Martin County Airport / Witham Field Noise Abatement Departure Profile (NADP) Demonstration Technical Report

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Prepared for:

Federal Aviation Administration (FAA)
Orlando Airport District Office

Prepared by:

CDM
Harris Miller Miller & Hanson Inc.
Hanson Professional Services Inc.

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1. INTRODUCTION

Martin County Airport/Witham Field (SUA) is located in the heart of Stuart, Florida. The airport is surrounded by established residential land areas in all quadrants and along the airport's primary Runway 12/30 departure flight paths. The airport serves as the executive flight center for Martin County, the City of Stuart and surrounding areas. Airport operations are centered on business and corporate aviation activities in addition to air taxi/charter operations and flight training. Due to its proximity to the West Palm Beach metropolitan area, the effects of heightened security at Palm Beach International Airport (PBI), and other factors, Witham Field has emerged as an alternative for the corporate business jet market. Year to date October 2009, the airport has recorded more than 67,150 aircraft operations. Approximately 15 percent were by jet aircraft.

Heightened concerns of area residents on the impacts of aircraft noise lead to the emergence of grassroots efforts to relocate or close the airport. Citizens were at odds with operators they believed weren't doing enough. To address community concerns, Martin County initiated a comprehensive voluntary noise abatement program and completed an FAR Part 150 Noise and Land Use Compatibility Study.[1] The Noise Study recommended numerous operational and land use compatibility planning measures, including the implementation of voluntary noise abatement takeoff procedures. Specifically, the Noise Study recommended the use of aircraft manufacturer, NBAA or AOPA noise abatement departure profiles for all aircraft departures. NBAA close-in profile is recommended for use by aircraft over 75, 000 pounds maximum gross takeoff weight.[2]

In the FAA's Record of Decision for the Airport's Noise Compatibility Program, the measure was "Disapproved pending submission of additional information to make an informed analysis." An excerpt of the FAA's ROD regarding this measure is included in Attachment A of this report.

Since the 2003 ROD, Martin County formed a 13 member Airport Noise Advisory Committee (ANAC), which includes residents of aircraft noise impacted neighborhoods, other citizens, businesses and elected officials interested in the activities at Martin County Airport. The committee monitors aviation activities during voluntary curfew hours and makes recommendations to the Board of County Commissioners regarding the implementation of noise abatement and land use compatibility planning and mitigation measures that Martin County has pursued since completion of the Part 150 Study. ANAC began focusing on the review of potential noise abatement departure profiles in 2008 with the goal of identifying the optimum procedure to request that operators utilize on a strictly voluntary basis.

[1] "Martin County Airport / Witham Field, FAR Part 150 Noise Study," prepared by Hoyle, Tanner & Associates, Inc. and Wyle Laboratories, 2002.
[2] *Ibid*., Noise Compatibility Program, Chapter 5, page 5-13, *OPS 7 – Voluntary Takeoff and Landing Procedures*.

Martin County worked with the ANAC and based aircraft operators to identify promising options for consideration and to organize a demonstration project, with two primary purposes: (1) to test the procedures to demonstrate potential benefits to local residents and (2) to obtain pilot feedback on any operational issues. The noise benefits of the alternatives were assessed in three ways: (1) noise measurements made during the demonstration of multiple departures, (2) preparation of single event noise contours, in terms of Sound Exposure Level (SEL), and (3) actual listening by human observers, including local residents, during the demonstration flights.

All three assessment methodologies supported the same conclusion; i.e., the National Business Aviation Association (NBAA) "close-in" noise abatement departure procedure (NADP) is the optimum profile to request that pilots use on a voluntary basis at Martin County Airport / Witham Field. The pilots who participated in the demonstration did not identify any operational concerns related to use of this procedure at the airport. The ANAC – including aviation, citizen, and other members – all supported these conclusions and the recommendation that the County request that pilots use the NBAA close-in NADP on a voluntary basis.

This report documents the noise abatement departure profile demonstration project and presents technical data related to the field measurements and SEL contours.

2. DEMONSTRATION PROJECT OVERVIEW

Martin County's FAR Part 150 Noise Study recommended the implementation of voluntary noise abatement departure profiles (NADPs) to reduce takeoff noise. Recognizing that the use of NADPs by jet aircraft operators in particular could potentially reduce noise levels for homeowners near the airport's two primary takeoff flight paths, Martin County made the formal evaluation and recommendation of a preferred profile a primary objective.

