NOISE STUDY FOR THE AVON PARK AIR FORCE RANGE, FLORIDA

wyle

Revised FINAL

WR 13-05

December 2013

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Noise Study for the Avon Park Air Force Range, Florida

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Acronyms & Abbreviations

ID	Definition
°F	degrees Fahrenheit
AAM	Advanced Acoustic Model
AAR	Air-to-Air Refueling
ABD	Average Busy Day
AFB	Air Force Base
AFE	Above Field Elevation
AG	Air-to-Ground
AGL	Above Ground Level
ANSI	American National Standards Institute
APAFR	Avon Park Air Force Range
ARB	Air Reserve Base
ARP	Airfield Reference Point
BNOISE	Blast Noise Prediction
CDNL	C-Weighted Day-Night Average Sound Level
CFRPC	Central Florida Regional Planning Council
CT	Center Tower
CY	Calendar Year
dB	Decibel
dBA	A-Weighted Decibels
dBC	C-Weighted Decibels
DHS	Department of Homeland Security
DNL	Day-Night Average Sound Level
DOD	Department of Defense
DZ	Drop Zone
EDE	Equivalent Daily Events
EPR	Engine Pressure Ratio
ETR	Engine Thrust Request (ETR)
FANG	Florida Air National Guard
FARRP	Forward Area Rearm and Refuel Point
ft	Feet
GBU	Guided Bomb Units
GIS	Geographic Information Systems

(Continued on next page ➲)

Acronyms & Abbreviations (concluded)

ID	Definition
HE	High Explosive
ID	Identification
in Hg	inches of mercury
in-lbs	inch pounds (torque)
JLUS	Joint Land Use Study
JSF	Joint Strike Fighter
JT	Jaded Thunder
KAGR	International Civil Airport Organization Identifier for MacDill AFB Auxiliary Field
kts	Knots
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
LF	Left Flank
LFE	Large Force Exercises
L_{max}	Maximum Sound Level
LZ	Landing Zone
MOA	Military Operating Area
MOUT	Military Operations in Urban Terrain
MR_NMAP	Military Operating Area and Range Noise Model
MSL	Mean Sea Level
MTR	Military Training Route
NC or %NC	Compressor RPM
NEPA	National Environmental Policy Act
NMAP	NOISEMAP
PK 15 (met)	Single Event Peak Sound Level Exceeded by 15 Percent of Events, accounting for variable meteorological conditions
RH	Relative Humidity
RPM	Revolutions Per Minute
SARNAM	Small Arms Range Noise Assessment Model
SAW	Squad Automatic Weapon
SEL	Sound Exposure Level
SELr	Onset-Rate Adjusted Sound Exposure Level
SUA	Special Use Airspace
TNT	Trinitrotoluene
US	United States
USAF	United States Air Force
USCG	United States Coast Guard

Executive Summary

This report presents an updated noise analysis for activity involving aircraft, large ordnance and small arms at the Avon Park Air Force Range (APAFR) in central Florida. The Central Florida Regional Planning Council (CFRPC) may incorporate the results of this noise analysis into a Joint Land Use Study (JLUS). This report models the following types of noise sources/components:

1. Aircraft utilizing MacDill AFB Auxiliary Airfield (KAGR),
2. Aircraft utilizing APAFR Special Use Airspace,
3. Air-to-ground and ground-to-ground small arms activity, and
4. Air-to-ground large ordnance activity.

The report examines existing conditions (Calendar Year (CY) 2010) and a Prospective scenario estimated for CY2020 activities. The Prospective scenario is estimated with the best information available at the time of noise modeling, and is subject to possible changes in mission requirements in the future. Measurements were not conducted for this study but the modeling relies on databases of measured noise data.

Airfield Noise

The CY2010 condition for MacDill AFB Auxiliary Airfield (KAGR) considers a tempo of less than 1,700 annual flight operations. KAGR has been decertified for regular activity due to runway maintenance since 2007. Airfield operations are sanctioned for helicopter, cargo, and emergency operations only. Activity is dominated by helicopter and propeller aircraft operations, although a relatively small number of F-16 operations (16 annual operations) are included in the Existing scenario since these fighter jet operations were reported in the data collection and validated by the Range (MacLaughlin 2012; Schultz 2013). The CY2020 scenario for KAGR assumes the airfield regains certification and resumes to the CY2006 tempo of approximately 2,600 annual flight operations, increased proportion of jet fighter traffic and a transition of F-16 aircraft to F-35 aircraft. Applying the DOD NOISEMAP suite, the 65 dBA Day-Night Average Sound Level (DNL) contours for Average Busy Day (ABD) aircraft operations for either CY2010 or CY2020, would not extend beyond the Range boundary.

Airspace Noise

Targeting the busiest month of the year to comply with DOD analysis guidelines, airspace noise exposure was based on APAFR's Jaded Thunder (JT) Large Force Exercises (LFE) in addition to A-10 aircraft activity. The JT exercise typically lasts two weeks and often utilizes large portions of APAFR that extend beyond individual Military Operating Areas (MOA). The Prospective CY2020 activity levels are expected to remain the same as the Existing CY2010 scenario and the F-35 is expected to replace the F-16C. The modeled busiest month includes 473 sorties, with the majority from fighter aircraft, e.g., F-16/F-35. The maximum Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) estimated with the DOD MR_NMAP computer program would be 50 dBA and 57 dBA for existing CY2010 and Prospective CY2020 scenarios, respectively, and would exist within the Range boundary.

Small Arms Noise

Annual small arms expenditure data provided by the Range was compiled for 10 small arms ranges within APAFR and totaled approximately 6.2 million annual rounds, dominated by M240 and M60 machine gun fire. Noise from small arms was computed with DOD's Small Arms Range Noise Assessment Model (SARNAM). The area exposed to greater than or equal to 104 PK 15 (met)[1] dB, which is categorized as 'most severe noise impact' and denoted Noise Zone III, stays wholly within the Range boundary. The area exposed to PK 15 (met) between 87 and 104 dB, which is categorized as 'moderate noise impact' and denoted Noise Zone II, is wholly within the Range boundary except for a relatively small portion (less than 150 acres) extending beyond the southern Range boundary within 1 mile of rural residential land use.

Large Ordnance Noise

C-weighted DNL (CDNL) from firing and explosion of large ordnance, i.e., air-to-ground weapons of caliber greater than or equal to 20 mm, was computed with the DOD Blast Noise Prediction (BNOISE) suite of programs, for average busy day operations in APAFR's North Conventional, North Tactical, and South Tactical Ranges. Expenditure data provided by the Range for the CY2010 scenario totaled approximately 222,000 annual rounds, 95 percent of which were from automatic gunfire. No change in large ordnance activity is expected for the Prospective CY2020 scenario thus its noise exposure would be identical to the existing CY2010 scenario.

Noise Zone III extends approximately 1,000 ft beyond the northern Range boundary and nearly 1 mile beyond the southern Range boundary into Highlands and Polk Counties. Noise Zone III area does not include any visible structures (according to aerial imagery). Noise Zone II (areas of moderate noise impact; CDNL between 62 and 70 dB) extend beyond the Range boundary by 3.6 miles into Highlands and Okeechobee Counties and likely contains residential land use. Noise Zone I and the Land Use Planning Zone (areas of minimal noise impact; CDNL between 57 and 62 dB) extends 4-8 miles beyond Range boundaries on all sides and serves as a guide to where noise impact may occur during times of heightened large ordnance activity.

[1] Per Army guidelines, "PK 15 (met)" is the single event peak noise level expected to be exceeded by at least 15% of the rounds fired, accounting for varying weather conditions.

SECTION 1

Introduction

The Central Florida Regional Planning Council (CFRPC) contracted with Wyle to update the noise study associated with Avon Park Air Force Range Complex (APAFR, or "the Range") in Florida (FL). In 2005, Wyle completed Wyle Report 03-15 (WR 03-15), a noise study report for APAFR based on Calendar Year (CY) 2000 conditions including aircraft and large caliber weapons noise (Schmidt-Bremer Jr. et al 2005). An updated noise study is needed for the Range in order for the four surrounding counties of Highlands, Okeechobee, Osceola, and Polk to make informed decisions on zoning, land use, and development issues and to supplement the Joint Land Use Study (JLUS). CFRPC coordinates with these four counties; the cities of Avon Park, Frostproof, and Sebring; and the Range for the JLUS.

APAFR is a bombing and gunnery range located approximately 11 miles (18 km) east of the cities of Avon Park and Sebring. The boundary of the Range is illustrated in the regional map depicted in Figure 1-1. The Range encompasses over 100,000 acres of land area and the Special Use Airspace (SUA) overlies nearly 1.5 million acres. While the Range boundary falls within only Polk and Highlands counties, the SUA activity areas include the additional counties of Osceola, Okeechobee, and Hardee.

The goal of the Noise Study is to accurately map noise levels generated from military operations at APAFR in order to protect existing property owners and promote compatible land use development. Through coordination with and operational information provided by the Range, noise exposure generated by aircraft, munitions, weapons systems, and airfield operations has been estimated. Accurate understanding of noise exposure is critical for the proper implementation of JLUS recommendations. The study assists in analyzing existing encroachment issues in order to reduce adverse effects from noise associated with military operations. Analyses presented in this report are limited to

- MacDill Air Force Base (AFB) Auxiliary Airfield (KAGR) activity;
- Special Use Airspace activity in
    - Military Operating Areas (Avon East/North/South, Bassinger, Lake Placid, and Marian) and
    - Restricted Area R-2901 (divided into functional parts R-2901A through R-2901N);
- Training ranges for ground-to-ground activity (small arms only) at the northern Mock Village (for Military Operations in Urban Terrain, MOUT), North Conventional, North Tactical, OQ, Oscar, and South Tactical Ranges;
- Target locations for air-to-ground activity (small arms and large ordnance) at North Conventional, North Tactical, South Tactical, and Oscar Ranges.

This study includes an Existing condition, defined by the Calendar Year 2010 (CY2010) tempo of operations and a Prospective condition defined by CY2020 projected operations. The Prospective scenario analysis accounts for the US Air Force (USAF) transition of the F-16C Fighting Falcon aircraft to the F-35A Lightning II [aka Joint Strike Fighter (JSF)] aircraft, an overall increase in KAGR operations, and unchanging operations for airspace, large ordinance, and small arms training activity.

APAFR is primarily utilized by aircraft from Moody AFB, Patrick AFB and Homestead Air Reserve Base (ARB), the Department of Homeland Security (DHS), the US Coast Guard (USCG), and the Florida Army National Guard (FANG). Other organizations may also train at APAFR. The 23rd Wing of Air Combat Command operating out of Moody AFB includes the 74th and 75th Fighter Squadrons flying the A-10 Thunderbolt II, and the 347th Rescue Group flying the HH-60 Blackhawk helicopter and MC-130 Hercules. Patrick AFB users include the 301st Rescue Squadron flying the HH-60 and MC-130. Homestead ARB users include F-16C from the 93rd Fighter Squadron – part of the 482nd Fighter Wing. The US Navy trains with FA-18E/F at Avon Park, too. The DHS and USCG conduct helicopter training at APAFR with the HH-60, OH-58 Kiowa, and other helicopters, and the FANG training activity includes use of the Range facilities.

This report is organized into six main sections and one appendix. Section 1, this section, is the introduction to the study. Section 2 discusses the study methodology, including an overview of the methodology guiding noise modeling, and introduces noise metrics and the computerized noise models used to compute the noise levels. Sections 3 and 4 present the noise exposure due to aircraft operations at KAGR and in the SUA, respectively. Sections 5 and 6 present the noise exposure due to activity at the small arms ranges and from large ordnance events, respectively. Appendix A provides representative flight profiles for aircraft operating at the KAGR airfield.

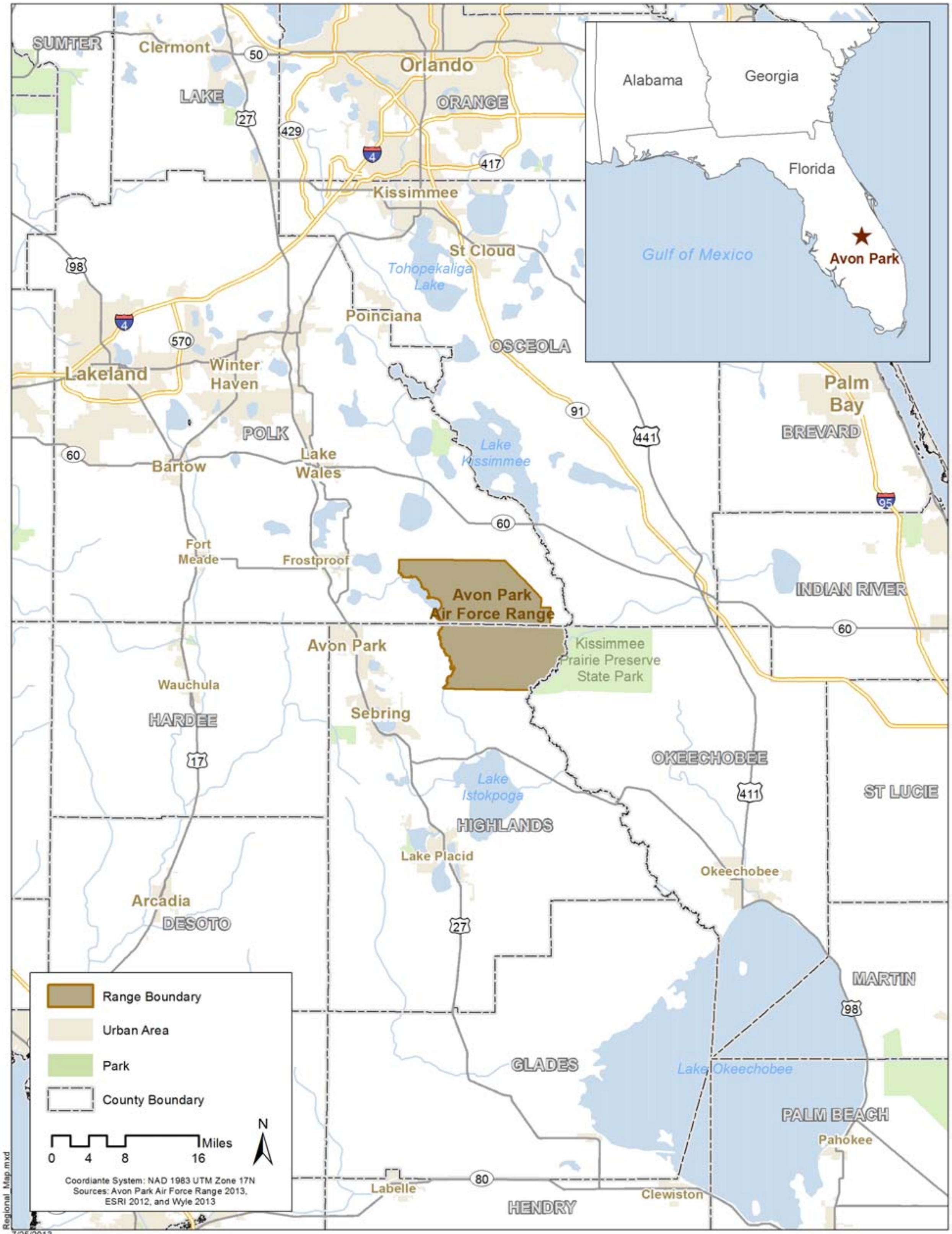

Figure 1-1 Avon Park Air Force Range Regional Map

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SECTION 2

Study Methodology & Data Collection

This section describes the data collection procedures and an overview of the noise study methodology in Section 2.1. Noise metrics and computerized noise models are detailed in Section 2.2.

2.1 Data Collection

The data collection phase began with an initial site visit to APAFR in the fall of 2011. A round of data collection continued through the beginning of 2012 but resulted in significant data gaps due to limited data availability from transient users. Due to the high number of users and different components in the noise study, data concepts were reconfigured, and a second site visit was coordinated in the fall of 2012 so Wyle personnel could meet directly with the appropriate APAFR personnel to gather follow-up data. Data gathered included range information, typical flight tracks and areas, flight profiles and types and quantities of ordnance used. Points of contact are shown in Table 2-1. For purposes of data collection, aircraft activity tempos and ordnance expenditure accounts were derived from air-traffic records and Range scheduling data provided by APAFR personnel. In situations lacking data specifics, reasonably conservative estimates are used which are based on Range guidance.

Table 2-1 Points of Contact

Name	Title/Function	Organization	Phone	E-Mail
Helen Sears	Program Director	CFRPC	863-534-7130	hsears@cfrpc.org
Ronald Borchers	Senior Planner	CFRPC	863-534-7130	rborchers@cfrpc.org
Ariel Godwin	Planner / Research Analyst	CFRPC	863-534-7130	agodwin@cfrpc.org
Joe Czech	Project Manager	Wyle	310-563-6628	joseph.czech@wyle.com
Troy Schultz	Aerospace / Acoustical Engineer	Wyle	502-693-5343	troy.schultz@wyle.com
Lt Col Paul Neidhardt	Commander	APAFR	863-452-4196	paul.neidhardt@us.af.mil
Ronald Riedel	Range Support Manager	APAFR	863-452-4110	ronald.riedel@us.af.mil
Paul Ebersbach	Environmental Flight Chief	APAFR	863-452-4105	paul.ebersbach@us.af.mil
Charles MacLaughlin	Range Operations Officer	APAFR	813-857-7109	charles.maclaughlin.1@us.af.mil
Gregory Duncan	Airfield Manager / Asst. Ops Officer	APAFR	863-452-4109	gregory.duncan.10@us.af.mil
Matthew Griffith	Range Operations	Jacobs/TEAS, APAFR	863-452-4140	matthew.griffith.ctr@us.af.mil
Robert Diggs	Site Manager, APAFR Control Tower	AHNTECH, APAFR Contractor	863-453-3851	robert.diggs.2.ctr@us.af.mil
David Briley	APAFR Control Tower	AHNTECH, APAFR Contractor	863-452-4138	david.briley.ctr@us.af.mil

Site-visit and follow-up data packages were compiled for noise modeling and validated via email correspondence with APAFR personnel in the spring of 2013 (Schultz 2013). This ensures the completeness and validity of the noise model data. The data validation process includes various interactions leading to the refinement of the modeling data and its approval for analysis, including:

- Preparation and submittal of detailed tables and summary visualizations of annual flight operations by specific aircraft type, day/night periods and type of operation, clearly labeled for each scenario, developed from input provided by Range personnel. These data along with associated assumptions and methodologies form the basis of the data validation package and are targeted in content to obtain speedy and effective review by Range personnel.
- Coordination of input on their integration into modeled profiles for the Range. An internal review and validation process assesses the feasibility and applicability of the profiles and identifies information gaps or feedback questions to the Range.
- Assurance that acoustic source data and all topographical and weather data are accurate and that model assumptions are validated by the Range prior to their exercise.

Figure 2-1 provides an overview of the major phases of the study and their associated quality control and program performance steps.

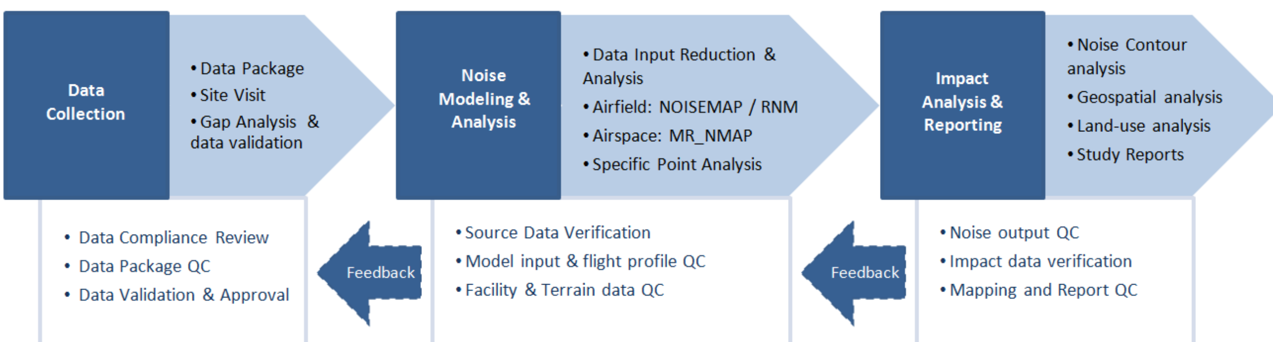

Figure 2-1 Major Phases of the Noise Study

Quality assurance is an indispensable component of the noise study process and data validation is an essential step to ensuring stakeholder acceptance of study inputs, assumptions and results. An internal assessment and validation process performed by Wyle environmental engineers and military operations experts allows for the review and integration of scientific, operational, and base planning knowledge into the noise modeling process. For noise assessments of small arms and large ordnance training activity, computer model input and output is quality checked by the Army Public Health Command.

2.2 Methodology

This section elaborates the noise metrics, computer models, and modeling parameters implemented in the noise analyses of this report. Section 2.2.1 describes noise metrics and "Noise Zones" used for planning purposes. Section 2.2.2 describes general characteristics of the noise models, and Section 2.2.3 further describes specific parameters of the noise models, such as weather and topography data used in the analyses.

2.2.1 Noise Metrics

Via US DOD instruction 4165.57, cumulative aircraft noise exposure is described and presented in terms of Day-Night Average Sound Level (DNL). DNL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, a 10 dB penalty is applied to nighttime events (10:00 p.m. to 7:00 a.m. time period). With DNL, individual flight and run-up[2] event noise exposure is estimated in terms of Sound Exposure Level (SEL) and instantaneous Maximum Sound Level (L_{max}), respectively. SEL is an integrated metric normalized to one second that accounts for the event duration. L_{max} is self-explanatory. SEL and L_{max} are expressed in A-weighted decibels (dB or dBA).

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes (MTRs), MOAs and Restricted Areas/Ranges, generate a noise environment that is somewhat different from that associated with airfield operations. As opposed to patterned or continuous noise environments associated with airfields, flight activity in SUAs is sporadic and often seasonal ranging from ten per hour to less than one per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset rate, causing an increase in the effective sound level.

To account for this effect, the conventional SEL metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans with an adjustment ranging up to 11 dB above the normal SEL (Stusnick, et al, 1992). Onset rates between 15 to 150 dB per second require an adjustment of 0 to 11 dB, while onset rates below 15 dB per second require no adjustment. The adjusted SEL is designated as the onset-rate adjusted sound exposure level (SEL_r).

Because of the sporadic characteristic of SUA activity, noise assessments are normally conducted for the month with the most operations or sorties -- the so-called busiest month. The term "aircraft sortie" is used to describe a single aircraft taking off, conducting an activity, and then returning. Multiple operations or mission events can be conducted within one aircraft sortie. One example would be multiple bombing target passes conducted during a single sortie. The cumulative noise exposure in these areas is computed by the DNL over the busiest month, but using SEL_r instead of SEL. This monthly average is denoted the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}).

The A-weighting in DNL and L_{dnmr} de-emphasizes low-frequency noise, i.e., noise containing components less than 200 Hertz (Hz), to approximate the response and sensitivity of the human ear. Large ordnance noise, which is impulsive, contains more low-frequency noise energy, and is best described in terms of C-weighted decibels (dBC), with little low-frequency de-emphasis as shown in Figure 2-2. Because they typically contain more low-frequency energy, impulsive sounds may induce secondary effects, such as shaking of a structure, rattling of windows, and inducing vibrations. These secondary effects can cause additional annoyance and complaints.

[2] No maintenance run-ups are modeled in this analysis.

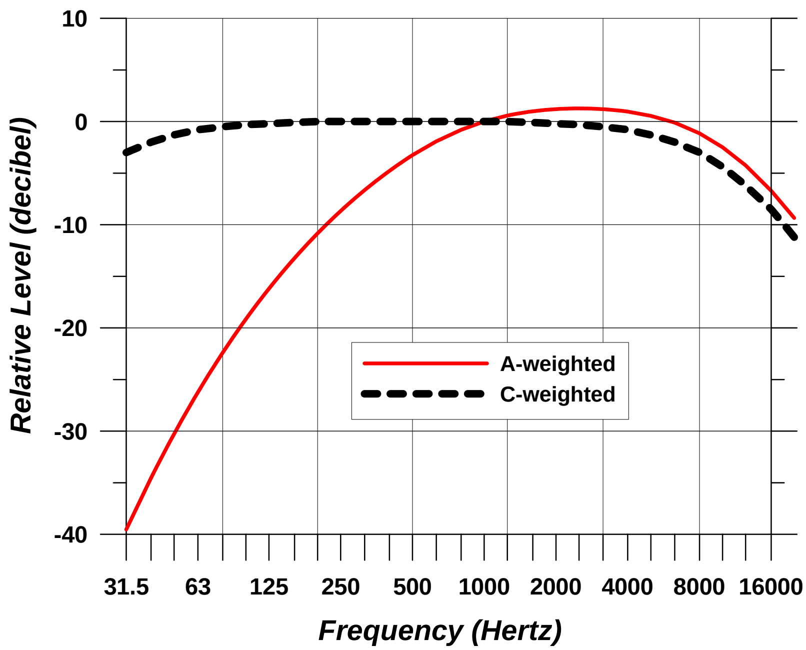

Figure 2-2 Frequency Response Characteristics of A- and C-Weighting Networks [3]

Small arms activity is described by a statistical noise metric called Single Event Peak Sound Level Exceeded by 15 Percent of Events, accounting for variable meteorological conditions, abbreviated "PK 15 (met)". PK 15 (met) is the calculated peak noise level, without frequency (i.e. "A" or "C") weighting, expected to be exceeded by 15 percent of all modeled events (Army 2007). It allows assessment of the risk of noise complaints from large caliber impulsive noise resulting from armor, artillery, mortars and demolition activities. PK 15 (met) is expressed in "dB", not "dBA" or "dBC".

The community response to aircraft and blast noise has long been a concern in the vicinity airfields, airspace training areas, and ranges on which ordnance containing a high explosive (HE) material is expended. For land-use planning purposes, the DOD guidance generally divides noise exposure into three zones listed in Table 2-2 and described as follows:

- Noise Zone I: Defined as an area of minimal impact. This is also an area where social surveys show less than 15 percent of the population would be expected to be highly annoyed.
- Noise Zone II: Defined as an area of moderate impact. This is the area where social surveys show between 15 percent and 39 percent of the population would be expected to be highly annoyed.
- Noise Zone III: Defined as an area of most severe impact. This is the area where social surveys show greater than 39 percent of the population would be expected to be highly annoyed.

For large ordnance noise, a fourth zone is the Land Use Planning Zone (LUPZ; Army 2007) which has limits less than Noise Zone I (minimal impact), but is presented to better predict noise impacts when levels of operations at large caliber weapons ranges are above average. Table 2-2 lists the noise metrics computed, Noise Zone thresholds, and contours shown for each noise analysis.

[3] Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Table 2-2 Noise Metrics, Zones, and Contours Computed

Noise Source	Metric (decibel)	Cumulative or Single-Event Metric	Events	DoD Land Use Compatibility Guideline: LUPZ	DoD Land Use Compatibility Guideline Noise Zone: I	II	III	Percent "Highly Annoyed" (HA) Noise Zone: I	II	III	Single-Event Noise Metrics (decibel): Sound Exposure Level (SEL)	Maximum Sound Level (L_{max})	PK 15(met)
Aircraft (airfield)	DNL (A-weighted)	Cumulative (24 hour)	Annual Average Daily Events	n/a	65-70	70-75	75+	<15% HA	15 - 39%HA	39%HA+	A-weighted		n/a
Aircraft (airspace)	L_{dnmr} (A-weighted)		Average Daily Events during the Busiest Month								A-weighted and Rise-time Corrected	A-weighted	
Large Ordnance (greater than 20 mm)	CDNL (C-weighted)		Annual Average Daily Events	57-62	<62	62-70	70+				C-weighted	Unweighted (L_{pk})	
								Complaint Risk: Low	Medium	High			
	PK 15(met) (unweighted)	Single Event	n/a	n/a				<115	115 - 130	130+ *	n/a		Yes
Small Arms	PK 15(met) (unweighted)	Single Event		n/a	<87	87-104	104+	< 87	87 - 104	104+			Yes

LUPZ = Land Use Planning Zone (Army-specific)
DNL = Day-Night Average Sound Level
Ldnmr = Onset-Rate Adjusted Monthy Day-Night Average Sound Level
Lpk = Peak Sound Pressure Level
PK 15(met) = Peak Sound Pressure Level exceeded by 15% of ordnance/blast events based on variable meteorological conditions
* = potential for structural damage begins at 140 dB

Source: DODI 4165.57 (2011); Army 2007, Table 14-1.

In calculating time-average sound levels, the reliability of the results varies at lower levels (below 45 dB DNL/L_{dnmr}/CDNL). This arises from the increasing variability of individual event sound levels at longer propagation distances due to atmospheric effects on sound propagation and to the presence of other sources of noise. Also, when ordnance or flight activity is infrequent, the time-averaged sound levels are generated by only a few individual noise events, which may not be statistically representative of the given events modeled. Most of the guidelines for the acceptability of aircraft noise are on the order of 65 dB and higher. Therefore, DNL/L_{dnmr}/CDNL less than 45 dB are presented herein as "<45 dB".

2.2.2 Noise Models

The models listed herein are the most accurate and useful for comparing "before-and-after" noise levels that would result from alternative scenarios when calculations are made in a consistent manner. The programs allow noise exposure prediction of such proposed actions without actual implementation and/or noise monitoring of those actions.

Tables 2-3 and 2-4 summarize the noise models and modeling parameters relevant to this report for ordnance noise and aircraft noise, respectively. More detail on weather and topography data are provided in Section 2.2.3. The noise analysis was conducted according to established US DOD guidelines and best practices and employed the US DOD NOISEMAP suite of computer-based modeling tools (Czech and Plotkin 1998; Page, J.A., Wilmer, C. and Plotkin, K.J. 2008; Wasmer and Maunsell 2006a; Wasmer and

Maunsell 2006b), the Military Operating Area and Range Noise Model (MR_NMAP; Lucas & Calamia 1994), the Blast Noise Prediction 2 (BNOISE) suite of programs (Army 2003) and the Small Arms Range Noise Assessment Model 2 (SARNAM; US Army 2008).

Table 2-3 Ordnance Noise Models, Methodology, and Weather

Small Arms Noise Model	
Software	Version
SARNAM	2.6
Parameter	Description
Receiver Grid Spacing	328 ft in x and y
Modeled Activity Days	n/a (peak levels)
Large Ordnance Noise Model	
Software	Version
BNOISE2	1.3
Parameter	Description
Receiver Grid Spacing	3,281 ft in x and y
Modeled Activity Days	250 days per year
Both Ordnance Noise Models	
Topography (n/a - flat, soft terrain)	
Modeled Weather (built-in weather profiles)	

Table 2-4 Aircraft Noise Models, Methodology, and Weather

Airfield Noise Model		
Software	Analysis	Version
NoiseMap	Fixed-wing Aircraft	7.2
RNM	Rotorcraft	8
Parameter	Description	
Receiver Grid Spacing	200 ft in x and y	
Modeled Flying Days	260 days per year	
Topography		
Elevation Data Source	1/3 arc-second NED	
Elevation and Impedance Grid spacing	500 ft in x and y	
Flow Resistivity of Land Areas (soft)	200 kPa-s/m^2	
Flow Resistivity of Water Areas	1,000,000 kPa-s/m^2	
Weather		
Temperature	71 °F	
Relative Humidity	68%	
Barometric Pressure	29.92 inHG	
Airspace Noise Model		
Software	Version	
MR_NMAP	2.2	
Parameter	Description	
Receiver Grid Spacing	626 ft in x and y	
Modeled Flying Days	Busiest Month Concept	
Topography (n/a - flat, soft terrain)		
Modeled Weather (Same as Airfield)		

NOISEMAP is a model for airbases and is most appropriate when the flight tracks are well defined, such as those associated with an airfield. The core computational modules of the NOISEMAP suite are NMAP and the Rotorcraft Noise Model (RNM). RNM is for high-fidelity simulation noise modeling of highly directional noise sources such as helicopters and tiltrotors. For this study, the Navy approved the use of acoustic source data for the CH-46E, CH-53E and SH-60B (US Navy 2013). For noise modeling, total annual flight operations were converted to Average Busy Day (ABD) flight operations by dividing annual flight operations by the number of airfield operating days in a year -- 260 days per year for KAGR.

When the aircraft flight tracks are not well defined, but are distributed over a wide area, such as in a MOA, Range/Restricted Areas, and MTR with wide corridors, noise is assessed using MR_NMAP. MR_NMAP is a distributed flight track model that allows for entry of airspace information, the horizontal distribution of operations, flight profiles (average power settings, altitude distributions, and speeds), and numbers of sorties. "Horizontal distribution of operations" refers to the modeling of lateral airspace utilization via three general representations: broadly distributed operations for modeling of MOA and Range events, operations distributed among parallel tracks for modeling of MTR events, and operations on specific tracks for modeling of unique MOA, Range, MTR, or target area activity. The core program MR_NMAP incorporates the number of monthly operations by time period, specified horizontal distributions, volume of the airspaces, and profiles of the aircraft to primarily calculate: (a) L_{dnmr} at many points on the ground, (b) average L_{dnmr} for entire airspaces, or (c) maximum L_{dnmr} under MTRs or specific tracks.

Noise from ordnance delivery (blast noise) is impulsive in nature and of short duration. Blast noise consists of two components, the firing of the projectile from the weapon and the detonation of the projectile if it contains a high-explosive (HE) charge. When a projectile or bomb is released from an aircraft, and the projectile contains HE material, only the noise resulting from the detonation of the projectile is calculated. The same process is applied to a projectile that is ground-delivered. If the projectile is non-HE, only the noise resulting from the firing of the projectile is calculated. Blast noise is often a source of annoyance for persons, and vibrations of buildings and structures induced by blast noise may result in increased annoyance and risk of noise complaints or damage.

Blast noise contours are developed using the DOD BNOISE suite of computer programs, which together can produce CDNL contours for blasting activities or military operations resulting in impulsive noise. Input into BNOISE includes information on the assessment period and selected noise metric, target points and their geographic coordinates, rectangular grid definition (southwest corner coordinates, length, width and the spacing between two consecutive grid points), and the firing/target pair, the ammunition type, the propellant trinitrotoluene (TNT) equivalent weight, the height of the explosion, and the ABD daytime (7:00a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) firings for each activity. Consistent with DOD standard practice in modeling cumulative daily noise exposure, annual firings (operations) are divided by 250 range operating days per year. Similar to NOISEMAP, the BNOISE computer program generates a grid file, which is simply a collection of noise levels at equally spaced points of a rectangular area.

In order to evaluate noise contours resulting from the small arms training operations, the DOD's SARNAM computer program was used. For small arms range complexes, SARNAM calculates and plots noise contours for a variety of noise management tasks, such as assessing long-term community noise impact, examining noise levels resulting from single firing events, or planning range operations. It includes consideration of weapon and ammunition type, spectrum and directivity for both muzzle blast and ballistic wave, number of rounds fired, time at which rounds are fired, range attributes, frequency weighting, propagation conditions, noise metrics, noise assessment penalties, and long-term assessment period and procedure. Effects of terrain on sound propagation are not considered in the program (a flat terrain assumption). Because the SARNAM software cannot take into account any shielding or attenuation of sound as a result of the terrain, the actual peak noise levels are expected to be less than those reported in this document.

For land use compatibility assessments, SARNAM can compute PK 15 (met). From the grid of points, lines of equal PK 15 (met) (contours) of 87 dB and 104 dB are plotted. Note that computational artifacts in SARNAM can result in directionality "spikes" and raw output from SARNAM is adjusted by the Army prior to publication (Broska 2013).

2.2.3 Noise Model Parameters

This section describes the topography and weather data utilized in the noise models listed in Tables 2-2 and 2-3.

The airfield modeling uses a local coordinate system with the origin at the KAGR Airfield Reference Point (ARP), which is at geographical coordinates 27.6408882° North / 81.3511124° West and an elevation of 68 feet above Mean Sea Level (MSL; USGS 2012). The current magnetic declination is 3° West (Airnav 2013). All maps in this report depict a north arrow pointing to true north. The modeled elevation area in the APAFR vicinity varies in elevation by only about 150 feet from lowest point to highest point. As indicated by Table 2-3, elevation and impedance grid files were created to model the immediate KAGR area (50,000 ft in each direction of the ARP) with a grid spacing of 500 feet based on data obtained from the US Geological Survey (USGS, 2012). Areas of land are modeled as an acoustically "soft" surface (with a flow resistivity of 200 kPa-s/m^2) and bodies of water, are modeled as "hard" (1,000,000 kPa-s/m^2).

MR_NMAP does not have the capability to model varying terrain or ground impedance. It assumes all flight profiles' altitudes are relative to the elevation of the ground (assumed to be at the ARP elevation of 68 ft MSL). The BNOISE computer program may include atmospheric sound propagation effects over varying terrain, including hills and mountainous regions. However, since terrain remains relatively flat over the entire study area, this particular analysis neglects the effects of terrain for large ordnance noise.

This report utilized detailed daily average weather conditions for each month for the city of Orlando, Florida (Weather 2013). APAFR does not track detailed weather and therefore nearby Orlando provides a good estimate for detailed weather conditions. Orlando is 60 miles north of KAGR and similarly located inland. Average daily temperature and relative humidity values are plotted in Figure 2-3. The average temperatures for summer months (May to September) and winter months (October to April) are 81°F and 66°F, respectively, and the average temperature overall is 72°F. Relative humidity for the same periods over the course of an entire day is 74 percent for the summer months and for winter months is 71 percent. The barometric pressure is assumed to be sea-level conditions of 29.9 inHg.

NOISEMAP's BaseOps program computes absorption coefficients for each month and selects the median coefficient to use in the noise exposure modeling (U.S. Air Force 1992). The modeled conditions selected by the BaseOps program correspond to the month of April with a temperature of 71°F and a relative humidity of 68 percent. These conditions were also used for MR_NMAP modeling. BNOISE and

SARNAM do not use weather conditions specific to the region, but rather a composite of various weather conditions representing "average" weather for most locations, allowing for computation of the statistical variations representative of impulsive noise.

