APPENDIX A

AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

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AICUZ CONCEPT, PROGRAM, METHODOLOGY, AND POLICIES

A.1 Concept

Federal legislation, national sentiment, and other external forces which directly affect the U.S. Air Force (USAF) mission have served to greatly increase the USAF's role in environmental and planning issues. Problems of airfield encroachment from incompatible land uses surrounding installations, as well as air and water pollution and socioeconomic impacts, require continued and intensified USAF involvement. The nature of these problems dictates direct USAF participation in comprehensive community and land use planning. Effective, coordinated planning that bridges the gap between the Federal government and the community requires the establishment of good working relationships with local citizens, local planning officials, and state and Federal officials. This planning depends on creating an atmosphere of mutual trust and helpfulness. The Air Installation Compatible Use Zone (AICUZ) concept has been developed in an effort to:

- Protect local citizens from the noise exposure and accident potential associated with flying activities
- Prevent degradation of the USAF's capability to achieve its mission by promoting compatible land use planning.

The land use guidelines developed herein are a composite of a number of other land use compatibility studies that have been refined to fit the Dyess Air Force Base (AFB) aviation environment.

A.2 Program

Base Commanders establish and maintain active programs to achieve the maximum feasible land use compatibility between air installations and neighboring communities. The program requires that all appropriate governmental bodies and citizens be fully informed whenever AICUZ or other planning matters affecting the installation are under consideration. This includes positive and continuous programs designed to:

- Provide information, criteria, and guidelines to Federal, state, regional, and local planning bodies, civic associations, and similar groups.
- Inform such groups of the requirements of the flying activity, noise exposure, aircraft accident potential, and AICUZ plans.
- Describe the noise reduction measures that are being used.
- Ensure that all reasonable, economical, and practical measures are taken to reduce or control the impact of noise-producing activities. These measures include proper location of engine test facilities, provision for sound suppressers where necessary, adjustment of flight patterns, and techniques to minimize the noise impact on populated areas. This must be done without jeopardizing safety or operational effectiveness.

A.3 Methodology

The AICUZ consists of land areas upon which certain land uses might obstruct the airspace or otherwise be hazardous to aircraft operations; and land areas which are exposed to the health, safety, or welfare hazards of aircraft operations. The AICUZ includes:

- Accident Potential Zones (APZs) and Clear Zones (CZs) based on past USAF aircraft accidents and installation operational data (**Appendix B**)
- Noise Zones produced by the computerized Day-Night Average A- Weighted Sound Level (DNL) metric (**Appendix C**)
- Imaginary Airspace Control Surfaces designated by the Federal Aviation Administration and the USAF for the purpose of height limitations.

The APZs, CZs, Noise Zones, and Imaginary Airspace Control Surfaces are the basic building blocks for land use planning with AICUZ data. Compatible land uses are specified for these zones, and recommendations on building materials and standards to reduce interior noise levels inside structures are provided in **Appendix E**.

As part of the AICUZ Program, the only real property acquisition for which the USAF has received congressional authorization, and for which the base and Major Commands request appropriation, are the areas designated as the CZ. Real property interests are acquired by fee or easement giving the base control over the use of the property. Fee land so acquired may be leased out for agricultural or grazing purposes. The northern CZ at Dyess AFB is located within the installation boundary, therefore no CZ easements are required. However, approximately half of the southern CZ is located within Taylor County. Compatible land use controls for the remaining airfield environs should be accomplished through the community land use planning processes.

A.4 AICUZ Land Use Development Policies

The basis for any effective land use control system is the development of, and subsequent adherence to, policies which serve as the standard by which all land use planning and control actions are evaluated. Dyess AFB recommends the following policies be considered for incorporation into the comprehensive plans of agencies in the vicinity of the base environs:

***Policy 1*.** To promote the public health, safety, peace, comfort, convenience, and general welfare of the inhabitants of airfield environs, it is necessary to:

- Guide, control, and regulate future growth and development
- Promote orderly and appropriate use of land
- Protect the character and stability of existing land uses
- Prevent the destruction or impairment of the airfield and the public investment therein
- Enhance the quality of living in the areas affected
- Protect the general economic welfare by restricting incompatible land use.

Policy 2. In furtherance of Policy 1, it is appropriate to:

- Establish guidelines of land use compatibility

- Restrict or prohibit incompatible land use
- Prevent establishment of any land use which would unreasonably endanger aircraft operations and the continued use of the airfield
- Incorporate the AICUZ concept into community land use plans, modifying them when necessary
- Adopt appropriate ordinances to implement airfield environs land use plans.

Policy 3. Within the boundaries of the CZ, certain land uses are inherently incompatible. The following land uses are not in the public interest and must be restricted or prohibited:

- Uses that release into the air any substance, such as steam, dust, or smoke, which would impair visibility or otherwise interfere with the operation of aircraft
- Uses that produce light emissions, either direct or indirect (reflective), which would interfere with pilot vision
- Uses that produce electrical emissions which would interfere with aircraft communication systems or navigation equipment
- Uses that attract birds or waterfowl, such as operation of sanitary landfills, maintenance or feeding stations, or growth of certain vegetation
- Uses that provide for structures within 10 feet of aircraft approach-departure or transitional surfaces.

Policy 4. Certain noise levels of varying duration and frequency create hazards to both physical and mental health. A limited, though definite, danger to life exists in certain areas adjacent to airfields. Where these conditions are sufficiently severe, it is not consistent with public health, safety, and welfare to allow the following land uses:

- Residential
- Retail business
- Office buildings
- Public buildings (schools, churches, etc.)
- Recreation buildings and structures.

Policy 5. Land areas below takeoff and final approach flight paths are exposed to significant danger of aircraft accidents. The density of development and intensity of use must be limited in such areas.

Policy 6. Different land uses have different sensitivities to noise. Standards of land use acceptability should be adopted, based on these noise sensitivities. In addition, a system of Noise Level Reduction guidelines (**Appendix E**) for new construction should be implemented to permit certain uses where they would otherwise be prohibited.

Policy 7. Land use planning and zoning in the airfield environs cannot be based solely on aircraft-generated effects. Allocation of land used within the AICUZ should be further refined by consideration of:

- Physiographic factors
- Climate and hydrology

- Vegetation
- Surface geology
- Soil characteristics
- Intrinsic land use potential and constraints
- Existing land use
- Land ownership patterns and values
- Economic and social demands
- Cost and availability of public utilities, transportation, and community facilities
- Other noise sources.

Each primary runway end at Dyess AFB has a 3,000 foot by 3,000 foot CZ and two APZs (see **Appendix B**). Accident potential on or adjacent to the runway or within the CZ is so high that the necessary land use restrictions would prohibit reasonable economic use of land. As stated previously, it is USAF policy to request the U.S. Congress to authorize and appropriate funds for the necessary real property interests in this area to prevent incompatible land uses.

