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(NASA-TM-X-74042) PUBLICATIONS IN ACOUSTICS  
AND NOISE CONTROL FROM THE NASA LANGLEY  
RESEARCH CENTER DURING 1940-1976 (NASA)  
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PUBLICATIONS IN ACOUSTICS AND NOISE CONTROL  
FROM THE NASA LANGLEY RESEARCH CENTER  
DURING 1940-1976

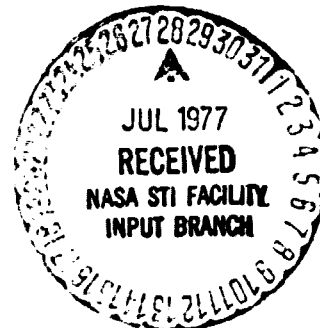
Compiled by B. A. Fryer  
and

The Staff of the Acoustics and  
Noise Reduction Division

July 1977

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**NASA**  
National Aeronautics and  
Space Administration  
**Langley Research Center**  
Hampton, Virginia 23665



## Forward

This document contains reference lists of published Langley Research Center papers in various areas of acoustics and noise control for the period 1940-1976. The research work was performed either in-house by the Center staff or by other personnel supported entirely or in part by grants or contracts. The references are listed chronologically and are grouped under the following general headings:

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Included are the generally available NACA and NASA Technical Reports (R-1), NACA and NASA Technical Notes (TN- and TN D-), NACA Research Memorandum (RM-), Contractor Reports (CR-), and Journal Articles, copies of which can be obtained from the NASA Scientific and Technical Information Facility (STIF), P. O. Box 8757, Baltimore/Washington International Airport, Maryland 21240, for a nominal charge. Other publications such as NACA Technical Memorandums (TM-), NASA Memorandums and Technical Memorandums (TM- and TM X-), are produced in limited supply but reproduction copies will in most cases also be available from STIF.

Langley Working Papers (LWP-), Masters and Doctoral Theses, and company reports are generally not available from STIF. In nearly all cases the supply is limited and copies have to be requested directly from the authors.

## **I. DUCT ACOUSTICS**

**Some of the topics covered in this section are as follows:**

**Reciprocating Engine Mufflers**

**Jet Engine Inlet and Discharge Duct Acoustic Liners**

**Propagation in Flowing Ducts**

**Liner Configurations and Materials**

**Helmholtz Resonators**

**Acoustic Impedance and Flow Resistance**

**Measurements and Analyses**

**Facilities and Test Equipment**

## i. DUCT ACOUSTICS

- Czarnecki, K. R.; and Davis, Don D., Jr.: Dynamometer-Stand Investigation of the Muffler Used in the Demonstration of Light-Airplane Noise Reduction. NACA TN 1688, October 1948.
- Davis, Don D., Jr.; and Czarnecki, K. R.: Dynamometer-Stand Investigation of a Group of Mufflers. NACA TN 1838, March 1949.
- Davis, Don D., Jr.; Stokes, George M.; Moore, Dewey; and Stevens, George L., Jr.: Theoretical and Experimental Investigation of Mufflers with Comments on Engine-Exhaust Muffler Design. NACA Report 1192, 1954.
- Stokes, George M.; and Davis, Don D., Jr.: Exhaust Mufflers as Applied to the Helicopter. Proceedings of NASA Conference on Helicopters, Langley Field, Virginia, May 12 and 13, 1954.
- Davis, Don D., Jr.: Chapter 21, Handbook of Noise Control. Acoustical Filters and Mufflers, December 1955.
- Fricke, W.; Bissell, J. R.; Bamberg, W. T.; and Martina, C. K.: Analytical and Experimental Studies of Sound Pressures on Ducted Propellers. NASA CR-66270, December 1966.
- Cawthorn, Jimmy M.; Morris, Garland J.; and Hayes, Clyde: Measurement of Performance, Inlet Flow Characteristics, and Radiated Noise for a Turbojet Engine Having Choked Inlet Flow. NASA TN D-3929, May 1967.
- Marsh, A. H.: Study of Acoustical Treatments for Jet-Engine Nacelles. Jour. Acous. Soc. of Amer., vol. 43, no. 5, May 1968.
- Marsh, A. H.; Elias, I.; Hoene, J. C.; and Frasca, R. L.: A Study of Turbofan Engine Compressor Noise Suppression Techniques. NASA CR-1056, June 1968.
- Chestnutt, David: Noise Reduction by Means of Inlet-Guide-Vane Choking in an Axial-Flow Compressor. NASA TN D-4682, July 1968.
- Cimerol, J. J.; Erickson, A. R.; and Fisher, J. I.: Investigation of the Properties of Fiber Metal Acoustical Materials. NASA CR-66643, September 1968.
- Watson, H. A., Jr.; Thompson, J. D.; and Rucker, Carl E.: Structural and Environmental Studies of Acoustical Duct-Lining Materials. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Zorumski, William E.; and Parrott, Tony L.: Nonlinear Acoustic Theory for Thin Porous Sheets. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.

- Chestnutt, David; and Crigler, John L.: Potential of Inlet-Guide-Vane Configuration for Inlet Noise Reduction. Conference on Noise Alleviation of Large Subsonic Jet Aircraft, Langley Research Center, October 8-10, 1968. NASA SP-189.
- Chestnutt, David: Jet Engine Inlet Noise Control. Sound and Vibration, vol. 2, no. 12, December 1968, pp. 10-14.
- Arnold, Lee; and Slutsky, Simon: Attenuation of Plane Waves of Sound by Suspension of Resonating Particles. Presented at Basic Aerodynamic Noise Research Conference, NASA Headquarters, Washington, D.C., July 14 and 15, 1969. NASA SP-207.
- Plumlee, Harry E.: Effect of Duct Heating on Jet and Fan Noise. Presented at Basic Aerodynamic Noise Research Conference, NASA Headquarters, Washington, D.C., July 14 and 15, 1969. NASA SP-207.
- Lansing, Donald L.: The Exact Solution for the Radiation of Sound from a Semi-Infinite Circular Duct with an Application to Fan and Compressor Noise. Presented at NASA Symposium on Analytical Methods in Aircraft Aerodynamics, Ames Research Center, October 28-30, 1969. NASA SP-228.
- Chestnutt, David; and Clark, Lorenzo R.: Effects of Inlet-Guide-Vane Configuration and Relative Blade Velocity on Noise from Axial-Flow Compressors. NASA TN D-5507, February 1970.
- Zorumski, William E.: Acoustic Scattering by a Porous Elliptic Cylinder with Nonlinear Resistance. Ph.D. Thesis, Virginia Polytechnic Institute, March 1970.
- Marino, Peter A., Jr.: Sound Absorption in Acoustically Treated Ducts in the Presence of Oblique Waves. NASA CR-66968, June 1970.
- Brown, David: Investigation of the Influence of Duct-Mounted Helmholtz Resonators on the Sound Field of a Model Ducted Propeller. NASA CR-1653, September 1970.
- Pendley, Robert E.; and Marsh, Alan H.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part I - Summary of Program Results. NASA CR-1705, December 1970.
- Marsh, Alan H.; Frasca, R. L.; Gordon, D. K.; Henry, C. A.; Laurie, G. L.; and Kamei, L. T.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part II - Design Studies and Duct-Lining Investigations. NASA CR-1706, December 1970.
- Manhart, J. Kenneth; Campbell, D. A.; Henry, C. A.; and Lowder, E. M.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part III - Static Tests of Noise Suppressor Configurations. NASA CR-1707, December 1970.
- Zwieback, E. L.; Lowder, E. M.; Ilkcagla, E. A.; Andresen, H.; Henry, C. A.; Marsh, Alan H.; Gordon, D. K.; Cleveland, N. L.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part IV - Flight Acoustical and Performance Evaluations. NASA CR-1708, December 1970.

- Wahlton, H. D.; Gabbay, Ellis J.; Ferry, G. B., Jr.; and Cleveland, N. L.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part V - Economic Implications of Retrofit. NASA CR-1709, December 1970.
- Langdon, Lawrence E.; Gabriel, Richard F.; and Marsh, Alan H.: Investigation of DC-8 Nacelle Modifications to Reduce Fan-Compressor Noise in Airport Communities. Part VI - Psychoacoustic Evaluation. NASA CR-1710, December 1970.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. II - Acoustic Lining Development. NASA CR-1712, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. III - Concept Studies and Ground Tests. NASA CR-1713, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. IV - Flightworthy Nacelle Development. NASA CR-1714, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. V - Sonic Inlet Development. NASA CR-1715, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. VI - Economic Studies. NASA CR-1716, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. VII - Subjective Evaluation Tests. NASA CR-1717, 1971.
- Anon.: Study and Development of Turbofan Nacelle Modifications to Minimize Fan-Compressor Noise Radiation. Vol. I - Program Summary. NASA CR-1711, 1971.
- Chestnutt, David; Hubbard, Harvey H.; and Feiler, Charles E.: Trends in Noise Control for Aircraft Gas Turbine Power Plants. Conference on Aircraft Safety and Operating Problems, Langley Research Center, NASA SP-270, May 1971.
- Zorumski, William E.; and Parrott, Tony L.: Nonlinear Acoustic Theory for Rigid Porous Materials. NASA TN D-6196, June 1971.
- Hayden, R. E.: Noise Generation by Duct Elements in Low Speed Air Flows. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- McDaniel, O. H.: Performance of Absorptive Duct Liners in the Presence of Spinning Modes. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.

- Oslac, M. J.: The Use of the Spinning Mode Synthesizer for Studying Complex Modes in Ducts of Varying Cross Sections. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Zorumski, William E.: Acoustic Scattering and Absorption by a Rigid Porous Elliptic Cylindrical Shell. NASA TN D-6340, August 1971.
- Hilton, David A.; Pegg, Robert J.; Parrott, Tony L.; and Alfredson, Robin J.: Evaluation of the Noise Reduction of Two Exhaust Muffler Configurations for the H-13 Helicopter. LWP No. 984, August 1971.
- Drischler, Joseph A.: Analytic Studies of Sound Pressures Inside the Duct of Ducted Propellers. NASA TN D-6345, September 1971.
- Chestnutt, David; and Clark, Lorenzo R.: Noise Reduction by Means of Variable Geometry Inlet Guide Vanes in a Cascade Apparatus. NASA TM X-2392, October 1971.
- Budoff, Marvin; and Zorumski, W. E.: Flow Resistance of Perforated Plates in Tangential Flow. NASA TM X-2361, October 1971.
- Barna, P.S.: Measurements of Flow Resistance of Various Resonator Orifice Configurations (Phase I). NASA CR (Contract NAS1-9434), 1972.
- Heller, Hanno H.; and Widnall, Sheila E.: The Role of Fluctuating Forces in the Generation of Compressor Noise. NASA CR-2021, 1972.
- Soffel, Arthur R.; and Morrow, Paul F.: Investigation of the Tone-Burst Tube for Duct Lining Attenuation Measurement. NASA CR-112031, 1972.
- Holm, Raymond G.; and Zorumski, William E.: Acoustics Radiation Patterns for a Source in a Hard-Walled Unflanged Circular Duct. NASA TN D-7360, 1973.
- Zorumski, William E.: Acoustic Impedance of Curved Multilayered Duct Liners. NASA TN D-7277, 1973.
- Harrington, Walter W.: Design and Development of an Automatic Control System for the In-Duct Cancellation of Spinning Modes of Sound. NASA CR-132317, 1973.
- Lowson, M. V.; and Baskaran, S.: Propagation of Sound in Elliptic Ducts. NASA CR-132307, 1973.



- Plumlee, H. E.; Dean, P. D.; Wynne, G. A.; and Burrin R. H.: Sound Propagation in and Radiation From Acoustically Lined Flow Ducts: A Comparison of Experiment and Theory. NASA CR-2305, 1973.
- Seiner, John; and Reethof, Gerhard: Design and Development of the Spinning Mode Synthesizer. NASA CR-2260, 1973.
- Lansing, Donald L.; and Zorumski, William E.: Effects of Wall Admittance Changes on Duct Transmission and Radiation of Sound. Journal of Sound and Vibration, vol. 27, no. 1, March 1973.
- Nayfeh, A. H.; and Zorumski, W. E.: The Acoustics of Aircraft Engine-Duct Systems. Proceedings of the CASI/AIAA Aeronautical Meeting, October 1973.
- Parrott, Tony L.: An Improved Method for Design of Expansion-Chamber Mufflers with Application to an Operational Helicopter. NASA TN D-7309, October 1973.
- Parrott, Tony L.: Propagation of Sound Through Thermal Gradients Along the Axis of a Quartz Tube. MS Thesis, GWU, Washington, DC, 1973.
- Zorumski, William E.: Generalized Radiation Impedance and Termination Reflection Coefficients of Circular and Annular Ducts. Journal of Acoustical Society of America, vol. 54, no. 6, 1973, pp. 1433-1844.
- Nayfeh, A. H. and Telionis, D. P.: Acoustic Propagation in Ducts with Varying Cross Sections. Journal of Acoustical Society of America, vol. 54, 1973, pp. 1654-1660.
- Nayfeh, A. H.: Effect of the Acoustic Boundary Layer on the Wave Propagation in Ducts. Journal of Acoustical Society of America, vol. 54, 1973, pp. 1737-1742.
- Nayfeh, A. H.; Telionis, D. P.; Lekoudis, S. H.: Acoustic Propagation in Ducts with Varying Cross Sections and Sheared Mean Flow. AIAA Paper No. 73-1008, 1973.
- Nayfeh, A. H.; and Telionis, D. P.: Algebraically Growing Waves in Ducts with Sheared Mean Flow. Journal of Acoustical Society of America, vol. 55, 1974, pp. 16-18.
- Nayfeh, A. H.: Sound Waves in Two-Dimensional Ducts with Sinusoidal Walls. Journal of Acoustical Society of America, vol. 55, 1974, pp. 768-770.
- Nayfeh, A. H.; and Tsai, M. S.: Nonlinear Acoustic Propagation in Two-Dimensional Ducts. Journal of Acoustical Society of America, vol. 55, 1974, pp. 1166-1172.
- Nayfeh, A. H.; Kaiser, J. E.; and Shaker, B. S.: Effect of Mean-Velocity Profile Shapes on Sound Transmission through Two-Dimensional Ducts. Journal of Sound and Vibration, vol. 34, 1974, pp. 413-423.
- Zorumski, William E.; and Mason, Jean P.: Multiple Eigenvalues of Sound-Absorbing Circular and Angular Ducts. Journal of the Acoustical Society of America. June 1974.

- Nayfeh, A. H.; and Sun, J.: Effect of Transverse Velocity and Temperature Gradients on Sound Attenuation in Two-Dimensional Ducts. *Journal of Sound and Vibration*, vol. 34, 1974, pp. 505-517.
- Nayfeh, A. H.; Sun, J.; and Telionis, D. P.: Effect of Bulk-Reacting Liners on Wave Propagation in Ducts. *AIAA Journal*, vol. 12, 1974, pp. 838-843.
- Clark, T. L.; Ganz, U. W.; Graf, G. A.; and Westall, J. S.: Analytic Models of Ducted Turbomachinery Tone Noise Sources - Vol. I: Analysis. NASA CR-132443, 1974.
- Clark, T. L.; Ganz, U. W.; Graf, G. A.; and Westall, J. S.: Analytic Models of Ducted Turbomachinery Tone Noise Sources - Vol. II: Subprogram Documentation. NASA CR-132444, 1974.
- Clark, T. L.; Ganz, U. W.; Graf, G. A.; and Westall, J. S.: Analytic Models of Ducted Turbomachinery Tone Noise Sources - Vol. III: Program Test Case Results. NASA CR-132445, 1974.
- Nayfeh, A. H.; Telionis, D. P.; and Kaiser, J. E.: Transmission of Sound Through Annular Ducts of Varying Cross Sections. *AIAA Paper No. 74-58*, 1974.
- Wyerman, Barry R.: Absorption Characteristics of Glass Fiber Materials at Normal and Oblique Incidence. NASA CR-132451, 1974.
- Nayfeh, A. H.; and Tsai, M.-S.: Finite Amplitude Waves in Cylindrical Lines Ducts. *AIAA Paper No. 74-553*, 1974.
- Ehlers, F. Edward: A Finite Difference Method for the Solution of the Transonic Flow Around Harmonically Oscillating Wings. NASA CR-2257, 1974.
- Pegg, Robert J.; and Hilton, David A.: Comparison of Acoustic Performance of Five Muffler Configurations on a Small Helicopter. NASA TN D-7495, 1974.
- Nayfeh, A. H.: Nonlinear Propagation of a Wave Packet in a Hard-Walled Circular Duct. VPI and SU Report E-74-9, 1974.
- Posey, Joe W.; and Compton, Kevin J.: Effect of Nonsymmetrical Flow Resistance Upon Orifice Impedance. NASA TM X-72624, 1974.
- Nayfeh, A. H.; and Tsai, M.-S.: High Intensity Sound in Lined Ducts. Proceedings of the Second Interagency Symposium on University Research in Transportation Noise, North Carolina State University, June 1974.
- Nayfeh, A. H.; Kaiser, J. E.; and Telionis, D. P.: Transmission of Sound Through Ducts with Varying Cross Sections. Proceedings of the Second Interagency Symposium on University Research in Transportation Noise, North Carolina State University, June 1974.
- Lumsdaine, Edward; and Clark, Lorenzo R.: Noise Suppression with Sonic and Near-Sonic Inlets. Proceedings of the Second Interagency Symposium on University Research in Transportation Noise, June 1974.

