**FINAL**

# ENVIRONMENTAL ASSESSMENT FOR THE UPDATE AND IMPLEMENTATION OF THE TOTAL FORCE TRAINING MISSION FOR VISITING UNITS (OPERATION SNOWBIRD, MULTI-SERVICE, AND FOREIGN MILITARY SALES) DAVIS-MONTHAN AIR FORCE BASE, ARIZONA

**April 2015**

# APPENDIX C
# NOISE ANALYSIS

# Aircraft Noise Analysis
# Davis-Monthan Air Force Base, Arizona

*In Support of the Environmental Assessment for the Proposed Update and Implementation of the Total Force Training Mission for Visiting Units (Operation Snowbird, Multi-Service, Foreign Military Sales)*

17 June 2014

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# 1.0 Introduction

This report documents the aircraft noise analysis in support of the Environmental Assessment (EA) for the *Proposed Update and Implementation of the Total Force Training Mission for Visiting Units (Operation Snowbird [OSB], Multi-Service, Foreign Military Sales [FMS]) at Davis-Monthan Air Force Base (DMAFB), Arizona* [1]. The results of this analysis will help inform the U.S. Air Force (USAF) decision maker of potential environmental changes during the Environmental Impact Analysis Process (EIAP) for the proposed action and alternatives [2].

## 1.1 Background

Headquarters (HQ) Air Combat Command (ACC) prepared a Draft EA of current National Guard Bureau (NGB)/ACC training at DMAFB and released it for public review in July 2012 [3]. Since that time, ACC, NGB, and the 355 Fighter Wing (355 FW) have reviewed the training mission and operations and determined that the Proposed Action addressed in the Draft EA required clarification. Of particular importance is the fact that NGB/Air National Guard (ANG) is responsible only for those units/aircraft that are planned specifically for OSB training missions. Other Depart of Defense (DoD) and FMS units that might participate in deployments to DMAFB would do so under the authority/coordination of 355 FW and ACC/International Aircraft Sales (IAS), respectively. Thus, ACC has decided to revise the 2012 Draft EA to more accurately describe the Visiting Units' flight operations that occur at DMAFB and to assess their potential impacts. It should also be noted that other routine ANG activities conducted by the 162 FW out of Tucson International Airport (TIA), located approximately 4 nautical miles (NM) southwest of DMAFB (Figure 1-1), are completely separate from the actions described herein and, thus, are not discussed in this EA. Additional information is available in Reference 1.

DMAFB is located within the city limits of Tucson in southern Arizona. The installation is southeast of downtown Tucson and northeast of TIA. DMAFB has one runway (RW) 12/30 that is 13,643-feet long and 200-feet wide. Also located on the airfield are one helicopter pad labeled 09/27 and a Helicopter Training Area (HTA) (not modeled for Visiting Units). Figure 1-2 depicts only the landing surfaces modeled in this analysis. DMAFB elevation is 2,704 feet above Mean Sea Level (MSL), and the magnetic declination is 12 degrees east.

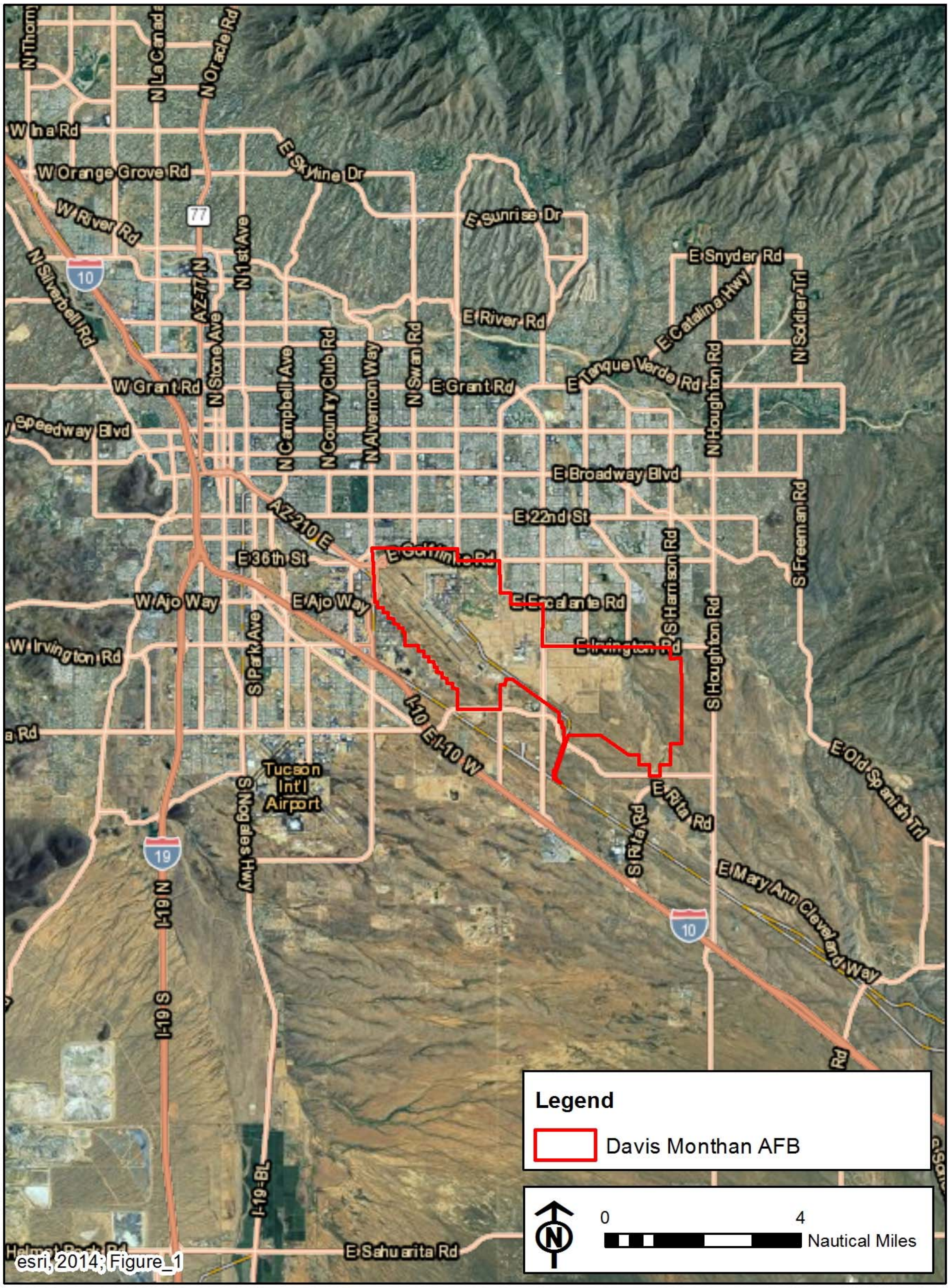



**Figure 1-1. Vicinity of Davis-Monthan Air Force Base, Arizona**


**Figure 1-2. Modeled Runway and Pad at Davis-Monthan Air Force Base, Arizona[4]**

## 1.2 Scope

The scope of this noise analysis includes three alternatives and the interpretation of the results. The noise analysis follows directions/guidance received from HQ ACC and DMAFB for modeling the following three alternatives (Additional information on the alternatives is available in Reference 1):

- **No Action Alternative**: This alternative describes the baseline of current operations that will be used to compare against the Proposed Action (Alternative 1) and Alternative 2. In this case, it consists of the Continuation of the Total Force Training Mission at 2009 levels, in addition to other based operations at DMAFB.
- **Alternative 1 (Proposed Action/Preferred Alternative)**: This alternative updates and implements the Total Force Training Mission, which would involve year-round training at DMAFB using ANG, Reserve, and DoD aircraft, as well as occasional FMS deployments.
- **Alternative 2**: This alternative updates and implements the same levels of training described for Alternative 1, except that FMS aircraft would be limited to one deployment per year.

The noise analysis involved collection of flight operations data and modeling for the above-described alternatives. Using the *2009 Draft Air Installation Compatible Use Zone (AICUZ) for DMAFB* [5] electronic noise files provided by the government as a starting point, OSB designated flight operations were replaced with flight operations for Visiting Units (OSB, Multi-Service, FMS) for the three alternatives. No other changes were made to the electronic noise files.

## 1.3 Organization

The remainder of this report is organized in three sections, including the Methodology (Section 2), Flight Operations (Section 3) and Noise Exposure (Section 4). Section 2 reviews the technical approach, assumptions and aircraft noise (sound, metrics and tools). Section 3 discusses the data collection process, and updated flight operations, flight tracks and flight profiles for each alternative. Section 4 describes the resulting noise contours, including interpretation of the results.

# 2.0 Methodology

This section describes the methodology used to conduct the noise analysis for the *Proposed Update and Implementation of the Total Force Training Mission for Visiting Units (OSB, Multi-Service, FMS) at DMAFB, Arizona* EA, including the overall approach and assumptions, noise models and noise metrics.

## 2.1 Technical Approach

The technical approach consists of five phases including Data Collection, Data Validation, Noise Analysis, Draft Report and Final Report (Figure 2-1). The following paragraphs summarize activities for each phase:

- **Data Collection**: A data collection package was issued to ACC and DMAFB representatives to collect information for the noise analysis. At the same time, previous studies such as EAs, AICUZ and DOPAAs were collected. AICUZ noise files were provided by the government.
- **Data Validation**: A data validation package was issued to ACC and DMAFB representatives for final coordination. Comments and inputs were incorporated into the noise analysis.
- **Noise Analysis**: Three model runs were completed using the data collected during the previous two phases. Differences between the No Action Alternative and Alternatives 1 and Alternative 2 were assessed.
- **Draft Report**: This draft noise analysis report was issued for review by DMAFB/ACC. Comments will be discussed and resolved in coordination with DMAFB/ACC. No re-analysis is anticipated at this stage of the process.
- **Final Report**: A final noise analysis report will be issued that includes all changes agreed to during the review of the draft report. Completion of this phase will mark the end of the noise analysis effort.

Except for the noise analysis phase, all other phases required significant coordination with DMAFB/ACC representatives to ensure that the data collected was as accurate as possible and reflective of current operations and future plans, and/or that assumptions made were acceptable to all stakeholders.

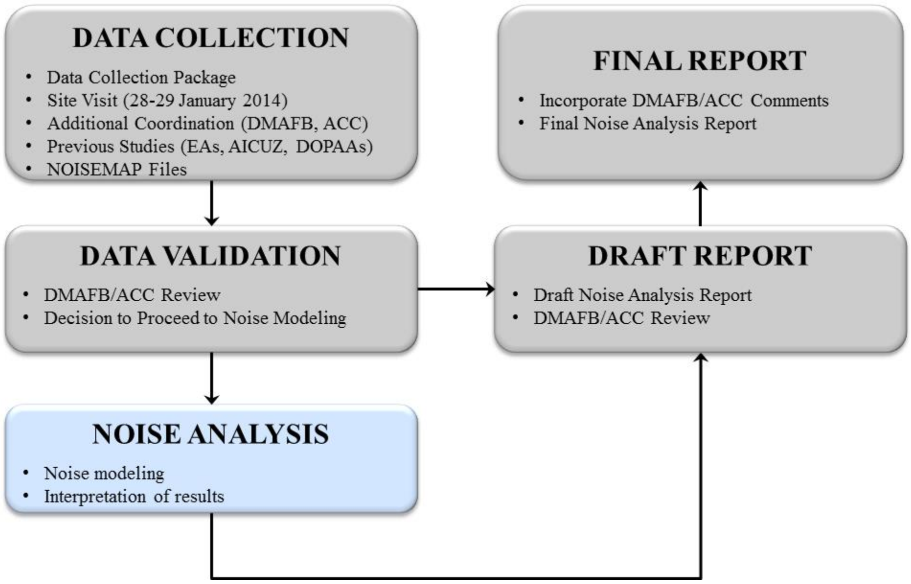



**Figure 2-1. Noise Analysis Approach**

## 2.2 Assumptions

In recognition of the evolving nature of this project, assumptions were made to enable noise modeling within the agreed-upon timelines; these assumptions reflect the scope of the project and/or the best judgment of Subject Matter Experts (SMEs) in the areas of airbase operations, airspace management, aircraft performance, aircraft maintenance, etc. These assumptions are documented in Table 2-1, including a description of each assumption, their categorization (project, technical, and modeling), a qualitative discussion of impacts, the likelihood that the assumption might change and the impact if it does change, and a conceptual risk profile. For example, an assumption that is highly likely to change resulting in a high impact to the project is deemed a high risk item.

**Table 2-1. List of Assumptions**

| Date | ID | Description | Category | Qualitative Description of Impact | Likelihood Rating (1-Low 2-Medium 3-High) | Impact Rating (1-Low 2-Medium 3-High) | Risk Profile |
|---|---|---|---|---|---|---|---|
| 5/12/2014 | 1.0 | For flight operations other than Visiting Units, use the 2009 Draft AICUZ electronic noise files as provided by the Government, without modification ("AS IS"). | Project | Data to support the TFT training EA was taken from the 2007 noise study. TFT sorites were adjusted to 2009 levels. | 3 | 3 | 6 |
| 5/12/2014 | 2.0 | Run Noisemap in topography mode when developing new contours for this EA; AICUZ and previous Draft EA noise analysis did not include topography | Modeling | Contour changes due to Noisemap topography which may result in inconsistencies with previously developed contours for DMAFB | 2 | 2 | 4 |
| 5/12/2014 | 3.0 | As pilot representatives for the F/A-18E/F, MV-22 and AV-8B were not available, flight profiles for these aircraft were assumed from previous noise analyses and were not re-confirmed by DMAFB | Modeling | Impact of this assumption would be expected to be negligible on the cumulative noise contours | 3 | 1 | 4 |
| 5/12/2014 | 4.0 | For the F-16, F-15, F-22 and F/A-18E/F, 95% of takeoff operations were modeled as Afterburner (AB) takeoffs, and 5% as Military (MIL) takeoffs | Modeling | Impact of this assumption would be expected to be negligible on the cumulative noise contours | 1 | 2 | 3 |
| 5/12/2014 | 5.0 | As pilot representatives for the SA330 PUMA were not available, H-60 power and speed data points were used along with SA330 PUMA noise source data in NOISEFILE | Modeling | Impact of this assumption would be expected to be negligible on the cumulative noise contours | 2 | 1 | 3 |
| 5/12/2014 | 6.0 | GR7/9 Harrier was modeled as AV-8B Harrier | Modeling | Impact of this substitution would be expected to be negligible on the cumulative noise contours | 1 | 1 | 2 |
| 5/12/2014 | 7.0 | Different Model Design Series (MDS) of the same airaft were modeled using one engine type | Modeling | Impact of this assumption would be expected to be negligible on the cumulative noise contours | 1 | 1 | 2 |

## 2.3 Aircraft Noise

Aircraft noise remains a significant constraint to military aviation training. In general, aircraft sound can be measured and/or modeled relatively easily, but community response continues to be difficult to predict. Individual response is even more complex owing to a wide range of confounding emotional factors: feelings about noise, feelings about the activity, own activity at the time of the noise, attitudes towards the environment, knowledge of health effects, etc. The following sections cover the basics of sound, noise metrics and modeling tools.

### 2.3.1 Basics of Sound

Sound is associated with small mechanical vibrations transmitted through a medium such as air, water, etc.  Three attributes define sound:  intensity, frequency, and duration. The following sections discuss these attributes.

Intensity is the energy of the sound or Sound Pressure Level (SPL). In other words, higher SPLs indicate louder sounds. The human ear can perceive a wide range of sound intensities and, further, the ratio of the highest to the lowest sound intensity that can be perceived by an average healthy human ear is on the order of 10 trillion. As a result, a logarithmic scale is used to transform sound intensities to decibels (dB) where the threshold of audibility is approximately 0 dB and the maximum audible sound (the threshold of pain) approaches 130 dB [6]. On a logarithmic scale, a change of 3 dB is a doubling /halving of sound intensity, and is generally considered noticeable. A 10-dB change is a 10-fold increase/decrease in sound intensity.

Frequency or pitch is defined as the number of vibrations per second measured in Hertz (Hz) which equates to one cycle per second (cps). Thunder is an example of a low frequency sound (more energy content in lower frequencies) whereas a bird chirping is an example of a high frequency sound (more energy content in higher frequencies). A sound may vary in intensity at different frequencies; equally, it may vary in both intensity and frequency at different locations. Not all frequencies are perceived equally by the human ear. The average healthy human ear perceives sounds ranging from 20 Hz to 15,000 Hz with greater sensitivity from 1,000 Hz to 4,000 Hz. Therefore, the A-weighted curve is used to approximate the sensitivity of the human ear to different types of sound. The A-weighted curve de-emphasizes very high and very low frequencies (less than 500 Hz and more than 10,000 Hz). A-weighted sound levels are symbolized using a dBA unit; for transportation noise, dB is often used to imply dBA. Figure 2-2 illustrates the A-weighted curve.

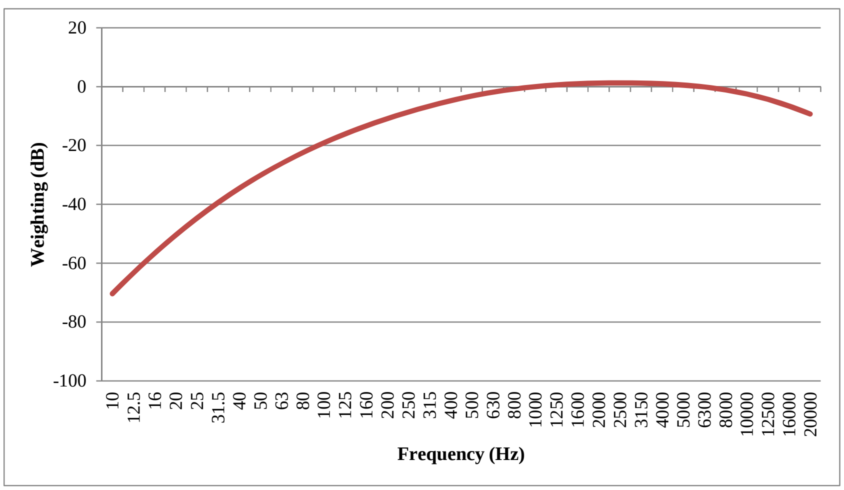



**Figure 2-2. Frequency Response of A-Weighted Curve**

The duration is the time span over which the sound is perceived. The duration is an important factor in the total annoyance from a noise event. The duration of an aircraft noise event is a function of the speed of the aircraft and the background sound levels. For example, a faster aircraft would result in a sound of a shorter duration.

Sound becomes noise when it is perceived to interfere with human activity. For example, in the vicinity of airports, the sound associated with aircraft operations often exceed the general background and may interfere with activities such as classroom learning, sleep, speech or other activities requiring some level of quiet. These sounds may be perceived as annoyance and, therefore, characterized as noise. Figure 2-3 depicts common sounds measured using the A-weighted curve.

| Sound Level (dBA) | Common Sounds | Perceived Loudness |
|---|---|---|
| 130 | Threshold of pain | UNCOMFORTABLE |
| 120 | Jet taking off | |
| 100 | Discotheque with loud music | |
| 80 | Vacuum cleaner | LOUD |
| 60 | Urban background | |
| 40 | Rural background | QUIET |
| 20 | Recording studio | |
| 0 | Threshold of hearing | BARELY AUDIBLE |

**Figure 2-3. Common A-Weighted Sounds**

### 2.3.2 Noise Metrics

Metrics are used to measure an attribute, in this case, noise. Several metrics have been developed over the years to quantify aircraft noise and its effects on the environment. This discussion focuses on relevant metrics used in accordance with the EIAP. The two metrics of interest are the Sound Exposure Level (SEL) and Day Night Average Sound Level (DNL):

SEL is a metric used to quantify the acoustic value of an event characterized by changing sound levels over a period of time. As the foundational element of DNL, SEL could be defined as the equivalent sound that, over one second, would contain the same total acoustic energy of a single event that varies over time (Figure 2-4). SEL accounts for both the intensity and duration of a sound and provides a good measure of the net acoustic value of a single event.

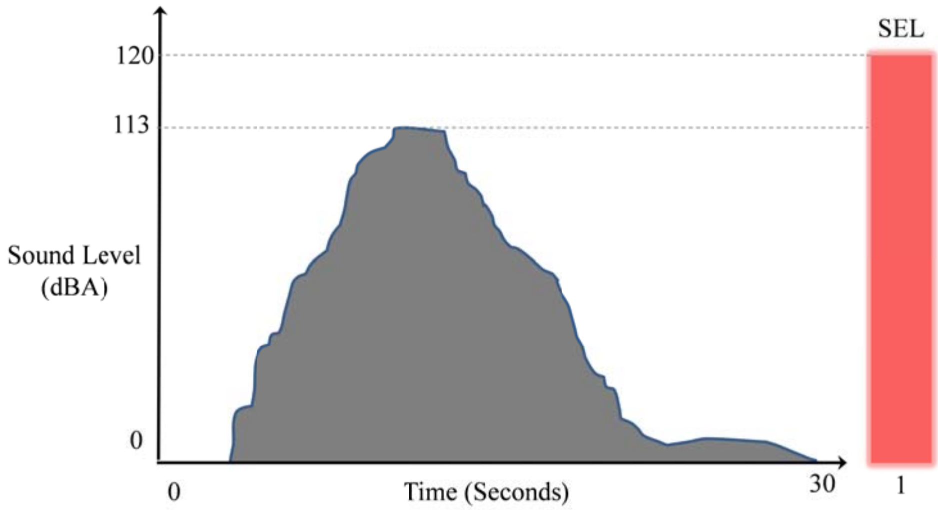
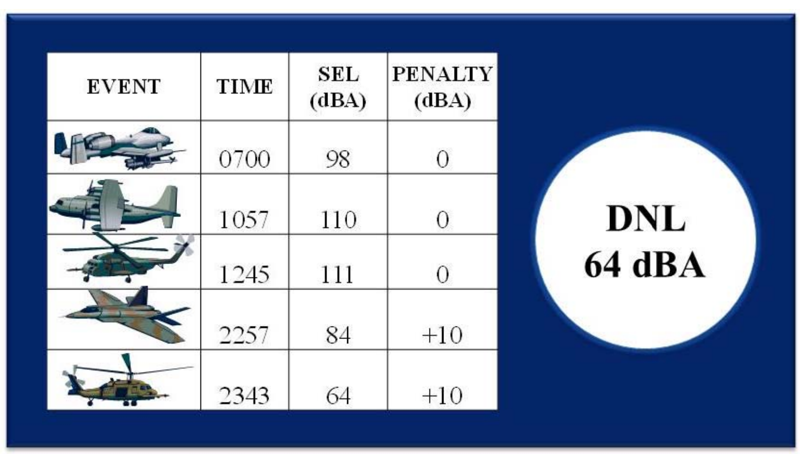



**Figure 2-4. Sound Exposure Level**

DNL describes multiple events, accounting for number of events, intensity and duration. The time scale is no longer the duration of one event, but a 24-hour period. DNL is therefore the average A-weighted sound level of multiple events over a 24-hour time period. DNL adds a 10 dB penalty for nighttime noise events between 2200 and 0700 local. The penalty represents the added annoyance caused by these events during nighttime when background sound levels are lower and there is an increased sensitivity to noise. Figure 2-5 shows five events at different times throughout a 24-hour period, with SELs ranging from 64 dBA to 111 dBA. The resulting DNL would be approximately 64 dBA.




| EVENT | TIME | SEL (dBA) | PENALTY (dBA) |
|---|---|---|---|
| | 0700 | 98 | 0 |
| | 1057 | 110 | 0 |
| | 1245 | 111 | 0 |
| | 2257 | 84 | +10 |
| | 2343 | 64 | +10 |

**Figure 2-5. Day Night Average Sound Level**

In general, DNL is modeled using annual flight operations averaged over a certain number of days. Annual flight operations can be averaged over the number of busy days to develop Average Busy Day (ABD) DNL contours, or over 365 days to develop Average Annual Day (AAD) DNL contours. DoD Instruction (DODI) 4165.57 provides guidance for averaging annual flight operations for DoD installations [7]. DODI 4165.57 directs that aircraft noise contours should be developed based on AAD operations. However, where the DoD component determines that AAD does not adequately represent the aircraft noise impacts at a particular air installation, ABD operations can be used with supporting rationale. For this analysis, ABD DNL contours are presented to remain consistent with the previous EA and AICUZ studies.

DNL is typically used to assess long-term community annoyance as it correlates well with the percent of communities highly annoyed [8, 9]. For example, Figure 2-6 (Schultz curve) shows that approximately 13% of communities are highly annoyed at a DNL 65 dBA. DODI 4165.57 suggests certain land use compatibility guidelines based on DNL values.

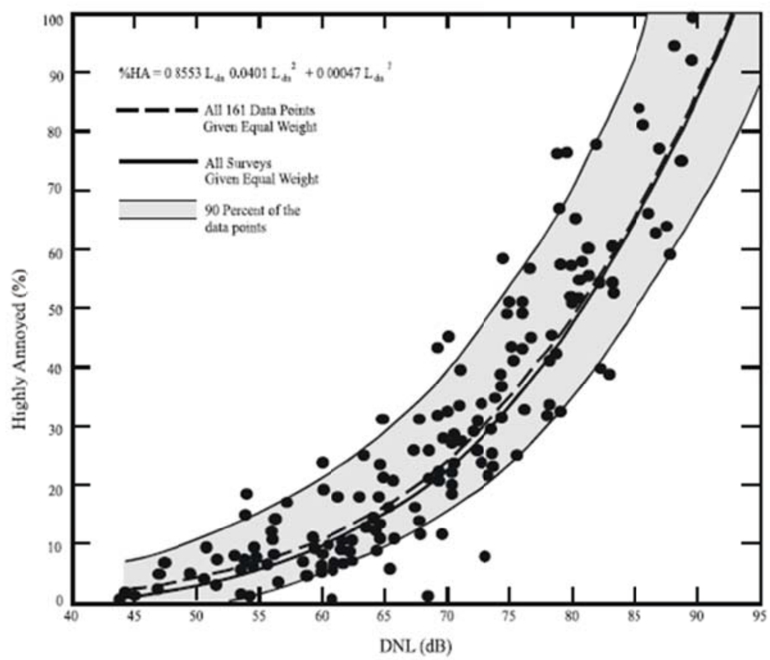



**Figure 2-6. Percent of Communities Highly Annoyed (Schultz Curve)**

### 2.3.3 Noise Models

Analyses of aircraft noise exposure around DoD facilities are normally accomplished using a group of computer-based programs known as Noisemap, and by using the graphical interface known as BaseOps. The BaseOps program allows entry of runway coordinates, airfield information, flight tracks, flight profiles (engine thrust settings, altitudes, speeds, and pitch, yaw, roll and nacelle angles for tilt rotors and helicopters), numbers of daily flight operations, and pre-flight and engine ground run-up spots and flight operations. The Noisemap suite of computer programs was primarily developed by USAF, which serves as the lead DoD agency for aircraft noise modeling. While the Noisemap suite of noise models includes three modules (NMAP, the

Advanced Acoustic Model [AAM], and the Rotorcraft Noise Model [RNM]), only NMAP and RNM are used for this analysis and discussed in the following sections.  AAM and RNM are analogous technologies except that RNM models rotorcraft noise and AAM fixed-wing noise. AAM is not yet approved for use as it is still under development and in its beta testing phase. RNM is approved for use and includes the MV-22.

NMAP includes OMEGA10, OMEGA11, NOISEMAP and NMPlot. The suite also includes the NOISEFILE databases. The different modules are described in the following paragraphs:

- OMEGA10: For fixed-wing and helicopters modeled using NMAP, the OMEGA10 program calculates SEL versus distance for each model of aircraft from the NOISEFILE database, taking into consideration the specified speeds, engine thrust settings, and environmental conditions appropriate to each type of flight operation. The NOISEFILE database contains one-third octave band sound data for pre-flight run-up and flight operations by most military aircraft and some civil aircraft. The OMEGA10 output is used by NOISEMAP in subsequent calculations.
- OMEGA11: The OMEGA11 program calculates maximum A-weighted sound levels from the NOISEFILE database for each model of aircraft taking into consideration the engine thrust settings and environmental conditions appropriate to ground engine maintenance run-up operations. Similar to the OMEGA10 output, the OMEGA11 output is also used by NOISEMAP in subsequent calculations.
- NMAP: NMAP uses the OMEGA10 and OMEGA11 outputs, incorporates the number of operations between 0700-2200 and 2200-0700 local, flight paths, and profiles of the aircraft to calculate the DNL at a series of points on the ground around the facility. This process results in a “grid” file containing noise levels at different points of a user specified rectangular area. NMAP has been expanded to include atmospheric sound propagation effects over varying terrain, including hills and mountainous regions, as well as regions of varying acoustical impedance—for example, water around coastal regions. This feature is used in computing the noise levels presented in this analysis.

The National Aeronautics and Space Administration (NASA)-Langley Research Center (LaRC) developed RNM as part of the Tilt Rotor Aeroacoustic Code (TRAC) suite of computer programs aimed at predicting far-field sound levels from tilt rotor aircraft and helicopters.  DoD and the North Atlantic Treaty Organization (NATO) have adopted RNM for the environmental impact assessment of rotorcraft noise. RNM uses sound hemispheres to simulate noise propagation in four dimensions, three dimensions plus time. RNM accounts for atmospheric sound propagation effects over varying terrain and water. RNM also generates grid files which can be used independently or combined with NMAP outputs.

# 3.0 Flight Operations for Visiting Units

This section describes proposed flight operations for Visiting Units for the No Action Alternative, Alternative 1 and Alternative 2. Sections 3.1 through 3.4 discuss aircraft sorties, Air Traffic Control (ATC) flight operations, runway/pad utilizations, flight tracks and flight profiles, respectively. The focus of this effort is on analyzing the environmental changes of transient Visiting Units which are modeled in place of OSB designated flight operations contained in the 2007 noise study. The noise analysis was based on Average Busy Day (ABD) operations with 2% of flight operations by Visiting Units modeled between 2200 and 0700 local per Reference 1.

## 3.1 Annual Aircraft Sorties for Visiting Units

The first step in the noise analysis process was to determine the annual flying activity level for each alternative as defined by both sortie level as well as ATC flight operations numbers.

Military operations planners discuss flying activities in terms of "sorties", i.e., the entire flight from start to end including the departure, any closed-pattern activities, and the arrival. Because each Visiting Unit sortie analyzed in this EA, by definition, can only include one departure and one arrival, and NO pattern or engine maintenance run-up operations, all Visiting Unit flying activities required for the noise analysis were collected in terms of sorties. Table 3-1 presents a summary of aircraft sorties for each alternative per Reference 1. The only difference between Alternative 1 and Alternative 2 is the reduced FMS sorties in Alternative 2.

**Table 3-1. Annual Aircraft Sorties for Visiting Units**

| Deployment | Reported Aircraft Type | Modeled Aircraft Type | No Action | Alternative 1 | Alternative 2 |
|---|---|---|---|---|---|
| ANG/OSB | F-16 | F-16C | 874 | 834 | 834 |
| | A-10 | A-10A | 302 | 490 | 490 |
| | F-22 | F-22 | - | 54 | 54 |
| | F-15C | F-15A | - | 54 | 54 |
| | HH-60 | UH-60A | 48 | 75 | 75 |
| | C-130H/J | C-130H&N&P | - | 75 | 75 |
| | SA 330 PUMA | PUMA SA330J | 52 | - | - |
| | GR7/9 HARRIER | AV-8B | 132 | - | - |
| DoD | F-16 | F-16C | - | 110 | 110 |
| | C-130H/J | C-130H&N&P | - | 8 | 8 |
| | F/A-18E/F | F/A-18E/F | - | 110 | 110 |
| | AV-8B | AV-8B | - | 60 | 60 |
| | MV-22 | MV-22 | - | 60 | 60 |
| FMS | F-16 | F-16C | - | 192 | - |
| | C-130H/J | C-130H&N&P | - | 12 | 12 |
| | GR-4 TORNADO | TORNADO | - | 192 | 192 |
| **TOTAL** | | | **1,408** | **2,326** | **2,134** |

## 3.2 Air Traffic Control Flight Operations

ATC, on the other hand, describes flying activities in terms of “flight operations”, i.e., a takeoff of a single aircraft is counted as one ATC flight operation; a landing of a single aircraft is counted as one ATC flight operation; a closed pattern (touch and go) is counted as two ATC flight operations. Since Visiting Units’ sorties can only include one departure and one arrival, and NO pattern or engine maintenance run-up operations, all Visiting Units’ sorties account for two ATC flight operations. Table 3-2 presents a summary of annual ATC flight operations for Visiting Units for each alternative.