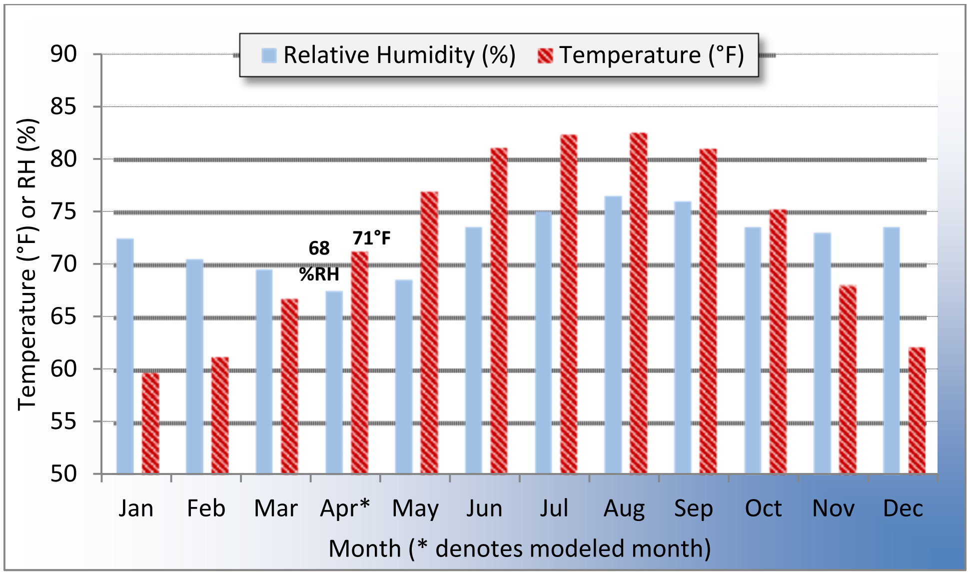

Figure 2-3 Average Daily Weather Conditions

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SECTION 3

MacDill AFB Auxiliary Airfield Noise Analysis

This section presents a brief summary of MacDill AFB Auxiliary Airfield (KAGR) followed by the Existing and Prospective scenario conditions in Sections 3.1 and 3.2, respectively. Detailed accounts of annual operations, flight track utilization, and noise exposure contours for KAGR are provided.

KAGR is located 8 miles northeast of the city of Avon Park, FL. The two runways are located east and adjacent to the APAFR main base complex. Existing regulations limit fixed-wing use to cargo activity and emergency operations due to the condition of the pavement and the associated danger of Foreign Object Damage (FOD) to aircraft. The layout and the vicinity of the airfield complex are depicted in Figure 3-1 (next page). Runway 05/23 is the main runway. Runway 14/32 is not used for fixed-wing operations, only helicopter operations that begin at the Forward Area Rearming and Refueling Point (FARRP) and include a stop at the Delta Ramp located upon Runway 14/32. The Delta Ramp is comprised of six helicopter landing locations along Runway 14/32, but for modeling purposes, only one single location is considered (in the approximate center). The orientation and dimension of Runway 05/23 is 8,000 ft long and 150 ft wide, with magnetic headings of 53º/233º.

Historical tower counts, i.e., airfield operations, are illustrated in Figure 3-2. The sharp decline in operations after 2007 is a result of airfield decertification. The Existing scenario airfield operations (fully described in Section 3.1) correspond to the CY2010 annual operations while the modeled CY2020 Prospective scenario scales the detailed CY2010 data to achieve the CY2006 annual number of events. This methodology involves the expectation of the airfield recertification by CY2020 and provides a conservative estimate by using the maximum number of annual events encountered in the previous several years.

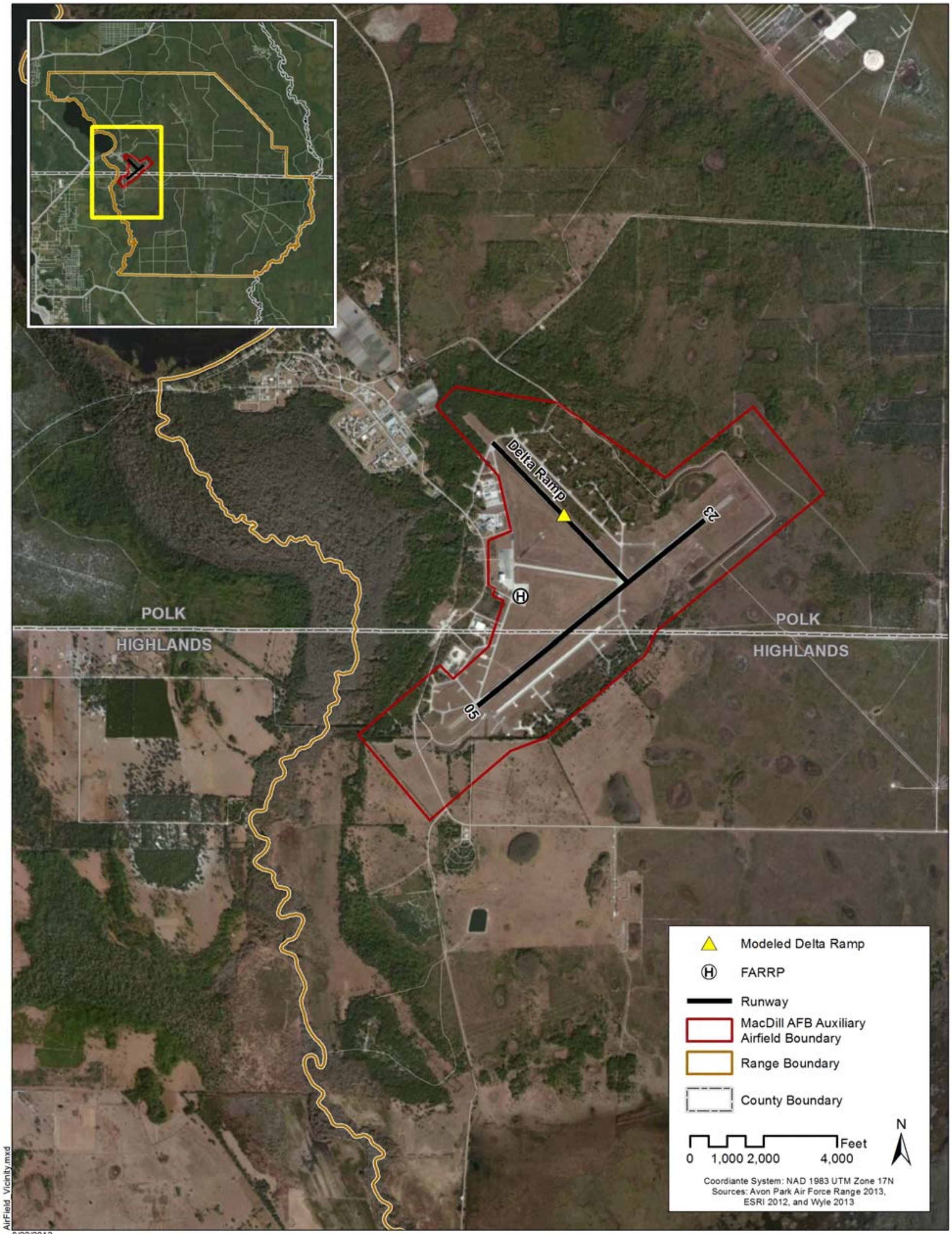

Figure 3-1 MacDill AFB Auxiliary Airfield (KAGR) Vicinity

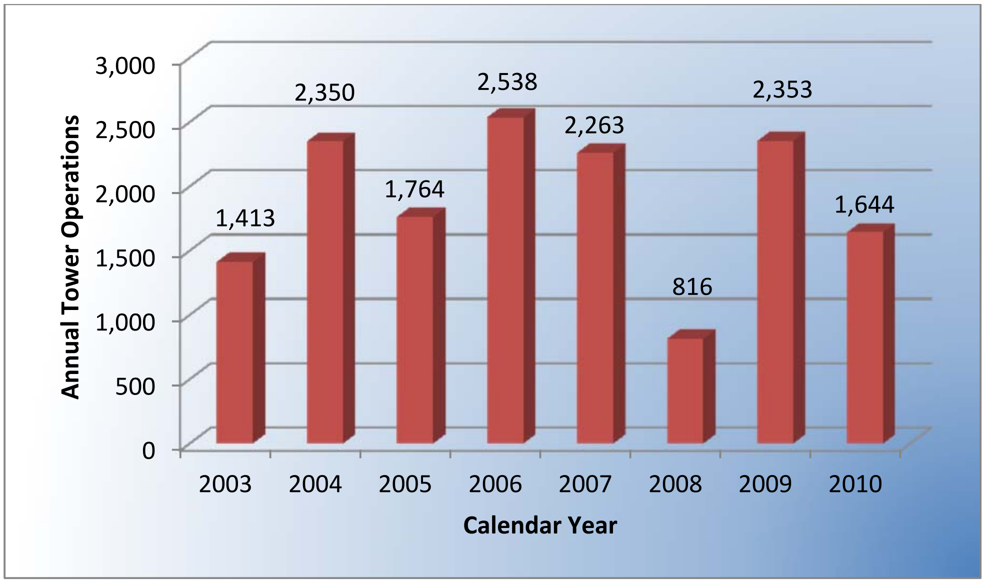

Figure 3-2 Historical Annual Tower Operations for MacDill AFB Auxiliary Airfield

3.1 Existing Airfield Conditions

The following sections detail modeled Existing scenario KAGR conditions in terms of annual flight operations (Section 3.1.1), runway and track utilization by aircraft type (Section 3.1.2), and the resulting estimated noise exposure contour maps (Section 3.1.3). Tables of annual flight operations, flight track distributions, and representative profile maps are verified through correspondence with the Range (Schultz 2013).

3.1.1 Existing Annual Airfield Flight Operations

The Existing year is considered CY2010 and 1,640 annual tower operations are included in the airfield modeling. The distribution of flight operations by aircraft and operation type provided and validated by APAFR (Schultz 2013) is given by Table 3-1. This analysis includes only fixed-wing arrivals and departures from Runway 05/23 and helicopter activity. Since the Range did not specify any, no pattern, overhead break arrivals, or pitch-out arrivals have been modeled in either the Existing or Prospective scenarios. Furthermore, no maintenance activity is modeled because no static run-up operations were reported by KAGR or APAFR during data collection.

Aircraft operations were categorized into four groups – Helicopters, Propeller Aircraft, Large Jets, and Fighter Jets. KAGR has been decertified for regular activity due to runway maintenance since 2007. Airfield operations are sanctioned for helicopter, cargo, and emergency operations only. Activity is dominated by helicopter and propeller aircraft operations, although a relatively small number of F-16 operations (16 annual operations) are included in the Existing scenario since these fighter jet operations were reported in the data collection and validated by the Range (MacLaughlin 2012; Schultz 2013). Note all propeller aircraft were simply modeled as the C-130H&N&P to provide a conservative noise estimate for those operations. Similarly, all OH-58 operations were modeled as an AH-1W SuperCobra. Due to noise data availability, the CH-47 is modeled as the CH-46E. All F-16 aircraft were modeled as the F-16C with the GE-100 engine.

Table 3-1 Annual Flight Operations at MacDill AFB Auxiliary Airfield for the Existing Scenario

Aircraft Type	Notes	Modeled Aircraft Type	Aircraft Group	Departure			Nonbreak Arrival			Total[1]		
				Day (0700 - 2200)	Night (2200 - 0700)	Total	Day (0700 - 2200)	Night (2200 - 0700)	Total	Day (0700 - 2200)	Night (2200 - 0700)	Total
AH1/UH1	2	AH-1W	Helo	83	4	87	83	4	87	166	8	**174**
CH-47	2	CH46E		30	11	41	30	11	41	60	22	**82**
CH-53	2	CH53E		11	-	11	11	-	11	22	-	**22**
H-60	2	SH60B		142	19	161	142	19	161	284	38	**322**
OH-58	2, 3	AH-1W		277	-	277	277	-	277	554	-	**554**
PC-12	4	C-130H&N&P	Prop	6	1	7	7	-	7	13	1	**14**
C-23	4			4	-	4	4	-	4	8	-	**8**
C-27	4			9	-	9	9	-	9	18	-	**18**
C-130				59	-	59	59	-	59	118	-	**118**
MC-130				4	-	4	4	-	4	8	-	**8**
C-182	4			3	-	3	3	-	3	6	-	**6**
C-208	4			-	1	1	1	-	1	1	1	**2**
Casa 212	4			5	-	5	5	-	5	10	-	**10**
Casa 235	4			1	-	1	1	-	1	2	-	**2**
Skymaster	4			4	4	8	4	4	8	8	8	**16**
AFSOC	4, 5			-	131	131	-	131	131	-	262	**262**
F-16	6	F-16C	Fighter Jet	8	-	8	8	-	8	16	-	**16**
C-9		C-9A	Large Jet	2	-	2	2	-	2	4	-	**4**
C-17		C-17		-	1	1	1	-	1	1	1	**2**
Subtotal by Modeled Aircraft Type												
		AH-1W	Helo	360	4	364	360	4	364	720	8	**728**
		CH46E		30	11	41	30	11	41	60	22	**82**
		CH53E		11	-	11	11	-	11	22	-	**22**
		SH60B		142	19	161	142	19	161	284	38	**322**
		C-130H&N&P	Prop	95	137	232	97	135	232	192	272	**464**
		F-16C	Fighter Jet	8	-	8	8	-	8	16	-	**16**
		C-9A	Large Jet	2	-	2	2	-	2	4	-	**4**
		C-17		-	1	1	1	-	1	1	1	**2**
Subtotal by Group												
			Helo	543	34	577	543	34	577	1,086	68	**1,154**
			Prop	95	137	232	97	135	232	192	272	**464**
			Fighter Jet	8	-	8	8	-	8	16	-	**16**
			Large Jet	2	1	3	3	-	3	5	1	**6**
Total	**7**			**648**	**172**	**820**	**651**	**169**	**820**	**1,299**	**341**	**1,640**

Notes:
(1) No Closed Pattern events (Touch and Go, GCA Box)
(2) Modeled in Rotorcraft Noise Model (RNM)
(3) Grouped as AH-1W ops for conservative and simplified modeling
(4) Propeller aircraft grouped as C-130 ops for conservative and simplified modeling
(5) Instructed by Base to Model as C-23
(6) All F-16 operations modeled with PW-220 engine.
(7) The total of 1,640 ops approximates Historical tower operations for CY2010

To illustrate the general distribution of airfield operations, Figure 3-3 portrays activity proportions by group according to tower events (left) and according to Equivalent Daily Events (EDE; right) by applying the DNL nighttime penalty to airfield operations occurring between 10:00 P.M. and 7:00 A.M. Figure 3-3 isolates the influence of number of total operations and distribution of DNL nighttime and daytime operations by aircraft group. EDE (as portrayed in Figure 3-3) does not consider the loudness of each aircraft or flight geometry, while the DNL results (Section 3.1.3) account for airfield noise by number of events, proportion of nighttime events, and the loudness of the aircraft relative to the ground.

Figure 3-3 demonstrates that a large proportion of propeller aircraft activity is modeled as occurring during the DNL nighttime hours. While helicopter activity contributes 70 percent of the annual tower operations, the DNL nighttime propeller events can be expected to contribute a greater amount to the noise than the helicopter events. This DNL nighttime activity is detailed by aircraft in Table 3-1. As a result of this DNL nighttime propeller activity, Figure 3-3 concludes the influence of propeller operations overall is much greater than helicopter operations. The quantification of contributors to the final noise contours is provided by the noise model analysis (Section 3.1.3), but Figure 3-3 provides an overview of overall airfield tempo.

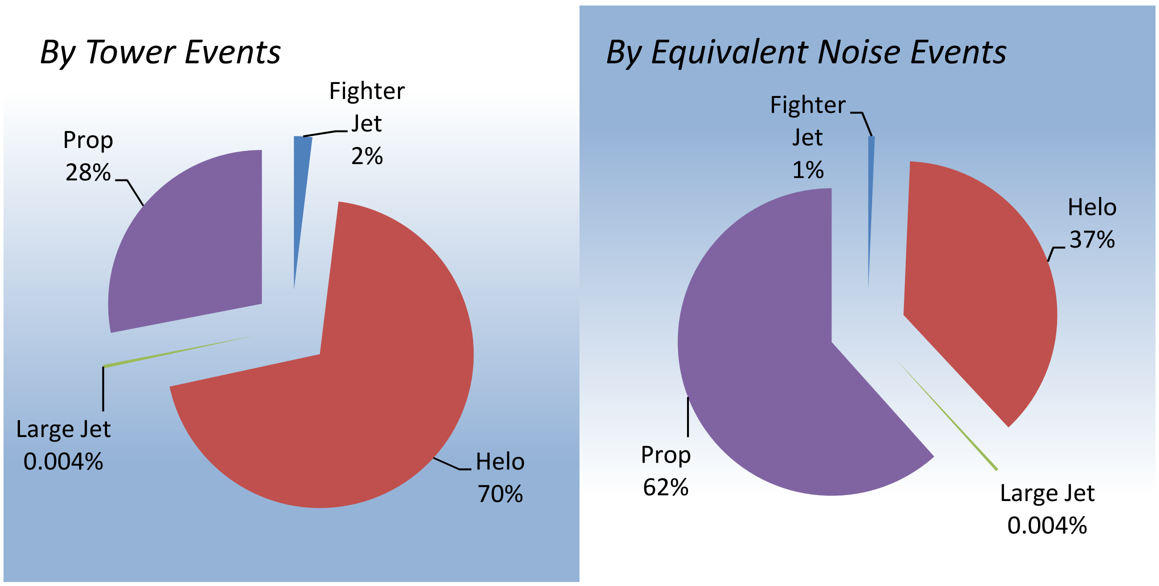

Figure 3-3 Distribution of Airfield Events by Aircraft Category for the Existing Scenario

3.1.2 Airfield Runway and Track Utilization

Table 3-2 contains the runway utilization percentages modeled for each aircraft group at KAGR. Fighters typically only use Runway 23 for departures and arrivals. Large Jets typically split their departures equally among Runways 05 and 23 while arrivals typically only use Runway 23. Most (70 percent) of Propeller operations utilize Runway 05 for departures and their remaining 30 percent of departures on Runway 23. All of the Propeller arrivals were modeled to Runway 23. Helicopters are discussed separately below.

Table 3-2 Modeled Runway and Flight Track Utilizations for Fighter Jet Operations at KAGR

Operation Type	Runway	Aircraft Category			
		Figher Jet	Large Jet	Propeller	Helicopter
Departure	5		50%	70%	
	Delta Ramp				100%
	23	100%	50%	30%	
Arrival	23	100%	100%	100%	
	Delta Ramp				100%

Table 3-3 Modeled Runway and Flight Track Utilizations for Large Jet Operations at KAGR

Operation Type	Runway	Flight Track ID	Flight Track Description	Aircraft Category: Fighter Jet	Large Jet	Propeller	Helicopter
Departure	5	05D1	Straight Out Departure				
		05D3	Departure to the North		100%	100%	
	Delta Ramp	14D01	Departure to North Conventional				33%
		14D02	Straight-out Departure to South Conventional				33%
		14D03	Departure to South Tactical				34%
	23	23D1	Departure to South	80%			
		23D3	Departure to MacDill AFB		33%	66%	
		23D4	Straight-Out Departure		34%	17%	
		23D5	Departure to Marion MOA		33%	17%	
		23D6	Departure to West	20%			
Arrival	23	23A1	Arrival from South	80%			
		23A4	Arrival from North	20%	100%	100%	
	Delta Ramp	32FA01	Arrival from North Conventional to Pad				33%
		32FA02	Arrival from South Conventional to Pad				33%
		32FA03	Arrival from South Tactical to Pad				34%

Tables 3-2 and 3-3 contain the flight track utilization percentages by runway modeled for each aircraft group. The tracks listed in the tables are illustrated in Figures 3-4 and 3-5. Most (80 percent) of Fighter operations are to/from the south (tracks 23D1/23A1). The remaining operations (20 percent) are to the west (departures; track 23D6) or from the north (arrivals; track 23A4). Departing Runway 05, Large Jets go to the north (track 05D3). Large Jet departures from Runway 23 are split evenly between departures to MacDill AFB (track 23D3), straight-out (track 23D4), or to the Marion MOA (track 23D5). Large Jet arrivals are typically only from the north (track 23A4). The Propeller aircraft departures from Runway 23 tend head towards MacDill AFB (Track 23D3) with some straight out departures (Track 23D4) and departures to the Marion MOA on Track 23D5.

Tables 3-2 and 3-3 describe the runway and track utilization percentages for the Helicopter group. Helicopter tracks depart from the Delta Ramp on Runway 14 and continue to training activity at North Conventional, South Conventional, and South Tactical Ranges on Tracks 14D01, 13D02, and 14D03, respectively. Track 14D01 departs the airfield with an initial northeast heading then heading towards North Conventional. The two departure tracks to the south include Track 14D02 with an eastern heading along Kissimmee Road and Track 14D03 heading southeast directly to South Tactical. Helicopter departure track utilization is modeled as an even split between the three aforementioned tracks. Helicopter arrival Tracks 32FA01, 32FA02, and 32FA03 are similarly distributed in three directions and terminate at the unarmed Helicopter FARRP pad.

For activity between the FARRP and the Delta Ramp, each helicopter departure also includes a special FARRP-Delta Ramp track segment. There are actually six landing areas along the Delta Ramp, which runs the length of Runway 14/32. This FARRP-Delta Ramp track segment is an approximation of helicopter activity during departure – in that a single track lands in the middle of the Delta Ramp rather than dispersion of tracks amongst the six locations. A continuous departure approximation would have the next departure phase beginning where Delta Ramp portion terminates. However, the next phase begins at the northwest end of the Delta Ramp, and therefore is not continuous. This approximation is a shortcoming of helicopter noise modeling trade-offs near an airfield – in reality, tracks are dispersed and not well defined in certain areas, but the model requires explicit line segments. This analysis uses the best available data at the time of execution. Note that helicopter noise exposure in terms of DNL is shown in later sections to be trivial compared to fixed-wing activity.

Representative flight profile information is available in Appendix A with detailed aircraft performance information such as altitude, speed, and power setting. While the airfield modeling consists of many additional profiles, the representative set is presented for brevity as this set includes those profiles which have the most operations for a particular aircraft and operation type. The representative flight profiles are spread to additional applicable flight tracks with minor adjustments for course rules as necessary. These flight profiles were reviewed and validated by Range personnel (Schultz 2013).

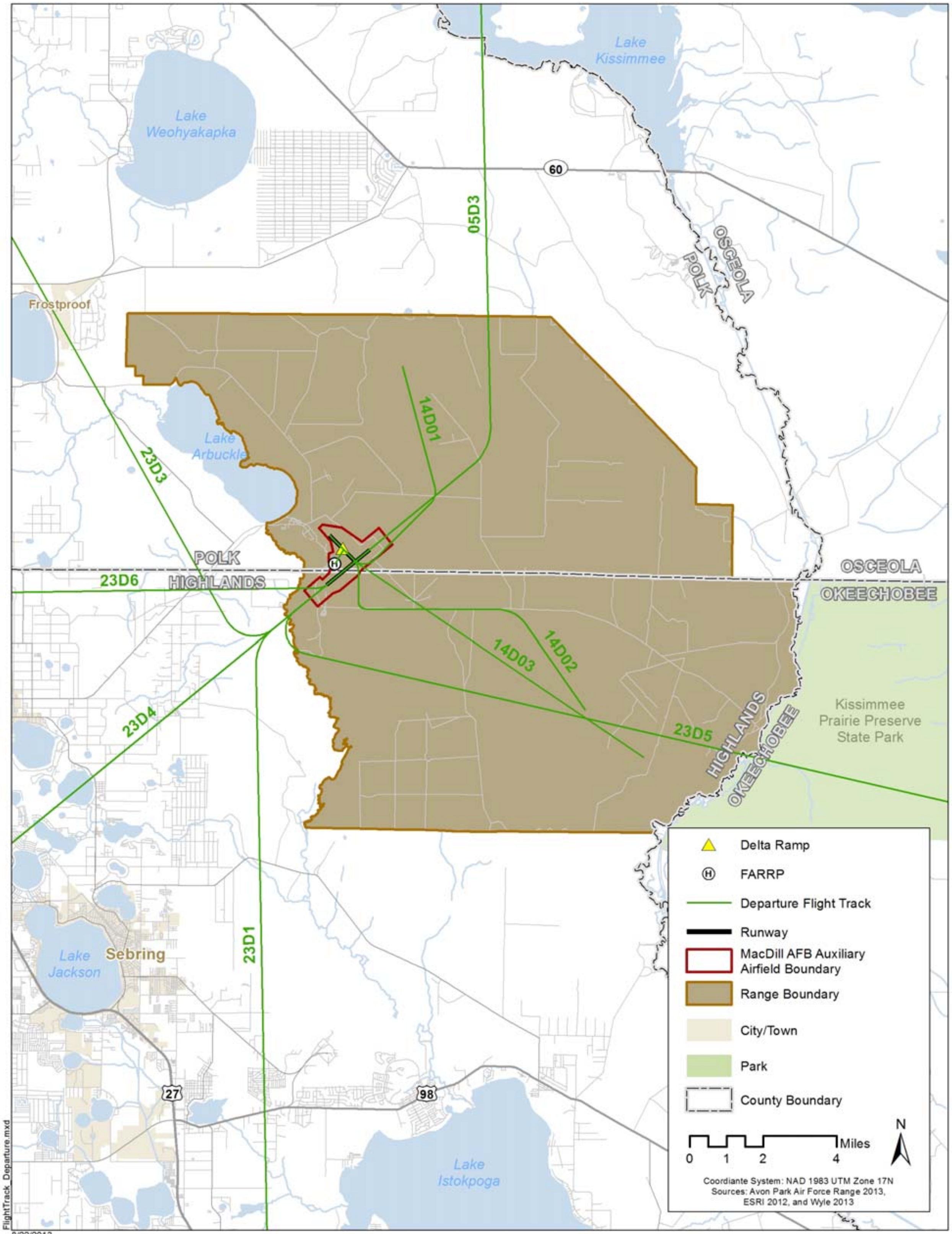

Figure 3-4 Modeled Average Busy Day Departure Flight Tracks

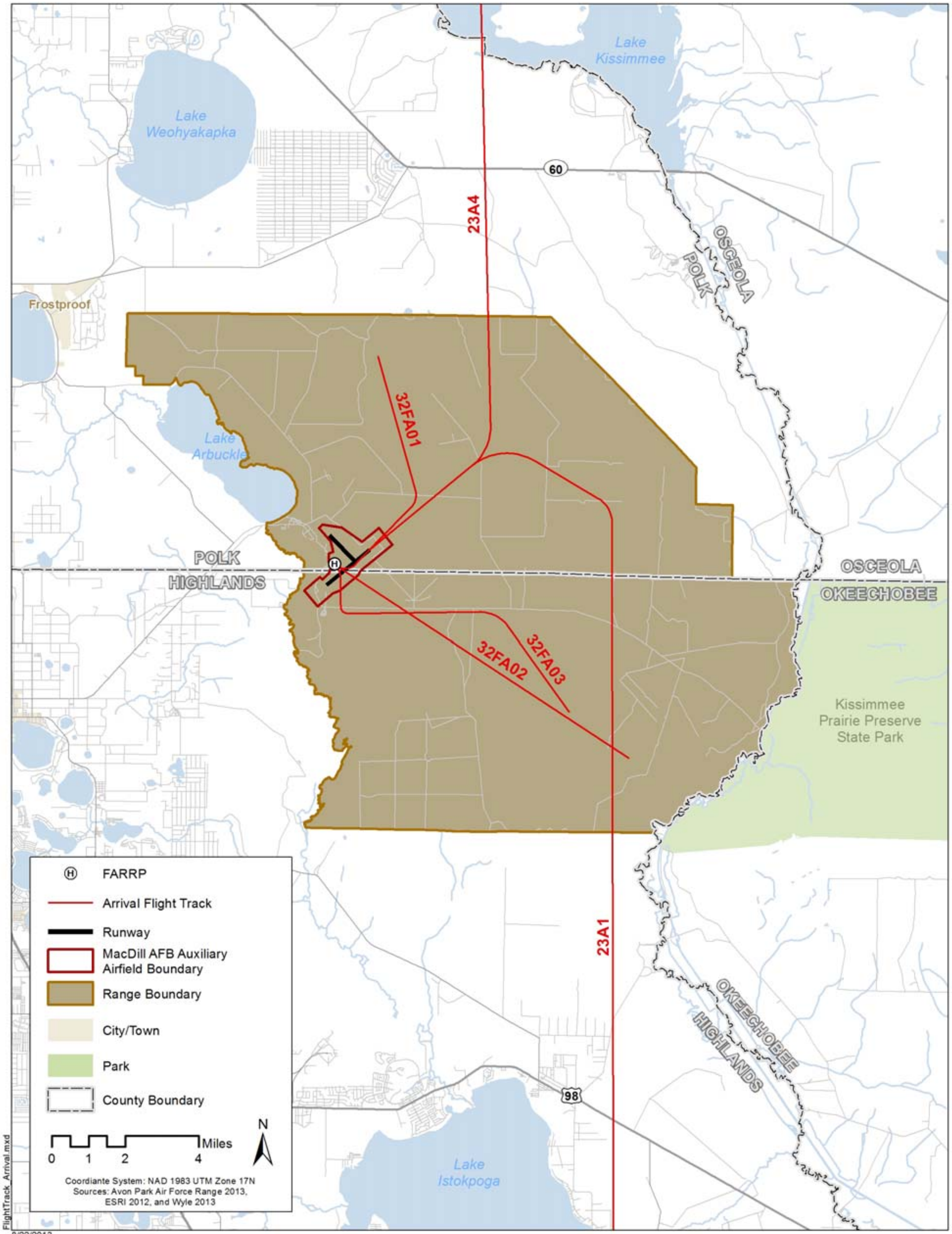

Figure 3-5 Modeled Average Busy Day Arrival Flight Tracks

3.1.3 Existing Airfield Noise Exposure

Using the data described in the sections 3.1.1 and 3.1.2, the NOISEMAP suite of programs was used to calculate and plot DNL for the existing ABD aircraft operations at KAGR. A map of estimated noise exposure in DNL is presented for KAGR in Figure 3-6. The 60 dBA DNL contour for the Existing scenario does not go beyond the APAFR boundary, so no official Noise Zones are outside the Range boundary for the Existing Scenario. In fact, Noise Zone II (DNL values between 65 – 70 dBA) extends only a small amount beyond the ends of the modeled Runway 05/23 (and appears to not extend past the paved runway, according to aerial imagery).

Figure 3-6 shows Noise Zone II essentially parallel to Runway 05/23 with a width of about 1,000 ft. The bulge to the southwest corresponds to the noise from start of take-off roll and the "ripples" to the northeast are due to some slightly varying terrain. While the terrain only varies by about 5 ft, flight profiles during departure roll are straight segments of constant MSL value, so small changes in terrain at this geometric scale can show up in the DNL contours, but can be considered negligible.

To the southwest and northeast, the 60 dBA contour threshold is dominated by C-130 departures from Runway 05 followed by C-130 arrivals to Runway 23. The dominant modeled helicopter type is the AH-1W, which contributes most to contours at FARRP location (arrivals) and at the Delta Ramp (departures). Although more annual events are modeled using the SH-60B airframe, the AH-1W has higher estimated single event noise energy and so fewer operations would account for more cumulative noise exposure. Helicopter arrivals to the FARRP location cause a bulge in the 60 dBA DNL contour line north of Runway 05/23 and south of the Delta Ramp, including a small Noise Zone II area near the FARRP location. Modeled helicopter departures originating from the northwest end of the Delta Ramp (Runway 14) cause a small area of 60 dBA DNL or greater.

Two areas of DNL greater than or equal to 75 dBA exist, corresponding to the Noise Zone III area of most severe noise impact. Noise Zone III areas in the Existing scenario can be neglected because they are located at the ends of the runways, only about 500 ft wide, and in the clear zone. It is not surprising to see since the two areas correspond to the locations of the start of take-off roll for departures – which includes the loudest typical engine power settings for aircraft on the ground for extended durations (for pre-flight static run-up noise).

Although airspace noise exposure is discussed in Section 4, it is noted here that combining aircraft noise exposure from the airfield (DNL) and airspace (L_{dnmr}) noise analyses has no effect on the Existing scenario 65 dBA DNL contours for KAGR.

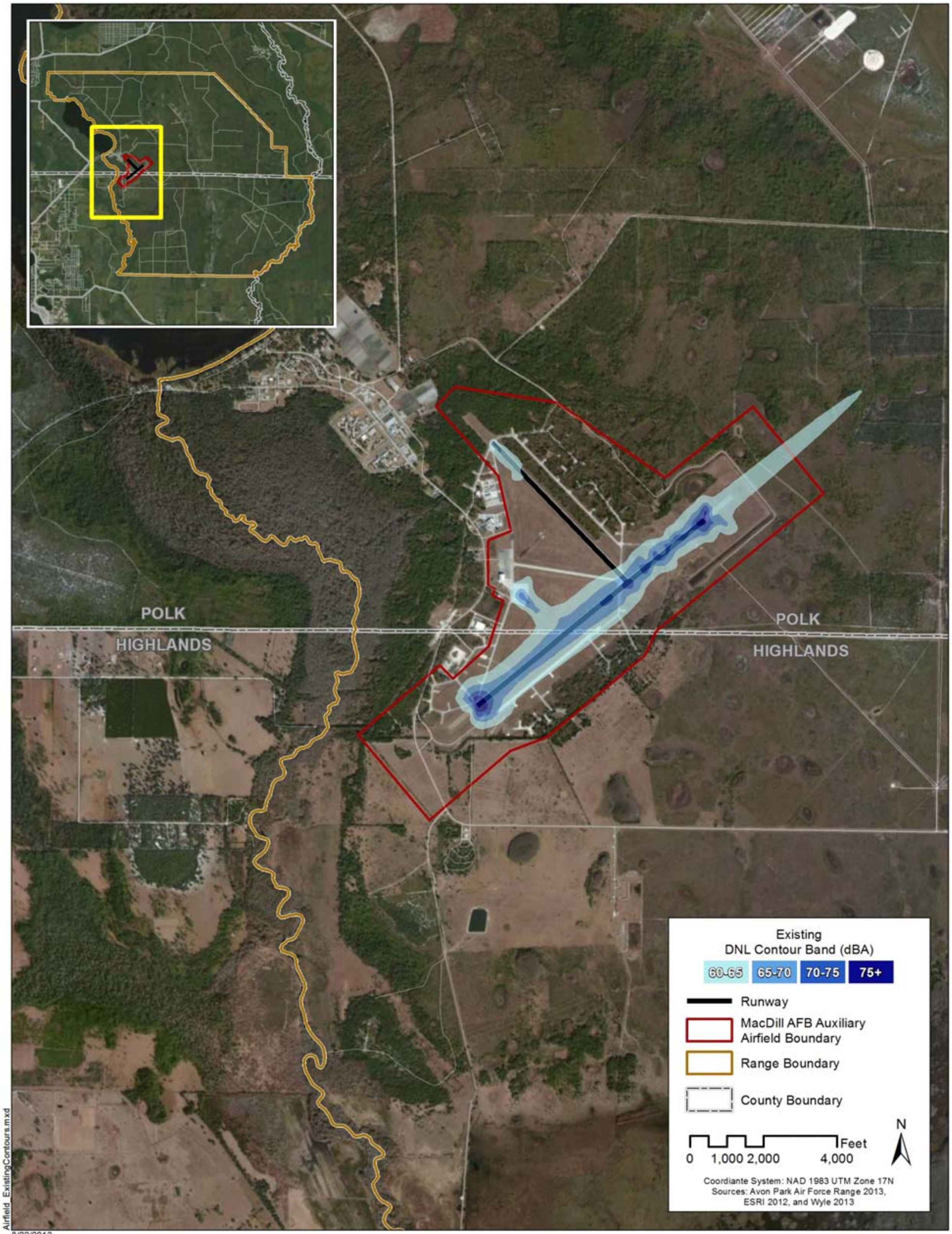

Figure 3-6 DNL Contour Bands for Existing (CY2010) Average Busy Day Aircraft Operations at MacDill AFB Auxiliary Airfield

3.2 Prospective Airfield Conditions

The following sections detail modeled Prospective scenario KAGR conditions in terms of annual flight operations (Section 3.2.1) and the resulting estimated noise exposure contour maps (Section 3.2.2). Runway and track utilization by aircraft type would remain the same as in the Existing scenario (refer to Section 3.1.2).

3.2.1 Prospective Annual Airfield Flight Operations

The prospective scenario is forecasted for CY2020. It is anticipated fighter operations would increase when the airfield is recertified and F-16 operations will be replaced with F-35 operations. The airfield officially closed in 2007, with the exception of emergency landings, cargo operations, and helicopters. It is anticipated the airfield will return to pre-closure annual numbers of operation similar to CY2006. The CY2006 total of 2,538 annual operations may be approximated (to within 1%) by multiplying the Existing operations for each aircraft by a factor of 1.5 and replacing the sixteen F-16 operations with a 100 annual operations for the F-35A. This results in 2,561 annual operations for the Prospective scenario, as indicated by Table 3-4. This methodology was agreed upon and validated by Range personnel (Schultz 2013).

Table 3-4 details the modeled Prospective annual operations by aircraft type. Proportionally the only change to the existing activity in terms of EDE would be an increase of fighter jet activity by 1% and a decrease of propeller aircraft activity by 1%. A pie-chart demonstrating the Prospective scenario EDE would look a lot like the right side of Figure 3-3. Figure 3-7 demonstrates the scaling of Prospective scenario annual operations relative to the Existing scenario, presented as both ratio and decibels. Note that due to only one C-17 departure in the Existing scenario, multiplying by the Prospective factor of 1.5 and rounding up to the nearest whole number (two departures) results in the overall factor of large jets to be 1.9 rather than 1.5. The replacement of F-16C events with 100 F-35A annual events results in the Prospective scenario factor for fighter jets equal to 3.9.

Modeling parameters such as runway utilization, flight tracks, and track utilization would remain the same as in the Existing scenario (Section 3.1.2). All profiles would be identical to those modeled for the Existing scenario, except F-16C profiles are replaced by F-35A profiles adapted from the "Karnes 3.1" F-35A representative flight profiles (Czech 2012). All F-35 operations were modeled as the F-35A variant. The F-35B or F-35C variants may also be introduced to KAGR in the future, but only the F-35A noise data have been collected and are used as the best available data for all three variants.

