IX. The Prince George's County Situation

A. Profile of Four Airports

Runways are listed and referred to by number, indicating the first digits in a compass reading. For example, Runway 6 is at 60 degrees from true North (or 0 degrees). As indicated earlier, "Visual" approach means that the runway can be approached by approaching aircraft *only* under VFR (Visual Flight Rules); "non-precision" means the runway can be approached using limited IFR procedures (Instrument Flight Rules). No other approaches are approved for runways in the four airports studied. It is not unusual for airports to designate different approach rules for different directions of approach, depending on prevailing conditions around the airport.

- **Potomac Airfield: Runway 6 – Non-Precision**
  Runway 24 -- Visual Only

Potomac Airfield was established in 1960 on 50 acres of land near Ft. Washington, Maryland. It was created as Rose Valley Air Park by Special Exception 1130 on March 30, 1965, and has been in operation since.

It is licensed by the Maryland Aviation Administration with a waiver for obstructions. It is located one mile west of Washington Executive/Hyde Field and uses a common unicom with that airport. It has one runway, designated 6 (in one direction) and one designated 24 (the same runway approached from the opposite direction) which is lighted and has displaced thresholds at both ends. Runway 6 is designated as the calm wind runway. The airport is open to the public from 8:00 a.m. to 10:00 p.m. There are four flight training schools located at Potomac Airfield and fuel, flight training, aircraft rental and charter, repair services and aircraft storage are available.

The runway is 2,665 feet long by 40 feet wide and has a displaced threshold of 376 feet on Runway 6 and a displaced threshold of 73 feet on Runway 24. A "displaced threshold" means that the threshold to be used by aircraft has been moved from the end of the paved portion to a point on the paved portion, say 73 feet from the runway end; such displacement is made known to pilots by a series of v's shaped as arrows and a while line across the runway. The approach angles are three degrees for Runway 6 and 4.5 degrees for Runway 24. The traffic pattern is "non-standard" for both Runway 6 and Runway 24. Runway 24 is used 80% of the time with Runway 6 being used 20% of the time, due to prevailing winds. Operations are on a "right-hand" only pattern that is non-standard for approaches to Runway 24. This is done to avoid the potential for a mid-air collision with aircraft operating to or from Washington Executive/Hyde Field.

There is a 20-30 foot high earthen berm perpendicular to the runway centerline if extended. This serves to deflect sounds from the airport to residents on Featherstone Drive to the south, but even though the top of the berm is technically within FAA limits, **it creates a hazard to pilots and passengers if there is an aircraft engine failure just at take-off** and the pilot is unable to glide straight back down to a "dead-stick" landing—the approved procedure in such cases. It can also represent a hazard if a landing on Runway 6 is "short" even though the runway is "displaced"—meaning the threshold is further down the runway than the actual pavement. While the berm is a physical barrier between the airfield and residences to the southwest along

POTOMAC AIRFIELD

CHART 10

Potomac Airfield: This is a view of the approach and what the pilot sees when turning "final" to Runway 6, Potomac Airfield. Note the line of houses immediately in line with the runway. When an aircraft is departing on Runway 24 (opposite direction towards the view seen here) the aircraft, at the most critical phase of climb-out, passes over the houses if the aircraft is proceeding in a center-line direction from the runway. Note also in the picture the "berm" which separates the houses on Featherstone Drive from the airfield that must be cleared on this approach to Runway 6.

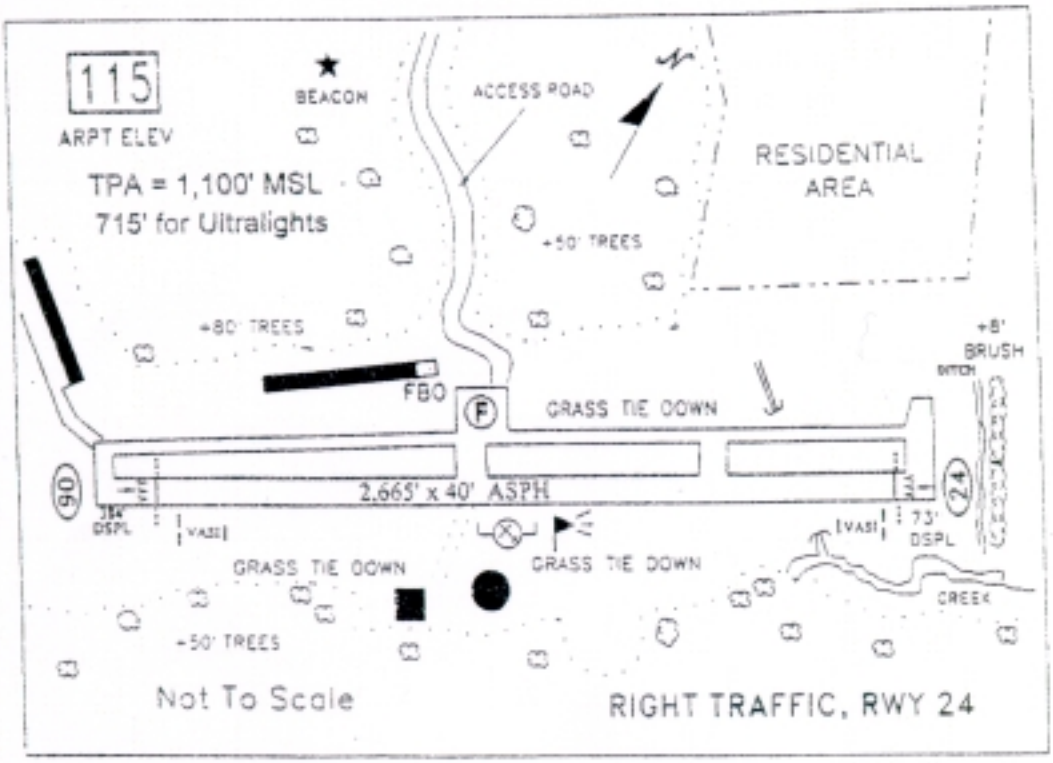
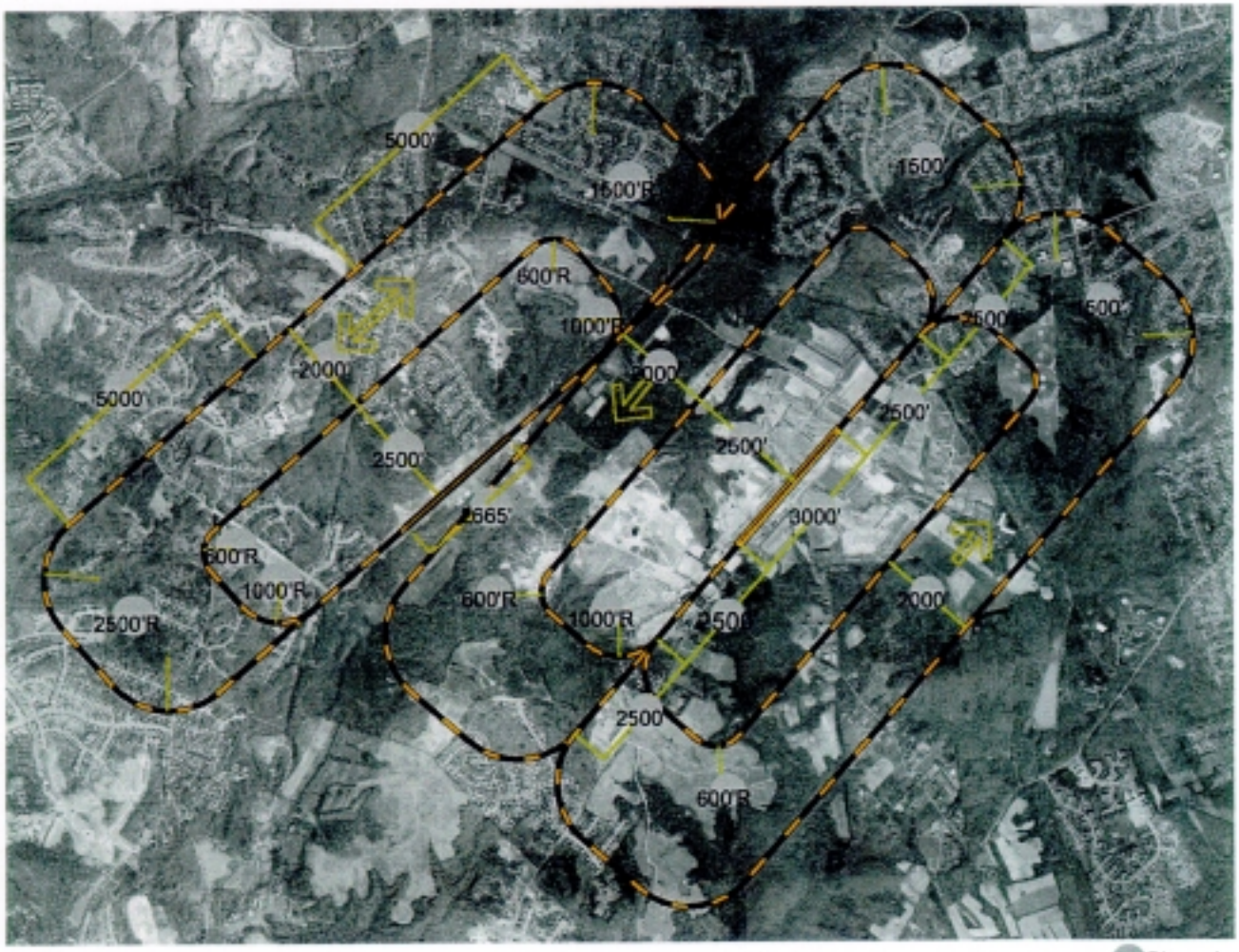


CHART 11

Washington Executive and Potomac Flight Patterns



Flight Patterns are in accordance with current airport operations.

CHART 12

Potomac Airfield: This picture shows an aircraft on approach to Runway 6; it was taken from the top of the earthen berm. Note houses on Featherstone Drive on each side of the street (bottom right and left of picture). Note the proximity of the aircraft to the houses.

Potomac Airfield: This is a photograph taken from the top of the berm looking towards the houses on Featherstone Drive. The earthen berm is approximately 20 to 30 feet high, below FAA required minimums. There are bushes and trees on the berm and on each side of the berm, some of which may actually exceed height minimums.

Featherstone Drive and may be a "safety" barrier for the residents from aircraft incursions that abort a takeoff on Runway 24, it is a hazard to pilots and other aircraft occupants.

The berm also serves as a psychological barrier to the residents because if they can't see or identify the sources of sound, and it's less harassing that it might be otherwise. The berm does reflect, refract and diffuse sound coming from the airport. In addition, the berm may protect the residents nearby from annoying light from the Runway End Identifier Lights (REIL) when they are operating. Shrubs, bushes and trees have been planted on the south side of the berm. Height of the vegetation varies up to a height of about 10 feet above the ground. Plantings do extend higher than the top of the berm and tend to increase aircraft vertical altitude for an approach to Runway 6. There are 28 single-family residences on Featherstone Drive that are directly affected by aircraft overflights.

There is a non-directional radio beacon on the airport for navigational purposes. Runway 24 approach is visual and Runway 6 has a published non-precision approach (VOR/DME and GPS).

The airport had 52,925 operations in 1999 (a "take-off" and a "landing" are each an operation) in 1999 with 112 based aircraft (97 single-engine and 15 light multi-engine aircraft). Traffic increased 121% from 1991-1994. The >65 Ldn noise contour, as explained later, is close to the airport boundaries.

Complaints and crashes have caused special attention to be paid to this airport by the planning staff of the M-NCPPC and other government officials. These concerns were addressed in the Potomac Airfield Report of June 1999.

Several measures can be taken to improve flight safety in the Potomac Airport area and they are detailed later in the "mitigation" section of this Report.

Comments: At present, there are no "illegal" structural incursions which violate FAR Part 77. However, the berm at the end of Runway 24 is only a FEW FEET below the minimum requirements. Engine failure of a small aircraft at the critical phase of take-off would give the pilot very little maneuvering room for a safe return to earth; aircraft would very likely strike the berm if it had not attained sufficient altitude to "clear" it, with catastrophic results to pilot, passengers and aircraft. If the aircraft had cleared the berm in an engine-out situation, it would likely end up in the housing development on Featherstone Drive, as one did in the past.

In addition, there are trees to the right and left of the extension of the centerline on Runway 24, which may be higher than required minimums for the end of a runway. Though technically not in violation of any regulation, the trees represent an additional hazard in the event an aircraft undertakes to turn left or right in an emergency situation. A likely scenario is that the aircraft trying to execute such a turn with an engine-out condition would impact the trees.

