

# Modeling Working Group Presentation

## A Look Back at the FICAN Decision and Other Activities

Presented to: First Meeting of the Grand Canyon Working Group  
Of the National Parks Overflights Advisory Group

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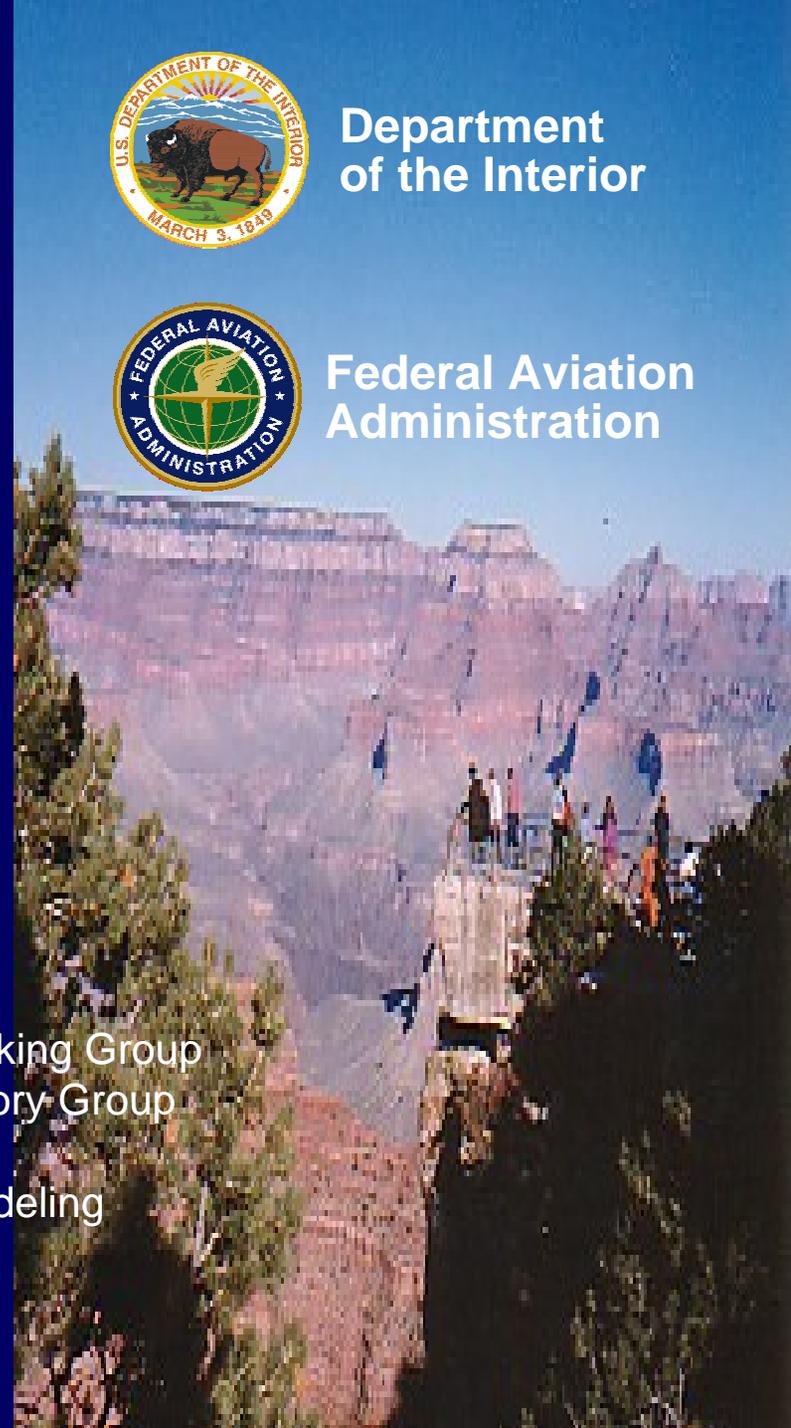
Date: July 14, 2005



Department  
of the Interior



Federal Aviation  
Administration



# Background - Goal

## The Grand Canyon NP Overflights Goal

The goal is to achieve restoration of natural quiet. Natural quiet is obtained when at least 50 percent of the park is experiencing natural quiet (i.e., **no aircraft audible**) 75 to 100 percent of the day, each and every day.