Table 3-4 Prospective CY2020 Annual Flight Operations at MacDill AFB Auxiliary Airfield

Aircraft Type	Notes	Modeled Aircraft Type	Aircraft Group	Departure			Nonbreak Arrival			Total[1]		
				Day (0700 - 2200)	Night (2200 - 0700)	Total	Day (0700 - 2200)	Night (2200 - 0700)	Total	Day (0700 - 2200)	Night (2200 - 0700)	Total
AH1/UH1	2	AH-1W	Helo	125	6	131	125	6	131	250	12	**262**
CH-47	2	CH46E		45	15	60	45	18	63	90	33	**123**
CH-53	2	CH53E		17	-	17	17	-	17	34	-	**34**
H-60	2	SH60B		213	29	242	213	29	242	426	58	**484**
OH-58	2, 3	AH-1W		416	-	416	416	-	416	832	-	**832**
PC-12	4	C-130H&N&P	Prop	9	2	11	11	-	11	20	2	**22**
C-23	4			6	-	6	6	-	6	12	-	**12**
C-27	4			14	-	14	14	-	14	28	-	**28**
C-130				89	-	89	89	-	89	178	-	**178**
MC-130				6	-	6	6	-	6	12	-	**12**
C-182	4			5	-	5	5	-	5	10	-	**10**
C-208	4			-	2	2	2	-	2	2	2	**4**
Casa 212	4			8	-	8	8	-	8	16	-	**16**
Casa 235	4			2	-	2	2	-	2	4	-	**4**
Skymaster	4			6	6	12	-	-	-	6	6	**12**
AFSOC	4, 5			-	197	197	-	197	197	-	394	**394**
F-16		F-16C	Fighter Jet	8	-	8	8	-	8	16	-	**16**
F-35	6	F-35A		50	-	50	50	-	50	100	-	**100**
C-9		C-9A	Large Jet	3	-	3	3	-	3	6	-	**6**
C-17		C-17		-	2	2	2	-	2	2	2	**4**
Subtotal by Modeled Aircraft Type												
		AH-1W	Helo	541	6	547	541	6	547	1,082	12	**1,094**
		CH46E		45	15	60	45	18	63	90	33	**123**
		CH53E		17	-	17	17	-	17	34	-	**34**
		SH60B		213	29	242	213	29	242	426	58	**484**
		C-130H&N&P	Prop	145	207	352	143	197	340	288	404	**692**
		F-16C	Fighter Jet	8	-	8	8	-	8	16	-	**16**
		F-35A		50	-	50	50	-	50	100	-	**100**
		C-9A	Large Jet	3	-	3	3	-	3	6	-	**6**
		C-17		-	2	2	2	-	2	2	2	**4**
Subtotal by Group												
			Helo	816	50	866	816	53	869	1,632	103	**1,735**
			Prop	145	207	352	143	197	340	288	404	**692**
			Fighter Jet	58	-	58	58	-	58	116	-	**116**
			Large Jet	3	2	5	5	-	5	8	2	**10**
Total	**7**			**1,022**	**259**	**1,281**	**1,022**	**250**	**1,272**	**2,044**	**509**	**2,553**

Notes:
(1) No Closed Pattern events (Touch and Go, GCA Box)
(2) Modeled in Rotorcraft Noise Model (RNM)
(3) Grouped as AH-1W ops for conservative and simplified modeling
(4) Propeller aircraft grouped as C-130 ops for conservative and simplified modeling
(5) Instructed by Base to Model as C-23
(6) F-35 replaces F-16 and a nominal 100 annual operations are included for the Prospective scenario. Modeled with F-35A acoustic data.
(7) Existing scenario operations are multiplied by 1.5 (then rounded) so total is within 1% of CY2006 Annual Operations, since the airfield is expected to recertify and resume to pre-closure numbers (i.e. CY2006).

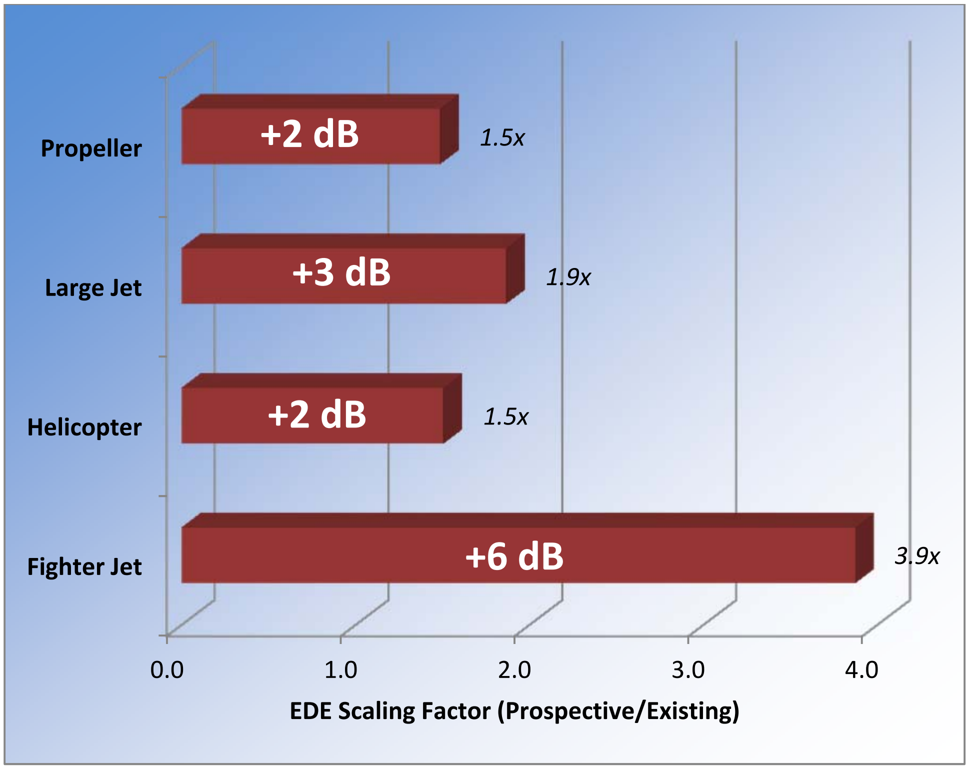

Figure 3-7 Airfield Activity Scaling Factors for Prospective Scenario by Aircraft Group

3.2.2 Prospective Airfield Noise Exposure

Using the data described in the section 3.2.1, the NOISEMAP suite of programs was used to calculate and plot DNL for the prospective ABD aircraft operations at KAGR. Figure 3-8 provides a detailed illustration of the Prospective scenario DNL contours, while Figure 3-9 compares the 65 dBA DNL contour lines to the Existing scenario. As expected, the increase in Prospective scenario activity would contribute to a DNL increase of at least 2 dB at all locations. Locations dominated by fighter jet aircraft would show increases of at least 6 dB, especially to where the 60-65 dBA DNL contour band pointing to the southwest would be dominated by F-35A departures from Runway 23. Compared to the Existing scenario, the Prospective scenario 65 dBA DNL contour would extend 3,300 ft further off Runway 23 (to the southwest) and 2,300 ft further to the northeast (off Runway 05). Even so, Noise Zone II would remain within the Range boundary for the Prospective scenario.

The F-35A dominates the southwest DNL. The bulge in the 60 dBA DNL contour north of this region (closest to the Range boundary) would be a result of an increase in fighter jet aircraft departures using Track ID 23D6, which would depart from Runway 23 and head west rather than southwest. Near this bulge, increases in DNL relative to the Existing scenario of up to 8 dB would be present, due to the added F-35A operations.

The contours extending off the main runway to the northeast would be dominated by C-130 departures from Runway 05 and C-130 arrivals to Runway 23. In this northeast region, DNL increases relative to the

Existing scenario would be only about 2 dB because DNL contours would be dominated by propeller aircraft operating in the area.

Due to the overall increase in activity, helicopter noise contributions to the Prospective scenario would be visible in the region of greater than 60 dBA DNL connecting the FARRP and Delta Ramps (as seen in Figure 3-8). Recall this activity is modeled as a straight line whereas in reality helicopter activity would be dispersed throughout the area. As such, the emergence of the 60 dBA DNL contour connecting the FARRP and Delta Ramp can be neglected because a) DNL values would be less due to dispersion, and b) the entire area is in Noise Zone I anyways (less than 65 dBA DNL). Similarly to the Existing scenario, noise contours near the FARRP and Delta Ramps would be dominated by helicopter activity modeled as the AH-1W.

Although airspace noise exposure is discussed in Section 4, it is noted here that combining aircraft noise exposure from the airfield (DNL) and airspace (L_{dnmr}) noise analyses has no effect on the Prospective scenario 65 dBA DNL contours for KAGR.

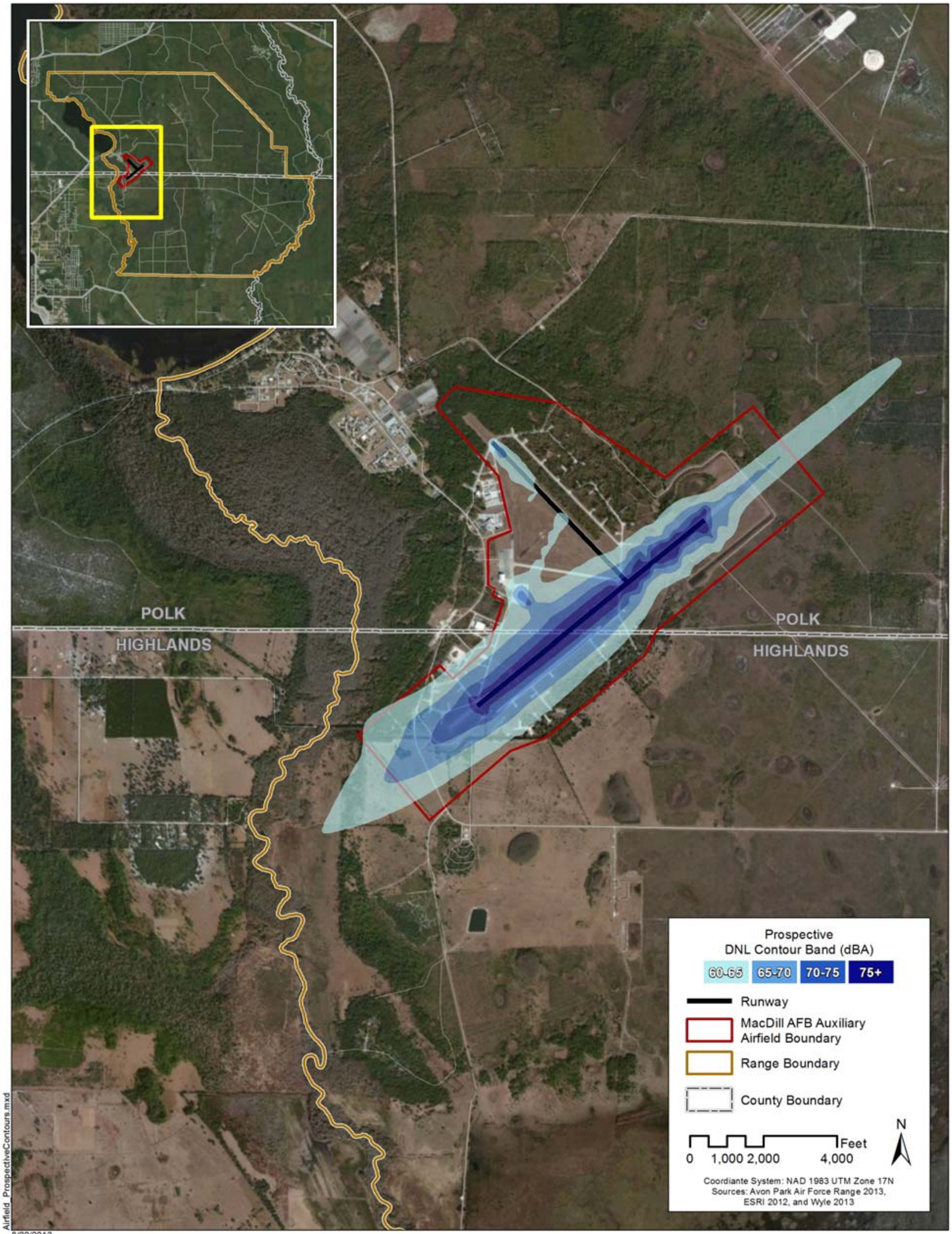

Figure 3-8 DNL Contour Bands for Prospective (CY2020) Average Busy Day Aircraft Operations at MacDill AFB Auxiliary Airfield

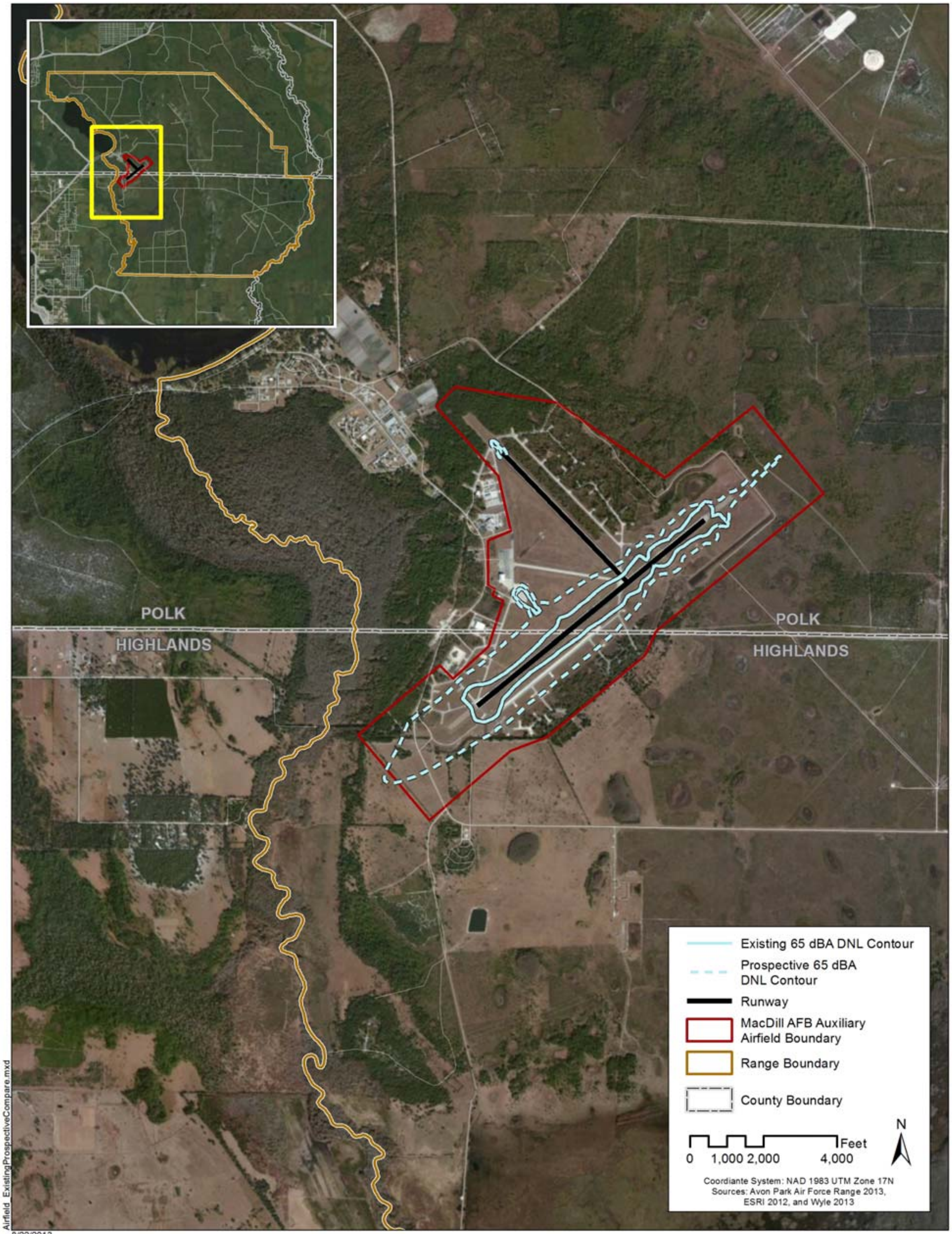

Figure 3-9 Comparison of Existing and Prospective 65 dB DNL Contour Bands

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SECTION 4

Special Use Airspace Noise Analysis

This section provides an overview of the defined APAFR Special Use Airspace (SUA). Section 4.1 describes the modeled airspace activity areas, followed by a detailed account of modeled missions in Section 4.2. Section 4.3 describes the airspace noise exposure levels in terms of the L_{dnmr} metric. For brevity, Existing and Prospective airspace noise activity and resulting noise exposure is presented together. No tempo changes would occur relative to the Existing scenario, so the Prospective table of modeled activity simply describes the two F-35A mission profiles that replace the F-16C.

No noise contours are presented for airspace noise activity since all geographical regions remain in Noise Zone I. Tables of selected results are provided to demonstrate the influence of different aircraft in different geographical regions.

The specifications of APAFR Special Use Airspace (SUA) are shown in Table 4-1. The middle section of the table graphically depicts the vertical dimensions of the SUAs and their overlap (or lack thereof), converting all altitudes to MSL. This is valid approximation because most of the vicinity has elevation of 100 ft or less. Three maps to illustrate the APAFR SUA and its vicinity are shown in Figures 4-1 through 4-4. Restricted airspace area R-2901 includes parts R-2901A through R-2901N and Military Operating Areas (MOA) include Avon East, Avon North, Avon South, Bassinger, Lake Placid (East, North, and West), and Marian. This complex is set in well-defined geographic areas made up of land areas and multiple SUA used for training operations, research, development, test and evaluation of military hardware, personnel, munitions, aircraft, and electronic countermeasures. It is critical to Air Force aviation training that APAFR be protected from encroachment that could restrict air operations, including the ability to fly sorties with live ordnance at all times of day or night.

Figure 4-3 also indicates the general location of possible flights entering the APAFR from low-level Military Training Routes (MTR). According to APAFR, these flights are infrequent and occur less than one time per month. While Figure 4-3 acknowledges these flights could exist, the impact of only one operation per month is trivial relative to the activity otherwise modeled in the Range and described herein. Therefore, the noise analysis does not include any MTR noise events.

Table 4-1 Avon Park Special Use Airspace Information and Floor/Ceiling Matrix

	Name	Airspace Floor (ft MSL)[1]	Airspace Ceiling (ft MSL)[1]	0 - 100 ft	100 - 300 ft	300 - 500 ft	500 - 1000 ft	1000 - 1500 ft	1500 - 3000 ft	3000 - 4000 ft	4000 - 5000 ft	5000 - 7000 ft	7000 - 10000 ft	10000-14000 ft	14000 - 18000 ft	18000 - 23000 ft	23000 - 31000 ft	31000 - 40000 ft	Notes
Military Operating Areas (MOA)	Avon East	500	40,000																14,000 feet MSL To but not including FL 180 / AVON EAST MOA/ATCAA 500-FL 400
	Avon North	4,000	40,000																4000-FL 400
	Avon South	4,000	40,000																4000-FL 400
	Basinger	500	5,000																500 - 5000
	Basinger Hi	5,000	40,000																5000 - FL 400
	Lake Placid E.	7,000	40,000																7000 - FL 400
	Lake Placid N.	7,000	40,000																7000 - FL 400
	Lake Placid W.	7,000	40,000																7000 - FL 400 / Normal Use Alt 7000 - 15000
	Marian	500	5,000																
Restricted Areas	R-2901A/B	-	18,000																SFC - 180
	R-2901A	-	14,000																SFC - 14000
	R-2901B	14,000	18,000																14,000 feet MSL To but not including FL 180.
	R-2901C	-	14,000																SFC - 14000
	R-2901D East	500	4,000																500 - 4,000 east of long. 81°21′00″ W
	R-2901D West	1,000	4,000																1,000 - 4,000 west of long. 81°21′00″ W.
	R-2901E	1,000	4,000																
	R-2901F	4,000	5,000																
	R-2901G	-	5,000																SFC - 5000 (amended)
	R-2901H	1,000	4,000																
	R-2901I	1,500	4,000																
	R-2901J	18,000	23,000																FL 180 To but not including FL 230
	R-2901K	23,000	31,000																FL 230 To but not including FL 310
	R-2901L	31,000	40,000																FL 310 To FL 400
	R-2901M	4,000	14,000																4,000 feet MSL To but not including 14,000 feet MSL
	R-2901N North	5,000	14,000																5,000 feet MSL To but not including 14,000 feet MSL north of a line
	R-2901N South	4,000	14,000																4,000 feet MSL To but not including 14,000 feet MSL south of that line

Notes:
1. MSL values relative to 68 ft modeled ground elevation. Altitutes 500 ft and below considered AGL.
Updated 3/5/2013 with modified floor / ceiling heights per Range SHP files and Amended definitions.
Source: Federal Register

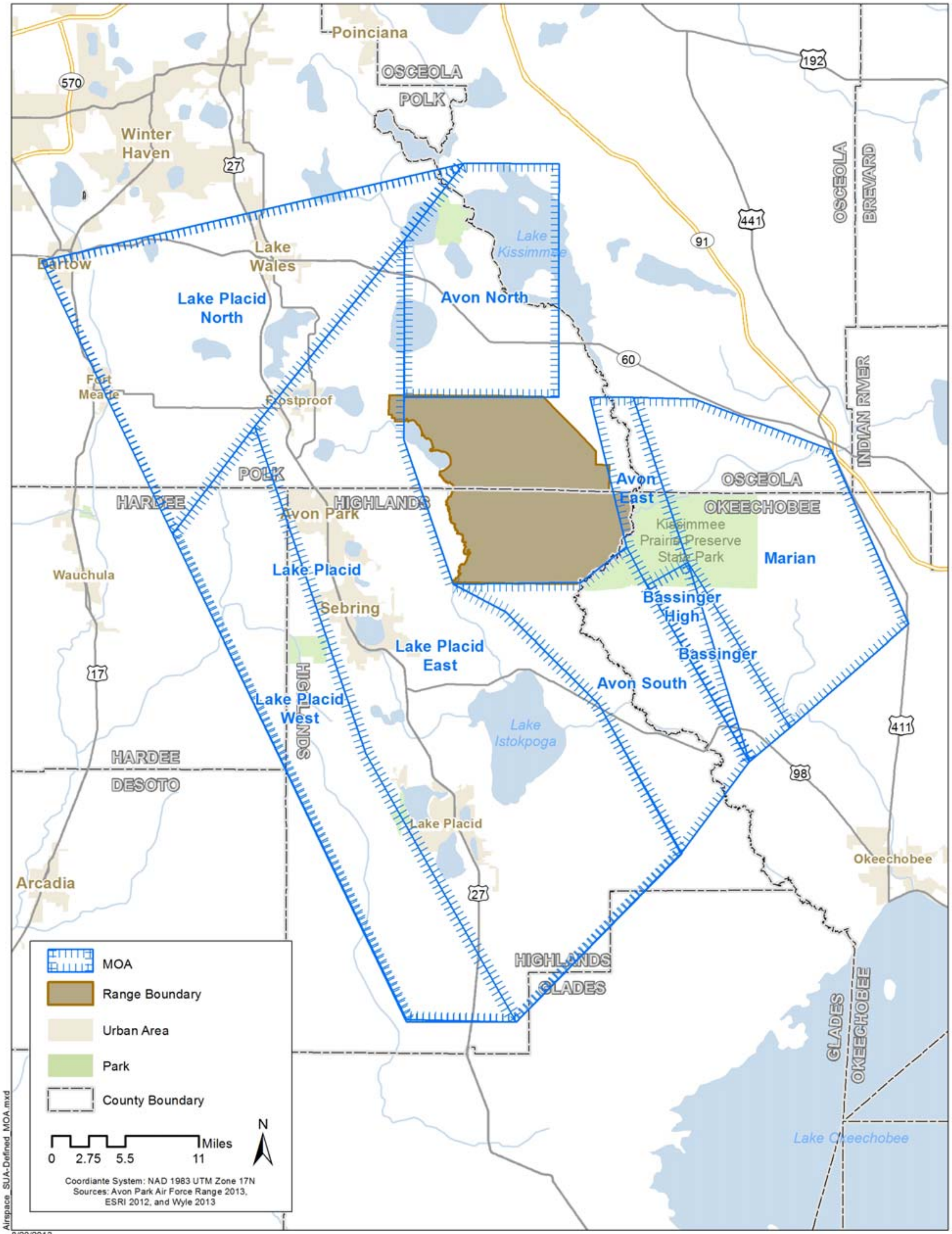

Figure 4-1 MOAs Associated with APAFR

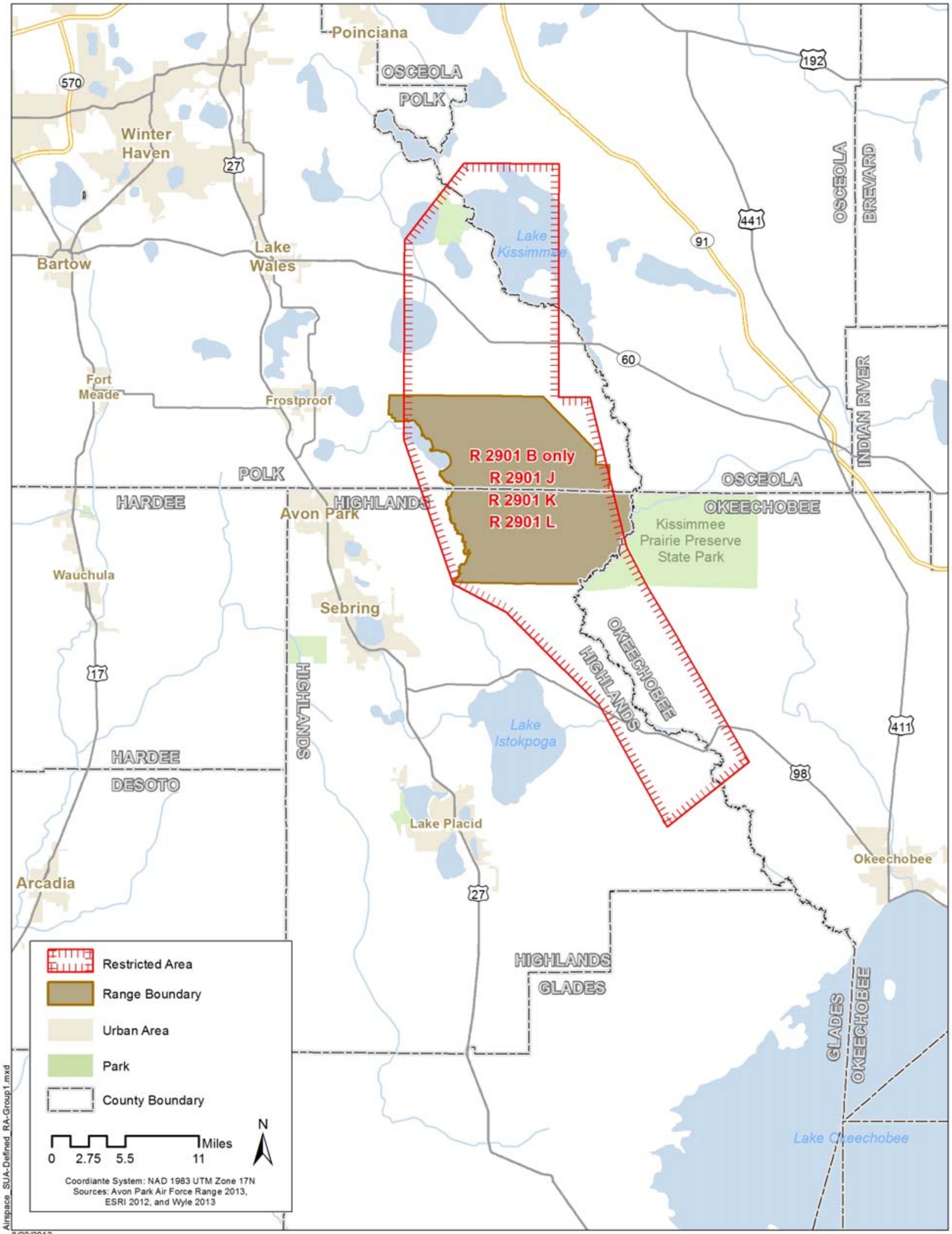

Figure 4-2 Restricted Areas Associated with APAFR (Group 1 of 3)

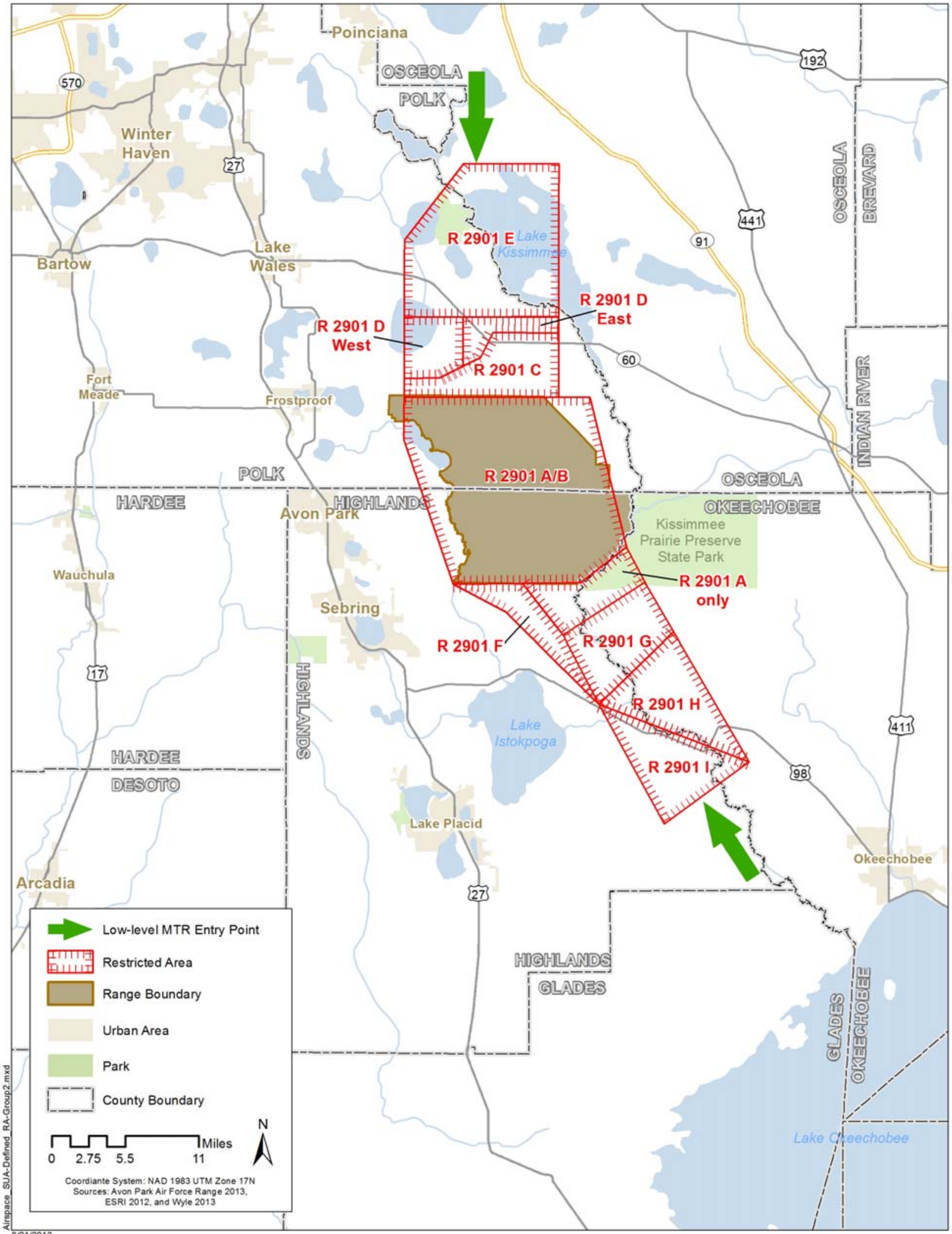

Figure 4-3 Restricted Areas Associated with APAFR (Group 2 of 3)

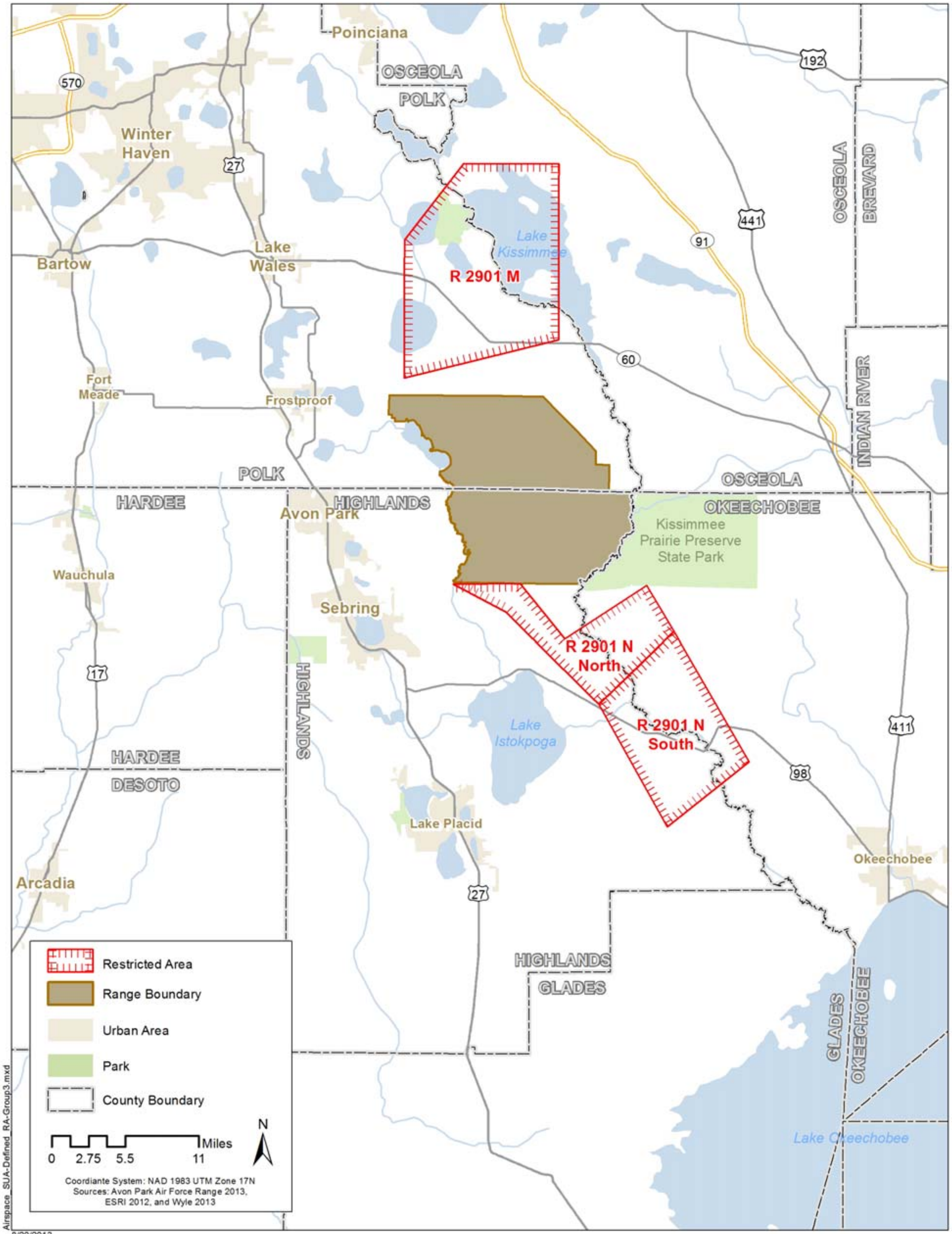

Figure 4-4 Restricted Areas Associated with APAFR (Group 3 of 3)

4.1 APAFR Special Use Airspace Operations

Due to variability in typical airspace range schedule tempos, DOD policy specifies airspace noise be evaluated for the busiest month of activity over the course of a year. For APAFR, Range personnel identified the "Jaded Thunder" Large Force Exercise as the busiest time of the year. The Range provided about six weeks of scheduling data corresponding to the timeframe of the Jaded Thunder exercise occurring sometime between March 27, and May 6, 2012 (Briley 2012). This data provides scheduled unit, aircraft type, number of aircraft, and duration of activity by nominal geographical area.

Resultant busiest month sorties and aircraft hours for each aircraft group and/or modeled aircraft type are listed in Table 4-2. The term "aircraft sortie" is used to describe a single aircraft taking off, conducting an activity, and then returning. Multiple operations or mission events can be conducted within one aircraft sortie. One example would be multiple bombing target passes conducted during a single sortie. The busiest month demonstrates 473 sorties or 736 flying hours in the Range.

Both H-65 Dolphin and HH-60 Blackhawk activity is reported in the notional Jaded Thunder schedule data provided. Since only the UH-60A noise data have been collected, all H-65 and HH-60 activity is modeled as the UH-60A. The substitution of the UH-60A noise data for the H-65 is conservative, in that noise levels would be over-estimated, but may be neglected since the HH-60 activity levels are more than six-times the activity levels of the H-65 (according to scheduling data provided by the Range). All propeller activity, including reconnaissance and airdrop missions, is modeled as the C-130H&N&P – consistent with the airfield modeling. It was decided because the busiest month did not include OH-58D, AH-64, and CH-47, these helicopters are not modeled. Modeling "F-18" schedule entries as the FA-18E/F Super Hornet ensures a conservative noise estimate. Range schedules report F-18 activity consists of 12.5 aircraft-hours total (about one hour per sortie; modeled as FA-18E/F). A-10 activity was not present in the provided schedules, but is modeled in addition to the busy month data to ensure a defensible analysis. A-10 activity is assumed to be about on the order of the FA-18E/F airspace activity in terms of total aircraft-hours, according to estimates by the Range. Other modeled fighter/attack aircraft include the F-16C. Transport activity includes C-17 and C-130 aircraft operations. Tankers utilizing the Crystal Air Refueling track[4] are modeled as the KC-135R, and the bomber activity is modeled with the B-2A, per scheduling data.

An overview of airspace activity is illustrated in Figure 4-5 as proportion of total aircraft-hours, which is the average sortie duration multiplied by the number of busy month sorties. Figure 4-5 shows modeled airspace activity is dominated by F-16C aircraft with more than half of all airspace activity (for analysis, all "F-16" entries in the range data are modeled as the F-16C with the GE-100 engine). The majority of Jaded Thunder activity in the schedules is for the F-16C – 372.5 aircraft-hours total (283 sorties/aircraft, 1.3 hours per mission, or 51% of all activity). Modeled airspace activity from the A-10 and FA-18E/F aircraft is considerably less than for the F-16C, with each contributing to only about 2% of total airspace activity for a total of only 28.5 aircraft-hours.

