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FINAL

AIR INSTALLATIONS COMPATIBLE USE ZONES STUDY FOR NAVAL AIR STATION KEY WEST

FEBRUARY 2018

PREPARED BY

UNITED STATES DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND SOUTHEAST

PREPARED FOR

UNITED STATES DEPARTMENT OF THE NAVY
NAVAL AIR STATION KEY WEST

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The United States Department of Defense (DOD) initiated the Air

Airfield Safety

ES.6 Land Use Planning Authorities, Policies, Regulations, and Programs

ES.7 Land Use Compatibility Analysis and Recommendations

Installations Compatible Use Zones (AICUZ) Program to assist governments and communities in identifying and planning for compatible land use and development near military installations. The goal of the AICUZ Program is to protect the health, safety, and welfare of the public while also protecting the operational capabilities of the military. Today, the AICUZ Program is a vital tool used by the Navy to communicate with neighboring communities, government entities, and individuals regarding compatible land uses and development concerns.

This AICUZ Study was prepared for Naval Air Station (NAS) Key West in accordance with federal regulations, guidelines, and Office of the Chief of Naval Operations Instruction (OPNAVINST 11010.36C), and is an update to the 2007 AICUZ Study. Pursuant to Navy Instruction, this 2018 AICUZ Study evaluates historical noise contours and accident potential zones (APZs) as well as projected noise contours and APZs. Noise contours and APZs, together, are commonly called the “AICUZ footprint.” The 2018 AICUZ footprint is shown on Figure ES-1, and discussed further in Section 7.1, Land Use Compatibility Guidelines and Classifications.

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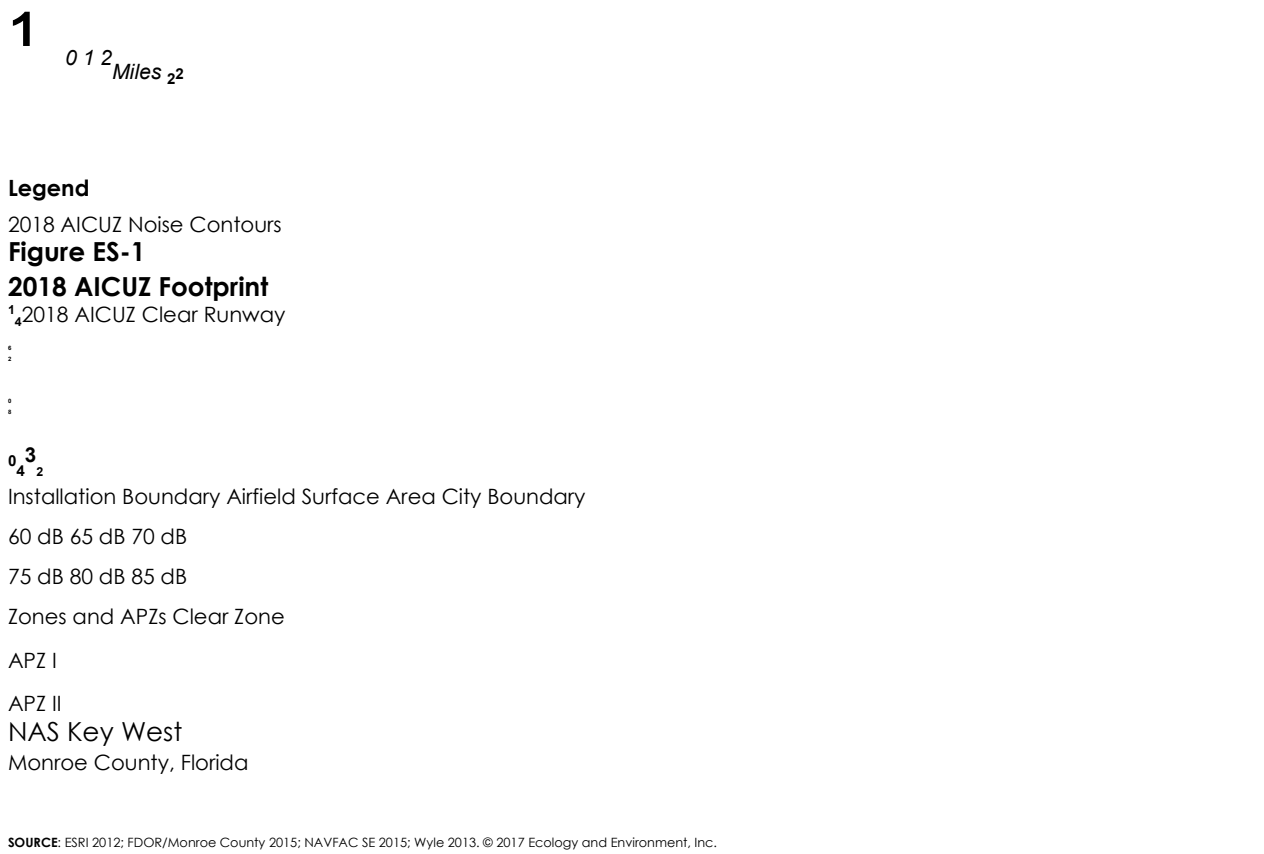
ATLANTIC OCEAN



SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015; Wyle 2013. © 2017 Ecology and Environment, Inc.

The 2018 AICUZ Study's APZs and noise contours differ from the 2007 AICUZ Study. This is because the 2018 AICUZ Study's APZs were based on the flight tracks and the number of annual operations used in the 2013 NAS Key West Airfield Operations Final Environmental Impact Statement (EIS) preferred alternative (proposed action [Alternative 2]) and the Record of Decision, dated October 31, 2013. The 2013 NAS Key West Airfield Operations Final EIS will hereinafter be referred to as the "2013 Airfield Operations EIS." The NAVFAC AICUZ Program Manager validated the EIS noise study methodology of the preferred alternative as sufficient for use in this 2018 AICUZ Study. Thus, the 2018 AICUZ footprint represents the validated EIS preferred alternative noise contours and air operations. Changes in the APZs are the result of the overlap of operational flight tracks off runway ends (approach/departure ends of Runway 08 and Runway 26), resulting in a wider than usual standard APZ configuration.

This 2018 AICUZ Study utilizes the 2013 Airfield Operations EIS data, which projected operations over a 10-year period by assessing changes in mission, aircraft, and projected operational levels through Calendar Year (CY) 2023. As a planning document, this 2018 AICUZ Study has a 10-year outlook. The Navy reviewed the 2013 Airfield Operations EIS data and determined that the projected annual operations were accurate and should be extended through CY2028 to be in line with the AICUZ update planning horizon.

ES.2 NAVAL AIR STATION KEY WEST

NAS Key West is located approximately 156 miles southwest of Miami and 90 air miles north

of Cuba. Key West is the closest point in the United States to Cuba, South America, and the Caribbean Sea, which makes NAS Key West an important military and homeland security asset, independent of its role as an aviation training facility. Boca Chica Field, the primary site and airfield at NAS Key West, is located on Boca Chica Key. Boca Chica Field is approximately 4,700 acres and is located about 3 miles east of the city of Key West. NAS Key West has proven to be a year-round training facility for various types of DOD pilots and aircraft, and a variety of airfield training operations have been conducted at the airfield, including touch-and-go's, field carrier landing practice (FCLP), and other pattern operations.

NAS Key West's primary mission supports operational and readiness requirements for the DOD, Department of Homeland Security, National Guard units, federal agencies, and allied forces. NAS Key West maintains mission-critical facilities, infrastructure, and property, which support readiness training exercises and operations as well as its various tenant commands' mission responsibilities.

NAS Key West is home to 22 aircraft (various) and has the ability to support up to approximately 80 visiting aircraft and 1,200 visiting personnel at one time in addition to providing port operations for

visiting ships (Navy 2013). NAS Key West also hosts various tenant and transient activities supporting such critical missions as unique naval research, development testing, counter-drug operations, and special warfare training, and includes users such as Joint Interagency Task Force South, United States Coast Guard (USCG), and U.S. Army Special Forces Underwater Training School, among others (NAS Key West 2016).

ES.3 Aircraft Operations

Aircraft operations are the primary source of noise associated with an installation. The level of noise exposure relates to several variables, including aircraft type, engine power setting, altitude flown, direction of the aircraft, flight track, temperature, relative humidity, frequency, time of operation, and duration of run-ups.

AICUZ studies account for future missions and operations. As such, this 2018 AICUZ Study analyzes and presents two conditions: (1) the historical (2007) noise contours and APZs, as presented in the 2007 AICUZ Study (NAVFAC 2007); and (2) the projected (CY2028) noise contours and operational levels, as presented in the 2013 Airfield Operations EIS (Navy 2013). Based on the changes captured in the EIS, the Navy forecasts that total annual flight operations at NAS Key West will be approximately 52,000.

The number of annual arrivals and departures are similar for the historical to projected scenario

with the exception of overhead break arrivals, which decreased by approximately 4,800 annual operations. The daytime split of operations is similar for the historical and projected scenarios, with a difference of only approximately 5,000 operations. However, there is a 78 percent decrease in acoustic nighttime (10:00 p.m. to 7:00 a.m.) operations from the historical and projected scenarios.

ES.4 AIRCRAFT NOISE

This 2018 AICUZ Study discusses noise associated with aircraft operations, including average noise levels, noise abatement/flight procedures, noise complaints, sources of noise, airfield-specific noise contours, and analysis of changes from the historical (2007 AICUZ) and projected (CY2028) noise contours.

The 2018 AICUZ noise contours and projected operational data used in this 2018 AICUZ Study were adopted from the 2013 Airfield Operations EIS. In support of the 2013 Airfield Operations EIS, NAS Key West conducted a noise analysis. Data were then collected from NAS Key West, compiled, and input into computer models that graphically depict noise exposure as noise contours.

Day-night average sound level (DNL) is depicted on a map as a noise contour that connects points of equal noise value. Contours are displayed in 5-decibel (dB) increments (i.e., 60, 65, 70, 75, 80, and 85 dB DNL). The projected noise contours for NAS Key West overlay the area in the immediate
vicinity of the airfield, with the vast majority of the higher noise contours concentrated within the installation boundary. The projected noise exposure primarily derives from FA-18E/F Super Hornets, F-5 Tigers, and F-35C Lightning IIs.

The historical noise contours (Noise Zones 1, 2, and 3) covered 32,986 acres as compared to 24,823 acres for the projected scenario (both on- and off-station), resulting in the total affected land area within the noise contours (Noise Zones 1, 2, and 3) decreasing by approximatly 25 percent.

ES.5 AIRFIELD SAFETY

While the likelihood of an aircraft mishap is unlikely, accidents do occur. The Navy has designated areas with an accident potential based on historical data for aircraft mishaps near military airfields to assist in land use planning. APZs identify areas where an aircraft accident is most likely to occur if an accident were to take place. The APZs are not a prediction of accidents or accident frequency. When adopted by local zoning authorities, APZs minimize

potential harm to the public, pilots, and property if a mishap does occur by limiting incompatible uses in the designated APZ areas.

APZs follow departure, arrival, and pattern flight tracks. There are three types of APZs: the Clear Zone, APZ I, and APZ II. APZs extend from the end of the runway, but apply to the predominant arrival and/or 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.

APZs in this 2018 AICUZ Study have been developed based on the projected annual aircraft operations presented in the 2013 Airfield Operations EIS and NAS Key West's unique training environment.

As noted in Section ES.1, Introduction, the 2018 APZs presented in this AICUZ were developed and modeled based on the operations and flight tracks approved in the 2013 Airfield Operations EIS. Changes in the APZs are the result of the overlap of operational flight tracks off Runway ends 08 and 26 (approach/departure ends), resulting in a wider than usual standard APZ configuration. The 2018 AICUZ Clear Zones and APZs for NAS Key West impact approximately 4,748 acres. About 25 percent of the impacted areas are within the installation boundary. The remaining 75 percent of impacted areas are off-station—with 88 percent (3,132 acres) of these off-station areas located over water, resulting in only 12 percent (440 acres) of the off-station areas located over land.

ES.6 Land Use Authorities, Policies, Regulations, and Programs

Successful AICUZ land use compatibility implementation is the collective responsibility of the Navy, state and local governments, and private sector and non-profit organizations. This AICUZ Study discusses federal, state, and local planning authorities, regulations, and programs that encourage compatible land use practices. Ultimate control over land use and development surrounding NAS Key West is the responsibility of local governments and landowners, therefore, the Navy encourages local governments to plan for compatible development. In addition, the Navy focuses efforts on outreach and coordination with local jurisdictions to provide greater awareness and transparency of the operations in and around the installation.

The AICUZ footprint (noise contours and APZs) is located in an unincorporated area of Monroe County, Florida, and near the City of Key West's jurisdiction. Although NAS Key

West's AICUZ footprint is not located within the city limit, the City has policies that relate to and affect NAS Key West. Land use planning programs, Comprehensive Plans, zoning codes, ordinances, and overlay districts, among others, with potential to influence land use near the airfield are discussed as part of this AICUZ Study.

ES.7 Land Use Compatibility Analysis and Recommendations

The AICUZ Study presents the land use compatibility analysis that identifies any existing or planned land use, zoning, and development compatibility issues, as well as to provide recommendations to manage existing and future development within and around the AICUZ footprint to ensure long-term land use compatibility between local land development and the Navy's operational mission. The 2018 AICUZ footprint (Figure ES-1) is discussed further in Section 7.1, Land Use Compatibility Guidelines and Classifications.

The Navy has developed land use compatibility recommendations for noise zones and APZs to foster land use compatibility. For land use planning purposes in AICUZ studies, noise exposure areas are divided into three noise zones, based on DNL measurements. Noise Zone 1 (<55 to <65 dB DNL) is an area of low or no impact. Noise Zone 2 (65 to <75 dB DNL) is an area of moderate impact where some land use controls are recommended. Noise Zone 3 (>75 dB DNL) is the most impacted area where the greatest degree of compatible land use controls are recommended. Likewise, recommended land use compatibility guidelines are established for Clear Zones, APZ I, and APZ II.

AICUZ guidelines recommend that land uses that concentrate large numbers of people (e.g., apartments, churches, and schools) be avoided within the APZs.

This AICUZ Study addresses land use compatibility within aircraft noise zones and APZs by examining existing and planned land uses near NAS Key West. To analyze whether existing land uses are compatible with aircraft operations, the 2018 AICUZ noise contours and APZs were overlaid on parcel data and land use classification information. The land use compatibility analysis was performed on a case-by-case basis and at the land parcel level using the Navy's land use compatibility guidance and land use data from Monroe County. Noise contours and/or APZs impact areas off the installation in all directions. While the majority of the areas impacted are military, conservation, and water, there are limited amounts of residential areas located within certain APZs and noise zones.

The Navy has the responsibility to communicate and collaborate with local governments on land use planning, zoning, and compatibility concerns that can have an impact on its mission. State and local governments have the authority to implement regulations and programs to control development and direct growth to ensure land use activity is compatible within the AICUZ footprint. Local governments are encouraged to recognize their responsibility in providing land use controls in those areas
encumbered by the AICUZ footprint by incorporating AICUZ information into their planning policies and regulations. Cooperation between NAS Key West and their neighboring communities is key to the AICUZ Program's success. The AICUZ Study recommendations, when implemented, will continue to advance the goal, "to protect the health, safety, and welfare of those living near military airfields, while preserving the defense flying mission."

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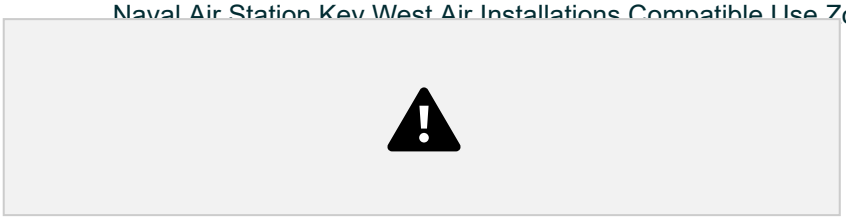

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ACRONYMS AND ABBREVIATIONS

AICUZ Air Installations Compatible Use Zones

Air Ops Air Operations

APHIS WS United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services

APZ accident potential zones

ATC Air Traffic Control

BASH bird/animal aircraft strike hazard

BPAS Building Permit Allocation System

CFR Code of Federal Regulations

CIP Capital Improvement Program

CNIC Commander Navy Installations Command CO

Commanding Officer

CPLO Community Planning and Liaison Officer

CY calendar year

dB decibel

dBA A-weighted decibel

DNL day-night average sound level

DOD United States Department of Defense

du/acre dwelling units per acre

EA environmental assessment

EAP encroachment action plan

EIS environmental impact statement

EMI electromagnetic interference

F.S. Florida Statutes

FAA Federal Aviation Administration

FAR Federal Aviation Regulations

FCLP field carrier landing practice

FRS Fleet Replacement Squadron

GCA ground control approach

GIS geographic information system

HUD United States Department of Housing and Urban Development KWIA

Key West International Airport

Marine Corps United States Marine Corps

MIAI Military Installation Area of Impact

MOA Military Operations Area

MSL mean sea level

NAS Naval Air Station

NATOPS Naval Air Training and Operating Procedures Standardization

NAVFAC Naval Facilities Engineering Command

Navy United States Department of the Navy

NEPA National Environmental Policy Act

NLR noise level reduction

NOTMAR Notice to Mariners

OPNAVINST Office of the Chief of Naval Operations Instruction

PAO Public Affairs Officer

REPI Readiness and Environmental Protection Integration RPC

Regional Planning Council

RV recreational vehicle

SUA Special Use Airspace

TDR transfer of development rights

U.S.C. United States Code

UFC Unified Facilities Criteria

USCG United States Coast Guard

US Hwy 1 Overseas Highway

VFA Strike Fighter Squadron

VFC Fighter Squadron Composite

W-### Warning Area

1

INTRODUCTION

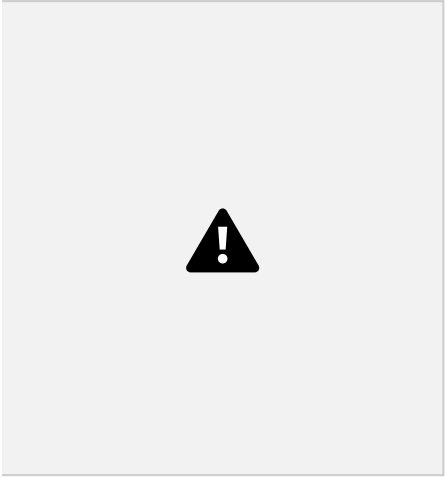
Recognizing the need to foster compatible land and air uses, the United States Department of Defense (DOD) initiated the Air Installations Compatible Use Zones (AICUZ) Program in 1973 to help governments and communities identify and plan for coordinated compatible land use and development around installations. The goal of the AICUZ Program is to protect the health, safety, and welfare of the public while also protecting the operational capabilities of the military. This goal is accomplished by achieving compatible land use around an air installation, and mutual cooperation between installations and their neighboring communities is key to the AICUZ Program's success.