- Nayfeh, A. H.; and Tsai, N.-S.: Finite Amplitude Waves in Two-Dimensional Lined Ducts. *Journal of Sound and Vibration*, vol. 36, no. 4, 1974.
- Nayfeh, A. H.; and Tsai, M.-S.: Nonlinear Wave Propagation in Acoustically Lined Circular Ducts. *Journal of Sound and Vibration*, vol. 35, no. 3, 1974.
- Zorumski, William E.: Acoustic Theory of Axisymmetric Multisection Ducts. NASA TN R-419, 1974.
- Kaiser, J. E.; Shaker, B. S.; and Nayfeh, A. H.: Influence of Liner Thickness of Wave Propagation in Ducts. VPI and SU Report No. E-74-8; *Journal of Sound and Vibration*, 1974.
- Nayfeh, A. H.; Kaiser, J. E.; and Telionis, D. P.: The Acoustics of Aircraft Engine-Duct Systems. AIAA Paper No. 73-1153, *AIAA Journal*, 1974.
- McDaniel, Oliver Herbert: Propagation of Sound at Moderate and High Intensities in Absorbent and Hard-Walled Cylindrical Ducts. NASA CR-132650, 1975. (NGL 39-009-212 PA State University)
- Savkar, S. D.; and Edelfelt, I. H.: Radiation of Cylindrical Duct Acoustic Modes with Flow Mismatch. NASA CR-132613, 1975 (NAS1-11984 General Electric Company)
- Clark, Lorenzo R.: Effects of Inlet Treatment Location and Treatment Cavity Depth on Compressor Noise. NASA TM X-72698, 1975.
- Lester, H. C.; and Posey, J. W.: Duct Liner Optimization for Turbomachinery Noise Sources. NASA TM X-72789, 1975.
- Zorumski, William E.; and Lester, Harold C.: Unified Analysis of Ducted Turbomachinery Noise. NASA TM X-72633, 1975.
- Lester, H. C.; and Posey, J. W.: Duct Liner Optimization for Turbomachinery Noise Sources. Presented at the 90th Meeting of the Acoustical Society of America, November 1975.
- Lester, Harold C.; and Posey, Joe W.: Optimal One-Section and Two-Section Circular Sound Absorbing Duct Liners for Plane-Wave and Monopole Sources Without Flow. NASA TN D-8348, 1976.
- Watson, Willie R.; and Lansing, Donald L.: A Comparison of Matrix Methods for Calculating Eigenvalues in Acoustically Lined Ducts. NASA TN D-8186, 1976.
- Barna, P. Stephen: High Subsonic Flow Tests of a Parallel Pipe Followed by a Large Area Ratio Diffuser. NASA CR-144955, 1976. (NAS1-11707 Old Dominion University)
- Motsinger, R. E.; Draft, R. E.; and Zwick, J. W.: Design of Optimum Treatment for Rectangular Ducts with Flow. ASME 76-GT-113, March 1976.

- Lumsdaine, Edward; Cherng, Jenn G.; and Tag, Ismail: Noise Suppression with High Mach Number Inlets. NASA CR-2708, 1976. (NSG-1081 University of Tennessee)
- Lansing, Donald L.; and Chestnutt, David: Survey of Inlet Noise Reduction Concepts for Gas Turbine Engines. Presented at the 1976 International Conference on Noise Control Engineering, April 1976.
- Posey, J. W.: Comparison of Cross-Spectral and Signal Enhancement Methods for Mapping Steady-State Acoustic Fields in Turbomachinery Ducts. Presented at the 91st Meeting of the Acoustical Society, April 1976.
- Lansing, D. L.; and Chestnutt, D.: Survey of Inlet Noise Reduction Concepts for Gas Turbine Engines. TM X-72801, April 1976.
- Kraft, R. E.; and Posey, J. W.: A Preliminary In-Duct Measurement of Spinning Models in the Inlet of a Rotating Vehicle. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Kraft, R. E.; Paas, J. E.; and Clark, L. R.: Effects of Multi-Element Acoustic Treatment on Compression Inlet Noise. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976.
- Kaiser, J. E.; and Nayfeh, A. H.: A Wave Envelope Technique for Wave Propagation in Nonuniform Ducts. AIAA 76-496, July 1976.
- Chestnutt, David; and Feiler, Charles E.: Advanced Inlet Duct Noise Reduction Concepts. Presented at the NASA Conference on Aircraft Safety and Operating Problems, October 1976.
- Nayfeh, A. H.: Sound Propagation Through Nonuniform Ducts. Presented at 13th Meeting SSoc. Eng. Sci., Hampton, VA November 1976.
- Callegari, A. J.; and Myers, M. K.: Effects of High Subsonic Flow on Sound Propagation in a Variable Area Duct. Presented at the 13th Meeting Soc. Eng. Sci., Hampton, VA November 1976.
- Lumsdaine, E.; and Silcox, R. J.: Experimental Determination of Sound and High Speed Flow Interaction. Presented at Internoise-77, Zurich, Switzerland, March 1977.

## II. PROPAGATION AND OPERATIONS

Some of the topics covered in this section are as follows:

Atmospheric Propagation of Sound and Shock Waves

Absorption, Scattering, Refraction, Diffraction, and Reflection

Turbulence and Wind Effects

Aural Detection

Noise Abatement Aircraft Operations

## II. PROPAGATION AND OPERATIONS

- Regier, Arthur A.: Effects of Distance on Airplane Noise. NACA TN 1353, June 1947.
- Vogeley, A. W.: Sound-Level Measurements of a Light Airplane Modified to Reduce Noise Reaching the Ground. NASA TN 1647, July 1948.
- Hubbard, H. H.: A Survey of the Aircraft Noise Problem with Special Reference to its Physical Aspects. NACA TN 2701, 1952.
- Ingard, Uno: The Physics of Outdoor Sound. Proceedings of the Fourth Annual National Noise Abatement Symposium, Armour Res. Found., Ill. Inst. of Tech., Chicago, Ill., 1953.
- Hubbard, H. H.: Airplane and Airport Noise. Proceedings of the Fourth Annual National Noise Abatement Symposium, Armour Res. Found., Ill. Inst. of Tech., Chicago, Ill., 1953.
- Franken, P. A.: A Theoretical Analysis of the Field of a Random Noise Above an Infinite Plane. NACA TN 3557, 1955.
- Pridmore-Brown, David C.; and Ingard, Uno: Sound Propagation into the Shadow Zone in a Temperature-Stratified Atmosphere Above a Plane Boundary. NACA TN 3494, October 1955.
- Pridmore-Brown, David C.; and Ingard, Uno: Tentative Method for Calculation of the Sound Field About a Source Over Ground Considering Diffraction and Scattering into Shadow Zones. NACA TN 3779, September 1956.
- Pridmore-Brown, David C.: Propagation of Sound into a Wind-Created Shadow Zone. NACA TM 57B25, April 22, 1957.
- Hubbard, Harvey H.; and Maglieri, Domenic J.: An Investigation of Some Phenomena Relating to Aural Detection of Airplanes. NACA TN 4337, September 1958.
- Hubbard, H. H.: Noise Problems Associated with Ground Operations of Jet Aircraft. NASA Memo 3-5-59L, March 1959.
- Hubbard, H. H.; and Maglieri, D. J.: Some Noise Problems of the Supersonic Transport. The Supersonic Transport - A Technical Summary by the Staff of the Langley Research Center. NASA TN D-423, June 1960.
- Hilton, U. A.; Mayes, W. H.; and Hubbard, H. H.: Noise Considerations for Manned Reentry Vehicles. NASA TN D-450, September 1960.

- Lyon, Richard H.: Diffusion of Sound Waves in a Turbulent Atmosphere. NASA TN D-456, September 1960.
- Hubbard, H. H.; and Maglieri, D. J.: Noise Considerations for Future Manned Aircraft. Compilation of Papers on the Future of Manned Military Aircraft, by the Staff of NASA. NASA TM X-420, October 1960.
- Maglieri, D. J.; Hilton, D. A.; and Hubbard, H. H.: Noise Considerations in the Design and Operation of V/STOL Aircraft. NASA TN D-736, April 1961.
- Hubbard, H. H.; and Maglieri, D. J.: Noise Considerations in the Design and Operation of the Supersonic Transport. Noise Control, vol. 7, no. 4, July-August 1961.
- Hilton, D. A.; Mayes, W. H.; and Hardesty, C. A.: In-Flight Noise Measurements for Three Project Mercury Vehicles. NASA TN D-997, January 1962.
- Mayes, W. H.; and Edge, P. M., Jr.: Noise Measurements During Captive and Launch Firings of a Large Rocket Powered Vehicle. NASA TN D-1502, November 1962.
- Hilton, D. A.; Bracalente, E. M.; and Hubbard, H. H.: In-Flight Aerodynamic Noise Measurements on a Scout Launch Vehicle. NASA TN D-1818, July 1963.
- Cawthorn, J. M.; and Maglieri, D. J.: Engine and Boundary-Layer Noise Considerations. Proceedings of NASA Conference on Supersonic-Transport Feasibility Studies and Supporting Research, September 17-19, 1963. NASA TM X-905, 1963.
- Maglieri, D. J.; Ritchie, V. S.; and Bryant, J. F., Jr.: In-Flight Flow-Field Measurements Above and Below a Bomber Aircraft for Mach Numbers 1.4 to 1.69. NASA TN D-1968, October 1963.
- Hilton, D. A.; Huckel, V.; Steiner, R.; and Maglieri, D. J.: Sonic-Boom Exposures During Oklahoma City Community Response Studies for the Period February Through May 1964. LWP No. 20, July 1, 1964. (Superseded by NASA TN D-2539, December 1964.)
- Hilton, D. A.; Copeland, W. L.; and Dibble, A. C.: Measurements of Noise Produced by a BAC-111-400 Series Turbofan Transport Airplane During Takeoff-Climbout Operations. LWP No. 211, April 20, 1966.
- Hilton, D. A.; Dibble, A. C.; and Copeland, W. L.: Measurements of Noise Produced by a Boeing 727 Turbofan Transport Airplane During Takeoff-Climbout Operations. LWP No. 214, April 20, 1966.
- Schaefer, William T., Jr.; and Copeland, William L.: Noise Abatement Approach Flight Test Investigation of a Convair 880M Airplane. LWP No. 305, October 1966.
- Connor, Andrew B.; Hilton, David A.; Copeland, W. Latham; and Clark, Lorenzo R.: Noise Characteristics of the O-1 Airplane and Some Approaches to Noise Reduction. LWP No. 313, October 1966.

- Copeland, W. Latham; Hilton, David A.; Huckel, Vera; Dibble, Andrew C.; Maglieri, Domenic J.: Noise Measurement Evaluations of Various Takeoff-Climbout Profiles of a Four-Engine Turbojet Transport Airplane. NASA TN D-3715, December 1966. (Supersedes LWP No. 206, April 6, 1966.)
- Hilton, D. A.; Connor, A. B.; Copeland, W. C.; and Dibble, A. C., Jr.: Noise Reduction Studies for the CV-1 Airplane. LWP No. 362, February 8, 1967. (Superseded by NASA TM X-72639, January 1975.)
- Franken, Peter, A.; and Bishop, Dwight E.: The Propagation of Sound From Airport Ground Operations. NASA CR-767, May 1967.
- Connor, Andrew B.; Hilton, David A.; and Dingeldein, Richard C.: Noise Reduction Studies for the Cessna Model 337 (O-2) Airplane. LWP No. 408, May 10, 1967. (Superseded by NASA TM X-72641, January 1975.)
- Hilton, David A.; Connor, Andrew B.; and Hubbard, Harvey H.: Noise Reduction Studies for the A-6 Airplane. LWP No. 409, May 11, 1967. (Superseded by NASA TM X-72643, April 1975.)
- Hilton, David A.; Connor, A. B.; Hubbard, H. H.; and Dingeldein, R. C.: Noise Reduction Studies for the U-10 Airplane. LWP No. 386, 1967. (Superseded by NASA TM X-72640, April 1975.)
- Dingeldein, R. C.; Connor, A. B.; and Hilton, D. A.: Noise Reduction Studies of Several Aircraft to Reduce Their Aural Detection Distance. LWP No. 432, June 1967. (Superseded by NASA TM X-72644, January 1975.)
- Lee, Robert; Farrell, James; Henry, George; and Lowe, Albert: Procedure for Estimating the Effects of Design and Operational Characteristics of Jet Aircraft on Ground Noise. NASA CR-1053, June 1968.
- Findley, Donald S.: Comparison of Measured and Calculated Aircraft Lift Generated Pressures. LWP No. 653, August 29, 1968. (Superseded by NASA TM X-72707, June 1975.)
- Bishop, Dwight E.; and Franken, Peter A.: Propagation of Sound From Airport Ground Operations. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Copeland, W. Latham: Two Methods of Evaluating Climbout Noise. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Farrell, James H.: Procedures for Estimating the Effects of Design and Operational Characteristics of Jet Aircraft on Ground Noise. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.



- Hilton, David A.; and Henderson, Herbert R.: Variability in Airplane Noise Measurements. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Hilton, David A.; Henderson, Herbert R.; Dibble, Andrew C., Jr.; Mason, Jean; and Maglieri, Domenic J.: Ground Noise Measurements During Landing and Takeoff Operations of the McDonnell-Douglas 188 (Breguet 941) STOL Airplane. LWP No. 741, April 18, 1969. (Superseded by NASA TN D-6486, December 1971.)
- Hilton, David A.; Henderson, Herbert R.; and Lawton, Ben W.: Ground Noise Measurement During Static and Flyby Operations of the Cessna 02-T Turbine Powered Aircraft. LWP No. 760, June 12, 1969. (Superseded by NASA TM X-72642, January 1975.)
- Quigley, Hervey C.; Snyder, C. Thomas; Fry, Emmett B.; Power, Leo J.; Innis, Robert C.; and Copeland, W. Latham: Flight and Simulation Investigation of Methods for Implementing Noise-Abatement Landing Approaches. NASA TN D-5781, May 1970.
- Gibson, Frederick W.: Measurement of the Effect of Air Bubbles on the Speed of Sound in Water. J. Acous. Soc. Amer., vol. 48, no. 5 (Part 2), November 1970, pp. 1195-1197.
- Bishop, Dwight E.: Variability of Flyover Noise Measures for Repeated Flights of Turbojet and Piston Engine Transport Aircraft. NASA CR-1752, March 1971.
- Maroti, Lewis A.; and Gibbert, Gerald B.: An Experimental Study of Noise Attenuation by Liquid Injection. NASA CR-111905, March 1971.
- Copeland, W. Latham; and Clark, Lorenzo R.: Noise Measurements for a Three-Engine Turbofan Transport Airplane During Climbout and Landing Approach Operations. NASA TN D-6137, May 1971.
- Bishop, Dwight E.; Simpson, Myles A.; and Chang, David: Experimental Atmospheric Absorption Values from Aircraft Flyover Noise Signals. NASA CR-1751, June 1971.
- Hilton, David A.; Henderson, Herbert R.; and Maglieri, Domenic J.: Ground Noise Measurements During Landing, Takeoff, and Flyby Operations of a Four-Engine Turbopropeller STOL Airplane. NASA TN D-6486, December 1971.
- Chang, David T.: Some Analyses of the Variability of Atmospheric Parameters at Low Altitude Significant for Aircraft Noise Propagation. NASA CR-1945, January 1972.
- Hayes, Wallace D.; and Runyan, Harry L.: Sonic Boom Propagation Through a Stratified Atmosphere. J. Acous. Soc. Amer., vol. 5, no. 2 (part 3), February 1972, pp. 695-701.