Table 4-2 also shows the flying duration by each modeled aircraft type by 'activity area' and mission. The activity areas and missions are described in Section 4.2.

[4] The track is not explicitly modeled but refueling operations are modeled as described in Section 4.2.

Table 4-2 Modeled Airspace Activity

Group	Modeled Aircraft Type	Note	Busy Month Sorties (Number of aircraft)	Sum of Aircraft Hours (by Sortie)	Mission ID	Activity Area Name	Aircraft Hours (by Mission)	Average Aircraft Duration per Mission (hrs)
Helicopters	UH60A	1,2	84	179.0	1	H_West	89.5	1.1
					2	H_Transit	44.8	0.5
					3	H_East (AAR)	44.8	0.5
Fighter/ Attack Jets	F-16C		283	372.5	4a	F_Holding	93.1	0.3
					5a	F_East_Plus_West	279.4	1.0
	FA-18E/F		12	12.5	6	F_Holding	2.0	0.2
					7	F_East_Plus_West	10.5	0.9
	A-10A	4	12	16.0	8	F_Holding_Plus_East	4.0	0.3
					9	F_East_Plus_West	12.0	1.0
Propellers	C-130H&N&P	5	50	81.0	10	Cargo/Prop	81.0	1.6
Large Jets	C-17		17	39.0	11	Cargo/Prop	39.0	2.3
Tankers	KC-135R		9	20.0	12	Tanker	20.0	2.2
Bombers	B-2A		6	16.0	13	Bomber	16.0	1.3
		Total	473	736			736	
For Prospective Scenario, replace F-16C activity in Existing scenario with the following F-35A data.								
Fighter /Attack Jets	F-35A		283	372.0	4b	F_Holding	93	0.3
					5b	F_East_Plus_West	279	1.0

Notes:

(1) H-65 and HH-60 modeled as UH-60A; Assume 50% total helicopter activity is low/near the base and 25% is Transit and 25% is AAR Activity.

(2) UH60 is assumed to be loaded (heavy) for activity (as opposed to light).

(3) Nominal average power/speed assumptions approved by range personnel.

(4) A-10 activity added in addition to range scheduling data per data validation response.

(5) All props (C-130, Casa 235, Cessna 172, Cessna 208, O-2, C-27 and C-130) modeled as C-130H&N&P due to lack of noise data (a conservative choice).

All events occur during DNL daytime (0700-2200) hours.

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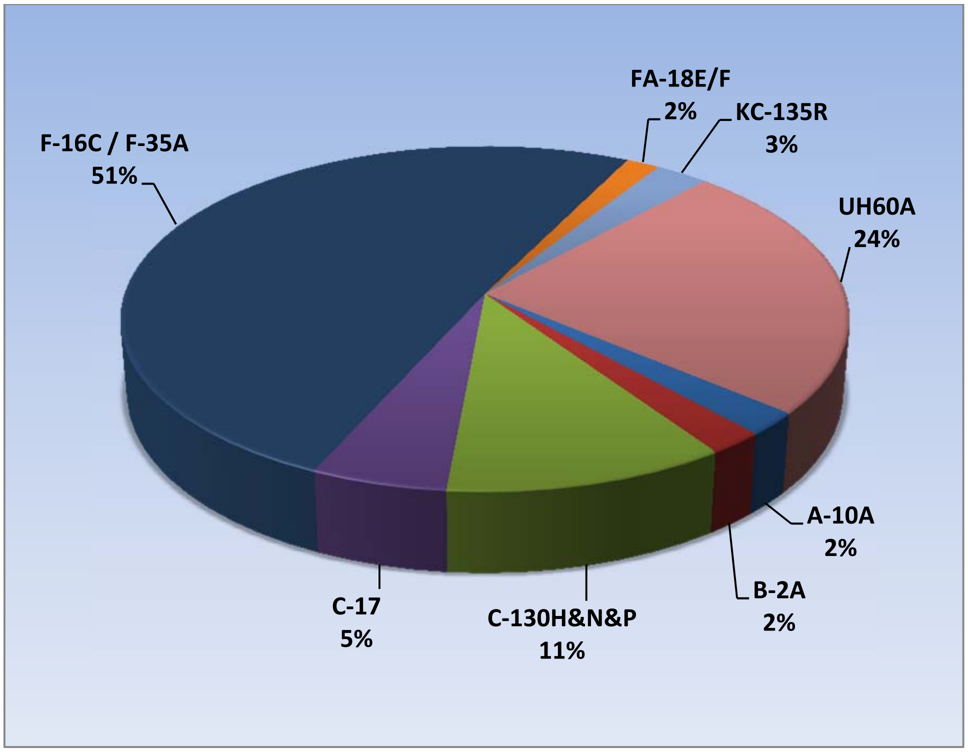

Figure 4-5 Modeled Airspace Utilization According To Total Aircraft Hours

4.2 APAFR Special Use Airspace Activity Areas

Generally, airspace activity can be split amongst four categories (below), and each category has at least one "airspace activity area" within designated airspace boundaries. These activity areas were defined by APAFR personnel during the data collection process by outlining appropriate areas of activity on a map (using a marker) for each Jaded Thunder aircraft mission scenario. Wyle compiled the geographical data into areas appropriate for airspace noise modeling and confirmed the digital representation of the geographical areas with the Range during the data validation process (Schultz 2013). The four categories include:

1. Fighter/attack (Figure 4-6),
2. Cargo/transport/propeller (Figure 4-7; "cargo/prop" for short),
3. Helicopter (Figure 4-8), and
4. High altitude tanker/bomber aircraft (Figure 4-9).

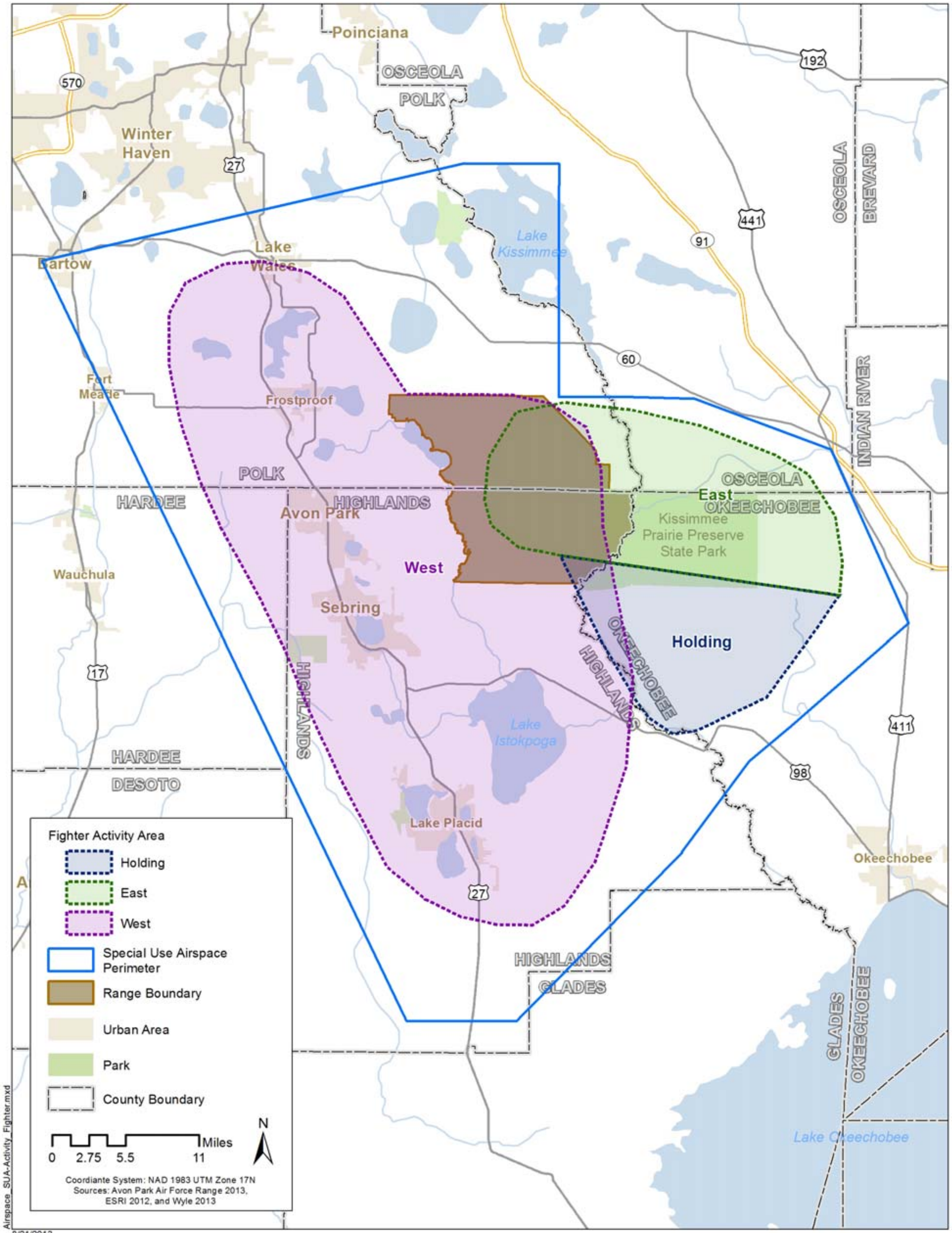

Figure 4-6 Fighter/Attack Airspace Activity Areas

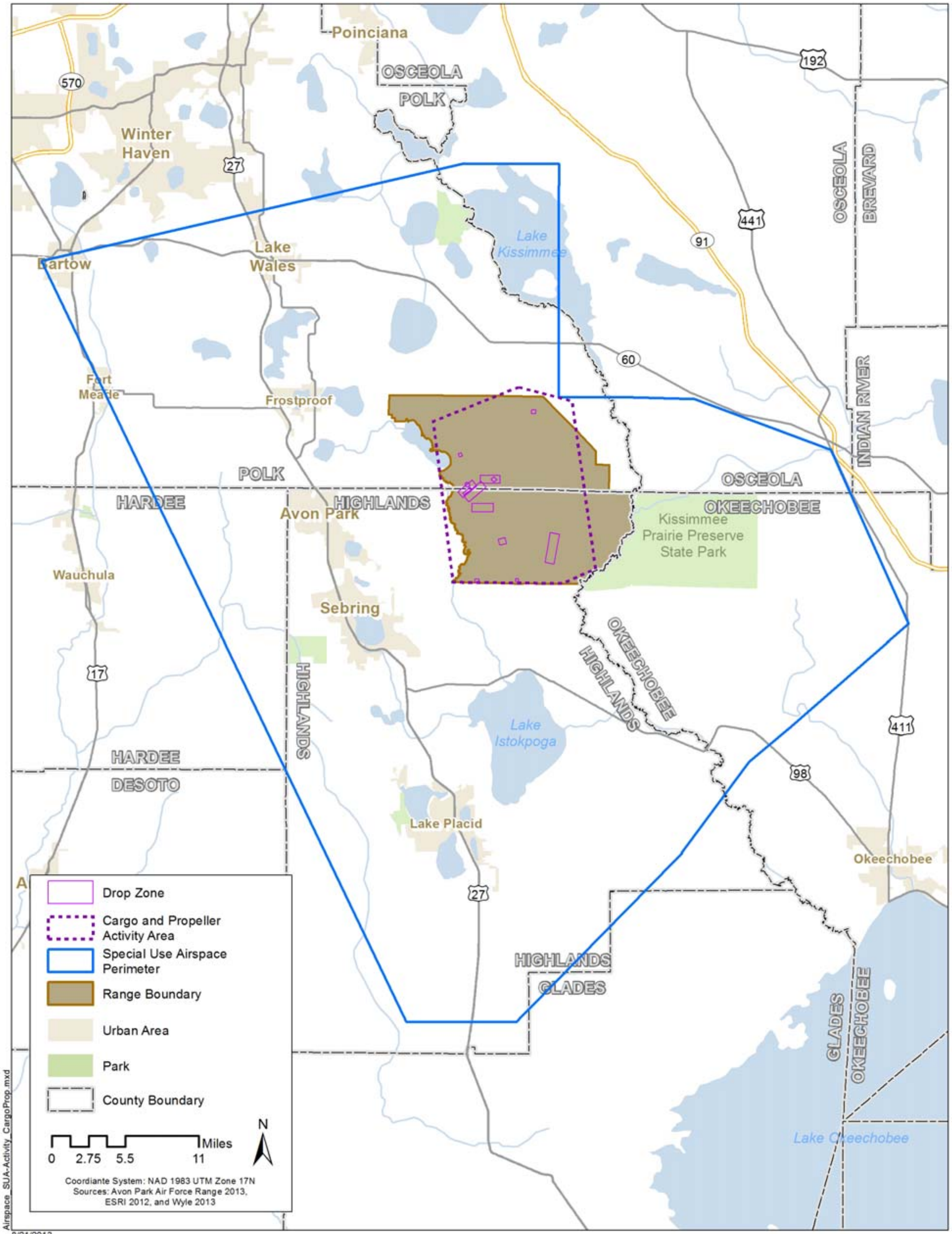

Figure 4-7 Cargo/Prop Aircraft Airspace Activity Areas

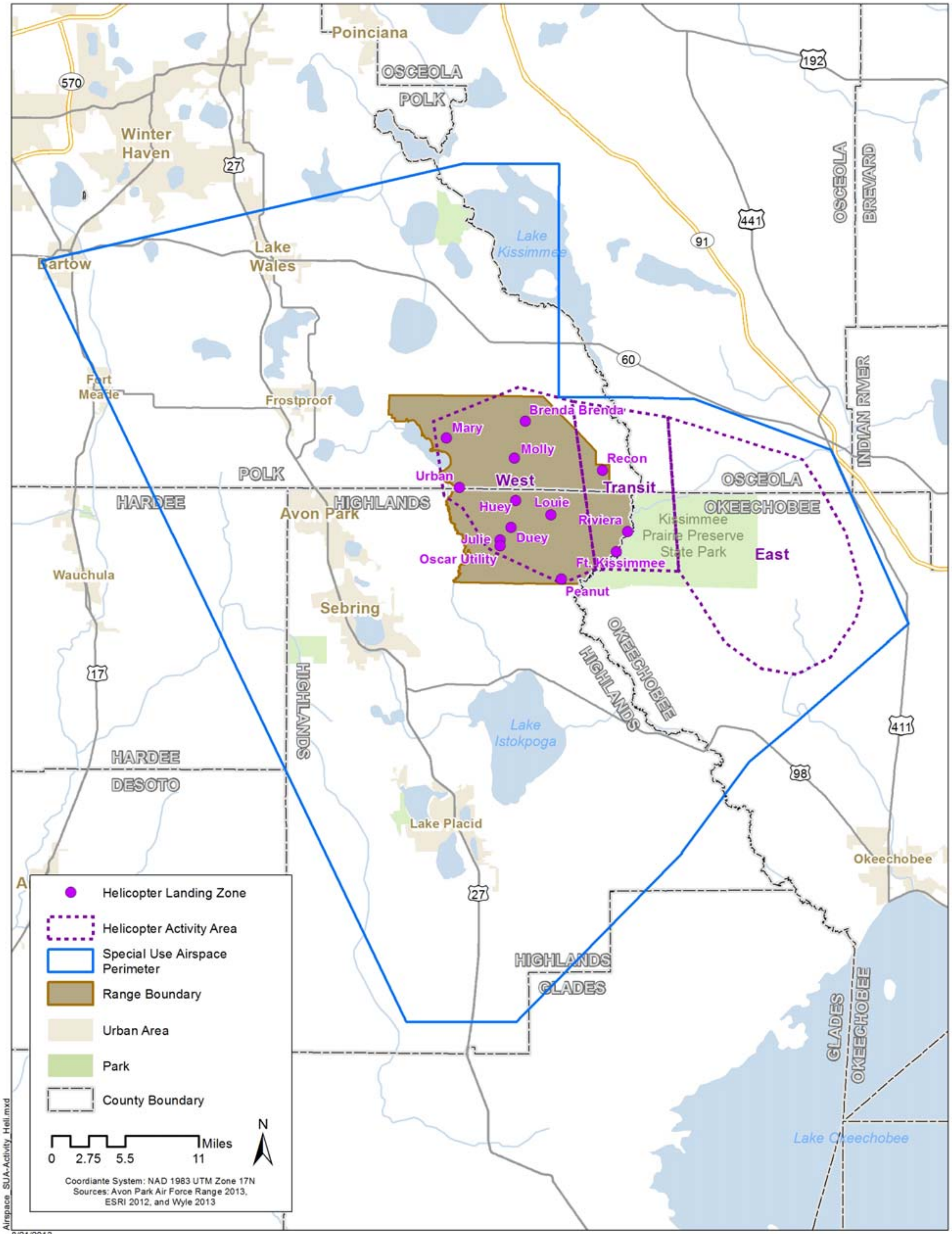

Figure 4-8 Helicopter Aircraft Airspace Activity Areas

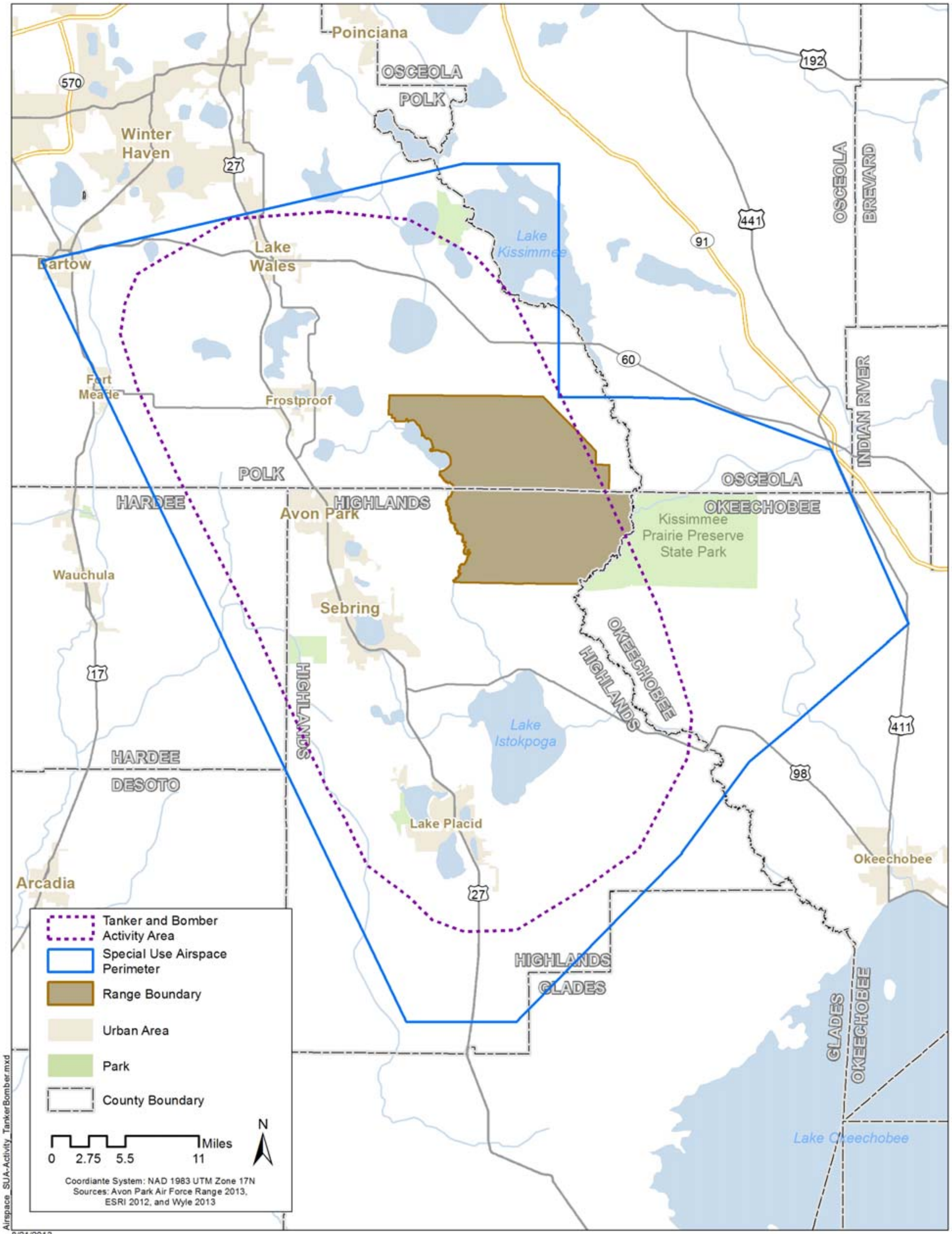

Figure 4-9 Tanker/Bomber Aircraft Airspace Activity Areas

Table 4-3 lists the vertical dimensions of the modeled activity areas. These altitudes comply with the defined boundaries of the associated MOAs and Restricted Areas in Table 4-1.

Table 4-3 Vertical Limits of Modeled Activity Areas

Mission Index	Activity Area Name	Floor (ft MSL)[1]	Ceiling (ft MSL)[1]
1	H_West	Surface	400
2	H_Transit	400	1,000
3	H_East (AAR)	1,000	4,000
4a/b	F_Holding	500	5,000
5a/b	F_East_Plus_West	500	24,000
6	F_Holding	1,500	5,000
7	F_East_Plus_West	1,500	24,000
8	F_Holding_Plus_East	300	5,000
9	F_East_Plus_West	1,500	20,000
10	Cargo/Prop	500	14,000
11	Cargo/Prop	500	14,000
12	Tanker	20,000	24,000
13	Bomber	40,000	41,000

Notes:
1. MSL values relative to 68 ft modeled flat ground.
Altitutes 500 ft and below considered AGL.

Table 4-4 details the flight profiles for the modeled aircraft types. Total time duration for each mission is proportioned in a stratified atmosphere, as evidenced by the modeled altitude distributions. Speed and power configurations are derived from descriptions of a "notional large scale exercise" provided by the Range. This data was validated through correspondence with the Range (Schultz 2013).

Helicopters fly the lowest, in general, but A-10 activity is modeled as low as 300 ft AGL. Some F-16C high speed training happens as low as 500 ft AGL, and cargo and propeller aircraft activity is modeled down to 500 ft AGL to accommodate activity within the Range boundary as the aircraft transition from the airfield environment to the airspace environment. See Section 3 regarding modeling of the KAGR airfield environment.

A quarter of all fighter activity is modeled in the holding area and 75% in the main activity area. For F-16C and FA-18E/F operations, the main activity area has three altitude bands – low (500 – 5,000 ft), medium (10,000 – 14,000 ft), and high (20,000 - 24,000 ft MSL). The low band has been further compartmentalized to 500 – 1,500 ft, 1,500 – 3,000 ft, and 3,000 – 5,000 ft MSL for noise analysis. High altitude scenarios for the A-10 range from 14,000 – 20,000 ft MSL, medium altitude A-10 scenarios are contained within 10,000 – 14,000 ft MSL, and low altitude missions are modeled down to 300 ft AGL for the A-10. Two distinct mission profiles are presented for each individual fighter/attack sortie to describe different operational modes for different areas and altitude bands. Generally, the F-16C activity is modeled mostly in the 10,000 – 14,000 ft band (70%). The F-18 activity remains below 5,000 ft 50% of the time. A-10 activity is generally at lower altitudes than the other fighters.

Table 4-4 Modeled Airspace Flight Profiles

Mission ID	Activity Area Name	Modeled Aircraft Type	Altitude Bands (ft MSL) 0 - 300	300 - 400	400 - 500	500 - 1000	1000 - 1500	1500 - 3000	3000 - 4000	4000 - 5000	5000 - 10000	10k - 14k	14k - 20k	20k - 24k	24k - 40k	40k +	Average Power[2]	Average Speed (kts)[2]
1	H_West	UH60A	100%														n/a	70
2	H_Transit	UH60A			100%												n/a	100
3	H_East (AAR)	UH60A					100%										n/a	100
4a	F_Holding	F-16C (Existing scenario only)				10%		30%	60%								85 %NC	225
5a	F_East_Plus_West	F-16C (Existing scenario only)				2%		3%	15%			70%		10%			97 %NC	235
4b	F_Holding	F-35A (Prospective Only)				10%		30%	60%								50% ETR	222
5b	F_East_Plus_West	F-35A (Prospective Only)				2%		3%	15%			70%		10%			75% ETR	240
6	F_Holding	FA-18E/F						40%	60%								80 %N2	270
7	F_East_Plus_West	FA-18E/F						20%	30%			45%		5%			85 %N2	425
8	F_Holding_Plus_East	A-10A		15%		15%		50%	20%								90% RPM	280
9	F_East_Plus_West	A-10A						10%	10%		15%	35%	30%				85% RPM	260
10	Cargo/Prop	C-130H&N&P				20%	60%		10%		5%	5%					775 CTIT	160
11	Cargo/Prop	C-17				20%	60%		10%		5%	5%					86 %NC	230
12	Tanker	KC-135R												100%			80.3 %NF	240
13	Bomber	B-2A														100%	70 PLA	220

Notes:
(1) Altitude distributions are derived from provided data and supplemented with distributions from previous study.
MSL values relative to 68 ft modeled ground elevation. Altitudes 500 ft and below considered AGL.
(2) Nominal average power/speed assumptions approved by range personnel.

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Helicopter activity includes 84 busy month sorties with an average sortie duration of slightly more than 2 hours (179 total aircraft-hours). Half of all helicopter activity is modeled in an altitude band of Surface to 400 ft AGL over the Helicopter West activity area with an average speed of 70 knots. The other half of modeled helicopter activity is split amongst the Helicopter Transit and Air-to-Air Refueling (AAR) activity areas at an average speed of 100 knots. The Helicopter Transit area has altitude bands of 400 – 1,000 ft AGL and the Helicopter East (AAR) activity area spans altitudes of 1,000 – 4,000 ft MSL.

The most activity area overlap occurs over the Range boundary, with Fighter East/West, Cargo/Prop, Bomber/Tanker, and Helicopter West activity areas all overlapping. Fighter East and West are modeled as one combined activity area, where necessary, so there is no duplication of fighter activity due to two discrete modeled areas overlapping. Training activity noise energy from all four aircraft categories will be superimposed in the regions of overlap (i.e. added on the ground). This is discussed in the airspace noise results in Section 4.3.

4.3 Special Use Airspace Noise Exposure

Using the data described in the sections 4.1 and 4.2, the MR_NMAP suite of programs was used to calculate L_{dnmr} for the existing/prospective busiest month aircraft operations in the APAFR SUA. L_{dnmr} does not exceed the Noise Zone II threshold of 65 dBA for either the Existing or the Proposed scenarios. Table 4-5 provides the maximum estimated L_{dnmr}, nominal area of maximum exposure, and dominant aircraft type for Existing and Proposed scenarios. For both scenarios, the area with maximum L_{dnmr} is the "cargo/prop" nominal activity area comprised within the Range boundary perimeter. Maximum L_{dnmr} results from all overlapping activity, but is dominated by F-16C operations in the Existing scenario and would increase 7 dB as a result of the F-35A in the Prospective scenario. Maximum L_{dnmr} in Existing and Prospective scenarios of 50 and 57 dBA L_{dnmr}, respectively, are within Noise Zone I, so minimal impact is estimated as a result of modeled airspace training activity.

Table 4-5 Maximum Airspace Noise Exposure

Scenario	Maximum L_{dnmr}	Nominal Activity Area	Dominant Aircraft
Existing (CY2010)	50 dBA	Cargo/Prop	F-16C
Prospective (CY2020)	57 dBA	Cargo/Prop	F-35A

The superposition of noise energy for each activity results in the L_{dnmr} values in Table 4-6. L_{dnmr} for some activity areas are omitted, since fixed-wing activity by the fighter/attack aircraft and the cargo/prop aircraft groups dominate the overall L_{dnmr} on the ground, rendering the omitted airspace activity area's L_{dnmr} as negligible, since other areas overlap with higher estimated L_{dnmr}. Refer to Figures 4-5 through 4-8 for activity area maps.

Table 4-6 Airspace Noise Exposure by Activity Area

Activity Area Name	Ldnmr (dBA) Existing (CY2010)	Prospective (CY2020)	Increase re Existing
Fighter/Attack West	47	57	10
Fighter/Attack Holding	<45	51	10
Fighter/Attack East	48	57	9
Cargo/Prop*	50	57	7

Notes:
Some activity areas omitted since noise exposure is dominated by overlapping activity.
Values in this table are for all activity combined in each area.
* Area with maximum estimated airspace noise exposure.

A supplemental analysis was performed in which each aircraft type was examined individually to determine the contribution of each to the total L_{dnmr} presented in Table 4-6. In the Existing scenario, the only single aircraft contributing more than 45 dBA L_{dnmr} is the F-16C with 47 dBA L_{dnmr} in the Fighter East and West areas. This activity dominates the FA-18E/F and A-10 activity, each contributing less than 45 dBA L_{dnmr}. Bombers and tankers also generate less than 45 dBA L_{dnmr}, and have been shown to contribute even less than the FA-18E/F and A-10. Helicopter activity contributes most in the Helicopter West area (which resides over the main Range boundary), where most low altitude training takes place, but L_{dnmr} remains less than 45 dBA. Note that while helicopter L_{dnmr} remain less than 45 dBA, they have been shown to contribute more than the FA-18E/F and A-10 but less than the C-17 and C-130 aircraft. Both C-130 and C-17 activity inside the main Range boundary remain less than 45 dBA L_{dnmr}, and the C-130 contributes slightly more to L_{dnmr} than the C-17.

For the Existing scenario, the Cargo/Prop activity area would have the greatest L_{dnmr} with 50 dBA. For the Prospective scenario, 3 of the 4 activity areas would share the greatest L_{dnmr} of 57 dBA. The leveling of L_{dnmr} among most of the activity areas would be caused by the replacement of F-16C aircraft with F-35A aircraft, since airspace noise exposure in these areas would be completely dominated by F-35A activity in the Prospective scenario, whereas in the Existing scenario multiple aircraft types contribute to the sum of noise energy. F-35A noise exposure would be 7-10 dB greater than any aircraft in the Existing scenario. This is simply a result of the SEL value of the modeled conditions for the F-35A being greater than for the F-16C.

Due to airspace training activity, the land area below APAFR SUA is estimated to be in Noise Zone I – an area of minimal impact – and would continue to be in Noise Zone I in the Prospective scenario.

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SECTION 5

Small Arms Noise Analysis

The small arms component of the noise study consists of munitions less than 20 mm caliber fired from the air or the ground. This section details annual activity levels in Section 5.1 and describes modeled Ground-to-Ground (G-G) and Air-to-Ground (A-G) training range locations in Section 5.2. The estimated resulting PK 15 (met) noise exposure is described in Section 5.3. The Range does not anticipate any changes to small arms training for CY2020, thus Existing and Prospective scenarios are identical, and both are presented in this section.

5.1 Small Arms Activity Levels

Modeled small arms training activity is summarized in Table 5-1. The modeled range name and weapon types are indicated in addition to total annual rounds fired. Figures 5-1 and 5-2 summarize Table 5-1 data in terms of location and weapon type, respectively. Over 6 million rounds are fired annually, 96 percent of which are G-G (approximately 5.9 million) and 4 percent of which are A-G (approximately 271,000 rounds). On average, 69% of small arms activity is modeled as occurring in the DNL daytime and 31% of activity is during the DNL nighttime. Overall, the single area with the most nighttime rounds is due to MOUT activity at the Mock Village location, with 365,500 rounds for all weapons. The weapon/area combination most used during the nighttime is the M2 .50-caliber machine gun at the North Conventional Center Tower range, which is modeled to have 150,000 annual nighttime rounds for the M2 .50-caliber only.

Table 5-1 includes rapid fire estimates and the day/night distribution of small arms fire. These data are not used in the analysis, since rapid-fire data and DNL nighttime penalties do not apply to PK 15 (met). In case future noise analyses using these data are warranted[5], these data are included as a reference. While no individual weapon is considered to have "rapid-fire" potential, i.e., greater than 30 rounds per second, the Range indicated rapid fire percentages in terms of expected time durations for multiple simultaneously firing weapons.

By location (Figure 5-1), the North Tactical area accounts for 36% of total modeled activity. The North Tactical area includes Mock Village, North Tactical 1, and North Tactical 2 ranges. Mock Village has the most rounds fired overall with approximately 1.2 million annual rounds. South Tactical 1 and South Tactical 2 combine for 30% of total modeled activity. The North Conventional area accounts for 20% of total activity with North Conventional Center Tower (CT) (just over 1 million annual rounds) and North Conventional Left Flank (LF) (233,000 annual rounds). Oscar Range accounts for 13% of total modeled activity (782,000 rounds) and the remaining 1% of total annual activity is for the OQ Ranges.

[5] For example, the CDNL metric would leverage the rapid fire data.

Table 5-1 Detailed Small Arms Activity by Location and Weapon

Range Name	Weapon Type (Range Indicated)	Weapon Type (SARNAM Model)	Annual Daytime (0700-2200) Rounds	Annual Nighttime (2200-0700) Rounds	Total Annual Rounds	% Rapid Fire[2] During Daytime (0700-2200)	% Rapid Fire[2] During Nighttime (2200-0700)	Notes
Mock Village	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	40,000	-	40,000	-	-	3, 6
	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	125,000	75,000	200,000	5%	2%	
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	70,500	-	70,500	-	-	3, 6
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	200,000	100,000	300,000	10%	5%	7
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	200,000	100,000	300,000	10%	5%	
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	2,500	500	3,000	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	50,000	25,000	75,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	30,000	15,000	45,000	25%	10%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	100,000	50,000	150,000	10%	5%	
North Conventional Center Tower	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	300,000	150,000	450,000	10%	5%	
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	200,000	100,000	300,000	5%	2%	7
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	-	500	500	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	10,000	5,000	15,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	10,000	5,000	15,000	-	-	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	50,000	25,000	75,000	5%	2%	
North Conventional Left Flank	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	50,000	20,000	70,000	10%	5%	
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	30,000	10,000	40,000	5%	2%	
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	50,000	20,000	70,000	5%	2%	7
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	-	500	500	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	10,000	5,000	15,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	2,500	-	2,500	-	-	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	25,000	10,000	35,000	5%	2%	

Table 5-1 Detailed Small Arms Activity by Location and Weapon - *continued*

Range Name	Weapon Type (Range Indicated)	Weapon Type (SARNAM Model)	Annual Daytime (0700-2200) Rounds	Annual Nighttime (2200-0700) Rounds	Total Annual Rounds	% Rapid Fire[2] During Daytime (0700-2200)	% Rapid Fire[2] During Nighttime (2200-0700)	Notes
Mock Village	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	40,000	-	40,000	-	-	3, 6
North Tactical 1	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	125,000	75,000	200,000	10%	5%	
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	7
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	2,500	500	3,000	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	25,000	12,500	37,500	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	15,000	7,500	22,500	10%	5%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	50,000	25,000	75,000	5%	2%	
North Tactical 2	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	7
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	25,000	12,500	37,500	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	15,000	7,500	22,500	10%	5%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	50,000	25,000	75,000	5%	2%	
OQ 5.56 MM Range	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	55,000	-	55,000	25%	-	
OQ 9 MM Range	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	7,000	-	7,000	-	-	
Oscar Range	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	10,000	-	10,000	-	-	4, 6
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	10%	5%	7
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	10%	5%	
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	1,000	500	1,500	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	50,000	20,000	70,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	100,000	25,000	125,000	10%	5%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	200,000	75,000	275,000	10%	5%	
	12 Gauge Shotgun	Shotgun 12 Ga pump / Mag T shot	500	-	500	-	-	

Table 5-1 Detailed Small Arms Activity by Location and Weapon - *concluded*

Range Name	Weapon Type (Range Indicated)	Weapon Type (SARNAM Model)	Annual Daytime (0700-2200) Rounds	Annual Nighttime (2200-0700) Rounds	Total Annual Rounds	% Rapid Fire[2] During Daytime (0700-2200)	% Rapid Fire[2] During Nighttime (2200-0700)	Notes
South Tactical 1 (see note 8)	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	200,000	100,000	300,000	10%	5%	
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	150,000	50,000	200,000	5%	2%	7
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	150,000	50,000	200,000	5%	2%	
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	500	-	500	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	30,000	15,000	45,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	10,000	5,000	15,000	10%	5%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	100,000	75,000	175,000	5%	2%	
South Tactical 2 (see note 8)	M2 50 Cal Machine Gun	MG M2 .50 cal / M2 710 gr	70,500	-	70,500	-	-	5, 6
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	80,350	-	80,350	-	-	5, 6
	M60 7.62mm Machine Gun	MG M60 7.62 mm / M80 147 gr	100,000	50,000	150,000	5%	2%	
	M240 Machine Gun	MG M60 7.62 mm / M80 147 gr	200,000	100,000	300,000	5%	2%	7
	9mm Pistol/SMG	Pistol M9 9mm / 115 gr	1,000	500	1,500	-	-	
	7.62mm Rifle	Rifle M14 7.62 mm / M118 150 gr	35,000	15,000	50,000	-	-	
	5.56mm Rifle	Rifle M16 5.56 mm / M193 55 gr	15,000	5,000	20,000	10%	5%	
	M249 SAW 5.56mm	SAW M249 5.56 mm / M193 55 gr	150,000	75,000	225,000	5%	2%	

Notes:
(1) Source: APAFR Email Correspondence May 23, 2013 "Data Validation Package"
(2) Rapid fire activity considered (>30 rounds/sec) occurs only when multiple weapons firing simultaneously
(3) A-G activity at N. Tactical Point modeled at Mock Village (closest small arms range)
(4) A-G Activity for Oscar Point Modeled at Oscar Range
(5) A-G Activity for S. Tactical Point Modeled at S. Tactical 2 small arms range
(6) Air-to-Ground Activity (A-G)
(7) M240 modled as the M60 per Army PHC instructions.
(8) includes South Conventional

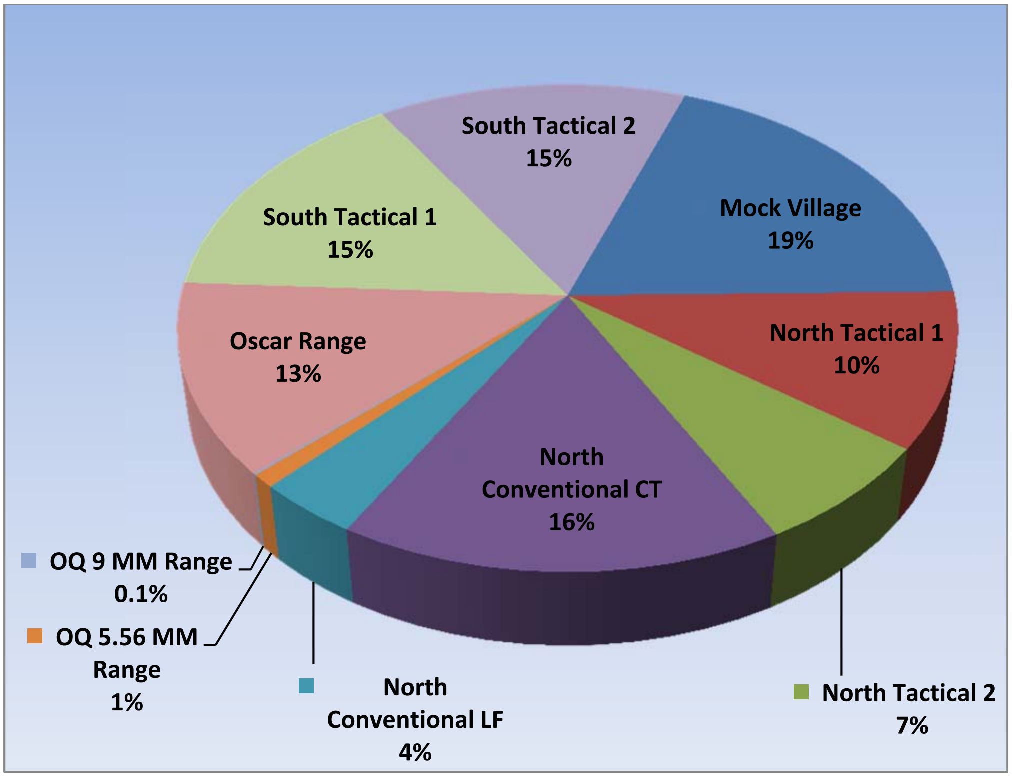

Figure 5-1 Modeled Small Arms Activity by Range Location

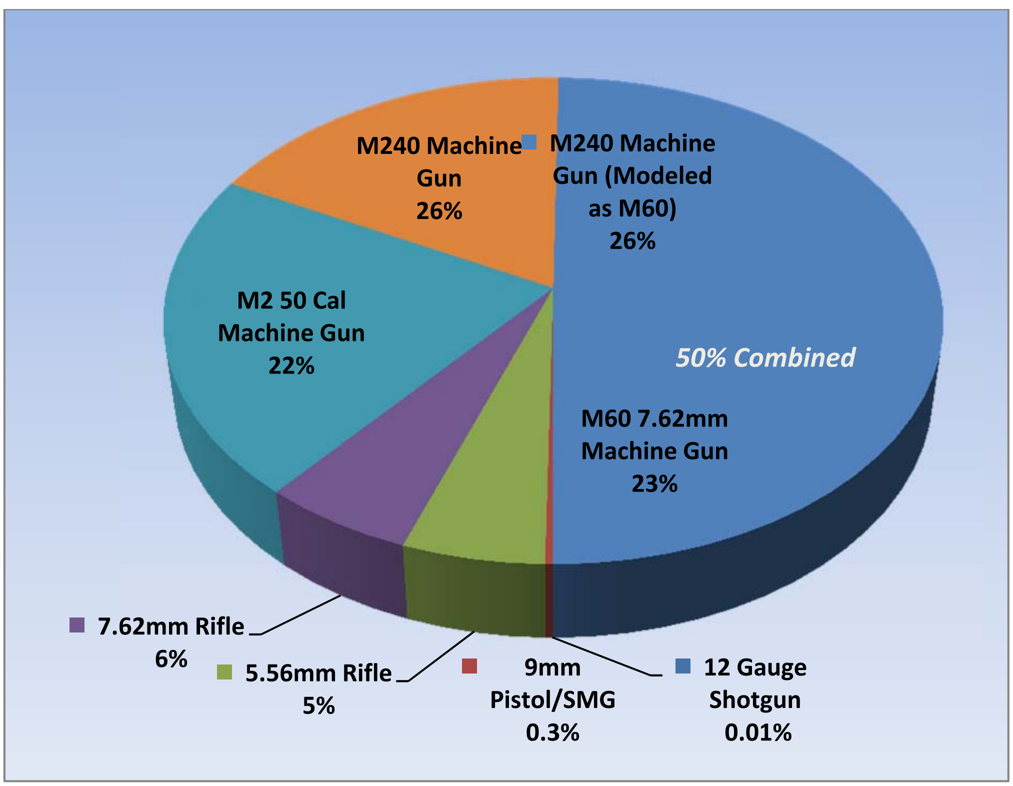

Figure 5-2 Modeled Small Arms Activity by Weapon Type

By weapon type (Figure 5-2), the M240 and M60 7.62 mm machine guns dominate range activity by total number of rounds. As Table 5-1 indicates by Note 7, M240 noise is modeled as the M60. As such, a combined total of 50% of all modeled small arms activity is the M60, or nearly 3 million annual rounds. The M2 .50-caliber machine gun fire accounts for approximately 1.3 million annual rounds, or 22% of the total. The M249 Squad Automatic Weapon (SAW) light machine gun includes nearly 1 million annual modeled rounds (18%). Rifle (7.62 mm and 5.56 mm), 9 mm pistol, and 12 gauge shotgun training accounts for the remaining 11% of total annual activity. Overall, 89% of total annual rounds are automatic weapon fire.