APZ I is less critical than the CZ, but still possesses a significant risk factor. This 3,000 foot by 5,000 foot area has land use compatibility guidelines which are sufficiently flexible to allow reasonable economic use of the land, such as industrial/manufacturing, transportation, communication/utilities, wholesale trade, open-space, recreation, and agriculture. However, uses that concentrate people in small areas are not acceptable.

APZ II is less critical than APZ I, but still has potential for accidents. APZ II is 3,000 feet wide by 7,000 feet long extending to 15,000 feet from the runway threshold. Acceptable uses include those of APZ I, as well as low-density single family residential, and those personal and business services and commercial/retail trade uses of low-intensity or scale of operation. High-density functions such as multistory buildings, places of assembly (e.g., theaters, churches, schools, restaurants), and high-density office uses are not considered appropriate.

High people densities should be limited to the maximum extent possible. The optimum density recommended for residential usage (where it does not conflict with noise criteria) in APZ II is one dwelling per acre. For most nonresidential usage, buildings should be limited to one story and the lot coverage should not exceed 20 percent.

A.5 Basic Land Use Compatibility

Research on aircraft accident potential, noise, and land use compatibility is ongoing at a number of Federal and other agencies. These studies and all other compatibility guidelines must not be considered inflexible standards. They are the framework within which land use compatibility questions can be addressed and resolved. In each case, full consideration must be given to local conditions such as the following:

- Previous community experience with aircraft accidents and noise
- Local building construction and development practices
- Existing noise environment due to other urban or transportation noise sources
- Time period of aircraft operations and land use activities

- Specific site analysis
- Noise buffers, including topography.

These basic guidelines cannot resolve all land use compatibility questions, but they do offer a reasonable framework within which to work.

A.6 Accident Potential

Land use guidelines for the two APZs are based on a hazard index system which compares the relationship of accident occurrence for five areas:

- On or adjacent to the runway
- Within the CZ
- In APZ I
- In APZ II
- In all other areas within a 10 nautical mile radius of the runway.

Accident potential on or adjacent to the runway or within the CZ is so high that few uses are acceptable. The risk outside APZ I and APZ II, but within the 10 nautical mile radius area, is significant, but is acceptable if sound engineering and planning practices are followed.

Land use guidelines for APZs I and II have been developed. The main objective has been to restrict all people-intensive uses because there is greater risk in these areas. The basic guidelines aim at prevention of uses that:

- Have high residential density characteristics
- Have high labor intensity
- Involve aboveground explosive, fire, toxic, corrosive, or other hazardous characteristics
- Promote population concentrations
- Involve utilities and services required for area wide population, such as telephone and gas, where disruption would have an adverse impact
- Concentrate people who are unable to respond to emergency situations, such as children, the elderly, and the handicapped
- Pose hazards to aircraft operations.

There is no question that these guidelines are relative. Ideally, there should be no people-intensive uses in either of the APZs. The free market and private property systems prevent this where there is land development demand. To go beyond these guidelines, however, substantially increases risk by placing more people in areas where there could ultimately be an aircraft accident.

A.7 Noise

Nearly all studies analyzing aircraft noise and residential compatibility recommend no residential uses in land areas associated with a DNL above 75 A-weighted decibels (dBA). Usually, no restrictions are recommended below 65 dBA. Between 65–74 dBA, there is currently no consensus or restrictions. These areas might not qualify for Federal mortgage insurance in residential categories according to U.S.

Department of Housing and Urban Development (HUD) Regulation 24 Code of Federal Regulations Section 51B. In many cases, HUD approval requires noise-attenuation measures, the Regional Administrator's concurrence, and an Environmental Impact Statement. The Department of Veterans Affairs also has airfield noise and accident restrictions, which apply to their home loan guarantee program. USAF land use recommendations also state that, whenever possible, residential land use should be located on land with a noise level below a DNL of 65 dBA.

Most *industrial/manufacturing* uses are compatible in the airfield environs. Exceptions are uses such as research or scientific activities, which require lower noise levels. Noise-attenuation measures are recommended for portions of buildings devoted to office use, receiving the public, or where there is a requirement for low background noise levels.

Transportation, communications, and *utility* categories have higher noise level compatibility because they generally are not people-intensive. When people use land for these purposes, the use is generally very short in duration; however, when buildings are required for these uses, additional evaluation is warranted.

The *commercial/retail trade* and *personal* and *business services* categories are compatible without restriction up to a DNL of 70 dBA; however, they are generally incompatible above 80 dBA. Between 70–80 dBA, noise level reduction measures should be included in the design and construction of buildings.

The nature of most uses in the *public* and *quasi-public services* category requires a quieter environment, and attempts should be made to locate these uses in land areas below 65 dBA (i.e., a USAF land use recommendation), or else provide adequate noise level reduction.

Although *recreational* use has often been recommended as compatible with high noise levels, recent research has resulted in a more conservative view. Above 75 dBA, noise becomes a factor, which limits the ability to enjoy such uses. Where the requirement to hear is a function of the use (e.g., music shell), compatibility is limited. Buildings associated with golf courses and similar uses should be noise attenuated.

Forestry activities; livestock farming; and uses in the *resources production*, *extraction*, and *open-space* categories are compatible almost without restrictions within all noise zones.

APPENDIX B

CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

APPENDIX B

CLEAR ZONES AND ACCIDENT POTENTIAL ZONES

B.1 Guidelines for Accident Potential

Urban areas around airports are exposed to the possibility of aircraft accidents even with well-maintained aircraft and highly trained aircraft crews. Despite stringent maintenance requirements and countless hours of training, past history makes it clear that accidents are going to occur.

When the Air Installation Compatible Use Zone (AICUZ) Program began, there were no current comprehensive studies on accident potential. In support of the program, the U.S. Air Force (USAF) completed a study of USAF accidents that occurred between 1968 and 1972 within 10 nautical miles of airfields. The study of 369 accidents revealed that 75 percent of aircraft accidents occurred on or adjacent to the runway (1,000 feet to each side of the runway centerline) and in a corridor 3,000 feet wide (1,500 feet on either side of the runway centerline), extending from the runway threshold along the extended runway centerline for a distance of 15,000 feet.

Three zones were established based on crash patterns: The Clear Zone (CZ), Accident Potential Zone (APZ) I, and APZ II. The CZ starts at the end of the runway and extends outward 3,000 feet. It has the highest accident potential of the three zones. The USAF has adopted a policy of acquiring property rights to areas designated as CZs because of the high accident potential. APZ I extends from the CZ an additional 5,000 feet. It includes an area of reduced accident potential. APZ II extends from APZ I an additional 7,000 feet in an area of further reduced accident potential.

The USAF research work in accident potential was the first significant effort in this subject area since 1952 when the President's Airport Commission published *The Airport and Its Neighbors*, better known as the "Doolittle Report." The recommendations of this earlier report were influential in the formulation of the APZ concept.