**Table 3-2. Annual ATC Flight Operations for Visiting Units**

| Deployment | Reported Aircraft Type | Modeled Aircraft Type | No Action | Alternative 1 | Alternative 2 |
|---|---|---|---|---|---|
| ANG/OSB | F-16 | F-16C | 1,748 | 1,668 | 1,668 |
| | A-10 | A-10A | 604 | 980 | 980 |
| | F-22 | F-22 | - | 108 | 108 |
| | F-15C | F-15A | - | 108 | 108 |
| | HH-60 | UH-60A | 96 | 150 | 150 |
| | C-130H/J | C-130H&N&P | - | 150 | 150 |
| | SA 330 PUMA | PUMA SA330J | 104 | - | - |
| | GR7/9 HARRIER | AV-8B | 264 | - | - |
| DoD | F-16 | F-16C | - | 220 | 220 |
| | C-130H/J | C-130H&N&P | - | 16 | 16 |
| | F/A-18E/F | F/A-18E/F | - | 220 | 220 |
| | AV-8B | AV-8B | - | 120 | 120 |
| | MV-22 | MV-22 | - | 120 | 120 |
| FMS | F-16 | F-16C | - | 384 | - |
| | C-130H/J | C-130H&N&P | - | 24 | 24 |
| | GR-4 TORNADO | TORNADO | - | 384 | 384 |
| **TOTAL** | | | **2,816** | **4,652** | **4,268** |

As shown in Table 3-3 under the column heading “Other”, with OSB flight operations deleted from the 2007 noise study, the files then contain 77,229 ATC flight operations resulting from all operations of BASED aircraft at DMAFB including 355 FW, 563 Rescue Group, 943 Rescue Group, 55 Electronic Combat Group, Customs and Border Protection, Aerospace Maintenance and Regeneration Group, 162 FW, and Transient Operations derived from Reference 5. Combining “Other” and “Visiting Units” yields total ATC flight operations for each alternative. Table 3-3 presents a summary of total ATC flight operations for each alternative, as well as a percentage of ATC flight operations due to Visiting Units.

**Table 3-3. Total Annual ATC Flight Operations by Alternative**

| Alternative | Flight Operations | | | Flight Operations | |
|---|---|---|---|---|---|
| | Other | Visiting Units | Total | % Other | % Visiting Units |
| No Action | 77,229 | 2,816 | 80,045 | 96.48% | 3.52% |
| Alternative 1 (Proposed Action) | 77,229 | 4,652 | 81,881 | 94.32% | 5.68% |
| Alternative 2 | 77,229 | 4,268 | 81,497 | 94.76% | 5.24% |

## 3.3 Runway/Pad Utilizations for Visiting Units

The second step in the noise analysis process is the allocation of operations to runways and vertical landing pads. The percentages of runway/pad utilization are normally based on wind direction and other operational requirements, as provided by DMAFB personnel in Reference 4. Figure 3-1 summarizes the runway utilizations for Visiting Units in east flow (landing East) and west flow (landing West) conditions for the periods 0700-2200 local and 2200-0700 local which correspond to required acoustical modeling criteria. For example, Visiting Units' fixed-wing aircraft would typically depart/land 70% of the time to the east and 30% of the time to the west. It should be noted that, during the hours of 2200-0700 local, Visiting Units' fixed-wing aircraft would typically land 20% of the time to the east and 80% of the time to the west. Helicopters would depart/arrive to/from the east 85% of the time and 15% to/from the west.

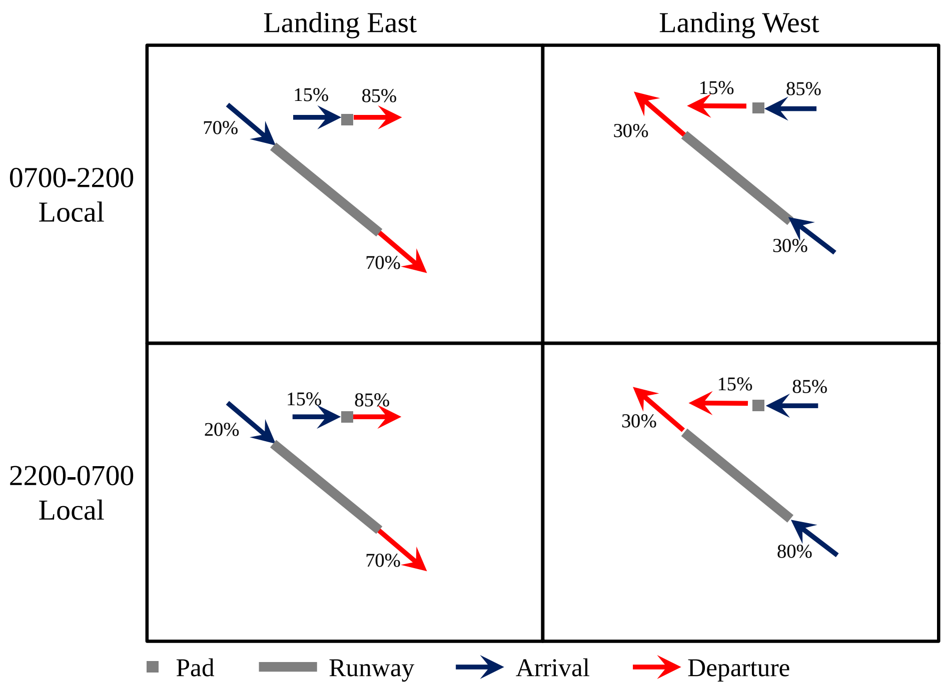



**Figure 3-1. Runway/Pad Utilization for Visiting Units**

## 3.4 Flight Tracks for Visiting Units

The next step in the noise analysis process is to determine the distribution of operations from/to each runway onto different flight tracks as represented in the DMAFB standard flying procedures. This data was collected for groups of aircraft from the Visiting Units, including cargo aircraft, tactical aircraft and helicopters. Attachment A provides details of flight tracks and utilizations [4, 10, 11, 12].

## 3.5 Flight Profiles for Visiting Units

Flight profiles consist of defining the typical altitude above ground, airspeed and engine power settings along flight tracks for each modeled aircraft type and operation (e.g., overhead arrival). This data defines the vertical profile of the operation as well as the power settings used, both of which are significant factors in modeling the noise generated. Attachment B provides representative flight profiles for each modeled aircraft per Reference 10 and subsequent changes [12].

# 4.0 Noise Exposure

Using the operations data described above, NOISEMAP and RNM were used to calculate DNL noise contours for DMAFB. RNM was used to model only the MV-22. The resulting ABD DNL contours of 65 through 85 dBA were computed and plotted in increments of 5 dB. Overall, the noise contributions of Visiting Units' flight operations to the DNL contours are extremely small and due solely to the fact that Visiting Units account for less than 6% of the total operations occurring at DMAFB annually under any of the three alternative conditions. As a result, the contours do not change significantly from the No Action Alternative to either Alternative 1 or Alternative 2.

The 65 dB DNL contour extends approximately 1.7 NM northwest of the departure end of RW 30 due to straight in/out operations, and it extends 1.8 NM southeast of the departure end of RW 12 due to the same kind of operations. The lobes or small bulges north and west of the departure end of RW 12 are due to run-up noise at the start of takeoff roll. Finally, the contours extend about 0.6 NM either side of the runway due to the lateral propagation of noise from operations on the runway. The following paragraphs provide a discussion of observed changes.

Figure 4-1 compares the contours of the No Action Alternative to Alternative 1. The contours are similar in shape with a minor increase in the size of the Alternative 1 DNL contours due mostly to the very small increase in operations of Alternative 1. The most visible changes are in the southeast quadrant and are due to additional departures of tactical aircraft such as F-22s, F/A-18E/Fs, F-16s, etc. of Visiting Units.

Figure 4-2 compares the contours of the No Action Alternative to Alternative 2. The contours are again, similar in shape with a minor increase in the size of the Alternative 2 DNL contours. The differences are of a lesser magnitude than in Alternative 1 since Alternative 2 includes only limited FMS deployments (no FMS F-16 flight operations). The most visible changes continue to occur in the southeast quadrant due to the additional departures of tactical aircraft such as F-22s, F/A-18E/Fs, F-16s, etc. of Visiting Units,.

Figure 4-3 compares the contours of the No Action Alternative to Alternative 1 and Alternative 2. The contours remain similar in shape for all three alternatives and increase only slightly in size from the No Action Alternative to Alternative 2, and then from Alternative 2 to Alternative 1.

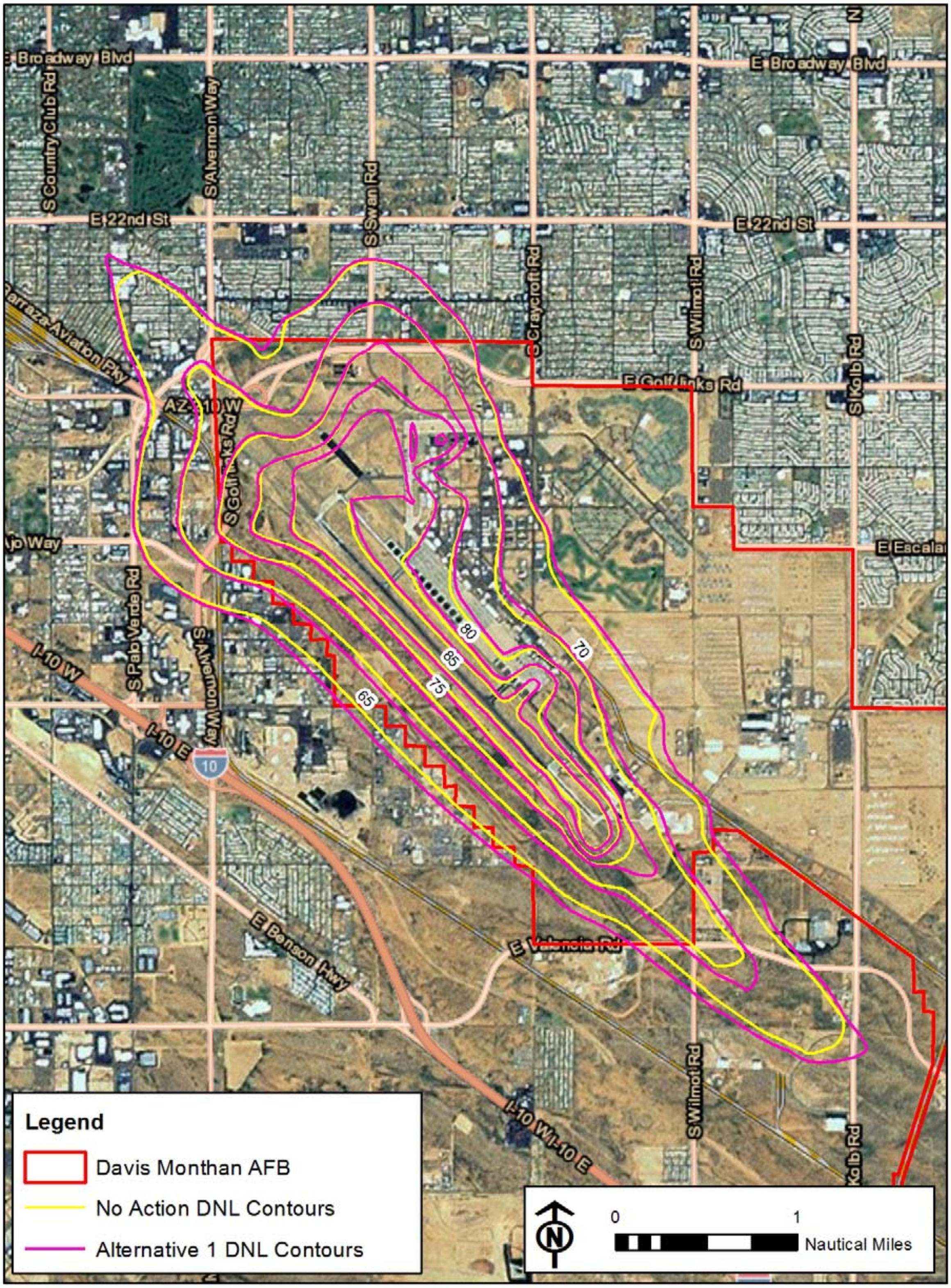



**Figure 4-1. No Action and Alternative 1 DNL Contours**

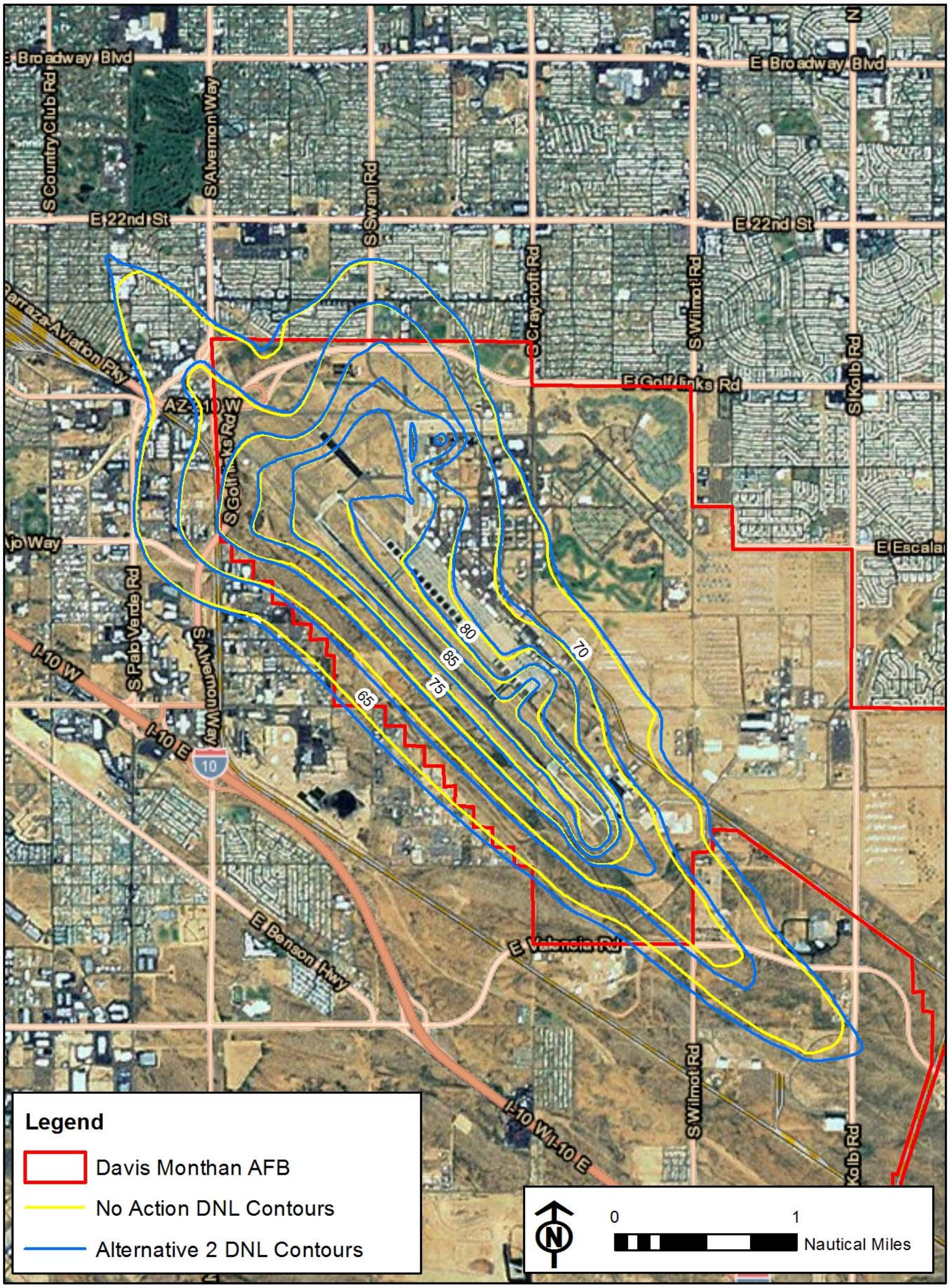



**Figure 4-2. No Action and Alternative 2 DNL Contours**

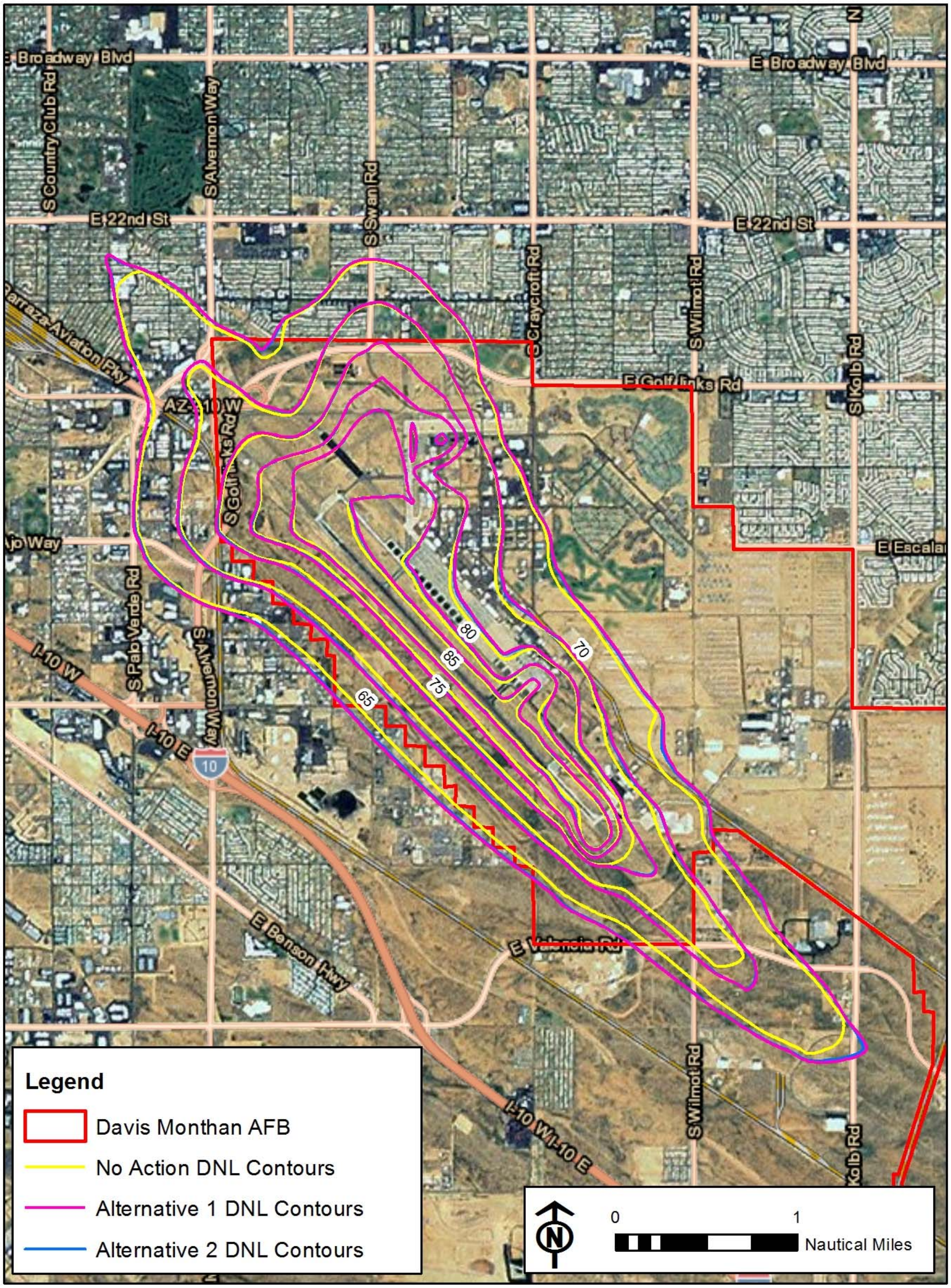



**Figure 4-3. No Action, Alternative 1 and Alternative 2 DNL Contours**

# References

[1] U.S. Air Force Air Combat Command. 2014. *Description of Proposed Action and Alternatives for the Proposed Update and Implementation of the Total Force Training Mission for Visiting Units (Operation Snowbird, Multi-Service, Foreign Military Sales) at Davis-Monthan Air Force Base, Arizona.* April.

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[3] U.S. Air Force Air Combat Command. 2012. *Environmental Assessment for Proposed Update and Implementation of the National Guard Bureau Training Plan 60-1 In Support of Operations Snowbird, Davis-Monthan Air Force Base, Arizona at Davis-Monthan Air Force Base, Arizona.* July.

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[9] Schultz, T.J. 1978. *Synthesis of Social Surveys on Noise Annoyance*. Journal of the Acoustical Society of America, 64: pp. 377-405.

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# Acronyms

| Acronym | Description |
|---|---|
| **AAD** | Average Annual Day |
| **AAM** | Advanced Acoustic Model |
| **ABD** | Average Busy Day |
| **ACC** | Air Combat Command |
| **AICUZ** | Air Installation Compatible Use Zones |
| **ANG** | Air National Guard |
| **ATC** | Air Traffic Control |
| **NGB** | National Guard Bureau |
| **cps** | Cycle Per Second |
| **dB** | Decibel |
| **DMAFB** | Davis-Monthan Air Force Base |
| **DNL** | Day Night Average Sound Level |
| **DoD** | Department of Defense |
| **EIAP** | Environmental Impact Analysis Process |
| **FMS** | Foreign Military Sales |
| **FW** | Fighter Wing |
| **HQ** | Headquarters |
| **HTA** | Helicopter Training Area |
| **Hz** | Hertz |
| **IAS** | International Aircraft Sales |
| **LaRC** | Langley Research Center |
| **MSL** | Mean Sea Level |
| **NASA** | National Aeronautics and Space Administration |
| **NATO** | North Atlantic Treaty Organization |
| **NM** | Nautical Mile |
| **OSB** | Operation Snowbird |
| **RNM** | Rotorcraft Noise Model |
| **RW** | Runway |
| **SEL** | Sound Exposure Level |
| **SPL** | Sound Pressure Level |
| **TIA** | Tucson International Airport |
| **TRAC** | Tilt Rotor Aeroacoustic Code |
| **USAF** | U.S. Air Force |

