DEPARTMENT OF THE INTERIOR

National Park Service

Change in Noise Evaluation Methodology for Air Tour Operations Over Grand Canyon National Park

AGENCY: National Park Service, Interior.

ACTION: Notice of Disposition of Public Comments and Adoption of Final Noise.

Evaluation Methodology for Air Tour Operations Over Grand Canyon National Park

SUMMARY: On January 26, 1999, the National Park Service (NPS) published a Public Notice of agency policy in the **Federal Register** with the above title (64 FR 3969–3972), requesting comments on refinements to NPS' noise evaluation (i.e., impact assessment) methodology for air tour operations over Grand Canyon National Park (GCNP). Specifically, the refinements contemplated a two-zone system for assessing impacts related to substantial restoration of natural quiet at GCNP. In Zone One, which would encompass about one-third of the Park's area, the threshold of noticeability previously used in noise modeling for environmental analyses related to GCNP air tours would continue to be used (i.e., the average A-weighted natural ambient level plus 3 decibels). In Zone Two, which would encompass about two-thirds of the Park's area, the threshold for the onset of impact would be audibility (i.e., the level at which aircraft can begin to be heard by people with normal hearing, determined to be 8 decibels below the average A-weighted natural ambient level at GCNP).

The NPS received 19 comments in response to the Public Notice. Comments were received from industry associations (e.g., United States Air Tour Association, Helicopter Association International, National Air Transportation Association); environmental groups (e.g., Sierra Club, Grand Canyon Trust, Friends of Grand Canyon); air tour operators; representatives of tribal concerns; and the general public. The NPS considered all substantive comments.

DATES: The noise impact assessment methodology presented herein is effective immediately.

FOR FURTHER INFORMATION CONTACT: Tom Hale, National Park Service, Grand Canyon National Park Science Center, 2255 North Gemini Drive, Bldg. 3, Flagstaff, AZ 86001, Telephone (520) 556–7219.

Background

In response to the comments received pursuant to the publication of the NPS Public Notice in the January 26, 1999 **Federal Register** (64 FR 3969–3972), the NPS has attempted to clarify the reasons for and the expected effects of the proposed refinement in the methodology used to assess noise impacts below and in the *Discussion of Comments* to follow.

Reasons for the Proposed Change

This Notice is one of several steps being taken by the Secretary of the Interior, through the NPS, and the Federal Aviation Administration (FAA) to fulfill the mandate established by Congress in Public Law 100–91, the National Parks Overflights Act, to provide for the substantial restoration of natural quiet in the Grand Canyon National Park. Section 3 of the Overflights Act mandated the Secretary of the Interior to submit to the Administrator of the FAA recommendations ''regarding actions necessary for the protection of resources in the Grand Canyon from adverse impacts associated with aircraft overflights.'' The express statutory goal for these recommendations is the ''substantial restoration of natural quiet and experience of the park and protection of public health and safety from adverse effects associated with aircraft overflight.'' The Overflights Act requires the Administrator to adopt the recommendations of the Secretary of the Interior ''without change unless the Administrator determines that implementing the recommendations would adversely affect aviation safety.''

Congress did not define natural quiet or substantial restoration of natural quiet in the Overflights Act and, instead, delegated the interpretation of the statute to the Secretary. Under well established rules of statutory construction, the agency's interpretation is given deference so long as it is based on a reasonable construction of the statute. The D.C. Circuit Court of Appeals found that the NPS had reasonable justification for its interpretations of natural quiet and substantial restoration of natural quiet, as set forth in the 1995 Report to Congress and the 1996 FAA Grand Canyon Special Flight Rules Area Final Rule. The court also deferred to the agencies' use of the 3 decibels above natural ambient threshold to assess audibility as consistent with the Act. (See *Grand Canyon Air Tour Coalition* v. *FAA*, 154 F.3d 455 (D.C. Cir. 1998)).

In its Report to Congress on ''Effects of Aircraft Overflights on the National Park System'' that stemmed from this public law (published in 1995), the NPS stated:

> Before overflights began, natural quiet existed over most of the park, virtually all of the time. Aircraft sound intrusions are a significant source of mechanical noise that eliminate natural quiet. Since the legislative history of Public Law 100–91 indicates that flight-free zones are to be large areas where visitors can experience the park essentially free from aircraft sound intrusions, and where the sound from aircraft traveling adjacent to the flight-free zone is not *detectable* from most locations within the zone, the primary measure of restoration is the percentage of time that aircraft are *audible*. Based on this definition from the legislative history, the policy decision of Grand Canyon National Park (GCNP) is that a substantial restoration requires that 50% or more of the park achieve ''natural quiet (i.e., *no aircraft audible*) for 75–100 percent of the day.'' (page 182—emphasis added) [1]

From the outset, the consistent policy of the NPS has been that audibility is the basis for assessing progress toward the legislatively mandated goal of substantially restoring natural quiet to the Grand Canyon, and that the time period of interest is the day (i.e., the average 12 daylight hours).

However, in preparation for the 1995 Report and modeling noise impacts, the NPS recognized that aircraft noise management in park environments was an emerging science. The NPS contracted with BBN Systems and Technologies to develop a model which could generate audibility-based metrics. That model became the National Park Service Overflights Decision Support System (NODSS).

Another concern at the time was the reliability of information about the numbers of air tour operations over GCNP (there were no requirements to report such data until 1996). Given the limitations of the data, the NPS and its contractors made a decision to take a very conservative approach to ensure that noise impacts were not overestimated. For that reason, the NPS opted to model noise impacts using ''noticeability'' as the threshold of impact (for additional information see NPS Responses to Comment # 8, *Audibility and Noticeability* and Comment # 17, *Proposal Conflicts with Definition of Substantial Restoration).* However, the results of this modeling were interpreted with full knowledge that the definition of substantial restoration was based on audibility. Even using the less stringent standard of noticeability, the NPS determined in its 1995 Report that natural quiet had not been substantially restored to GCNP.

The FAA continued this approach when it modified its own INM model for use in the 1996 Environmental Assessment supporting the rules developed for GCNP Special Flight Rules Area (SFRA). Because INM uses only A-weighted sound levels and has no frequency based calculation ability, the threshold used by the NPS and determined from actual Grand Canyon data was translated to an ambient plus 3 decibels threshold for use by the FAA. Again, using a conservative approach, the FAA found that the new rules did not result in the substantial restoration of natural quiet (61 FR 69302–69333).

Since 1996 the agencies have continued to gather additional information and conduct additional research. The NPS and FAA have significantly improved their knowledge and understanding of air tour operations over GCNP as a direct result of the reporting requirements implemented by the 1996 FAA airspace regulation. The NPS has greatly improved its understanding of the natural ambient sound conditions across the Park. Through research, a greater number of ambient sound areas have been identified and the ambient sound levels in each area have been adjusted upwards between 3 and 16 decibels. In addition, NPS acoustic experts have concluded that the most accurate measurements of audibility for models based on A-weighted sound levels is 8 decibels below the average natural ambient. Consequently, the FAA and NPS have been better able to accurately assess the extent of aircraft noise in the park. Based on the more comprehensive data base and understanding of noise impacts on the park, the NPS has appropriately modified and improved its noise impact assessment methodology in GCNP.

Effects of the Proposed Change

The NPS definitions of natural quiet and substantial restoration of natural quiet remain the same. Natural quiet is defined as the natural ambient sound conditions found in the Park. Substantial restoration of natural quiet at GCNP is defined as 50% or more of the Park achieving ''natural quiet'' (i.e., no aircraft audible) for 75–100 percent of the day. The Notice only has the effect of changing the threshold for measuring the onset of noise impact for certain areas of the Park for noise modeling purposes.

In Zone One, which includes developed areas of the park, the

threshold for measuring noise will continue to be based on noticeability, 3 decibels above the average natural ambient. NPS believes that using the noticeability threshold in Zone One is appropriate for the activities that occur and characteristics in this area of the park. In Zone Two, the threshold for measuring will be based on audibility, when people can hear aircraft in these areas. Again, because the FAA INM model uses only A-weighted sound levels and has no frequency based calculation, the threshold developed by NPS from actual GCNP data translates to approximately 8 decibels below the average natural ambient. In developing the audibility threshold, the Secretary has exercised his discretion to use the most appropriate measuring methodology which takes into account the resource characteristics in this zone. The thresholds for both Zones One and Two are affected by use of the recently updated average natural ambient sound levels in the respective zones.