# Background - Modeling

“The NPS sponsored development of a computer model (the National Park Service Overflight Decision Support System or NODSS) (Reddingius 1994) that can calculate various sound metrics across parks, including time-above a specified threshold (e.g., natural quiet).”



## Report on Effects of Aircraft Overflights on the National Park System

*Executive Summary  
Report to Congress  
Appendices*



United States Department of the Interior / National Park Service

# Background - Action

“As discussed in Chapter 9 (Section 9.2.3) and graphically compared in Figure 10.4, unless action is taken to effect the substantial restoration brought about by the NPS recommendation, the legislative mandate of P.L. 100 cannot be met.”

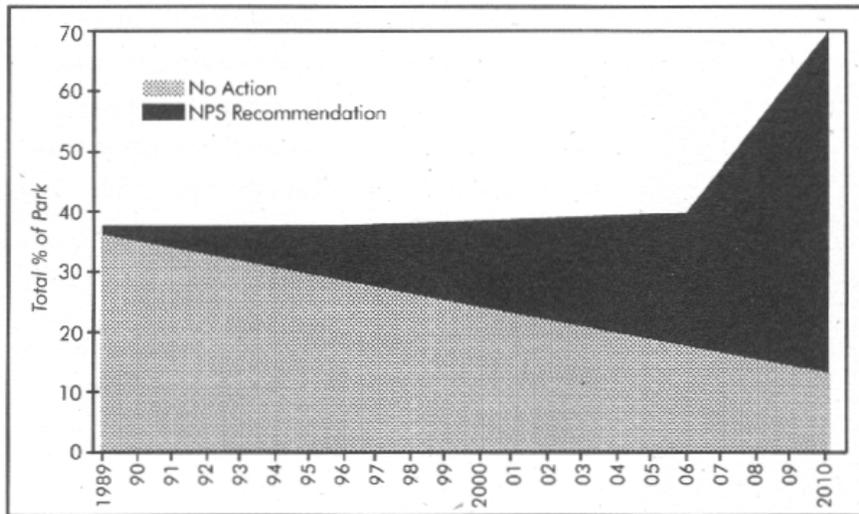
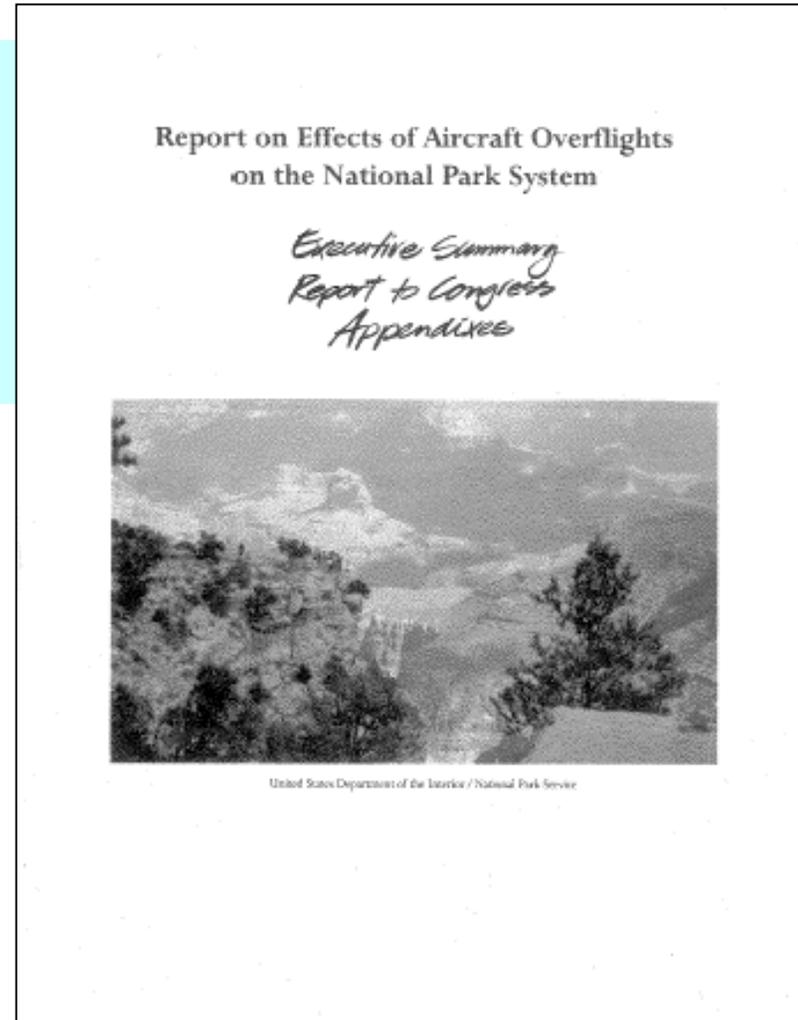


