

5 Airfield Safety

The Navy has identified airfield safety issues to assist the community in developing land uses compatible with airfield operations. These issues include accident potential and hazards within the airfield vicinity that obstruct or interfere with aircraft and departures, pilot vision, communications, or aircraft electronics.

While the likelihood of an aircraft mishap occurring is remote, the Navy identifies areas of accident potential to assist in land-use planning. The Navy has identified APZs around its runways based on historical data for aircraft mishaps. The Navy recommends certain land uses that concentrate large numbers of people (e.g., apartments, churches, and schools) be constructed outside the APZs.

In addition, the FAA and the military have defined flight safety zones (imaginary surfaces) below aircraft arrival and departure flight tracks and surrounding the airfield. For the safety of the aircraft, the heights of structures and vegetation are restricted in these zones. The flight safety zones are designed to minimize the potential harm if a mishap does occur.

Other hazards to flight safety that should be avoided in the airfield vicinity include:

- Uses that would attract birds, especially waterfowl;
- Lighting (direct or reflected) that would impair pilot vision;
- Uses that would generate smoke, steam, or dust; and
- Electromagnetic interference with aircraft communication, navigation, or other electrical systems.

5.1 Accident Potential Zones

5.1.1 Aircraft Mishaps

In the 1970s, recognizing the need to identify areas of accident potential, the military conducted a tri-service study of historic accident and operations data throughout the military. The study showed that most aircraft mishaps occur on or near the runway or along the centerline of the runway, diminishing in likelihood with distance. Based on the study, the DoD has identified APZs as areas where an aircraft accident is most likely to occur (if one were to occur); the APZs do not reflect the probability of an accident. APZs follow departure, arrival, and pattern flight tracks and are based upon analysis of historical data.

There are three categories of aircraft mishaps. The most severe is a Class A mishap. This is an accident in which the total cost of damage to property or aircraft exceeds \$1 million, an aircraft is destroyed or missing, or a fatality or permanent total disability results from the direct involvement of naval aircraft.

There have been two Class A mishaps at NAS Patuxent River in the past 10 years according to the Naval Safety Center (Hobbs 2008).

5.1.2 APZ Configurations and Areas

Clear Zones and APZs are areas in the vicinity of airfield runways where an aircraft mishap is most likely to occur (if one were to occur). While the likelihood of a mishap is remote, the Navy recommends land uses within APZs be minimal or low density to ensure the maximum protection of public health and property. The DoD uses two classes of fixed-wing runways (Class A and Class B) for the purpose of defining APZs. A Class A runway is intended primarily for small light aircraft whereas a Class B runway can accommodate heavy aircraft and/or have the potential for development to heavy aircraft use. NAS Patuxent River is a Class B runway.

The components of a standard APZ are identified on Figure 5-1 and are defined as (OPNAVINST 11010.36C):