- **Washington Executive/Hyde Field**

Runway 5 – Visual Only
Runway 23 - Visual Only

Washington Executive/Hyde Field was established in 1939 as a private airport and has developed into a public and commercial use general aviation airport. It is located two miles southwest of Clinton, Maryland, in a generally rural area, approximately nine miles southeast of the District of Columbia, and one mile east of Potomac Airfield.

The number of operations was estimated by the airport manager at approximately 90,000 per year. However, the Maryland Aviation Administration estimated 38,000 operations in 1999, using its system of counting. The wide discrepancy in the counts probably occurs because counts are taken at infrequent intervals during the year without regard to weather, time of year, or other variables, then "annualized." Nonetheless, in doing some probability calculations, Consultant used a figure of 36,000 operations because it believes that the MAA count was more likely to be closer to the correct number than the operator's estimate.

Runway 5 (meaning 50 degrees from magnetic North, plus or minus five degrees) and Runway 23 (running in the opposite direction) is the principal runway. The crosswind runway 13/31 was closed for failure to meet line-of-sight criteria. Although there are three flight schools located at the airport, "touch-and go" landings and takeoffs are not permitted; all aircraft must come to a full stop on landing. Only Visual Flight Rules (VFR) approaches are approved for this airport from either direction.

The airport contains 140 acres and is privately owned and operated. It is ineligible to receive federal airport grant funds at this time, but because it has been classified as a "reliever" airport to Reagan-Washington National Airport, it is "qualified" and may be able to obtain funds in the future under the Airport Improvement Plan (AIP) administered by FAA. At this time there is no tower and pilots are responsible for their own separation from other aircraft. Washington Executive/Hyde Field shares a unicom auto-response radio communication with Potomac Airfield.

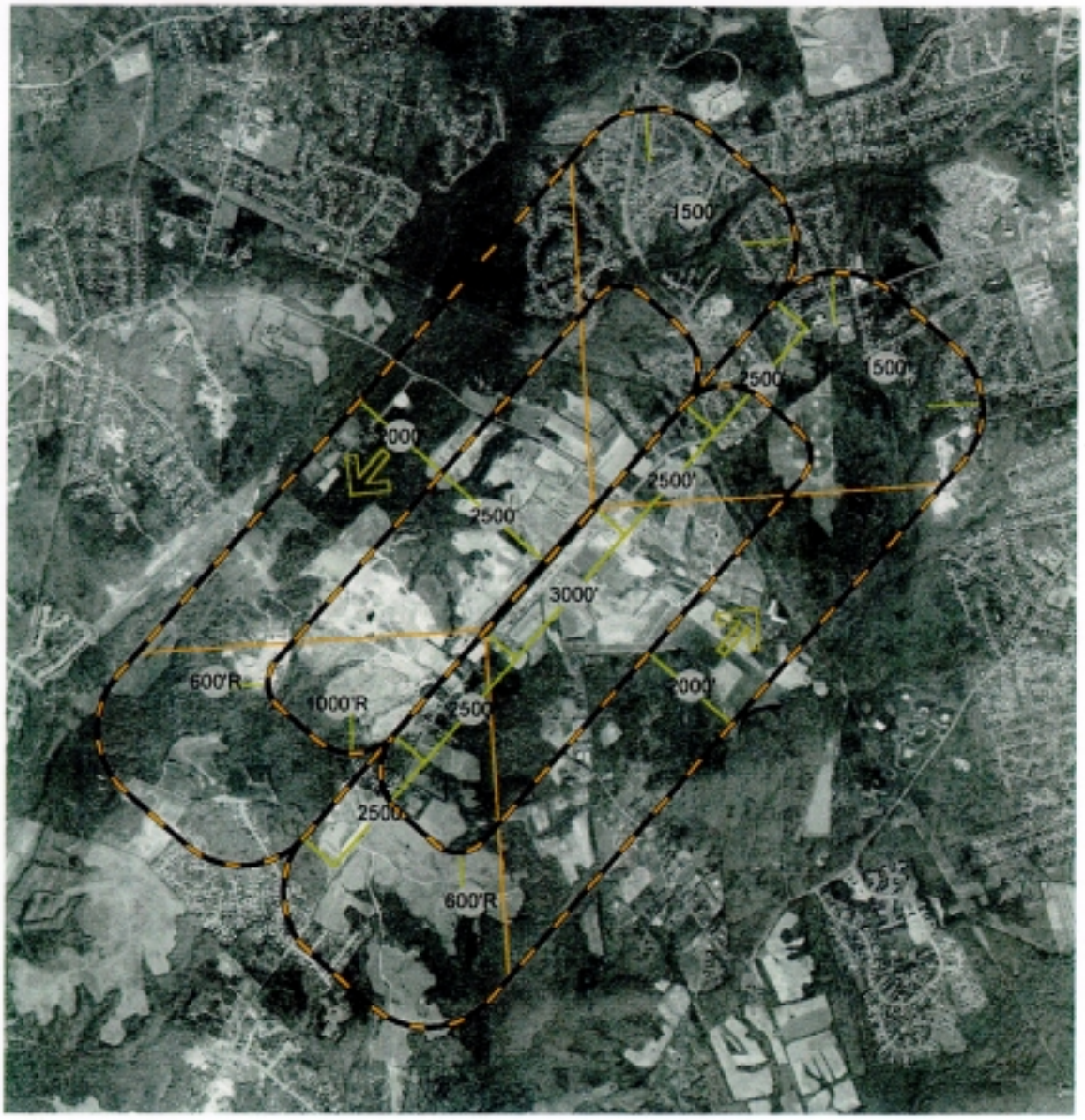
The airport is licensed by the Maryland Aviation Administration and has received a waiver for runway and taxiway separation at 76 feet, below minimum standards. Services provided at the airport by the operator or Fixed Base Operators (FBOs) include flight training, aircraft rental and charter, aircraft repair and maintenance, turf tie-down for aircraft, and the rental of "T" hangars. There is aviation fuel available for aircraft based at the field and for transient aircraft. The hours of operation are 8:00 a.m.-6:00 p.m. all year, although runway lights are available 24 hours per day.

Approximately 90 aircraft are based at the airport consisting mainly of light single-engine private aircraft, four light twin-engine aircraft, two helicopters, and two ultra-light aircraft.

According to the airport owner, there are plans to realign the runway direction to 40/220, repave and upgrade the landing surfaces and facilities, and extend the runway to 4,800 feet, if FAA grant monies are available. FAA funding would be contingent upon compliance with FAR Parts 77 and 150 regulations and mandatory compliance with relevant Advisory Circulars. These are

CHART 13

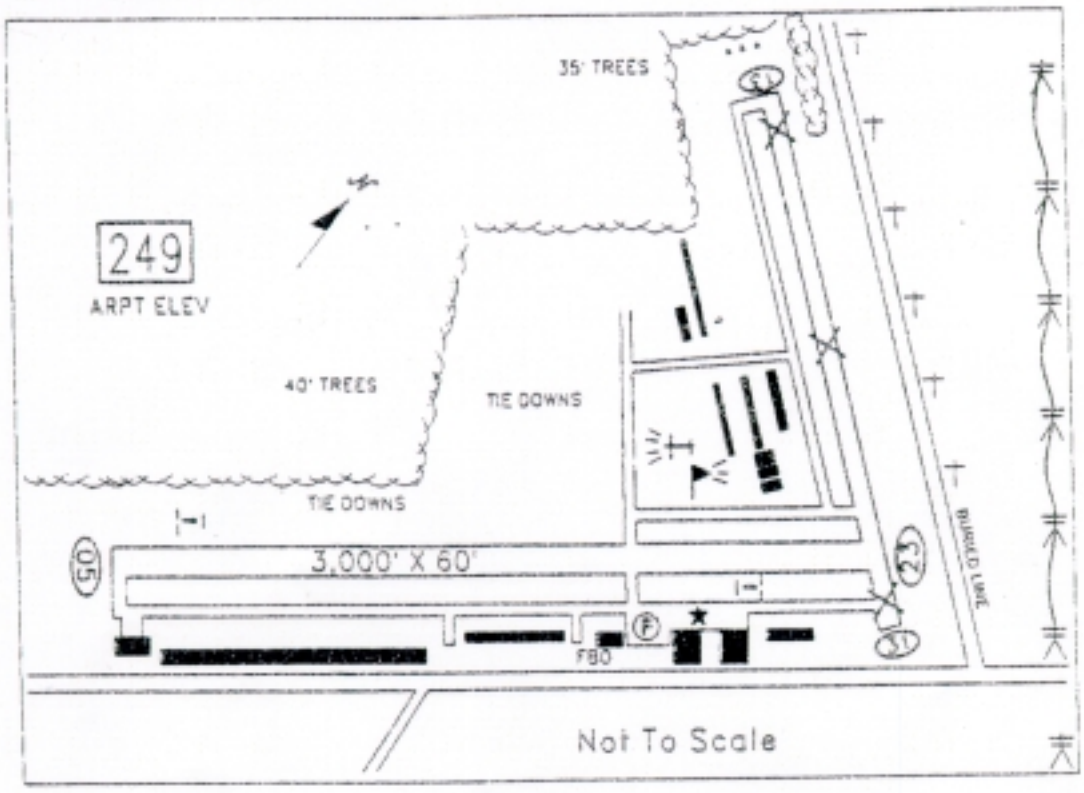
Washington Executive Flight Patterns



Flight Patterns are in accordance with current airport operations.

CHART 14 WASHINGTON EXECUTIVE/HYDE FIELD

Washington Executive/Hyde Field: View from an aircraft approaching Runway 5. Note that the approach is relatively clear of residential development.



complex processes and represent an entirely different mode of operation than is presently in place at Washington Executive/Hyde Field. Secondly, and as a part of the evaluation by FAA, realigning the runway will put aircraft departing from it into additional conflict by route of flight of aircraft from the centerline extension for Potomac Airfield, only a mile distant. Whether the airport will be able to secure FAA funds is questionable. If it does it may elect to seek funds to acquire a "clear zone" ("RPZ" or what is called "APZ-1" in this Report) or beyond, to prevent the situation found at Potomac Airfield. Airport improvement funds may be used for clear zone land acquisition if approved by FAA.

Washington Executive/Hyde Field uses standard traffic patterns (left hand turns in the approach pattern) for both runways whereas Potomac Airfield uses a standard traffic pattern for Runway 6 and a right-hand pattern (non-standard) for Runway 24, designed to reduce the chance of a near-miss or mid-air collision between aircraft flying towards the two different airports.

- **College Park**

  Runway 15 – Non-Precision
  Runway 33 – Visual Only

College Park Airport is the world's oldest continuously operating airport. The Wright brothers began giving flying lessons to Army students at this site in 1909. In 1973, the Maryland-National Capital Park and Planning Commission (M-NCPPC) purchased the field to utilize it both as an operating airport and an historic site. The airport was entered into the National Register of Historic Places in 1977 in recognition of its significant role in aviation history. Probably no other field in aviation can boast of such a significant clientele or such an amazing list of achievements as College Park Airport. Today, it is a modern general aviation airport that meets FAA standards. It is located on 70 acres of land one mile east of College Park and the University of Maryland campus.

College Park Airport is licensed by the Maryland Aviation Administration with no waivers. An airport layout plan for the airport was prepared with FAA grant money for the M-NCPPC in February, 1999. There are displaced thresholds on both runways, 15/33. The airport is open from 7:00 a.m. to 10:00 p.m. for takeoffs. It is capacity-limited to 100 based tenant aircraft, has no flight schools, and does not permit training operations except for based aircraft during the normal week, Monday through Friday.

The runway elevation is 48 feet. Runway 15 is a non-precision runway with a VOR/DME RNAV or GPS approach. Runway 33 is a visual runway and approach. The runway is 2,610 feet long with a displaced threshold of 413 feet for Runway 15 and a displaced threshold of 195 feet for Runway 33. Both traffic patterns are standard (left-hand). Altering the traffic pattern may satisfy the neighboring University of Maryland interests, but would cause other residents to be affected negatively by aircraft sounds. The prevailing wind is generally from the north with 70% of the departures reported towards that direction with landings from the south an equal percentage.

There are 70 based aircraft, mostly single-engine with four light twin-engine aircraft, and no helicopters or aircraft weighing over 8,500 pounds gross take-off weight.

CHART 15

College Park Flight Patterns

Flight Patterns

N

0 5000 10000 15000 Feet

Flight Patterns are in accordance with current airport operations.

CHART 16

COLLEGE PARK AIRPORT

College Park Airport: View from an aircraft approaching for landing on Runway 33. Although the picture is not clear, one can see that the airfield is surrounded on three sides with mature trees. Directly beyond and slightly to the left of the centerline extension of Runway 33 are buildings of the University of Maryland, with high density population.