Figure 10.4: Percent of Park Where Natural Quiet Substantially Restored:  
A Comparison Between NPS Recommendation and No Action



# Background - MVS

## Aircraft Noise Model Validation Study

HMMH Report No. 295860.29

January 2003

Prepared for:

National Parks Service  
Denver Service Center

“Because only through noise modeling is it practical to assess whether or not natural quiet has been substantially restored, this report presents the methods and results of a study that examines which of four computer models best calculates tour aircraft audibility in the Grand Canyon.”

- Integrated Noise Model (INM)- 2 versions
- NPS Overflight Decision Support System (NODDS)
- **NOISEMAP Simulation Model (NMSIM) – Authors’ choice**

<http://www.nps.gov/grca/overflights/index.htm>



# Background – After MVS

## Events since the Model Validation Study Release

- NPS selected NMSim as the model of choice for calculating aircraft audibility at GCNP and other National Park Service units (68 FR 63131).
- FAA continued to improve audibility prediction capability of INM.
- NMSim improved to include many ambients.
- Both models demonstrate strengths and weaknesses.
- In 2004, FAA and DOI form a joint technical working group and agree to seek expert advice from FICAN on modeling.



# FAA/NPS Modeling Working Group

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Office of Environment & Energy  
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District Office  
Federal Aviation Administration

Ken McMullen

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Soundscape Program Manager  
Grand Canyon  
National Park Service



# What is FICAN?

- The **Federal Interagency Committee on Aviation Noise (FICAN)** began in 1993 as a technical liaison among agencies to develop recommendations and priorities on needed research and noise assessment issues

## FICAN

Federal Interagency Committee on Aviation Noise



([www.fican.org](http://www.fican.org))



# FICAN Scope of Work

- Evaluate FAA's Integrated Noise Model (**INM**) and DOD's NOISEMAP Simulation Model (**NMSim**) adopted by NPS.
- Review the joint FAA-NPS **Aircraft Noise Model Validation Study** (HMMH Report No. 295860.29, January 2003).
- Provide recommendations on the **appropriate use and limitations of computer models** and other tools for the calculation of aircraft noise in GCNP
- Determine the extent to which this study may be **helpful in other national parks**.



# Model Assessment Criteria

- **Accuracy** = model calculations compared to “gold standard” – GCNP Aircraft Noise Model Validation Study
- **Usability** = user guidance, supporting documentation, and runtimes
- **Databases** = coverage in the aircraft noise and performance databases
- **Defensibility** = adherence to international standards and practices
- **Maintenance and Development** = agency investment
- **Model-to-Model comparison** = consistencies and limitations in generating audibility output



# FICAN Finding

FICAN met on January 27, 2005 to discuss the second draft of the Volpe Center and Wyle Lab joint report ...