- Hardin, Jay C.: Theoretical Analysis of Rough Surface Shadowing from Point Source Radiation. *J. Acous. Soc. Amer.*, vol. 52, no. 2 (part 2), July 1972, pp. 227-233.
- Gruschka, H. D.: On the Role of the Radiation Directivity in Noise Reduction for STOL Aircraft. *Proceedings of INTER NOISE 72*, Washington, D. C., October 4-6, 1972.
- Hubbard, Harvey H.; Chestnutt, David; and Maglieri, Domenic J.: Noise Control Technology for Jet Powered STOL Vehicles. *Proceedings of the VIIIth International Council of Aeronautical Sciences Congress*, August 1972.
- Pierce, A. D.; and Maglieri, D. J.: Effects of Atmospheric Irregularities on Sonic-Boom Propagation. *J. Acous. Soc. Amer.*, vol 51, no. 2 (part 3), February 1972, pp. 702-721.
- Parrott, T. L.: An Improved Method for Design of Expansion Chamber Mufflers with Application to an Operational Helicopter. *NASA TN D-7309*, 1973.
- Schorling, Michael: A Nonlinear Theory for Sonic-Boom Calculations in a Stratified Atmosphere. *NASA TN D-7105*, 1973.
- Smith, Wayne Farrior: Investigation of the Statistics of Pure Tone Sound Power Injection from Low Frequency, Finite Sized Sources in a Reverberant Room. *NASA CR-132279*, 1973.
- Cawthorn, Jimmy M.; and Brown, Christine G.: Effect of Advanced Aircraft Noise Reduction Technique on the 1990 Projected Noise Environment Around Patrick Henry Airport. *NASA TM X-71953*, 1974.
- Hilton, David A.; and Pegg, Robert J.: The Noise Environment of a School Classroom Due to the Operation of Utility Helicopters. *NASA TM X-71957*, 1974.
- Connor, Andrew B.; Copeland, William L.; and Fulbright, Danny C.: Low Altitude Temperature and Humidity Profile Data for Application to Aircraft Noise Propagation. *NASA TN D-7975*, 1975.
- Kasper, Peter K.; Pappa, Richard S.; Keefe, Laurence R.; and Sutherland, Louis C.: A Study of Air-to-Ground Sound Propagation Using an Instrumented Meteorological Tower. *NASA CR-2617*, 1975. (NAS1-12841, Wyle Laboratories)

- Chow, P. L.; Liu, C. H.; and Maestrello, L.: Scattering of Coherent Sound Waves by Atmospheric Turbulence. Presented at the AIAA Second Aeroacoustics Specialists Meeting, March 1975. Preprint No. 75-545.
- Hosier, Robert N.; and Hilton, David A.: Some Effects of the Atmosphere and Microphone Placement on Aircraft Flyover Noise Measurements. NASA TM X-72791, 1975.
- Pierce, A. D.; and Hadden, W. J.: Noise Diffraction Around Barrier of Finite Acoustic Impedance. Proc. 3rd Interagency Symposium on University Research in Transportation Noise, November 1975, pp. 50-58.
- Hadden, W. J., Jr.; Sencil, P. M.; Videmos, R. A.; Turner, I. L.; and Pierce, A. D.: Effect of Variable Ground Impedance on Noise Propagation. Proc. 3rd Interagency Symposium on University Research in Transportation Noise, November 1975, pp. 59-73.
- Hadden, W. J., Jr.; Videmos, R. A.; and Sencil, P. M.: Sound Reflection from Locally Reacting Surfaces of Finite Extent. Presented at 92nd Meeting of the Acoustical Society of America, 1976.
- Chow, P. L.; Liu, C. H.; and Maestrello, L.: Scattering of Coherent Sound Waves by Atmospheric Turbulence. AIAA Progress in Astronautics and Aeronautics, 1976, vol. 46, pp. 51-66, 1976.
- Myles, Mark M.; Ver, Istvan L.; and Henderson, Herbert R.: Outdoor Life Test of Acoustical Absorbing Materials. Presented at the 1976 International Conference on Noise Control Engineering, April 1976.
- Zuckerwar, Allan J.: Operation of a Condenser Microphone as the Terminal Element of a Half Wavelength Transmission Line in an AM Carrier System. Presented at the April 1976 Acoustical Society of America Meeting.
- Hilton, David A.; and Henderson, Herbert R.: The Remotely Operated Multiple Array Acoustic Range (ROMAAR) and its Application for the Measurement of Airplane Flyover Noise Footprints. Presented at the 92nd Meeting of the Acoustical Society of America, NASA TM X-73986, November 1976.
- Marsh, Alan H.: Recommended Procedures for Measuring Aircraft Noise and Associated Parameters. NASA CR-145187, 1977.

Ventres, C. S.; Myles, M. M.; Ver, I. L.: Measurements of the Reflection Factor of Flat Ground Surfaces. NASA CR-145138, 1977.

Zuckerwar, Allan J.; and Holmes H. K.: A Unified Acquisition System for Acoustic Data, NASA TN D-8326, March 1977.

Zuckerwar, Allan J.: A High Temperature Wideband Pressure Transducer. Final Report, ODU NSG-1039, March 1977.

Hosier, R. N.: A Comparison of Two Independent Measurements and Analyses of Jet Aircraft Flyover Noise. NASA TN D-8379, May 1977.

### III. ROTATING BLADE NOISE

Some of the topics covered in this section are as follows:

Free and Ducted Propellers; Tilt Rotors; Main and Tail Rotors of Helicopters

Noise due to Torque, Thrust, Coning, Thickness, Unsteady Loads, and Vortex Shedding and Nonuniform Inflow

Near- and Far-Field Noise Measurement, Analysis, Prediction, and Reduction

Rotating Blade Induced Loads on Structures

## III. ROTATING BLADE NOISE

- Deming, Arthur F.: Propeller Rotation Noise Due to Torque and Thrust. NACA TN 747, January 1940.
- Theodorsen, Theodore; and Regier, Arthur A.: The Problem of Noise Reduction with Reference to Light Airplanes. NACA TN 1145, August 1946.
- Yudin, E. Y.: On the Vortex Sound from Rotating Rods. NACA TM 1136, March 1947.
- Crigler, John L.; and Jacquis, Robert E.: Propeller-Efficiency Charts for Light Airplanes. NACA TN 1338, July 1947.
- Hicks, Chester W.; and Hubbard, Harvey H.: Comparison of Sound Emission from Two-Blade, Four-Blade, and Seven-Blade Propellers. NACA TN 1354, July 1947.
- Hubbard, Harvey H.; and Regier, Arthur A.: Propeller-Loudness Charts for Light Airplanes. NACA TN 1358, July 1947.
- Regier, Arthur; and Hubbard, Harvey H.: Factors Affecting the Design of Quiet Propellers. NACA TM No. L7H05, September 19, 1947.
- Hubbard, Harvey H.: Sound from Dual-Rotating and Multiple Single-Rotating Propellers. NACA TN 1654, July 1948.
- Gutin, L.: On the Sound Field of a Rotating Propeller. NACA TM 1195, October 1948.
- Hubbard, Harvey H.: Sound Measurements for Five Shrouded Propellers at Static Conditions. NACA TN 2024, April 1950.
- Beranek, Leo L.; Elwell, Fred S.; Roberts, John P.; and Taylor, C. Fayette: Experiments in External Noise Reduction of Light Airplanes. NACA TN 2079, May 1950.
- Hubbard, Harvey H.; and Regier, Arthur A.: Free-Space Oscillating Pressures Near the Tips of Rotating Propellers. ANCA Report 996, 1950.
- Roberts, John P.; and Beranek, Leo L.: Experiments in External Noise Reduction of a Small Pusher-Type Amphibian Airplane. NACA TN-2727, July 1952.
- Hubbard, Harvey H.; and Lassiter, Leslie W.: Sound from a Two-Blade Propeller at Supersonic Tip Speeds. NACA Report 1079, 1952.

- Hubbard, Harvey H.: Propeller-Noise Charts for Transport Airplanes. NACA TN 2968, June 1953.
- Gilman, Jean, Jr.: Propeller-Performance Charts for Transport Airplanes. NACA TN 2966, July 1953.
- Regier, Arthur; and Hubbard, Harvey H.: Status of Research on Propeller Noise and Its Reduction. J. Acous. Soc. Amer., vol. 24, no. 3, May 1953, pp. 395-404.
- Radin, Edward J.; and Carpenter, Paul J.: Investigation of a Pulse-Jet-Powered Helicopter Rotor on the Langley Helicopter Test Tower. NACA RM L53L15, February 8, 1954.
- Hubbard, Harvey H.; and Lassiter, Leslie W.: Oscillating Pressures Near a Static Pusher Propeller at Tip Mach Numbers up to 1.20 with Special Reference to the Effects of the Presence of the Wing. NACA TN 3202, July 1954.
- Hubbard, Harvey H.; and Lassiter, Leslie W.: Some Aspects of the Helicopter Noise Problem. NACA TN 3239, August 1954.
- Regier, A. A.; Hubbard, H. H.; and Lassiter, L. W.: Technical Aspects of Sound. Aircraft Noise, Elsevier Press, vol. II, chapter 24, 1954.
- Hubbard, Harvey H.: Effects of Some Variables on Near-Field Noise from Propellers. Proceedings of NACA Conference on Some Problems of Aircraft Operation, LFPL, Cleveland, Ohio, November 17 and 18, 1954.
- Garrick, I. E.; and Watkins, Charles E.: A Theoretical Study of the Effect of Forward Speed on the Free-Space Sound-Pressure Field Around Propellers. NACA Report 1198, 1954.
- Kurbjun, Max C.: Noise Survey of a 10-Foot Four-Blade Turbine-Driven Propeller Under Static Conditions. NACA TN 3422, July 1955.
- Mace, William D.; Haney, Francis J.; and Brummer, Edmund A.: Instrumentation for Measurement of Free-Space Sound Pressures in the Immediate Vicinity of a Propeller in Flight. NACA TN 3534, January 1956.
- Watkins, Charles E.; and Durling, Barbara J.: A Method for Calculation of Free-Space Sound Pressures Near a Propeller in Flight Including Considerations of the Chordwise Blade Loading. NACA TN 3809, November 1956.
- Kurbjun, Max C.: Noise Survey of a Full-Scale Supersonic Turbine-Driven Propeller Under Static Conditions. NACA TN 4059, July 1957.

- Kurbjun, Max C.: Noise Survey Under Static Conditions of a Turbine-Driven Transonic Propeller with an Advance Ratio of 4.0. NASA Memo 4-18-59L, May 1959.
- O'Bryan, Thomas C.; and Hammack, Jerome B.: Flight Performance of a Transonic Turbine-Driven Propeller Designed for Minimum Noise. NASA Memo 4-19-59L, May 1959.
- Hubbard, H. H.; and Maglieri, D. J.: Noise Characteristics of Helicopter Rotors at Tip Speeds up to 900 Feet Per Second. J. Acous. Soc. Amer., vol. 32, no. 9, September 1960.
- Scheiman, James; and Ludi, LeRoy H.: Qualitative Evaluation of Effect of Helicopter Rotor Blade Tip Vortex on Blade Airloads. NASA TN D-1637, May 1963.
- Scheiman, James: A Tabulation of Helicopter Rotor-Blade Differential Pressures, Stresses, and Motions as Measured in Flight. NASA TM X-952, 1964.
- Copeland, W. Latham: Inlet Noise Studies for an Axial-Flow Single-Stage Compressor. NASA TN D-2615, February 1965.
- Crigler, John L.; and Copeland, W. Latham: Noise Studies of Inlet-Guide-Vane-Rotor Interaction of a Single-Stage Axial-Flow Compressor. NASA TN D-2962, September 1965.
- Copeland, W. Latham; Crigler, John L.; and Dibble, Andrew C.: Contribution of Downstream Stators to the Interaction Noise of a Single-Stage Axial-Flow Compressor. NASA TN D-3892, April 1967.
- Scheiman, James; and Kelley, Henry L.: Comparison of Flight Measured Helicopter Rotor Blade Chordwise Pressure Distributions and Two-Dimensional Airfoil Characteristics. NASA TN D-3936, May 1967.
- Chestnutt, David; and Stewart, Nora D.: Axial Flow Compressor Noise Reduction by Means of Inlet Guide Vane Choking. LWP No. 473, August 30, 1967. (Superseded by NASA TN D-4682, July 1968.)
- Chestnutt, David: Noise Reduction by Means of Inlet-Guide-Vane Choking in an Axial-Flow Compressor. NASA TN D-4682, July 1968.
- Crigler, John L.; Copeland, W. Latham; and Morris, Garland J.: Turbojet-Engine Noise Studies to Evaluate Effects of Inlet-Guide-Vane-Rotor Spacing. NASA TN D-4690, August 1968.
- Chestnutt, David; and Crigler, John L.: Potential of Inlet-Guide-Vane Configuration for Inlet Noise Reduction. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.



- Lowson, Martin V.: Compressor Noise Analysis. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Leverton, John W.: Helicopter Noise - Blade Slap. Part I - Review and Theoretical Study. NASA CR-1221, October 1968.
- Tanna, H. K.: Computer Program for the Prediction of Rotational Noise Due to Fluctuating Loading on Rotor Blades. NASA CR-66867, December 1968.
- Maglieri, Domenic J.; and Crigler, John L.: Noise Reduction Techniques for Engines and Propellers. FAA Conference on STOL Transport, Noise Certification Report No. FAA-NO-69-1, January 30, 1969.
- Hubbard, Harvey H.; and Maglieri, Domenic J.: Noise Source Characteristics of Engines and Propellers. FAA Conference on STOL Transport, Noise Certification Report No. FAA-NO-69-1, January 30, 1969.
- Lowson, M. V.: Theoretical Studies of Compressor Noise. NASA CR-1287, March 1969.
- Tanna, H. K.: Theoretical Investigation of Rotational Noise. NASA CR-66870, March 1969.
- Heller, Hanno H.; Widnall, Sheila E.; and Gordon, Colin G.: Correlation of Fluctuating Forces with the Sound Radiation from Rigid Flow Spoilers. NASA CR-1340, May 1969.
- Sadler, S. Gene; and Loewy, Robert G.: A Theory for Predicting the Rotational and Vortex Noise of Lifting Rotors in Hover and Forward Flight. NASA CR-1333, May 1969.
- Wright, S. E.; and Tanna, H. K.: A Computational Study of Rotational Noise. NASA CR-66869, May 1969.
- Hilton, David A.; and Henderson, Herbert R.: Description of the Noise Measurement Program on a Standard and a Modified Kaman HH-43B Helicopter with Some Initial Results. LWP No. 755, June 1969. (Superseded by NASA TM X-2226, February 1971.)
- Leverton, J. W.: Experimental Study of Rotor Noise. NASA CR-66868, June 1969.
- Ollerhead, J. B.; and Munch, C. L.: An Application of Theory to Axial Compressor Noise. NASA CR-66859, July 1969.
- Henderson, Herbert R.; and Hilton, David A.: Description of the Noise Measurement Program on a Standard and a Modified Sikorsky SH-3A Helicopter with Some Initial Results. LWP No. 803, September 1969. (Superseded by NASA TN D-7330, 1973.)