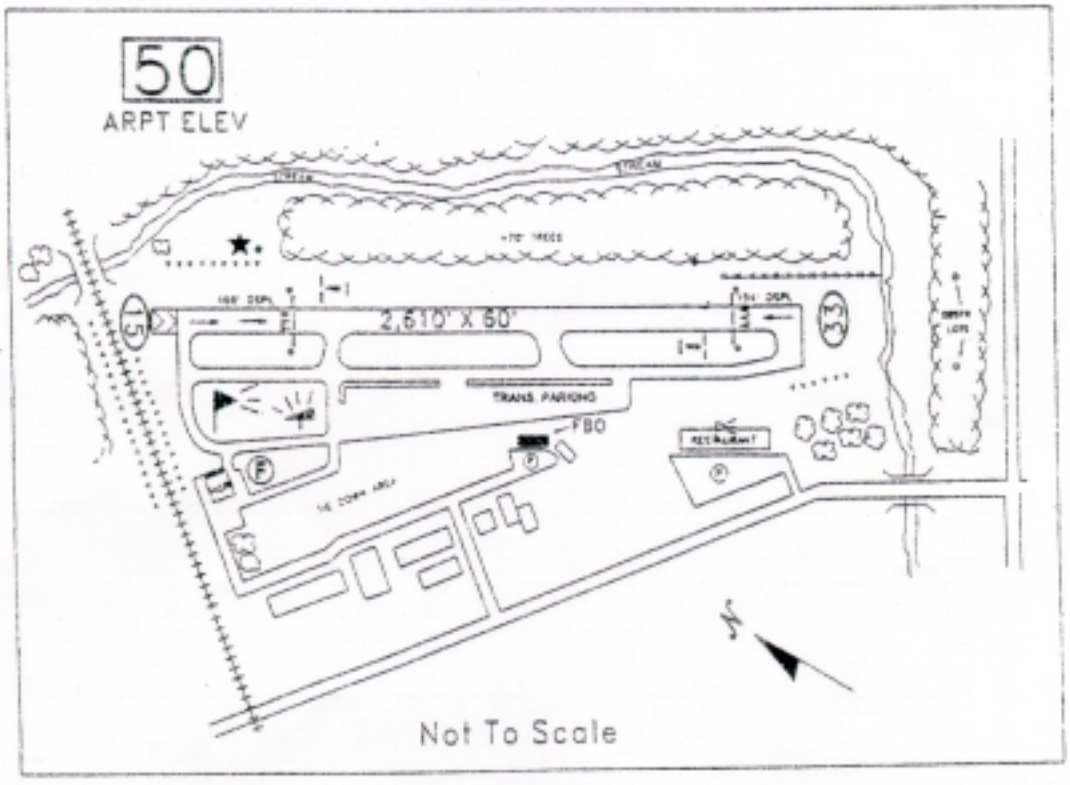
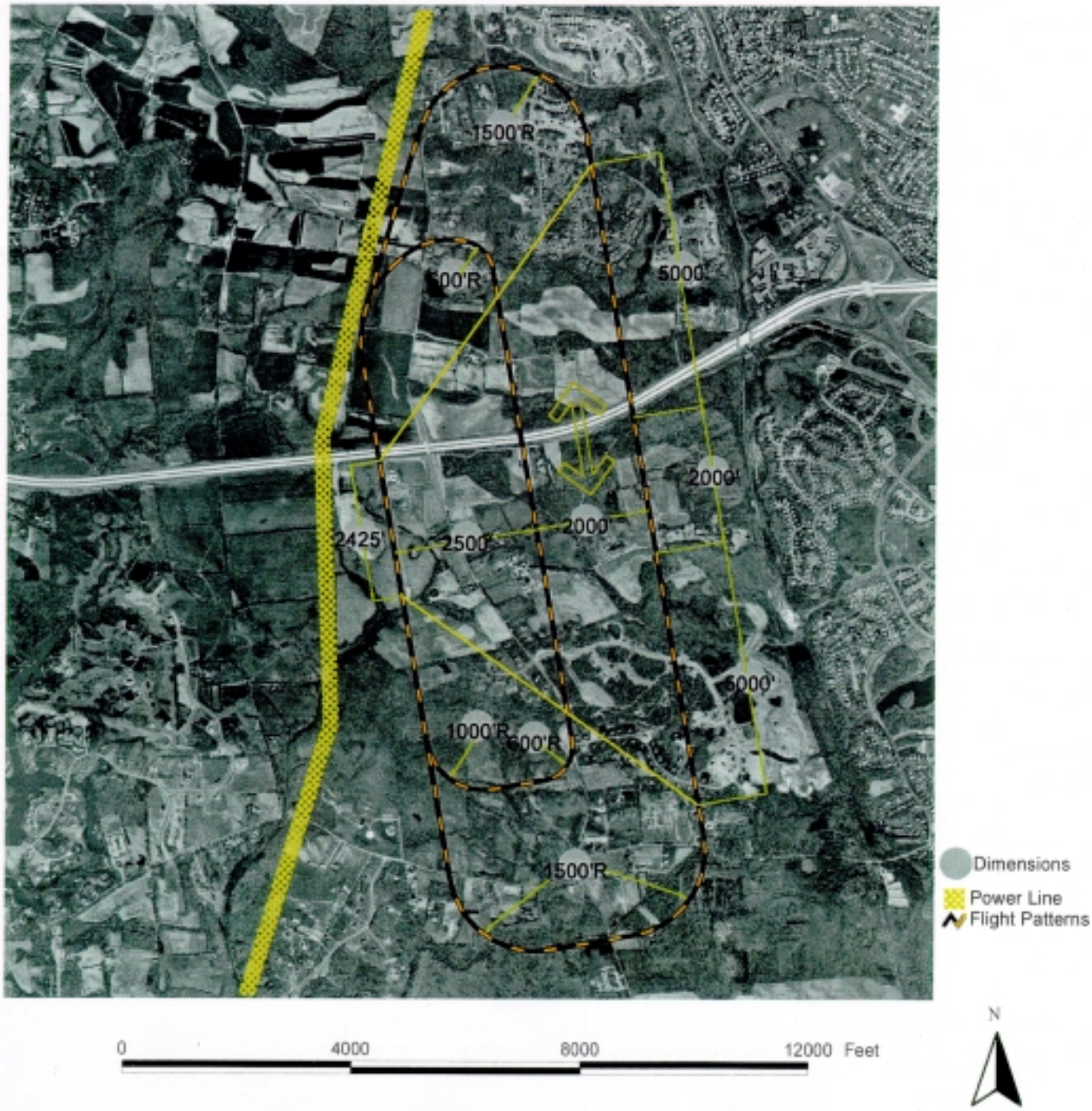


CHART 17

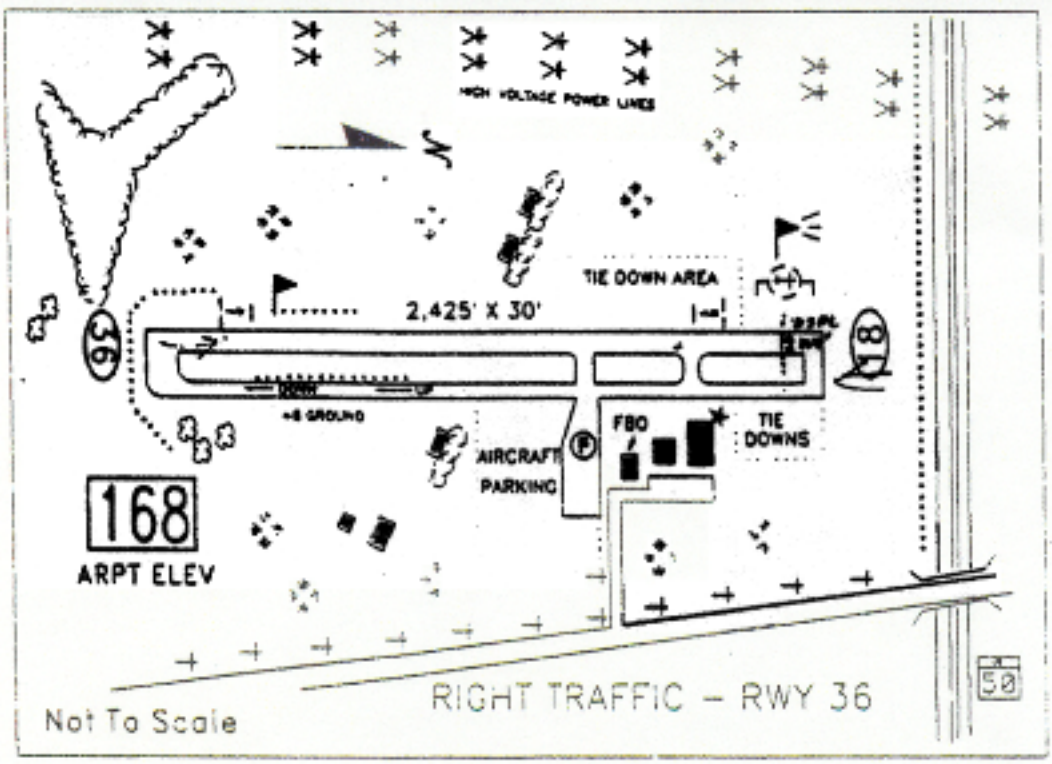
Freeway Flight Patterns



Flight Patterns are in accordance with current airport operations.

CHART 18 FREEWAY AIRPORT

Freeway Airport: View from an aircraft approaching for landing on Runway 36. US-50 is just beyond and perpendicular to the runway. Just visible are the high tension power lines on the left (west side) of the approach. Aircraft must stay well clear of these power lines on the approach which is a "non-standard" right-hand approach. When departing on Runway 36, pilots must execute a right turn shortly after take-off to stay clear of the power lines. When landing on Runway 18 (the same runway in the opposite direction), aircraft must execute a "dog-leg" approach on the base leg before turning onto "final" in order to avoid the power lines.



approach (VOR or GPS). There is a 104 foot displaced threshold on Runway 18. There is a 0.7% gradient for Runway 36. The traffic pattern for Runway 18 is left-hand and for Runway 36 it is non-standard. Approach angles for Runway 18 and Runway 36 respectively are four degrees and three degrees. The approach slopes are 15:1 and 20:1 respectively. The runway is lighted, with night and instrument operations being an estimated 20-30% of the total operations.

All landings must be to a full stop. No "touch-and-go's" or simulated engine-out operations are approved by airport management. There is a high voltage power transmission line to the west, running approximately parallel to the north/south runway. The line is marked and lighted. This requires departing aircraft to climb abruptly on takeoff from Runway 36 and make an early right turn after crossing U.S. 50 which is 115 feet from the threshold of Runway 18. Approaches to Runway 18 require pilots on approach to make a "dog-leg" turn on the base leg and transition to the final leg because of the power lines to the west of the airport area. On Runway 36 there are trees about 100 feet from the threshold, but they do not penetrate above the legal plane as defined by the FAA in FAR Part 77. Runway 36 is the operational runway 60% of the time and runway 18 is in use 40% of the total.

The airport and runway is surrounded by undulating terrain, a power line to the west and north, U.S. 50 to the north, Church Road to the east and woods to the south. There are no plans for expansion of the airport. Growth is limited by size of the airport; possibly another 20 aircraft could be based at the airport but its configuration and runway orientation, direction and geometry are fixed by the topography of the surrounding area.

The Rouse-Fairwood Development (residential and commercial) has been approved north of the airport across U.S. 50 with a planned area development of 1,058 acres. Residences constructed under and near the take-off leg of Runway 36 of Freeway Airport will be affected by aircraft sound and the potential for a forced landing or crash by aircraft on attempted take-off or landing. See Accident Potential Zone discussion in this Report.

Comments: High tension wires are on the immediate left of an aircraft taking off on Runway 36, or on the right to an aircraft taking off on Runway 18. This means that on takeoff from Runway 36 (the preferred runway), a pilot must execute a right-hand turn immediately after attaining sufficient altitude to do so safely. This is not an ideal circumstance. Further, immediately forward of Runway 36 is a major arterial, U.S. 50, which, while not creating obstructions into the air, does represent a potential for a serious accident between aircraft and highway traffic in the event of an emergency situation immediately after take-off from Runway 36 or on approach to Runway 18.