Martin County formed a project team to assist with the analysis. The team included **CDM**, the Prime Consultant, **Hanson Professional Services Inc**. **(Hanson)**, responsible for coordinating the NADP demonstration project, community involvement program and study documentation, **Harris Miller Miller & Hanson Inc. (HMMH)**, responsible for organizing the portable noise measurement program and noise modeling analysis.

The demonstration project was designed to test several profiles by jet aircraft types that dominate the fleet at Witham Field. On June 26, 2008, with a grant provided by the Florida Department of Transportation, District 4, the consultant team collected field data of aircraft takeoff noise testing two different profiles: (1) a procedure developed by a local operator, "Fair Wind Air Charter," which local citizens had indicated seemed to result in reduced noise levels, and (2) the NBAA close-in NADP. Fair Wind had developed their procedures and trained their pilots to use it as part of their ongoing "good neighbor" policies. In a further good-neighbor manner, Fair Wind donated a Lear 31 and a Lear 55 and associated crew time for the demonstration, and two other local operators, Stuart Jet Center and Galaxy Aviation, donated the aircraft fuel needed for the demonstration. Takeoff weights were maintained to represent operational characteristics of the airports average stage length (500-1,000 nautical miles).

The airport's Runway 12-30 was used during the demonstration. Runway 12-30 is 5,826 feet long and 100 feet wide and is the primary runway used by jet aircraft and larger multi-engine airport at the airport, and provides the best wind coverage of the three available runways. Land uses in the runway environs include residential and commercial uses in addition to the Martin County Golf Course. Figure 1 illustrates the airport configuration and surrounding land uses.

Figure 1. Martin County Airport, Witham Field, Aerial

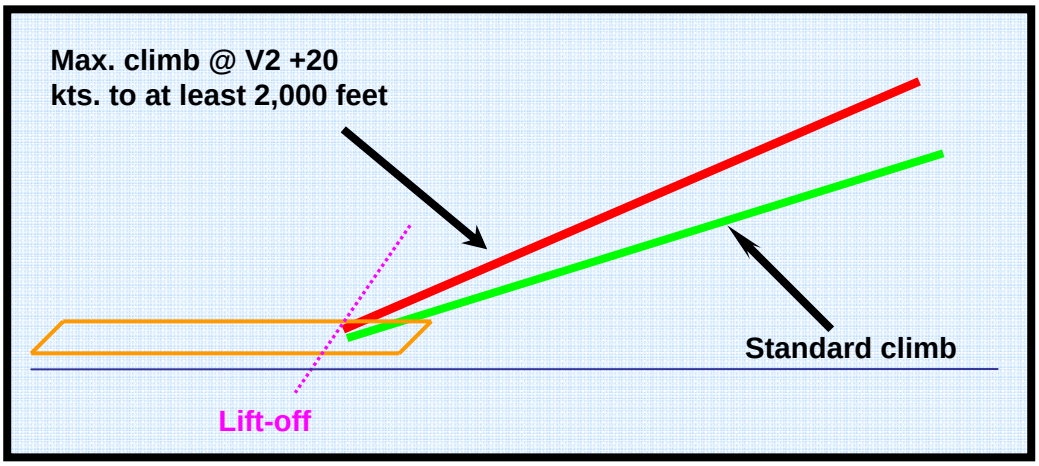
The local Air Traffic Control Tower assigned straight-out takeoff flight tracks to simulate tracks that are routine since the FAA finalized the noise abatement departure track for Runway 12 in December 2009[3].

2.1 Aircraft NADP Demonstration

Aircraft flight demonstration of two profiles, the Fair Winds Charter Departure Profile and the NBAA Close-In NADP, took place on June 26, 2008. Winds were light, and conditions were clear. Each profile was flown twice by each aircraft. The first profile flown was the Fair Wind profile, developed by Fair Wind Air Charter and utilized routinely by the company's pilots for all takeoffs. This profile is similar to the NBAA standard departure profile. Neighbors had commented that the reduction in noise when Fair Wind was operating was "noticeable" compared to other operators. Figure 2 depicts the Fair Wind NADP illustrated in Figure 2.

