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SUMMARY REPORT OF THE NAVY CONFERENCE ON ENVIRONMENTAL NOISE 18--ETC(U)
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ENVIRONMENTAL NOISE 18-20 NOVEMBER 1975

NAVAL UNDERSEA CENTER
SAN DIEGO, CALIFORNIA

MARCH 1976

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SUMMARY REPORT OF THE NAVY CONFERENCE ON ENVIRONMENTAL NOISE 18-20 NOVEMBER 1975 "

Sponsored by
Navy Material Command
Office of Naval Research
Bureau of Medicine and Surgery
March 1976



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NAVAL UNDERSEA CENTER, SAN DIEGO, CA. 92132

AN ACTIVITY OF THE NAVAL MATERIAL COMMAND

R. B. GILCHRIST, CAPT, USN

Commander

HOWARD L. BLOOD, PhD

Technical Director

ADMINISTRATIVE STATEMENT

The Navy Conference on Environmental Noise was sponsored jointly by the Naval Material Command, the Office of Naval Research and the Bureau of Medicine and Surgery. This report was compiled and edited by R. S. Gales, NUC, Code 401, Conference Chairman. The report presents the opinions of the participants, and should not be construed as representing official policy of the Naval Undersea Center or Navy Department.

Released by

R. S. GALES
Conference Chairman

Under Authority of

B. A. POWELL, Head
Undersea Sciences Department

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Conference planning was done by LCDR Charles Farrell (NAVMAT), LCDR Joseph Drozd (BUMED), Dr. Donald Woodward (ONR) and R. S. Gales (NUC). Assistance in the later stages was provided by M. Stanley and CDR Myron Hura of NAVMAT.

Meeting arrangements at the Naval Academy were ably handled by Professor Arthur E. Bock, assisted by Ms. Freia Kershow.

Special thanks are due the working group chairmen, who planned, conducted, and reported on the four workshops: Medical Problems, CAPT Robert Cantrell and Dr. Carl Williams; Aircraft Noise Problems, Ms. Carole Tanner; Shore and Community Noise, David Owen; and Shipboard Noise, Donald Maxwell.

Allen Saltzman of NUC was responsible for the final preparation and issuance of the report.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The Navy Conference on Environmental Noise was held at the Naval Academy, Annapolis, in November 1975 under joint sponsorship of NAVMAT, ONR, and BUMED. The purpose was an in-house review of the Navy's capabilities, plans, programs, and needs in the area of environmental and occupational noise. This general area deals with airborne noise — its sources (on ships, aircraft, and ashore), its effects on personnel (those in the operational and work environment, and those exposed to Navy noise in the off-station or home environment),		

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Abstract
and methods for noise abatement. This report summarizes the proceedings, conclusions, and recommendations of the conference. The principal outputs are the recommendations of the four workshops in the areas of (1) Medical Problems, (2) Aircraft Noise, (3) Shore and Community Noise, and (4) Shipboard Noise. The executive summary provides a concise overall review of the conference goals and findings.

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EXECUTIVE SUMMARY

1. A Navy Conference on Environmental Noise was held in November 1975 to focus upon key issues and problems the Navy faces today. The conference was a specific-area Navy response to the broad-area Interservice Environmental Quality Conference held by DOD in September 1974. This specific area, environmental noise, comprises noise created by Navy sources and impinging upon humans wherever they may be situated. The problems involve Navy environments (ships, aircraft, and shore facilities) as well as the adjacent civilian community; therefore, they deal with occupational safety and health (OSHA) as well as with environmental protection (EPA).

2. Several key issues identified for immediate Navy response are:

a. The Navy Hearing Conservation Program, although recognized as necessary and basically well designed, is ineffective due, in part, to a lack of well-motivated supervisory implementation. Command appreciation of risks to Navy personnel exposed to excessive noise levels is needed.

b. Split responsibility for Navy environmental noise, health, and safety and the subdivision of the Navy noise control efforts among the various Command programs has resulted in a complex of relatively small efforts with minimal coordination or evaluation in the sense of assuring maximum service benefits for resources expended.

c. Cost benefit studies are lacking and must be initiated to develop solutions to known noise hazards.

d. In view of the markedly reduced reenlistment rates among Navy personnel exposed to high-noise environments and the fact that hearing-loss compensation costs attributable to Navy noise far exceed those in the comparable civilian sector, does the Navy intend to enforce strict OSHA-like standards to protect Navy personnel from the hazards of excessive noise exposure?

e. Does the Navy intend to comply with state and local environmental noise laws and regulations?

f. Existing administrative mechanisms are awkward because of the separation of responsibilities between medical, engineering, and operational areas. A common point of administrative contact is needed for effective Navy action to meet existing and pending standards, guidelines, and programs.

3. In summary, it was recognized that in many instances present Navy practices represent inadequate fulfillment of its responsibilities to its personnel and impacted communities and serve to the detriment of achieving service missions and objectives. Conference recommendations to resolve these and other critical issues are contained in the Conference Report. Among the most urgent of these is the formation of an Ad-Hoc Working Group for Environmental Noise to initiate planning of a responsive, Navy-wide program.

TABLE OF CONTENTS

SECTION I	----INTRODUCTION	1-1
SECTION II	----CONCLUSIONS	2-1
SECTION III	----RECOMMENDATIONS	3-1
APPENDIX A	----Conference Agenda	A-1
APPENDIX B	----Conference Participants	B-1
APPENDIX C	----Address by John C. Schettino, USEPA	C-1
APPENDIX D	----Address by CDR R. A. Nelson, MC, USN	D-1
APPENDIX E	----Workshop Recommendations:	
E-1	---- Medical Problems	E-1
E-2	---- Aircraft Noise Problems	E-2
E-3	---- Shore and Community Noise	E-3
E-4	---- Shipboard Noise	E-4-1
APPENDIX F	----USEPA/NSWC Interagency Agreement	F-1
APPENDIX G	----Draft Charter for a Navy Ad-Hoc Working Group for Airborne Noise	G-1

Section I

INTRODUCTION

The Navy Conference on Environmental Noise, under joint sponsorship of the Navy Material Command (NAVMAT), Office of Naval Research (ONR), and Bureau of Medicine and Surgery (BUMED), was held on 18--20 November 1975 at the U.S. Naval Academy. Its general purpose was to review the Navy's capabilities, plans, programs, and needs in the area of environmental noise. One objective was to identify and clarify airborne noise problems and organizational responsibilities. A second objective was to develop improved coordination of various Navy efforts being conducted under the cognizance of NAVMAT, ONR, and BUMED.

The terms environmental/airborne noise are used interchangeably herein to mean noise, created by Navy sources, which impinges upon humans wherever they may be situated, e.g., in Navy ships and aircraft, at Navy shore establishments, and in the adjacent civilian communities. Thus, the conference considered the effect of noise on human health and job performance, and on habitability of the environment; and dealt with all types of Naval sources, including ships, small craft, aircraft, ordnance, and industrial equipment. The breadth of scope of problems and interrelated command responsibilities resulted in noise-related information transfer between people-oriented, material-oriented, and operations-oriented Naval activities in a manner that does not normally occur and should be encouraged.

Conference concerns are schematically depicted in Figure 1, which illustrates some interrelationships of the environmental noise problem. Navy noise sources are shown radiating into the surrounding environment, which includes both the in-house environment (on ships, aircraft, and shore facilities) and that of the adjacent civil community as many Navy sources (particularly aircraft) radiate noise into the outside community. The remainder of Figure 1 shows some of the interactions. Both Navy material and operations directly affect the noise environment on board ships and aircraft, which in turn has a direct and often critical effect on the performance of Navy tasks and missions, mainly through its effect on operator task performance and health. The effect of Navy noise radiated into the civilian environment eventually reacts back on Naval Mission Effectiveness as the annoyed civil community influences the Navy's operational posture by political and financial means (an aroused community can cause operations to be curtailed or transferred, bases to be moved, budgets to be cut off, etc.).

Two courses of action are shown in Figure 1. Action one reduces noise impact by operational controls; an example is curtailing nighttime ground run-up of aircraft engines. This generally has an adverse effect on Navy Mission Effectiveness. Action two reduces noise by

material quieting; an example is the recent installation of the dry jet engine run-up noise suppressor system at NAS Miramar. In contrast to Action one, Action two when properly applied will generally have a positive effect on Mission Performance by providing a more favorable in-house environment for Naval personnel.

The conference agenda is presented in Appendix A. In addition to the invited speakers from the United States Environmental Protection Agency (USEPA) and the Occupational, Safety, and Health Administration (OSHA) of the Department of Labor (DOL), there was Navy representation from 14 laboratories as well as various administrative, fleet, and training commands. A list of conference participants is presented in Appendix B. Addresses by John C. Schettino and CDR R. A. Nelson are given in Appendices C and D respectively.

The conference culminated in four concurrent workshops (Medical Problems, Aircraft Noise Problems, Shore and Community Noise, and Shipboard Noise) which occupied the major portion of the third day. Attendees were invited to choose the workshop most closely related to their area of specialization for participation. The full recommendations of each workshop are presented in Appendix E.

The final two appendices deal with two actions that occurred subsequent to the conference but are considered to be of interest to readers of this summary report. Appendix F is a copy of an interagency agreement between the USEPA and the Naval Surface Weapons Center (NSWC). Appendix G is a copy of a draft charter for a Navy Ad-Hoc Working Group for Airborne Noise that is currently under review.

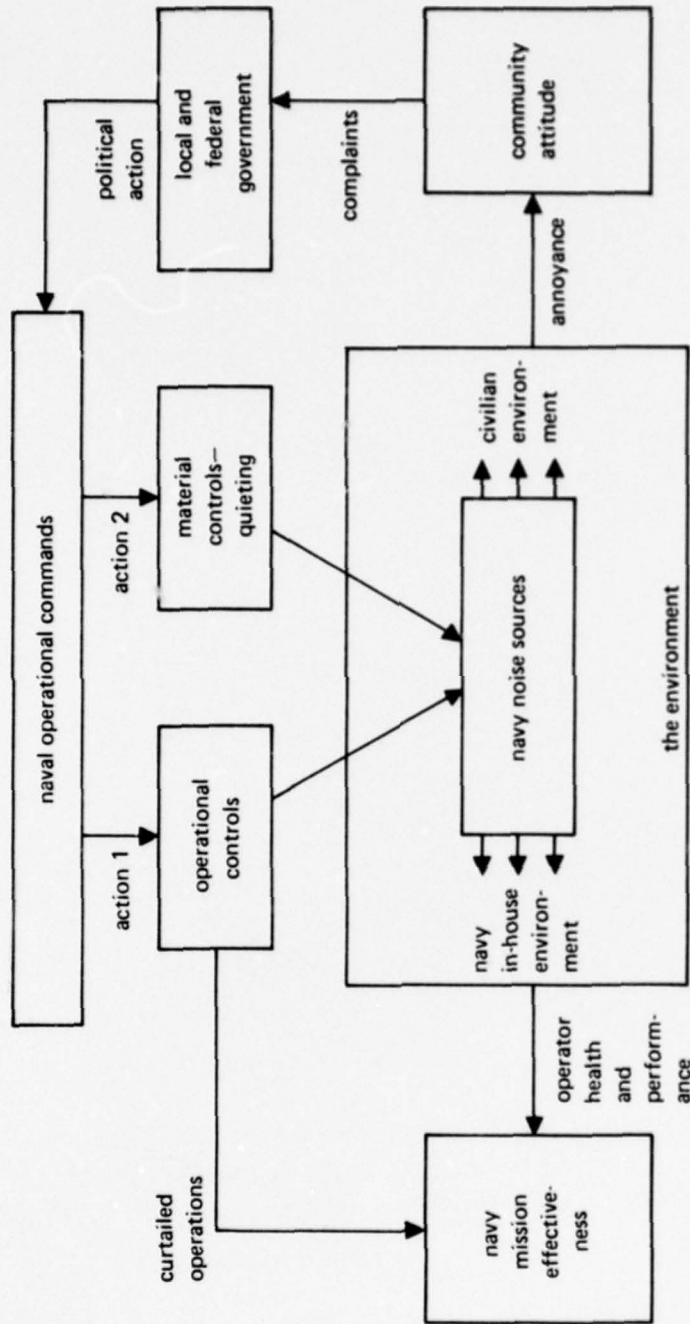


Figure 1. Naval Environmental Noise and its Interaction with Mission and Community

