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Guidance for Noise Screening of Air Traffic Actions

Revision 2

Koffi A. Amefia

December 2012

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Abstract

The Federal Aviation Administration (FAA) Air Traffic Organization (ATO) established a noise screening process to help determine the need for a detailed noise analysis of air traffic actions. The MITRE Corporation's Center for Advanced Aviation System Development (CAASD) prepared this document to assist the FAA and others involved in proposed air traffic actions. This document is not an absolute step-by-step guide; instead, it provides users with a solid and repeatable approach to noise screening within the regulatory framework of FAA Order 1050.1E, Environmental Impacts: Policies and Procedures. The goal is to provide noise screening techniques to facilitate compliance with the requirements of the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality (CEQ) regulations.

Acknowledgements

The Federal Aviation Administration (FAA), in collaboration with The MITRE Corporation's Center for Advanced Aviation System Development (CAASD), published the initial version of this document in July 2009. The authors of this revision acknowledge the prior efforts of Scott D. Carpenter, Stan K. Eshelman, and Jesse A. Baker of Landrum and Brown; Michael Graham formerly of Metron Aviation; Fred Bankert, Angela Signore and Kristy Landry of CAASD; and Ernestine Gatewood and Donna Warren of the FAA. Further, the authors acknowledge the significant contributions of Donna Warren and Terry English of the FAA, and Angela Signore, Anuja Mahashabde, Neal Westlund, Fred Bankert and Gerry Dorfman of CAASD to this revision.

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1 Introduction

This document provides an overview of the noise screening process and general guidance on how to conduct a noise screening assessment for a pending air traffic action. The noise screening process can be used to determine the potential for noise impacts related to most air traffic actions.

The guidance provided conforms to the Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures* [1] which outlines the agency's policies and procedures for complying with the *National Environmental Policy Act of 1969 (NEPA)* [2] and the *Council on Environmental Quality (CEQ) Regulations* [3]. Consistent with NEPA and the CEQ regulations, FAA adjusts the level of environmental analysis to the expected level of impact of a proposed action. For example, FAA Order 1050.1E contains a list of air traffic actions which normally do not result in significant impacts to the environment (Categorical Exclusion [CATEX]) and therefore, do not require the preparation of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS). One of the requirements for a CATEX determination is to ensure that there are no extraordinary circumstances as defined in FAA Order 1050.1E.

The noise screening process provides a solid and repeatable approach to identify extraordinary circumstances and/or the potential for significant impacts associated with noise impacts of proposed air traffic actions for fixed-wing aircraft. The process is based on currently-approved FAA tools and policies. In practice, the proponent of an air traffic action would perform a series of relatively simple tests prior to contacting an Environmental Specialist (ES) in the Air Traffic Organization (ATO) Service Center (SC) based on the geographic area. Actions that pass the noise screening tests would normally be eligible for a CATEX and could proceed to the subsequent steps in the design and implementation process without further environmental review. This document is expected to evolve as new air traffic issues emerge, users provide feedback, or as FAA introduces new tools, updates existing tools, or changes policies.

This update stems from the need to adapt the noise screening process to a rapidly evolving National Airspace System (NAS) that the FAA is developing through the Next Generation Air Transportation System (NextGen). Since the first issue of the *Guidance for Noise Screening of Air Traffic Actions* [4] in 2009 (henceforth referred to as previous document), FAA has received valuable insights from the user community, and updated a number of noise screening tools. The primary objective of this update is to consolidate the noise screening guidance for ease of use, and incorporate updated tools. The document is organized in eight sections and three appendices as follows:

- Section 2, **Background**, provides a brief history of precedent-setting NEPA studies, prior noise screening tools, and relevant aircraft noise regulations. This section builds on the content in Section 2 **Background** of the previous document.

- Section 3, **Noise Screening Process**, describes the noise screening process in terms of actions and outcomes. This section updates and consolidates the content in Sections 3 **What is Noise Screening** and 3.1 **Purpose of Noise Screening** of the previous document.
- Section 4, **Users of the Noise Screening Process**, provides a brief overview of the major stakeholders of the noise screening process. The value of this section is to frame the discussion of the types of actions suitable for noise screening.
- Section 5, **Air Traffic Actions Suitable for Noise Screening**, discusses circumstances where noise screening may be appropriate. It describes cases in terms of the changes to aircraft route of flight or altitude that may result in environmental impacts. This section updates and consolidates the content in Sections 3.2 **Actions that Do Not Require Screening**, 3.3 **Actions that Require Screening**, 4.1 **Define the Proposed Action** and 4.5 **Identify Further Actions** of the previous document.
- Section 6, **Noise Screening Tools and Tests**, describes FAA-approved noise screening tools and their limitations, as well as a general mapping of air traffic actions in Section 5 to the tools. This section also describes inputs, outputs, and examples of noise screening tests. This section updates and consolidates the content in Sections 3.4 **Noise Screening Tools**, 4.2 **Noise Screening Data**, 4.3 **Pre-screening**, and 4.4 **Full-Screening** of the previous document.
- Section 7, **List of References**, contains a list of the documents referred to throughout this document.
- Appendix A, **Data Collection**, provides guidance for collecting data needed for noise screening, including selection of radar track data dates to represent one year of operations for noise modeling purposes; Appendix A also provides links to resources that can assist in the noise screening process. This section updates and consolidates the content covered in Appendices **A** through **C** of the previous document.
- Appendix B, **Examples of Noise Screening Tests**, works through simple examples using the noise screening tests discussed in this document.
- Appendix C, **Glossary**, provides a list of the acronyms used throughout this document.

2 Background

In the past, the public's concern about aircraft noise was typically centered on airports. However, that perspective changed in 1987 following the comprehensive revision of air traffic control (ATC) routes and procedures in the eastern United States under the Expanded East Coast Plan (EECP) [5]. Following EECP implementation, noise complaints to the FAA, the Port Authority of New York and New Jersey, and various local and national elected officials increased significantly. FAA investigation of the issue revealed that many of the complaints and concerns came from communities located 30 nautical miles (NM) or more from a major airport within the study area. The concerns persisted over time, leading to a Government Accountability Office (GAO) investigation and a 1988 report entitled *Implementation of FAA's Expanded East Coast Plan* [6]. GAO determined that FAA followed its own policies, namely that an EA or EIS was not required since air traffic actions above 3,000 feet Above Ground Level (AGL) are CATEXs. However, GAO also suggested that FAA should have anticipated the potential for public controversy and prepared an EA for the project. Consequently, Congress mandated that FAA complete a retrospective EIS analyzing and documenting the noise impacts from the project. While the EECP EIS did not find any significant noise impacts due to the action [7], it set a new precedent by considering aircraft noise at levels far below the A-weighted Day-Night Average Sound Level (DNL) of 65 decibels (dBA or dB). As a result of the EECP, FAA developed an increased awareness of potential noise issues and/or controversy from air traffic actions beyond the immediate vicinity of the airport.

On September 14, 1990, FAA issued *Notice N7210.360, Noise Screening Procedure for Certain Air Traffic Actions Above 3,000 Feet AGL* [8], including a series of decision tables to assist airspace planners in assessing the potential for noise impacts of proposed air traffic actions. The approach was relatively simple, largely focusing on the louder Stage 2 aircraft in the fleet during that time. The decision tables were subsequently automated in the initial release of the Air Traffic Noise Screening model (ATNS) Version 1.0 in 1995 [9]. The tool was limited to single route changes and could not be used for large-scale airspace modifications. In July 1998, FAA released the Noise Integrated Routing System (NIRS) Version 1.0 for noise analyses of large-scale airspace modifications over broad areas that include multiple airports, and thousands of flight tracks and operations. FAA later released the NIRS Screening Tool (NST) in 2009 as a replacement for ATNS. With the advent of Performance-Based Navigation (PBN), FAA initiated the integration of a noise plug-in into the Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS) software [10] used by airspace and procedure designers. The initial release of the TARGETS Noise Plug-in leverages the Integrated Noise Model (INM) to provide an assessment capability for designers of airspace and procedures. In March 2012, FAA released the Aviation Environmental Design Tool (AEDT) Version 2a [11] as a replacement for NIRS for regional noise analysis. AEDT Version 2a dynamically models aircraft performance in space and time to produce fuel burn, emissions and noise metrics. FAA is in the process of developing an updated TARGETS Noise Plug-in and the Aviation Environmental Screening Tool (AEST), both of which are based on AEDT computation modules for noise and emissions.

3 Noise Screening Process

This screening guidance focuses on techniques to screen for noise impacts without having to use more complex modeling tools. The goal of noise screening is to streamline the environmental review process for air traffic actions, helping to decide if a detailed noise analysis is required. Noise screening trades modeling precision for a simplified process when and where possible. The simpler noise screening techniques provide conservative results very quickly, whereas the more complex modeling tools provide more precise results, but take more time and require more data. The screening tests have been constructed to minimize the risks of false-negative results, i.e., an action potentially causing significant noise impacts passing the noise screening process. Passing noise screening implies that the potential for significant impacts and/or extraordinary circumstances due to aircraft noise is negligible, and a CATEX is appropriate. The noise screening documentation can be used to support the CATEX determination. Given the large number of air traffic changes subject to environmental review under NEPA, noise screening:

- Establishes an expedited approach to determine where time and resources should be allocated for detailed noise analyses.
- Provides a basis for complying with FAA's environmental requirements in the design and implementation for proposed air traffic actions.
- Provides an additional tool to airspace and procedure designers for modifying their designs in light of the potential for environmental impacts.

The following sections discuss the regulatory framework for noise screening and the major steps of the noise screening process.

3.1 Regulatory Framework

FAA Order 1050.1E provides agency-wide guidance for implementing NEPA requirements consistent with CEQ regulations. FAA Order 1050.1E Section 311 lists several air traffic actions that are CATEXs in the absence of extraordinary circumstances. Further, Section 304 contains a list of extraordinary circumstances some of which relate to exceeding certain DNL noise thresholds. DNL reflects the noise exposure on an Average Annual Day (AAD). AAD data includes weather, flight profile information, and airport operations reflective of an average long-term condition. Examples of the kinds of data collected for noise modeling include the types of aircraft, the number of operations, the route structure, the runway use, aircraft performance data, etc. To account for the additional annoyance due to lower ambient sound levels and the increased sensitivity to noise during sleeping hours, nighttime operations (10:00 p.m. to 07:00 a.m. local) are weighted by a factor of 10. In California, the Community Noise Equivalent Level (CNEL) is used which, in addition to the nighttime penalty, provides for a weighting of 3 for evening operations (7:00 p.m. to 10 p.m.). Additional information for developing AAD data is provided in Appendix A.

In practice, the DNL change used in noise screening has evolved over time. The original ATNS tested for a 5 dB change over noise sensitive areas exposed to 60 dB or less. In 1992, the Federal Interagency Committee on Noise (FICON) published guidelines for change analysis in the

Federal Agency Review of Selected Airport Noise Analysis Issues [12]. FAA adopted the FICON criteria for change analysis in its release of NST [13].

Table 3-1 summarizes FAA change thresholds per FAA Order 1050.1E and other aircraft noise related guidance. For example, a noise increase of 1.5 dB at the DNL 65 dB or higher over a noise sensitive area is considered a significant impact. Consistent with FICON recommendations, the Order states that an increase of 3 dB between the DNL 60 and 65 dB should be reported when there already is a 1.5 dB increase at the DNL 65 dB levels. In addition, an increase of 5 dB between the DNL 45 and 60 dB has the potential to be highly controversial on environmental grounds and may be the subject of extraordinary circumstances precluding the use of a CATEX. FAA guidance also limits the need for noise screening to the study area below 10,000 feet AGL for departures and 7,000 feet AGL for arrivals, except when the proposed change is above a national park or wilderness area. In those cases, noise screening could be conducted up to 18,000 feet AGL [14].

Table 3-1. Noise Screening Change Thresholds

Proposed Action DNL Value (dB)	DNL Increase with Proposed Action (dB)
65 +	1.5 dB(1)
60-65	3.0 dB(2)
45-60	5.0 dB(3)

Source:
(1) FAA Order 1050.1E, Appendix A, 14.3; Part 150, Sec. 150.21(2) (d); FICON 1992
(2) FAA Order 1050.1E, Appendix A, 14.4c; FICON 1992
(3) FAA Order 1050.1E, Appendix A, 14.5d, 14.5e

The change analysis requirements add an additional layer of complexity to noise screening. As a result, it was important to develop a more complete understanding of the noise environment to include the location of the expected 45 dB, 60 dB and 65 dB DNL levels of exposure in order to determine the potential for noise impacts in accordance with FAA Order 1050.1E. Consistent with the notion of screening, conservative rules-of-thumb were developed to minimize the complexity of using noise screening techniques:

1. An altitude of 3,000 feet AGL was adopted as the cut-off point for DNL levels of 65 dB. The noise screening process tests for the potential for significant impacts below 3,000 feet AGL using 1.5 dB as the minimum acceptable change.
2. An altitude of 7,000 feet AGL was adopted as the cut-off point for DNL levels of 60 dB. The noise screening process tests for extraordinary circumstances between 3,000 feet AGL and 7,000 feet AGL using the more stringent FICON criterion of 3 dB.

3. An altitude of 10,000 feet AGL was adopted as the cut-off point for DNL levels of 45 dB. Based on the EECP, FAA adopted *Notice of Change in Air Traffic Noise Screen Policy* [15] recognizing 10,000 feet AGL as an acceptable altitude cut-off for DNL levels of 45 dB or more. Further, the EECP EIS identified a change of 5 dB as the threshold above which the potential exists for extraordinary circumstances.

3.2 Process Overview

The noise screening process allows for quick identification of those actions that could result in significant impacts to the environment due to aircraft noise or that may be highly controversial on environmental grounds; this approach facilitates proper budgeting and scheduling for detailed noise analyses, and helps focus resources on the most challenging issues. Effective implementation of this process, however, requires an understanding of user groups, actions, and outcomes.

Figure 3-1 depicts the various elements of the noise screening process at a high level. The noise screening process starts with an air traffic action initiated by the FAA or other stakeholders. The proponent performs the noise screening steps, starting with the Environmental Pre-screening Filter [16] and moving to the noise screening tests if needed. The action proceeds to the FAA for approval and documentation if it passes noise screening at any point. Otherwise, the proponent could refine the proposal or seek assistance from a SC ES. In general, the Environmental Pre-Screening Filter helps to determine if operations numbers are high enough to generate noise at levels likely to cause noise impacts. The noise screening tests, on the other hand, test for the magnitude of the impact. The noise screening tests vary in complexity from simple tables to FAA-approved models; the user should start with the simplest test for their specific circumstances before attempting more complex tests. The technical approach for the noise screening tests is documented in the *Technical Addendum to the Noise Screening Guidance* [17].

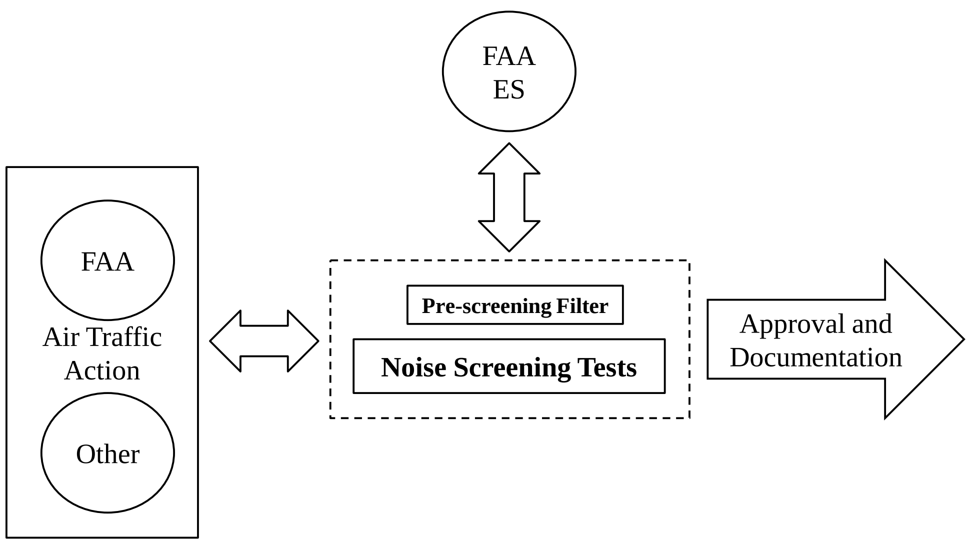


Figure 3-1. Noise Screening Process

4 Potential Users of the Noise Screening Process

The noise screening process is available to a wide range of users involved with developing new or revised ATC routes and procedures. The aim is to provide easy-to-use tools for quick review of air traffic proposals, therefore minimizing delays in the environmental review process. This section presents individuals or groups most likely to benefit from this process; this overview is not all-inclusive, and should not limit the use of this process in any way. Potential user groups include:

- FAA– including personnel within the ATO; FAA managers with environmental responsibilities including functional managers in the areas of procedure development, maintenance and redesign (e.g., FAA ATC facility managers); SC ESs as the FAA's Subject Matter Expert (SME) for aircraft noise issues, including the noise screening process and tools etc.
- Public entities – other federal, state or local agencies, citizen groups, etc.
- Private entities – air carriers, airport authorities, general aviation stakeholders, manufacturers of airframes, engines or avionics, consultants, etc.