These measurements will collectively be used to assess whether natural quiet has been substantially restored to GCNP. NPS's interpretation of modeling results from both zones will take into account that the overall definition of substantial restoration of natural quiet is based on audibility.

The measurements are not ''standards'' which would prohibit aircraft that generate noise louder than 8 decibels below the average natural ambient from conducting air tours. Neither ''audibility'' nor ''noticeability'' are standards for aircraft to meet. They are thresholds for measuring the onset of noise impact.

Discussion of Comments

About one-third of the commenters generally supported the noise impact assessment methodology. Other commenters expressed reservations regarding its validity, applicability, or workability. Still other commenters expressed some level of support for the concept, but rejected the specific threshold levels. Many commenters were critical of the NPS for not providing sufficient discussion of scientific methodology and technical information used in refining the impact assessment methodology. The NPS has provided additional technical information in response to the substantive issues raised by commenters below.

1. Approach and Resolution of Issue

A few comments focused on using a conflict resolution approach to find an acceptable compromise. One commenter indicated that a more productive process would encourage open public deliberation to resolve the conflicting interests at stake. Another commenter urged NPS and FAA to stop the haphazard regulatory approach and seek closure through negotiated settlement.

NPS Response: The FAA and NPS are committed to finding more effective approaches to problem solving in the Grand Canyon. As the NPS and FAA begin to develop a comprehensive noise management plan for GCNP, a forum will be re-established to facilitate discussion among all stakeholders to continue efforts toward consensus-building.

The current action simply takes advantage of better data and experience to update noise impact assessment methodology, allowing more accurate assessment of the onset of impact as previously defined at GCNP. The effects of this action will be apparent in the Draft Supplemental Environmental Assessment for rulemaking actions at Grand Canyon available for public review soon. The FAA rulemaking actions are part of a phased approach to achieve the mandated goal of substantial restoration of natural quiet at GCNP by 2008. The NPS and the FAA welcome suggestions for improvements in ways to achieve that goal. While impact assessment methodology is not normally opened for public review as this action is, the NPS is taking that extra step in this case to ensure open public deliberation in the hope of resolving conflicting interests.

2. Concurrence With Two-Zone System

Several commenters commended the new two-zone geographic system as an improvement over the current system. One commenter wrote that the two-zone geographic system with different noise thresholds appeared to be a long awaited answer to restoring a substantial amount of natural quiet in the Park. Another commenter applauded the NPS for recognizing that its current standard was inconsistent with the Overflights Act, 1994 Report to Congress, and visitor experience. One commenter called the change a welcome, significant, and valuable improvement. Another commenter welcomed NPS' new flexible approach to analyzing noise impacts and agreed that the methodology should take into account the characteristics of specific areas of GCNP. Another also commended the NPS for recognizing that different areas and land uses required distinct standards for measuring noise intrusions and impacts.

NPS Response: The NPS appreciates the positive acknowledgement. Although the NPS believes the proposed change in methodology is a much more realistic and flexible approach to assessing the onset of impacts to natural quiet at GCNP, there is in fact little new in the ''new'' approach. Audibility (i.e., can aircraft be heard by people with normal hearing) has always been the basis for the definition of substantial restoration of natural quiet and determining whether it has been achieved. Noticeability was used in previous noise modeling for GCNP due to limitations in operations data, ambient sound level data, and the ability of software to manage different impact thresholds. Since that time, software has been improved to address these issues. Results of previous modeling were interpreted with full knowledge that the definition of substantial restoration was based on audibility and that noise modeling used noticeability for impact assessment. Now, with better data available for natural ambient levels as well as when aircraft become audible at GCNP, it is possible to be more accurate and to incorporate the use of audibility for impact assessment. Acknowledging that impact assessment can and should vary across different parts of the Park better aligns park planning in the Grand Canyon with FAA regulatory and noise modeling approaches. In proposing these changes to the noise impact assessment methodology, the NPS attempted to integrate the best acoustic data available with park management policy and FAA noise modeling technology in light of the mandated goal of substantial restoration of natural quiet.

3. Disagreement With Two-Zone System

Commenters claimed that noticeability and audibility could not simultaneously represent the concept of natural quiet and that NPS provided no reason why ''natural quiet'' should mean different things in different parts of the Park. One of the commenters asserted that NPS reasoning was inconsistent with the ''substantial restoration'' definition and claimed that the threshold in Zone Two would be exceptionally difficult to attain. The commenter further stated that much of the substantial restoration would likely be achieved in Zone One (noticeability threshold)—a backward result based on NPS' reasoning. The commenter proposed to abandon the two-zone approach and suggested that if there were some parts of the Park that were more noise sensitive (e.g., backcountry), it made sense to identify those critical areas and set standards for them, thereby allowing regulations to directly meet apparent need.

NPS Response: The definitions of ''natural quiet'' and ''substantial restoration of natural quiet'' remain unaffected by this action. They remain the same as previously defined, with no differences in any part of the Park.

The concept being proposed simply indicates that the threshold for measuring the onset of impact will vary across the Park for the two zones as described. NPS has made a management decision to use the audibility threshold for measuring in Zone Two. This approach does not set standards for different parts of the Park that industry will be required to meet. For example, aircraft will not be required to meet a ''standard'' of 8 decibels below the average natural ambient level in Zone 1.

Following the 1996 and 1997 FAA rulemaking actions and environmental assessment, the NPS determined that using a threshold of 3 decibels above the average A-weighted natural ambient level could result in a situation where aircraft could be heard below that threshold as much as 100% of the time, but the noise modeling would show no impact. This result would be possible because the data showed that aircraft can be heard an average of 8 decibels below natural ambient A-weighted sound levels at GCNP. Clearly, this problem was an artifact of the noise modeling threshold and other tools, and the use of single A-weighted decibel values for ambient and aircraft sound levels. This action corrects that potential problem, proposing a more flexible and realistic approach to impact assessment using available modeling tools for the Park as a whole.

As indicated in the Public Notice, it is common to zone areas of National Parks differently for management purposes based on differences in natural and cultural resources, resource protection goals, visitor use, visitor experience goals and opportunities, etc. Because of the varying circumstances affecting these zones, they are managed differently, but for the same ultimate goal. In the context of new ambient sound levels used in modeling and a variety of management actions being proposed, the NPS believes that there will be progress toward the restoration of natural quiet in both zones.

The NPS does not expect to achieve substantial restoration of natural quiet in Zone One, except where Zone One occurs within flight-free zones. Flight-free zones remain the areas where substantial restoration is expected to be achieved. However, by definition, achievement of substantial restoration of natural quiet is calculated on a park-wide basis, not by zones.

4. Noise Threshold for Zone One

Several commenters contended that the Sanup Plateau and Marble Canyon should not be included in Zone One. One commenter submitted that Zone One included many areas that were qualitatively different from one another and did not merit the same treatment. The commenter stated that the areas of the Sanup Plateau, Marble Canyon, Bright Angel Point, and stretches of the South Rim should not use the same noise threshold as the developed South Rim Area and that the NPS should apply the audibility threshold to 99% of the Park, instead of only 67%. In agreement with this point, another commenter asserted that there should be a distinct difference in noise thresholds for developed areas and backcountry/wilderness areas. Another commenter further stated that one-third of the Park (Zone One) should not receive a weaker standard, noting that the Sanup Plateau, Marble Canyon, and North Rim backcountry were all part of NPS' wilderness recommendation because of their wild and pristine qualities. The commenter contended that those areas should receive the highest level of protection. One commenter strongly objected to exempting one-third of the Park from the objective standard of audibility. The commenter claimed there was no scientific justification for this, because Marble Canyon and the Sanup Plateau are among the least developed areas of the Park and are therefore the most noise sensitive. This commenter asserted that use of the noticeability standard was inconsistent with the ''wild'' and ''primitive'' designations these areas have in the Backcountry Management Plan. Another commenter wrote that he was disappointed that the NPS was leaving one-third of the Park in a noise sacrifice zone and that inclusion of the Sanup Plateau and Marble Canyon in that zone rested on failures to properly correct existing air tour noise, not on their lack of natural character or pristine quality.