Section II

CONCLUSIONS

1. There is a significant lack of data concerning the physiological/psychological effects of noise exposures on Navy personnel, especially in conjunction with other stress agents (e.g., heat, vibration, etc.). The adequacy and applicability of proposed OSHA criteria is not clear as related to shipboard personnel, especially with respect to combinations of steady state and impulse noise (e.g., gunfire). It is recognized that there are differences in the noise susceptibility of individuals, but little data are available reflecting the effects of noise on job performance (task degradation, lost time, morbidity) or hearing level criteria for specific tasks in specific Navy environments. New record keeping requirements relative to the Privacy Act and the use of Human Subjects in Medical Research do not facilitate the gathering of needed data.
2. Little progress has been made in implementing the Navy's Hearing Conservation Program. Enforcement of requirements for the use of hearing protection devices in hazardous noise environments is often lacking. There is little apparent acceptance of the line supervisor's role in assuring compliance.
3. Within the Navy there would appear to be a number of skilled and well equipped groups and facilities that are especially suited to performing certain environmental noise tasks. Collectively they represent a valuable in-house asset and store of expertise, but their optimum application to addressing airborne noise problems in a cost-effective fashion is hindered by the lack of an integrated Navy-wide airborne noise program.
4. Many Navy R&D personnel have extant knowledge, skills, and technologies that could be applied immediately to the solution of Fleet environmental noise problems, but they are often simply unaware of the existence or specifics of such problems. Operations personnel, on the other hand, are aware of real world problems and needs but lack either the capability funding or time to effect solutions. If R&D, Engineering and Fleet personnel had better communications it would facilitate solution of airborne noise problems.
5. There is no clear administrative approach to identifying, processing, and abating airborne noise problems on a Navy-wide basis. There is no ongoing analysis and review of Navy resource allocation (either in-house or other) attributable to airborne noise abatement. In fact, there appears to be less than Service-wide recognition of noise as a pollutant.

6. Airborne noise control considerations should be included in ship and equipment designs from the earliest stages. Quiet design technology is fragmentary, and not fully applied at present, even though the inclusion of quiet designs is often the most efficient and cost effective means of obtaining solutions to noise problems. Noise reviews should be held throughout all phases of design and fabrication/construction to insure that recommended noise control measures are implemented.

7. It is recognized that constraints on funding and other resources dictate that all problems of noise reduction cannot be solved simultaneously. A prioritized approach based on populations at risk, severity of exposure, and the existing state of the art should be followed.

Section III

RECOMMENDATIONS

At the conclusion of the concurrent workshops, the chairman of each presented a summary of the recommendations of his group to the entire conference. A period of discussion followed, resulting in a consensus listing of nine high-priority recommendations which comprise a principal output of the meeting. They fall into two general categories: (1) Technical, which identifies problems urgently needing additional Navy R&D effort for their solution; and (2) Administrative, which suggests mechanisms for efficient handling of environmental noise problems in both the operational and R&D contexts. The recommendations below are grouped in the two categories for systematic presentation. The order of listing is arbitrary.

Technical Recommendations

1. Study and document the cost-effectiveness considerations of noise control. This should include both the direct cost of noise control action and the risk-cost of absence of noise control (disability payments, medical costs, hearing aids, etc.). The observation was made that the costs to the government of lack of noise control may be very great but generally fall in V. A. and other accounting, hence do not appear as Navy costs.

2. OSHA noise requirements should be met by the Naval environment. The risks and costs associated with not meeting the OSHA standards should be analyzed.

3. Conduct studies on the effects of noise on human health, task performance, and habitability in the Naval environment. Noise may be producing very significant long-term effects on health and task performance without being identified, principally because of man's high adaptive capability.

4. Develop light-weight noise reduction technology in the form of materials and structural configurations suitable for use in Naval applications such as hydrofoils, surface effect ships, etc.

Administrative Recommendations

1. An overall Development Plan for environmental noise should be prepared and should be updated annually.

2. Designate a coordinating office for Navy environmental noise. It should include OPNAV (OP 45), NAVAIR, NAVFAC, NAVSEA, BUMED, and operational commands. It should provide the point of contact for remedial

action in all instances where excessive noise is found in the Fleet--for example, where a noise survey shows hearing damage risk. A funding base for essential noise control actions should be provided.

3. Establish a committee to identify airborne noise problems in the Fleet and recommend needed implementation of R&D and other actions. An ATOWG (Advanced Technical Objectives Working Group) was suggested as an existing mechanism to accomplish this.

4. Establish Medical Service Corps billets for Navy Audiologists as is now done in the Army and Air Force.

5. Plan a future all-Navy Environmental Noise Conference to review a Development Plan for environment noise. Emphasize Fleet participation.

Appendix A

CONFERENCE AGENDA

Tuesday, 18 November

0800--0900--Registration--Rickover Hall

0900 Welcome, Professor Jerome Williams, U.S. Naval Academy

0905 Conference Objectives, R. S. Gales, NUC, Chairman

0915 Keynote Address, John Schettino, EPA

1000 Legislative and Administrative Directives on Noise

Federal Legislation and Directives-----Gerry Depken, NAVFAC

State and Local Regulations-----Casey Caccaveri, EPA

Occupational Safety and Health Reg.-----Dan Boyd, OSHA

Navy Instructions-----LCDR Joseph Drozd, BUMED

1230 LUNCH

1330 Naval Laboratory Facilities and Capabilities

Chairman, R. S. Gales, Naval Undersea Center, San Diego, CA

Naval Academy, Annapolis, MD (USNA) Prof. S. A. Elder

Naval Aerospace Medical Research Lab, Pensacola, FL (NAMRL)

Dr. C. Williams

Naval Air Engineering Center, Lakehurst, NJ (NAEC) D. Croce

Naval Aircraft Environmental Support Office, San Diego, CA

(NAESO) R. Glass

Naval Air Test Center, Patuxent River, MD (NATC) C. F. Abell

Naval Electronics Laboratory Center, San Diego, CA (NELC) Ms. E. Schiller

Navy Environmental Health Center, Cincinnati, OH (NEHC) CDR Wm. Brownlow

Naval Environmental Support Office, Port Hueneme, CA (NESO) D. Owen

Naval Health Research Center, San Diego, CA (NHRC) Dr. R. E. Townsend

Navy Personnel R&D Center, San Diego, CA (NPRDC) R. A. Newman

Navy Regional Medical Center, Bremerton, WA CDR R. Nelson

Naval Research Laboratory, Washington, DC (NRL) M. Potosky

David W. Taylor Naval Ship R&D Center, Bethesda, MD (DTNSRDC) G. J. Franz

Naval Ship R&D Center, Annapolis, Laboratory, Annapolis, MD, D. Maxwell

Naval Ship Engineering Center, Philadelphia, PA (NSEC) B. M. Shapiro

Naval Submarine Medical Center, New London, CT (NSMC) P. F. Smith

Naval Underwater Systems Center, New London, CT (NUSC) M. S. Leff

Naval Undersea Center, San Diego, CA (NUC) R. S. Gales

Pacific Missile Test Center, Point Mugu, CA (PMTC) D. G. Robertson

Wednesday, 19 November

Environmental Noise Problems and R&D Efforts

0800--1000 Medical Problems

Chairman, LCDR Joseph Drozd, BUMED

Noise and Aviation--Ron Robertson, NAMRL, Pensacola, FL
Problems Ashore and Afloat--CDR R. A. Nelson, MC, USN, Bremerton, WA
Submarine and Diving Environments--LT Ted Miller, NSMRL, New London, CT
Problems in the Marine Corps--Dr. R. A. Goldenberg, NRMCC, Camp Lejeune, NC

1000 BREAK

1030--1230 Aircraft Noise Problems

Chairman, W. Morhard, NAVAIR

Problems of Aircraft Noise Measurement, External--Ray Glass, AESO,
North Island, San Diego, CA Internal--Doug Robertson, PMTC, Point
Mugu, CA
Problems of Voice Communication in Aircraft Noise--John Webster, NELC
San Diego, CA
Noise Problems in Airborne Sonar Operation--Roy Klumpp, NUC, San Diego, CA
Ground Run-up Suppressors for Jet Aircraft--Dominic Croce, NAEC,
Lakehurst, NJ

1200 LUNCH

1330--1530 Noise Problems at Shore Establishments and in the Community

Chairman, CDR J. Greenwald, OPNAV

Trends in Noise Measurement and Monitoring, R. W. Young, NUC, San Diego, CA
Noise Criteria for Land Use Planning, Ed Feiner, NAVFAC
AICUZ--Problems and Plans, CDR Greenwald, OPNAV
Noise Reduction Technology--Problems, Meyer Lepor, NUC, San Diego, CA
Environmental Impact Statements--Problems, Ed Johnson, OPNAV
Joint Services Manual for Noise Planning, Dave Kurtz, NAVFAC

1530 BREAK

1600--1800 Shipboard Noise Problems

Chairman, L. Herstein, NAVSEA

Shipboard Measurement of Airborne Noise, Bill Barnes, NSRDC, Annapolis, MD
Shipboard Noise Criteria--Problems of Wearable Ear Protection on Shipboard,
Roy Klumpp, NUC, San Diego, CA
Engineering Control of Noise in Machinery Spaces, Ed Thomas, NSRDC,
Annapolis, MD

Specification of Equipment Noise (MIL SPEC 740), Lou Herstein, NAVSEA
Interior Noise of Active Sonar, Meyer Lepor, NUC, San Diego, CA
Small Boat Noise, Don Thompson, NSRDC, Annapolis, MD

Thursday, 20 November

Workshops on Coordinated Navy Program on Environmental Noise

0800 Introductory paper--Physiological Effects of Noise, CAPT R. Cantrell,
NRMC, San Diego, CA

0830 Organization of workshops

0900--1230 Four concurrent workshops:

Workshop 1: Medical Problems, Co-chairmen, CAPT R. Cantrell, NRMC, San
Diego, CA and C. Williams, NAMRL, Pensacola, FL

Workshop 2: Aircraft Noise Problems, Chairperson, C. Tanner, AESO,
North Island, San Diego, CA