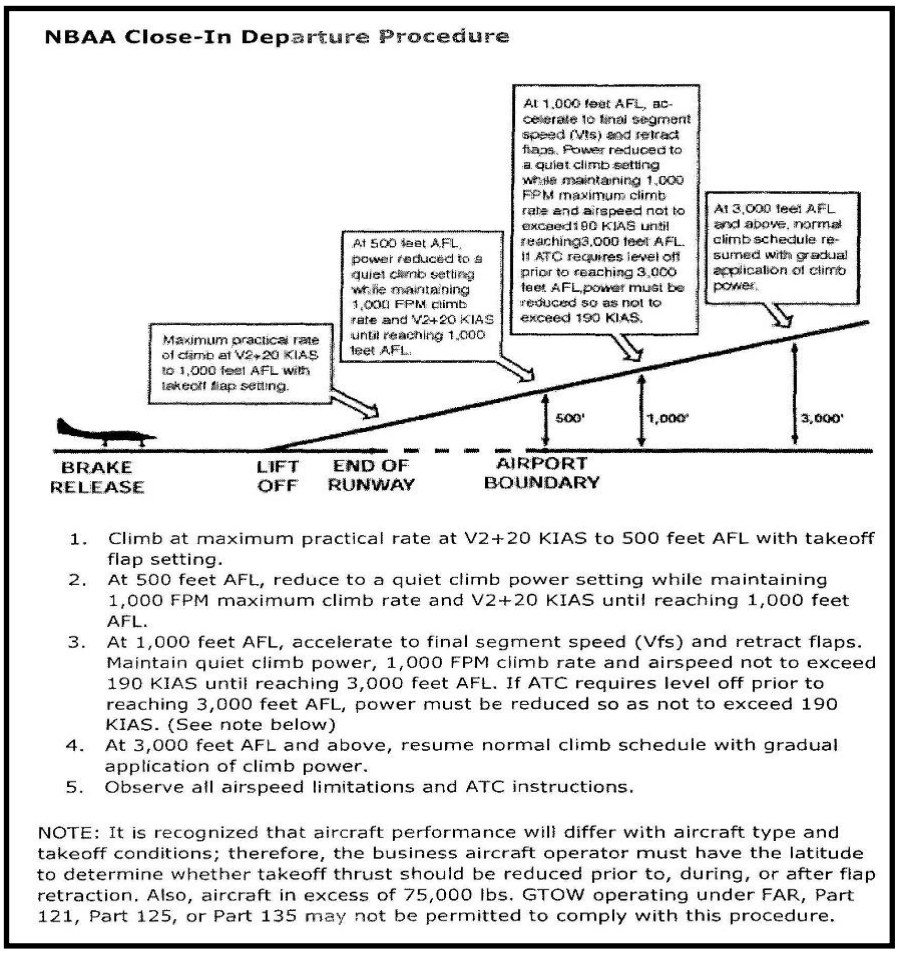
[3] The Runway 12 voluntary noise abatement departure flight track is a separate measure of the Part 150 Noise Study recommending the development of a formal departure procedure (DP) for use by pilots operating under Instrument Flight Rules on Runway 12. The procedure will guide pilots electronically along a flight path that is straight out and centered over the St. Lucie Inlet to avoid residential areas prior to turning on course. FAA published the straight-out DP in December 2009.

Figure 2. Fair Wind NADP



The second profile tested was the NBAA close-in NADP. NBAA has developed standardized profiles designed to complement other local noise abatement measures and are generally known to most jet and business aircraft operators. The close-in NADP was selected for testing since Martin County Airport has sensitive land uses within two nautical miles of the airport. The procedure is depicted below.

Figure 3 NBAA Close In Departure Profile



1. Climb at maximum practical rate at V2+20 KIAS to 500 feet AFL with takeoff flap setting.
2. At 500 feet AFL, reduce to a quiet climb power setting while maintaining 1,000 FPM maximum climb rate and V2+20 KIAS until reaching 1,000 feet AFL.
3. At 1,000 feet AFL, accelerate to final segment speed (Vfs) and retract flaps. Maintain quiet climb power, 1,000 FPM climb rate and airspeed not to exceed 190 KIAS until reaching 3,000 feet AFL. If ATC requires level off prior to reaching 3,000 feet AFL, power must be reduced so as not to exceed 190 KIAS. (See note below)
4. At 3,000 feet AFL and above, resume normal climb schedule with gradual application of climb power.
5. Observe all airspeed limitations and ATC instructions.