The risk to people on the ground of being killed or injured by aircraft accidents is small. However, an aircraft accident is a high consequence event and when a crash does occur, the result is often catastrophic. Because of this, the USAF does not attempt to base its safety standards on accident probabilities. Instead the USAF approaches this safety issue from a land use planning perspective.

B.2 Accident Potential Analysis

Military aircraft accidents differ from commercial air carrier and general aviation accidents because of the variety of aircraft used, the type of missions, and the number of training flights. In 1973, the USAF performed an aircraft accident hazard study to identify land near airfields with significant accident potential. Accidents studied occurred within 10 nautical miles of airfields.

The study reviewed 369 major USAF accidents during 1968 – 1972, and found that 61 percent of the accidents related to landing operations and 39 percent related to takeoffs. It also found that 70 percent occurred in daylight, and that fighter and training aircraft accounted for 80 percent of the accidents.

Because the purpose of the study was to identify accident hazards, the study plotted each of the 369 accidents in relation to the airfield. This plotting found that the accidents clustered along the runway and its extended centerline. To further refine this clustering, a tabulation was prepared which described the

cumulative frequency of accidents as a function of distance from the runway centerline along the extended centerline. This analysis was done for widths of 2,000, 3,000, and 4,000 feet. **Table B-1** shows the results of the location analysis.

Table B-1. Location Analysis

Length From Both Ends of Runway (feet)	Width of Runway Extension (feet)		
	2,000	**3,000**	**4,000**
Percent of Accidents			
On or adjacent to runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	35	39	39
3,000 to 8,000	8	8	8
8,000 to 15,000	5	5	7
Cumulative Percent of Accidents			
On or adjacent to runway (1,000 feet to each side of runway centerline)	23	23	23
0 to 3,000	58	62	62
3,000 to 8,000	66	70	70
8,000 to 15,000	71	75	77

Figure B-1 indicates that the cumulative number of accidents rises rapidly from the end of the runway to 3,000 feet, rises more gradually to 8,000 feet, and then continues at about the same rate of increase to 15,000 feet, where it levels off rapidly. The location analysis also indicates that the optimum width of the safety zones, designed to include the maximum percentage of accidents in the smallest area, is 3,000 feet (see **Figures B-2** and **B-3**).

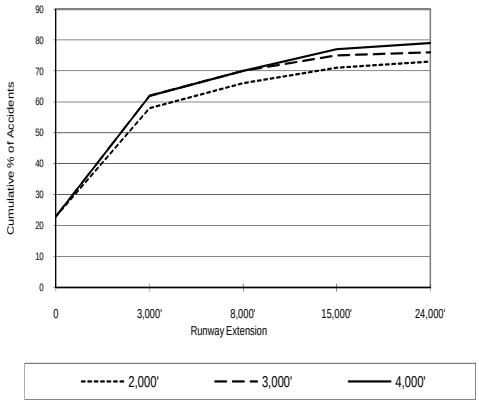

Figure B-1. Distribution of USAF Aircraft Accidents

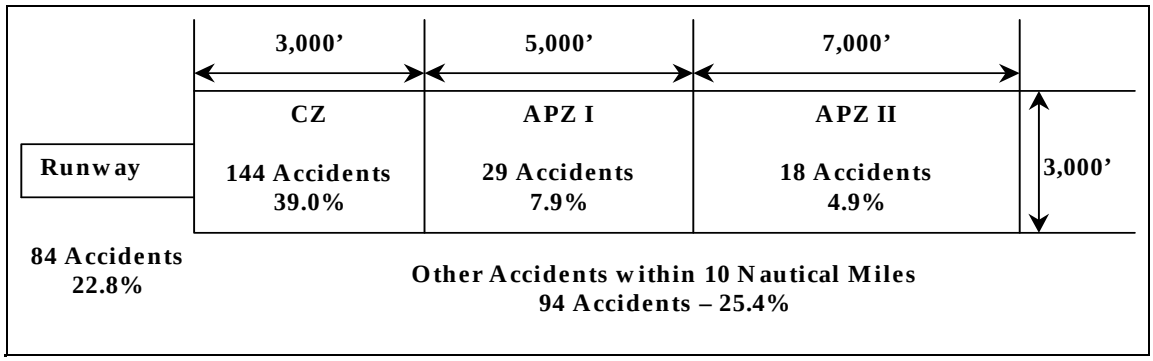

Figure B-2. USAF Accident Data (369 Accidents — 1968–1972)

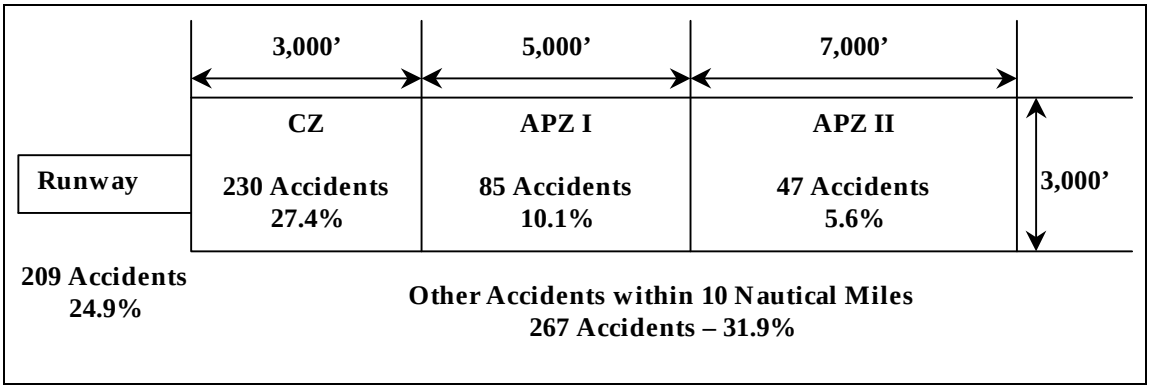

Figure B-3. USAF Accident Data (838 Accidents — 1968–1995)

The original study was updated to include accidents through September 1995. The updated study now includes 838 accidents during the 1968–1995 period. Using the optimum runway extension width of 3,000 feet, the accident statistics of the updated study are shown below.

Using the designated zones and accident data, it is possible to calculate a ratio of percentage of accidents to percentage of area size. These ratios indicate that the CZ, with the smallest area size and the highest number of accidents, has the highest ratio, followed by the runway and adjacent area APZ I and APZ II (see **Table B-2**).