Workshop 3: Shore and Community Noise, Chairman, D. Owen, NESO, Port
Hueneme, CA

Workshop 4: Shipboard Noise, Chairman, D. Maxwell, NSRDC, Annapolis, MD

1230: LUNCH

1330--1530 Reports of workshops by chairmen, and discussion

1600 Conclusion of Conference

Appendix B

CONFERENCE PARTICIPANTS

<u>Participant</u>	<u>Agency and Address</u>
ABELL, Mr. Carl F. (301) 963-4186	NATC, Code 57E6 Patuxent River, Maryland 20670
BARNES III, Mr. Wm. H. (301) 267-2451	DTNSRDC (Code 1927) Annapolis, Maryland 21402
BEGGIN, Mr. John (215) 755-3922	NAVSECPHILADIV, Code 6762C Philadelphia Naval Base Philadelphia, Pennsylvania 19112
BELLANCA, CDR Joseph J., MC USN (301) 295-1202	National Naval Medical Center Occupational & Environmental Health Ser. Bethesda, Maryland 20014
BOCK, Prof. Arthur E. (301) 267-3791	Naval Systems Engineering Department U.S. Naval Academy Annapolis, Maryland 21402
BORWASKI, Edward Mr. (301) 295-1202	National Naval Medical Center Occupational & Environmental Health Ser. Bethesda, Maryland 20014
BOYD, Mr. Dan (202) 523-7081	Occupational Safety & Health Adm. Department of Labor, Room N3718 Washington, D.C. 20210
BROWN, Mr. Earl J. (301) 295-1450	National Naval Medical Center Audio Div., Department of ENT, Ward 5B Bethesda, Maryland 20854
BROWNLOW, CDR W. G., Jr., USN (804) 444-7672	Navy Environment Prevention Unit - 2 Code 01C Norfolk, Virginia 23511
BUYNAK, Mr. Pete (703) 325-0266	Naval Facilities Engineering Command Code 0451D 200 Stovall Street Alexandria, Virginia 22332
CACCAVERI, Mr. Casey (703) 557-2126	Environmental Protection Agency Office of Noise Abatement & Control Washington, D.C. 20460

Participant

Agency and Address

CALVIN, Mr. Kim J.
(202) 436-1195

NAVSEC, Code 6144F
Naval Ship Engineering Center
Center Building
Prince George's Center
Hyattsville, Maryland 20782

CANTRELL, CAPT Robert, MC USN

Navy Regional Medical Center
Department of Otolaryngology
San Diego, California 92134

CROCE, Mr. Dominic
AV 624-2706

Naval Air Engineering Center
Code 92623
Lakehurst, N.J. 08733

DEPKIN, Gerry
(703)325-8551

Naval Facilities Engineering Command
Code 09CC
200 Stovall Street
Alexandria, Virginia 22332

DROZD, LCDR Joseph J., MSC USN
(202) 254-4620

Bureau of Medicine and Surgery
Code 5533
Washington, D.C. 20372

DURKEE, Mr. Stanley B.
(703) 557-8292

U.S. Environmental Protection Agency
Noise Office, Code AW-471
Washington, D.C. 20460

ELDER, Prof. Samuel A.
(301) 267-3488

Physics Department
U.S. Naval Academy
Annapolis, Maryland 21402

FERGUSON, LCDR John C. USN
(301) 295-1333 or 254-4236

Naval Medical R&D Command
Code 441, Bldg. 142
National Naval Medical Center
Bethesda, Maryland 20014

FOGELS, Mr. Edgars O.
(703) 325-0560

Naval Facilities Engineering Command
Code 2013
200 Stovall Street
Alexandria, Virginia 22332

FRANZ, Mr. Gerald J.
(301) 227-1558

DTNSRDC
Code 194
Bethesda, Maryland 20084

GAFOS, Mr. Adamandios G.
(301)267-2669

DTNSRDC, Code 2743
Annapolis, Maryland 21402

GALES, Mr. Robert S.
AV 933-7255

Naval Undersea Center
Code 401
San Diego, California 92132

Participant

Agency and Address

GLASS, Mr. Ray
(714) 437-5032

AESO, Code 661
Naval Air Rework Facility
San Diego, California 92109

GOLDENBERG, Dar. R. A.

BUMED Research & Development
Naval Regional Medical Center
ENT Clinic
Camp Lejeune, North Carolina 28542

GOLDSMITH, Mr. David E.
(301) 267-2562

DTNSRDC, Code 2742
Annapolis, Maryland 21402

GOODMAN, Mr. Jerome
(202) 227-1761

DTNSRDC, Code 1945
Bethesda, Maryland 20084

GREENE, Mr. James W.
(904) 452-4457
AV 922-4457

Naval Aerospace Medical Institute
Code 05
Pensacola, Florida 32512

GREENWALD, CDR J. USN
(703) 325-0501

CNO OP 04E
11S67 Hoffman Bldg. 2
200 Stovall Street
Alexandria, Virginia 22332

HEITKOTTER, Mr. Robert H.
AV 22-2518/19/20
692-2518/19/20

Naval Air Systems Command
Code AIR 330D
Washington, D.C. 20301

HERSTEIN, Mr. Louis A., III
(202) 692-0873

Naval Sea Systems Command
Code 037
Washington, D.C. 20362

HURA, LCDR Myron, USN
(202) 692-2147

Naval Material Command Headquarters
Code 0341
Room 1044, C.P. #5
Washington, D.C. 20360

HURLEY, Mr. Steve
(703) 325-9044

Naval Facilities Engineering Command
Code 032B
200 Stovall Street
Alexandria, Virginia 22332

KEARNS, Mr. James M., Jr.
OX4-1425
AV 224-3188/2171

HQS, Marine Corps
Code LFF
Washington, D.C. 20380

KLUMPP, Dr. Roy G.
(714) 225-7918

Naval Undersea Center
Code 4011
San Diego, California 92132

Participant

Agency and Address

KOSS, Mr. Lawrence P.
AV 222-2072 or 692-2072

Naval Facilities Engineering Command
Code 0492
Washington, D.C. 20362

KURTZ, Mr. David
(703)325-0561

Naval Facilities Engineering Command
Code 2013
200 Stovall Street
Alexandria, Virginia 22332

LEFF, Mr. Martin S.
AV 636-2551
(203) 442-0771, X-2551

Naval Underwater Systems Center
Applied Engineering Division, Code EA 312
Fort Trumbull
New London, Connecticut 06320

LEPOR, Mr. Meyer
AV 933-7916
(714) 225-7916

Naval Undersea Center
Code 4012
San Diego, California 92132

LIBBER, Dr. Leonard M.
Ox2-4053

Office of Naval Research
Code 441
800 N. Quincy Street
Arlington, Virginia 22217

LOPARDO, Prof. Vincent J.
(301) 267-3583

Mechanical Engineering Department
U.S. Naval Academy
Annapolis, Maryland 21402

MASSENGILL, Mr. Earl B.
AV 22-27480
(202) 692-7480

Naval Air Systems Command Headquarters
Code (Air 5311E)
Washington, D.C. 20361

MATHIEU, Dr. Richard D.
(301) 267-2504/2401

Director of Research
U.S. Naval Academy
Annapolis, Maryland 21402

MAXWELL, Mr. Donald
(301) 267-2759

DTNSRDC, Code 2742
Annapolis, Maryland 21402

MILLER, CDR R.R., USN
AV 222-2072 or 692-2072

Naval Sea Systems Command
Code 0492
Washington, D.C. 20362

MILLER, Mr. Theodore H.
(203) 449-3201

NavSubMedResLab
Navy Submarine Base New London
Groton, Connecticut 06340

MISIALEK, Mr. Raymond
(215) 755-3922

NAVSECPHILADIV, Code 6762C
Philadelphia Naval Base
Philadelphia, Pennsylvania 19112

MORGANELLI, Mr. Thomas D.
(301) 267-3649

DTNSRDC, Code 2743
Annapolis, Maryland 21402

Participant

Agency and Address

MORHARD, Mr. William C.
(202) 692-7988

Naval Air Systems Command
Code AIR 01B
Room 1176 JPY
Washington, D.C 20361

NELSON, CDR Richard, MC USN
AV 439-4204 or (206) 478-4202

Director,
Occupational and Environmental Health
Navy Regional Medical Center, Code 400
Bremerton, Washington 98314

NEWMAN, Mr. Richard A.
AV 933-6617
(714) 225-6617

Navy Personnel R&D Center
Code 311
San Diego, California

OLEJACK, Mr. John
(703) 979-8300

TSI (NAEC)
2300 S. 9th Street
Arlington, Virginia 22204

OWEN, Mr. David A.
AV 360-4327, 5071
(805) 982-4327, 5071

Navy Environmental Support Office
Code 2522
Naval Construction Bn. Center
Port Hueneme, California 93043

PENCE, Mr. Virgil L.
(301) 267-2562

DTNSRDC, Code 2743
Annapolis, Maryland 21402

PERKINS, Mr. Robert L.
(301) 227-1520

DTNSRDC, Code 1966
Bethesda, Maryland 20084

POPPERT, Mr. Bernard L.
AV 22-27443

Naval Air Systems Command
Code AIR 34DE
Washington, D.C. 20361

POTOSKY, Mr. Maruice
(202) 767-2016

Naval Research Laboratory
Code 8109
Washington, D.C. 20375

ROBERTSON, Mr. Douglas G.
AV 873-8871 or (805) 982-8304

Pacific Missile Test Ctr., Code 1131
Point Mugu, California 93042

ROBERTSON, Dr. Ronald M.
AV 922-4457

Naval Aerospace Med. Res. Lab.
Code L34A
Acoustical Sci. Div.
Pensacola Florida 32512

SCHAB, Mr. H.W.
(301) 267-2359

DTNSRDC, Code 2707
Annapolis, Maryland 21402

SCHETTINO, Mr. John C.
(703) 557-7600

Environmental Protection Agency
Code AW-471, Room 1121, CM-2
1921 Jefferson Davis Highway
Arlington, Virginia 20460

Participant

Agency and Address

SCHILLER, Ms. Elaine
AV 933-7372

Naval Electronics Lab. Center
Code 3400
San Diego, California 92152

SHAPIRO, Mr. Bernard M.
(215) 755-3922

NAVSEC PHILADIV, Code 6760
Philadelphia Naval Base
Philadelphia, Pennsylvania 19112

SINGERMAN, Mr. Harold H.
(301) 267-2773

DTNSRDC, Code 286
Annapolis, Maryland 21402

SMITH, Mr. Paul F.
(203) 449-3201

NavSubMedResLab
Naval Submarine Base New London
Groton, Connecticut 06340

STANLEY, Mr. E.M.
(301) 267-3535

DTNSRDC, Code 2853
Annapolis, Maryland 21402

STUCKER, CDR Fred
(215) 758-8238

USNH Philadelphia
Philadelphia, Pennsylvania 19145

TANNER, Mrs. Carole Sue
(714) 437-5032

Naval Air Rework Facility
Code 660, Building M-1
San Diego, California 92135

THOMAS, Mr. Edward V.
(301) 267-2653

DTNSRDC, Code 2742.2
Annapolis, Maryland 21402

THOMSON, Mr. Donald
(301) 267-2668

DTNSRDC, Code 2741.1
Annapolis, Maryland 21402

TOWNSEND, Dr. Richard E.
(714) 225-6671

Naval Health Research Center
Code 8000
San Diego, California 92152

TYLER, CAPT Paul, MC USN
(301) 295-1140

Medical R&D Command
National Naval Medical Center
Bethesda, Maryland 20014

ULDRICK, Prof. John P.
(301) 267-3186

Mechanical Engineering Department
U.S. Naval Academy
Annapolis, Maryland 21402

WEBSTER, Dr. John C.
AV 933-7372 or (714) 225-7372

NELC Code 3400
San Diego, California 92152

WILLIAMS, Dr. Carl E.
AV 922-4457

Naval Aerospace Med. Res. Lab.
Code L34, Acoustical Sci. Div.
Hearing Conservation Department
Pensacola, Florida 32512

Participant

WILLIAMS, Prof. Jerome
(301) 267-3791

WOODWARD, Dr. Donald P.
(703) 692-4053

WYATT, Mr. Samuel V.
(301) 436-1206

YOUNG, Dr. Robert W.
AV 933-6309

ZILLIG, Mr. Carl
AV 227-3639

Agency and Address

Environmental Sciences Department
U.S. Naval Academy
Annapolis, Maryland 21402

Office of Naval Research
Code 441
800 N. Quincy Street
Arlington, Virginia 22217

NAVSEC, Code 6153c
3700 East-West Highway
Hyattsville, Maryland 20715

Naval Undersea Center
Code 40102
San Diego, California 92132

Chief of Naval Operations
OP45, The Pentagon
Washington, D.C. 20350

Appendix C

ENVIRONMENTAL NOISE AND ITS CONTROL

Address by John C. Schettino, USEPA

Good morning ladies and gentlemen, it is a pleasure for me to speak to you today. Usually, my addresses are an explanation of the Environmental Protection Agency's activities in the field of noise abatement and control. Generally, my audiences are comprised of industry trade groups and ardent environmental activists. The trade groups eagerly await my final pause so that they can inform me that my office is doing too much. The environmentalists counter that my office is not doing enough. Today, with you, I am among friends, for the Navy has long been active in the field of noise abatement and control.