# FICAN Recommendation

- INM Version 6.2 and NMSim perform equally well, on average, when compared with the “gold standard” audibility data measured in the GCNP Aircraft Noise Model Validation Study.
- NMSim is a valuable tool but lacks fundamental processes and aircraft source databases to be viable for environmental assessments.
- With its long history of development and enhancements, extensive aircraft source database, and widely available user support, INM is currently a superior tool.
- **INM 6.2 is the best practice modeling methodology currently available to evaluate aircraft noise in national parks.**



# Next Steps?

1. Release INM 6.2.
2. Develop measurement protocol and conduct additional measurements to expand ambient database for GCNP.
3. Complete **sensitivity analysis of aircraft audibility modeling in GCNP** using INM 6.2.
4. Perform noise analyses as requested under the GCNP Alternative Dispute Resolution (ADR) process using INM 6.2.



# Margin of Safety

“FICAN agreed that no model will ever be able to predict with absolute certainty the audibility of any particular aircraft event at any specific location. The problem lies in predicting with certainty all three key elements of audibility: **ambient sound environment**, **source noise level**, and **detectability threshold of the observer** (human or animal).”

*[FICAN Findings and Recommendations on Tools for Modeling Aircraft Noise in National Parks, February 2005]*

“The uncertainty with such predictions is an important parameter for both NPS and FAA to understand, particularly in cases where the models indicate values close to the NPS goal of restoration. The purpose of the **margin of safety** assessment is to provide a first-order approximation of the lower bound to uncertainty around the GCNP contours generated in support of this study. The uncertainty assessment is included in this study primarily for the benefit of the FAA and NPS as part of the ADR process.”

*[Assessment of Tools for Modeling Aircraft Noise in the National Parks, March 2005]*



# Sensitivity Analysis Study Goal

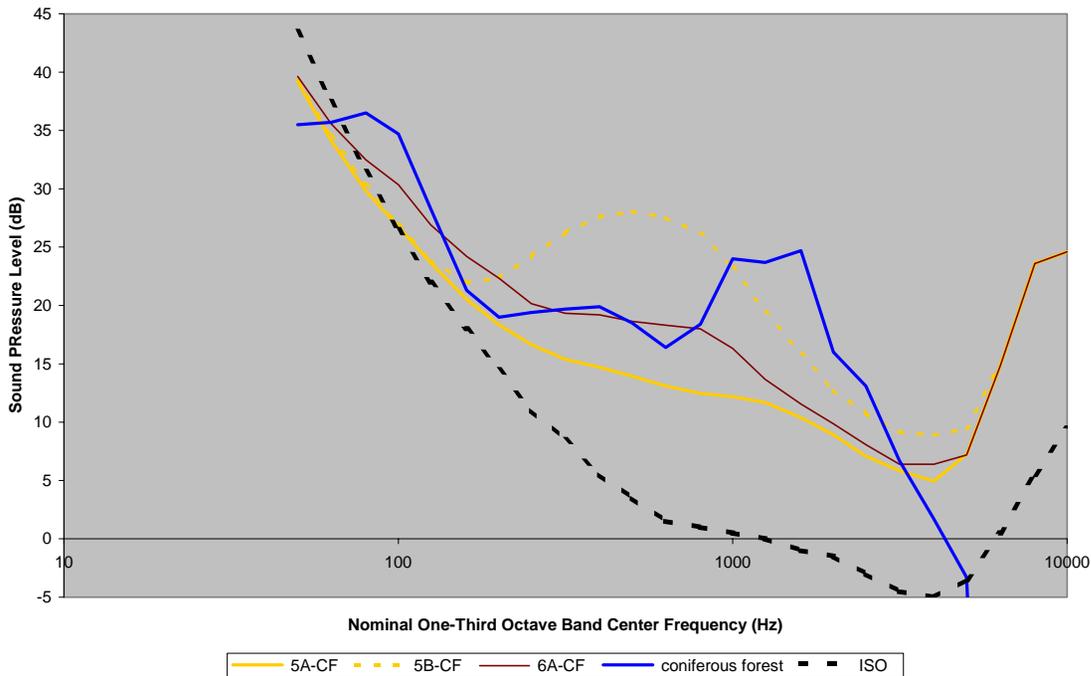
The aim of sensitivity analysis is to identify the role of certain park, computational, and aircraft related parameters in achieving substantial restoration of natural quiet in the Park. The parameters to study include:

- Ambient sound levels
- Terrain data sources
- Other aircraft operations
- Quiet technology
- Number of air tour operations
- Flight corridors.