NPS Response: Again, these are not standards to be achieved, but simply points from which the onset of impact will be modeled. They result partially from the need to use single A-weighted decibel values in the noise modeling for GCNP. They are not meant to directly reflect physical properties of the Park's natural environment or of the aircraft flying over the Park.

In the Notice, the NPS stated that there are multiple reasons for including diverse areas within Zone One, and the NPS believes that these remain valid. The Sanup Plateau and Marble Canyon were included in Zone One after consultations with FAA regarding safety considerations. FAA has the sole authority to make safety determinations. The safety measures employed in these areas create the potential for greater noise and NPS has made a management decision to include the Sanup Plateau and Marble Canyon in Zone One. In the event FAA modifies any safety measures in these areas, NPS will revisit their inclusion in Zone One.

Zones do not set standards, zones are in fact described in terms of indicators and standards. A difference in the threshold of impact does not turn Zone One into a noise sacrifice zone. The NPS definition of ''substantial restoration of natural quiet'' allows for some level of impact in all parts of the Park, and the two-zone impact assessment proposal does not change that. As with most complex management issues, it is easy to generalize the apparent outcome of a given action. Ultimately, the end result relies on the interplay of many variable elements (e.g., impact assessment thresholds, location of air tour routes, natural ambient levels, air tour operation levels). Different combinations of these elements may or may not result in increased noise levels in particular portions of the Park. Substantial restoration is calculated on a park-wide basis, not by zone. Adjusting the thresholds for impact assessment in the two zones is appropriate and consistent with NPS management philosophy.

Respondents will better understand the effect of the thresholds and zones when they see the Supplemental Environmental Assessment for FAA rulemaking actions to be published soon. The NPS and FAA are committed to an adaptive management approach and new comments or criticisms are welcomed at any point.

5. Noise Threshold for Zone Two

One commenter disagreed that a lower threshold (audibility) should be used over areas where the numbers of visitors were very few. Instead, noise should be regulated to benefit the visitor experience. For this reason, the commenter claimed the threshold for Zone Two was illogical.

NPS Response: The NPS does not and cannot regulate national parks solely on the basis of visitor attitudes, annoyance, or experience. The NPS is required by law to preserve park resources in an unimpaired condition for the benefit of present as well as future generations. Where and how to protect park resources and provide various visitor experience opportunities are addressed in park legislation and planning documents that address resource

protection and visitor services. In this context, the NPS manages park resources to minimize impacts and to ensure that future generations have similar or better opportunities to experience these national treasures. The proposal in this notice is consistent with Park legislation and management plans for the GCNP. The threshold for Zone Two is based upon the NPS definition of substantial restoration of natural quiet, which is based upon audibility (i.e., can a person with normal hearing hear aircraft).

6. Tribal Trust Resources

Regarding the Sanup Plateau, one commenter questioned the Park Service's acceptance of noise generated by tour flights over the Sanup Plateau as inevitable and charged that the FAA and NPS were shirking their responsibility to consider all alternatives to restore natural quiet to the Park, the Grand Canyon, and to protect tribal trust resources.

Related to the issue of zonation and appropriate threshold levels for modeling, the commenter requested standards that accurately reflected uses of tribal lands, similar to the zones and thresholds developed for the GCNP. The commenter asserted that the residential noise threshold of 65 dB(A) was not appropriate for most tribal land uses and that some areas of the Hualapai reservation deserved the stricter standard of 8–12 dB below ambient.

NPS Response: The NPS has authority to establish policy regarding noise impact assessment methodology for Grand Canyon National Park under Section 3 of PL 100–91. For purposes of this notice, PL 100–91 limits the application of the methodology to areas within the boundaries of Grand Canyon National Park. NPS may not exceed its delegated authority and establish similar thresholds for areas of the Hualapai Reservation or other neighboring lands. Regarding the inclusion of the Sanup Plateau in Zone One, please refer back to NPS Response to Comment #4, Noise Threshold for Zone One. As to the use of the residential noise standard, refer back to NPS Response to Comment #3, Disagreement with Two-zone System, which explains that this is not a standard, but rather a way of assessing impacts on GCNP.

7. Ambient Sound Levels

One commenter stated that a fundamental component of the establishment of any threshold sound value keyed to ''ambient levels'' must be the completion of a scientifically unbiased and methodologically rigorous ambient sound measurement program within the Park. In addition, some commenters pointed out that current data show some areas of the Grand Canyon (and other parks) have ambient levels that are, at times, below the human threshold of hearing. Some commenters were of the opinion that typical daytime, not overall minimum, sound levels should be used to characterize ambient levels.

Regarding the use of ambient levels, a commenter asserted that it was possible to develop effective regulations concerning aircraft overflights of GCNP without reference to ambient sound levels (e.g., routes should stay in areas that have low visitor usage or where natural sounds mask aircraft noise).

NPS Response: The NPS agrees that the data show Grand Canyon to be a very quiet place, with A-weighted natural ambient levels near the threshold of human hearing in many places. In the presence of such quiet natural ambient levels, it is not surprising that aircraft can be heard at A-weighted decibel levels for the aircraft also near the threshold of human hearing. This occurs because the A-weighted decibel level collapses the frequency spectra into a single number. Aircraft noise levels in part of the frequency spectra may be well above the threshold of hearing (and well above the same part of the natural ambient environment's spectra) and still have an A-weighted decibel value at or near the threshold of human hearing. The NPS agrees to further explore the situation where aircraft are audible close to the threshold of human hearing, to see if any additional refinements to this methodology might be warranted in the future development of the comprehensive noise management plan.

The NPS agrees that the best data available on natural ambient sound levels should be used in impact assessment, since hearing aircraft depends upon both the aircraft and the natural ambient sound levels throughout their entire frequency spectra. The NPS has recently updated natural ambient levels used in the noise modeling based upon a recent analysis of the best available data for GCNP. Natural ambient levels vary both over time and from place to place. Currently, the best available A-weighted data have been used to estimate the natural ambient levels in the Canyon.[1] However, in the interest of improving currently available data, the NPS is developing a rigorous data collection program to refine these levels for future use in a comprehensive noise management plan.

All natural ambient sound level values currently being used by GCNP for noise modeling purposes are derived from daytime acoustic measurements. This is consistent with its definition of the substantial restoration of natural quiet (i.e., aircraft not audible in 50 percent of the Park for 75 percent of the *day*).

The resource of natural quiet is not meant to represent the ''average'' natural ambient sound environment. In the 1994 Report to Congress, the NPS sets forth that ''The quiet to be preserved is the lower end of the ambient sound level range that occurs regularly between wind gusts, animal sounds, etc., not just the average sound level.'' (pg. 83). Further, it states: ''In considering natural quiet as a resource, the ability to hear clearly the delicate and quieter intermittent sounds of nature, the ability to experience interludes of extreme quiet for their own sake, and the opportunity to do so for extended periods of time is what natural quiet is all about.'' (pg. 78, emphasis added).

In terms of protecting park resources, the NPS agrees that it is desirable to place air tour operations over areas with higher natural ambient levels to help minimize impacts of aircraft noise. However, given the NPS' audibility-based definition of the substantial restoration of natural quiet, it is not possible to restore natural quiet without establishing natural ambient levels. Detailed acoustic information on the natural ambient and aircraft noise levels is essential for accurate noise modeling.

8. Audibility and Noticeability

Many commenters expressed opinions about the use of audibility of aircraft as a threshold for evaluating whether natural quiet is substantially restored. While some supported its use as the only ''truly scientific standard,'' others were strongly opposed, stating that the audibility threshold was unreasonably low and that the use of noticeability was a more appropriate threshold. Several commenters preferred the use of noticeability, and one used data from an NPS report.