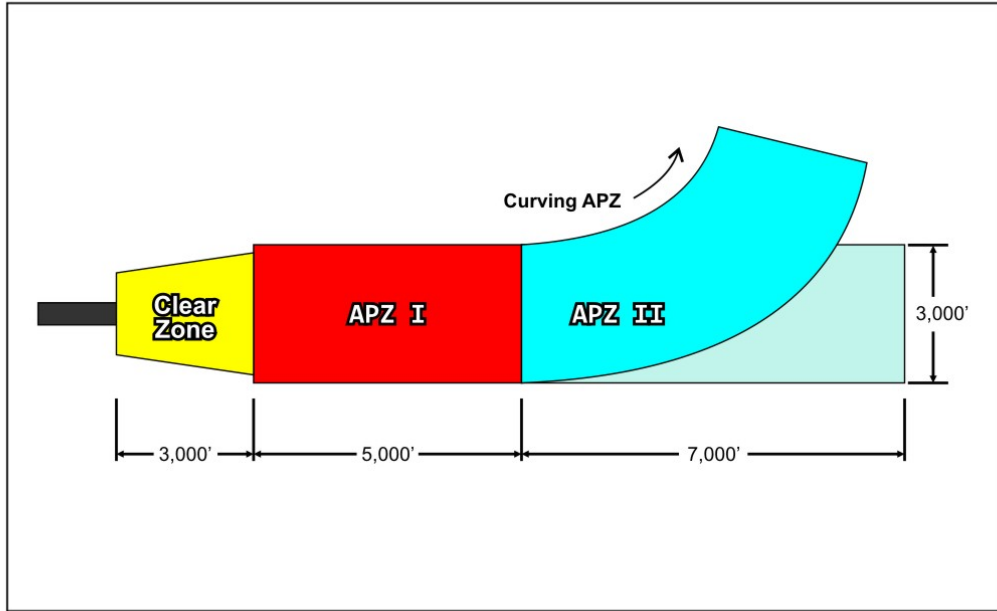
- **Clear Zone.** The trapezoidal area lying immediately beyond the end of the runway and outward along the extended runway centerline for a distance of 3,000 feet. For U.S. Navy and Marine Corps installations, the dimensions are 1,500 feet wide at the runway threshold and 2,284 feet wide at the outer edge. The Clear Zone is required for all active runway ends.
- **APZ I.** The rectangular area beyond the Clear Zone, which still has a measurable potential for aircraft accidents relative to the Clear Zone. APZ I is provided under flight tracks that experience 5,000 or more annual operations (departures or approaches). APZ I is typically 3,000 feet wide by 5,000 feet long and may be rectangular or curved to conform to the shape of the predominant flight track.
- **APZ II.** The rectangular area beyond APZ I (or the Clear Zone if APZ I is not used), which has a measurable potential for aircraft accidents relative to APZ I or the Clear Zone. APZ II is always provided where APZ I is required. The dimensions of APZ II are typically 3,000 feet wide by 7,000 feet long and, as with APZ I, may be curved to correspond with the predominant flight track.

An accident is more likely to occur in APZ I than APZ II and is more likely to occur in the Clear Zone than in APZ I or APZ II. An APZ II area is designated whenever APZ I is required. APZs extend from the end of the runway but apply to the predominant arrival and departure flight tracks used by the aircraft. Therefore, if an airfield has more than one predominant flight track to or from the runway, APZs can extend in the direction of each flight track (see Figure 5-1).

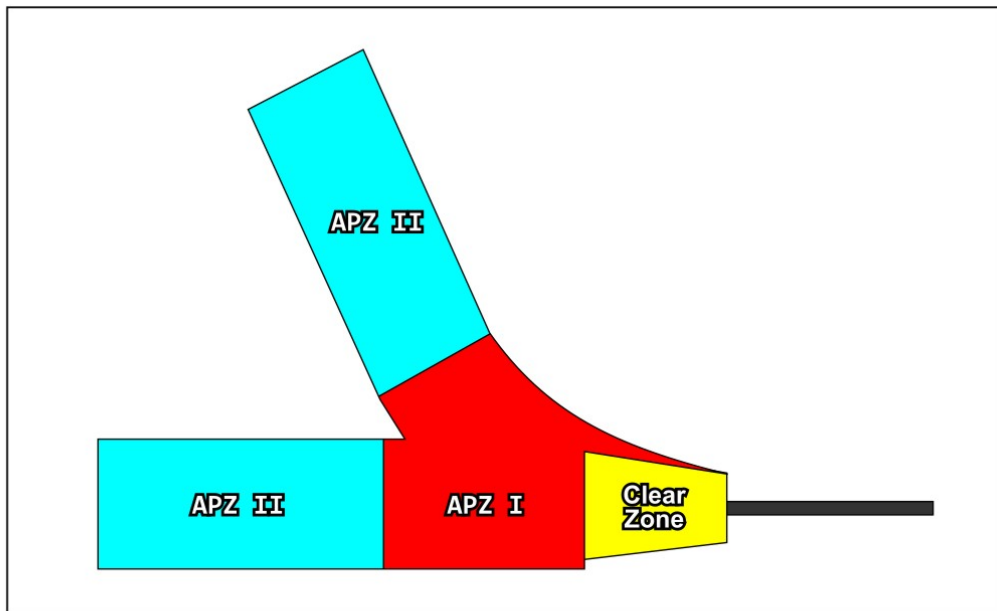
Within the Clear Zone, most land uses are incompatible with military aircraft operations. For this reason, the Navy's policy is to acquire sufficient real property interests in land within the Clear Zone to ensure incompatible development does not occur. Within APZ I and APZ II, a variety of land uses are compatible; however, people-intensive uses (e.g., schools and apartments) should be restricted because of the greater risk in these areas. When events resulting in threats to the operational integrity from incompatible development (encroachment) occur, and when local communities are unwilling or unable to take the

