For noise modeling purposes, the 2004 baseline input was modified to reflect the new procedure. Large and turbojet aircraft traffic departing Runway 12C/L were assigned percentages reflecting current operations with 75 percent of aircraft departing on a 110-degree heading. The remaining 25 percent were dispersed upon departure, not utilizing the departure procedure.

Noise Reduction Effects

The noise contours presented in **Exhibit 4H** illustrate the effects of this procedure. The size and shape of the alternative noise contours is similar to the 2004 baseline contours except for a very slight shift in the 60 and 65 DNL contours southeast of the airport. This shift reflects the alternative aircraft departure tracts from Runways 12C and 12L.

Table 4B presents the population impacts for this alternative. This alternative impacts 62 fewer people than the 2004 baseline condition. Decreases are seen in both the 60-65 DNL and 65-70 DNL contours of 49 and 13 persons respectively. The Level Weighted Population (LWP), an estimate of the number of people actually annoyed by noise, decreases from 2,874 to 2,859 with this procedure.

TABLE 4B
Population Impacted by Noise
Alternative 2 - Runway 12L/C Departure Turns

DNL Range	2004 Baseline	Alternative 2
60-65	7,850	7,801
65-70	1,909	1,896
70-75	847	847
75+	2	2
Total	10,608	10,546
LWP*	2,874	2,859

* 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:60-65 DNL = .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.

Operational Issues

This procedure could reduce ATC flexibility by sustaining aircraft in the departure corridor. This could slightly reduce peak airport capacity by requiring additional aircraft separation.

An advantage of this procedure is that it is simple enough to be used by aircraft without newer generation avionic and navigational equipment and doesn't require the development and publication of a Standard Instrument Departure Procedure (SID).

Costs

The only operational costs of this procedure might be slightly increased flight times and fuel consumption by aircraft delaying their turn on course. During especially busy periods, de-parture delays could increase due to separation requirements.

Environmental Issues

There are no environmental issues associated with this alternative.

Implementation

This procedure would primarily be implemented by ATC. A tower order would inform pilots of their departure procedure per the appropriate destination direction. Information regarding the procedure also could be published in a Notice to Airmen (NOTAM) and depicted on local pilots guides.

Preliminary Recommendation

This alternative is moderately effective in reducing aircraft noise impacts southeast of the airport. It deserves further consideration.

ALTERNATIVE 3 - RELOCATE INSTRUMENT LANDING SYSTEM TO RUNWAY 30R

Goals

This alternative seeks to reduce noise impacts of landing aircraft on noise-sensitive areas west of the airport. The relocation of the ILS could move noise contours east into unpopulated areas.

Procedure

This alternative would relocate the ILS on Runway 30C to Runway 30R. This involves the relocation of all ground based equipment (localizer and glide slope antennas) defining the approach. In addition, the new approach would need to be designed and published by the FAA.

For noise modeling purposes operational percentages reflected those for the year 2020, which had previously been modeled with the relocation of the ILS to Runway 30R. These percentages correspond to 80 percent of arrivals, 80 percent of departures, and 75 percent of touch-and-go activity on Runway 12L/30R by military and commercial/air cargo aircraft. Runway 12L/30R was projected to remain the general aviation runway during this period.

Noise Reduction Effects

The noise contours presented in **Exhibit 4J** illustrate the effects of this procedure. The size and shape of the alternative noise contours are similar to the 2004 baseline contours. All of the contours elongate slightly to the southeast, off the approach end of Runway 30R, reflecting increased aircraft approaches to this runway due to the relocation of the ILS. Northeast of the airport, the 60, 65, and 70 DNL noise contours shift very slightly east consistent with a shift in touch-and-go operations by aircraft utilizing the ILS.

Table 5B presents the population impacts for this alternative. This alternative impacts 371 fewer people than the 2004 baseline condition. A decrease is experienced in all contour ranges except 75 DNL and above. The Level Weighted Population (LWP), an estimate of the number of people actually annoyed by noise, decreases from 2,874 to 2,768 with this procedure.

TABLE 4C
Population Impacted by Noise
Alternative 3 - Relocation of ILS to Runway 30R

DNL Range	2004 Baseline	Alternative 3
60-65	7,850	7,650
65-70	1,909	1,741
70-75	847	844
75+	2	2
Total	10,608	10,237
LWP*	2,874	2,768

* 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:60-65 DNL = .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.

Costs

The cost of this alternative would entail expenses incurred in the relocation of ground based navigational equipment and the design and publishing of the new approach. The cost to move such a system is estimated at about $200,000. Slight costs to aircraft operator may be include additional fuel usage due to increased taxi distance to the ramp.

Operational Issues

No additional operational issues should result from this alternative other than an increased taxi distance to the ramp.