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# Attachment A

# Modeled Flight Tracks for Visiting Units

**17 June 2014**

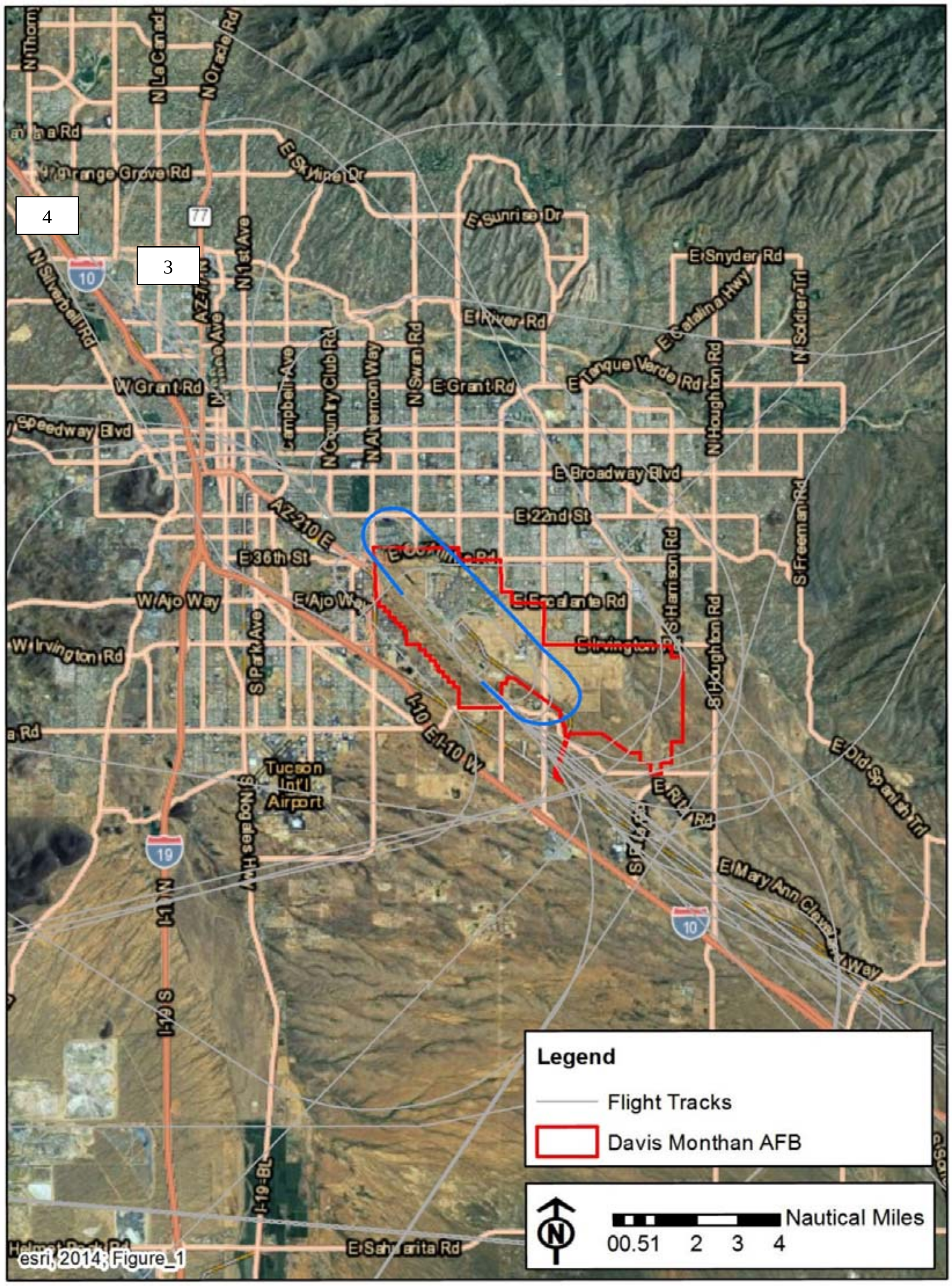



**Figure A-1. Cargo Aircraft Arrival Flight Tracks Landing East**

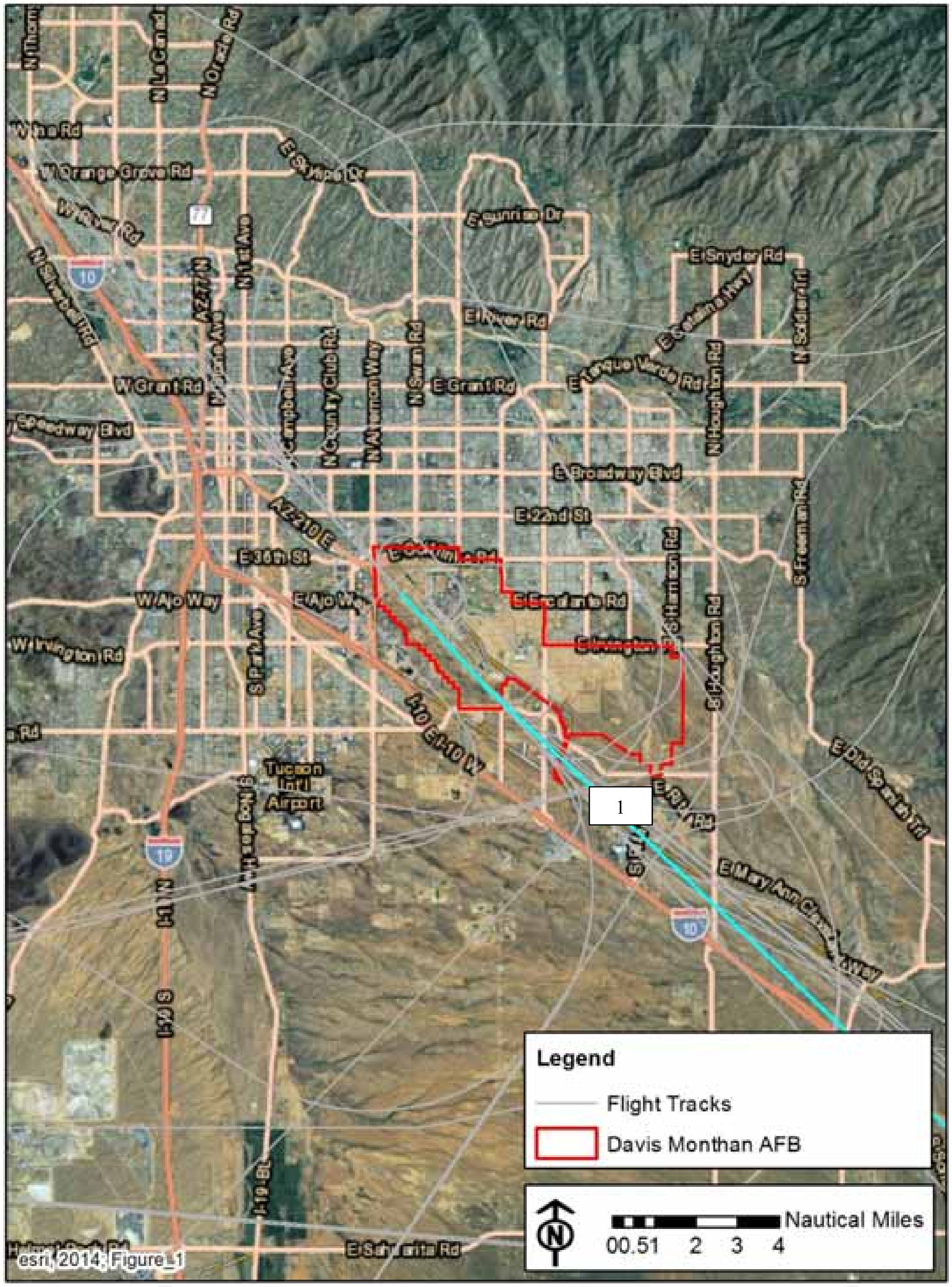



**Figure A-2. Cargo Aircraft Departure Flight Tracks to the East**

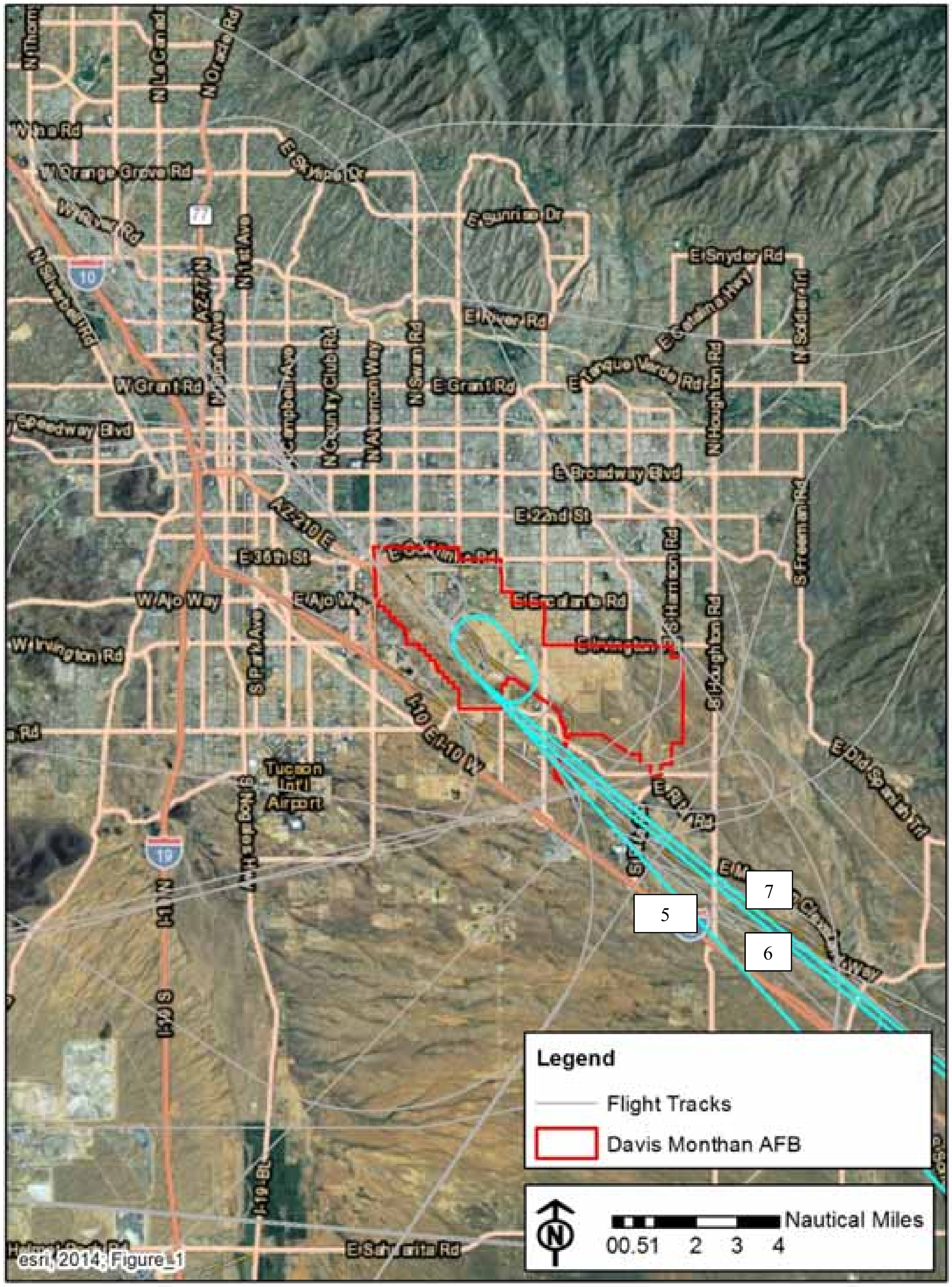



**Figure A-3. Cargo Aircraft Arrival Flight Tracks Landing West**

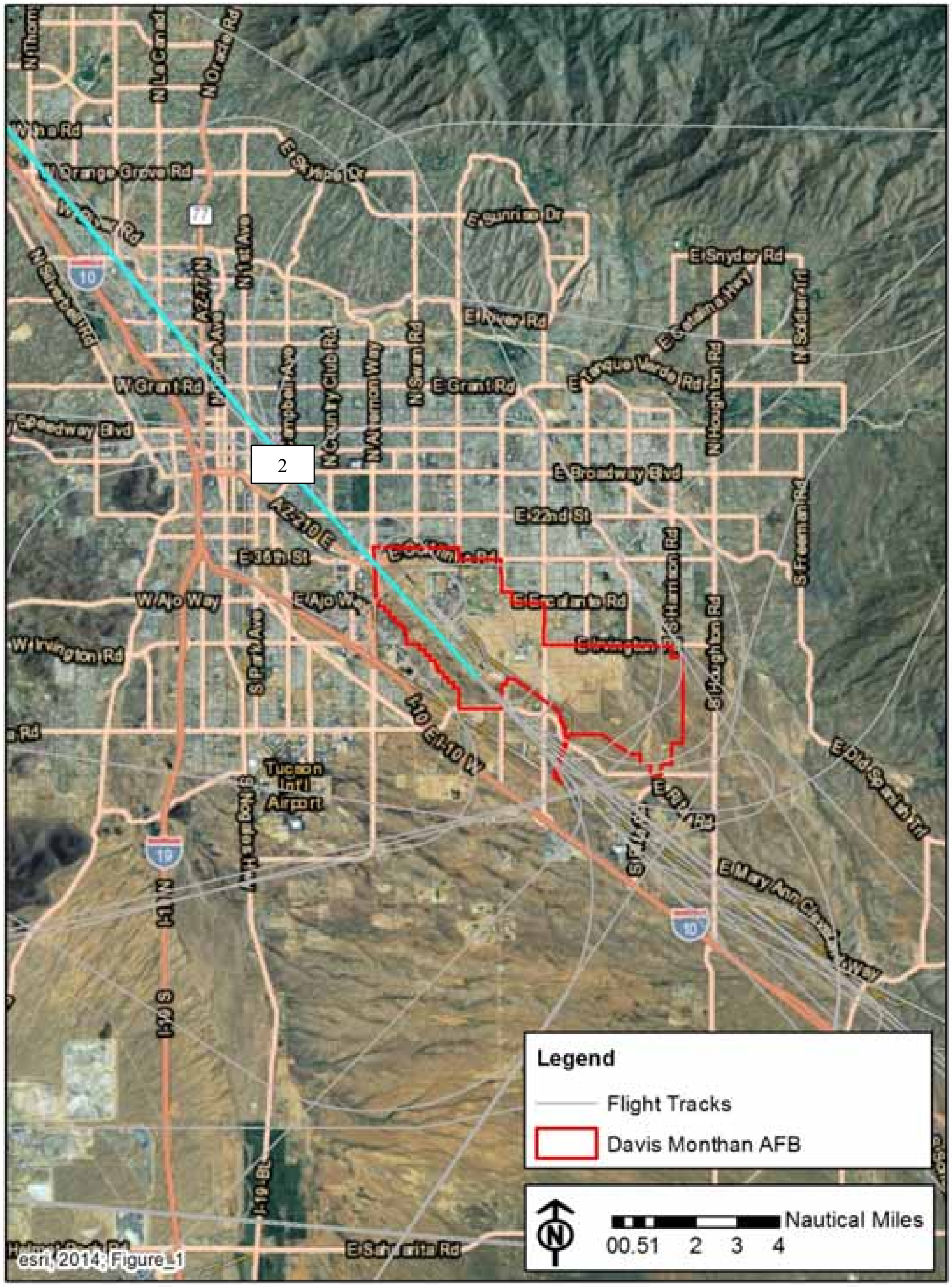



**Figure A-4. Cargo Aircraft Departure Flight Tracks to the West**

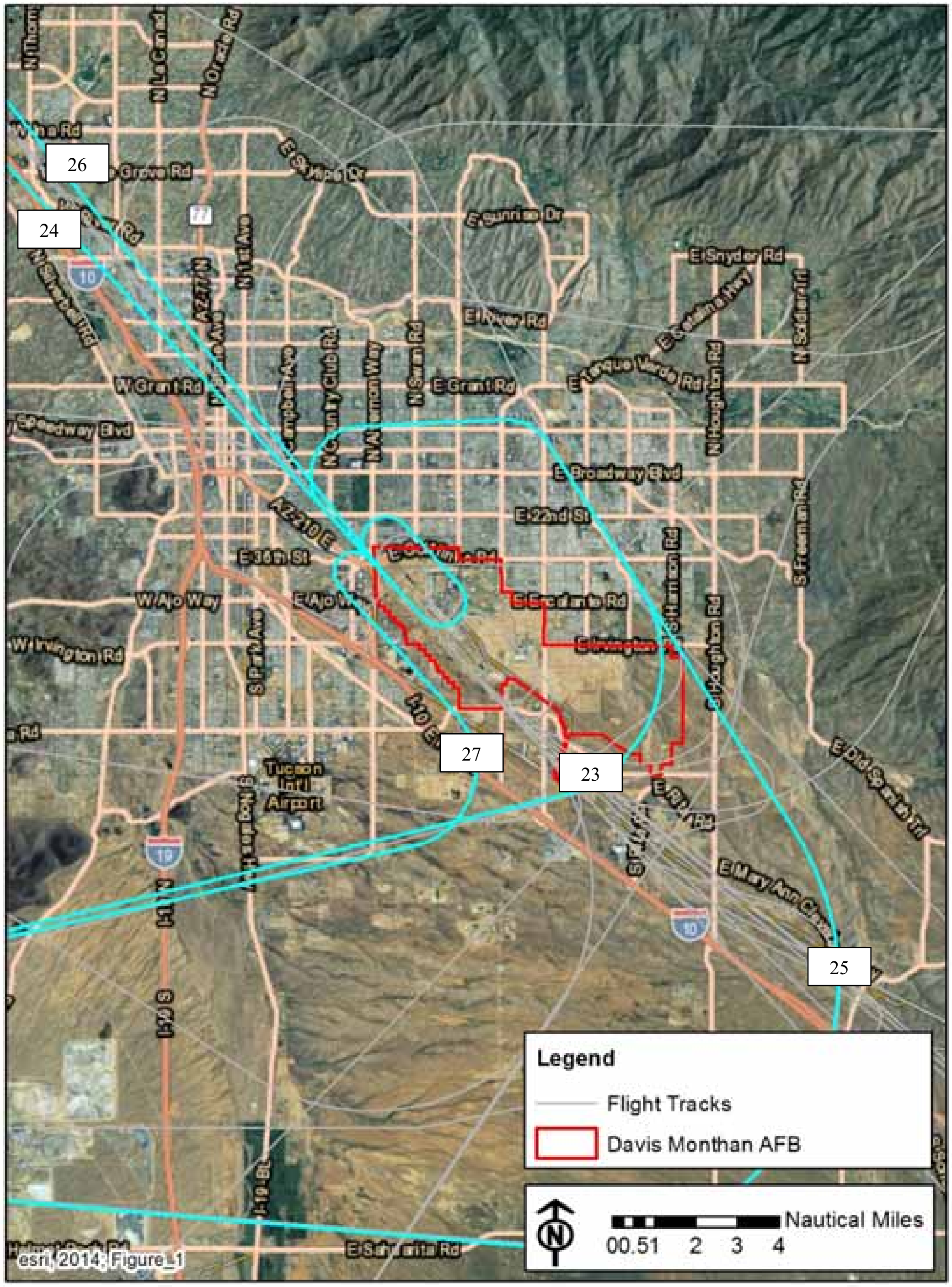



**Figure A-5. Tactical Aircraft Arrival Flight Tracks Landing East**

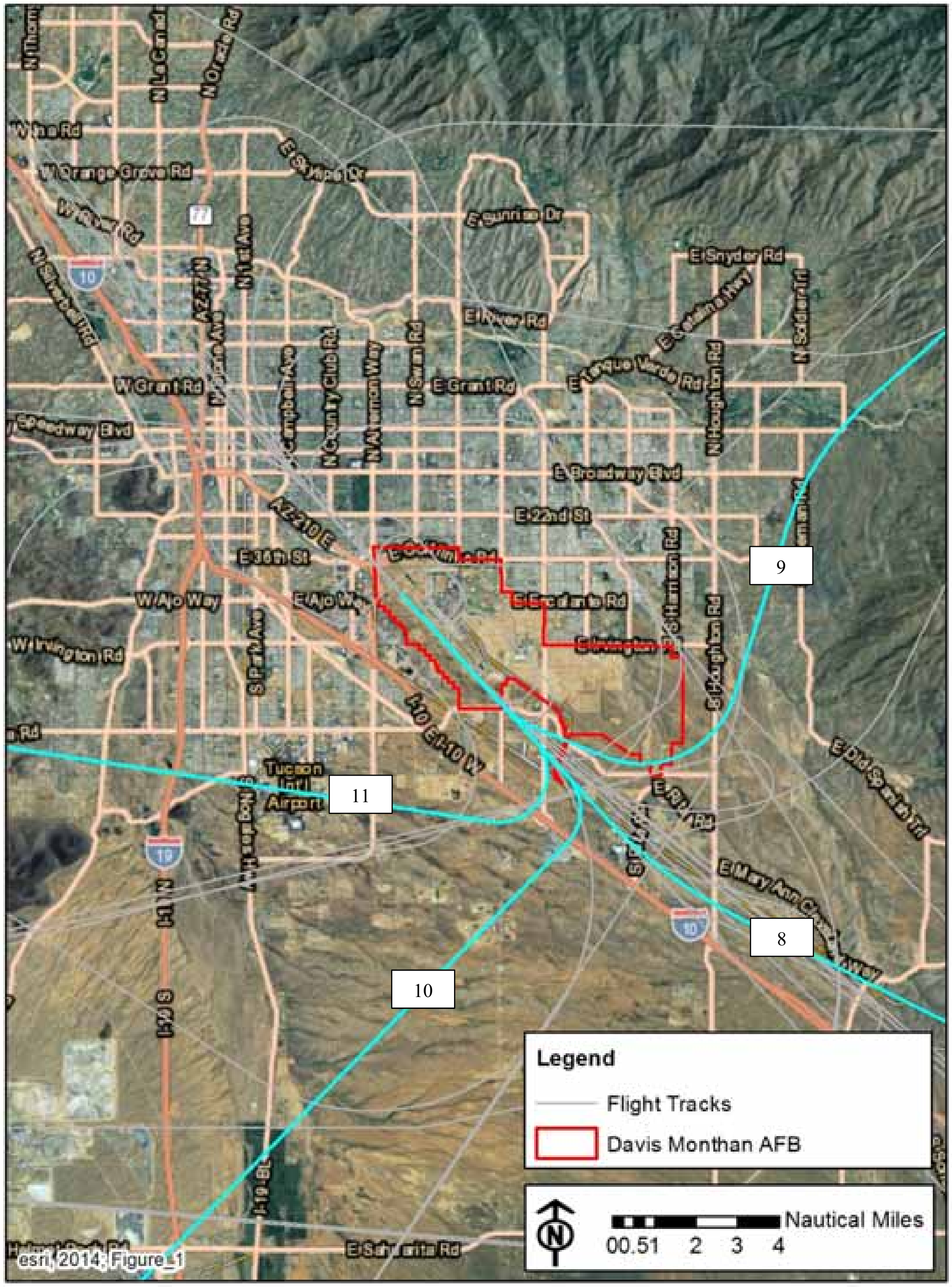



**Figure A-6. Tactical Aircraft VFR Departure Flight Tracks to the East**

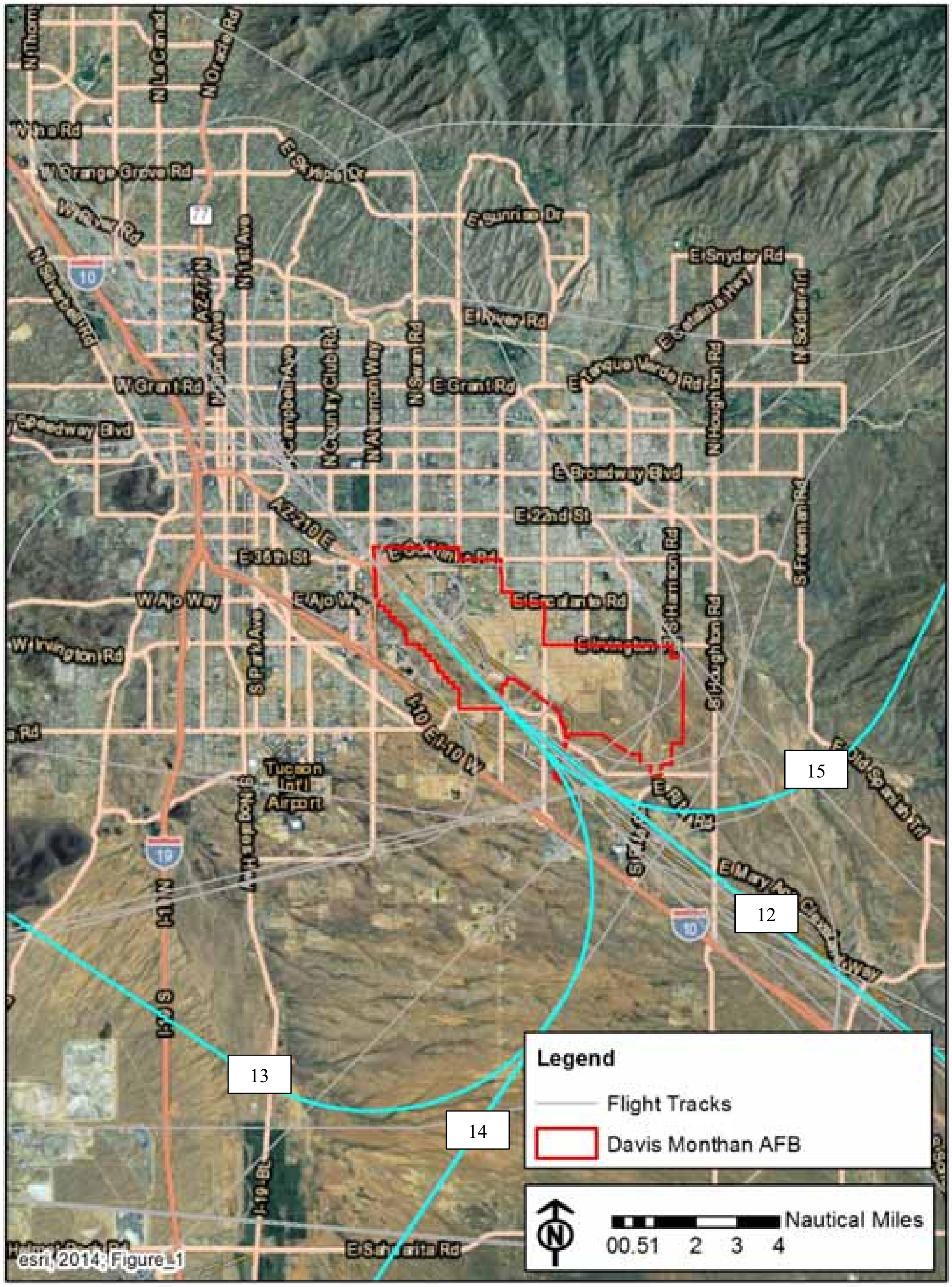



**Figure A-7. Tactical Aircraft IFR Departure Flight Tracks to the East**

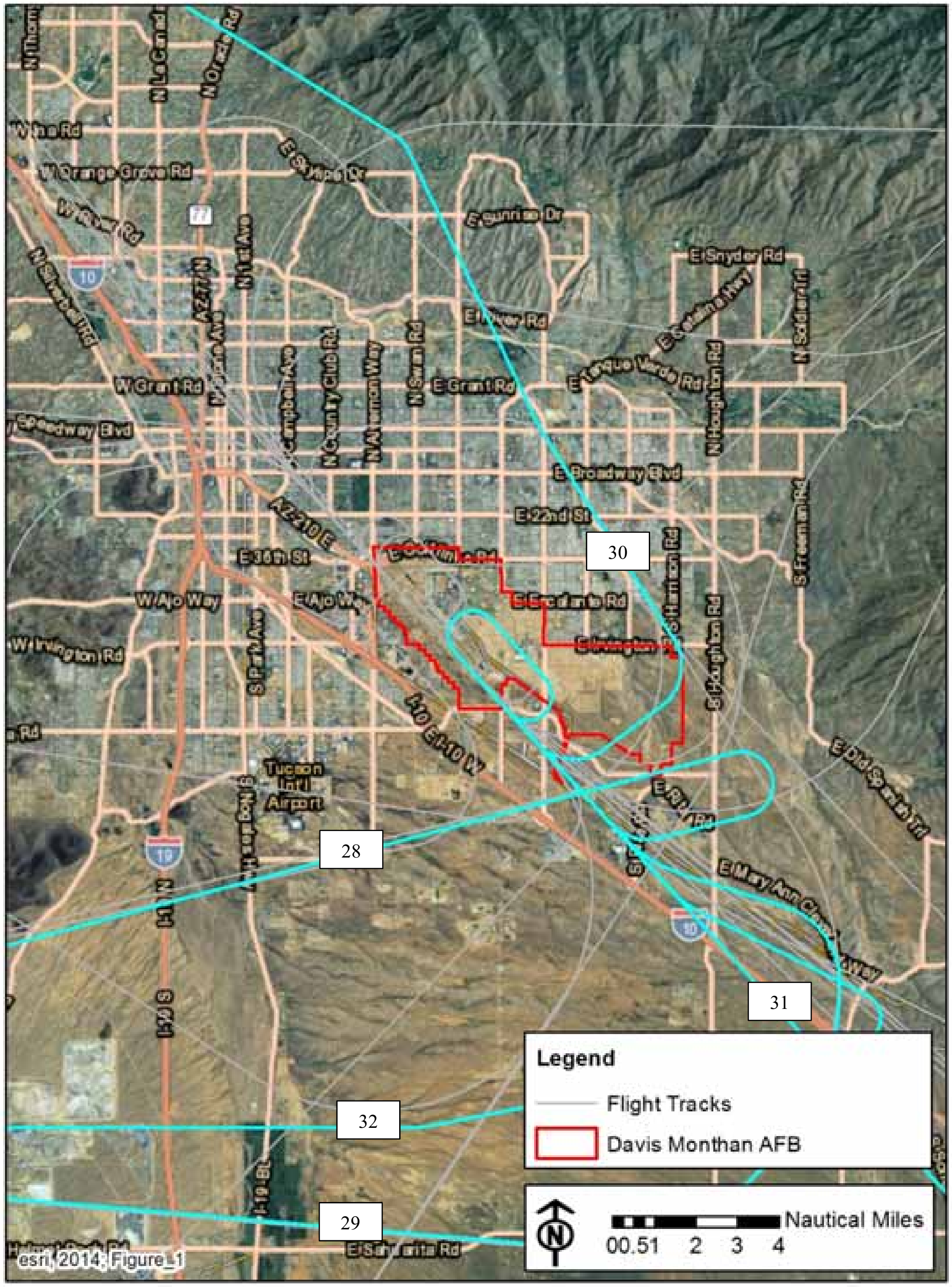



**Figure A-8. Tactical Aircraft Arrival Flight Tracks Landing West**

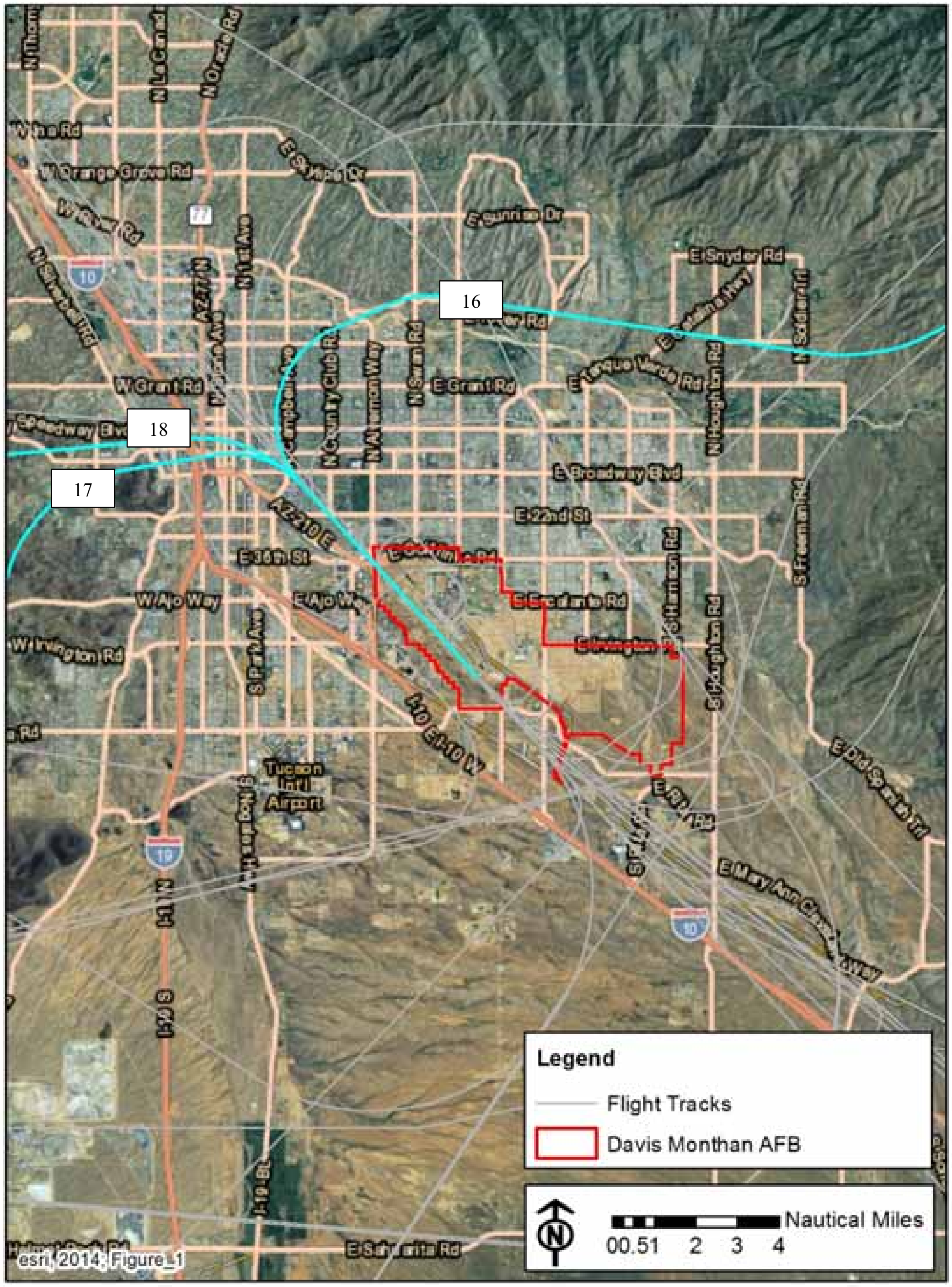



**Figure A-9. Tactical Aircraft VFR Departure Flight Tracks to the West**

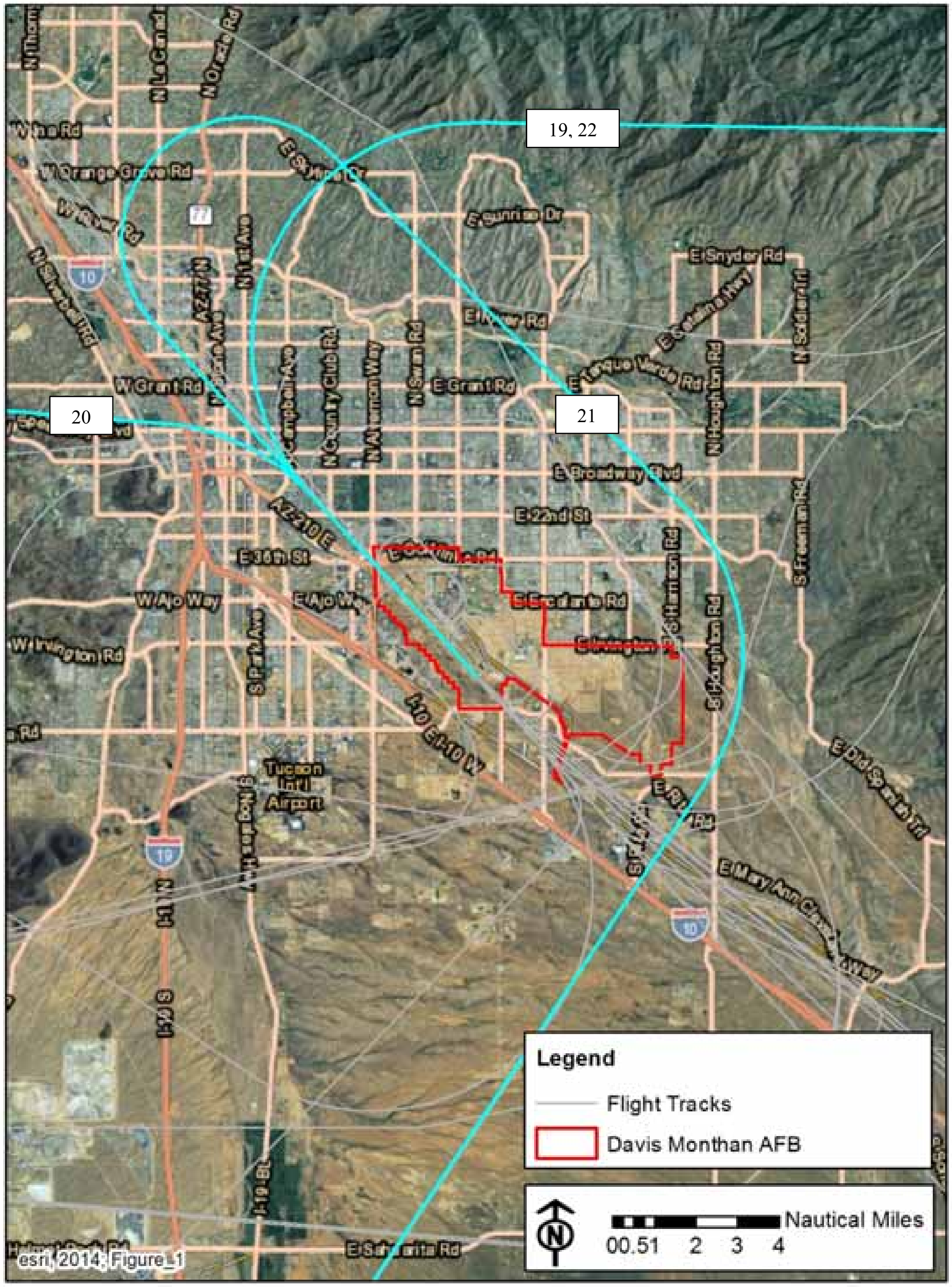



**Figure A-10. Tactical Aircraft IFR Departure Flight Tracks to the West**

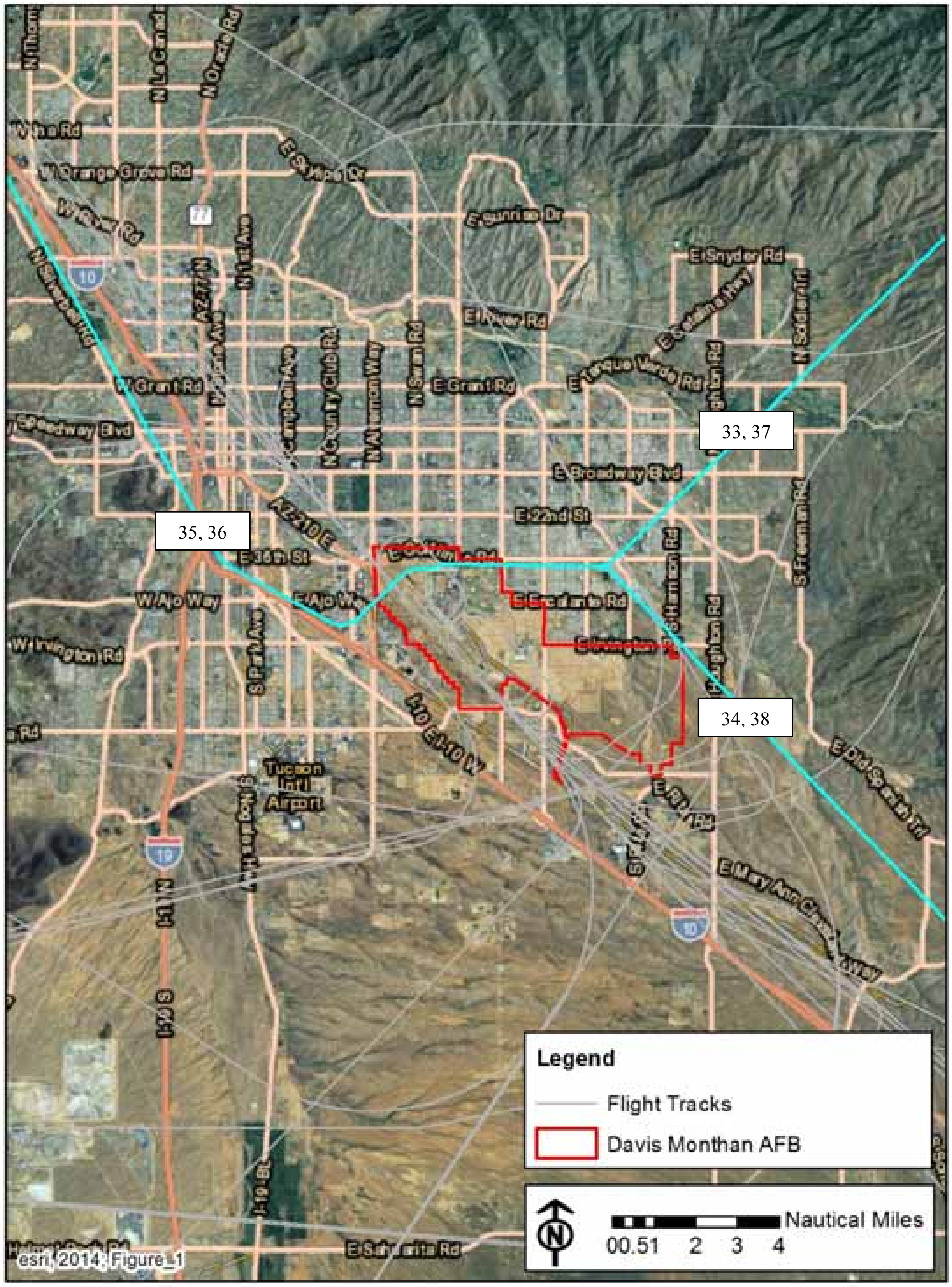



**Figure A-11. Helicopter Flight Tracks**

## Table A-1. Flight Track Utilization

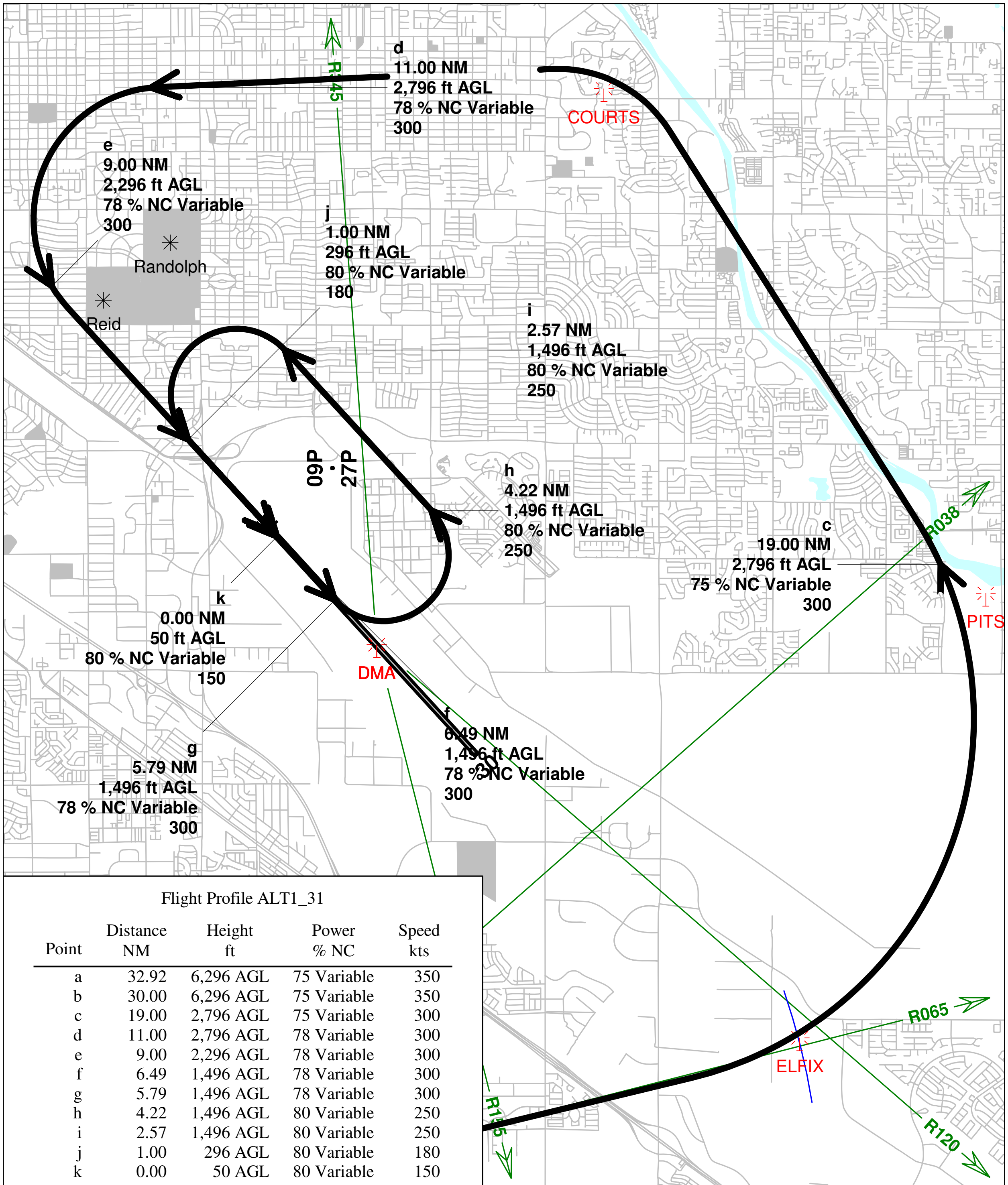
| Category | ID | Operation Type | Track ID | Track Description | Percent 0700-2200 | Percent 2200-0700 |
|---|---|---|---|---|---|---|
| Cargo | 1 | Departure | 12D01 | Davis Monthan Three | 100.00% | 100.00% |
| | 2 | | 30D01 | Davis Monthan Three | 100.00% | 100.00% |
| | 3 | Arrival | 12A03A | TACAN/Visual Straight-in | 90.00% | 90.00% |
| | 4 | | 12A03B | Straight-in (Overhead Break) | 10.00% | 10.00% |
| | 5 | | 30A03A | Visual Straight-in | 20.00% | 20.00% |
| | 6 | | 30A04A | TACAN | 70.00% | 70.00% |
| | 7 | | 30A04C | Straight-in (Overhead Break) | 10.00% | 10.00% |
| Tactical | 8 | VFR Departure to the East | 12D02 | Vail 1 VFR Departure | 0.00% | 0.00% |
| | 9 | | 12D04 | Reddy 1 VFR Departure | 2.50% | 2.50% |
| | 10 | | 12D05 | Tubac 1 VFR Departure | 2.50% | 2.50% |
| | 11 | | 12D07 | Kitt 1 VFR Departure | 70.00% | 70.00% |
| | 12 | IFR Departure to the East | 12D01A | Tombstone East/West IFR Departure | 15.00% | 15.00% |
| | 13 | | 12D02A | Sells 1/Gila Bend 1 IFR Departure | 5.00% | 5.00% |
| | 14 | | 12D03A | Ruby 1 IFR Departure | 2.50% | 2.50% |
| | 15 | | 12D04A | Jackal Low 1/Outjack IFR Departure | 2.50% | 2.50% |
| | 16 | VFR Departure to the West | 30D04 | Reddy 1 VFR Departure | 2.50% | 2.50% |
| | 17 | | 30D05 | Tubac 1 VFR Departure | 2.50% | 2.50% |
| | 18 | | 30D07 | Kitt 1 VFR Departure | 70.00% | 70.00% |
| | 19 | IFR Departure to the West | 30D01A | Tombstone East/West IFR Departure | 15.00% | 15.00% |
| | 20 | | 30D02A | Sells 1/Gila Bend 1 IFR Departure | 5.00% | 5.00% |
| | 21 | | 30D03A | Ruby 1 IFR Departure | 2.50% | 2.50% |
| | 22 | | 30D04A | Jackal Low 1/Outjack IFR Departure | 2.50% | 2.50% |
| | 23 | Arrival Landing East | 12A01A | Davez Five VFR Recovery (Overhead Break) | 75.00% | 75.00% |
| | 24 | | 12A06 | La Cholla VFR Recovery Procedure (Overhead Break) | 4.00% | 4.00% |
| | 25 | | 12A08 | Green Valley VFR Recovery (Overhead Break) | 8.00% | 8.00% |
| | 26 | | 12A03A | Straight-in (TACAN, etc.) | 10.00% | 10.00% |
| | 27 | | 12A04 | Hung Ordnance | 3.00% | 3.00% |
| | 28 | Arrival Landing West | 30A01A | Davez Five VFR Recovery (Overhead Break) | 89.00% | 89.00% |
| | 29 | | 30A07 | La Cholla VFR Recovery Procedure (Overhead Break) | 0.00% | 0.00% |
| | 30 | | 30A08 | Green Valley VFR Recovery (Overhead Break) | 8.00% | 8.00% |
| | 31 | | 30A03A | Straight-in (ILS, etc.) | 0.00% | 0.00% |
| | 32 | | 30A05 | Hung Ordnance | 3.00% | 3.00% |
| Helicopter | 33 | Departure | 09PD01 | Via Gulf Link Road to Northeast | 25.00% | 25.00% |
| | 34 | | 09PD02 | Via Gulf Link Road to Southeast | 75.00% | 75.00% |
| | 35 | | 27PD01 | To Sentinel Peak "A-Mountain" | 100.00% | 100.00% |
| | 36 | Arrival | 09PA01 | From Sentinel Peak "A-Mountain" | 100.00% | 100.00% |
| | 37 | | 27PA01 | Via Gulf Link Road to Northeast | 25.00% | 25.00% |
| | 38 | | 27PA02 | Via Gulf Link Road to Southeast | 75.00% | 75.00% |