5.2 Small Arms and Large Ordnance Training Locations

G-G small arms training at the Range includes activity at nine firing range locations in addition to Mock Village, for a total of ten G-G locations. Table 5-2 provides details of the modeled G-G firing ranges, which include firing heading and distance as well as, where appropriate, the number and width of firing lanes. A-G training activity data for small arms was provided by the Range for North Tactical, South Tactical, and Oscar Ranges shown in the Figure 5-3 map.

At South Tactical 1 and 2, multiple firing headings were provided, but a single firing heading was modeled as the average of the two heading limits (indicated in parenthesis). Although multiple firing heights for Oscar Range and South Tactical 2 were provided, the modeled firing height is the average of the two (indicated in parenthesis). Training in Mock Village was modeled as a basic firing range rather than dispersed activity throughout the Mock Village spaces.

A-G data was collected from the Range for large ordnance and small arms activity at a total of four locations, indicated by Table 5-3. This table also provides the locations for the modeled large ordnance A-G target points. Maps of locations with aerial imagery are provided in Figure 5-3. A-G activity is defined at a specific ground target point rather than including the aerial firing location. For simplicity, the closest large ordnance target location was chosen for small arms A-G modeling, according to Table 5-1. Each target location is modeled as a single point at ground level, for example at the center of a bull's-eye. Obviously the target is not always directly hit, but, in the large ordnance noise model, the differences in noise exposure is negligible for a normal distribution of impact locations compared to modeling all impacts at the center of the bull's-eye. No specific information for strafing pits was available, so all automatic gunfire is also modeled at a target point.

Table 5-2 Ground-to-Ground Training Ranges (Modeled Small Arms Activity)

Range Name	UTM Zone	UTM Easting (m)	UTM Northing (m)	Firing Line Heading (from N)	Height AGL (m)	Fire>Target Distance (m)	No. Firing Lanes	Lane Spacing (m)
Mock Village	17 R	471514	3065924	194°	2	160	4	22
North Conventional Center Tower	17 R	467778	3062900	46°	3	800	1	0
North Conventional Left Flank	17 R	466991	3063810	79°	1	600	1	0
North Tactical 1	17 R	471604	3063899	319°	2	1000	1	0
North Tactical 2	17 R	471908	3064400	320°	3	256	1	0
OQ 5.56 MM Range	17 R	466562	3055676	89°	2	25	54	4
OQ 9 MM Range	17 R	466562	3055997	89°	2	25	10	10
Oscar Range	17 R	470167	3051309	339°	2 / 4 (3)	500	4	46
South Tactical 1	17 R	478438	3051605	230-290° (260°)	3	500	1	0
South Tactical 2	17 R	477678	3050310	240-310° (275°)	2 / 6 (4)	400	1	0

Notes:
Where multiple or spans of numbers are provided, numbers in parenthesis represent modeled data.
Coordinates are in WGS84 datum.

Table 5-3 Air-to-Ground Target Points (modeled small arms and large ordnance activity)

Range Name	UTM Zone	UTM Easting (m)	UTM Northing (m)	Large Ordnance A-G Activity	Small Arms A-G Activity
North Conventional Point	17 R	469370	3064250	✓	
South Tactical Point	17 R	476500	3048993	✓	✓
North Tactical Point	17 R	472130	3066050	✓	✓
Oscar Point	17 R	470358	3052022		✓

Notes:
Coordinates are in WGS84 datum.

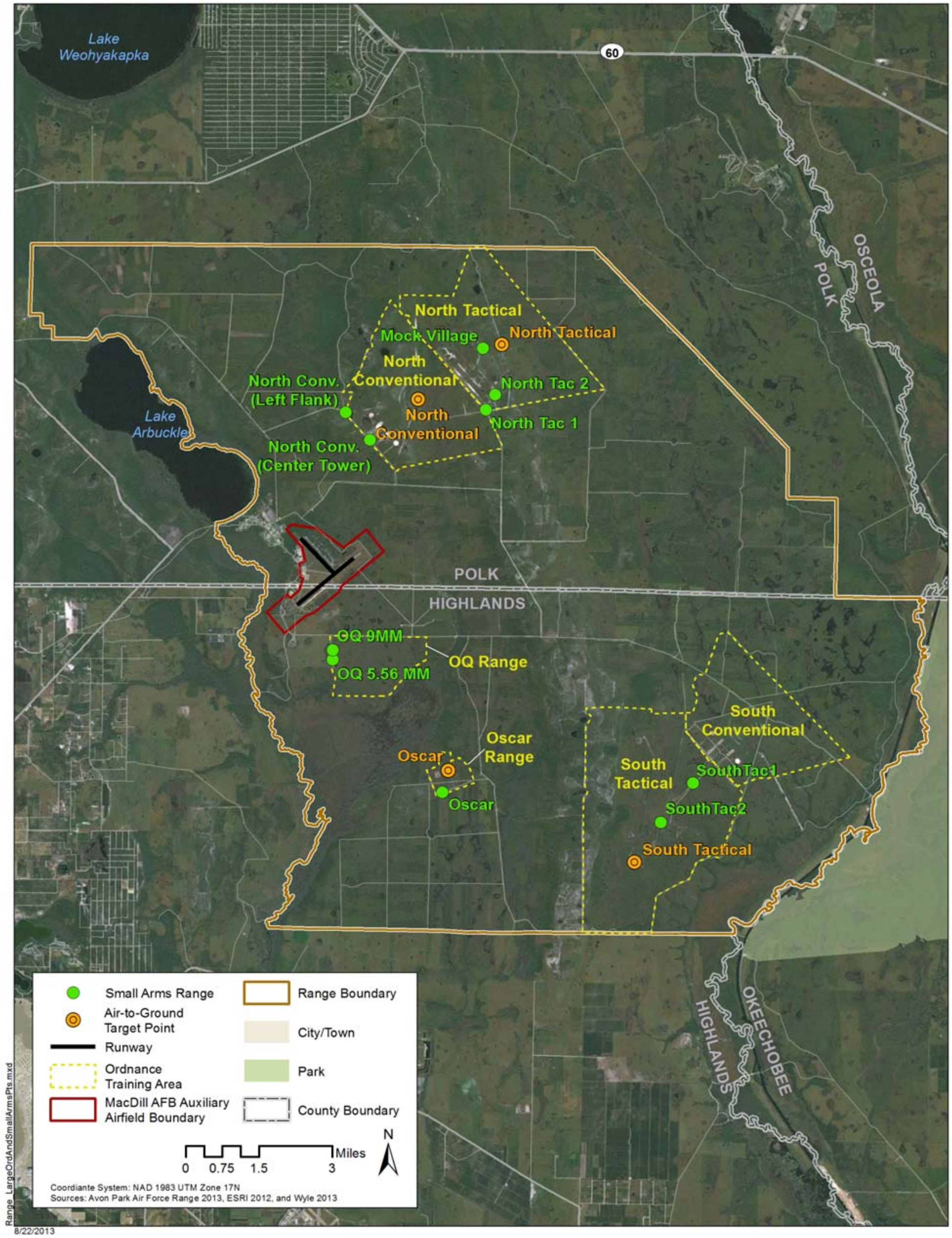

Figure 5-3 Large Ordnance and Small Arms Ranges and Modeled Locations

5.3 Small Arms Noise Exposure

Using the data described in the sections 4.1 and 4.2, the SARNAM suite of programs was used to calculate and plot PK 15 (met) for the existing/prospective small arms activity at APAFR. The small arms noise analysis is in accordance with Army guidelines and considers the statistical PK 15 (met) noise metric and three Noise Zones described in Section 2. Figure 5-4 illustrates the resultant 87 dB and 104 dB PK 15 (met) noise contour lines for small arms training activity. The noise contours have been adjusted (according to Army instruction) to remove computational artifacts in SARNAM. The small arms noise analysis data files and methodology were quality checked by the Army (Broska 2013).

Of all modeled small arms weapons, the M2 .50-caliber is the greatest in terms of PK 15 (met). The reason for the difference in size and shape of the OQ and Oscar Ranges compared to the contours in the North Conventional/Tactical areas and South Tactical areas is the absence of M2 .50-caliber weapon activity at the OQ and Oscar Ranges. Since PK 15 (met) noise contours are based on peak noise levels rather than cumulative noise levels, the M2 .50-caliber noise will generally drive the contours (where M2 .50-caliber activity is present) regardless of the number of rounds fired and when they are fired during the day.

As shown in Figure 5-4, Noise Zone III [greater than or equal to 104 PK 15 (met) dB] stays wholly within the Range boundary perimeter. Noise Zone II [PK 15 (met) between 87 and 104 dB] is wholly within the Range boundary except for a relatively small portion (less than 150 acres) extending beyond the southern Range boundary in Highlands County due to training activity at ranges South Tactical 1 and 2. Aerial imagery suggests Noise Zone II comes to within about a mile of what appears to be a residence. The Noise Zone II area extending past the southern range boundary is a result of the ballistic wave from bullets travelling faster than the speed of sound.

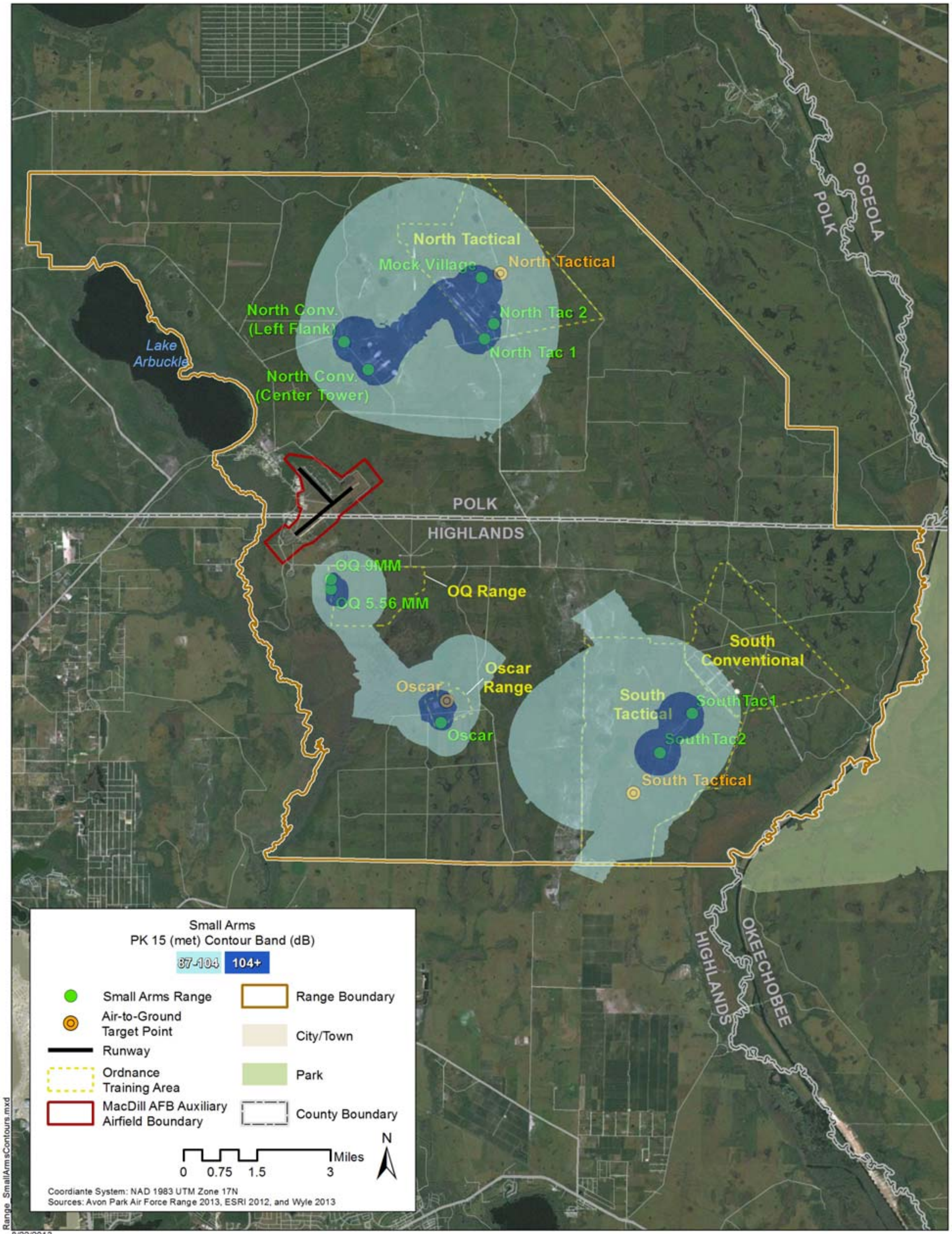

Figure 5-4 PK 15 (met) Contour Bands for Existing (CY2010) and Prospective (CY2020) Small Arms Training

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SECTION 6 Large Ordnance Noise Analysis

The large ordnance noise analysis consists of air-to-ground weapons of caliber greater than 20 mm at target locations in North Conventional, North Tactical, and South Tactical Ranges. Refer to Section 5 for information on these three A-G target locations, such as the coordinates in Table 5-2, and the map of Figure 5-3. This section describes modeled annual large ordnance activity levels in Section 6.1 and estimated CDNL noise exposure in Section 6.2.

Each target location is modeled as a single point at ground level, for example at the center of the bull's-eye at North Conventional. No specific information for directionality of strafing pits is available, so A-G strafing fire is also modeled at a single point. BNOISE has the ability to model firing location noise, but tests have shown this only slightly alters contours of cumulative noise exposure on the ground. For example, a circular noise contour will stretch to a slight egg shape in the direction of the firing location. Because multiple firing points are dispersed throughout the airspace, and because the Range was not able to provide detailed information (except for Hellfire missiles) for firing locations, it is assumed only target locations need be modeled. This methodology is consistent with WR 03-15, and quality-checked by the Army (Broska 2013).

6.1 Large Ordnance Activity Levels

Large ordnance noise analyses refer to the annual levels of activity for noise modeling in accordance with Army guidance. Detailed activity by weapon type at each target location is presented in Table 6-1. Tables 6-2 and 6-3 summarize modeled large ordnance training activity in terms of location and weapon type, respectively. The detailed activity is also summarized by target location and weapon type in Tables 6-2 and 6-3, respectively. No increase in or changes to large ordnance activity is expected for CY2020 so the Existing and Prospective scenarios are identical.

A total of 221,569 annual rounds are considered – 95% of these rounds are from automatic gunfire (210,900 rounds of 20-40 mm caliber) and the remaining 5% is dominated by general-purpose dumb bombs (5,000 rounds of BDU-33); guided bomb units (3,000 rounds); missiles (including 250 Hellfires); and miscellaneous rockets, missiles, and artillery. Of the total rounds, 46% are fired at North Tactical and 46% at South Tactical Ranges with the remaining 8% fired at the North Conventional Range. South Tactical range activity numbers include MOUT activity. Each range consists of a single target location, since distribution of target locations within a confined range area has little influence on the resulting noise contour extents. A 20% proportion of overall activity is modeled during the DNL nighttime hours while 80% of the activity is modeled during the DNL daytime hours, as estimated by Range personnel (Schultz 2013).

Table 6-1 Modeled Annual Large Ordnance Expenditures

Target Location[2]	Ammo Type	Annual Daytime (0700-2200) Rounds[3]	Annual Nighttime (2200-0700) Rounds[3]	Total Annual Rounds[3]	Description	Noise Model Target Noise Source Description	Modeled As (if different than Ammunition Type)	Noise Model Target Noise Source ID
North Conventional Point	Hellfire	200	50	250	A-G Missile System - Missile	Hellfire Missile (Impact)		IHF01
	40mm	720	180	900	40mm Sidefire - Automatic Gun	40-mm Gun		P4040
	25mm	12,000	3,000	15,000	25mm Sidefire - Automatic Gun	25-mm Gun		PG525
	105mm	400	100	500	105mm Sidefire - Artillery	105-MM Howitzer M102		PH2H2
North Tactical Point	BDU-33	2,000	500	2,500	General Purpose Dumb Bumb	BDU33 PRACTICE BOMB		BD301
	MK-82	400	100	500	General Purpose Bumb	MK82 GP 500 LBS BOMB		BM201
	GBU-12	400	100	500	Guided Bomb Unit	MK82 GP 500 LBS BOMB	MK82 bomb	BM201
	GBU-38	200	50	250	Guided Bomb Unit	MK82 GP 500 LBS BOMB	MK82 bomb	BM201
	GBU-16	200	50	250	Guided Bomb Unit	MK83 GP 1,000 LBS BOMB	MK83 bomb	BM301
	GBU-32	200	50	250	Guided Bomb Unit	MK83 GP 1,000 LBS BOMB	MK83 bomb	BM301
	LGTR	80	20	100	Laser Guided Training Round (LGTR	MK76 PRACTICE BOMB	MK76 practice bomb	BM701
	MK-76	160	40	200	General Purpose Dumb Bomb	MK76 PRACTICE BOMB		BM701
	30mm	64,000	16,000	80,000	30mm Strafing - Automatic Gun	40-mm Gun HE	40 mm auto gun	P4040
	20mm	14,000	3,500	17,500	20mm Strafing - Automatic Gun	20-MM GUN HE		PG220
South Tactical/ Conventional Point	BDU-33	2,000	500	2,500	General Purpose Dumb Bumb	BDU33 PRACTICE BOMB		BD301
	GBU-12	400	100	500	Guided Bomb Unit	MK82 GP 500 LBS BOMB	MK82 bomb	BM201
	GBU-38	200	50	250	Guided Bomb Unit	MK82 GP 500 LBS BOMB	MK82 bomb	BM201
	MK-82	400	100	500	General Purpose Bumb	MK82 GP 500 LBS BOMB		BM201
	GBU-16	200	50	250	Guided Bomb Unit	MK83 GP 1,000 LBS BOMB	MK83 bomb	BM301
	GBU-32	200	50	250	Guided Bomb Unit	MK83 GP 1,000 LBS BOMB	MK83 bomb	BM301
	GBU-10	400	100	500	Guided Bomb Unit	MK84 GP 2,000 LBS BOMB	MK84 bomb	BM401
	LGTR	80	20	100	Laser Guided Training Round (LGTR	MK76 PRACTICE BOMB	MK76 practice bomb	BM701
	MK-76	160	40	200	General Purpose Dumb Bumb	MK76 PRACTICE BOMB		BM701
	2.75	151	38	189	Inert Rocket	2.75" ROCKET INERT (IMPACT)		I28I0
	2.75	104	26	130	WP (Smoke) warhead - Rocket	2.75" ROCKET INERT (IMPACT)		I28I0
	30mm	64,000	16,000	80,000	30mm Strafing - Automatic Gun	40-mm Gun HE	40 mm auto gun	P4040
	20mm	14,000	3,500	17,500	20mm Strafing - Automatic Gun	20-MM GUN HE		PG220
	Grand Totals:	177,255	44,314	221,569				
		80%	20%					

Notes:
(1) Source: APAFR via Email Correspondence "Data Validation Package"
(2) Only target noise is considered, due to lack of specific firing locations.
(3) Nighttime (2200-0700) operations modeled as 20% of total activity.

Table 6-2 Modeled Annual Large Ordnance Expenditures (by location)

Location	Annual Rounds
North Conventional Point	16,650
North Tactical Point	102,050
South Tactical / Conventional Point	102,869
Grand Total	**221,569**

Table 6-3 Modeled Annual Large Ordnance Expenditures (by weapon type)

Weapon Type	Annual Rounds	
105mm	500	
20mm	35,000	
25mm	15,000	**Automatic**
30mm	160,000	**Gun**
40mm	900	**Total: 211,400**
2.75	319	
BDU-33	5,000	
GBU-10	500	
GBU-12	1,000	
GBU-16	500	
GBU-32	500	
GBU-38	500	
Hellfire	250	
LGTR	200	
MK-76	400	**Total bomb, rocket, &**
MK-82	1,000	**missile 10,169**
Grand Total	**221,569**	

6.2 Large Ordnance Noise Exposure

Using the data described in the Section 6.1, the BNOISE suite of programs was used to calculate and plot CDNL for the existing/prospective ABD large ordnance activity at APAFR. As illustrated in Figure 6-1, areas of severe noise impact, i.e., Noise Zone III (greater than or equal to 70 dB CDNL), extend beyond the northern and southern Range boundaries. Noise Zone III extends approximately 1,000 feet beyond the northern Range boundary into Polk County and includes area south of County Road 630 but does not extend into Indian Lake Estates (which is to the southeast of Lake Weohyakapka). Ordnance firing at North Tactical drives the CDNL contours to the north.

Highlands County is exposed to Noise Zone III south of the Range. Dominated by ordnance activity at South Tactical, Noise Zone III extends nearly 1 mile beyond the southern Range boundary. The Noise Zone III area does not include any visible structures (according to aerial imagery), but Noise Zone II (moderate noise impact; between 62 and 70 dB CDNL) extends beyond the Range boundary by 3.6 miles into Highlands and Okeechobee Counties and includes some structures visible in aerial imagery.

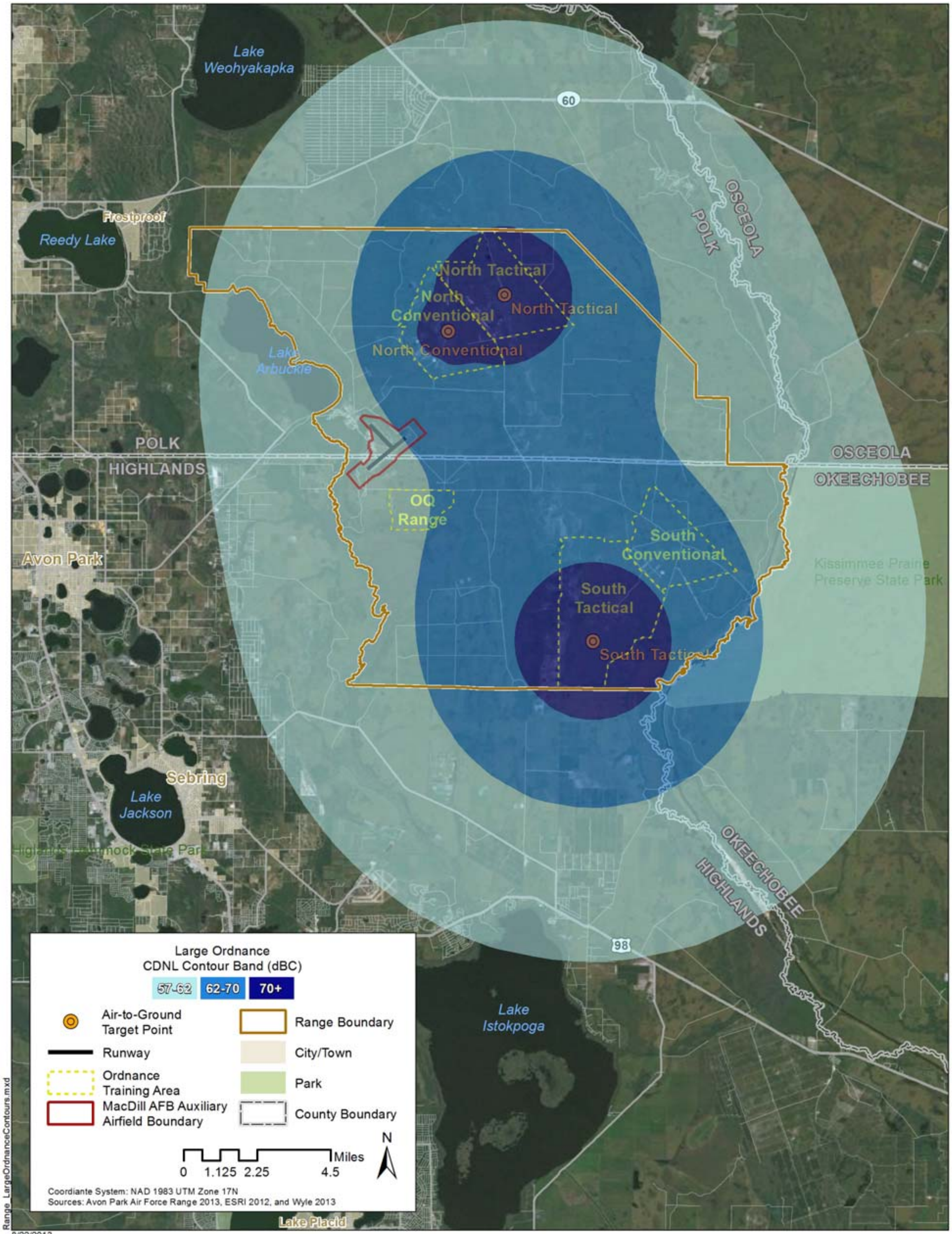

Figure 6-1 CDNL Contours for Existing (CY2010) and Prospective (CY2020) Average Busy Day Large Ordnance Training

As mentioned in Table 2-2, areas of noise exposure between 57 dB and 62 dB CDNL are considered "Land Use Planning Zones" (LUPZ) and fall under the Noise Zone I definition as an area of minimal impact. The LUPZ contours are used to better predict noise impacts when levels of operations at large caliber weapons ranges are above average. Note these are Army standards and are not part of the current JLUS. The LUPZ extends 4-8 miles beyond Range boundaries on all sides and serves as a guide to where noise impact may occur during times of heightened large ordnance activity and includes portions of the surrounding counties of Polk, Osceola, Okeechobee, and Highlands.

The nighttime activity contributes a great deal to the size of the CDNL contours. The Range estimated 20% of all rounds for all large ordnance types are occurring in the nighttime hours of 10:00 p.m. to 7:00 a.m. This increases the computed CDNL values by 4.5 dB relative to the CDNL values if all rounds were to be fired in the daytime rather than with a 20% nighttime estimate.

Figures 6-2 through 6-5 highlight the CDNL contours for each of the four affected counties.

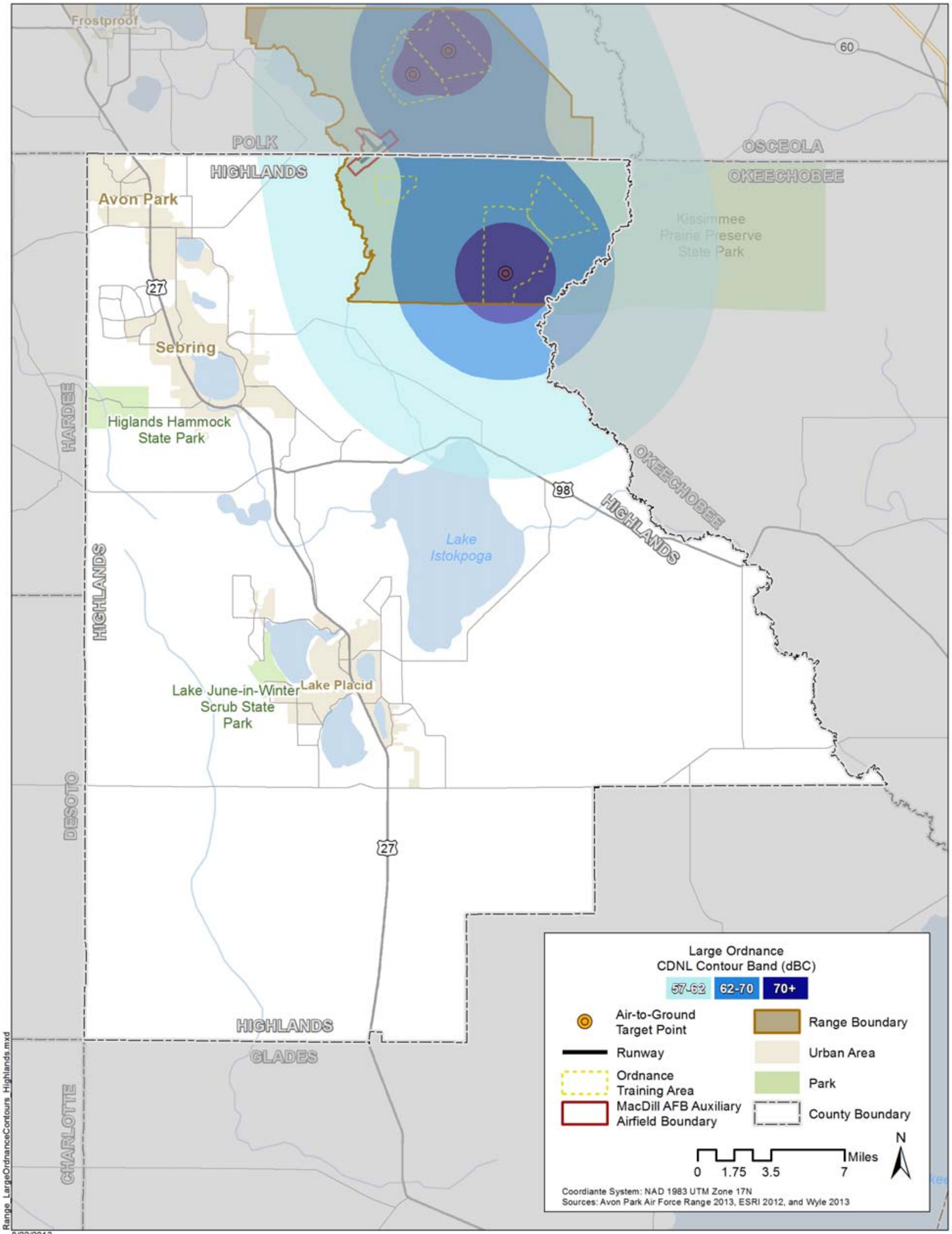

Figure 6-2 CDNL Contours for Existing (CY2010) and Prospective (CY2020) Average Busy Day Large Ordnance Training in Highlands County

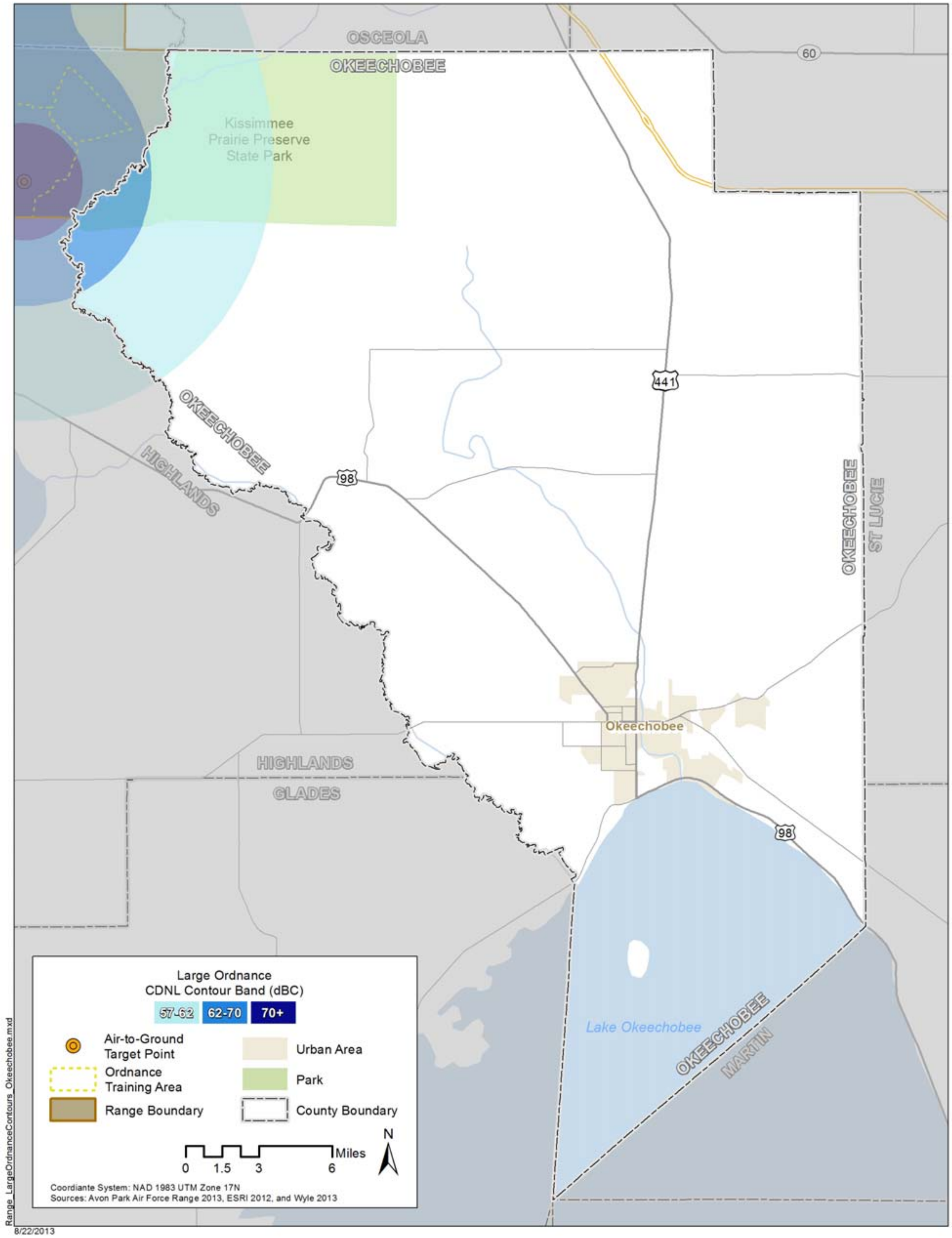

Figure 6-3 CDNL Contours for Existing (CY2010) and Prospective (CY2020) Average Busy Day Large Ordnance Training in Okeechobee County