- Hilton, David A.; and Henderson, Herbert R.: Description of the Noise Measurement Program on a Standard and Two Modified Hughes OH-6A Helicopters with Some Initial Results. LWP No. 838, December 23, 1969. (Superseded by NASA TN D-7216, 1973.)
- Chestnutt, David; and Clark, Lorenzo R.: Effects of Inlet-Guide-Vane Configuration and Relative Blade Velocity on Noise from Axial-Flow Compressors. NASA TN D-5507, February 1970.
- Ollerhead, J. B.; and Munch, C. L.: An Application of Theory to Axial Compressor Noise. NASA CR-1519, April 1970.
- Kramer, James J.; Chestnutt, David; Krejsa, Eugene A.; Lucas, James G.; and Rice, Edward J.: Noise Reduction. Presented at NASA Conference on Aircraft Propulsion, Lewis Research Center. November 18 and 19, 1970, NASA SP-259.
- Metzger, F. B.; and Ganger, T. G.: Prop Fan: Results of Initial Prop-Fan Model Acoustic Testing - Vol. I. NASA CR-111842, December 4, 1970.
- Metzger, F. B.; and Ganger, T. G.: Prop Fan - Results of Initial Prop-Fan Model Acoustic Testing - Vol. II. NASA CR-111842, December 4, 1970.
- Hilton, David A.; Henderson, Herbert R.; and Pegg, Robert J.: Ground Noise Measurements During Flyover, Hover, Landing, and Take-Off Operations of a Standard and a Modified HH-43B Helicopter. NASA TN X-2226, February 1971.
- Chestnutt, David; Hubbard, Harvey H.; and Feiler, Charles E.: Trends in Noise Control for Aircraft Gas Turbine Powerplants. Proceedings of NASA Aircraft Safety and Operating Problems Conference, Langley Research Center, May 4-6, 1971. NASA SP-270.
- Henderson, Herbert R.; and Hilton, David A.: Description of the Noise Measurement Program on a Standard and the Modified Phase II OH-6A Helicopter. LWP No. 963, May 26, 1971.
- Alfredson, R. J.: Performance Predictions of Resonator Mufflers. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Hardin, J. C.; and Brown, T. J.: Time Series Analysis of Compressor Noise. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Reethof, G.: Rotor Noise Sources - A Review. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.

- Wright, S. E.: Discrete Rotor Noise. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Scheiman, J.; Hilton, D. A.; and Shivers, J. P.: Acoustical Measurements of the Vortex Noise for a Rotating Blade Operating With and Without Its Shed Wake Blown Downstream. NASA TN D-6364, August 1971.
- Pegg, Robert J.; and Hosier, Robert N.: VTOL Noise Research at the Langley Research Center. Proceedings of ARO-D/AHS Helicopter Noise Symposium, Durham, North Carolina, September 29 and 30, 1971.
- Scheiman, James; and Hilton, David A.: Rotating Blade Vortex Noise With and Without Axial Velocity. Proceedings of the ARO-D/AHS Helicopter Noise Symposium, Durham, North Carolina, September 29 and 30, 1971.
- Wright, S. E.: Discrete Rotor Noise. Proceedings of the ARO-D/AHS Helicopter Noise Symposium, Durham, North Carolina, September 29 and 30, 1971.
- Chestnutt, David; and Clark, Lorenzo R.: Noise Reduction by Means of Variable-Geometry Inlet Guide Vanes in a Cascade Apparatus. NASA TM X-2392, October 1971.
- Hubbard, H. H.; Lansing, D. L.; and Runyan, H. L.: A Review of Rotating Blade Noise Technology. J. Sound Vib., vol. 19, no. 3, December 1971, pp. 227-249.
- Wright, S. E.: Discrete Radiation from Rotating Periodic Sources. J. Sound and Vibration, vol. 17, no. 4, 1971, pp. 437-498.
- Leverton, John W.: Helicopter Noise - Blade Slap. Part 2: Experimental Results. NASA CR-1983, March 1972.
- Heller, Hanno H.; and Widnall, Sheila E.: The Role of Fluctuating Forces in the Generation of Compressor Noise. NASA CR-2012, March 1972.
- Holm, K. G.: On the Aerodynamic Noise Generation by Axial-Flow Compressor. Master's Thesis, George Washington University, September 1972.
- Lowson, M. V.: Fan Noise Mechanisms and Control II. Proceedings of INTERNOISE 72, Washington, D.C., October 4-6, 1972.
- Lowson, M. V.; Whatmore, A.; and Whitfield, C. E.: Source Mechanisms for Rotor Noise Radiation. NASA CR-2077, 1972.
- Henderson, Herbert R.; Pegg, Robert J.; and Hilton, David A.: Results of the Noise Measurements Program on a Standard and Modified OH-6A Helicopter. NASA TN D-7216, 1973.
- Pegg, Robert J.; Henderson, Herbert R.; and Hilton, David A.: Results of the Flight Noise Measurements Program Using a Standard and Modified SH-3A Helicopter. NASA TN D-7330, 1973.

- Lowson, M. V.; Whatmore, A.; and Whitfield, C. E.: Source Mechanisms for Rotor Noise Radiation. NASA CR-2077, 1973.
- Magliozzi, B.; Johnson, B. V.; Hanson, D. B.; and Metzger, F. B.: Noise and Wake Structure Measurements in a Subsonic Tip Speed Fan. NASA CR-2323, 1973.
- Magliozzi, B.; Johnson, V. B.; Hanson, D. B.; and Metzger, F. B.: Noise and Wake Structure Measurements on a Subsonic Tip Speed Fan Tabulation and Plots of Test Data. NASA CR-132259, 1973.
- Metzger, F. B.; Hanson, D. B.; Menthe, R. W.; and Towle, G. B.: Analytical Parametric Investigation of Low Pressure Ratio Fan Noise. NASA CR-2188, 1973.
- Stewart, John S.: A Theoretical and Experimental Study of Wood Planer Noise and Its Control. NASA CR-112314, 1973.
- Whatmore, A. R.; and Lowson, M. V.: Some Effects of Ground and Side Planes on the Acoustics Output of a Rotor. NASA CR-132306, 1973.
- Pegg, Robert J.; Henderson, Herbert R.; and Hilton, David A.: Flyover Noise Characteristics of a Tilt-Wing V/STOL Aircraft (XC-142A). NASA TM X-3074, 1974.
- Hosier, Robert N.; and Ramakrishnan, Ramani: Helicopter Rotor Rotational Noise Predictions Based on Measured High-Frequency Blade Loads. NASA TN D-7624, 1974.
- Stoffel, S. W.: NASA-Langley Helicopter Tower Instrumentation System. NASA CR-132522, 1974.
- Farassat, F.: Thickness Noise of Rotating Machinery at Low and High Speeds. Proceedings of the Eight International Congress on Acoustics, London, 1974.
- Farassat, F.: Some Research on Helicopter Noise-Thickness and Rotational Noise. Proceedings of Second Interagency Symposium on University Research in Transportation Noise, June 5-7, 1974.
- Farassat, F.: The Acoustic Far Field of Rigid Bodies in Arbitrary Motion. J. of Sound and Vibration, vol. 32, part 3, 1974.
- Brooks, Thomas F.; and Bailey, J. Ronald: Reduction of Aerodynamic Noise in Idling Woodworking Machines. Presented at the 1974 International Conference on Noise Control Engineering, September 1974.
- Scheiman, James: Further Analysis of Broadband Noise Measurements for a Rotating Blade Operating With and Without Its Shed Wake Blown Downstream. NASA TN D-7623, September 1974.

- Farassat, F.: Theory of Noise Generation from Moving Bodies with an Application to Helicopter Rotors. NASA TR-451, 1975.
- Pegg, Robert J.; Hosier, Robert N.; Balcerak, John C.; and Johnson, H. Kevin: Design and Preliminary Tests of a Blade Tip Air Mass Injection System for Vortex Modification and Possible Noise Reduction on a Full-Scale Helicopter Motor. NASA TM X-3314, 1975.
- Hanson, Donald B.: Study of Noise Sources in a Subsonic Fan Using Measured Blade Pressures and Acoustic Theory. NASA CR-2574, 1975 (NAS1-12505 Hamilton-Standard)
- Kasper, P. K.: Determination of Rotor Harmonic Blade Loads from Acoustic Measurements. NASA CR-2580, 1975 (NAS1-12390 Wyle Laboratories).
- Connor, Andrew B.; Hilton, David A.; and Dingeldein, Richard C.: Noise Reduction Studies for the Cessna Model 337 (0-2) Airplane. NASA TM X-72641, 1975.
- Connor, Andrew B.; Hilton, David A.; Copeland, W. Latham; and Clark, Lorenzo R.: Noise Characteristics of the O-1 Airplane and Some Approaches to Noise Reduction. NASA TM X-72638, 1975.
- Hilton, D. A.; Connor, A. B.; Copeland, W. L.; and Dibble, A. C., Jr.: Noise Reduction Studies of the OV-1 Aircraft. NASA TM X-72639, 1975.
- Hilton, David A.; Connor, Andrew B.; Hubbard, Harvey H.; and Dingeldein, Richard C.: Noise Reduction Studies for the U-10 Airplane. NASA TM X-72640, 1975.
- Hilton, David A.; Henderson, Herbert R.; and Lawton, Ben W.: Ground Noise Measurements During Static and Flyby Operations of the Cessna O2-T Turbine Powered Airplane. NASA TM X-72642, 1975.
- Lane, Frank: Broadband Noise Generated by Turbulent Inflow to Rotor or Stator Blades in an Annular Flow. NASA CR-2503, 1975 (NAS1-10309 KLD Associates, Inc.)
- Farassat, F.; Pegg, R. J.; and Hilton, D. A.: Thickness Noise of Helicopter Rotors at High Tip Speeds. Presented at the AIAA 2nd Aeroacoustics Specialists Conference, March 1975. Preprint No. 75-453.
- White, Richard P., Jr.; Balcerak, John C.; and Pegg, Robert J.: Summary of Results Indicating the Beneficial Effects of Rotor Vortex Modification. Presented at the American Helicopter Society National Symposium on Helicopter Aerodynamic Efficiency, March 1975.

- Catherines, John J.; and Mayes, William H.: Interior Noise Levels of Two Propeller Driven Light Aircraft. Presented at the National Noise and Vibration Control Conference and Exhibition, April 1975.
- Hosier, R. N.; Ramakrishnan, R.; and Pegg, R. J.: The Prediction of Rotor Rotational Noise Using Measured Fluctuating Blade Loads. Journal of the American Helicopter Society, April 1975.
- Maglieri, Domenic J.; and Hubbard, Harvey H.: Factors Affecting the Noise from Small Propeller Driven Aircraft. Presented at the 1975 SAE National Business Aircraft Meeting, April 1975. Preprint No. 750516.
- Brooks, Thomas F.; and Bailey, J. Ronald: Mechanisms of Aerodynamic Noise Generation in Idling Woodworking Machines. Presented at ASME 5th National Conference on Mechanical Vibrations. Sept. 1975.
- Mall, G. H.; and Farassat, F.: A Computer Program for the Determination of the Acoustic Pressure Signature of Helicopter Rotors Due to Blade Thickness. NASA TM X-3323, 1976.
- Ramakrishnan, Ramani; Randall, Donald; and Hosier, Robert N.: A-Computer Program to Predict Rotor Rotational Noise of a Stationary Rotor from Blade Loading Coefficients. NASA TM X-3281, 1976.
- Farassat, F.; Pegg, R. J.; and Hilton, D. A.: Thickness Noise of Helicopter Rotors at High Tip Speeds. AIAA Progress in Astronautics and Aeronautics, 1976, vol. 44, pp. 601-613.
- Magliozzi, B.: The Influence of Forward Flight on Propeller Noise. NASA CR-145105, 1976 (NAS1-13015 United Aircraft Corporation).
- Pegg, R. J.; Farassat, F.; and Magliozzi, B.: Some Effects of Forward Velocity on Propeller Driven Aircraft Noise. Presented at ASME Gas Turbine Conference, March 1977. Preprint No. 77-GT-70.
- Metzger, Bruce; Magliozzi, Bernard; and Pegg, R. J.: Progress Report on Propeller Aircraft Flyover Noise Research. Presented at the SAE Business Aircraft Meeting, April 1976. Preprint No. 760454.
- Brown, Thomas J.; and Farassat, Fereidoun: A New Capability for Predicting Helicopter Rotor Noise in Hover and in Flight. Presented at the 1976 Army Science Conference, June 1976. Conference Proceedings, Vol. II.
- Farassat, F.; and Brown, T. J.: Development of a Noncompact Source Theory with Applications to Helicopter Rotors. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976. Preprint No. 76-563.

White, Richard P.; Balcerak, John C.; and Pegg, Robert J.: A Parametric Model Study of the Noise Generated by the Aerodynamic Intergration of the Tail Rotor With the Wake of the Main Rotor. Presented at the American Helicopter Society Symposium on Rotor Technology, August 1976.

Pegg, Robert J.: Insights Into the Nature and Control of Rotor Noise. Presented at the NASA Conference on Aircraft Safety and Operating Problems, October 1976. NASA SP 416.

#### **IV. JET NOISE**

**Some of the topics covered in this section are as follows:**

**Near- and Far-Noise Fields**

**Subsonic and Supersonic Flows**

**Model Jets, Jet Engines, and Rocket Engines**

**Free Jets, Shear Layers, Impinging Jet and Coaxial Jets**

**Mach Waves, Turbulence, Temperature and Velocity Profiles,  
and Combustion**

**Mufflers, Suppressors, and Noise Control**

**Equipment, Facilities, and Test Methodology**



## IV. JET NOISE

- Lassiter, Leslie W.; and Hubbard, Harvey H.: Experimental Studies of Noise From Subsonic Jets in Still Air. NACA TN 2757, 1952.
- Lassiter, Leslie W.; and Hubbard, Harvey H.: Pressure Fluctuations due to Jets. Proceedings of NACA Conference on Aircraft Loads, Flutter, and Structures, Langley Field, Virginia, March 2-4, 1953.
- Uberoi, Mahinder S.: Correlations Involving Pressure Fluctuations in Homogeneous Turbulence. NACA TN 3116, January 1954.
- Hubbard, H. H.; and Regier, A. A.: The Nature of Aircraft Noise Sources. Proceedings of the NACA University Conference on Aerodynamics, Construction, and Propulsion. Vol. II - Aerodynamics. Lewis Flight Propulsion Laboratory, Cleveland, Ohio, October 1954.
- Lassiter, Leslie W.; and Heitkotter, Robert H.: Some Measurements of Noise from Three Solid-Fuel Rocket Engines. NACA TN 3316, December 1954.
- Lassiter, L. W.; and Hubbard, H. H.: Some Results of Experiments Relating to the Generation of Noise in Jets. J. Acous. Soc. Amer., vol. 27, no. 3, May 1955, pp. 431-437.
- Lassiter, Leslie W.; and Hubbard, Harvey H.: The Near Noise Field of Static Jets and Some Model Studies of Devices for Noise Reduction. NACA TN 3187, 1956.
- Lassiter, Leslie W.; and Hess, Robert W.: Calculated and Measured Stresses in Simple Panels Subject to Intense Random Acoustic Loading Including the Near Noise Field of a Turbojet Engine. NACA TN 4076, 1958.
- Kurbjun, Max C.: Limited Investigation of Noise Suppression by Injection of Water into Exhaust of Afterburning Jet Engine. NACA TM L57L05, February 20, 1958.
- Edge, Philip M., Jr.: Random Noise Testing of Aircraft and Missile Components with the Aid of a Laboratory Air Jet. Shock, Vibration, and Associated Environments, part ii, bul. no. 27, June 1959.
- Mayes, W. H.; Lanford, W. E.; and Hubbard, H. H.: Near-Field and Far-Field Noise Surveys of Solid-Fuel Rocket Engines for a Range of Nozzle Exit Pressures. NASA TN D-21, August 1959.
- Mollo-Christense, Erik; and Maramisimka, R.: Sound Emission from Jets of High Subsonic Velocities. J. Fluid Mechanics, vol. 8, May 1960, pp. 49-60.