Understanding of the user groups frames the discussion presented in the following section of air traffic actions suitable for noise screening.

5 Air Traffic Actions Suitable for Noise Screening

A Federal action is any public or private proposal subject to Federal control and/or responsibility. Air traffic actions are Federal actions because they require FAA involvement. One of the challenges of noise screening is to define these actions in sufficient detail for noise evaluations. The following sections address broad categories of air traffic actions, and the kinds of changes they involve.

5.1 Examples of Air Traffic Actions

As previously mentioned in Section 3.1, noise screening is required for arrivals below 7,000 feet AGL and departures below 10,000 feet AGL. These limits increase to 18,000 feet AGL over national parks or wilderness areas. Within these areas, air traffic actions could include route or procedure utilization changes, vertical profile changes, and PBN procedures as follows:

- **Route or procedure utilization –** includes routes and procedures that may increase the frequency of events, the number of nighttime events (between 10:00 p.m. and 07:00 a.m.), the number of certain aircraft types, etc. In California, increases in the number of evening events (between 7:00 p.m. and 10:00 p.m.) should also be considered. These changes could result in increased noise levels over sensitive receptors.
- **Movement of a route or procedure resulting from adding, removing or changing the location of a fix –** these changes could introduce traffic over new areas, potentially resulting in an increased noise exposure over a sensitive receptor.
- **New conventional or Area Navigation (RNAV)/Required Navigation Performance (RNP) route or procedure –** Inherent in the FAA’s mission to provide a safe and efficient NAS is the need to introduce new airspace design practices as they mature. The introduction of new routes or procedures under certain conditions could cause aircraft to fly over new areas, potentially resulting in an increased noise exposure over a sensitive receptor.
- **Optimized Profile Descent (OPD) or removal of altitude restrictions -** Optimization of vertical profiles is an important element of NextGen. These actions enable aircraft to maximize the time spent at higher altitudes, using lower thrusts, and flying in favorable winds, therefore minimizing fuel consumption and other environmental impacts. In practice, the number of level-offs or hold-downs are reduced which may lead to a reduction in noise exposure. In some cases, changes in vertical profiles may result in the lowering of altitude potentially leading to an increased noise exposure over a sensitive receptor.

- **RNAV/RNP overlay of a conventional route or procedure –** As part of NextGen, FAA is implementing an increasing number of RNAV/RNP procedures, including overlays of existing conventional routes or procedures. RNAV/RNP helps concentrate traffic over the centerline of the route, therefore reducing the amount of dispersion. This capability has the advantage of more predictable paths to improve safety and throughput. However, the concentration of traffic could cause an increase in the number of operations over the centerline, potentially resulting in an increased noise exposure over a sensitive receptor.

The potential to increase noise over a sensitive receptor results from certain types of changes. The following sections discuss the kinds of changes to routes and procedures that could result in noise impacts on the ground.

5.2 Define the Proposed Action

Properly defining the proposed action to be evaluated is the most important step and perhaps the most difficult step in the screening process. Those that have developed the action or desired change will sometimes present it in terms of only the primary change, which is often the change that affects the most air traffic. While this is important, it may not reflect all the physical changes to aircraft location that a proposed action could produce. A comprehensive definition of the proposed action is required so that the analysis process can properly account for all the secondary effects of the action.

In an effort to ensure that a well-defined action is screened, the definition process has been broken down into three parts. These include defining the primary action, identifying any secondary actions that the primary change may cause, and detecting any other effects that could have a bearing on the noise screening input.

5.2.1 Primary Actions

Defining the primary action or change should generally be straightforward. The user should obtained detailed information about the new or modified route or procedure from the procedure designer.

The necessary information can be in several forms, but should at least include a description of the new route or procedure as well as the current route or procedure that is being changed, moved or eliminated. The information should either include mapping of the nominal route or be adequate enough that the route can be mapped accurately. Designs developed in TARGETS will have adequate detail and the TARGETS files are a good source.

In cases where procedure altitudes are changing either on an existing route or for a new route, the user should obtain the altitudes. Furthermore, if possible, the user should gather actual (not procedural) typical altitudes for the current procedure or route being changed. This can be important as typical actual altitudes can sometimes vary, especially where vectoring is common. Also, there may be flat spots (departure tunneling or arrival step-downs) in the actual current condition that may be moved or eliminated with the new procedure/route. This type of change could have a beneficial impact on the overall noise under the route. This information can come from a modest analysis of radar data, which the procedure designers may have gathered.

Finally, if a primary component of the action relates to changing the amount or type of traffic that is typically assigned to a route or procedure, the user should obtain these parameters in adequate detail. Again, in order to understand the potential effect of this type of change, it is important to have accurate information related to the traffic mix and volume that is currently using the route or procedure. Table 5-1 summarizes the key data needed by type of change expected.

Table 5-1. Data Requirements

Type of Change	Key Data
Route Location	Route location data for the current and proposed routes along with the altitude and operations information below. Note that the lowest typical altitude where the route moves is especially important.
Altitude	Route location data and several typical altitudes along current route up to 10,000 feet AGL. Must include the lowest altitude where the procedure changes or there is a lateral move of the route. The information should include typical altitudes every 1,000 to 2,000 feet.
Operations Increase	Route location data, the altitude data described above, and the AAD operations for the route before the change, the expected number after the change, type of aircraft, and the time of day (daytime [7:00 a.m. to 10:00 p.m.] or nighttime [10:00 p.m. to 7:00 a.m.], and evening [7:00 p.m. to 10:00 p.m. in California]). It is important to have both daytime and nighttime tallies.
Route Dispersion (for RNAV Procedures)	All of the above data and current route dispersion distances at different altitudes. RNP values for the proposed route.

5.2.2 Secondary Actions

Once the primary action is defined, the user should consider the possibility that the primary action could require or cause other changes to happen. While it is possible that these secondary actions have been incorporated and documented as part of the new route or procedure design, often a little detective work is required.

As an example, an action could be presented with detailed information (TARGETS package/files, etc.) related to the creation of a “new north departure route to relieve a heavy north-bound departure push that occurs early in the afternoon.” The information provided may include the definition of the new route along with the existing north routes that are not changing. While this may seem like a simple and adequate definition of the action, further investigation may reveal secondary changes.

Additional discussions with the designers and/or controllers might reveal that while the new route is indeed the primary change, a nearby arrival route may also have to be shifted to accommodate the new departure route. Other types of secondary actions might include changes to vectoring patterns near the new route, or possible changes in altitudes on other routes to better accommodate the new route. The new route could also cause changes to routes to/from satellite airports.

The user should always consider the possibility of secondary actions prior to noise screening. Discussions with the designers and/or controllers may help to reveal any secondary changes. In addition, reviewing the proposed procedure or route in TARGETS along with some radar data may reveal other things that might need to change. Once the user identifies these changes, they need to define them to the same extent as the primary action.

5.2.3 Other Effects

In addition to secondary actions, there are other effects that could result from the action and have a notable influence on the noise screening analysis. These effects are generally not anticipated as part of the new procedure or route design and are usually only found if specifically investigated or after implementation.

In terms of noise screening, the two most important other effects that could be overlooked in the primary and secondary action identification process are possible changes to runway use or changes to route loadings below 3,000 feet AGL. A lesser potential is an unintended change to nighttime traffic patterns.

The user should consider any changes to runway use a red flag in the screening process as they could create changes in the DNL 65 dB or higher noise levels. The key is to consider the potential for the new route or procedure to make using a specific runway, configuration, or flow more or less desirable. While the action may not be “officially” changing the runway use or preference, it could affect the day-to-day operating of the airport as the most efficient runways tend to get used most. Since even an unofficial practical change in runway use could affect the higher noise levels near the airport, this possibility must be considered when defining the action. This screening process may not be applicable if there is a possibility of a runway use change; in those cases, the user should coordinate the subsequent course of action with a SC ES.

Another potential issue could arise when the action relates to moving traffic from one departure route to another. As long as both routes are the same below 3,000 feet AGL, then the screening process applies. However, if for some reason the traffic being moved comes from a route that uses a different departure heading or a different ground track below 3,000 feet AGL, the action effectively is a change below 3,000 feet. This screening process may also not apply in these cases and consultation with a SC ES is appropriate.

Finally, the user should also consider any potential to affect evening operations (7:00 p.m. to 10:00 p.m.) or nighttime (10:00 p.m. to 7:00 a.m.) operations. In general, there is a 10-times penalty (each operation is counted as 10) placed on nighttime operations in the DNL metric. Further, there is a 3-times penalty placed on evening operations in the CNEL metric used in California. Any unintended changes to evening or night traffic patterns could have a notable effect on predicted noise levels. These changes could be in the form of less use of direct routing (short cuts) during off-peak hours (evening or night) and, as a result, an increased use of other routes. Conversely, these changes could be a disproportionally high use of short cuts during off-peak hours if they provide more favorable routing. While the noise screening process can address changes in evening and nighttime operational levels, it is important to identify the subtle effect and be sure to incorporate it into the analysis.

6 Noise Screening Tools and Tests

This section describes the noise screening tools, and the hierarchy of tests available for various changes. As previously discussed in Section 5, air traffic actions can be stand-alone changes or a series of interdependent changes, all of which require evaluation under NEPA.

6.1 Noise Screening Tools

The noise screening tools consist of a hierarchy of tools or techniques to evaluate changes to route or procedures for fixed-wing aircraft. The recommended practice is to start with the simpler tools, switching to more complex ones only if the test fails. In general, the simpler tools evaluate isolated changes with the goal of deriving quick but conservative results and require input of a minimal amount of data. The more complex tools evaluate multiple interdependent changes and require input of a more comprehensive set of data. The following tools are available for noise screening and are listed in order of complexity:

- Environmental Pre-screening filter (Pre-Screening): a web-based portal that helps make an initial determination based on operational requirements and/or other policy exemptions
- Operations Test (OPS): a tool to help decide if further noise screening is required based on the number of operations at the airport of interest
- Traffic Test (TRAF): a tool to determine if the change in the number of operations is enough to cause a change in DNL exceeding the noise screening thresholds
- Lateral Movement Test (LAT): a tool to determine if the lateral movement of a route resulting from adding, removing or changing the location of a fix is enough to cause a change in DNL exceeding the noise screening thresholds
- Altitude/Operations Test (A/O): a tool to determine if changes in the number of operations or altitudes or both are enough to cause a change in DNL exceeding the noise screening thresholds
- RNAV/RNP Overlay Test (RNVO): a tool to determine if the change in the lateral dispersion of a route is enough to cause a change in DNL exceeding the noise screening thresholds
- TARGETS Noise Plug-in: a tool to determine if the proposed design including changes in location, altitude, lateral dispersion are enough to cause a change in DNL exceeding the noise screening thresholds
- Noise Screening Tool (NST)/Aviation Environmental Screening Tool (AEST): tools to conduct a detailed noise analysis of a baseline and a proposed design to determine if the proposed changes are enough to exceed the noise screening thresholds

The following sections provide more information about each test, including required inputs and limitations.

6.1.1 Environmental Pre-Screening Filter

The FAA developed the Instrument Flight Procedure (IFP) environmental pre-screening filter as the initial screening tool for new procedures or modifications to existing procedures. Using the filter, the proponent would research and provide sufficient information about the proposed action by answering a series of simple questions. Based on the proponent’s inputs, the environmental pre-screening filter would provide information to assist the responsible FAA official in determining whether a CATEX is appropriate, or if additional noise screening is required. The output of the environmental pre-screening filter could also serve as the initial data set for subsequent noise screening. The objective of pre-screening is to enable an expedited initial environmental review at the proponent’s level using a reliable and efficient process. (Note: At the time this document was completed, the Environmental Pre-Screening Filter had not been released.)

6.1.2 Operations Test (OPS)

The OPS Test helps determine if further noise screening is required based on the number of operations at the airport of interest. FAA Order 1050.1E, paragraph 14.6, states that no noise analysis is needed for proposals involving Design Group I and II airplanes (wingspan less than 79 feet) in Approach Categories A through D (landing speed less than 166 knots) operating at airports whose forecast operations in the period covered by the environmental review do not exceed 90,000 annual propeller operations (247 average daily operations) or 700 jet operations (2 average daily operations). Based on this document, Table 6-1 shows combinations of propeller and jet operations that must be exceeded for the airport of interest to warrant further noise screening. For example, an airport with 700 or less annual jet operations does not require noise screening. In a similar way, an airport with 662 or less annual jet operations and 5,000 or less annual propeller operations does not require noise screening. Appendix B presents an example of the OPS Test.

Table 6-1. OPS Test for the Airport of Interest

Annual Propeller Operations	Annual Jet Operations
0	700
5,000	662
10,000	622
15,000	584
20,000	544
25,000	506
30,000	466
35,000	428
40,000	388
45,000	350
50,000	310
55,000	272
60,000	232
65,000	194
70,000	154
75,000	116
80,000	76
85,000	38
90,000	0

6.1.3 Traffic Test (TRAF)

The TRAF Test is used to determine if the number of operations on a particular route or procedure is high enough to generate noise levels that exceed noise screening thresholds. The TRAF Test considers aircraft types, percent of operations during the time period of 10:00 p.m. to 07:00 a.m. (also 07:00 p.m. to 10:00 p.m. in California), and the altitudes flown. Using these factors, the test determines the maximum number of operations allowable before further noise screening is required. The TRAF Test can be performed for piston aircraft, small jets, turboprop aircraft, large jets, heavy jets, or any combination of them. The proposed action failing the TRAF Test is an indication that the potential exists for extraordinary circumstances or significant impacts. In those cases, the user must perform additional noise screening as discussed in this document. Appendix B presents an example of the TRAF Test.

6.1.3.1 Data Requirements

To perform the TRAF Test, the user must first collect the following AAD data on the proposed operations:

- The altitudes flown on the procedure or route; these altitudes should be the lowest typical altitude in AGL (not Mean Sea Level [MSL]) flown by each of the piton, small jets, turboprop, large jets and heavy jets categories
- Proposed operations between 10:00 p.m. and 07:00 a.m. multiplied by 10. In California, operations between 7:00 p.m. and 10:00 p.m. must also be multiplied by 3. The total of all operations during the 24-hour period (including the weighted evening and/or night numbers) are inputted into the test
- Presence of noise sensitive receptors near the changed portion of the route (refer to Appendix A for additional information on noise sensitive areas). While not a requirement, this information provides additional flexibility to pass the test. For example, the TRAF Test may not be necessary if the changed portion of the route is over water and there are no sensitive receptors in the vicinity

6.1.3.2 Conducting the TRAF Test (TRAF)

Tables 6-2 and 6-3 depict the TRAF Test for departure and arrival procedures, respectively. Noise screening is not required for changes to departure procedures above 10,000 feet AGL or arrival procedures above 7,000 feet AGL, and therefore, the tables do not go beyond these altitudes.

Step 1. Round down the flown altitude to the closest matching values on the TRAF Test tables

Step 2. For departures, using Table 6-2, enter on the row representing the altitude to be tested; move across the table to the column that is a conservative representation of the fleet mix. For example, if the fleet mix is composed of pistons and small jets, then use the small jets column as a conservative estimate. The altitude/aircraft group combination yields the maximum daily number of departure operations below which additional noise screening is not required (refer to Appendix B for an example of the TRAF Test)

Step 3. For arrivals, using Table 6-3, enter on the row representing the altitude to be tested; move across the table to the column that is a conservative representation of the fleet mix. For example, if the fleet mix is composed of pistons and small jets, then use the small jets column as a conservative estimate. The altitude/aircraft group combination yields the maximum daily number of arrival operations below which additional noise screening is not required (refer to Appendix B for an example of the TRAF Test)

Step 4. For fleet mixes consisting of any combination of piston, small jets, turboprops, large jets and heavy jets, use the TRAF Test spreadsheet tool if Steps 2 and 3 fail. The tool allows for entry of altitudes and specific number of operations for each aircraft group and is discussed in the following paragraph

Step 5. If the proposed action does not pass the TRAF Test, the user could revise the procedure design, use one of the LAT, A/O, or RNVO tests, attempt full screening using the TARGETS Noise Plug-in or similar tool, or request additional guidance from a SC ES

Table 6-2. TRAF Test for Departure Routes or Procedures

Altitude (feet AGL)	Pistons	Small Jets	Turboprops	Large Jets	Heavy Jets
0	0	0	0	0	0
500	1	0	0	0	0
1000	1	0	1	0	0
1500	4	0	5	0	0
2000	9	0	11	1	0
2500	14	0	16	1	1
3000	21	0	21	2	2
4000	43	1	25	5	6
5000	65	2	27	7	9
6000	97	3	30	10	13
7000	128	4	30	14	18
8000	161	6	31	18	24
9000	189	8	34	22	31
10000	368	18	53	44	64

Notes:
1 Counts by categories are mutually exclusive; test fails when counts exceed threshold for any one category

Table 6-3. TRAF Test for Arrival Routes or Procedures

Altitude (feet AGL)	Pistons	Small Jets	Turboprops	Large Jets	Heavy Jets
0	0	0	0	0	0
500	6	0	1	1	0
1000	28	1	4	3	1
1500	52	6	13	8	2
2000	92	16	26	13	3
2500	128	39	39	20	5
3000	164	68	58	56	8
4000	266	172	137	157	20
5000	394	368	249	285	41
6000	751	990	532	768	109
7000	751	990	532	768	109

Notes:
1 Numbers for 6,000 feet AGL and 7,000 feet AGL are intentionally identical due to noise modeling limitations
2 Counts by categories are mutually exclusive; test fails when counts exceed threshold for any one category

The TRAF Test spreadsheet tool depicted in Figure 6-1 provides more flexibility in terms of fleet mix, altitude, evening and night adjustments. The spreadsheet evaluates user inputs to indicate if the number of operations is high enough to warrant additional noise screening. The tool can be obtained from a SC ES. The following inputs are required as illustrated in Figure 6-1:

1. Enter the name of the route or procedure being analyzed.
2. Indicate if the route or procedure is located in the state of California by selecting yes/no on the pull down menu.
3. Indicate if this is a departure or an arrival route or procedure by selecting departure/arrival on the pull down menu.
4. Enter the number of operations on an AAD basis for pistons, small jets, turboprops, large jets and heavy jets.
5. Enter the altitudes flown by each aircraft group using the procedure discussed in Step 1 of the TRAF Test.
6. If the route or procedure is located in California, enter the percentage of operations between 7:00 p.m. and 10:00 p.m. for each aircraft group.
7. Enter the percentage of operations between 10:00 p.m. and 07:00 a.m. for each aircraft group; the tool indicates if the TRAF Test passes based on the user inputs.