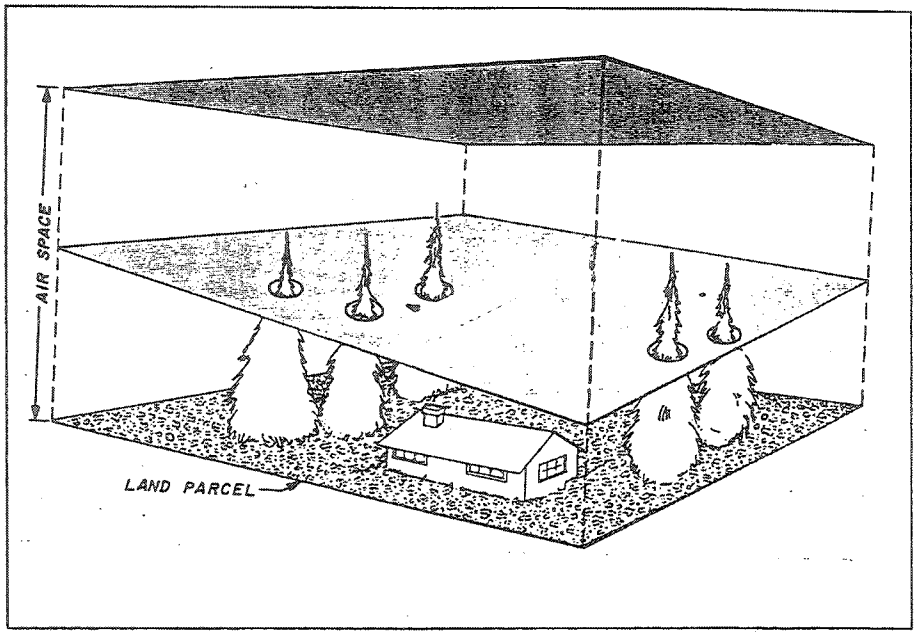
A major residential subdivision is planned in the area directly north and in line with the centerline of Runway 36. Dense development would represent a repetition of the Potomac Airfield situation with houses and multiple dwellings immediately off the end of the runway, and in an Accident Potential Zone (APZ)—see later discussion.

B. Noise and Annoyance Factors

As stated elsewhere in this Report, nothing either from the resident survey or the discussions had with airport managers/operators suggests that aircraft noise is a major problem with any of the small airports in Prince George's County, except an occasional call prompted by transient or military aircraft. No reports of "annoyance," such as TV-screen or radio interference, or other "nuisances" were evident from the sampling done by Consultant. Even though the diagrams show noise footprints, this was done to make comparisons as between Accident Potential Zones and the typical "acceptable" noise footprint, not to suggest that there is any real problem with noise. A few respondents to the telephone survey mentioned aircraft noise related to Andrews Air Force Base as being an occasional annoyance.

C. Structure Height Issues

As set forth in more detail in reference to recommendations of Consultant with respect to tree heights at two airports, an earthen berm at one airport, and a high tension power line at one of the airports, no other structure heights issues were detected that need attention. Below is a diagram borrowed from the North Dakota Aeronautics agency to illustrate the tree height issue.



D. Risk Factors and Air Safety Issues Regarding Prince George's County Airports

Most airport land use models identify the three major issues affecting safety of flight and compatibility of airports with their neighbors. These are:

1) Safety Hazards to pilot, crew, passengers and airport neighbors on the ground—on, at and beyond the airport runways.

3) Noise—aircraft-generated noise which can be tolerated or which can, in the extreme, be so intrusive as to make it intolerable to humans.

Each of these issues is treated separately. Safety concerns are, of course, paramount. Since local governments are ultimately responsible for land use decisions, with a few exceptions noted elsewhere in this Report, those governments must inform themselves of the facts.

With knowledge of aviation hazards, land uses permitted by local government which allows development such as single-family residences in identified airport risk areas may run counter to the responsibility of such government to protect the health and welfare of its citizens.

Several studies, particularly one conducted for the State of California by Hodges & Shutt, using University of California-Berkeley research, which is the seminal study in the area, are instructive in this regard.

There is no doubt, based on historic data, that aircraft accidents will occur in the life of an airport, and the probability of such occurrences can be forecast by using mathematical probability techniques, using industry and government data, and applying experience in aviation to such techniques. As the Washington State report says:

> **Due diligence concerns become paramount should an accident or incident occur resulting in damage to property, loss of livelihood, injury, or death.** (Page 17, *Airports and Compatible Land Use,* Vol. 1, WSDOT Report).

There are objective bases for "best practices" in airport land use control policy, which are:

1) Risk identification and application of probability analyses based upon historic data and applied to the local situation;

2) Government and aviation record-keeping which document the historic data concerning aircraft accidents, their frequency, their causes, and their exact locations in most cases;

3) Review of tort law in the aviation area;

4) Observation and implementation of a number of risk-avoidance policies to eliminate or mitigate potential catastrophes.

E. Accident Potential Zones ("APZs")

A number of studies have been accomplished to determine Accident Potential Zones (APZs) in the areas on and around airports. The most complete study is this area, outside of military studies, was originally done by Hodges & Shutt, a consulting firm in California, in response to a request of the State of California Transportation authority (CALTRANS) in 1983. The materials were updated in 1993, and in fact, the successor firm, Shutt & Moen of Santa Rosa, California, is conducting a further update of the study, but no new aircraft crash "spotting" data is being done by the University of California-Berkeley at this time..

The original study relied on data supplied by the National Transportation Safety Board (NTSB), a federal agency dedicated to investigating aircraft (and other transportation) accidents, and providing recommendations to other agencies and users as to how to prevent future accidents. The NTSB data, updated by the consultants, was used in connection with a detailed study done by the University of California-Berkeley showing aircraft accident patterns in reference to airport runways. (See Chart attached forwarded to Consultant by UC-Berkeley). The findings of the original study are still quite valid with respect to aircraft accident "spotting" at or near runways/airports. The original study considered all types of aircraft, including single-engine and twin-engine general aviation aircraft, as well as other large aircraft, but it separated accident location data for small aircraft from large ones, and specified aircraft runway lengths. This further quantified the data.

As a result of the study, Hodges & Shutt constructed an Aircraft Accident Safety Zone Diagram and identified six potential accident zones (See Chart). The zones showed dimensions of each zone that would differ depending on the length of the runway. This partly recognizes that the runway length, in turn, limits the type of aircraft that can serve a particular airport. The study also undertook to calculate the approximate land area in acres for each zone so identified, and suggest appropriate land uses in the respective zones.

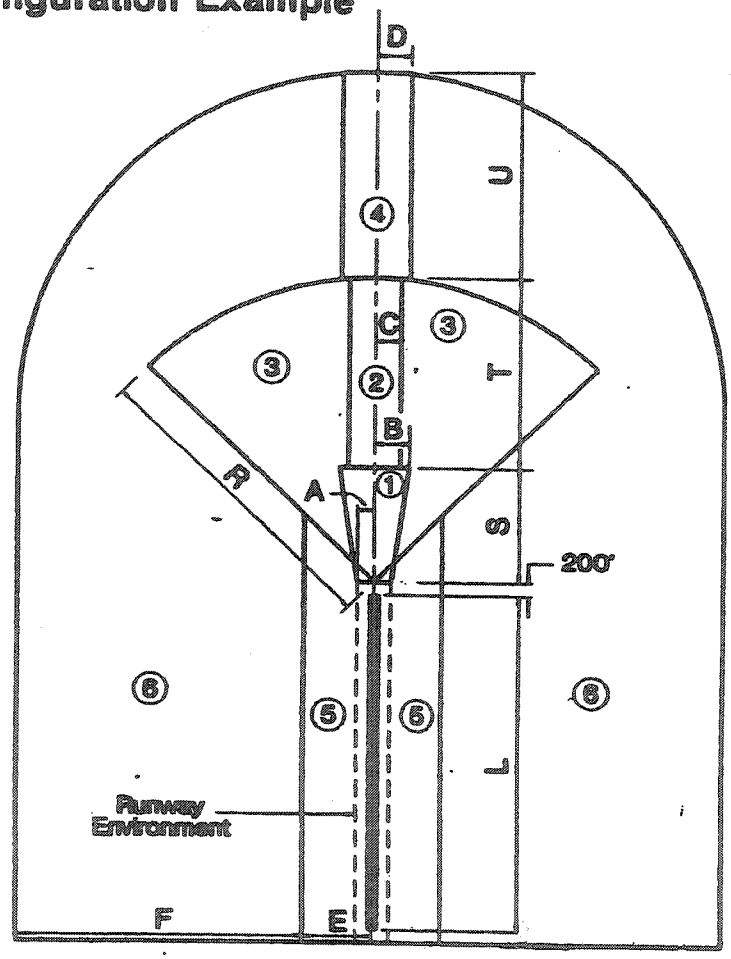
This data has been compared with certain Navy and Air Force studies done within the Department of Defense and used to calculate **Accident Potential Zones** at or near military airports. These zones were called Air Installation Compatible Use Zones (AICUZs) and represented studies of literally hundreds of military aircraft accidents at various airports. Each Air Force base or Naval air station was required to conduct a study to provide local assessments and create zones extending on and beyond the confines of the base or air station. In this connection, in preparation for this Report, William V. Cheek & Associates, Aviation Consultants, reviewed several military and naval AICUZ Reports, including Mather AFB (Sacramento, California); Miramar Naval Air Station (San Diego, California) and McGuire AFB (New Jersey).

As a result of observing the previous civilian studies, and the AICUZs of the Department of Defense, Consultant *revised* the APZs and the relative risk assessments made in the Hodges & Shutt study and created a breakdown for general aviation airports where runway lengths do not exceed 4,000 feet. This method uses some of the logic applied by Hodges & Shutt, but *renames* some of the zones. Calculations of probable accident frequencies at the four Prince George's County general aviation airports were calculated on the basis of these APZs and appear below.

Using the combination of the first study, the UC-Berkeley accident "spotting" data, and a constructed chart of Aircraft Accident Safety Zones, and interpolating the data for small general aviation aircraft and airports, the following is presented as a guide to assess the proposed land uses which appear in chart form. The Airport Land Use categories were *adapted* from the Denver Regional Council of Governments' (DRCOG) presentation in its *Airport Compatible Land Use Design Handbook* (1998). Similar presentations appear in the California study, in the Washington state study, in several local airport studies, and elsewhere. All have some differences, but the principles are fundamentally the same, namely: risk is reduced by lower density uses and concentrations of buildings and people in identified Accident Potential Zones (APZs).

When the APZs are accompanied by a land use chart, showing what land uses are and are *not* compatible with the identified zones, a clear pattern emerges to help guide local planning authorities. Some ordinances or regulations incorporate by reference these types of charts and maps of the APZs in order to make the information understandable and useful for the public. If, at the same time, aircraft accident probabilities are calculated for the identified zones, land owners, developers and buyers can evaluate the risk potentials and act accordingly. See examples in the Appendices. Most the charts included in zoning regulations, ordinances or statutes allow some measure of flexibility in approving proposed land uses, but the fact that such charts and maps exist are helpful as all parties undertake to assess what risks they are prepared to take. That is the logic of the following set of risk assessments for each of the airports that are the subject of this Report.

Safety Zone Configuration Example



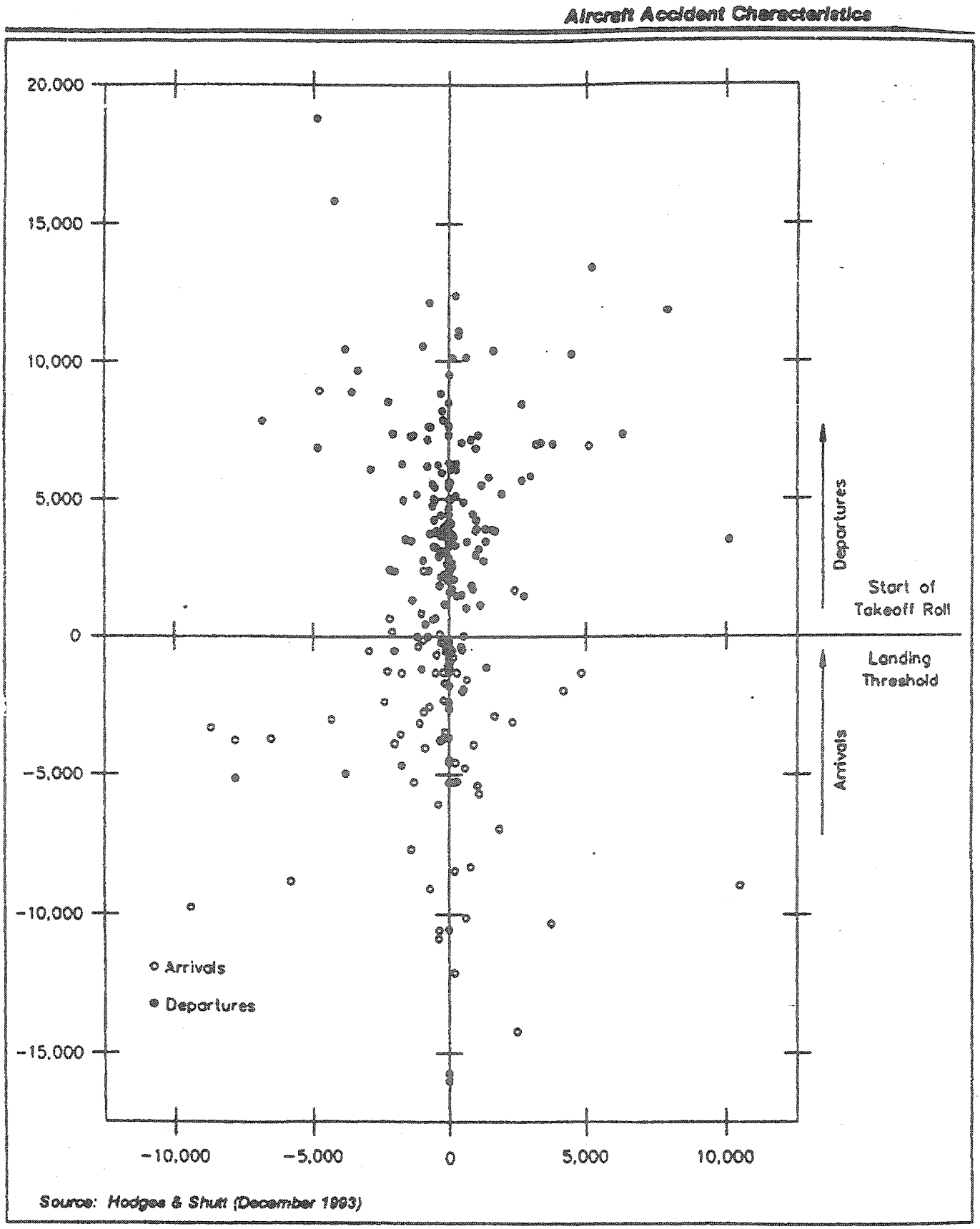
Safety Zone Names	
1	Runway Protection Zone
2	Inner Safety Zone
3	Inner Turning Zone
4	Outer Safety Zone
5	Sideline Safety Zone
6	Traffic Pattern Zone