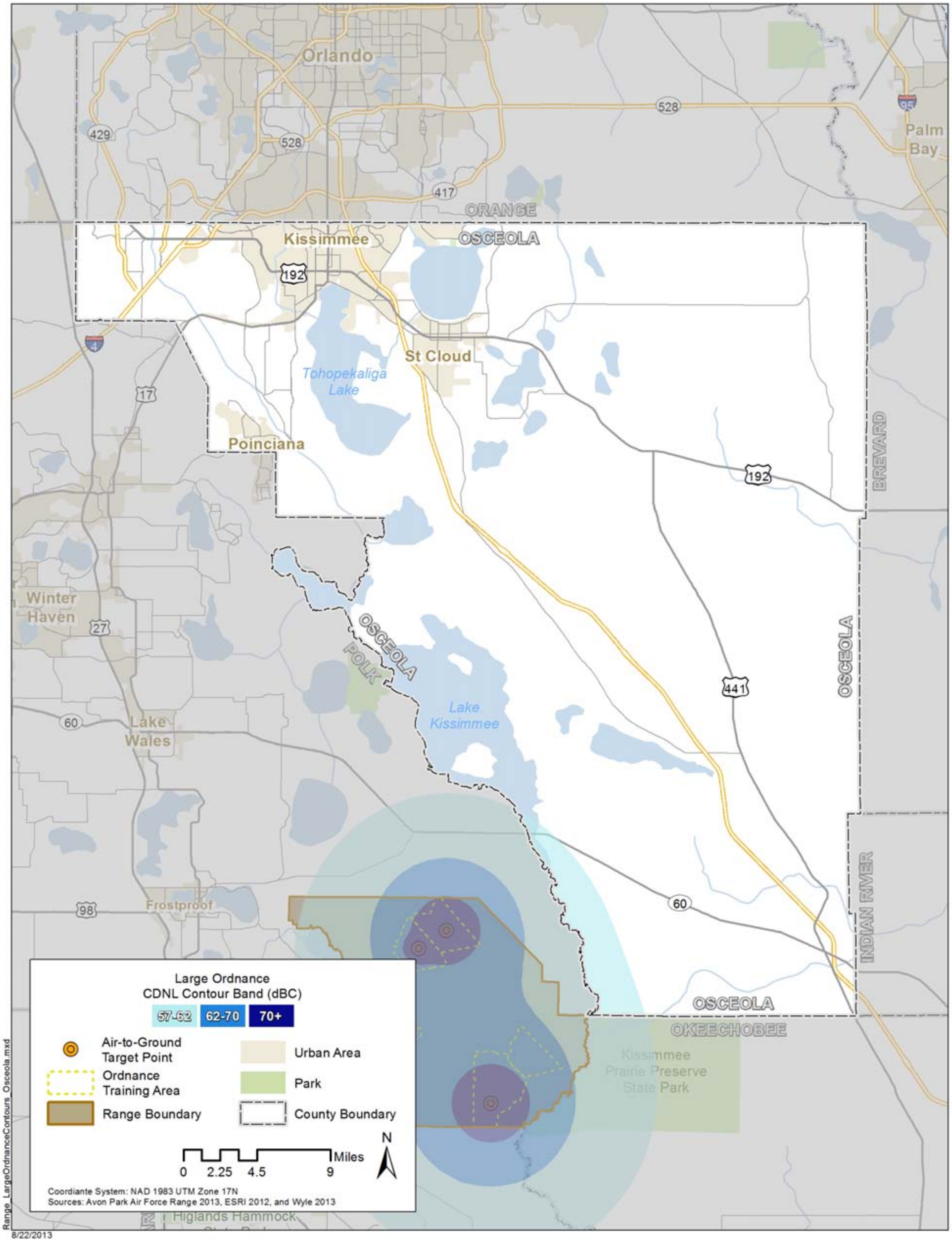

Figure 6-4 CDNL Contours for Existing (CY2010) and Prospective (CY2020) Average Busy Day Large Ordnance Training in Osceola County

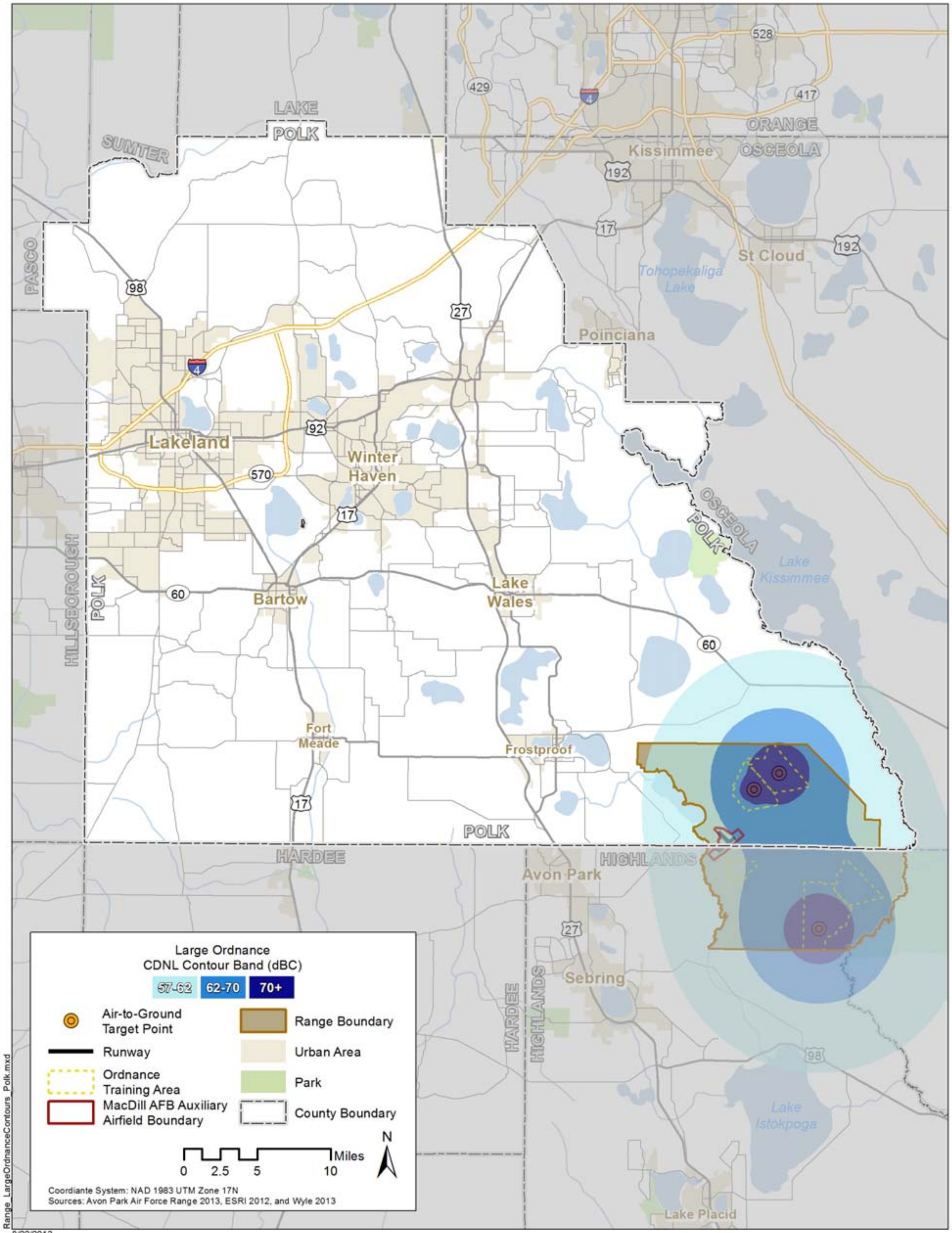

Figure 6-5 CDNL Contours for Existing (CY2010) and Prospective (CY2020) Average Busy Day Large Ordnance Training in Polk County

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Appendix A

REPRESENTATIVE FLIGHT PROFILES AT MACDILL AFB AUXILIARY FIELD

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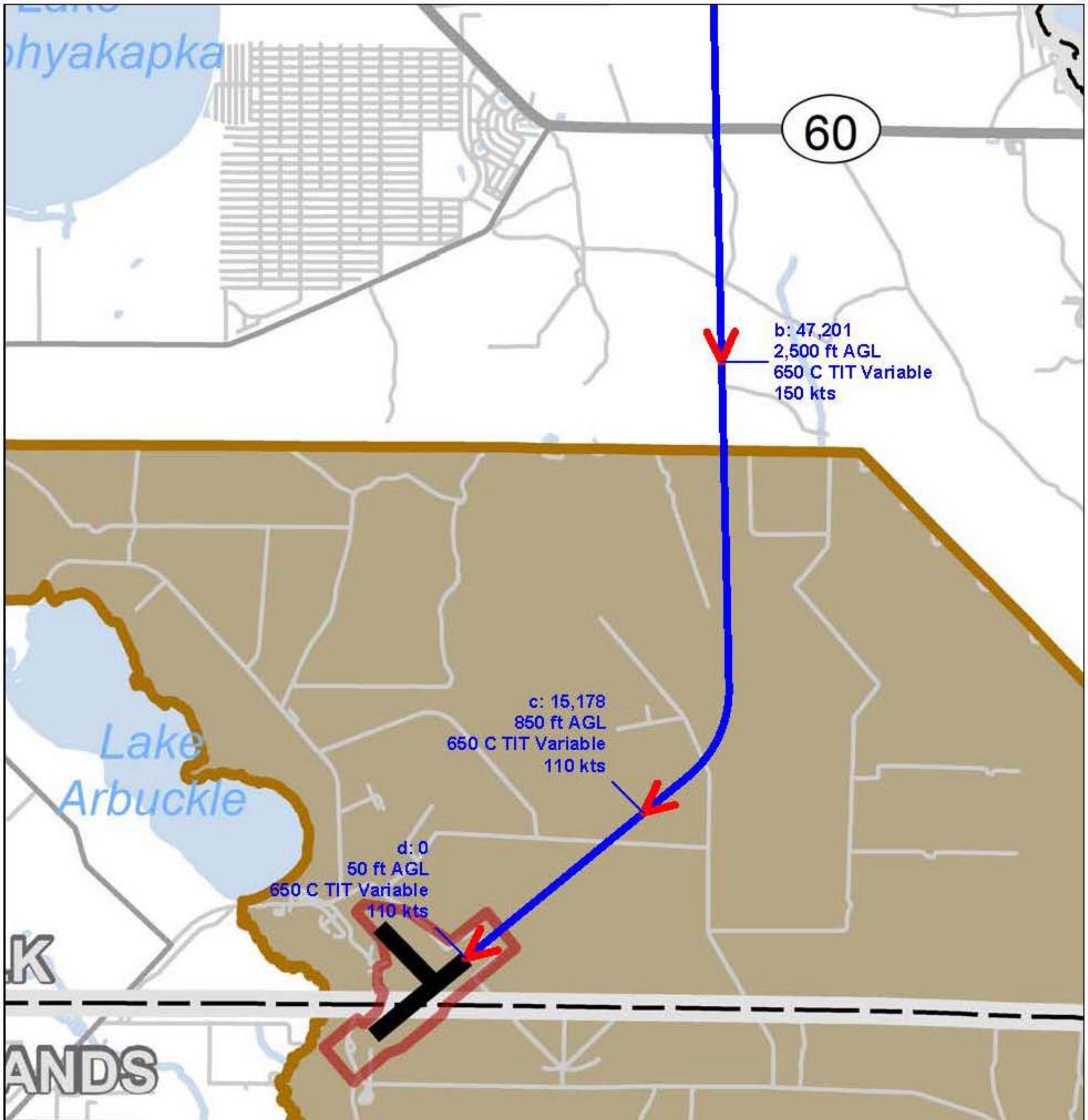
This document provides scaled plots of representative flight profiles for each modeled aircraft type on a representative flight track. The flight profiles are shown in the following order:

Profile Pages	Aircraft
A2 - A4	C-130H&N&P
A5 - A7	AH-1W
A8 - A10	C-9A
A11 - A13	C-17
A14 - A15	CH46E
A16 - A18	CH53E
A19 - A20	F-16C
A21 - A22	F-35A
A23 - A25	SH60B

Each figure includes a table describing the profile parameters of the associated flight track. The columns of the profile data tables are described below:

Column Heading	Description
Point	Sequence letter along flight track denoting change in flight parameters
Distance (feet)	Distance along flight track from runway threshold in feet
Height (feet)	Altitude of aircraft in feet Above Ground Level (AGL) or relative to Mean Sea Level (MSL)
Power (Appropriate Unit)*	Engine power setting and Drag Configuration/Interpolation Code (defines sets of interpolation code in NOISEMAP (F for FIXED, P for PARALLEL, V for VARIABLE))
Speed (kts)	Indicated airspeed of aircraft in knots
Yaw Angle (degrees)**	Angle of the aircraft relative to its vertical axis in degrees; positive nose left
Angle of Attack (degrees)**	Angle of the aircraft, not of the wing; angle between the climb angle and the pitch angle, in degrees, positive nose up. The climb angle is the angle between the horizontal and the velocity vector (same convention). The pitch angle is the angle between the horizontal and the thrust vector (same convention)
Roll Angle (degrees)**	Angle of the aircraft relative to its longitudinal axis in degrees; positive left side down.
Nacelle Angle (degrees)***	Angle of engine nacelle pylon relative to the horizontal (airplane) mode; positive up; maximum of 90

Notes: * not applicable to Helicopter
** for RNM and AAM aircraft only
*** for tilt-rotor aircraft (e.g., MV-22B) only; fixed to 90 degrees for RNM helicopters



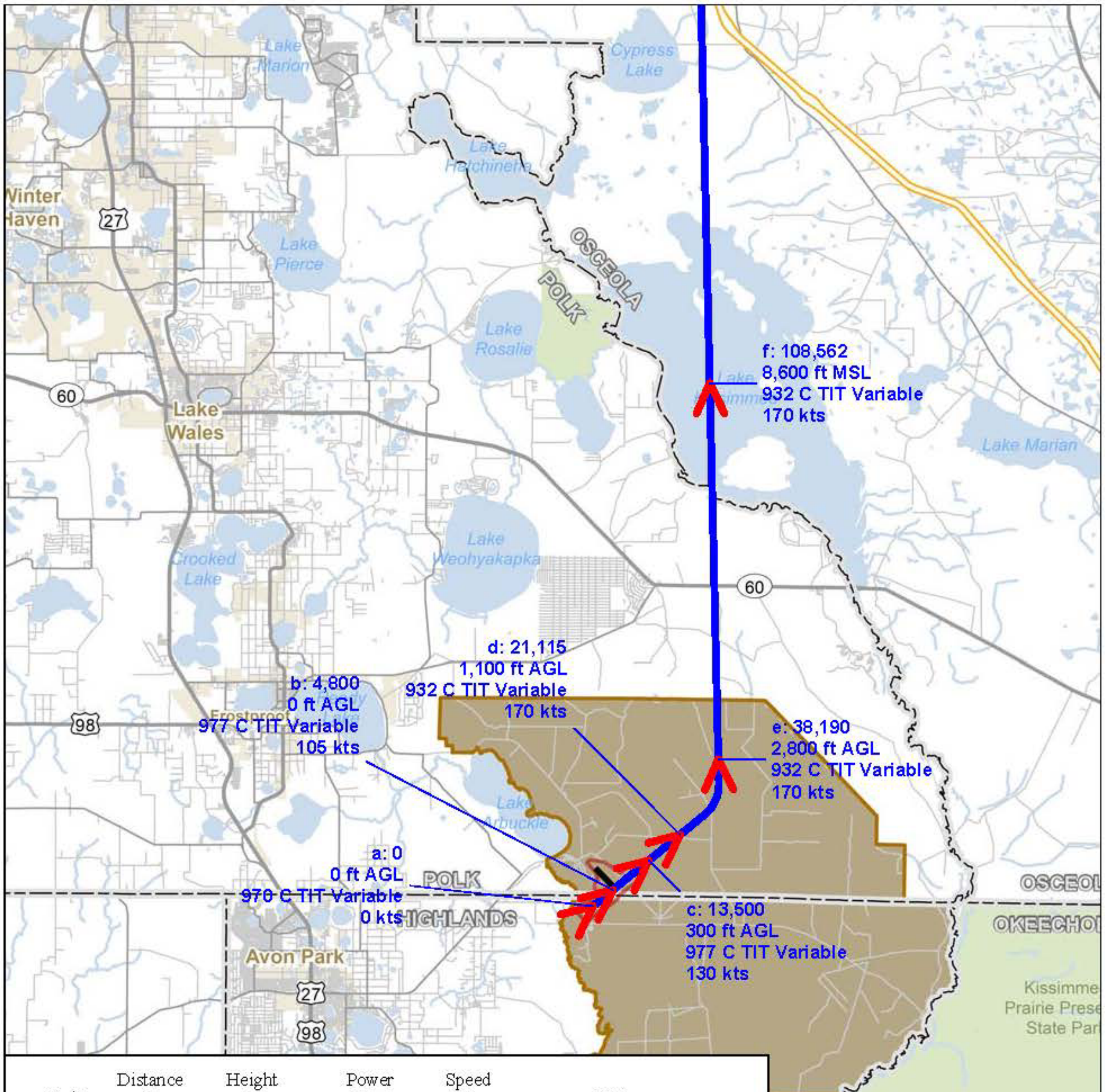
Point	Distance ft	Height ft	Power C TIT	Speed kts	Notes
a	200,000	10,500 MSL	650 Variable	170	-3° , -3400 fpm, 139 sec
b	47,201	2,500 AGL	650 Variable	150	-3° , -3400 fpm, 29 sec
c	15,178	850 AGL	650 Variable	110	-3° , -3400 fpm, 14 sec
d	0	50 AGL	650 Variable	110	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile 130A05
Flight Track: 23A4 - Arrival
Aircraft: C-130H&N&P Engine: T56-A-15
profile from previous noisestudy

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:132,000 (1 inch = 11,000 feet)

N

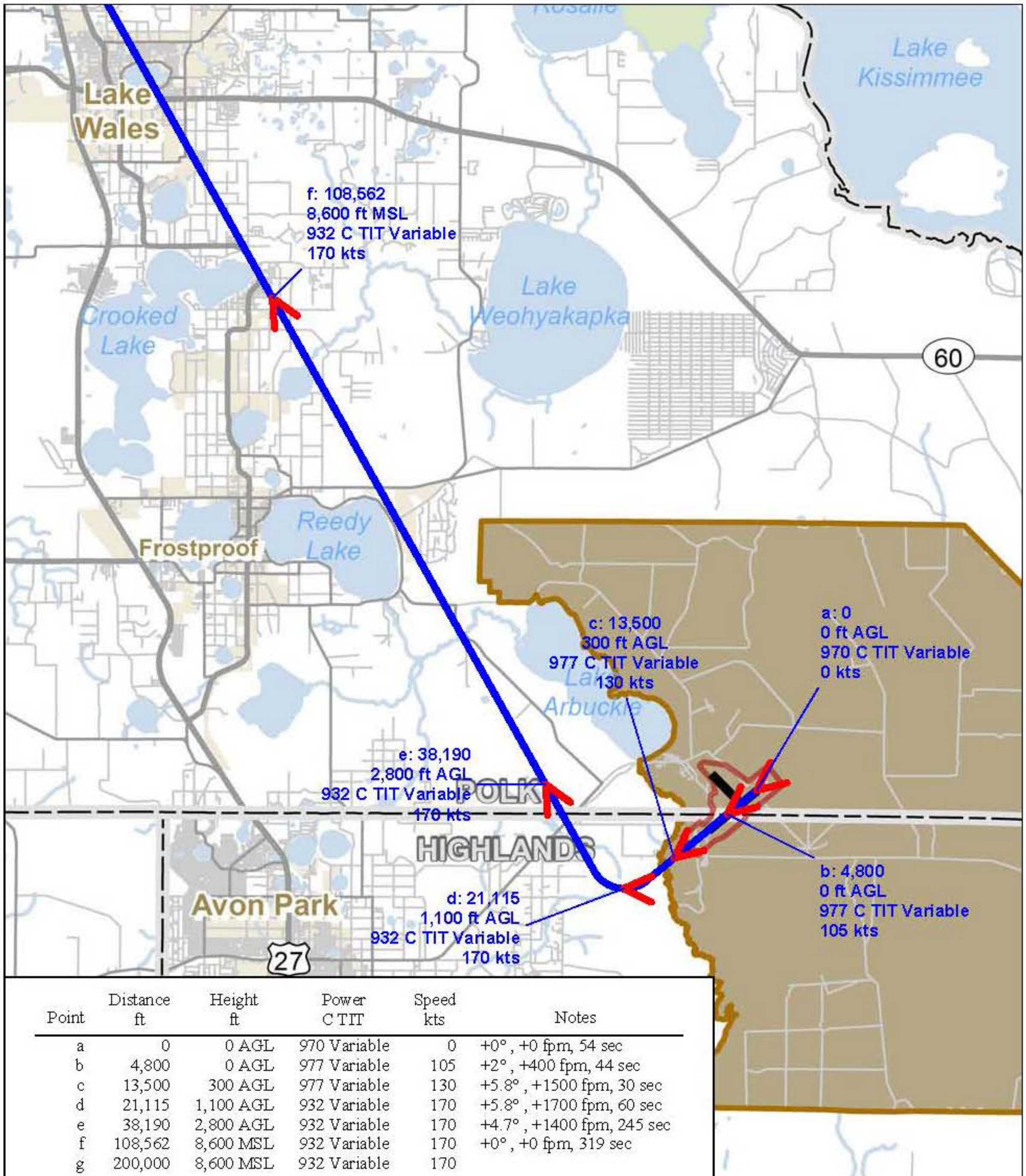


Point	Distance ft	Height ft	Power C TIT	Speed kts	Notes
a	0	0 AGL	970 Variable	0	+0° , +0 fpm, 54 sec
b	4,800	0 AGL	977 Variable	105	+2° , +400 fpm, 44 sec
c	13,500	300 AGL	977 Variable	130	+5.8° , +1500 fpm, 30 sec
d	21,115	1,100 AGL	932 Variable	170	+5.8° , +1700 fpm, 60 sec
e	38,190	2,800 AGL	932 Variable	170	+4.7° , +1400 fpm, 245 sec
f	108,562	8,600 MSL	932 Variable	170	+0° , +0 fpm, 319 sec
g	200,000	8,600 MSL	932 Variable	170	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile 130D03
Flight Track: 05D3 - Departure
Aircraft: C-130H&N&P Engine: T56-A-15
Prior to brake release, aircraft sits at 970 C TIT Variable for 5 sec
profile from previous noisestudy

0 20,000 40,000 60,000 80,000 100,000 120,000

Scale in Feet 1:379,000 (1 inch = 31,600 feet)



Point	Distance ft	Height ft	Power C TIT	Speed kts	Notes
a	0	0 AGL	970 Variable	0	+0° , +0 fpm, 54 sec
b	4,800	0 AGL	977 Variable	105	+2° , +400 fpm, 44 sec
c	13,500	300 AGL	977 Variable	130	+5.8° , +1500 fpm, 30 sec
d	21,115	1,100 AGL	932 Variable	170	+5.8° , +1700 fpm, 60 sec
e	38,190	2,800 AGL	932 Variable	170	+4.7° , +1400 fpm, 245 sec
f	108,562	8,600 MSL	932 Variable	170	+0° , +0 fpm, 319 sec
g	200,000	8,600 MSL	932 Variable	170	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile 130D11

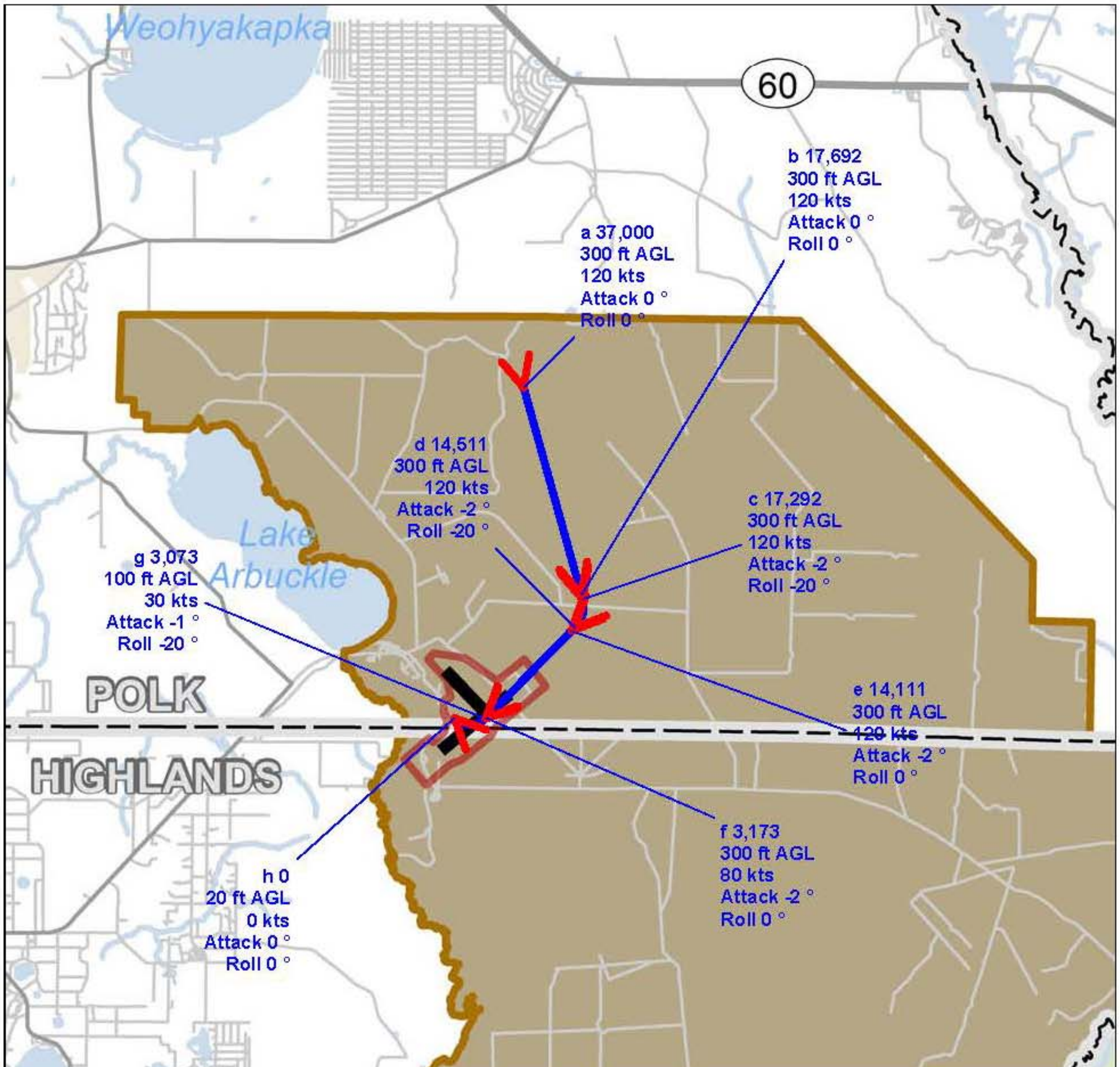
Flight Track: 23D3 - Departure to MacDill AFB

Aircraft: C-130H&N&P Engine: T56-A-15

Prior to brake release, aircraft sits at 970 C TIT Variable for 5 sec

profile from previous noisestudy

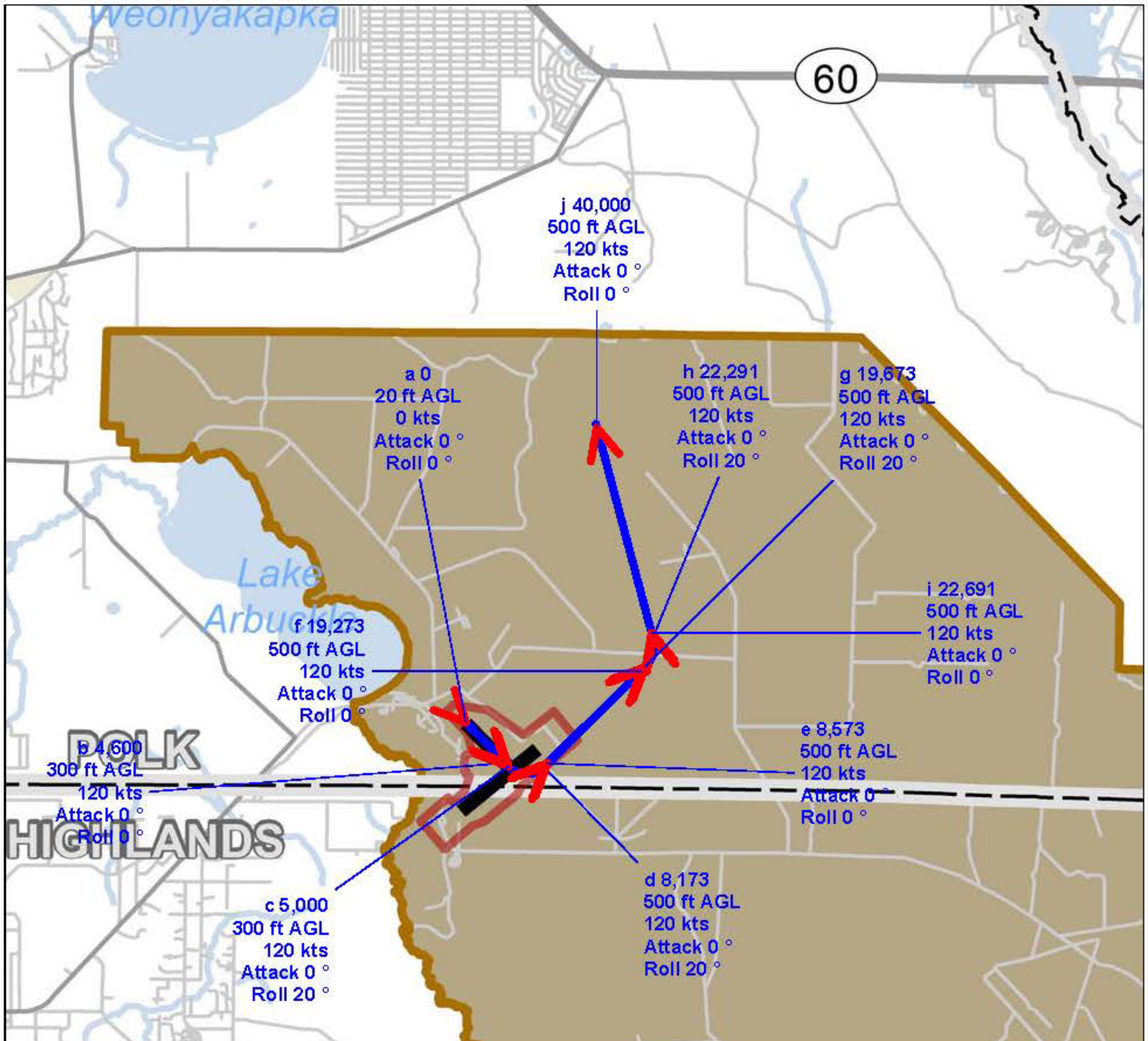
Scale in Feet 1:237,000 (1 inch = 19,700 feet)



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	37,000	300 AGL	120	0	0	0	90	+0° , +0 fpm, 490 sec
b	17,692	300 AGL	120	0	0	0	90	begin roll, +0° , +0 fpm, 2 sec
c	17,292	300 AGL	120	0	-2	-20	90	reach roll angle, begin turn, +0° , +0 fpm, 14 sec
d	14,511	300 AGL	120	0	-2	-20	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
e	14,111	300 AGL	120	0	-2	0	90	wings level, end turn, +0° , +0 fpm, 65 sec
f	3,173	300 AGL	80	0	-2	0	90	begin roll, -63.4° , -5000 fpm, 1 sec
g	3,073	100 AGL	30	0	-1	-20	90	reach roll angle, begin turn, -1.5° , +0 fpm, 121 sec
h	0	20 AGL	0	0	0	0	90	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile AH1A08
Flight Track: 32FA01 - Arrival from North Conventional
Aircraft: AH-1W Engine: N/A
based on Kbay profile AH1WA1

Scale in Feet 1:184,000 (1 inch = 15,300 feet)



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	0	0	0	0	90	+3.5°, +400 fpm, 45 sec
b	4,600	300 AGL	120	0	0	0	90	begin roll, +0°, +0 fpm, 2 sec
c	5,000	300 AGL	120	0	0	20	90	reach roll angle, begin turn, +3.6°, +800 fpm, 16 sec
d	8,173	500 AGL	120	0	0	20	90	begin rolling, wings level, +0°, +0 fpm, 2 sec
e	8,573	500 AGL	120	0	0	0	90	wings level, end turn, +0°, +0 fpm, 53 sec
f	19,273	500 AGL	120	0	0	0	90	begin roll, +0°, +0 fpm, 2 sec
g	19,673	500 AGL	120	0	0	20	90	reach roll angle, begin turn, +0°, +0 fpm, 13 sec
h	22,291	500 AGL	120	0	0	20	90	begin rolling, wings level, +0°, +0 fpm, 2 sec
i	22,691	500 AGL	120	0	0	0	90	wings level, end turn, +0°, +0 fpm, 480 sec
j	40,000	500 AGL	120	0	0	0	90	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile AH1D05

Flight Track: 14D01 - Departure to North Conventional

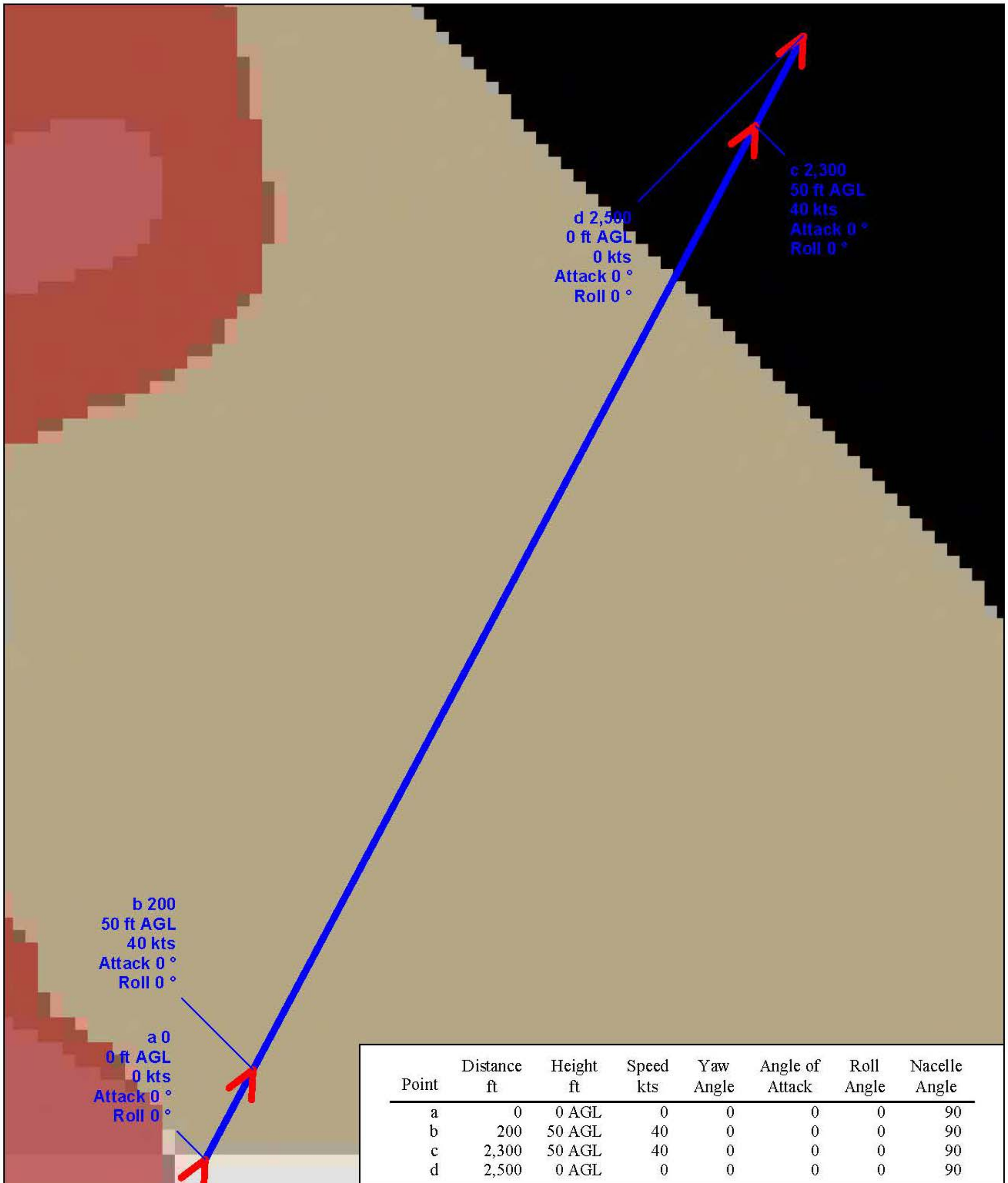
Aircraft: AH-1W Engine: N/A

Based Kbay profile AH1WD1

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:170,000 (1 inch = 14,200 feet)