Many of you have been in the field of noise abatement for longer than you care to remember. My Agency has only had a noise program since 1972. but the Navy has had a hearing conservation program since 1955 and has fostered active research in the field. Many of the Navy's technological innovations have been made because noise is a factor to security. For instance, sound detection of submarines has always been of prime concern. Therefore, innovations have been made which quiet associated machinery. That research has contributed much data to the repository of knowledge EPA depends upon for its criteria, establishment of standards and promulgation of regulations. We continue to depend upon you.

Although it is like carrying coals to Newcastle, I would like to review the diverse noise programs and accomplishments by the Navy. These include hearing conservation, research and development activities, abatement and control of aircraft noise, and promotion of land use zoning around airports. I shall also discuss the relevance of the Navy programs to current EPA goals.

The basic objective of the Navy hearing conservation program is to prevent hearing loss in personnel assigned to areas of high intensity noise. The Bureau of Medicine and Surgery has responsibility for directing and coordinating the Navy program. The first, formal comprehensive Navy hearing conservation program was initiated in 1955. The current program is directed at all U.S. Naval Commands, ashore and afloat. It applies to both civilian and military personnel.

The program specifies use of the Department of Labor's Occupational Safety and Health Administration's permissible noise exposure levels based on damage risk criterion level of 90 dB(A). When the noise level exceeds 90 dB(A), the Navy requires mandatory institution of a hearing conservation program.

You might note that both the Army and the Air Force have more stringent standards than the Navy. The Air Force standard establishes an 84 dB(A) limit for 8 hour exposure with a 4 dB time/intensity trading ratio and ceiling of 115 dB(A) for exposure without adequate ear protection. The Army standard requires initiation of hearing conservation measures for exposure to steady noise levels above 85 dB(A) regardless of duration of exposure. Ten other agencies also have more stringent standards than the Navy.

As stated above, the Navy utilizes the OSHA 90 dB(A) standard. The Environmental Protection Agency strongly believes that the 90 dB(A) time-weighted average criterion and the 5 dB(A) time intensity tradeoff do not adequately protect the health of the noise exposed worker as intended by Congress. Essentially, EPA believes that a time-weighted average exposure of 85 dB(A) and time-intensity tradeoff of 3 dB(A) are feasible and necessary and should be adopted. EPA has made its position known to OSHA and extensive public hearings have been held.

You may have read in the Bureau of National Affairs' publication or the Noise Control Reporter the EPA is now pressuring the Department of Labor for an 80 dB(A) standard. That reporting is incorrect. EPA has suggested 80 dB(A) as a futuristic goal. What EPA is attempting at this point in time is the OSHA adoption of an 85 dB(A) standard in three to five years.

EPA is developing a hearing conservation program based on the eight hour time-weighted average of 85 dB(A) with a time intensity of 3 dB for each halving of exposure time. The EPA program will be a model for other Agencies. We are also developing a hearing conservation manual to be published next year. We would like the Navy to participate in our project.

The Navy's practical application in the form of its hearing conservation program discussed above is grounded in solid research and development activities. I would like to discuss some of those activities.

The U.S. Navy program of research in noise-induced hearing loss is directed to development of increased knowledge of the mechanisms of anatomical change, to define the incidence of noise-induced hearing loss in Navy job specialties, and to develop hearing conservation standards for specific job specialties.

Current Navy research on individual behavior effects of noise is directed toward evaluating and optimizing human performance under exposure to noise in submarine and aircraft environments. Laboratory evaluations have been conducted on headsets proposed for use by acoustic sensor operators in antisubmarine warfare patrol and on military noise cancelling microphones. Experiments have been conducted on the effects of high noise levels on sonar doppler and on auditory tracking of a signal under perceptual arrangements.

In the area of measurement methodology and calibration, the Navy's research on noise criteria for ships and submarines emphasizes the

establishment of measurement methods and criteria for limiting airborne noise in ship spaces and enforceable specifications for acceptable noise by equipments produced for use on naval vessels.

Regarding machinery noise, eight Federal agencies are sponsoring research. The Navy by far has the largest activity, with about a million dollars per year spent in the machinery noise area. However, the results of this research are classified and thus are not currently publicly available. While the Navy effort is primarily concerned with radiated and sonar self-noise, such effort results in quieter machinery.

There are several prominent Naval facilities whose mission is oriented toward acoustics research. The Acoustical Sciences Laboratory at the Naval Aerospace Medical Institute and Research Laboratory in Pensacola, Florida conducts Navy relevant research in the areas of psychoacoustics, audiology, speech communications, and hearing conservation. The Human Factors Division of the Naval Electronics Laboratory (NELC) and the Undersea Sciences Department of the Naval Undersea Center (NUC) in San Diego, California, presently share the auditory research facilities at NELC. The Crew Systems Branch of the Flight Test Division at the Naval Missile Center in Point Mugu, California conducts developmental tests and evaluations of aircrew life support systems, escape/survival equipment, auditory target acquisition weapons systems, communications systems, and acoustical noise. The Auditory Research Division of the Naval Submarine Medical Research Laboratory at Groton, Connecticut, conducts basic and applied auditory research in submarine and diving medicine. In addition to the above mentioned Naval laboratories engaged in auditory research, some studies are also conducted at Naval Hospital, Oakland, and the Naval Hospital, San Diego.

Turning now to aviation, the impact of aircraft noise on civilian and residential communities is alleviated by the Navy through the Department of Defense Air Installation Compatible Use Zones program, commonly referred to as AICUZ. The increasing frequency of community encroachment, especially residential development, on privately owned lands abutting military air installations has led to the establishment of the AICUZ program. The purpose of AICUZ is to prevent incompatible development in high noise exposure areas, to minimize public exposure to potential safety hazards associated with aircraft operations, and to protect the operational capability of the air installation. AICUZ applies to air installations of the military departments located within the United States, its territories, trusts, and possessions. First priority is that all reasonable, economical, and practical noise source control measures be taken. Typical measures normally include siting of engine test and runup facilities in remote areas if practical and provision of sound suppression equipment where necessary. It may include adjustment of traffic patterns to avoid built-up areas where such can be accomplished safely and without significant impairment of operational effectiveness.

For overall aircraft noise reduction, the Federal Aviation Administration and EPA are recommending noise abatement and control technology measures for civil aircraft. The Air Force, which also has an AICUZ

program, has indicated an intent in its purchase of noncombat aircraft to meet these civilian aircraft noise abatement requirements. We assume the Navy will also adopt these guidelines.

After all reasonable noise source control measures have been taken, there will usually remain significant land areas in which the total noise exposure is incompatible with certain types of land development. In these situations, the AICUZ program provides that attempts should be made to work with local governing bodies, planning commissions, zoning boards and similar bodies to alleviate problems by zoning or similar local measures. Where practical and advisable, necessary rights in land within the AICUZ may be obtained through land exchange, purchase, donation, or other methods, or retained for the protection of the operational capability of air installations. Such restrictive easements may include the right to make low and frequent flights over land or the right to restrict the use of the area for human habitation and construction of dwellings, except for pre-existing dwellings.

The AICUZ program is designed to be evolutionary in nature and to be responsive to differing State and local conditions. The EPA is particularly pleased with the cooperative spirit of the AICUZ program. The program is compatible with EPA's own efforts in developing a civilian airport regulation to be recommended to the Federal Aviation Administration (FAA). EPA is also pleased that the AICUZ program has adopted the L_{eq}/L_{dn} methodology used in the EPA "Levels Document" as the uniform environmental noise descriptor.

As you can see from my description of some--and I repeat--some, of the Navy's accomplishments in the field of noise abatement and control, the Navy has a record which it can be proud of. You will be learning about more of the accomplishments in greater depth over the next two days.

The Noise Control Act of 1972 gives the Administrator of EPA the responsibility to coordinate all Federal efforts as they relate to noise abatement. The EPA review of Labor's OSHA standard was one discharge of that duty. The Navy has twenty-one noise abatement projects requiring total funding of approximately \$24 million in FY '76. As part of EPA's coordinating responsibilities as defined in Executive Order 11752, EPA assigned priorities to identified noise abatement projects for FY 76 and submitted its recommendations to the Office of Management and Budget. EPA is also formulating technical guidelines to assist Federal facilities in complying with Federal, State and local noise regulations.

EPA also coordinates in other ways. EPA reviews all environmental impact statements. Furthermore, advisory committees, interagency agreements and ad hoc arrangements exist for coordination. Along those lines we have recently initiated an interagency agreement with the Naval Surface Weapons Center which will provide EPA with substantial interagency technology transfer. The agreement includes two important concepts--technology search actions and technology transfer. Technology search actions will be taken to assess what specific technology the Navy has which we need. Once the EPA needs have been matched with existing Navy

technological and data capabilities which meet those needs, then transfer of technology can be applied. Your technological innovations can therefore be altered with significant by-products of environmental benefit. We will also derive knowledge from your top security innovations without threatening that security.

Efficiency has long been equated with power and speed. For instance, an effective quiet vacuum cleaner has existed for some time. But, people associate all that noise with sucking up the dirt; and, they have, therefore been unwilling to purchase the quieter model.

Recently, however, environmental and energy causes have dominated the corporate preliminary design departments in all areas of technological development. Even NASA, who successfully experimented us into space, is reevaluating reduced speed commercial transports and is reevaluating the benefits of the turboprop. Sometimes, in order to make progress, and I put "progress" in quotes, we need to look back. Even the airship concept has been revitalized. The civil Navy agency, the Maritime Administration, is looking at the sailing ship as a possibility for its future merchant vessels. The energy crisis was the catalyst for such a sailing ship, but the ship would also be a great degree quieter than current ships. Environmental and non-environmental goals need not be incompatible.