Environmental Issues

There are no environmental issues associated with this alternative.

Implementation

The new approach would need to be designed and published. The removal of the ILS from Runway 30C should be published in a Notice to Airmen (NOTAM). The change should also be broadcast in an ATIS message to notify inbound pilots.

Preliminary Recommendations

This procedure is effective in reducing the number of people impacted by aircraft noise both southeast and northwest of the airport, although it is quite costly. Since no individuals are currently impacted within the 65 DNL contour, the cost of relocation for noise abatement purposes would be the responsibility of the airport authority. This alternative does however, merit further consideration.

SUMMARY

Table 4D summarizes the alternatives analyzed in this chapter. This table lists the costs, operational issues, and requirements for the implementation of each alternative. These are preliminary recommendations and all alternatives must be reviewed by the Planning Advisory Committee, airport officials, local citizens, and other local interests before they can be made final. Noise abatement measures alone cannot resolve noise issues at an airport. The next chapter addresses noise issues thought the evaluation of various land use management techniques. Final recommendations will be presented in Chapter Six, the Noise Compatibility Program.

TABLE 4D
Summary of Noise Abatement Alternatives Selected for Detailed Analysis
Williams Gateway Airport

Alternative	Advantages	Disadvantages/ Costs	Implementation Action
1. Runway 12L/C/R Calm Wind Runway Use Program.	- Reduces the number of approaches over noise-sensitive areas northwest of the airport.	- Reduces ATC flexibility by restricting arrivals and departures in the same direction. - Concentrates low approaches over concentrated residential areas.	- Tower order - Issue Notice to Airmen (NOTAM) - Publish in local Pilots Guide
2. Runway 12L/C Departure Turn.	- Reduces aircraft overflights of noise-sensitive areas south of the airport.	- Reduces ATC flexibility by sustaining aircraft in the departure corridor. - Reduces peak time airport efficiency by requiring additional aircraft separation. - Slight increase in fuel use and travel time due to elongated departure.	- Tower order - Issue Notice to Airmen (NOTAM) - Publish in local Pilots Guide
3. Relocate Instrument Landing System to Runway 30R.	- Reduces overflights of noise-sensitive areas south and southeast of the airport by shifting aircraft further east.	- Relocate localize and glide slope antennas. Approximate cost: $200,000 - Slight increase in fuel consumption and taxi time due to increased taxi distance.	- FAA needs to design new approach - Publish approach plate. - Identify change in Notice to Airmen (NOTAM) and ATIS message.

TABLE 4D (Continued)
Noise Abatement Measures Deserving Additional Consideration
Williams Gateway Airport

Alternative	Advantages	Disadvantages/ Costs	Implementation Action
4. Departure Procedure for KC-135 Aircraft Flown By Arizona Air National Guard, 161st Air Refueling Wing.	- Standardize departure procedure for air guard pilots and ATC staff. - Avoid departures overflights over noise-sensitive areas north and northeast of the airport.	None	- Informal letter of agreement between 161st Refueling Wing, ATC, and the Airport Authority.
5. Helicopter Reporting Points and Arrival and Departure Routes.	- Standardize helicopter arrival and departure routes for pilots and ATC staff. - Avoid arrival and departure overflights over noise-sensitive areas in the airport vicinity.	- Potentially increased fuel consumption and flight time.	- Issue Notice to Airmen (NOTAM) - Publish in local Pilots Guide
6. Request Aircraft Using Runway 12R/30L Traffic Pattern to Remain East of the Southern Pacific Railroad During Downwind Leg.	- Reduces aircraft overflights over noise-sensitive areas west of the airport.	None	- Publish in local Pilots Guide
7. Encourage Use of NBAA Noise Abatement Procedures.	- Reduces departure and approach noise.	None	- Publish in local Pilots Guide - Install taxiway signage
8. Encourage Use of AC 91.53A Noise Abatement Departure Procedures By Air Carrier Jets.	- Reduces departure noise.	None	-Promote use to air carrier aircraft users.
9. Encourage Use of AOPA Noise Awareness Steps.	- Reduces aircraft overflights of noise-sensitive areas in the airport vicinity.	None	- Publish in local Pilots Guide. - Install taxiway signage.

TABLE 4D (Continued)
Noise Abatement Measures Deserving Additional Consideration
Williams Gateway Airport

Alternative	Advantages	Disadvantages/ Costs	Implementation Action
10. Install PAPI-4 Lighting on Runway 12R/30L.	- Reduces low approaches, power fluctuations, and airframe noise.	- Cost of PAPI-4 lighting system including installation: $40,000 per runway end. - Additional cost for maintenance needs.	- Secure funding. - Promote use to local pilots.