B.3 Definable Debris Impact Areas

The USAF also determined which accidents had definable debris impact areas, and in what phase of flight the accident occurred. Overall, 75 percent of the accidents had definable debris impact areas, although they varied in size by type of accident. The USAF used weighted averages of impact areas, for accidents occurring only in the approach and departure phase, to determine the following average impact areas:

The USAF study used weighted averages of impact areas, for accidents occurring only in the approach and departure phase, to determine the following average impact areas:

- Overall Average Impact Area
- Fighter, Trainer, and Miscellaneous Aircraft
- Heavy Bomber and Tanker Aircraft.

Table B-2. Accident to Area Ratio

Ratio of Percentage of Accidents to Percentage of Area (USAF Accident Data 1968 – 1995)						
	Area (acres)[1]	**Number of Accidents[2]**	**Accidents per Acre**	**% Total Area**	**% Total Accidents**	**Ratio: Accidents to Area[3]**
Runway Area[4]	487	209	1 per 2.3	0.183	24.9	136.0
CZ	413	230	1 per 1.8	0.155	27.4	177.0
APZ I	689	85	1 per 8.1	0.258	10.1	39.0
APZ II	964	47	1 per 20.5	0.362	5.6	16.0
Other	264,053	267	1 per 989.0	99.042	31.9	0.3

Notes:
[1] Area includes land within 10 nautical miles of runway (266,606 acres).
[2] Total number of accidents is 838 (through 1995).
[3] Percent total accidents divided by percent total area.
[4] Runway dimension is 2,000' x 10,600'.

B.4 Findings

Designation of safety zones around the airfield and restriction of incompatible land uses can reduce the public's exposure to safety hazards. USAF accident studies have found that aircraft accidents near USAF installations occurred in the following patterns:

- 61 percent were related to landing operations
- 39 percent were related to takeoff operations
- 70 percent occurred in daylight
- 80 percent were related to fighter and training aircraft operations
- 25 percent occurred on the runway or within an area extending 1,000 feet out from each side of the runway
- 27 percent occurred in an area extending from the end of the runway to 3,000 feet along the extended centerline and 3,000 feet wide, centered on the extended centerline
- 15 percent occurred in an area between 3,000 and 15,000 feet along the extended runway centerline and 3,000 feet wide, centered on the extended centerline.

USAF aircraft accident statistics found that 75 percent of aircraft accidents resulted in definable impact areas. The size of the impact areas were

- 5.1 acres overall average
- 2.7 acres for fighters and trainers
- 8.7 acres for heavy bombers and tankers.

APPENDIX C

DESCRIPTION OF THE NOISE ENVIRONMENT

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C.1 Noise Environment Descriptor

The noise contour methodology used herein is the Day-Night Average A-weighted Sound Level (DNL) metric of describing the noise environment. Efforts to provide a national uniform standard for noise assessment have resulted in adoption by the U.S. Environmental Protection Agency of DNL as the standard noise descriptor. The U.S. Air Force (USAF) uses the DNL descriptor in assessing the amount of aircraft noise exposure, and as a metric for community response to the various levels of exposure. The DNL values used for planning purposes are 65, 70, 75, and 80 decibels (dB). Land use guidelines are based on the compatibility of various land uses with these noise exposure levels.

It is generally recognized that a noise environment descriptor should consider, in addition to the annoyance of a single event, the effect of repetition of such events and the time of day in which these events occur. DNL begins with a single event descriptor and adds corrections for the number of events and the time of day. Since the primary development concern is residential, nighttime events are considered more annoying than daytime events and are weighted accordingly. DNL values are computed from the single event noise descriptor, plus corrections for number of flights and time of day (**Figure C-1**).

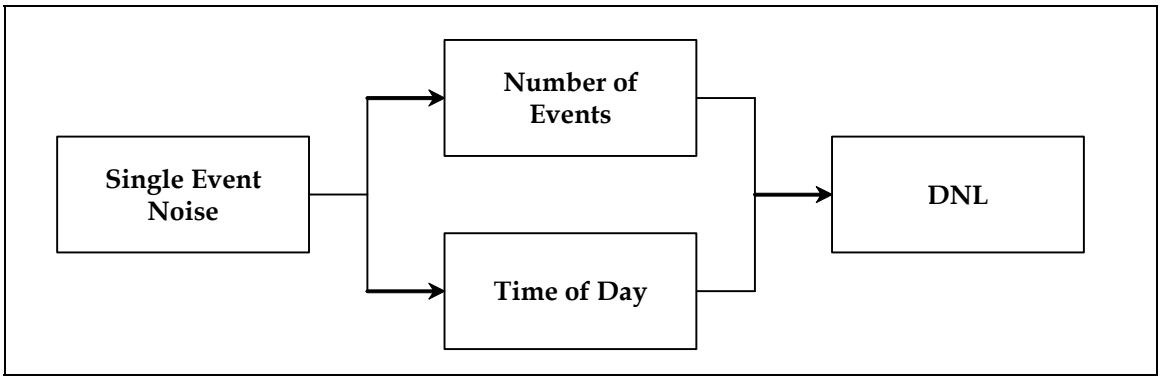

Figure C-1. Day-Night Average A-Weighted Sound Level

As part of the extensive data collection process, detailed information is gathered on the type of aircraft, and the number and time of day of flying operations for each flight track during a typical day. This information is used in conjunction with the single event noise descriptor to produce DNL values. These values are combined on an energy summation basis to provide single DNL values for the mix of aircraft operations at the base. Equal value points are connected to form the contour lines.

C.2 Noise Event Descriptor

The single event noise descriptor used in the DNL system is the Sound Exposure Level (SEL). The SEL measure is an integration of an A-weighted noise level over the period of a single event such, as an aircraft flyover, in dB.

Frequency, magnitude, and duration vary according to aircraft type, engine type, and power setting. Therefore, individual aircraft noise data are collected for various types of aircraft and engines at different

power settings and phases of flight. **Figure C-2** shows the relationship of the single event noise descriptor (SEL) to the source sound energy.