We should not inhibit our thinking in looking for technological innovations for the future. I expect that your discussions of the next few days will explore in depth where we are and where we might expect to be in the years ahead in the complex area of noise abatement and control. The Navy's progress in this arena will filter into the progress of other agencies and--more importantly--will contribute to a better environment for all of us. We rely on your information and your continued cooperation. Thank you and we wish you a successful conference.

Presented at the Navy Conference on Environmental Noise held at the U.S. Naval Academy on 18--20 November 1975 by John C. Schettino, USEPA Office of Noise Abatement and Control, Noise Control Requirements and Technology Staff.

Appendix D

NOISE PROBLEMS ASHORE AND AFLOAT

Address by CDR R. A. Nelson MC, USN

Ladies and Gentlemen--I want to talk with you as a representative of an industrialized Navy Medical Region. The concern for medical R&D is not a major problem of mine--but I think that you as R&D oriented people should be aware of what my problems are and what the problems are of a goodly number of the medical people serving shore based industrial facilities and ships. My comments are based on my recent experiences as the head of the Occupational Health program for a medical region and my experiences over the past few years as an Occupational Health representative for BUMED and the Navy Environmental Health Center. I've visited shore facilities and a few ships all across the country and have critically viewed their Hearing Conservation Programs.

I want to discuss some of our basic problems with you. The solutions to many of our problems lie outside our authority and don't involve the need for medical research.

Yesterday Mr. Schettino of EPA gave us a glowing report on the Instructions the Navy has had for Hearing Conservation Programs since 1955. What he didn't mention or didn't know is that there has never been a widespread implementation of those instructions and we're only a little better off than we were in 1955!

Simplified--our problem is that we need a rubber chipping hammer or--in lieu of that we need an enforced hearing protection program. We have neither!

From a medical aspect our scientific research efforts have far outstripped the basic application of good hearing conservation practices aboard ships and at shore activities. Our needs are more basic than exotic R&D projects. It's my opinion that researchers can be most useful now by visiting field activities and viewing our problems first hand and perhaps recognizing problems we've overlooked plus providing us with solutions where the state of the art will permit, or developing research projects on other problems with specific Navy application.

Our problems as we see them fall into 4 basic categories:

1. Need for Noise Reduction
2. Management Enforcement
3. Medical aspects of Hearing Conservation
4. Hearing Loss Compensation Practices

I'd like to discuss each of the areas briefly:

Noise Reduction, to meet hearing conservation needs, has been a long neglected area which, in my opinion, needs the bulk of our research and development efforts. We need a concerted effort to identify and develop standard shelf-available solutions for major noise source problems which are common to many navy industrial activities. I'm thinking of noise sources such as the various pneumatic operated tools and equipment. We need the application of known noise control techniques. All the problems of noise reduction can't be solved simultaneously so let's set priorities based on populations at risk, the severity of the exposure and the existing state of the art.

In my region our major shore industrial activities don't have engineers with training in noise reduction--much less an active acoustical engineer. We do have a limited number concerned with strictly shipboard noise reduction.

My industrial hygienists have for the most part already identified and documented the sources of hazardous noise and their characterization. In many instances they have made specific recommendations for noise reduction--but we don't have the engineering competence to routinely provide this service and no one else is doing it.

Our 2nd problem area is enforcement. Because we don't yet have adequate noise reduction to prevent noise induced hearing loss, we must depend now, and for several years to come, on the use of hearing protective devices. OSHA's Dan Boyd says it will take 5--20 years if we start now--to reach adequate engineering control of hazardous noise. To assure the use of these devices by the workers and sailors requires supervisory enforcement. Ladies and Gentlemen--this is presently the single most significant hole in our attempt to prevent hearing loss.

Line Commanders, as a group, have not recognized nor accepted their responsibility in this. All the medical research the Navy can fund will be for naught if this hole isn't patched. Line Commanders must be held accountable for their responsibilities in this program.

We need education of our line commanders concerning the importance of this program--it should begin right here at the Naval Academy--if it isn't already included in the curriculum. There is a young LCDR XO of a nuclear submarine presently located in our region who doesn't like the philosophy of Occupational health in general and Hearing conservation

in particular. He disdains the use of hearing protection by members of his crew and has been known to order their removal. We also have a Shipyard Commander who refuses to in any way enforce or require 1st line supervisors to enforce the use of hearing protection in known noise hazardous areas. If we don't succeed in turning these types around now--we won't be any farther ahead in 5 years than we are now.

I believe we also need a new BUMED Instruction on Hearing Conservation with a concurrent OPNAV Instruction for implementation of noise abatement and program enforcement.

Our 3rd area of concern is the medical aspects of noise and hearing conservation. This raises several questions--some of which may be potentially R&D.

Are the noise criteria for shipboard spaces in new construction adequate--especially for 24 hours per day human habitation? This involves psychological, physiological and loss of hearing considerations. I believe CAPT Cantrell will discuss the non-auditory physiological effects of noise exposure tomorrow.

Can hazardous noise exposed shipboard trades really hear what they need to at their work while wearing hearing protection? For years we have argued with them but some still disagree.

We need better methods for assuring regular audiometry on shipboard personnel--I've reviewed health records on large groups of sailors and found that very few have received audiograms during shipboard duty and many have no audiograms in their record. I believe that mobile audiometric vans that could potentially come pier-side might help provide a solution.

We need to have an updated hearing conservation instruction with better guidelines for referral criteria and disposition of sailors and civil servants with hearing loss. We can expect this will be particularly pertinent once OSHA publishes the new noise standard. Joe Drozd has told us we can expect such an instruction.

Can we expect the further development of any criteria, such as the use of Temporary Threshold Shift, for the early detection of noise susceptible personnel? Along with my first question concerning shipboard noise is this one--Is the proposed OSHA criteria for hazardous impulse noise adequate for the effects of shipboard gunfire--or does it even apply?

These are a few of the questions that have been brought to my attention concerning the medical aspects of noise--perhaps many of the answers already exist.

The 4th problem area I just mention for completeness--that is Hearing Loss Compensation for Civil Service Employees.

Folks, this program has made a mockery of the original intent of medical compensation. The pay off is so lucrative that it makes any enforcement of a Hearing Conservation Program doubly difficult. Also, it is my studied opinion that a very sizeable percentage--perhaps as high as 50%--of the claims paid are based on either non-noise induced hearing loss or at least not due to exposure while employed by the Navy. The Navy needs to enjoin and join with other affected Federal Agencies in seeking legislative correction of this misguided social welfare program.

I appreciate your allowing me to vent my spleen on you, and I apologize to Bob Gales for not holding closer to the R&D theme of this conference.

Appendix E-1

MEDICAL PROBLEMS

Chairman: CAPT R. Cantrell, NRMDC, San Diego, Ca.

Co-Chairman: C. Williams, NAMRL, Pensacola, Fla.

Attendees:

J. Drozd, NMRDC, Bethesda, Md.
J. Ferguson, NMRDC, Bethesda, Md.
R. Goldenberg, NRMDC, Camp Lejeune, N.C.
R. Klumpp, NUC, San Diego, Ca.
T. Miller, NSMRL, Groton, Conn.
R. Nelson, NRMDC, Bremerton, Wash.
R. Robertson, NAMRL, Pensacola, Fla.
P. Smith, NSMRL, Groton, Conn.
E. Thomas, NSRDC, Annapolis, Md.
R. Townsend, NHRC, San Diego, Ca.
P. Tyler, NMRDC, Bethesda, Md.
J. Webster, NELC, San Diego, Ca.
D. Woodward, ONR, Arlington, Va.

Individuals whose participation would have been desirable, circumstances permitting: G. Lawton, BuMed Code 55; J. Shultz, BuMed Code 55A; T. Markham, OIC, NEHC, Cincinnati; P. Nelson, NMRDC Code 44; J. D. Harris, NSMRL, Groton; T. Miller and C. Fankhauser, NRMDC, Oakland; F. Stucker and J. Scanlon, NRMDC, Philadelphia; H. DeFries and E. Brown, NRMDC, Bethesda; P. Hartman and Palmer Neff, NRMDC, San Diego, J. Page, NAMI, Pensacola; and J. Masko, NAMRL, Pensacola. In addition, it would have been desirable to have had some fleet medical and line personnel in attendance.

R&D Problem Areas and Needs

1. Increased record keeping requirements relative to the Privacy Act and the use of human subjects in medical research.

a. Problem at Headquarters level in attempting to serve as buffer so laboratory personnel can do their work.

b. Need for NMRDC to know what laboratories are utilizing human subjects in medical research. (Unified records are required).

2. Need for research proposals to have solid documented data justifying the need for research on a particular problem.

3. Need to get research programs down to a dollar figure that people can buy.

4. Need to look at better and more comfortable hearing protective devices for specific noise environments.

5. Need to study longer than 8-hour noise exposures and their effects on man (auditory and non-auditory).

a. Is the proposed criteria of OSHA adequate for shipboard personnel or does it even apply?

b. Is the OSHA criteria adequate for gunfire noise and combinations of steady-state and impulse noise?

6. Need for a mechanism for identifying medical related problems and channeling them to the appropriate Navy laboratories for investigation.

7. Need to determine hearing level criteria for specific tasks in specific Navy environments.

8. Need to pull together and surface all good data on Navy noise environments and their effects on man. Much data exists but is hidden away and has not been utilized in the implementation of effective hearing conservation procedures.

9. Need to further study individual differences with respect to noise susceptibility (auditory and non-auditory). Secondary tasks should be utilized in studying the effects of noise in performance.

10. Need to determine the extent to which exposure to loud radio communications may be hazardous.

11. Need to study further the effects of noise in combination with other stressors (heat, vibration, etc.).

12. Need to determine whether personnel in specific noise environments can hear the signals they are required to hear in carrying out their duties. Can they also hear auditory warning signals?

Other than R&D Problem Areas and Needs

1. Need for a cooperative effort between Navy and other agencies to seek legislative directives with respect to hearing loss compensation claims: A mockery has been made of hearing loss compensation claims at naval shipyards. Many of the losses for which claims have been paid were not noise-induced and many were not incurred in the Navy.

2. Need for a standardized audiometric record form as related to hearing conservation.

3. Navy needs MSC billets for audiologists as per Army. Every regional ENT clinic should be required to have a qualified audiologist (M.A. or Ph.D.).

4. Need for application of known noise control techniques.
5. Need for enforcement of use of hearing protective devices in Hazardous Noise Environments. Supervised enforcement required; line supervisor's have not accepted role.
6. Need for better method for insuring good audiometric records.
 - a. Poor audiograms on ships; may be no audiograms at all in health record.
 - b. Consideration should be given to audiometric testing in port for shipboard personnel (van concept).
7. Need for better guidelines for referral and disposition criteria of individuals exhibiting hearing loss.
8. Need for updating of Navy's Hearing Conservation Instruction.
 - a. Consideration should be given to a concurrent OPNAV instruction for Command Emphasis.
 - b. Only a little progress has been made in implementing Navy Hearing Conservation.

Points Raised but not Discussed

1. Need for better communication among the various Navy laboratories and between Project Monitors and laboratory personnel.
2. Reduction of R&D personnel and funding.
3. Audiometric data base.
4. Need for differentiation between medical and non-medical research. Medical type research being done by non-medical laboratories.