Note: These safety zone shapes and sizes are intended only to illustrate the concepts discussed in the text. They do not represent standards or recommendations.

Source: Hodges & Shutt (December 1993)

Safety Zone Dimensions (Feet)	
Runway Length Group (L)	less than 4,000
A	125
B	225
C	225
D	225
E	500
F	4,000
R	2,500
S	1,000
T	1,500
U	2,500

CHART 20 **Single-Engine Airplane Accident Pattern**



Aircraft Accident Potential Zones ("APZs")

Accident Frequency Calculations for Prince George's County Airports: Potomac Airfield, Wash. Executive/Hyde Field, College Park Airport and Freeway Airport

Assumptions:

1. NTSB data was used to identify the frequency of general aviation accidents per 100,000 flight hours.
2. The accidents per flight hour were adjusted to estimate the frequency of general aviation accidents per 100,000 operations (either a take-off or a landing).
3. NTSB data was used to determine the percentage of accidents that occurred within one mile of the airport of takeoff/intended landing.
4. CALTRANS, Division of Aeronautics, "Airport Land Use Handbook" was used to determine the event density [1] of the land surrounding airports whose runway lengths are less than 4,000 feet.
5. The CALTRANS data was adjusted to reflect the volume of traffic and traffic patterns used by the four airports in question.
6. Six Accident Potential Zones (APZs) and associated accident densities were projected onto the maps of the land surrounding the four airports in question.
7. The expected number of accidents in each of the six APZs during one year, five years and ten years was estimated for each of the four airports.
8. The probability of no accidents, one accident and two or more accidents in each of the six APZs during one year, five years and ten years was estimated for each of the four airports.

The accident data provided by the Commission for the last six years of airplane operations (1993-1998) was used to calculate an average accident/serious incident rate of approximately 1.5 per 100,000 operations. The data provided by airport managers or, in the case of Washington Executive/Hyde Field, the MAA estimate (as slightly modified), was used to calculate this rate:

Potomac Airfield - 1.15 events per 100,000 operations.
Washington Executive/Hyde Field - 0.95 events per 100,000 operations.
Freeway Airport - 1.7 events per 100,000 operations
College Park Airport – 2.3 events per 100,000 operations

An average of 1.5 accident/serious incident events per 100,000 operations was calculated for the above airports, which was then used in all future calculations.

Accident Potential Zones were designated which surround airports with runway lengths of less than 4,000 feet.

Accident Potential Zone 1 (APZ-1) - (sometimes called Runway Protection Zone ["RPZ"] or "Clear Zone"): A trapezoid, centered on the runway centerline. It starts 200 feet from the runway threshold on a line extending 125 feet on either side of the centerline. It ends 1,000 feet out along the centerline. At its furthest point from the runway, it extends 225 feet on either side of the runway. APZ-1 captures 24% of the accidents in the Hodges & Shutt study. Each APZ-1 comprises 8 acres. Each runway has two APZ-1s, one at each end of the runway, making a total of approximately 16 acres of zone 1 space at each airport. APZ-1 had the highest accident density of all APZs.

Accident Potential Zone 2 (APZ-2) - A rectangle, centered on the runway centerline. It is adjacent to APZ-1 extending 1,500 feet further out along the runway centerline. It extends 225 feet on either side of the runway. APZ-1 captures 10% of the accidents in the Hodges & Shutt study. Each APZ-2 comprises 16 acres. Each runway has two APZ-2s, one at each end of the runway, making a total of approximately 32 acres of APZ-2 space at each airport.

Accident Potential Zone 3 (APZ-3) - A pie-shaped section starting centered at the runway end of APZ-1 and extending outward at 45° each side of the extended runway centerline for 2,500 feet. APZ-3 captures 13% of the

[1] "Event Density" is a term used to describe the accident and serious incident probability or frequency per acre of land. The CALTRANS report uses the study by Hodges & Shutt (December 1993) which estimated the percentage in six zones around airports.

accidents in the Hodges & Shutt study. Each APZ-2 comprises 90 acres. Each runway has two APZ-3s, one at each end of the runway, making a total of approximately 179 acres of APZ-3 space at each airport. The portion of APZ-3 along the extended runway centerline is occupied by APZ-1 and APZ-2 and this acreage is not counted as a part of APZ-3.

Accident Potential Zone 4 (APZ-4) - A rectangle, centered on the runway centerline. It is adjacent to APZ-2 extending 2,500 feet further out along the runway centerline. It extends 225 feet on either side of the runway. APZ-4 captures 2% of the accidents in the Hodges & Shutt study. Each APZ-4 comprises 26 acres. Each runway has two APZ-4s, one at each end of the runway, making a total of approximately 52 acres of APZ-4 space at each airport.

Accident Potential Zone 5 (APZ-5) - A rectangle with a pie-shaped piece cut out at each end of the rectangle, centered on the runway and spreading 500 feet on either side of the runway and 700 feet beyond each end of the runway. The triangular cutouts at each end of the runway do not double-count portions of APZ-1 and APZ-3, centered on the runway center line. APZ-5 captures 28% of the accidents in the Hodges & Shutt study. Due to varying runway lengths, the acreage of each APZ-5 was different for each airport.

Accident Potential Zone 6 (APZ-6) - A roughly rectangular shape with rounded ends, extending 4,500 feet from each point along the runway's centerline, APZ-6 captures 11% of the accidents in the Hodges & Shutt study. The acreage for APZ-1 through APZ-5 was subtracted from the area identified above to calculate the acreage for APZ-6. Due to varying runway lengths, the acreage of each APZ-6 was different for each airport.

Further Assumptions:

Assume the fatal accident rate stabilizes at approximately 1.25 /100,000 flight hours.

Due to the highly variable nature of airplane accident data, an average of the above values was used to determine a value of 1.5 events per 100,000 operations, which was then used in all future calculations. By calculating the expected number of events per acre for several time intervals, the significance of the size of each accident potential zone is accounted for. APZs with large areas and relatively high event rates may actually have event rates per acre which are similar to APZs with small areas and relatively low event rates.

In addition, it must be remembered that the accident density doesn't suddenly change as one crosses from one APZ to another. The change is gradual. For example, the accident densities of APZ-1, APZ-2, and APZ-4 are highest along the runway's extended centerline. APZ-3's accident density increases as you approach APZ-1 and APZ-2 and, at their border, is the same.

The analysis shows that APZ-1 has the highest event densities of any of the four airports. APZ-2 and APZ-5 have approximately the same event densities. They are approximately 22% of those found in APZ-1. APZ-3 has the fourth highest event density and it averages approximately 5% of that of APZ-1. APZ-4 has the fifth highest event density, averaging just 3% of APZ-1. APZ-6 has the lowest of all APZs and averages only 0.4% of APZ-1.

Percentage of events which occur in each of the Accident Potential Zones (APZs)[2]. (All Airports in this Study).

APZ-1	APZ-2	APZ-3	APZ-4	APZ-5	APZ-6
24%	10%	13%	2%	28%	11%

Approximately 13% of the events occurred in the airport proximity, say within 5 miles, but further than the 4,500 foot distance from the airport incorporated in the APZs.

[2] Source: Airport Land Use Planning Handbook, CALTRANS Division of Aeronautics, December 1993.

Potomac Airfield

The expected number of accidents at Potomac Airfield in one year, five years and ten years has been estimated. These calculations assume approximately 52,000 operations per year as reported by the airport manager and an event rate of 1.5 events per 100,000 operations. This equates to and event rate of 0.78 events per year. The expected number of events in one, five and ten year periods was then multiplied by the percentage of events in each of the six APZs to determine the expected number of events in each APZ during one, five and ten year periods.

		Expected Number of Events in Proximity to Potomac Airfield		
		1 year	5 years	10 years
W	Airport proximity	0.7800	3.9000	7.8000
i	APZ-1	0.1872	0.9360	1.8720
t	APZ-2	0.0780	0.3900	0.7800
h	APZ-3	0.1014	0.5070	1.0140
i	APZ-4	0.0156	0.0780	0.1560
n	APZ-5	0.2184	1.092	2.1840
	APZ-6	0.0858	0.4290	0.8580

The probability of experiencing zero, one, two, three and more than three events in one, five and ten year periods was calculated using the equation shown below where:

P(n) = the probability that "n" event will occur during the time period being evaluated.
λ = the event rate, in this case 1.5 events per 100,000 operations.
τ = the exposure period, in this case 52,000 operations for one year, 260,000 operations for five years and 520,000 operations for ten years.

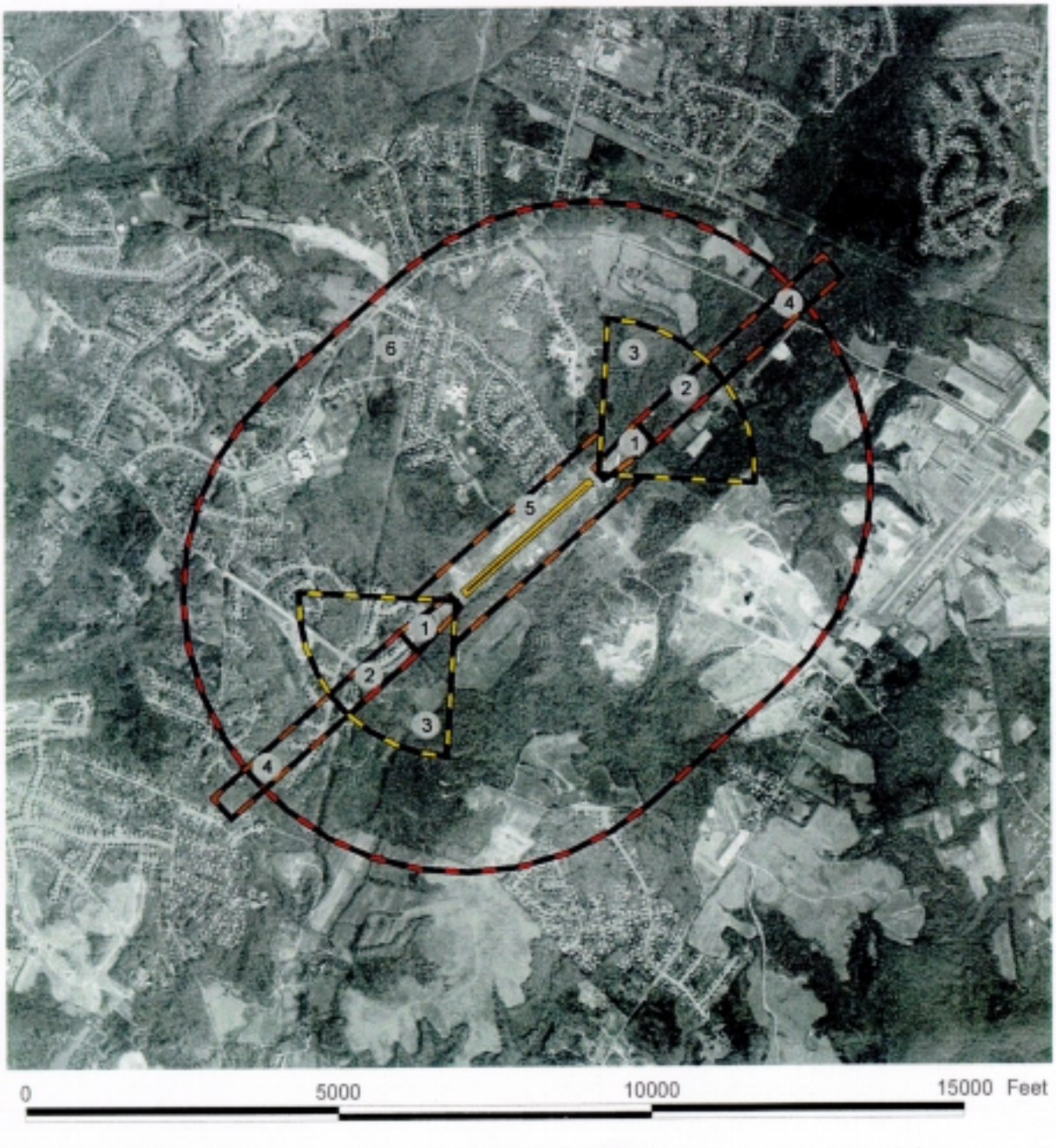
$$P(n) = e^{-\lambda\tau}\left(\frac{\lambda\tau^n}{n!}\right)$$