Military installations and their host communities often have a history of cooperation and mutual benefits. Installations provide economic benefits through jobs and contracts, while host communities provide housing, services, retail, and schools. The presence of a military installation attracts nearby community and private development of housing, restaurants, shops, and other land uses. This development can be complementary in nature, enhancing an installation's value and function, or the surrounding land uses may be located in areas of high noise zones or accident potential, making it incompatible with the sustained long-term mission of the installation.

The AICUZ Program recommends that noise contours, accident potential zones (APZs), height obstruction criteria, and land use recommendations be incorporated into local community planning policies and activities to minimize impacts to the military mission and the residents in the surrounding communities.

As the communities that surround an airfield grow and develop, the United States Department of the Navy (Navy) has the responsibility to communicate and collaborate with local governments on land use planning and mission impacts. As stakeholders in the community, installations provide awareness of the military mission and operations to local communities to ensure the health, safety, and welfare of the local community and to protect the mission.

This AICUZ Study was prepared for Naval Air Station (NAS) Key West in accordance with federal regulations, guidelines, and Office of the Chief of Naval Operations Instruction (OPNAVINST 11010.36C), and is an update to the 2007 AICUZ Study. Pursuant to Navy Instruction, this 2018 AICUZ Study evaluates historical AICUZ noise contours and APZs as well as projected noise contours and APZs. The 2018 AICUZ APZs and noise contours differ from the 2007 AICUZ, as they are derived from noise contours, flight tracks, and the number of annual operations used in the 2013 Naval Air Station Key West Airfield Operations Final Environmental Impact Statement (EIS), hereinafter referred to as the 2013 Airfield Operations EIS. The NAVFAC AICUZ Program Manager validated the EIS noise study methodology of the preferred alternative (proposed action [Alternative 2]) as sufficient for use in the 2018 AICUZ Study. The historical scenario utilized in this AICUZ Study is the 2007 AICUZ Study.



This 2018 AICUZ Study utilizes the 2013 Airfield Operations EIS data, which projected operations over a 10-year period by assessing changes in mission, aircraft, and projected operational levels through Calendar Year (CY) 2023. As a planning document, this 2018 AICUZ Study has a 10-year outlook. The Navy reviewed the 2013 Airfield Operations EIS data, determined that the projected annual operations were accurate, and should be extended through CY2028 to be in line with the AICUZ update planning horizon.

This 2018 AICUZ Study analyzes and presents two conditions:

(1) The historical (2007) noise contours and APZs, as presented in the 2007 AICUZ Study (NAVFAC 2007); and

(2) The projected (CY2028) noise contours and operational levels, as presented in the 2013 Airfield Operations EIS (Navy 2013).

1.1 AICUZ PROGRAM

The DOD established the AICUZ Program to balance the need for aircraft operations with community concerns regarding aircraft noise and accident potential. The AICUZ Program provides a format to document the effects of aircraft operations in a community, while encouraging compatible development to minimize future conflicts.

The objectives of the AICUZ Program, according to the OPNAVINST 11010.36C, are:

- To protect the health, safety, and welfare of civilians and military personnel by encouraging land use that is compatible with aircraft operations;
- To reduce noise impacts caused by aircraft operations, while meeting operational, training, and flight safety requirements, both on and in the vicinity of air installations;
- To inform the public and seek cooperative efforts to minimize noise and aircraft accident potential impacts by promoting compatible development; and
- To protect Navy and United States Marine Corps (Marine Corps) installation investments by safeguarding the installation's operational capabilities.

To help meet AICUZ Program objectives, the Federal Aviation Administration (FAA) and DOD have developed specific instructions and guidance to encourage local communities to restrict development or land uses that could endanger pilots operating aircraft near an airfield. Examples of such development or land uses include: lighting (direct or reflected) that would impair pilot vision; towers, tall structures, and vegetation that penetrate navigable airspace or are constructed near an airfield; uses that generate smoke, steam, or dust; uses and/or vegetation that attract birds (especially waterfowl) as well as deer or other wildlife; and electromagnetic interference (EMI) sources that may adversely affect aircraft communication, navigation, or other electrical systems.

To meet the objectives of the AICUZ Program, the Navy recommends that local community planning authorities incorporate development criteria in areas surrounding an installation and incorporate noise exposure contours and APZs into local plans and development ordinances. Noise exposure contours and APZs, which are described in detail in Chapter 4, Aircraft Noise, and Chapter 5, Airfield Safety, respectively, are areas of concern for air installations and neighboring communities. Noise contours and APZs, together, are commonly called the "AICUZ footprint." Because noise exposure contours and APZs often extend beyond the "fence line" of an installation, presenting current noise exposure contours and APZs to local governments is essential to fostering mutually beneficial land uses and development.

1.1.1 Purpose, Scope, and Authority

The purpose of the AICUZ Program is to achieve compatibility between air installations and neighboring communities. To satisfy this purpose, the Navy works with local communities to foster compatible development.

The scope of this AICUZ Study analyzes:

- ❑ Historical and projected aircraft operations, including arrivals, departures, and pattern work (e.g., touch-and-go);
- ❑ Noise contours;
- ❑ Aircraft APZs;
- ❑ Land use compatibility;
- ❑ Noise reduction strategies; and
- ❑ Possible solutions to existing and potential incompatible land uses.

An AICUZ Study presents analysis of community development trends, land use tools, and mission requirements to recommend strategies for communities to prevent incompatible development. Implementation of these strategies requires cooperation between the Installation Commanding Officer, Community Planning and Liaison Officer (CPLO), and the local governments. Key documents that outline the authority for the establishment and implementation of the AICUZ Program, as well as guidance on facility requirements, are derived from:

- ❑ DOD Instruction 4165.57, "Air Installations Compatible Use Zones," dated May 2, 2011(incorporating Change 1, Effective March 12, 2015);

❑ OPNAVINST 11010.36C, “Air Installations Compatible Use Zones Program,” dated October 9, 2008;

❑ Unified Facilities Criteria (UFC) 3-260-01, “Airfield and Heliport Planning and Design,” dated November 17, 2008;

❑ Naval Facilities Engineering Command (NAVFAC) P-80.3, “Facility Planning Factor Criteria for Navy and Marine Corps Shore Installations: Airfield Safety Clearances,” dated January 1982; and

❑ United States Department of Transportation, FAA Regulations, Title 14 Code of Federal Regulations (CFR) Part 77, “Objects Affecting Navigable Airspace.”

1.2 Responsibility for Compatible Land Use

The AICUZ Program promotes compatible land use development and activities around military air installations through cooperation and engagement with the community. Therefore, ensuring land use compatibility near an air installation is a collaborative effort by many organizations, including the DOD, Navy, local naval installation command, state and local governments, planning and zoning agencies, developers, real estate agencies, and residents.

State and local governments have the responsibility to protect public health, safety, and welfare. The Navy has similar responsibilities, while concurrently preserving the mission and operations of the installation. The Navy actively works with state and local government agencies to engage and inform the local communities throughout the development and implementation of compatible land use recommendations that minimize noise impacts and the potential for accidents around air installations. While military installations can advise local government agencies on land use near the installation by providing information on aircraft noise and accident potential, the state and local government agencies have the authority to preserve land use compatibility through the adoption and implementation of appropriate control measures. This AICUZ Study provides recommendations to encourage the local community to consider and adopt such measures.

Cooperative action by all parties is essential in promoting compatible land use and deterring potential hazards. Chapter 7, Land Use Compatibility Analysis and Recommendations, discusses the Navy’s compatible land use tools and recommendations in more detail.

1.3 Previous AICUZ Efforts and Related Studies

Updates to an AICUZ Study often account for changes in aircraft that utilize an installation, changes in operational parameters, and changes derived from revisions to the Navy AICUZ Instruction. Since the inception of the AICUZ Program in 1973, NAS Key West has experienced many mission and operational changes, and has undergone several AICUZ studies. The following sections highlight the AICUZ Study history at NAS Key West, describe the changes that require an AICUZ Study Update, summarize the changes that necessitate this AICUZ Study update, and provide an overview of this document.

1.3.1 Previous AICUZ Efforts

There have been various AICUZ studies completed for NAS Key West since the inception of the AICUZ Program. The following sections present the key elements of the two AICUZ studies completed for NAS Key West.

1977 AICUZ Study for NAS Key West

This original AICUZ Study, published in 1977, was prepared following the establishment of the DOD AICUZ Program under the authority of the 1975 DOD Instruction. The 1977 AICUZ Study served as the basis for NAS Key West's AICUZ Program and formalized the installation's communication and outreach with the local communities.

2004 AICUZ Study Update for NAS Key West

In May of 2004, the Chief of Naval Operations approved an AICUZ Study Update for NAS Key West. The AICUZ Study Update superseded the 1977 AICUZ and incorporated more modern analytical tools to address noise, safety, and land use compatibility issues associated with then current and projected future aircraft training in the vicinity of the installation.

2007 AICUZ Study Update for NAS Key West

The 2007 AICUZ Study Update, published in March 2007, revised the original 1977 AICUZ Study and was an update to the 2004 AICUZ Study Update. The 2007 AICUZ Study Update was published under the authority of OPNAVINST 11010.36B, "Air Installations Compatible

Use Zones Program (AICUZ)," dated December 19, 2002.

1.3.2 Other Related Planning Documents

Other planning documents related to NAS Key West provide additional context in the development and management of their existing AICUZ Program. In addition to the previously conducted AICUZ studies, there has also been an EIS (2013).

NAS Key West Airfield Operations Environmental Impact Statement (2013)

The 2013 Airfield Operations EIS described the Navy's proposed actions to support and conduct aircraft training operations at NAS Key West by maintaining current and existing airfield operations, supporting airfield operations by new types of aircraft, and modifying airfield operations, as necessary in support of the Fleet Readiness Training Plan (Navy 2013). The 2013 Airfield Operations EIS preferred alternative and Record of Decision, dated October 31, 2013, represent the projected

(CY2028) operations used for this 2018 AICUZ Study. The noise contours and operational levels (up to approximately 52,000 annual airfield operations) serve as the basis for this 2018 AICUZ Study.

1.3.3 Changes that Necessitate this AICUZ Update

AICUZ updates follow DOD and Navy Instruction. Updates are determined necessary based on a variety of factors, but primarily are conducted if an air installation has a significant change or projected change in aircraft operations, a significant increase in nighttime flying activities, a change in the aircraft based and operating at the installation, or changes in flight paths or runway utilization. Another critical determining factor is an installation's acquisition or discontinuation of a mission that affects aircraft operations. Other factors to consider include the year of the previous AICUZ Study, updates to the DOD or Navy Instruction, updates to noise modeling methods, and local community land use changes and developments.

This 2018 AICUZ Study was developed in accordance with OPNAVINST 11010.36C and is a formal update to the 2007 AICUZ Study Update. This 2018 AICUZ Study provides NAS Key West's projected aircraft operations for CY2028. The justifications for this 2018 AICUZ Study include:

- Updated AICUZ Program guidance and instructions:
  - OPNAVINST was updated in 2008; and

- DOD Instruction was updated in 2011.

❑ Changes in aircraft types operating at the installation.

❑ Changes in transient aircraft types at the installation.

❑ Adjustments to flight tracks and flight track utilization.

❑ Changes in designated locations for aircraft maintenance and engine

run-ups. ❑ The age of the current AICUZ Study (>10 years old).

❑ Advancements in the DOD NOISEMAP suite of computer-based noise modeling tools that are used to generate the AICUZ noise contours:

- Updated aircraft acoustical data;
- Addition of terrain into noise modeling;
- Conducted using the “Average Annual Day” methodology; and

- Improved geographical technology.

❑ Changes in the local planning and governmental settings and the recommendations and strategies for local land use compatibility.

These factors have differing effects on the noise contours and APZs, commonly called the AICUZ footprint. These effects, as well as the extent of changes from the 2007 AICUZ Study, are discussed further in Chapter 3, Aircraft Operations, Chapter 4, Aircraft Noise, and Chapter 5, Airfield Safety.

1.3.4 AICUZ STUDY

Pursuant to Navy Instruction, this AICUZ Study evaluates historical (2007 AICUZ) noise contours and APZs and projected (CY2028) noise contours and APZs. The comparison of these data sets provides an understanding of the changes at NAS Key West that have occurred and provides the basis for the projected scenario. This AICUZ Study addresses the expected changes in mission, aircraft, and
projected operational levels through CY2028.

This AICUZ Study is comprised of the following chapters:

❑ Chapter 1: Provides background information on the AICUZ Program, NAS Key West

AICUZ overview, and changes that require an AICUZ Update;

❑ Chapter 2: Describes the location, history, mission, users, and operational areas; ❑ Chapter 3: Discusses aircraft types, operations, and operational alternatives;

❑ Chapter 4: Contains the AICUZ noise contours, outlines the methodology for determining noise contours, and discusses measures the Navy has implemented to mitigate any community noise concerns;

❑ Chapter 5: Discusses AICUZ APZs and airfield safety;

❑ Chapter 6: Describes land use authorities, policies, regulations, and programs, and how they promote, or can promote, the land use goals of the AICUZ Program; and

❑ Chapter 7: Provides an analysis of land use compatibility, as well as recommendations for promoting land use compatibility consistent with the goals of the AICUZ Program.

2

2.1 Location and History

2.2 Mission and Installation Activities 2.3 Operational Areas

2.4 Local Economic Impacts and Population Growth

NAVAL AIR

STATION

KEY WEST

2.1 LOCATION AND HISTORY

NAS Key West is comprised of approximately 6,500 acres of land distributed over several properties in the Florida Keys in Monroe County, Florida (Figure 2-1). NAS Key West is located approximately 156 miles southwest of Miami and 90 air miles north of Cuba. Key West is the closest point in the United States to Cuba, South America, and the Caribbean Sea, which makes NAS Key West an important military and homeland security asset, independent of its role as an aviation training facility. Boca Chica Field, the primary site and airfield at NAS Key West, is located on Boca Chica Key. Boca Chica Field is approximately 4,700 acres and is located about three miles east of the city of Key West (Figure 2-2). In addition to the airfield, the Boca Chica Field property also includes administrative and industrial facilities as well as recreational areas.

The Navy's presence in Key West dates back to 1823 when a naval base was established to stop piracy in the

2013)

NAS Key West was established at its present location on Boca Chica Key in the early 1940s during World War II. Boca Chica Field originated as a civilian airfield. When three paved runways were built in 1942, the airfield was leased

to the Army and it was then transferred to the Navy by the end of that same year. During the war, the installation was used to train carrier pilots, among other functions. (Navy 2013)

2. Naval Air Station Key West Page 2-1

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Legend

ATLANTIC OCEAN

Populated Place Major Road

Installation Boundary

Regional Location Map NAS Key West

Florida

National Wildlife Refuge

SOURCE: ESRI 2012; NAVFAC SE 2015. © 2017 Ecology and Environment, Inc.

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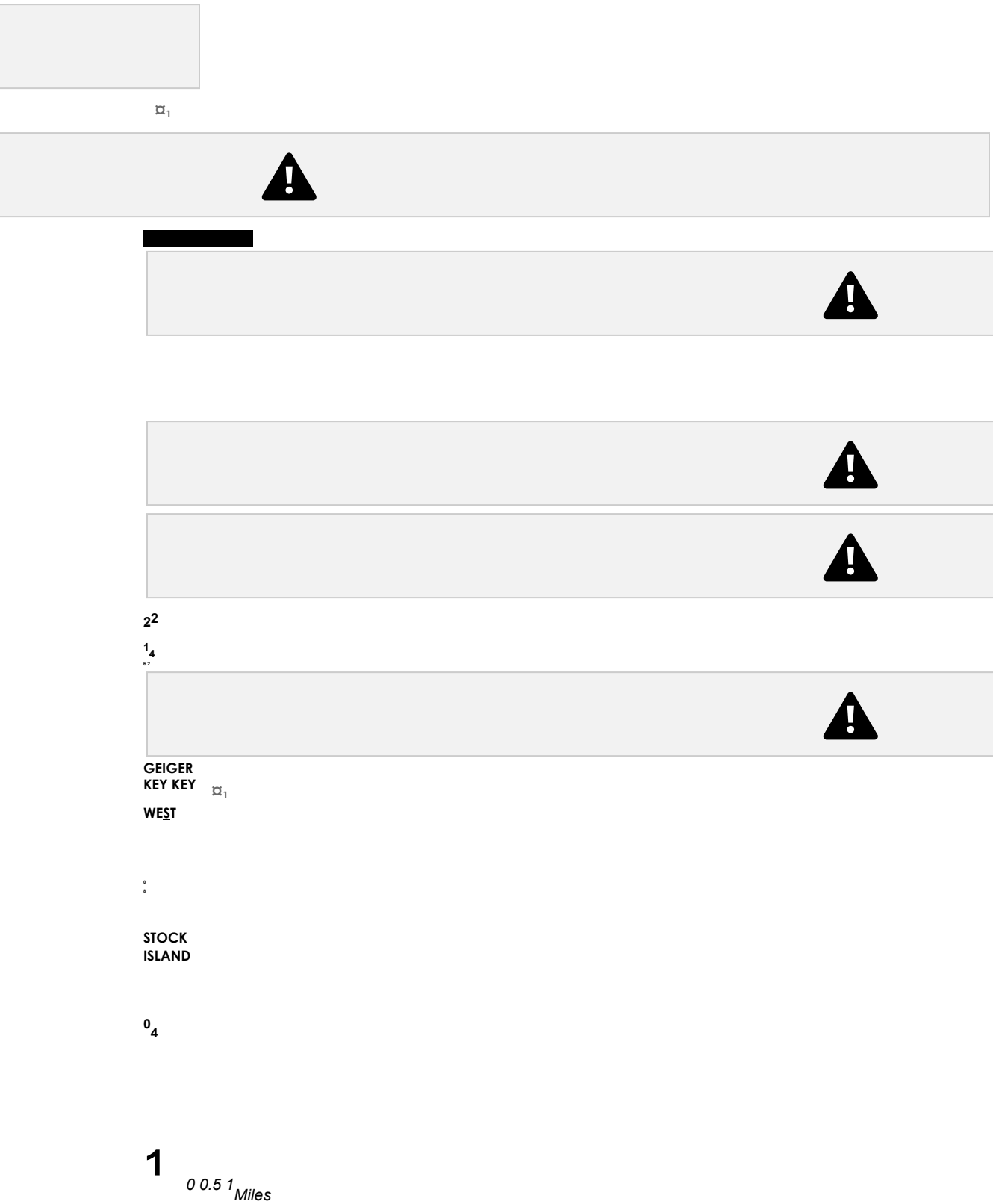
GULF OF
MEXICO
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KEY KEY
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ISLAND
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Legend

ATLANTIC OCEAN

Figure 2-2

Runway

Installation Boundary Airfield Surface Area

NAS Key West
Monroe County, Florida

City Boundary

SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015. © 2017 Ecology and Environment, Inc.

