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UNITED STATES AIR FORCE RESEARCH LABORATORY

Federal Interagency Committee on Aviation Noise: 1997 Annual Report

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Interim Report for the Period January 1997 to December 1997

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FOR THE COMMANDER

MARIS M. VIKMANIS
Chief, Crew System Interface Division
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The Federal Interagency Committee on Aviation Noise (FICAN) was formed in 1993 to provide forums for debate over needs for future aviation nosie research and to encourage new development efforts in this area. All federal agencies concerned with aviation noise are represented on the Committee, including the U.S. Army, the U. S. Air Force, the U.S. Navy, the Department of Interior, the Department of Transportation, the Federal Aviation Administration, the U. S. Environmental Protection Agency, the National Aeronautics and Space Administration, the Department of Housing and Urban Development, and the Department of Health and HumanServices/Centers for Disease Control and Prevention. To help coordinate ongoing and future federal initiatives, FICAN meets regularly and holds additional forums to obtain broader input from the public at large as well as from interested members of the technical community. The Committee's activities in 1997 included five meetings, a public forum, publication of a position paper on the effects of aircraft noise on awakenings from sleep, and maintenance of FICAN's Web page on the Internet.

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EXECUTIVE SUMMARY

The Federal Interagency Committee on Aviation Noise (FICAN) was formed in 1993 to provide forums for debate over needs for future aviation noise research and to encourage new development efforts in this area. All federal agencies concerned with aviation noise are represented on the Committee, including the U.S. Army, the U.S. Air Force, the U.S. Navy, the Department of Interior, the Department of Transportation, the Federal Aviation Administration, the U.S. Environmental Protection Agency, the National Aeronautics and Space Administration, the Department of Housing and Urban Development, and the Department of Health and Human Services/Centers for Disease Control and Prevention.

To help coordinate ongoing and future federal initiatives, FICAN meets regularly and holds additional forums to obtain broader input from the public at large as well as from interested members of the technical community.

The Committee's activities in 1997 included:

- five FICAN meetings, held on 26 February, 27 April, 13 June, 8 September, and 30 October.
- a public forum, held in Minneapolis, Minnesota, 13 May 1996.
- publication of a position paper on the effects of aircraft noise on awakenings from sleep.
- maintenance of FICAN's Web Page on the Internet.

At the conclusion of its fourth year, FICAN makes the following recommendations and findings concerning the Committee and its activities:

- FICAN meetings continue to provide opportunities for interagency communication that is worthwhile.
- The public forum is a valuable mechanism for soliciting input from interested members of the aviation profession and community members. FICAN intends to hold a fifth public forum in 1998.
- FICAN's home page on the Internet's World Wide Web provides an important resource for interested citizens and researchers to find out about federal aviation noise research. FICAN has expanded its Web site in 1997 by both increasing its visibility, and improving the technical content of the page. The address is: http://www.fican.org.
- FICAN recommends the use of a revised dose-response relationship for predicting awakenings from sleep.
- FICAN will continue to publish technical positions on aviation noise topics of interest as definitive research by member agencies concludes.

- FICAN has investigated the issue of the effects of aircraft noise on school-aged children. Although research on this topic is not currently on any agency's agenda, FICAN is interested in this topic and will continue to maintain technical contact with members of the scientific community who are studying the subject.

FICAN's activities for 1998 will include:

- continued meetings on a quarterly basis,
- FICAN public forum, March 18, in Washington DC,
- publication of a report on aviation noise research conducted and sponsored by FICAN member agencies, and
- continued expansion of its Web page.

Table of Contents

List of Exhibits

1. INTRODUCTION

The Federal Interagency Committee on Aviation Noise (FICAN) was formed in 1993 to provide forums for debate over future research needs to understand, predict, and control better the effects of aviation noise, and to encourage new development efforts in these areas.

This report summarizes the work accomplished by the Committee during calendar year 1997. Previous work by the Committee is summarized in its *Annual Report: 1994* (FICAN, 1995), *Annual Report: 1995* (FICAN, 1996), and *Annual Report: 1996* (FICAN, 1997).

1.1 Background

In 1992, the Federal Interagency Committee on Noise (FICON) published its findings in a report entitled *Federal Agency Review of Selected Airport Noise Analysis Issues* (FICON, 1992). Among its findings, the Committee identified a need to increase research on the basic elements of aircraft noise assessment methods including (1) a reexamination of Day-Night Average Sound Level (or DNL) as the primary metric for describing aircraft noise, (2) an evaluation of the dose-response relationship between DNL and its effect on people (quantified as percent of people highly annoyed), and (3) the appropriateness of the noise criteria used to define compatibility with different land uses.

To foster the research, FICON recommended that a new federal interagency committee be formed with a mandate to provide forums for debate of future research needs and to encourage new development efforts in these areas. Specifically, the FICON report stated that "a standing federal interagency committee should be established to assist agencies in providing adequate forums for discussion of public and private sector proposals, identifying needed research, and in encouraging the conduct of research and development in these areas" (FICON, 1992).

1.2 FICAN Members

Each of the federal agencies conducting significant research on aviation-related noise is represented on FICAN. In addition, other agencies that are not currently conducting research but have broad policy roles with respect to aviation noise issues (such as HUD and EPA) are represented on the committee. In 1997, the Department of Health and Human Services/Centers for Disease Control and Prevention joined the Committee. The FICAN membership list is presented in Exhibit 1.

Participating member agencies have signed a Letter of Understanding, which defines the purpose, scope, membership, process, and products of FICAN, and formally documents the commitment of the participating agencies.

Exhibit 1. FICAN Members

Member	Department/Agency Represented
Mr. Thomas L. Connor	Department of Transportation/Federal Aviation Administration
Dr. Wesley Henry	Department of the Interior/National Park Service
Mr. Arnold Konheim	Department of Transportation/Office of the Secretary
Mr. Robert Lee	Department of Defense/U.S. Air Force
Mr. Jim Littleton	Department of Transportation/Federal Aviation Administration
Dr. George Luz	Department of Defense/U.S. Army
Mr. Ken Mittelholtz	Environmental Protection Agency
Ms. Amanda Niskar	Department of Health and Human Services/Centers for Disease Control and Prevention/National Center for Environmental Health
Dr. Jake Plante	Department of Transportation/Federal Aviation Administration
Dr. Clemans A. Powell	National Aeronautics and Space Administration
Mr. Joel Segal	Department of Housing and Urban Development
Dr. Kevin Shepherd	National Aeronautics and Space Administration
Mr. Alan Zusman, Chairman	Department of Defense/U.S. Navy

1.3 FICAN Scope

The FICAN Letter of Understanding defines the following scope for the Committee:

- provide a clearinghouse for federal aircraft noise research and development;
- develop recommendations on research and development and noise assessment issues;
- serve as a focal point for public/private/government questions and recommendations on aviation noise research and development;
- conduct public conferences on a periodic basis to exchange information on research and development findings, conclusions, and new aviation topics of public concern; and
- establish a network of sources for the accumulation and distribution of technical information on aviation noise to public/private/government entities.

Progress on these tasks is discussed throughout this report.

2. FEDERAL AGENCY NOISE PROGRAMS

All federal agencies undertaking significant aviation noise research are represented on FICAN. FICAN member agencies share a common goal of addressing aviation-related noise, but each individual agency has its own mission, and agency programs are designed to carry out those missions. The ultimate purpose and underlying mission for agency research, therefore, is critical to understanding the motivation for individual projects and the context in which that research is carried out.

The program goals and mission for each agency are discussed below. For those agencies with policy-making branches, a description of the process by which research is translated into policy is included.

2.1 Department of Defense/Air Force

Noise research for the Air Force is conducted under the purview of Armstrong Laboratory. The mission of the Laboratory's environmental noise program is to maintain the Air Force's ability to conduct flight operations at its airfields, military training routes and operations areas, weapons ranges, and other controlled and restricted airspace. This is accomplished by preventing or controlling encroachment of airfields and ranges, implementing aircraft mission realignment actions and acquiring and maintaining airspace. Performance of this mission is dependent on the ability to describe and assess, in a timely and defensible manner, the magnitude and impact of subsonic and supersonic noise.

In order for the Air Force to better predict aircraft noise and sonic booms and the potential impact on the environment, the Armstrong Laboratory maintains the Noise Effects Branch at Wright-Patterson Air Force Base in Dayton, Ohio. This organization is responsible for developing predictive noise models, measuring noise and sonic booms, and understanding the effects of noise and sonic booms on the environment. This requirement fulfills the need of the National Environmental Policy Act of 1969.

2.2 Department of Defense/Army

The primary center for research on Army-unique environmental noise is the U.S. Army Construction Engineering Research Laboratory, Champaign, Illinois. At the same time, various other Army organizations contribute new knowledge. A Directorate of the Army Research Laboratory works on ways to improve the prediction of sound propagation from meteorological data. Another Directorate develops electronic equipment for the automatic recognition of the acoustic signatures of military equipment. At the U.S. Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, there is a long standing program on sound propagation over snow. Evaluations of new noise assessment and mitigation technology is frequently carried out by the Army Center for Health Promotion and Preventive Medicine, Aberdeen Proving Ground, Maryland.

In response to a continued decline in funding for environmental noise research, Army researchers are achieving greater efficiencies through joint work with their Air Force counterparts. For example, a recent

Air Force study of the effects of jet aircraft on ratites was supplemented by Army and Army National Guard funding, personnel, and helicopters so that the analysis could cover Army helicopters as well. Greater efficiencies are also realized by partnerships with military noise experts in Norway, The United Kingdom, Canada, Germany, Denmark, Netherlands, Switzerland and Sweden.

Funding saved through reliance on national and international teamwork over helicopter noise has allowed Army environmental noise scientists to concentrate on the assessment and mitigation of the noise of large weapons (e.g. artillery, demolitions, tank guns). Social surveys have shown that large weapons are the Army's primary environmental noise issue.

Research on environmental noise is incorporated into policy in two ways: (1) revisions of Chapter 7 of Army Regulation (AR) 200-1, Environmental Protection and Enhancement, and (2) Participation by Army experts in standards setting groups such as the American National Standards Institute (ANSI) and the International Standards Organization (ISO).

2.3 Department of Defense/Navy

The Department of Navy has initiated two research programs under the auspices of the Chief of Naval Operations and the Naval Facilities Engineering Command. The Navy is the Executive agent for a bi-lateral agreement for environmental cooperation between the U.S. Department of Defense and the Armed Forces of the Kingdom of Sweden. In the area of aircraft noise, a project was initiated in 1996 investigating the effects of wind, water, and terrain on the propagation of aircraft noise. To address the propagation over water, measurements are being conducted at two U.S. Naval Air Stations and a Fighter Base in Sweden. The research is being conducted through a cooperative arrangement with the Air Force's Armstrong Laboratory. Results of this effort are expected in the summer of 1997 and will enable planners to better predict noise exposure in the vicinity of airfields located near major bodies of water.

In addition, the Navy in cooperation with the U.S. Army Construction Engineering Research Laboratory has initiated a project to address sound propagation of blast noise from large guns and air-to-ground ordnance in coastal areas. The project will result in algorithms addressing the land-water interface of sound propagation for incorporation into a new version of the U.S. Army's Blast Noise Program currently under development. Results of this effort are anticipated by FY 99.

2.4 Environmental Protection Agency

Section 1500.2(f) of the National Environmental Policy Act (NEPA) instructs federal departments and agencies to "use all practicable means, consistent with the requirements of the Act and other essential considerations of national policy, to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment."

In 1982 the EPA's Office of Noise Abatement and Control was closed for budgetary reasons. Subsequently, the EPA's involvement with noise issues has been largely limited to issues related to NEPA review and comment under Section 309 of the Clean Air Act (CAA).

Section 309(a) of the CAA states, "The [Environmental Protection Agency (EPA)] Administrator shall review and comment in writing on the environmental impact of any matter relating to duties and responsibilities granted pursuant to this Act or other provisions of the authority of the Administrator, contained in any .... newly authorized federal projects for construction and any major federal agency action ..." Pursuant to the NEPA and Section 309 of the Clean Air Act, EPA reviews and comments on proposed major federal actions that significantly affect the quality of the human environment.

Additionally, the EPA is authorized to develop and submit recommendations to the Federal Aviation Administration regarding noise produced by aircraft and aircraft-related activities under the Noise Control Act of 1972 and the Quiet Communities Act of 1978.

Prior to its participation on FICAN, the EPA also participated in a predecessor group, the Federal Interagency Committee on Noise (FICON), which reviewed federal policies governing the assessment of airport/air facility noise impacts. As a result of the FICON recommendations, EPA has developed a guidance manual for EPA staff who provide scoping and review comments on NEPA documents.

2.5 Department of Transportation/Federal Aviation Administration

Goal 9 of the FAA Strategic Plan (FAA, 1993) calls for the agency to provide strong leadership in mitigating the adverse impact of aviation. The first objective under that goal is to reduce the impact of aircraft noise by 80 percent (based upon population) by the year 2000, through an optimal mix of new aircraft noise certification standards, operational procedures, and technology. Under the mandate of the National Environmental Policy Act, the Noise Control Act, CFR 14 Parts 36 and 150, FAA's research program addresses the environmental consequences of FAA's actions and identifies procedures and technologies to reduce aircraft noise.

A major activity is the FAA/NASA long-term research program to investigate the state of technology to reduce aircraft noise from airframe and engines as part of the Advanced Subsonic Aircraft Technology Initiative. The NASA section of this report provides more details on this program (Section 2.6). FAA's role in the program is to understand the technology under consideration and to help guide the program toward solutions that are technologically practicable and economically reasonable. Along with program elements to identify manufacturing technologies to reduce noise, the community noise impact program element will assess operation noise reduction possibilities and identify methods to minimize community noise impact.

The FAA's community noise impact program has close ties to another part of the agency's research program to promote advances in the state-of-the-art technologies to assess and abate aviation environmental effects. The approach to improve and expand upon existing environmental assessment capabilities includes an

integrated system of analytical tools, guidelines, and training regimens to apply to the assessment of the environmental impacts of agency actions.

FICAN serves as a forum for members to discuss research findings, identify topics requiring research, and solicit the public's concerns about aviation noise effects. FAA envisions that FICAN will lead to expanded coordination and cooperative research efforts among individual agencies and, thus, result in more efficient use of federal funds for aviation noise research. FAA also anticipates that the recommendations and findings of FICAN will become part of an integrated system of analytical tools, guidelines and training regimens to apply to the assessment of the environmental impacts of agency actions including airport development, aircraft operating strategies, air traffic management, and airspace design. As an example, the agency is currently revising FAA Order 1050 to include the recommendations of the Federal Interagency Committee on Noise (FICON) which was the predecessor to FICAN. In conjunction with new guidelines, the agency is enhancing the computer models used in airport noise analysis. The enhancements include use of demographic and topographic data bases along with computational processes for additional supplemental noise analyses as recommended in the FICON report.

Federal Aviation Administration Order 1050, "Policies and Procedures for Considering Environmental Impacts", implements the National Environmental Policy Act of 1969 (NEPA) and the related orders, statutes, and regulations. The order establishes the procedures for the preparation of Environmental Impact Statements (EIS's) and Findings of No Significant Impact (FONSI's) and for preparing and processing environmental assessments of FAA actions. The objective of the order is to clarify, for FAA Headquarters, Regional and field personnel the NEPA process in terms of planning, procedures, content and format, and public participation.

The NEPA environmental review process is most concerned with environmental activities related to the "natural world", such as air and water quality and the effects of the human environment. Impact categories include noise, socioeconomic, land uses, and transportation among many others. Order 1050 presents information and guidance on the assessment of the effects for all environmental categories. Guidance includes specific data gathering and assessment responsibilities along with the threshold of significance on the maximum/minimum level of effect. In the aircraft noise category, the order provides guidance on required and supplementary noise measures, threshold of significant increase, and identification of potential effects to assess including community annoyance, sleep disturbance, and speech interference.

FAA's Office of Environment and Energy (AEE) is responsible for the overall review of FAA compliance with the provisions of Order 1050. AEE provides assistance as necessary to offices, services, regions, and centers in developing guidelines and procedures for their program areas. This office is the focal point for all aviation-related environmental programs within the agency and represents the agency on FICAN. AEE is charged with formulating long-range objectives and priorities for aircraft noise and engine exhaust emissions research and development programs. The return on investment is measured by the agency's actions to diminish aviation environmental impacts while also removing constraints upon aviation system growth. Better means of assessing aviation noise impacts will lead to better agency decisions on the aviation system and reduce environmental constraints on airport and system capacity.

Accordingly, FICAN products will be formally transmitted to the appropriate policy officials within the participating agencies, who in turn will initiate appropriate policy changes, either as independent agency actions or as a result of interagency policy coordination. Such coordination will occur on an ad hoc basis when appropriate, based on FICAN products.

2.6 Department of Housing and Urban Development

The Department of Housing and Urban Development maintains a liaison with other federal agencies on research and demonstration activities related to noise and its effect upon housing and land use. The Department's concern with noise as a major source of environmental pollution can be traced back to the objectives of the Housing Act of 1949 which established a national goal to provide "a decent home and a suitable living environment for every American family." In 1961, the Federal Housing Administration's appraisal guidance material identified noise as an issue to be considered in property appraisals in order to meet the requirements of the Housing Act of 1949. A subsequent concern about noise was voiced in the Housing and Urban Development Act of 1965 which requested HUD to "determine feasible methods of reducing the economic loss and hardships suffered by homeowners as a result of the economic depreciation in the values of their properties following the construction of airports in the vicinity of their homes." This included a study of feasible methods of insulating such homes from the noise of aircraft.

24 CFR Part 51 Subpart B "Noise Abatement and Control" established Departmental standards, requirements and guidelines for all HUD housing and community development programs. The regulation encourages the control of noise at its source in cooperation with other federal agencies; encourages land use patterns for housing and other noise-sensitive urban needs that will provide a suitable separation between them and major noise sources; generally prohibit HUD support for new construction of noise-sensitive uses on sites having unacceptable noise exposure; provides a policy on the use of structural and other noise attenuation measures where needed; provides policy to guide implementation of various HUD programs; and recognizes the use the Day-Night Average Sound Level (DNL) to describe noise.

The basic document to implement the noise regulation (24 CFR Part 51B) is the *Noise Guidebook* (HUD, 1985). The Guidebook contains desktop methods for calculating noise levels from aircraft, highways, and railroads. It also encourages the HUD field offices and its clients to rely on the Federal Aviation Administration, airport operators, and the Department of Defense for aviation noise data and for land use conformity practices.

2.7 National Aeronautics and Space Administration

NASA's noise reduction program is a major part of NASA's Advanced Subsonic Technology Initiative Program which began in October 1993 to develop technology to ensure that the U.S. aviation industry is prepared to meet the demands placed on the aviation system by growing traffic volume and safety requirements. The goal of the program is to provide noise reduction technology readiness to allow unrestrained market growth, provide increased U.S. market share, and insure compliance with international

environmental requirements. The current program plan spans a seven year period. The program approach is designed to develop noise reduction technology in cooperation with U.S. industry and the FAA to enhance growth and competitiveness, while maintaining high efficiency. The technology areas included in the program are engine noise reduction, nacelle aeroacoustics, engine/airframe integration, interior noise reduction, and flight procedures to reduce airport community noise.

The objective of the program will be achieved via systematic development and validation of noise reduction technology. The timing of the technology development will be consistent with the anticipated timing of recommendations for increased stringency in noise standards. There has been a strong coordination among government, industry and academia in the planning of this noise reduction program. This close coordination will continue during the execution of the program to effectively transfer the noise reduction technologies to the U.S. industry.

To achieve the goals of the program, NASA has established an objective of 10 dB noise reduction relative to 1992 technology. This goal will be achieved by a team of industry, university, and government technologists working within a well-established noise technology infrastructure. The noise reduction program objective will be achieved by combined noise reduction improvements in the engine, aircraft system, and in aircraft operations. The five elements of the noise reduction program are directed toward three desired technology results: engine design for noise reduction, aircraft system noise minimization, and community noise impact minimization.

In addition to the Advanced Subsonic Technology Noise Reduction Program, NASA is supporting and conducting noise research applicable to helicopters, general aviation airplanes, and future aviation systems, such as tiltrotor aircraft and high speed (supersonic) civil transports.

NASA does not develop national noise policy. It participates in policy development at other agencies primarily by providing research and advising agency policy makers. Formal advice generally is transmitted through comments on actions such as Notices of Proposed Rulemaking (NPRM).

2.8 Department of the Interior/National Park Service

The objective of the National Park Service's Aircraft Overflight Research Program has been to answer the major questions posed by Public Law 100-91, the National Park Overflight Act. The two major questions are as follows:

- Is there a proper minimum altitude which should be maintained by aircraft when flying over units of the National Park System? (Subsidiary questions tie to impacts of overflights on on-ground users, impairment of visitor enjoyment, injurious effects of overflights on natural and cultural resources, and values associated with aircraft flights over parks); and

- Have the Special Federal Aviation Regulations (SFAR 50-2) that regulate the airspace over the Grand Canyon succeeded in substantially restoring the natural quiet in that park?