		Potomac Airfield (~52,000 operations/year)		
		in 1 year	In 5 years	in 10 years
% chance of 0 events	In Airfield Proximity	45.84%	2.02%	0.04%
% chance of 1 events		35.76%	7.89%	0.32%
% chance of 2 events		13.94%	15.39%	1.25%
% chance of 3 events		3.63%	20.01%	3.45%
% chance of 4 or more events		0.83%	54.69%	95.15%

		Event Density (Expected Number of Events Per Acre)		
APZ	Acres	1 Year	5 years	10 years
1	16	0.0117	0.0585	0.1170
2	32	0.0024	0.0122	0.0244
3	179	0.0006	0.0028	0.0057
4	52	0.0003	0.0015	0.0030
5	79	0.0028	0.0138	0.0276
6	1745	0.0001	0.0003	0.0006

CHART 21

Potomac APZ's



APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4065'	1000'
6	11665'	9000'
Runway	2665'	40'

Note: Accident Potential Zones are described in text.

CHART 22

Potomac Accident Potential Zones with Noise Contours

Noise contour shapes and sizes are for illustrative purposes. Details are described in text.

CHART 22

Potomac Accident Potential Zones with Noise Contours

Noise contour shapes and sizes are for illustrative purposes. Details are described in text.

CHART 23

Potomac Accident Potential Zones with Zoning

APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4065'	1000'
6	11666'	9000'

Note: Accident Potential Zones are described in text.

Washington Executive/Hyde Field

The expected number of accidents at Washington Executive/Hyde Field in one year, five years and ten years has been estimated. These calculations assume approximately 36,000 operations per year (close to the MAA estimate) and a rate of 1.5 events per 100,000 operations. . This equates to and event rate of 0.54 events per year. The expected number of events in one, five and ten year periods was then multiplied by the percentage of events in each of the six APZs to determine the expected number of events in each APZ during one, five and ten year periods.

		Expected Number of Events in Proximity to Wash. Exec/Hyde Field in		
		1 year	5 years	10 years
Within	Airport proximity	0.540	2.700	5.400
	APZ-1	0.130	0.648	1.296
	APZ-2	0.054	0.270	0.540
	APZ-3	0.070	0.351	0.702
	APZ-4	0.011	0.054	0.108
	APZ-5	0.151	0.756	1.512
	APZ-6	0.059	0.297	0.544

The probability of experiencing zero, one, two, three and more than three events in one, five and ten year periods was calculated using the equation shown below where:

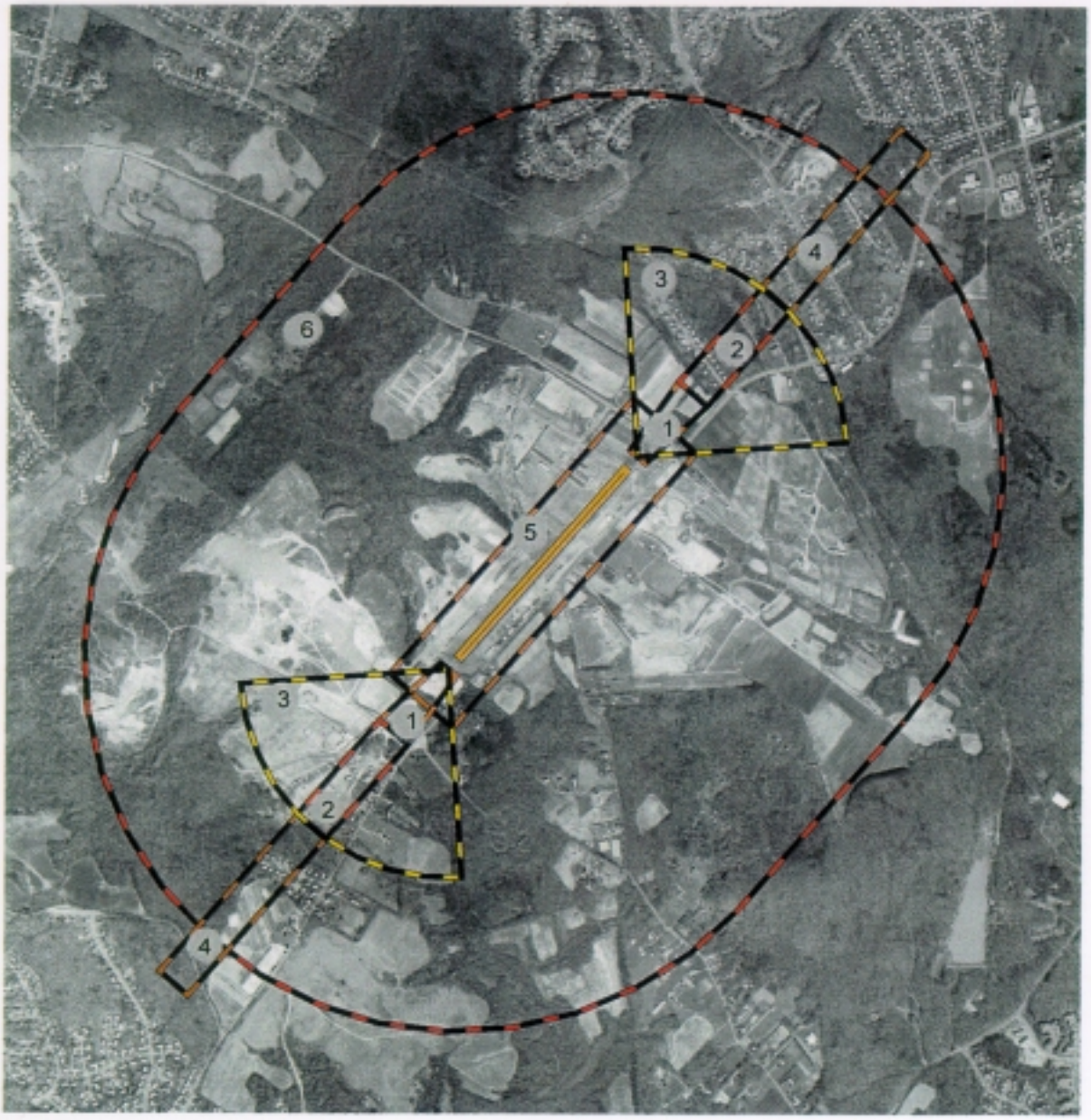
P(n) = the probability that "n" event will occur during the time period being evaluated.
λ = the event rate, in this case 1.5 events per 100,000 operations.
τ = the exposure period, in this case 36,000 operations for one year, 180,000 operations for five years and 360,000 operations for 10 years.

$$P(n) = e^{-\lambda\tau}\left(\frac{\lambda\tau^n}{n!}\right)$$

		Wash. Exec./Hyde Field (~36,000 operations/year)		
		in 1 year	in 5 years	In 10 years
% chance of 0 events	In Airfield Proximity	58.27%	6.72%	0.45%
% chance of 1 events		31.47%	18.16%	2.44%
% chance of 2 events		8.50%	24.50%	6.59%
% chance of 3 events		1.53%	22.05%	35.56%
% chance of 4 or more events		0.23%	28.57%	54.96%

		Event Density (Expected Number of Events Per Acre)		
APZ	Acres	1 Year	5 years	10 years
1	16	0.0081	0.0406	0.0813
2	32	0.0017	0.0084	0.0169
3	179	0.0004	0.0020	0.0039
4	52	0.0002	0.0011	0.0021
5	90	0.0017	0.0084	0.0168
6	1803	~0	0.0002	0.0003

CHART 24 Washington Executive Accident Potential Zones



APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4400'	1000'
6	12000'	9000'
Runway	3000'	60'

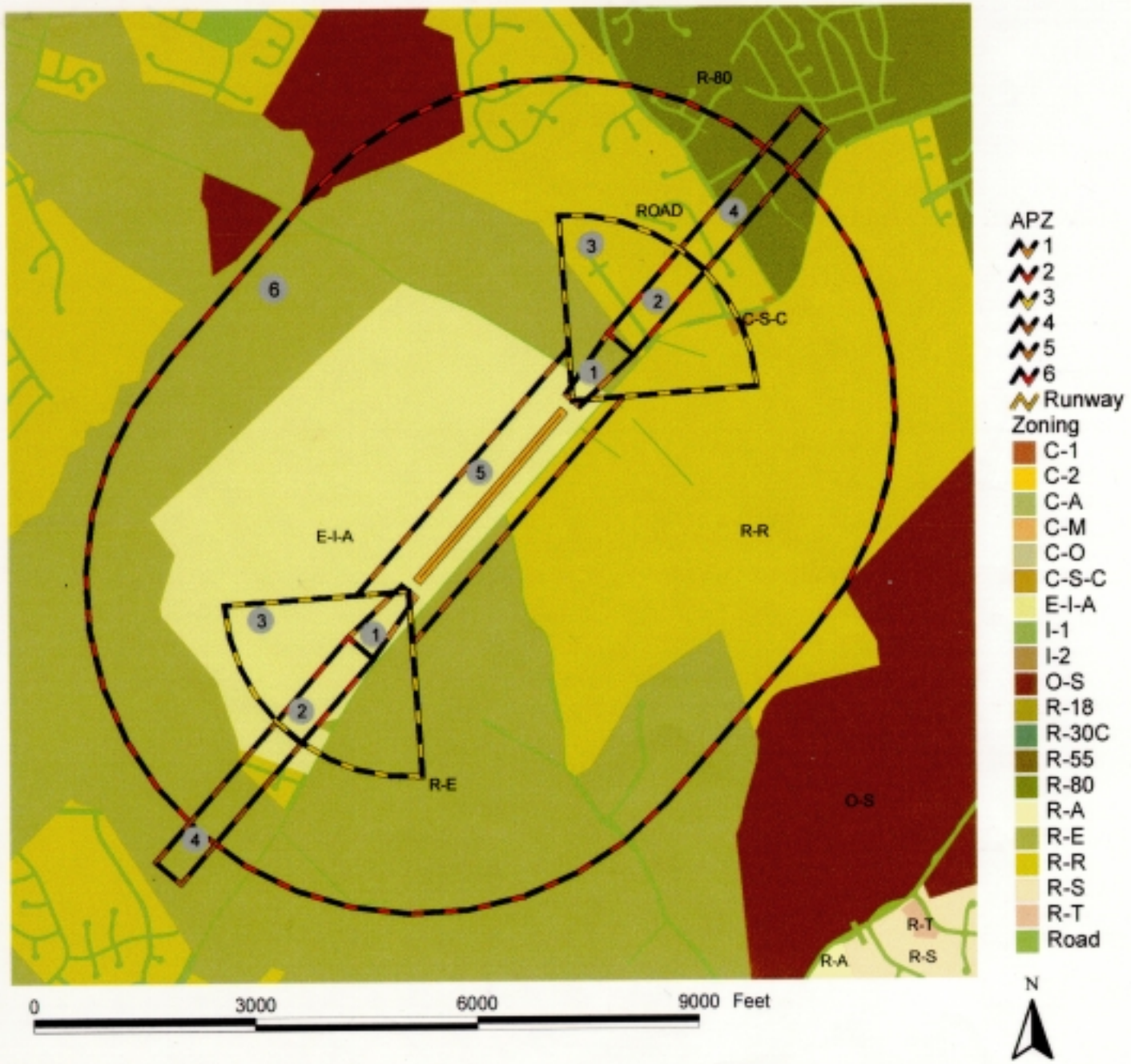
Note: Accident Potential Zones are described in text.