- Mayes, W. H.; Edge, P. M., Jr.; and O'Brien, J. S., Jr.: Near-Field and Far-Field Noise Measurements for a Blowdown-Wind Tunnel Supersonic Exhaust Jet Having about 475,000 Pounds of Thrust. NASA TN D-517, April 1961.
- Koipin, Marc A.: Flow in the Mixing Region of a Jet. MIT Report ASRL TR 92-3, June 1962.
- Modlin, C. T., Jr.; and Edge, P. M., Jr.: Model Studies of Jet Noise Generation. Sound - Its Uses and Control, July - August 1962.
- Mollo-Christensen, E.: Jet Flow and Jet Noise. Presented at Annual Meeting of JAS, January 1963. MIT Report ASRL TR 1006, January 1963.
- Mollo-Christensen, E.: Measurements of Near Field Pressures of Subsonic Jets. MIT Report ASRL TR 1009, April 1963. AGARD Report 449, 1963.
- Mollo-Christensen, Erik; Koipin, Marc A.; and Martucelli, John R.: Experiments on Jet Flows and Jet Noise Far Field Spectra and Directivity Patterns. J. Fluid Mech., vol. 18, part 2, 1964, pp. 285-301.
- Cawthorn, J. M.; and Green, R. N.: Correlation of the Exhaust Jet Noise Field of the 9- by 6-Foot Thermal Structures Tunnel with Its Operating Conditions. LWP No. 22, July 28, 1964.
- Kantarges, George T.; and Cawthorn, Jimmy M.: Effects of Temperature on Noise of Bypass Jets as Measured in the Langley Noise Research Facility. NASA TN D-2378, August 1964.
- Ffowcs-Williams, J. E.; and Maidanik, G.: Mach Wave Radiation from a Highly Sheared Supersonic Turbulent Flow. J. Fluid Mech., vol. 21, part 4, 1965, pp. 641-657.
- Ffowcs-Williams, J. E.: On the Development of Mach Waves Radiated by Small Disturbances. J. Fluid Mech., vol. 22, part 1, 1965, pp. 49-55.
- Atvars, J.; Schubert, L. K.; and Ribner, H. S.: Refraction of Sound from a Point Source Placed in an Air Jet. J. Acous. Soc. Amer., vol. 37, no. 1, January 1965, pp. 168-170.
- Ffowcs-Williams, J. E.: Sound Emission from Turbulence in Inhomogeneous Convective Motion. Proceedings of the 5th International Congress on Acoustics. Liege, Belgium, September 7-14, 1965.
- Grande, E.: Refraction of Injected Sound by a Very Cold Nitrogen Jet. J. Acous. Soc. Amer., vol. 38, no. 6, Letter-to-Editor, December 1965, pp. 1063-1064.
- Sheeran, W. J.; and Dosanjh, D. S.: Noise from Impinging Two-Dimensional, Underexpanded Jet Flows. J. Acous. Soc. Amer., vol. 38, no. 3, September 1965, pp. 482-484.

- Manhart, J. Kenneth; Ailman, C. M.; Lane, S. R.; and Marsh, A. H.: An Acoustical Study of the Kiwi B Nuclear Rocket. NASA CR-370, January 1966.
- Mueller, Arnold W.: Description and Operating Characteristics of Langley's Environmental Noise Facility Utilizing a 15-Inch Diameter Jet Random Noise Source, LWP No. 193, March 7, 1966.
- Atvars, J.; Schubert, L. K.; Grande, E.; and Ribner, H. S.: Refraction of Sound by Jet Flow Temperature. NASA CR-494, May 1966.
- Gordon, Colin G.; and Maidanik, Gideon: Influence of Upstream Flow Discontinuities on the Acoustic Power Radiated by a Model Air Jet. NASA CR-679, January 1967.
- Grande, E.: Refraction of Sound by Jet Flow and Jet Temperature. NASA CR-840, August 1967.
- Cawthorn, Jimmy M.; and Smith, Wayne F.: Acoustic and Performance Evaluations of Two Slotted (Karlson) Jet Exhaust Nozzles. LWP No. 550, February 8, 1968.
- Gordon, Colin G.: A Study of Exhaust Noise as It Relates to the Turbofan Engine. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Dosanjh, Darshan S.; and Montegani, Frances J.: Underexpanded Jet Noise Reduction Using Radial Flow Impingement. AIAA Journal, vol. 7, no. 3, March 1969, pp. 458-464.
- Dosanjh, Darshan S.; Abdelhamid, Amr N.; and Yu, James C.: Noise Reduction from Interacting Coaxial Supersonic Jet Flows. Presented at Basic Aerodynamic Noise Research Conference, NASA Headquarters, Washington, D.C., July 14 and 15, 1969. NASA SP-207.
- Plumlee, Harry E.; Wynne, George A.; and Zinn, Ben T.: Effect of Jet Temperature on Jet and Pure Tone Noise Radiation. NASA CR-1472, November 1969.
- Hardin, Jay C.: Effects of Temperature-Profile Variation on Refraction of Sound by Jet Flow. NASA TN D-5779, April 1970.
- Farassat, Fereidoun: Noise from High Speed Coaxial Interacting Jets. Master's Thesis, Syracuse University, September 1970.
- Yu, James C.; and Dosanjh, Darshan S.: The Noise Field from Coaxially Interacting Supersonic Jet Flows. Part I Jour. Acous. Soc. of Amer., vol. 51, no. 5, 1972, pp. 1400-1410.

- Maestrello, Lucio; and McDaid, Edward P.: Near-Field Characteristics of a High Subsonic Jet. Presented at AIAA Ninth Aerospace Sciences Meeting, New York, New York, January 25-27, 1971. AIAA paper No. 71-155.
- Manson, L.; Lieberman, S.; and Burge, H. L.: A Study of the Use of Liquid Base Foams for Jet Noise Reduction. NASA CR-1695, February 1971.
- Hardin, Jay C.; and Sweet, Arnold L.: Stochastic Model of Turbulent Channel Flow. J. Eng. Mech. Div., ASCE, vol. 97, no. EM2, April 1971, pp. 375-389.
- Manson, Lidia; and Burge, H. L.: Jet Noise Reduction Through Liquid-Base Foam Injection. J. Acous. Soc. Amer., vol. 50, no. 4 (part 1), October 1971, pp. 1067-1074.
- Dosanjh, D. S.; Yu, J. C.; and Abdelhamid, A. N.: Reduction of Noise from Supersonic Jet Flows. AIAA Journal, vol. 9, no. 12, December 1971, pp. 2346-2453.
- Maestrello, Lucio; and McDaid, Edward P.: Acoustic Characteristics of a High-Subsonic Jet. AIAA Journal, vol. 9, no. 6, June 1971, pp. 1058-1066.
- Dosanjh, D. S.; and Yu, J. C.: Supersonic Jet Noise Suppression Using Coaxial Flow Interaction. Proceedings of 7th International Congress on Acoustics, Budapest, Hungary, August 18-26, 1971.
- Manson, Lidia; and Lieberman, Seymour: Sound Propagation and Absorption in Foam: A Distributed Parameter Model. J. Acous. Soc. Amer., vol. 50, no. 4 (part 1), October 1971, pp. 1075-1080.
- Yu, J. C.: Noise Field of a Supersonic Mach 1.5 Cold Model Jet. J. Acous. Soc. Amer., vol. 51, no. 5 (part 1), May 1972, pp. 1400-1410.
- Barna, P. S.: Performance and Noise Generation Studies of Supersonic Air Ejectors. NASA CR-2056, June 1972.
- Hosier, Robert N.; and Mayes, William H.: A Procedure for Predicting Internal and External Noise Fields of Blowdown Wind Tunnels. NASA TM X-2556, 1972.
- McDaid, Edward P.; and Maestrello, Lucio: Estimation of Spectra From Moving Sound Sources. Presented at the AIAA 5th Fluid and Plasma Dynamics Conference, AIAA Paper No. 72-667, 1972.
- Plett, E. G.; Tower, M.; Abdelhamid, A. N.; and Summerfield, M.: Noise of Jets Discharging from a Duct Containing Bluff Bodies. Proceedings of INTER NOISE 72, Washington, D. C., October 4-6, 1972.

- Hardin, Jay C.: Analysis of Noise Produced by an Orderly Structure of Turbulent Jets. NASA TN D-7242, April 1973.
- Plett, E. G.; Chiu, H. H.; and Summerfield, M.: Combustion Roughness as a Contribution to the Jet Noise Component of Aircraft Engines. Proceedings of DOT, Symposium on Transportation Noise Research, March 28-30, 1973.
- Maestrello, Lucio: On the Relationship Between Acoustic Energy Density Flux Along the Jet Axis and Far-Field Acoustic Intensity. NASA TN D-7269, 1973.
- Norum, Thomas D.: Measured and Calculated Transmission Losses of Sound Waves Through a Helium Layer. NASA TN D-7230, 1973.
- Norum, Thomas D.; and McDaid, Edward P.: Analytical Evaluation of Jet Noise Source Location Technique, Utilizing an Acoustically Hard Baffle With Aperture. NASA TN D-7228, 1973.
- Maestrello, Lucio: On the Relationship Between Acoustic Energy Density Flux Near the Jet and Far-Field Acoustic Intensity. Presented at the AIAA Aeroacoustics Specialists Conference, October 1973. AIAA Paper 73-958.
- Liu, C. H.; and Maestrello, L.: Propagation of Sound Through a Real Jet Flow Field. Presented at the AIAA 12th Aerospace Sciences Meeting, January 1974. AIAA Paper No. 74-5.
- Graham, E. W.; and Graham, B. B.: Theoretical Study of the Effects of Refraction on Noise Produced by Turbulent Jet. NASA CR-2390, 1974.
- Seiner, John M.; Reethof, Gerhard: Distribution of Source Coherency in an Axisymmetric Subsonic Jet. Proceedings of the North Carolina State Transportation Symposium, June 1974.
- Maestrello, L.; Liu, C. H.; Gunzburger, M. D.; and Ting, Lu: Sound Propagation Through a Real Jet Flow With Scattering Due to Interaction With Turbulence. Presented at the AIAA 7th Fluid and Plasma Dynamics Conference, June 1974. AIAA Paper No. 74-551.
- Liu, Chen-Huei; and Maestrello, Lucio: Propagation of Sound Through a Spreading Jet. Proceedings of the 8th International Congress on Acoustics, July 1974.
- Greene, George C.; and Brink, Donald F.: Method for Producing a Uniform, Low Reynolds Number Jet. AIAA Journal of Spacecraft and Rockets, vol. 11, no. 8, August 1974.

- Padula, Sharon; and Liu, C. H.: A Computing Method for Sound Propagation Through a Nonuniform Jet Stream. NASA TM X-71941, 1974.
- Greene, George C.: Comparison of Measured and Calculated Velocity Profiles of a Laminar Incompressible Free Jet at Low Reynolds Numbers. NASA TN D-7510, 1974.
- Norum, Thomas D.: A Model for Jet-Noise Analysis Using Pressure-Gradient Correlations on an Imaginary Cone. NASA TN D-7751, 1974.
- Padula, Sharon L.; and Liu, Chen-Huei: Numerical Study of Sound Propagation in a Jet Flow. NASA TN D-8012, 1975.
- Graham, E. W., and Graham, B. B.: Theoretical Study of Refraction Effects on Noise Produced by Turbulent Jets. NASA CR-2632, 1975. (NAS1-12834 Graham Associates)
- Metcalfe, Ralph W.; and Orszag, Steven A.: Numerical Simulation of Turbulent Jet Noise - Part I. NASA CR-132693, 1975. (NAS1-12870 Flow Research Inc.)
- Maestrello, Lucio: Relationship Between Acoustic Energy Density Flow Near the Jet Axis and Far-Field Acoustic Intensity. AIAA Progress in Astronautics and Aeronautics, vol. 37, 1975.
- Maestrello, Lucio; and Pao, S. Paul: New Evidence of the Mechanisms of Noise Generation and Radiation of a Subsonic Jet. Journal of the Acoustical Society of America, vol. 57, no. 4, 1975.
- Hilton, David A.; Connor, Andrew B.; and Hubbard, Harvey H.: A Noise Study of the A-6 Airplane and Techniques for Reducing its Aural Detection Distance. NAFA TM X-72643, 1975.
- Liu, C. H.; and Maestrello, L.: Propagation of Sound Through a Real Jet Flowfield. AIAA Journal, January 1975.
- Davies, P. O. A. L.; Hardin, J. C.; Edwards, A. V. J.; and Mason, J. P.: A Potential Flow Model for Calculation of Jet Noise. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Liu, C. H.; Maestrello, L.; and Gunzburger, M. D.: Simulation by Vortex Rings of the Unsteady Pressure Field Near a Jet. AIAA Progress in Astronautics and Aeronautics, vol. 43, 1976.

- Pao, S. Paul; and Maestrello, Lucio: New Evidence of Subsonic Jet Noise Mechanisms. AIAA Progress in Astronautics and Aeronautics, vol. 43, 1976.
- Pao, S. Paul; and Maestrello, Lucio: Evidence of the Beam Pattern Concept of Subsonic Jet Noise Emission. NASA TN D-8104, 1976.
- Ribner, Herbert S.: Theory of Two-Point Correlations of Jet Noise. NASA TN D-8330, 1976.
- Kentzer, Czeslaw P.: Wavy Theory of Turbulence in Compressible Media. NASA CR-2671, 1976 (NGR 15-005-174 Purdue University).
- Kentzer, Czeslaw P.: Nonclassical Acoustics. NASA CR-145071, 1976 (NSG 1293 Purdue University).
- Metcalfe, Ralph A.; and Orszag, Steven A.: Numerical Simulation of Turbulent Jet Noise - Part II. NASA CR-144978, 1976. (NAS1-12870 Flow Research Inc.)
- Plett, E. G.; Abdelhamid, S. N.; Harrje, D. T.; and Summerfield, M.: Combustion Contribution to Noise in Jet Engines. NASA CR-2704, 1976. (NGR 31-001-241, Princeton University)
- Davies, P. A. O. L.; Hardin, J. C.; Edwards, A. J. V.; and Mason, J. P.: A Potential Flow Model for Calculation of Jet Noise. AIAA Progress in Astronautics and Aeronautics, 1976.
- Maestrello, Lucio: Two-Point Correlations of Sound Pressure in the Far Field of a Jet. Space Experiment, NASA TM X-72835, 1976.
- Maestrello, Lucio: Two-Point Correlations of Sound Pressure in the Far Field of a Jet: Experiment. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Ribner, Herbert S.: Two-Point Correlations of Sound Pressure in the Far Field of a Jet: Theory. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Maestrello, Lucio; and Liu, Chen-Huei: Numerical Evaluation of the Jet Noise Source Distribution from Far Field Cross Correlations. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976. Preprint No. 76-543.
- Ribner, H. S.: The Issue of Source Terms for Jet Noise. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976.

Gunzburger, M.; Maestrello, L.; Liu, C. H.; and Ting, L.: Mathematical Formulation for the Propagation of Sound Through a Turbulent Jet. *Journal of Engineering Mathematics*, vol. 10, no. 3, July 1976.

Norum, T. D.; and Liu, C. H.: The Acoustic Monopole in Motion. Presented at the 92nd Meeting of the Acoustical Society of America, TM X-73985, November 1976.

Fung, Y. T.; and Liu, C. H.: Vortex Simulation of the Pressure Field for a Jet. Presented at the 92nd Meeting of the Acoustical Society of America, TM X-73984, November 1976.

Hardin, J. C.: Numerical Simulation of Turbulence by Point Vortices. Presented at the NSF-CBMS Regional Conference on Computational Fluid Dynamics and Turbulence Theory, August 1976.



## V. SONIC BOOM

Some of the topics covered in this section are as follows:

Generation, Propagation, Minimization, and Prediction

Effects of Vehicle Altitude, Mach Number, Size and Shape,  
Lift Distribution, Flightpath, and Acceleration

Generation by Projectiles, Aircraft, and Spacecraft

Ballistic Ranges, Rocket Sleds, Wind Tunnels, and Other  
Simulators

Effects of Atmospheric Gradients, Turbulence, and Ground  
Reflections

Lateral Spread Ground Patterns Including Super-Booms from  
Maneuvers

Measurements and Analyses

Responses of Buildings, Building Components, Equipment, and  
Terrain

Loudness, Startle, Awakening and Annoyance Responses of  
People

## V. SONIC BOOM

- Busemann, Adolf: The Relation Between Minimizing Drag and Noise at Supersonic Speeds. Proceedings of the Conference on High-Speed Aeronautics, Polytechnic Institute of Brooklyn, January 20-22, 1955.
- Carlson, Harry W.: An Investigation of Some Aspects of the Sonic Boom by Means of Wind-Tunnel Measurements of Pressures About Several Bodies at a Mach Number of 2.01. NASA TN D-161, 1959.
- Maglieri, D. J.; and Carlson, H. W.: The Shock-Wave Noise Problem of Supersonic Aircraft in Steady Flight. NASA Memo 3-4-59L, April 1959.
- Carlson, Harry W.: A Wind-Tunnel Investigation of Some Aspects of the Supersonic Boom. Aero/Space Engineering, vol. 18, no. 7, July 1959.
- Hubbard, H. H.: Factors Affecting the Shock-Wave Noise of Supersonic Aircraft. Proceedings of 3rd International Congress on Acoustics, Stuttgart, Germany, September 1-8, 1959.
- Maglieri, D. J.; and Hubbard, H. H.: Some Ground Measurements of the Shock-Wave Noise From Airplanes in Steady Flight at Altitudes from 25,000 to 45,000 Feet. NASA TN D-48, September 1959.
- Langley Research Center Staff: The Supersonic Transport - A Technical Summary. NASA TN D-423, December 1959.
- Lansing, Donald L.: Calculated Effects of Body Shape on the Bow-Shock Overpressures in the Far Field of Bodies in Supersonic Flow. NASA TR R-76, 1960.
- Lina, L. J.; Maglieri, D. J.; and Hubbard, H. H.: Supersonic Transports - Noise Aspects with Emphasis on Sonic Boom. Second Supersonic Transports (Proceedings). S.M.F. Fund Paper No. FF-26, Inst. Aero. Sci., January 25-27, 1960, pp. 2-12.
- Lina, Lindsay J.; and Maglieri, Domenic J.: Ground Measurements of Airplane Shock-Wave Noise at Mach Numbers to 2.0 and at Altitudes to 60,000 Feet. NASA TN D-235, March 1960.
- Smith, Harriet J.: Experimental and Calculated Flow Fields Produced by Airplanes Flying at Supersonic Speeds. NASA TN D-621, November 1960.
- Carlson, Harry W.: An Investigation of the Influence of Lift on Sonic-Boom Intensity by Means of Wind-Tunnel Measurements of the Pressure Fields of Several Wing-Body Combinations at a Mach Number of 2.01. NASA TN D-881, 1961.