ROUTE OR PROCEDURE NAME (1)				
IS THIS ROUTE OR PROCEDURE LOCATED IN CALIFORNIA?				NO (2)
IS THIS A DEPARTURE OR AN ARRIVAL ROUTE OR PROCEDURE?			(3)	DEPARTURE
PROPOSED FLIGHT OPERATIONS				
AIRCRAFT CATEGORY	AVERAGE ANNUAL DAY NUMBER OF OPERATIONS	ALTITUDE (FEET, AGL)	PERCENT 7:00 P.M. to 10:00 P.M. (CALIFORNIA ONLY)	PERCENT 10:00 P.M. to 07:00 A.M.
PISTON	5	3,000	0.00%	0.00%
SMALL_JET	1	5,000	0.00%	0.00%
TURBOPROP	0	0	0.00%	0.00%
LARGE_JET	(4) 0	(5) 0	(6) 0.00%	(7) 0.00%
HEAVY_JET	0	0	0.00%	0.00%
WARNING MESSAGES				
TRAF TEST PASSED; NOISE SCREENING IS COMPLETE				

Figure 6-1. TRAF Test Spreadsheet Tool

6.1.3.3 Limitations of the Traffic Test (TRAF)

The TRAF Test is used as an initial noise screening tool to check if the number of operations on a route is high enough to warrant further screening. However, this test may not be appropriate in cases involving military or other custom-built aircraft; the current tests are based on aircraft types in the FAA INM database as documented in Appendix A. The SC ES can provide additional guidance in situations where the TRAF Test may not suitable.

6.1.4 Lateral Movement Test (LAT)

The LAT Test is used to screen for potential noise impacts resulting from the lateral movement of a route that would occur by adding, removing or changing the location of a fix, assuming the location change occurs in isolation. This test can be used for both jet and/or propeller traffic, and also in cases where the location change is accompanied by an increase in altitude or a decrease in the number of operations. The proposed action failing this test is an indication that the potential exists for extraordinary circumstances above 3,000 feet AGL, or significant impacts at or below 3,000 feet AGL. In those cases, the user should perform additional environmental review in coordination with a SC ES. Appendix B presents an example of the LAT Test.

6.1.4.1 Data Requirements

To perform the test, the user first should first collect the following data on the existing and proposed route or procedure:

- Geographic coordinates of the fixes that define the route or procedure; this information is used to determine the greatest lateral displacement of the proposed route from the existing route in thousands of feet
- Lowest altitude flown along the changed portion of the route or procedure; this altitude must be specified in feet AGL, not MSL
- Presence of noise sensitive receptors near the changed portion of the route (refer to Appendix A for additional information on noise sensitive areas). While not a requirement, this information provides additional flexibility to pass the test. For example, the LAT Test may not be necessary if the changed portion of the route is over water and there are no sensitive receptors in the vicinity

6.1.4.2 Conducting the Lateral Movement Test (LAT)

The LAT Test is performed with one of the two charts shown in Figures 6-2 and 6-3. Figure 6-2 applies to air traffic actions at or below 3,000 feet AGL, whereas Figure 6-3 applies to air traffic actions above 3,000 feet AGL.

Step 1. Round down the altitude to the closest matching values on the LAT Test charts; conversely, round up the lateral displacement distance in feet to the closest matching value on the screening chart.

Step 2. If the lowest altitude along the changed portion of the route is at or below 3,000 feet AGL, proceed to Step 3 and use Figure 6-2. Otherwise, if the lowest altitude along the changed portion of the route is more than 3,000 feet AGL, go to Step 4 and use Figure 6-3.

Step 3. Using Figure 6-2, enter on the row representing the altitude to be tested (3,000 feet AGL or below); move across the chart to the column that best represents the proposed lateral movement in feet. If the altitude/lateral distance combination falls in the white zone, then the noise screening test passes for the proposed action.

Step 4. Using Figure 6-3, enter on the row representing the altitude to be tested (more than 3,000 feet AGL); move across the chart to the column that best represents the proposed lateral movement at that altitude. If the altitude/lateral distance combination falls in the white zone, then the noise screening test passes for the proposed action.

Step 5. If the proposed action does not pass the LAT for an isolated location change, the user could revise the procedure design, attempt full screening using the TARGETS Noise Plug-in or similar tool, or request additional guidance from a SC ES.

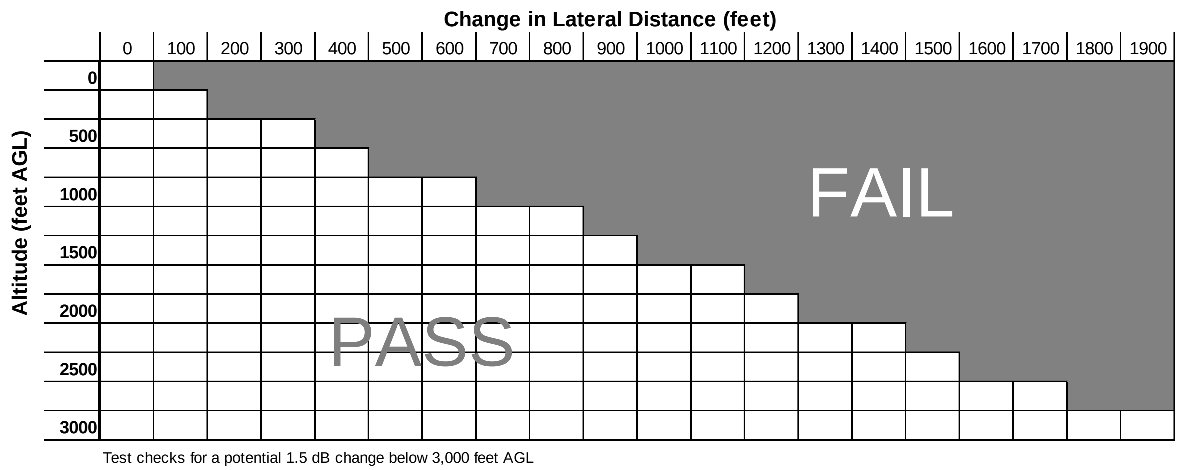


Figure 6-2. LAT Test At/Below 3,000 feet AGL

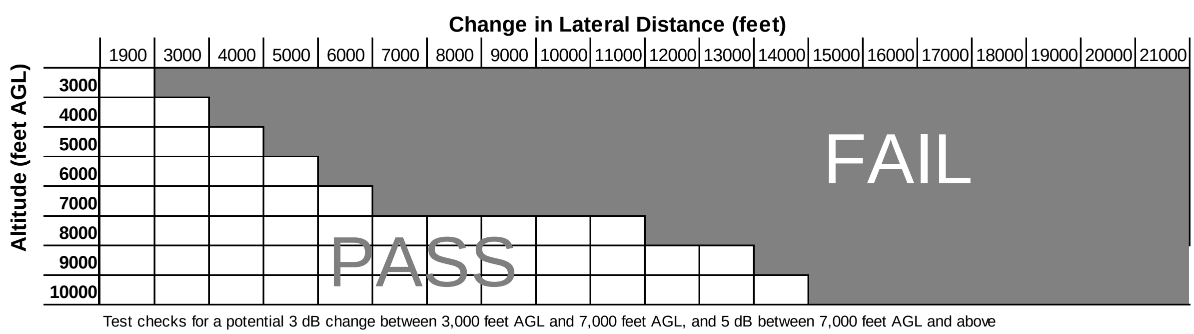


Figure 6-3. LAT Test Above 3,000 feet AGL

6.1.4.3 Limitations of the Lateral Movement Test (LAT)

The LAT Test is only valid for lateral displacement of an existing route normally resulting from creating or moving a fix, assuming all other factors remain unchanged. Further, the LAT Test may be used to screen for noise impacts when moving a fix more than once as part of the same procedure development action. For each of the revisions to the position of the fix during development of the procedure, the LAT Test should compare the revised position of the fix with the position that was in the initial design or the location of the fix in a published procedure. The SC ES can provide additional guidance in the following situations where the LAT Test may not suitable:

- Cases involving more than the lateral movement of a route resulting from changing a fix, for example, increases in the number of operations, changes in fleet mix, lowering of altitudes, etc.
- Cases where a conventional procedure is changed to an RNAV procedure; additional environmental review is required for the RNAV procedure

6.1.5 Altitude/Operations Test (A/O)

The A/O Test is used to screen for potential noise impacts resulting from a single change in altitude on a route or procedure, or simultaneous change in number of operations and altitude. This test applies to both jet and/or propeller traffic. The proposed action failing this test is an indication that the potential exists for extraordinary circumstances above 3,000 feet AGL or significant impacts at or below 3,000 feet AGL. In that case, the user should perform additional environmental review in coordination with the SC ES. Appendix B presents an example of the A/O Test.

6.1.5.1 Data Requirements

To perform this test, the user should first collect the following AAD data on the existing and proposed operations:

- Existing (Existing Ops) and Proposed operations (Proposed Ops) with operations between 10:00 p.m. and 07:00 a.m. multiplied by 10 (operations between 7:00 p.m. and 10:00 p.m. must also be multiplied by 3 for California). The percent change is computed as:

$$\%\ Ops\ Change = \frac{Proposed\ Ops - Existing\ Ops}{Existing\ Ops}$$

- If the increase in operations applies to a specific aircraft type only, collect the percent increase in the number of operations on an AAD basis. The percent change is computed following the same procedure as above, but including only operations for the aircraft of interest

- For a change in altitude, start with the lowest existing altitude in AGL (not MSL) ($Existing\ Alt$) typically flown at the location of the largest altitude decrease. Next, collect the lowest proposed altitude in AGL ($Proposed\ Alt$) expected to be flown along the route or procedure being investigated, once the action is implemented; the percent altitude change ($\%\ Alt\ Change$) is then computed as:

$$\%\ Alt\ Change = \frac{Proposed\ Alt - Existing\ Alt}{Existing\ Alt}$$

- Presence of noise sensitive receptors near the changed portion of the route. While not a requirement, this information provides additional flexibility to pass the test. For example, the A/O Test may not be necessary if the changed portion of the route is over water and there are no sensitive receptors in the vicinity

6.1.5.2 Conducting the Altitude/Operations Test (A/O)

The A/O Test is performed using one of Figures 6-4, 6-5 or 6-6 as follows:

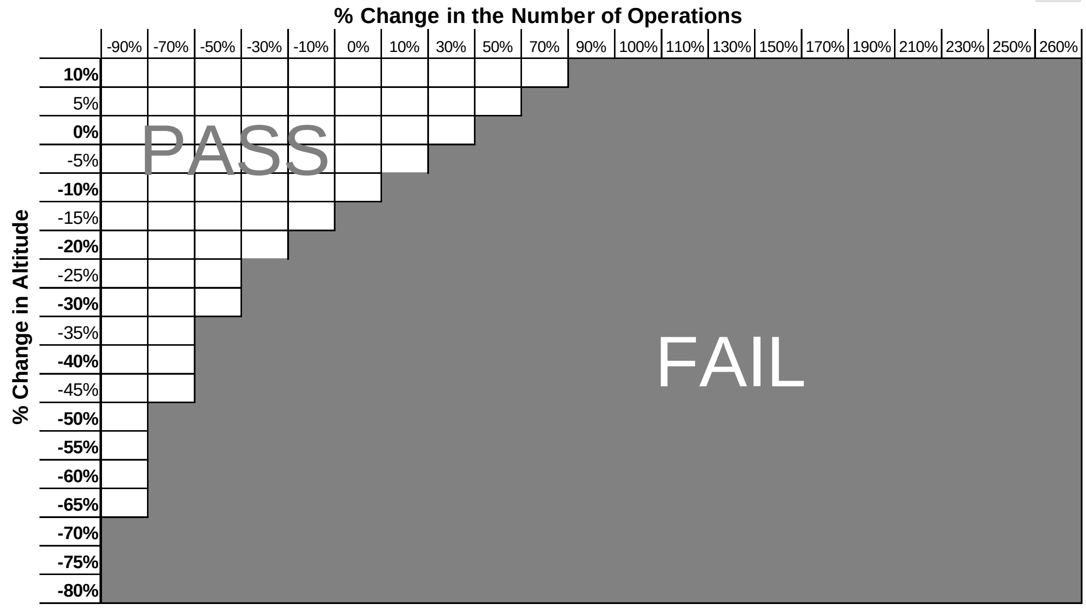
Step 1. Round the percent change in altitude up to the nearest 5%, and the percent change in operations up to the nearest 10%.

Step 2. If the lowest of the existing and proposed altitudes is at or below 3,000 feet AGL, then use Figure 6-4; enter on the row representing the computed percent change in altitude as a result of the action; next, move across the chart to the computed change in operations. If the combined operation and altitude change falls in the white zone, then the action passes the noise screening.

Step 3. If the lowest of the existing and proposed altitudes is above 3,000 feet AGL and at or below 7,000 feet AGL, then use Figure 6-5; enter on the row representing the computed percent change in altitude as a result of the action; next, move across the chart to the computed change in operations. If the combined operation and altitude change falls in the white zone, then the action passes the noise screening.

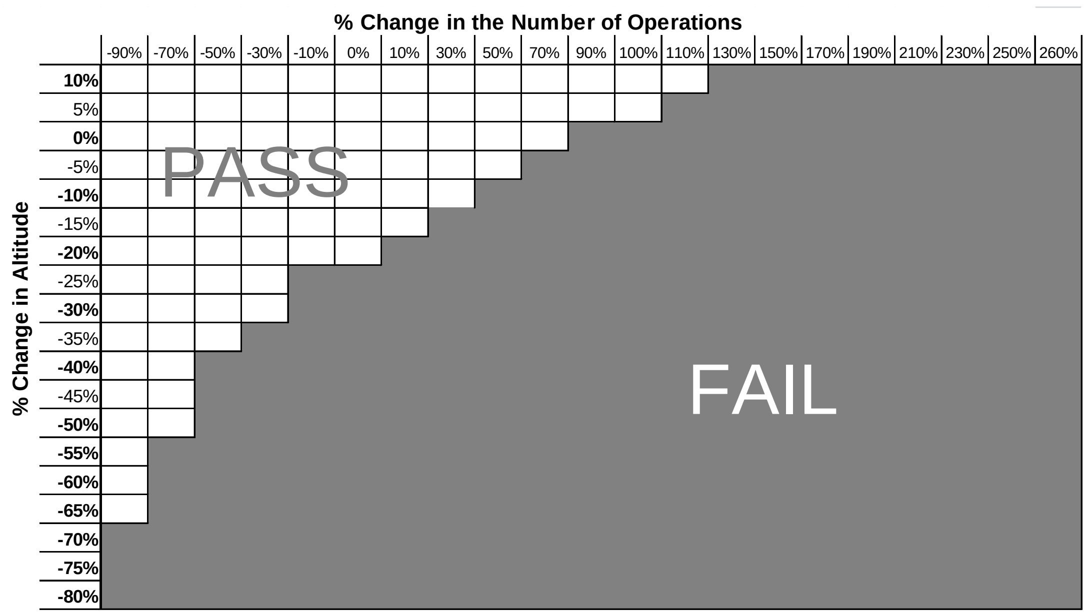
Step 4. If the lowest of the existing and proposed altitudes is above 7,000 feet AGL and at or below 10,000 feet AGL, then use Figure 6-6; enter on the row representing the computed percent change in altitude as a result of the action; next, move across the chart to the computed change in operations. If the combined operation and altitude change falls in the white zone, then the action passes the noise screening.

Step 5. If the proposed action does not pass the A/O Test, the user could revise the procedure design, attempt full screening using the TARGETS Noise Plug-in or similar tool, or request additional guidance from a SC ES.