During the Cuban missile crisis in the early 1960s, operational and reconnaissance flights were flown from the air station in support of the blockade around Cuba. After the Cuban missile

crisis, permanent missile sites were constructed at various locations around the air station, and alert aircraft were maintained at the airfield. (Navy 2013)

Although much of the military presence in the Lower Keys was disestablished in March 1979, NAS Key West continues to be a fully operational naval air station (Navy 2013). Throughout the decades, NAS Key West has proven to be a year-round training facility for various types of DOD pilots and aircraft, and a variety of airfield training operations have been conducted at the airfield, including touch-and-go's, field carrier landing practice (FCLP), and other pattern operations. NAS Key West's access to offshore ranges and its temperate weather conditions provide an ideal flying environment with unparalleled aerial ranges that offer aircrew training within minutes after takeoff (NAS Key West 2016).

2.2 Mission and Installation Activities

NAS Key West's primary mission supports operational and readiness requirements for the DOD, Department of Homeland Security, National Guard units, federal agencies, and allied forces. NAS Key West maintains mission-critical facilities, infrastructure, and property, which support readiness training exercises and operations, as well as its various tenant commands' mission responsibilities.

NAS Key West is equipped with a Tactical Combat Training System that tracks and records aerial maneuvers, making it the Navy's premier East Coast transient pilot training facility for tactical aviation squadrons. Ideal weather throughout the year, efficient access to offshore training areas, and existing aviation-related assets allow NAS Key West to serve as an ideal operating base for opposition and aggressor forces that conduct operations against Carrier Strike Group assets during readiness exercises. Military assets in training evolutions utilize designated airspace and the Tactical Combat Training System in the Key West area. (NAS Key West 2016)

2.2.1 Tenant Commands

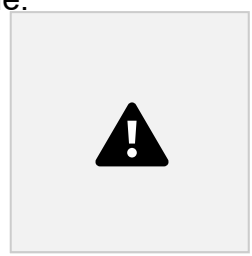
NAS Key West is home to 22 aircraft (various) and has the ability to support up to approximately 80 visiting aircraft and 1,200 visiting personnel at one time in addition to providing port operations for visiting ships (Navy 2013). NAS Key West also hosts various tenant and transient activities supporting such critical missions as unique naval research, development testing, counter-drug operations, and special warfare training, and includes users such as Joint Interagency Task Force South, United States Coast Guard (USCG), and U.S. Army Special Forces Underwater Training School, among others (NAS Key West 2016).

Aviation squadrons from around the country utilize NAS Key West on a regular basis to fulfill

their missions, and include active and reserve fighter/strike fighter communities, Fleet Replacement Squadrons (FRSs), and other military service users. NAS Key West has been a home base to various squadrons and squadron detachments flying anti-submarine warfare, tactical electronic warfare, reconnaissance, attack, combat adversary, and strike fighter aircraft.

The most frequent operators at NAS Key West utilizing the airfield include:

- ❑ Fighter Squadron Composite (VFC) 111 "Sundowners" Adversary Squadron: VFC-111 is part of the Navy Reserves' fleet adversary program and acts as an opposing force in air-to-air combat training. VFC-111's primary role is to serve as an air-to-air combat training adversary squadron for various visiting detachments. VFC-111 flies F-5N Tiger aircraft and is the only fighter squadron home based at NAS Key West. (Wyle 2013)



- ❑ Strike Fighter Squadron (VFA) 106 "Gladiators" Detachment Key West: Based at NAS Oceana, Virginia, VFA 106 flies FA-18 C/D Hornet and FA-18 E/F Super Hornet aircraft and prepares fleet pilots for assignment to deploying FA 18 squadrons. VFA-106 is a Fleet Replacement Squadron (FRS) with a permanent detachment in Key West.

Table 2-1 provides a list of NAS Key West's major tenants and transient users.

TABLE 2-1 NAS KEY WEST MAJOR TENANTS AND TRANSIENT USERS

TENANTS:

Naval Air Detachment Key West. Supports the mission of the parent command in providing research, design, development, and systems engineering; acquisition; test and evaluation; training facilities and equipment; repair and modification; and in-service engineering and logistics support and other pertinent system developments within the scope of the Naval Air Warfare Center Detachment.

Fleet Readiness Center Southeast. Maintains capability for and performs a complete range of depot-level rework operations on designated weapon systems, accessories, and equipment; manufactures parts and assemblies; provides engineering services in the development of changes of hardware design; furnishes technical and other professional services on aircraft maintenance and logistics problems.

Fleet and Industrial Supply Center Jacksonville Detachment Key West. Provides air operations support (storage and distribution of liquid oxygen and nitrogen) and administrative support services (administrative supplies, purchasing, Defense Reutilization Marketing Office).

VFC 111 "Sundowners" Adversary Squadron. Part of the Navy Reserves' fleet adversary program and provides dissimilar air combat training; VFC 111 flies F-5N Tiger aircraft and acts as an opposing force in air-to-air combat training.

TABLE 2-1 NAS KEY WEST MAJOR TENANTS AND TRANSIENT USERS

VFA 106 "Gladiators" Detachment Key West. Based at NAS Oceana, Virginia; flies FA-18 C/D Hornet and FA-18 E/F Super Hornet aircraft and prepares fleet pilots for assignment to deploying FA-18 squadrons.

Joint Interagency Task Force South. Conducts interagency and international detection and monitoring operations, reconnaissance, counter-drug, and counterterrorism; facilitates the interdiction of illicit trafficking in support of national security.

U.S. Army Special Forces Underwater Operations School. Provides Special Operations training centered on maritime operations and techniques used to infiltrate enemy areas to avoid detection.

Naval Research Laboratory. Operates the Marine Corrosion Facility, which conducts research, development, testing, and evaluation in corrosion control to provide engineering solutions to the Navy fleet to reduce the effects of the marine environment on naval systems.

Navy Branch Health Clinic. Provides medical and dental services for Navy personnel, dependents, transients, and tenants, and is the southernmost clinic in Navy Medicine Support Command Jacksonville.

Navy Munitions Command Detachment. Provides ammunition and other ordnance material, operates and maintains explosive ordnance outloading/transshipment, and maintains aviation weapons support equipment to support Atlantic Fleet and DOD ammunition requirements.

Center for Security Forces. Provides training and human performance solutions to meet fleet requirements for antiterrorism/security force, expeditionary warfare, and code of conduct mission areas.

United States Coast Guard. USCG Sector Key West provides maritime safety, search and rescue, and national security mission support under the Department of Homeland Security. The Sector was created from combining the resources of Group Key West and Marine Safety Detachment Marathon and authorities from Marine Safety Office Miami.

TRANSIENTS:

Commander, Naval Air Forces, Chief of Naval Air Training (CNATRA). Headquartered on board NAS Corpus Christi, Texas, CNATRA leads the Naval Air Training Command (NATRACOM) composed of five Training Air Wings. CNATRA conducts six Student Naval Aviator training pipelines – Strike, Rotary, Maritime, Tilt-rotor, E-2/C-2, and E-6.

Naval Special Warfare Groups. Command, train, equip, and deploy components of Naval Special Warfare squadrons built around deployed sea, air, and land (SEAL) teams to meet exercise, contingency, and wartime requirements around the world.

Fleet Replacement Squadrons (FRS). Strike Fighter Squadron (VFA) VFA-101, based at Eglin Air Force Base in Fort Walton Beach, Florida, trains and qualifies F-35C aircrew and maintenance professionals as part of a Carrier Air Strike Group; VFA 106 flies FA-18 C/D Hornet and FA-18 E/F Super Hornet aircraft and prepares fleet pilots for assignment to deploying FA-18 squadrons.

Marine Tactical Electronic Warfare Training Squadron 1 (VMAQT-1). The Marine Corps electronic warfare training squadron consisting of EA-6B Prowler jets. The squadron is based at Marine Corps Air Station Cherry Point, North Carolina, and falls under the command of Marine Aircraft Group (MAG) 14.

2.3 Operational Areas

NAS Key West is comprised of Boca Chica Airfield and several separate annexes, properties, and training areas located within the boundaries of Monroe County and near the City of Key West (Navy 2016). While NAS Key West maintains mission-critical facilities, infrastructure, and property, which support readiness training exercises and operations, as well as its various tenant commands' mission responsibilities, the focus of this AICUZ Study is on aircraft operations conducted at Boca Chica Field.

2.3.1 Airfield

Boca Chica Field, NAS Key West's airfield, is comprised of three asphalt runways (Runways 04/22, 08/26 and 14/32) and is utilized by fixed-wing aircraft. Runways are numbered according to their magnetic heading for aircraft approach or departure. For example, on Runway 04/22, the number
04 and 22 signify that this runway is most closely aligned with a compass heading of 40 and 220 degrees, respectively.

The runways discussed in this 2018 AICUZ Study have been renumbered from the runway numbers presented in the 2007 AICUZ and 2013 Airfield Operations EIS, which were labeled as 03/21, 07/25, and 13/31. This is due to magnetic variation, sometimes called magnetic declination, which changes over time and with location. In order to determine the magnetic variation, the DOD uses the World Magnetic Model (WMM) developed by the National Centers for Environmental information and the British Geological Survey. The WMM is the standard model used by the DOD for navigation, attitude, and heading referencing systems using the geomagnetic field. The latest update to the WMM was published in December of 2014 for the 2015 to 2020 time period (NOAA, n.d.). Per FAA Advisory Circular 150/5340-1, Standards for Airport Markings, the runway designation number should be the whole number nearest one-tenth of the magnet azimuth when viewed from the direction of approach. For example, where the magnetic azimuth is 183 degrees, the runway designation marking would be 18; and for a magnetic azimuth of 87 degrees, the runway designation

marking would be 9. For a magnetic azimuth ending in the number “5”, such as 185 degrees, the runway designation marking can be either 18 or 19. Although the runways were renumbered since the 2007 AICUZ Study and the 2013 Airfield Operations EIS, the runway layouts and configurations remains the same at NAS Key West and as presented in this 2018 AICUZ Study.

Runway 08/26 is 10,000 feet by 200 feet, and crosswind Runways 04/22 and 14/32 are both 7,000 feet by 150 feet. The NAS Key West airfield elevations are 6 feet above mean sea level (MSL).

Normal hours of operation at NAS Key West are during acoustic daytime (7:00 a.m. to 10:00 p.m.), seven days a week, except in observance of federal holidays when the airfield is closed for air operations; however, operational requirements may necessitate operations to take place outside of these hours, such as during acoustic nighttime hours (10:00 p.m. to 7:00 a.m.).

2.3.2 AIRSPACE

The FAA’s National Airspace System dictates the use of airspace over NAS Key West and also seeks to ensure the safe, orderly, and efficient flow of commercial, private, and military aircraft. There are two categories of airspace: regulatory and non-regulatory. Within these two categories, there are four types of airspace: controlled, uncontrolled, special use, and other airspace. Controlled airspace, designated Class A through Class E, covers the airspace within which Air Traffic Control (ATC) clearance is required. Uncontrolled airspace is the portion of the airspace not designated as Class A through Class E within which ATC has no authority or responsibility to control air traffic (Figure 2-3) (FAA 2016).

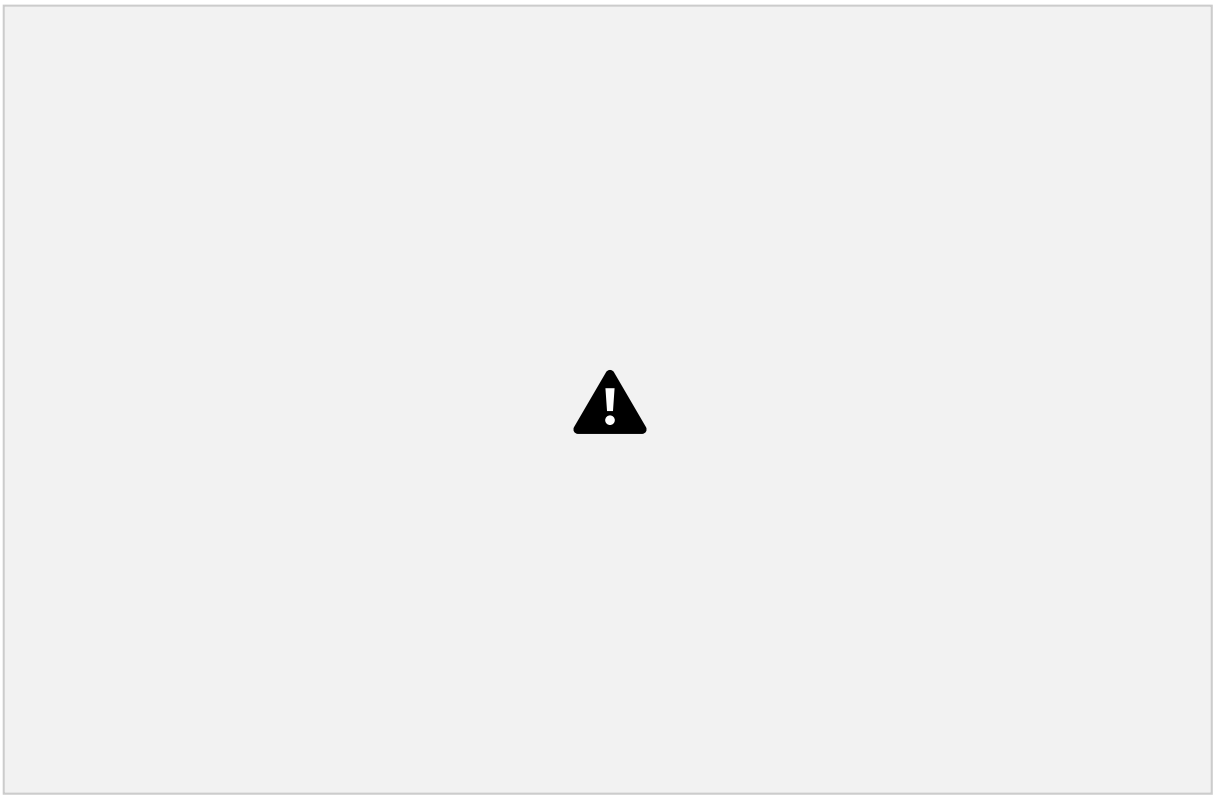


FIGURE 2-3 GENERAL AIRSPACE CLASSIFICATIONS

NAS Key West is the East Coast's premier transient pilot training facility and includes an air-to-air venue that is able to accommodate a variety of training exercises that include air combat maneuvering, live-fire activity, and ordnance delivery. NAS Key West's airspace consists of two large blocks of Special Use Airspace (SUA), Warning Areas W-174 and W-465, which are divided into 17 individual SUA grids. W-174 is a 19,459-square-nautical-mile area of offshore SUA, west and north of NAS Key West. W-174 is divided into nine sub-areas (A, B[A], B[B], C[A], C[B], D, E, F, and G). SUA extends from the surface to flight level 700 in areas W-174A/B/C/D/F/G and from the surface to flight level 300 in area W-174E. The entire warning area is designated for concurrent use. Under these conditions, military aircraft share the airspace with commercial air traffic. W-465 is an approximately 3,687-square-nautical-mile area of offshore SUA, located 50 nautical miles east of NAS Key West. W-465 is divided into three sub-areas (A, B, and C). SUA extends from the surface to flight level 700 in areas W-465A and B and from flight level 210 to FL 700 in area W-465C.

Boca Chica Field is located within a Class D controlled airspace complex that serves NAS Key West and Key West International Airport (KWIA). The Class D airspace extends from the ground to 2,500 feet above ground level within a 3.9-mile radius of KWIA and within a 5.3-mile radius of NAS Key West (Figure 2-4). NAS Key West's ATC provides approach control services for both airfields during the normal operating hours of 7:00 a.m. to 10:00

p.m. (Navy 2013).

2.4 Local Economic Impacts and Population Growth

The military provides direct, indirect, and induced economic benefits to the regional and local communities where they are located through jobs and wages, regional sales and production, and contracts (expenditures). Benefits include employment opportunities and increases in local business revenue, property sales, and tax revenue. The military creates a stable and consistent source of revenue for surrounding communities. Working to achieve compatabiltiy with local development and activities with NAS Key West's mission continues to ensure its viability into the future and its postive impact on the local communities and the surrounding region.

In 2014, NAS Key West employed an estimated workforce of approximately 2,700 personnel on station (Department of Transportation Aviation and Spaceports Office 2014). Overall, NAS Key West accounted for 8,606 jobs in Monroe County and $1 billion in total Gross Regional Product (total value of all goods and services produced in the region), which was roughly 26 percent of county's total estimated 2014 Gross Regional Product (Enterprise Florida, and Exponential Analytics, Inc. 2015).