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.1 - F-16C Flight Profile Maps

11:50 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_31

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 75 Variable | 350 |
| b | 30.00 | 6,296 AGL | 75 Variable | 350 |
| c | 19.00 | 2,796 AGL | 75 Variable | 300 |
| d | 11.00 | 2,796 AGL | 78 Variable | 300 |
| e | 9.00 | 2,296 AGL | 78 Variable | 300 |
| f | 6.49 | 1,496 AGL | 78 Variable | 300 |
| g | 5.79 | 1,496 AGL | 78 Variable | 300 |
| h | 4.22 | 1,496 AGL | 80 Variable | 250 |
| i | 2.57 | 1,496 AGL | 80 Variable | 250 |
| j | 1.00 | 296 AGL | 80 Variable | 180 |
| k | 0.00 | 50 AGL | 80 Variable | 150 |

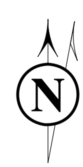
**Flight Profile ALT1_31**

ANG F-16C Overhead Break Arrival

Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

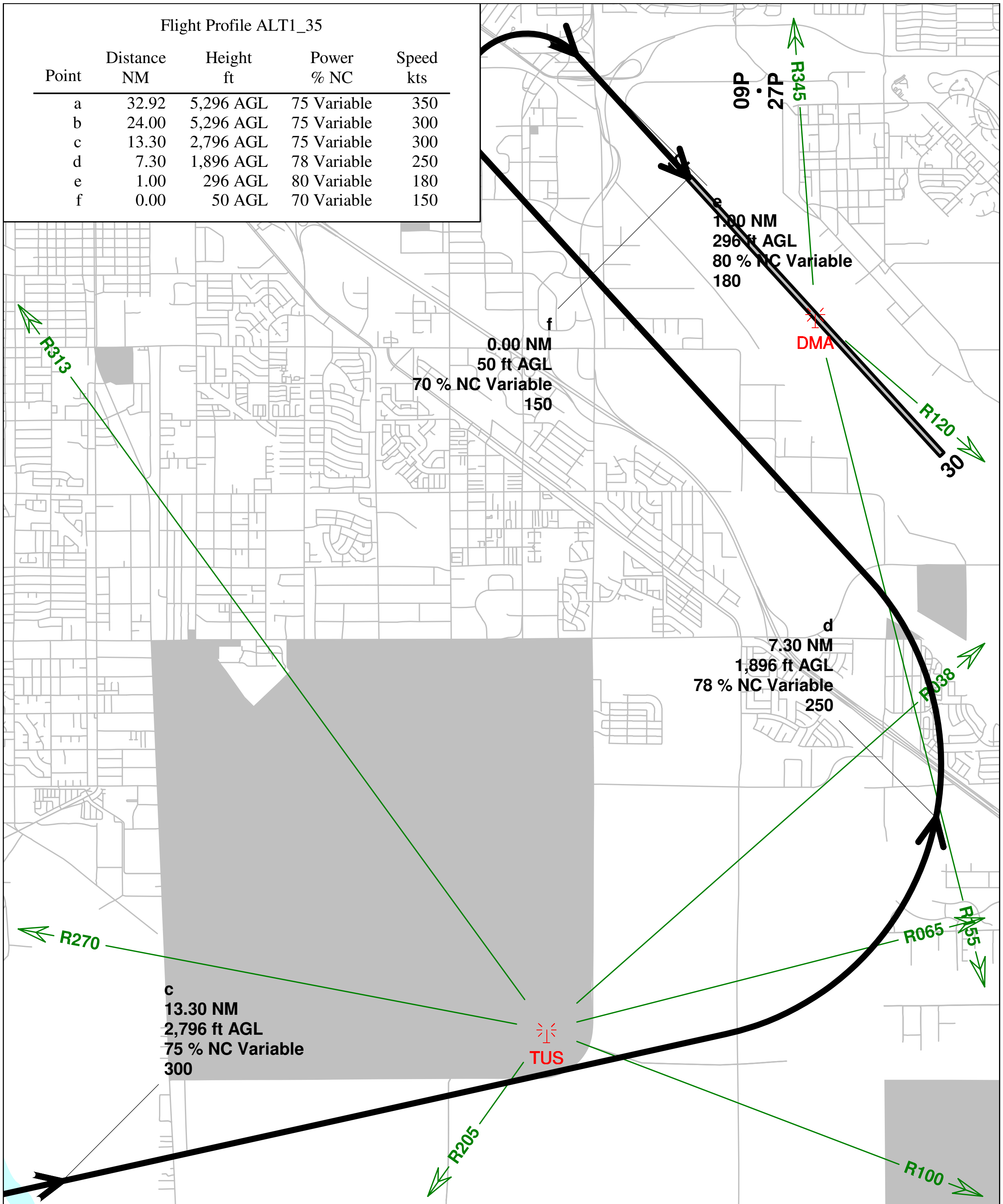
F-16C Engine: F100-PW-220


Scale in Feet 1:85,500 (1 inch = 7,130 feet)



Flight Profile ALT1_35

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 75 Variable | 350 |
| b | 24.00 | 5,296 AGL | 75 Variable | 300 |
| c | 13.30 | 2,796 AGL | 75 Variable | 300 |
| d | 7.30 | 1,896 AGL | 78 Variable | 250 |
| e | 1.00 | 296 AGL | 80 Variable | 180 |
| f | 0.00 | 50 AGL | 70 Variable | 150 |




**Flight Profile ALT1_35**

ANG F-16C Straight-in Arrival

Flight Track: 12A04 - Hung Ordnance Aircraft: Transient F-16C Engine: F100-PW-220

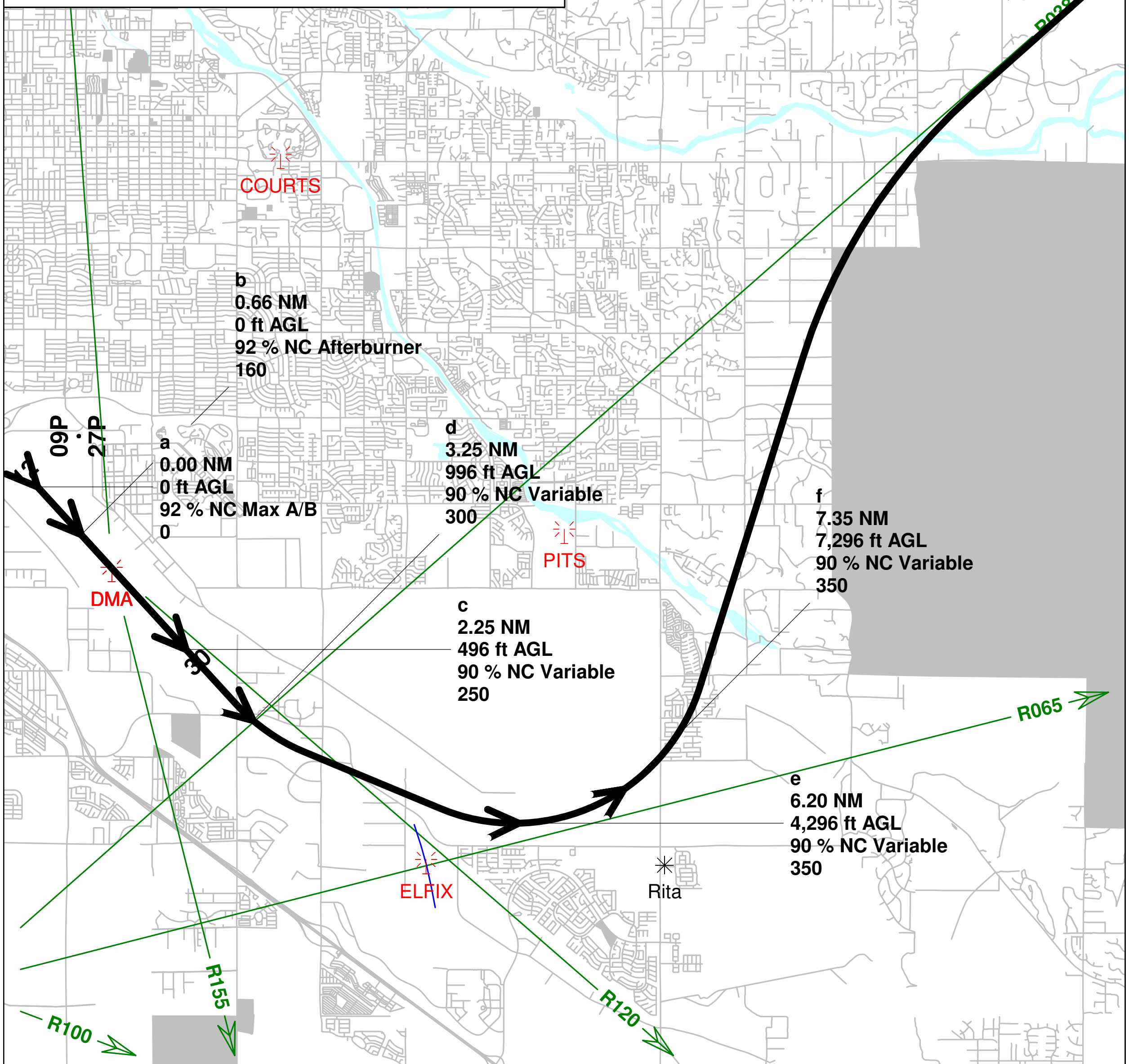
0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:67,100 (1 inch = 5,590 feet)

N

Flight Profile ALT1_2

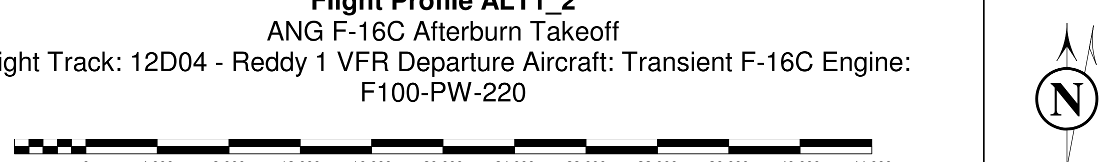
| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 92 Max A/B | 0 |
| b | 0.66 | 0 AGL | 92 Afterburner | 160 |
| c | 2.25 | 496 AGL | 90 Variable | 250 |
| d | 3.25 | 996 AGL | 90 Variable | 300 |
| e | 6.20 | 4,296 AGL | 90 Variable | 350 |
| f | 7.35 | 7,296 AGL | 90 Variable | 350 |
| g | 22.88 | 7,296 AGL | 80 Variable | 350 |




**Flight Profile ALT1_2**

ANG F-16C Afterburn Takeoff

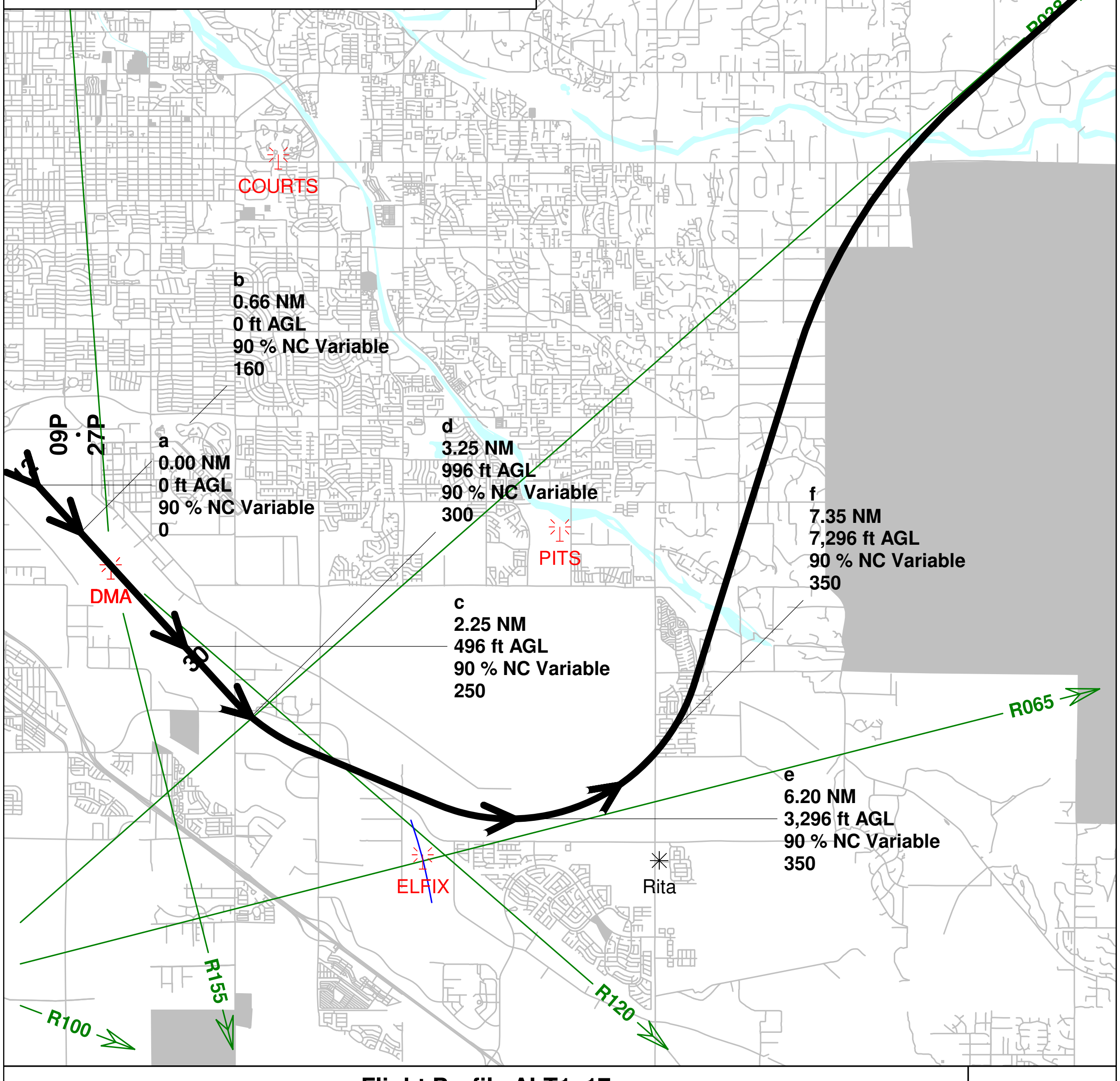
Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-16C Engine: F100-PW-220




Scale in Feet 1:129,000 (1 inch = 10,700 feet)

Flight Profile ALT1_17

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 90 Variable | 0 |
| b | 0.66 | 0 AGL | 90 Variable | 160 |
| c | 2.25 | 496 AGL | 90 Variable | 250 |
| d | 3.25 | 996 AGL | 90 Variable | 300 |
| e | 6.20 | 3,296 AGL | 90 Variable | 350 |
| f | 7.35 | 7,296 AGL | 90 Variable | 350 |
| g | 22.88 | 7,296 AGL | 80 Variable | 350 |




**Flight Profile ALT1_17**
ANG F-16C Mil Takeoff
Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-16C Engine: F100-PW-220

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

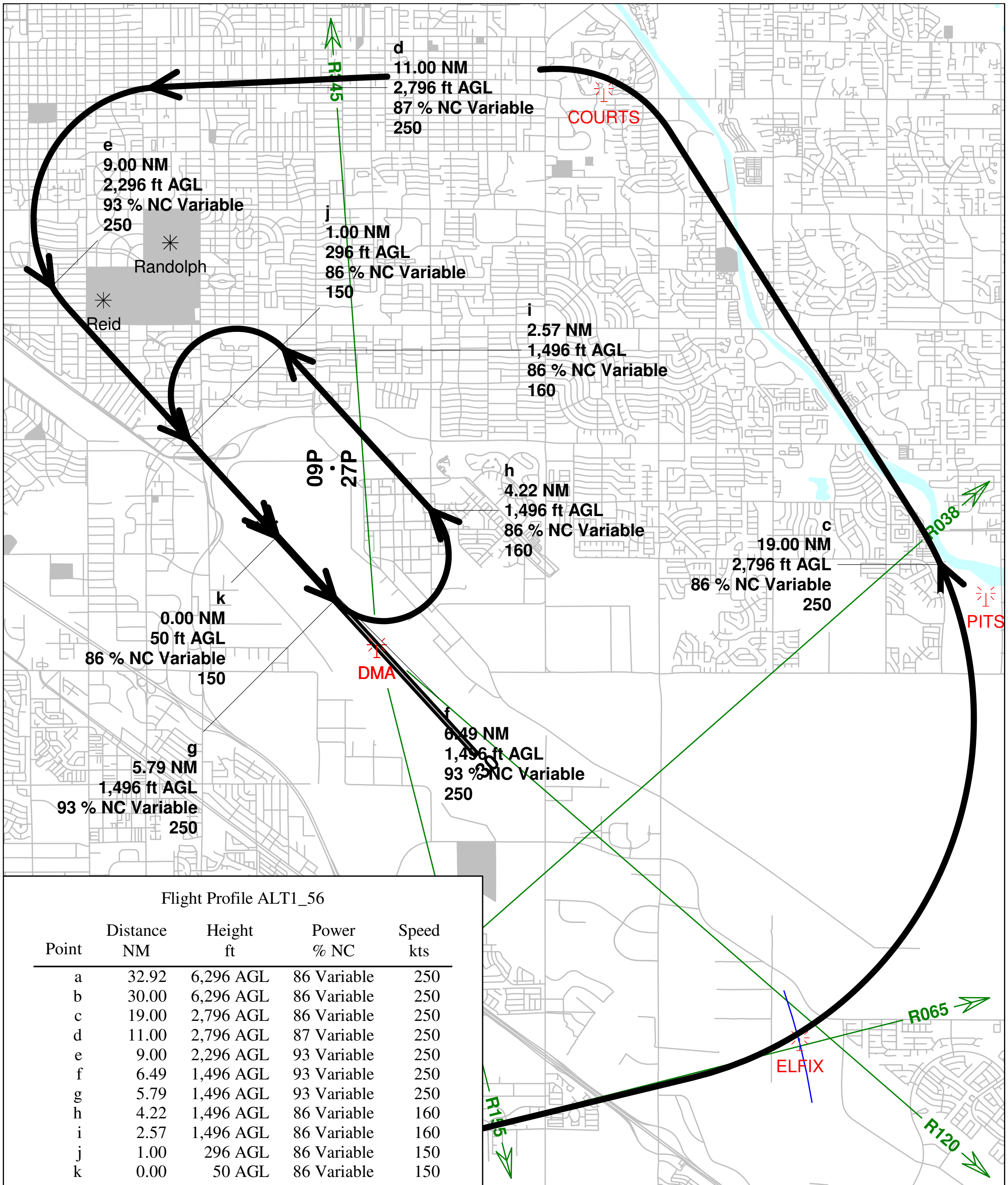
Scale in Feet 1:129,000 (1 inch = 10,700 feet)

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.2 - A-10A Flight Profile Maps

11:51 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_56

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 86 Variable | 250 |
| b | 30.00 | 6,296 AGL | 86 Variable | 250 |
| c | 19.00 | 2,796 AGL | 86 Variable | 250 |
| d | 11.00 | 2,796 AGL | 87 Variable | 250 |
| e | 9.00 | 2,296 AGL | 93 Variable | 250 |
| f | 6.49 | 1,496 AGL | 93 Variable | 250 |
| g | 5.79 | 1,496 AGL | 93 Variable | 250 |
| h | 4.22 | 1,496 AGL | 86 Variable | 160 |
| i | 2.57 | 1,496 AGL | 86 Variable | 160 |
| j | 1.00 | 296 AGL | 86 Variable | 150 |
| k | 0.00 | 50 AGL | 86 Variable | 150 |

**Flight Profile ALT1_56**

ANG A-10A Overhead Break Arrival

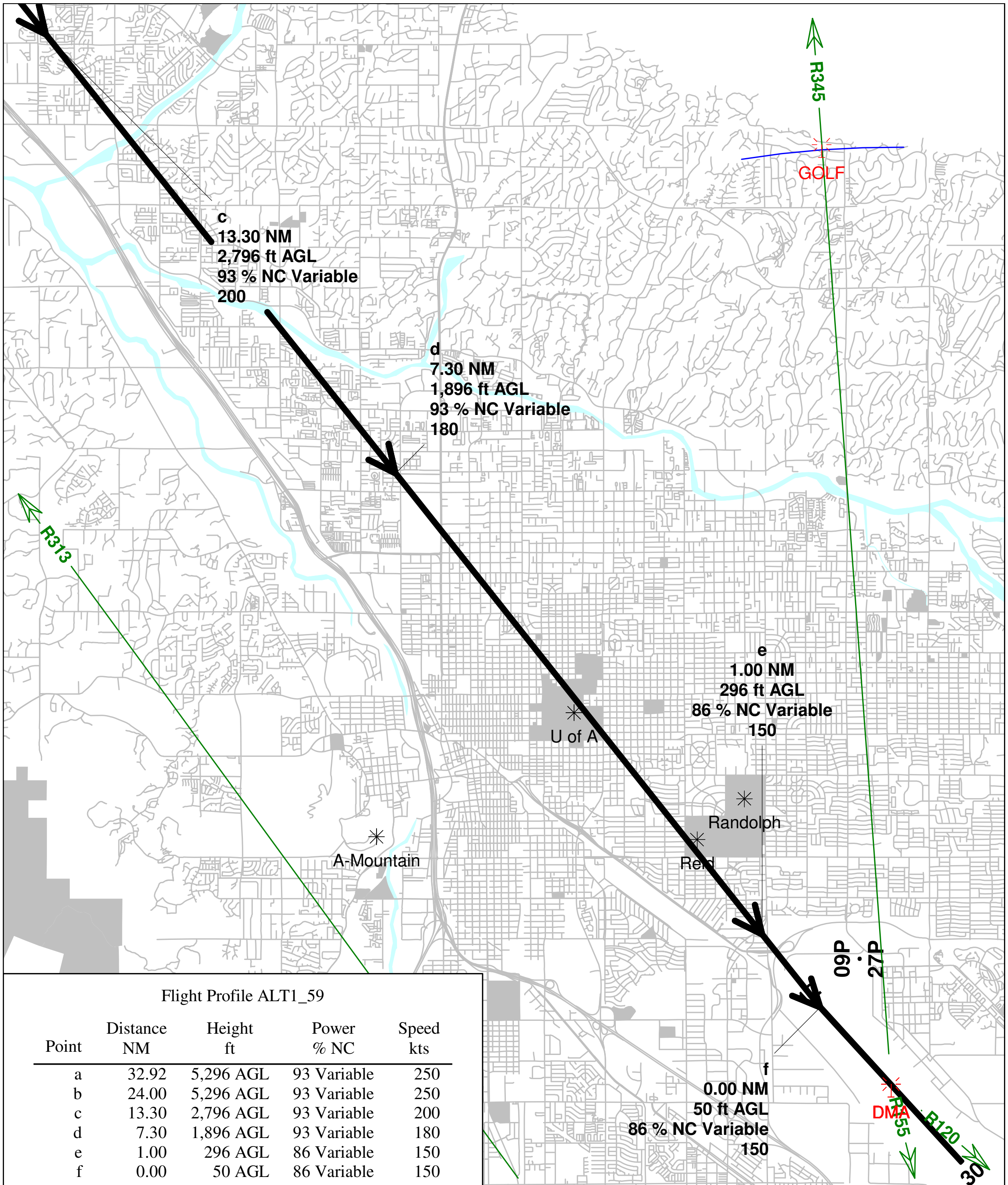
Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

A-10A Engine: TF34-GE-100

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,500 (1 inch = 7,130 feet)

N




Flight Profile ALT1_59

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 93 Variable | 250 |
| b | 24.00 | 5,296 AGL | 93 Variable | 250 |
| c | 13.30 | 2,796 AGL | 93 Variable | 200 |
| d | 7.30 | 1,896 AGL | 93 Variable | 180 |
| e | 1.00 | 296 AGL | 86 Variable | 150 |
| f | 0.00 | 50 AGL | 86 Variable | 150 |

**Flight Profile ALT1_59**

ANG A-10A Straight-in Arrival

Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient A-10A Engine: TF34-GE-100

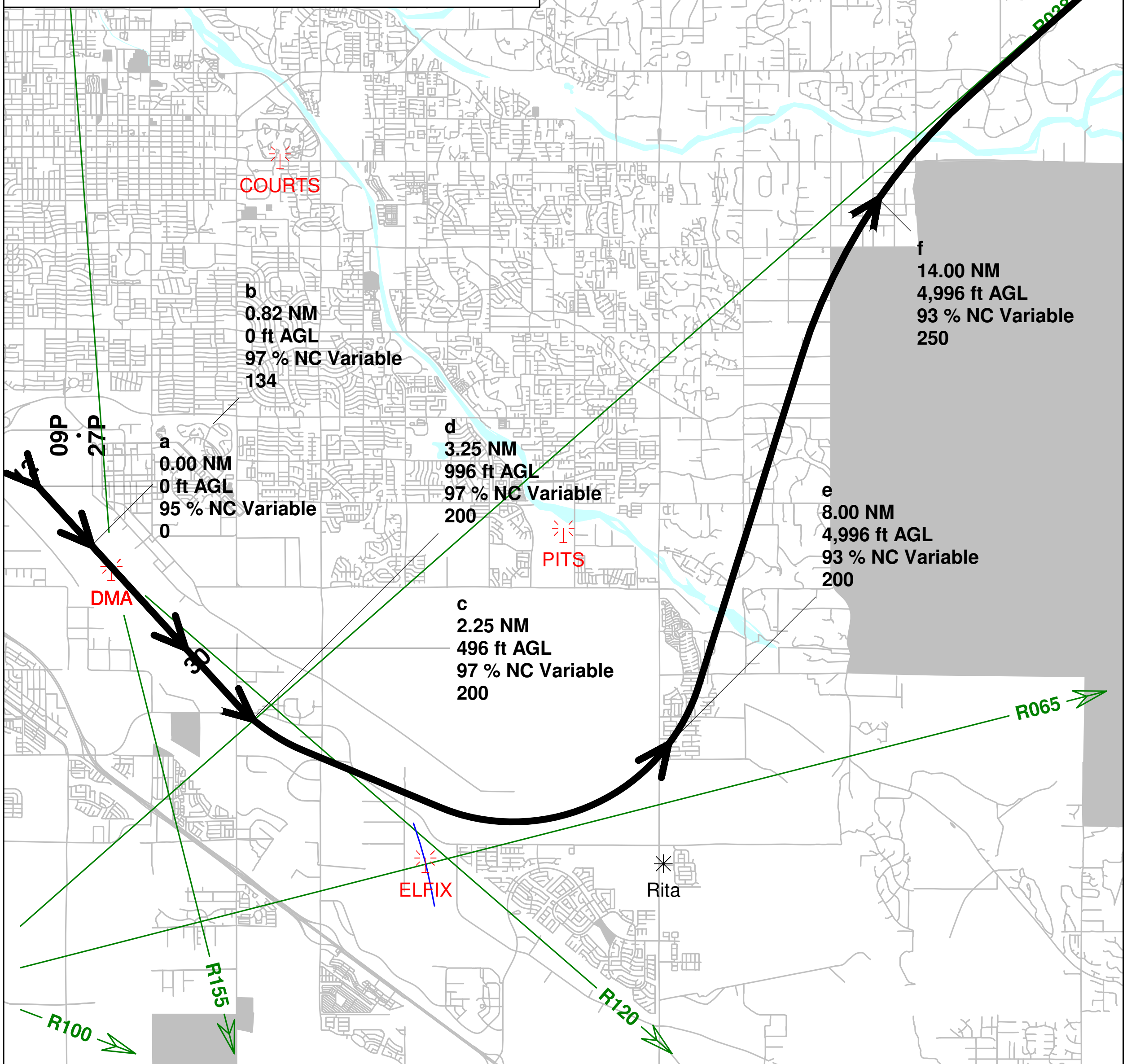
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:121,000 (1 inch = 10,000 feet)