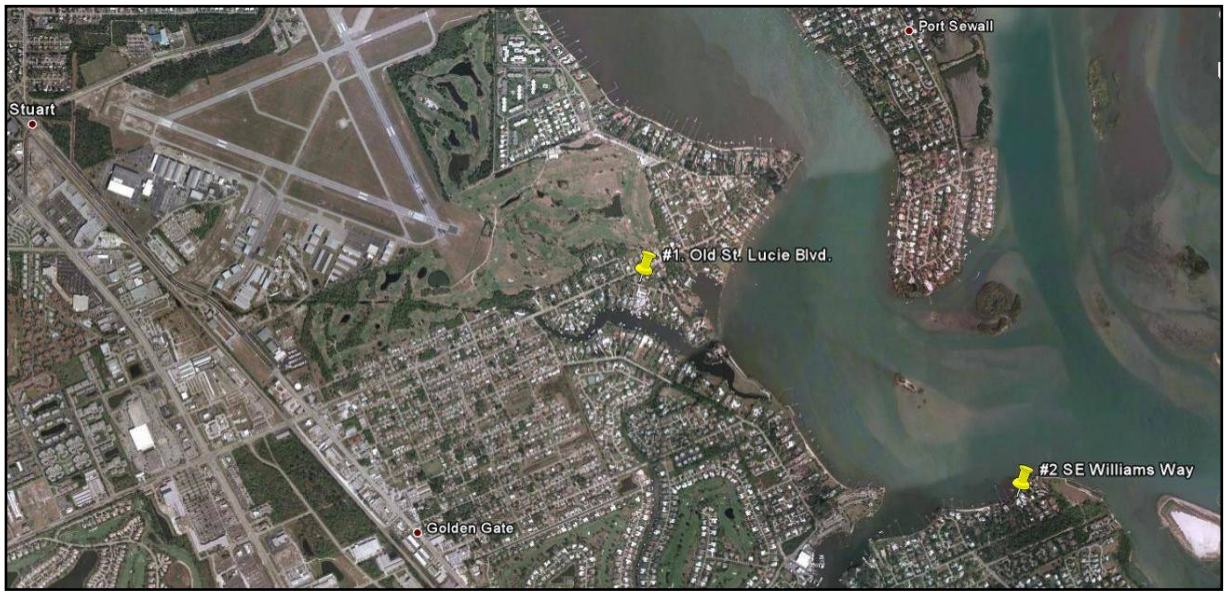
NOTE: It is recognized that aircraft performance will differ with aircraft type and takeoff conditions; therefore, the business aircraft operator must have the latitude to determine whether takeoff thrust should be reduced prior to, during, or after flap retraction. Also, aircraft in excess of 75,000 lbs. GTOW operating under FAR, Part 121, Part 125, or Part 135 may not be permitted to comply with this procedure.

ANAC member Mr. Steven Sedor, a retired airline pilot volunteered as an observer in the aircraft during each departure. Mr. Sedor recorded crucial data pertaining to weather and aircraft performance.

2.2 Portable Noise Monitoring Program

Noise measurement equipment was placed in the neighborhood to record noise levels during each takeoff. Consultant and community observers were present at two monitoring locations along the departure flight path. The monitoring locations are shown in Figure 4.

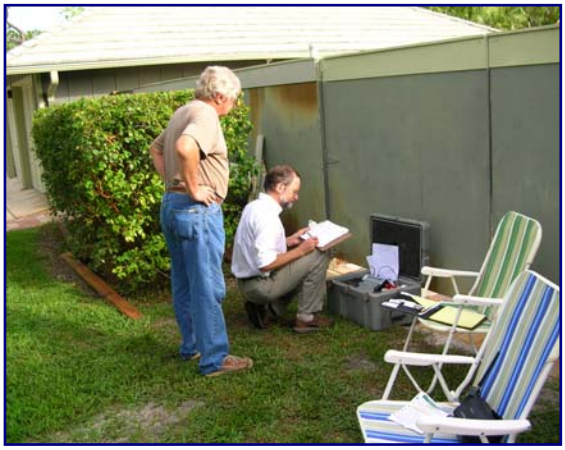
Figure 4. Noise Monitoring Locations, NADP Demonstration Project