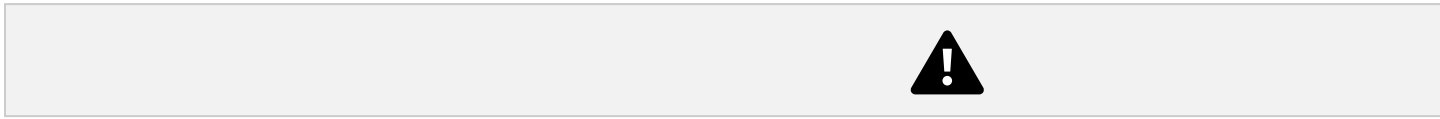
International Airport **Truman**
Annex
NAS Key West

ATLANTIC
OCEAN

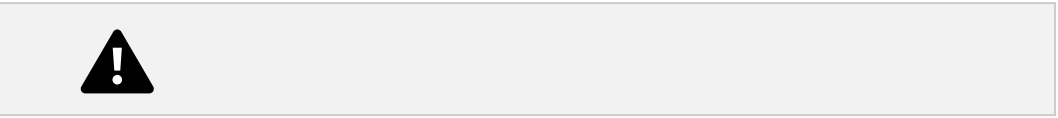
Florida

Fort
Lauderdale

W-174A



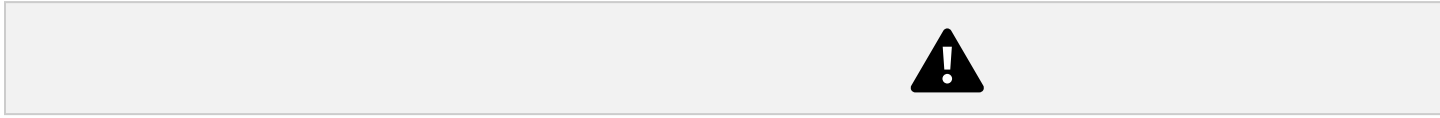
W-174F W-174G



Bonefish
ATCAA

NAS Key West

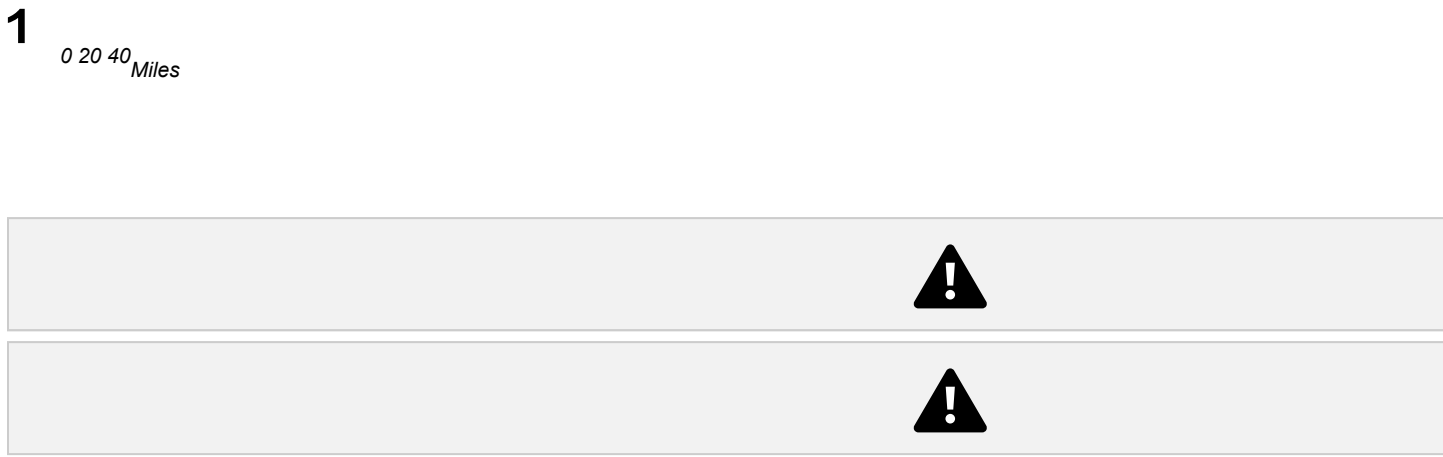
W-174B
MOA US 02174



W-174E

Truman
Annex

W-465A
W-465B



FINAL Naval Air Station Key West Air Installations Compatible Use Zones Study

NAS Key West payroll and expenditures in 2014 totaled $159,200,000 and $69,800,000, respectively (Department of Transportation Aviation and Spaceports Office 2014). This includes active and inactive duty military pay, military retirement and disability payments,

civilian pay, and procurements. By 2012, the ratio of average military earnings per military worker to average earnings per worker had reached 283% (Enterprise Florida, and Exponential Analytics, Inc. 2015). As a result, the military creates a stable and consistent source of employment and tax revenue for the area's local economies. Besides military spending, other key economic drivers of the area around NAS Key West include tourism, accommodations, and food services.

NAS Key West is located east of the City of Key West and is situated in Monroe County. In 2000, there were 79,589 residents in Monroe County and 73,090 residents in 2010, resulting in an 8.17 percent decrease, (U.S. Census Bureau 2010). It is estimated that the population will increase to 74,414 by 2020, or 1.81 percent more than the 2010 population. Florida population data and growth projections for the city of Key West, Monroe County, and the state of Florida are summarized in Table 2-2.

Although the population of the City of Key West and Monroe County have experienced negative growth since 2000, the population of Monroe County is projected to grow by 2.04 percent between 2010 and 2030. This regional growth has the potential to impact NAS Key West in terms of new developments around the installation. A discussion of local and regional compatibility issues is provided in Chapter 7, Land Use Compatibility Analysis and Recommendations, of this AICUZ.

TABLE 2-2 REGIONAL POPULATION ESTIMATES AND PROJECTIONS

Population Area	1990	2000	2010	2020	2030	% Growth 2010-2020	% Growth 2020-2030
Key West	24,832	25,478	24,649	23,997 [c]	23,350 [c]	-2.65%	-2.7%
Monroe County	78,024	79,589	73,090	74,414 [b]	74,583 [b]	1.81%	0.23%
Florida	12,938,071	15,982,824	18,802,847	21,372,207 [b]	24,070,978 [b]	13.66%	12.63%

Sources:
[a] U.S. Census Bureau 2010
[b] Bureau of Economic and Business Research 2016
[c] City of Key West 2013

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3

AIRCRAFT OPERATIONS

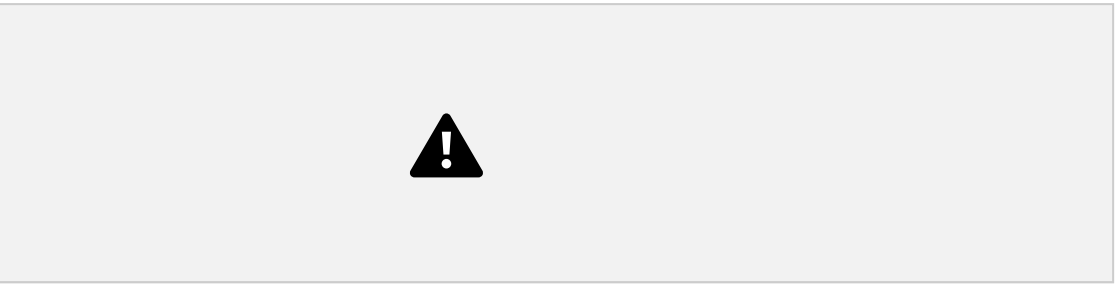
Aircraft operations are the primary source of noise associated with an installation. The level of noise exposure relates to a number of variables, including aircraft type, engine power setting, altitude flown, direction of the aircraft, flight track, temperature, relative humidity, frequency, time of operation, and duration of run-ups.

This chapter of the AICUZ Study discusses aircraft types and aircraft operations at NAS Key West, including based aircraft and transient aircraft, as well as preflight and maintenance operations, flight operations, annual operations, flight track use, and operational alternatives.

3.1 AIRCRAFT TYPES THAT OPERATE AT NAS KEY WEST

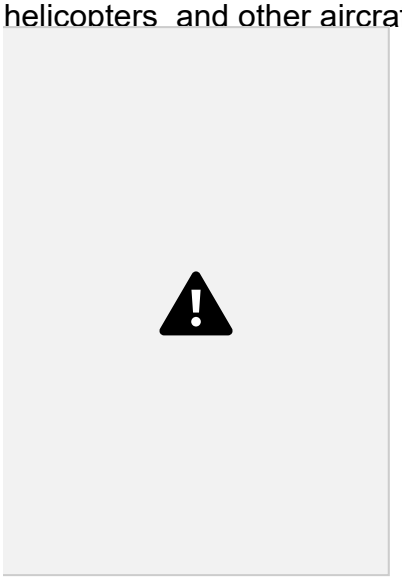
This AICUZ Study analyzes two types of aircraft: fixed-wing and rotary-wing (called rotary wings or rotor blades). Fixed-wing aircraft include turbine (jet) and propeller-driven aircraft, and generate lift by forward motion through the air. Rotary-wing aircraft, commonly called helicopters, generate lift by wing motion relative to the aircraft.

Aircraft that operate at NAS Key West are either based or transient. Based aircraft are permanently assigned at NAS Key West. Based aircraft utilize NAS Key West on a regular basis and are the most common aircraft conducting operations at and around the airfield. Transient aircraft are all other aircraft not permanently based at NAS Key West. Transient aircraft conduct training or other mission-related operations at the airfield for weeks at a time, but some may only land briefly to refuel.



3.1.1 Typical Aircraft Mix

The aircraft described in this section are associated with the squadrons and/or tenants described in Section 2.2, Mission and Installation Activities, and are the most common aircraft conducting operations at and around the NAS Key West airfield (Boca Chica field). Approximately 52,000 airfield operations are conducted each year at NAS Key West (Navy 2013). Aircraft that currently operate at NAS Key West include the FA-18C/D Hornet, FA-18E/F Super Hornet, F-5N Tiger, E-2C Hawkeye, EA-6B Prowler, AV-8B Harrier, F-16 Fighting Falcon, F-15 Eagle, and F 22 Raptor, as well as various helicopters and other aircraft (see Table 3-1).



Next generation aircraft began to replace those currently in the DOD inventory, including the F-35 Lightning II, EA-18G Growler, and P-8 Poseidon. The gradual transition to next generation aircraft that operate at NAS Key West includes:

- The Navy F-35C Lightning II, Joint Strike Fighter carrier variant, began to replace the Navy FA 18C/D Hornet in 2016, with the transition expected to be completed by 2029; however,

the end date for the transition may shift, depending on the Navy's procurement budget.

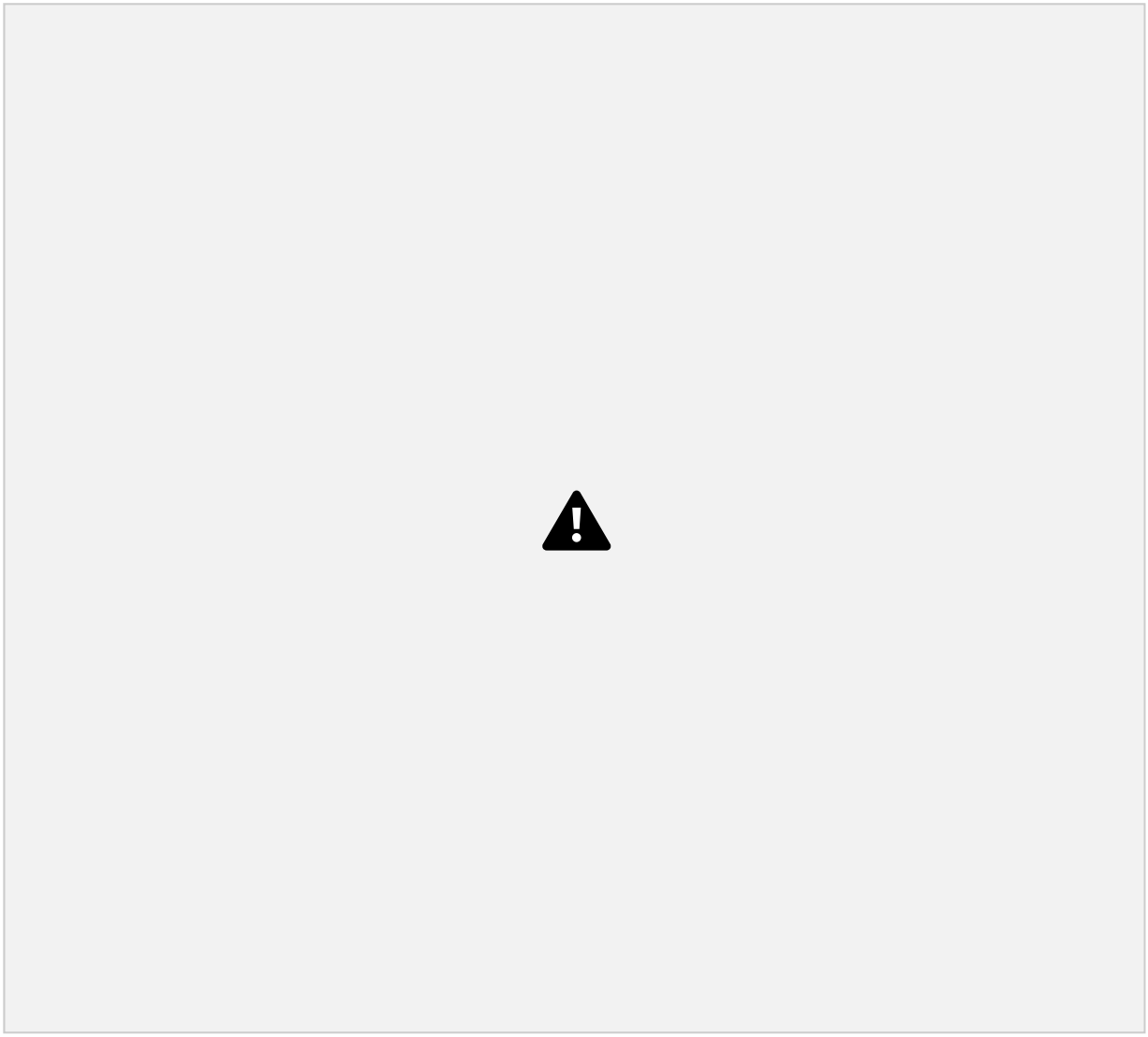
- The Navy P-8A Poseidon began to replace the P-3 Orion in 2012, with the transition scheduled to be completed by 2019 (Navy 2008).

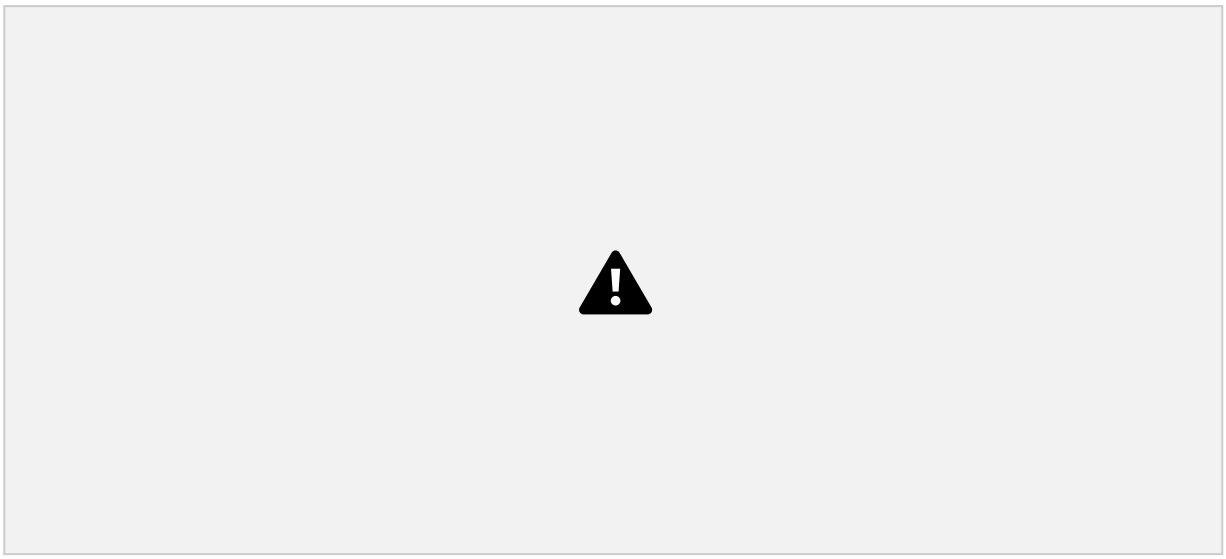
- The Marine Corps F-35B Lightning II (short takeoff and vertical landing variant) and F-35C Lightning II (aircraft carrier variant) Joint Strike Fighter began to replace Marine Corps AV-8B Harrier and FA-18C/D Hornet aircraft in 2012, with the transition scheduled to be completed by 2023; however, the end date for the transition may shift depending on the Navy's procurement budget.

- The Air Force F-35A Lightning II, Joint Strike Fighter conventional takeoff and landing variant, began to replace the F-16 Fighting Falcon in 2013; the transition is expected to be completed by the mid-2030s; however, the end date for the transition may shift depending on the Air Force's procurement budget.

- The Air Force F-22 Raptor is replacing some F-15 Eagle aircraft.

TABLE 3-1 AIRCRAFT CURRENTLY OPERATING AT NAS KEY WEST





3.2 NAS Key West Aircraft Operations

A primary function of an AICUZ Study is to present noise contours and APZs for an airfield. The

foundation for development of both noise contours and APZs are aircraft operations. “Aircraft operation” is a term that describes the pre-flight and flying activities of an aircraft. These activities make up the two primary sources of aircraft noise at NAS Key West: (1) pre-flight and maintenance operations; and (2) flight operations. The level of noise exposure from an aircraft operation is related to the aircraft type, engine power setting, altitude flown, direction of the aircraft, duration of run-up, flight track, temperature, relative humidity, frequency, and time of operation.