Figure 5-1
Accident Potential Zones

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a) Standard Accident Potential Zones



b) Accident Potential Zones With More Than One Predominant Flight Track

necessary steps to combat the encroachment threat via their own land use and zoning authority, consideration will be given by the Navy to land acquisition, with priority to Clear Zones and secondary priority to APZs. Outside the Clear Zone, APZ I, and APZ II, the risk of aircraft accidents is not significant enough to warrant special consideration in land-use planning.

In addition to the Clear Zone, there is a lateral Clear Zone (called the primary surface) that extends outward for 500 feet on each side and for the length of the runway.

5.1.3 Helicopter APZs

APZ guidelines for helicopters are much smaller than those for fixed-wing aircraft and are outlined below:

- **Clear Zone.** The take-off safety zone for VFR rotary-wing facilities shall be used as the Clear Zone. The Takeoff Safety Zone is that area under the VFR approach/departure surface until that surface is 50 feet above the established landing area elevation.
- **APZ I.** An area beyond the Clear Zone for the remainder of the approach/departure zone, which is defined as the area under the VFR approach/departure surface until that surface is 150 feet above the established landing area elevation.
- **APZ II.** Normally not applied to helicopter flight paths unless the local accident history indicates the need for additional protection.

The Clear Zones for helicopters are provided for all VFR landing pads/runways. The use of APZ-I is provided for all VFR landing pads/runways located at air installations that support daily training and operations missions. Normally, helipads provided to support administrative functions and hospitals, which generate a low volume of helicopter operations, do not require APZ I or APZ II.

5.1.4 Comparison of 1979 and 2009 AICUZ APZs

Figure 5-2 illustrates the 2009 APZs for NAS Patuxent River and Figure 5-3 shows a comparison of the 1979 and 2009 AICUZ APZs for the air station. As Figure 5-3 and Table 5-1 below illustrate there are

small differences in total areas covered by the 1979 and 2009 APZs. These differences are on-station and are mainly due to updating the 1979 APZs with the guidance outlined in the AICUZ instruction (OPNAVINST 11010.36C).

Table 5-1
Areas within APZs (1979 and 2009)¹
NAS Patuxent River

APZ	1979 APZs (acres)	2009 APZs (acres)
Clear Zone	-	-
APZ 1	20.95	23.29
APZ 2	998.46	1002.09
TOTAL AREA	1019.41	1025.38

¹ Does not include on-station acreage and area over water.

The 2009 AICUZ APZs include straight APZs I and II southwest of Runway 06/24 as well as APZs to the southwest that conform to curved flight tracks per Navy APZ criteria. These straight APZs result from approach and departure operations while the curved APZs are attributable primarily to pattern operations (i.e., FCLPs, touch-and-goes, overhead break, etc.). These APZs are located south and to the west of the base, extending into the Lexington Park, Southampton, and Southgate Park neighborhoods.

NAS Patuxent River falls within Restricted Area Airspace R-4007 (see Figure 3-1). R-4007 is utilized for intensive aircraft flight activity that is in keeping with the air station's mission as a Research, Test and Evaluation facility. Thirty-five different aircraft types typically fly at NAS Patuxent River, including fixed-wing, rotary wing (helicopters) and tilt wing aircraft. They vary from jets to turboprops to gliders and manned to unmanned aerial vehicles. Approach speeds range from 60 to nearly 200 mph, while the turn radius for patterns may vary from less than 1 to nearly 3 miles from the airfield. Because of the NAS Patuxent River mission, operational tempo and flight geometry are subject to change.

The 1979 APZs represent a reasonable reflection of the air station mission and, except for some minor increases on-station, remain unchanged in the 2009 AICUZ.