- Maglieri, D. J.; and Hubbard, H. H.: Ground Measurements of the Shock-Wave Noise from Supersonic Bomber Airplanes in the Altitude Range from 30,000 to 50,000 Feet. NASA TN D-880, July 1961.
- Maglieri, D. J.; Huckel, V.; and Parrott, T. L.: Ground Measurements of Shock-Wave Pressures for Fighter Airplanes Flying at Very Low Altitudes and Comments on Associated Response Phenomena. NASA TM X-611, December 1961. (Superseded by NASA TN D-3443, July 1966.)
- Hubbard, H. H.; Maglieri, D. J.; Huckel, V.; and Hilton, D. A.: Ground Measurements of Sonic Boom Pressures for the Altitude Range of 10,000 to 75,000 Feet. NASA TM X-633, January 1962. (Superseded by NASA TR R-198, 1964.)
- Carlson, Harry W.: The Lower Bound of Attainable Sonic-Boom Overpressure and Design Methods of Approaching this Limit. NASA TN D-1494, 1962.
- Carlson, Harry W.: Wind-Tunnel Measurements of the Sonic-Boom Characteristics of a Supersonic Bomber Model and a Correlation with Flight-Test Ground Measurements. NASA TM X-700, 1962.
- Parrott, T. L.: Experimental Studies of Glass Breakage due to Sonic Boom. Sound - Its Uses and Control, May-June 1962.
- Morris, Odell A.: A Wind-Tunnel Investigation at a Mach Number of 2.01 of the Sonic Boom Characteristics of Three Wing-Body Combinations Differing in Wing Longitudinal Location. NASA TN D-1384, September 1962.
- Maglieri, D. J.; and Lansing, D. L.: Sonic Booms from Aircraft in Maneuvers. Sound - Its Uses and Control, vol. 2, no. 2, March-April 1963.
- Maglieri, D. J.; and Parrott, T. L.: Atmospheric Effects on Sonic Boom Pressure Signatures. Sound - Its Uses and Control, vol. 2, no. 4, July-August 1963, pp. 11-14.
- Maglieri, D. J.; and Morris, G. J.: Measurements of the Response of Two Light Aircraft to Sonic Booms. NASA TN D-1941, August 1963.
- Carlson, Harry W.; and Shrout, Barrett L.: Wind-Tunnel Investigation of the Sonic-Boom Characteristics of Three Proposed Supersonic Transport Configurations. NASA TM X-889, October 1963.
- Maglieri, D. J.; Parrott, T. L.; Hilton, D. A.; and Copeland, W. L.: Lateral Spread Sonic-Boom Ground-Pressure Measurements from Aircraft at Altitudes to 75,000 Feet and at Mach Numbers to 2.0. NASA TN D-2021, November 1963.

- Barger, Raymond L.: Some Effects of Flight Path and Atmospheric Variations on the Boom Propagated from a Supersonic Aircraft. NASA TR R-191, 1964.
- Carlson, Harry W.: Correlation of Sonic-Boom Theory with Wind-Tunnel and Flight Measurements. NASA TR R-213, 1964.
- Carlson, Harry W.: Influence of Airplane Configuration on Sonic-Boom Characteristics. J. Aircraft, vol. 1, no. 2, March-April 1964.
- Maglieri, D. J.; and Lansing, D. L.: Sonic Booms from Aircraft in Maneuvers. NASA TN D-2370, July 1964.
- Hilton, D. A.; Huckel, V.; Steiner, R.; and Maglieri, D. J.: Sonic-Boom Exposures During Oklahoma City Community Response Studies for the Period February Through May 1964. LWP No. 20, July 1, 1964. (Superseded by NASA TN D-2539, December 1964.)
- Cheng, David H.: Some Dynamic Effects of Sonic Booms on Building Structural Elements. LWP No. 25, August 14, 1964.
- Hubbard, H. H.; and Maglieri, D. J.: Noise and Sonic Boom Considerations in the Operation of Supersonic Aircraft. Proceedings of 4th Congress of International Council of Aeronautical Sciences (ICAS), Paris, France, August 24-28, 1964.
- Hilton, D. A.; Huckel, V.; Steiner, R.; and Maglieri, D. J.: Sonic-Boom Exposures During FAA Community-Response Studies Over a 6-Month Period in the Oklahoma City Area. NASA TN D-2539, December 1964.
- Middleton, Wilbur D.; and Carlson, Harry W.: A Numerical Method for Calculating Near-Field Sonic-Boom Pressure Signatures. NASA TN D-3082, 1965.
- Carlson, Harry W.; Mack, Robert J.; and Morris, Odell A.: A Wind-Tunnel Investigation of the Effect of Body Shape on Sonic-Boom Pressure Distributions. NASA TN D-3106, 1965.
- McLean, F. Edward: Some Nonasymptotic Effects on the Sonic Boom of Large Airplanes. NASA TN D-2877, 1965.
- Friedman, M. P.: A Description of a Computer Program for the Study of Atmospheric Effects on Sonic Booms. NASA CR-157, February 1965.

- Clark, Buhr, and Nexen, Inc.: Report of Architect and Engineer Services for Studies of Sonic Boom Induced Damage. NASA CR-227, 1965.
- Friedman, Manfred P.; and Chou, David C.: Behavior of the Sonic Boom Shock Wave Near the Sonic Cutoff Altitude. NASA CR-358, March 1965.
- Lansing, Donald L.; and Maglieri, Domenic J.: Comparison of Measured and Calculated Sonic-Boom Ground Patterns due to Several Different Aircraft Maneuvers. NASA TN D-2730, April 1965.
- Nixon, Charles W.; and Hubbard, Harvey H.: Results of USAF-NASA-FAA Flight Program to Study Community Responses to Sonic Booms in the Greater St. Louis Area. NASA TN D-2705, May 1965.
- Parrott, Tony L.: Summary of Results of Sonic Boom Measurements Conducted During Joint FAA-USAF-NASA Snow-Avalanche Project in the Vicinity of Leadville, Colorado, March 1965. LWP No. 105, May 12, 1965. (Superseded by FAA Report SST 65-9, August 1965.)
- Mayes, William H.; and Newman, James W.: Analytical Study of the Response of a Single-Degree-of-Freedom System to Sonic-Boom Type Loadings. LWP No. 154, February 16, 1966.
- Simpson, J. D.: The Transient Response of a Helmholtz Resonator with Application to Sonic Boom Studies. Ph.D. Thesis, Oklahoma State University, May 1966.
- Baron, Melvin L.; Bleich, Hans H.; and Wright, Joseph P.: An Investigation of Ground Shock Effects due to Rayleigh Waves Generated by Sonic Booms. NASA CR-451, May 1966.
- Barger, R. L.; and Jordan, F. L., Jr.: Investigation of a Class of Bodies that Generate Far-Field Sonic-Boom Shock Strength and Impulse Independent of Body Length and Volume. NASA TN D-5148, May 1966.
- Baals, Donald D.; and Foss, Willard E., Jr.: Assessment of Sonic-Boom Problem for Future Air-Transport Vehicles. J. Acous. Soc. Amer., vol. 39, no. 5 (part 2), May 1966, pp. 573-580.
- Hubbard, Harvey H.: Nature of the Sonic-Boom Problem. J. Acous. Soc. Amer., vol. 39, no. 5 (part 2), May 1966, pp. S1-S6.
- Carlson, Harry W.; Mack, Robert J.; and Morris, Odell A.: Sonic-Boom Pressure Field Estimation Techniques. J. Acous. Soc. Amer., vol. 39, no. 5 (part 2), May 1966, pp. S10-S18.
- McLean, F. Edward; and Shrout, Barrett L.: Design Methods for Minimization of Sonic-Boom Pressure-Field Disturbances. J. Acous. Soc. Amer., vol. 39, no. 5 (part 2), May 1966, pp. S19-S25.
- Hilton, David A.; and Newman, James W., Jr.: Instrumentation Techniques for Measurement of Sonic-Boom Signatures. J. Acous. Soc. Amer., vol. 39, no. 5 (part 2), May 1966, pp. S31-S35.

- Maglieri, Domenic J.: Some Effects on Airplane Operations and the Atmosphere on Sonic-Boom Signatures. *J. Acous. Soc. Amer.*, vol. 39, no. 5 (part 2), May 1966, pp. S36-42.
- Morris, Odell A.: Wind-Tunnel Investigation of Sonic-Boom Characteristics of a Delta-Wing Combination at Mach Numbers of 1.41 and 2.01. NASA TN D-3455, June 1966.
- Zumwalt, Glen W.: Computation of the Pressure-Time History of a Sonic Boom Shock Wave Acting on a Window Glass in a Building. NASA CR-66169, June 1966.
- Carlson, Harry W.; and McLean, F. Edward: The Sonic Boom. *International Science and Technology*, July 1966.
- Carlson, Harry W.; McLean, F. Edward; and Middleton, Wilbur D.: Prediction of Airplane Sonic-Boom Pressure Fields. NASA Conference on Aircraft Operating Problems. May 10-12, 1965. NASA SP-83.
- Maglieri, Domenic J.; and Hilton, David A.: Significance of the Atmosphere and Aircraft Operations on Sonic-Boom Exposures. Presented at Conference on Aircraft Operating Problems, Langley Research Center, May 10-12, 1965. NASA SP-83.
- Maglieri, Domenic J.; and Hubbard, Harvey H.: Atmospheric Effects on Sonic Boom Signatures. Proceedings of Fifth International Congress on Acoustics, Liege, Belgium, September 7-14, 1965.
- McLean, F. Edward; Carlson, Harry W.; and Hunton, Lynn W.: Sonic-Boom Characteristics of Proposed Supersonic and Hypersonic Airplanes. NASA TN D-3587, 1966.
- Carlson, Harry W.; McLean, F. Edward; and Shrout, Barrett L.: A Wind-Tunnel Study of Sonic-Boom Characteristics for Basic and Modified Models of a Supersonic Transport Configuration. NASA TM X-1236, 1966.
- Jackson, Charlie M., Jr.; and Carlson, Harry W.: Nomograms for Determining Sonic Boom Overpressure. *J. Aircraft*, vol. 3, no. 1, January-February 1966.
- Maglieri, Domenic J.; Huckel, Vera; and Parrott, Tony L.: Ground Measurements of Shock-Wave Pressure for Fighter Airplanes Flying at Very Low Altitudes and Comments on Associated Response Phenomena. NASA TN D-3443, July 1966.
- Maglieri, Domenic J.; Hilton, David A.; and McLeod, N. J.: Experiments on the Effects of Atmospheric Refraction and Airplane Accelerations on Sonic-Boom Ground-Pressure Patterns. NASA TN D-3520, July 1966.

- Findley, Donald S.; Huckel, Vera; and Hubbard, Harvey H.: Vibration Response of Test Structure No. 2 During the Edwards Air Force Base Phase of the National Sonic Boom Program. LWP No. 259, August 5, 1966. (Superseded by NASA TM X-72704, June 1975.)
- Findley, Donald S.; Huckel, Vera; and Henderson, Herbert R.: Vibration Responses of Test Structure No. 1 During the Edwards Air Force Base Phase of the National Sonic Boom Program. LWP No. 288, September 1966. (Superseded by NASA TM X-72706, June 1975.)
- Callaghan, J. G.: A Feasibility Investigation Concerning the Simulation of Sonic Boom by Ballistic Models. NASA CR-603, October 1966.
- Hilton, David A.; Huckel, Vera; and Maglieri, Domenic J.: Sonic-Boom Measurements During Bomber Training Operations in the Chicago Area. NASA TN D-3655, October 1966.
- Carlson, Harry W.: Experimental and Analytical Research on Sonic Boom Generation at NASA. NASA SP-147, pp. 9-23.
- Brown, R.; and Van Houten, J. J.: Calibration of Photocon Pressure Transducer Model No. 464-150. NASA CR-66369, March 1967.
- Igoe, William B.: Application of Richardson's Extrapolation to Numerical Evaluation of Sonic Boom Integrals. NASA TN D-3806, March 1967.
- Maglieri, D. J.; Huckel, V.; Henderson, H. R.; and Putman, Terry: Preliminary Results of XB-70 Sonic Boom Field Tests During National Sonic Boom Evaluation Program. LWP No. 382, March 9, 1967. (Superseded by NSBEO 1-67, CFSTI, U.S. Dept. of Commerce, July 1967.)
- Garrick, I. E.; and Maglieri, D. J.: A Summary of Results on Sonic-Boom Pressure-Signature Variations Associated with Atmospheric Conditions. NASA TN D-4588, May 1968.
- Maglieri, Domenic J.: Sonic Boom Ground Pressure Measurements for Flights at Altitudes in Excess of 70,000 Feet and at Mach Numbers up to 3.0. Presented at Second Conference on Sonic Boom Research, NASA, Washington, D.C., May 9 and 10, 1968. NASA SP-180.
- Runyan, Harry L.; and Henderson, Herbert R.: Evaluation of Certain Minimum Boom Concepts. Presented at Second Conference on Sonic Boom Research, NASA, Washington, D.C., May 9 and 10, 1968. NASA SP-180.
- Hubbard, Harvey H.: Recent Results of Sonic Boom Research. Proceedings of the AFOSR-UTIAS Symposium on Aerodynamic Noise, Toronto, Canada, May 20 and 21, 1968.

- Dahlke, Hugo E.; Kantarges, George T.; Siddon, Thomas E.; and Van Houten, John J.: The Shock Expansion Tube and Its Application as a Sonic Boom Simulator. NASA CR-1055, June 1968.
- Van Houten, J. J.; and Brown, R.: Investigation of the Calibration of Microphones for Sonic Boom Measurement. NASA CR-1075, June 1968.
- Seebass, R.; and McLean, F. Edward: Far-Field Sonic Boom Waveforms. AIAA Journal, June 1968, pp. 1153-1155.
- Maglieri, Domenic J.; Huckel, Vera; and Henderson, Herbert R.: Sonic Boom Ground Pressure Measurements for Flights to Mach Number 3.0 and Altitudes in Excess of 70,000 Feet. LWP No. 627, July 1968. (Superseded by NASA TN D-6823, September 1972.)
- Crandall, Stephen H.; and Kurzweil, Leonard: On the Rattling of Windows by Sonic Booms. J. Acous. Soc. Amer., vol. 44, no. 2, August 1968, pp. 464-472.
- Goforth, Tom T.; and McDonald, John A.: Seismic Effects of Sonic Booms. NASA CR-1137, September 1968.
- Shepherd, L. J.; and Sutherland, W. W.: Relative Annoyance and Loudness Judgments of Various Simulated Sonic Boom Waveforms. NASA CR-1192, September 1968.
- Lukas, Jerome S.; and Kryter, Karl D.: A Preliminary Study of the Awakening and Startle Effects of Simulated Sonic Booms. NASA CR-1193, September 1968.
- Hubbard, Harvey H.; Maglieri, Domenic J.; and Mayes, William H.: Results of Recent NASA Research Pertinent to Aircraft Noise and Sonic-Boom Alleviation. Proceedings of the Sixth Congress of the International Council of the Aeronautical Sciences (ICAS), September 9-13, 1968, Munich, Germany.
- Barger, R. L.: Development of Sonic-Boom Signatures in a Stratified Atmosphere. NASA TN D-4890, November 1968.
- Lowery, R. L.: Critical Structural Response to the Sonic Boom. NASA CR-66750, December 1968.
- Popplewell, Neil: Response of Box-Type Structures to Sonic Booms. Ph.D. Thesis, University of Southampton, Institute of Sound and Vibration Research, 1969.
- Maglieri, Domenic J.; Huckel, Vera; Henderson, Herbert R.; and McLeod, Norman J.: Variability in Sonic-Boom Signatures Measured Along an 8,000-Foot Linear Array. NASA TN D-5040, February 1969.
- Carden, H. B.; and Mayes, W. H.: Experimental Forced Vibration Responses of Two Test Houses Used During the Edwards Air Force Base Phase of the National Sonic Boom Test Program. LWP No. 714, February 4, 1969.