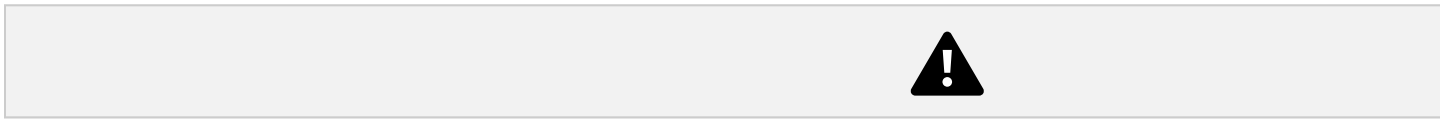
3.2.1 Pre-Flight and Maintenance Operations

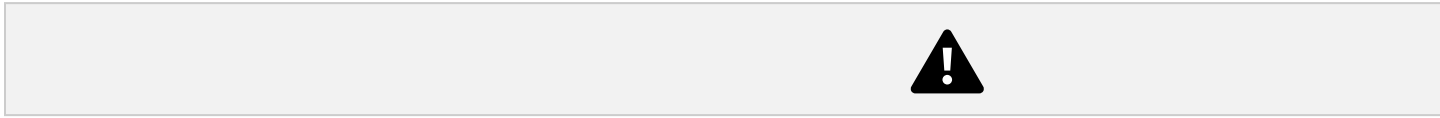
“Pre-flight run-ups” refer to aircraft engine checks conducted immediately prior to takeoff. Pre-flight run-ups are conducted on the runway ends or within designated areas. To perform various tests or repairs, run-ups are also conducted when an aircraft is parked on the ground and the engine is running. Maintenance run-up operations (i.e., aircraft engine maintenance) are conducted along the flight line at designated areas commonly referred to as high-power turn-up pads. Engine maintenance activities include engine rinses and washes, maintenance turn-ups, and high-power turn-ups. In some instances, the engine may be removed from the aircraft and placed on an engine stand. Figure 3-1 shows the locations of pre-flight and engine maintenance operations at NAS Key West.

3.2.2 Flight Operations

A flight operation refers to any occurrence of an aircraft taking off or landing on the runway at an airfield. A common example of a takeoff operation is a departure of an aircraft to another location; a landing operation is an aircraft arrival from another location to the airfield. Additionally, a takeoff and landing may be part of a training maneuver or pattern (e.g., touch-and-go), which includes a takeoff and landing back to the same runway. These patterns are considered two operations because the departure and arrival each count as one operation. Typical flight operations at NAS Key West are described below:

- ❑ Departure. An aircraft takes off to leave the installation or as part of a training maneuver.
- ❑ Straight-In/Full-Stop Arrival. An aircraft lines up on the runway centerline, descends gradually, lands, comes to a full stop, and then taxis off the runway.





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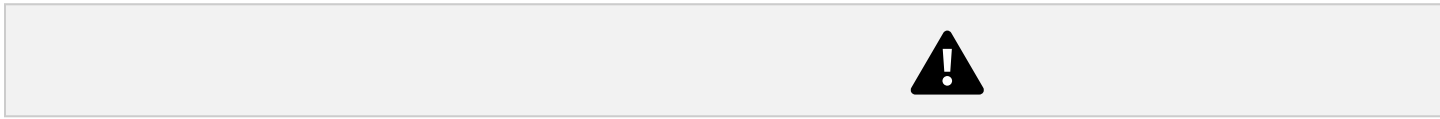

GEIGER
KEY ¤1

STOCK
ISLAND

1

0 0.5 1 Miles

Naval Air Station Key West Air Installations Compatible Use Zones Study FINAL

- ❑ Overhead Break Arrival. An expeditious arrival where an aircraft approaches the runway 200 feet above the altitude of the landing pattern (1,500 feet above ground level) and, approximately halfway down the runway, the aircraft performs a 180-degree turn to enter the landing pattern. Once established in the pattern, the aircraft lowers landing gear and flaps and performs a 180- degree descending turn to land on the runway. A carrier break is nearly identical to an overhead break except the landing pattern is 600 feet above the

ground, which is the same pattern used when aircraft land on an aircraft carrier.

- ❑ Pattern Work. Pattern work refers to traffic pattern training where the pilot performs takeoffs and landings in quick succession by taking off, flying the pattern, and then landing. Traffic pattern training is demanding and utilizes all of the basic flying maneuvers a pilot learns: takeoffs, climbs, turns, climbing turns, descents, descending turns, and straight and level landings. Most patterns have a left-handed orientation (counter clockwise, as viewed from above), which mimics how pilots fly on an aircraft carrier at sea. Specific types of pattern work include:

  - o Touch-and-Go. An aircraft lands and takes off on a runway without coming to a full stop. After touching down, the pilot immediately goes to takeoff power and takes off again. A touch-and-go pattern is counted as two operations—the landing is counted as one operation, and the takeoff is counted as another.

  - o Field Carrier Landing Practice (FCLP). FCLP is a training procedure that simulates landing an aircraft on the flight deck of a carrier. It is similar to a touch-and-go, but has specific altitudes, turning radii, and power settings to replicate, as closely as possible, the procedures of landing on a carrier.

  - o Ground Control Approach (GCA). GCA is a radar or "talk down" approach directed by ATC on the ground. ATC personnel provide pilots with verbal course and glide slope information, allowing them to make an instrument approach during inclement weather. A box pattern is normally flown to practice GCA approaches and utilizes a "box-shaped" flight pattern with four 90-degree turns conducted at a set altitude.

Each airfield has designated runways with designated flight procedures that provide for the safety, consistency, and control of an airfield. A flight track is a route an aircraft follows while conducting an operation at the airfield, between airfields, or to/from a Military Operations Area (MOA), and demonstrates how the aircraft will fly in relation to the airfield.

Flight tracks are graphically represented as single lines, but how closely an aircraft flies to the specified track can vary due to aircraft performance, pilot technique, and weather conditions, such that the actual flight track could be considered a band or corridor varying from a few hundred feet to

several miles wide. Flight tracks are typical or average representations based on pilot and ATC input. Representative flight tracks for NAS Key West are shown on Figure 3-2.

3.2.3 Annual Operations

“Annual operations” describe all aircraft operations that occur at NAS Key West during a calendar year. As described above, total annual operations account for each arrival and departure, including those conducted as part of a pattern operation. Aircraft operations are tracked using systems maintained by ATC personnel. For the projected scenario analyzed in this AICUZ Study, the operational data were adopted from the 2013 Airfield Operations EIS preferred alternative and the Record of Decision, dated October 31, 2013. The historical scenario utilized in this AICUZ Study is the 2007 AICUZ Study.

For the purposes of this AICUZ Study, and to develop noise contours and APZs, annual operations are further detailed by the following factors:

- Aircraft conducting the operation;
- Aircraft identified as based or transient;
- Squadron the aircraft is assigned to;
- Time of day the operation is conducted;
- Operation performed;
- Runway the operation is conducted on;
- Number of operations performed; and
- Flight track flown to conduct the operation.

These factors all have differing effects on noise contours and APZs and provide key information into the changes in the AICUZ footprint from the historical (2007 AICUZ) and projected (CY2028) scenario. Additional parameters, such as altitude, power setting, and speed, are collected and considered for the noise modeling analysis and are discussed in Chapter 4, Aircraft Noise.

This AICUZ Study considers two operational scenarios:

- The historical, or 2007 AICUZ Study; and
- The projected scenario, or average annual flight operations over a 10-year period (CY2028), which are based on 2013 Airfield Operations EIS operational data.

This section describes how operations information was gathered and provides a concise interpretation of operations data for each of the scenarios listed above.

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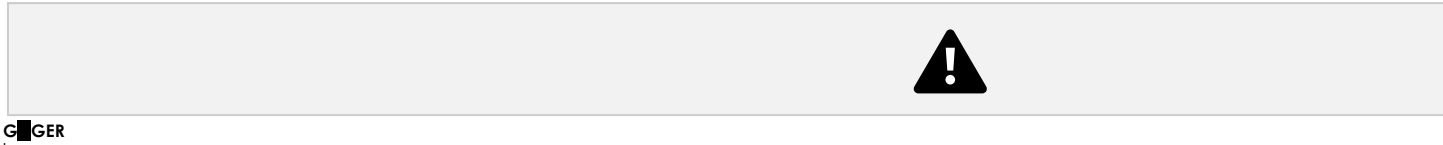

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Runway

Installation Boundary Airfield Surface Area

Flight Tracks

Arrivals

Departures
GCA

Overhead/Carrier Break
Representative Flight Tracks NAS Key West
Monroe County, Florida

FCLP
Touch-and-Go
SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015, 2016. © 2017 Ecology and Environment, Inc.

HISTORICAL: 2007 AICUZ STUDY

The operational tempo has fluctuated over time due to changes in mission and based aircraft. As missions change, so do training requirements, which changes the amount and type of operations flown and flight tracks utilized. The historical scenario's 61,402 annual operations, as presented in the 2007 AICUZ, (see Table 3-2) are attributed to the variety of missions operations and aircraft that were at the airfield during CY2007. Eighteen aircraft types were included in the 2007 total flight operations, including 60,631 fixed-wing aircraft and 771 rotary-wing aircraft operations (NAVFAC 2007). The operations types include departures, straight-in full-stop arrivals, overhead break arrivals, carrier break arrivals, and touch-and-go, FCLP, and GCA box patterns. Approximately 3,925 operations, or 6 percent of the grand total for aircraft operations, occurred during acoustic nighttime hours (10:00 p.m. to 7:00 a.m.), with nearly 31 percent of those nighttime operations conducted by FA-18C/D and FA-18E/F aircraft and 57 percent by the E-2/C-2 turboprop aircraft (NAVFAC 2007). The FA-18E/F, FA-18C/D and the E-2/C-2 aircraft contributed to approximately 70 percent of the grand total (see Table 3-3) (NAVFAC 2007).

PROJECTED (CY2028): 2018 AICUZ STUDY

AICUZ studies account for future missions and operations. As such, this AICUZ Study provides analysis for the projected scenario and incorporates known and anticipated changes in mission and operations for 2018 through 2028, as analyzed in the 2013 Airfield Operations EIS. Based on the changes captured in the EIS, the Navy forecasts that total annual operations at NAS Key West will decrease to approximately 52,000. As shown in Tables 3-1 and 3-2, projected operations will decrease to 51,914 total operations from the historical, with 50,083 fixed-wing and 1,831 rotary wing operations.

The primary factor attributed to the decrease in operations is the reduction in pattern operations flown at the airfield. Pattern operations are projected to decrease by approximately 6,100 annual operations, from 28 percent of the historical annual operations to 21 percent of the projected (CY 2028) annual operations (see Table 3-3).

The number of annual arrivals and departures are similar for the historical to projected scenarios with the exception of overhead break arrivals, which decreased by approximately 4,800 annual operations. The daytime split of operations is similar for the historical and projected scenarios, with a difference of only approximately 5,000 operations. However, there is a 78 percent decrease in acoustic nighttime (10:00 p.m. to 7:00 a.m.) operations from the historical and projected scenarios.

The historical and projected scenarios are comprised of a mix of aircraft, both based and transient, conducting various operation types at NAS Key West.

TABLE 3-2 COMPARISON OF ANNUAL OPERATIONS BY OPERATION TYPE

Operation Type	Historical (2007 AICUZ)			Projected (CY2028) (2018 AICUZ)		
	Daytime	Nighttime	Total	Daytime	Nighttime	TOTAL
Fixed-Wing						
Departure	21,012	500	**21,512**	19,179	264	**19,442**
Straight-In/Non-Break Arrival	4,169	308	**4,477**	5,358	508	**5,866**
Overhead Break Arrival	8,170	275	**8,445**	3,504	124	**3,628**
Carrier Break Arrival	8,867	14	**8,881**	9,948	0	**9,948**
Touch-and-Go Pattern	0	3,555	**3,555**	3,254	28	**3,282**
FCLP Pattern	9,799	2,687	**12,486**	5,210	600	**5,810**

GCA Box Pattern	1,196	79	**1,275**	2,028	78	**2,106**
Fixed-Wing Total	**53,213**	**7,418**	**60,631**	**48,481**	**1,602**	**50,083**
Rotary-Wing (Various)						
Rotary-Wing Total			**771**			**1,831**
GRAND TOTAL			**61,402**			**51,914**

Sources:
[a] Navy 2007
[b] Wyle 2013 and Navy 2013
Notes:
Acoustic daytime hours are from 7:00 a.m. to 10:00 p.m.
Acoustic nighttime hours are from 10:00 p.m. to 7:00 a.m.

TABLE 3-3 COMPARISON OF ANNUAL OPERATIONS BY AIRCRAFT TYPE

Aircraft Type	Historical (2007 AICUZ)	Projected (CY2028) (2018 AICUZ)
Fixed-Wing		
FA-18C/D	14,149	0
F-35C*	0	10,718
FA-18E/F	15,953	13,848
E-2/C-2	12,968	0
F-5N/F	0	12,714
F-5E/F	486	0
P-3	0	0
P-8	0	4,007
F-16	1,060	0
F-35A*	0	1,421
F-15A/E	960	0
F-22*	0	445

TABLE 3-3 COMPARISON OF ANNUAL OPERATIONS BY AIRCRAFT TYPE

Aircraft Type	Historical	Projected

	(2007 AICUZ)	(CY2028) (2018 AICUZ)
AV-8	600	0
F-35B*	0	344
EA-6	200	0
EA-18G	0	62
Transient Jet – Fighter/Trainer (e.g., T-45, Hunter, A-10, A-4, T-38)	6,039	1,310
Transient Jet – Cargo/Passenger (e.g., C-21, C-560, Gulfstream, Learjet, Beech, Saber)	332	1,003
Transient Jet – Medium Transport (e.g., C-9, C-40)	0	540
Transient Jet – Large Transport and Refuel (e.g., C-17, KC-10, C-5)	21	181
Transient Prop – Small/Medium (e.g., CASA, G-159, T-34, C-12, C26, T-6, Beech-36, Beech-9, Mitsubishi-20)	2,456	2,209
Transient Prop – Large (e.g., C-130)	0	1,281
Transient Transport (not specified)	5,407	0
Rotary-Wing (Various)	771	1,831
GRAND TOTAL	**61,402**	**51,914**

Sources:
[a] Navy 2007
[b] Wyle 2013 and Navy 2013
Notes:
*= modeled as a next generation aircraft, as presented in Section 3.1.1.
Acoustic daytime hours are from 7:00 a.m. to 10:00 p.m.
Acoustic nighttime hours are from 10:00 p.m. to 7:00 a.m.

3.2.4 Runway and Flight Track Utilization

The frequency with which a runway is used by different aircraft types is determined by a variety of factors, including runway length, winds, location of airfield features (e.g., lights, arresting gear), number of aircraft in the pattern, or the preference of a runway for noise abatement or safety concerns (e.g., birds). Runway use at NAS Key West is determined by the Air Operations (Air Ops) Manual, which the Air Ops Officer maintains. The Air Ops Manual sets the course rules for the airfield and establishes the patterns and procedures for aircraft movement. All aircraft operating at NAS Key West follow the course rules in the Air Ops Manual.

As discussed in Section 3.2.2, Flight Operations, and depicted on Figure 3-2, flight tracks are the general paths aircraft fly while conducting missions or operations. The following factors determine flight track utilization: operation performed; runway utilized for the

operation; and flight track followed to conduct the operation.

Flight tracks are nominal representations (often a few hundred feet to several miles wide) depicting an aircraft's typical route. Flight tracks demonstrate how and where aircraft fly in relation to an airfield. Flight tracks provide safety, consistency, and control of an airfield and are selected based on multiple factors, including operation performed, runway utilized for the operation, and flight track followed to conduct the operation. The flight tracks and utilization data gathered from the 2013 Airfield Operations EIS were utilized in this AICUZ Study to inform the flight frequency concentrations of aircraft flights for the historical and projected scenarios. The effect of flight track utilization on noise contours is presented in Chapter 4, Aircraft Noise; the association between flight tracks and APZs is included in Chapter 5, Airfield Safety.

NAS Key West's airfield is comprised of three asphalt runways—Runways 04/22, 08/26, and 14/32. The changes in runway utilization from historical to projected levels are shown in Table 3-4. Runway utilization varies significantly by aircraft type. Historically, Runway 08 has been the most active runway and was used 49 percent of the time at the time of the 2007 AICUZ. The second-most active runway was Runway 14, which was used 32 percent of the time.

TABLE 3-4 CHANGES IN RUNWAY UTILIZATION

Runway	Percent Utilization for Each Scenario	
	Historical (2007 AICUZ [a])	Projected (CY2028) (2018 AICUZ [b])
04	11	10
22	1	3
08	49	59
26	5	8
14	32	17
32	2	3

Sources:
[a] Navy 2007
[b] Wyle 2013 and Navy 2013

3.2.5 OPERATIONAL ALTERNATIVES

Operational alternatives are changes in operations that should reduce noise and APZ impacts and can include flight track modifications, altering hours of operation, changes in pattern altitude, or construction of acoustical enclosures (for ground engine maintenance). This AICUZ Study evaluation of operational alternatives balanced noise and APZ changes with impacts on flight safety and operational capability.

NAS Key West Air Ops and the FAA provide rules that all aircraft are required to follow when utilizing controlled airspace and the airfield. The course rules establish control and safety by providing procedures that account for aircraft separation, traffic patterns for runways in use, arrivals/departures, noise abatement, altitudes and airspeed, allowable weather conditions, and aircraft emergencies. As such, aviators performing operations at NAS Key West and associated airspace follow established rules and procedures while operating at the airfield. Likewise, aviators perform operations at specific altitudes, airspeeds, and power settings, and follow set flight tracks to operate the aircraft at peak performance and to train for operations conducted at sea. Aircraft operating procedures are performed according to OPNAVINST 3710.7, “Naval Air Training and Operating Procedures Standardization (NATOPS) General Flight and Operating Instruction.” NATOPS are published for the purpose of standardizing ground and flight procedures. The purpose of the NATOPS Program is to increase combat readiness and improve flight safety. Limitations or restrictions on performing such operations pose a risk to pilots and the mission at NAS Key West.

NAS Key West is committed to the health, safety, and welfare of the local community, and considers alternatives to mitigate the impact to the local community as they are identified; however, NAS Key West’s capacity to implement operational alternatives is limited by several factors that are outlined in the Air Ops Manual or otherwise identified. NAS Key West course rules are updated in response to changes in mission and safety hazards and to minimize noise and safety impacts, some of which restrict certain operation types from being conducted on all runways. The following course rules and factors are implemented operational alternatives that apply limitations or restrictions on flight tracks, altitudes, or runway usage in efforts to reduce off-station noise and impacts, as described below:

- ❑ FCLP operations are only conducted on Runways 04, 08, and 14, and carrier break arrivals are not conducted on Runway 04 (Wyle 2013).