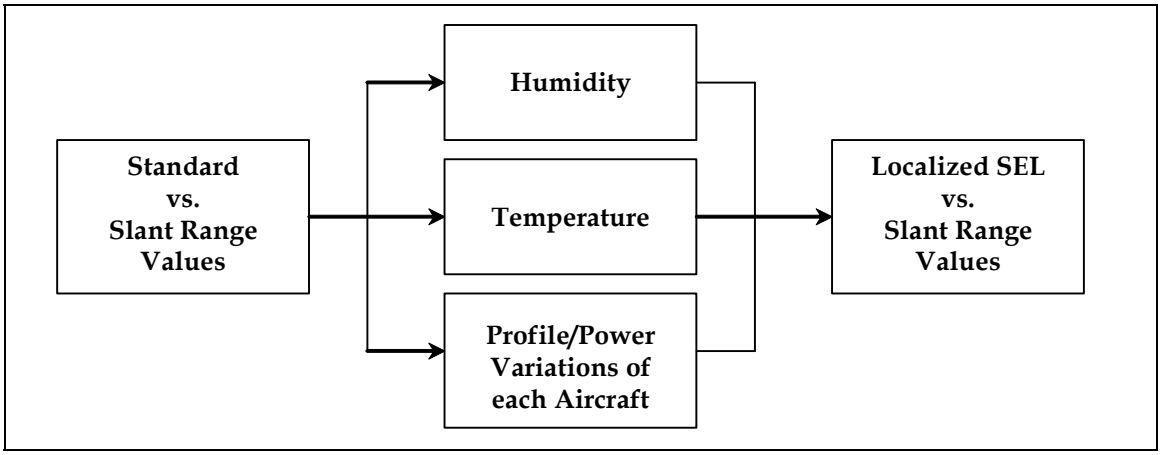

Figure C-2. Sound Exposure Level

SEL versus slant range values are derived from noise measurements made according to a source noise data acquisition plan developed by Bolt, Beranek, and Newman, Inc., in conjunction with and carried out by the USAF's Armstrong Laboratory. These standard day, sea level values form the basis for the individual event noise descriptors at any location and are adjusted to the location by applying appropriate corrections for temperature, humidity, and variations from standard profiles and power settings.

Ground-to-ground sound propagation characteristics are used for altitudes up to 500 feet absolute with linear transition between 500 and 700 feet and air-to-ground propagation characteristics above 700 feet.

In addition to the assessment of aircraft flight operations, the DNL system also incorporates noise resulting from engine and aircraft maintenance checks on the ground. Data concerning the orientation of the noise source, type of aircraft or engine, number of test runs on a typical day, power settings used and their duration, and use of suppression devices are collected for each ground runup or test position. This information is processed and the noise contribution added (on an energy summation basis) to the noise generated by flying operations to produce noise zones reflecting the overall noise environment with respect to aircraft air and ground operations.

C.4 Noise Contour Production

Data describing flight track distances and turns, altitudes, airspeeds, power settings, flight track operational utilization, maintenance locations, ground run-up engine power settings, and number and duration of runs by type of aircraft and engine are assembled by each individual Air Force Base. Flight track maps are generated for verification and approval by the base and Headquarters Air Combat Command. After any required changes have been incorporated, DNL noise contours are generated by the computer using the supplied data and standard source noise data corrected to local weather conditions. These contours are plotted and prepared for photographic reproduction. A set of these contours is provided in the body of the report.

C.5 Technical Information

Additional technical information on the DNL procedures is available in the following publications:

- *Community Noise Exposure Resulting from Aircraft Operations: Applications Guide for Predictive Procedure*. AMRL-TR-73-105, November, 1974, from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.
- *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with Adequate Margin of Safety*, US EPA Report 550/9-74-004, March, 1974, from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.
- *Adopted Noise Regulations for California Airports*, Title 4, Register 70, No. 48-11-28-70, Subchapter 6, Noise Standards.

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APPENDIX D

HEIGHT OBSTRUCTION CRITERIA

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HEIGHT OBSTRUCTION CRITERIA

D.1 Height Obstruction Criteria – 14 CFR 77 Imaginary Surfaces

D.1.1 General. This appendix establishes criteria for determining whether an object or structure is an obstruction to air navigation. Obstructions to air navigation are:

- Natural objects or man-made structures that protrude above ground planes or surfaces as defined in the following paragraphs.
- Man-made objects that extend more than 500 feet above the ground at the site of the structure.

Explanation of Terms. The following will apply:

- *Controlling Elevation*. Whenever surfaces or planes within the obstructions criteria overlap, the controlling (or governing) elevation becomes that of the lowest surface or plane.
- *Runway Length*. Dyess Air Force Base (AFB) has one bi-directional primary runway (Runway 16/34), and 13,500 feet of pavement designed and built for sustained aircraft landings and takeoffs.
- *Established Airfield Elevation*. The elevation, in feet above mean sea level (MSL), for Dyess AFB is approximately 1,789 feet above mean sea level (MSL).
- *Dimensions*. All dimensions are measured horizontally unless otherwise noted.

For a more complete description of airspace and control surfaces for Class B runways, see 14 Code of Federal Regulations (CFR) Part 77 *Objects Affecting Navigable Airspace*, or to Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*.

D.1.2 Planes and Surfaces. Definitions are as follows (see **Figures D-1** through **D-3**):

Primary Surface

- This surface defines the limits of the obstruction clearance requirements in the immediate vicinity of the landing area.
- The primary surface comprises surfaces of the runway, runway shoulders, and lateral safety zones and extends 200 feet beyond the runway end.
- The width of the primary surface for a single Class B runway is 2,000 feet, or 1,000 feet on each side of the runway centerline.

Clear Zone Surface

- This surface defines the limits of the obstruction clearance requirements in the vicinity contiguous to the end of the primary surface.
- The clear zone surface is located on the ground or water at each end of the primary surface, with a length of 1,000 feet and the same width as the primary surface. (This definition is for FAA defined surfaces and should not be confused with the Clear Zone defined at paragraph 3.3, which is used to describe accident potential.)