N

Flight Profile ALT1_42

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 95 Variable | 0 |
| b | 0.82 | 0 AGL | 97 Variable | 134 |
| c | 2.25 | 496 AGL | 97 Variable | 200 |
| d | 3.25 | 996 AGL | 97 Variable | 200 |
| e | 8.00 | 4,996 AGL | 93 Variable | 200 |
| f | 14.00 | 4,996 AGL | 93 Variable | 250 |
| g | 22.88 | 6,296 AGL | 93 Variable | 250 |




**Flight Profile ALT1_42**

ANG A-10A Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient A-10A Engine: TF34-GE-100

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 1:129,000 (1 inch = 10,700 feet)

N

# Davis Monthan AFB - ALTERNATIVE 1

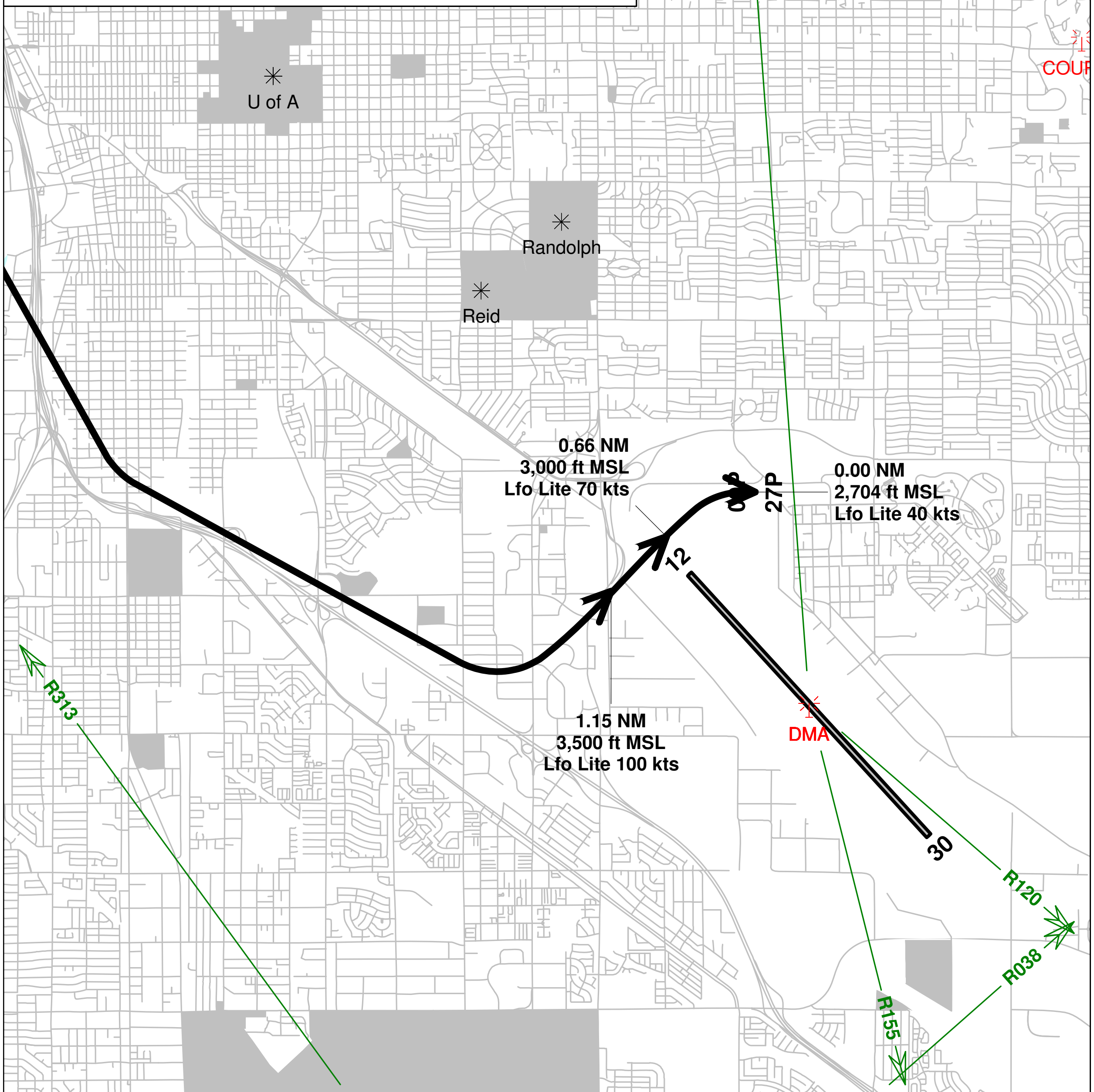
# ATTACHMENT B.3 - UH-60A Flight Profile Maps

11:51 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps

Flight Profile ALT1_149

| Point | Distance NM | Height ft | Power KNOTS | Notes |
|---|---|---|---|---|
| a | 32.92 | 3,500 MSL | Lfo Lite 100 kts | 800ft, 110 KIAS |
| b | 1.15 | 3,500 MSL | Lfo Lite 100 kts | 800ft, 110 KIAS |
| c | 0.66 | 3,000 MSL | Lfo Lite 70 kts | 300 ft, 80 KIAS |
| d | 0.00 | 2,704 MSL | Lfo Lite 40 kts | 0 ft, 0KIAS |




**Flight Profile ALT1_149**

ANG UH-60A Arrival

Flight Track: 09PA01 - Sentinel Peak - "A Mountain" Arrival Aircraft: Transient UH60A

Engine: T700-CE-700

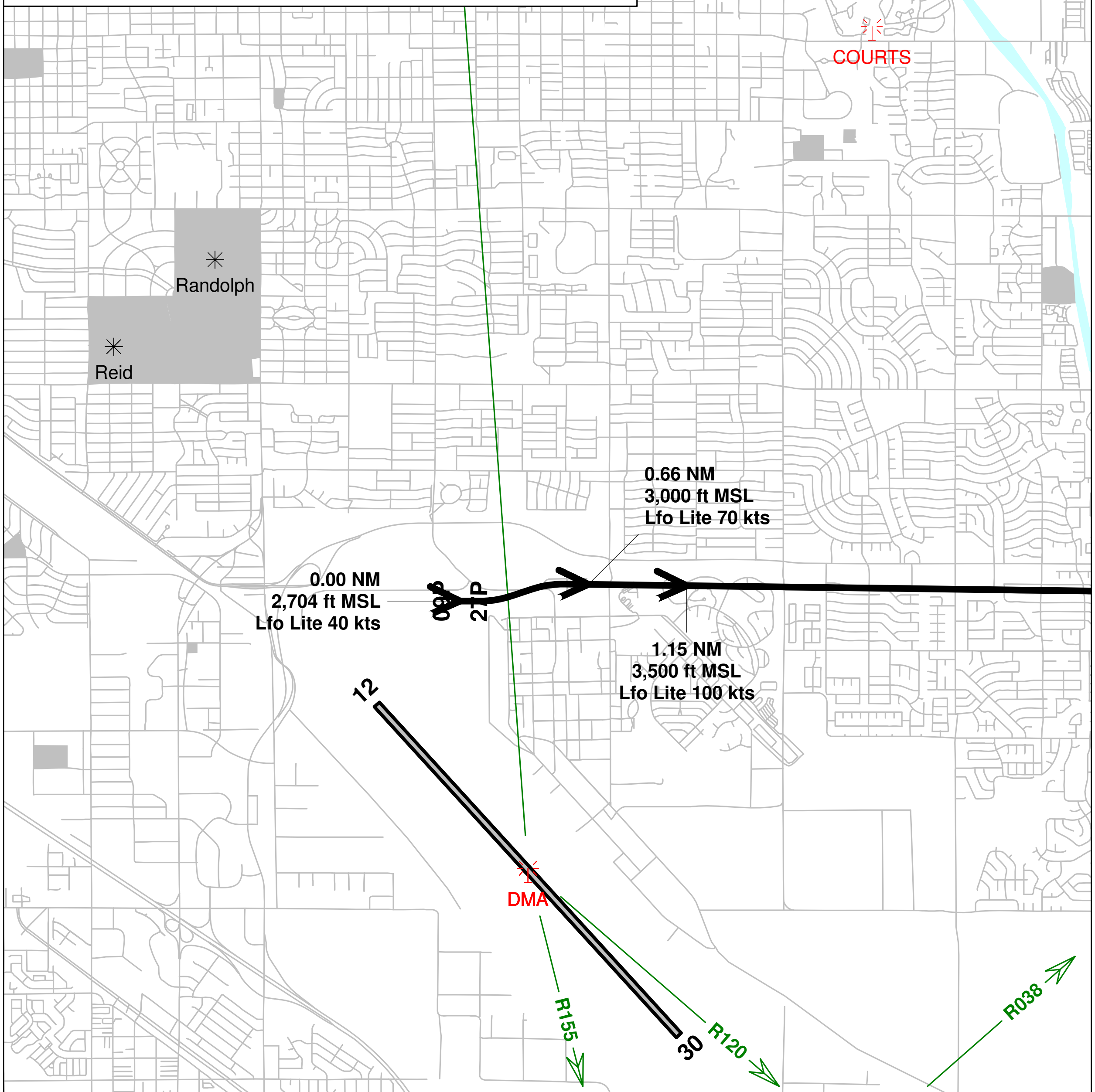
0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:77,400 (1 inch = 6,450 feet)

N

Flight Profile ALT1_146

| Point | Distance NM | Height ft | Power KNOTS | Notes |
|---|---|---|---|---|
| a | 0.00 | 2,704 MSL | Lfo Lite 40 kts | 0 ft, 0KIAS |
| b | 0.66 | 3,000 MSL | Lfo Lite 70 kts | 300 ft, 80 KIAS |
| c | 1.15 | 3,500 MSL | Lfo Lite 100 kts | 800ft, 110 KIAS |
| d | 32.92 | 3,500 MSL | Lfo Lite 100 kts | 800ft, 110 KIAS |

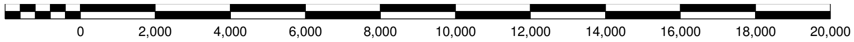



**Flight Profile ALT1_146**

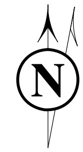
ANG UH-60A Takeoff

Flight Track: 09PD01 - Gulf Link Rd Arrival - from NE Aircraft: Transient UH60A

Engine: T700-CE-700




Scale in Feet 1:61,400 (1 inch = 5,110 feet)

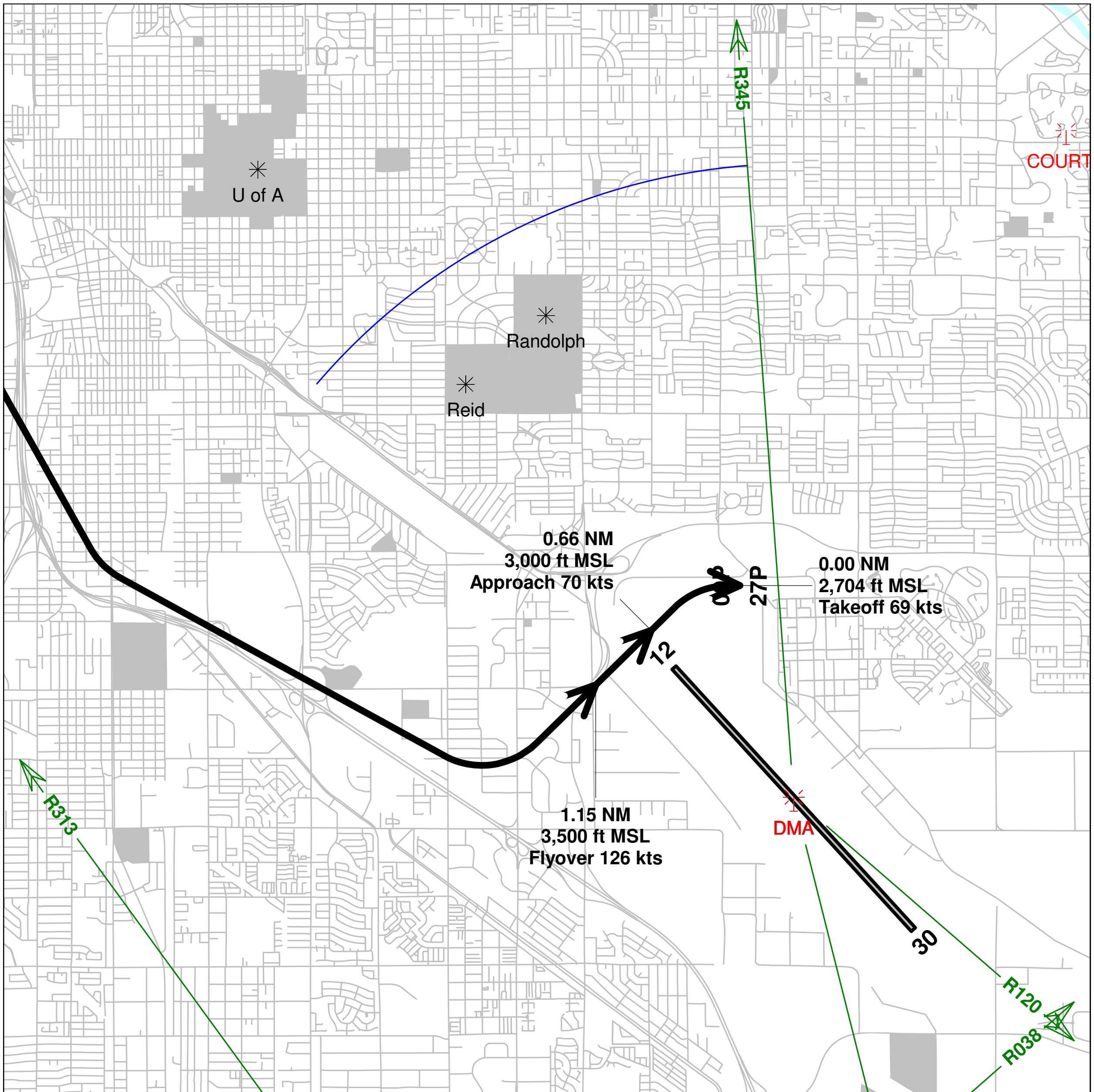


# Davis Monthan AFB - NO ACTION

# ATTACHMENT B.4 - PUMA SA330J Flight Profile Maps

11:55 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile NA_75

| Point | Distance NM | Height ft | Power KNOTS | Notes |
|---|---|---|---|---|
| a | 32.92 | 3,500 MSL | Flyover 126 kts | 800ft, 110 KIAS |
| b | 1.15 | 3,500 MSL | Flyover 126 kts | 800ft, 110 KIAS |
| c | 0.66 | 3,000 MSL | Approach 70 kts | 300 ft, 80 KIAS |
| d | 0.00 | 2,704 MSL | Takeoff 69 kts | 0 ft, 0KIAS |

**Flight Profile NA_75**

PUMA SA330J Arrival

Flight Track: 09PA01 - Sentinel Peak - "A Mountain" Arrival Aircraft: Transient PUMA SA330J Engine: Turmo 4C

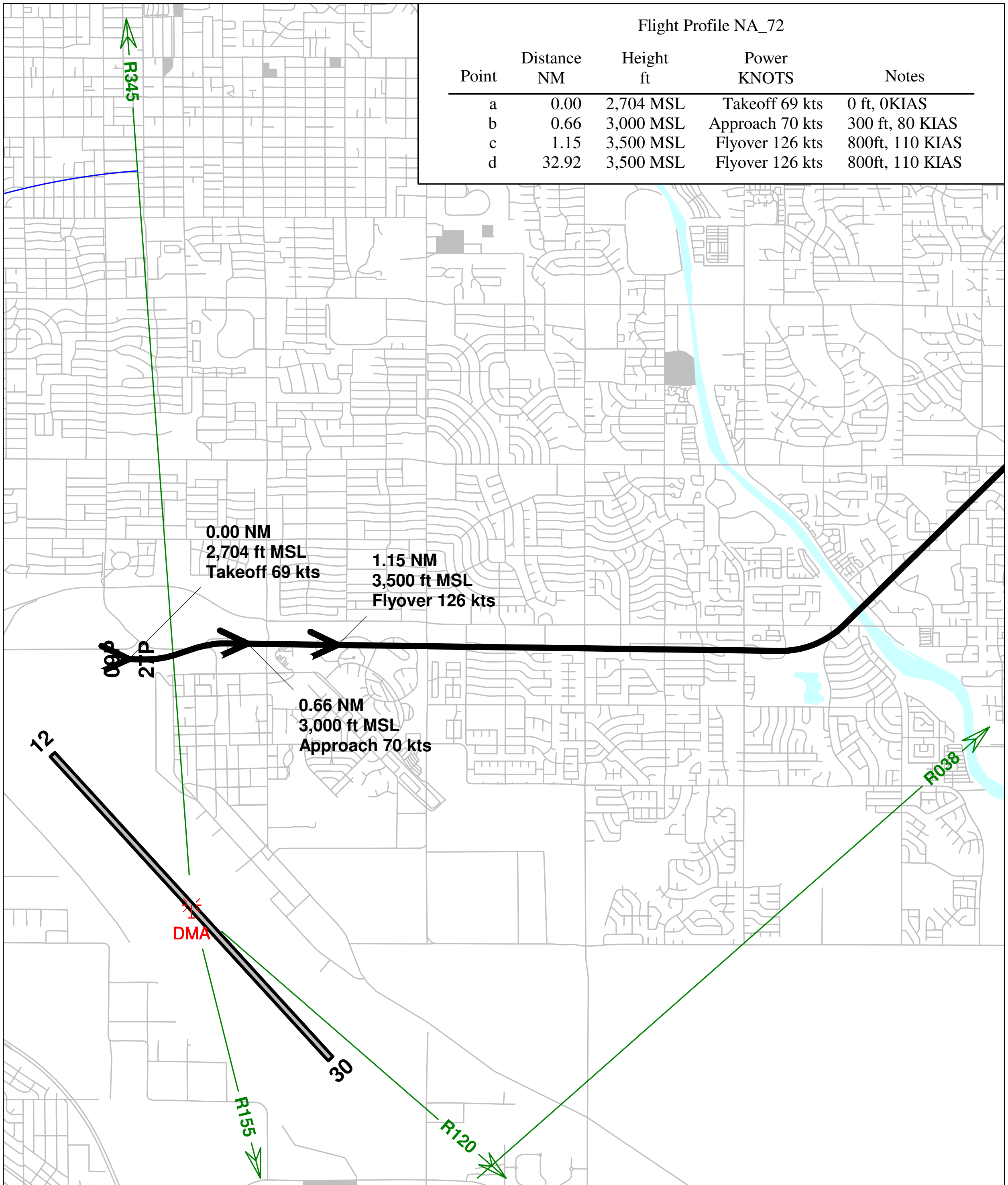
0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:77,400 (1 inch = 6,450 feet)

N

Flight Profile NA_72

| Point | Distance NM | Height ft | Power KNOTS | Notes |
|---|---|---|---|---|
| a | 0.00 | 2,704 MSL | Takeoff 69 kts | 0 ft, 0KIAS |
| b | 0.66 | 3,000 MSL | Approach 70 kts | 300 ft, 80 KIAS |
| c | 1.15 | 3,500 MSL | Flyover 126 kts | 800ft, 110 KIAS |
| d | 32.92 | 3,500 MSL | Flyover 126 kts | 800ft, 110 KIAS |




**Flight Profile NA_72**
PUMA SA330J Takeoff
Flight Track: 09PD01 - Gulf Link Rd Arrival - from NE Aircraft: Transient PUMA SA330J Engine: Turmo 4C

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

Scale in Feet 1:61,400 (1 inch = 5,110 feet)

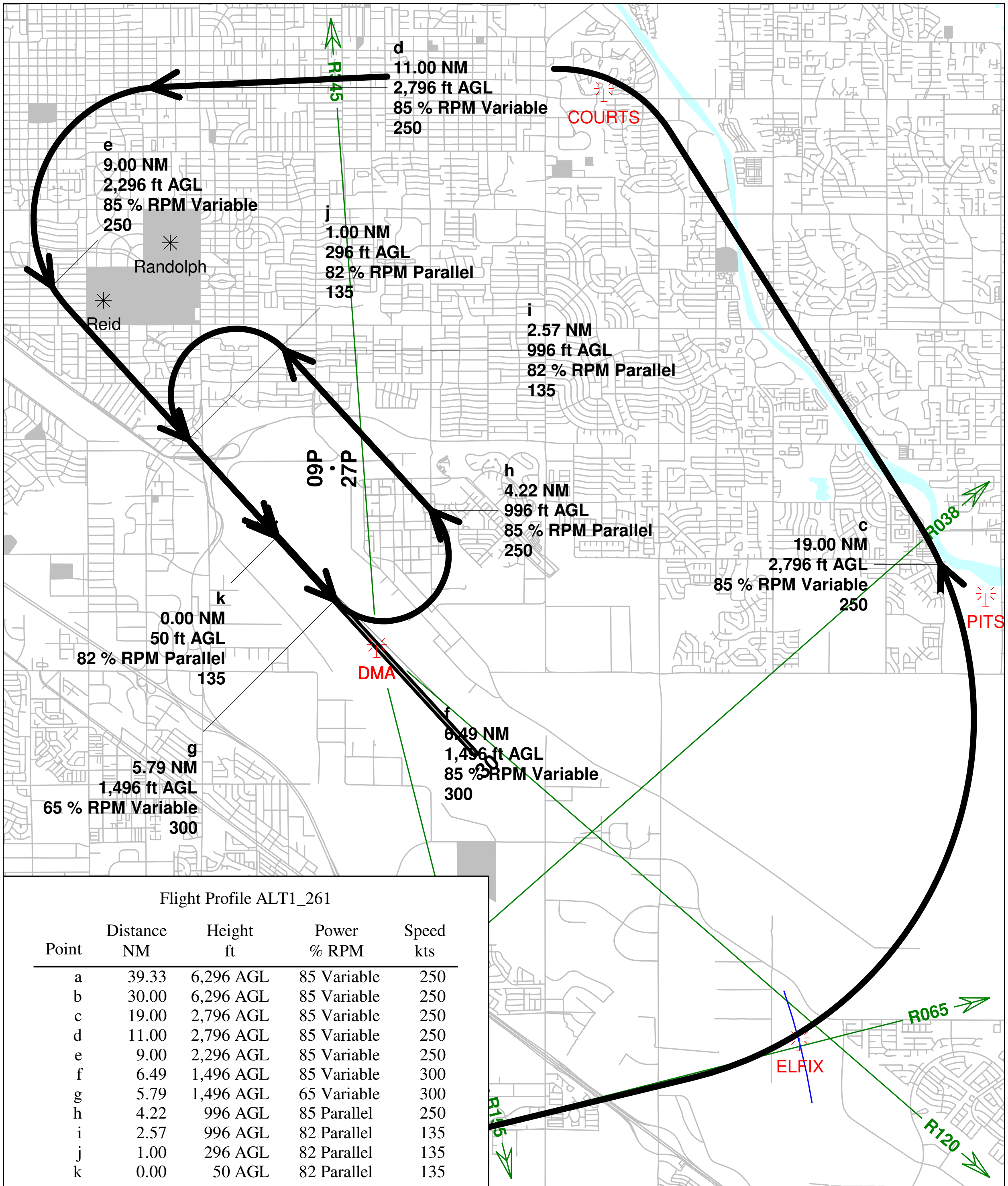
N

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.5 - AV-8B Flight Profile Maps (AV-8B and GR-7/9 Harrier)

11:52 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_261

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 39.33 | 6,296 AGL | 85 Variable | 250 |
| b | 30.00 | 6,296 AGL | 85 Variable | 250 |
| c | 19.00 | 2,796 AGL | 85 Variable | 250 |
| d | 11.00 | 2,796 AGL | 85 Variable | 250 |
| e | 9.00 | 2,296 AGL | 85 Variable | 250 |
| f | 6.49 | 1,496 AGL | 85 Variable | 300 |
| g | 5.79 | 1,496 AGL | 65 Variable | 300 |
| h | 4.22 | 996 AGL | 85 Parallel | 250 |
| i | 2.57 | 996 AGL | 82 Parallel | 135 |
| j | 1.00 | 296 AGL | 82 Parallel | 135 |
| k | 0.00 | 50 AGL | 82 Parallel | 135 |

**Flight Profile ALT1_261**

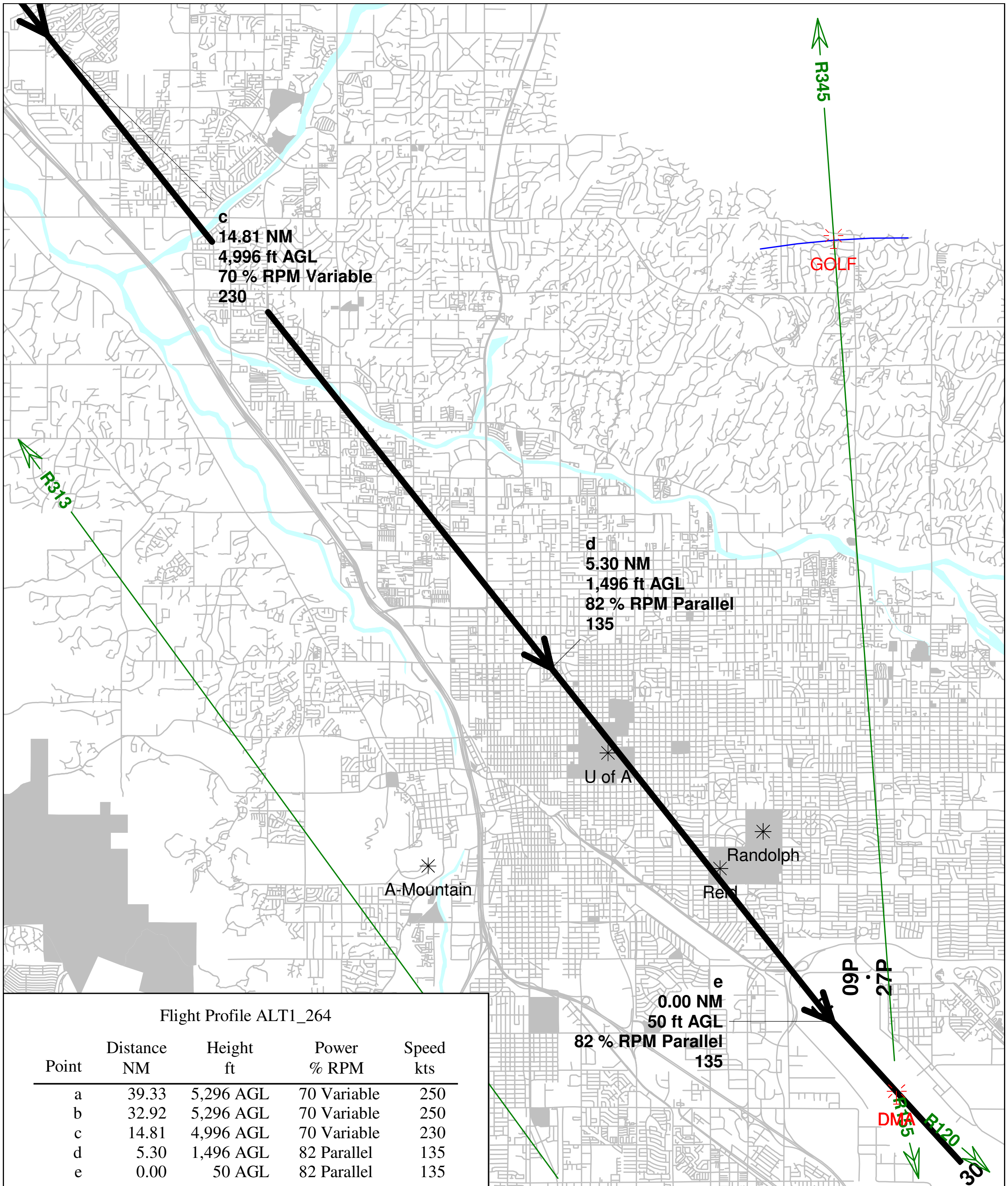
DoD AV-8B Overhead Break Arrival

Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient AV-8B Engine: F402-RR-408

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,500 (1 inch = 7,130 feet)

N




Flight Profile ALT1_264

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 39.33 | 5,296 AGL | 70 Variable | 250 |
| b | 32.92 | 5,296 AGL | 70 Variable | 250 |
| c | 14.81 | 4,996 AGL | 70 Variable | 230 |
| d | 5.30 | 1,496 AGL | 82 Parallel | 135 |
| e | 0.00 | 50 AGL | 82 Parallel | 135 |

**Flight Profile ALT1_264**

DoD AV-8B Straight-in Arrival

Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient AV-8B Engine: F402-RR-408

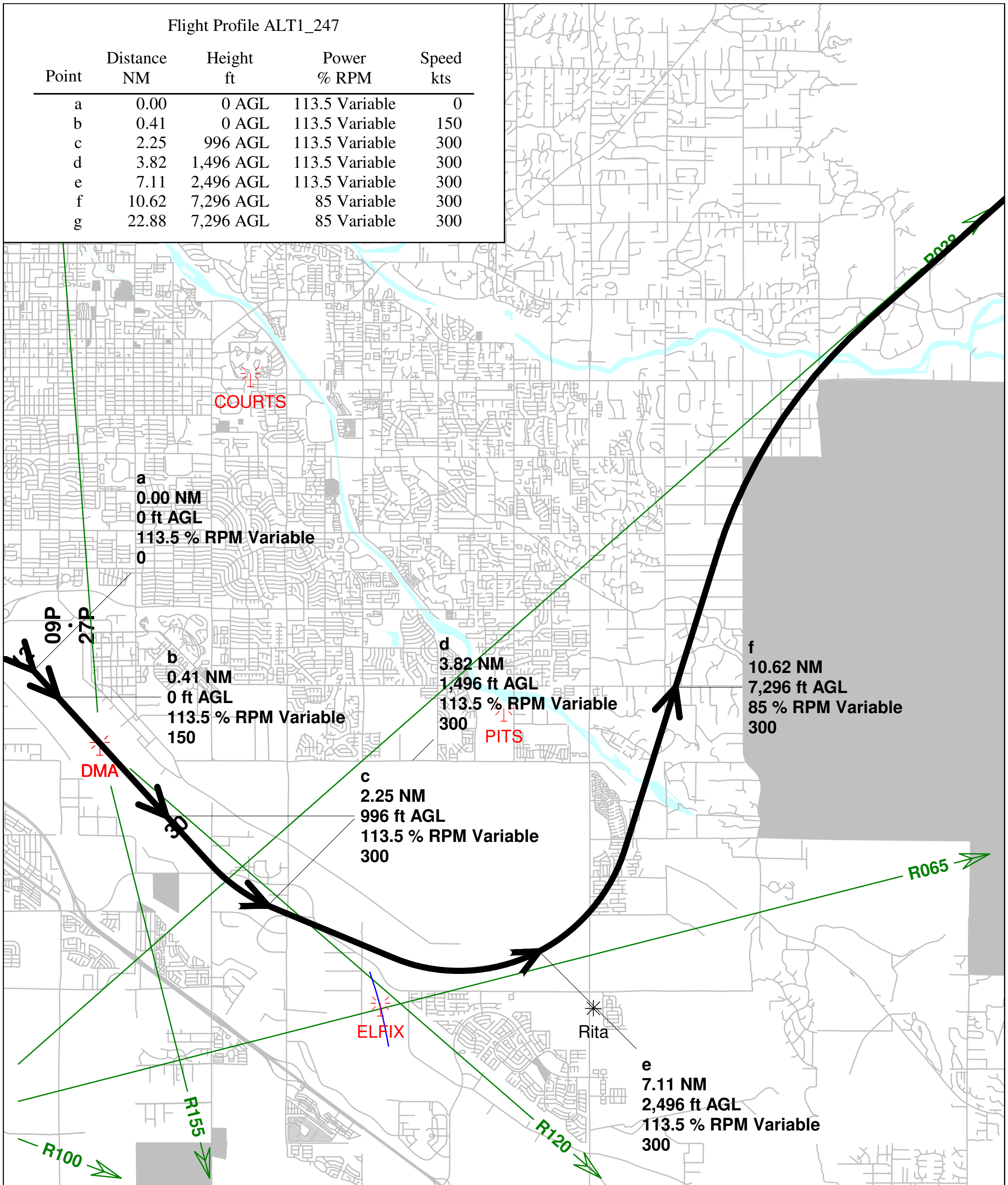
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