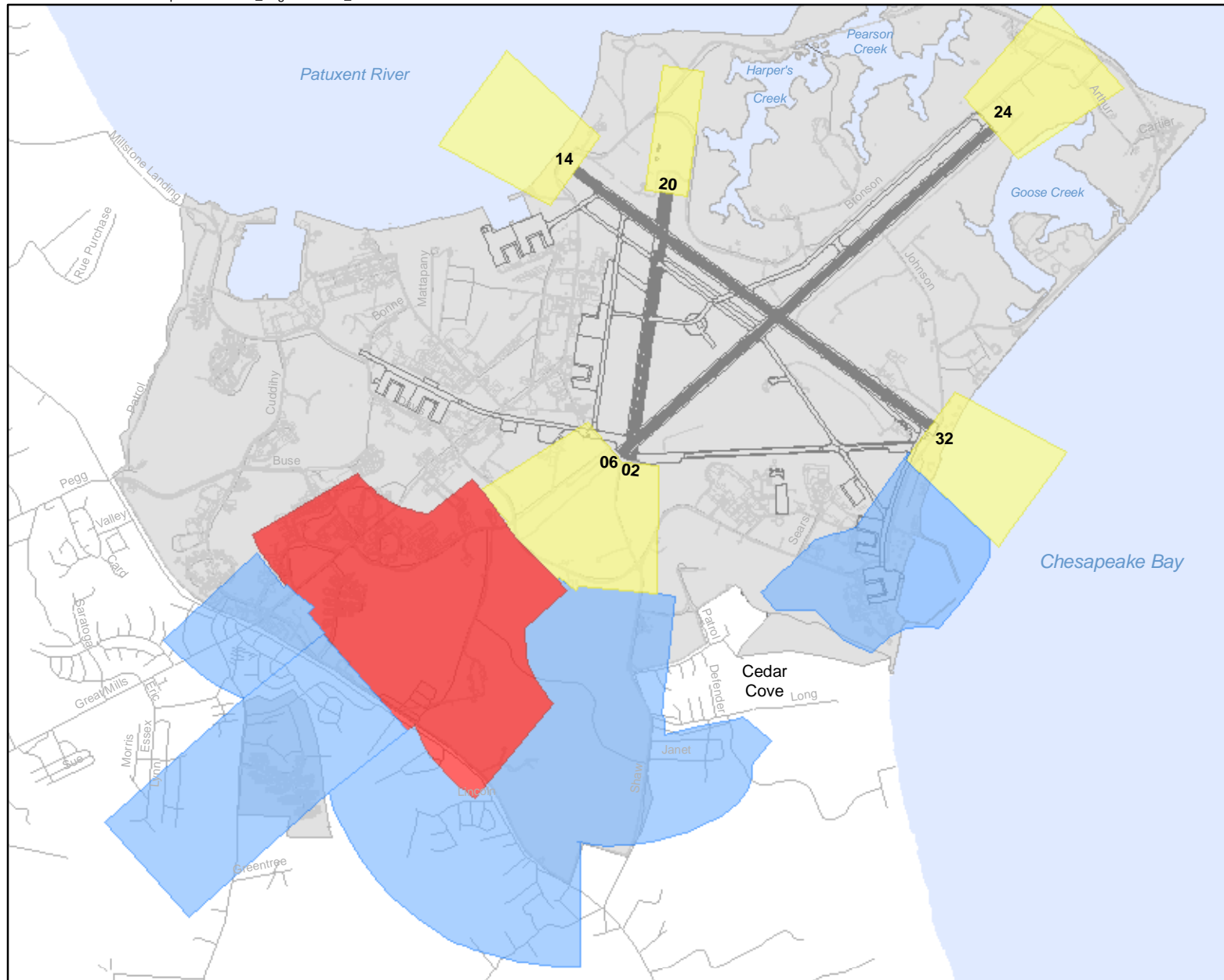




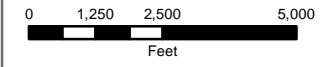


Figure 5-2
2009 AICUZ APZs
NAS Patuxent River

- Accident Potential Zone**
-  Clear Zone
 -  APZ I
 -  APZ II
 -  Runway

APZs were modified to comply with APZ criteria as specified in OPNAV INST 11010.36C