Recommendations

The two major recommendations of the workshop were as follows:

1. To establish a small cross-sectional Navy-wide committee whose task would be to create a mechanism by which fleet problems can be identified for R&D efforts. Such a committee could meet in conjunction with a professional meeting. It was felt that the committee should be comprised of no more than 10-12 people (R&D people representing medical aspects, task performance, engineering control and community noise as well as fleet line personnel). An initial meeting would be held in conjunction with the Spring meeting of the Acoustical Society of America scheduled for Washington.
2. To re-emphasize the need for MSC billets for Navy audiologists.

General Comments

This Navy Environmental Noise Conference has been a good first step toward paving the way for a coordinated program of RDT&E and O&M efforts with respect to Navy Environmental Noise. It is felt that meetings similar in nature should be held in the future with line personnel in attendance. The greater portion of time should be devoted to individual workshops in the following areas: Medical Aspects, Task Performance, Engineering Control, and Community Noise.

APPENDIX E-2

AIRCRAFT NOISE PROBLEMS

Chairman: Carole S. Tanner, NARF, North Island, San Diego, CA 92135

Participants:

Bernard L. Poppert, NAVAIR 340E, AV 222-7443
R. H. Heitkotter, NAVAIR 330D, 22-22518/19
Dominic D. Croce, NAVAIRENGCEN Code 92623, AV 624-2706
James W. Greene, NAMI, Hearing Conservation Dept., 922-4457
Carl F. Abell, NATC SYEO, (301)863-4158
Douglas G. Robertson, PMTC 1131, AV 873-8871
Earl B. Massengill, NAVAIR (5311E), AV 222-7480/82/83
Meyer Lepor, Naval Undersea Center, AV 933-7916
W. C. Morhard, NAVAIR 01B, AV 22-27989
Carole S. Tanner, NAVAIREWORKFAC, AV 951-5032/6564
S. A. Elder, U.S. Naval Academy (301)267-3488

The workshop was called to order by Chairman, C. S. Tanner on November 20, 1975. Participants introduced themselves and briefly described their interests.

The workshop format was oriented towards a round table discussion of research needs and problem areas relating to aircraft noise both from an exterior and interior point of view.

The exterior problems included a discussion of the desirability of a ground runup correction factor be applied to L_{dn} noise contours. The response of the community to runup operations noise appears to be different than the response to other aircraft operations. The extent of community response will impact upon land-use plans and the budgeting for ground runup suppressor or hush-houses. To that extent it is extremely critical that no potential response mechanism be overlooked. A secondary concern was the need for an elaboration of the differences between the CNR and L_{dn} descriptors.

The interior problems related to the need for investigation of aircraft cockpit communications problems caused by the interior noise levels and the need for adequate hearing protection for test cell operators.

An illuminating discussion was held regarding the R&D funding rules. Basically, R&D funds are in six categories as shown in Table I. As pointed out 6.1 and 6.2 monies are used to obtain basic new knowledge. The remainder of the funding categories are related to applications. The funding concept is a hierarchy wherein productive

efforts move through the cycle from 6.1 to 6.6 but the percent turnover will vary with the state. A 25 percent turnover of work each year in the 6.2 area was suggested.

The need for R&D is driven by weapons requirements, and various long-range plans; these plans may take the form of advance system concept papers, technology forecasts, or technology coordination plans. As a result of the discussion it was suggested that a long-range plan was needed for aircraft noise. A hypothetical outline for such a plan is given in Table II.

It was suggested that future meetings of the Naval Environmental Noise Conference be structured around updating the plan. Additionally, it was suggested that operational personnel should be included so that field problems will receive attention. Likewise, it would appear that more of the money people should attend future meetings.

The assessment of R&D needs must be related by a priority system and an evaluation of the present state-of-the-art. A specific goal is to pinpoint those areas where only minimal improvements can be achieved using present state-of-the-art. These areas may require additional basic R&D or technological breakthroughs to achieve significant cost-effective gains.

The revision and updating of acoustics standards to align them with those more widely used would be of value. Specifically, a review of acoustics standards and their compliance with OSHA was suggested.

A portion of the discussion centered around administrative issues. It was pointed out that the R&D laboratories had to become more responsive to meeting schedules and to providing usable end products. Considerable discussion focused upon how to formulate work units. The work unit should be clearly relevant to an end product and fit into the technology forecast. It was clearly evident that many of the attendees to the workshop found the discussion on R&D very informative.

Discussions regarding the sharing of equipment or use of other in-house services was inconclusive. There are within the Navy some highly trained and well equipped groups specially suited to performing certain tasks in acoustics. Within the constraints of scheduling and manpower, everyone is encouraged to use existing service and equipment rather than expend funds on developing overlapping capabilities. It has been suggested that use of the Inter-Laboratory Facilities Committee and its publication be revitalized as a way of sharing equipment and facilities.

Based on the discussion during the workshop the following recommendations for further action were presented to the plenary session.

1. Technical problems requiring work include annoyance criteria for aircraft ground runups. Both community response and the need for corrections factors for applications to noise models should be investigated.

2. The Investigation of aircraft cockpit communication problems from an equipment quieting and speech intelligibility point of view is recommended.

3. Updating old standards and aligning present standards with new requirements such as OSHA is recommended.

4. Several recommendations relating to management problems were suggested. A workshop on the rules and regulations of obtaining funds was thought to be of practical value. The need for a long-range environmental noise plan was evident. The plan would be useful in locating technical areas where research is required where a specific work unit might be of use.

5. It was suggested that future meeting of the group should relate to consolidating the plan, and pinpointing technical problem areas. Further, the meeting should be scheduled to mesh with the budget cycle.

6. It was recommended that updating and distribution of the "Directory of Federal Contacts for Airborne Acoustics, NESO Report 20.2-001" be continued.

7. The above recommendations were presented to the plenary session with the added information that the focal point for aircraft noise problems is NAVAIR Code 01B.

TABLE I--R&D FUND DESIGNATIONS

<u>TYPE OF MONIES</u>	<u>PURPOSE</u>	<u>MANAGER</u>	
6.1	Research	ONR 03	
6.2	Exploratory Development (C&M)	NAIR 03	↑ Basic Knowledge

6.3	Advanced Development (OPNAV)	NAIR 03	↓ Applications
6.4	Engineering Development	NAIR 05	
6.5	Laboratory Management		
6.6	Operational System	NAIR 05	

TABLE II

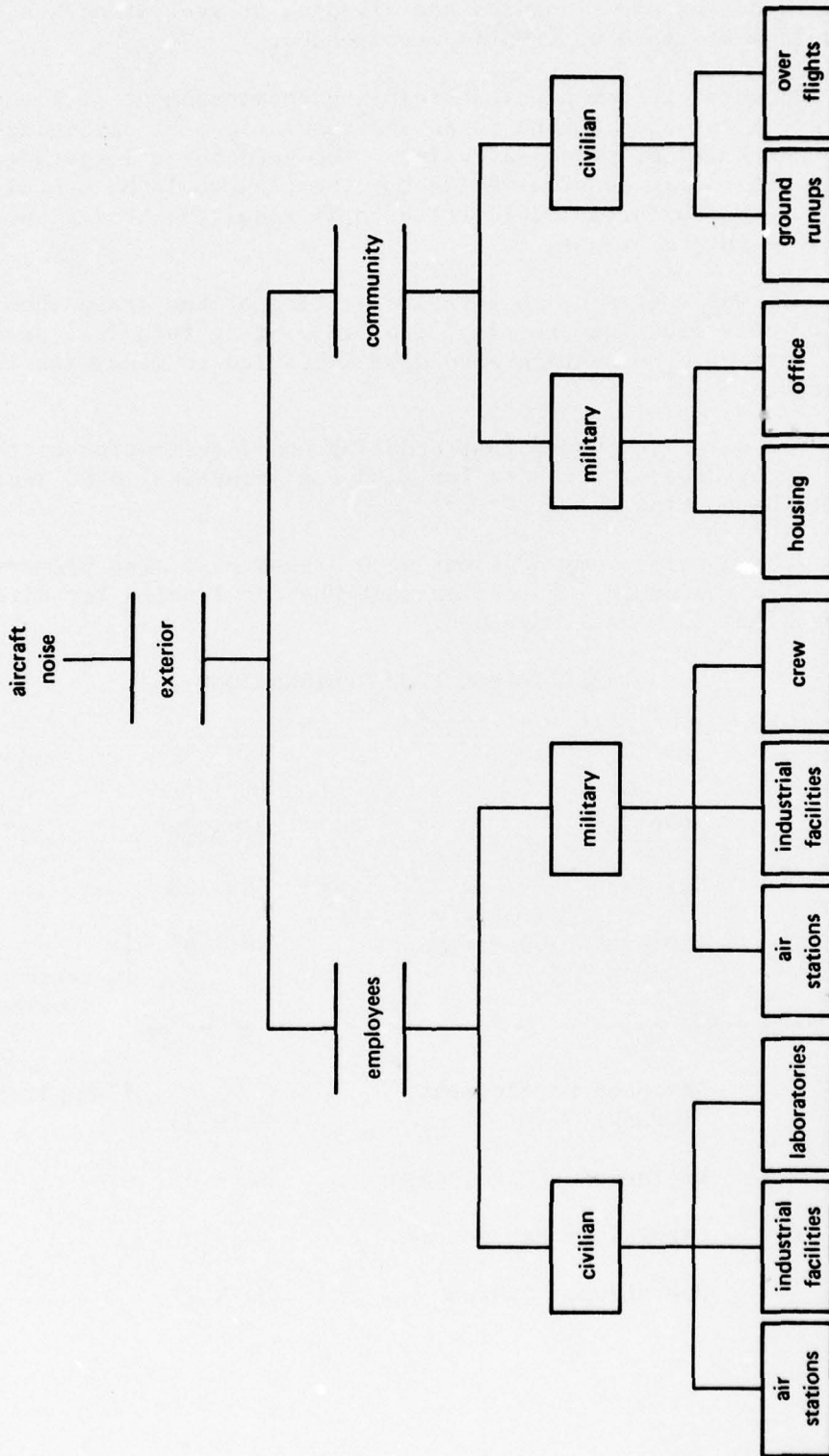
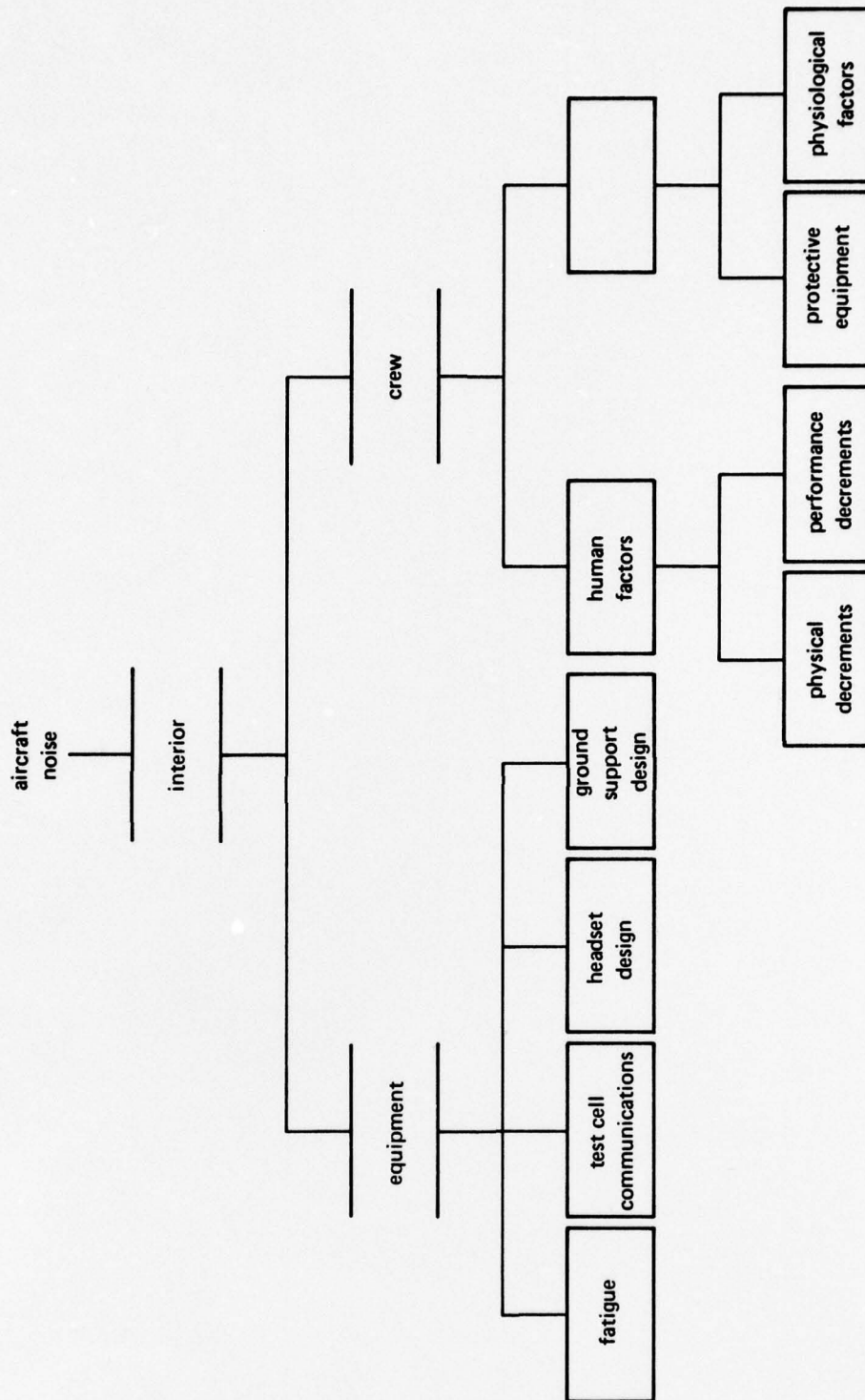