The Secretary of the Interior submitted a report to the Congress in the fall of 1994. In part, that report concluded the following:

> Aircraft overflights can cause impacts to park resources and values. For certain visitors, for visitors engaging in certain activities, and for certain areas, there is a very real potential for overflights to impact parks' natural and cultural resources, visitor experiences, and solitude and tranquility -- the very fabric of many national parks. A systematic framework for addressing those problems is a first step; it should be flexible enough to address the unique airspace/park use issues identified in this report. NPS priorities should be used to effectively focus problem-solving efforts. At the same time, aviation confers benefits to parks and to some park visitors. The NPS needs the assistance of the FAA and the Department of Defense so that the scarce resources of natural quiet and airspace can be most effectively conserved for the common good and benefit of the American public, while also preserving the benefits provided by aviation. All of the involved agencies have very different missions with little tradition for working together for effective solutions. This needs to change, and there is some evidence that this is possible (NPS, 1994).

The current focus of research conducted by the NPS is to develop a methodology to solve aircraft overflight problems at park service units. The NPS Manger's Survey and Visitor Survey indicate that there could be as many as 50 to 100 units of the park system where overflight problems are likely or certain to exist. NPS managers have consistently identified 30 to 40 parks as priorities for research and problem solving.

2.9 Department of Health and Human Services/Centers for Disease Control and Prevention/National Center for Environmental Health

The National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention, has been a national leader in environmental health since its creation in 1980. NCEH is dedicated to serving the global community by preventing disease, birth defects, disability, and death due to environmental factors. NCEH studies ways to prevent and control health problems associated with exposure to air pollution, nuclear radiation, lead and other toxicants, and physical hazards (e.g., noise, heat, and cold), as well as hazards resulting from natural and technologic disasters. NCEH is conducting research on hearing loss among children associated with exposure to environmental toxicants and hazards. Research on environmental noise is incorporated into NCEH studies on noise-induced hearing loss among children. In addition, NCEH is studying the interaction of noise and smoking on hearing loss among children.

3. FICAN MEETINGS

During 1997, FICAN met five times: 26 February, 27 April, 13 June, 8 September, and 30 October.

The Contractor prepared and distributed agendas prior to the meeting date, and also took minutes at each meeting and distributed them to Committee members subsequently. Agendas and minutes for each meeting are presented in Appendix A.

Mr. Alan Zusman, FICAN Chairman, facilitated the first four meetings; Dr. George Luz facilitated the fifth meeting in Mr. Zusman's absence.

The Committee's first meeting in 1996 was on 26 February 1996 at Department of Transportation Headquarters (Washington, DC). The major research items discussed at that meeting were sleep disturbance and low frequency noise. NASA presented a recommended dose-response curve for predicting awakenings from sleep, which was supported by the Committee. The FAA representative initiated a discussion of low frequency noise problems and their relationship to sound insulation programs.

The second meeting in 1996 was held on 27 April, at DOT Headquarters (Washington, DC). The main discussion items were FICAN's sleep disturbance position and health effects. The Committee reviewed and discussed the draft sleep disturbance position, developed from the dose-response curve presented at the February meeting. Representatives from the Centers for Disease Control and Prevemtion's (CDC) National Center for Environmental Health (NCEH) discussed their concerns regarding aircraft noise and public health. FICAN also discussed plans for its public forum on May 12.

The third meeting was held on 13 June at DOT Headquarters. The focus of the meeting was finalization of FICAN's sleep disturbance position, discussed in detail in Section 5.1 of this report. The Committee also discussed the issues raised at the public forum in Minneapolis.

The fourth meeting was held on 8 September at DOT Headquarters. The subject of this meeting was the effects of aircraft noise on school-aged children. Dr. Gary Evans and Dr. Aline Bronzaft, researchers in the field, presented findings of their research to the Committee.

The final FICAN meeting of 1997 was held at DOT Headquarters on 30 October. The major research issue under discussion at that meeting was the effects of aircraft noise on school-aged children. This issue is discussed further in Section 5.2 of this report. At that meeting, FICAN also discussed plans for its fifth public forum (March 1998).

4. PUBLIC OUTREACH

One of FICAN's major efforts is outreach to other researchers, acoustics professionals, aviation noise control professionals, and members of the general public. To that end, FICAN provides a number of vehicles for dissemination of information on FICAN and its activities.

4.1 Public Forum

One of the principal purposes outlined in the FICAN Letter of Understanding is to provide "adequate forums for discussion of public and private sector proposals (for aviation noise research)." Specifically, the scope states that FICAN will "conduct public forums on a periodic basis to exchange information on R&D findings, conclusions and new aviation noise topics of public concern."

To that end, FICAN conducted its fourth public forum on 12 May 1997 in Minneapolis, Minnesota. The meeting site and date were selected to attract attendees of the 1997 American Association of Airport Executives Annual Conference, which was held in Minneapolis earlier that same week, as well as interested members of the public. FICAN sent invitation letters to all other parties on the FICAN mailing list (compiled from previous meetings, interest, etc), as well as several hundred contacts in the Minneapolis area. The letter is included in Appendix B. In addition, a Federal Register announcement was made, and the forum was announced in the *Airport Noise Report*, and *Noise Regulation Report*, both widely-read aviation trade journals.

The agenda for the public forum is presented in Appendix B. The agenda was designed to allow enough time for researchers to present relatively detailed descriptions of their research programs and individual projects, while at the same time providing maximum interaction between presenters (researchers) and forum attendees (members of the aviation community and general public). Therefore, presentations were grouped by major topic area, with comments and discussion permitted at the conclusion of each session.

Thirty-five people signed the attendance sheet presented in Appendix B. It is estimated that an additional 10 to 15 people attended the forum but did not sign the attendance sheet.

A number of issues were raised during the course of discussions at the public forum. The major issues, along with FICAN's response, are discussed below:

Many of the attendees to the public forum focussed on local noise issues having to do with the Minneapolis-St. Paul Airport (MSP). Unfortunately, the Metropolitan Airports Commission (MAC), which operates MSP, did not send a representative to the meeting to respond to those concerns, which ranged from poor implementation of MSP's sound insulation program, to issues concerning the new third parallel runway. Local issues which can be applied in a more general context are included in the discussion below.

Other topics raised at the public forum are identified below. For each topic, the public forum discussion is presented, as well as additional subsequent action or information, if applicable.

- **Noise of Stage 3 "hushkit/retrofit" aircraft**

Issues Raised by Attendees: A specific question was asked concerning the inclusion of retrofit and hushkit aircraft in FAA's projected goal of an 80% reduction in aircraft noise by 2000. In addition, attendees asked about phase-out plans for these aircraft types, which "barely meet" the Part 36 Stage 3 requirements.

Discussion: T. Connor indicated that the projection had assumed "pure" Stage 3 aircraft (i.e., non-hushkit/retrofit), and that perhaps, in that sense it may be optimistic. With respect to phase-out of these aircraft, there is no set schedule. However, many of the aircraft that have been hushkitted or retrofitted are approaching the end of their useful life (25 - 30 years) as compared with newer technology, "pure" Stage 3 aircraft.

Additional Information: Additional information on the phase out of Stage 2 aircraft is detailed in FAA's annual Report to Congress, the most recent entitled *1996 Progress Report on the Transition to Quieter Airplanes*, which is available through FAA and on the Internet at the Office of Environment and Energy's Web site (http://aee.hq.faa.gov). That report indicated that all air carriers are in compliance with the Airport Noise and Capacity Act of 1990 (ANCA, codified at 49 USC 47521-47533). Although carriers apply to the Secretary of Transportation for a limited waiver of phase out requirements, no waivers have been granted to date.

- **Noise Modeling Issues**

Issues Raised by Attendees: Specific questions concerned low frequency noise, particularly for ground operations; the incorporation of propagation effects over water (including the effects of "rough" and "smooth" water surfaces); the issue of noise barriers; and validation of the INM.

Discussion: T. Connor indicated that DNL and other A-weighted metrics are the standard used by FAA to address aircraft noise issues in the INM; FAA does not have a separate standard for low frequency noise. Bob Lee responded to questions of propagation by indicating that NOISEMAP version 7, which should be completed this summer, will include the results of the ongoing propagation research, including the work currently underway in Norway to evaluate propagation over water. With regard to noise barriers and modeling in general, T. Connor indicated that FICAN is relying on the SAE A-21 Committee to provide guidance on the relative importance of noise modeling issues. He also added that the INM Design Review Group, which is made up of INM users, provides significant input to the INM design process.

Additional Information: The FAA continues to make improvements to the model based on agency applications and recommendations of the government and industry INM Design Review Group (DRG). Current development plans include enhanced acoustic calculations using the spectral shape of the noise source. The techniques implemented will support a wider range of modeling conditions and will improve the lateral attenuation component of the model. Other enhancements include the merger of the FAA's Heliport Noise Model (HNM) into the INM, improved user input and display

abilities, support of new GIS links, and increased computing performance. In addition, the system will be updated to support the latest version of the Windows operating system and new aircraft data from the manufacturers. Technical support will be maintained for the more than 600 worldwide users of the model.

- **Health Effects**

Issues Raised by Attendees: Several questions were asked regarding research on the auditory and non-auditory health effects of aircraft noise exposure. Particular concern was expressed regarding effects on children and learning and on elderly populations. Frustration was also voiced at the lack of progress in this area.

Discussion: A. Powell responded that NASA has not included any health effects studies as part of its current community research program (although NASA is studying sleep disturbance, and response to changes in noise environments); a great deal of hearing research was done in the 1970s by EPA, which determined that aviation noise levels experienced in communities is not high enough to cause hearing damage. T. Connor further added that Centers for Disease Control and Prevention (CDC) had recently joined FICAN, and that their representatives were surprised that FICAN agencies would contemplate undertaking epidemiological research on non-auditory health effects which, in their opinion, was sure to result in non-findings (due to the complexity of the issue, preponderance of confounding variables, and huge sample size that would be necessary). G. Luz pointed out that existing research fails to demonstrate any health effects, presumably because adults are subjected to many stressors, which are confounders in the analysis. Studies with children, on the other hand, have shown some subtle effects, mostly in the area of learning: reading skills, frustration, and "conditioned helplessness". Statistically significant cardiovascular changes also have been demonstrated in some studies of children in noisy schools, but without longitudinal studies, there is no way of knowing whether these changes have any significance for health.

FICAN Response: FICAN has reviewed the literature on the health effects of aircraft noise on school-aged children; the topic was a focus of two Committee meetings in 1997. Findings on this issue are discussed in Section 5.2 of this report.

- **Noise Abatement Approach and Departure Procedures**

Issues Raised by Attendees: FAA policy regarding the use of Noise Abatement Departure Procedures (NADPs) does not consider communities which may be even more "distant" than the areas assumed in the FAA's Advisory Circular (AC) 91-53A Distant NADP, and might be better served by a departure procedure which eliminates climb restrictions. Research into the effectiveness of more aggressive departure procedures is warranted. Attendees also requested information on the status of GPS technology and its potential use for noise abatement approaches.

Discussion: T. Connor responded that AC 91-53A states that an airline can have two NADPs (and a third "standard" departure); each carrier's interpretation of the NADP guidelines is different,

resulting in different procedures for each carrier. The intent of the AC is for airport operators to work with air carriers to identify the procedure which best suits the individual airport's noise environment.

FICAN Response: A few airports are currently extensively involved in this issue, and are working with air carriers to identify the procedures that best suit the airport. However, the responsibility for recommending NADPs lies with the airport operator, and the responsibility for implementing them lies with the air carrier, and ultimately the individual pilot. FAA's role in this process is to provide guidance.

- **DNL 65 dB Standard and Methodology**

Issues Raised by Attendees: Many people do not agree with the use of the Day-Night Average Sound Level (DNL) standard of 65 dB for land use compatibility. Even if DNL is the best indicator of response to aircraft noise, two issues should be pursued: (1) first, the Schultz curve should be updated regularly to identify changes in response to aircraft noise over time, and (2) as noise levels from individual events (SELs) decrease over time, the number of events has increased, and the repetition of overflights has become an increasing concern at greater distances from the airport. These factors may validate the desire to reduce the recognized level of nuisance to 60 dB or lower. In addition, the issue of the acceptability of DNL 65 as the standard for compatibility in rural areas was raised.

Discussion: T. Connor responded that FICON addressed the issue of the appropriateness of DNL 65 for identifying incompatibility with residential land use. That report noted that, although not perfect, DNL provides the best indicator of response to aircraft noise. R. Lee also added that FICON recommended supplementing DNL analyses with other metrics, such as the use of sound exposure level (SEL) contours for individual events; he admitted that the problem with these metrics is that there is little guidance for interpreting community response with these other metrics. He also added that no definitive studies have been conducted on the difference in response to aircraft noise in rural areas versus suburban or urban areas, which presumably have higher ambient noise levels.

Additional information: The FICON report (FICON, 1992) discusses this issue at length, addressing both the scientific and policy-related applicability of the DNL metric, as well as the land use compatibility guidelines. The research supporting FICON's decision and the dose-response curve (the "Updated Schultz curve") presented in the FICON report is described in more detail in an article in the *Journal of the Acoustical Society of America* (Fidell, 1991).

- **Funding of noise research programs**

Issues Raised by Attendees: Comments were made regarding the importance of continued research on aircraft source noise reduction and aviation noise effects. Concern was raised regarding potential reduction of funding in these areas. Additional concern was raised regarding reduction of Airport Improvement Program (AIP) funding for noise mitigation, and the use of Passenger Facility Charges (PFCs) for noise mitigation programs, particularly the less stringent requirements for public notice with implementation of PFC funding. Related comments included requests for FICAN's support of

the FAA Noise Ombudsman position and the re-establishment of the EPA Office of Noise Abatement and Control (ONAC).

Discussion: T. Connor responded that reduction in federal noise research budgets are indeed a reality; unfortunately, FICAN members have little control over the budgets assigned to them. However, the diminishing funds means that agencies must prioritize their research needs.

Additional information: FICAN member agencies continue to share limited research budgets, and coordinate on research programs in order to eliminate redundancy of effort. This is one of the greatest benefits of the Committee. Furthermore, agencies are making concerted efforts, such as the FAA's Environmental Research 2000 program, to prioritize research needs and coordinate with other interested parties.

- **Noise Issues related to hub airports and event clustering**

Issues Raised by Attendees: The question was asked whether any FICAN agency has studied the potentially unusual noise effects that hub airport neighbors experience, namely, the clustering of events as hub airlines work in "banks" of operations.

Discussion: A. Powell responded that NASA is looking at clustering effects in some of its community noise research program.

Additional information: Preliminary results of NASA's research in this area are expected to be available in 1998.

- **Stage 3.5/4 aircraft**

Issues Raised by Attendees: Attendees expressed support for the establishment of Part 36 Stage "3.5" or 4 noise standards. They also suggested FAA develop incentives for the phaseout of older technology Stage 3 aircraft (hushkit/re-engined aircraft, MD-80-type aircraft).

Discussion: These comments were made in the context of other remarks; no direct response was given.

Comments: FAA participates in the International Civil Aviation Organization's (ICAO's) Committee on Aviation Environmental Protection (CAEP) "Model 1" task group by providing leadership in the development of improved standards for airport and airspace noise methodology.

- **Effects of noise on housing values**

Issues Raised by Attendees: Attendees expressed concern that additional research on this topic is warranted, and that there are conflicting results regarding effects of noise on housing values.

Discussion: T. Connor agreed that the results of FAA's study were not conclusive, and that additional knowledge would be helpful. However, he added that at the present time, FAA was not clear how it could proceed, short of conducting a similar study at airports across the country; this clearly is prohibitively expensive.

Individuals were invited to fill out comment forms provided at the forum or to submit comments to the contractor at a subsequent date. The comment form also provided check-off boxes for people to indicate if they wished to receive a FICAN *Report on Aviation Noise Research Conducted at U.S. Federal Agencies* or to be added to the FICAN mailing list. Eleven individuals submitted written comment before, during, and subsequent to the public forum. These are provided in Appendix B.

4.2 World Wide Web Page

An issue that has been raised at every FICAN public forums is better dissemination of information on FICAN, its activities, and research conducted by FICAN member agencies. In particular, attendees at public forums have expressed concern about those who are not "plugged in" to FICAN through normal routes (i.e., professional societies, etc).

To respond to this need, FICAN established a "home page" on the Internet's World Wide Web in 1996. This home page provides information on FICAN, its activities and research conducted by FICAN member agencies. One of the great strengths of the Web is its ability to provide "links" to other pages: FICAN's home page is linked to all FICAN member agencies which have pages, and to sources of research reports prepared by member agencies (e.g., NTIS).

Additions to the page in 1997 included a comprehensive, searchable bibliography of reports and articles published as a result of member agency research; a "What's new?" section for publicizing aviation-related topics of interest; and regular posting of minutes of FICAN meetings.

The Web also is interactive, and provide opportunities for Web browsers to submit comments on FICAN's work, and to request FICAN documents online. Approximately 300 internet browsers explored FICAN's Web Page in 1997.

The FICAN Web Page address is: http://www.fican.org.

5. FINDINGS AND RECOMMENDATIONS

Through the course of its meetings, public forum, and conference attendance, FICAN has made progress on research in a number of different areas. These issues include sleep disturbance, effects of noise on school-aged children, and others.

5.1 Sleep Disturbance

The effect of aviation noise on sleep is a long-recognized concern of those interested in addressing the impacts of noise on people. Historical studies of sleep disturbance were conducted mainly in laboratories, using various indicators of response (electroencephalographic recordings, verbal response, button push, etc). Field studies also were conducted, in which subjects were exposed to noise in their own homes, using real or simulated noise. However, in a 1989 assessment of existing research, Pearsons indicated the need for substantially more work in this area, citing the large discrepancy between laboratory and field studies as a major concern.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened (% awakening) as a function of the exposure to single event noise levels expressed in terms of sound exposure level (SEL). This interim curve was based on the data presented in the 1989 study. The FICON report also recommended continued research into community reactions to aircraft noise, including sleep disturbance.

Since the adoption of FICON's interim curve in 1992, substantial field research in the area of sleep disturbance has been completed, using a variety of test methods, and in a number of locations. The data from these studies show a consistent pattern, with considerably less percent of the exposed population expected to be behaviorally awakened than had been shown with laboratory studies.

In light of this new information, FICAN recommends the adoption of a new dose-response curve for predicting awakening [Exhibit 2]. The Committee takes the conservative position that, because the adopted curve represents the upper limit of the data presented, it should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the "maximum % awakened". FICAN cautions that the dose-response relationship presented here relies on behavioral awakening as the indicator of sleep disturbance; relationships between aircraft noise and other potential sleep disturbance or related health effects responses have not been established by any of these newer studies. FICAN further notes that this curve should be applied only to long-term residential settings and should not be generalized to include children.

The new finding on the relationship between aircraft noise and sleep disturbance does not call into question the nighttime penalty applied to Day Night Sound Level (DNL). The 10 dB penalty added to noise levels for the period 10 p.m. to 7 a.m. is intended to account for the increased intrusiveness of noise at night. The ambient is generally lower and more people are at home during this period than at other times of the day. Thus, the opportunities for activity interference are much higher during nighttime which could lead to greater annoyance.

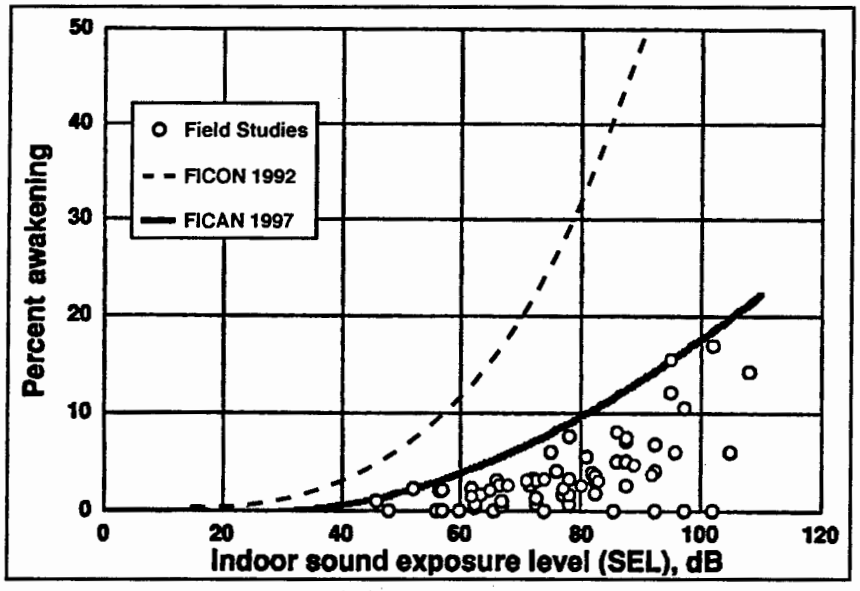

Exhibit 2. Recommended Sleep Disturbance Dose-Response Relationship

Continuing efforts to identify other dose-response relationships are being undertaken by standards-setting organizations, such as the American National Standards Institute. FICAN will evaluate proposed relationships developed by such groups as they are published; until that time, FICAN recommends the use of the curve presented here for assessing potential sleep disturbance caused by aircraft noise.