Sources:
St. Mary's County GIS, 2001
ESRI, 2005



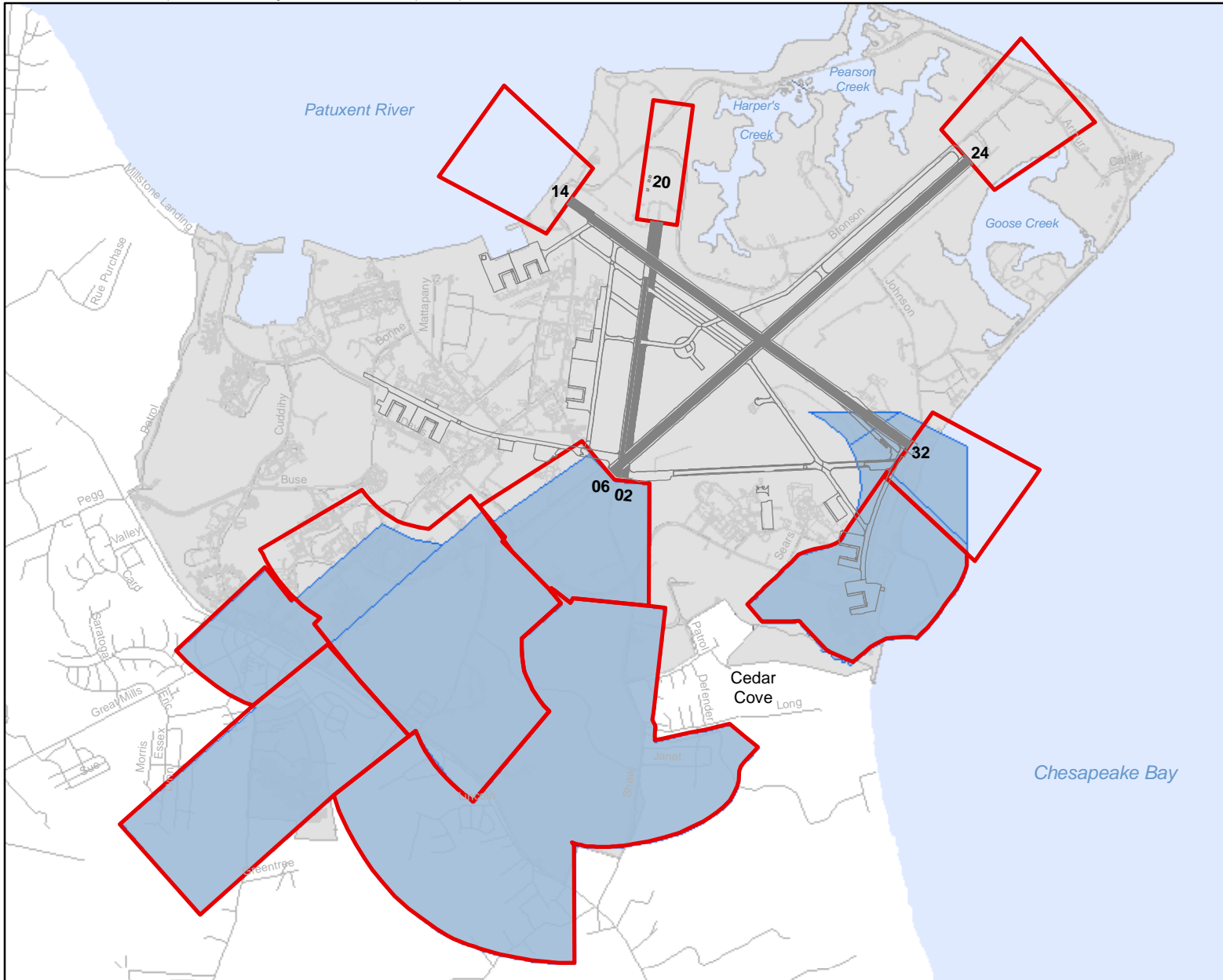


Figure 5-3
Comparison of 1979
and 2009 AICUZ APZs
NAS Patuxent River

- Runway
- 2009 APZs
- 1979 APZs

Sources:
St. Mary's County GIS, 2001
ESRI, 2005



0 1,250 2,500 5,000
Feet

5.2 Flight Safety

Flight safety refers to important safety steps taken and/or measures implemented to ensure both pilot safety during aircraft operations and the safety of those on the ground in the community who live and work in the vicinity of an air station. This section discusses such flight safety issues as imaginary planes and transition surfaces, Bird/Animal Strike Hazard (BASH) issues, and measures to avoid other potential pilot interferences such as electromagnetic interference, smoke, dust, steam, and lighting.