TABLE II, continued



Appendix E-3

SHORE AND COMMUNITY NOISE

Chairman: David Owen, Navy Environmental Support Office, Code 2522

Attendees:

Peter Buynak, Naval Facilities Engineering Command, Code 0461E
David Copp, Naval Facilities Engineering Command, Code 202AA
Ray Glass, Aircraft Environmental Support Office, Code 661
James Greenwald, Chief of Naval Operations, Code 04E
Steve Hurley, Naval Facilities Engineering Command, Code 032B
David Kurtz, Naval Facilities Engineering Command, Code 2013
Robert Young, Naval Undersea Center, Code 401

Discussion Area No. 1

Problem: In the building design process, current construction materials have ratings of sound transmission class (STC). The need exists to relate STC-rated materials to the sound level reduction requirements of a complete building system.

Suggestion: Approach the Environmental Protection Agency or the National Bureau of Standards through the Building Research Advisory Board to investigate analytical and procedural methods to design and verify structural noise attenuation. BRAB is sponsored by the National Academy of Sciences and has representatives from various Federal construction agencies.

Discussion Area No. 2

Problem: The need exists to develop the means to reduce the noise impact from pretake-off ground run-ups in a cost-effective manner.

Suggestion: Evaluate with full- or scale-model barriers to test flow diversion effectiveness.

Comment from the Chairman: The Office of Research and Development of the Environmental Protection Agency supported an Interagency Noise Research Coordination Council consisting of four panels, one of which was the Aircraft Noise Research Panel. Since ground run-up noise is a universal problem, this group might be resurrected (with a Navy representative, this time) to recommend funding sources and coordinate research efforts.

Discussion Area No. 3

Problem: The need exists to develop a consistent methodology to portray realistic operational levels at an air installation.

Suggestion: Evaluate Navy Operation level figures and trends in order to develop a statistical base supporting operational parameters and noise contour areas for typical types of activities.

Discussion Area No. 4

Problem: The need exists to recognize noise as a pollutant.

Suggestion: Prepare an analysis of Navy funding programs and budgeting systems and their applicability to noise support. Make recommendations for Office of Management and Budget Circular A-106 revisions. Also develop a presentation which displays the severity of the noise problems, risks, and consequences of "no action" vice alternative levels of program support. Develop relationship by cost/benefit analysis to validate the action selected.

Discussion Area No. 5

Problem: The need exists to provide a credible relationship between monitored noise levels and modeled noise contours.

Suggestion: Demonstrate the correlation of long-term noise monitoring for a demonstration air installation and occasional mathematically-derived contours.

Discussion Area No. 6

Problem: The need exists to present problems in terms of human performance such as task degradation, morbidity, lost man-years, etc, to justify funding requests.

Suggestion: Identify physiological/psychological impacts of noisy environments. Task DNL's Support Technology Division (MAT-0344) to include this concern within the human factors aegis.

Discussion Area No. 7

Problem: The need exists for a formal administrative approach to identifying, processing, and abating noise problems.

Suggestion: Encourage CNM/BUMED to recommend that DNL create an Advanced Technical Objective Working Group (ATOWG) to identify and coordinate noise research. The purpose would be to provide the means and formal recognition for R&D program support of unsatisfied operational needs for noise suppression/control.

Comment from the Chairman: As currently defined, an ATOWG is not an appropriate vehicle for accomplishing the coordination desired.

Following a 7 June 1966 meeting of commanding officers and technical directors of certain laboratories, the Director of Navy Laboratories, by letter, created eight warfare mission areas requiring continuing committee effort.

In order that all committees operate similarly, the problem for solution is defined as "To make critical technical assessment of the designated warfare areas in the light of enemy threats within scope of Navy Laboratories for the 1970 decade. An examination of vulnerability of current systems in these warfare mission areas after careful study of possible threats is appropriate. The evaluations will be expected to provide guidelines for future research development and test needs, and also to define new systems requirements."

ATOWGs are established and disestablished by DNL, who also issues charters for each group. Charters are active for:

- Amphibious warfare
- Electronic warfare
- Fire research
- Intelligence collection and exploitation
- Naval warfare
- Sea-based deterrence
- Undersea technology

Operating funds are provided to the committee chairman by the Director of Laboratory Programs (MAT-035/03L). As a general rule ATOWG funds should be expended in-house. Contract expenditures of twenty percent or more of the annual funding allocation for any one ATOWG must have prior approval of DNL.

Committee chairmen are selected by DNL from employees of Navy laboratories. Members are selected by the chairman, who invites nominees from a functional cross-section of expertise and disciplines as appropriate to support the ATOWG mission. The time, place and frequency of meetings are determined by the chairman. Because of limited funds available, chairmen are encouraged to limit general meetings to not more than two per year.

Discussion Area No. 8

Problem: The need exists to standardize the air operations information collection, storage, and retrieval systems.

Suggestion: Fund a study (possibly by NAVAIR) to evaluate a Navy-wide system response requirement and identify satisfactory alternatives, possibly a mechanized control tower tabulator.

Discussion Area No. 9

Problem: The need exists to relate man's reaction to long-term steady-state noise environments at crew and maintenance stations.

Suggestion: Continue to investigate acoustic/psychoacoustic situations while at the same time coordinating with other investigators, such as the Aeromedical Research Laboratory, to maximize DOD's return-on-investment.

Discussion Area No. 10

Problem: The need exists to evaluate noise impacts from helicopter operations, i.e. bladeslap, variable durations, etc.

Suggestion: As part of a Tri-Service effort, the Construction Engineering Research Laboratory at Champaign assisted the Navy in the collection of helicopter data at MCALF Pendleton. The data will be formatted appropriately for the Air Force-developed Noise Exposure Forecast computer program. Because this model was created with fixed wing operation parameters, no justification has been developed to support these parameters for helicopters. It is suggested that the available data base held by CERL be analyzed and provide the basis for psycho-acoustic and community reaction tests to verify existing needed descriptors.

Discussion Area No. 11

Problem: The need exists to identify and analyze existing building noise problems--external and internal--and provide solutions.

Suggestion: Have the Joint Services "Noise Planning Manual" include guidance on survey techniques for and rehabilitation of existing facilities. Have NAVFAC (possibly through a design manual change) provide guidance on priority determination and cost/benefit determination when contemplating the renovation of older structures to new noise (and energy) conservation standards.

Discussion Area No. 12

Problem: The need exists to determine the Office of Naval Research's interest in expanding the Navy's scientific knowledge in airborne noise.

Suggestion: Recommend that the Chief of Naval Development make noise research suggestions for ONR responsibility.

Discussion Area No. 13

Problem: The need exists to develop the integration of all noise sources in the evaluation of an activity's noise environment.

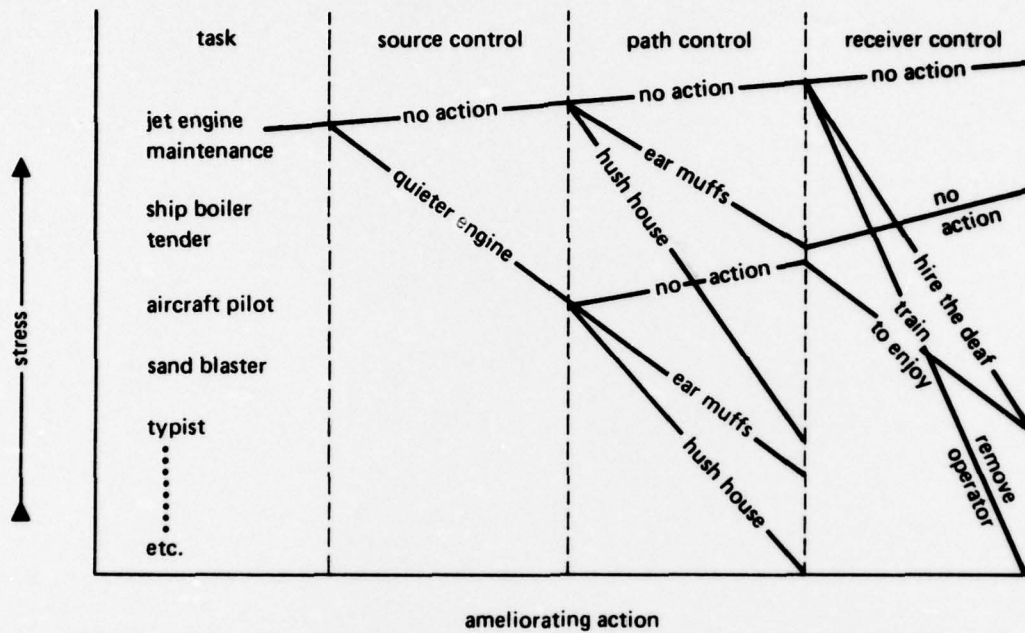
Suggestion: Develop noise level versus slant range for fixed and mobile sources. Modify existing mathematical models for more general application to include as the activity's environment all forms of noise.