Test checks for a potential 1.5 dB change below 3,000 feet AGL

Figure 6-4. A/O Test At/Below 3,000 feet AGL



Test checks for a potential 3 dB change between 3,001 feet AGL and 7,000 feet AGL

Figure 6-5. A/O Test Between 3,001 feet AGL and 7,000 feet AGL

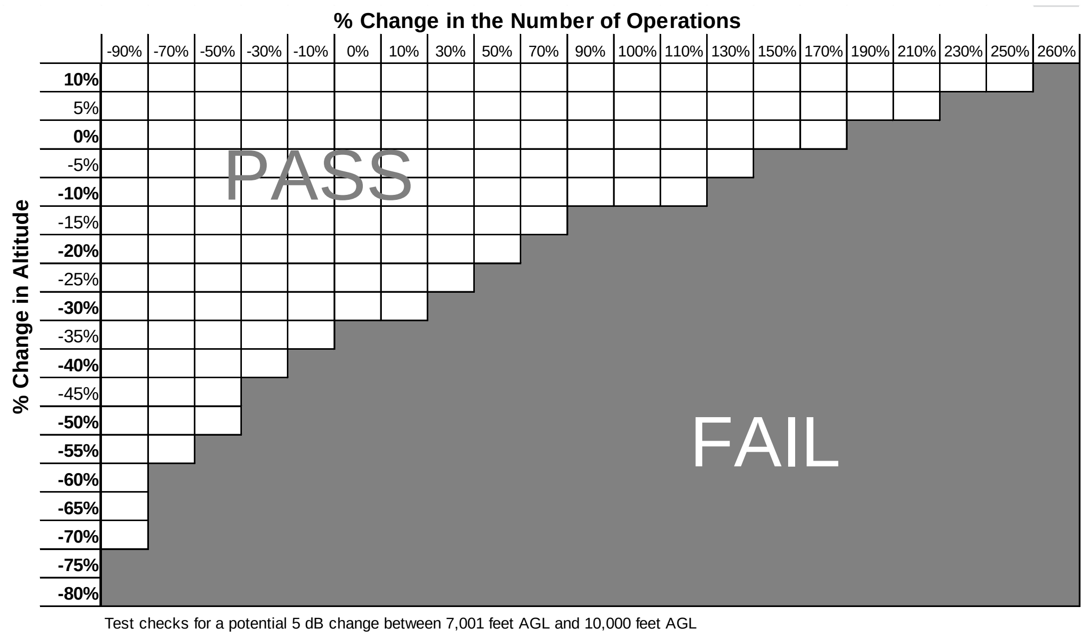


Figure 6-6. A/O Test Between 7,001 feet AGL and 10,000 feet AGL

6.1.5.3 Limitations of the Altitude/Operations Test (A/O)

The A/O Test is only valid for isolated or combined changes in total operations and/or altitude assuming all other factors remains unchanged. The A/O Test may be used to screen for noise impacts more than once as part of the same procedure development action. For each change of altitude or number of operations, the A/O Test should compare the revised altitude or number of operations with the existing altitude or number of operations. The SC ES can provide additional guidance in the following situations where the A/O Test may not suitable:

- Cases involving more than changes in operations and altitudes; for example, lateral movements of the route, changes in lateral dispersion, etc.
- Cases where a conventional procedure is changed to an RNAV procedure; additional environmental review is required for the RNAV procedure

6.1.6 RNAV Overlay Test (RNVO)

The RNVO Test is used to screen for potential noise impacts resulting from a PBN overlay of a conventional route or procedure. Under the PBN umbrella, RNAV and RNP are navigation capabilities that allow an aircraft to fly on any desired flight path within the coverage of ground or space-based navigation aids while maintaining a level of accuracy consistent with the onboard navigation equipment. The primary difference between RNAV and RNP is that RNP provides an onboard performance monitoring and alerting capability. With the NextGen program, FAA is increasingly relying on RNAV/RNP. The navigation system error specifications depend on the type of equipment and the training of the crew. For example, an RNAV-1 aircraft would be able to maintain a lateral navigation accuracy either side of the centerline of less than 1 NM 95% of the time, and 2 NM, 99.99% of the time. Similarly, an RNP-0.3 equipped aircraft would be able to maintain lateral navigation accuracy either side of the centerline of less than 0.3 NM 95% of the time and 0.6 NM 99.99% of the time.

Notwithstanding the system error specifications described above, PBN SMEs estimate the actual lateral dispersions (total route widths) are generally no more than 0.5 NM for RNAV procedures and 0.3 NM for RNP procedures [18]. Figure 6-7 illustrates the concept of an RNAV/RNP overlay of a conventional route.

For the purpose of noise screening, the conventional route width is assumed to be whatever width is necessary to contain 95% of all flights whereas the RNAV and RNP route widths are assumed to be 0.5 NM and 0.3 NM, respectively. Appendix A provides additional guidance on how to determine the width of conventional routes. This test applies to both jet and/or propeller traffic; failing this noise screening is an indication that the potential exits for extraordinary circumstances, or significant impacts. In those cases, the user would perform additional environmental review in coordination with a SC ES. Appendix B presents an example of the RNVO Test.

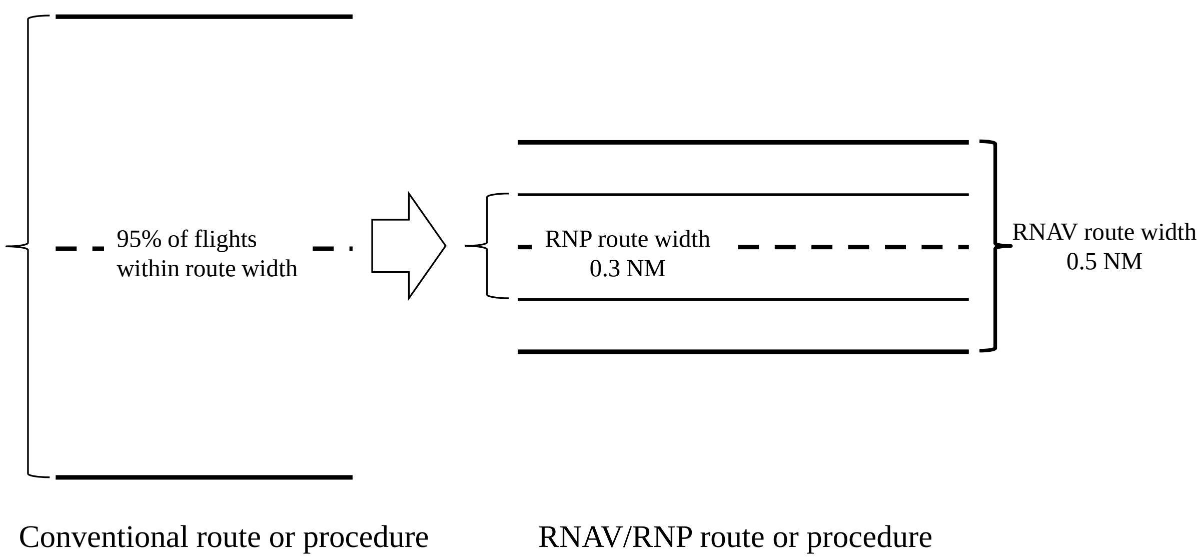


Figure 6-7. RNAV/RNP Overlay of a Conventional Route or Procedure

6.1.6.1 Data Requirements

To perform this test, the user first collects the following data on the existing and proposed operations:

- Route width of the conventional procedure (the width containing 95% of all operations on an AAD basis)

- Route width of the proposed RNAV/RNP procedure, i.e., 0.5 NM for RNAV procedures and 0.3 NM for RNP procedures
- Altitude along the affected segment of route as the lowest of (1) the typical altitude currently flown and (2) the typical altitude expected to be flown once the RNAV/RNP overlay is implemented; for noise screening, these altitudes must be specified as AGL not MSL
- Presence of noise sensitive receptors near the changed portion of the route. While not a requirement, this information provides additional flexibility to pass the test. For example, the RNVO Test may not be necessary if the changed portion of the route is over water and there are no sensitive receptors in the vicinity

6.1.6.2 Conducting the RNAV Overlay Test (RNVO)

The test is performed using Figure 6-8 as follows:

Step 1. Round the altitude at which the change is occurring down to the closest altitude on the chart.

Step 2. Round the conventional route width up to the closest matching value on the chart; conversely, round the RNAV/RNP route width down to the closest matching value on the chart.

Step 3. Enter the chart on the row corresponding to the altitude; next, move across the chart to the column representing both the conventional route width and the RNAV/RNP route width. If the intersection of the combined route widths and the altitude falls in the white zone, then the action passes the noise screening.

Step 3. If the proposed action does not pass the RNVO Test, the user could revise the procedure design, attempt full screening using the TARGETS Noise Plug-in or similar, or request additional guidance from a SC ES.

Altitude (feet AGL)	Conventional Route Width (NM)							Conventional Route Width (NM)						
	0.5	1	2	4	6	8	10	0.5	1	2	4	6	8	10
	RNAV Route Width (NM)							RNP Route Width (NM)						
	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3
0														
500														
1,000														
1,500														
2,000														
2,500														
3,000														
3,500												FAIL		
4,000						FAIL								
4,500														
5,000														
5,500														
6,000														
6,500														
7,000														
7,500		PASS							PASS					
8,000														
8,500														
9,000														
9,500														
10,000														

Test checks for a potential 1.5 dB change below 3,000 feet AGL, 3 dB between 3,000 feet AGL and 7,000 feet AGL, and 5 dB between 7,000 feet AGL and 10,000 feet AGL

Figure 6-8. RNVO Test

6.1.6.3 Limitations of the RNAV Overlay Test (RNVO)

The RNVO Test is only valid for isolated changes in the lateral dispersion of a route or a procedure, assuming all other factors remain unchanged. The SC ES can provide additional guidance in the following situations where the RNVO Test may not suitable:

- Cases involving more than a changed lateral dispersion, for example operations, altitudes, lateral movements, etc.
- Cases where a conventional procedure is changed to an RNAV procedure by means other than an overlay; additional environmental review is required for the RNAV procedure

6.1.7 TARGETS Noise Plug-in

TARGETS Noise Plug-in allows specialists to design procedures for the terminal environment and assess alternative concepts leading to final designs that consider both operational and noise constraints. The current version of the tool integrates FAA's INM. A future release will integrate with AEDT Version 2a for noise, fuel burn and emission computations. A detailed user guide of the TARGETS Noise Plug-in can be downloaded by the SC ES at https://tracker4.caasd.org/uploaded_files/outcomes/2012/TARGETS_AEDT_INTERFACE_USERS_GUIDE.pdf [19] and provided to the users.

6.1.8 Noise Screening Tool (NST)/Aviation Environmental Screening Tool (AEST)

FAA provided NST Release 7.0a in May 2009 for evaluating changes in aircraft routing, aircraft altitude, aircraft fleet mix, number of operations, time of day, and operational procedures. The user can either import data from other sources and/or manually create the routes and associated data in NST. Once the user has performed the analysis, NST prepares a report for the user detailing the results and any potential increase or decrease in noise due to the proposed air traffic action.

FAA is in the process of developing AEST as the replacement for NST. Similar to NST, AEST could be used to determine if the potential exists for increased noise levels over sensitive locations as result of proposed air traffic actions. AEST will leverage AEDT technology and provide the capability to conduct tradeoff analysis between noise and emissions. Specific guidance on the use of the AEST application will become available when the application is released.

6.2 Air Traffic Actions and Corresponding Tests

In the previous sections, the noise screening tools and techniques have been presented as stand-alone instruments to evaluate single, well-defined changes. In practice, however, air traffic actions are configured in ways that are more complex; for example, the primary and secondary changes may require different sets of tests. Table 6-4 describes different situations and the recommended sequence of tests during noise screening. For example, in a situation where the change associated with the proposed action is solely the lateral movement of a route, the user should attempt in sequence the Pre-screening, OPS, TRAF, LAT, and TARGETS Noise Plug-in and AEST, if required. The subsequent test in the sequence is required only if the preceding test fails. For a combination of changes such as an altitude decrease coupled with an increase in operations, the user should attempt in sequence the Pre-screening, OPS, TRAF, A/O, and TARGETS Noise Plug-in and AEST, if required. Again, the subsequent test in the sequence is required only if the preceding test fails. The user may also start with any of the tests in a sequence.

Table 6-4. Noise Screening Tests and Sequence

Changes				Noise Screening Tests and Sequence					
Lateral Movement of a Route	**Altitude Decrease**	**Operations Increase**	**RNAV/RNP Overlay**	**1**	**2**	**3**	**4**	**5**	**6**
Yes	No	No	No	**Pre-Screening**	**OPS**	**TRAF**	**LAT**	**TARGETS Noise Plug-in**	**AEST**
No	Yes	No	No	**Pre-Screening**	**OPS**	**TRAF**	**A/O**	**TARGETS Noise Plug-in**	**AEST**
No	No	Yes	No	**Pre-Screening**	**OPS**	**TRAF**	**A/O**	**TARGETS Noise Plug-in**	**AEST**
No	No	No	Yes	**Pre-Screening**	**OPS**	**TRAF**	**RNVO**	**TARGETS Noise Plug-in**	**AEST**
No	Yes	Yes	No	**Pre-Screening**	**OPS**	**TRAF**	**A/O**	**TARGETS Noise Plug-in**	**AEST**
Other Combinations of Changes				**Pre-Screening**	**OPS**	**TRAF**	**TARGETS Noise Plug-in**	**AEST**	**-**

7 List of References

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[19] Duenas, J. and J. Harding, March 2012, *TARGETS-AEDT Environmental Screening Tool User's Guide*, McLean, VA.

Appendix A Data Collection

This appendix presents data gathering techniques for developing an Average Annual Day (AAD) for noise screening and/or noise modeling. The data sources vary depending on the level of analysis to be conducted. For preliminary screening tests such as the Environmental Pre-Screening Filter (Pre-screening), the Operations Test (OPS), the Traffic Test (TRAF), the Lateral Movement Test (LAT), the Altitude/Operations Test (A/O) or the Area Navigation (RNAV) Overlay (RNVO), specific sets of data are required for conducting the tests. For detailed noise modeling using the Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS) Noise Plug-in or similar tool, radar track data may be more appropriate. The following sections discuss data for the various noise screening techniques starting with a discussion of an AAD.

A.1 Average Annual Day Data

For noise modeling purposes, the AAD concept implies the collection of data representative of long-term variations of airport operations. Collecting AAD data is a key process of performing noise modeling because the Day-Night Average Sound Level (DNL) and other similar metrics are based on long-term exposure to airport operations. Due to the cyclical nature of airport operations, one year of data is generally accepted as representative of the long-term variations of airport operations. The following sections discuss ways of reducing the burden of collecting one year of operational data for noise screening or noise modeling.

A.1.1 Flight Operations

A flight operation is an approach or a departure of a single aircraft (an approach followed by a departure is counted as two operations). For air traffic actions, an overflight of the study area is also counted as one operation. The number of operations is one of the most important considerations of noise screening. Operations data can be collected from one of the following sources, depending on the complexity of the analysis:

1. Documents describing the proposed action, for example, design studies; while the information may be notional, it may still be adequate for noise screening tests.
2. Previous Environmental Assessment (EA), Environmental Impact Statement (EIS), and other environmental documents; when this information is modified based on the requirements of the proposed action, the supporting rationale should be documented along with the noise screening test.
3. Requests to the airport authority; this is an excellent source of information to help establish the AAD, particularly flight operations.
4. Interviews of Subject Matter Experts (SMEs to collect estimates based on their experience; both the source and the rationale for SME estimates should be documented with the noise screening test. For example, correspondence with Air Traffic Control Tower (ATCT)/ Terminal Radar Approach Control

(TRACON)/Air Route Traffic Control Center (ARTCC) staff should be documented to the extent that they help explain operations estimates.

5. Data from FAA's Office of Aviation Policy and Plans (APO) databases located at https://aspm.faa.gov/Default.asp. Specifically, Aviation System Performance Metrics (ASPM), Aviation Performance Metrics (APM), Operational Network (OPSNET), Air Traffic Activity System (ATADS), Traffic Flow Management System Count (TFMSC), Terminal Area Forecast (TAF) are all good sources of operations data.
6. Samples of radar track data representative of an AAD; the methodology for selecting the radar track data sample is discussed in Section A.3.

Another consideration is the fleet mix, i.e., the distribution of operations by specific aircraft types (and sometimes specific aircraft/engine combinations). Fleet mix is important because noise levels of different aircraft types may vary widely. Fleet mix data can be obtained from the above-referenced sources for operations data.

Another requirement for operations is the distribution by daytime periods of 07:00 a.m. to 10:00 p.m. local and nighttime periods of 10:00 p.m. to 07:00 a.m. local. For the purposes of DNL, nighttime operations are weighted by a factor of 10. In California where CNEL is used, evening operations between 07:00 p.m. and 10:00 p.m. local are also weighted by a factor of 3. In addition to the above-referenced sources for operations data, this information can also be obtained from APO's Flight Schedule Data System (FSDS) at https://aspm.faa.gov/Default.asp or the Official Airline Guide (OAG) for commercial airports.