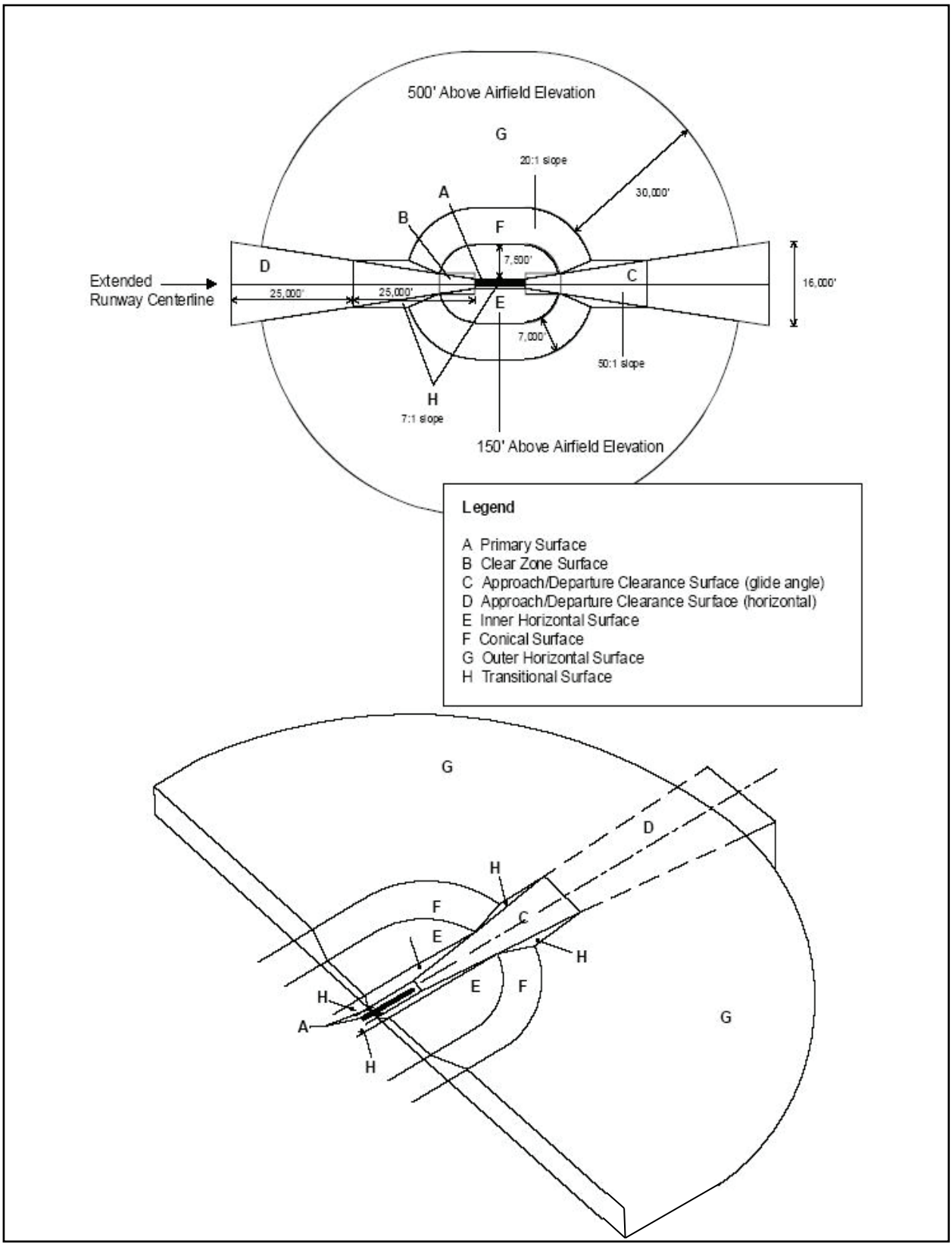


Figure D-1. Plan View of 14 CFR 77 Imaginary Surfaces

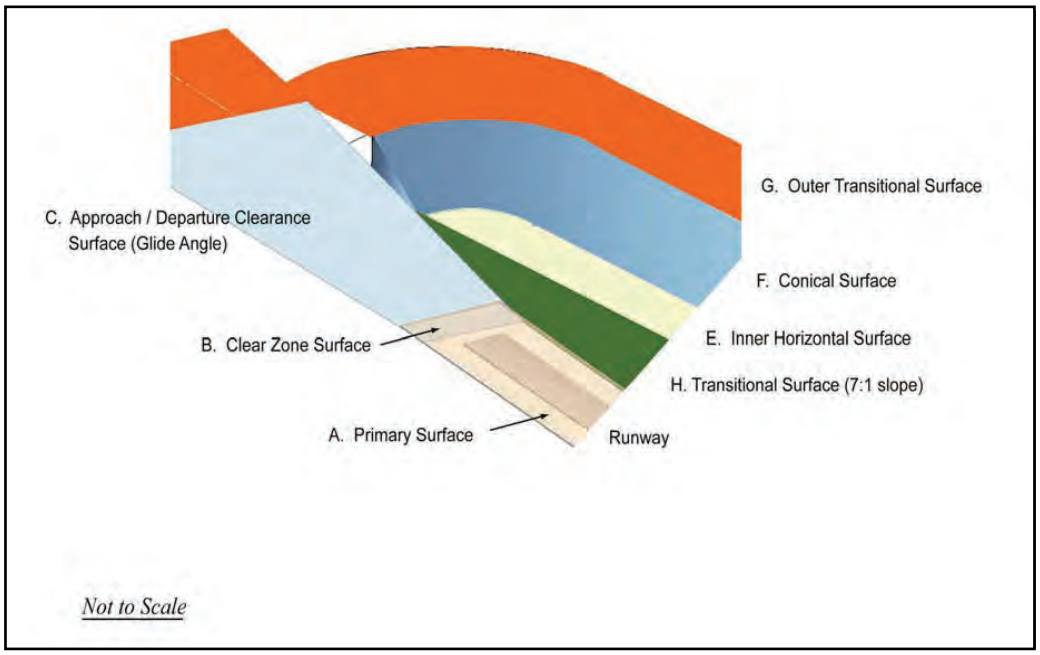


Figure D-2. Three Dimensional View of 14 CFR 77 Imaginary Surfaces

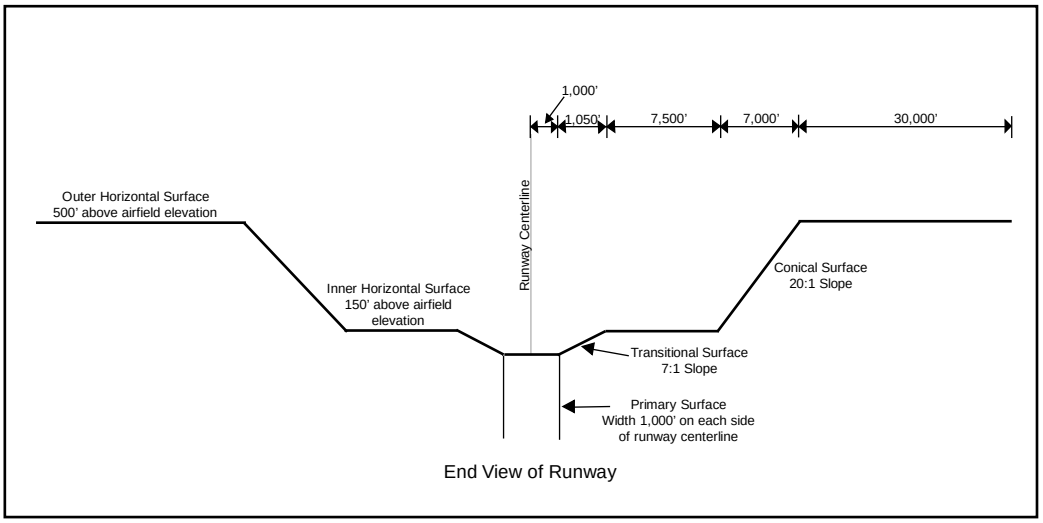


Figure D-3. Cross-Section View of 14 CFR 77 Imaginary Surfaces

Approach-Departure Clearance Surface

- This surface is symmetrical around the runway centerline extended, begins as an inclined plane (glide angle) 200 feet beyond each end of the primary surface of the centerline elevation of the runway end, and extends for 50,000 feet.
- The slope of the approach-departure clearance surface is 50:1 along the extended runway (glide angle) centerline until it reaches an elevation of 500 feet above the established airfield elevation.
- It then continues horizontally at this elevation to a point 50,000 feet from the start of the glide angle.
- The width of this surface at the runway end is 2,000 feet; it flares uniformly, and the width at 50,000 feet is 16,000 feet.