A complete discussion of FICAN's findings can be found in Appendix C.

5.2 Effects of Aviation Noise on School-aged Children

The issue of health and social science research with respect to aviation noise continues to provoke comments at FICAN and other public forums. Of particular interest in 1997 was the issue of the potential effects of aviation noise on school-aged children. This issue was raised by a number of attendees to the public forum, and in subsequent comments FICAN received. To better understand and address the issue, FICAN invited members of the research community to discuss their interests at a FICAN meeting on September 8, 1997 (see minutes of that meeting). At its meeting in October 1997, FICAN discussed the challenges raised by the researchers, and possible responses. In summary, these are:

- One shortcoming is that none of the agencies has a specific program to review or study the issue, and in fact, the USAF is the only agency to study it at all. Research is usually directed as a result of legislation or other policy decisions; in order for issues to make it to the front of the research agenda, it must be high on the priority list. Furthermore, research these days must be focused, and have a targeted result in order to be funded. An example of such a policy decision could be the requirement that noise analyses require different assessments at schools to address speech interference. Although

such research is not currently on any agency's agenda, FICAN will continue to maintain technical contact with members of the scientific community who are studying the subject.

- NASA is currently trying to lay out its research agenda to follow the Advanced Subsonic Technology (AST) Program, which is winding down. NASA's future research agenda is called "Three Pillars for Success"; in the Global Civil Aviation Pillar, environmental compatibility is a key goal, with a specific technological goal of noise reduced by a factor of two (10 EPNdB) over today's aircraft. The detailed research agenda is being developed with the assistance of the FAA, as well as a number of steering committees. Health effects on children might be an area that would be included in the research program; this research will not be initiated until the completion of the AST program, probably around 2004.

- FAA also is embarking on the development of its future research agenda. FAA's program is entitled "Environmental Research Beyond 2000". The goal of the program is to prioritize FAA research funding.

- FICAN should continue with interagency cooperation on noise research issues.

- It is important to note that aircraft are not the only sources contributing to noisy school environments. It seems logical that the Department of Education should be the leader on this issue. FICAN will contact the Department of Education to identify a representative to FICAN to discuss this issue.

5.3 FICAN Agenda for 1998

At the conclusion of its fourth year, FICAN makes the following recommendations and findings concerning the Committee and its activities:

- FICAN meetings continue to provide opportunities for interagency communication that is worthwhile.

- The public forum is a valuable mechanism for soliciting input from interested members of the aviation profession and community members. FICAN intends to hold a fifth public forum in 1998.

- FICAN's home page on the Internet's World Wide Web has provided an important resource for interested citizens and researchers to find out about federal aviation noise research. FICAN intends to continue to maintain its Web page in 1998.

- FICAN will publish technical positions on aviation noise topics of interest as definitive research by member agencies concludes.

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APPENDIX A. AGENDAS AND MINUTES

Federal Interagency Committee on Aviation Noise (FICAN)
Meeting, 26 February 1997

Agenda

Time: 10 a.m. to 2 p.m.
Location: Command Conference Room at Naval Facilities Headquarters

I. Introductions

II. Administration

III. Status of Assignments

IV. Public Forum '97
1. Location/dates
2. Agenda
3. FICAN speaker

V. HMMH Follow-up
1. 1996 Annual Report
2. WWW home page

VI. SLUCM Update (J. Segal)

VII. SAE A-21 Recommended Practices for Noise Modeling
1. Discussion
2. FICAN Position

VIII. Health Effects
1. Discussion of USAF and tri-nation reports
2. FICAN position

XIX. ASTM Noise Metrics (G. Luz)
1. Discussion
2. FICAN Recommendation

X. Sleep Disturbance
1. Discussion of NASA/DIA Studies
2. FICAN Position

XI. Sound Insulation Criteria (T. Connor)

XII. Other
1. Research Report
2. Public Information Materials Inventory
3. FAA Noise Policy

XIII. Action Plan

XIV. Close

Federal Interagency Committee on Aviation Noise
(FICAN)
Washington, DC
26 February 1997
Minutes of Meeting

I. INTRODUCTIONS

I.1 The meeting began at 10:00 a.m. with 11 persons present. Attendees are listed below.

Name:	Agency Represented:
Mr. Alan Zusman	DOD/USN
Dr. George Luz	DOD/USA
Mr.Thomas L. Connor	DOT/FAA
Mr. James Littleton	DOT/FAA
Mr. Arnold Konheim	DOT/OST
Dr. Andy Powell	NASA
Mr. Joel Segal	HUD
Mr. Ken Mittelholtz	EPA
Mr. William Dickerson	EPA
Mr. Robert Miller	HMMH, Contractor
Ms. Mary Ellen Eagan	HMMH, Contractor

II. ADMINISTRATION

II.1 G. Lux asked that minutes of the previous meeting be altered to reflect the fact that the DOD Handbook, "Planning in the Noise Environment" is under preparation; it has not been completed (Item D.5).

II.2 A. Zusman suggested that the agenda item VIII, Health Effects, be tabled until the next meeting, primarily because R. Lee was unable to attend.

On that subject, T. Connor stated that FAA would be unable to make a statement, based on the fact that the research FICAN has been reviewing is related to low-level military flying, and would have no relationship to civil noise exposure. A. Zusman said that he would ask R.

Lee to conduct a brief literature search for other research on aircraft (civil) noise exposure as it relates to health effects [TASK].

R. Miller also pointed out that he had received a call from Dr. Susan Staples regarding NIH/CDC participation in FICAN. She has identified an individual who would be willing to serve on the Committee; A. Zusman agreed to contact the individual [TASK].

II.3 A. Zusman asked if others were aware of H.R. 536, the "Quiet Communities Act of 1997", and its possible influence on the FICAN. K. Mittelholtz indicated that he was aware of the resolution, and that it reflects continuing efforts by some members of the public to re-establish the EPA Noise Office.

III. STATUS OF ASSIGNMENTS

III.1 M. Eagan indicated that all assignments were reflected in the agenda for today's meeting, with the exception of the bibliography of public information materials. She indicated that she is still waiting for information from FICAN members.

IV. PUBLIC FORUM '97

IV.1 R. Miller re-stated HMMH's recommendation that the 1997 FICAN public forum be held in conjunction with the American Association of Airport Executives (AAAE) Annual Conference, which will be held in Minneapolis, MN, May 11-14. The Committee agreed to hold the public forum in conjunction with the AAAE Conference, and will look for opportunities to work with the Minneapolis St. Paul Metropolitan Airports Commission (MSP MAC) staff to identify a location for the public forum. The forum will be held on Tuesday, May 12, with an afternoon and evening session. HMMH will make arrangements for the forum [TASK].

IV.2 AAAE has invited a FICAN member to speak at its Environmental Committee Technical Meeting. A. Zusman volunteered to speak at that meeting [TASK], which will be held during the conference.

IV.3 N.O.I.S.E. has also invited FICAN to speak at its next conference, in July, 1997. A. Zusman volunteered to provide the same presentation to that group [TASK].

IV.4 Regarding the AAAE Exhibition, the Committee agreed that if there is still sufficient budget, HMMH should make arrangements to set up a booth at the Exhibition Hall [TASK].

V. HMMH Follow-Up

V.1 M. Eagan asked for comments on the 1996 Annual Report. G. Luz suggested that the report include a section on the US Navy's Noise Program. A. Zusman agreed to provide this [TASK]. A. Zusman also indicated that he would like to include a section on the Navy's current research on propagation effects over water [TASK].

V.2 FICAN WWW Home Page

M. Eagan indicated that progress is continuing on expansion of FICAN's Web page, to include NTIS citations for aviation research projects. Also, that HMMH continues to receive one or two requests per week for FICAN information. A. Zusman indicated that he would like the page to have a counter to track the number of "hits" to the page, as an indication of how popular the page is. M. Eagan also indicated that FICAN should look into expanding links from other pages and/or search engines. HMMH will continue to work on the page [TASK].

VI. Standard Land Use Coding Manual (SLUCM) Update

VI.1 J. Segal indicated that there was a meeting held in Chicago, January 19-20, 1997 to review progress to date on the project and discuss problems with the current land use coding methods (a list of attendees at the conference attached). A summary report of the two day conference will be out in approximately two weeks; J. Segal will distribute to the Committee. The SLUCM group is interested in using the "earth cover" definitions (a distinction is made between "earth cover", defined as natural use of land, and "land use", defined as man-made use) developed for other countries, as a means of minimizing effort on this part of the project. J. Segal agreed to keep FICAN informed of progress on the project, which is expected to be completed in 1999.

VI.2 A. Zusman asked about the Technical Advisory Committee, and its function. He (and several others) had been invited to participate, but was unclear of the function of the Committee. J. Segal indicated that he expected the Technical Advisory Committee would advise APA, act as reviewers, and provide case studies.

VII. SAE Recommended Practices for Noise Modeling

VII.1 T. Connor reported that there has not been any meeting of the SAE A-21 Committee since the last FICAN meeting. He will report on issues with SAE A-21 as they develop. He added that all noise modeling issues are being examined by SAE A-21, including propagation, and that A-21 will be interested in the ongoing US Navy propagation work.

VII.2 On a related topic, G. Luz reported that ANSI is developing a standard for combining noise from different sources. FICAN should probably review this standard. He agreed to forward a copy of the final draft to HMMH for distribution to the rest of the Committee [TASK].

VIII. Health Effects

VIII.1 This item was tabled until the next meeting, in order to include R. Lee's input.

XIX. ASTM Standard Guidelines for Selection of Environmental Noise Measurements and Criteria

XIX.1 G. Luz introduced the ASTM Standard Guidelines as a compendium of all noise metrics available. ASTM was encouraged by citizen activists to develop these guidelines, and they are intended primarily for informational purposes, by providing noise metric descriptions and references to ANSI and ISO standards. A. Zusman voiced his concern that the proliferation of standards and guidelines being published by a variety of bodies makes agency noise work, particularly Environmental Impact Statements, difficult to support. T. Connor suggested that since these are only guidelines, and not standards, there is no need for FICAN to establish a position. The Committee agreed that this was appropriate.

X. Sleep Disturbance

X.1 A. Zusman introduced the topic by stating that, since the "Interim" sleep interference relationships were published by FICON, his agency has been in the position of reporting a range of potential sleep interference, using the FICON curve as a conservative estimate, and the more recent field data as the lower bound. He suggested that, now that all the sleep studies have been completed, it is an appropriate time for FICAN to establish a position.

X.2 A. Powell distributed copies of a recommended curve, using the upper limit of the field data, to identify a "maximum expected" level of potential awakenings. T. Connor responded that he thought this was a good approach; however, FICAN's position should clearly state that FICAN still supports the use of DNL, and the 10 dB nighttime penalty associated with DNL. W. Wilkerson asked two questions from EPA's perspective: first, would this curve apply to camping or other outdoor situations, and second, there seemed to be an implicit assumption by FICAN that the two curves are directly comparable. Is this so? T. Connor indicated that he thought the curve should only be applied to residential situations. A. Zusman was encouraged that the data from all the field studies appeared to be "clustered".

X.3 A. Zusman suggested that HMMH draft a FICAN position on sleep disturbance for discussion at the next FICAN meeting [TASK].

XI. Sound Insulation Criteria

XI.1 T. Connor explained that his office has been asked to evaluate a request by Baltimore Washington International Airport (BWI) for additional sound insulation funding, because of special situations at some homes near the runway that experience high levels of low-frequency noise (from ground operations, takeoff roll, and reverse thrust). He indicated that he was seeking information from FICAN members on several topics: (1) general information related to low-frequency aircraft noise, particularly from ground operations, (2) the appropriate metric and/or measurement procedures to use to identify problem areas, (3) an approach to translate whatever measurements are made into valid criteria to use in addressing these kinds of problems.

XI.2 G. Luz described several projects the Army had undertaken to address the issue of low-frequency helicopter noise and "blade slap". In general, the Army found that indoors, in the presence of rattle, helicopter blade slap noise was found to be more annoying than other helicopter noise. In the absence of rattle however, no difference was observed. Today, the Army assigns no penalty for blade slap if the house construction prevents rattle.

XI.3 R. Miller described some of the work at Logan International Airport on low-frequency noise which had similar origins. He also described Logan's sound insulation program, which includes a "room of preference" which is a building isolation treatment to address, among other things, noise-induced vibration. He offered to provide a copy of the program to FICAN [TASK].

XI.4 T. Connor stated that he would collect additional information between now and the next FICAN meeting, and report back on his findings [TASK].

XII. Other Issues

XII.1 A. Zusman asked the status of the FAA Ombudsman position. T. Connor indicated that it has been established at FAA as a part-time position for the next six months, after which it will be evaluated.

XII.2 The next meeting was set for Monday, April 14, 1997.

The following table indicates outstanding tasks:

Item	Ref.	Task	Assigned to
1	II.2	Conduct literature review of health effects issues in IBON	R. Lee
2	II.2	Contact potential NIH/CDC representative to FICAN	A. Zusman
3	III.1	Provide inventories of public information material to HMMH	All
4	IV.1	Make arrangements for FICAN public forum	HMMH
5	IV.2	Present FICAN information to AAAE Noise Committee	A. Zusman
6	IV.3	Present FICAN information to N.O.I.S.E. Conference	A. Zusman
7	IV.4	Make arrangements for FICAN booth at AAAE	HMMH
8	V.1	Write-up of Navy Noise Program for Annual Report	A. Zusman
9	V.1	Write-up of Navy research on over-water propagation for Annual Report	A. Zusman
10	V.2	Continue development of FICAN Web page	HMMH

11	VI.1	Distribute SLUCM conference report to FICAN	J. Segal
12	VII.2	Forward ANSI standard on combining noise sources to HMMH for distribution	G. Luz, HMMH
13	X.3	Draft FICAN Position on sleep disturbance	HMMH
14	XI.3	Distribute Massport Sound Insulation Guidelines to FICAN	HMMH
15	XI.4	Collect low-frequency/sound insulation information. Report to FICAN	T. Connor

XIII. CLOSE

H.1 The meeting adjourned at 2:30 p.m.

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Federal Interagency Committee on Aviation Noise (FICAN)
Meeting, 14 April 1997

Agenda

Time: 10 a.m. to 2 p.m.
Location: Department of Transportation Headquarters, Room 9320

I. Introductions

II. Administration

III. Status of Assignments

IV. Public Forum '97 Update

V. Draft ANSI Standard for Combining Noise Sources (G. Luz)

VI. Sleep Disturbance
1. FICAN Position

VII. Health Effects
1. Presentation by Dr. Carol Rubin, Centers for Disease Control
2. Discussion of USAF and tri-nation reports

VIII. Sound Insulation Criteria for Low-Frequency Noise Update (T. Connor)

XIX. Action Plan

X. Close

Federal Interagency Committee on Aviation Noise (FICAN)
Washington, DC
Minutes of Meeting
14 April 1997
As approved 27 June 1997

I. INTRODUCTIONS

I.1 The meeting began at 10:00 a.m. with 14 persons present. Attendees are listed below. In the interest of time, A. Zusman suggested that the agenda be modified to cover sleep disturbance and health effects issues in the morning, and follow with administrative issues in the afternoon.

Name:	Agency Represented:
Mr. Alan Zusman	DOD/USN
Dr. George Luz	DOD/USA
Mr.Thomas L. Connor	DOT/FAA
Mr. Arnold Konheim	DOT/OST
Dr. Andy Powell	NASA
Mr. Robert Lee	DOD/USAF
Mr. Ken Mittelholtz	EPA
Mr. William Dickerson	EPA
Mr. Ken Feith	EPA
Dr. Carol Rubin	CDC/NCEH
Dr. Emilio Esteban	CDC/NCEH
Ms. Amanda Niskar	CDC/NCEH
Mr. Robert Miller	HMMH, Contractor
Ms. Mary Ellen Eagan	HMMH, Contractor

II. SLEEP DISTURBANCE

II.1 A. Zusman introduced the topic, stating that in light of research that has been completed since the issuance of the FICON interim curve (1992), it is appropriate for FICAN to state a position on sleep disturbance at this time. The Committee had had an opportunity to review the draft position prepared by HMMH, and he opened the discussion for comment on it.

II.2 T. Connor indicated that he was satisfied with the proposed position, but would like to add a paragraph which explicitly states that FICAN continues to support the 10 dB nighttime penalty in the Day Night Average Sound Level (DNL). The Committee approved his proposed paragraph.

II.3 A. Zusman indicated that he had been in communication with Dr. Larry Finegold of USAF/AMRL, who pointed out that the ANSI S12 (Noise) Committee is in the early stages of developing a standard for sleep disturbance. Dr. Finegold indicated that some confusion might be generated by FICAN's issuance of a proposed dose-response relationship, especially if the ANSI standard indicated a different relationship. A. Zusman asked for committee opinion on whether to delay FICAN's position.

R. Lee indicated that he also had spoken with Dr. Finegold, and had some additional information on schedule and other potential issues. First, the USAF contribution to the standard would not be completed until late August (1997) at the earliest; ANSI would probably not initiate its standard development until sometime after that. Second, issues which still need resolution include: (1) awakening vs. arousal, and the applicability of each; (2) short term vs. long term exposure, i.e., habituation; (3) which of the older field studies should be included in the standard (several of the older studies used estimates of outdoor noise, rather than measurements of indoor noise); (4) linkage of arousals/awakenings to the "epoch" (time period) in which the event occurred, and the definition of the epoch (e.g., 30 seconds vs. 2 minutes); (5) international positions which use Lmax and outdoor noise (vs. U.S. position of indoor SEL); and (6) limit of extrapolation for dose-response curve. Finally, Dr. Finegold suggested that FICAN should contact Karl Pearsons, chair of the sleep disturbance committee, to discuss this issue, and in particular, the schedule. R. Lee expected that the ANSI dose-response curve would, if different at all, be somewhat less conservative in predicting sleep disturbance than the proposed FICAN curve (i.e., it would probably represent the central tendency of the data rather than the maximum limit).

A. Konheim indicated that his experience with ANSI committees suggested that, though the sleep disturbance committee is working very quickly compared to other committees, it probably still would be some time before anything is finalized.

T. Connor agreed, and suggested that FICAN ask ANSI S-12 to review the technical issues of FICAN's position, and respond by the next FICAN meeting. The Committee concurred with this opinion.

II.4 R. Lee suggested that the FICAN position should also include a paragraph cautioning that the sleep disturbance response indicated in the dose-response relationship is awakening, not arousal, and that a distinction should be made between the two responses.

II.5 W. Dickerson asked if background noise had been taken into account in the current sleep research. Specifically, he was interested in the difference ("delta") between background noise, as measured in the subject's bedroom, and the intruding noise level. R. Lee indicated that the Castle AFB study had very large differences (40 to 50 dB) between background level and intruding sound exposure level, while the Denver study areas generally had much less difference, covering a broad range of conditions.

II.6 W. Dickerson also indicated concern that the sleep disturbance work seems to focus on awakening, and does not get to the question of health effects, i.e., it may be possible to be unawakened by aircraft noise, yet still suffer ill health effects by some mechanism which is unknown or unidentified by current research. K. Fief concurred, and suggested that FICAN clarify its position to state as much. R. Lee agreed, stating that the current dose-response curve predicts only awakenings.

G. Luz indicated that arousal (behavioral or actimetric) is only a gross measure of sleep disturbance. Physiological arousal may be a problem we have not addressed. He described several non-U.S. studies of this issue, and indicated that he believes there are two susceptible populations which have not been addressed: children and ill people.

A. Zusman stated that he believed the Committee was talking about two different issues. First, that FICAN is generally concerned with the health effects of arousal/awakening, but research to date does not address those issues. However, FICON did establish a dose-response curve in 1992 that is based on behavioral awakening, which appears to be inappropriate to stand in light of current data. He suggested that Committee try to separate the two issues, by releasing the proposed position, with a statement regarding the need for additional research on health effects of sleep disturbance.

II.7 Finally, K. Mittelhotlz suggested that the wording regarding applicability of the dose-response relationship to campgrounds, mobile homes, etc. should be clarified to indicated "short term" housing. The Committee agreed with this recommendation.

II.8 HMMH agreed to revise the draft proposal to reflect the comments described here, and distribute the revised position to FICAN and ANSI for review by the next FICAN meeting [TASK].