A.1.2 Flight Tracks

Flight tracks are the trajectory of the aircraft as it flies a route or a procedure. Areas directly underneath a flight track often experience higher noise levels. Flight tracks are a function of the geometry of the airport's runways, surrounding airspace structure, and airport configuration. Nominal flight track information can be obtained from:

1. Documents describing the proposed action, for example, design studies; while the information may be notional, it may still be adequate for noise screening tests.
2. Previous EAs, EISs, and other environmental documents; when this information is modified based on the requirements of the proposed action, the supporting rationale should be documented along with the noise screening test.
3. Publicly-available Instrument Approach Procedure (IAP), Departure Procedure (DP), and Standard Terminal Arrival (STAR) charts.
4. Requests to the airport authority; this is an excellent source of information to help establish the AAD.
5. Interviews of SMEs to collect estimates based on their experience; both the source and the rationale for SME estimates should be documented with the noise

screening test. For example, correspondence with ATCT/TRACON/ARTCC staff should be documented to the extent that they help explain the location of tracks

6. Samples of radar track data representative of an AAD; the methodology for selecting the radar track data sample is discussed in Section A.3. The degree of lateral dispersion on a current route could also be derived for use with the RNVO Test.

A.1.3 Flight Profiles

A flight profile is the location, altitude, speed and thrust information for a specific aircraft along the route or procedure of interest. While complete flight profiles are required for modeling with the TARGETS Noise Plug-in or similar tool, only altitude is required for most noise screening tests. Profile data can be collected from the following sources:

1. Documents describing the proposed action, for example, design studies; while the information at times be notional, it may still be adequate for noise screening tests.
2. Previous EAs, EISs, and other environmental documents; when this information is modified based on the requirements of the proposed action, the supporting rationale should be documented along with the noise screening test.
3. Publicly-available IAP, DP, and STAR charts.
4. Interviews of SMEs to collect estimates based on their experience; both the source and the rationale for SME estimates should be documented with the noise screening test. For example, correspondence with ATCT/ TRACON/ARTCC staff should be documented to the extent that they help explain altitudes used in noise screening.
5. Samples of radar track data representative of an AAD; the methodology for selecting the radar track data sample is discussed in Section A.3.

The user should attempt to remain conservative consistent with the notion of noise screening when selecting altitudes. Altitude profile is required for air traffic changes below 7,000 feet Above Ground Level (AGL) for arrivals, 10,000 feet AGL for departures, and up to 18,000 feet AGL above national parks and wilderness areas.

A.1.4 Runway Use Data

Runway use is to the long-term allocation of traffic to specific runways. Runway use may be further broken down by categories of aircraft (jet vs. propeller, etc.), time periods of 07:00 a.m. to 10:00 p.m. or 10:00 p.m. to 07:00 a.m., etc. Runway use data can be collected from the following sources:

1. Documents describing the proposed action, for example, design studies; while the information may at times be notional, it may still be adequate for noise screening tests.

2. Previous EAs, EISs, and other environmental documents; when this information is modified based on the requirements of the proposed action, the supporting rationale should be documented along with the noise screening test.
3. Requests to the airport authority; this is an excellent source of information to help establish the AAD, particularly runway use.
4. Interviews of SMEs to collect estimates based on their experience; both the source and the rationale for SME estimates should be documented with the noise screening test. For example, correspondence with ATCT/TRACON/ARTCC staff should be documented to the extent that they help explain the runway use data.
5. Data from the FAA's Office of Aviation Policy and Plans (APO) databases located at https://aspm.faa.gov/Default.asp, specifically ASPM data.

A.2 Other Relevant Data

Other information that may be useful for noise screening/modeling includes the location of noise sensitive areas and elevation data. Understanding noise sensitive locations helps limit the scope of noise screening to the locations that are truly impacted by noise. For example, failing noise screening tests may not be an issue over a body of water that is not protected as a park. In addition, elevation data is useful for determining altitudes for noise screening since most altitude data is MSL and noise screening requires AGL data.

A.2.1 Noise Sensitive Locations

Noise sensitive locations are areas where noise interferes with typical activities and/or uses. For example, residential uses, educational, health, religious facilities and sites, quiet use parks and recreational areas (including areas having wilderness characteristics), wildlife refuges, and cultural and historical sites are generally considered as noise sensitive locations.

The United States Census Bureau provides statistics for all states and counties, and for cities and towns to include land uses, population distributions, etc. TIGER/Line[1] data are spatial extracts from the U.S. Census databases containing the above-referenced features as well as roads, railroads, rivers, legal and statistical geographic areas, etc. The data can be downloaded from the U.S. Census website at http://www.census.gov/geo/www/tiger/tgrshp2010/2010DP1.html. Federal Information Processing Standard (FIPS) codes can be used to identify both legal and statistical entities for county subdivisions. Table A-1 shows a sample of FIPS codes that can be used to identify county level data.

Table A-1. Sample FIPS Codes

State	FIPS	Code	County	FIPS Cl
AL	1	1	Autauga	H1
AL	1	3	Baldwin	H1

[1] TIGER/Line is a federally registered trademark of the U.S. Census Bureau

State	FIPS	Code	County	FIPS Cl
AL	1	5	Barbour	H1
AL	1	7	Bibb	H1
AL	1	9	Blount	H1

Other sources of information include the National Park Service (NPS) website at https://irma.nps.gov/App/Portal/Home for noise sensitive locations data and the local planning and zoning department for land use data. The NPS site provides information on more than 124 historical parks or sites, 75 monuments, 58 national parks, 25 battlefields or military parks, 18 preserves, 18 recreation areas, 10 seashores, four parkways, four lakeshores, and two reserves administered by the agency.

A.2.2 Terrain Data

As an input, altitude is one of the most important variables affecting the outcome of noise screening tests. Altitudes must be in AGL, which implies knowledge of the ground elevation in the study area when the reported altitude is MSL. Consistent with the notion of noise screening, the highest ground elevation near the study area should be used when computing the altitude in AGL:

$$Altitude\ (feet\ AGL) = Altitude\ (feet\ MSL) - Ground\ Elevation$$

Resources such as the Google Earth website at http://www.google.com/earth/index.html, and the United States Geological Survey (USGS) site at http://viewer.nationalmap.gov/viewer/ can be used to determine the ground elevation in the vicinity of the route. Previous studies with topographical maps of the region may also provide the necessary information.

A.3 Radar Track Data

Radar data can be acquired from the FAA's Offload Extractor Site at http://172.27.66.131/ATALAB/OffloadExtractor which is available to FAA personnel. The objective when downloading radar track data is to have sufficient information to represent an AAD. In general for all airports in the NAS [17], 90 days of radar track data sampled randomly over the course of one year provide a conservative representation of an AAD. However, noise screening tests may be performed with reduced samples representing typical conditions for a route or procedure. The following sections discuss specific uses of radar track data for noise screening.

A.3.1 Radar Track Data for Noise Screening

For noise screenings using one of the TRAF, LAT, A/O and RNVO tests, a sample of radar track data including the major configurations that use the procedure or route of interest would be adequate. The screener should select sample dates using ASPM data to filter dates where the selected configurations are in use at average levels of operations. The following sections discuss the analysis of radar track data for specific information. While this document assumes use of TARGETS, the screener could also use other radar processing tools to produce similar results.

A.3.1.1 Flight Operations

To derive operations, fleet mix and time of day information from radar track, load and display the sample of radar track data using the TARGETS software (Figure A-1).

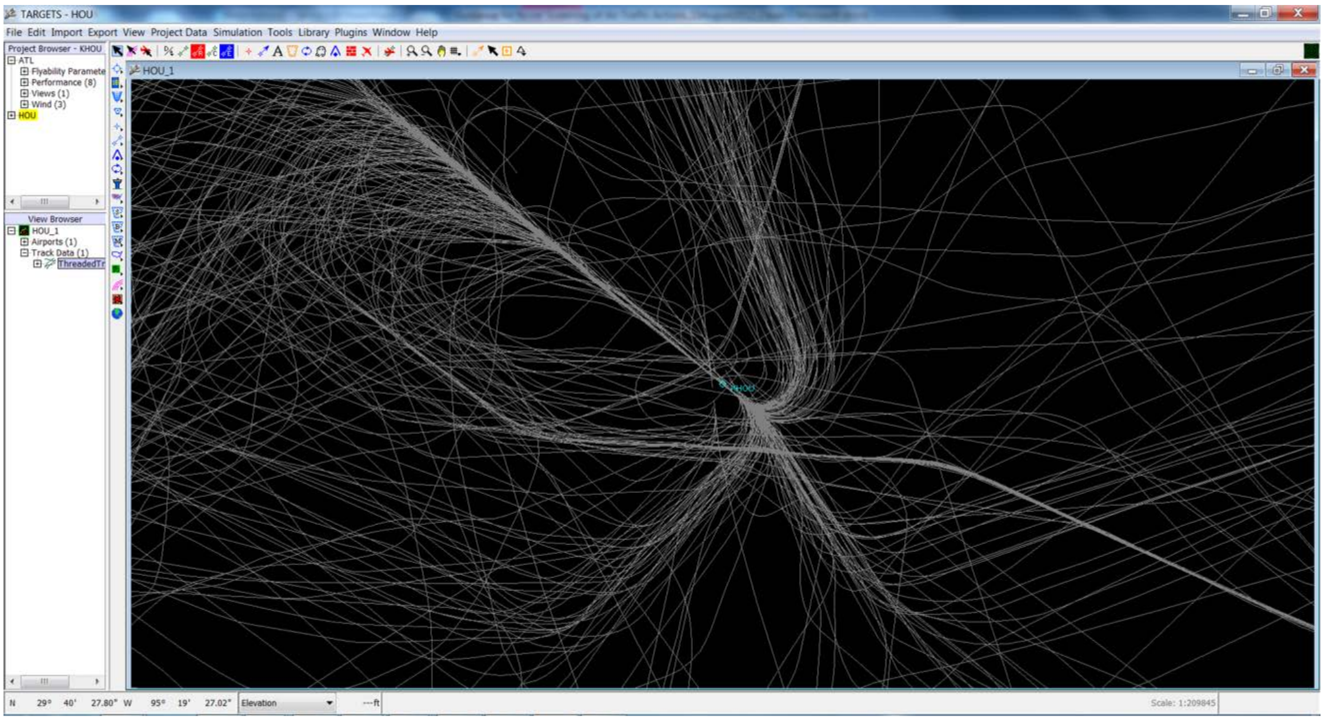


Figure A-1. Illustration of Tracks in TARGETS

Next, view the track table by right-clicking on the track bundle in the “View Browser” and selecting “View Track Table From View Panel” (Figure A-2).

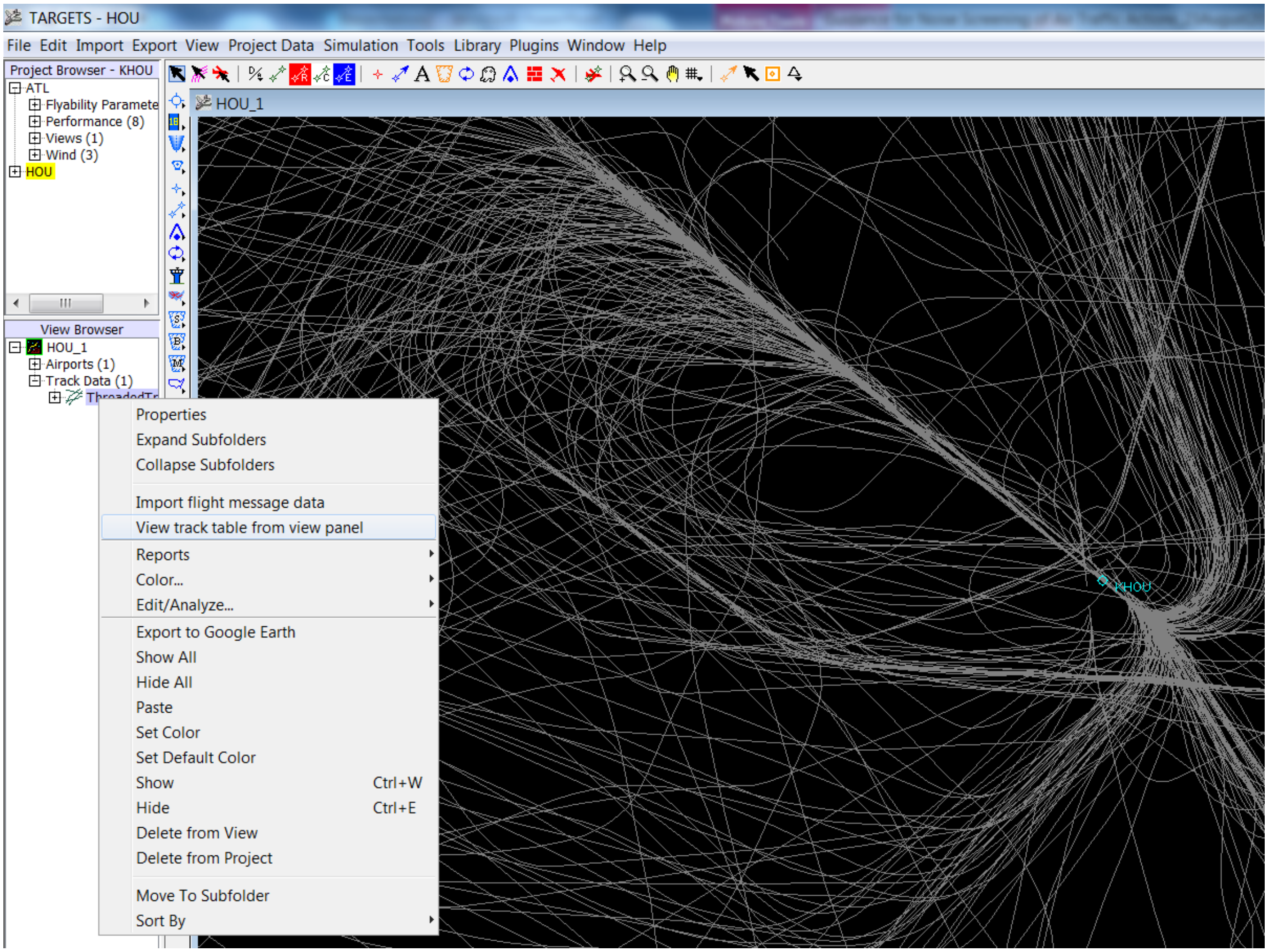


Figure A-2. Illustration of Track Table View in TARGETS

Finally, export the track table to a comma-separated value (csv) which is useable in Excel (Figure A-3). The number of operations is the total count of operations divided by the number of days in the sample. Equally, the fleet mix and time of day percentages could also be derived from manipulating the table in Excel, when the equipment type and time fields are populated.

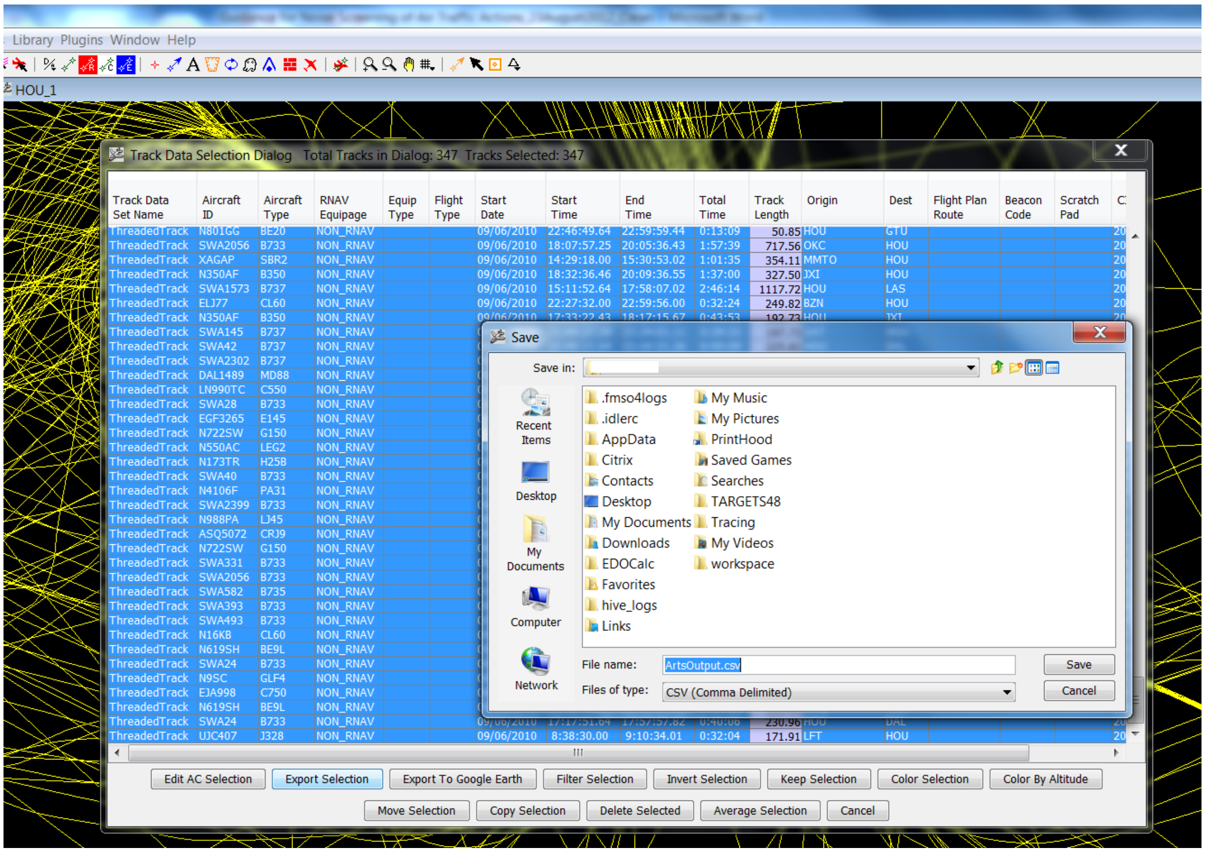


Figure A-3. Illustration of Track Table View Export in TARGETS

A.3.1.2 Flight Tracks

Radar data track data can also be used to build flight tracks and to find the route width for the RNVO Test. First, select the sample of radar track data using the TARGETS software and use TARGETS Noise Plug-in Backbone Builder Tool to build a backbone for the route or procedure of interest. Figure A-4 illustrates a backbone developed by the TARGETS Noise Plug-in [19]