- Parnes, Raymond: Effects of Boundary Restraints on the Dynamic Response of Circular Plates Subjected to Transients Such as Sonic Booms. LWP No. 716, February 11, 1969.
- Cheng, David H.; and Benveniste, Jacques E.: Dynamic Response of Structural Elements Exposed to Sonic Booms. NASA CR-1281, March 1969.
- Hayes, Wallace D.; Haefeli, Rudolph C.; and Kulsrud, H. E.: Sonic Boom Propagation in a Stratified Atmosphere, with Computer Program. NASA CR-1299, April 1969.
- Haefeli, Rudolph C.: Effects of Atmosphere, Wind, and Aircraft Maneuvers on Sonic Boom Signatures. NASA CR-66756, April 1969.
- McDonald, John A.; and Goforth, Tom T.: Seismic Effects of Sonic Booms: Empirical Results. J. Geophysical Research, vol. 74, no. 10, May 15, 1969.
- Powers, John O.; Sands, J. M.; and Maglieri, D. J.: Theory Calculation and Experimental Results. Presented at AGARD Fluid Dynamics Panel and Propulsion and Energetics Panel (33rd) Joint Meeting, Saint-Louis, France, May 27-30, 1969. AGARD Conference Proceedings No. 42.
- Henderson, Herbert R.; and Huckel, Vera: Sonic Boom Measurements Relating to Seismic Studies at the Payson, Arizona, and Vernal, Utah, Seismological Sites. LWP No. 428, June 9, 1969.
- Beasley, W. D.; Brooks, J. D.; and Barger, R. L.: A Laboratory Investigation of N-Wave Focusing. NASA TN D-5306, July 1969.
- Tombouliau, Roger: Research and Development of a Sonic Boom Simulation Device. NASA CR-1378, July 1969.
- Barger, Raymond L.: Procedure for Designing Supersonic Bodies of Revolution from Prescribed Surface Pressure Distribution. No. 4 of NASA SP-228, October 28-30, 1969. NASA Conference on Analytical Methods in Aircraft Aerodynamics at Ames, October 28-30, 1969.
- Miller, D. S.; and Carlson, Harry W.: A Study of the Application of Heat or Force Fields to the Sonic-Boom-Minimization Problem. NASA TN D-5582, December 1969.
- Anon.: Report of ICAO Second Sonic Boom Panel Meeting, October 12-21, 1970. DOC 8894, SBR/II, 1970.
- Hubbard, Harvey H.; and Maglieri, Domenic J.: Sonic Boom. McGraw-Hill Yearbook of Science and Technology, 1970, pp. 334-336.
- Morris, Odell S.: Experimental Studies of Sonic Boom Phenomena at High Supersonic Mach Numbers. Third NASA Conference on Sonic Boom Research. NASA SP-255, 1970.

- Carlson, Harry W.: Some Notes on the Present Status of Sonic Boom Prediction and Minimization Research. NASA SP-255, 3rd Conference on Sonic Boom Research, 1970, pp. 395-399.
- Lukas, Jerome S.; Peeler, Donald J.; and Kryter, Karl D.: Effects of Sonic Booms and Subsonic Jet Flyover Noise on Skeletal Muscle Tension and a Paced Tracing Task. NASA CR-1522, February 1970.
- Kurze, U. J.; Hayden, R. E.; Madden, R.; Allen, C. H.; and Ungar, E. E.: Sonic Boom Simulation by Means of Low-Pressure Sources. NASA CR-66969, March 1970.
- Cook, John C.; and Goforth, Tom T.: Ground Motion from Sonic Booms. J. Aircraft, vol. 7, no. 2, March-April 1970, pp. 126-129.
- Knapp, Lawrence J.; and Cheng, David H.: Linear and Nonlinear Response of a Rectangular Plate Subjected to Lateral and Inplane Sonic Boom Disturbances. NASA CR-66936, April 1970.
- Rao, Balusu, M.; and Zumwalt, Glen W.: Prediction of Geometry of Sonic Boom Waves Incident on Arbitrarily Oriented Plane Walls. J. Aircraft, vol. 7, no. 3, May-June 1970.
- Lukas, Jerome S.; and Kryter, Karl D.: Awakening Effects of Simulated Sonic Booms and Subsonic Aircraft Noise on Six Subjects, 7 to 72 Years of Age. NASA CR-1599, May 1970.
- Brooks, J. D.; Beasley, W. D.; and Barger, R. L.: A Laboratory Investigation of Diffraction and Reflection of Sonic Boom by Buildings. NASA TN D-5830, June 1970.
- Rao, B. M.; and Zumwalt, G. W.: Diffraction and Reflection of Sonic Boom Waves. J. De Mechanique, vol. 9, June 1970, pp. 309-324.
- Tracor, Inc.: Public Reactions to Sonic Booms. NASA CR-1665, September 1970.
- Goforth, Tom T.; and McDonald, John A.: A Physical Interpretation of Seismic Waves Induced by Sonic Booms. J. Geophysical Research, vol. 75, no. 26, September 10, 1970, pp. 5087-5092.
- Vaidya, P. G.: The Transmission of Sonic Boom Signals Into Rooms Through Open Windows - Part I: The Steady State Solution. NASA CR-111786, October 1970.
- Vaidya, P. G.: The Transmission of Sonic Boom Signals Into Rooms Through Open Windows - Part II: The Time Domain Solutions. NASA CR-111787, October 1970.
- Vaidya, P. G.: The Transmission of Sonic Boom Signals Into Rooms Through Open Windows - Part III: Experimental Work and General Discussion. NASA CR-111788, October 1970.

- Hubbard, H. H.; Maglieri, D. J.; and Huckel, V.: Variability of Sonic Boom Ground Exposure Signatures. Presented at Third Conference on Sonic Boom Research, Washington, D.C., October 29 and 30, 1970. NASA SP-255.
- Maglieri, D. J.; Hilton, D. A.; Huckel, V.; Henderson, H. R.; and McLeod, N. J.: Measurements of Sonic Boom Signatures from Flights at Cutoff Mach Number. Presented at Third Conference on Sonic Boom Research, Washington, D.C., October 29 and 30, 1970. NASA SP-255.
- Runyan, H. L.; Henderson, H. R.; Morris, O. A.; and Maglieri, D. J.: Measured and Calculated Sonic Boom Signatures from Six-Nonaxisymmetric Wind-Tunnel Models. Presented at Third Conference on Sonic Boom Research, Washington, D.C., October 29 and 30, 1970. NASA SP-255.
- Tombouljian, Roger; and Peschke, William: Description and Capabilities of a Traveling Wave Sonic Boom Simulator. NASA CR-1696, November 1970.
- Miller, D. S.: Status of Research on Boom Minimization Through Airstream Alteration. Third Conference on Sonic Boom Research, NASA SP-255, 1971.
- Carlson, Harry W.: Sonic Boom, Generation and Suppression of, Encyclopedia Dictionary of Physics, Supplementary Volume 4, Pergamon Press - Oxford and New York, 1971.
- Peschke, W.; Sanlorenzo, E.; and Abele, M.: Experimental Determination of Acoustic and Structural Behavior of Wall Panel-Cavity Configurations Exposed to Sonic Booms. NASA CR-111925, 1971.
- Shrout, Barrett L.; Mack, Robert J.; and Dollyhigh, Samuel M.: A Wind-Tunnel Investigation of Sonic-Boom Pressure Distributions of Bodies of Revolution at Mach 2.96, 3.83, and 4.63. NASA TN D-6195, 1971.
- Mack, Robert J.: An Improved Method for Calculating Supersonic Pressure Fields About Bodies of Revolution. NASA TN D-6508, 1971.
- Davy, Bruce A.; and Blackstock, David L.: Measurements of the Refraction and Diffraction of a Short N-Wave by a Gas-Filled Soap Bubble. J. Acous. Soc. Amer., vol. 49, no. 3 (part 2), March 1971, pp. 732-737.
- Pierce, Allan D.: Statistical Theory of Atmospheric Turbulence Effects on Sonic-Boom Rise Times. J. Acous. Soc. Amer., vol. 49, no. 3 (part 2), March 1971, pp. 906-924.
- Runyan, Harry L.; Henderson, Herbert R.; Morris, Odell A.; and Pusey, Christine G.: Investigation of Flow-Field Development for a Series of Sonic Boom Wind-Tunnel Models. NASA TN D-6143, March 1971.

- Miller, D. S.; Morris, O. A.; and Carlson, Harry W.: Wind-Tunnel Investigation of Sonic Boom Characteristics of Two Simple Wing-Body Models at Mach Numbers from 2.13 to 4.63. NASA TN D-6201, April 1971.
- Maglieri, Domenic J.; Carlson, Harry L.; and McLeod, Norman J.: Status of Studies on Sonic Boom. Presented at NASA Aircraft Safety and Operating Problems Conference, Langley Research Center, May 4-6, 1971, NASA SP-270.
- Lukas, J. S.; Dibbs, M. E.; and Peeler, D. J.: Effects on Muscle Tension and Tracing Task Performance of Simulated Sonic Booms with Low and High Intensity Vibrational Components. NASA CR-1781, June 1971.
- Pierce, A. D.: Scaling Laws for the Estimation of Peak Sonic Boom Overpressures During Maneuvers. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Schorling, M.: Calculation of Supersonic Flows at Large Distances From Inclined Slender Bodies of Revolution in a Stratified Atmosphere. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Schorling, Michael: Calculation of Supersonic Flows at Large Distances from Slender Lifting Bodies. NASA TN D-6446, August 1971.
- Miller, D. S.; and Carlson, H. W.: Application of Heat and Force Fields to Sonic-Boom Minimization. J. Aircraft, vol. 8, no. 8, August 1971, pp. 657-662.
- Hubbard, Harvey H.: Sonic Boom. Proceedings of 7th International Congress on Acoustics, Budapest, Hungary, August 18-26, 1971.
- Kryter, Karl D.: Methods and Results of Some Recent Studies of Arousal from Sleep by Noise and Booms. Proceedings of 4th Karolinska Institute Symposium on Environmental Health, Stockholm, Sweden, August 30 - September 4, 1971.
- Horning, W. A.: Sonic Boom in Turbulence. NASA CR-1879, September 1971.
- Lukas, Jerome S.: Awakening Effects of Simulated Sonic Booms and Aircraft Noise on Men and Women. Proceedings of Symposium on Sonic Boom Exposure Effects - Methods and Criteria, Saltsjobaden, Sweden, September 7-9, 1971.
- Lukas, J. S.: Awakening Effects of Simulated Sonic Booms and Aircraft Noise on Men and Women. J. Sound and Vibr., vol. 20, no. 4, 1972, pp. 457-466.
- Borsky, P. N.: Annoyance Reactions. Presented at Workshop on Sonic Boom Exposure Effects, Saltsjobaden, Sweden, September 7-9, 1971. J. Sound Vibr., vol. 20, no. 4, February 1972, pp. 527-530.

- Carlson, H. W.; and Maglieri, D. J.: Review of Sonic-Boom Generation Theory and Prediction Methods. J. Acous. Soc. Amer., vol. 51, no. 2 (part 3), February 1972, pp. 675-685.
- Hayes, Wallace D.; and Runyan, Harry L.: Sonic-Boom Propagation Through a Stratified Atmosphere. J. Acous. Soc. Amer., vol. 51, no. 2 (part 3), February 1972, pp. 695-701.
- Pierce, Allan D.; and Maglieri, Domenic J.: Effects of Atmospheric Irregularities on Sonic Boom Propagation. J. Acous. Soc. Amer., vol. 51, no. 2 (part 3), February 1972, pp. 702-721.
- Edge, Philip M., Jr.; and Hubbard, Harvey H.: Review of Sonic-Boom Simulation Devices and Techniques. J. Acous. Soc. Amer., vol. 51, no. 2 (part 3), February 1972, pp. 722-728.
- Clarkson, Brian L.; and Mayes, William H.: Sonic-Boom-Induced Building Structure Responses Including Damage. J. Acous. Soc. Amer., vol. 51, no. 2. (part 3), February 1972, pp. 742-758.
- Kryter, Karl D.; and Lukas, Jerome S.: Simulated Indoor Sonic Booms Judged Relative to Noise from Subsonic Aircraft. NASA CR-2106, August 1972.
- Maglieri, Domenic J.; Huckel, Vera; and Henderson, Herbert R.: Sonic-Boom Measurements for SR-71 Aircraft Operating at Mach Numbers to 3.0 and Altitudes to 24,384 Meters. NASA TN D-6823, September 1972.
- Hilton, David A.; Henderson, Herbert R.; and McKinney, Royce: Sonic-Boom Ground Pressure Measurements from Apollo 15. NASA TN D-6950, September 1972.
- Mack, Robert J.: A Study of Methods which Predict Supersonic Flow Fields from Body Geometry, Distance, and Mach Number Data. NASA TN D-7387, 1973.
- Parker, Lee W.; and Zalosh, Robert T.: Godunov Method and Computer Program to Determine the Pressure and Flow Field Associated with a Sonic Boom. NASA CR-2127, January 1973.
- Haglund, George T.; and Kane, Edward J.: Flight Test Measurements and Analysis of Sonic Boom Phenomena Near the Shock Wave Extremity. NASA CR-2167, February 1973.
- Schorling, Michael: A Nonlinear Theory for Sonic-Boom Calculations in a Stratified Atmosphere. NASA TN D-7105, March 1973.
- Carlson, H. W.; Barger, Raymond L.; and Mack, Robert J.: Application of Sonic Boom Minimization Concepts in Supersonic Transport Design. NASA TN D-7218, June 1973.

- Haglund, George T.; and Kane, Edward J.: Analysis of Sonic Boom Measurements Near Shock Wave Extremities for Flight Near Mach 1.0 and for Airplane Accelerations. NASA CF-2417.
- Henderson, Herbert R.; and Hilton, David A.: Sonic-Boom Ground Pressure Measurements from Launch and Reentry of Apollo 16. NASA TN D-7606, 1974.
- Henderson, Herbert R.; and Hilton, David A.: Sonic-Boom Measurements in the Focus Region During the Ascent of Apollo 17. NASA TN D-7806, 1974.
- Reed, Jack W.: Sonic Boom Measurements from Accelerating Supersonic Tracked Sleds. NASA CR-132388, 1974.
- Darden, Christine M.: Summary of Preliminary Low Sonic Boom Aircraft Studies. Paper presented at the Symposium on Blacks in Science and Engineering, Cleveland, Ohio, October 1974.
- Darden, Christine M.: Minimization of Sonic-Boom Parameters in Real and Isothermal Atmospheres. NASA TN D-6842, 1975.
- Darden, Christine M.: Comparison of Sonic-Boom Minimization Results in Real and Isothermal Atmospheres. J. Aircraft, vol. 12, no. 5, May 1975, pp. 496-497.
- Darden, Christine M.: Relaxation of Sonic Boom Minimization Requirements for Nose Bluntness. Presented at the 1975 Langley Basic Research Review, September 9 and 10, 1975, Langley Research Center, Hampton, Virginia.
- Darden, Christine M.: Sonic Boom Theory: Its Status in Prediction and Minimization. Presented at the AIAA 14th Aerospace Sciences Meeting, January 28-29, 1976, Washington, D. C.
- Darden, Christine M.; and Mack, Robert J.: Current Research in Sonic Boom Minimization. Presented at the NASA Supersonic Cruise Aircraft Research Conference, November 9-12, 1976, Langley Research Center, Hampton, Virginia.