Monitoring site #1 is located approximately 11,000 feet from start of takeoff roll on Runway 12; Site #2 approximately 21,000 feet from start of takeoff roll. The specific data collected included:

- **Sound Exposure Levels (SEL, dBA)** – a measure of the total noise energy produced during an event from the time the A-weighted sound level first exceeds a threshold level (normally just above the background or ambient noise) to the time that the sound level drops back down below the threshold.

- **Maximum Noise Levels (Lmax, dBA)** – The maximum level of noise during a specific event.



Data was collected for several hours before and after the demonstration testing. The consultant team also collected data from other sources including other aircraft, vehicle traffic, and community sources. Average hourly noise levels and DNL was also collected during the monitoring period. The table below lists the SEL, Lmax and event duration for each of the demonstration takeoffs.

Aircraft	Procedure	Old St. Lucie Blvd.			S.E. Williams Way		
		Sound Exposure Level, SEL	Maximum Level, Lmax	Seconds Above 55 dBA	Sound Exposure Level, SEL	Maximum Level, Lmax	Seconds Above 55 dBA
Lear 31	Fair Wind 1	89.1	79.2	46	≤65	57.5	est. 3
	Fair Wind 2	89.1	79.7	48	71.8	62.5	33
	Average	89.1	79.5	47	≤68	60.0	18
	NBAA 1	84.4	77.5	26	74.8	65.3	35
	NBAA 2	80.2	72.6	32	73.8	65.5	34
	Average	82.3	75.1	29	74.3	65.4	35
Lear 55	Fair Wind 1	90.4	82.4	43	80.8	69.3	48
	Fair Wind 2	90.3	82.5	49	79.3	67.8	45
	Average	90.4	82.5	46	80.1	68.6	47
	NBAA 1	82.3	76.0	21	74.4	66.5	34
	NBAA 2	82.0	75.3	20	74.2	64.4	34
	Average	82.2	75.7	21	74.3	65.5	34

Each of the two aircraft types conducted two departures following each procedure. The preceding table presents the resulting 16 measurement results (from two procedures, times two aircraft types, times two tests in each aircraft/procedure combination, times two locations). The average measurement results (including SEL, Lmax, and duration above 55 dBA) were calculated for each pair of test flights.

The shaded cells in the table show which of the procedures was quieter on an average basis over the two demonstration flights for each of the four aircraft type / location combinations. In three of the four combinations, the NBAA close-in NADP was clearly preferred in terms of SEL, Lmax, and duration; i.e., for both the Lear 31 and Lear 55 at the close-in, Old St. Lucie Blvd. site, and for the Lear 55 at the more distant, S. E. Williams Way site. The observers' impressions at the measurement sites agreed with the measurement results. Observers at the more distant, S. E. Williams Way site noted that it appeared that site was close to the point at which the Lear 31 reached 3,000' and cut back power under the Fair Wind procedure.

The measured results and observer impressions were consistent with INM-based noise modeling conducted as a third means of comparing the procedures. Figures 5 and 6 present SEL contours and climb profiles for NBAA close-in NADP and the Fair Wind procedure, compared to the INM standard procedure, for the Lear 31 and Lear 55, respectively.

Figure 5. Comparison of Lear 31 SEL Contours for Three Depature Profiles.