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

N

Flight Profile ALT1_247

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 113.5 Variable | 0 |
| b | 0.41 | 0 AGL | 113.5 Variable | 150 |
| c | 2.25 | 996 AGL | 113.5 Variable | 300 |
| d | 3.82 | 1,496 AGL | 113.5 Variable | 300 |
| e | 7.11 | 2,496 AGL | 113.5 Variable | 300 |
| f | 10.62 | 7,296 AGL | 85 Variable | 300 |
| g | 22.88 | 7,296 AGL | 85 Variable | 300 |




**Flight Profile ALT1_247**

DoD AV-8B Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient AV-8B Engine: F402-RR-408

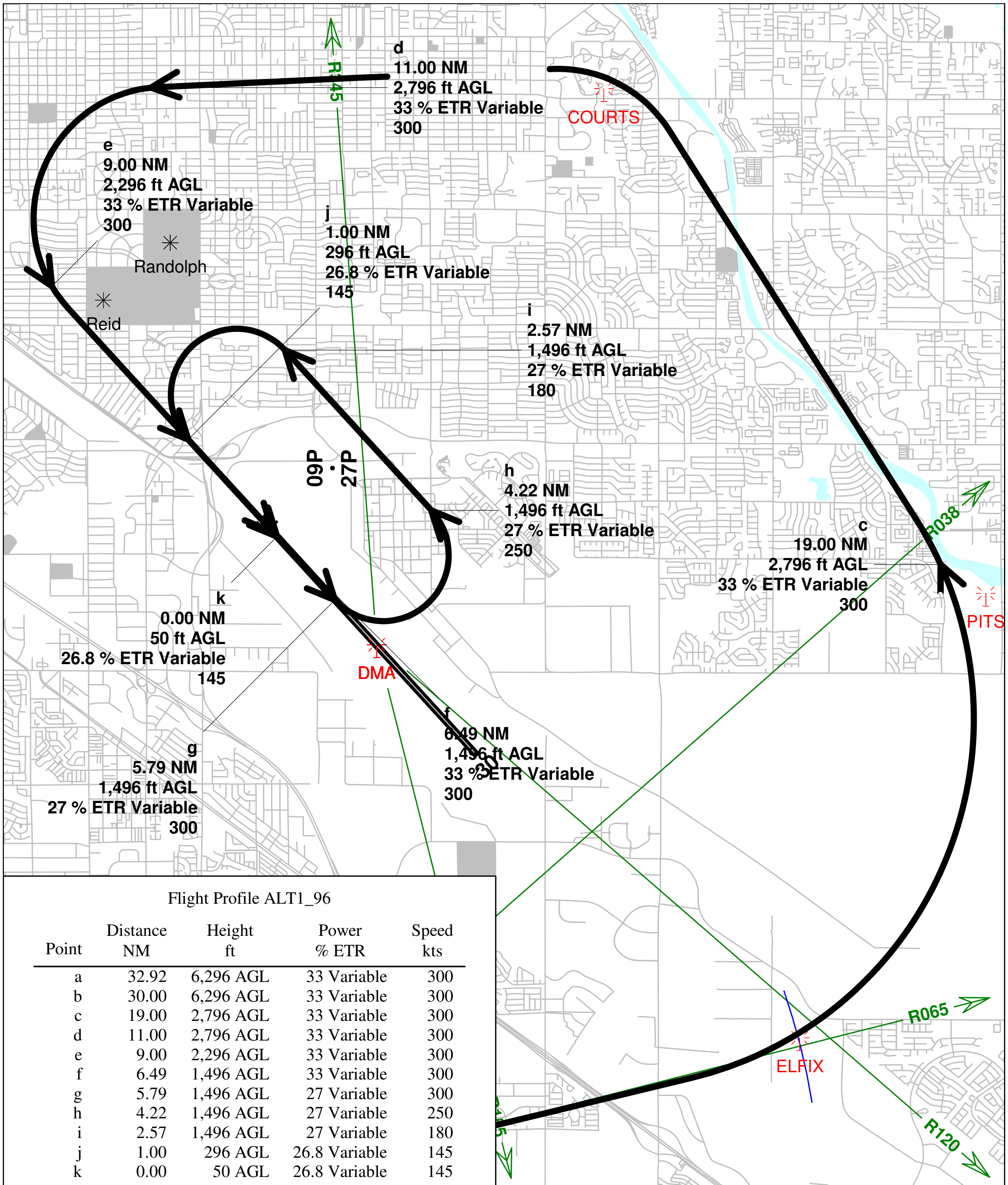

Scale in Feet 1:129,000 (1 inch = 10,700 feet)

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.6 - F-22 Flight Profile Maps

11:52 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_96

| Point | Distance NM | Height ft | Power % ETR | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 33 Variable | 300 |
| b | 30.00 | 6,296 AGL | 33 Variable | 300 |
| c | 19.00 | 2,796 AGL | 33 Variable | 300 |
| d | 11.00 | 2,796 AGL | 33 Variable | 300 |
| e | 9.00 | 2,296 AGL | 33 Variable | 300 |
| f | 6.49 | 1,496 AGL | 33 Variable | 300 |
| g | 5.79 | 1,496 AGL | 27 Variable | 300 |
| h | 4.22 | 1,496 AGL | 27 Variable | 250 |
| i | 2.57 | 1,496 AGL | 27 Variable | 180 |
| j | 1.00 | 296 AGL | 26.8 Variable | 145 |
| k | 0.00 | 50 AGL | 26.8 Variable | 145 |

**Flight Profile ALT1_96**

ANG F-22 Overhead Break Arrival

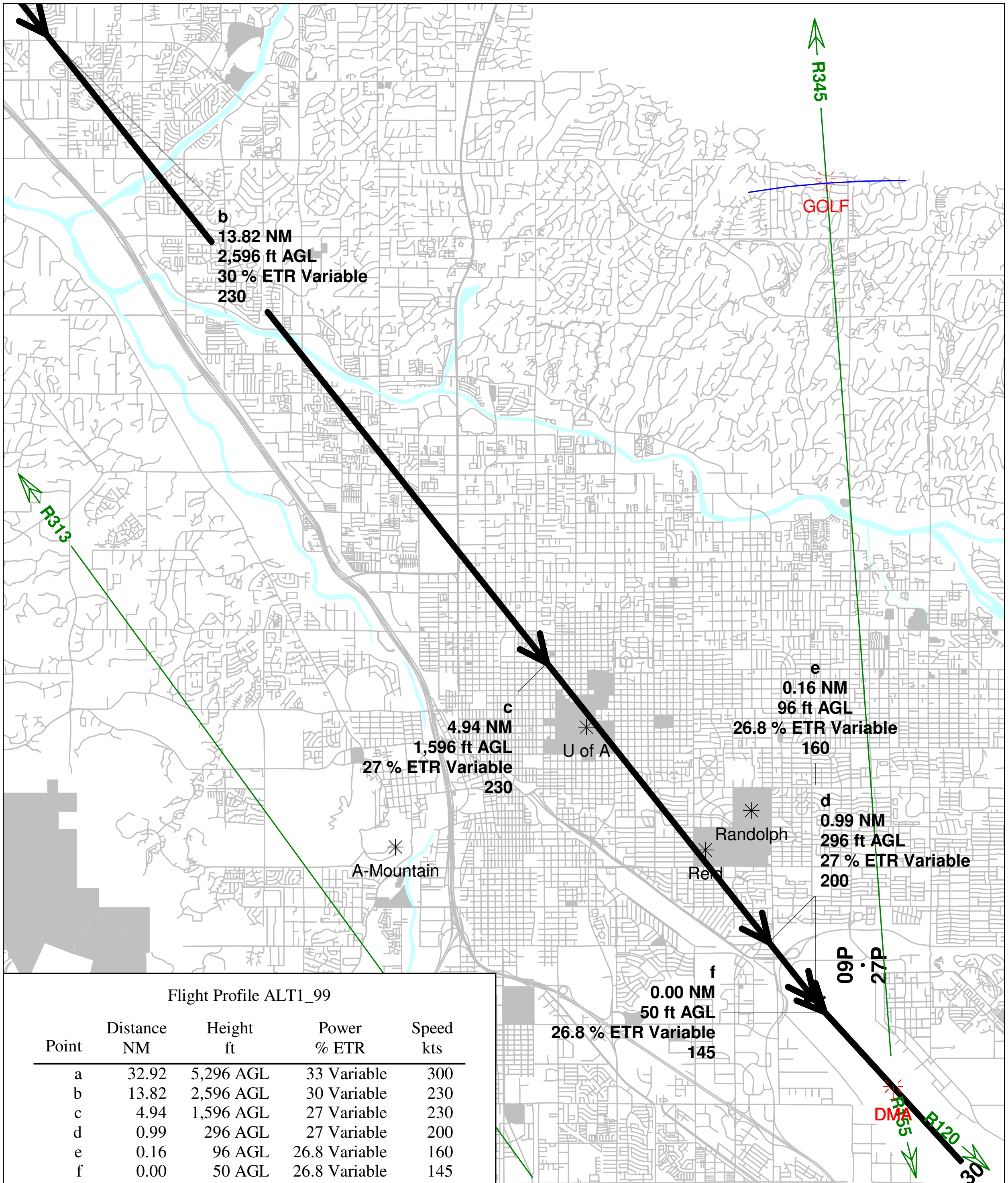
Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

F-22 Engine: F119-PW-100

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,500 (1 inch = 7,130 feet)

N




Flight Profile ALT1_99

| Point | Distance NM | Height ft | Power % ETR | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 33 Variable | 300 |
| b | 13.82 | 2,596 AGL | 30 Variable | 230 |
| c | 4.94 | 1,596 AGL | 27 Variable | 230 |
| d | 0.99 | 296 AGL | 27 Variable | 200 |
| e | 0.16 | 96 AGL | 26.8 Variable | 160 |
| f | 0.00 | 50 AGL | 26.8 Variable | 145 |

**Flight Profile ALT1_99**

ANG F-22 Straight-in Arrival

Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient F-22 Engine: F119-PW-100

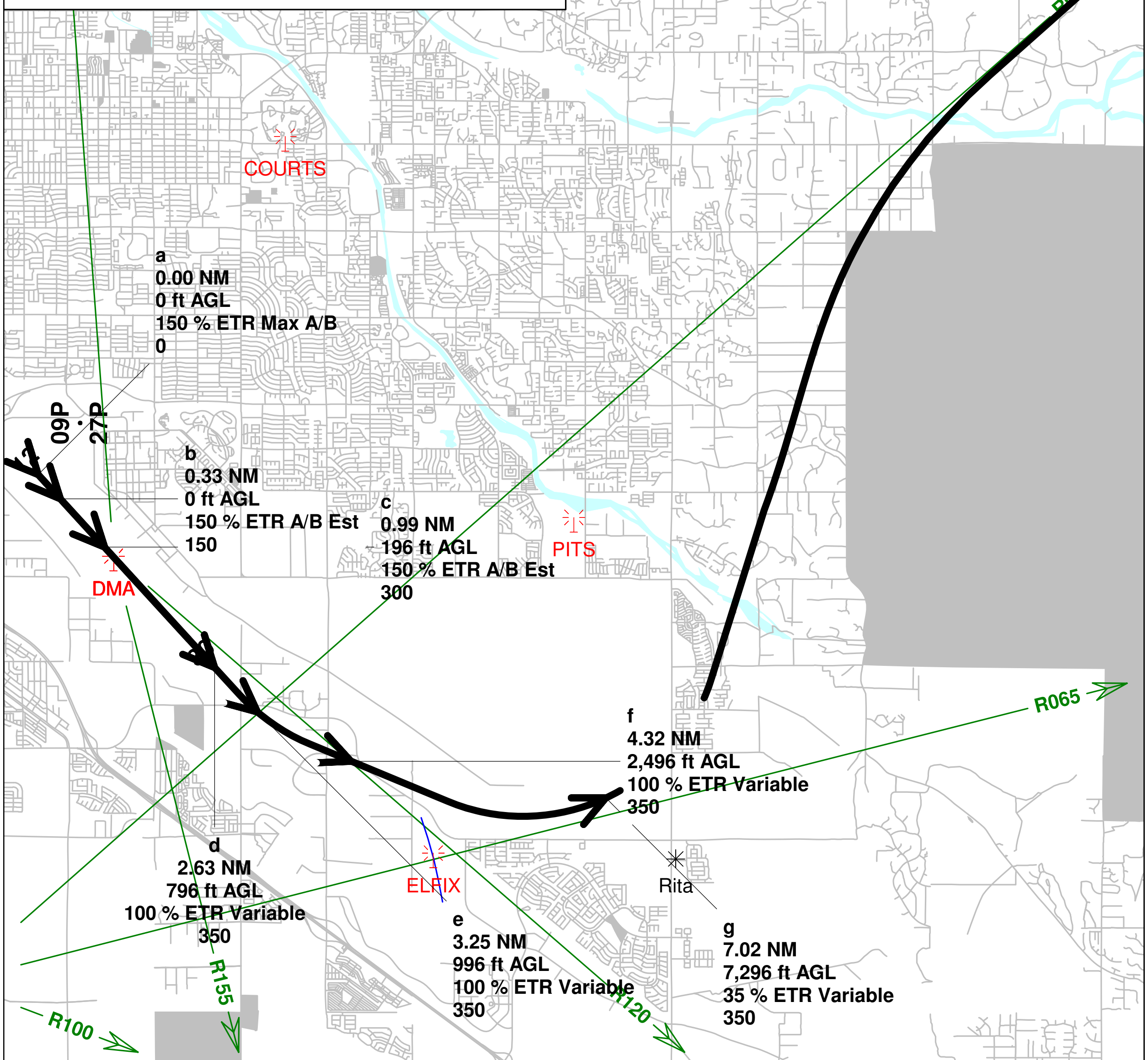
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:125,000 (1 inch = 10,400 feet)

N

Flight Profile ALT1_67

| Point | Distance NM | Height ft | Power % ETR | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 150 Max A/B | 0 |
| b | 0.33 | 0 AGL | 150 A/B Est | 150 |
| c | 0.99 | 196 AGL | 150 A/B Est | 300 |
| d | 2.63 | 796 AGL | 100 Variable | 350 |
| e | 3.25 | 996 AGL | 100 Variable | 350 |
| f | 4.32 | 2,496 AGL | 100 Variable | 350 |
| g | 7.02 | 7,296 AGL | 35 Variable | 350 |
| h | 22.88 | 7,296 AGL | 35 Variable | 350 |

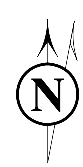



**Flight Profile ALT1_67**

ANG F-22 Afterburn Takeoff

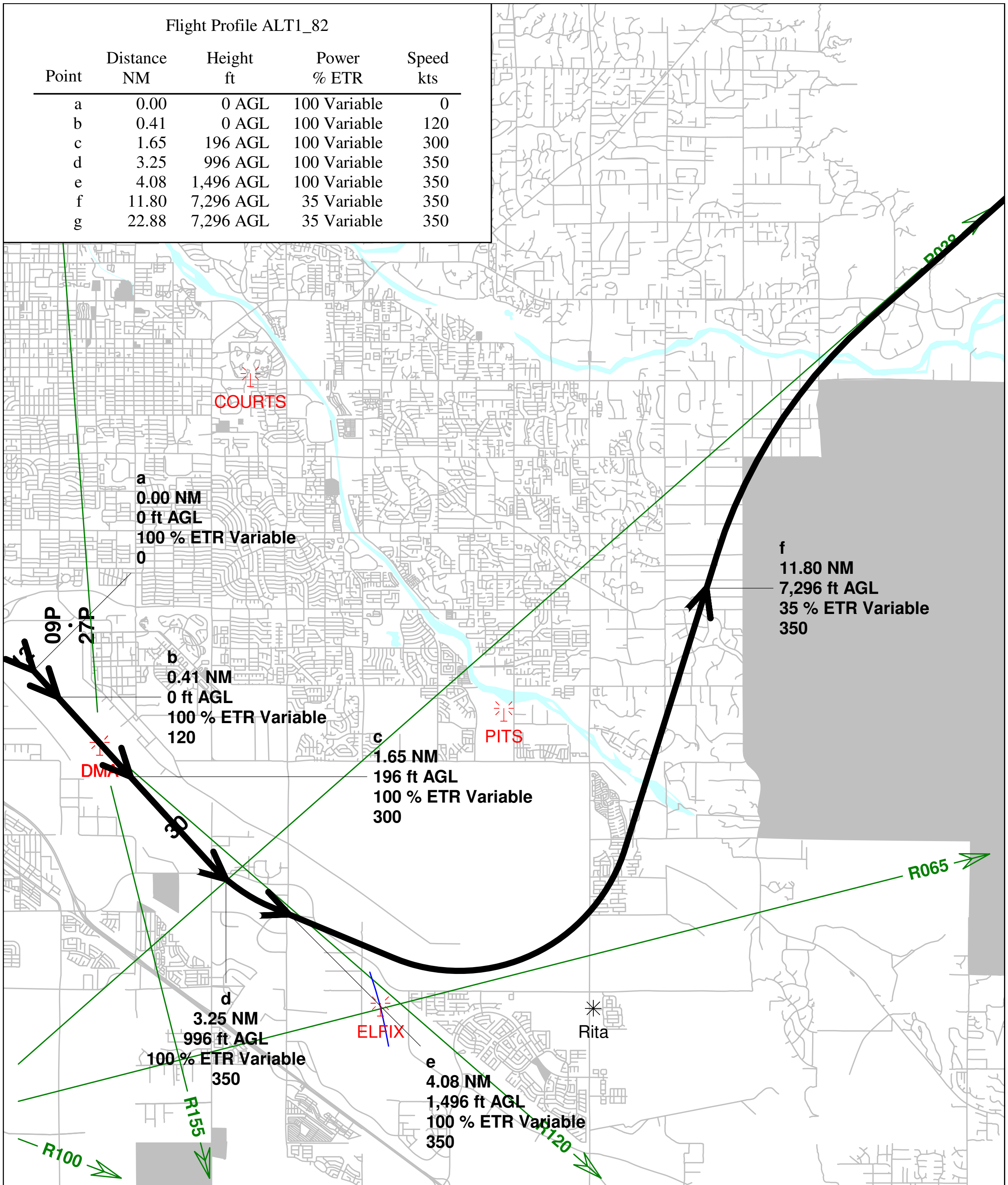
Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-22 Engine: F119-PW-100


Scale in Feet 1:129,000 (1 inch = 10,700 feet)



Flight Profile ALT1_82

| Point | Distance NM | Height ft | Power % ETR | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 100 Variable | 0 |
| b | 0.41 | 0 AGL | 100 Variable | 120 |
| c | 1.65 | 196 AGL | 100 Variable | 300 |
| d | 3.25 | 996 AGL | 100 Variable | 350 |
| e | 4.08 | 1,496 AGL | 100 Variable | 350 |
| f | 11.80 | 7,296 AGL | 35 Variable | 350 |
| g | 22.88 | 7,296 AGL | 35 Variable | 350 |




**Flight Profile ALT1_82**

ANG F-22 Mil Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-22 Engine: F119-PW-100

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 1:129,000 (1 inch = 10,700 feet)

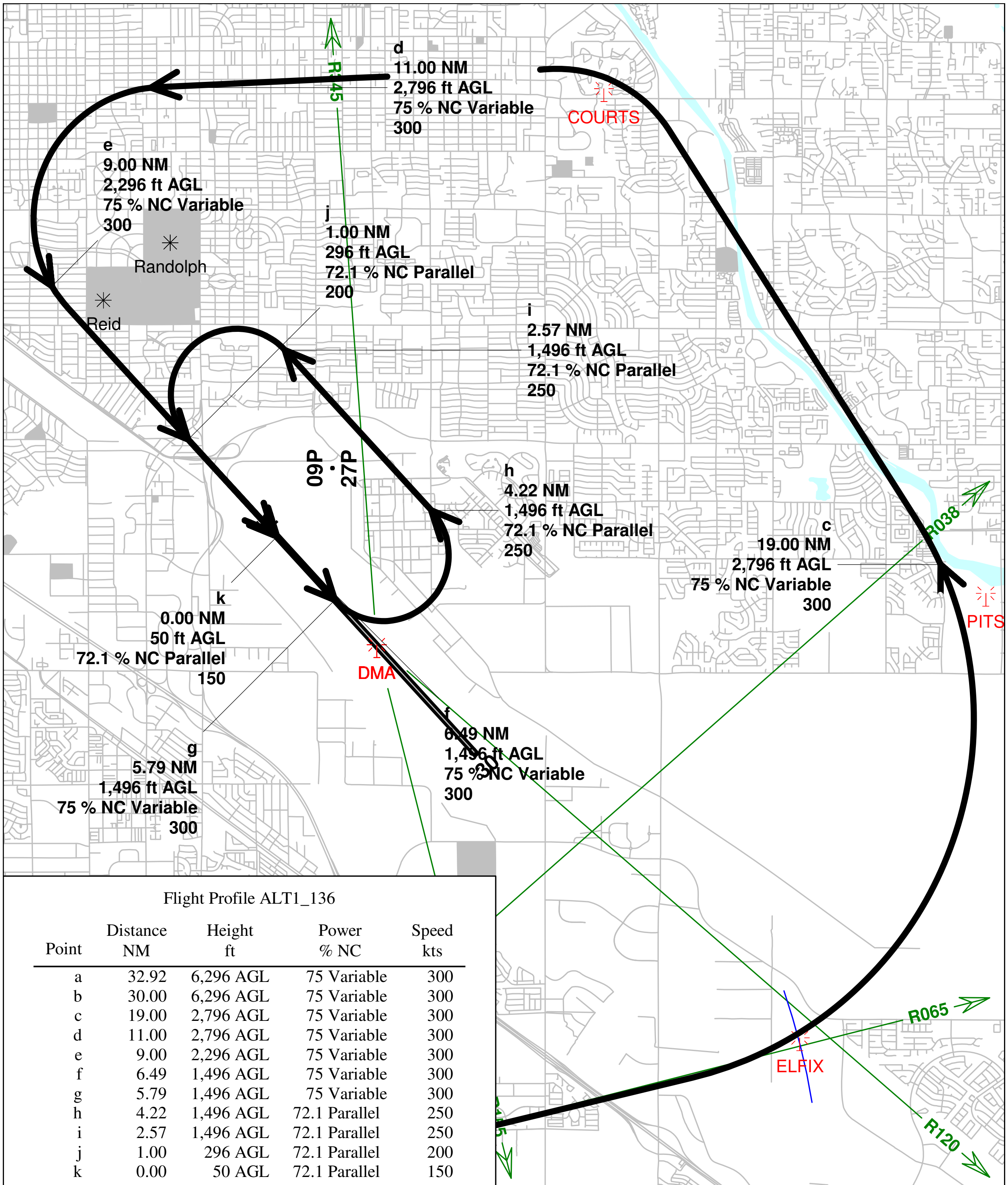
N

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.7 - F-15A Flight Profile Maps

11:52 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_136

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 75 Variable | 300 |
| b | 30.00 | 6,296 AGL | 75 Variable | 300 |
| c | 19.00 | 2,796 AGL | 75 Variable | 300 |
| d | 11.00 | 2,796 AGL | 75 Variable | 300 |
| e | 9.00 | 2,296 AGL | 75 Variable | 300 |
| f | 6.49 | 1,496 AGL | 75 Variable | 300 |
| g | 5.79 | 1,496 AGL | 75 Variable | 300 |
| h | 4.22 | 1,496 AGL | 72.1 Parallel | 250 |
| i | 2.57 | 1,496 AGL | 72.1 Parallel | 250 |
| j | 1.00 | 296 AGL | 72.1 Parallel | 200 |
| k | 0.00 | 50 AGL | 72.1 Parallel | 150 |

**Flight Profile ALT1_136**

ANG F-15A Overhead Break Arrival

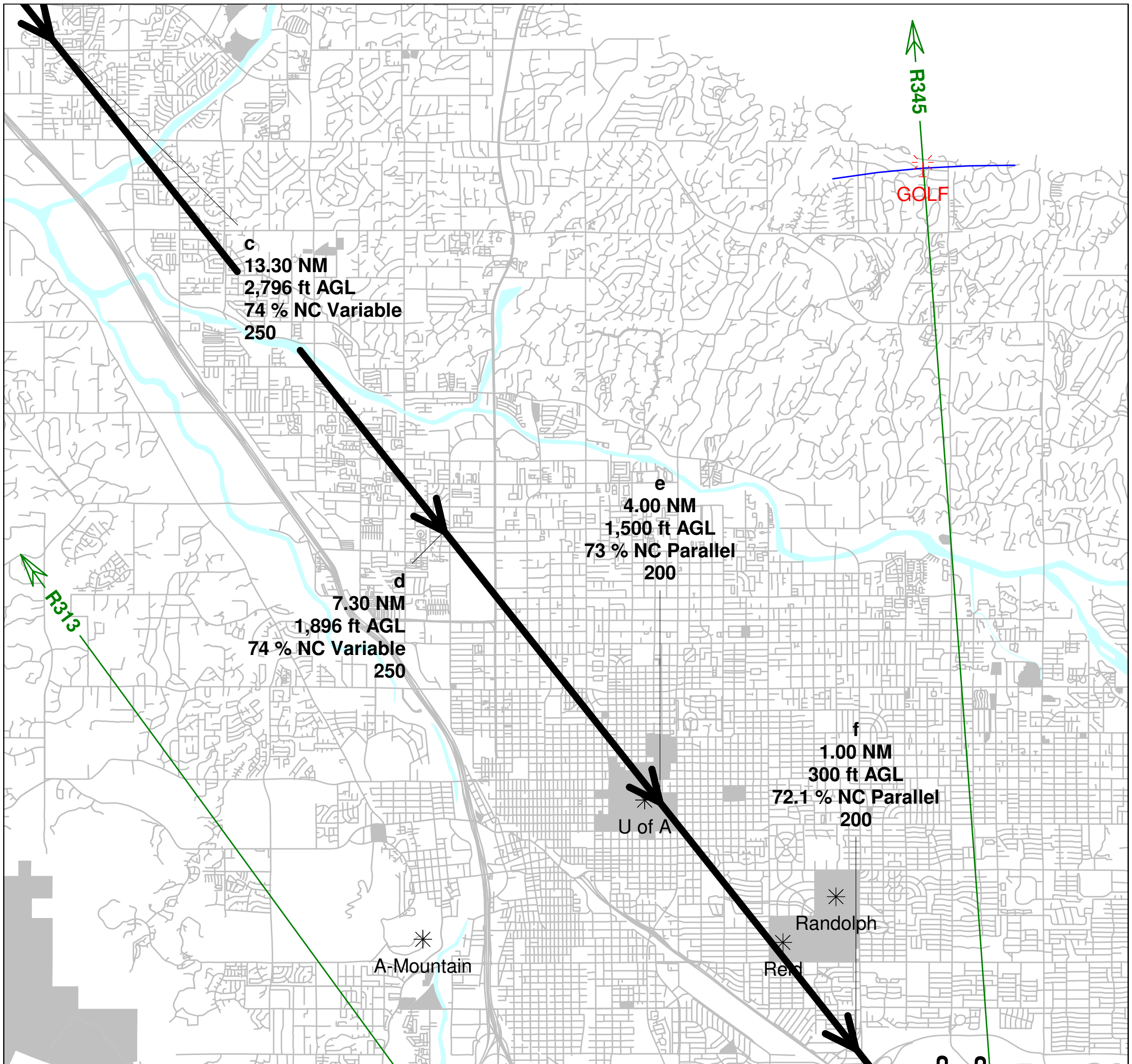
Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

F-15A Engine: F100-PW-100

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,500 (1 inch = 7,130 feet)

N




Flight Profile ALT1_139

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 74 Variable | 250 |
| b | 24.00 | 5,296 AGL | 74 Variable | 250 |
| c | 13.30 | 2,796 AGL | 74 Variable | 250 |
| d | 7.30 | 1,896 AGL | 74 Variable | 250 |
| e | 4.00 | 1,500 AGL | 73 Parallel | 200 |
| f | 1.00 | 300 AGL | 72.1 Parallel | 200 |
| g | 0.00 | 50 AGL | 72.1 Parallel | 150 |

**Flight Profile ALT1_139**

ANG F-15A Straight-in Arrival

Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient F-15A Engine: F100-PW-100

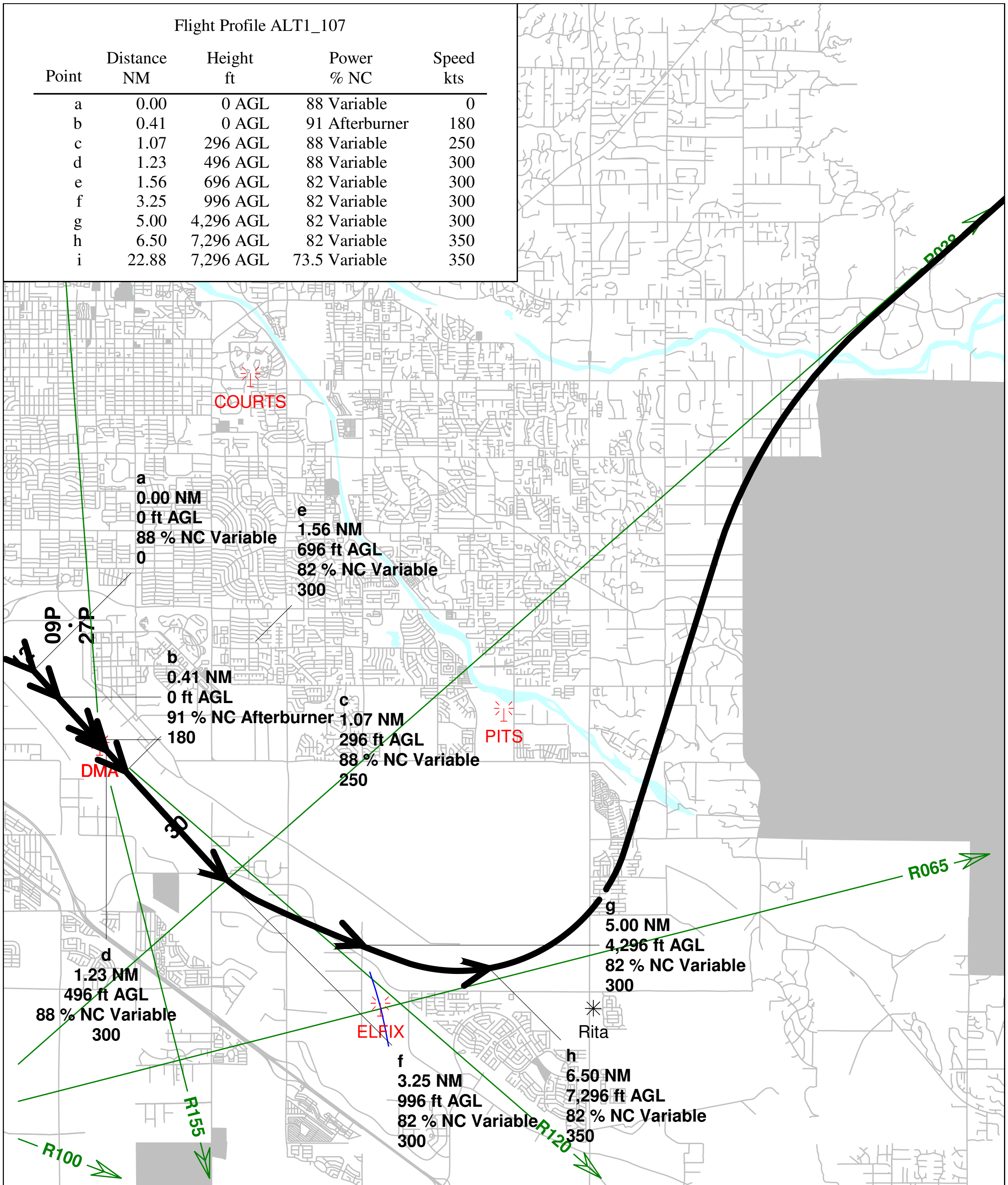
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:121,000 (1 inch = 10,000 feet)

N

Flight Profile ALT1_107

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 88 Variable | 0 |
| b | 0.41 | 0 AGL | 91 Afterburner | 180 |
| c | 1.07 | 296 AGL | 88 Variable | 250 |
| d | 1.23 | 496 AGL | 88 Variable | 300 |
| e | 1.56 | 696 AGL | 82 Variable | 300 |
| f | 3.25 | 996 AGL | 82 Variable | 300 |
| g | 5.00 | 4,296 AGL | 82 Variable | 300 |
| h | 6.50 | 7,296 AGL | 82 Variable | 350 |
| i | 22.88 | 7,296 AGL | 73.5 Variable | 350 |