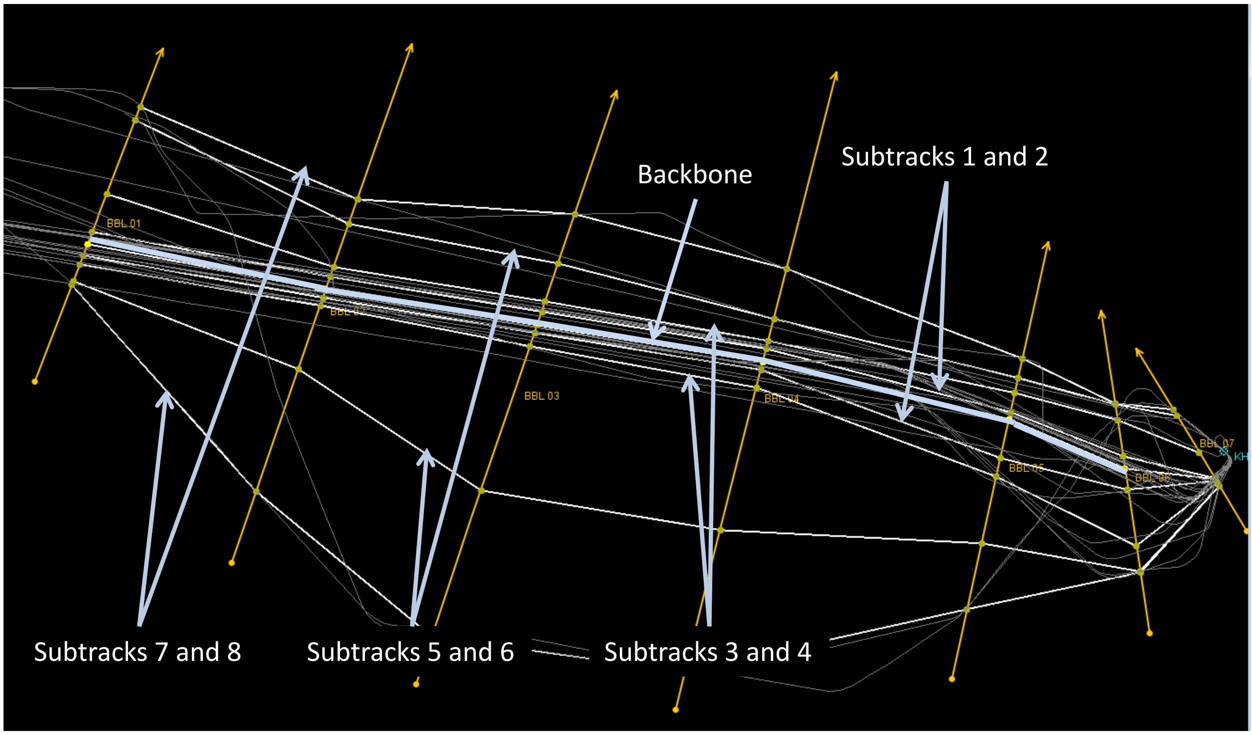


Figure A-4. Illustration of Backbone and Subtracks

To determine route width, use the TARGETS Noise Plug-in Backbone Builder Tool to generate not only a backbone but also eight subtracks as shown if Figure A-5 [19]. Since approximately 95% of all operations are contained between Subtrack 5 and Subtrack 6, the lateral distance between these two subtracks is the route width of the conventional route and can be used in the RNVO Test.

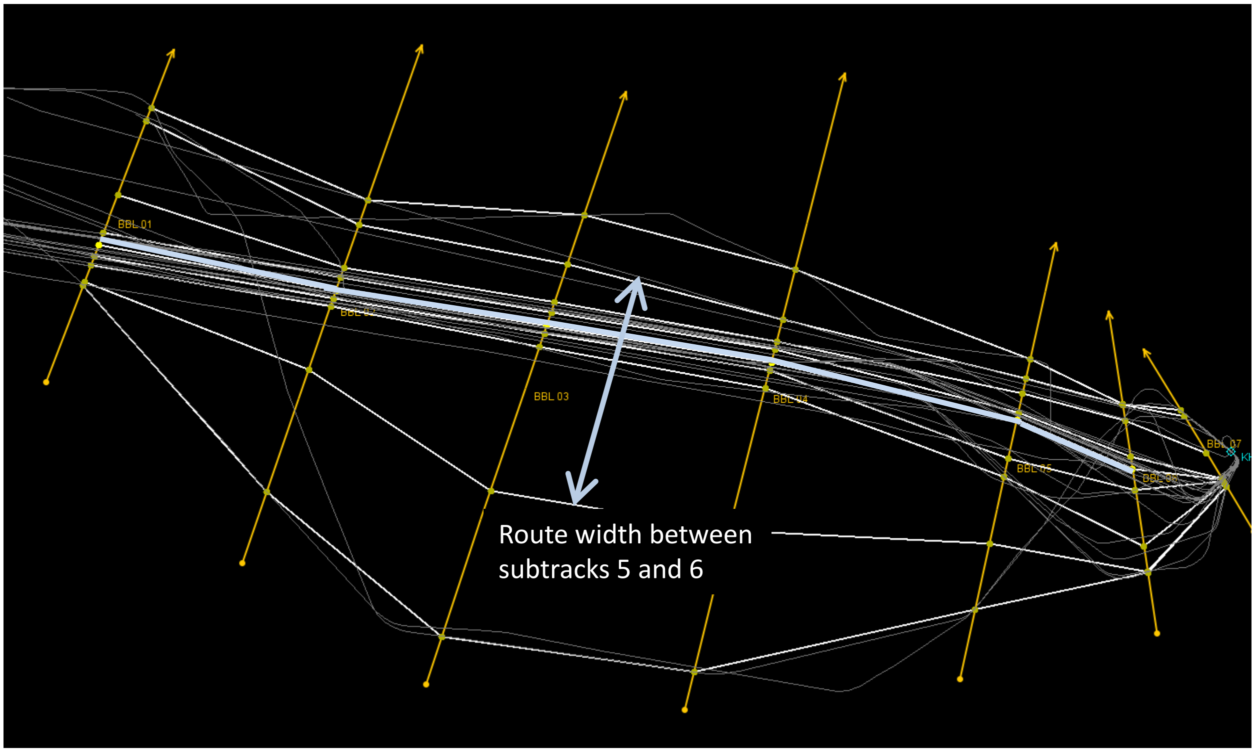


Figure A-5. Illustration of Route Width Using TARGETS Backbone Builder Tool

A.3.1.3 Flight Profiles

As shown in Figure A-6, TARGETS can load and display radar data for evaluation. The figure depicts jet departure radar tracks for a single runway and multiple days. The radar tracks can be parsed into groups for specific routes as shown in red.

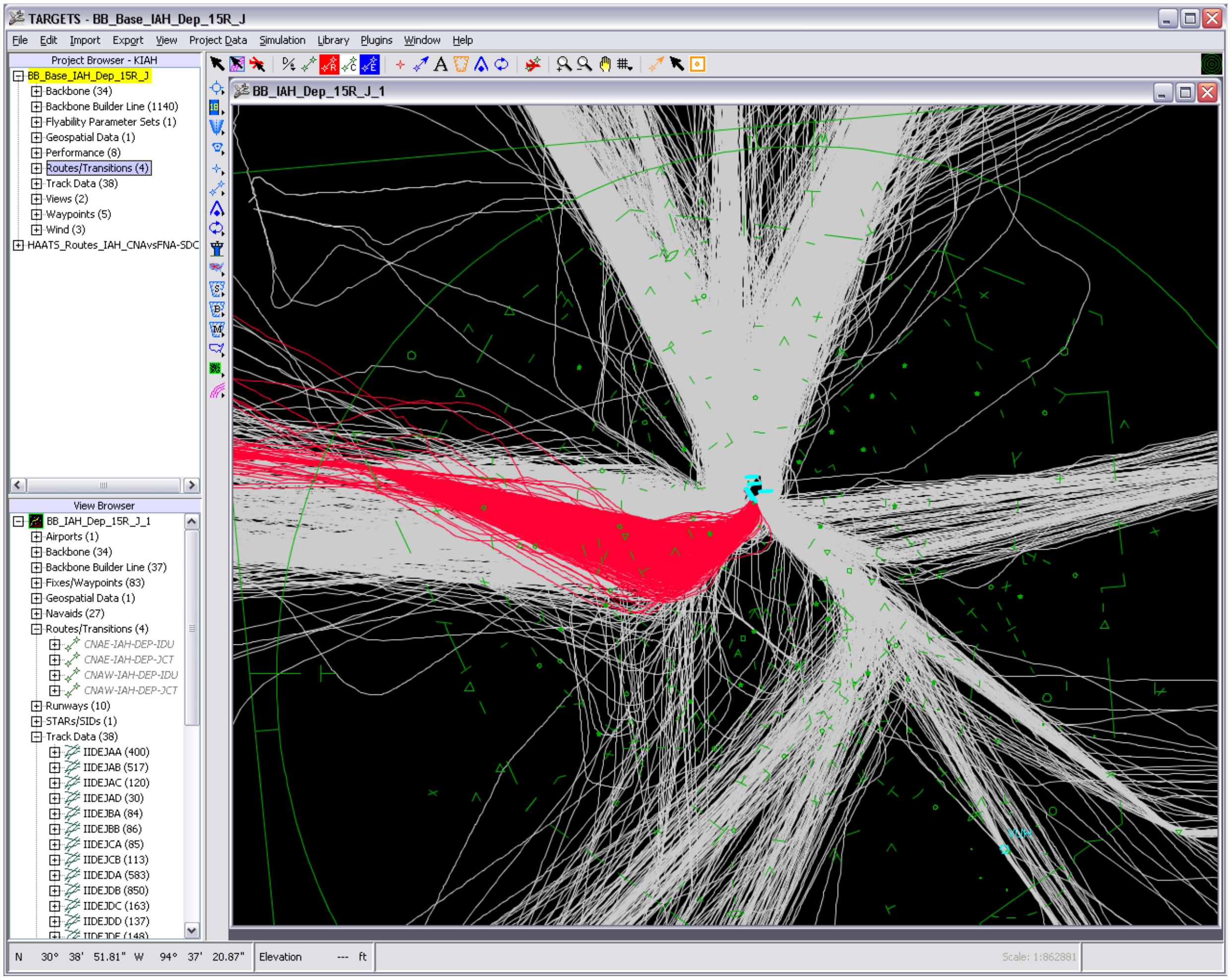


Figure A-6. Radar Track Data Shown in TARGETS

TARGETS can color radar tracks based on altitude as shown in Figure A-7. The user selects the color scheme and altitude interval from the dialog box shown in the figure. The example shows traffic below 3,000 feet as red and above 10,000 feet as light gray. Intermediate altitudes change color at 1,000-foot intervals.

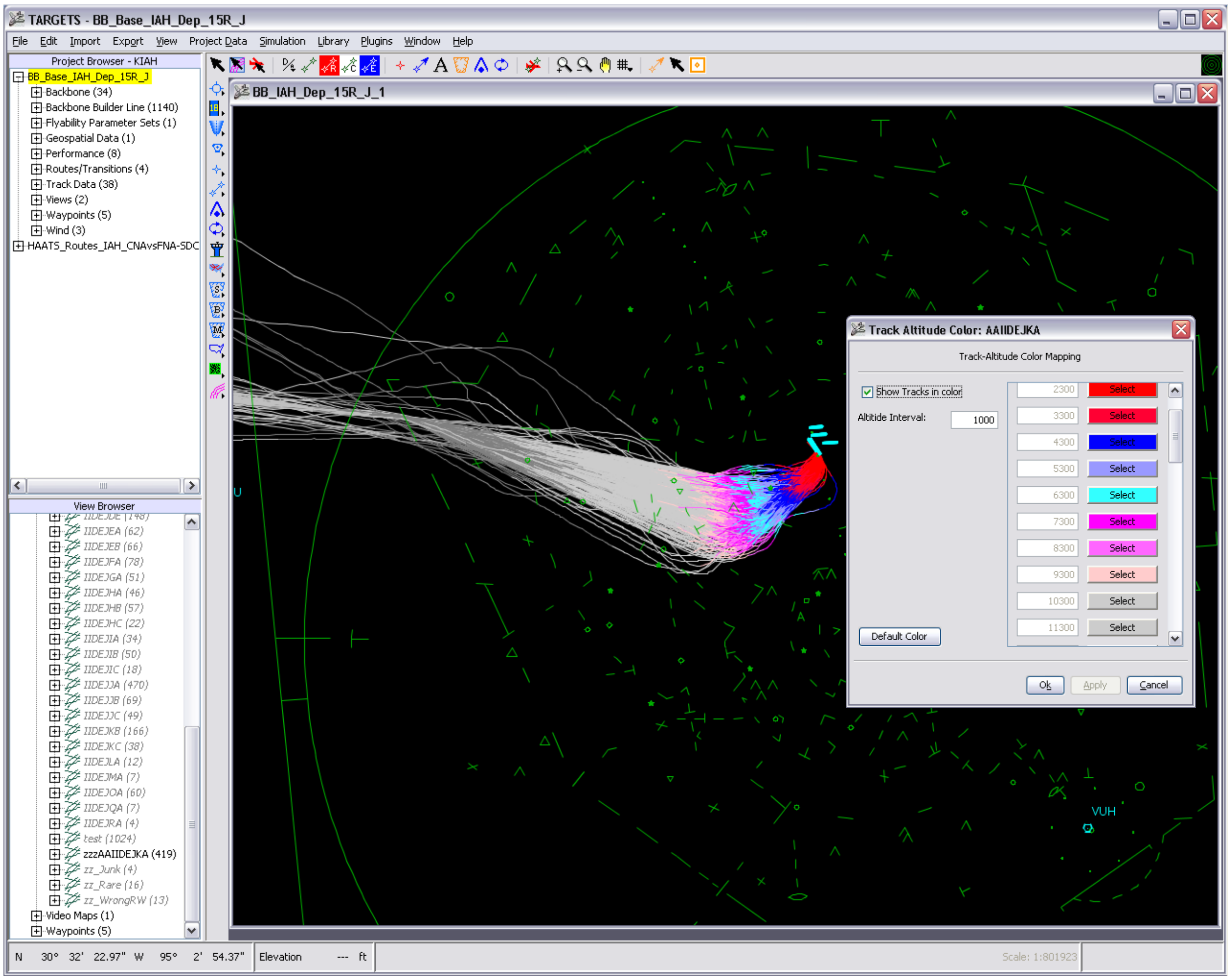


Figure A-7. Radar Tracks Colored by Altitude

The user can use the color pattern to estimate the location of typical altitudes along the route. Figure A-8 illustrates this approach by sketching in lines at approximate altitude breaks.