N



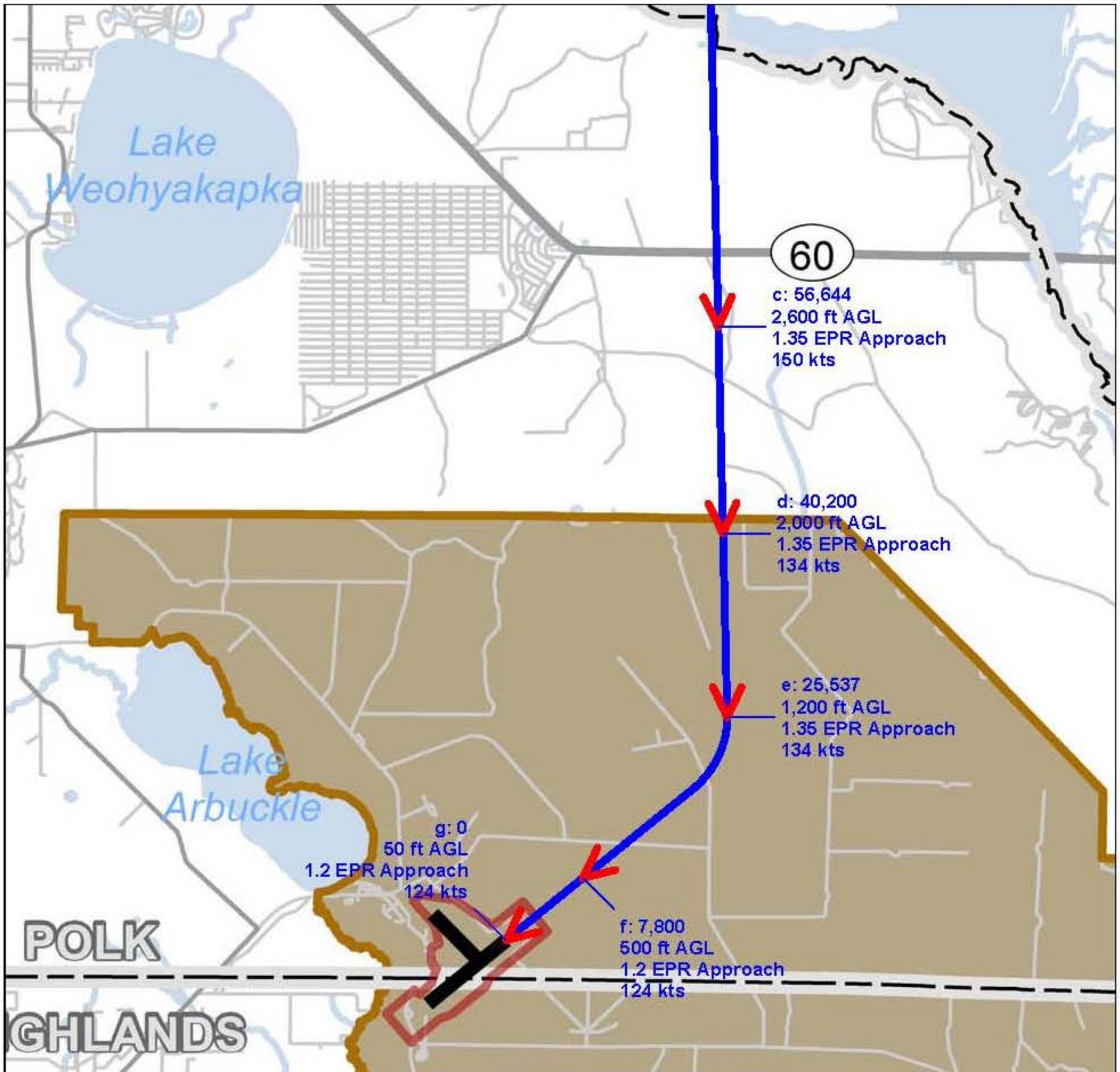
Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	0 AGL	0	0	0	0	90
b	200	50 AGL	40	0	0	0	90
c	2,300	50 AGL	40	0	0	0	90
d	2,500	0 AGL	0	0	0	0	90

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile AH1D15
Flight Track: FARRP
Aircraft: AH-1W Engine: N/A
Hop from FARRP pad (for all three departures)

0 200 400 600 800 1,000

Scale in Feet 1:3,630 (1 inch = 302 feet)

N



Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,000 MSL	1.35 Approach	250	-2.9° , -1100 fpm, 263 sec
b	100,000	5,000 AGL	1.35 Approach	200	-3.2° , -1000 fpm, 147 sec
c	56,644	2,600 AGL	1.35 Approach	150	-2.1° , -500 fpm, 69 sec
d	40,200	2,000 AGL	1.35 Approach	134	-3.1° , -700 fpm, 65 sec
e	25,537	1,200 AGL	1.35 Approach	134	-2.3° , -500 fpm, 81 sec
f	7,800	500 AGL	1.2 Approach	124	-3.3° , -700 fpm, 37 sec
g	0	50 AGL	1.2 Approach	124	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C9AA05

Flight Track: 23A4 - Arrival

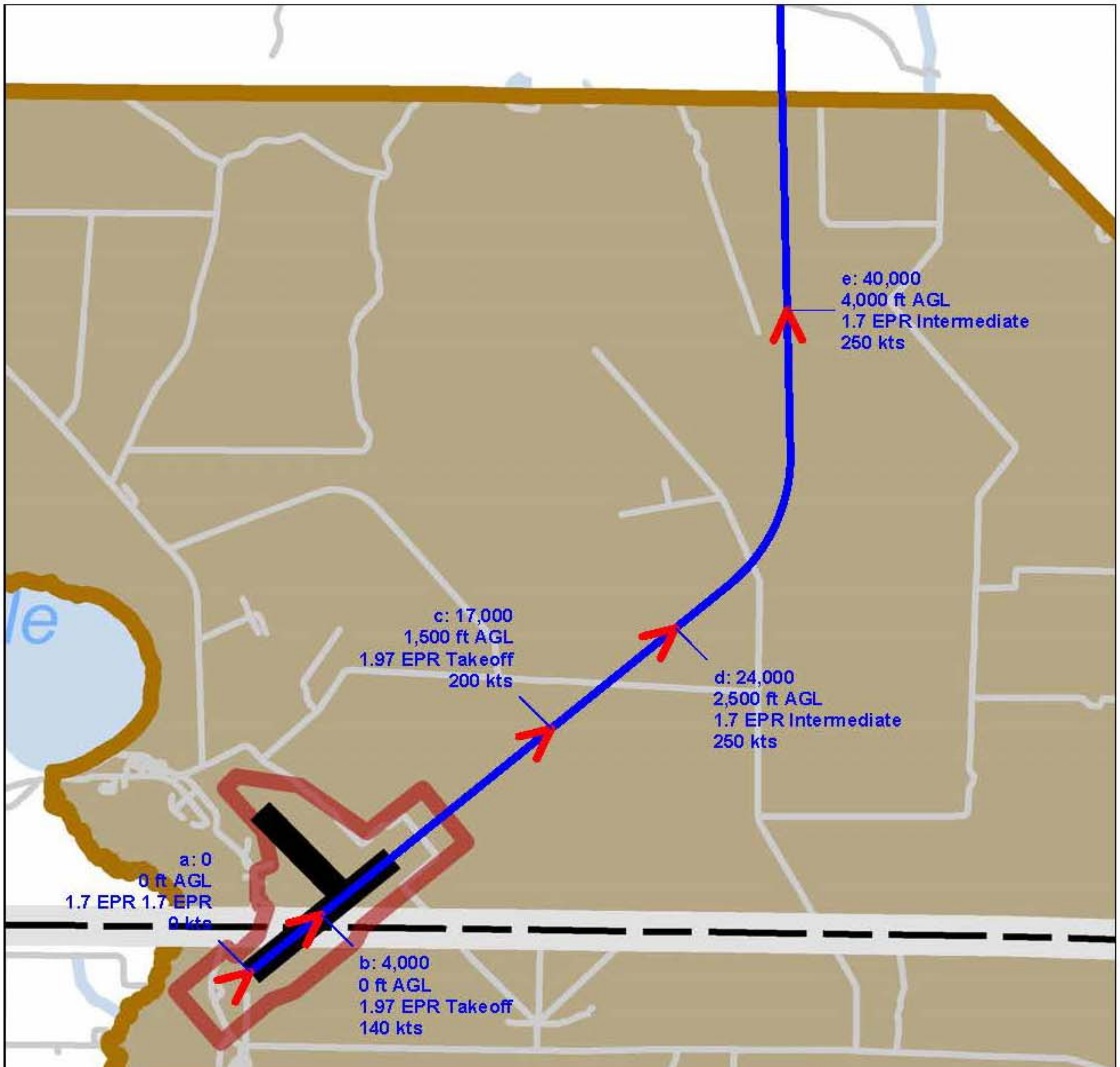
Aircraft: C-9A Engine: JT8D-9A

Based on Mugu profile C-9A06

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:161,000 (1 inch = 13,500 feet)

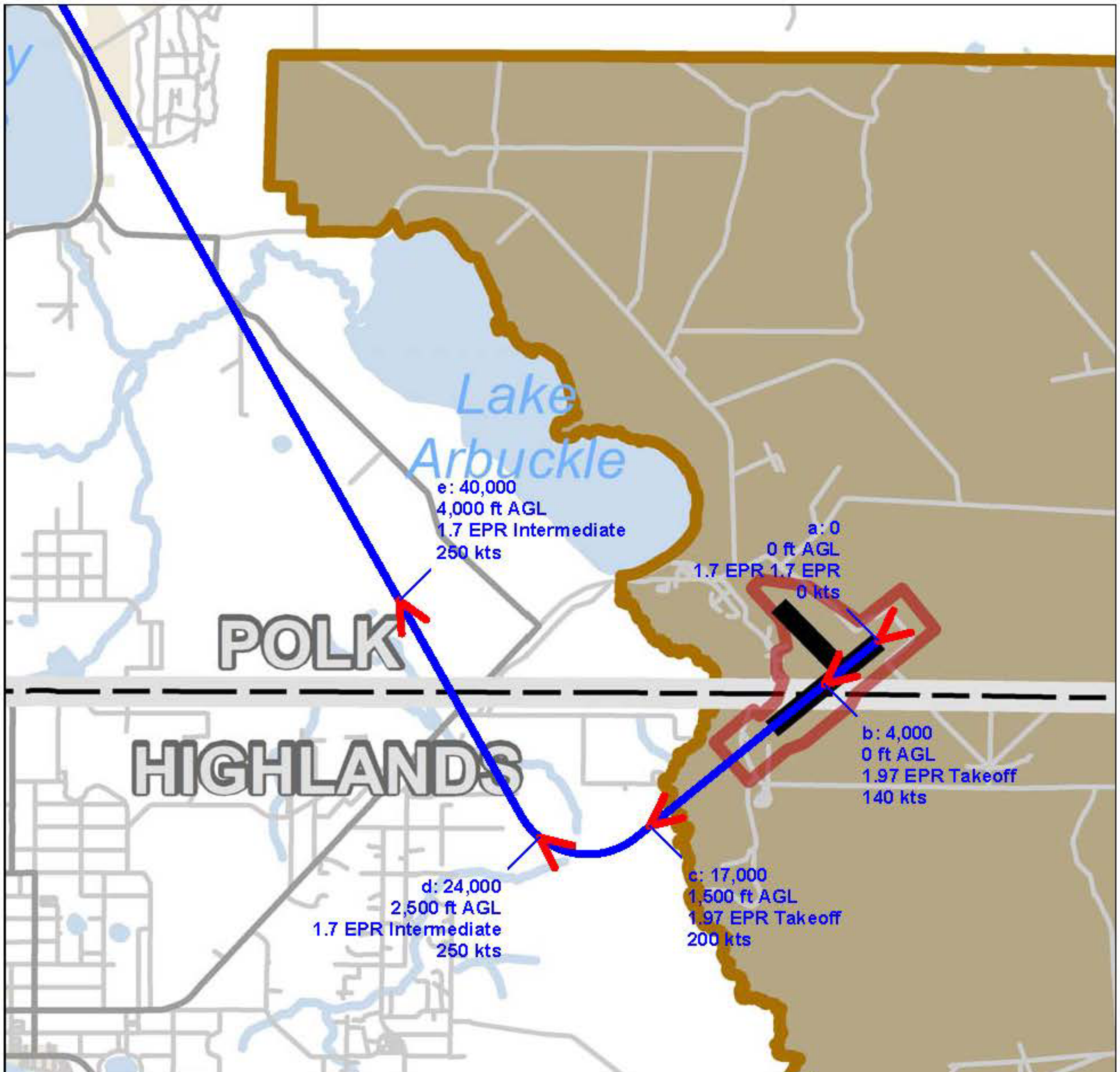
N



Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.7 1.7 EPR	0	+0° , +0 fpm, 34 sec
b	4,000	0 AGL	1.97 Takeoff	140	+6.6° , +2000 fpm, 45 sec
c	17,000	1,500 AGL	1.97 Takeoff	200	+8.1° , +3200 fpm, 18 sec
d	24,000	2,500 AGL	1.7 Intermediate	250	+5.4° , +2400 fpm, 38 sec
e	40,000	4,000 AGL	1.7 Intermediate	250	+2.1° , +900 fpm, 379 sec
f	200,000	10,000 MSL	1.7 Intermediate	250	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C9AD03
Flight Track: 05D3 - Departure
Aircraft: C-9A Engine: JT8D-9A
Prior to brake release, aircraft sits at 1.7 EPR 1.7 EPR for 5 sec
Based on Mugu profile C-9D11

Scale in Feet 1:89,500 (1 inch = 7,460 feet)



Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.7 1.7 EPR	0	+0°, +0 fpm, 34 sec
b	4,000	0 AGL	1.97 Takeoff	140	+6.6°, +2000 fpm, 45 sec
c	17,000	1,500 AGL	1.97 Takeoff	200	+8.1°, +3200 fpm, 18 sec
d	24,000	2,500 AGL	1.7 Intermediate	250	+5.4°, +2400 fpm, 38 sec
e	40,000	4,000 AGL	1.7 Intermediate	250	+2.1°, +900 fpm, 379 sec
f	200,000	10,000 MSL	1.7 Intermediate	250	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C9AD11

Flight Track: 23D3 - Departure to MacDill AFB

Aircraft: C-9A Engine: JT8D-9A

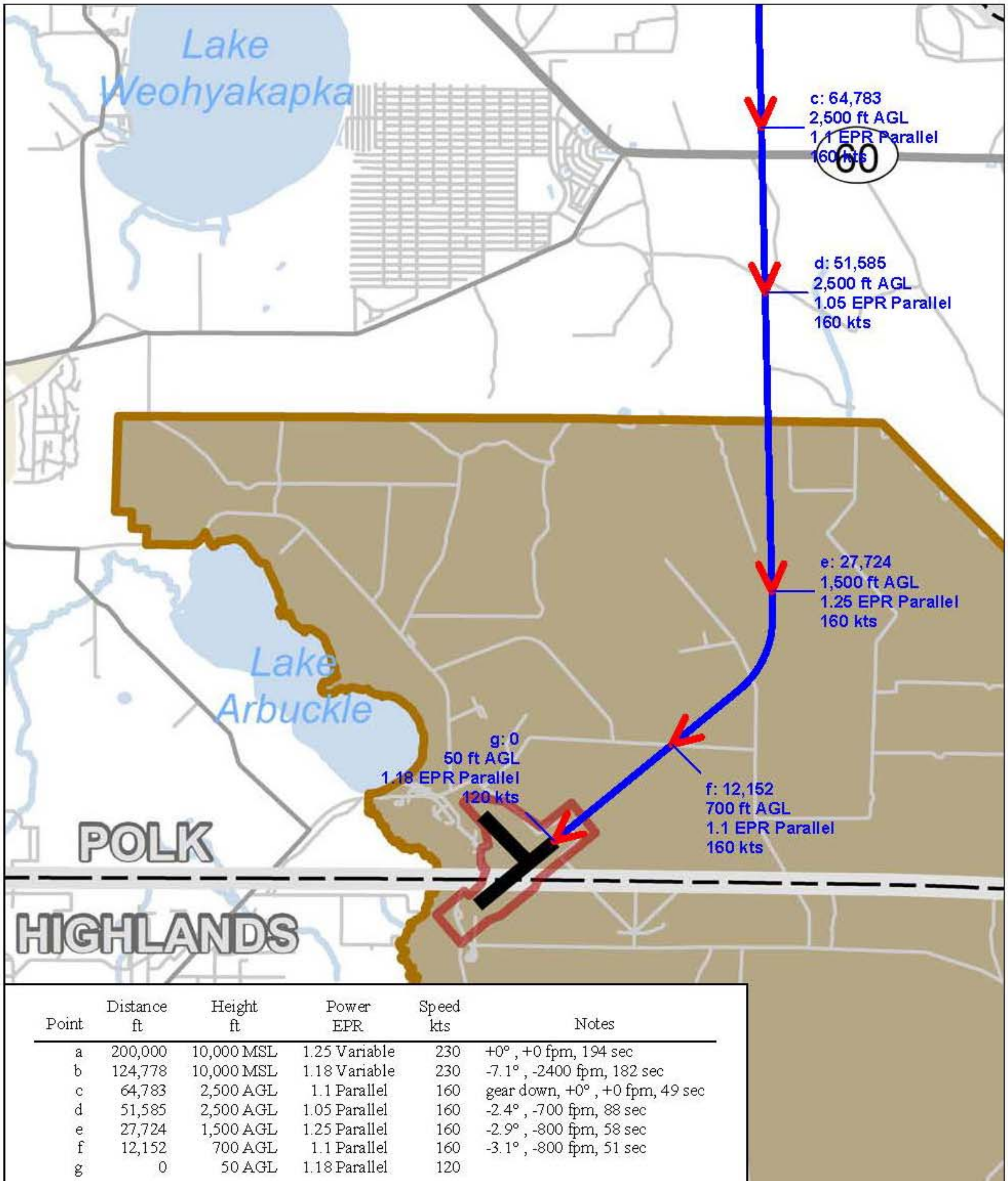
Prior to brake release, aircraft sits at 1.7 EPR 1.7 EPR for 5 sec

Based on Mugu profile C-9D11

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:118,000 (1 inch = 9,820 feet)

N



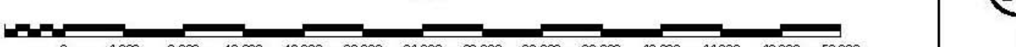
Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,000 MSL	1.25 Variable	230	+0° , +0 fpm, 194 sec
b	124,778	10,000 MSL	1.18 Variable	230	-7.1° , -2400 fpm, 182 sec
c	64,783	2,500 AGL	1.1 Parallel	160	gear down, +0° , +0 fpm, 49 sec
d	51,585	2,500 AGL	1.05 Parallel	160	-2.4° , -700 fpm, 88 sec
e	27,724	1,500 AGL	1.25 Parallel	160	-2.9° , -800 fpm, 58 sec
f	12,152	700 AGL	1.1 Parallel	160	-3.1° , -800 fpm, 51 sec
g	0	50 AGL	1.18 Parallel	120	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C17A05

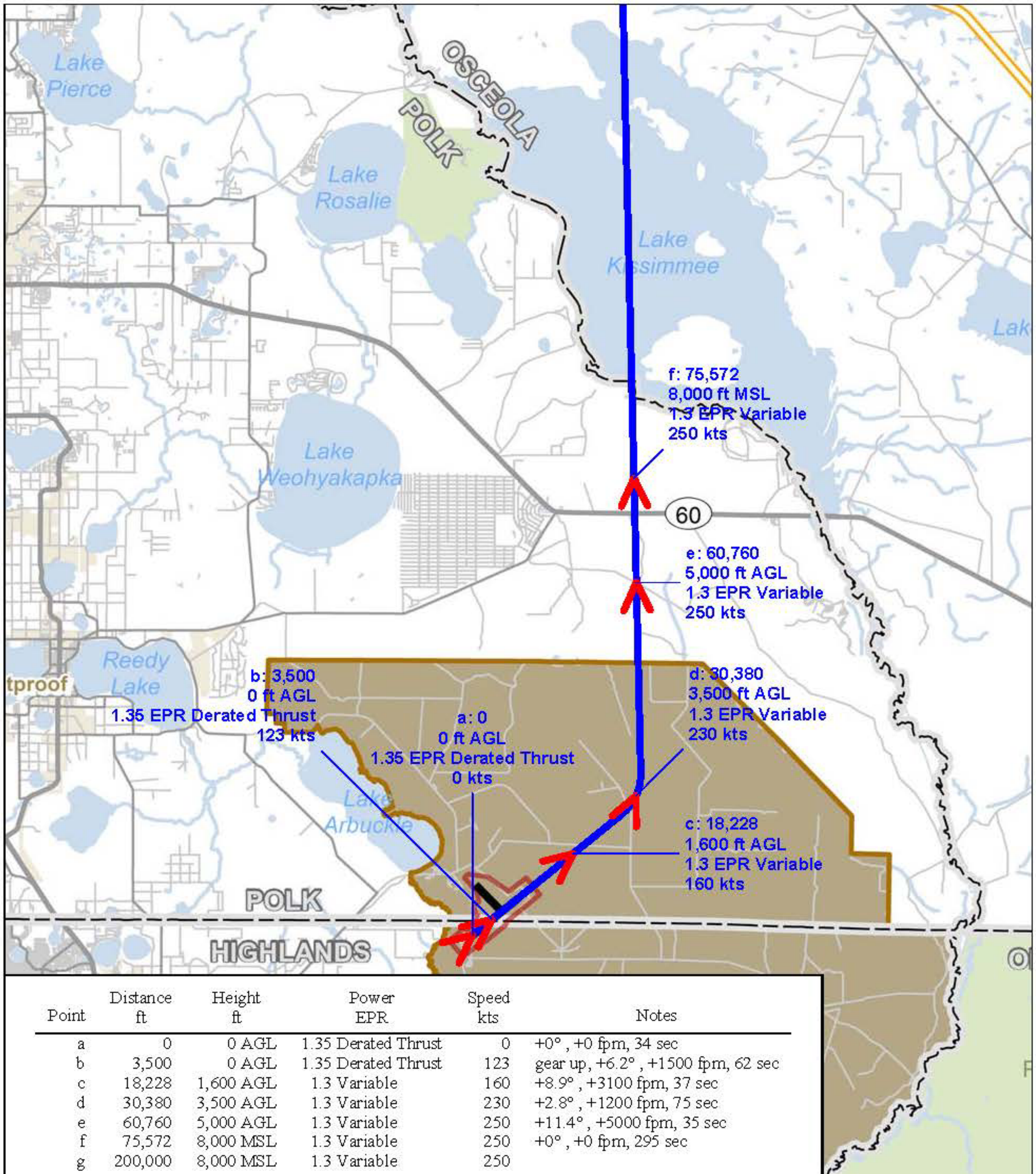
Flight Track: 23A4 - Arrival

Aircraft: C-17 Engine: F117-PW-100

based on Kbay profile C17A4



Scale in Feet 1:147,000 (1 inch = 12,300 feet)



Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.35 Derated Thrust	0	+0° , +0 fpm, 34 sec
b	3,500	0 AGL	1.35 Derated Thrust	123	gear up, +6.2° , +1500 fpm, 62 sec
c	18,228	1,600 AGL	1.3 Variable	160	+8.9° , +3100 fpm, 37 sec
d	30,380	3,500 AGL	1.3 Variable	230	+2.8° , +1200 fpm, 75 sec
e	60,760	5,000 AGL	1.3 Variable	250	+11.4° , +5000 fpm, 35 sec
f	75,572	8,000 MSL	1.3 Variable	250	+0° , +0 fpm, 295 sec
g	200,000	8,000 MSL	1.3 Variable	250	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C17D03

Flight Track: 05D3 - Departure

Aircraft: C-17 Engine: F117-PW-100

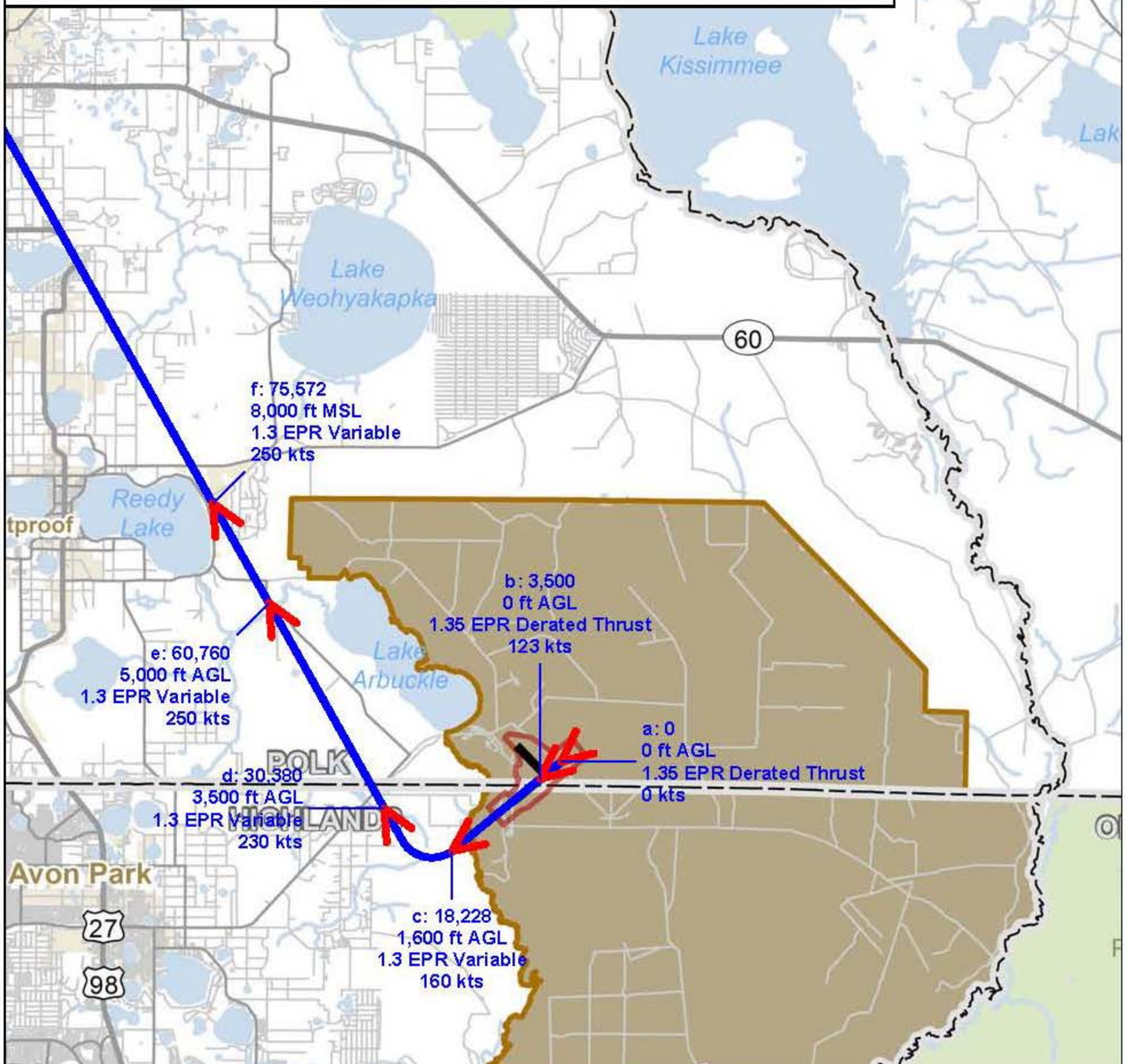
Prior to brake release, aircraft sits at 1.35 EPR Derated Thrust for 5 sec based on Andersen profile C17D16

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

Scale in Feet 1:266,000 (1 inch = 22,200 feet)

N

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.35 Derated Thrust	0	+0° , +0 fpm, 34 sec
b	3,500	0 AGL	1.35 Derated Thrust	123	gear up; +6.2° , +1500 fpm, 62 sec
c	18,228	1,600 AGL	1.3 Variable	160	+8.9° , +3100 fpm, 37 sec
d	30,380	3,500 AGL	1.3 Variable	230	+2.8° , +1200 fpm, 75 sec
e	60,760	5,000 AGL	1.3 Variable	250	+11.4° , +5000 fpm, 35 sec
f	75,572	8,000 MSL	1.3 Variable	250	+0° , +0 fpm, 295 sec
g	200,000	8,000 MSL	1.3 Variable	250	



MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile C17D11

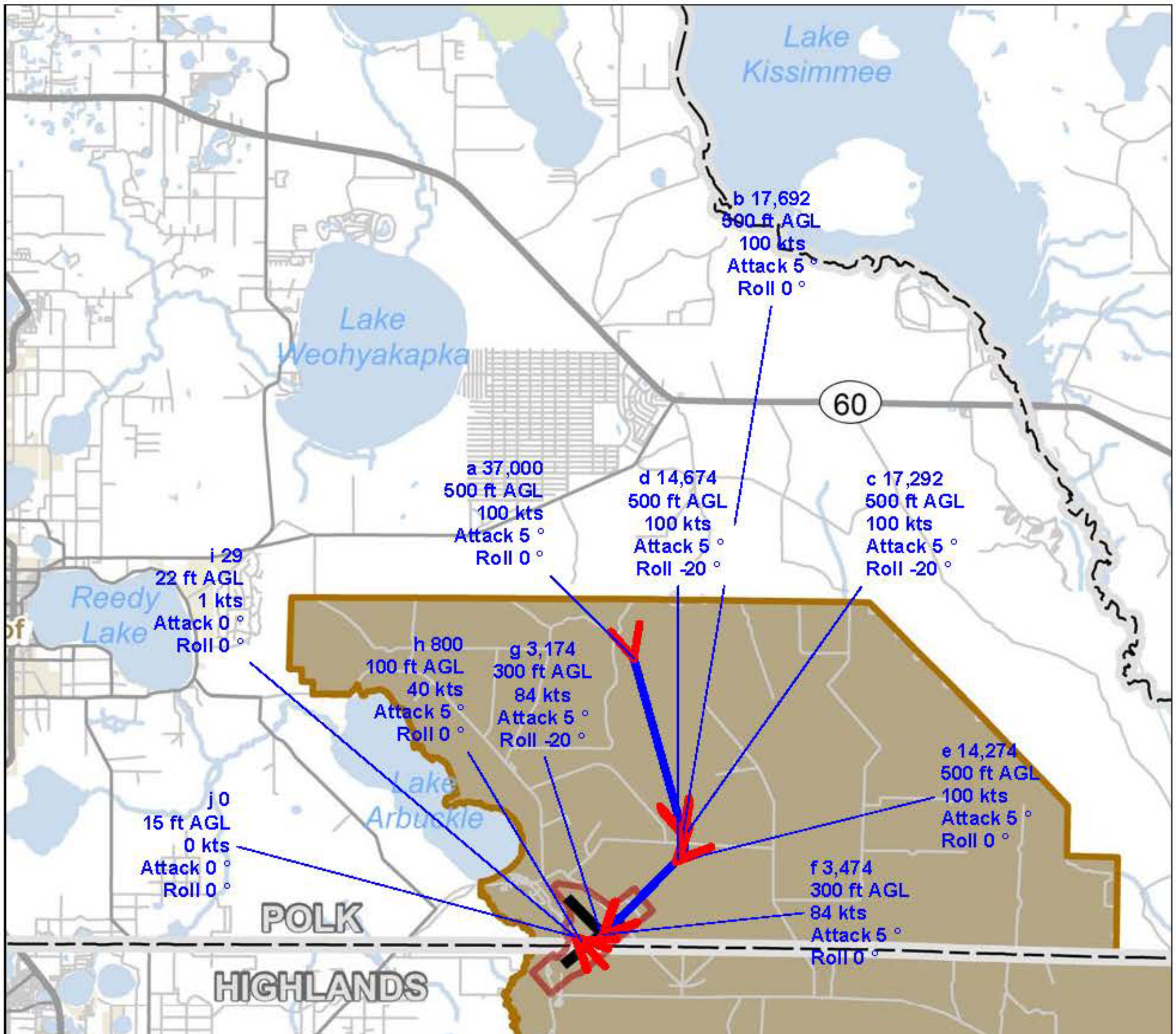
Flight Track: 23D3 - Departure to MacDill AFB

Aircraft: C-17 Engine: F117-PW-100

Prior to brake release, aircraft sits at 1.35 EPR Derated Thrust for 5 sec based on Andersen profile C17D16

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

Scale in Feet 1:266,000 (1 inch = 22,200 feet)



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	37,000	500 AGL	100	0	5	0	90	-0.6° , -100 fpm, 270 sec
b	17,692	500 AGL	100	0	5	0	90	begin roll, +0° , +0 fpm, 2 sec
c	17,292	500 AGL	100	0	5	-20	90	reach roll angle, begin turn, +0° , +0 fpm, 16 sec
d	14,674	500 AGL	100	0	5	-20	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
e	14,274	500 AGL	100	0	5	0	90	wings level, end turn+0° , +0 fpm, 70 sec
f	3,474	300 AGL	84	0	5	0	90	begin roll, +0° , +0 fpm, 2 sec
g	3,174	300 AGL	84	0	5	-20	90	reach roll angle, begin turn, -4.8° , -500 fpm, 23 sec
h	800	100 AGL	40	0	5	0	90	begin rolling, wings level, -5.8° , -200 fpm, 22 sec
i	29	22 AGL	1	0	0	0	90	-13.6° , +0 fpm, 34 sec
j	0	15 AGL	0	0	0	0	90	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile CH46A08

Flight Track: 32FA01 - Arrival from North Conventional

Aircraft: CH46E Engine: N/A

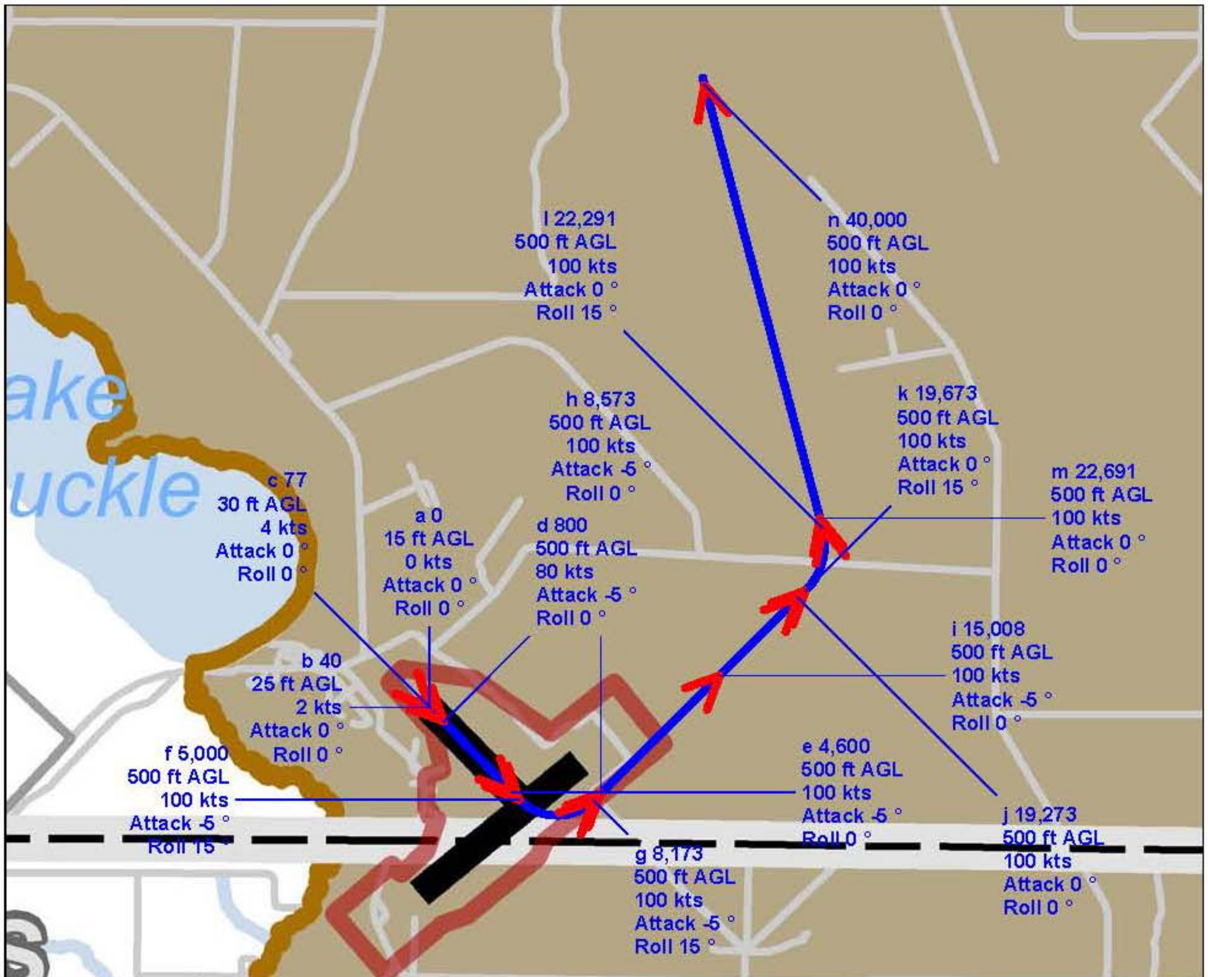
Based on Miramar profile 414

Altitude adjusted so < 500 ft in Avon park

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:227,000 (1 inch = 18,900 feet)

N



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	15 AGL	0	0	0	0	90	+14° , +0 fpm, 24 sec
b	40	25 AGL	2	0	0	0	90	+7.7° , +0 fpm, 7 sec
c	77	30 AGL	4	0	0	0	90	+20.5° , +1500 fpm, 10 sec
d	800	500 AGL	80	0	-5	0	90	+3° , +500 fpm, 25 sec
e	4,600	500 AGL	100	0	-5	0	90	begin roll, +0° , +0 fpm, 2 sec
f	5,000	500 AGL	100	0	-5	15	90	reach roll angle, begin turn, +0° , +0 fpm, 19 sec
g	8,173	500 AGL	100	0	-5	15	90	begin rolling wings level, +0° , +0 fpm, 2 sec
h	8,573	500 AGL	100	0	-5	0	90	wings level, end turn, +0° , +0 fpm, 38 sec
i	15,008	500 AGL	100	0	-5	0	90	+0° , +0 fpm, 25 sec
j	19,273	500 AGL	100	0	0	0	90	begin roll, +0° , +0 fpm, 2 sec
k	19,673	500 AGL	100	0	0	15	90	reach roll angle, begin turn, +0° , +0 fpm, 16 sec
l	22,291	500 AGL	100	0	0	15	90	begin rolling wings level,+0° , +0 fpm, 2 sec
m	22,691	500 AGL	100	0	0	0	90	wings level, end turn, -0.3° , +100 fpm, 588 sec
n	40,000	500 AGL	100	0	0	0	90	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile CH46D05

Flight Track: 14D01 - Departure to North Conventional

Aircraft: CH46E Engine: N/A

Based on Miramar profile 405

Altitude adjusted so < 500 ft in Avon park

Scale in Feet 1:85,000 (1 inch = 7,080 feet)