**Flight Profile ALT1_107**

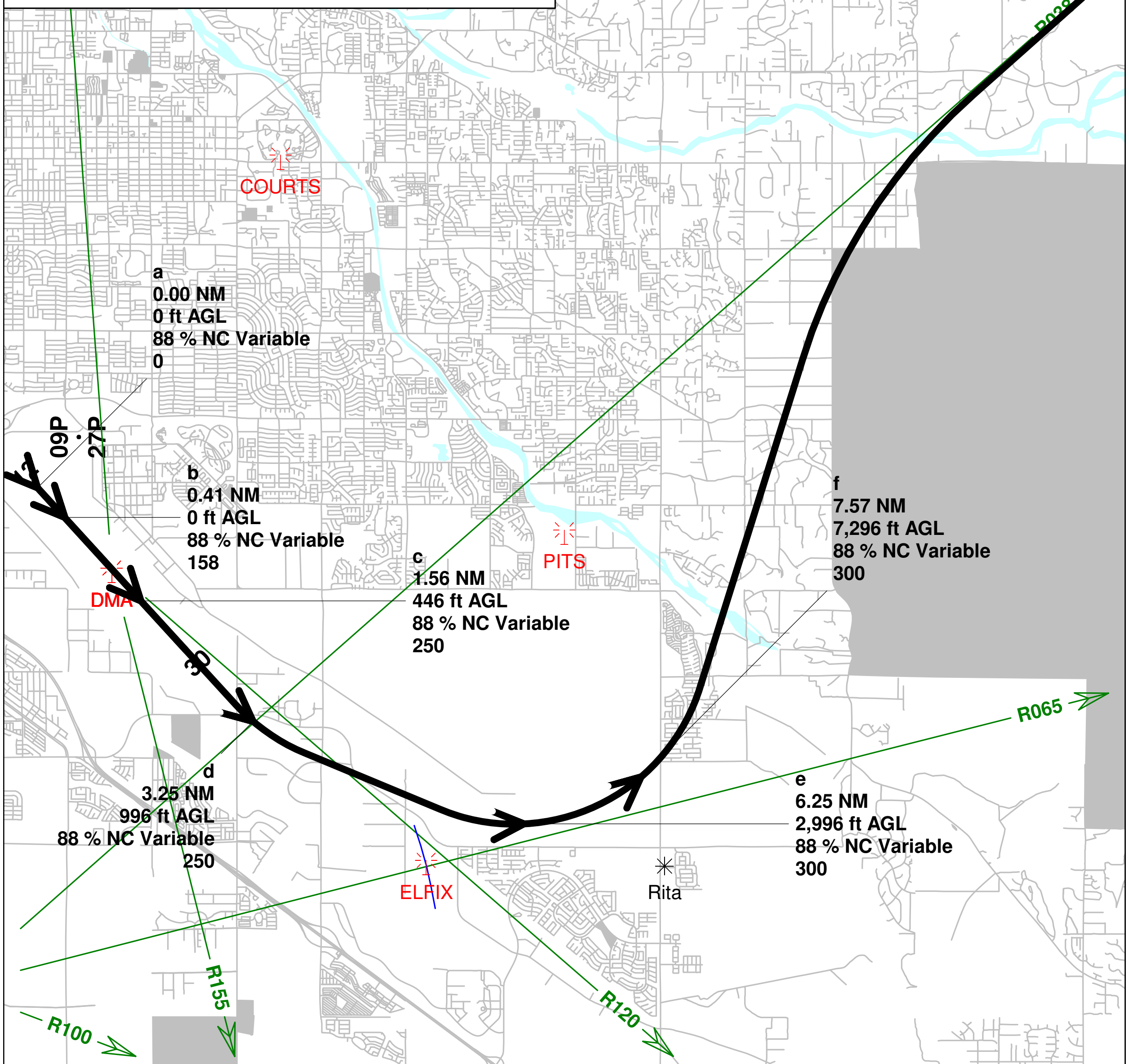
ANG F-15A Afterburn Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-15A Engine: F100-PW-100


Scale in Feet 1:129,000 (1 inch = 10,700 feet)

Flight Profile ALT1_122

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 88 Variable | 0 |
| b | 0.41 | 0 AGL | 88 Variable | 158 |
| c | 1.56 | 446 AGL | 88 Variable | 250 |
| d | 3.25 | 996 AGL | 88 Variable | 250 |
| e | 6.25 | 2,996 AGL | 88 Variable | 300 |
| f | 7.57 | 7,296 AGL | 88 Variable | 300 |
| g | 22.88 | 7,296 AGL | 73.5 Variable | 300 |




**Flight Profile ALT1_122**

ANG F-15A Mil Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-15A Engine: F100-PW-100

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 1:129,000 (1 inch = 10,700 feet)

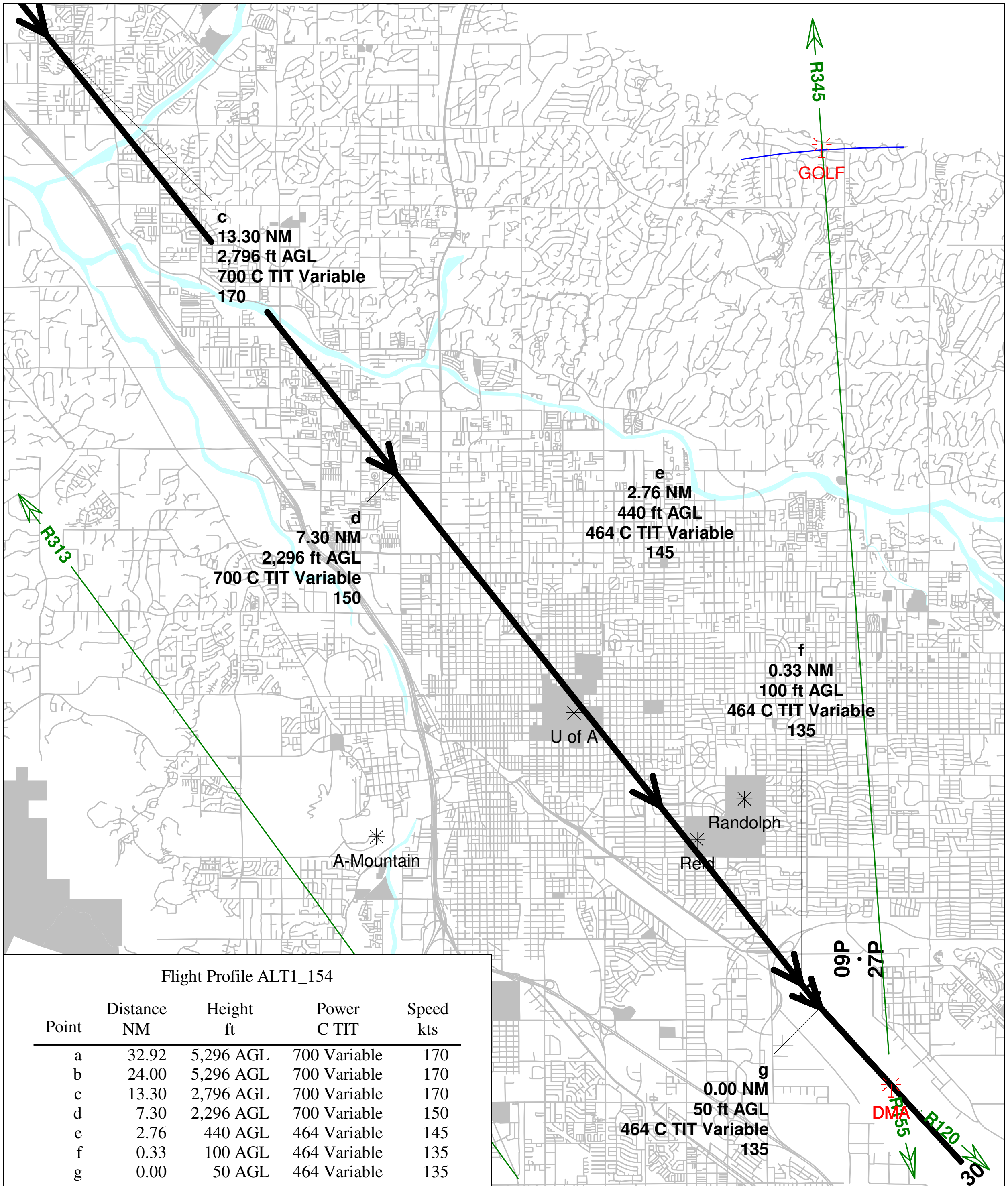
N

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.8 - C130H&N&P Flight Profile Maps

11:52 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_154

| Point | Distance NM | Height ft | Power C TIT | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 700 Variable | 170 |
| b | 24.00 | 5,296 AGL | 700 Variable | 170 |
| c | 13.30 | 2,796 AGL | 700 Variable | 170 |
| d | 7.30 | 2,296 AGL | 700 Variable | 150 |
| e | 2.76 | 440 AGL | 464 Variable | 145 |
| f | 0.33 | 100 AGL | 464 Variable | 135 |
| g | 0.00 | 50 AGL | 464 Variable | 135 |

**Flight Profile ALT1_154**

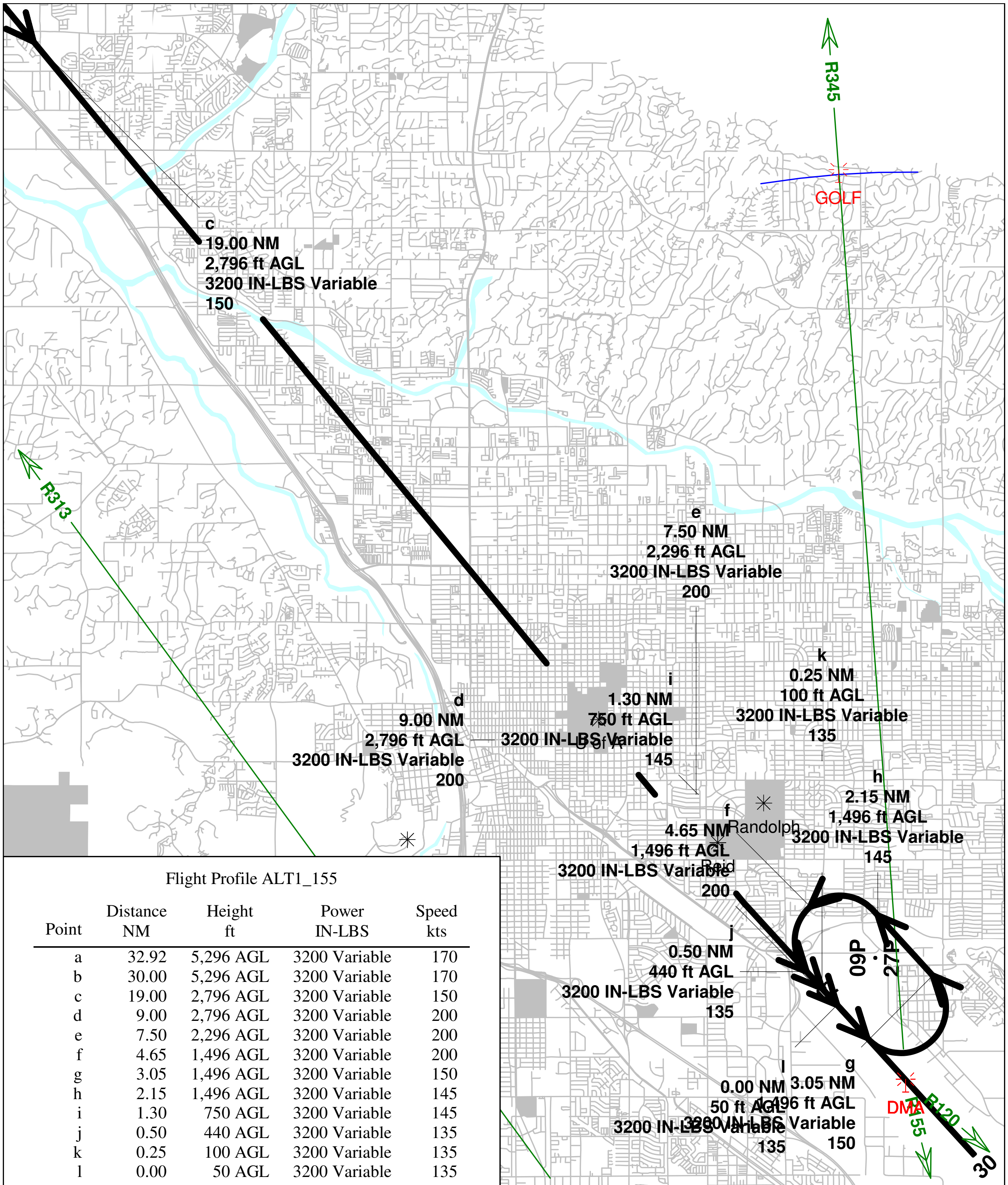
ANG C-130H&N&P Straight-in Arrival

Flight Track: 12A03A_1 - TACAN/Straight-in Aircraft: Transient C-130H&N&P Engine: T56-A-15

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

Scale in Feet 1:121,000 (1 inch = 10,000 feet)

N




Flight Profile ALT1_155

| Point | Distance NM | Height ft | Power IN-LBS | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 3200 Variable | 170 |
| b | 30.00 | 5,296 AGL | 3200 Variable | 170 |
| c | 19.00 | 2,796 AGL | 3200 Variable | 150 |
| d | 9.00 | 2,796 AGL | 3200 Variable | 200 |
| e | 7.50 | 2,296 AGL | 3200 Variable | 200 |
| f | 4.65 | 1,496 AGL | 3200 Variable | 200 |
| g | 3.05 | 1,496 AGL | 3200 Variable | 150 |
| h | 2.15 | 1,496 AGL | 3200 Variable | 145 |
| i | 1.30 | 750 AGL | 3200 Variable | 145 |
| j | 0.50 | 440 AGL | 3200 Variable | 135 |
| k | 0.25 | 100 AGL | 3200 Variable | 135 |
| l | 0.00 | 50 AGL | 3200 Variable | 135 |

**Flight Profile ALT1_155**

ANG C-130H&N&P Overhead Break Arrival

Flight Track: 12A03B - Straight-in to Overhead (Cargo) Aircraft: Transient

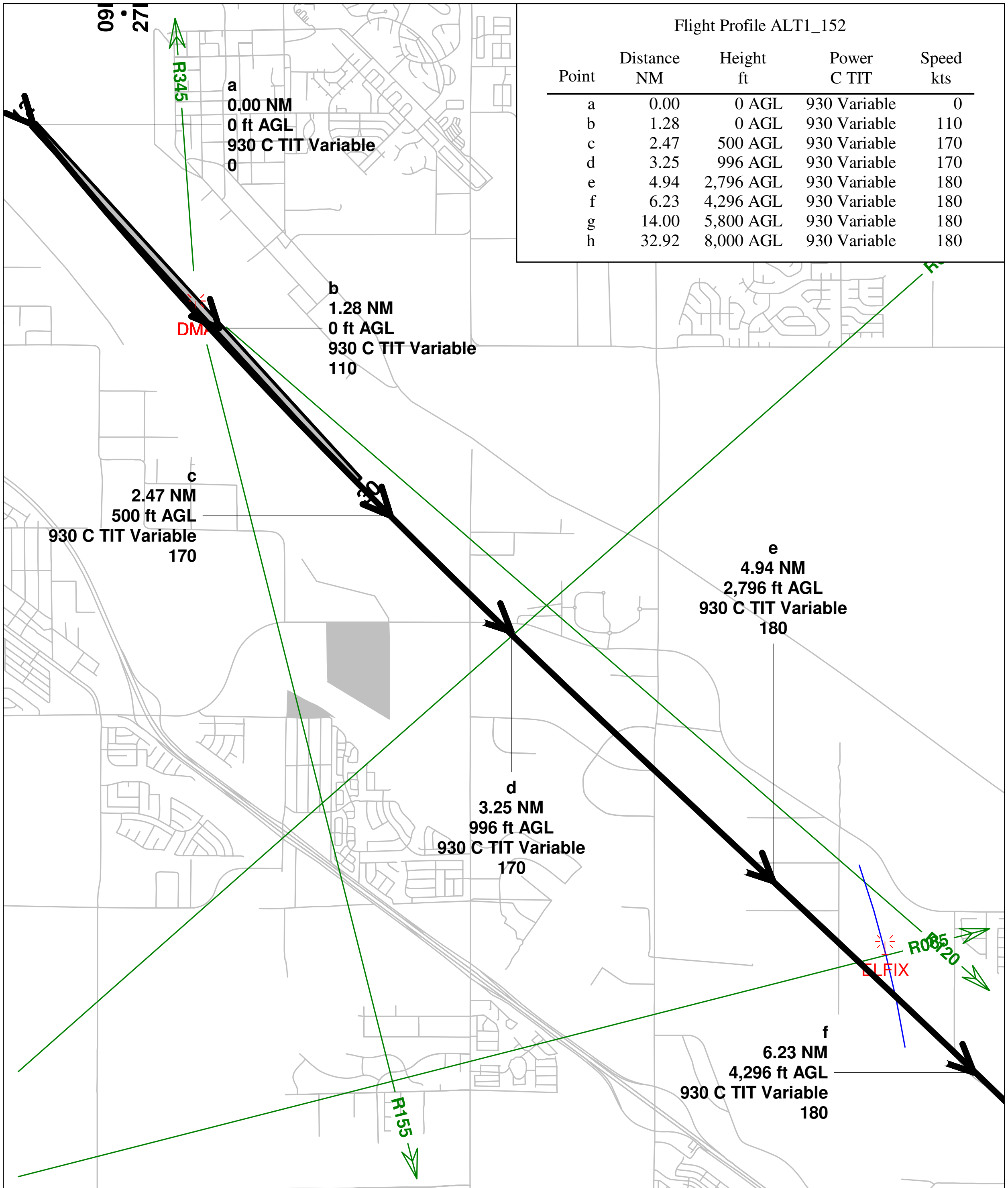
C-130H&N&P Engine: T56-A-15

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

Scale in Feet 1:124,000 (1 inch = 10,400 feet)

Flight Profile ALT1_152

| Point | Distance NM | Height ft | Power C TIT | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 930 Variable | 0 |
| b | 1.28 | 0 AGL | 930 Variable | 110 |
| c | 2.47 | 500 AGL | 930 Variable | 170 |
| d | 3.25 | 996 AGL | 930 Variable | 170 |
| e | 4.94 | 2,796 AGL | 930 Variable | 180 |
| f | 6.23 | 4,296 AGL | 930 Variable | 180 |
| g | 14.00 | 5,800 AGL | 930 Variable | 180 |
| h | 32.92 | 8,000 AGL | 930 Variable | 180 |




**Flight Profile ALT1_152**

ANG C-130H&N&P Takeoff

Flight Track: 12D01 - Davis Monthan Four Departure Aircraft: Transient C-130H&N&P

Engine: T56-A-15

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000

Scale in Feet 1:52,500 (1 inch = 4,380 feet)

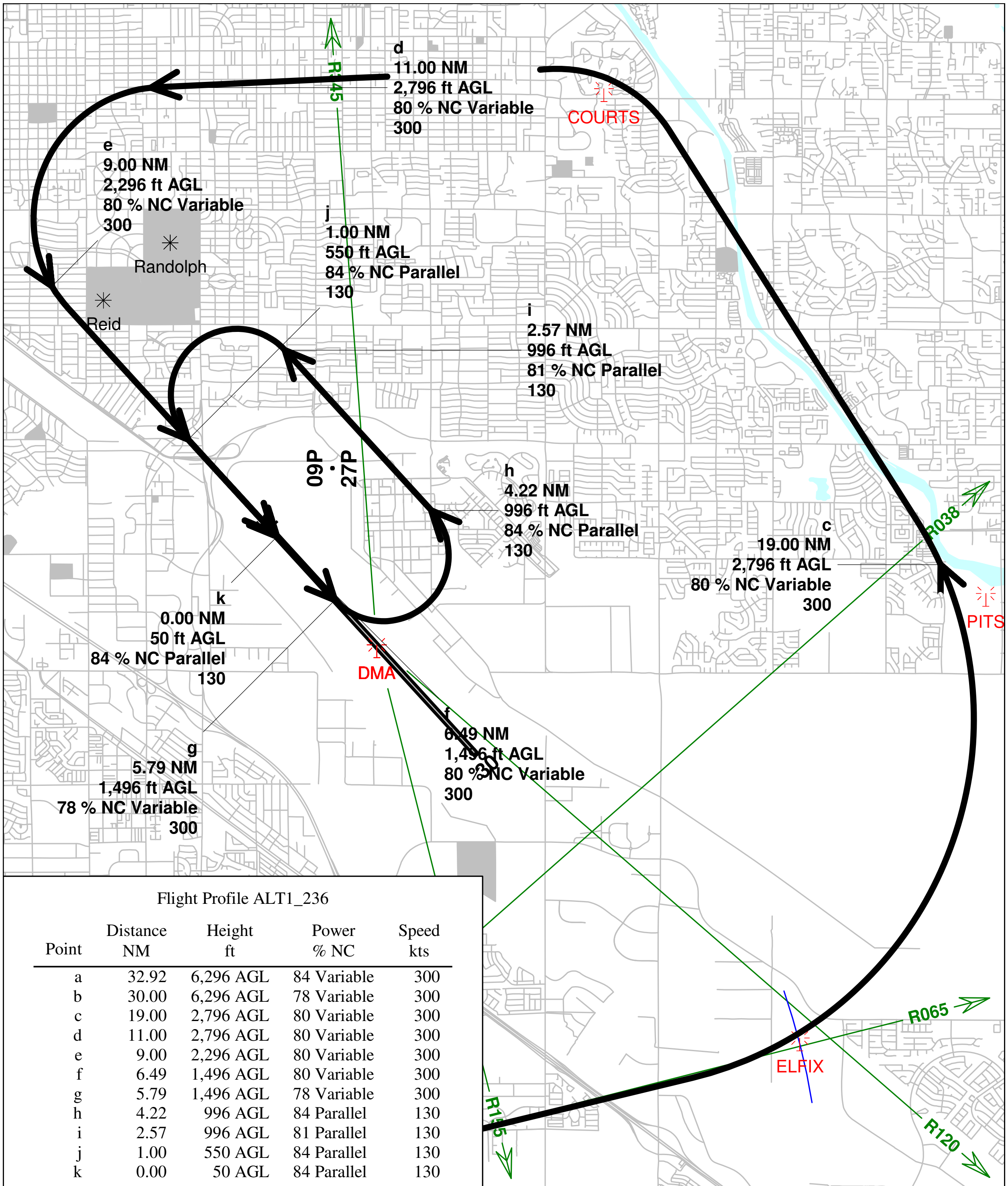
N

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.9 - F/A-18E/F Flight Profile Maps

11:53 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_236

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 84 Variable | 300 |
| b | 30.00 | 6,296 AGL | 78 Variable | 300 |
| c | 19.00 | 2,796 AGL | 80 Variable | 300 |
| d | 11.00 | 2,796 AGL | 80 Variable | 300 |
| e | 9.00 | 2,296 AGL | 80 Variable | 300 |
| f | 6.49 | 1,496 AGL | 80 Variable | 300 |
| g | 5.79 | 1,496 AGL | 78 Variable | 300 |
| h | 4.22 | 996 AGL | 84 Parallel | 130 |
| i | 2.57 | 996 AGL | 81 Parallel | 130 |
| j | 1.00 | 550 AGL | 84 Parallel | 130 |
| k | 0.00 | 50 AGL | 84 Parallel | 130 |

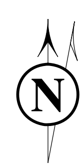
**Flight Profile ALT1_236**

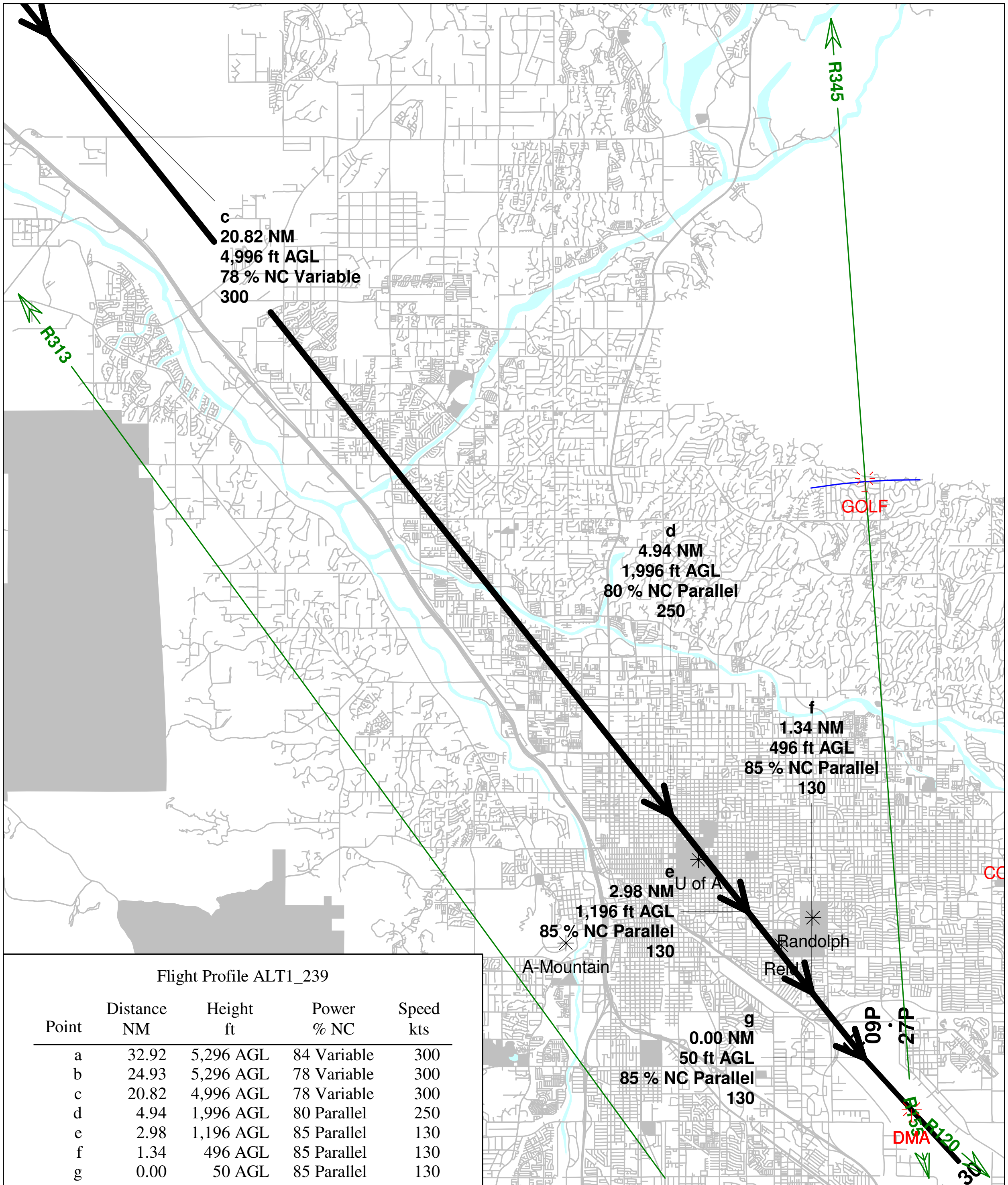
DoD F-18EF Overhead Break Arrival

Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

F-18E/F Engine: F414-GE-400


Scale in Feet 1:85,500 (1 inch = 7,130 feet)






Flight Profile ALT1_239

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 84 Variable | 300 |
| b | 24.93 | 5,296 AGL | 78 Variable | 300 |
| c | 20.82 | 4,996 AGL | 78 Variable | 300 |
| d | 4.94 | 1,996 AGL | 80 Parallel | 250 |
| e | 2.98 | 1,196 AGL | 85 Parallel | 130 |
| f | 1.34 | 496 AGL | 85 Parallel | 130 |
| g | 0.00 | 50 AGL | 85 Parallel | 130 |

**Flight Profile ALT1_239**

DoD F-18EF Straight-in Arrival

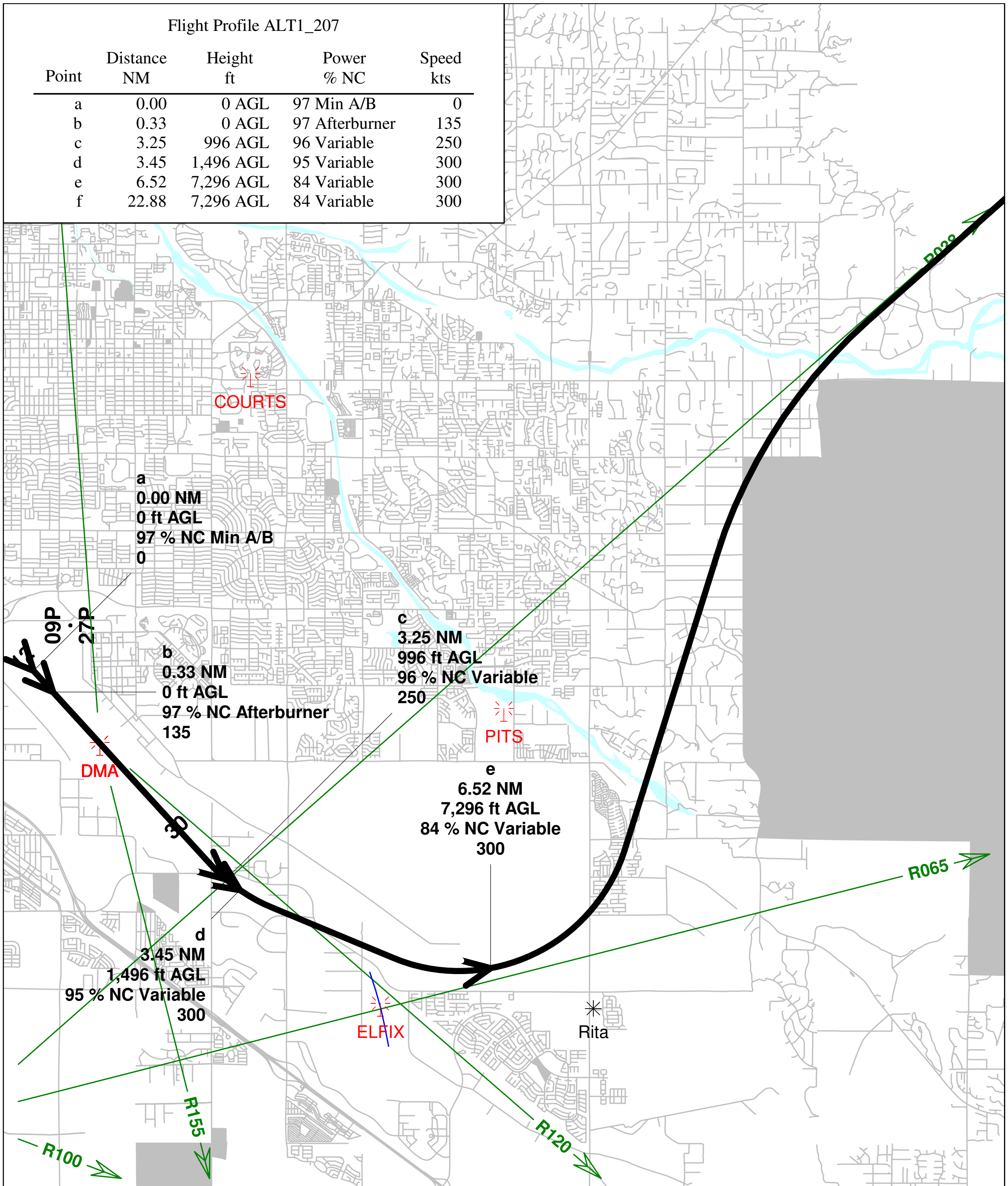
Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient F-18E/F Engine: F414-GE-400

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

Scale in Feet 1:179,000 (1 inch = 15,000 feet)

Flight Profile ALT1_207

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 97 Min A/B | 0 |
| b | 0.33 | 0 AGL | 97 Afterburner | 135 |
| c | 3.25 | 996 AGL | 96 Variable | 250 |
| d | 3.45 | 1,496 AGL | 95 Variable | 300 |
| e | 6.52 | 7,296 AGL | 84 Variable | 300 |
| f | 22.88 | 7,296 AGL | 84 Variable | 300 |




**Flight Profile ALT1_207**

DoD F-18EF Afterburn Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-18E/F Engine: F414-GE-400