CHART 25 Washington Executive Accident Potential Zones with Sound Contours

Note: Accident Potential Zones are described in text.

CHART 26

Washington Executive Accident Potential Zones with Zoning



APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4400'	1000'
6	12000'	9000'
Runway	3000'	60'

Note: Accident Potential Zones are described in text.

College Park Airport

The expected number of accidents at College Park Airport in one year, five years and ten years has been estimated. These calculations assume approximately 12,000 operations per year. This equates to an event rate of 0.18 events per year. The expected number of events in one, five and ten year periods was then multiplied by the percentage of events in each of the six APZs to determine the expected number of events in each APZ during one, five and ten year periods.

		Expected Number of Events in Proximity to College Park Airport in		
		1 year	5 years	10 years
W	Airport proximity	0.180	0.900	1.800
i	APZ-1	0.043	0.216	0.432
t	APZ-2	0.018	0.090	0.180
h	APZ-3	0.023	0.117	0.234
i	APZ-4	0.004	0.018	0.036
n	APZ-5	0.050	0.252	0.504
	APZ-6	0.020	0.099	0.198

The probability of experiencing zero, one, two, three and more than three events in one, five and ten year periods was calculated using the equation shown below where:

P(n) = the probability that "n" event will occur during the time period being evaluated.
λ = the event rate, in this case 1.5 events per 100,000 operations.
τ = the exposure period, in this case 12,000 operations for one year, 60,000 operations for five years and 120,000 operations for 10 years.

$$P(n) = e^{-\lambda\tau}\left(\frac{\lambda\tau^n}{n!}\right)$$

		College Park Airport (~12,000 operations/year)		
		in 1 year	in 5 years	in 10 years
% chance of 0 events	in airfield proximity	83.53%	40.66%	16.53%
% chance of 1 event		15.03%	36.59%	29.75%
% chance of 2 events		1.35%	16.47%	26.78%
% chance of 3 events		0.08%	4.94%	16.07%
% chance of 4 or more events		0.01%	1.34%%	10.37%

		Event Density (Expected Number of Events Per Acre)		
APZ	Acres	1 Year	5 years	10 years
1	16	0.0027	0.0134	0.0269
2	32	0.0006	0.0028	0.0056
3	179	0.0001	0.0006	0.0013
4	52	0.0001	0.0004	0.0008
5	78	0.0006	0.0032	0.0064
6	1735	~0	0.0001	0.0001

CHART 27

College Park Flight Patterns

Dimensions

Flight Patterns

0 5000 10000 15000 Feet

N

Flight Patterns are in accordance with current airport operations.

CHART 28

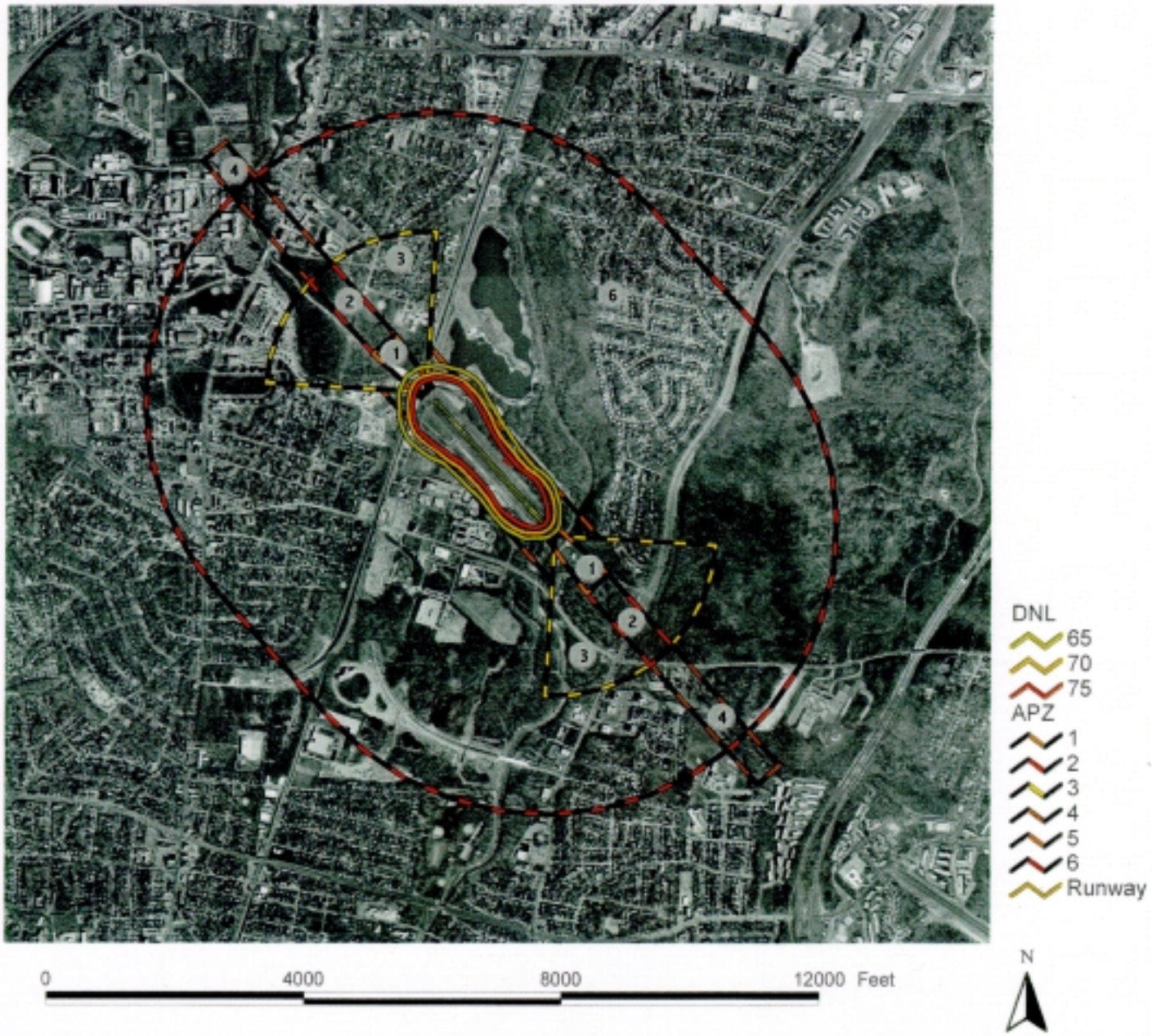
College Park Accident Potential Zones

APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4010'	1000'
6	11611'	9000'

Note: Accident Potential Zones are described in text.

CHART 29

College Park Accident Potential Zones with Sound Contours

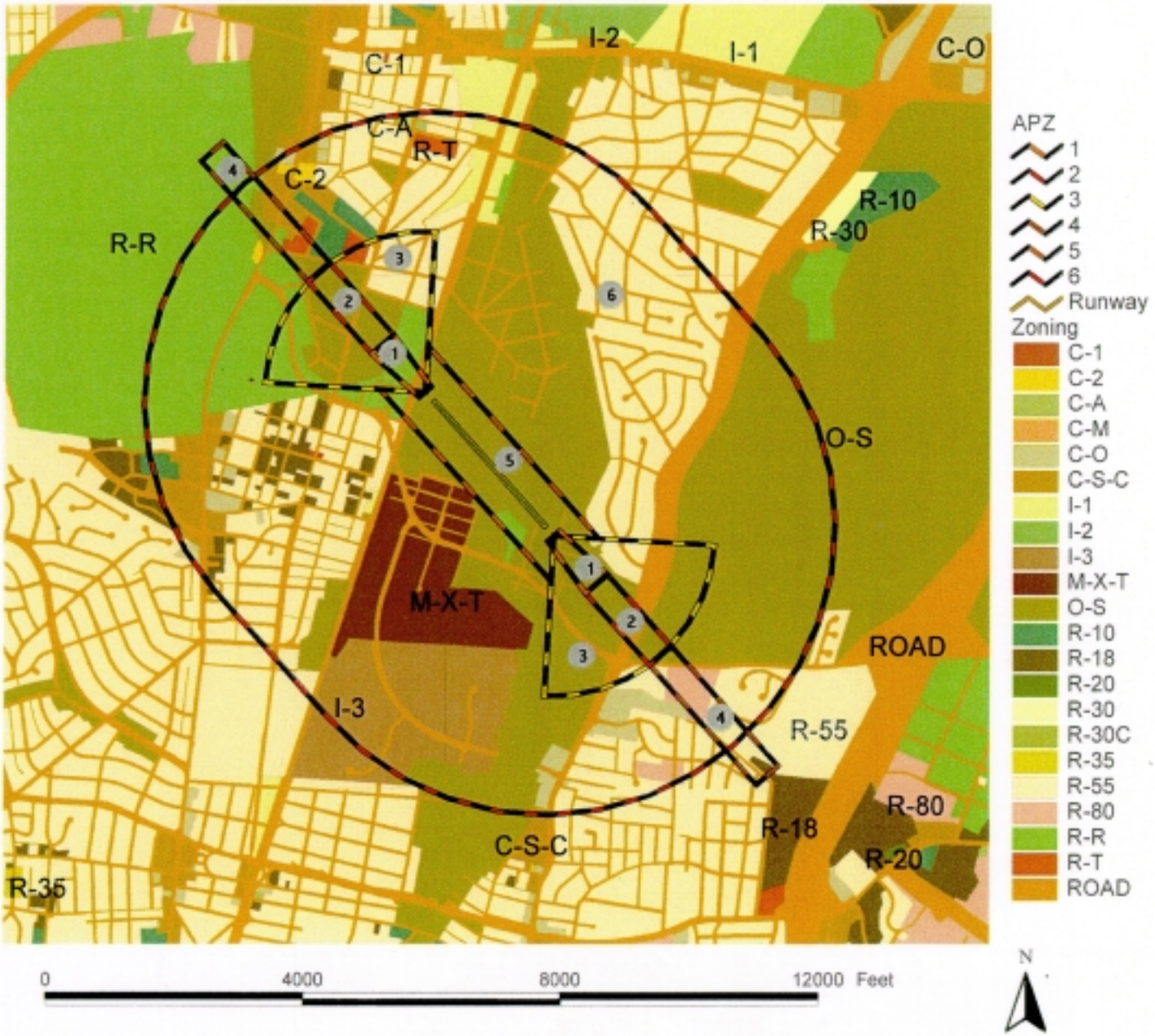


APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4010'	1000'
6	11611'	9000'

Note: Accident Potential Zones are described in text.

CHART 30

College Park Accident Potential Zones with Zoning



APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	90D
4	2500'	450'
5	4010'	1000'
6	11611'	9000'

Note: Accident Potential Zones are described in text.

Freeway Airport

The expected number of accidents at Freeway Airport in one year, five years and ten years has been estimated. These calculations assume approximately 25,000 operations per year reported by the airport manager and an event rate of 1.5 per 100,000 operations. This equates to an event rate of 0.375 events per year. The expected number of events in one, five and ten year periods was then multiplied by the percentage of events in each of the six APZs to determine the expected number of events in each APZ during one, five and ten year periods.