III. HEALTH EFFECTS

III.1 A. Zusman introduced Dr. Carol Rubin of the Centers for Disease Control and Prevention's (CDC's) National Center for Environmental Health (NCEH). Dr. Rubin explained that she, Dr. Esteban, and Ms. Niskar are members of the Health Studies Branch, which is concerned primarily with the health effects of environmental exposures. NCEH has an extensive biomonitoring laboratory, where it studies the health effects of pesticides, chemicals, heat, cold, and noise. The NCEH's goal is to provide practical studies which determine, if possible, a relationship between an exposure and an outcome, and furthermore propose ways to avoid the exposure (and related outcome). NCEH generally does not address occupational issues (this is done by NIOSH). NCEH's work relative to noise had focussed on traffic (surface) noise, "walkmans" and other personal stereo equipment, and firearms, though generally not aircraft noise; she indicated that NCEH certainly is interested in pursuing the issue.

Dr. Rubin stated that there are priorities for research at CDC: (1) CDC prefers to work through the state agency, (2) CDC prefers to work with exposures for which a reference "normal" range is known, and if unknown, can be determined, (3) to the extent possible, field work involves

quantifying exposure, and not relying on anecdotal information, (4) CDC looks at the most vulnerable population, often children, and (5) CDC avoids investigations that reach non-findings.

With respect to NCEH and FICAN, Dr. Rubin indicated that she believes that noise is an important issue that has generally been ignored by the environmental community.

In reviewing FICON and FICAN reports, she was surprised that FICAN intends to conduct research on non-auditory health effects but not on noise-induced hearing loss (NIHL). Both T. Connor and K. Feith replied that EPA sponsored very extensive NIHL research in the U.S. during the early 1970s. The findings of that research indicate that aircraft noise exposure in residential communities is below the threshold to induce NIHL. Since FICON believed that auditory health effects are understood, the next logical area of study would be non-auditory health effects. Dr. Rubin is of the opinion that research on non-auditory health effects is not practical and that such investigations are bound to reach non-findings. She offered that the many confounding factors embodied in the alleged health consequences (hypertension, birth defects, mental health problems, etc) would prevent any success in pinpointing aircraft noise as the main culprit.

III.2 Dr. Esteban briefly explained that National Health and Nutrition Examination Survey (NHANES) to FICAN. NHANES is an extensive health survey of a weighted sample of the entire U.S. population. There have been three such surveys conducted (most recently over 1988-1994), and the fourth study is currently being designed. NHANES includes audiometry data on a sample of 6,100 children; NCEH is in the process of comparing the hearing data to data collected from the first NHANES (in the 1960s), to determine if there has been a change in the "normal" hearing range of children over time. He indicated that one problem with the NHANES study is determining environmental exposure to noise. NCEH would like to include environmental exposure as a component of the next NHANES.

III.3 G. Luz indicated that he believes the issue with regard to children is the signal-to-noise ratio at which 100% discrimination of noise is possible. He referred that Committee to a recent article in the Journal of Sound and Vibration concerning hearing effects on school children, which documents that degraded performance is greater among younger children than older children with hearing loss. He further indicated that if audiometry is conducted as part of NHANES, it should include high-frequency testing, to 16 KHz, if possible.

III.4 Dr. Rubin concluded the discussion by stating that CDC is interested in continued involvement with FICAN. One concern is the possibility that the audiometric testing may be dropped from the next NHANES, and she is interested in finding ways to support and encourage the testing.

IV. ADMINISTRATIVE

IV.1 A. Zusman indicated that he welcomed ongoing participation by CDC/NCEH in FICAN. He asked T. Connor about current process for adding members. T. Connor indicated he would find appropriate paperwork to invite CDC to participate in FICAN [TASK].

V. STATUS OF ASSIGNMENTS

V.1 M. Eagan stated that all assignments from the previous meeting had been completed, with two exceptions: (1) A. Zusman had indicated he would ask R. Lee to prepare a literature search of health effects information in IBON; R. Lee stated that this would be difficult, however, he would provide the Committee with a copy of Stan Harris' paper on health effects [TASK], and (2) FICAN members should provide information on public information materials to HMMH [TASK].

VI. PUBLIC FORUM '97

VI.1 R. Miller and M. Eagan updated the Committee on plans for the public forum in May. M. Eagan asked FICAN members to submit potential changes to the FICAN slides by 21 April [TASK]. R. Lee indicated he could be available to present FICAN information at AAAE if A. Zusman was not.

VII. DRAFT ANSI STANDARD FOR COMBINING NOISE SOURCES

VII.1 G. Luz provided some background to the draft standard: it is a military-driven issue, initiated by concern at multi-use military facilities (e.g., Otis AFB. MA) because of the confusion caused by "piecemeal" noise evaluation. The procedure described by the standard is to convert noise events into equivalent "annoyance", then sum the annoyance over all events. The conversion includes penalties for a variety of noise source types, such as small arms and other impulsive noise. He had not brought the issue to the entire FICAN because he believed it is an issue primarily of concern to the military.

R. Lee indicated that his concern with the proposed methodology is that it has not been tested anywhere. G. Luz agreed, stating that he had made that suggestion to the ANSI Committee, but had been turned down. A. Powell added his concern that similar research by Ollerhead and others seemed to have been ignored in the development of this standard.

R. Lee stated that he would like FICAN to comment on the standard, making the following specific points: (1) the standard is confusing, even to professional experts in the field, (2) as agencies that will potentially be tasked with implementing this standard, FICAN would like more information on the scientific basis of the procedure, and (3) FICAN would like to see the procedure tested at some location. HMMH agreed to draft such a comment letter, and will provide copies to FICAN for comment; the Committee recommended that it be sent with A. Zusman (Chair) as signatory.

VII.2 With regard to Part 5 of the same standard, G. Luz offered to reply on behalf of FICAN, and will indicate that coordination with SLUCM update group is warranted.

T. Connor suggested that, in the future, FICAN members of such standards committees should bring draft standards and/or updates of committee activity to FICAN.

VIII. RESIDENTIAL SOUND INSULATION OF LOW FREQUENCY NOISE (UPDATE)

VIII.1 T. Connor provided FICAN with a brief status report of his work to date on the issue of sound insulation against low frequency noise (see 26 February Meeting). He offered to provide copies of the BWI test plan when it is available [TASK], and will continue to update FICAN as necessary. T. Connor's status report is attached.

IX. Other Issues

IX.1 The next meeting was set for the week of June 2, 1997. HMMH will coordinate [TASK].

The following table indicates outstanding tasks:

Item	Ref.	Task	Assigned to
1	II.8	Revise FICAN draft position on sleep disturbance; distribute to FICAN and ANSI S-12	HMMH
2	IV.1	Investigate procedures for inviting CDC to join FICAN as a permanent member.	T. Connor
3	V.1	Provide copy of Stan Harris report on health effects to FICAN	R. Lee
4	V.1	Provide inventories of public information material to HMMH	All
5	VI.1	Finalize arrangements for FICAN public forum, AAAE booth	HMMH
6	VI.1	Modify public forum slides; submit to HMMH	All
7	VI.2	Respond to ANSI re: ANSI S12.9-199x - Part 5	G. Luz
8	VII.1	Provide copies of BWI test plan to FICAN	T. Connor
9	IX.1	Schedule next FICAN meeting for week of 2 June	HMMH

XIII. CLOSE

H.1 The meeting adjourned at 2:30 p.m.

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Federal Interagency Committee on Aviation Noise (FICAN)
Meeting, 27 June 1997

Agenda

Time: 10 a.m. to 2 p.m.
Location: Department of Transportation Headquarters, Room 9230

I. Introductions

II. Administration

III. Status of Assignments

IV. Public Forum '97 Recap
1. Issues/Response/Publicity
2. 1998 Forum

V. Draft ANSI Standard for Combining Noise from Different Sources - P. Schomer

VI. Sleep Disturbance
1. Finalize FICAN Position
2. Publicity

VII. Health Effects
1. Stan Harris Report
2. FICAN Position

VIII. Aviation Noise Research Report

XIX. Action Plan

X. Close

Federal Interagency Committee on Aviation Noise (FICAN)
Washington, DC
Minutes of Meeting
27 June 1997
As approved 5 February 1998

I. INTRODUCTIONS

I. The meeting began at 10:00 a.m. with 11 persons present. A. Zusman introduced Mr. Paul Schomer of the US Army's Construction Engineering Research Laboratory (CERL), who had been invited to attend the meeting to discuss a new ANSI standard addressed under Agenda Item V.

Name:	Agency Represented:
Mr. Alan Zusman	DOD/USN
Dr. George Luz	DOD/USA
Mr. Jim Littleton	DOT/FAA
Mr. Robert Lee	DOD/USAF
Mr. Arnold Konheim	DOT/OST
Dr. Andy Powell	NASA
Mr. Ken Mittelholtz	EPA
Ms. Amanda Niskar	CDC/NCEH
Mr. Joel Segal	HUD
Mr. Paul Schomer	DOD/USA, CERL, Invited Guest
Mr. Robert Miller	HMMH, Contractor

II. ADMINISTRATION

II.1 There were several typographical edits made to the minutes of the previous meeting of 14 April 1997; HMMH agreed to revise and redistribute [TASK].

III. FICAN PUBLIC FORUM

III.1 The Committee discussed the public forum which was held on May 12th in Minneapolis, MN, and, in particular, the positive response but generally low public turnout that has occurred consistently across many of the forums. The group discussed various methods of increasing attendance at the next meeting, including public service announcements, video conferencing to a satellite site, and alternative cities to maximize interest. A. Zusman suggested Washington for the next site, not

only because of the community concern for noise at three airports but it would afford the opportunity for many elected officials to attend as well. HMMH agreed to begin plans for holding the next forum in Washington and to investigate costs of video-conference at a single test site [TASK].

The group also agreed to post HMMH's memo summarizing the public forum on the FICAN Web page and to indicate that FICAN is taking the various comments received at the forum under advisement and will be responding in greater detail on a number of the issues raised there in its Annual Report [TASK].

IV. SLEEP DISTURBANCE

IV.1 The Committee discussed the draft position paper on sleep disturbance including the fact that the paper was a summary of others' research on "awakenings" only and did not address shifts in sleep state or other aspects of "disturbance". Also, the research did not isolate possible effects on sensitive populations such as children or the elderly, nor did the results apply to non-residential land uses such as campsites. Committee members adopted several edits reflecting these discussions and unanimously approved the position paper as revised. The Committee agreed to print the position paper and to publish it on its Web page [TASK].

V. ANSI STANDARD FOR COMBINING NOISE FROM DIFFERENT SOURCES

V.1 Mr. Paul Schomer had been invited by FICAN to discuss the new ANSI standard S12.9-1996/Part 4, "Quantities and Procedures for Description and Measurement of Environmental Sound -- Part 4: Noise Assessment and Prediction of Long-Term Community Response". Mr. Schomer began the discussion by explaining that the standard was an outgrowth of the Strategic Environmental Research and Development Program (SERDP), a joint program of DOD, DOE, and EPA. That group had identified a need to combine disparate noise sources at certain military facilities to estimate overall noise impacts and also to provide the best possible legal basis for taking future Federal actions based on Environmental Impact Statement findings.

Mr. Schomer also presented some background into the American National Standards Institute (ANSI) committee framework. He pointed out that ANSI standards are initially developed within accredited standards committees under the auspices of the Standards Secretariat of the Acoustical Society of America. Standards coming out of these committees require consensus of a cross-section of the acoustical community, and votes usually achieve 90 to 100% consensus of members before they are passed on to ANSI for adoption. He pointed out that anyone is welcome to join a Committee (although there is a $750 cost for membership); also, that several Federal agencies are represented on the S-12 Noise Committee which voted to adopt the present standard. Drafting of each standard is accomplished by working groups, in this case the Noise Committee's Working Group S12.15, Measurement and Evaluation of Outdoor Community Noise. Once ANSI receives a standard for Furthermore, ANSI requires a public comment period for all its proposed standards,

and none were received on this draft. Thus, the standard was formally adopted by ANSI in November 1996, and is currently in printing.

P. Schomer then explained many of the technical details of the document. It defines mathematical means of calculating DNL by incorporating corrections for sounds having special characteristics such as impulses, prominent tones, strong low frequency content, and high on-set rates. It also provides for inclusion of background noise when it is determined to be significant. Thus, for example, noise from aircraft operations, artillery fire, and small arms fire can all be combined to determine a single value of DNL.

Various FICAN members expressed significant concern that there has been no scientific testing of community annoyance from combined noise sources to back up the standard, and that it may be very misleading to presume that the "Schultz curve" (which relates percent of people highly annoyed to individual noise sources) is useful as a predictor of annoyance from the adjusted DNL values computed for multiple noise sources, each having very different noise characteristics. Various FICAN members also expressed concern that there appeared to be little understanding of policy implications of the new standard.

[Copies of Standard S12.9-1996/Part 4 are now available from Standards Manager, Acoustical Society of America, 120 Wall Street, 32nd Floor, New York, NY 10005-3993; telephone (212) 248-0373.]

VI. HEALTH EFFECTS

VI.1 A. Zusman initiated the discussion by stating that the DOD Environmental Noise Working Group had met yesterday on various issues and among other things concluded that the term "health effects" is too broad. FICAN's present interest in noise effects is much narrower -- effects of noise on learning in schoolage children.

R. Miller expressed concern that Dr. Stan Harris' report on Health Effects was being perceived by the public as a FICAN document. R. Lee pointed out that it should be made clear that the USAF published Dr. Harris' report to capture his thoughts and views as a researcher who had examined numerous claims of noise effects on health. This report represents Dr. Harris' position and does not represent the position of the USAF or DOD. R. Lee wanted the report brought forward to open discussion about this important issue. He wanted to thank Dr. Bronzaft for pointing out her work on noise effects on learning. He stated that he believes that this is an important issue and needs careful study because large impacts for policymakers.

On the subject of reading, P. Schomer referred the group to a 1969 or 1970 study of reading conducted near the Seattle-Tacoma Airport which found impacts on low- and mid-ability students, but he did not know if the work was ever published. HMMH agreed to investigate whether documentation of the results exists [TASK].

The group then discussed the possibility of inviting Dr. Bronzaft and Professor Gary Evans, both researchers in the field, to its next meeting. HMMH agreed to check into their availability for a meeting in late summer [TASK]. G. Luz volunteered to do a literature search on the effects of noise on learning and provide the group with the results [TASK]. A. Zusman offered to contact the Department of Education to invite someone from that organization to represent DOE on such issues [TASK].

VII. NEXT MEETING

VII.1 The Committee agreed to meet next late summer.

VII.2 The meeting adjourned at 1:00 p.m.

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Federal Interagency Committee on Aviation Noise (FICAN)
Meeting, 8 September 1997

DOT Headquarters Building
400 7th Street, SW
Washington, D.C. 20590
Room 9230

Agenda

Time: 10 a.m. to 2 p.m.
Location: Department of Transportation Headquarters, Nassif Building, Room 9230
Contact: Mr. Arnold Konheim, phone (202) 366-4849

I. Introductions

II. Administration

III. Effects of Aircraft Noise on School-age Children

1. Arline L. Bronzaft, Ph.D.
   Noise Committee, Council on the Environment, New York City

2. Gary W. Evans
   Dept. of Design and Environmental Analysis, College of Human Ecology, Cornell University

IV. Action Plan

V. Other Business

VI. Next Meeting

VII. Close

Federal Interagency Committee on Aviation Noise (FICAN)
Washington, DC
Minutes of Meeting
8 September 1997

I. INTRODUCTIONS

I.1 The meeting began at 10:00 a.m. with 13 persons present. Attendees are listed below. A. Zusman began the meeting by introducing the invited guests, Dr. Arline Bronzaft and Professor Gary Evans, to the Committee.

Name:	Agency Represented:
Mr. Alan Zusman	DOD/USN
Dr. George Luz	DOD/USA
Mr. Thomas L. Connor	DOT/FAA
Mr. Arnold Konheim	DOT/OST
Dr. Andy Powell	NASA
Mr. Robert Lee	DOD/USAF
Mr. Ken Mittelholtz	EPA
Ms. Amanda Niskar	CDC/NCEH
Mr. Joel Segal	HUD
Arline Bronzaft, PhD	City of New York, Invited Guest
Gary Evans, PhD	Cornell University, Invited Guest
Mr. Robert Miller	HMMH, Contractor
Ms. Mary Ellen Eagan	HMMH, Contractor

II. EFFECTS OF AIRCRAFT NOISE ON SCHOOL-AGED CHILDREN

II.1 Arline Bronzaft described her background to the Committee, which includes Chair of the Noise Committee for the New York City Council on the Environment, Professor Emeritus at the City University of New York, and most recently, participation in the newly formed Citizens Aviation Watch. Dr. Bronzaft described her initial experience with transportation noise, which focused on noise levels in schools adjacent to the New York City transit. Dr. Bronzaft consulted to the Transit Authority for a number of years, during which she conducted some of her research on schools.

Dr. Bronzaft's research with respect to the schools included before and after measurements of the reading skills of students initially exposed to transit noise in classrooms which were subsequently quieted by six to eight decibels using rubber track mounts and acoustic tile ceilings in classrooms.

Dr. Bronzaft discussed her interest in the body of research around this issue, and stressed the need for aggressive study of the issue in the U.S., which she believes is far behind some other countries in this area. She added that research also needs to be done on the home environment and its effects on cognitive development.

II.2 Professor Gary Evans' presentation on the effects of aircraft noise on school-aged children was divided into three areas: (1) his research, (2) other research in the field, and (3) areas for future research.

Dr. Evans presented results of his research conducted at schools near Los Angeles International Airport (LAX), near the New Munich Airport in Germany, and in New York City. Professor Evans' research focuses on chronic noise effects – all of the children are tested under quiet conditions, screening out the possible effects of acute noise exposure. The non-auditory testing conducted by Evans includes reading tests as well as cardiovascular and neuroendicrine (stress hormone) testing. Evans' research has shown small elevations of blood pressure (about 4-5 millibars) with little or no habituation over time. These elevations in blood pressure do not suggest hypertension, but there is concern that continued elevation could lead to hypertension in adulthood. Neuroendicrine testing shows significant elevation of stress hormones.

Reading tests show differences in reading over time. An interesting finding is that the differences appear to be greater as the reading task is made more difficult. Researchers in this area hypothesize that language acquisition changes when exposed to chronic noise, and that the mechanism responsible for the learning effects is a noise - language - reading pathway. That is, exposure to high noise levels interferes with the acquisition of language, which affects reading ability.

Another interesting effect has been termed "learned helplessness" – this occurs when the child is exposed to uncontrolled stimuli, and eventually learns not to respond to the stimulus. It has been observed in children exposed to noise who give up on puzzle-solving sooner than children not exposed to the high noise levels.

Other research in the field shows consistent but small effects in the areas of reading, non-auditory health effects, motivation and other areas of learning, as described in Evans' article in the journal *Children's Environments*. One area significantly lacking in the research is development of a dose-response relationship.

Dr. Evans identified priorities for future research as follows: (1) longitudinal, prospective studies which track the same students over time, (2) dose-response functions, including more accurate measurements of the noise exposure that children are exposed to in school and at home, (3) more work to understand the mechanism involved, including reading and language acquisition, as well as the home environment.

II.3 R. Lee asked both researchers to describe what they think FICAN should do with this information.

Dr. Bronzaft identified four areas where she believes FICAN could become involved. First, FICAN should recommend and support the re-establishment of the EPA's Office of Noise Abatement and Control (ONAC). Second, Dr. Harris' report on health effects largely ignored this issue; FICAN should acknowledge the body of research on this issue that exists. Third, more research funding is needed. Finally, additional vehicles besides the public forum are needed to reach out to larger groups of people.

Dr. Evans responded that to the extend FICAN members can communicate priorities to those with funding, it should focus on interagency cooperation for research. Another possible vehicle FICAN could consider would be to sponsor a short symposium on the subject, and invite physical and behavioral scientists to develop a research agenda.

III. OTHER BUSINESS

III.1 A, Zusman suggested that FICAN members should consider today's presentations over the next few weeks, and be prepared to discuss the issue at the next FICAN meeting. He further suggested that the Committee should meet next in October to discuss this issue and other FICAN activities.

IV. CLOSE

IV.1 The meeting adjourned at 12:45 p.m.

Federal Interagency Committee on Aviation Noise (FICAN)
Meeting, 30 October 1997

DOT Headquarters Building
400 7th Street, SW
Washington, D.C. 20590
Room 9234

Agenda

Time: 10 a.m. to 2 p.m.
Location: Department of Transportation Headquarters, Nassif Building, Room 9234
Contact: Mr. Arnold Konheim, phone (202) 366-4849

I. **Introductions**

II. **Administration**

III. **Effects of Aircraft Noise on School-age Children**

IV. **FICAN Public Forum '98**

V. **Aviation Noise Research Report**

VI. **Action Plan**

VII. **Next Meeting**

VIII. **Close**

Federal Interagency Committee on Aviation Noise (FICAN)
Washington, DC
Minutes of Meeting
30 October 1997
As Approved 5 February 1998

I. INTRODUCTIONS

I.1The meeting began at 10:00 a.m. with 8 persons present. In Alan Zusman's absence, George Luz agreed to chair the meeting. Jake Plante introduced Emily Barnett (AEE-120) to the Committee.