Comment from the Chairman: By memo on 15 Oct 75, OASD (I&L), subj: Air Installations Compatible Use Zones Noise Descriptors, DOD standardized the use of the L_{dn}/L_{eq} methodologies for air installation noise measurements performed by the three services. By inference, the use of L_{dn}/L_{eq} for other sources seems appropriate.

Discussion Area No. 14

Problem: The need exists to display the noise problems graphically for the purpose of promoting appreciation and correct understanding of the health effects and risks.

Suggestion: Develop a stress (ordinate) to ameliorating action (abscissa) pictorial diagram with the impact of various measures on the stress. For example:



Appendix E-4

SHIPBOARD NOISE

Chairman: Donald Maxwell, NSRDC, Annapolis

Attendees:

William H. Barnes, III, Code 1927 DTNSRDC, Annapolis, MD
W. J. Brownlow, CDR MC USN OIC NEPMU-2, Norfolk, VA 23511 (AV 690-7671)
Adam Gafos, DTNSRDC, Annapolis, MD (AV 267-2669)
R. S. Gales, NUC Code 401, (AV 933-7255)
J. Goodman, DTNSRDC, Carderock
L. Herstein, NAVSEA 037
M. Hura, NAVMAT 0341
Martin S. Leff, NUSC/NL Code EA312
L. M. Libber, ONR, Code 411, Arlington, VA OX2-4053
Ray Misialek, NAVSECPHILADIV Code 6762
Thomas D. Morganeli, DTNSRDC, Annapolis, MD
R. Newman, NPRDC, San Diego, CA
Virgil Pence, DTNSRDC, Annapolis, MD (AV 267-2562)
Robert Perkins, DTNSRDC, Bethesda, MD Code 1966
H. W. Schab, DTNSRDC, Annapolis, MD
Bernard Shapiro, NAVSECPHILADIV Code 6760
E. M. Stanley, DTNSRDC, Annapolis, MD
Donald Thomson, DTNSRDC, Annapolis, MD (AV 267-2668)

Recommendations from Shipboard Noise Workshop

The Occupational Safety and Health Act is now a reality and in the near future an OSHA office will probably be established in an OPNAV Code. The Navy must begin now to resolve noise problems related to personnel safety, health, and performance before being forced to do so by public pressure and/or law suits. The solution of shipboard noise problems will be of great and direct benefit to the men manning fleet units.

A central office located at the OPNAV or NAVMAT level must be established to act as a clearing house and coordinator for environmental (including shipboard) noise problems reported by all Navy sources. That office should have the responsibility for directing the total Navy environmental, shipboard, and aircraft noise reduction effort. The office should:

(a) Evaluate the nature of a reported noise problem and determine which Naval facility has the expertise necessary to implement corrections (the SYSCOMS).

(b) Collect data on the overall Navy environmental (airborne) noise problem.

(c) Have sufficient funding authority to initiate the work required to solve noise problems.

(d) Be responsible for educating ship designers, ship personnel (especially commanding officers and engineering officers) and manufacturers of shipboard equipment on the effects of environmental airborne noise on the health, safety and operational effectiveness of personnel.

(e) The office must be backed by a SECNAV or OPNAV instruction.

Funds should be available to provide for the application of known solutions to shipboard noise problems; to provide for engineering development of existing technology; and to provide for R&D to eliminate the noise problems at the source. Needed developments include quiet, light-weight machinery, new sound isolation technology and materials and light, comfortable, ear protection devices with built-in communication capability as well as other equipment. These efforts will give a return on investment by:

(a) Reducing future hearing damage claims.

(b) Reducing personnel and training costs by improving retention rates.

(c) Improving performance of ship personnel.

The Navy has a unique environment aboard ship and therefore should not adopt without question industrial standards and criteria on acceptable noise exposure levels. The Navy should undertake the research and development necessary to establish the noise levels allowable for continuous extended noise exposure periods unique to Navy operations.

Environmental airborne noise control considerations must be included in ship design at the concept formulation stage. Noise control booklets should be developed and noise reviews held through all phases of design and construction to insure that recommended noise control measures are implemented. The inclusion of quiet designs is the most efficient and cost-effective means of attaining solutions to the shipboard environmental noise problems.

Navy advanced ship concepts presently in the RDT&E phases of development have not placed much emphasis on the environmental noise problem associated with these high performance craft. As these ships reach operational status, the noise problems will become extremely important to mission effectiveness. Funding must be provided immediately to develop the quiet design technology necessary to solve the problems unique to these craft.

Efforts should be undertaken to remove ship personnel from the

sound isolated control rooms complete with automated controls where needed, remote indicators, and remote audio output for the operating personnel to safely listen for cues which are indicative of machinery performance.

Appendix F
INTERAGENCY AGREEMENT
ENVIRONMENTAL PROTECTION AGENCY
AND
NAVAL SURFACE WEAPONS CENTER

PURPOSE

The Office of Noise Abatement and Control of the Environmental Protection Agency (EPA) wishes to enter into an agreement with the Naval Surface Weapons Center (NSWC) of the Department of Defense (DOD) for work to be accomplished by NSWC which would inventory the technology and expertise available within DOD and other agency laboratories in the area of noise abatement and control.

SERVICE TO BE PROVIDED:

The NSWC will provide necessary services under this agreement to accomplish the tasks contained in the scope of work below.

The Director, Office of Noise Abatement and Control (ONAC), Environmental Protection Agency, will be responsible for all EPA administrative functions associated with this NSWC support. These services are to be accomplished in-house by the U.S. Navy. None of the funds provided under this agreement are to be used in support of third party contracts.

SCOPE OF WORK:

1. Identify technology and resources available in noise control.
 - a. Describe current and recently completed Federal research in such areas as:
 - (1) Noise Effects
 - (a) Individual Response
 - (b) Collective Community Response
 - (2) Personal Dosimetry
 - (3) Hearing Protective Devices
 - (4) Building Code Research
 - (a) Human Response Criteria for Interior Noise
 - (b) Acoustic Performance Standards and Building Techniques

- (5) Community Survey Design Methodology
- (6) Community Noise Monitoring and Assessment Techniques
- (7) Statistical Sampling of Environmental Noise
- (8) Construction Site Noise
- (9) Surface Transportation Noise
- (10) General Product Noise

b. Determine research capabilities including areas of expertise, equipment, and facility capabilities.

c. Determine testing capabilities including equipment and services available.

d. Determine potential for technical assistance including equipment available for loan.

2. Outline workable administrative procedures for utilization of identified technology and capabilities by EPA, other Federal agencies, and State and local governments.

STATEMENT OF WORK:

The scope of work will be undertaken by NSWC in a step-by-step manner with EPA/ONAC approval required after the completion of each step.

Step 1--NSWC will first submit a program plan for approval of the required scope of work based on discussions with EPA/ONAC staff, (by definition, EPA/ONAC staff includes representatives from Aviation Noise Control Requirements Study, Standards and Regulations, and Technical Assistance and Operations Division) and will report on information already available and accessible without laboratory visitations.

Step 2--Final scope of work will be determined on the basis of further consultation with the EPA/ONAC staff. Consideration will be given to information gathering already underway for regulatory activity.

Step 3--Upon approval of the Program Plan, the information contained therein will be used to structure a search of DOD and other government laboratories. The investigation will concentrate on current or recently completed research and on information not available from the Defense Documentation Center and other readily available sources. An initial phone survey of laboratories will be utilized to determine those laboratories having information and resources requiring personal visits and follow-up inquiries.

Step 4--Based on the information obtained, a recommended selection of laboratories to be visited will be submitted to the project officer for approval in consultation with the ONAC staff. It is estimated that a total of approximately 50 laboratories will be initially contacted by phone and that no more than 20 laboratories will be visited.

Step 5--Provide a draft and final report on the above information. Technical progress reports (3 copies) will be submitted by NSWC to EPA on a monthly basis.

These tasks may be accomplished in conjunction with similar tasks for other government agencies in order to optimize the results and provide a more cost-effective investigation of noise control.

TIME PERIOD OF AGREEMENT:

This agreement becomes effective on date of signature by authorized representatives of EPA and the Department of the Navy and continues for a period of twelve (12) months. This agreement may be terminated by either party after thirty (30) days notice to either party of the intent to terminate and reason therefor.

PROJECT OFFICER:

The project officer for EPA is David H. Mudarri, telephone (703)557-7760. The principal investigator for the U.S. Navy is Mr. Carl M. Franz, Code WE-13, telephone (202)394-2575.

FINANCIAL PROVISIONS:

(a) Agency with which agreement is being consummated--Department of the Navy, Naval Surface Weapons Center, White Oak, Silver Spring, Maryland 20910 (Attn: Mr. Robert F. Mead, Code WE-11).

(b) Billing Instructions - Request will cite the number of the agreement, together with the following accounting information:

Appropriation Number:	68X0108
Common Account Number:	637921ALBO
Object Classification Number:	25.70
Document Control Number:	A00648

(c) Billing Method - EPA will reimburse the U.S. Navy for actual costs incurred for the performance of the work described in paragraph 3 above in amount not to exceed \$20,000. The U.S. Navy will request reimbursement by itemized SF 1081, submitted quarterly to the EPA Division of Financial Management, 401 M Street, S.W., Washington, D.C. 20460.

AUTHORITY:

Authority for this action may be found in (1) Economy Act of 1932,

as amended (31USC686); (2) the National Environmental Policy Act of 1969;
and (3) Section 402(c), Title IV of PL 91-604.

Approved for EPA:

/s/ Charles L. Elkins
CHARLES L. ELKINS
Deputy Assistant Administrator
for Noise Control Programs

Approved for the
Department of the Navy:

/s/ J. S. Di Rende
J. S. DI RENDE
Head, Engineering Department
Naval Surface weapons Center
White Oak Laboratory
Silver Spring, Maryland 20910

Appendix G

(DRAFT) CHARTER NAVY AD-HOC WORKING GROUP FOR AIRBORNE NOISE

The mission of the Navy Ad-Hoc Working Group for Airborne Noise is to make a critical assessment of the extent to which noise generated during the conduct of Naval operations is or may in the near future represent a hindrance to the successful accomplishment of Navy objectives or a health hazard to its personnel, to investigate infrastructural/institutional impediments to the Navy hearing conservation program and provide recommendations for amelioration, to examine the amenability/vulnerability of current systems/operations to reduction in allowable noise generated, to provide guidelines for future RDT&E needs in the noise abatement area, and to assist in defining new system/ operations requirements in noise generation terms. Specifically, the Group will:

- a. Establish and promote a result-oriented dialogue on airborne noise problems and viable solutions between the Navy R&D community and the operating forces of the Navy and Marine Corps.
- b. Identify specific areas where current and near-future technology can provide improvements in noise levels or enforcement activities and recommend appropriate actions.
- c. Identify critical problems that should be addressed by research and development programs and prioritize them in a cost/benefit fashion.
- d. Review existing and proposed RDT&E programs, identify and evaluate gaps or weaknesses, and recommend guidelines and programs to insure the attainment of technological objectives necessary for meeting noise abatement requirements.
- e. Make recommendations involving the application of expertise available in the Naval laboratories to most efficiently provide solutions and meet objectives in the noise abatement area.
- f. Make recommendations involving the assignment of responsibilities and application of resources among the various Navy Commands with the aim of assuring cohesiveness of effort, focusing authorities/accountabilities, minimizing duplication of effort, and maximizing return on investment in solving airborne noise problems.
- g. Submit a report summarizing its findings and recommendations within six months of its establishment.