NPS Response: The NPS has consistently used an audibility-based definition for the ''substantial restoration of natural quiet.'' While it is true that NPS noise modeling in the 1994 Report to Congress used a noticeability threshold (as 10 log d = 17), the modeling results were interpreted with full knowledge that the definition of substantial restoration was based on audibility (see NPS Responses to Comments # 2, Concurrence with Two-zone System and #17, Proposal

Conflicts with Definition of Substantial Restoration). This conservative approach was taken so that noise impacts, based on limited data, were not overestimated. The FAA followed this approach in its 1996 and 1997 GCNP rulemaking. Now, with more accurate data available, including better information on natural ambient sound levels, numbers of air tour operations, etc., it is possible to make the modeling conform better to the NPS definition of substantial restoration of natural quiet by moving to the proposed two zone approach to noise impact assessment.

Because of numerous misperceptions, the following information is provided to clarify the definitions of audibility and noticeability, how they are quantified, and how they relate to the concept of natural quiet. One misperception seems to be that NPS is trying not only to restore natural quiet, but to restore 8 decibels below natural quiet. This is not the case. Natural quiet remains the same as ''no aircraft audible'' in this context. Due to the nature of A-weighted decibel values, the data indicates that aircraft become audible at GCNP on average at 8 decibels below the ambient A-weighted levels, as explained below. In order to adequately model how much of the time aircraft are audible, the modeling must start measuring the impact of aircraft noise on natural quiet when it first becomes audible (i.e., 8 decibels below the ambient A-weighted level, on average) not at the much higher level called for by the use of noticeability.

Audibility and Hearing Aircraft. In common usage, audibility (also called detectability) refers to the ability of a human, free of external distractions, to hear a specific sound in a particular setting.[2] In this context, the question concerning audibility at GCNP is: Can a person with normal hearing hear aircraft in the presence of the natural ambient Park soundscape? Whether one can hear aircraft noise or not depends on the interplay of several variables including natural ambient level, volume of the sound (''loudness''), and frequency distribution of the sound (''pitch''). The importance of frequency is discussed below. Clearly there are degrees of audibility, from a condition where the sound cannot be heard at all, all the way to where the sound is deafening. For the purposes of this discussion, the sound to be heard will be termed the ''target'' sound.

The two most important factors affecting audibility of the target sound are the frequency-based sound levels of both the target sound and the ambient or ''background'' sound. If the two sets of frequencies are similar and completely overlap, the target sound will not be heard. But the less these frequencies overlap, the more audible the target sound will be. With even a few non-overlapping frequencies, the target sound will become audible.

Over the past 30 to 40 years, considerable research has been directed at understanding how humans hear or detect one sound in the presence of another. Listening tests, using a wide variety of specialized sounds have been employed to determine how people process the combined target and background sounds to do the best possible job of hearing and identifying (detecting) the target sound. Three important findings of these tests are: (1) Humans can listen to sound in narrow regions of pitch, called frequency bands, and determine the presence or absence of the target sound separately in each frequency band;[3] (2) there is little variation in detection performance across a population of healthy young adults;[4] and (3) the results of these tests can be reduced to a series of mathematical equations that describe the physiological detection process.[5] Given moderately detailed knowledge of both the target and background sounds, the probability of detecting the target sound can be predicted from these equations.

The ability of humans to listen to sound in frequency bands has significance in many activities. For example, during a concert if we listen for a high note on the piccolo, only the portion of the background sound (e.g., the rest of the orchestra) that is of nearly the same pitch can interfere with our ability to hear the piccolo. The base violins can play as loudly as they like without the piccolo becoming inaudible. On the other hand, loud high notes on the violins could interfere with hearing the piccolo as long as the violins were playing in the same frequency band as the piccolo. Hence, the relative overall ''loudness'' of the background and the target sounds is not the key factor in the detection process. For a target sound to be audible, it must contain more sound energy (be ''louder'' than) background sounds in the same frequency band.

The equations that predict when a target sound is audible calculate a metric called ''acoustic detectability,'' abbreviated d (pronounced ''dee-prime''). The d calculation is performed in each narrow frequency band (one-third Octave Bands), using both the target and background sounds. The d calculation yields a result in each band; the results from each band are then summed and averaged to yield a composite total.[6] The band or bands with the highest d values are the ones that most influence the result and that are most likely to be audible. In the laboratory setting, a target sound is likely to become audible to trained listeners when the acoustical detectability, in decibels (computed as 10 log d) lies between 3 dB and 5dB.

In the fall of 1989 and spring of 1990, tape recordings were made at 13 different sites in the Grand Canyon. During each recording session, an observer identified air tour aircraft and pressed a button whenever the aircraft could be heard. By using the tape recorded natural ambient sound level information just before each aircraft was audible, and the total level at the onset and offset of observed audibility, the acoustic detectability level (10 log d) was computed for 163 air tour aircraft overflights at 11 of the measurement sites. These computations yielded an average value of 7.3 dB. ''The grand average of 10 log d of 7.3 (rounded to 7) can therefore be taken as a typical 10 log d value for a vigilant observer, and thus provides a useable working definition of audibility under field conditions.'' [7]

From this research and field work, aircraft overflights of the Grand Canyon are judged to be audible when, compared with the local ambient level, the detectability level equals 7 dB or greater. It is important to keep in mind that any determination of audibility depends upon the levels and frequency content of both the aircraft and ambient sounds present at the location under consideration. Hence, to fully determine audibility, both the sound levels of the target sound and of the ambient or background sound must be known as a function of frequency.

Audibility and A-Weighted Sound Levels. In examining the effects of tour operations on 'natural quiet' across a large area, computer modeling is necessary to judge how natural quiet might be substantially restored through changes in airspace use, increased use of quieter aircraft, etc. The most widely used program for analysis of the noise effects of changes in airspace or aircraft operations is the Integrated Noise Model (INM) developed and supported by the FAA. The INM currently uses only ''A-weighted'' sound levels to compute sound levels and display results.

The A-weighted level of a sound is a single number determined by combining the sound levels in all frequencies. This combining de-emphasizes the low and high frequencies in a manner similar to the sensitivities of human hearing. The A-weighted level is widely accepted as one of the best over-all sound level metrics for analysis of transportation noise. It has been shown to correlate

well with human assessment of the loudness or noisiness of a sound. It has not, however, been used as a measure for evaluating audibility.

Because it uses only A-weighted sound levels, the INM does not currently compute audibility directly because it contains no frequency based calculation ability. It can, however, compute the time that aircraft sound levels exceed a specific A-weighted threshold. If the threshold can be chosen to be approximately equal to the level at which an aircraft becomes audible, then it can compute, to a reasonable approximation, the time that aircraft sound is predicted to be audible.

This threshold of audibility depends not only upon the sound level of the aircraft, but on the level of the natural ambient as well, so adequate A-weighted approximations of aircraft and natural ambient sound levels must also be provided. Hence, each natural ambient level in the Park requires identification of a different A-weighted audibility threshold. The method used to determine these thresholds is through determining the typical difference between the natural ambient level and the aircraft level at the onset of aircraft audibility.

Five different national park natural ambient spectra and eight different aircraft spectra were examined to determine the differences in the natural ambient and the aircraft A-weighted sound levels when the aircraft spectra were adjusted so that the acoustic detectability (10 log d′) equaled 7.[8] Average A-weighted differences between seven non-jet, tour type aircraft and three Grand Canyon ambient environments were computed from these data. (The 117.4 mile camp ambient was omitted because it included higher frequency noise, such as water noise, which affects the ambient A-weighted level, but does not affect aircraft audibility.) From these data, helicopter sound levels were computed to become audible (10 log d′ = 7) on average when their A-weighted level was 7.2 dB below the ambient; propeller aircraft become audible when their A-weighted level was 9.5 dB below the ambient, on average. For the noise impact assessment method presented in the **Federal Register** notice, the average of these two of 8.4 dB (or 8 dB) was used as the typical difference between natural ambient and aircraft at onset of audibility.

Noticeability. Several research efforts have addressed the premise that people who are engaged in some activity other than listening may not be aware that a new or intruding sound is present, though it is audible. Three different studies have examined the acoustic detectability of sounds when subjects engaged in a specific task first ''notice'' the presence of a specific sound.[9] Different types of background sounds were played, and different types of activities were used, such as reading, playing video games, or maintaining a specific speed in an automobile set up to run in place. In general, the target sound needed to be about 10 decibel units above the threshold of audibility for the people in these experiments to take a positive action (such as pushing a button) indicating they had heard the sound.