- ❑ The primary use of Runways 08 and 14 accounts for approximately 75 percent of operations and allow for departures and arrivals to remain mostly over installation property and/or over the ocean, thus avoiding populated areas and reducing noise and safety impacts.

❑ High-performance/unrestricted climbs are prohibited.

❑ Pilots avoid overflying Key Haven, Stock Island, East Rockland Key, and Geiger Key, per course rules.

❑ In the pattern for Runway 14, aircraft remain within 2 miles on the downwind leg of the pattern (i.e., the northeast leg of this track).

❑ Aircraft do not overfly Key West or any other Florida Key below 3,000 feet unless on published instrument approach, instructed by ATC or for safety of flight.

❑ The arrival to Runway 08 is south of Key West and Stock Island and is adjusted to remain over water (the Boca Chica Channel) near the final approach to the runway.

❑ Resident and migratory bird activity increases the potential for bird/animal aircraft strike hazard (BASH). To reduce this hazard, flight patterns are altered during times of increased bird activity.

❑ Potential for conflict exists with light/low/slow aircraft in the vicinity of the airfield. ❑

Variations in flight operations around the installation shifts impacts from urbanized

areas.

❑ NAS Key West typically operates from 7:00 a.m. to 10:00 p.m. daily, except in observance of federal holidays when the field is closed for air operations. However, operational requirements may necessitate operations outside of normal hours of operation.

❑ The engine maintenance run-up location more interior to the installation (near the southern end of Runway 04) is used for the majority (approximately 80 percent) of engine maintenance run ups.

❑ NAS Key West Command Staff provides an in-brief to all arriving squadrons to review course rules and to make pilots aware of noise issues associated with airfield operation at NAS Key West.

4

AIRCRAFT NOISE

How an installation manages its aircraft noise plays a key role in the installation's relationship with neighboring communities. Aircraft noise is also a factor in local land use planning. Because noise from aircraft operations could have an impact on areas near NAS Key West, the Navy has analyzed the noise resulting from its aircraft and has established noise contours around the installation using the guidance provided in the AICUZ Instruction. Noise contours provide communities and planning organizations with information to better plan for development near airfields. The noise contours developed for this AICUZ Study represent the

noise generated by aircraft based on aircraft type, aircraft operations, and the time of day aircraft are flown. This chapter discusses noise associated with aircraft operations, including average noise levels, noise abatement/flight procedures, noise complaints, sources of noise, airfield-specific noise contours, and analysis of changes from the historical (2007 AICUZ) and projected (CY2028) noise contours. The 2018 AICUZ noise contours for NAS Key West are presented in the following sections along with detailed descriptions of the noise environments for the airfield. Also provided are comparisons and figure overlays of the 2007 AICUZ Study and the 2018 AICUZ noise contours.

4.1 What is Noise?

Sound is vibrations in the air that can be generated by multiple sources. When sound is invasive or unwanted, it is often considered noise. Generally, sound becomes noise to a listener when it interferes with normal activities. Common sources of noise include roadway traffic, recreational activities, railway activities, and aircraft operations. For further discussion of noise and its effect on people and the environment, see Appendix A.

In this AICUZ Study, all sound or noise levels are measured in A-weighted decibels (dBA), which represent sound pressure adjusted to better represent human hearing response. (Note: For brevity, the adjective “A-weighted” is often omitted and the measurements are expressed as dB.) Humans are most sensitive to sound frequencies within the range of human speech and less sensitive to lower and higher frequencies. The A-weighted scale emphasizes those mid-range frequencies while de emphasizing the remaining frequencies.

On an A-weighted scale, barely audible sound is just above 0 decibels (dB), and normal speech has a sound level of approximately 60 to 65 dB. Generally, a sound level above 120 dB will cause discomfort to a listener, and the threshold of pain is 140 dB (Berglund and Lindvall 1995).

The noise exposure from aircraft at NAS Key West is measured using the day-night average sound level (DNL) noise metric. The DNL noise metric, established in 1980 by the Federal Interagency Committee on Urban Noise, presents a reliable measure of community sensitivity to aircraft noise and has become the standard metric used in the United States. DNL averages the sound energy from aircraft operations at a location over a 24-hour period. DNL also adds an additional 10 dB to events occurring between 10:00 p.m. and 7:00 a.m. These decibel adjustments represent the added intrusiveness of

0 dB – Threshold of Hearing 20 dB – Ticking Watch
45 dB – Bird Calls (distant) 60 dB – Normal Conversation 70 dB – Vacuum Cleaner (3 ft) 80 dB – Alarm Clock (2 ft) 90 dB – Motorcycle (25 ft)
100 dB – Ambulance Siren (100 ft) 110 dB – Chain Saw
120 dB – Rock Concert
130 dB – Jackhammer
140 dB – Threshold of Pain

sounds due to increased sensitivity to noise when ambient sound levels are low.

DNL provides a single measure of overall noise impact by combining disparate noise events (e.g., brief events with high noise levels, longer duration events at lower noise levels, and events occurring during different times of day which are more likely to disturb people in the community). Scientific studies and social surveys conducted to evaluate community annoyance with all types of environmental noise have found DNL to be the best measures available for predicting community annoyance (Federal Interagency Committee on Urban Noise 1980; Federal Interagency Committee on Noise 1992). Although DNL provides a single measure of overall noise impact, it does not provide specific information on the number of noise events or the individual sound levels that occur during the day. For example, a DNL of 65 dB could result from only a few noisy events or from a large number of quieter events.

DNL is depicted on a map as a noise contour that connects points of equal noise value. Contours are displayed in 5-dB increments (i.e., 60, 65, 70, 75, 80, and 85 dB DNL). Noise levels inside a

contour may be similar to those outside a contour line. Where the contour lines are close together, the change in noise level is greater. Where the lines are far apart, the change in noise level is more gradual. Calculated noise contours do not represent exact measurements and are discussed further in Section 4.3, Noise Abatement and Complaints.

For land use planning purposes, the AICUZ Program divides noise exposure into three categories, known as “noise zones,” based on DNL measurements:

❑ Noise Zone 1: less than 65 dB DNL (<55 to <65 dB DNL);

❑ Noise Zone 2: 65 to <75 dB DNL; and

❑ Noise Zone 3: Greater than 75 dB DNL (>75 dB DNL).

Land use recommendations within these zones are discussed and provided in Chapter 7, Land Use Compatibility Analysis and Recommendations.

4.2 NAS Key West Airfield Noise Sources and Noise Modeling

The Navy conducts noise studies, as needed, to assess the noise impacts of aircraft operations. This AICUZ Study presents the historical (2007 AICUZ) and projected (CY2028) noise contours at NAS Key West. The Navy utilized NOISEMAP, the DOD standard model for assessing noise exposure from military aircraft operations at air installations. NOISEMAP calculates DNL contours resulting from aircraft operations using variables such as aircraft types and aircraft profiles comprised of changing power settings, speeds, and altitudes as aircraft traverse the airspace.

In support of the 2013 Airfield Operations EIS, NAS Key West conducted a noise analysis. Data were then collected from NAS Key West and compiled and input into computer models that graphically depict noise exposure as noise contours. The primary Navy-generated sources of noise at an airfield are aircraft flight operations and ground maintenance (run-ups). The inputs and data provided by the Navy and analyzed with the NOISEMAP software suite include:

- ❑ Operation performed (arrival, departure, and pattern);
- ❑ Number of operations per day;
- ❑ Time of day;
- ❑ Flight track;

- ❑ Aircraft power settings, speeds, and altitudes;
- ❑ Number and duration of pre-flight and maintenance run-ups;
- ❑ Terrain (surface type); and
- ❑ Environmental data (temperature and humidity).

Noise contours generated from this information represent NAS Key West's noise environment and planning contour for 2018 through 2028. The noise contours used in this 2018 AICUZ Study were adopted from the 2013 Airfield Operations EIS and are discussed further in Section 4.4, AICUZ Noise Contours.

4.3 Noise Abatement and Complaints

NAS Key West conducts noise abatement to the best of its ability, commensurate with safety and operational training requirements. Noise abatement procedures at NAS Key West are implemented under the Air Ops Manual and are summarized below. The purpose of these procedures is to minimize impacts from aircraft noise.

Even with noise abatement procedures in place, noise impacts cannot be completely minimized or avoided; therefore, on occasion, NAS Key West receives calls from concerned citizens regarding noise. NAS Key West manages noise concerns and complaints according to the set protocol discussed below.

4.3.1 Noise Abatement

NAS Key West actively employs noise abatement or avoidance procedures with which all aviators are required to comply. Noise abatement procedures also apply to engine maintenance operations conducted on-station, which are documented in the Air Ops Manual. The purpose of noise abatement and avoidance procedures is to minimize noise in recognition of community response to aircraft noise. While the Navy cannot alter critical portions of flight patterns to accommodate noise complaints without increasing the risk to pilots, there are other measures in place to reduce noise impacts. Noise abatement procedures at NAS Key West are listed below:

- ❑ NAS Key West conducts noise abatement procedures commensurate with safety and operational training requirements.
- ❑ The minimum altitude for military fixed-wing aircraft is normally 3,000 feet, unless the mission requires lower altitude. Aircraft do not normally fly over the Florida Keys (part of the Florida Keys

National Marine Sanctuary) below 3,000 feet, unless under radar control or executing an approved instrument approach.

- ❑ Pilots of aircraft departing from or remaining in the Runway 08 traffic pattern will use climb and flight paths that avoid flying over Key Haven, Big Coppitt, Tamarac Park, and Geiger Key Marina.
- ❑ Supersonic flight operations are conducted in accordance with OPNAVINST 3710.7.
- ❑ Aircraft remain above 2,500 feet while within a 3.9-statute-mile radius of the center of KWIA unless they are: under radar control; executing a published instrument approach; in direct radio communications with the KWIA Tower; or operating within the NAS Key West Class D Surface Area.

- ❑ The engine maintenance run-up location more interior to the installation (near the southern end of Runway 04) is used for the majority (approximately 80 percent) of engine maintenance run ups.

- ❑ NAS Key West Command Staff provides an in-brief to all arriving squadrons to review course rules and to make pilots aware of noise issues associated with airfield operation at NAS Key West.

4.3.2 Noise Complaints

The origin and nature of noise complaints is a tangible barometer of the success or failure of noise abatement procedures. Noise complaints are related to the intensity and frequency of the events, as well as individual sensitivity. Complaints can arise outside the areas depicted by noise contours. This is frequently due to a single event that is unusual, such as when an aircraft flies over an area not commonly overflown or a new aircraft begins operating in the region. In general, individual responses to noise levels vary and are influenced by several factors, including:

- ❑ The activity an individual was engaged in at the time of the noise

event; ❑ The individual's general sensitivity to noise;

- ❑ The time of day or night;

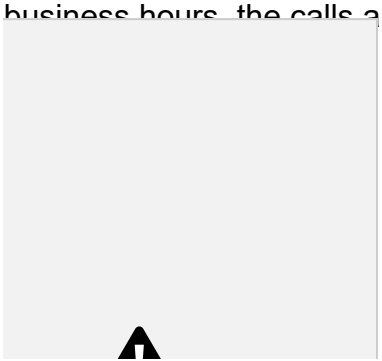
- ❑ The length of time an individual is exposed to the noise;

- ❑ The predictability of the noise; and

- ❑ Weather conditions.

Noise contours and land use recommendations are based on average annoyance responses of a population, but some people have greater noise sensitivity than others. Generally, a small increase in noise level will not be noticeable; however, as the change in noise level increases, individual perception becomes greater.

Noise complaints are received by NAS Key West Air Ops via a designated hotline and are coordinated with the Public Affairs Office and CPLO. During normal business hours, calls are answered and information is collected from the caller concerning the time, location, and description of the noise generating event. After normal business hours, the calls are logged



1 Decibel:

Requires close attention to notice

3 Decibels:
Barely noticeable

5 Decibels:
Quite noticeable

10 Decibels:
Dramatic – twice or half as loud

20 Decibels:
Striking – fourfold change

and responded to the following business day. The complaint is reviewed by NAS Key West Air Ops, and (when appropriate) the responsible flight squadron is notified and any deviations from standard procedures are identified. If a ”call back“ is requested by the individual submitting the complaint, the Air Ops Officer or representative will contact the individual to gather more information and to personally address any concerns of the caller. Unlike most airfields that generally receive noise complaints in the summer, NAS Key West typically receives complaints in the winter months when residents turn off their air conditioners and open windows. Historically, noise complaints have been minimal. Complaints typically occur with several calls regarding one event. Because the resident population in the NAS Key West area is generally accustomed to the presence of aircraft and the accompanying noise, noise complaints typically occur during unscheduled operations and repetitious aircraft activity.

4.4 AICUZ Noise Contours

Noise contours can be mapped to show noise exposure resulting from modeled aircraft operations. Noise contours, when overlaid with local land uses, can assist NAS Key West, local community planning organizations, and citizens in locating and addressing incompatible land uses and in planning for future development.

The noise contours provided in this AICUZ Study are identified as either historical (2007 AICUZ) or projected (CY2028). The projected noise contours represent NAS Key West’s noise environment and planning contour for 2018 through 2028. The 2018 AICUZ noise contours and projected operational data used in this 2018 AICUZ Study were adopted from the 2013 Airfield Operations EIS. Aircraft operations are projected into the future to help ensure that the future operational capability of the air installation is accounted for. As a planning document, the AICUZ Study forecasts aircraft operations out 10 to 15 years into the future to assess an air

station's impact on the local community. Therefore, projected operations are incorporated into this 2018 AICUZ Study. The operational tempo over time and the projected operations for NAS Key West are presented in Chapter 3, Aircraft Operations, and detailed in Tables 3-2 through 3-3.

The 2018 AICUZ noise contours for NAS Key West are presented in the following sections, along with detailed descriptions of the noise environment. Also provided are comparisons and figure overlays of the historical and projected scenarios. The comparison identifies changes to noise exposure (based on changes and projected changes in aircraft operations) and allows the identification of incompatible land use and potential recommendations to mitigate noise impacts. Land use and recommendations for addressing incompatibility issues within noise contours are provided and discussed in Chapter 7, Land Use Compatibility Analysis and Recommendations.

4.4.1 Projected Noise Contours

The 2018 projected noise contours for NAS Key West overlay the area in the immediate vicinity of the airfield, with the vast majority of the higher noise contours concentrated within the installation boundary (Figure 4-1). The projected noise exposure primarily derives from FA-18E/F Super Hornets, F-5 Tigers, and F-35C Lightning IIs.

West of NAS Key West, both the 65 dB DNL and the 70 dB DNL projected noise contours extend onto the eastern portion of Stock Island. Geiger Key, along the eastern edge of NAS Key West, is primarily exposed to DNL values greater than or equal to 70 dB. The projected noise exposure in the northern portion of Geiger Key primarily results from FA-18E/F Super Hornet arrivals to Runway 26 and departures from Runway 08. Southern Geiger Key's projected noise exposure primarily results from FA-18E/F Super Hornet and F-35C Lightning II FCLP patterns on Runway 14 and departures from Runway 08.

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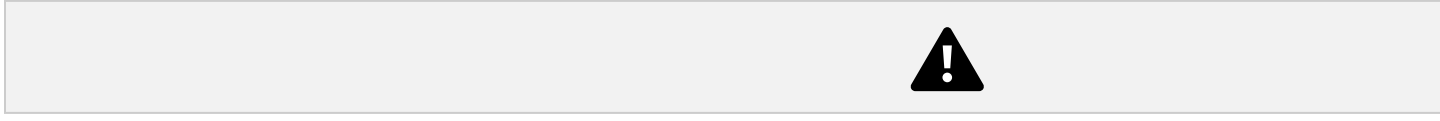

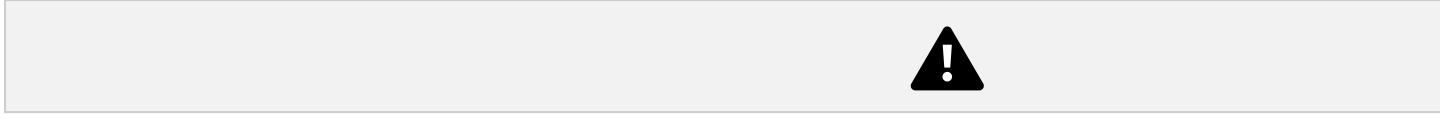

ATLANTIC OCEAN

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Runway

Legend

2018 AICUZ Noise Contours

Figure 4-1

e Contours NAS Key West

Installation Boundary Airfield Surface Area City Boundary

60 dB 65 dB 70 dB

75 dB 80 dB 85 dB

Monroe County, Florida

SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015; Wyle 2013. © 2017 Ecology and Environment, Inc.

At the northeast edge of NAS Key West, the 65 dB DNL projected noise contour extends over the southern half of Big Coppitt Key. The increased noise exposure in the easternmost region of Big Coppitt Key (south of Route 1) is due to additional FCLP operations, but continue to primarily result from FA-18E/F Super Hornet, F-5 Tiger, and F-35C Lightning II departures from Runway 08. The noise exposure in the southwestern region of Big Coppitt Key (north of Route 1) results primarily from FA-18E/F Super Hornet, and F-35C Lightning II departures from Runway 08 and FA-18E/F Super Hornet break arrivals to Runway 22. To further describe noise contours, they are divided into four general areas: inside the installation boundary (on-station), outside the installation boundary (off station), over land, and over water. The acreages within the projected noise contours were calculated using geographic information system (GIS) overlay analysis and are presented in Table 4-1.