Inner Horizontal Surface

- This surface is a plane, oval in shape at a height of 150 feet above the established airfield elevation.
- It is constructed by scribing an arc with a radius of 7,500 feet above the centerline at the end of the runway and interconnecting these arcs with tangents.

Conical Surface

- This is an inclined surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation.
- The slope of the conical surface is 20:1.

Outer Horizontal Surface

- This surface is a plane 500 feet above the established airfield elevation.
- It extends for a horizontal distance of 30,000 feet from the outer periphery of the conical surface.

Transitional Surfaces

- These surfaces connect the primary surfaces, CZ surfaces, and approach-departure clearance surfaces to the outer horizontal surface, conical surface, other horizontal surface, or other transitional surfaces.
- The slope of the transitional surface is 7:1 outward and upward at right angles to the runway centerline.
- To determine the elevation for the beginning of the transitional surface slope at any point along the lateral boundary of the primary surface, including the CZ, draw a line from this point to the runway centerline.
- This line will be at right angles to the runway axis.
- The elevation at the runway centerline is the elevation for the beginning of the 7:1 slope.

The land areas outlined by these criteria should be regulated to prevent uses which might otherwise be hazardous to aircraft operations. The following uses should be restricted or prohibited:

- Uses which release into the air any substance which would impair visibility or otherwise interfere with the operation of aircraft (e.g., steam, dust, or smoke).
- Which used produces light emissions, either direct or indirect (reflective), which would interfere with pilot vision.
- Uses which produce electrical emissions which would interfere with aircraft communications systems or navigational equipment.
- Uses which would attract birds or waterfowl, including operation of sanitary landfills, maintenance of feeding stations, or the growing of certain vegetation.
- Uses that provide for structures within 10 feet of aircraft approach-departure or transitional surfaces.

D.2 Topography Surrounding Dyess AFB

Guidance in 14 CFR Part 77 states that the area surrounding a runway must be kept clear of objects that might damage an aircraft and therefore is bounded by imaginary airspace control surfaces that are defined in **Section D.1**. 14 CFR Part 77 classifies an object as an obstruction to air navigation if the object is more than 500 feet above ground level at the site of the object, or exceeds the height of the imaginary airspace control surfaces. The purpose of these imaginary airspace control surfaces is to enhance the safety and efficiency of aircraft operations. The imaginary airspace control surfaces are established in relation to the established elevation of the airfield, which for Dyess AFB is 1,789 feet above MSL. For example, the height of the Outer Horizontal Surface is 2,289 feet above MSL, which is the Dyess AFB established airfield elevation (1,789 feet above MSL) plus the height of the surface itself (500 feet).

What drives the obstruction issue at Dyess AFB is the rising ground elevation to the southwest of the installation. In this area, structures do not have to be very tall to be an obstruction. The terrain itself already penetrates the Outer Horizontal Surface in multiple locations (as shown in **Figure D-4**) and any objects constructed in this area would be an obstruction to navigable airspace. For example, if a 150 foot-tall wind turbine were to be built to the southwest of Dyess AFB on a hilltop that has an elevation of 2,200 feet above MSL, the top of the wind turbine would be at an elevation of 2,350 feet above MSL. Since the Outer Horizontal Surface is 2,289 above MSL, the combination of the terrain and the wind turbine would be an obstruction to Dyess AFB navigable airspace because the top of the turbine would extend 61 feet above the Outer Horizontal Surface.

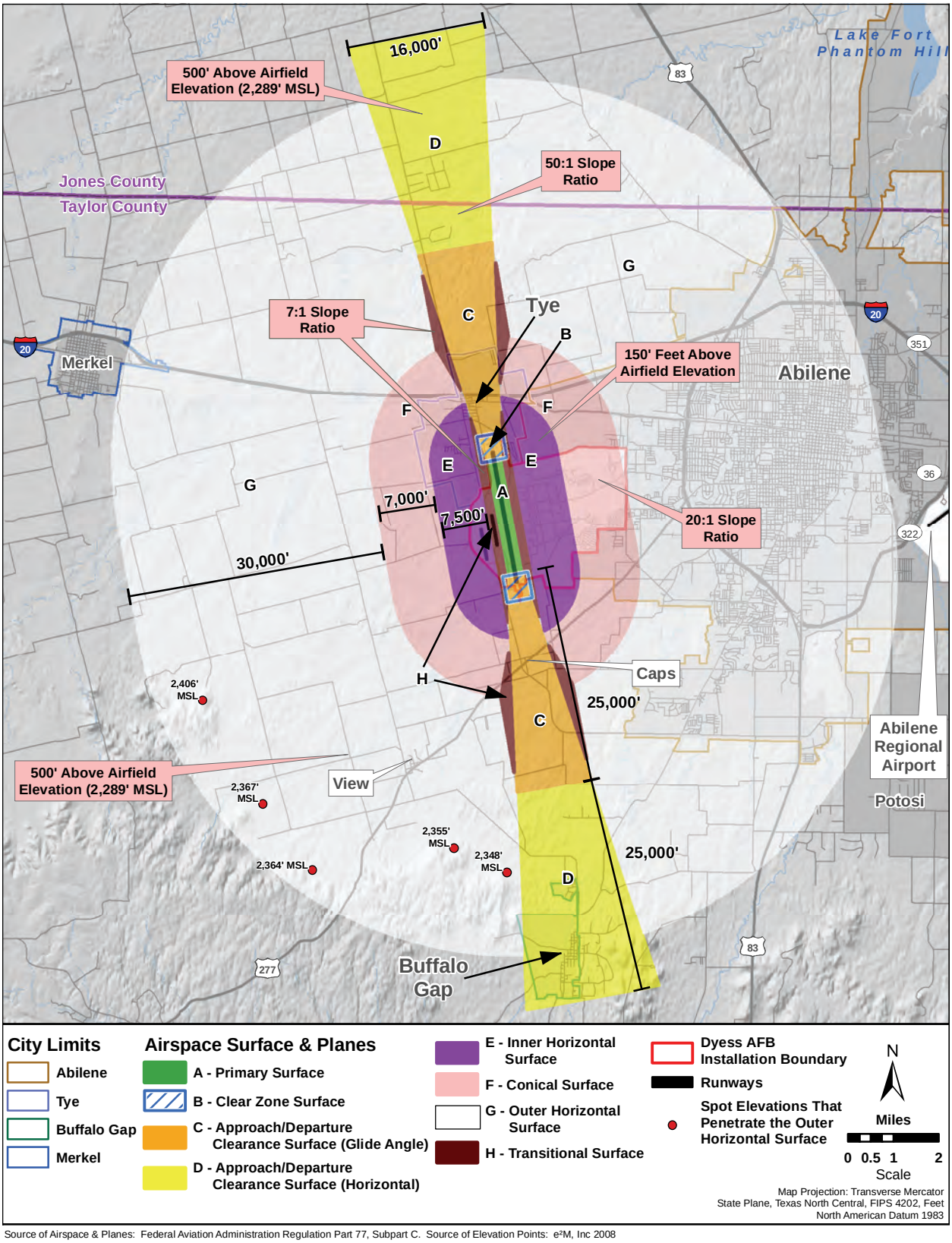
D.3 Drop Zone Criteria

Marrion Drop Zone. C-130 aircraft stationed at Dyess AFB train at the Marrion Drop Zone west of Dyess AFB (see **Figure D-5**). Training procedures include dropping heavy equipment and personnel over the Marrion Drop Zone from C-130 aircraft. Aircraft are usually flown in stacked formations.