As noted above, several commenters preferred the use of noticeability, and one used data from an NPS report[10] to determine a noticeability threshold. This method used A-weighted sound level data measured at 13 different sites, and applied what is generally a technically reasonable method to derive a noticeability threshold. Two aspects of this method, however, are inapplicable to this situation and inconsistent with NPS policy. First, audibility (rather than noticeability) is the criterion upon which the definition of substantial restoration of natural quiet at GCNP is based: ''substantial restoration requires that 50 percent or more of the Park achieve 'natural quiet' (i.e. no aircraft audible) for 75–100 percent of the day.'' Second, the resulting threshold from the suggested method is an absolute level (i.e., 30 dB(A)), dependent upon the ambient levels at just the 13 sites, which are not necessarily representative of all ambient environments in the Canyon (see also the NPS Response to Comment #10 below). The NPS approach overcomes these issues by: (1) Using natural ambient levels characteristic of various areas of the Park; and (2) determining the difference between aircraft and ambient A-weighted levels at the onset of audibility.

9. Hearing Aircraft Below Ambient Levels

Some commenters said that hearing an aircraft when its sound level is below the average A-weighted ambient level was not intuitive and made no sense to the lay person.

NPS Response: Although perhaps not intuitive to the lay person, aircraft can be heard when their average A-weighted noise level is below average A-weighted values for the natural ambient. This is because one or more specific aircraft tones are, in fact, louder than ambient tones in the same frequency. This phenomenon is more easily understood using the piccolo example offered previously (see NPS Response to Comment #8, Audibility and Noticeability). This comment may arise from trying to understand audibility strictly through the use of average A-weighted sound levels for the comparison of aircraft and natural ambient sound levels. Since A-weighted levels are computed from all the individual levels at specific frequencies, important information concerning differences in the individual frequency bands is lost.

For example, at the onset of audibility (detectability level = 7 dB), the A-weighted level of a propeller plane measured at Point Imperial (Prop 1[11]) is about 11 dB lower than the Point Imperial ambient A-weighted level. However, in the 125 Hz one-third Octave Band, the sound level of the propeller plane is about 4 dB louder than the ambient level in the band; hence the aircraft is clearly audible to visitors at Point Imperial even though the A-weighted levels would suggest that the aircraft noise is not audible.

In general, for the target sound to be audible in the presence of background sound, the target will either exceed the background level in at least one one-third Octave Band, or be within one or two decibels of the background sound levels in several one-third Octave Bands.[12]

10. Threshold of Impact is 30 dB(A)

Some commenters identified 30 dB(A) [A-weighted average of 30 decibels] as an appropriate threshold for impacts because this level was the approximate average of the level at onset and offset of audibility, as reported in Report NPOA Report No. 93–1.[13] One commenter proposed a method for deriving the threshold of noticeability from these data.

NPS Response: The NPS-determined threshold for impact assessment is audibility or noticeability, depending upon the zone. Although thirty dB(A) may be noticeability for certain natural ambient sound areas, it is not an appropriate threshold of impact assessment for the whole Park. Nor is any other single value an appropriate acoustic threshold for the entire Park. Natural ambient values have been found to vary by vegetation communities, the presence of water-produced sounds from perpetually running water sources, and size and distance from water falls and rapids. Commenters may also have misinterpreted the data in NPOA Report No. 93–1. Specifically, the A-weighted levels reported in Table E–3 of that report are total sound levels, not those produced by aircraft alone. Because the aircraft are audible when their A-weighted level is below the A-weighted natural ambient levels, the onset and

offset levels reported are primarily a measure of the average ambient A-weighted levels, not the aircraft levels (as verified by the authors of that report).

11. HMMH Memorandum on A-Weighted Level Differences [14]

In response to requests for additional information from several commenters, the NPS provided copies of a memorandum: ''A-weighted Level Differences Compared with Detectability,'' Memorandum to W. R. Henry, HMMH Job No. 294530.22, May 15, 1997. Several commenters saw no relevance in the information presented in this memorandum, stating that it provided no new information and that it gave only calculations using previous data. Some also commented that it identified thresholds of audibility that were below the human threshold of hearing.

NPS Response: The purpose of the memorandum was to provide: (1) A-weighted differences between measured park environment sound levels and measured aircraft overflight sound levels at the onset of audibility; (2) values of the acoustic detectability level for situations where the aircraft A-weighted sound level is 3 dB greater than the A-weighted park background level. This information was computed from available tape recordings of only park environment sounds (natural ambient) and of only aircraft overflight sounds. All recorded samples used were carefully checked for absence of other non-park, non-aircraft sounds, so that the frequency information analyzed was either pure park environment sound or pure overflight sound. Because the purpose was to determine differences only, only the differences in sound level by frequency band were of interest, not the absolute level of the sounds. Hence, the data of this memorandum should be used only for analysis of differences between sounds, not for determining absolute levels of either the background or of the aircraft.

Because the INM uses A-weighted levels and cannot reproduce the standard calculations to determine onset of audibility, a method was needed to accommodate this limitation. The INM does calculate the time a specific threshold (as an A-weighted level) is exceeded by aircraft sound. The method chosen was to use existing data to compute a typical difference between representative A-weighted national park ambient sound environments and A-weighted aircraft sound levels at the onset of audibility (detectability level = 7 dB) and to compute detectability levels when aircraft A-weighted levels equal ambient A-weighted levels plus 3 dB.

This memorandum used frequency band levels and A-weighted levels tape recorded for five national park environments and eight different aircraft overflights. It computed and provided first the A-weighted differences for all 40 combinations of background and aircraft levels by adjusting the aircraft spectra to yield the onset of audibility (detectability level = 7 dB). At onset of audibility, aircraft A-weighted levels ranged from about 4dB below the ambient to about 22 dB below the ambient. Using just the three most relevant Grand Canyon ambients and the tour type aircraft, the aircraft A-weighted noise level averaged 8 dB below the average A-weighted ambient level (the 117.4 mile camp ambient was omitted because it included higher frequency noises, such as water noise, which affects the ambient A-weighted level, but does not affect aircraft audibility).

Second, the memorandum sought to answer the question: What is the detectability level when aircraft sound is 3dB above the background? This question arose because the FAA's 1996 and 1997 Environmental Assessments used 3 dB above the ambient in the INM modeling as the threshold sound level that indicates when natural quiet is lost. The threshold of audibility occurs at a detectability level (10 log d′) of 7 dB; the memorandum shows that the detectability level, when A-weighted aircraft sound is 3 dB greater than the background, averages about 18 dB or about 10 dB higher than the threshold of audibility. In other words, aircraft sound 3 dB above the ambient is approximately equivalent in detectability level to the detectability level needed for people to notice a target sound in the laboratory tests of noticeability.

Finally, it should be emphasized that the information in the memorandum was derived from tape recordings made separately of ambient and of aircraft sounds. The goal, as stated, was to use ambient-only and aircraft-only spectra to conduct the calculations. Thus, there was no need to derive aircraft spectra from recordings made at the on-set of audibility; rather, the aircraft spectra were derived from portions of the recordings when only the aircraft were the dominant source of sound.

12. Use of Attentive Listeners

Some commenters claimed that the use of technicians actively seeking to hear aircraft noise did not reasonably represent the disruption of natural quiet for park visitors and that listening for aircraft was not the same as enjoying natural quiet. Other commenters objected to the use of attentive listeners to determine at what point aircraft could be heard and said that this method was subjective and not associated with what would be considered credible research.

NPS Response: Park visitors sitting quietly and enjoying the natural sounds of the Park are equivalent to technicians actively seeking to hear aircraft noise. The definition of substantial restoration is very clearly based on audibility, not noticeability (see earlier discussion in NPS Response to Comment #8, Audibility and Hearing Aircraft and Noticeability sections). Audibility is the ability of a human with normal hearing, free of external distractions, to hear a specific sound in a particular setting. Noticeability is much more difficult to measure, and much more variable and difficult to reproduce because of the variability of activities people might be engaged in. One of the activities people engage in at the Grand Canyon is sitting quietly and enjoying the natural ambient sound environment—this represents a more stable and reproducible measuring point because it depends on the ambient. Anyone with normal hearing will begin to hear aircraft at very close to the same audibility point (10 log d = 7) given the same ambient level.