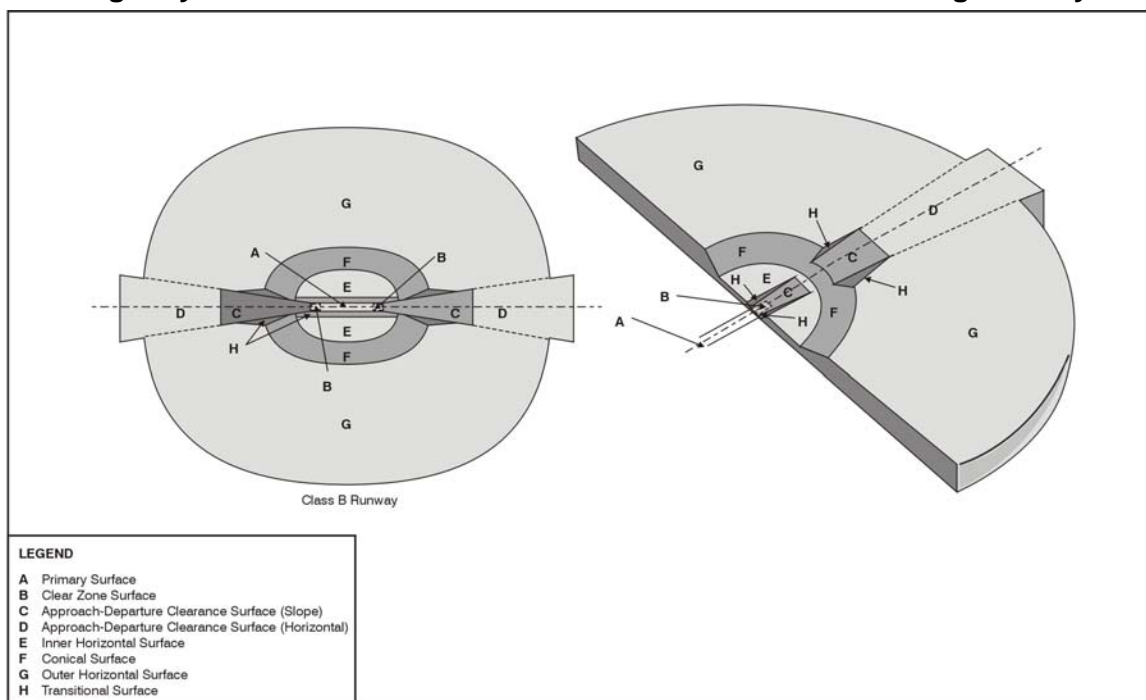
5.2.1 Imaginary Surfaces

Imaginary planes and transition surfaces define the required airspace that must remain free of obstructions to ensure safe flight approaches, departures, and patterns. Obstructions may include natural terrain and man-made features such as buildings, towers, poles, and other vertical obstructions to airspace navigation. Brief descriptions of the imaginary surfaces for Class B runways are provided in Table 5-2. These areas are also labeled on Figure 5-4. Figure 5-4 also shows the composite imaginary and transitional surfaces at NAS Patuxent River.