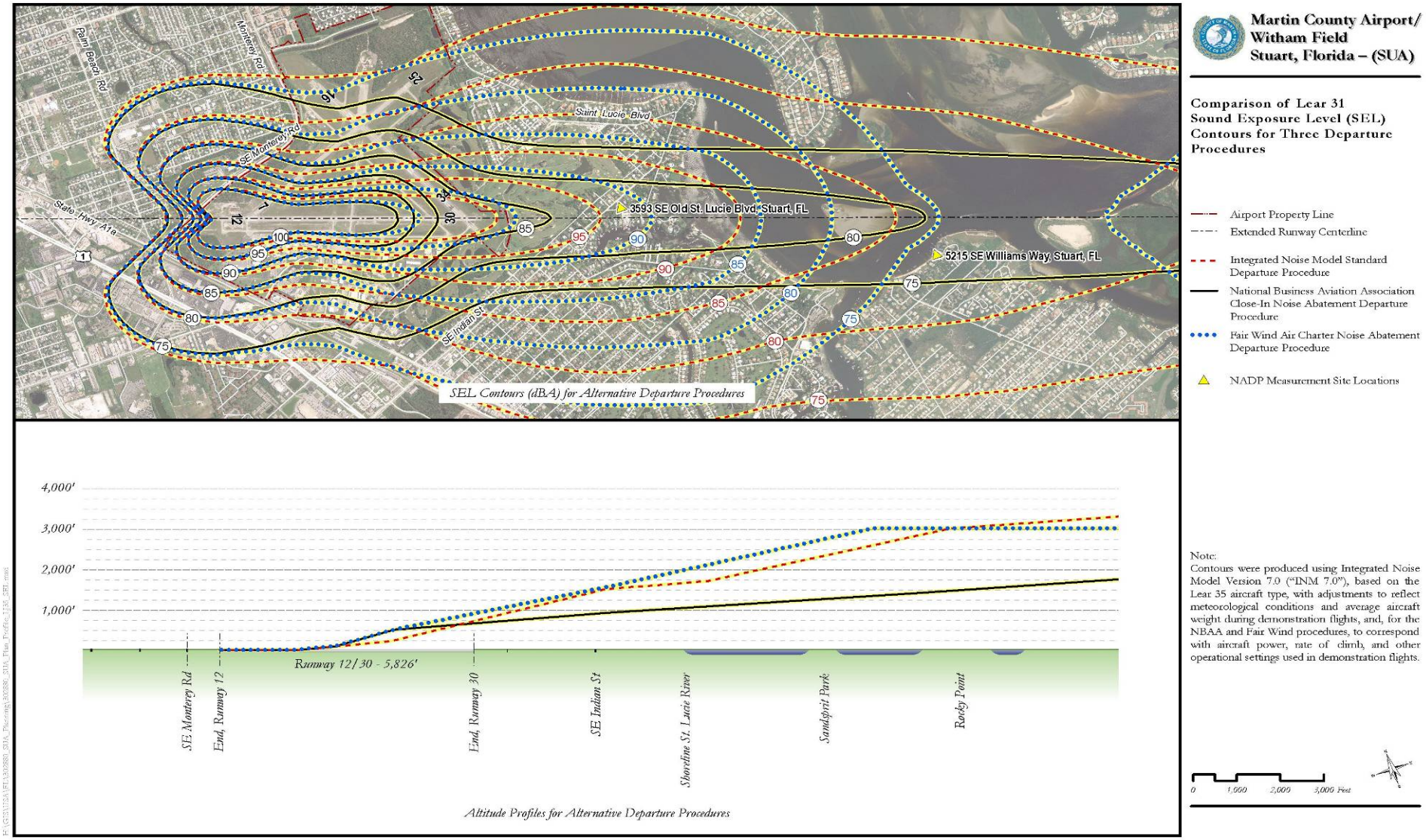
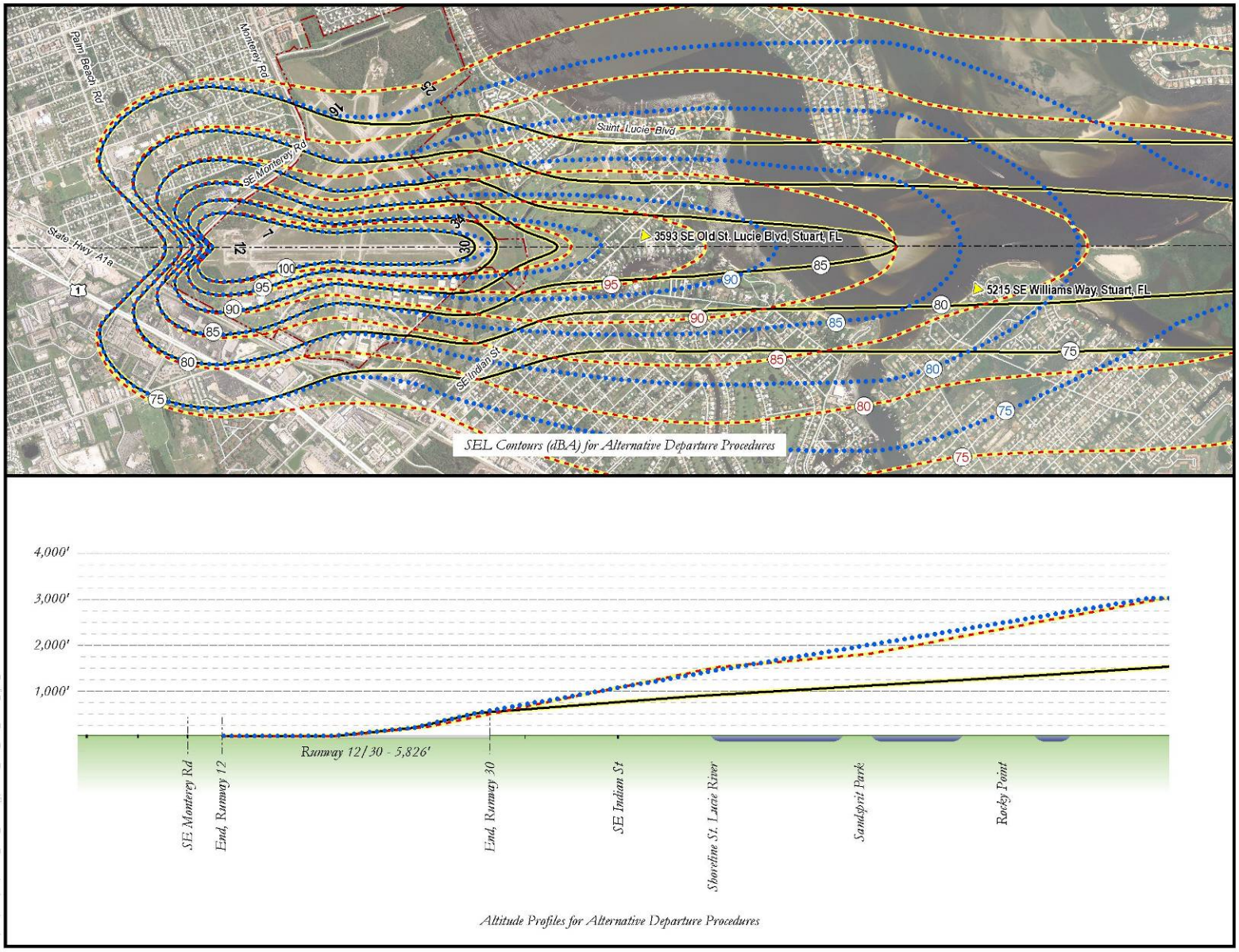