TABLE 4-1 COMPARISON OF LAND AND WATER AREAS IMPACTED WITHIN THE NOISE ZONES (IN ACRES)

Scenario	Land Off-station	Land On-station	Waterbody Off-station	Waterbody On-station	Grand Total
2007 Historical[a]					
Noise Zone 1 (<55 to <65 dB DNL)	906	0	12,860	0	**13,767**
Noise Zone 2 (65 to <75 dB DNL)	1,391	583	11,218	380	**13,572**

Noise Zone 3 (>75 dB DNL)	603	2,100	2,090	855	**5,647**
Subtotal	**2,900**	**2,683**	**26,168**	**1,235**	**32,986**
Total	**5,583**		**27,403**		
2018 Projected (CY2028)[b]					
Noise Zone 1 (<55 to <65 dB DNL)	791	0	7,980	0	**8,771**
Noise Zone 2 (65 to <75 dB DNL)	822	373	7,563	91	**8,849**
Noise Zone 3 (>75 dB DNL)	895	2,310	2,855	1,144	**7,203**
Subtotal	**2,508**	**2,683**	**18,397**	**1,235**	**24,823**
Total	**5,191**		**19,632**		

Sources:
[a] Navy 2007
[b] Wyle 2013 and Navy 2013
Notes:
Acreages shown in this table for Noise Zone 2 and Noise Zone 3 are slightly varied from those shown in the 2013 Airfield Operations EIS. This variation could be caused, in part, by updated data sets and methods for classifying water acreages. Total acreage amounts are higher because the 2013 Airfield Operations EIS did not include Noise Zone 1 acreages and this AICUZ Study includes the Noise Zone 1 acreages.

The total area within the projected noise contours (Noise Zones 1, 2, and 3 combined) is 24,823 acres. Approximately 16 percent (3,918 acres) of this total is on-station, with 84 percent (20,905 acres) located off-station. Because NAS Key West is surrounded by water, and due to the installation's course rules and flight tracks, over 90 percent of the area impacted by contours in Noise Zone 1 (<55 to <65 dB DNL) and 85 percent of the area impacted by contours in Noise Zone 2 (65 to <75 dB DNL) are over water. Approximately 39 percent of acres impacted by contours in Noise Zone 3 (>75 dB DNL) are over water. Chapter 7, Land Use Compatibility Analysis and Recommendations, presents land use within the off-station acres and the compatibility analysis.

Noise Gradient and Propagation

The sound associated with aircraft operations extends beyond the plotted DNL contours. Figure 4-2 provides a DNL color gradient that illustrates how the noise originating at NAS Key West dissipates into the surrounding communities. The sequence of sound waves propagates

through the air. During the propagation, sound waves are reflected, refracted, and attenuated (i.e., weakened) by the density of the air. Therefore, the highest noise levels are concentrated at the source within NAS Key West and decrease to lower levels farther out off-station and into Monroe County. Figure 4-2 also depicts the noise levels outside the 65 dB DNL noise contour.

4.4.2 Comparison of Noise Contours

A comparison of the historical and projected noise contours shows some similarities in shape, general location, and DNL levels. The comparison also shows a decrease in overall size and coverage from the historical to the projected noise contours, as depicted on Figure 4-3. The changes between the historical and projected noise contours are attributed to several factors, including:

- ❑ Changes in aircraft types (historical noise contours modeled P-3 Orion and FA-18E/F Super Hornet aircraft operations, and projected noise contours modeled P-8 Poseidon and F-35C Lightning II operations);
- ❑ Changes in aircraft flight patterns;
- ❑ Changes in operational levels (the number of operations has increased from the historical to the projected scenarios); and
- ❑ Improved noise mapping techniques (discussed in Section 1.3.3, Changes that Necessitate this AICUZ Update).

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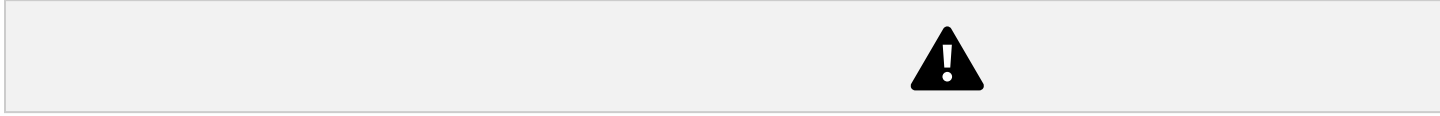

Runway

Legend

2018 AICUZ Noise Gradient (dB) 90

e Gradient NAS Key West

Installation Boundary

80

70

60

50

Monroe County, Florida

; FDOR/Monroe County 2015; NAVFAC SE 2015. © 2017 Ecology and Environment, Inc.

AICUZ\Maps\MXD\Report\2018_Jan\4_3_Noise_Contours_Comparison_2007_2018_aerial.mxd

GULF OF MEXICO

KEY

WEST

Figure 4-3
2007 AICUZ and 2018 AICUZ Noise Contours

SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015; Wyle 2007, 2013. © 2017 Ecology and Environment, Inc.

As shown in Table 4-1, the historical noise contours (Noise Zones 1, 2, and 3) covered 32,986 acres as compared to 24,823 acres for the projected scenario (both on- and off-station), resulting in the total affected land area within the noise contours (Noise Zones 1, 2, and 3) decreasing by approximatly 25 percent. There has been an overall decrease in off-station land area within Noise Zones 1 and 2, and while the total off-station area impacted within Noise Zone 3 has increased between the historical and the projected noise contours, 82 percent of off-station impacts are within Noise Zone 1 and Noise Zone 2. Over 90 percent of the area

impacted by contours in Noise Zone 1 and 85 percent of the area impacted by contours in Noise Zone 2 are over water.

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5

AIRFIELD SAFETY

Community and airfield safety is paramount to the Navy. The Navy has established a flight safety program and areas of accident potential around NAS Key West to assist in planning for health, safety, and welfare in communities near the airfield. Cooperation between the Navy and local communities can improve land use planning and development surrounding naval airfields. APZs in this 2018 AICUZ Study were developed based on the projected annual aircraft operations presented in the 2013 Airfield Operations EIS and NAS Key West's unique training environment. The following sections present the 2018 AICUZ APZs for NAS Key West, including a detailed analysis of the impacted areas. Also provided are comparisons and figure overlays for the 2007 AICUZ Study and the 2018 AICUZ APZs. The comparison helps identify changes to the APZs based on projected aircraft operations and targets land use recommendations to mitigate incompatible development. Identifying safety issues assists the community in developing land uses compatible with airfield operations. These issues include areas of accident potential and hazards around the airfield that obstruct or interfere with aircraft arrivals and departures, pilot vision, communications, or aircraft electronics. While aircraft mishaps are rare, they do occur. Aircraft safety and mishaps at NAS Key West

are discussed in detail in this chapter.

5.1 Accident Potential Zones

Recognizing the need to identify areas of accident potential, in the 1960s, 1970s, and 1980s the military conducted studies of historical accidents and operations data throughout the military. The studies showed that most aircraft mishaps occur on or near the runway, diminishing in likelihood with distance from the runway. Based on the studies, the DOD identified APZs as areas where an aircraft accident would most likely occur.

APZs align with departure, arrival, and pattern flight tracks. While APZs are not a prediction of the number of accidents or the odds of an accident occurring, APZs reflect the most likely location of an accident and are designed to minimize potential harm if a mishap were to occur by limiting activities in these locations. The Navy and local planning authorities use APZs to ensure compatible development in proximity to runway ends and slightly beyond. Although the likelihood of an accident is remote, the Navy recommends that land uses that concentrate large numbers of people, such as apartments, churches, and schools, are not located within APZs.

5.1.1 Clear Zone and APZ Requirements and Dimensions

APZ configurations and dimensions derive from AICUZ Instruction and are established for all runway classifications. There are three APZs: Clear Zone, APZ I, and APZ II. APZs are, in part, based on the number of operations conducted at the airfield—more specifically, the number of operations conducted for specific flight tracks.

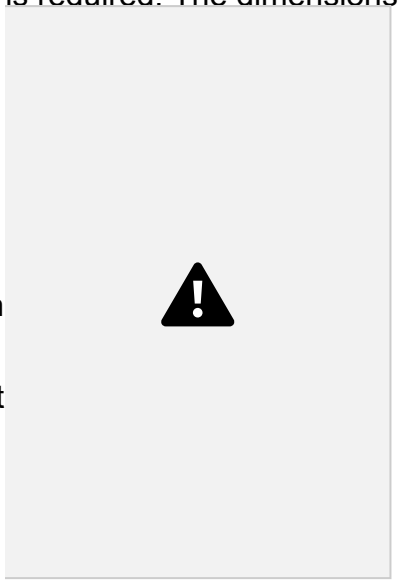
DOD fixed-wing runways are separated into two classes, Class A and Class B. Class A runways are primarily used by light aircraft and do not have the potential for intensive use by heavy or high performance aircraft. Class B runways are all other fixed-wing runways. The runways at NAS Key West are Class B. The AICUZ Instruction defines the components of standard APZs for Class B runways as shown on Figure 5-1 and described below:

- Clear Zone. The Clear Zone is a trapezoidal area located immediately beyond the end of

the runway and outward along the extended runway centerline for a distance of 3,000 feet. The Clear Zone measures 1,500 feet in width at the runway threshold and 2,284 feet in width at the outer edge. A Clear Zone is required for all active runways and should remain undeveloped.

❑ APZ I. APZ I is the rectangular area beyond the Clear Zone that 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 in width and 5,000 feet in length and may be rectangular or curved to conform to the shape of the predominant flight track.

❑ APZ II. APZ II is the rectangular area beyond APZ I (or the Clear Zone, if APZ I is not used) that 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 1,000 feet in width by 2,500 feet in length and, as with APZ I, may be curved to correspond with the predominant flight track.

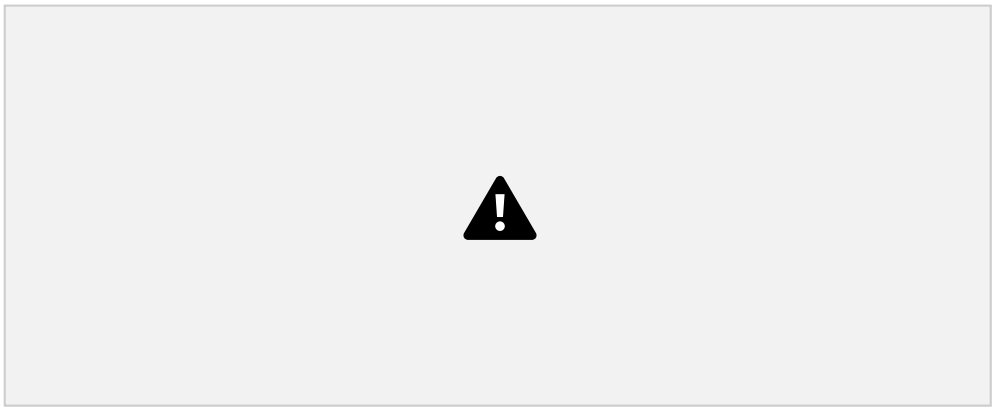


FIGURE 5-1 STANDARD CLASS B RUNWAY, FIXED-WING APZS

APZs extend from the end of the runway, but apply to the predominant arrival and/or 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. As the flight track of an aircraft gets closer to the airfield, the potential for flight tracks to overlap or converge increases. When similar tracks align (e.g., straight-in arrival, overhead break arrival, arrival portion of a pattern operation), the operation counts are combined to determine if the number of annual operations requires the designation as APZ I. The AICUZ Instruction permits modification of APZ dimensions for safety purposes and specific operations. Per the AICUZ Instruction, if the APZ annual operations threshold is fulfilled due to FCLP operations, then APZ II shall extend the entire length of the FCLP track, resulting in a closed loop for the entire pattern.

Due to safety concerns, most land uses within the Clear Zone are incompatible with military aircraft operations. Within APZ I and APZ II, some land uses are compatible; however, people-intensive uses (e.g., schools, apartments, churches) should be restricted because of the greater risk. Chapter 7, Land Use Compatibility Analysis and Recommendations, further explains land use compatibility within Clear Zones and APZs.

5.2 AICUZ Clear Zones and APZs

The following sections present the 2018 APZs for NAS Key West, including a detailed analysis of their development and the areas impacted. This section also provides comparisons and figure overlays for the historical (2007 AICUZ) and projected APZs (CY2028) that can be used to identify changes resulting from projected aircraft operations. An analysis of land use and compatibility within

the APZs for NAS Key West are provided and discussed in Section 7.2, Land Use Compatibility Analysis.

5.2.1 Projected Clear Zones and APZs

The NAS Key West 2018 AICUZ APZs were developed based on the projected annual aircraft operations presented in the 2013 Airfield Operations EIS as well as NAS Key West's unique training environment. Clear Zones and APZs that were developed as part of this AICUZ Study update are presented on Figure 5-2. The projected APZs shown on the figure represent the detailed aircraft operations counts, flight tracks, and runway utilization data presented in Chapter 3, Aircraft Operations, and the AICUZ Instruction APZ development guidance. The APZs off the approach and arrival ends of Runway 08 and Runway 26 are the result of multiple APZs off each runway end, resulting in a wider than usual APZ configuration due to the overlapping of APZs. Approximately 4,748 acres are impacted by the projected Clear Zones and APZs for NAS Key West (Table 5-1). About 25 percent of the impacted areas are within the installation boundary. The remaining 75 percent of impacted areas are

off-station—with 88 percent (3,132 acres) of these off-station areas located over water, resulting in only 12 percent (440 acres) of the off-station areas located over land.

TABLE 5-1 COMPARISON OF LAND AND WATER AREAS IMPACTED WITHIN THE CLEAR ZONE AND APZS (IN ACRES)

Scenario	Land		Waterbody		Grand Total
	Off-station	On-station	Off-station	On-station	
2007 Historical					
Clear Zone	22	420	124	204	**771**
APZ I	285	152	356	242	**1,035**
APZ II	101	49	1,270	26	**1,447**
Subtotal	**409**	**621**	**1,750**	**473**	**3,252**
Total	**1,029**		**2,223**		
2018 Projected (CY2028)					
Clear Zone	22	419	124	205	**771**
APZ I	290	162	853	272	**1,577**
APZ II	127	86	2,155	32	**2,400**
Subtotal	**440**	**667**	**3,132**	**508**	**4,748**
Total	**1,107**		**3,641**		

Sources:
[a] Navy 2007
[b] Navy 2013

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GEIGER KEY

STOCK ISLAND

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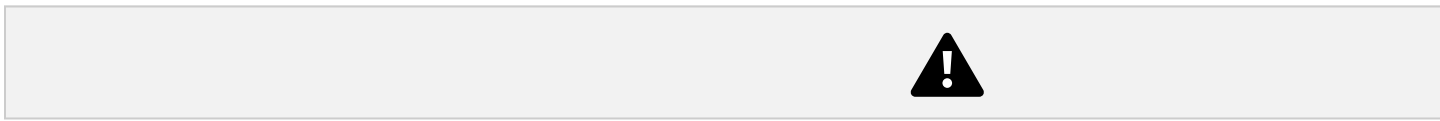

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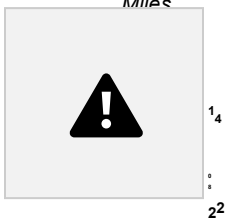


Legend

Runway

Installation Boundary Airfield Surface Area

2018 AICUZ Clear Zones and APZs

Clear Zone

Figure 5-2
2018 AICUZ Clear Zones and APZs NAS Key West
Monroe County, Florida

City Boundary
APZ I APZ II

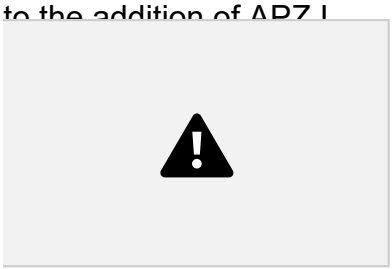
SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015. © 2017 Ecology and Environment, Inc.

5.2.2 Comparison of 2007 AICUZ APZs and 2018 AICUZ APZs

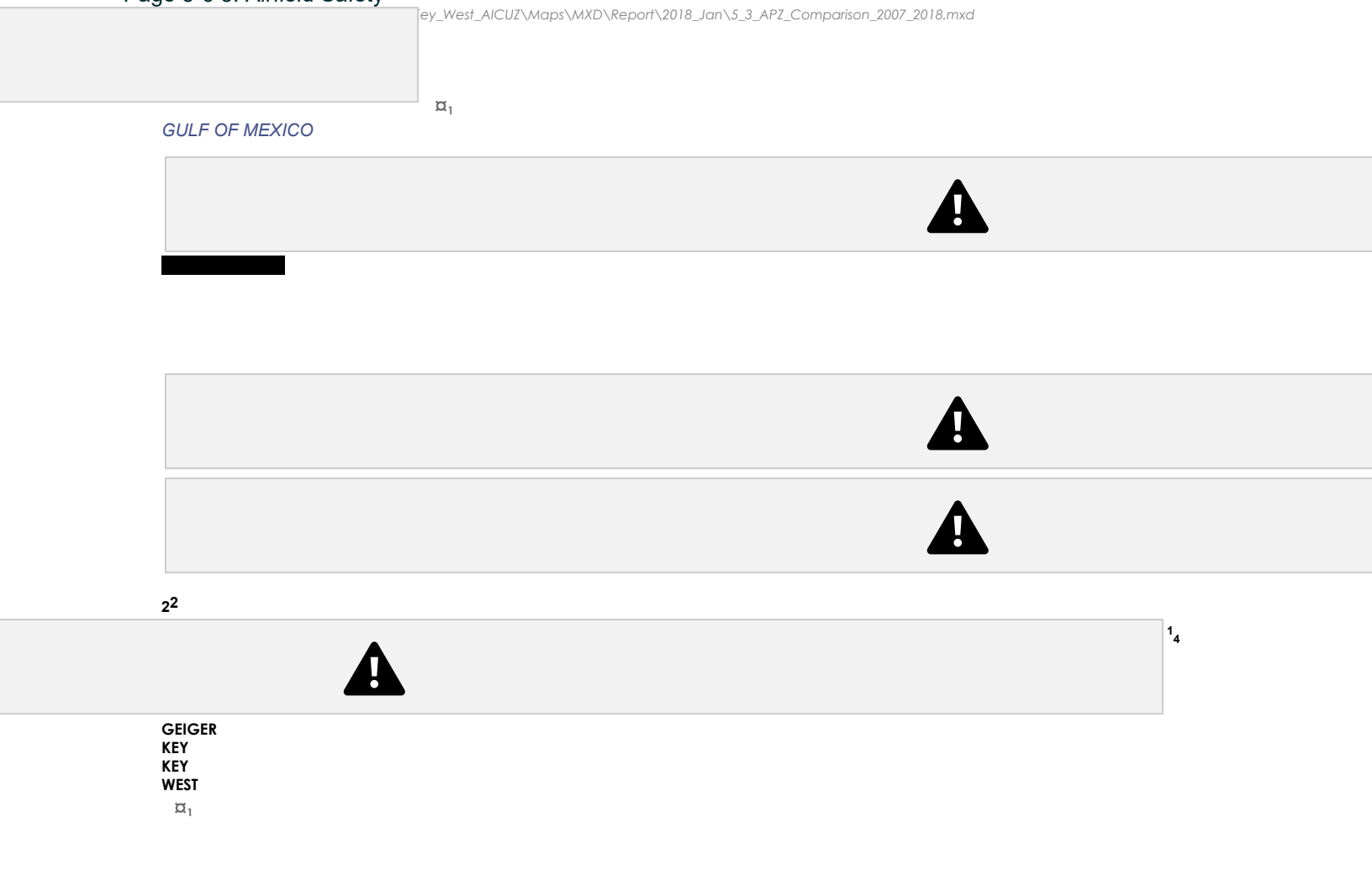
Figure 5-3 compares NAS Key West's Clear Zones and APZs in the 2007 historical and 2018 projected scenarios. A comparison of acreages within the Clear Zones and APZs for both are provided as Table 5-1. The Clear Zones and APZs are organized by on-station, off-station, and over land or over water. When comparing acreage under the 2007 historical and the 2018 projected scenarios, the following should be noted:

- The 2007 historical Clear Zone and APZ footprints covered 3,252 acres, as compared to 4,748 acres for the 2018 projected scenario (on- and off-station);
- There was an increase of 1,496 acres when comparing off-station impacts for the historical scenario (2,158 acres) to the 2018 projected scenario (3,572 acres); and
- 3,132 acres of projected off-station Clear Zone and APZ areas are located over water, resulting in only 440 acres of impacted land off-station, as compared to 409 acres in the historical scenario—a net increase of 31 acres.