13. Laboratory Tests

One commenter suggested that laboratory tests did not necessarily reflect actual audibility in the Grand Canyon.

NPS Response: As discussed in the NPS Response to Comment #8, Audibility and Noticeability, considerable scientific research has developed equations for predicting when a target sound is audible in the presence of background sounds. These equations that compute the audibility metric have been developed from laboratory tests, and relate to human physiology; that is, to basic properties of human hearing, and these properties vary little across a population of healthy young adults.

These equations were then applied to field data, gathered in the Canyon, of some 163 tour aircraft overflights at onset and offset of audibility. The results yielded an average acoustic detectability level of 7 dB which ''* * * provides a useable working definition of audibility under field conditions.'' Hence, the scientific laboratory work determined the basic ability of human hearing to detect one sound in the presence of a second, and the field data provided the value of the

detectability level that applies to the audibility of tour aircraft at GCNP.

14. NPS Statutory Authority

Some commenters asserted that the NPS' Notice was not authorized by the Overflights Act. One commenter summarized this sentiment as follows: ''Continued regulation is unnecessary and illegal if NPS is citing PL 100–91 as its authority to act.'' The commenter alleged that NPS had discharged its obligation under the act by submission of its original Report to Congress and with the completion of that requirement, NPS' authority under the act was expired.

NPS Response: Section 3 of PL 100–91 authorizes the Secretary to provide continued advice and recommendations to the FAA regarding the interpretation of policy on noise impact assessment. The NPS may issue this guidance to assist the FAA in the development of its regulations. In reviewing the Special Flight Rules in the Vicinity of Grand Canyon National Park, 61 Fed. Reg. 69,302 issued by FAA in December, 1996, the Court of Appeals for the D.C. Circuit upheld NPS's and FAA's pursuit of additional measures to substantially restore natural quiet after NPS submitted its Report to Congress in 1994. (*Grand Canyon Air Tour Coalition* v. *FAA*, 154 F.3d 455 (D.C. Cir. 1998).

15. No Need for Further Action

One commenter stated that NPS surveys showed that relatively small percentages of visitors (about 5% for the Grand Canyon) reported annoyance with aircraft noise. The commenter also stated that in 1995, 30 of 5 million visitors complained of aircraft noise and this was attributable to the notion that the current SFAR 50–2 and noise thresholds were working.

Many commenters expressed the opinion that there was no need for this or any other regulatory action, as the substantial restoration of natural quiet had already been achieved under SFAR 50–2 and that the NPS was addressing a problem that did not exist. One commenter wrote that Flight-free zones had already substantially restored natural quiet to the Park. Another commenter recommended that the Public Notice be retracted and that the air tour route structure in SFAR 50–2 be maintained, as it has already achieved substantial restoration.

NPS Response: The NPS protects resources and provides visitor services on the basis of policy, legislation, and careful public planning. The purpose of SFAR 50–2 was to provide for the substantial restoration of natural quiet to Grand Canyon, not low annoyance levels among ground visitors. The NPS agrees that SFAR 50–2 has subsequently been responsible for some increase in the percent of substantial restoration at GCNP and that SFAR 50–2 has certainly benefited the Park. However, substantial restoration of natural quiet is not based on visitor annoyance. It is based on audibility of aircraft. As the Report to Congress clearly states: ''When visitors can hear the sound of aircraft, they cannot experience natural quiet.''[15] In addition, continuing industry growth results in a perpetual decline in the percent of substantial restoration achieved.

Furthermore, using somewhat different procedures, INM and NODDS each independently indicate that the implementation of SFAR 50–2 has not resulted in substantial restoration of natural quiet (i.e., 50% or more of the Park 75–100% of the day no aircraft audible). Noise measurements confirming that tour aircraft are still clearly audible within the flight-free zones further bear this out. Achieving the mandated goal will require implementation of a variety additional management actions that will contribute to a reduction of air tour-produced noise.

16. Focus on Visitor Experience

One commenter suggested that the NPS had ignored actual visitor experience in developing the new thresholds and indicated that the Overflights Act required that NPS' recommendations to the FAA provide for ''substantial restoration of the natural quiet and experience of the park and protection of public health and safety from adverse affects associated with aircraft overflights.'' The commenter stated that it did not speak of ''substantial restoration of natural quiet'' in isolation and that the context clearly stated the purpose of substantial restoration was to reduce the effect of aircraft overflights on disturbing visitors' park experience.

NPS Response: The NPS has not ignored visitor experience in developing its proposed policy. Visitor experience is just one of many factors involved in NPS policy and planning. The NPS manages national parks based on the NPS Organic Act, as amended by the Redwoods Act (16 U.S.C. 1 to 1a–1) individual park legislation, and a variety of park management plans that have gone though extensive public review. These address the most salient resource protection and visitor services in the park.

The commenter is correct that the NPS is required to consider both resources and visitor experiences in managing parks. However, the commenter incorrectly asserts that the phrase applies only to visitor experience; as with virtually everything else in parks, it applies both to resources (i.e., natural quiet) and visitor experience.

17. Proposal Conflicts With Definition of Substantial Restoration

A commenter claimed that the two-zone noise threshold system conflicted with the current definition and interpretation of ''substantial restoration.'' The commenter said that the new noise standard arbitrarily departed from its previously settled definition of ''substantial restoration of natural quiet'' and asserted that natural quiet was defined as ''no more than 3 dB above ambient background noise'' in the 1994 Report to Congress.

NPS Response: The two-zone proposal for assessing noise impacts does not conflict with or affect the current definition and interpretation of the ''substantial restoration of natural quiet;'' it still requires that 50% or more of the Park achieve natural quiet (i.e., no aircraft audible) for 75–100% of the day.[16] The definition of substantial restoration has always been based on audibility, and this is not changed.

However, early in the modeling process, the NPS took a fairly conservative approach in setting an impact threshold for noise modeling used in predicting the achievement of substantial restoration in the Park. This stemmed primarily from having coarse natural ambient levels and limited air tour operations data to work with and was also driven by the inability of INM to calculate audibility directly. The NPS used a conservative metric of 10 log d = 17 (approximating the threshold of noticeability) to make certain that even with limited data, it could be certain that noise impacts were not overestimated. This is the threshold that was used for the modeling in the Report to Congress. However, because INM uses only A-weighted sound levels and has no frequency based calculation ability, the 10 log d = 17 metric used by the NPS was roughly translated to an ambient plus 3 dB threshold for use in the FAA's 1996 Environmental Assessment. The rationale given in the FAA document (page 4–4) for use of the ambient plus 3 dB threshold was that ''an aircraft was audible if it increased the ambient noise level by three decibels, the smallest change perceptible to the human ear'' (see NPS Responses to Comment #8, Audibility and Noticeability and Comment #11, HMMH Memorandum on A-Weighted

Level Differences for additional information).

Now that the GCNP is approaching its goal of substantial restoration of natural quiet and with the availability of more accurate natural ambient and air tour operations data, the NPS is proposing the two-zone approach to further refine its impact assessment methodology to more closely coincide with the audibility-based definition of substantial restoration. This will allow the NPS to be more accurate in determining the level of substantial restoration of natural quiet being achieved at GCNP.

18. Premature Release of Notice

One commenter asserted that the proposal was premature with the ongoing efforts of the FAA to develop Special Flight Rules in the vicinity of GCNP. A commenter also stated that because the Notice did not present the scientific methodology used in deciding the new standard, the Notice should be rescinded or the comment period lengthened so the public would have a chance to review the methodology. Another commenter claimed that the NPS did not fulfill its obligation to ensure an adequate factual basis for rulemaking before implementing a new regulation.

NPS Response: This action is not a regulation; it simply announces a change in impact assessment methodology related to noise modeling at GCNP.