Figure 6. Comparison of Lear 55 SEL Contours for Three Depature Profiles.



3. Public Consultation

The Airport Noise Advisory Committee is the primary forum for community involvement on airport noise related issues. ANAC meetings are held 8 times each year and are advertised on the County's' meetings website and in the local newspaper. Public attendance is encouraged. The following provides a list of meetings and presentations made during the NADP study process:

- **April 26, 2007** – ANAC regular meeting, presentation by Fair Wind Air Charter of their noise abatement departure profile
- **June 25, 2008** – ANAC regular meeting, presentation by consultant team, demonstration program kick-off
- **August 28, 2008 -** ANAC regular meeting, presentation of demonstration program and noise monitoring program results.
- **March 16, 2010 –** Presentation of NADP results and Florida Airports Council Noise Abatement Project of the Year Award to the Board of County Commissioners

ANAC members and interested citizens were notified of the portable noise monitoring locations and were invited to participate during the June 26, 2008 flight demonstration.

4. NADP Recommendations

The results of the demonstration project were presented to the full ANAC committee in August 2008. The committee voted unanimously to recommend the voluntary use of the Close-in NADP by jet aircraft when departing Witham Field.

Recognizing that educating pilots to utilize the NBAA close-in NADP is key, the committee and staff have actively promoted the voluntary use of the close-in NADP. Posters have been placed in flight planning rooms and special card size announcements have been developed for distribution to based and itinerant pilots. Fractional operators have also been contacted. Neighbors along the departure path have reported that they recognize a noticeable reduction in noise when the NADP is used.