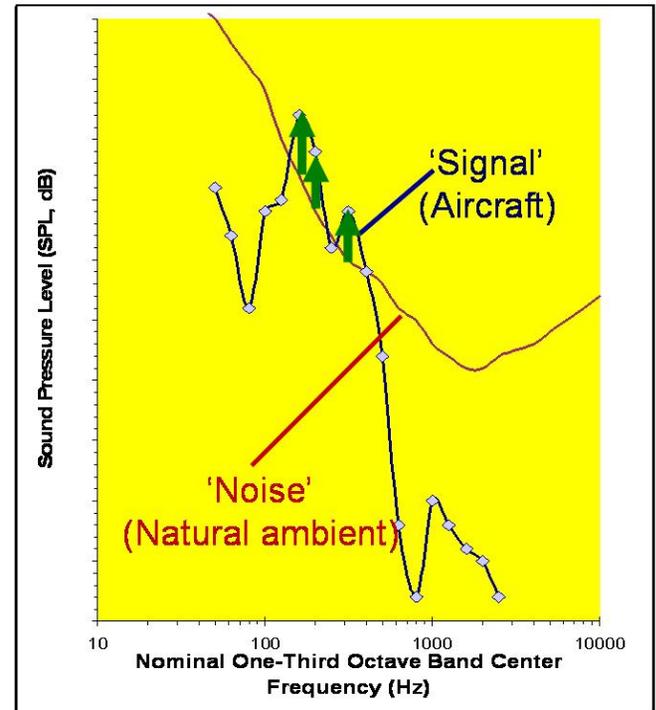


# Sensitivity Analysis - Ambient

GCNP Ambient Spectral Data Comparison



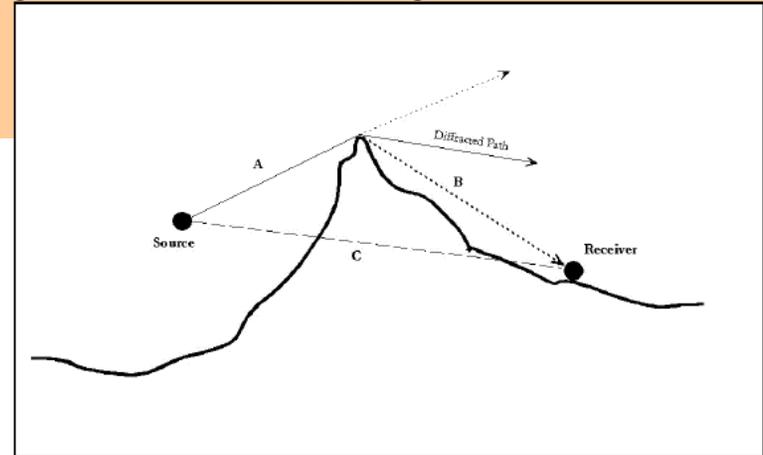
Aircraft audibility is the detection of a signal over the natural background in the form of signal to noise ratio.



# Sensitivity Analysis - Terrain

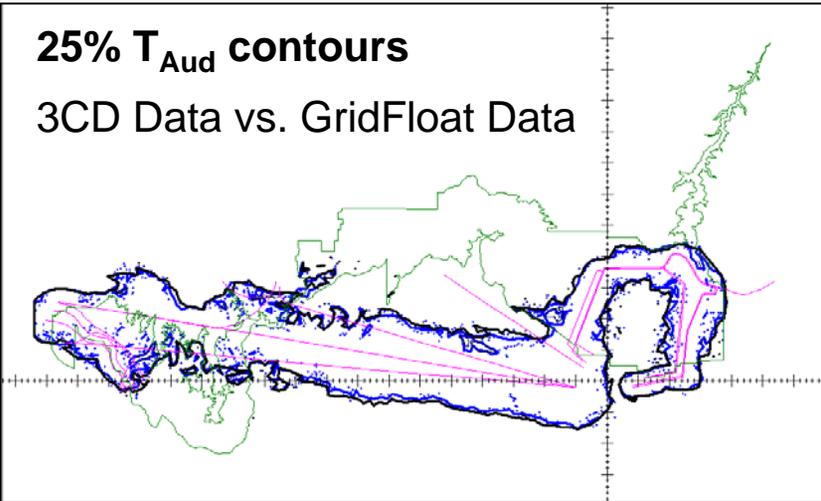


The **Line-of-sight (LOS) blockage** calculation = difference in propagation path length between direct LOS propagation and propagation over the top of terrain features.