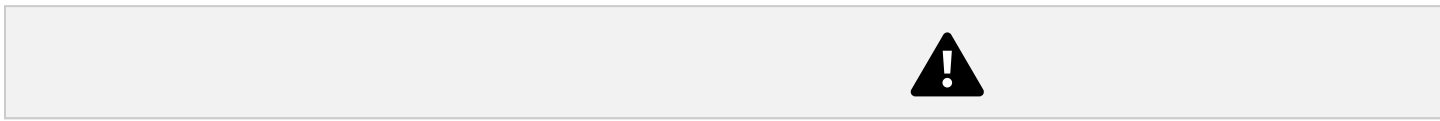
The acreage increases are attributed, in part, to the addition of APZ I.

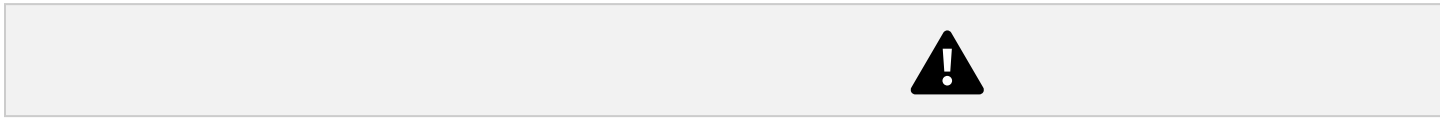


and APZ II coverage over water off the approach end of Runway 32 (same location as Runway 14's departure end), which were not included in the 2007 AICUZ due to the Navy's practice of not showing APZs that only impact water. However, the Navy has changed their practice to now plot APZs over water, especially since more recreational activities (e.g., kite surfing, windsurfing, parasailing) and other developments (e.g., boat houses, wind turbines, cell towers) are occurring within waterways adjacent to active runways. Other factors that contribute to the increases in APZs include the widening of the approach end Runway 08 APZ due to a flight path adjustment to avoid, mitigate, and minimize noise impacts towards Stock Island and Key Haven. In addition, there was an expansion of the departure end of Runway 08's (same location as the approach end for Runway 26) APZ to the north due to a departure flight track adjustment to avoid/mitigate Geiger Key impacts. Therefore, the 2018 APZs off Runway 08 (approach end) and Runway 26 (approach end) are the result of the overlap of operational flight tracks off each runway end, resulting in a wider than usual standard APZ configuration.



STOCK ISLAND





ATLANTIC OCEAN

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Legend

2007 AICUZ

Runway

Installation Boundary Airfield Surface Area City Boundary

2018 AICUZ APZs Clear Zone

APZ I

APZ II

and 2018 AICUZ APZs NAS Key West
Monroe County, Florida

SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAS Key West 2007; NAVFAC SE 2015. © 2017 Ecology and Environment, Inc.

The 2013 Airfield Operations EIS found that the runways at NAS Key West are compliant with all airfield safety and planning criteria, and the projected aircraft would not require that runway length or orientation be reconfigured to retain optimal safety and efficiency of the airfield. The APZs are based on Class B Runway APZ designation and predominant flight path. In addition, the projected aircraft are similar in operation to existing aircraft and would not result in a change to predominant flight paths (Navy 2013).

5.3 IMAGINARY SURFACES

The Navy and the FAA identify a complex series of imaginary planes and transition surfaces that define the airspace that needs to remain free of obstructions around an airfield. Obstruction-free imaginary surfaces help to ensure safe flight approaches, departures, and pattern operations. Obstructions include natural terrain and man-made features, such as buildings, towers, poles, wind turbines, cell towers, and other vertical obstructions to airspace navigation. In general, no aboveground structures are permitted in the primary surface of Clear Zones, and height restrictions apply to transitional surfaces and approach and departure surfaces. Height restrictions are more stringent as one approaches the runway and flight path. As discussed previously, all runways at NAS Key West are Class B runways. An illustrations of the imaginary surfaces for fixed-wing Class B runways is provided as Figure 5-4, and Figure 5-5 illustrates the imaginary surface specific to NAS Key West.

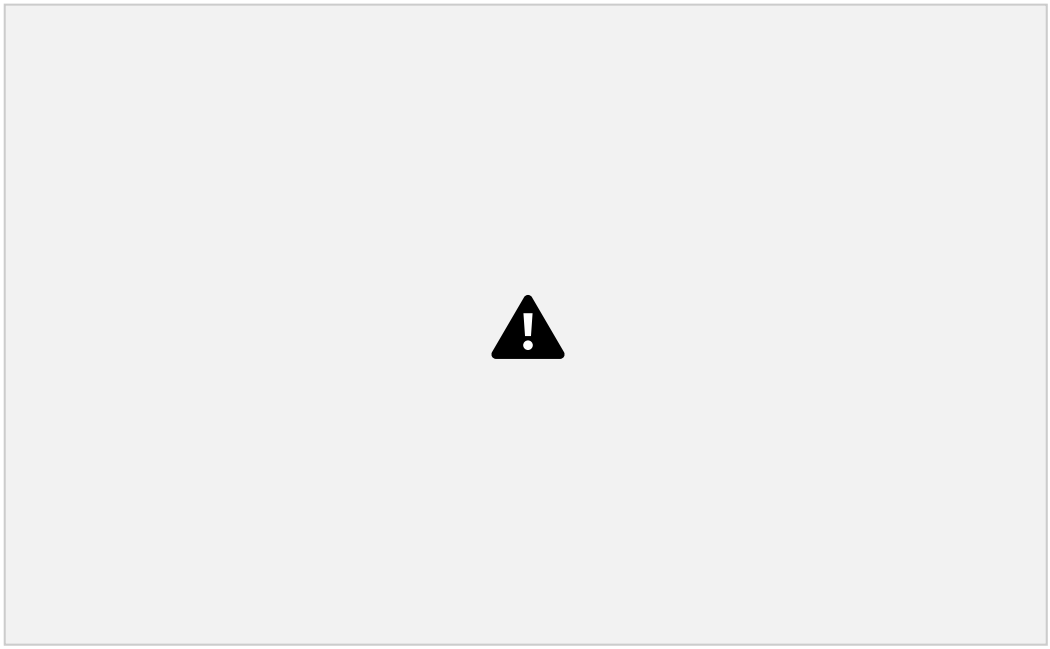
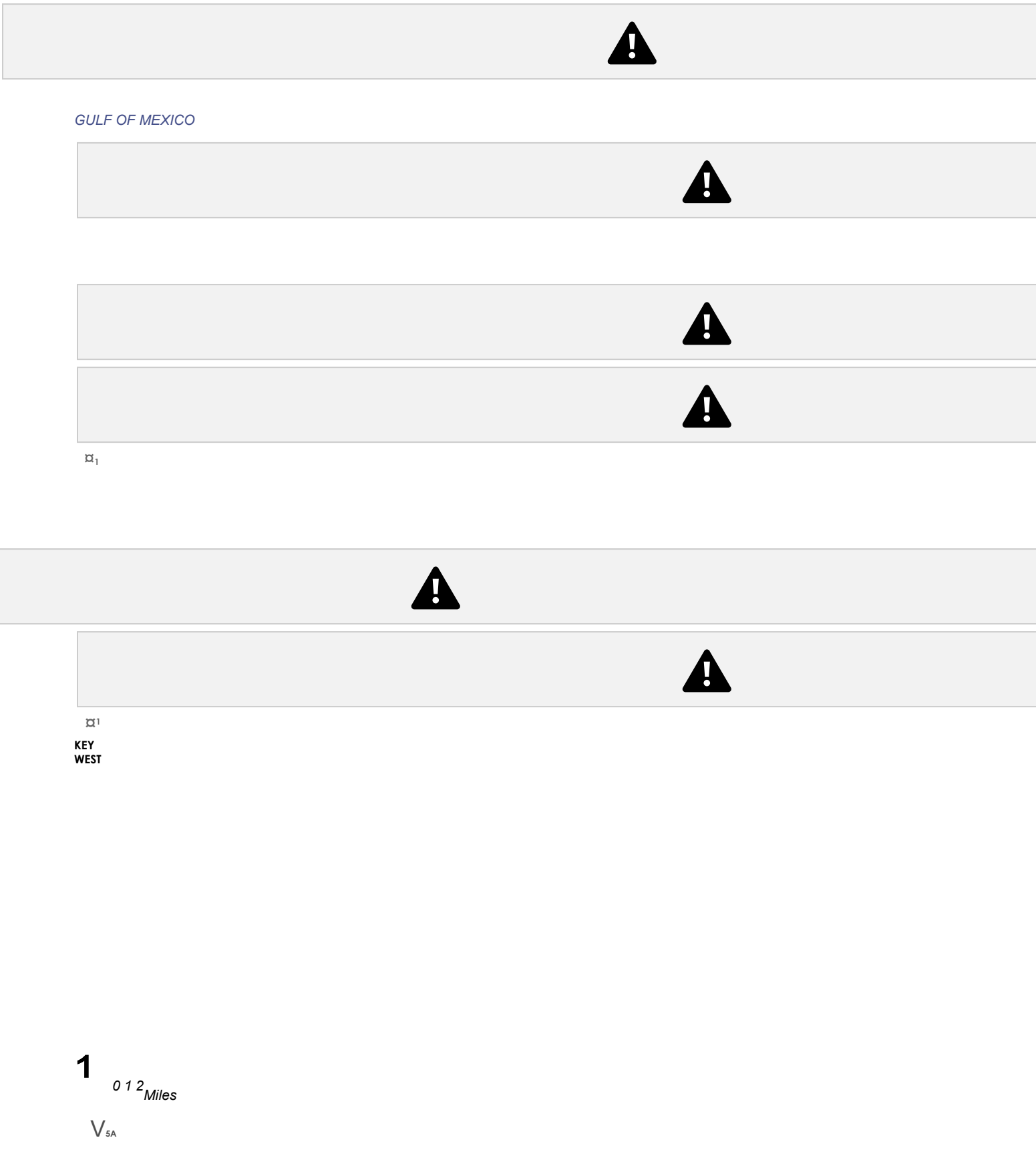


FIGURE 5-4 IMAGINARY SURFACES AND TRANSITION PLANES FOR

CLASS B FIXED-WING RUNWAYS



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ATLANTIC OCEAN

Imaginary Surfaces

A: Primary Surface
B: Type 1 Clear Zone
B: Type 2 Clear Zone
B: Type 3 Clear Zone
C: Approach-Departure Clearance Surface (50:1 Slope Ratio) D: Approach-Departure Clearance Surface (Horizontal)
E: Inner Horizontal Surface (150')
F: Conical Surface (20:1 Slope Ratio) G: Outer Horizontal Surface (500')
H: Transitional Surface (7:1 Slope Ratio)**Figure 5-5**

Runway

Major Road

Installation Area

Imaginary Surfaces NAS Key West
Monroe County, Florida

SOURCE: ESRI 2012; FDOR/Monroe County 2015; NAVFAC SE 2015.

5.4 FLIGHT SAFETY

Flight safety programs are designed to reduce hazards that cause aircraft mishaps; APZs are designed to minimize harm if a mishap occurs. Flight safety not only includes measures for pilot safety during aircraft operations, but also for the safety of those in the community. The FAA and the military define flight safety zones (imaginary surfaces) below aircraft arrival and departure flight tracks around airfields. Heights of structures and trees are restricted in these imaginary surfaces, and the FAA evaluates proposed construction to mitigate impacts. The

flight safety zones are designed to reduce hazards that can cause an aircraft mishap. This section discusses aircraft mishaps at NAS Key West, hazards to flight safety that should be avoided in the airfield vicinity, and measures to avoid potential pilot interferences.

5.4.1 Aircraft Mishaps

The Navy categorizes aircraft mishaps into three primary groups: Class A, Class B, or Class C. The classification system is based on the severity of injury to the individuals involved and the total property damage. The most severe is Class A, and the least severe is Class C (for reportable mishaps).

Naval Safety Center records include 17 Class A mishaps in and around NAS Key West from January 1980 through August 2011 (Navy 2013). Of the 17 Class A mishaps, 14 occurred in the offshore training areas or other overwater areas. Three of the Class A mishaps occurred in the vicinity of NAS Key West. Two of those were in the same mishap event, in 1991, when an F-5E and an FA-18C had a midair collision in the overhead pattern at NAS Key West. The third Class A mishap was in 1994, when an error made in the landing of a touch-and-go pattern operation resulted in the pilot ejecting and the aircraft veering off the runway into a tidal pool. These data illustrate that most accidents in and around NAS Key West are associated with aircraft training operations. Since most of the aircraft training operations conducted at NAS Key West occur offshore, it is not surprising that most aircraft mishaps that result in aircraft crashes occur offshore, as well. In the 31+ years of Naval Safety Center data (January 1980 through August 2011), there were two mishaps resulting in three crashes in vicinity of the airfield. (Navy 2013)

5.4.2 Bird/Animal Aircraft Strike Hazards

Bird/animal aircraft strike hazards (BASH) are another safety concern to aircraft operations. Birds and wildlife are drawn to different habitat types found in the airfield environment (e.g., edges, grass, brush, forest, water, and warm pavement). Due to the speed of the aircraft, collisions with wildlife can have considerable force and can cause substantial damage. Although most bird and animal

strikes do not result in crashes, they can cause structural and mechanical damage to aircraft, as well as loss of flight time.

Most bird collisions occur when the aircraft is at an elevation of less than 1,000 feet. To reduce BASH, the FAA and the military recommend locating land uses that attract birds at least 10,000 feet from active movement areas of the airfields. Land uses that attract birds and other wildlife include transfer stations, landfills, golf courses, wetlands, stormwater ponds, and dredge disposal sites. Design modifications can reduce the appeal of these land uses for

birds and other wildlife.

The Navy BASH program aims to minimize the risk of collisions involving birds/wildlife and aircraft and the subsequent loss of life and property. The BASH abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined include monitoring the airfield for bird and other wildlife activity, issuing bird hazard warnings, installing and maintaining bird/wildlife avoidance measures, initiating bird/wildlife avoidance procedures when potentially hazardous bird/wildlife activities are reported, and submitting BASH reports for all incidents. NAS Key West has an effective BASH program that involves the distribution of information and active and passive measures to control how birds use the critical areas around the airfield. Methods outlined in the plan to reduce BASH risk at the airfield include habitat management, bird dispersal, depredation, and bird avoidance.

The United States Navy, Commander Navy Installations Command (CNIC) has entered into an agreement with the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services (APHIS WS) to provide assistance to mitigate potential and realized wildlife hazards at Navy air stations. APHIS WS is recognized as the appropriate agency to conduct wildlife hazard management at military installations, as well as civilian airports, to reduce wildlife hazards. APHIS WS has assigned one full-time Wildlife Biologist at NAS Key West to conduct Wildlife Hazard Assessments and mitigate wildlife hazards on the airfield. Aircrews flying in and around NAS Key West will continue to adhere to the BASH program and flight operations standard operating procedures, using all available resources to minimize exposure during higher risk times of day and migration periods.

5.4.3 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 activities that create EMI. The American National Standards Institute defines EMI as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. EMI can be intentional, as in electronic warfare, or

unintentionally, such as high-tension line leakage. Megawatt wind turbines cause EMI and pose a hazard to air navigation. 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. EMI also affects consumer devices, such as cell phones, FM radios, television reception, and garage door openers. For air operations, EMI is a concern because it can disrupt navigation and communications

equipment. There also have been reports of EMI affecting aircraft fuel systems, warning lights, and propulsion. Any of these disruptions could lead to loss of aircraft and life.

5.4.4 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 pilot virtually blind. This is particularly dangerous at night when the flash can diminish the eye's adaptation to darkness. Partial recovery takes only a few minutes, but full recovery can take 40 to 45 minutes. Visible lasers, including low-powered legal laser pointers, are emerging as a safety concern for pilots. Visual interference with pilot performance due to lasers can result in temporary flash blindness, glare, disruptions, and distractions. These are most hazardous during critical phases of flight—landings, takeoffs, and emergency maneuvers. There is also concern about urban lighting that is not downward-directed, as well as the potential impacts of light-emitting diode, or "LED," lights on pilots who are training with night vision goggles.

5.4.5 Smoke, Steam, and Dust

Land uses that generate 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. Examples include dust from agricultural activities and thermal plumes from geothermal industries.