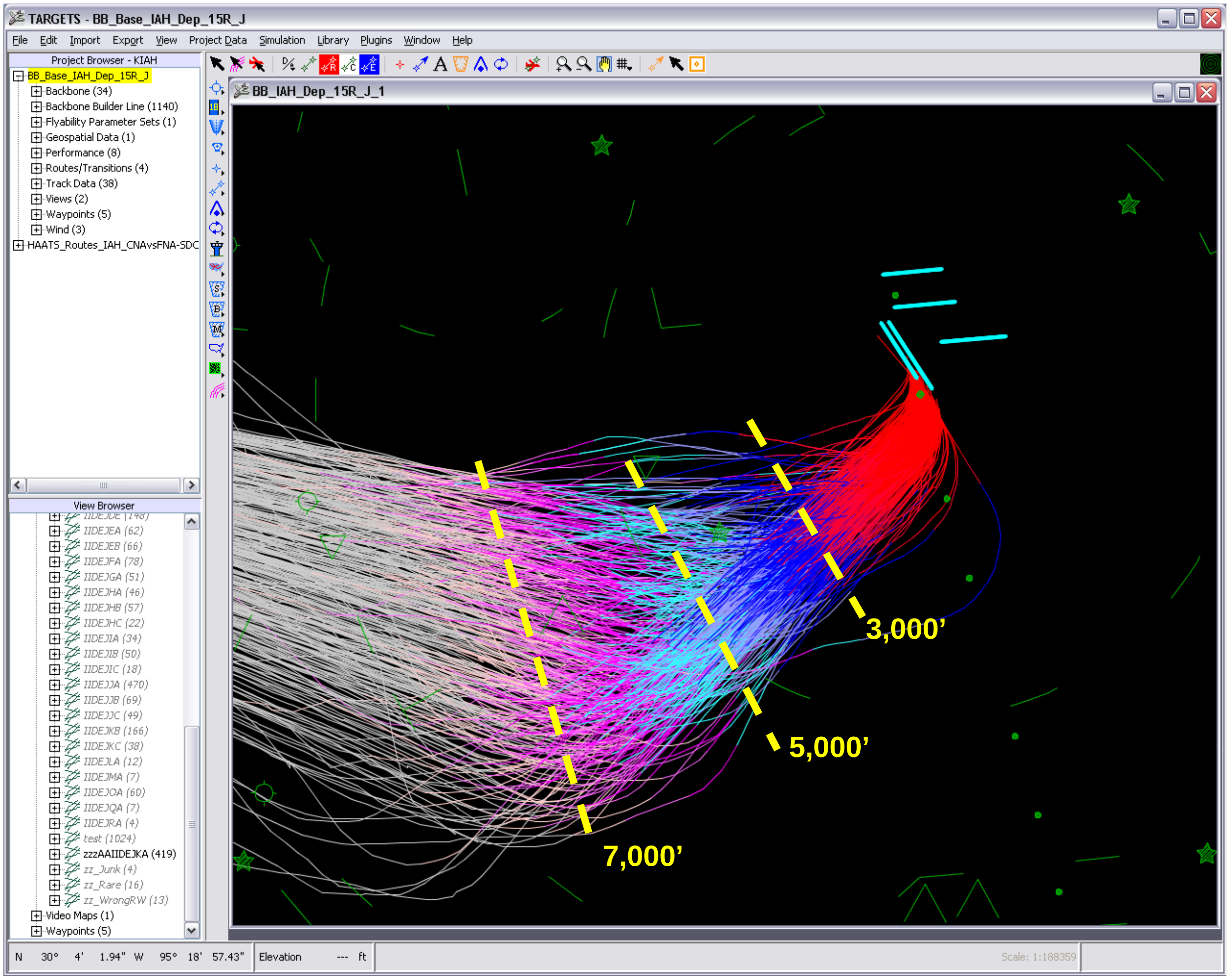


Figure A-8. Representation of Typical Altitude Breaks

A.3.3 Radar Track Data for Noise Modeling

For noise modeling using TARGETS or other tools and for all airports in the NAS, 90 days of radar track data sampled randomly throughout the year would provide a conservative representation of an AAD. The radar track data dates could be selected using the spreadsheet tool attached to this report and illustrated in Figure A-9. The user enters the first date of the year, in this case 01/01/2010 for January 01, 2010. The tool lists 90 dates selected at random throughout the year 2010 (only 11 dates are shown in this illustration) for which the user could collect radar track data to represent an AAD. The user should select and copy the dates listed by the tool into a separate file for documentation. The tool can be obtained from a SC ES.

This Tool is intended to help randomly select 90 dates of radar track data throughout one year. Enter the first date of the year and the tool will list 90 dates selected at random	
FIRST DATE OF YEAR	1/1/2010
90 RANDOM DATES	
ID	**DATES**
1	**2/26/2010**
2	**2/8/2010**
3	**12/25/2010**
4	**6/1/2010**
5	**10/14/2010**
6	**5/23/2010**
7	**10/13/2010**
8	**10/3/2010**
9	**7/1/2010**
10	**7/25/2010**
11	**10/31/2010**

Figure A-9. Random Selection of 90 Radar Track Data Dates

When using the TARGETS Noise Plug-in or similar tool, the user could group the radar track data into bundles by dates, configuration (based on ASPM data), aircraft type, etc. for processing. Modeling each group separately may be more manageable than attempting process 90 days of radar track data. In all cases, refer to the tool user manual for appropriate details.

A.4 Other Resources

This section provides a listing of various resource and reference materials that may assist in further understanding noise, environmental policy, and air traffic issues (Table A-2). Many of the resources listed cover multiple topics to varying degrees. To facilitate research on specific questions, Table A-2 has been organized by topic area based on the resource's primary value. The user may contact the SC ES for further assistance, questions, or consultation related to pending actions or noise issues.

Table A-2. Noise Subject Area Resources

Category	Resource	Link
Noise Literature	Noise Pollution Clearinghouse	http://www.nonoise.org/index.htm
	Partnership for AiR Transportation Noise and Emissions Reduction	http://web.mit.edu/aeroastro/partner/index.html
	Boeing Airport Noise and Emissions Regulations	http://www.boeing.com/commercial/noise/index.html
	Federal Interagency Committee on Aviation Noise	http://www.fican.org/
	FICON - Federal Agency Review of Selected Airport Noise Analysis Issues, 1992	http://www.fican.org/pdf/nai-8-92.pdf
	Acoustical Society of America	http://acousticalsociety.org/
FAA Noise Policy	FAA Environmental Issues	http://www.faa.gov/air_traffic/environmental_issues/
	FAA Order 1050.1E, Environmental Impacts: Policies and Procedures	http://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.information/documentID/13975
	ATA-300 memo dated September 15, 2003	http://atoexperience.faa.gov/sysops/files/airspace_aim/Altitude_Cut_Off_for_NAR_Memo.pdf
Airspace and Air Traffic Control Policy	FAA Order JO 7110.65T, Air Traffic Control	http://www.faa.gov/air_traffic/publications/atpubs/atc/
	FAA Order JO 7400.2J, Procedures for Handling Airspace Matters (Appendices 1,4,5,9)	http://www.faa.gov/documentLibrary/media/Order/7400.2JBasic.pdf
	FAA Order JO 7210.3X, Facility Operation and Administration (Ch-4)	http://www.faa.gov/regulations_policies/orders_notices/index.cfm/go/document.information/documentID/1019804
Other	U.S. Geological Survey	http://www.usgs.gov/
	U.S. Census Bureau	http://www.census.gov/
	Google Earth	http://earth.google.com/
	FAA APO Data System	http://aspm.faa.gov/
	National Park Service	http://www.nps.gov/index.htm
	Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS)	http://targets.cssiinc.com/
	Radar Data Offload Extractor Site	http://172.27.66.131/ATALAB/OffloadExtractor

Table A-3 provides the data used for grouping aircraft into pistons, small jets, turboprops, large jets and heavy jets categories for the purpose of the TRAF Test. This information is intended to provide an indication of the aircraft types appropriate for each group. The Weight Class is based on maximum gross takeoff weight such that a “Small” aircraft is 12,500 pounds or less, a “Large” aircraft is heavier than 12,500 but less than 300,000 pounds, and a “Heavy” aircraft is 300,000 pounds or more. The engine type “Jet” refers to turbofan and turbojets, “Turboprop” refers to turbojet propeller-driven airplanes and Piston to piston-engine propeller-driven airplanes. For example, the 747-200 is a commercial heavy jet with four engines.

Table A-3. Aircraft Types by TRAF Test Category

TRAF Test Category	Aircraft ID	Description	Weight Class	Owner Category	Engine Type	Number of Engines
Heavy Jets	747200	Boeing 747-200/JT9D-7	Heavy	Commercial	Jet	4
	747400	Boeing 747-400/PW4056	Heavy	Commercial	Jet	4
	767300	Boeing 767-300/PW4060	Heavy	Commercial	Jet	2
	767400	Boeing 767-400ER/CF6-80C2B(F)	Heavy	Commercial	Jet	2
	777200	Boeing 777-200ER/GE90-90B	Heavy	Commercial	Jet	2
	777300	Boeing 777-300/TRENT892	Heavy	Commercial	Jet	2
	74720A	Boeing 747-200/JT9D-7A	Heavy	Commercial	Jet	4
	74720B	Boeing 747-200/JT9D-7Q	Heavy	Commercial	Jet	4
	747SP	Boeing 747SP/JT9D-7	Heavy	Commercial	Jet	4
	767CF6	Boeing 767-200/CF6-80A	Heavy	Commercial	Jet	2
	767JT9	Boeing 767-200/JT9D-7R4D	Heavy	Commercial	Jet	2
	A300B4-203	Airbus A300B4-200/CF6-50C2	Heavy	Commercial	Jet	2
	A300-622R	A300-622R\PW4168	Heavy	Commercial	Jet	2
	A310-304	A310-304\GE CF6-80 C2A2	Heavy	Commercial	Jet	2
	A330-301	A330-301\GE CF6-80 E1A2	Heavy	Commercial	Jet	2
	A330-343	A330-343\RR TRENT 772B	Heavy	Commercial	Jet	2
	A340-211	A340-211\CFM56-5C2	Heavy	Commercial	Jet	4
	A340-642	A340-642\Trent 556	Heavy	Commercial	Jet	4
	A380-841	A380-841\RR trent970	Heavy	Commercial	Jet	4
	A380-861	A380-861\EA GP7270	Heavy	Commercial	Jet	4
	DC1010	DC10-10/CF6-6D	Heavy	Commercial	Jet	3
	DC1030	DC10-30/CF6-50C2	Heavy	Commercial	Jet	3
	DC1040	DC10-40/JT9D-20	Heavy	Commercial	Jet	3
	MD11GE	MD-11/CF6-80C2D1F	Heavy	Commercial	Jet	3

TRAF Test Category	Aircraft ID	Description	Weight Class	Owner Category	Engine Type	Number of Engines
	MD11PW	MD-11/PW 4460	Heavy	Commercial	Jet	3
Large Jets	717200	Boeing 717-200/BR 715	Large	Commercial	Jet	2
	737300	Boeing 737-300/CFM56-3B-1	Large	Commercial	Jet	2
	737400	Boeing 737-400/CFM56-3C-1	Large	Commercial	Jet	2
	737500	Boeing 737-500/CFM56-3C-1	Large	Commercial	Jet	2
	737700	Boeing 737-700/CFM56-7B24	Large	Commercial	Jet	2
	737800	Boeing 737-800/CFM56-7B26	Large	Commercial	Jet	2
	757300	Boeing 757-300/RB211-535E4B	Large	Commercial	Jet	2
	727EM2	FEDX 727-200/JT8D-15	Large	Commercial	Jet	3
	7373B2	Boeing 737-300/CFM56-3B-2	Large	Commercial	Jet	2
	757PW	Boeing 757-200/PW2037	Large	Commercial	Jet	2
	757RR	Boeing 757-200/RB211-535E4	Large	Commercial	Jet	2
	A319-131	A319-131\IAE V2522-A5	Large	Commercial	Jet	2
	A320-211	A320-211\CFM56-5A1	Large	Commercial	Jet	2
	A320-232	A320-232\V2527-A5	Large	Commercial	Jet	2
	A321-232	A321-232\V2530-A5	Large	Commercial	Jet	2
	BAE146	BAE146-200/ALF502R-5	Large	Commercial	Jet	4
	BAE300	BAE146-300/ALF502R-5	Large	Commercial	Jet	4
	DC93LW	DC9-30/JT8D-9 w/ ABS Lightweight hushkit	Large	Commercial	Jet	2
	DC95HW	DC9-50/JT8D17 w/ ABS Heavyweight hushkit	Large	Commercial	Jet	2
	EMB145	Embraer 145 ER/Allison AE3007	Large	Commercial	Jet	2
	EMB14L	Embraer 145 LR / Allison AE3007A1	Large	Commercial	Jet	2
	F10062	F100/TAY 620-15	Large	Commercial	Jet	2
	F10065	F100/TAY 650-15	Large	Commercial	Jet	2
	MD81	MD-81/JT8D-217	Large	Commercial	Jet	2
	MD82	MD-82/JT8D-217A	Large	Commercial	Jet	2
	MD83	MD-83/JT8D-219	Large	Commercial	Jet	2
	MD9025	MD-90/V2525-D5	Large	Commercial	Jet	2
	MD9028	MD-90/V2528-D5	Large	Commercial	Jet	2
Pistons	BEC58P	BARON 58P/TS10-520-L	Small	General Aviation	Piston	2
	CNA172	Cessna 172R / Lycoming IO-360-L2A	Small	General Aviation	Piston	1
	CNA206	Cessna 206H / Lycoming IO-540-AC	Small	General Aviation	Piston	1
	CNA182	Cessna 182H / Continental O-470-R	Small	General Aviation	Piston	1

TRAF Test Category	Aircraft ID	Description	Weight Class	Owner Category	Engine Type	Number of Engines
	CNA20T	Cessna T206H / Lycoming TIO-540-AJ1A	Small	General Aviation	Piston	1
	COMSEP	1985 1-ENG COMP	Small	General Aviation	Piston	1
	GASEPF	1985 1-ENG FP PROP	Small	General Aviation	Piston	1
	GASEPV	1985 1-ENG VP PROP	Small	General Aviation	Piston	1
	PA28	PIPER WARRIOR PA-28-161 / O-320-D3G	Small	General Aviation	Piston	1
	PA30	PIPER TWIN COMANCHE PA-30 / IO-320-B1A	Small	General Aviation	Piston	2
	PA31	PIPER NAVAJO CHIEFTAIN PA-31-350 / TIO-5	Small	General Aviation	Piston	2
Small Jets	CIT3	CIT 3/TFE731-3-100S	Large	General Aviation	Jet	2
	CL600	CL600/ALF502L	Large	General Aviation	Jet	2
	CL601	CL601/CF34-3A	Large	General Aviation	Jet	2
	CNA500	CIT 2/JT15D-4	Large	General Aviation	Jet	2
	CNA510	Cessna Mustang Model 510 / PW615F	Small	Commercial	Jet	2
	CNA525C	Cessna Citation CJ4 525C /FJ44-4A	Small	Commercial	Jet	2
	CNA55B	Cessna 550 Citation Bravo / PW530A	Large	General Aviation	Jet	2
	CNA560E	Cessna Citation Encore 560 / PW535A	Small	Commercial	Jet	2
	CNA560U	Cessna Citation Ultra 560 / JT15D-5D	Small	Commercial	Jet	2
	CNA560XL	Cessna Citation Excel 560 / PW545A	Small	Commercial	Jet	2
	CNA680	Cessna Citation Sovereign 680 / PW306C	Small	Commercial	Jet	2
	CNA750	Citation X / Rolls Royce Allison AE3007C	Large	General Aviation	Jet	2
	COMJET	1985 BUSINESS JET	Large	General Aviation	Jet	2
	CRJ9-ER	CL-600-2D15/CL-600-2D24/CF34-8C5	Large	General Aviation	Jet	2
	CRJ9-LR	CL-600-2D15/CL-600-2D24/CF34-8C5	Large	General Aviation	Jet	2
	ECLIPSE500	Eclipse 500 / PW610F	Small	Commercial	Jet	2
	FAL20	FALCON 20/CF700-2D-2	Large	General Aviation	Jet	2
	GII	Gulfstream GII/SPEY 511-8	Large	General Aviation	Jet	2
	GIIB	Gulfstream GIIB/GIII - SPEY 511-8	Large	General Aviation	Jet	2
	GIV	Gulfstream GIV-SP/TAY 611-8	Large	General Aviation	Jet	2
	GV	Gulfstream GV/BR 710	Large	General Aviation	Jet	2
	IA1125	ASTRA 1125/TFE731-3A	Large	General Aviation	Jet	2
	LEAR25	LEAR 25/CJ610-8	Large	General Aviation	Jet	2
	LEAR35	LEAR 36/TFE731-2	Large	General Aviation	Jet	2
	MU3001	MU300-10/JT15D-5	Large	General Aviation	Jet	2
	SABR80	NA SABRELINER 80	Large	General Aviation	Jet	2

TRAF Test Category	Aircraft ID	Description	Weight Class	Owner Category	Engine Type	Number of Engines
Turboprops	1900D	Beech 1900D / PT6A67	Large	Commercial	Turboprop	2
	CNA208	Cessna 208 / PT6A-114	Small	General Aviation	Turboprop	1
	CNA441	CONQUEST II/TPE331-8	Small	Commercial	Turboprop	2
	CVR580	CV580/ALL 501-D15	Large	Commercial	Turboprop	2
	DHC6	DASH 6/PT6A-27	Small	Commercial	Turboprop	2
	DHC6QP	DASH 6/PT6A-27 Raisbeck Quiet Prop Mod	Small	Commercial	Turboprop	2
	DHC7	DASH 7/PT6A-50	Large	Commercial	Turboprop	4
	DHC8	DASH 8-100/PW121	Large	Commercial	Turboprop	2
	DHC830	DASH 8-300/PW123	Large	Commercial	Turboprop	2
	DO228	Dornier 228-202 / TPE 311-5	Large	General Aviation	Turboprop	2
	DO328	Dornier 328-100 / PW119C	Large	General Aviation	Turboprop	2
	EMB120	Embraer 120 ER/ Pratt & Whitney PW118	Large	Commercial	Turboprop	2
	HS748A	HS748/DART MK532-2	Large	Commercial	Turboprop	2
	PA42	Piper PA-42 / PT6A-41	Small	General Aviation	Turboprop	2
	SD330	SD330/PT6A-45AR	Large	Commercial	Turboprop	2
	SF340	SF340B/CT7-9B	Large	Commercial	Turboprop	2

Appendix B Examples of Noise Screening Tests

The following sections discuss examples of noise screening using the OPS, TRAF, LAT, A/O and RNVO tests. The user should refer to the TARGETS Noise Plug-in User Guide [19] and AEST User Guide (when it becomes available) for information on using these tools.