Name:	Agency Represented:
Dr. George Luz	DOD/USA
Mr. Jake Plante	DOT/FAA
Ms. Emily Barnett	DOT/FAA
Mr. Arnold Konheim	DOT/OST
Dr. Andy Powell	NASA
Mr. Ken Mittelholtz	EPA
Mr. Robert Miller	HMMH, Contractor
Ms. Mary Ellen Eagan	HMMH, Contractor

II. ADMINISTRATION

II.1 M. Eagan asked Committee members to update contact information.

II.2 M. Eagan gave a brief update on FICAN's Web page: the address has changed (www.fican.org); the page now has FICAN's sleep disturbance position posted. She noted that there have been several requests for meeting minutes, and polled the Committee regarding the possibility of posting minutes to the Web page. The Committee agreed that it would be appropriate to post meeting minutes after their approval.

II.3 There were minor editorial comments on minutes of September 8 meeting.

III. EFFECTS OF AIRCRAFT NOISE ON SCHOOL-AGED CHILDREN

III.1 G. Luz led the discussion, recalling that Dr. Bronzaft and Professor Evans had laid down a series of challenges for FICAN to address regarding the issue of aircraft noise on school-aged children. Dr. Bronzaft had issued four challenges: (1) FICAN should support the re-establishment of the EPA's Office of Noise Abatement and Control (ONAC), (2) Dr. Harris' report on health effects of

noise should acknowledge the body of literature on the subject of noise and children, (3) more research funding is needed, and (4) additional vehicles besides the public forum are needed to reach out to larger groups of people. Dr. Evans had responded that to the extent FICAN members can communicate priorities to those with funding, it should focus on interagency cooperation for research. Another possible vehicle FICAN could consider would be to sponsor a short symposium on the subject, and invite physical and behavioral scientists to develop a research agenda.

III.2 G. Luz addressed Dr. Bronzaft's concerns first. Regarding support of the re-establishment of ONAC, several Committee members expressed opinions that their respective agencies probably would support the legislation. However, official positions on such policy matters are outside the charter of the Committee; individual agencies will contribute to the decision-making on the issue.

III.3 With regard to Dr. Harris' report, G. Luz agreed that FICAN should first clarify that the report was not prepared for FICAN, and was simply one of several reports on the subject that FICAN members had agreed to review. FICAN did not intend to suggest that Dr. Harris' report was the authoritative document on the subject. He suggested that FICAN also should review the report that will be prepared following the NATO CCMS meeting in Portugal on the Health Effects of Noise (March 1998). R. Lee is the DOD representative to that meeting; he should brief FICAN on its activities [TASK].

III.4 The Committee next discussed Dr. Bronzaft's position that more research funding is needed. A. Powell pointed out that one shortcoming is that none of the agencies has a specific program to review or study the issue, and in fact, the USAF is the only agency to study it at all. J. Plante added that research is usually directed as a result of legislation or other policy decisions; in order for issues to rise it to the front of the research agenda, it must be high on the priority list. Furthermore, research these days must be focused, and have a targeted result in order to be funded. K. Mittelholtz suggested that an example of such a policy decision could be the requirement that noise analyses require different assessments at schools to address speech interference. G. Luz added that the issue with schools is more than just that of speech interference, and has also to do with vulnerable populations (children with attention deficits, non-native English speakers, etc) – at this point, we would not even know how to design a better study. The Committee acknowledged that such research is not currently on any agency's agenda, but that it would continue to maintain technical contact with members of the scientific community who are studying the subject.

A. Powell added that NASA is currently trying to lay out its research agenda to follow the Advanced Subsonic Technology (AST) Program, which is winding down. NASA's future research agenda is called "Three Pillars for Success"; in the Global Civil Aviation Pillar, environmental compatibility is a key goal, with a specific technological goal of noise reduced by a factor of two (10 EPNdB) over today's aircraft. The detailed research agenda is being developed with the assistance of the FAA, as well as a number of steering committees. A. Powell stated that health effects on children might be an area that would be included in the research program; he cautioned that this research will not be initiated until the completion of the AST program, probably around 2004.

J. Plante added that FAA also is embarking on the development of its future research agenda. FAA's program is entitled "Environmental Research Beyond 2000". The goal of the program is to prioritize FAA research funding. He pointed out that FAA is holding a public forum on November 20th, specifically designed to solicit input from the public on the subject of FAA's environmental research needs.

Regarding Professor Evans' comments, FICAN agreed that it should continue with interagency cooperation on noise research issues. With regard to sponsoring a symposium on the subject, G. Luz pointed out that FICAN itself does not have any funding. A. Powell indicated that should NASA do research on the subject, a likely first step would be to hold such a symposium to define the research agenda.

J. Plante pointed out that FICAN should address the fact that aircraft are not the only sources contributing to noisy school environments. It seems logical that the Department of Education should be the leader on this issue. R. Miller pointed out that A. Zusman had suggested contacting the Department of Education to identify a representative to FICAN to discuss this issue. R. Miller agreed to contact A. Zusman about this issue again [TASK].

IV. FICAN PUBLIC FORUM

IV.1 M. Eagan stated that FICAN had agreed informally to hold its next public forum in Washington D.C. The advantages of holding it locally are: (1) all FICAN members can attend, (2) Congressional staffers can attend, (3) interest groups for national organizations (e.g., ACI-NA, AAAE, N.O.I.S.E) and national noise press (Airport Noise Report, Noise Regulation Report) all are located in the D.C. area, and (4) there are three major airports with active noise committees, as well as several smaller airports. She added that FICAN should make greater outreach efforts to increase attendance at the public forum, including: identifying members of Congressional Aviation Sub-committee and Appropriations Aviation Sub-Committee, obtaining mailing lists for local airport advisory committees, enlisting support of local airport noise officers, and publicity in national noise press.

J. Littleton and A. Konheim agreed to discuss possible locations for the public forum, including the FAA Auditorium and DOT meeting rooms [TASK].

V. AVIATION NOISE RESEARCH REPORT

V.1 M. Eagan asked Committee members to provide input to HMMH by mid-December [TASK]. HMMH will provide a draft by mid-January [TASK], with the ultimate goal of producing a final report by mid-February [TASK].

VI. OTHER

VI.1 G. Luz noted that the comments provided at the public forum by the City of Richfield raise many common issues, which have not received direct responses. He offered to develop answers to these questions, for inclusion in the 1997 FICAN Annual Report [TASK].

VI.2 K. Mittelholtz distributed copies of Congressional testimony on aviation noise given by James Erickson (FAA), and Dr. Whitehead (NASA).

VI.3 K. Mittelholtz pointed out that FICAN has not discussed the issue of noise in the National Parks lately, and would like to add this to FICAN's agenda for its next meeting.

The following table presents outstanding tasks:

Item	Ref.	Task	Assigned to
1	II.2	Post FICAN minutes to Web page	HMMH
2	III.3	Brief FICAN on NATO CCMS meeting on health effects	R. Lee
3	III.4	Contact Dept. Of Education re: FICAN participation	HMMH, A. Zusman
4	IV.1	Determine location for 1998 public forum	A. Konheim, J. Plante
5	V.1	Provide input for research report by mid-December	All
6	V.1	Draft research report, mid-January	HMMH
7	V.1	Final Research report, mid-February	HMMH
8	VI.1	Provide response to City of Richfield	G. Luz

VII. NEXT MEETING

VII.1 The Committee agreed to meet next after the New Year.

VII.2 The meeting adjourned at 1:00 p.m.

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APPENDIX B. PUBLIC FORUM AND COMMENTS

Federal Interagency Committee on Aviation Noise
(FICAN)
Public Forum on Federal Research to Address Aircraft Noise Issues
Thunderbird Hotel and Convention Center
Bloomington, Minnesota
May 13, 1997

DRAFT AGENDA

12:30 pm - 9:00 pm	**Sign-in Desk and Written Comment Drop Box**		
1:00 pm - 1:15 pm	**Introduction**		
	Opening Remarks	Mr. Robert Miller, HMMH	
	Welcome/FICAN Background	Mr. Alan Zusman, U.S. Navy	
1:15 pm - 2:30 pm	**Noise Reduction Technologies**		
	NASA Aircraft Noise Reduction Program	Dr. Clemans Powell, NASA	1:15 - 1:45
	Active Noise Reduction	Mr. Robert Lee, USAF	1:45 - 2:00
	Quiet Technology for Propeller-Driven Aircraft	Mr. Tom Connor, FAA	200 - 2:15
	Discussion		2:15 - 2:30
2:30 - 2:45 pm	**Break**		
2:45 - 3:45 pm	**Noise Modeling Issues**		
	Civil Noise Models	Mr. Tom Connor, FAA	2:45 - 3:00
	Military Noise Models	Mr. Robert Lee, USAF	3:00 - 3:15
	Helicopter Noise Modeling	Dr. George Luz, USA	3:15 - 3:30
	Propagation over Water	Mr. Alan Zusman, USN	3:30 - 3:45
3:45 - 4:00 pm	**General Discussion Period**		
4:00 - 5:00 pm	**Break**		

5:00 pm - 5:05 pm	**Introduction**		
	Introduction	Mr. Alan Zusman, USN	
5:05 pm - 6:45 pm	**Noise Effects**		
	Community Noise Research Program	Dr. Clemans Powell, NASA	5:05 - 5:30
	Effects of Aircraft Overflights on the National Park System	Mr. Richard Ernenwein, NPS	5:30 - 5:45
	Noise Effects on Animals	Mr. Robert Lee, USAF	5:45 - 6:05
	Structural Response to Sound	Dr. George Luz, USA	6:05 - 6:15
	Structural Assessment Tool	Mr. Robert Lee, USAF	6:15 - 6:25
	Discussion		6:25 - 6:45
6:45 pm - 7:00 pm	**Break**		
7:00 pm - 7:20 pm	**Land Use Compatibility**		
	Effects of Noise on Housing Values and SLUCM Project	Mr. Thomas Connor, FAA	7:00 - 7:10
	Discussion		7:10 - 7:20
7:20 pm - 8:00 pm	**Public Information**		
	FAA's Public Information Program	Mr. Thomas Connor, FAA	7:20 - 7:35
	FICAN Public Information Program	Mr. Alan Zusman, USN	7:35 - 7:50
	Discussion		7:50 - 8:00
8:00 - 8:30	**General Discussion Period**		
8:30	**Close**		
	Closing Remarks	Mr. Alan Zusman, USN	

Eleven individuals submitted written comment before, during, and subsequent to the public forum. These are summarized below, and are also attached.

Individual	Affiliation	Location
Tom Egan	City of Eagan	Eagan, MN
Betty Ann Kane	National Organization to Insure a Sound-controlled Environment	Alexandria, VA
Dick Saunders	South Metro Airport Action Coalition	Minneapolis, MN
Diana Schneider	Resident in Community Board 7	New York, NY
Alan Greene	Resident	Howard Beach, NY
Arline Bronzaft	Council on the Environment	New York, NY
Robert M. Senderhauf	Custer County Action League	Westcliffe, CO
Dale Ahlquist	National Airspace Coalition	Bloomington, MN
James D. Prosser	City of Richfield	Richfield, MN
Neil Clark	South Metro Airport Action Council	Minneapolis, MN
John Nelson	City of Bloomington	Bloomington, MN

FICAN

Federal Interagency Committee on Aviation Noise

Name	Organization
Jan Nelson	City of Bloomington / MASAC
Bob Johnson	MASAC
Lorenzo Davis	City of Eagan / MASAC
DALE AHLQUIST	NATIONAL AIRSPACE COALITION
Neil Clark	SMAAC
Petrona Lee	City of Bloomington
Gordon Nelson	FAA MSP-ADO
JACOB SNOW	CLARK COUNTY DEPT. of AVIATION
VICTOR GLOVER	Richards Airport
Ron Glaub	FAA NWA-CMU
Carter Morris	AAAE
JON LARSEN	MN. EQB
Glenn Woodman	Port of Portland
DAWN Weitzel	City Of Richfield
RICHARD T. SAUNDERS	SMAAC
Jon Del Calzo	mpls.
Melissa BURN	Wyle Labs
LADDIE IRION	URS Greinor
RUE Shibata	I G H. commission.
Frank Benson	FAA - MSP. ADO
Glen Orcutt	FAA - MSP. ADO
Dan Millenacker	FAA- MSP-ADO

FICAN

Federal Interagency Committee on Aviation Noise

Name	Organization
Frank Ario	SMAAC
Mike Geger	UAPSCO
Bryn M. Fosse	
Jon Hohenstein	City of Eagan
Dawn Decosse	SOUTAC
S. Doré Mead	Minn City Council
D. Scott Dibble	"
Ted Gaithill	City of Eagan
Marie Saunders	SMAA
John Richter	MAAC
Will Egerton	Inver Grove Hts Aircraft Noise
Jon Woodward	Landrum & Brown
JAMES BOUST	INVER GROVE HTS

COMMENTS BY THE CITY OF EAGAN
TO THE FEDERAL INTERAGENCY COMMITTEE ON AVIATION NOISE
MAY 13, 1997

The City of Eagan, Minnesota appreciates the opportunity to make the following comments as part of FICAN's series of public forums. The focus of the comments is the encouragement of continued or new research in areas which will benefit the aviation industry and noise affected communities.

- Noise Abatement Departure Profiles - Current FAA policy calls upon airlines to define a distant and close-in departure procedure for all aircraft types and permits airports to select which of the procedures are to be used from each runway end. Both of the procedures, as defined by most airlines, involve reductions in climb rate at certain altitudes. Certain distant communities and some others with large areas of noise compatible land use may be better served by departure procedures which eliminate such climb reductions or implement them later in the take off procedure. Since distance from the noise source is among the key factors in determining its impact, research regarding the noise abatement effectiveness and operations and maintenance consequences of more aggressive departure procedures would be valuable for communities and the industry.

- Ldn 65 Standard and Methodology - The Ldn 65 standard is extremely controversial. Supporters argue that it may not be perfect, but it is the best indicator we have of the significance of noise nuisance. Noise impacted communities are always interested in finding a better indicator. Even if that is not possible, two issues ought to be considered. First, the Schultz curve used in determining nuisance levels is based on surveys of individual responses. These surveys should be regularly updated and validated because changes in the nature of the noise environment has the potential to change responses. A related second point is that noise impacted residents are beginning to note that with the decline in single event noise levels and the continued growth of operations, the repetition of overflights has become bothersome at greater distances from airports. Even if Ldn remains the most appropriate metric to quantify noise impacts over periods of time, research may indicate that the nuisance level at different Ldn levels is changing over time. There may be validity for the federally recognized level of nuisance to be at 60 Ldn or even lower.

- Land Use Compatibility - In addition to noise abatement departure profiles, cities which have provided areas of noise compatible land use are interested in other operations or air traffic control procedures which will effectively contain noise impacts within those areas. In the case of the City of Eagan, the City is actually penalized for its foresight in planning compatibly for the airport because air traffic priorities place the majority of all operations over not just the commercial areas of the City, but the residential ones as well. If the federal government is going to continue to encourage compatible land use as the means for local governments to participate in

the noise abatement effort, operational means must be found to further minimize impacts adjacent to but outside of the noise compatible areas. FICAN can be effective in undertaking studies in this regard.

- Aviation Noise Effects - The noise abatement community and others have long debated the potential health effects of extended noise exposure. Definitive research in this area could better inform federal, state and local decision making about capacity growth and the actual costs to airport neighbors.

- Source Noise Reduction - Encouragement of further means of source noise reduction will be essential to the continued growth of the airline industry. While the definition of actual Stage IV standards may occur at some time in the future and ultimate fleet conversion to such technologies would occur after that, continued study may offer some benefits to not only the noise affected community, but to the efficiency of the industry as well. Study should focus not only on engine noise which is significantly reduced in Stage III aircraft, but on airframe noise as well.

- Compensation for Noise Impacts - As a part of the recently concluded Dual Track Airport Planning Process in Minneapolis-St. Paul, considerable discussion revolved around tools for community stabilization and receiver-based noise mitigation strategies in areas of continued and expanding operations impacts. As demand for capacity growth continues, communities would benefit by a broad based study of successful means of noise abatement and noise impact compensation. These may include expansions of Part 150 programs, graduated sound insulation programs, purchase assurance programs, preferential tax programs, direct compensation, additional tools for redevelopment to noise compatible land uses and other concepts. It would appear that further research of innovative noise compensation alternatives would be worthwhile to all noise impacted communities.

National Organization to Insure a Sound-controlled Environment

118 5th Street, N.E * Washington, D.C. 20002

(202) 546-9062 telephone * (202) 547-9598 fax

Statement of Tom Egan, President

Before the Federal Interagency Committee on Aircraft Noise (FICAN)

May 13, 1997

On behalf of the National Organization to Insure a Sound-controlled Environment (NOISE), I am pleased to have the opportunity to submit these comments to the Federal Interagency Committee on Aircraft Noise (FICAN) on the occasion of your field hearing in Minneapolis. As the Mayor of a Minneapolis area community impacted by aircraft noise, I am particularly pleased that you are meeting in our area. I would also like to bring to your attention the fact that NOISE will be holding its annual meeting and the 27th Aviation Noise Symposium in Egan this summer, from July 23 to 26, 1997. I invite you all to return to Minnesota this summer and join us for three days of in depth attention to this very important topic.

The National Organization to Insure a Sound-controlled Environment is an association of local governments and others concerned about aircraft noise. NOISE has long supported Federal policies to reduce unreasonable noise impacts from civil aviation by a combination of quieter aircraft, safe noise abatement operating procedures, and Federal funding for local programs to achieve compatible land uses around airports. The Department of Transportation has recognized NOISE as the authoritative voice of cities and counties on these issues by appointing NOISE to represent these interests on bodies such as the NASA/FAA Advanced Subsonic Transport Noise Reduction Project and the Aviation Rulemaking Advisory Committee.

Consistent with NOISE's mission, our comments today focus on the noise-related aspects of federal programs and policies, particularly the Airport Improvement Program (AIP). The AIP has been a useful program for helping to provide funds for noise mitigation. It would be an even better program for doing this if the funding were greater and there was a wider eligibility for participation.

Airport noise continues to be both an environmental problem and a potential constraint on capacity. An impression has been created in some circles that with the passage and implementation of the Airport Noise and Capacity Act of 1990, which required the phase-out of Stage Two aircraft and the attainment of an all-Stage Three fleet mix by the year 2000, airport noise had ceased or will soon cease to be a concern. This is highly inaccurate. First, there are degrees of quiet within the Stage Three category, with some aircraft significantly quieter and others just barely making the threshold. This is why NOISE is highly supportive of the FAA's continued participation in research with NASA

and the industry to develop aircraft quieter than the current Stage Three level. Second, a quieter fleet mix is just one of the tools needed to reduce airport and aircraft noise. Other tools include land and building acquisition, sound insulation, land use restrictions, take off, landing and run up procedures, and overflight controls.

While noise contours are shrinking at some airports due to the phase in of the Stage Three fleet, an expected increase in the number of flights will expand these contours again in many instances. Noise contours will also increase with the introduction of the next generation of larger aircraft. In addition, the development and expansion of regional and reliever airports and the conversion of former military bases to civilian airports will bring noise problems to many communities that are not now exposed to it. Citizens experience significant annoyance from aircraft noise at levels below the 65 Ldn contour used by FAA for most Part 150 and AIP grant purposes. Finally, even under current operating levels there exists a large backlog of noise mitigation needs. The residential sound insulation program agreed to by the San Francisco Airport and surrounding communities, for example, will cost over $130 million. We understand that the San Francisco Airport has committed to using its own revenue for this program to the extent not covered by federal funds. This is fortunate because the entire annual set aside of discretionary funds in the FY 1997 AIP appropriation for noise is only $144 million for the whole country. If the President's proposed FY 1998 appropriation is approved by Congress, the amount of this minimal statutory set-aside will drastically shrink to only $21 million.

In this regard, NOISE wants to emphasize that a lower level of set-aside federal funds does not relieve an airport sponsor of its obligation to fulfill noise mitigation promises made to its surrounding communities as part of a Part 150 Plan or airport master plan, or to address future noise problems that may arise in a community. Operators may therefore have to use other AIP funds, or their own funds to fulfill these promises, reducing funds available for other airport needs.

During the debate on reauthorization of the AIP last year, some suggested that instead of a full reauthorization the AIP should be simply extended for one year in its current form, putting off decisions on a substantive reauthorization until next year. NOISE preferred a full reauthorization, for at least three years and preferably longer. Noise reduction projects take long-range planning, and noise-impacted communities need the certainty that airports will have a source of funds and requirements for noise mitigation for a significant time in the future.

Eligibility for noise mitigation funds should be more widely extended to communities that are impacted by airport noise but are not the airport sponsor. While these communities are eligible under current law, few grants are actually made to non-sponsors. For example, the reauthorized FAA Act allows grants to non-sponsor communities only with the concurrence of the airport sponsor.