The FAA and NPS are committed to an adaptive management approach as they continue to work cooperatively to develop regulations in a phased manner that assist in meeting the mandated goal of substantial restoration of natural quiet at GCNP. At any appropriate point in this process the agencies must make adjustments to approaches and methodologies where new knowledge or better science make the changes warranted. This change in impact assessment methodology recognizes that different areas of the Park need to be treated differently in impact assessment and represents an effort to bring the current methodology more in line with the goal of substantial restoration, which is based on audibility. The new approach starts measuring aircraft noise and counting it against the substantial restoration goal as soon as aircraft are audible, as the definition requires. Using the former single impact assessment threshold, aircraft could theoretically be audible to ground visitors 100% of the time over 100% of the Park without being counted against the goal.

While NPS did not provide all the details of field data collection, data reduction, and analyses used in the study referred to in the Notice, sufficient information was provided in a reasonably understandable format to adequately describe the purpose and justification for the action. In response to this and similar comments, however, the NPS is providing substantial additional technical detail in this disposition of comments to better portray the justification for changes in the noise impact assessment methodology. The NPS also provided copies of technical memoranda to anyone who requested such additional detailed information during the public comment period. See the NPS Response to Comment #8, *Audibility and Hearing Aircraft*, for a more detailed treatment of methods.

FAA's 1996 EA used the best data and analysis approaches available at that time. However, some of the public comments criticized some of the approaches. Therefore, in consideration of the comments and when it became apparent that additional rulemaking actions and NEPA analysis would be needed to meet the mandate to substantially restore natural quiet to GCNP, the NPS cooperated with the FAA and asked HMMH, Inc. to determine if better approaches or data were currently available that should be used in subsequent analyses. The subsequent HMMH analysis found, using actual Grand Canyon data and the findings of the previous BBN work, that aircraft noise could be heard considerably below the A-weighted ambient levels.[17] Based upon this analysis, and the limits of using A-weighted ambient and aircraft values rather than values based upon frequency spectral characteristics, the NPS subsequently recommended to FAA that the best data available in 1998 indicated that the A-weighted ambient level minus 8dB was the best single A-weighted surrogate for 10 log d = 7 (detectability level at which aircraft can begin to be heard by people with normal hearing) in the Park.

19. Model Validation Study

A few commenters asserted that the noise model validation study currently underway should be completed prior to any additional rulemaking. Supporting this, one commenter wrote that the Notice was prematurely issued and should be withdrawn until the model validation study is completed, as the acoustic modeling upon which it is based has been challenged as bad science.

NPS Response: As noted in the NPS Response to Comment #18, *Premature Release of Notice*, the FAA and NPS are committed to an adaptive management approach as they continue to work cooperatively to develop regulations that assist in meeting the mandated goal of a substantial restoration of natural quiet at GCNP. At appropriate points in this process the agencies will make adjustments to approaches and methodologies where new knowledge or better science make the changes warranted. This will also be true if the FAA–NPS noise model validation study points to the need for further adjustments. Calling it a ''validation'' study does *not* imply that the current modeling is somehow ''invalid.'' On the contrary, it is the best science available and seems to produce results quite consistent with available data. In this context, ''validation'' is equivalent to ''improvement.'' As with all scientific modeling, it will improve over time with the addition of new information and research. It is prudent to constantly question methodologies in order to incrementally improve them. It is imprudent, however, to indefinitely delay management efforts with the expectation that methodologies may be perfected.

The Notice proposes one step in the process of assessing the impacts of air tour-produced noise and measuring the relative progress toward the mandated goal of substantial restoration of natural quiet. The step establishes the acoustic thresholds at which air tour-produced noise begins to be counted against the goal using current INM noise modeling technology. These thresholds are critical as inputs used in the noise modeling process. The model validation study may be another important step in strengthening methodologies, to the extent that it may allow the FAA and NPS to more accurately predict noise impacts and monitor the level of substantial restoration in the Grand Canyon. However, since the thresholds proposed are used as inputs for modeling and have no bearing on the internal workings of the models (i.e., the algorithms and assumptions upon which the models are built) that are addressed in the validation study, there is no reasonable basis to postpone implementation of the changes to the assessment process.

20. Rulemaking Process and Public Comment

Some commenters viewed the publication of the Notice as ignoring established rulemaking procedures. One commenter stated that the Notice circumvented any reasonable attempt to

work with the air tour industry and that it was a clear statement of the Park Service's intention to implement the new noise threshold immediately.

Regarding public involvement, one commenter stated that the NPS has an obligation to explain and make available to the public the research behind the decision. The commenter continued to say that at the very least, the Notice itself should have offered to make this information available to commenters that may have wanted to review it. As previously noted, another commenter suggested that the new noise standard departs from the previously settled definition of ''substantial restoration of natural quiet'' and that the Notice amends that key statutory definition without opportunity for notice or comment. Further, the commenter submitted that NPS actions require notice and comment rulemaking and reiterated that NPS' own regulations require that actions of a ''* * * highly controversial nature, shall be published as rulemaking in the **Federal Register**.''

NPS Response: This Notice falls under the interpretive rule and policy statement provisions of the Administrative Procedure Act, 5 U.S.C. 552(a)(D) and is a statement of agency policy. Although not required, the NPS is following the more rigorous notice and comment procedures under 5 U.S.C. 553 to encourage public participation in this Notice. The Notice is an attempt to notify concerned publics that the NPS is refining its methodologies for assessing aircraft noise impacts, an internal policy decision. As explained previously, the Notice does not change the definition of substantial restoration of natural quiet. The NPS has in fact provided notice and the opportunity for public comment, and has considered such comments in this Disposition of Public Comments. As mentioned previously, the effects of these thresholds will be readily apparent in the noise modeling conducted for the supplemental environmental assessment accompanying FAA rulemaking actions that will soon be available for public review. The NPS embraces an adaptive management approach and welcomes any new comments or criticism regarding this methodology.

21. Effect of Proposal on Air Tour Industry

Many commenters from the air tour industry felt that the action was an aggressive move against air tour businesses and that it was not in keeping with the assurances offered by the NPS that it supported the air tour industry at Grand Canyon. One commenter said that implicit in this Notice was that air tours were unwelcome anywhere over the Grand Canyon. Another commented that the Notice was evidence that the public statements made by NPS/DOI in support of the air tour industry were not true. One commenter called the Notice an act of bad faith.

Many commenters were also concerned that the proposed noise thresholds would have substantial impacts on the viability of area air tour businesses. One commenter claimed that if the new noise standard was adopted, commercial air tours in the Grand Canyon would cease. Another commented that imposing these new standards would further restrict already limited aircraft operations and would jeopardize the existence of the areas air tour businesses. Another commenter asserted that this new benchmark would effectively ground every air tour aircraft in service at the Grand Canyon today.

NPS Response: A refinement in the NPS approach to noise impact assessment may have indirect effects on the commercial air tour industry. As was previously mentioned, specific effects rely on the complex interplay of several elements (e.g., impact assessment thresholds, location of air tour routes, sensitive cultural sites, natural ambient levels, air tour operation levels). Different combinations of these elements may make it easier or harder to reach natural quiet in particular areas of the Park. For example, desert scrub areas have been recently reevaluated as having a natural ambient level of 20 dB (an increase of 5 dB, from 15dB). Thus, there would be less noise impacts on desert scrub areas in Zone One (noticeability threshold) than before (i.e., the impact threshold would be 5 dB higher than before). Another simple example: Air tour flights over coniferous forest (with a reassessed natural ambient of 31 dB, from 26 dB) in Zone Two may have a greater impact than before (i.e., the impact threshold would be 6 dB lower than before). However, substantial restoration of natural quiet is calculated for the Park as a whole, not by zones or other discrete areas.

It should be noted that even if increased noise impacts are indicated, the decision regarding what should be done would be addressed through subsequent policymaking. Future effects on the industry is dependent upon other policy decisions that the FAA will make in cooperation with the NPS. The NPS policy that commercial air tours are a part of visitor services at GCNP remains unchanged. The NPS cannot make good management decisions on GCNP noise management and recommend these to the FAA unless it accurately assesses the impact of aircraft noise on GCNP. That is the purpose of the methodological refinements.