		Expected Number of Events in Proximity to Freeway Airport in		
		1 year	5 years	10 years
Within	Airport proximity	0.375	1.875	3.750
	APZ-1	0.090	0.450	0.900
	APZ-2	0.038	0.188	0.375
	APZ-3	0.049	0.244	0.488
	APZ-4	0.008	0.038	0.075
	APZ-5	0.105	0.525	1.050
	APZ-6	0.041	0.206	0.413

The probability of experiencing zero, one, two, three and more than three events in one, five and ten year periods was calculated using the equation shown below where:

P(n) = the probability that "n" event will occur during the time period being evaluated.
λ = the event rate, in this case 1.5 events per 100,000 operations.
τ = the exposure period, in this case 25,000 operations for one year, 125,000 operations for five years and 250,000 operations for 10 years.

$$P(n) = e^{-\lambda\tau}\left(\frac{\lambda\tau^{n}}{n!}\right)$$

		Freeway Airport (~25,000 operations/year)		
		in 1 year	in 5 years	in 10 years
% chance of 0 events	In Airfield Proximity	68.73%	15.36%	2.35%
% chance of 1 event		25.77%	28.75%	8.82%
% chance of 2 events		4.83%	26.96%	16.54%
% chance of 3 events		0.60%	16.85%	20.67%
% chance of 4 or more events		0.07%	12.25%	51.62%

		Event Density Expected Number of Events Per Acre		
APZ	Acres	1 Year	5 years	10 years
1	16	0.0056	0.0281	0.0563
2	32	0.0019	0.0059	0.0119
3	179	0.0003	0.0014	0.0027
4	52	0.0002	0.0008	0.0015
5	73	0.0014	0.0072	0.0144
6	1702	~0	0.0001	0.0002

CHART 31

Freeway Accident Potential Zones

APZ
1
2
3
4
5
6
Runway
Power Line

N

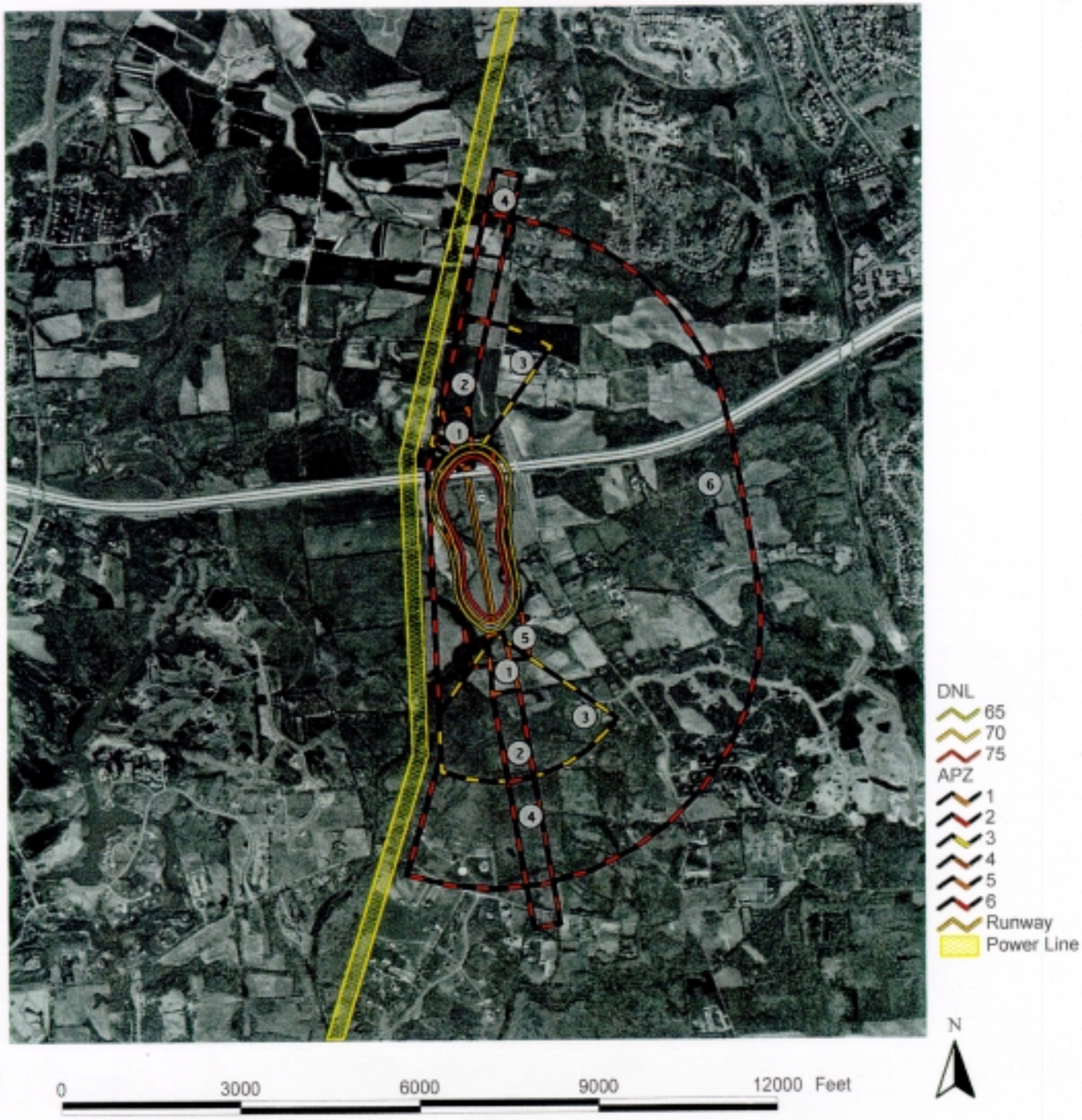
0 3000 6000 9000 12000 Feet

APZ	Length	Width
1	1000'	250'-450'
2	1500'	450'
3	2500'R	900
4	2500'	450'
5	3025'	1000'
6	11425'	9000'

Note: APZ dimensions are described in text.

CHART 32

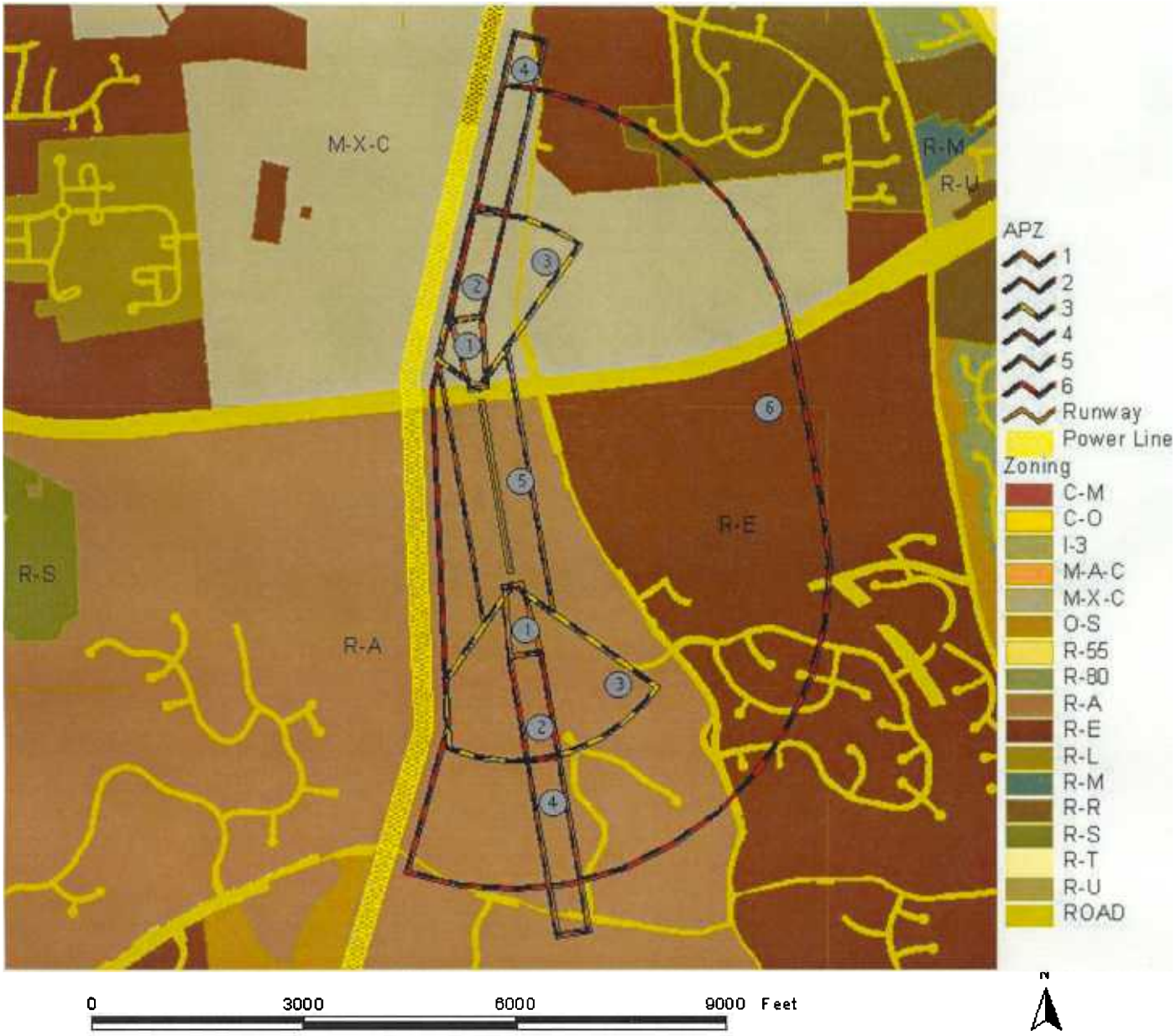
Freeway Accident Potential Zones with Sound Countours



Note: APZ dimensions are described in text.

Chart 33

Freeway Non-Standard Accident Potential Zones with Zoning



APZ	Length	Width
1	3000'	250'-450'
2	2500'	450'
3	2500'R	90D
4	2500'	450'
5	5625'	1800'
6	11425'	3000'
RUNWAY	9425'	20'

Accident Potential Zones are described in text.

COMPATIBLE AND NON-COMPATIBLE LAND USES BASED ON ACCIDENT POTENTIAL ZONE ANALYSIS

The land uses set forth are classified as to the APZs and are based on the logic of Compatibility Land Use Listings used in the *Denver Regional Council of Governments (DRCOG) Design Handbook*, but some modifications have been made by Consultant. Each of the identified Land Use Categories is listed and various land uses have been identified and the interpretation and comments follow. Various land uses, when viewed against Accident Potential Zones (APZs) are classified as:

1) Clearly Acceptable
2) Normally Acceptable
3) Marginally Acceptable
4) Normally Unacceptable
5) Clearly Unacceptable

Symbol	Classification	Comments

1) ++ = CLEARLY ACCEPTABLE: The activities associated with the specified land use will experience little or no impact due to airport operations. Disclosure of airport proximity should be required as a condition of development.

2) + = NORMALLY ACCEPTABLE: The specified land use is acceptable in this zone or area. Impact may be perceived by some residents. Disclosure of airport proximity should be required as a condition of development. In addition, dedication of an avigation easement may also be advisable.

3) o = MARGINALLY ACCEPTABLE: An impact will be perceived as a result of allowing the specified use in this zone or area. Disclosure of airport proximity and avigation easements should be required as a condition of development

4) -- = NORMALLY UNACCEPTABLE: Specified use should be allowed ONLY if no reasonable alternative exists. Disclosure of airport proximity and avigation easements should be required as a condition of development

5) --- = CLEARLY UNACCEPTABLE: Specified use should not be allowed. Potential safety or overflight nuisance impacts are likely in this area.

Each Land Use Category would need to be integrated into existing or "new" county land use designations, but the principles would be the same. This could be done by zoning, overlay zoning, performance standards or regulations, subdivision controls, or similar mechanisms. The appropriate mechanism would call for identifying the zones shown on the accompanying APZ charts, and cross-reference those areas to the Airport Land Use Compatibility listing below, requiring compliance with the land uses set forth on the chart, are subject to qualifications such as "Normally Acceptable," "Marginally Acceptable," etc.

Note that obstructions regulated under FAR Part 77 and noise issues under FAR Part 150 and related Advisory Circulars have not been specifically addressed in this treatment. It is assumed that no land use in any of the APZs would violate the obstruction rules. The noise issues are somewhat more fluid. Nonetheless, an "overlay" chart showing probable Noise Contours has been provided to illustrate how the noise footprint at each of the Prince George's County airports matched up to the boundaries of the APZs; except for Potomac Airfield and the information on those noise contours furnished to Consultant, no precise study of noise contours have been made.

AIRPORT LAND USE AND COMPATIBILITY LISTING (1)

Table Revised - 3/6/01

Residential	**APZ-1(RPZ)**	**APZ-2**	**APZ-3**	**APZ-4**	**APZ-5**	**APZ-6**
Single-family, nursing homes, mobile	---	---	---	---	---	+
Homes, multi-family, apartments, Condominiums	---	---	---	---	---	+
Public						
Schools, libraries, hospitals,	---	---	---	---	---	--
Churches, auditoriums, concert halls	---	---	---	---	---	--
Transportation, parking, cemeteries	--	+	++	++	+	++
Commercial & Industrial						
Offices, retail trade	---	--	--	o	--	+
Service commercial, wholesale trade, Warehousing, light industrial	---	--	--	o	--	+
General Manufacturing, utilities, Extractive industry	---	--	o	o	--	+
Agricultural & Recreational						
Cropland	++	++	++	++	++	++
Livestock (not feed lots)	++	++	++	++	++	++
Feed Lots	--	--	o	o	--	++
Parks, playgrounds, zoos	---	---	+	+	---	++
Golf courses, riding stables, Water recreation	---	--	+	+	--	++
Outdoor spectator sports	---	---	--	--	---	+
Amphitheaters	---	---	--	--	---	o
Open Space	++	++	++	++	++	++

(1) Assumes no obstructions violate FAR Part 77.