All projects funded with Passenger Facility Charges must be required to conform to the existing Part 150 plan. PFC revenue may be used under much less restrictive

conditions than apply to noise compatibility measures and other projects that use federal AIP grant funds. NOISE is particularly concerned that current law allows airports to use PFC revenue for "noise compatibility measures eligible for assistance under [49 U.S.C. §47504], whether or not a program for those measures has been approved under section 47504" (49 U.S.C. §40117). This exemption allows airports with approved Part 150 plans to use PFC revenue without respecting Part 150 plans, even though the communities surrounding the airport rely on those plans when making their own land use decisions. It also allows airports to avoid the requirements of §47504(a) for "consulting with public agencies and planning authorities in the area surrounding the airport" as part of preparing the project application, for notice and an opportunity for a public hearing on the proposed noise compatibility measure, and for demonstrating that the project will reduce existing noncompatible uses and prevent introducing additional noncompatible uses. The only requirement for general public notice in a PFC project application is by publication in the Federal Register after submission to the FAA. When airports use PFC funds in ways inconsistent with Part 150 plans, without conducting Part 150 review including public involvement, or avoid the Part 150 process entirely, the value of the plans is undermined.

As PFCs grow in use, replacing federal funds that have to meet stricter conformity with approved plans and programs, this becomes an even more serious consideration. Otherwise PFC revenue itself can become another form of revenue diversion, a policy which both federal law and federal policy opposes. At a minimum, the FAA should be required to hold a public hearing in the airport area before approving an application for use of a PFC where the proposed project financed by the PFC is not part of an already approved airport plan.

The following additional policies are recommended for incorporation into a federal aircraft and airport noise policy and procedure:

1. Require the FAA to redefine DNL and to study the health effects of noise.

2. Require monitoring of SEL by all commercial airports.

3. Establish incentives to hasten conversion to Stage 3 aircraft.

4. Establish a Stage 3.5 deadline.

5. Require meaningful input by citizens impacted by aircraft noise in National Environmental Policy Act (NEPA) reviews and requiring airport proprietors to hold public hearings for all other non-major actions that have a noise impact.

6. Reassess the validity of the Integrated Noise Model.

7. Amend certain federal laws, such as the housing replacement law, that limit local governments' ability or increase the cost of noise mitigation.

8. Oppose the proposed drastic reduction in funding of the statutory 31% set-aside for aviation noise mitigation, from $144 million in fiscal 1997 to $21 million in fiscal 1998 and oppose a similarly severe proposed reduction in overall Airport Improvement Program funding from $1.46 billion to $1 billion, one result of which is to further diminish the funds available to address noise pollution;

9. Oppose a proposed reduction in research, engineering and development funds for environment and energy, which includes the development of quieter aircraft engine technology, from $4 million to $3 million;

10. Support adequate funding for the new Office of Noise Ombudsman and related community advocacy and involvement initiatives;

11. Support restoration of funding and functioning for the Noise Office in the Environmental Protection Agency; and

12. Support Research to develop quieter aircraft engines.

I will end with some additional comments on this last point. NOISE was pleased to hear on March 20 the announcement by NASA Director Dan Goldin identifying noise reduction research as a priority for that agency. NOISE Executive Director Betty Ann Kane recently participated in the semi-annual meeting of the Steering Committee of the Noise Reduction Element for the NASA-FAA Subsonic Transport project. This joint project is working with aircraft engine manufacturers to design and test technology that could produce the next stage of quiet aircraft engines. NOISE is the only non-federal or non-industry group on the Steering Committee. The goal of the project is to develop technology by the year 2000 that can reduce aircraft noise by 10 db. We are very pleased that this research, which was mandated by Congress, is on schedule and is producing some very promising results that can lead to practical production of Stage 4 jet engines, quieter helicopters, and quieter propeller craft.

The prospects for continued progress got a big boost with Administrator Goldin's announcement that his primary goals for NASA include working with industry to develop an even greater reduction in aircraft noise. Goldin announced support for research "to reduce the perceived noise levels of future aircraft by a factor of two from today's subsonic aircraft within 10 years, and by a factor of four within 20." That would translate to reduction of 20 db by the year 2017. This is particularly good news because in recent years NASA has borne almost the entire federal cost of the current quiet aircraft research project.

Thank you for your attention to our comments. I would be happy to answer any questions.

FROM: Dick Saunders
South Metro Airport Action Council
Minneapolis, MN 55419
612/869-1501

FOR IMMEDIATE RELEASE
May 13, 1997

CITIZEN COALITION URGES RESTRAINTS ON AIRPORT POLLUTION

MINNEAPOLIS, May 13--A coalition of citizen organizations fighting airport pollution today urged tighter federal regulations and greater airline cooperation to limit environmental effects of sharply increased air traffic predicted in the next 20 years.

"The prospect of a tripling of global air travel, coupled with an anticipated decline in U. S. funds available to fund noise mitigation programs, points to a significant threat of deteriorating health conditions for millions living near airports," said Dick Saunders, a Minneapolis-based spokesperson for the coalition.

"With many of the largest U. S. airports nearing or exceeding capacity, the costs of new runway construction soaring, and relatively few convenient sites for new airports available, residential communities near established airports will likely bear the largest share of the pollution burden in the next two decades," he predicted.

"It is therefore incumbent on government agencies and airlines to work more closely with citizen groups to develop added safeguards to physical health and community stability, and to adapt flight patterns to reflect community inputs."

Saunders outlined a composite list of suggestions from some 10 airport community organizations at a public hearing sponsored by the Federal Interagency Committee on Aviation Noise (FICAN). FICAN, formed in 1993 to provide forums for discussion of aviation noise problems and solutions, is made up of all federal agencies concerned with the issue, including the Department of Defense, the Department of Interior, the Department of Housing and Urban Development, the Department of Transportation, the Environmental Protection Agency and

(more)

2--CITIZEN COALITION VIEWS

National Aeronautics and Space Administration.

Among the citizen coalition proposals were:

--More accurate ways of reflecting true aircraft noise levels in present computer models defining aircraft noise patterns;

--Recognition of the 55 DNL (day-night level) threshold as a starting point for noise mitigation measures, as compared with the present 65 DNL practice;

--More research into the long-term effects of noise on children and senior citizens;

--Reestablishment of the EPA's Office of Noise Abatement and Control, which was closed in the early 1980s, ostensibly for budgetary reasons;

--Changing federal law to require airports to report toxic emissions such as ozone, volatile organic compounds and nitrogen oxides just as other industrial polluters must;

--Requiring more attention to public health impacts in environmental impact statements prepared before new runways or airports can be approved by the FAA;

--Regulation of tiny airborne particles such as those found in aircraft exhaust fumes and soot, which are not covered under present law;

--Better monitoring of hazardous chemicals used in de-icing and other operations at airports before they leak or are spilled in groundwater supplies;

--Greater use of high-speed rail for trips under 500 miles;

--Studying cutbacks in the disproportionate share of pollution impacts borne by residents living in airline hub cities by dispersing more flights to non-hub cities.

Citizen groups represented in today's FICAN presentation included those affected near New York's Kennedy; northern New Jersey; Columbus, Ohio; Chicago O'Hare; Minneapolis-St. Paul International; Denver International; San Jose, CA., Seattle-Tacoma, and Manchester, England.

-0-

Name: Diana Schneider
Topic: Jet/Prop Traffic/Noise - Pollution Problems
Organization: Resident in Community Board 7, New York City
Address: PO Box 805, Midtown Station
New York, NY 10018
Phone: 212/724-3062
Fax: 212/724-3062

Comments:

My name is Diana Schneider. I have been a resident of the Upper West Side in Manhattan, New York, on 75th Street between Columbus Avenue and Amsterdam for over 37 years.

Only recently - approximately three years ago - have aircraft overflies become a major problem. Up until that time most craft followed and flew over the Hudson River only. I am an international vacation travel co-ordinator and did have advance knowledge of the shift of landing patterns that would be taking place in general over New York City. Little did I know at the time that it would affect myself and my neighbors personally.

There is now a pattern of aircraft traffic directly over our homes due in large part to the opening of another runway at LaGuardia Airport, takeoffs from Newark Airport (middle of the nigh flights which the FAA says are due to Fed Ex's new ultra plus early service, sometimes occurring at 3:45a, 4:10a, 5:45a and so forth directly over our apartments hindering proper sleep patterns and causing sleep deprivation even when we have had the requisite number of hours sleep; commuter flights; private prop traffic. All this in addition to 9,000 helicopter flights a month over the West Side (please see separate helicopter testimony; the FAA had a very active role in designing new Letters of Agreement which ameliorated the problem directly over my apartment on the issue of the helicopters.

Sudden noise such as the whining of jet engines or the roar of a departing craft - very much sounding like an earthquake directly over your head - product fight or flight syndromes (sometimes even close to the startle response), and have been known to cause myriad health problems such as: speech interference, hypertension and cardiovascular and gastro-intestinal functions, lower reading comprehension among others. Documentation is readily available to support these findings.

Whole areas of population are now adversely affected and their lives being permanently damaged by the constant ongoing abuse. Fly overs now occur round the clock, seven days a week, with the only time off when the airports are closed down.

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Comments: page 2

My lease says I am entitled to quiet habitation of my apartment between the hours of 10:00pm and 8:00am. Do you think I can get a pro-rated refund on my rent from the FAA for the damage they are allowing to my peace and quiet.

Since February 1996 I have been attending and actively participating in meetings at Borough President Ruth Messinger's office to deal with both the helicopter situation and the plan traffic over the West Side. At these meetings the FAA usually had two representatives, several Government officials either attended themselves or sent staff, citizen organizations, and citizen activists were in attendance as well. Also at several of these meetings the Port Authority took an active role. It was the Port Authority that initially lent corroboration and showed the Task Force the flow charts designating the proliferation of air traffic over the West Side.

We have gotten to the point in our discussions where the FAA acknowledges the gravity of the problem. As a first step toward the elimination of the overflies, the process of establishing a curfew which we were told is relatively complicated needs to be thoroughly explained to us and steps taken toward this end.

We were told by the FAA that aviation is big business and that the monetary appetites of the aircraft industry come first dismissing the health and safety concerns of thousands if not millions of New Yorkers.

We were also told that it would be possible for a study to be made with the possibility of extending some routes over the unpopulated Red Hook areas, thus possibly alleviating the overflies over our neighborhoods.

Incidentally, the FAA says they do not have the funding to do this study. Where oh where did the millions of dollars gathered through the years in the

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Comments: page 3

It is truly unconscionable and a travesty of justice and a disservice to the American people that this Aviation Fund was never used for the purpose for which it was created. Can we prosecute our own Government for this egregious conduct?

Also, apparently New York City does not seem to be involved in the Noise Abatement Program as other cities are. Why is this? We will query our local Government on this issue.

It is apparent that the needs and concerns of New York residents are being blatantly disregarded.

We are currently working with various Governmental officials to address both the aircraft and helicopter traffic issues at the National Governmental level. The Transportation Committee of Community Board 7 has taken up the issues of the overflights by both helicopter and plane traffic similar to Ruth Messinger's Task Force.

Actions I will work to see implemented are:

1) Evaluation of the proliferation of air traffic
2) Significant reduction in overflights and eventual elimination thereof over residential areas
3) The initial introduction of all flights curfew between the hours of 10:00pm and 8:00am seven days a week all year long
4) The New York Metropolitan area applying for a receiving its share of the millions of dollars available for the Part 150 insulation and noise abatement program such as New Jersey has
5) Conduction of a study by the FAA with the objective of rerouting traffic over the Red Hook area and away from the residential areas
6) Subsequent elimination of all helicopter and plane traffic over residential areas with the exception of emergency vehicles

Thank you for allowing me to add my comments to your record and for your meeting to work toward achieving viable solutions which protect the residents of this country and hear their concerns first.

Name: Diana Schneider
Topic: Helicopter Noise
Organization: Resident in Community Board 7
in New York City
Address: PO Box 805, Midtown Station
New York, NY 10018
Phone: 212/724-3062
Fax: 212/724-3062

Comments:

For 37 years I have been a resident of the Upper West Side in New York City - Community Board 7 area. My apartment on West 75th Street is specifically between Central Park West and Columbus Avenue; but the area affected is from 59th Street to the upper reaches of our Community Board; i.e.: West 110th Street.

About three years ago at about the same time the landing patterns were changed to direct jet and other plane traffic now over the West Side (which had never been the case previously), the tourist helicopter business began to take off (pun intended) and what was a relatively innocuous industry now became an obnoxious one. Helicopters were travelling over my apartment every two minutes seven days a week for about two plus years.

Because my sanity, health, safety and peace of mid as well as that of my neighbors were being seriously threatened and imperiled, I became passionately involved with both these issues and began attending the Task Force meetings convened by the City at the Borough President's office in February 1996.

Since that time the Task Force has brokered an agreement with the Eastern Regional Helicopter Association a few months ago with a goal of achieving a tourist route over the least amount of people and animals possible. Thus, instead of flying west from the Metropolitan Museum of Art, diagonally over my apartment, down to Lincoln Centre and the Hudson River, the new route goes directly over West 86th Street or above straight over to the Hudson River and downtown.

A similar route was designed for the East River. Helicopter noise carries very far and is very intrusive. Thus, even though some of the craft were over the East River, the constant din of the rotors was heard in a Ms. Held's apartment after the routing change. Now a whole new populace on the West Side and the East Side was affected.

Name: Diana Schneider
Topic: Helicopter Noise
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Comments: page 2

The Helicopter Noise Coalition was born as a response to this situation. Ms. Joy Held is the director. The goal of the HNC is to restrict helicopter traffic over New York City solely to emergency vehicles. That has been and is my personal goal as well.

As a pertinent aside, one morning about 7:30am as I was standing at 75th Street and Central Park West, I heard the din of a copter's rotors. The copter was actually hovering at approximately 56th Street and 6th Avenue.

The proliferation of helicopter traffic in New York City is unconscionable: tourist helicopters transversing over 86th Street at the rate of approximately 9,000 per month; news helicopters waking us all up at 6:56a just to "shoot the sunrise!," news helicopters often flying in tandem scouting possible stories, hovering for up to a half hour at a time over a breaking story, interfering with actual fire fighting operations, hovering over parades for hours at a time and disturbing both children's and adult's enjoyment of the parade itself, corporate choppers bringing their executives to the City crashing into the Hudson River.

Helicopters are dangerous, fume spouting, pollution producing, nerve wracking, intrusive vehicles which endanger the lives of millions in our New York metropolitan area including those in the vehicles themselves.

We need your assistance to put an end to this helicopter madness.

Governmental agencies have a mandate to heed the wishes of the electorate.

Please help us reach a solution for the benefit of the millions of us affected. Please work with us to ban unnecessary helicopter flights over New York City and "any" metropolitan city. People are "animals" and just as valuable as our friends in the national parks over whom copter flights in many instance have already been banned.

Thank you for your time, attention and assistance.

A. Allan Greene, D. P. M.
P. O. Box 183
Howard Beach, N. Y. 11414
Fax 718-848-1800
Phone: 718-848-1800

RE: Press Conference on
Aircraft Noise 4/28/97
at Halsey Jr. High School
Queens, N. Y. C.

Rep. Nita Lowey, Members of the Press
and Guests:

My name is Dr. A. Allan Greene, I am one of the founders of "Sane Aviation For Everyone", also known as "Safe, Inc."

Recently an airline executive was being interviewed by the press. He said air traffic within the next ten years will double unless there is strong opposition from the communities around the airports and the environmentalists.

Hopefully the tide is turning. People are beginning to wake up and realize that the sky belongs to them and is not the exclusive domain of the airport operators, the airlines, and the FAA. For years they have abused the privilege of flying over our heads and homes by increasing the number and frequency of flights by loud, screaming, blasting Jet Planes, causing intolerable noise and dangerous pollution.

It is time that the City of New York and other cities around the country live up to their obligation to protect the health, safety and quality of life of those citizens that have been adversely impacted by aircraft noise, pollution and the insensitive and politically motivated policies of the FAA. Our local elected officials look at the airports as a cash cow and those living under flight paths as poor, unfortunate, sacrificial lambs. Are you willing to sacrifice your life for the profitability of the airlines and the economy?

New York City must follow the example of the City of Elizabeth, N. J., who is suing the FAA for routing planes over residential areas of that city. Those of you who live under flight paths must become actively involved in protecting <u>your</u> airspace which you <u>own</u>.

Nita Lowey's bill, H R 536, The Quiet Communities Noise Act of 1997, when enacted will be a big step to realizing quiet in our time. We must all work together to get the bill passed in a Congress that is controlled by airline interests.

5/31/97

FEDERAL INTERAGENCY COMMITTEE ON AVIATION NOISE
C/O MARY ELLEN EAGEN
HARRIS MILLER MILLER AND HANSON, INC.
77 NEW ENGLAND EXECUTIVE PARK
BURLINGTON, MA 01803
FAX 617-229-7959

DEAR MRS. EAGEN,

I WAS TOLD BY AIRLINE BRANCH OF THE FICAN 1996 PUBLIC FORUM WILL BE HELD IN WASHINGTON, D.C..

IF FICAN IS REALLY INTERESTED IN THE DEVASTATING EFFECTS OF AIRCRAFT NOISE, I SUGGEST THE MEETING BE HELD DIRECTLY UNDER A FLIGHT PATH AT NATIONAL AIRPORT. THOSE IN ATTENDANCE WILL THEN LEARN FIRST HAND ABOUT JET NOISE AND ITS HARMFUL EFFECTS UPON THE HUMAN BODY AND MIND. WE DONT NEED STUDIES TO TELL US THAT JET NOISE IS HARMFUL, WHAT IS NEEDED IS COMMON SENSE AND HONESTY.

DR. A. ALLAN GRLENL

160-53 86th ST.
P.O. BOX 183
HOWARD BEACH, N.Y. 11414
PHONE/FAX 718-835-1800

May 7, 1997

To: Mr. Alan Zusman
Chairman, FICAN

From: Arline L. Bronzaft,
Chair, Noise Committee, Council on the Environment
New York City

Although I have made a request to receive Dr. Stan Harris' report on "The Noise Effects of Health," I have not yet received it and thus do not know whether the report will contain the latest data on the health effects of noise. However, after reading the 1996 annual report and the committee's previous reports, I still believe the committee will take the position that the existing data don't support a relationship between noise and adverse physical and mental well-being. This position stands in sharp contrast to the views of EPA Administrator Russell E. Train who in an address on April 5, 1976 stated: "The evidence is overwhelming that, unless we make the system quieter, both human health and the financial health of the industry will continue to suffer." Apparently Mr. Train believed that there was sufficient support for a relationship between noise and health. He went on to say: "It is time for us all to come together, and to come to grips with the problem of aviation noise, and to build, at long last, an air transportation system that is safe, healthy and quieter." Isn't it about time that we did "come to grips" with increasing aviation noise!

Over twenty years ago my co-author Dennis McCarthy and I conducted a study that demonstrated the relationship between noise and lower reading scores and other researchers have described the same relationship. Now in a soon-to-be published study (see enclosed) Evans and Maxwell have found that aircraft noise has a "devastating effect on the academic performance of children in noisy homes and schools." How in good conscience can we continue to have children adversely impacted by aircraft noise when we have known for years that noise impedes learning? Do we really require additional studies before we act appropriately to remedy the situation?

Similar there are studies, primarily done in Europe, that report an association between noise and health but with few such studies recently carried out in the United States, the FAA claims that we need further evidence for this association. I am enclosing the abstract of a health-related noise study done on Staten Island that is in press (Bronzaft, et. al). Noise was found to be related to poorer health perception, sleep disturbances, and interference with quality of life activities. This is only one study in support of the adverse effects of noise on health but it should encourage policy makers to fund further noise research. At the very least, this study does illustrate the need to caution people about the hazards of aircraft noise.

As a researcher I know that data are needed to confirm relationships but I have to agree with Dr. William H. Stewart, former Surgeon General, who in his keynote address to the 1969 Conference on Noise as a Public Health Hazard said: "Must we wait until we prove every link in the chain of causation? To wait for it is to invite disaster or to prolong suffering unnecessarily." As I stated in my comments last year, FICAN and the FAA sound like the tobacco growers who still claim that there is not enough evidence to indicate that smoking is detrimental to one's health. Fortunately our

government did not wait until all the data were all in to warn people about the dangers of smoking because to have done so would have invited disaster for thousands of people and to have prolonged suffering for thousands more. There are enough studies for the United States government to take stronger actions to abate aircraft noise. By not acting the government is inflicting suffering and pain on thousands who live, go to school, and work within the paths of overhead aircraft.

June 1, 1997

To: Mr. Alan Zusman
Chairman, FICAN

From: Arline L. Bronzaft,
Chair, Noise Committee, Council on the Environment
New York City

When I submitted my earlier statement to FICAN (May 7th), I noted that I had not yet read Dr. Harris' report The Effects of Noise on Health. I just received a copy and would appreciate having the following comments attached to my earlier statement.