25%  $T_{Aud}$  contours

3CD Data vs. GridFloat Data



Available digital terrain data sources are **not** the same.

# Other Aircraft

“And in the absence of any reasonable justification for excluding **non-tour aircraft** from its noise model, we must conclude that this aspect of the FAA's methodology is arbitrary and capricious and requires reconsideration by the agency.”

[USATA v. FAA (DC Circuit 2002)]

- Commercial high altitude overflights
- General aviation
- Military
- Exempted air tours
- Air tour related (reposition, transport, training, etc.)
- River rafting support

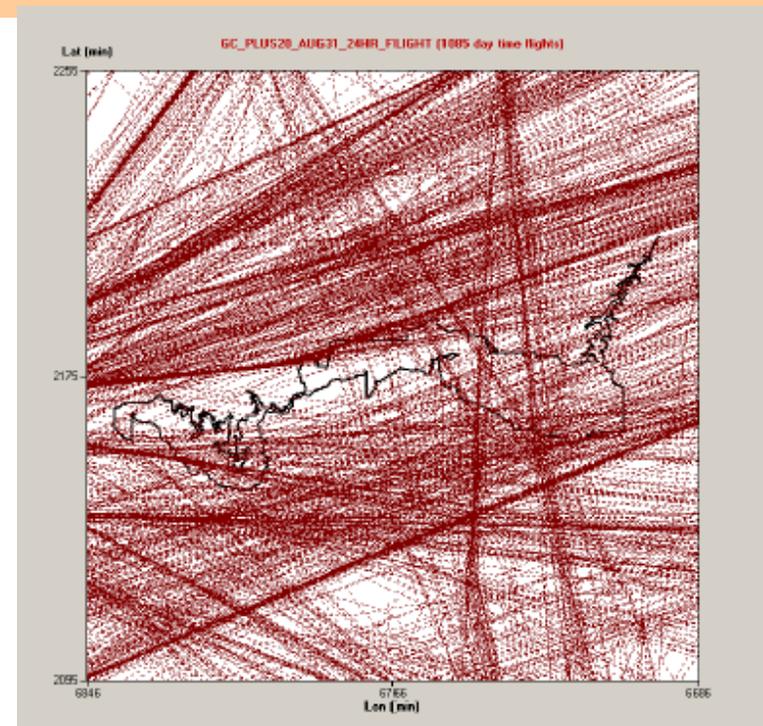


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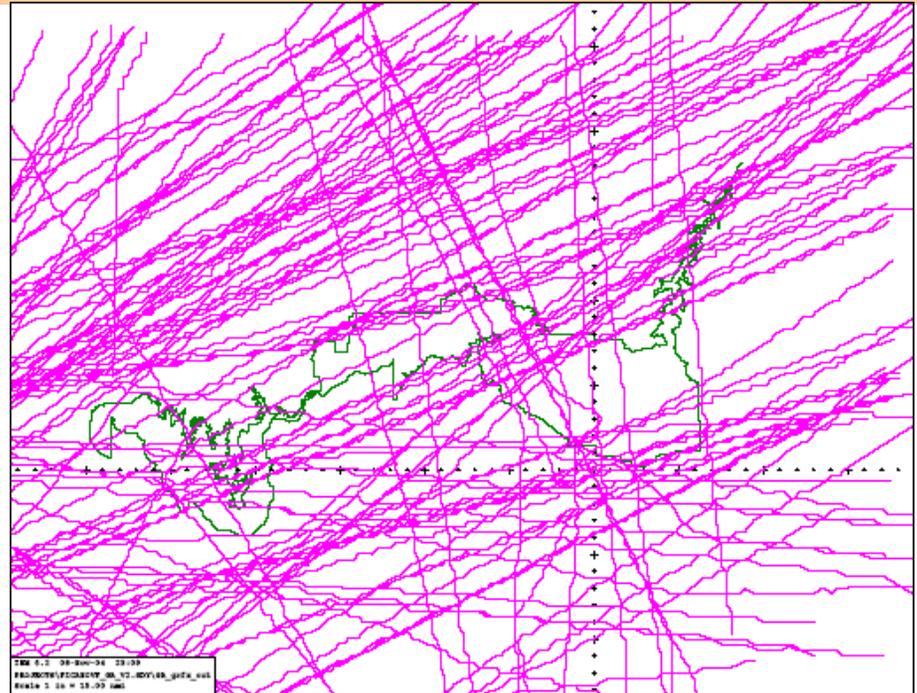
[Source: FAA's Enhanced Traffic Management System (ETMS)]