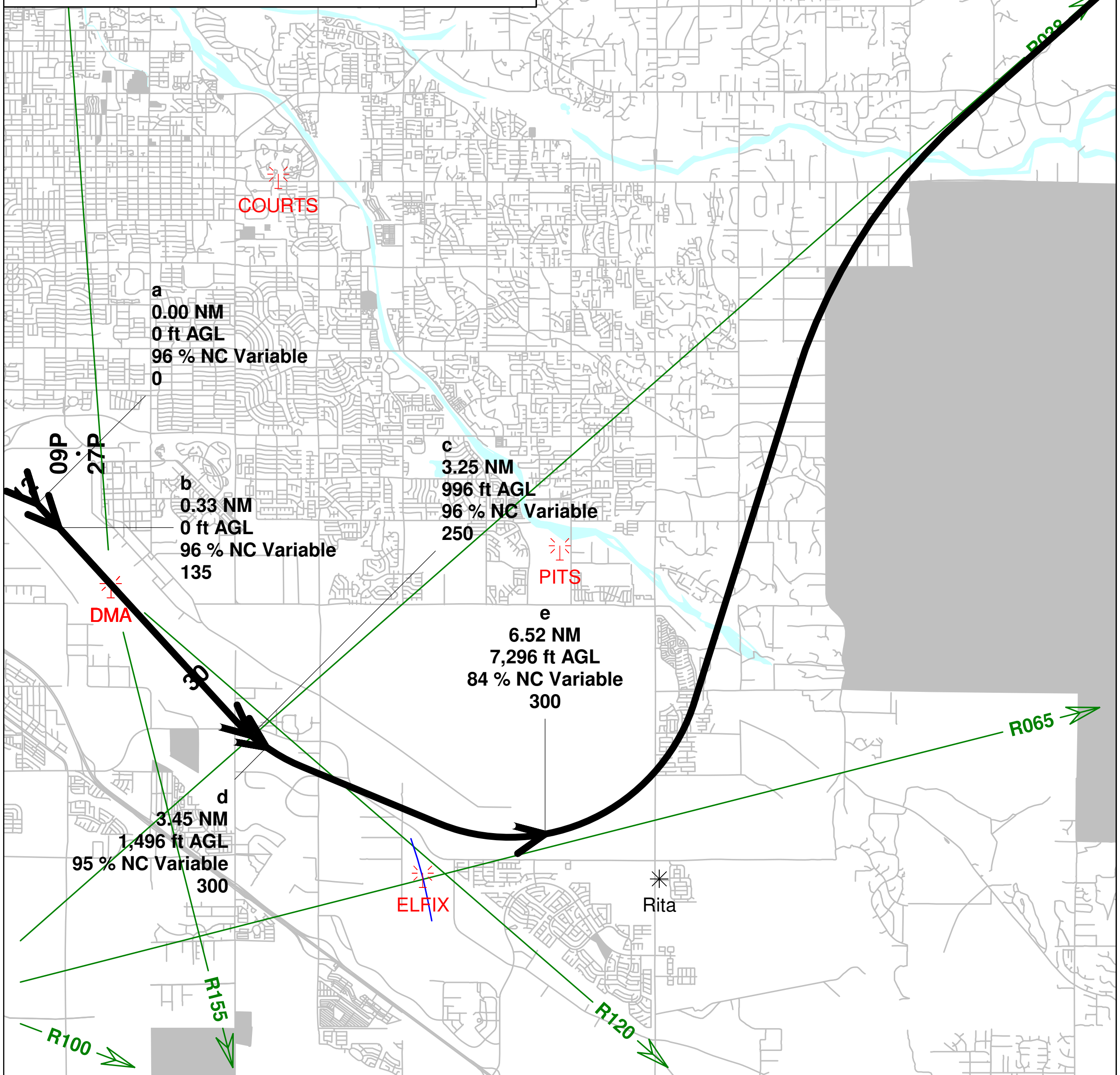
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:129,000 (1 inch = 10,700 feet)

N

Flight Profile ALT1_222

| Point | Distance NM | Height ft | Power % NC | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 96 Variable | 0 |
| b | 0.33 | 0 AGL | 96 Variable | 135 |
| c | 3.25 | 996 AGL | 96 Variable | 250 |
| d | 3.45 | 1,496 AGL | 95 Variable | 300 |
| e | 6.52 | 7,296 AGL | 84 Variable | 300 |
| f | 22.88 | 7,296 AGL | 84 Variable | 300 |




**Flight Profile ALT1_222**

DoD F-18EF Mil Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient F-18E/F Engine: F414-GE-400

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 1:129,000 (1 inch = 10,700 feet)

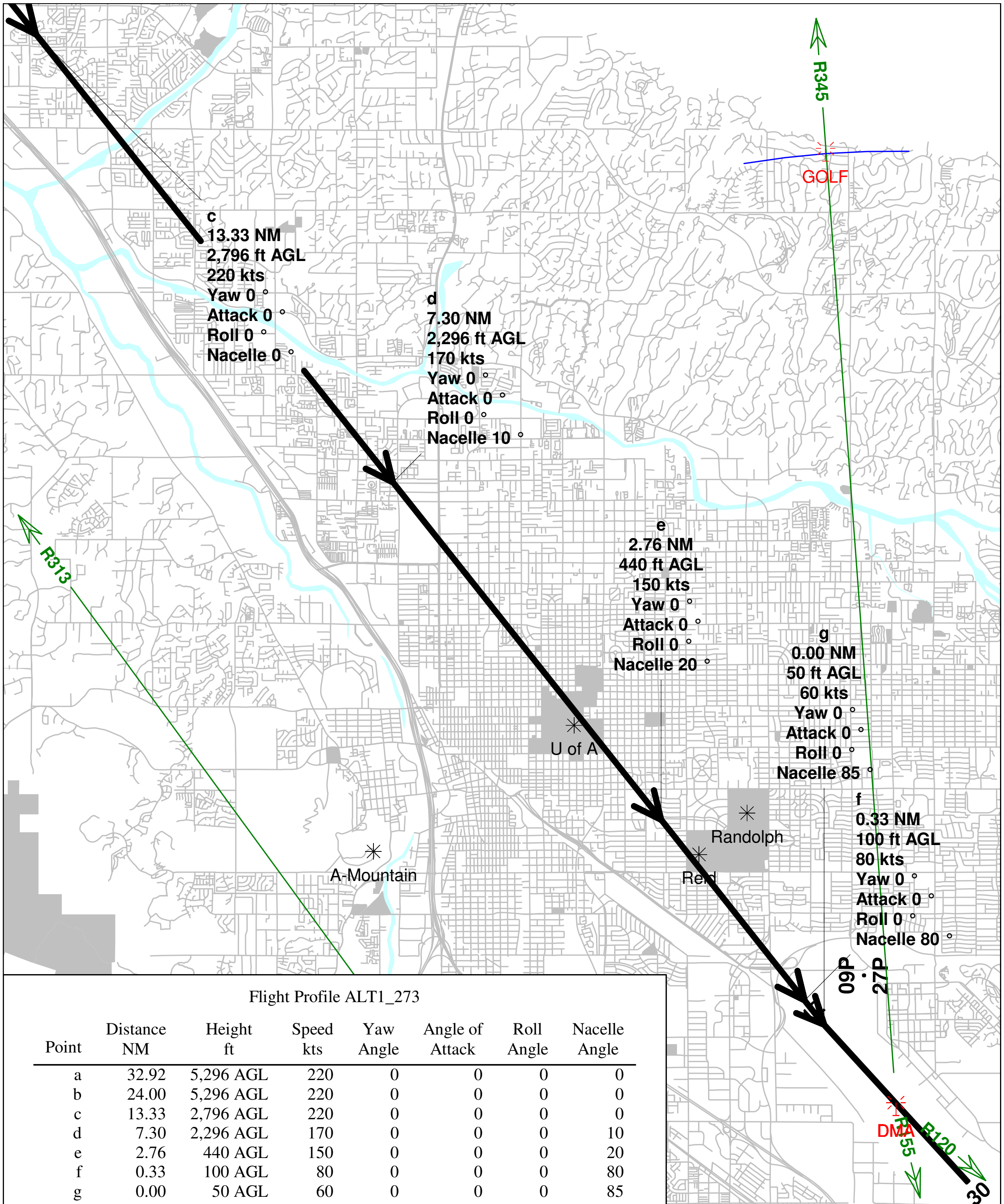
N

# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.10 - MV-22 Flight Profile Maps

11:53 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_273

| Point | Distance NM | Height ft | Speed kts | Yaw Angle | Angle of Attack | Roll Angle | Nacelle Angle |
|---|---|---|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 220 | 0 | 0 | 0 | 0 |
| b | 24.00 | 5,296 AGL | 220 | 0 | 0 | 0 | 0 |
| c | 13.33 | 2,796 AGL | 220 | 0 | 0 | 0 | 0 |
| d | 7.30 | 2,296 AGL | 170 | 0 | 0 | 0 | 10 |
| e | 2.76 | 440 AGL | 150 | 0 | 0 | 0 | 20 |
| f | 0.33 | 100 AGL | 80 | 0 | 0 | 0 | 80 |
| g | 0.00 | 50 AGL | 60 | 0 | 0 | 0 | 85 |

**Flight Profile ALT1_273**

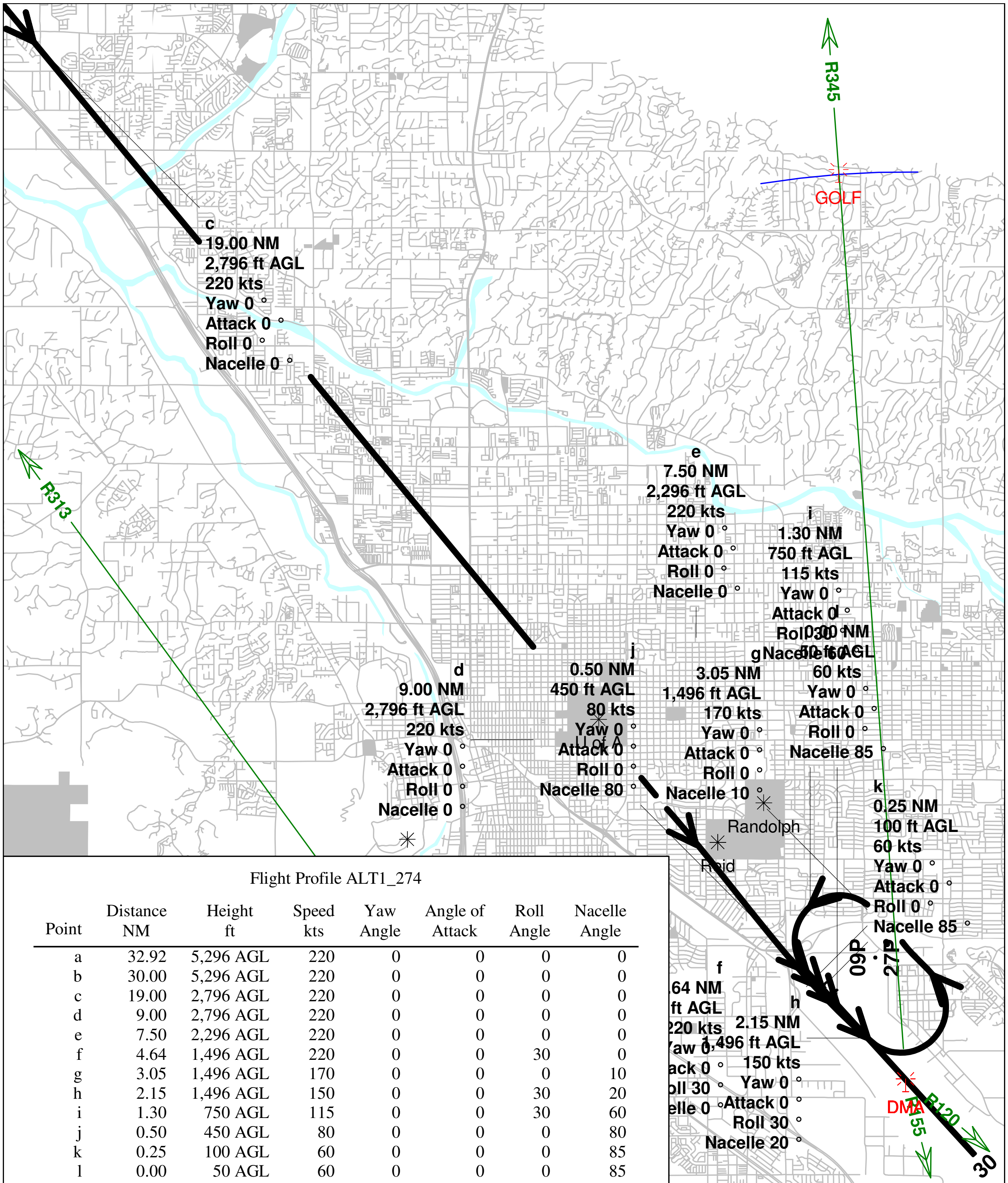
DoD MV-22 Straight-in Arrival

Flight Track: 12A03A_1 - TACAN/Straight-in Aircraft: Transient MV22B Engine: N/A

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 = 9,850 feet)

N




Flight Profile ALT1_274

| Point | Distance NM | Height ft | Speed kts | Yaw Angle | Angle of Attack | Roll Angle | Nacelle Angle |
|---|---|---|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 220 | 0 | 0 | 0 | 0 |
| b | 30.00 | 5,296 AGL | 220 | 0 | 0 | 0 | 0 |
| c | 19.00 | 2,796 AGL | 220 | 0 | 0 | 0 | 0 |
| d | 9.00 | 2,796 AGL | 220 | 0 | 0 | 0 | 0 |
| e | 7.50 | 2,296 AGL | 220 | 0 | 0 | 0 | 0 |
| f | 4.64 | 1,496 AGL | 220 | 0 | 0 | 30 | 0 |
| g | 3.05 | 1,496 AGL | 170 | 0 | 0 | 0 | 10 |
| h | 2.15 | 1,496 AGL | 150 | 0 | 0 | 30 | 20 |
| i | 1.30 | 750 AGL | 115 | 0 | 0 | 30 | 60 |
| j | 0.50 | 450 AGL | 80 | 0 | 0 | 0 | 80 |
| k | 0.25 | 100 AGL | 60 | 0 | 0 | 0 | 85 |
| l | 0.00 | 50 AGL | 60 | 0 | 0 | 0 | 85 |

**Flight Profile ALT1_274**

DoD MV-22 Overhead Break Arrival

Flight Track: 12A03B - Straight-in to Overhead (Cargo) Aircraft: Transient MV22B

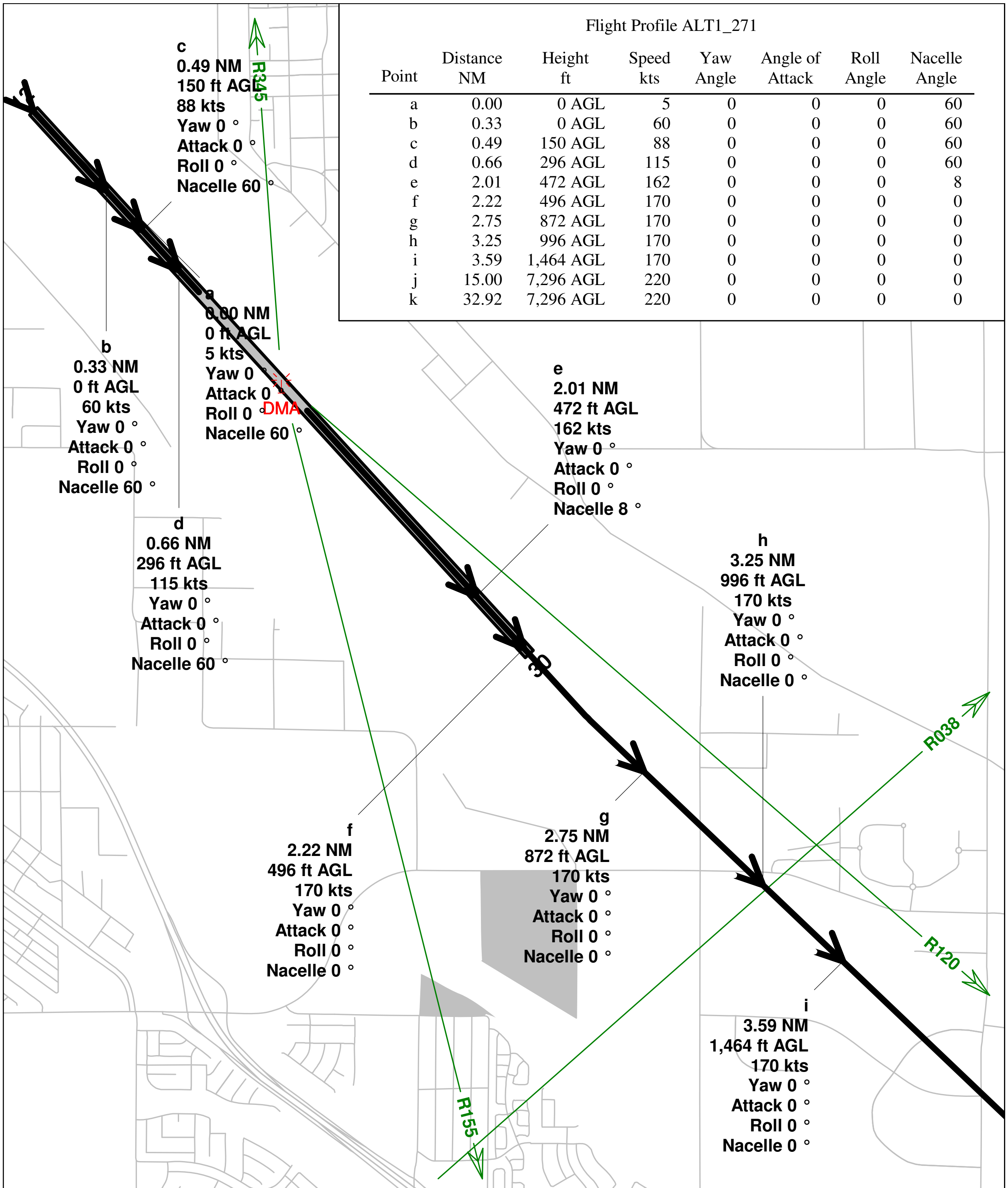
Engine: N/A

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

Scale in Feet 1:124,000 (1 inch = 10,400 feet)

Flight Profile ALT1_271

| Point | Distance NM | Height ft | Speed kts | Yaw Angle | Angle of Attack | Roll Angle | Nacelle Angle |
|---|---|---|---|---|---|---|---|
| a | 0.00 | 0 AGL | 5 | 0 | 0 | 0 | 60 |
| b | 0.33 | 0 AGL | 60 | 0 | 0 | 0 | 60 |
| c | 0.49 | 150 AGL | 88 | 0 | 0 | 0 | 60 |
| d | 0.66 | 296 AGL | 115 | 0 | 0 | 0 | 60 |
| e | 2.01 | 472 AGL | 162 | 0 | 0 | 0 | 8 |
| f | 2.22 | 496 AGL | 170 | 0 | 0 | 0 | 0 |
| g | 2.75 | 872 AGL | 170 | 0 | 0 | 0 | 0 |
| h | 3.25 | 996 AGL | 170 | 0 | 0 | 0 | 0 |
| i | 3.59 | 1,464 AGL | 170 | 0 | 0 | 0 | 0 |
| j | 15.00 | 7,296 AGL | 220 | 0 | 0 | 0 | 0 |
| k | 32.92 | 7,296 AGL | 220 | 0 | 0 | 0 | 0 |



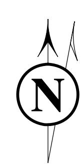

**Flight Profile ALT1_271**

DoD MV-22 Takeoff

Flight Track: 12D01 - Davis Monthan Four Departure Aircraft: Transient MV22B

Engine: N/A


Scale in Feet 1:34,400 (1 inch = 2,870 feet)

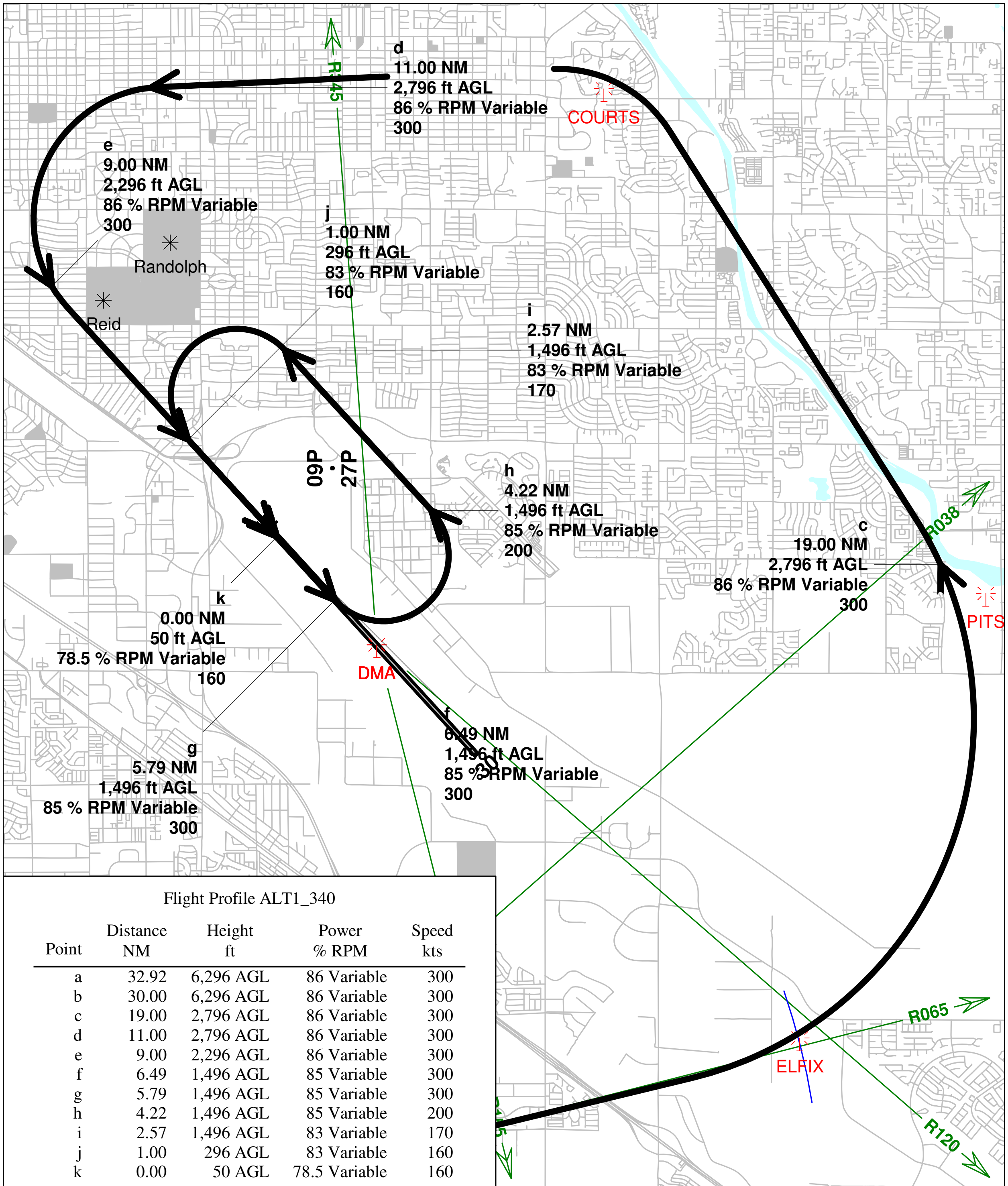


# Davis Monthan AFB - ALTERNATIVE 1

# ATTACHMENT B.11 - TORNADO Flight Profile Maps

11:53 AM
Sunday, June 15, 2014
BaseOps 7.357

# Flight Profile Maps




Flight Profile ALT1_340

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 6,296 AGL | 86 Variable | 300 |
| b | 30.00 | 6,296 AGL | 86 Variable | 300 |
| c | 19.00 | 2,796 AGL | 86 Variable | 300 |
| d | 11.00 | 2,796 AGL | 86 Variable | 300 |
| e | 9.00 | 2,296 AGL | 86 Variable | 300 |
| f | 6.49 | 1,496 AGL | 85 Variable | 300 |
| g | 5.79 | 1,496 AGL | 85 Variable | 300 |
| h | 4.22 | 1,496 AGL | 85 Variable | 200 |
| i | 2.57 | 1,496 AGL | 83 Variable | 170 |
| j | 1.00 | 296 AGL | 83 Variable | 160 |
| k | 0.00 | 50 AGL | 78.5 Variable | 160 |

**Flight Profile ALT1_340**

FMS TORNADO Overhead Break Arrival

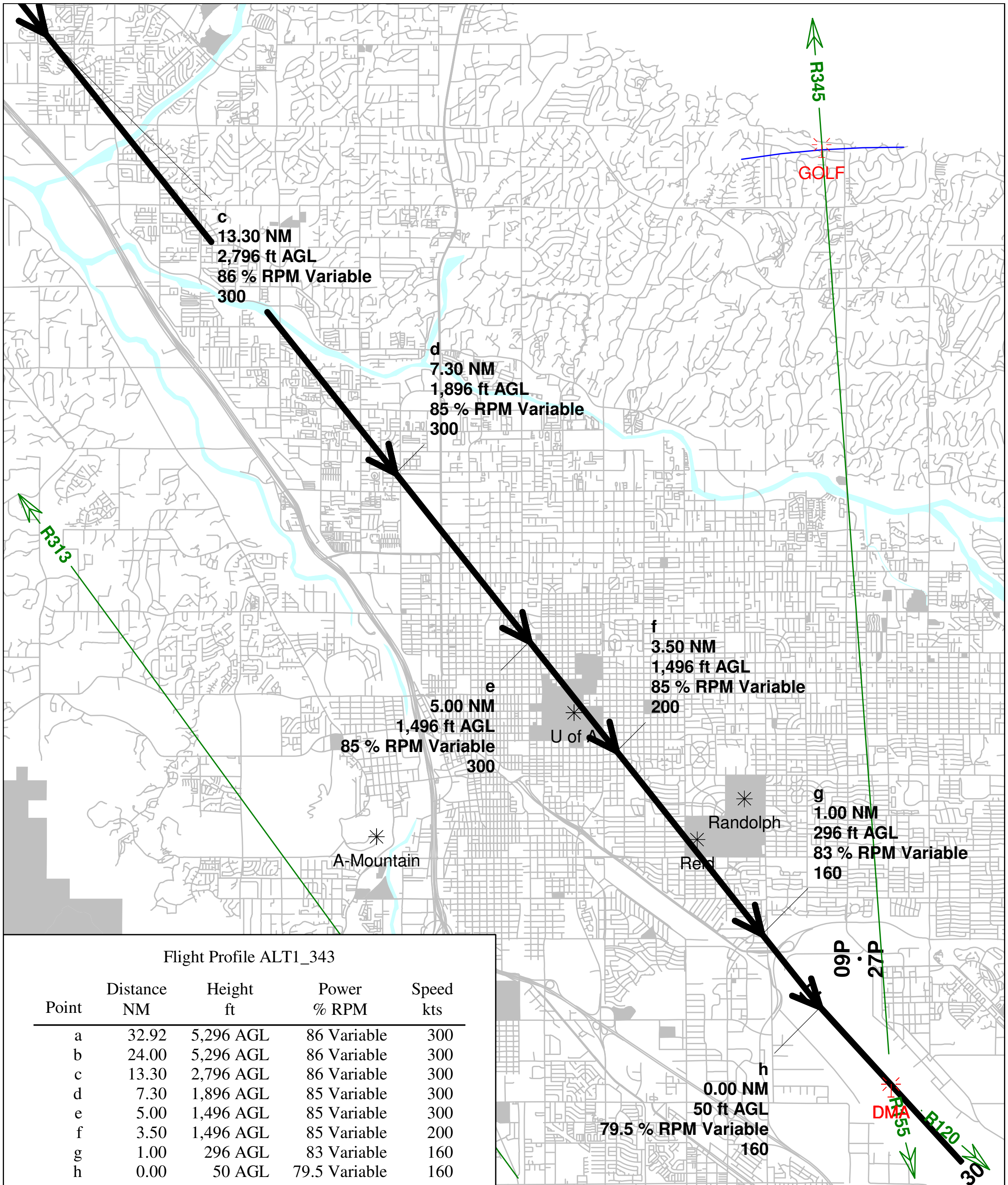
Flight Track: 12A01A - Davez Five VFR Recovery (Overhead Break) Aircraft: Transient

TORNADO Engine: RB.199-34R-04

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:85,500 (1 inch = 7,130 feet)

N




Flight Profile ALT1_343

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 32.92 | 5,296 AGL | 86 Variable | 300 |
| b | 24.00 | 5,296 AGL | 86 Variable | 300 |
| c | 13.30 | 2,796 AGL | 86 Variable | 300 |
| d | 7.30 | 1,896 AGL | 85 Variable | 300 |
| e | 5.00 | 1,496 AGL | 85 Variable | 300 |
| f | 3.50 | 1,496 AGL | 85 Variable | 200 |
| g | 1.00 | 296 AGL | 83 Variable | 160 |
| h | 0.00 | 50 AGL | 79.5 Variable | 160 |

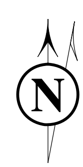
**Flight Profile ALT1_343**

FMS TORNADO Straight-in Arrival

Flight Track: 12A03A - Straight-in (TACAN, etc.) Aircraft: Transient TORNADO

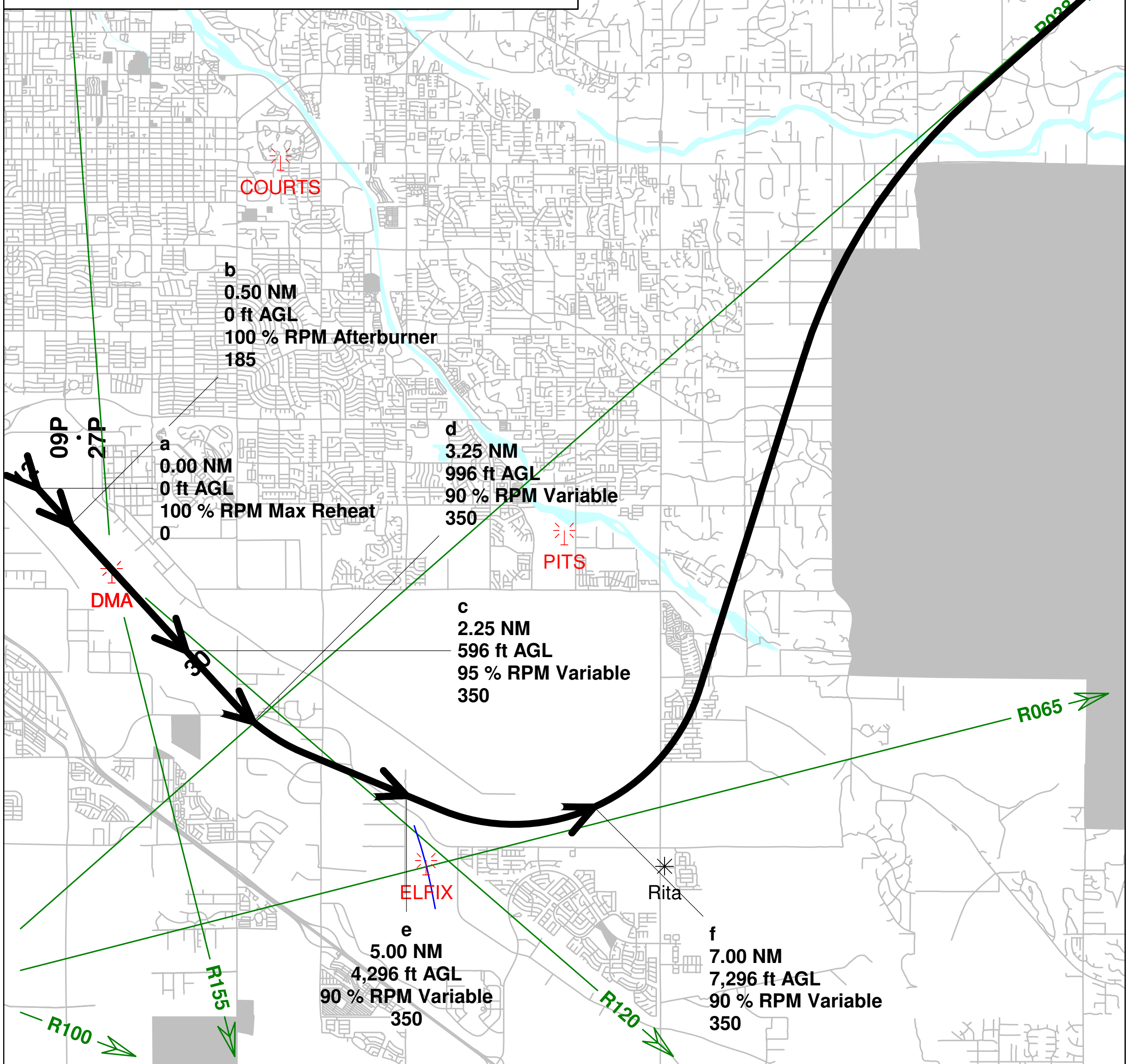
Engine: RB.199-34R-04


Scale in Feet 1:121,000 (1 inch = 10,000 feet)



Flight Profile ALT1_326

| Point | Distance NM | Height ft | Power % RPM | Speed kts |
|---|---|---|---|---|
| a | 0.00 | 0 AGL | 100 Max Reheat | 0 |
| b | 0.50 | 0 AGL | 100 Afterburner | 185 |
| c | 2.25 | 596 AGL | 95 Variable | 350 |
| d | 3.25 | 996 AGL | 90 Variable | 350 |
| e | 5.00 | 4,296 AGL | 90 Variable | 350 |
| f | 7.00 | 7,296 AGL | 90 Variable | 350 |
| g | 22.88 | 7,296 AGL | 85 Variable | 350 |




**Flight Profile ALT1_326**

FMS TORNADO Reheat Takeoff

Flight Track: 12D04 - Reddy 1 VFR Departure Aircraft: Transient TORNADO Engine: RB.199-34R-04

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 1:129,000 (1 inch = 10,700 feet)

N