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	15 AGL	0	0	0	0	90	+11.4° , +100 fpm, 20 sec
b	99	35 AGL	6	0	0	0	90	+3.4° , +200 fpm, 73 sec
c	4,500	300 AGL	65	0	-5	0	90	begin roll, +11.3° , +1300 fpm, 4 sec
d	5,000	400 AGL	70	0	-5	20	90	reach roll angle, begin turn, +1.8° , +300 fpm, 20 sec
e	8,173	500 AGL	120	0	-5	20	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
f	8,673	500 AGL	120	0	-5	0	90	wings level, end turn, +0° , +0 fpm, 31 sec
g	15,008	500 AGL	120	0	-5	0	90	+0° , +0 fpm, 21 sec
h	19,173	500 AGL	120	0	-5	0	90	begin roll, +0° , +0 fpm, 2 sec
i	19,673	500 AGL	120	0	-5	20	90	reach roll angle, begin turn, +0° , +0 fpm, 13 sec
j	22,291	500 AGL	120	0	-5	20	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
k	22,791	500 AGL	120	0	-5	0	90	wings level, end turn, +0° , +0 fpm, 490 sec
l	40,000	500 AGL	120	0	0	0	90	+0.3° , 0 fpm, 490 sec

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile CH53D05

Flight Track: 14D01 - Departure to North Conventional

Aircraft: CH53E Engine: N/A

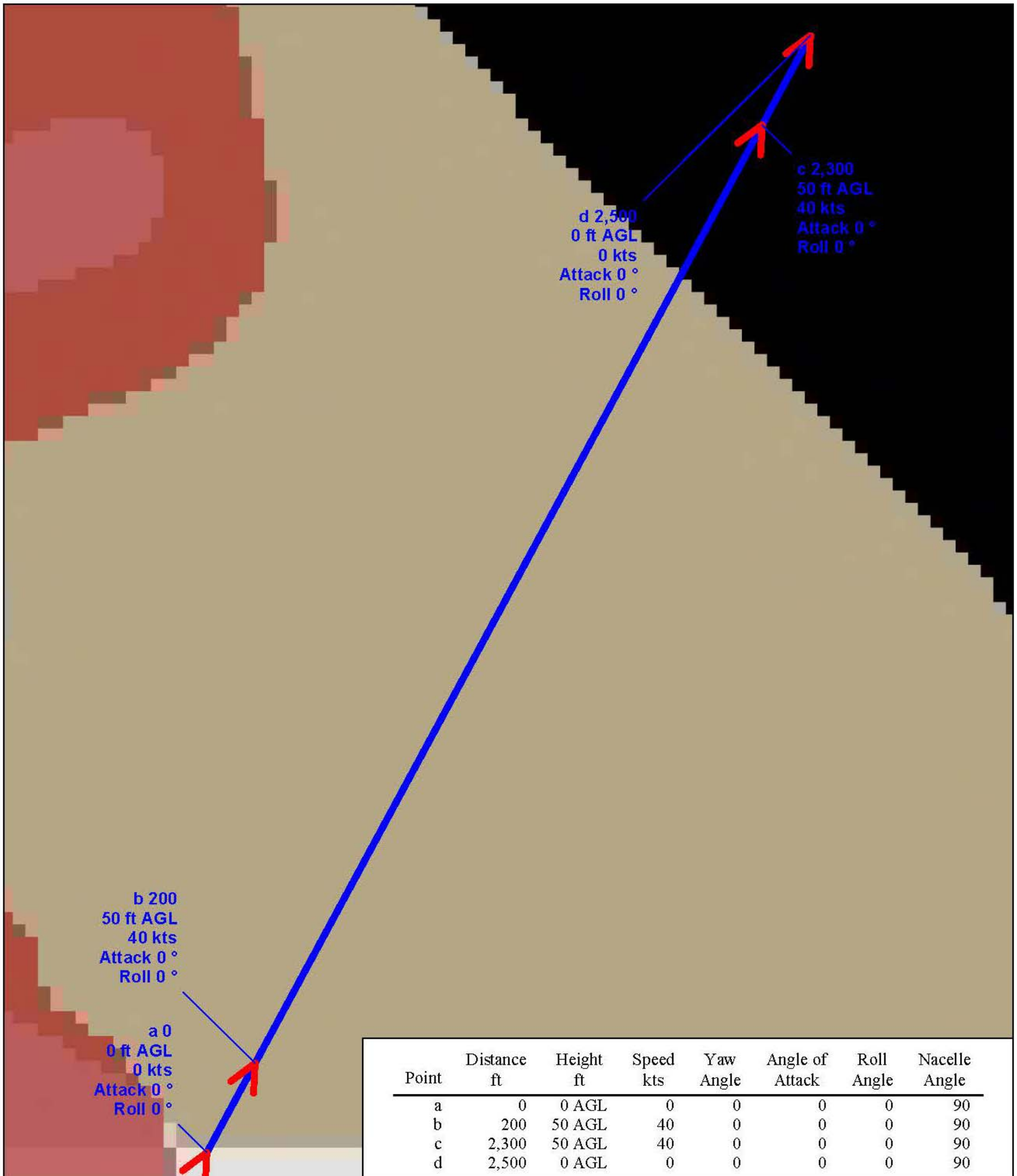
Based on Miramar profile 306

Altitude adjusted so < 500 ft in Avon park

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:72,600 (1 inch = 6,050 feet)

N



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	0 AGL	0	0	0	0	90
b	200	50 AGL	40	0	0	0	90
c	2,300	50 AGL	40	0	0	0	90
d	2,500	0 AGL	0	0	0	0	90

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile CH53D15

Flight Track: FARRP

Aircraft: CH53E Engine: N/A

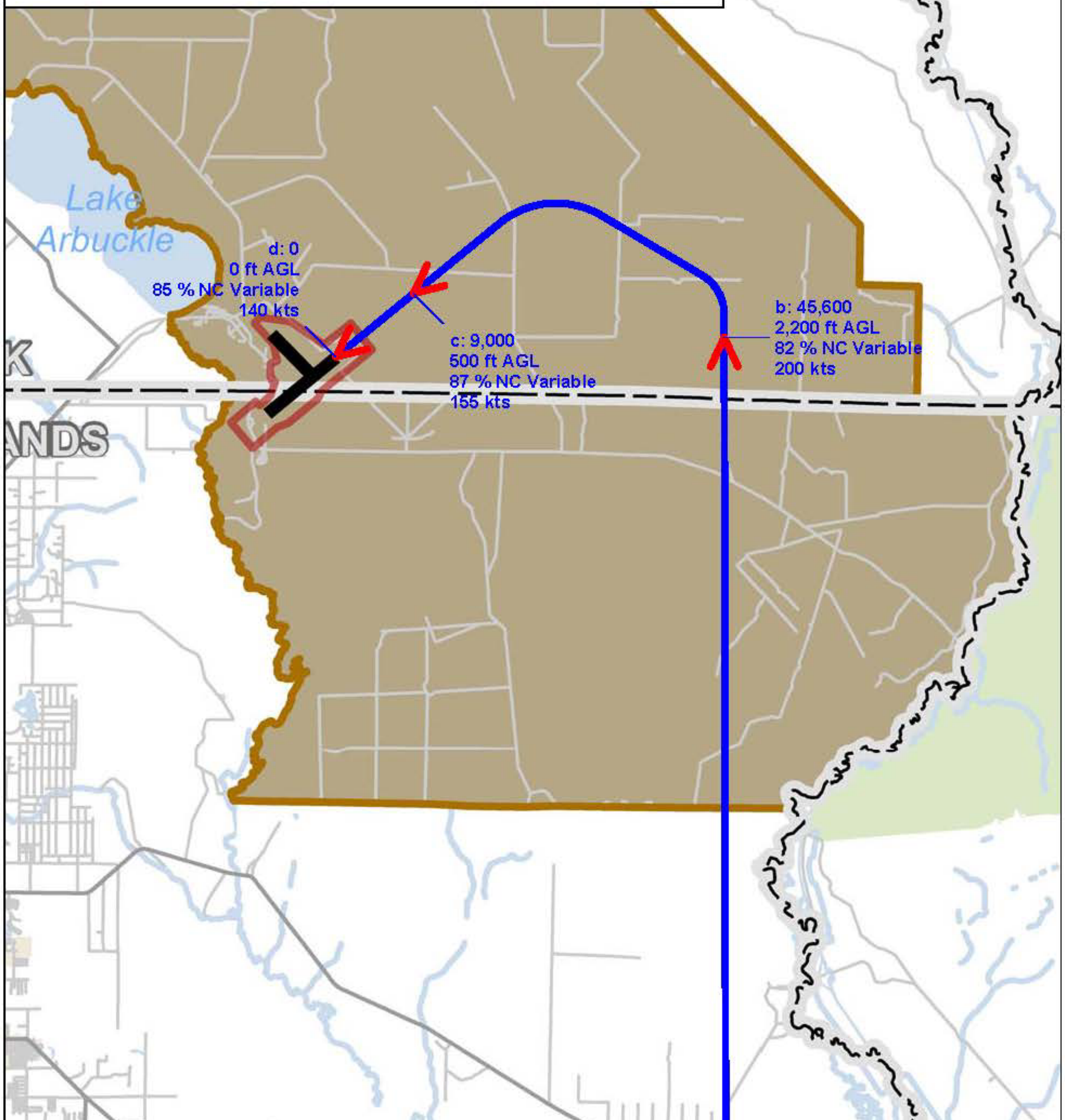
Hop from FARRP pad (for all three departures)

0 200 400 600 800 1,000

Scale in Feet 1:3,630 (1 inch = 302 feet)

N

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	200,000	8,000 MSL	82 Variable	300	-2.2° , -1000 fpm, 366 sec
b	45,600	2,200 AGL	82 Variable	200	-2.7° , -800 fpm, 122 sec
c	9,000	500 AGL	87 Variable	155	-3.2° , -800 fpm, 36 sec
d	0	0 AGL	85 Variable	140	



MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile F16A02

Flight Track: 23A1 - Arrival

Aircraft: F-16C Engine: F110-GE-100

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:175,000 (1 inch = 14,600 feet)

N

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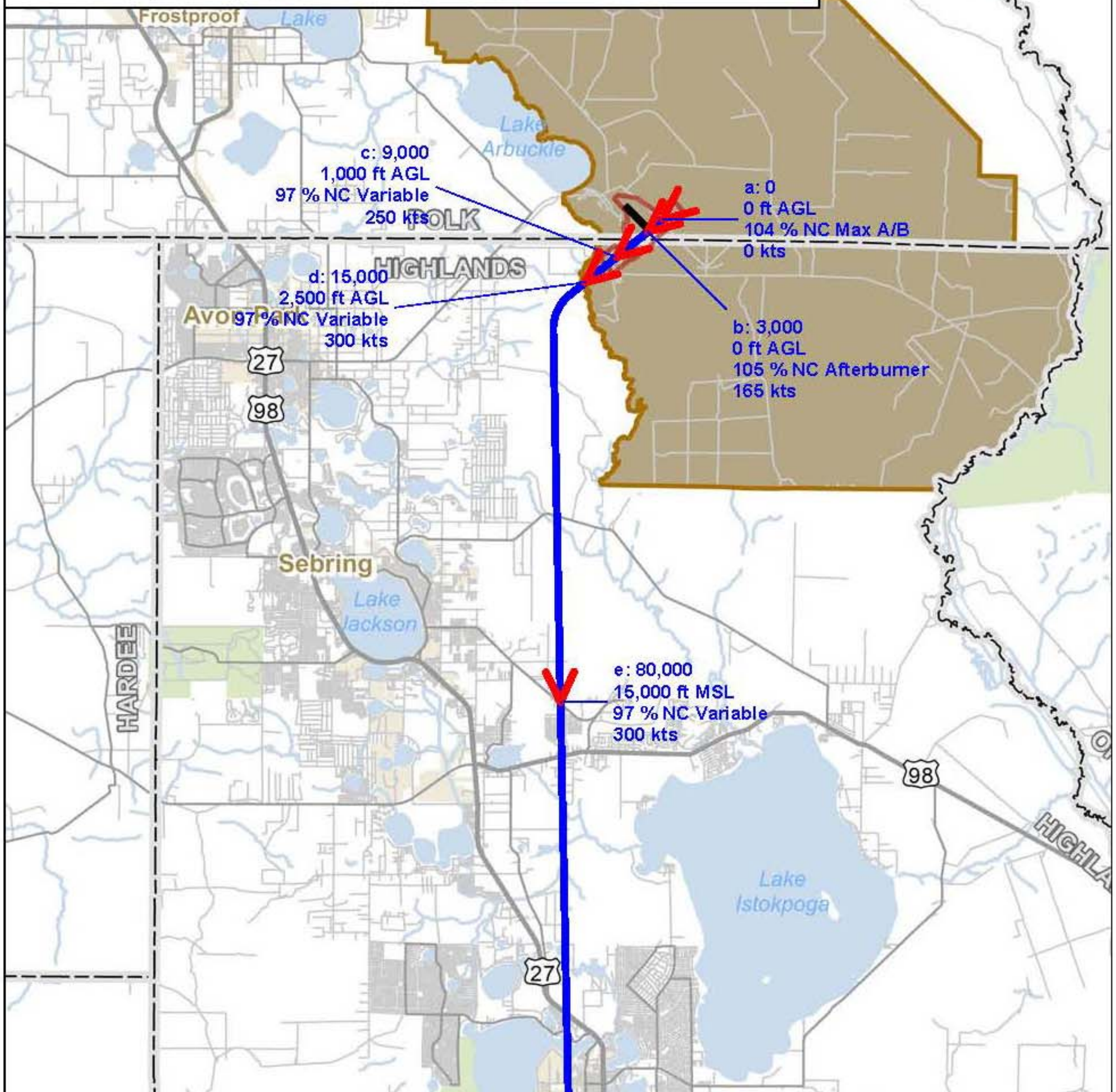
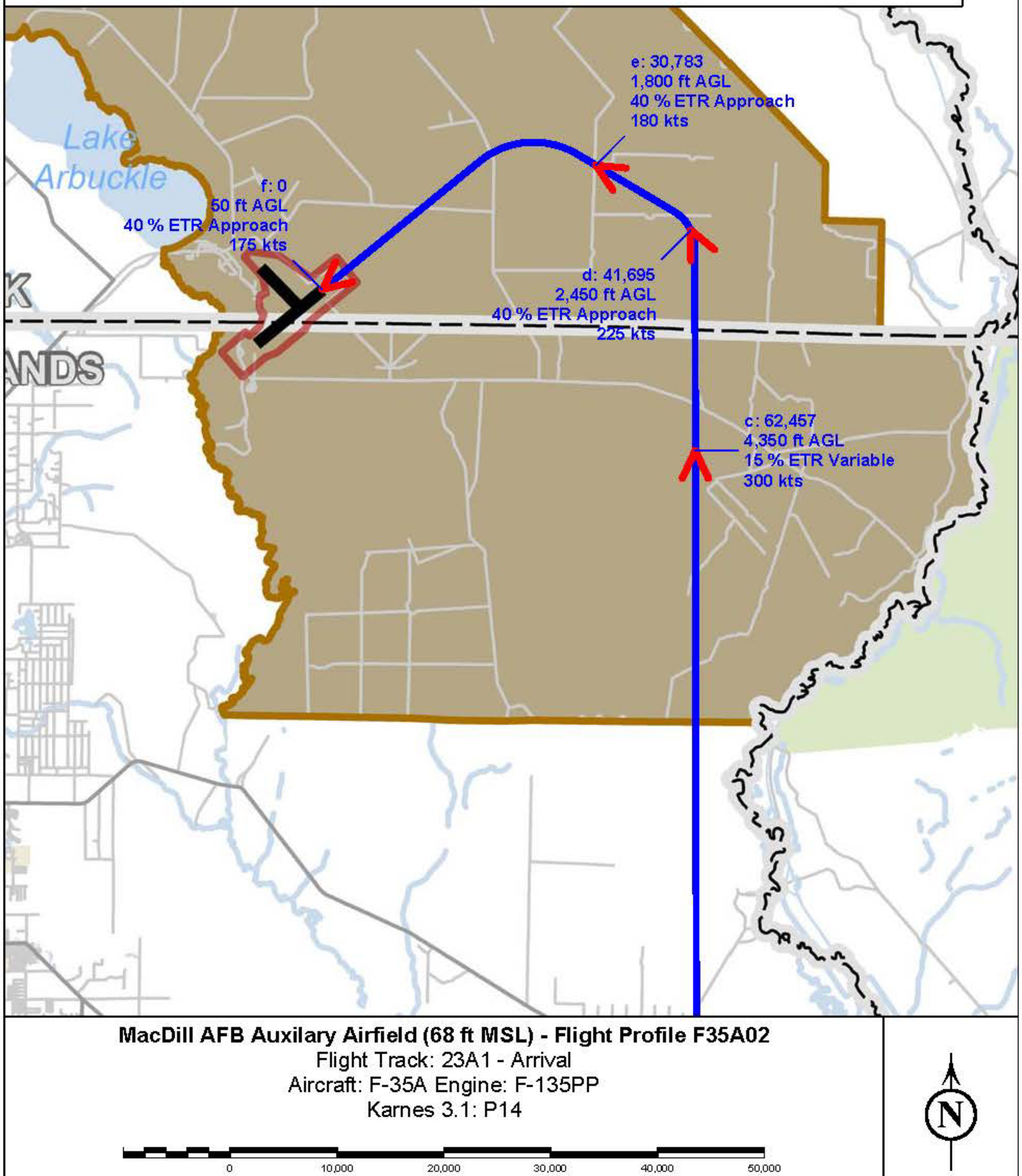
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	104 Max A/B	0	+0° , +0 fpm, 22 sec
b	3,000	0 AGL	105 Afterburner	165	+9.5° , +3500 fpm, 17 sec
c	9,000	1,000 AGL	97 Variable	250	+14° , +6800 fpm, 13 sec
d	15,000	2,500 AGL	97 Variable	300	+10.9° , +5700 fpm, 128 sec
e	80,000	15,000 MSL	97 Variable	300	+0° , +0 fpm, 237 sec
f	200,000	15,000 MSL	91 Variable	300	



MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile F16D09
Flight Track: 23D1 - Departure
Aircraft: F-16C Engine: F110-GE-100
Prior to brake release, aircraft sits at 104 % NC Max A/B for 5 sec

Scale in Feet 1:303,000 (1 inch = 25,300 feet)

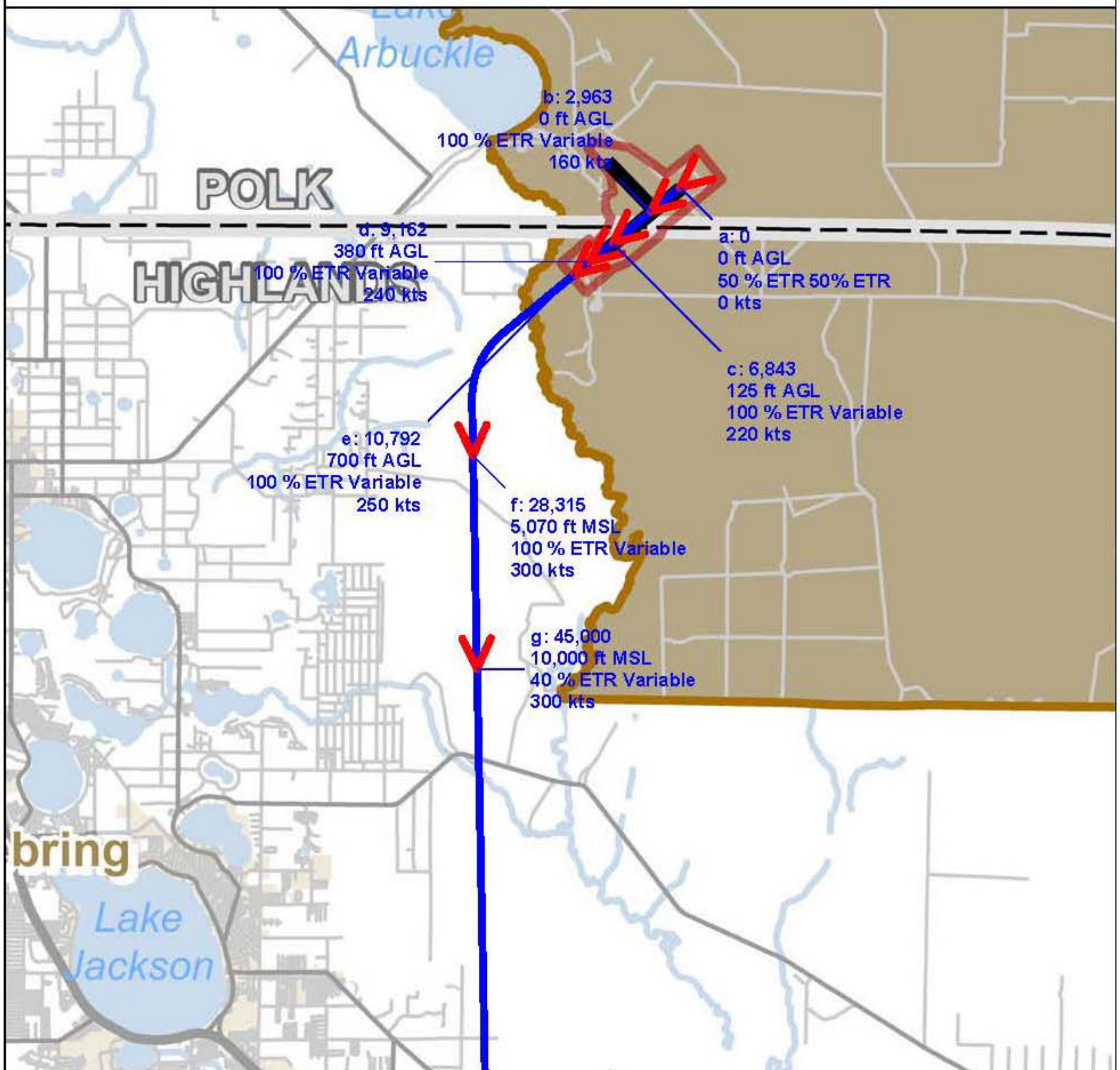
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	200,000	10,000 MSL	15 Variable	350	+0° , +0 fpm, 133 sec
b	121,520	10,000 MSL	15 Variable	350	Begin descent from 10000 ft MSL, -5.5° , -3100 fpm, 108 sec
c	62,457	4,350 AGL	15 Variable	300	300 kts, -5.2° , -2400 fpm, 47 sec
d	41,695	2,450 AGL	40 Approach	225	Gear down, -3.4° , -1200 fpm, 32 sec
e	30,783	1,800 AGL	40 Approach	180	Initial Point, -3.3° , -1000 fpm, 103 sec
f	0	50 AGL	40 Approach	175	Assume cross threshold at 50 ft AGL,



MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile F35A02
Flight Track: 23A1 - Arrival
Aircraft: F-35A Engine: F-135PP
Karnes 3.1: P14

Scale in Feet 1:175,000 (1 inch = 14,600 feet)

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	50 50% ETR	0	Assume 1 second @ 50% ETR before brake release, +0° , +0 fpm, 22 sec
b	2,963	0 AGL	100 Variable	160	Rotate, +1.8° , +600 fpm, 12 sec
c	6,843	125 AGL	100 Variable	220	Gear up, +6.3° , +2500 fpm, 6 sec
d	9,162	380 AGL	100 Variable	240	Speed slope change, +11.1° , +4800 fpm, 4 sec
e	10,792	700 AGL	100 Variable	250	approx 7000 fpm climb, +14° , +6700 fpm, 38 sec
f	28,315	5,070 MSL	100 Variable	300	Begin approx 9000 fpm climb at 300 KIAS below 10000 feet MSL, +16.5°
g	45,000	10,000 MSL	40 Variable	300	Assume continuous climb to 10,000 ft MSL and level flight (power reducti
h	200,000	10,000 MSL	40 Variable	300	



MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile F35D09

Flight Track: 23D1 - Departure

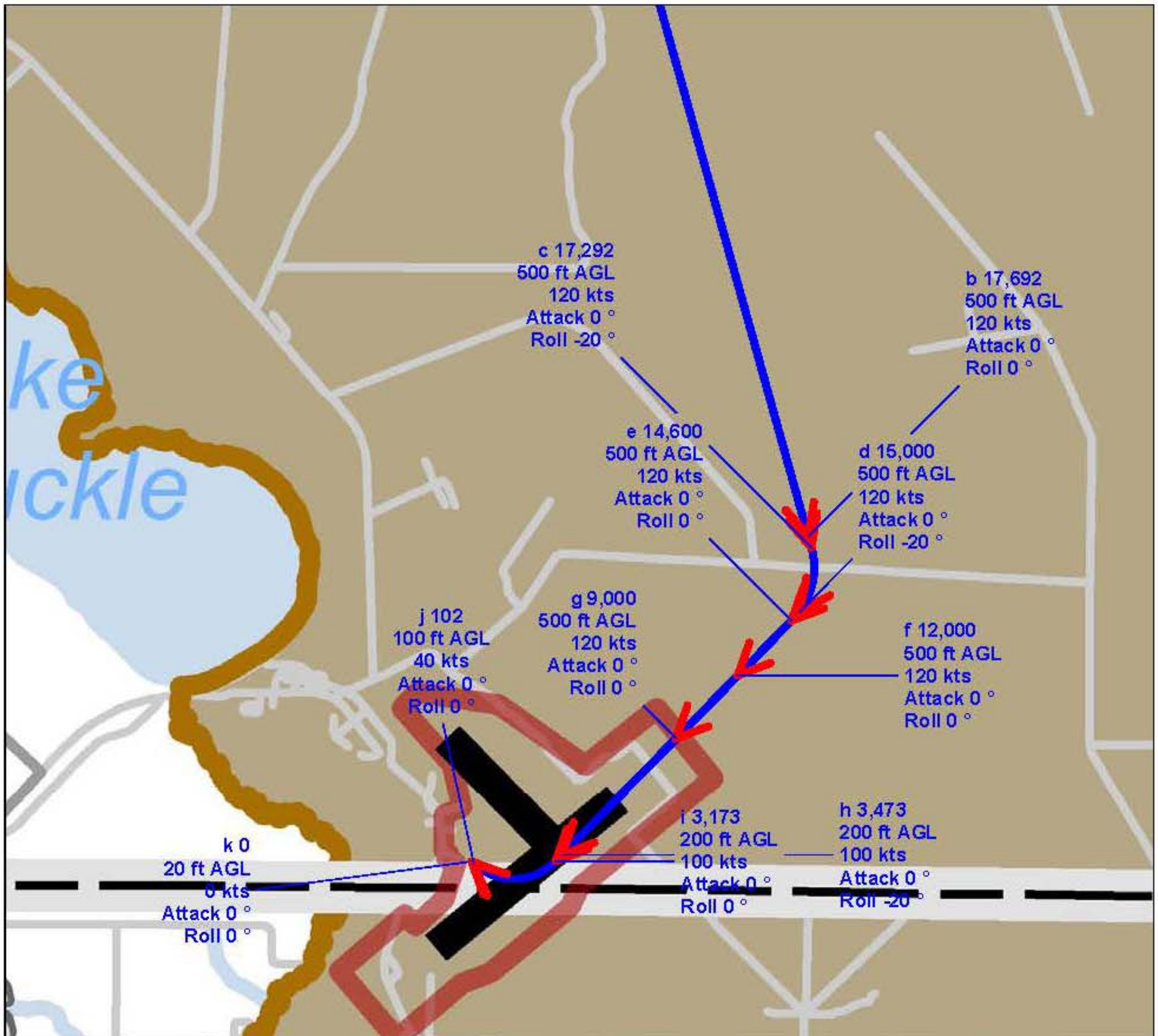
Aircraft: F-35A Engine: F-135PP

Karnes 3.1: P2

0 10,000 20,000 30,000 40,000 50,000

Scale in Feet 1:161,000 (1 inch = 13,400 feet)

N



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	37,000	500 AGL	120	0	0	0	90	+0°, +0 fpm, 31 sec
b	17,692	500 AGL	120	0	0	0	90	begin roll, +0°, +0 fpm, 2 sec
c	17,292	500 AGL	120	0	0	-20	90	reach toll angle, begin turn, +0°, +0 fpm, 11 sec
d	15,000	500 AGL	120	0	0	-20	90	begin rolling, wings level, +0°, +0 fpm, 2 sec
e	14,600	500 AGL	120	0	0	0	90	wings level, end turn, +0°, +0 fpm, 13 sec
f	12,000	500 AGL	120	0	0	0	90	+0°, +0 fpm, 15 sec
g	9,000	500 AGL	120	0	0	0	90	-3.1°, -600 fpm, 30 sec
h	3,473	200 AGL	100	0	0	-20	90	begin roll, +0°, +0 fpm, 2 sec
i	3,173	200 AGL	100	0	0	0	90	reach toll angle, begin turn, -1.9°, -200 fpm, 26 sec
j	102	100 AGL	40	0	0	0	90	-38.1°, -1200 fpm, 3 sec
k	0	20 AGL	0	0	0	0	90	

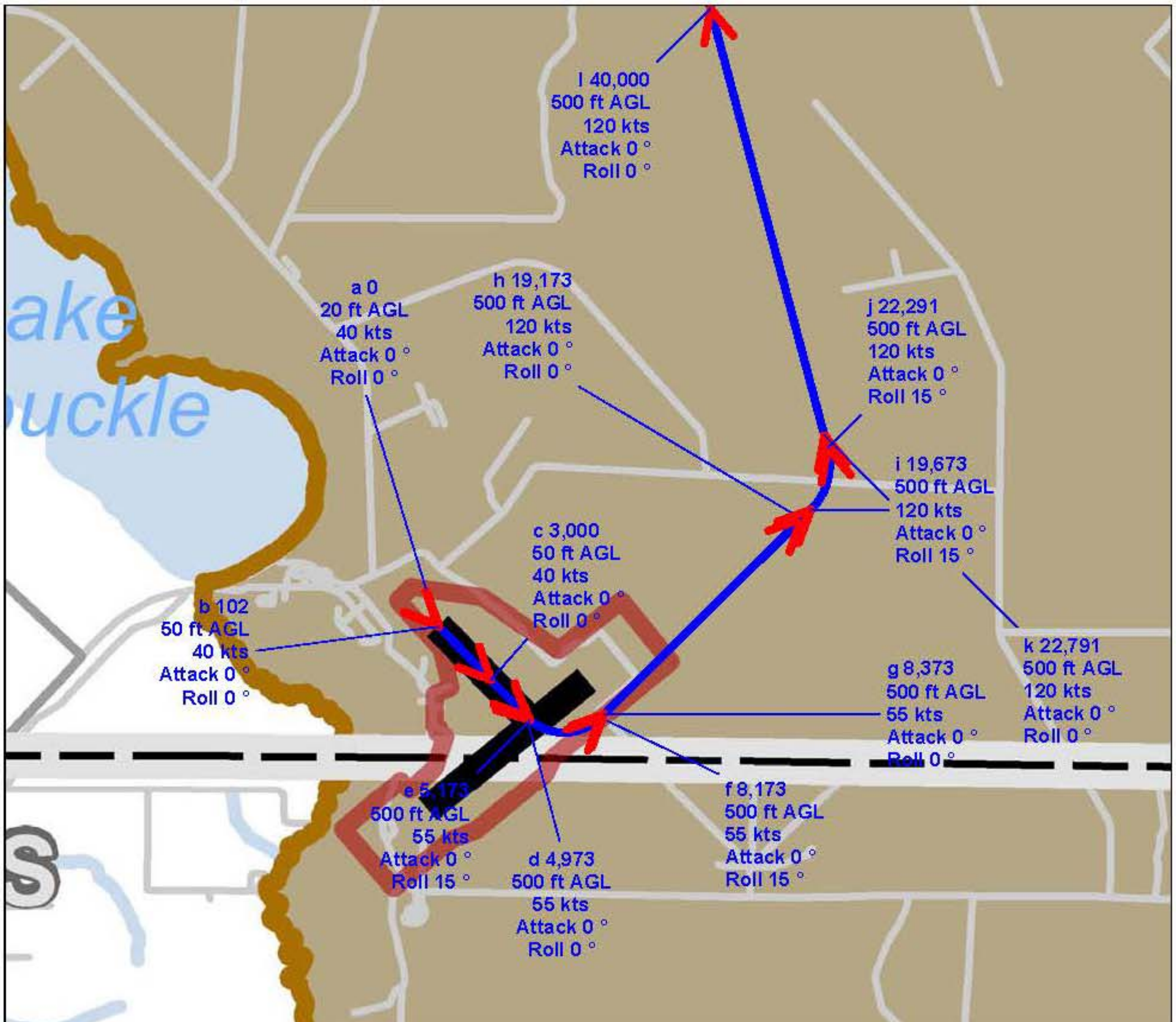
MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile SH60A08

Flight Track: 32FA01 - Arrival from North Conventional

Aircraft: SH60B Engine: N/A

Based on Andersen profile HSCA04

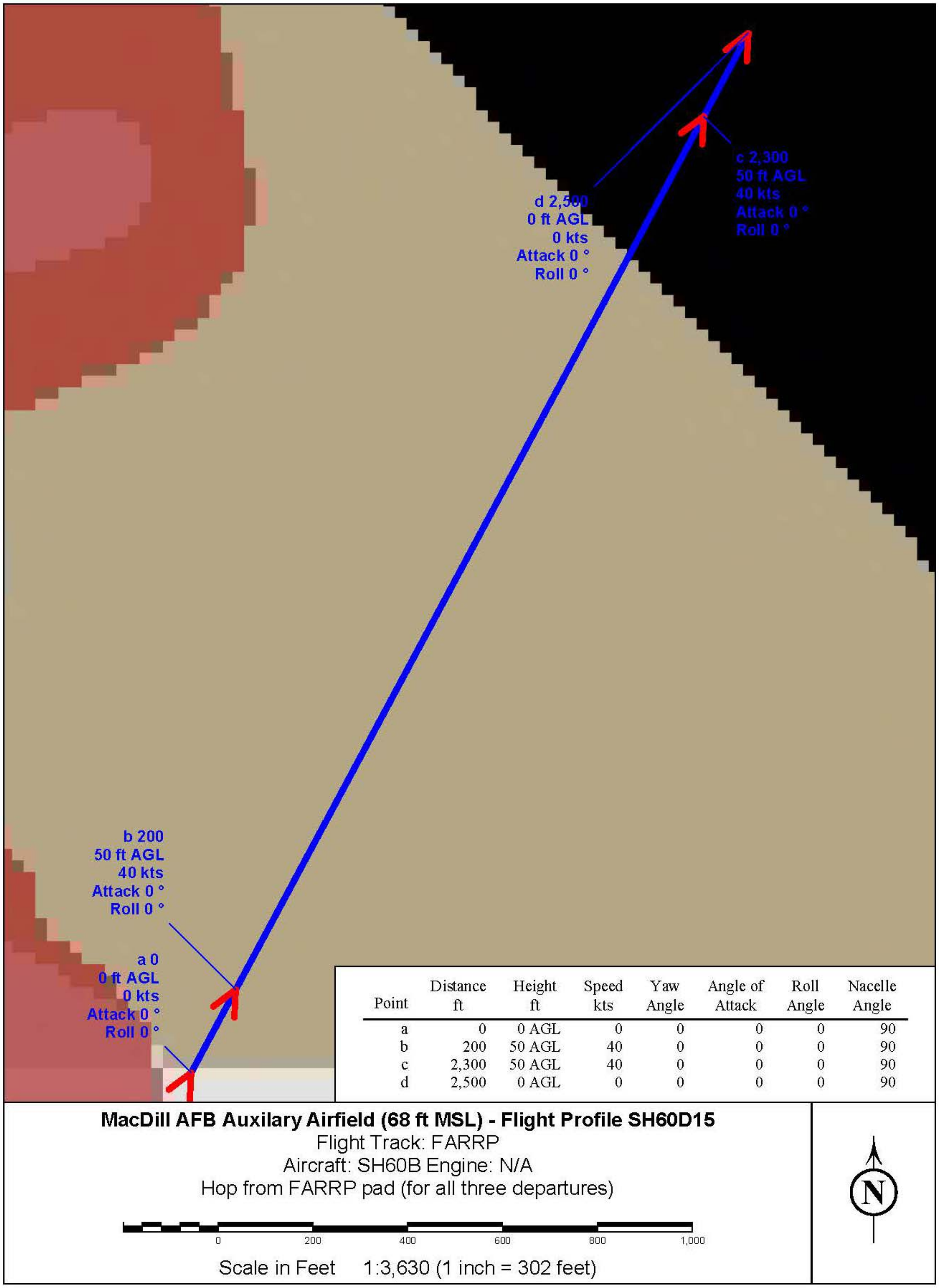
Scale in Feet 1:71,800 (1 inch = 5,990 feet)



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle	Notes
a	0	20 AGL	40	0	0	0	90	+16.4° , +1100 fpm, 2 sec
b	102	50 AGL	40	0	0	0	90	+0° , +0 fpm, 43 sec
c	3,000	50 AGL	40	0	0	0	90	+12.8° , +1100 fpm, 25 sec
d	4,973	500 AGL	55	0	0	0	90	begin roll, +0° , +0 fpm, 2 sec
e	5,173	500 AGL	55	0	0	15	90	reach roll angle, begin turn, +0° , +0 fpm, 32 sec
f	8,173	500 AGL	55	0	0	15	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
g	8,373	500 AGL	55	0	0	0	90	wings level, end turn, +0° , +0 fpm, 73 sec
h	19,173	500 AGL	120	0	0	0	90	begin roll, +0° , +0 fpm, 2 sec
i	19,673	500 AGL	120	0	0	15	90	reach roll angle, begin turn, +0° , +0 fpm, 13 sec
j	22,291	500 AGL	120	0	0	15	90	begin rolling, wings level, +0° , +0 fpm, 2 sec
k	22,791	500 AGL	120	0	0	0	90	wings level, end turn, +0° , +0 fpm, 381 sec
l	40,000	500 AGL	120	0	0	0	90	

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile SH60D05
Flight Track: 14D01 - Departure to North Conventional
Aircraft: SH60B Engine: N/A
Based on Andersen profile HSCD04

Scale in Feet 1:83,400 (1 inch = 6,950 feet)



Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Nacelle Angle
a	0	0 AGL	0	0	0	0	90
b	200	50 AGL	40	0	0	0	90
c	2,300	50 AGL	40	0	0	0	90
d	2,500	0 AGL	0	0	0	0	90

MacDill AFB Auxilary Airfield (68 ft MSL) - Flight Profile SH60D15
Flight Track: FARRP
Aircraft: SH60B Engine: N/A
Hop from FARRP pad (for all three departures)

Scale in Feet 1:3,630 (1 inch = 302 feet)

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