The proposal is consistent with recommendations the NPS made in the 1994 Report to Congress and with NPS policies that require the agency to accurately assess impacts in the process of determining management actions. However, there is a difference between accurately assessing impacts and deciding what to do about those impacts. The Public Notice addressed how impacts were to be assessed. It did not set management standards or actions. This change in methodology *does not* require aircraft to be quieter than the noise impact thresholds in order to fly over the Park. It does not restrict air traffic in any way. The thresholds are simply the point at which aircraft noise will begin to be measured against the mandated goal of substantial restoration. This action reflects the obligation NPS has to provide the FAA with the most accurate information possible about impacts on park resources and with recommendations on how to best achieve substantial restoration of natural quiet. Impact assessment is only one of many factors considered in policymaking. The FAA, in cooperation with the NPS, will propose and implement management actions designed to achieve the mandated goal of substantial restoration of natural quiet and allow a safe air tour industry to operate within the context of that legislative mandate. Application of the methodological refinements may, in conjunction with FAA rulemaking, require reductions in operations, changes to routes or other measures to achieve the statutory goal.

22. Need for Economic Analysis

A few commenters pointed out the need for the NPS to consider potential economic impacts on air tour operators as a result of the action. One commenter stated that the NPS is required by the Overflights Act and the Small Business Regulatory Flexibility Act to consider the economic impacts of this action on the small business entities that comprise the air tour industry.

NPS Response: As noted above in the NPS Response to Comment #21, Effect of Proposal on Air Tour Industry, the NPS is providing notice of a policy related to refinements in its noise impact assessment. The Notice, in and of itself, does not prescribe mitigation or management actions that lead to impacts on air tour operators. Neither the Overflights Act, nor the Regulatory Flexibility Act require an economic impact analysis for this Notice.

Economic impacts on the small business entities that comprise the air tour industry will be conducted in any FAA rulemaking actions employing the methodology in this Notice.

23. FAA Authority and Role

Several commenters asserted that through this and other actions the NPS was essentially usurping the FAA's authority to make decisions regarding the use of air space. Commenters contended that by establishing a noise threshold which prohibits aircraft from accessing certain air space the NPS was exercising de facto control over that air space, an authority provided solely to the FAA by Congress. They stated that land management agencies, including the NPS, do not have the jurisdiction, mandate, or expertise needed to safely regulate the use of our nation's air space. Commenters emphasized that the FAA must remain the leader in dealing with all air space issues.

NPS Response: Federal law and Congressional policy mandate that the authority to control the use of our nation's airspace resides solely with the FAA, while the NPS is charged with the management of the natural and cultural resources and values associated with units of the National Park System. Part of the NPS management responsibility is to determine the nature and extent of impacts on parks from all uses of the parks. The noise thresholds proposed in the Public Notice are strictly related to NPS noise impact assessment; they are not directly related to FAA's management authority of the airspace.

The FAA retains its full authority to manage the air space, and in cooperation with the NPS, will continue to consider how to best address these impacts through its rulemaking process. The FAA evaluates all NPS proposals related to GCNP noise management and mitigation, rejecting any that it considers unsafe. The NPS believes that through continued cooperation with the FAA, alternatives that are both safe and sensitive to noise impacts can be developed and implemented.

24. Safety

One commenter was concerned that the action would effectively restrict where operators could fly, resulting in increased congestion and potential adverse impacts on safety. Another commenter expressed that safety should not be forsaken in an effort to reduce sound and that if the NPS changes route structures that result in additional safety risks, they should be prepared to accept responsibility.

NPS Response: Safety issues are of paramount importance to both the FAA and the NPS. The NPS always defers to FAA on all issues associated with aviation safety. Rulemaking for GCNP can only proceed if FAA concludes it to be safe. (See NPS Response to Comment #23, FAA Authority and Role.)

25. Terminology Used in the Notice

Commenters questioned the use of various terms throughout the Public Notice. One commenter suggested that a ''day'' be defined universally as 24 hours. Another commenter requested consistency in the use of terms to avoid confusion, e.g., what was the difference, if any, between the terms ''quiet to be preserved'' (as stated in the 1994 Report to Congress) and ''average natural ambient'' as stated in this Notice. Finally, a few commenters claimed that the action was not a ''refinement'' of the current methodology, but that it was a departure from ''noticeability'' to ''detectability.''

NPS Response: In its definition of substantial restoration, the Report to Congress carefully used the phrase ''of the day'' rather than ''of the time'' (an earlier version) to distinguish that it referred to the daylight hours when air tours were flying. For modeling purposes, this refers to the 12 hour time period from 7 AM to 7 PM. Air tour aircraft do not operate at night, so that is how the definition was framed. To change that to a 24 hour period would require a redefinition of ''substantial restoration of natural quiet.''

In the 1994 Report to Congress ''quiet to be preserved'' refers to the lower end of the ambient sound level range that occurs regularly between wind gusts, animal sounds, etc., not just the average sound level (pg. 83). The ''average natural ambient'' in the Notice refers to the average background sound level for a given location, less any mechanical noise from aircraft or other sources. Again, the definitions are not changed by this action.

As has been mentioned previously, these changes are to bring current impact assessment methods more in line with the goal of substantial restoration, which is based on audibility.

26. Refining the Definition of Substantial Restoration of Natural Quiet

Several commenters suggested that the current definition of substantial restoration of natural quiet was not adequate to protect GCNP resources.

NPS Response: Though appreciated, these comments do not directly apply to the refinement of noise impact assessment methodology presented in the Public Notice. The NPS does not currently have any plans to redefine the substantial restoration of natural quiet.

27. Restrictions at Higher Altitudes

One commenter expressed concern that though the current action is focused on air tour operations, noise thresholds could ultimately lead to restrictions at higher altitudes.

NPS Response: No such restrictions are being contemplated. In any case, the GCNP SFRA has an effective ceiling of 17,999 feet MSL.

28. Proposed Wilderness

One commenter suggested that any future actions should speak to the possible enactment of a wilderness area at the Park.

NPS Response: This point is an important one and will be addressed in the development of the comprehensive noise management plan, in light of the Park's General Management Plan and Wilderness and Colorado River Management Plan.

29. Future Studies

A few commenters indicated that future acoustical studies at the Park should use defensible methods and employ peer review to ensure scientific validity.

NPS Response: The NPS concurs. The generation of solid, reliable scientific data is essential to inform sound resource management decisions.

Summary of the Proposal

In summary, the proposal is to refine the current noise impact assessment methodology to incorporate a two-zone geographic system with different noise thresholds applicable to the circumstances of each of the two zones. Zone One would be composed of (1) the developed areas of GCNP as generally identified in GCNP's 1995 General Management Plan (except Tuweep, Phantom Ranch, and the North Rim paved roads), encompassing, on the South Rim, the area from approximately Desert View to Hermits Rest, and, on the North Rim, the developed area on Bright Angel Point; (2) the area of the Park west of Whitmore Rapids, including the Sanup Flight-free Zone; and (3) the Marble Canyon Sector. Zone One comprises approximately one-third of the area of GCNP.

Zone Two would encompass, in a large contiguous area in the center of GCNP, approximately the remaining two-thirds of the Park's area .

Under this proposal, the noise threshold for Zone One is set at 3 decibels above the average natural ambient A-weighted sound levels found to exist in those areas of the Park as determined by previous scientific acoustic measurement studies. This is the same as the single standard used in

previous assessments (i.e., noticeability). The threshold for Zone Two will be set at 8 decibels below the average natural ambient A-weighted sound levels (i.e., audibility). The noise thresholds will be used in noise modeling for impact assessment to determine the onset of impact to natural quiet at GCNP.

Conclusion

As discussed above, the National Park Service has carefully considered and responded to the comments received on the Public Notice published in the **Federal Register** on January 26, 1999 (64 FR 3969–3972), concerning a change in the noise impact assessment methodology for air tour operations over Grand Canyon National Park. Based on this consideration, and the additional data and experience explained above which led to the Public Notice, the NPS decision is to adopt the proposed noise impact assessment methodology, and to request the FAA to use it for current rulemaking related to GCNP air tour overflight management and mitigation.

Future application of these refinements of the impact assessment methodology in FAA rulemaking measures are likely to make more challenging the agencies' efforts to achieve the substantial restoration of natural quiet. However, the use of the two noise thresholds and two geographic zones will better achieve the preservation of the GCNP resources and visitor experiences the NPS is charged to protect, and be more in line with the definition of substantial restoration of natural quiet.

Robert Stanton,

Director.

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