The required size of the drop zone, i.e., the drop target area, increases as the altitude of the aircraft increases. The Marrion Drop Zone is 3,000 feet (1,000 yards) wide by 3,300 feet (1,100 yards) long allowing drops from up to 3,029 feet above MSL. Any higher, and the minimum required drop zone is more than the Marrion Drop Zone can accommodate.

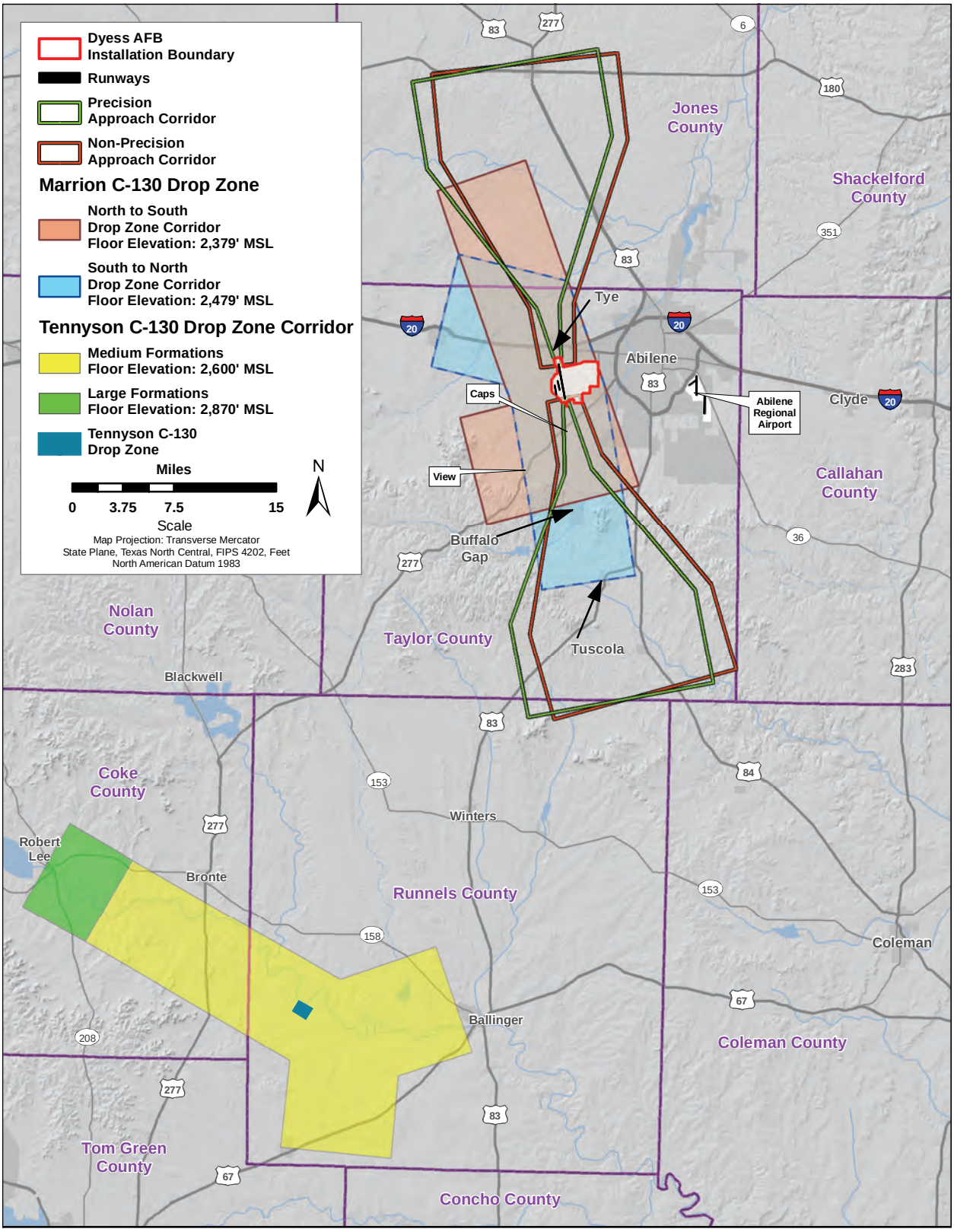
Aircraft must maintain an altitude that allows them to clear any known obstacles by 500 feet. Therefore, any structure within 3 nautical miles of the drop zone entry/exit centerline that raises the minimum altitude would negatively affect training with the C-130 aircraft since it will cause the aircraft to complete their drop from a higher altitude than can be accommodated within the confines of the drop zone.

Tennyson Drop Zone. In addition to the Marrion Drop Zone, C-130 aircraft utilize the Tennyson Drop Zone, as shown in **Figure D-5**. The Tennyson Drop Zone is southwest of Dyess AFB in Runnels and Coke County, 15 miles west of Ballinger, Texas. Most of the training with C-130 aircraft is conducted at the Tennyson Drop Zone. The Tennyson Drop Zone is 5,400 feet long by 4,200 feet wide. C-130 formations approaching the Tennyson and Marrion Drop Zones will usually be between 800 and 1200 feet above ground level at 130–140 knots through the completion of their drops.



Source of Airspace & Planes: Federal Aviation Administration Regulation Part 77, Subpart C. Source of Elevation Points: e²M, Inc 2008

Figure D-4. FAA Imaginary Surfaces (Including Spot Elevations)



Source of Drop Zones: Dyess AFB 2008

Figure D-5. Marrion and Tennyson Drop Zones at Dyess AFB

APPENDIX E

NOISE LEVEL REDUCTION GUIDELINES

APPENDIX E

NOISE LEVEL REDUCTION GUIDELINES

A study which provides in-depth, state-of-the-art noise level reduction guidelines was sponsored by the Department of the Navy, Naval Facilities Engineering Command by Wyle Laboratories in April 2005. The study title is *Guidelines for Sound Insulation of Residences Exposed to Aircraft Operations*. The study is available online from Wyle Laboratories at http://www.wylelabs.com/content/global/documents/WSI.pdf.

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