**Table 5-2
 Imaginary Surfaces – Class B Fixed-wing Runways**

Planes and Surfaces	Geographical Dimensions
Class B	
Primary Surface	The Primary Surface is a surface on the ground or water centered lengthwise on the runway and extending 200 feet beyond each end of the runway. The width is 1,000 feet or 1,500 feet per runway, Class A or B, respectively. The Primary Surface is normally highly protected and free of all obstructions.
Clear Zone	The Clear Zone is located immediately adjacent to the end of the runway and extends 3,000 feet outward along the runway centerline for both Class A and B runways.
Approach-Departure Clearance Surfaces	Approach-Departure Clearance Surfaces extend from the primary surfaces at a 40:1 and 50:1 inclined plane for Class A or B runway respectively. When the surface reaches an elevation of 500 feet the surface becomes a horizontal plane for both Class A and B runways.
Horizontal Clearance Surfaces	Horizontal Clearance Surfaces include one at 150 feet above airfield elevation extending to 7,500 feet from the runway and another at 500 feet above airfield elevation extending from 14,500 feet to 44,500 feet from the runway end for both Class A and B runways.
Conical	Conical and other Transitional Surfaces connect the Horizontal Surfaces to the Approach/Departure Clearance Surfaces and the Primary Surfaces.
Source: U.S. Department of Transportation – Federal Aviation Administration 2006	

Figure 5-4
Imaginary Surfaces and Transition Planes for Class B Fixed-Wing Runways



5.2.2 Bird/Animal Strike Hazard

Wildlife represents a significant hazard to flight operations. Birds, in particular, are drawn to the open, grassy areas and warm pavement of the airfield. Although most bird and animal strikes do not result in crashes, they cause structural and mechanical damage to aircraft. Most collisions occur when the aircraft is at an elevation of less than 1,000 feet. Due to the speed of the aircraft, collisions with wildlife can happen with considerable force.

To reduce BASH, the FAA and the military recommend that land uses that attract birds be located at least 10,000 feet from the airfield. These land uses include:

- Waste disposal operations;
- Wastewater treatment facilities;
- Landfills;
- Golf courses;

- Wetlands;
- Dredge disposal sites;
- Seafood processing plants; and
- Storm water ponds.

Design modifications also can be used to reduce the attractiveness of these types of land uses to birds and other wildlife.

5.2.3 Electromagnetic Interference

New generations of military aircraft are highly dependent on complex electronic systems for navigation and critical flight and mission-related functions. Consequently, care should be taken in siting any activities that create electromagnetic interference (EMI). EMI is defined by the American National Standards Institute as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. It can be induced intentionally, as in forms of electronic warfare, or unintentionally as a result of spurious emissions and responses, such as high tension line leakage. Additionally, EMI may be caused by atmospheric phenomena such as lightning and precipitation static and by non-telecommunication equipment, such as vehicles and industry machinery.

An additional concern about EMI that requires close examination in the future is the potential for future alternative energy exploration by private industry off the coast of Maryland, Delaware, and Virginia in the Atlantic Warning Area; this potential development could impact NAS Patuxent River's ability to maintain and expand air and weapons testing levels. The presence of wind farms or oil exploration development could present several obstacles to testing, ranging from physical profile to radar interruption.

With respect to development of wind energy projects, NAS Patuxent River sent a letter in December 2008 to St. Mary's County in response to the County's request for Navy comments as related to the

zoning regulations concerning Wind Turbine Systems (U.S. Department of the Navy 2008).

The letter, in part, states the following:

“Wind turbines dynamically reflect radio frequency (RF) energy; large wind turbines reflect large amounts of energy and multiple units (wind farms) create large complex reflections. Those reflections include some characteristics that are similar to aircraft in flight. The reflected energy can raise the local RF energy noise and clutter to levels that reduce the performance of radar and radar-based measurement systems. The dynamic nature of the noise/clutter is particularly worrisome”

NAS Patuxent River has requested that St Mary’s County provide the Navy with the opportunity to be informed and to provide comments on any proposed wind turbine systems in order to evaluate their compatibility with the Navy’s Naval Communication and Tracking Systems.

5.2.4 Lighting

Bright lights, either direct or reflected, in the airfield vicinity can impair a pilot’s vision, especially at night. A sudden flash from a bright light causes a spot or “halo” to remain at the center of the visual field for a few seconds or more, rendering a person virtually blind to all other visual input. This is particularly dangerous at night when the flash can diminish the eye’s adaptation to darkness. Partial recovery of this adaptation is usually achieved in minutes, but full adaptation typically requires 40 to 45 minutes.

5.2.5 Smoke, Dust, and Steam

Industrial or agricultural sources of smoke, dust, and steam in the airfield vicinity could obstruct the pilot’s vision during takeoff, landing, or other periods of low-altitude flight.