B.1 Example of Operations Test (OPS)

Proposed Action: The OPS Test can be used for any proposed air traffic action; it helps determine if the number of operations at the airport of interest is high enough to warrant further noise screening.

Data Required: This example assumes Albuquerque International Airport (ABQ) with 154,140 operations (Figure B-1), of which 40% are propeller (61,656) and 60% jet (92,484).

ATADS : Airport Operations : Standard Report

From 01/01/2011 To 12/31/2011 | Facility=ABQ

						Itinerant					Local			
Date	Facility	State	Region	Service Area	Class	Air Carrier	Air Taxi	General Aviation	Military	Total	Civil	Military	Total	Total Operations
Sub-Total for ABQ						65,500	34,299	26,144	15,534	141,477	5,420	7,243	12,663	154,140
Total:						**65,500**	**34,299**	**26,144**	**15,534**	**141,477**	**5,420**	**7,243**	**12,663**	**154,140**

Report created on Wed Sep 5 13:27:24 EDT 2012

Sources: Air Traffic Activity System (ATADS)

Figure B-1. Annual Operations for ABQ

OPS Test: Using the data described above, round the number of propeller operations up to the closest matching value in Table B-1, i.e., from 61,656 to 65,000. Using Table B-1, enter on the row representing the annual number of propeller operations of 65,000 and move across to the corresponding maximum number of annual jet operations of 194 which is far less than the 92,484 jet operations at ABQ. As a result, the OPS Test fails.

Table B-1. OPS Test Results for ABQ

Annual Propeller Operations	Annual Jet Operations
0	700
5,000	662
10,000	622
15,000	584
20,000	544
25,000	506
30,000	466
35,000	428
40,000	388
45,000	350
50,000	310
55,000	272
60,000	232
65,000	194
70,000	154
75,000	116
80,000	76
85,000	38
90,000	0

B.2 Example of the Traffic Test (TRAF)

Proposed Action: The TRAF Test can be used for any proposed air traffic action; it helps determine if the number of operations on the route or procedure of interest is high enough to warrant further noise screening.

Data Required: This example assumes for an Arrival Route with 3 AAD heavy jet operations at 6,000 feet AGL, 2 AAD turboprop operations at 4,000 feet AGL and 5 AAD piston operations at 2,600 feet AGL. Approximately 10% of all operations occur between 10:00 p.m. and 07:00 a.m. or 0.3 for heavy jets, 0.2 for turboprops and 0.5 for pistons. Using these inputs, the equivalent number of operations on the route is computed as:

10% of heavy jet operations

Multiplier of 10 for operations between 10:00 p.m. and 07:00 a.m.

$$Operations = [2.7 + (0.3 \times 10)] + [1.8 + (0.2 \times 10)] + [4.5 + (10 \times 0.5)] = 19$$

90% of heavy jet operations

TRAF Test: The test follows these steps:

Step 1. Round down all flown altitudes to the closest matching values on the TRAF Test in Table B-2, i.e., 2,500 feet AGL

Step 2. Using Table B-2, enter on the row representing 2,500 feet AGL; move across the table to the column that is a "conservative representation" of the fleet mix, in this case 5 for heavy jet. In other words, the test is conducted using the loudest aircraft category (heavy jet) and the total number of operations. The test fails because the total number of operations on the route of 19 (referenced data required section) is far higher than the maximum allowable of 5. The TRAF spreadsheet tool may be used for more accurate results.

Table B-2. TRAF Test for Arrival Routes

Altitude (feet AGL)	Pistons	Small Jets	Turboprops	Large Jets	Heavy Jets
0	0	0	0	0	0
500	6	0	1	1	0
1000	28	1	4	3	1
1500	52	6	13	8	2
2000	92	16	26	13	3
2500	128	39	39	20	5
3000	164	68	58	56	8
4000	266	172	137	157	20
5000	394	368	249	285	41
6000	751	990	532	768	109
7000	751	990	532	768	109

Step 3. Using the illustration of the TRAF Test Spreadsheet Tool in Figure B-2, enter the necessary data:

1. Is this route or procedure located in California? NO
2. Is this a departure or an arrival route or procedure? ARRIVAL
3. Enter the AAD operations for heavy jets (3), turboprops (2) and pistons (5)
4. Enter flown altitude for heavy jets (6,000 feet AGL), turboprops (4,000 feet AGL) and pistons (2,500 feet AGL)
5. The TRAF Test Spreadsheet Tool indicate the proposed action passes the TRAF Test

ARRIVAL ROUTE				
IS THIS ROUTE OR PROCEDURE LOCATED IN CALIFORNIA?				NO
IS THIS A DEPARTURE OR AN ARRIVAL ROUTE OR PROCEDURE?				ARRIVAL
PROPOSED FLIGHT OPERATIONS				
AIRCRAFT CATEGORY	AVERAGE ANNUAL DAY NUMBER OF OPERATIONS	ALTITUDE (FEET, AGL)	PERCENT 7:00 P.M. to 10:00 P.M. (CALIFORNIA ONLY)	PERCENT 10:00 P.M. to 07:00 A.M.
PISTON	5	2,500	0.00%	10.00%
SMALL_JET	0	0	0.00%	0.00%
TURBOPROP	2	4,000	0.00%	10.00%
LARGE_JET	0	0	0.00%	0.00%
HEAVY_JET	3	6,000	0.00%	10.00%
WARNING MESSAGES				
TRAF TEST PASSED; NOISE SCREENING IS COMPLETE				

Figure B-2. TRAF Test Spreadsheet Tool

B.3 Example of the Lateral Movement Test (LAT)

Proposed Action: The proposed action changes a route by moving a fix laterally by 700 feet at 1,500 feet AGL.

Data Required: The altitude is 1,500 feet AGL and the lateral movement is 700 feet.

LAT Test: Using Figure B-3 (for 3,000 feet AGL or less), enter on the row representing the altitude to be tested; move across the chart to the column that best represents the proposed lateral movement in feet. The combination of altitude/lateral distance falls in the white zone indicating the action passed the LAT Test

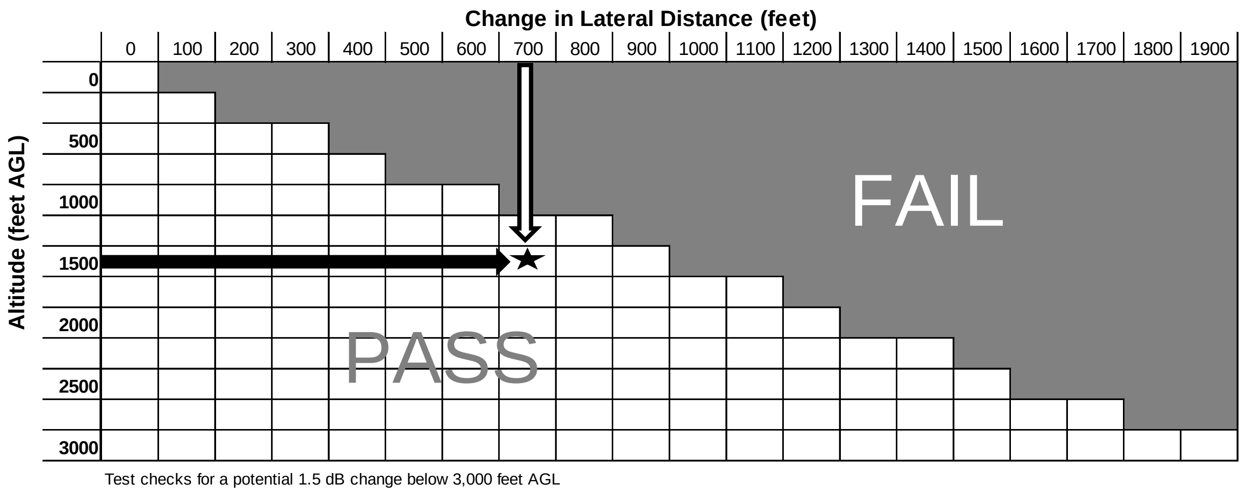


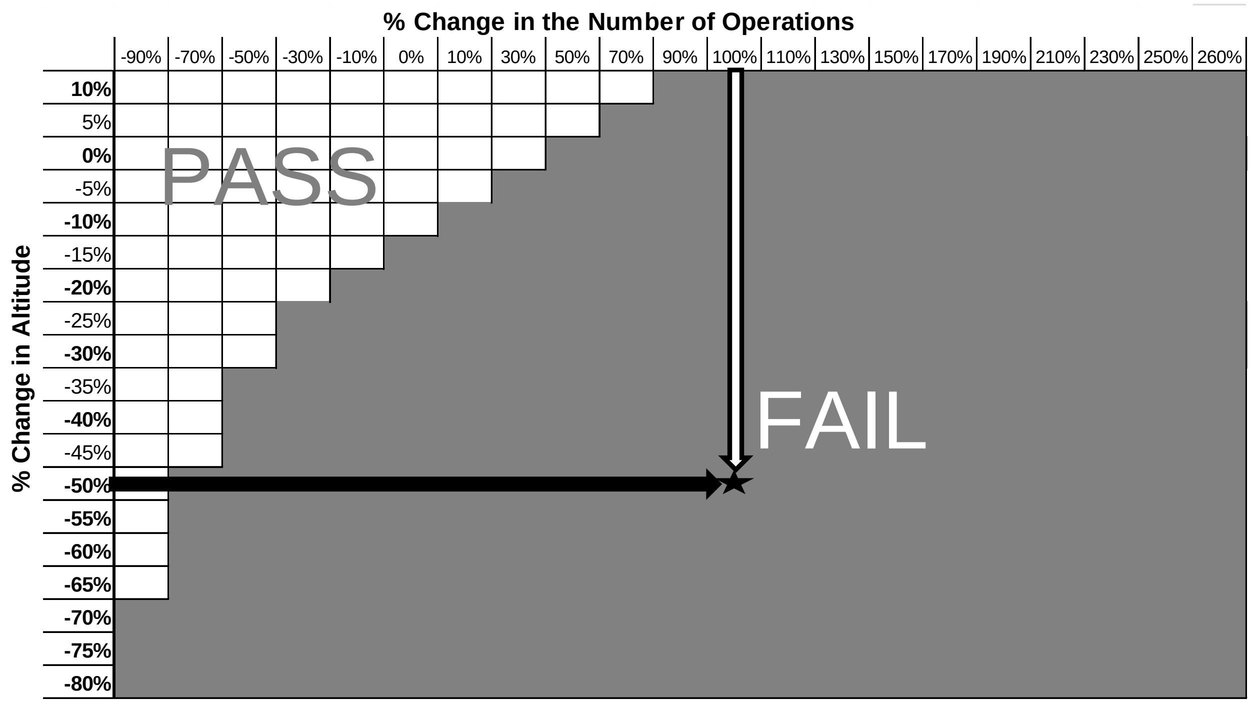
Figure B-3. LAT Test At/Below 3,000 feet AGL

B.4 Example of the Altitude/Operations Test (A/O)

Proposed Action: The proposed action increases the AAD number of operations from 25 to 50 and decreases the altitude flown from 6,000 feet AGL down to 3,000 feet AGL.

Data Required: The number of operations is increased by 100% on an AAD basis, assuming the fleet mix remains unchanged. The altitude, on the other hand, is decreased by 50% down to 3,000 feet AGL.

A/O Test: Use Figure B-4 (A/O Test At/Below 3,000 feet AGL) because the proposed altitude is 3,000 feet AGL. Enter on the row representing the altitude to be tested and move across the chart to the column that best represents the proposed lateral movement in feet. The combination of altitude/lateral distance falls in the gray zone indicating the action failed the A/O Test



Test checks for a potential 1.5 dB change below 3,000 feet AGL

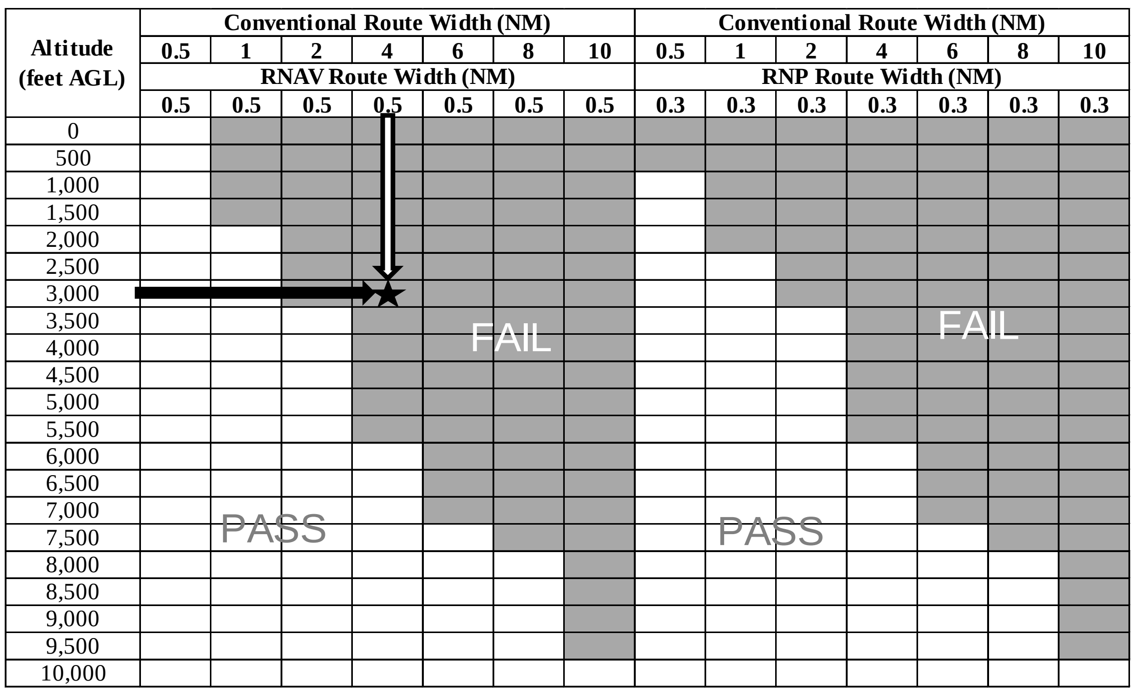
Figure B-4. A/O Test At/Below 3,000 feet AGL

B.5 Example of RNAV Overlay Test (RNVO)

Proposed Action: The proposed action transforms a conventional route of an estimated width of 4 NM to an RNAV-1 route. The lowest altitude on the route is 3,000 feet AGL.

Data Required: The conventional route width is provided as 4 NM and the RNAV route width is estimated as 0.5 NM. The altitude to be used in the test is 3,000 feet AGL.

RNVO Test: Using Figure B-5, enter on the row representing the altitude to be tested (3,000 feet AGL); move across the chart to the column that best represents the conventional and RNAV route width combination of 4 NM/0.5 NM. The combination of altitude/conventional route width/RNAV route width falls in the gray zone indicating the action failed the RNVO Test.



Test checks for a potential 1.5 dB change below 3,000 feet AGL, 3 dB between 3,000 feet AGL and 7,000 feet AGL, and 5 dB between 7,000 feet AGL and 10,000 feet AGL

Figure B-5. RNVO Test

Appendix C Glossary

AAD	Average Annual Day
ABQ	Albuquerque International Airport
AEDT	Aviation Environmental Design Tool
AEST	Aviation Environmental Screening Tool
AGL	Above Ground Level
A/O	Altitude/Operations Test
APM	Aviation Performance Metrics
APO	Office of Aviation Policy and Plans
ARTCC	Air Route Traffic Control Centers
ASPM	Aviation System Performance Metrics
ATADS	Air Traffic Activity Data System
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
ATNS	Air Traffic Noise Screening
ATO	Air Traffic Organization
CAASD	Center for Advanced Aviation System Development
CATEX	Categorical Exclusion
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CNEL	Community Equivalent Noise Level
CSV	Comma-Separated Values
dB/dBA	Decibel/s
DNL	Average Day-Night Sound Level
DP	Departure Procedure
EA	Environmental Assessment
EECP	Expanded East Coast Plan
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency

ES	Environmental Specialist
FAA	Federal Aviation Administration
FICON	Federal Inter-Agency Committee on Noise
FIPS	Federal Information Processing Standards
FSDS	Flight Schedule Data System
GAO	Government Accountability Office
IAP	Instrument Approach Procedure
IFP	Instrument Flight Procedure
INM	Integrated Noise Model
LAT	Lateral Movement Test
MSL	Mean Sea Level
NAS	National Airspace System
NEPA	National Environmental Policy Act
NextGen	Next Generation Air Transportation System
NIRS	Noise Integrated Routing System
NM	Nautical Mile
NPS	National Parks Service
NST	NIRS Screening Tool
OAG	Official Airline Guide
OPD	Optimized Profile Descent
OPS	Operations Test
OPSNET	Operations Network
PBN	Performance-Based Navigation
RNAV	Area Navigation
RNVO	RNAV Overlay Test
RNP	Required Navigation Performance
SME	Subject Matter Expert
SC	Service Center
STAR	Standard Terminal Arrival
TAF	Terminal Area Forecast

TARGETS	Terminal Area Route Generation Evaluation and Traffic Simulation
TFMSC	Traffic Flow Management System Count
TRACON	Terminal Radar Approach Control
TRAF	Traffic Test
USGS	United States Geological Survey