FICAN in its 1996 annual report stated that it intends to use the Harris review as a "springboard for discussion at its next meeting." Although FICAN recognized that Dr. Harris' review would not be an exhaustive one of the existing literature, FICAN expected that it would still be a good summary of current findings. Several pages later in the annual report, FICAN states that it would like to "address the issue with regard to children if data are available," thus indicating an interest in the research on the effects of noise on children. Therefore, it strikes me as incredible that Dr. Harris omitted the growing body of literature on the effects of noise on children's cognitive and language development and learning. Although Dr. Harris would not be expected to be aware of the Evans and Maxwell study on learning and noise that is in press in Environment & Behavior, he most certainly could have accessed the other research in this area by Cohen, Evans, Green, Hambrick-Dixon, Wachs, and Bronzaft, to name a few. Had he done so and noted findings that link noise to impeded language and cognitive development and learning, Dr. Harris couldn't have concluded, as he did on page 11, that the "interference with the learning of children" research is based on the "most tenuous of evidence" (p. 11). I don't believe this body of data on child development should be ignored and urge the members of FICAN to look at this literature.

I expected that Dr. Harris in his review would cite the existing literature, as well as comment on the validity and reliability of these studies, but I didn't expect him to call the scientists who believe there is some evidence to support a noise-health relationship "headline seekers." However, after reading further that he found bias in the reporting of articles on noise in that they tend to be pro-effect, I was no longer surprised by his conclusion that the scientists who report "no effect on human health" are at a disadvantage. By the way what is Dr. Harris' evidence to support his opinion that the press is not even-handed? As to the fact that the press does not report "no effects," how would Dr. Harris explain the many headlines stating that breast implants do not harm recipients? Now let me use Dr. Harris' critiquing techniques to evaluate his review document. How much faith can we put in a review document that has been commissioned by the Air Force? Can we possibly expect such a document to be critical of aircraft noise, or any noise for that matter? Who would have the advantage - the people who live beneath the planes, or with other noises, or the agencies responsible for making the noises?

Why didn't Dr. Harris direct his attention to the psychological processes in relation to noise? Since Dr. Harris acknowledges on p. 36 that "the impact of noise on the health of an individual is

more likely to occur through the psychological processes of appraisals and perceived mode of coping," he is obligated to look at the role of these processes in the interpretation of noise events. Looking at the psychological mechanisms allows us to understand why noises don't have to be loud to be perceived as bothersome. The discussion of lower sounds as intrusive has to be included into any examination of sound volume and intrusiveness, and, unfortunately, Dr. Harris' failure to do so has led me to deem this section of his report most deficient.

Furthermore, Dr. Harris' definition of health failed to include mental health. Although he does recognize that there is research on annoyance and admissions to mental hospitals, again he tends to dismiss this research. Shouldn't the mental state of the individual be considered in evaluating that person's overall health? Individuals may become anguished by noise without necessarily developing hypertension or some other physiological ailment. But how good is the quality of life or the overall health of a person who cannot talk on the telephone, open a window, watch television, or carry out other activities without noise incursions from overhead jets? As a consultant to the Council on the Environment in New York City, I've received noise complaints from a woman who, when the planes fly over her home, speaks to me from her closet. Other people disturbed by noises have talked to me from rooms with darkened, barricaded windows. I have also listened to the pain expressed by the residents of the Pontalba apartments in the New Orleans French Quarter who may have to relinquish their highly-treasured apartments because increased noise in the Quarter has made their balconies unusable and sleep in their front bedrooms impossible. All these noises have prevented these people from enjoying life and the enjoyment of life is indeed a health issue. Furthermore, in the final analysis it is always difficult to separate the physiological from the psychological because they do interact.

I disagree with Dr. Harris' statement that health and noise have "been the subject of considerable research." This is not true for mental health nor, for that matter, in the physical health area. However, he can't really believe the research is plentiful when in the next breath he claims that the appropriate studies have not yet been undertaken. I too believe that the existing correlative studies require validation by more extensive investigations but the fact that they are suggestive indicates the need for this research. That most of the recent studies cited by Dr. Harris are from abroad is a sad commentary on this country's failure to commit dollars to this required noise research.

I also found it interesting that Dr. Harris is selective in his quotes. For example, he examines the Health Council of the Netherlands report by W. Passchier-Vermeer in great length and even quotes the next to last paragraph in his review. But why did he stop with that quote? Why did he not add the last paragraph of the report? It states: "In summary, the committee concludes that noise exposure has an important effect on public health in industrialised societies such as the Netherlands. This effect is clearly evidenced by analyses of quality of life rather than by mortality data." Possibly to have added this statement would have left the reader with a different view of the Netherlands document.

In discussing the work of J. S. Lukas, Dr. Harris chose a study in which Lukas calls for more research to identify the types of noises that are "likely to interfere with sleep." Why wasn't Dr. Lukas' other works cited, e.g. the 1975 paper in which Dr. Lukas reported that 50% of his subjects were awakened by aircraft noise of 90 EPNdb. This again is selective reporting of data.

If I were to continue discussing all the comments I placed in the margins of Dr. Harris' work, it

would take at least another page. Therefore, I've decided to stop now because enough has been written to indicate my dissatisfaction with Dr. Harris' review. Although it is true that if I, who tend to be what Dr. Harris calls a pro-effect person, were to write the review, it too might be somewhat biased. However, I believe Dr. Harris would agree that to be fair the committee should have assigned the task of writing a review to both sides. How about giving the opportunity to the other, disadvantaged side?

(Accepted for publication - Environment and Behavior - 1997)

AIRCRAFT NOISE: A POTENTIAL HEALTH HAZARD

Arline L. Bronzaft
Lehman College, City University of New York
Kathleen Ahern, Regina Mc Ginn, Joyce A. O'Connor, Bart Savino
Staten Island University Hospital

Abstract

A questionnaire distributed to two groups, one living within the flight pattern of a major airport and the other in a non-flight area, sought to determine whether these groups would respond differently to questions pertaining to noise, health perception and quality of life issues. Nearly seventy percent of the residents living within the flight corridors reported themselves bothered by aircraft noise. Aircraft noise, in contrast to other bothersome noises, interfered more frequently with daily activities. Subjects who were bothered by aircraft noise were more likely to complain of sleep difficulties and more likely to perceive themselves to be in poorer health. The study's finding of a possible relationship between noise and adverse health effects might encourage policy makers to enact pending anti-noise legislation and to fund further noise research.

CORNELL UNIVERSITY NEWS SERVICE

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FOR RELEASE: April 24, 1997

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Kids near airports don't read as well because they tune out speech, Cornell study finds

ITHACA, N.Y. — Children in schools bombarded by frequent aircraft noise don't learn to read as well as children in quiet schools, Cornell University researchers have confirmed. And they have discovered one major reason: kids tune out speech in the racket.

"We've known for a long time that chronic noise is having a devastating effect on the academic performance of children in noisy homes and schools," says Gary Evans, an international expert on environmental stress, such as noise, crowding and air pollution. "This study shows that children don't tune out sound per se, rather they have difficulty acquiring speech recognition skills."

Evans and his collaborator, Lorraine Maxwell, both environmental psychologists, are in the Department of Design and Environmental Analysis in the College of Human Ecology at Cornell.

Evans and Maxwell compared children in a noisy school (in the flight path of a major international airport) with similar children in a quiet school. Unlike in other studies, both groups of children were tested in quiet conditions. By doing so, the researchers showed that the link between chronic noise and reading scores is the chronic noise exposure -- not noisy episodes that might have occurred during the testing sessions.

Evans and Maxwell, whose study will be published in ***Environment and Behavior*** later this year, compared a total of 116 first and second graders from two elementary schools. One school was battered by peaks of up to 90 decibels of noise every 6.6 minutes by low-flying planes passing overhead. The other school, closely matched for ethnicity and percentage of children receiving subsidized school lunches and speaking English as a second language, was in the same urban area but in a quiet neighborhood. Only children for whom English was their first language were included in the study.

Each child was first given an auditory screening test. They were subsequently tested for abilities to read, distinguish words with background noise, distinguish sounds with background noise and distinguish word sounds (phonemes) under quiet conditions. The tests, with the exception of the initial auditory test, were conducted by Elissa Tolle and Pegauy Santil, 1996 Cornell graduates in human ecology, who were both seniors at the time. When the data were analyzed, the researchers controlled for mother's education.

-more-

(216/97)

"Interestingly, the findings were only significant for speech perception amidst noise, not sound perception" says Maxwell. "This implies that language acquisition is an underlying, intervening mechanism that accounts for some of the noise-reading deficit link."

Evans and Maxwell also suspect that other factors may be at work in noisy schools and neighborhoods, such as teacher and parent irritability and their reluctance to talk as much, use as many complete sentences and read aloud as often as other teachers and parents.

Both researchers stress the need to reestablish an office of noise abatement within the Environmental Protection Agency; such an office was abolished during the Reagan administration. They point to other health concerns related to chronic noise, including hearing damage, chronic cardiovascular activation, elevated annoyance and irritation, motivation problems such as learned helplessness, and impaired cognitive development and reading achievement.

"These effects have all been well documented," says Evans. "Unfortunately, we're experiencing exponential increases in worldwide, ambient noise levels that are a byproduct of economic development, particularly prevalent among economically underdeveloped countries."

The research was supported by the Cornell College of Human Ecology and the National Heart, Lung and Blood Institute and the U.S. Department of Agriculture.

-30-

CUSTER COUNTY ACTION ASSOCIATION

P.O. BOX 552 WESTCLIFFE, COLORADO 81252-9902
PHONE / FAX: (719) 783-2061

May 22, 1997

Mr. Robert Miller
Harris, Miller, Miller and Hanson, Inc.
15 New England Executive Park
Burlington, MA 01803

RE: Comments for FICAN Public Forum, Bloomington, MN, May 13, 1997

Dear Mr. Miller:

I was not able to attend the FICAN Public Forum, but on behalf of the Custer County Action Association, I would like to submit the following comments:

1. We are still waiting for the Final EIS for the Colorado Airspace Initiative. The Draft EIS was round criticized from a variety of sectors - private citizens, academics, acoustical experts, ranchers, business and civic groups, etc. - and the overwhelming criticism had to do with using DNL as a tool for measuring the impact of noise from military overflights. It was felt that, in spite of such devices as the onset rate adjustment, the true impact of noise from military jets in our quiet setting was not revealed in the Day-Night Levels shown in the Draft EIS.

2. Apart from the appropriateness of DNL itself is the even more pertinent question of the appropriateness of using 65 DNL as the minimum level to determine "significant" impact. This is not our community standard, but a standard that has been imposed upon us by the Air National Guard. As I have testified previously, our whole economy, our whole way of life, is based on quiet. That's why we live here, that's why people visit. Our minimum standard must be considered to be much lower than an airport community. We have argued for years and with a chorus of support that military overflights are not a compatible activity in our area. We strongly object to being told that there is No Significant Impact when the finding is based on faulty reasoning and unrealistic standards.

3. The Final EIS supposedly has taken into account these objections, but since we have not seen the Final EIS, I cannot comment on it. However, I've also been told that the Final EIS is going to have the same Preferred Alternative as the Draft EIS. If that is the case, what is the point of the public process? What is the point of NEPA? Or, for that matter, of FICAN? We make our objections, we document them, we get popular support for them, and they all get explained away by government contractors.

4. Based on a report of the Public Forum, I understand that the Air Force is developing improved noise modeling that takes into account terrain, whereas previous noise modeling was based on "the flat earth" theory. The result, not surprisingly, is higher noise impacts in mountainous areas. We have argued this all along. While terrain is finally being taken into account, does the upgraded noise modeling take air temperature and altitude/density into account? Does noise travel faster, further, "louder" in thinner air? We suspect it does. We also suspect that the EIS does not deal with this. Will FICAN make it a matter of investigation in measuring more accurately the impact of noise?

We are grateful for FICAN and we appreciate the opportunity to submit these comments. If you are interested in further information regarding military overflights in our community, please do not hesitate to contact me.

Sincerely,

CUSTER COUNTY ACTION ASSN.

Bob

Robert M. Senderhauf
President

RMS:lf

NATIONAL AIRSPACE COALITION

MAY 2 7 1997

May 19, 1997

Mr. Robert Miller
Harris Miller Miller & Hanson, Inc
15 New England Executive Park
Burlington, MA 01803

Re: FICAN Public Forum - Bloomington, MN - May 13, 1997

Dear Mr. Miller:

I would like to submit the following comments to the Federal Interagency on Aviation Noise.

But before I discuss noise issues, I would like to say that it is a great pity that more people were not in attendance at the Public Forum on May 13. There was such valuable information presented by the panelists and it provided such a needed opportunity for concerned citizens to offer first hand perspectives on aviation noise issues, and yet so few people were able to benefit from this gathering. Is it possible to do more to publicize these events? I can tell you that the only reason I knew about the event was because of a letter from Mr. Alan Zusman. I saw no public announcements in the Twin Cities. I live and work in Bloomington, the site of the meeting, but I did not see any publicity for the forum, nor did anyone else whom I talked to. My concern is that FICAN might discontinue these forums based on poor attendance. But if people don't find out about the forums, they're not going to show up. I also attended the Public Forum last October in Seattle, and I noticed that attendance was not so good there, either. I feel these public forums are extremely important, and I would like to see them continue.

Unlike the rest of the people at the most recent public forum, who were there because of airport noise issues, my concerns are about military overflights in remote rural areas. I was pleased to see that FICAN continues to take an active interest in this problem, and that panelists such Mr. Bob Lee, specifically admitted that "Noise is a major concern for the Air Force," and that "it causes lots of problems."

However, a general concern of the National Airspace Coalition continues to be that while the Air Force makes this admission, we have seen so many Environmental Assessments and Environmental Impact Statements not only downplay the impact of noise, but rationalize it away. I have never seen an EA or EIS for military airspace reach a "Finding of Signicant Impact" - as opposed to the inevitable FONSI - due to noise from military overflights. There is something incongruous here. The Air Force admits that noise is a problem, yet every time it wants to create new areas for low-altitude training, the EIS concludes that noise isn't a problem. Mitigation, scheduling, etc. may alleviate some problems, but I would like to see the day when the Pentagon (and FICAN) stand up and admit that some places proposed for military overflights are simply not appropriate for such an activity.

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airspace@juno.com

Along the same lines, I am encouraged by the fact that the Air Force is conducting research into the effects of noise on animals. And while I am the first to admit that it is important to separate the fact from the fiction, the history from the hysteria, I am not comforted by "scientific" findings that contradict first hand accounts that have come my way for the last four or five years. (The first example that comes to mind has to do with horses. Horse owners laugh and shake their heads when told that horses become accustomed to military flyovers. I find their stories much more trustworthy than the research papers which contradict them. I suppose the only thing more aggravating than using science to prove common sense, is using it to disprove common sense. And in this case, we're talking about common horse sense.)

I am also well aware of contradictory findings in the "scientific" research depending on who is funding the research. Utah State vs. Penn State. (I will be very interested in studying the IBON CD-ROM made available from Bob Lee's office.) And while I think it is incumbent upon the Air Force to fund such research, I would like to propose that it find a way to fund some studies anonymously, so that an institution or a laboratory or an acoustical scientist does not who they are working for. I believe it would yield more objective results.

It was noteworthy that some of the statements from the public at the Public Forum specifically asked that the standard of annoy ance be lowered from 65 DNL to 55 DNL. I can only add that if there is such a concern for communities around airports, the concern is augmented for rural communities where the level of annoyance must be considered even lower. The issue of "compatible land uses" was briefly discussed, as I tried to point out that rural communities should not be given the same standard of 65 DNL in order to measure "significant impact" in an Environmental Impact Statement. Mr. Lee said that land planning per se does not take place in rural areas so that noise standards for "compatible land uses" are not ever established. My question is: If County Boards of Commissioners were to establish such noise standards, would the military and FAA abide by them?

An interesting issue was raised at the public forum, but it also raises a grave concern that was not addressed. The fact that countries in Europe have toughened their noise standards has not only forced industry to build quieter aircraft, it has pushed low-altitude military training out of many countries over there and brought it here. The Germans in New Mexico are the most obvious example. There are of course other less publicized foreign air forces training in U.S. airspace as well.

The National Airspace Coalition stands opposed to the expansion and creation of new airspace for military operations. The Air Force, Navy and Air National Guard have been systematically expanding airspace for the past seven years, using such rationale as improved aircraft, changes in forces and missions, etc. The result is more people in more places exposed to what amounts to a war-time experience in peace time. The irony is that we as a nation should be enjoying unprecedented peace, with the end of the Cold War, and relatively stable global politics and economy. And yet the people at home are not able to enjoy it. Any of the arguments of the Pentagon about the need for this expanded airspace are certainly hampered by the fact that we are renting out our skies to foreign military units. If the people of Europe have demonstrated that they will not put up with military flyovers, why is the Pentagon assuming U.S. citizens will put up with them? Why isn't the United States following Europes lead in toughening noise

standards, rather than creating and welcoming more low-altitude military training from both domestic and foreign units?

In summary, our concerns about the noise from military overflights continue to be:

1. Using 65 DNL as a minimum standard for determining annoyance in remote, rural areas.

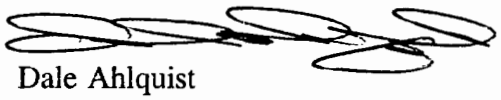
2. EIS's that never find significant impacts due to the noise from military overflights even while the military admits that such noise is a "problem," and while improved noise modelling reveals greater noise levels from overflights in mountainous areas, over water, etc.

3. Obscuring and disregarding first hand testimony about the detrimental effects of military overflights because such testimony cannot be validated clinically or "scientifically."

4. Expanding military airspace so that more people are exposed to overflights, and even absorbing foreign military units in the midst of toughened noise standards abroad.

Please keep me informed of FICAN's activities.

Sincerely,



Dale Ahlquist
Director
National Airspace Coalition

cc: Mr. Alan Zusman, Chairman, FICAN

CITY OF RICHFIELD

6700 Portland Avenue • Richfield, Minnesota 55423-2599

City Manager James D. Prosser
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August 1, 1997

Alan Zusman
Federal Interagency Committee on Aviation Noise
Harris Miller Miller and Hanson
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Chair Zusman:

We are grateful for this opportunity to submit comments to the Federal Interagency Committee on Aviation Noise and for the future efforts on the part of federal agencies to address the issues in relation to aviation noise. Richfield is a city highly impacted by adverse airport noise impacts. The proposed construction of a new runway would subject thousands of residents to additional levels of noise.

Richfield, Minnesota is a first ring suburb located ten minutes from Minneapolis and the Minneapolis-St. Paul International Airport. It has a modest population of 36,000 residents and does well to blend urban amenities with small town appeal. Richfield is known for affordable neighborhoods, exemplary schools, and a multi-cultural, stable, friendly community. Surrounded by urban areas, its seven square miles are filled with well kept, established neighborhoods, beautiful parks, and quaint shops.

As the years progress, it becomes harder to protect our residents and schools from the intrusive impacts of the nearby airport. Residents routinely call the City of Richfield and the Metropolitan Airports Commission's Complaint Line to assert disapproval over extremely loud low flying planes, late night and early morning flights, and airline run-ups. As a direct result of low frequency and overflight impacts, the Richfield neighborhoods of New Ford Town and Rich Acres requested that their homes be purchased by the Metropolitan Airports Commission. The combined impact of the noise and the future uncertainty of this location caused economic and social disinvestment.

Expansion of runways has brought forth a flurry of complaints from residents. Now that additional runway length enables the larger international flights to take place, residents (who are not within the DNL contour ranges projected in 1993) are subjected to impacts at a much closer range. The slow shift to Stage III aircraft has been seen to bring forth little relief.

In the midst of current problems, the Minneapolis-St. Paul International Airport will be expanding. A new North-South runway will be added along the eastern border of the city. And once again, the crosswind runway will be extended so as to accommodate larger aircraft and distribute the in-flight air traffic over a larger area.

Operations to and from the south on this new runway together with increased traffic on the extended crosswind runway will impose extensive, persistent, pervasive, physical, financial, and institutional impacts, primarily on portions of the City of Richfield, many of its residents, businesses, schools, churches, and users of affected facilities. Effective and responsive mitigation of these impacts will be as important to the success of the airport's expansion project as design and construction of the airport facility itself. Concerns that we believe need to be addressed include: proper and accurate evaluation of the impacts will not occur using the LDN metric alone, and because impacts are not identified appropriately, significant mitigation that should be a part of the proposed airport development will not be considered.

Noise Exposure Experience

The following are observations that are relevant to our experience in the City of Richfield.

1. People that are disturbed by aircraft noise complain about single event occurrences, not LDN.

2. The aspects of aircraft noise that cause it to be "disturbing" are that the noise: has not been experienced regularly in the past, is noticeably louder than ambient noise levels for the time of day, is unnecessary noise as related to neighborhood activities, that it interferes with other activities such as speech and sleep.

3. The time of each aircraft event is of a much longer duration than that of a passing automobile or truck.

4. Other loud noises, such as leaf blowers or motorcycles, are distinct events that do not continue throughout the day and night.

5. Streets with heavy traffic generate continuous noise during daytime hours; the traffic usually becomes single vehicles or non-existent during the nighttime hours.

6. Because street noise emanates at ground level only, it is often shielded over short distances by structures and terrain.