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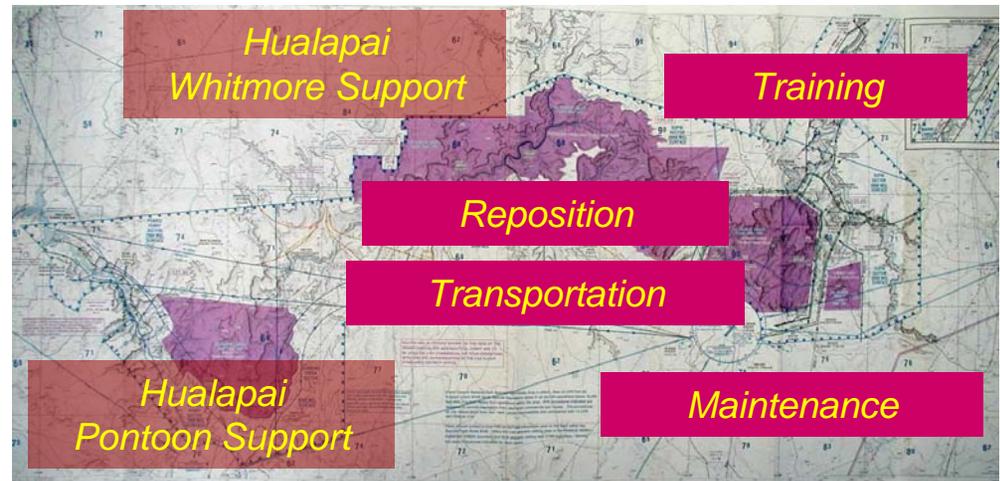
[Source: FAA's Performance Data and Analysis Report System (PDARS)]

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# Quiet Technology

How much restoration is possible through substituting the current fleet with an all quiet technology fleet?



EC 130



S55-55QT



DHC6QP 'Vistaliner'



MDHS MD-900



DO-228

# Tour Operations & Corridors

Objective: Quantify the relative change in 25% TAud contour due to a change in the value of each of the 3 test parameters.

	Test Parameter		
	Quiet Technology	Change in Air Tour Operations	Change in Air Tour Corridors
Sensitivity measure	<ul style="list-style-type: none"> <li>• <b>Current fleet</b></li> <li>• 100% replacement on aircraft for aircraft basis (Vistaliner for fixed wing and EC-130 for helicopters)</li> <li>• 100% replacement on passenger seat for passenger seat basis (Vistaliner for fixed wing and EC-130 for helicopters)</li> </ul>	<ul style="list-style-type: none"> <li>• At the cap limit</li> <li>• <b>Avg. Day Peak Month</b></li> <li>• Avg. Day High Season</li> <li>• -10%</li> <li>• -20%</li> <li>• ...</li> <li>• -XX% to achieve goal</li> </ul>	<ul style="list-style-type: none"> <li>• <b>No changes</b></li> <li>• Eliminate Dragon Corridor</li> <li>• Eliminate Zuni Point Corridor</li> <li>• ...</li> </ul>



# Questions?