Noise Metrics that are Responsive to Community Concerns

In addition to the use of the LDN metric, our experience suggests that several other metrics would be appropriate to capture:

Single event noise - The SEL metric is a measure of an aircraft event that includes the duration of the event and helps distinguish aircraft noise from continuous noises such as those emanating from street activity. The L_{max} is the simplest measurement for people to understand and relate to. There are numerical differences between the SEL and the L_{max} metrics as the distance from the source changes. This item is of interest to the City of Richfield.

Low frequency noise - The discussion of the impacts of low frequency noise is usually focused on the structural damage and health effects rather than disturbance as is the LDN metric. The problem that we experience that is associated with low frequency noise is secondary noise that comes from windows/door rattling and clattering dishes.

Time-above - This metric can be of great assistance in speech interference issues associated with classrooms, church services and out-of-doors public events. While the 85 dBA level is often used to reflect in doors speech interference, other levels are appropriate for "windows open" conditions and for out-of-doors situations.

Suggested Noise Criteria

It is often noted that the metrics we have cited here can not be used because there is not a demonstrated correlation between the metric and human response. We believe that, while that may be true for the total statistical population, each community is capable of establishing criteria that are appropriate for their individual situation and that their determination need not apply to all other cities.

Based on work that we have reviewed, the following could be considered for triggering initial concerns about noise impacts:

LDN metric - Noise complaint records indicate that residential areas encompassed by the 55 DNL noise contour are most likely to be the areas that generated complaints. The frequency of complaints, number of people disturbed and the intensity of reaction increase as the noise exposure increases closer to the airport.

Single event - Because of its simplicity, the A-weighted maximum (L_{max}) metric can be used as a criteria as follows:

80 dBA day (0700-2200)	-	Speech interference indoors (windows closed); Speech interference outdoors with raised voice
70 dBA night (2200-0700)	-	Speech interference indoors (windows open); Speech interference outdoors with normal voice

Low frequency noise - Because the A-weighted scale understates the sound pressure levels of lower frequencies at the distances related to the City of Richfield, the C-weighted scale offers a better metric to indicate the sound levels likely to cause perceptible vibrations in homes that annoy residents. The maximum C-weighted level of 80 dBC is suggested as that which is likely to cause perceptible vibrations in a home.

It was disturbing to hear at the FICAN Aviation Meeting (May 13, 1997) a panel member stating that it will be interesting to see how residents who were once not subjected to aircraft noise, will cope with the additional North-South runway's aircraft noise impacts. He emphasized this point by stating that FICAN will have to remember to use MSP's airport expansion project for a study of residential adverse reaction. The time for a study is now, before airport expansions take place. Communities need to know what health effects airports have on humans (clearly more so than the impact on fish and turtles). FICAN members need to lead the way by being proactive... not purely reactive.

We appreciate the opportunity to comment on these issues. The residents and businesses of our community look forward to FICAN's continual work on the mitigation of overflight and low frequency noise impacts of those who are neighbors of airports.

Sincerely,

James D. Prosser
City Manager

JDP:dmw

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Comments

Please use this space to provide comments. We are seeking input on your interests in aviation noise research, as well as feedback on FICAN itself, including its objectives and organization. Please continue on the reverse of this sheet, if necessary.

Good info presented at the Minneapolis meeting. Too bad the meeting was not adequately promoted. I feel the airport authorities are not the best source for advertising noise research. They would just as soon we forget it. Apparently FICAN and its objectives are NOT well understood here. We, at SMAAC could easily have doubled the attendance if we had known more about the speakers, the schedule, and your objectives. We are much in need of authorative information and reports on the noise research listed in your "Report on..." June 1994. We'll try the home pages listed on your "Public Forum" and see if we can get the reports & information we need.

Thank you for your input.

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Comments

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Please send a copy of the glider.

Found the meeting very useful as a (convenient) way to ~~focus~~ ~~on~~ ovation noise research issues in group one sitting.

Thank you for your input.

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Please send me a copy of the program sites.

Thank you for your input.

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APPENDIX C. EFFECTS OF AVIATION NOISE ON AWAKENINGS FROM SLEEP

Federal Interagency Committee on Aviation Noise (FICAN)
Effects of Aviation Noise on Awakenings from Sleep

June 1997

The effect of aviation noise on sleep is a long-recognized concern of those interested in addressing the impacts of noise on people. In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened as a function of the exposure to single event noise levels expressed in terms of SEL. Since the adoption of FICON's interim curve in 1992, substantial field research in the area of sleep disturbance has been completed. The data from these studies show a consistent pattern, with considerably less percent of the exposed population expected to be behaviorally awakened than had been shown with laboratory studies.

FICAN recommends the adoption of a new dose-response curve for predicting awakening, based on the field data described in this paper and supporting references. The Committee takes the conservative position that, because the adopted curve represents the upper limit of the data presented, it should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the "maximum % awakened".

1. SUMMARY

The effect of aviation noise on sleep is a long-recognized concern of those interested in addressing the impacts of noise on people. Historical studies of sleep disturbance were conducted mainly in laboratories, using various indicators of response (electroencephalographic recordings, verbal response, button push, etc). Field studies also were conducted, in which subjects were exposed to noise in their own homes, using real or simulated noise. However, in a 1989 assessment of existing research, Pearsons indicated the need for substantially more work in this area, citing the large discrepancy between laboratory and field studies as a major concern.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened (% awakening) as a function of the exposure to single event noise levels expressed in terms of sound exposure level (SEL). This interim curve was based on the data presented in the 1989 study. The FICON report also recommended continued research into community reactions to aircraft noise, including sleep disturbance.

Since the adoption of FICON's interim curve in 1992, substantial field research in the area of sleep disturbance has been completed, using a variety of test methods, and in a number of locations. The data from these studies show a consistent pattern, with considerably less percent of the exposed population expected to be behaviorally awakened than had been shown with laboratory studies.

In light of this new information, FICAN recommends the adoption of a new dose-response curve for predicting awakening, based on the field data described in this paper and supporting references. The Committee takes the conservative position that, because the adopted curve represents the upper limit of the data presented, it should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the

"maximum % awakened". FICAN cautions that the dose-response relationship presented here relies on behavioral awakening as the indicator of sleep disturbance; relationships between aircraft noise and other potential sleep disturbance or related health effects responses have not been established by any of these newer studies. FICAN further notes that this curve should be applied only to long-term residential settings and should not be generalized to include children.

The new finding on the relationship between aircraft noise and sleep disturbance does not call into question the nighttime penalty applied to Day Night Sound Level (DNL). The 10 dB penalty added to noise levels for the period 10 p.m. to 7 a.m. is intended to account for the increased intrusiveness of noise at night. The ambient is generally lower and more people are at home during this period than at other times of the day. Thus, the opportunities for activity interference are much higher during nighttime which could lead to greater annoyance.

Continuing efforts to identify other dose-response relationships are being undertaken by standards-setting organizations, such as the American National Standards Institute. FICAN will evaluate proposed relationships developed by such groups as they are published; until that time, FICAN recommends the use of the curve presented here for assessing potential sleep disturbance caused by aircraft noise.

2. BACKGROUND

2.1 The Nature of Sleep Disturbance

The effect of aviation noise on sleep is a long-recognized concern of those interested in addressing the impacts of noise on people. Historical studies of sleep disturbance were conducted mainly in laboratories, using various indicators of response (electroencephalographic recordings, verbal response, button push, etc). Field studies also were conducted, in which subjects were exposed to noise in their own homes, using real or simulated transportation noise [Lukas, 1975; Griefahn and Muzet, 1978; and Pearsons et al., 1989].

Based on a 1989 literature review by Pearsons for the U.S. Air Force, no specific adverse health effects have been clearly associated with sleep disturbance, characterized either by awakening or by sleep-state changes [Pearsons, 1989]. Nevertheless, sleep disturbance is deemed undesirable, and may be considered an impact caused by noise exposure.

2.2 Methodological Considerations

Sleep disturbance studies have employed a variety of factors in study design, sleep disturbance measurement, and noise exposure assessment. Differences in these techniques can have influences on the results of the studies, and a basic understanding of the differences is important for interpreting the results.

Study Design: Laboratory vs. Field Research

The most important issue with regard to the design of sleep disturbance studies has been the location of test subjects: as demonstrated in the meta-analysis by Pearsons, there has been a consistent, significant difference in the level of disturbance observed between *laboratory studies*, in which subjects are exposed to noise in a laboratory setting, and *field studies*, in which subjects are exposed to noise (actual or simulated) in their own home. Generally, laboratory studies have shown considerably more disturbance than field studies [Pearsons, 1992]. Finegold speculates that the significantly greater awakening observed in the laboratory is due to the lack of habituation [Finegold, 1993].

Measures of Sleep Disturbance

Distinctions can be made between a variety of sleep disturbance responses, which can be

identified through different data collection methods in sleep studies.

Behavioral awakenings typically are defined as awakening by the subject enough to initiate a physical acknowledgment, such as button-pushing or verbal response. Sleep disturbance also can be defined as *arousals* or *gross bodily movement (motility)*, identified by periods of actimetric response[1], or by electroencephalographic (EEG) response, which may or may not result in actual awakening. Researchers are careful to point out that the relationship between behaviorally-confirmed awakening and motility is not clear, though both show clearly defined dose-response relationships.

In addition to the variety of measures for identifying disturbances from individual events, most sleep disturbance studies collect data from subjects concerning cumulative sleep effects. For example, measurements can be made of the total sleep time and/or time to fall asleep, and subjects can be questioned on sleep quality (feeling upon arousal, etc.). Two major problems with collecting cumulative data are the potential influences of disturbance caused by non-noise sources, and the difficulty of avoiding bias in test subjects on self-report.

Noise Metrics

Similarly, the noise metrics used to quantify noise exposure in sleep research fall into two categories: (1) measures of individual events, and (2) cumulative measures. Single event measures that have been used in sleep disturbance studies include the Maximum A-weighted Level (Lmax), Perceived Noise Level (PNL), Sound Exposure Level (SEL), Effective Perceived Noise Level (EPNL), and C-Level (CL). Cumulative measures are used to characterize the noise events over an entire night or day, and have included the Equivalent Noise Level (Leq), Composite Noise Level (CNL), Day-Night Average Sound Level (DNL), Community Noise Equivalent Level (CNEL), and Cumulative Distribution Levels or Percentile Levels, (Lx).

A-weighted measures of single events have been most often used in sleep disturbance studies, with either Lmax or SEL being used in most of the recent studies, based on general consensus that single event metrics are more useful for predicting sleep disturbance than cumulative measures[2].

2.3 FICON Sleep Disturbance Recommendations

In 1992, the Federal Interagency Committee on Noise (FICON) recommended an interim dose-response curve to predict the percent of the exposed population expected to be awakened (% awakening) as a function of the exposure to single event noise levels expressed in terms of the sound exposure level, SEL [FICON, 1992]. This interim curve was based on statistical adjustment of Pearsons' 1989 analysis, and included data from both laboratory and field studies [Finegold, 1993]. The recommended dose-response relationship is shown in Figure 1, and can be expressed by the following equation:

[1] Actimeters are activity monitors, which record significant limb movements over a long period of time. In sleep disturbance studies, they generally are strapped to the wrist. Actimeters are generally considered to be a more practical and cost-effective method of collecting physical sleep disturbance data.

[2] The use of single event measures in sleep disturbance studies does not suggest that the nighttime penalties used to assess noise in Day-Night Average Sound Level or other cumulative measures are incorrect or need re-evaluation; FICAN continues to support the use of DNL for addressing cumulative impact and its underlying assumptions regarding nighttime noise events.

$$\%Awakenings = .000007079 \times SEL^{3.496}$$

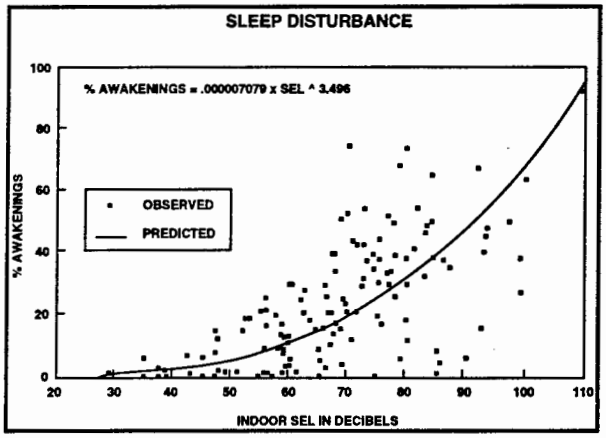

Figure 1. Interim Sleep Disturbance Dose-Response Relationship Recommended by FICON (FICON, 1992)

The FICON report also recommended continued research into community reactions to aircraft noise, including sleep disturbance.

3. RECENT SLEEP DISTURBANCE RESEARCH

Three recent studies have added considerably to the stock of data on sleep disturbance caused by aviation noise. The first of these was conducted in the United Kingdom in 1992; the second in the U.S. near Castle Air Force Base and near Los Angeles International Airport in California in 1992; and the most recent study was conducted in communities near Stapleton International Airport (DEN) and near Denver International Airport (DIA) in Colorado, both before and after the opening of DIA in 1995. These studies are summarized below.

3.1 U.K. Study

The United Kingdom's (U.K.'s) Civil Aviation Authority initiated a study of aircraft noise and sleep disturbance in 1990 to assist the U.K. Department of Transport in developing proposals for future restrictions on nighttime aircraft operations at the London airports [Ollerhead et al., 1992]. In this field study, nearly 50,000 subject-hours of sleep disturbance were collected at four airports, using both activity meters (actimeters) and EEG to measure sleep disturbance in test subjects. In total, 5,742 subject-nights of actimetry data and 178 subject-nights of sleep-EEG data were collected.

The major conclusions of the study are as follows:

- All subjective reactions to noise vary greatly from person to person and from time to time and sleep disturbance is no exception; deviations from the average can be very large. Even so, this study indicates that, once asleep, very few people living near airports are at risk of any substantial sleep disturbance due to aircraft noise, even at the high event levels.

- At outdoor event levels below 90 dBA SEL (80 dBA Lmax), average sleep disturbance rates are unlikely to be affected by aircraft noise. At higher levels, and most of the events upon which these conclusions are based were in the range 90 to 100 dBA SEL (80 to 95 dBA Lmax), the chance of the average person being wakened is about 1 in 75. Compared with the overall average of about 18 nightly awakenings, this probability indicates that even large numbers of noisy nighttime aircraft movements will cause very little increase in the average person's nightly awakenings. Therefore, based on expert opinion on the consequences of sleep disturbance, the results of this study provide no evidence to suggest that aircraft noise is likely to cause harmful after effects [Ollerhead et al., 1992].

Finally, the study emphasized that these are estimates of *average* awakenings, and it acknowledges that some individuals in any exposed population are likely to be more sensitive to nighttime noise, while others will be less sensitive.

3.2 Los Angeles Study

The 1992 study conducted for the USAF [Fidell et al., 1994] observed the effects of nighttime noise

exposure on the in-home sleep of residents near Castle Air Force Base and near Los Angeles International Airport and in several suburban control households with negligible aircraft noise exposure. Test participants pressed a button upon awakening for any reason, after retiring for the evening. A total of 1,887 subject-nights of data were collected from 38 men and 47 women living in 45 different homes. Length of residence for the test subjects ranged from two to more than 40 years.

Major findings of the study are as follows:

- A statistically reliable relationship was observed between sound exposure levels of noise intrusions in sleeping quarters and behaviorally confirmed awakenings within five minutes of occurrence of noise intrusions.
- Although outdoor noise exposure level at the test sites varied over the range of levels of principal interest for environmental analysis purposes[3], the prevalence for awakening among test participants did not increase greatly with sound exposure levels of noise intrusions in sleeping quarters.
- Of a total of 4,452 awakening responses, only 326 could be associated with noise events.
- The average spontaneous rate of behaviorally confirmed awakenings among test participants at all sites was approximately two per night. This figure did not differ significantly across sites with varying levels of nighttime noise exposure [Fidell et al., 1994].

The authors cautioned that the test subjects may not be representative of all residential situations, and that generalizatons of the data obtained in the study should be limited to long term residents of areas with stable nighttime noise exposure.

3.3 Denver Study

A large scale field study of noise-induced sleep disturbance was conducted in the vicinities of Stapleton International Airport (DEN) and Denver International Airport (DIA) in anticipation of the closure of DEN and the opening of DIA. Both indoor and outdoor measurements of aircraft and other nighttime noises were made during four data collection periods. Measurements were made in 57 homes, over a total of 2,717 subject-nights of observations. Sleep disturbance was measured by several methods, including button pushes upon awakening and body movements, recorded by actimeters.

Although average noise event levels measured outdoors decreased significantly at sites near DEN after its closure and increased slightly at sites near DIA after its opening, indoor noise levels varied much less in homes near both airports. No large differences were observed in noise-induced sleep disturbance at either airport, as measured before and after the DIA opening. Indoor Sound Exposure Levels of noise events were, however, closely related to and good predictors of actimetrically defined motility and arousal.

The major findings of the Denver study are the following:

- The current findings closely resemble those of prior field studies of noise-induced sleep disturbance.
- Outdoor nighttime Leq decreased about 12 dB on average at DEN upon closure of the airport, but increased only about 3 dB at DIA after opening of the airport. Indoor nighttime Leq varied little at either location with the transfer of flight operations from DEN to DIA.

[3] Day-Night Average Sound Levels (DNL) at sites near Castle AFB ranged from 50 to 90 dB, while DNL at sites near LAX ranged from 60 to 70 dB. DNL at control sites ranged from about 50 to 70 dB (some control sites were exposed to high levels of road traffic noise).

- The average number of behavioral awakenings per night was 1.8 at DEN and 1.5 at DIA. The number of spontaneous awakening responses (unassociated with noise events) was 1.5 per night at DEN and 1.3 at DIA.

- Statistically reliable relationships were observed between sound exposure levels of individual noise intrusions as measured inside sleeping quarters and several measures of sleep disturbance. [Fidell et al., 1995]

4. RECOMMENDED REVISED SLEEP DISTURBANCE RELATIONSHIP

FICAN has evaluated the data and conclusions of the three field studies described in this paper. The combined data are presented in Figure 2, along with data from six previous field studies [Pearsons, 1989]. The "FICAN 1997" curve shown in Figure 2 predicts a conservative dose-response relationship for the combined field data. The FICON curve is also depicted, for comparison purposes; based on the current field data, the dose-response relationship given by this older curve significantly overestimates the extent of aircraft noise-related awakenings for a given SEL exposure.

The FICAN 1997 curve represents the upper limit of the observed field data, and should be interpreted as predicting the "maximum percent of the exposed population expected to be behaviorally awakened", or the "maximum % awakened" for a given residential population. The central tendency of the recent data was not chosen as the recommended curve because it could underestimate awakenings for some situations or communities. FICAN cautions that the dose-response relationship presented here relies on behavioral awakening as the indicator of sleep disturbance; relationships between aircraft noise and other potential sleep disturbance or related health effects responses have not been established by any of these newer studies.

FICAN further cautions that these data should be applied only to long term residents, although the inclusion of data from the opening of Denver International Airport suggests that people adapt to "new" noise rapidly. This curve should not be applied to estimate sleep disturbance in campgrounds, trailer parks, or other temporary residences. Nor should it be assumed that the curve can be generalized to include children, as only adults were included in the field studies.

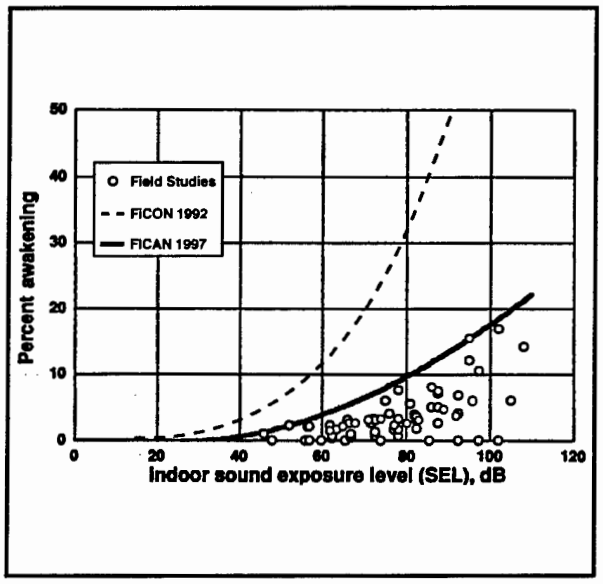

Figure 2. Recommended Sleep Disturbance Dose-Response Relationship

The FICAN 1997 curve also is represented by the following equation:

$$\%Awakenings = .0087 \times (SEL-30)^{1.79}$$

Continuing efforts to identify other dose-response relationships are being undertaken by standards-setting organizations, such as the American National Standards Institute. FICAN will evaluate proposed relationships developed by such groups as they are published; until that time, FICAN recommends the use of the curve presented here for assessing potential sleep disturbance caused by aircraft noise.

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