## VI. AIRFLOW-SURFACE INTERACTION NOISE

Some of the topics covered in this section are as follows:

Turbulent Boundary Layers; Separated Flows; and Impinging  
Jet Flows from Upper Surface Blowing, Jet Augmented Flaps,  
and Externally Blown Flaps

Noise from Airframes Including Such Components as Struts,  
Cavities, Spoilers, Flaps, and Porous Surfaces

Free-Flight Tests and Simulation by Wind Tunnels and  
Tracked Vehicles

Lift Induced Ground Pressures

Radiated Noise, Surface Pressures, Correlation Areas, and  
Vorticity

## VI. AIRFLOW-SURFACE INTERACTION NOISE

- Corcos, G. M.; and Liepmann, H. W.: On the Contribution of Turbulent Boundary Layers to the Noise Inside a Fuselage. NACA TM 1420, December 1956.
- Hubbard, Harvey H.: Some Experiments Related to the Noise from Boundary Layers. Proceedings of Second International Congress on Acoustics, MIT, Cambridge, Massachusetts, June 17-23, 1956.
- Willmarth, William W.: Wall Pressure Fluctuations in a Turbulent Boundary Layer. NACA TN 4139, March 1958.
- Maglieri, D. J.; and Hubbard, H. H.: Preliminary Measurements of the Noise Characteristics of Some Jet-Augmented-Flap Configurations. NASA Memo 12-4-58L, January 1959.
- Willmarth, William W.: Space-Time Correlations and Spectra of Wall Pressure in a Turbulent Boundary Layer. NASA Memo 3-17-59W, March 1959.
- Maglieri, Domenic J.: Shielding Flap Type Jet Engine Noise Suppressor. J. Acous. Soc. of Amer., vol. 31, no. 4, April 1959, pp. 420-422.
- Mollo-Christensen, Erik: Some Aspects of Free Shear Layer Instability and Sound Emission. Fluid Dynamics Research Laboratory, MIT Memorandum 60-1, 1960.
- Garrick, I. E.; Hilton, D. A.; and Hubbard, H. H.: Recent Free-Flight Boundary-Surface Aerodynamic Noise Measurements. AGARD Report 467, April 1963.
- Smith, Robert D.: The Effects of Free Stream Turbulence and Vorticity on the Radiative Sound Field of a Free Jet. MIT Report ASRL TR-1013, August 1963.
- Hilton, D. A.: Scout Vehicle Aerodynamic Noise Measurements. Sound - Its Uses and Control, vol. 2, no. 5, September-October 1963.
- Murphy, J. S.; Bies, D. A.; Speaker, W. V.; and Franken, P. A.: Wind Tunnel Investigation of Turbulent Boundary Layer Noise as Related to Design Criteria for High Performance Vehicles. NASA TN D-2247, April 1964.
- Browand, F. K.: An Experimental Investigation of the Instability of an Incompressible, Separated Shear Layer. Aeroelastic and Structures Research Laboratory, MIT Report ASRL TR 92-4, January 1965.



- Speaker, W. V.; and Ailman, C. M.: Spectra and Space-Time Correlations of the Fluctuating Pressures at a Wall Beneath a Supersonic Turbulent Boundary Layer Perturbed by Steps and Shock Waves. NASA CR-486, May 1966.
- Potter, R. C.: An Experiment to Examine the Effect of Porous Trailing Edges on the Sound Generated by Blades in an Airflow. NASA CR-66565, March 1968.
- Black, Thomas J.: An Analytical Study of the Measured Wall Pressure Field Under Supersonic Turbulent Boundary Layers. NASA CR-888, April 1968.
- Ailman, C. M.; and Hopkins, A. S.: Narrow Band Cross-Correlation Analysis of Fluctuating Pressures Beneath a Turbulent Boundary Layer. NASA CR-1056, May 1968.
- Findley, D. S.: Comparison of Measured and Calculated Aircraft Lift Generated Pressures. LWP No. 653, August 29, 1968. (Superseded by NASA TM X-72707, June 1975.)
- Abuelhamid, Amr N.; and Dosanjh, Darshan S.: Shock Structure in Transversely Impinging Jet Flows. Proceedings of ASME Applied Mechanics and Fluids Engineering Conference, Evanston, Illinois, June 16-18, 1969.
- Heller, Hanno H.; and Widnall, Sheila E.: Sound Radiation from Rigid Flow Spoilers Correlated with Fluctuating Forces. J. Acous. Soc. Amer., vol. 47, no. 3 (part 2), March 1970, pp. 925-936.
- Maestrello, Lucio; and Linden, Thomas L.: Response of an Acoustically Loaded Panel Excited by Supersonically Convected Turbulence. J. Sound Vib., vol. 9, no. 3, 1971, pp. 365-384.
- Chestnutt, David; Copeland, William L.; and Clark, Lorenzo R.: Noise Generation by Plates in the Presence of Jets. Part D. LWP No. 989, September 14, 1971.
- Hardin, Jay C.; Krein, Walter; and Dorsch, Robert: Dynamic Pressure Measurements on a Half Scale Externally Blown Flap Model in Results of Free-Flight Simulation Noise and Loads Investigations Related to the NASA Experimental STOL Transport Research Airplane. LWP No. 989, September 1971.
- Budoff, Marvin; and Zorumski, William E.: Flow Resistance of Perforated Plates in Tangential Flow. NASA TM X-2361. October 1971.
- Heller, Hanno H.; and Holmes, D. Graham: Unsteady Aerodynamic Loads During Reentry of the Straight-Wing Orbiter Configuration. NASA CR-111960, October 1971.

- Hubbard, Harvey H.; Chestnutt, David; and Maglieri, Domenic J.:  
Noise Control Technology for Jet-Powered STOL Vehicles. Proceedings  
of 8th ICAS Congress, Amsterdam, The Netherlands, August 28 to  
September 2, 1972.
- Dorsch, Robert G.; Lasangna, Paul L.; Maglieri, Domenic J.; and Olsen,  
William A.: Flap Noise. Proceedings of Conference on Aircraft  
Engine Noise Reduction, Lewis Research Center, Cleveland, Ohio,  
May 16 and 17, 1972. NASA SP-311.
- Lansing, D. L.; Drischler, J. A.; Brown, T. J.; and Mixson, J. S.:  
Dynamic Loading of Aircraft Surfaces due to Jet Exhaust Impingement.  
Proceedings of AGARD Specialists Meeting on Sonic Fatigue, Toulouse,  
France, September 26 and 27, 1972.
- Lansing, D. L.; Mixson, J. S.; Brown, T. J.; and Drischler, J. A.:  
Externally Blown Flap Dynamic Loads. Proceedings of NASA STOL  
Technology Conference, Ames Research Center, October 17-19, 1972.  
NASA SP-307.
- Chestnutt, D.; Hayden, R. E.; and Maglieri, D. J.: Flap Noise Generation  
and Control. Proceedings of NASA STOL Technology Conference, Ames  
Research Center, October 17-19, 1972. NASA SP-307.
- Gibson, Frederick W.: Noise Measurements of Model Jet-Augmented Lift  
Systems. NASA TN D-6710, 1972.
- Harris, Wesley L., Sr.: Application of Quasi-Linearization Techniques to  
the Analysis of Aerodynamic-Noise Fields. NASA CR-112084, 1972.
- Hayden, Richard E.: Noise From Interaction of Flow With Rigid Surfaces:  
A Review of Current Status of Prediction Techniques. NASA CR-2126,  
1972.
- Hayden, Richard E.; Kadman, Yoram; and Chanaud, Robert C.: A Study of  
the Variable Impedance Surface Concept as a Means for Reducing  
Noise from Jet Interaction with Developed Lift-Augmenting Flaps.  
NASA CR-112166, January 2, 1973.
- Hayden, R. E.; Scharton, T. D.; Kadman, Y.; Wilby, J.; and Rudd, M. J.:  
A Preliminary Evaluation of Noise Reduction Potential for the Upper  
Surface Blown Flap. NASA CR-112246, April 1973.
- Scharton, Terry D.; Pinkel, Benjamin; and Wilby, John F.: A Study of  
Trailing Edge Blowing as a Means of Reducing Noise Generated by  
the Interaction of Flow with a Surface. NASA CR-132270, June 1973.

- Smith, Charles C., Jr.; Phelps, Arthur E. III; and Copeland, William L.: Large-Scale Wind-Tunnel Investigation of a Semispan Wing with an Upper-Surface Blown Jet Flap. LWP No. 1115, June 26, 1973.
- Schreeker, G. O.; and Maus, J. R.: Noise Characteristics of Jet Flap Type Exhaust Flows. NASA CR-2342, 1973.
- Healy, Gerald J.: Measurement and Analysis of Aircraft Far-Field Aerodynamic Noise. NASA CR-2377, 1974.
- Gibson, John S.: Non-Engine Aerodynamic Noise Investigation of a Large Aircraft. NASA CR-2378, 1974.
- Smith, Charles C., Jr.; Phelps, Arthur E. III; and Copeland, W. Latham: Wind-Tunnel Investigation of a Large-Scale Semispan Model with an Unswept Wing and an Upper-Surface Blown Jet Flap. NASA TN D-7526, February 1974.
- Hastings, Earl C., Jr.; Shanks, Robert E.; Champine, Robert A.; Copeland, W. Latham; and Young, Douglas C.: Preliminary Results of Flight Tests of Vortex Attenuating Splines. TM X-71928, March 1974.
- Pan, Y. S.; and Preisser, John S.: A Method for Studying Near- and Far-Field Noise Characteristics of Impinging Jets. Presented at the AIAA 7th Fluid and Plasma Dynamics Conference, June 1974. AIAA Paper No. 74-569.
- Pan, Y. S.: A Study of Impinging Jet-Noise Characteristics of Cross-Correlation Techniques. Proceedings of 2nd Interagency Symposium on University Research in Transportation Noise, N.C. State Univ., Raleigh, N.C., June 5-7, 1974.
- Yu, J. C.; Reddy, N. N.; and Whitesides, J. L.: Noise and Flow Characteristics of an Externally Blown Flap. Proceedings of the 2nd Interagency Symposium on University Research in Transportation Noise, N. C. State Univ., N. C., June 5-7, 1974.
- Foss, John F.: Vorticity Effects in a Large Angle Oblique Jet Impingement Flow. Proceedings of the 2nd Interagency Symposium on University Research in Transportation Noise, N. C. State Univ., Raleigh, N. C., June 5-7, 1974.
- Hardin, J. C.: Noise Produced by the Large-Scale Transition Region Structure of Turbulent Jets. AIAA Paper Presented at the AIAA 7th Fluid and Plasma Dynamics Conf., Palo Alto, California, June 1974. AIAA Paper No. 74-550.
- Morgan, Homer G.; and Hardin, Jay C.: Airframe Noise - The Next Aircraft Noise Barrier. Presented at the AIAA 6th Aircraft Design, Flight Test and Operations Meeting, Los Angeles, California, August 1974. AIAA Paper No. 74-949.

- Reed, James B.; and Schoenster, James A.: Fluctuation Surface Measurements on USB Wing Using Two Types of Transducers. NASA TM X-72775, 1975.
- Block, Patricia J.; and Heller, Hanno: Measurements of Far Field Sound Generation from a Flow-Excited Cavity. NASA TM X-3292, 1975.
- Hardin, Jay C.; Fratello, David J.; Hayden, Richard E.; Kadman, Yoran; and Africk, Steven: Prediction of Airframe Noise. NASA TN D-7821, 1975.
- Reddy, N. N.; and Yu, J. C.: Radiated Noise from an Externally Blown Flap. NASA TN D-7908, 1975.
- Fratello, David J.; and Shearin, John G.: A Preliminary Investigation of Remotely Piloted Vehicles for Airframe Noise Research. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Mixson, John S.; Schoenster, James A.; and Willis, Conrad M.: Fluctuating Pressures on Aircraft Wing and Flap Surfaces Associated with Powered-Lift Systems. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Preisser, John S.; and Fratello, David J.: Acoustic Characteristics of a Large Upper-Surface Blown Configuration with Turbofan Engines. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Shearin, J. G.; and Block, P. J.: Airframe Noise Measurements on a Transport Model in a Quiet Flow Facility. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Morgan, Homer G.; and Hardin, J. C.: Airframe Noise - The Next Aircraft Noise Barrier. AIAA Journal of Aircraft, July 1975.
- Reed, James B.; and Schoenster, James A.: Fluctuating Surface Pressure Measurements on USB Wing Using Two Types of Transducers. Presented at the 90th Meeting of the Acoustical Society of America, November 1975.
- Schroeder, J. C.; and Haviland, J. K.: Fluctuating Pressures in Flow Fields of Jets. Presented at the 28th Annual Meeting of the American Physical Society - Division of Fluid Dynamics, November 1975.
- Foss, J. F.; and Kleis, S. J.: Vorticity and Acoustic Measurements in Vertically Impinging Jet Flows. Presented at 3rd Interagency Symposium on University Research in Transportation Noise, Univ. Utah, November 1975.

- Karamcheti, K.; Wooley, J. P.; and Guenther, J. L.: An Analytical Study of Noise Generation by Subsonic Flows in the Presence of Rigid Surfaces. NASA CR-145027, 1976. (NAS1-13699 Nielsen Engineering and Research, Inc.)
- Fratello, David J.; and Shearin, John G.: A Preliminary Investigation of Airframe Noise Using Remotely Piloted Vehicles. AIAA Progress in Astronautics and Aeronautics, 1976.
- Paterson, Robert W.; and Amiet, Roy K.: Acoustic Radiation and Surface Pressure Characteristics of an Airfoil Due to Incident Turbulence. NASA CR-2733, 1976. (NAS1-13823 United Aircraft Corporation)
- Preisser, John S.; and Fratello, David J.: Acoustic Characteristics of a Large Upper-Surface Blown Configuration in a Wind Tunnel. AIAA Progress in Astronautics and Aeronautics, 1976.
- Shearin, J. G.; and Block, P. J.: Preliminary Noise Measurements on a Transport Model in a Quiet Flow Facility. AIAA Progress in Astronautics and Aeronautics, 1976.
- Block, Patricia J. W.: Noise Response of Cavities of Varying Dimensions at Subsonic Speeds. NASA TN D-8351, 1976.
- Bliss, Donad B.; and Hayden, Richard E.: Landing Gear and Cavity Noise Prediction. NASA CR-2714, 1976. (L-18051A Bolt Beranek and Newman, Inc.).
- Hayden, Richard E.: Exploratory Investigation of Aeroacoustic Optimization of the Variable Impedance Edge Concept. NASA CR-145072, 1976 (NAS1-13896 Bolt Beranek and Newman, Inc.).
- Hayden, R. E.; Fox, H. L.; and Chanaud, R. C.: Some Factors Influencing Radiation of Sound from Flow Interaction with Edges of Finite Surfaces. NASA CR-145073, 1976 (NAS1-9559-25 Bolt Beranek and Newman, Inc.).
- Hardin, J. C.; and Mason, Jean P.: A Vortex Model of Cavity Flow. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976.
- Preisser, John S.; and Block, Patricia J. W.: An Experimental Study of the Aeroacoustics of a Subsonic Jet Impinging Normal to a Large Rigid Surface. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976.

- Shearin, John G.; Fratello, David J.; Bohn, A. J.; and Burggraf, W. D.: Model and Full-Scale Large Transport Airframe Noise. Presented at the AIAA 3rd Aeroacoustics Conference, July 1976.
- Reddy, N. N.; and Yu, J. C.: Noise from Turbulent Jet Flow Over Wing/Flap Surfaces. Presented at 3rd AIAA Aeroacoustics Conference, Palo Alto, CA. AIAA Paper No. 76-522, July 1976.
- Foss, J. C.: Accuracy and Uncertainty of Transverse Vorticity Measurement. Presented at NSF-CBMS Region Conference on Computational Fluid Dynamics and Turbulence Theory, Virginia Beach, VA August 1976.
- Hardin, J. C.: Numerical Simulation of Turbulence by Point Vortices. Presented at NSF-CBM; Regional Conference on Computational Fluid Dynamics and Turbulence Theory, Virginia Beach, VA, August 1976.
- Woolley, J. P.; Karmacheti, K.; and Guenther, J. L.: An Analytical Study of Noise Generation by Subsonic Flows in the Presence of Rigid Surfaces. NASA CR-145027, October 1976.
- Hardin, Jay C.: Airframe Noise - A Design and Operating Problem. Presented at the NASA Conference on Aircraft Safety and Operating Problems, October 1976.
- Hardin, Jay C.: Airframe Self-Noise - Four Years of Research. Presented at the AGARD-VKI Lecture Series No. 80 on "Aerodynamic Noise," December 1976.
- Ramakrishnan, R.: Sound Radiation from a Turbulent Wall Jet with Compliance Boundary. Ph.D. Thesis, George Washington University, January 1977.
- Clark, L. R.; and Yu, J. C.: Effects of Geometry and Jet Velocity on Noise Associated with an Upper-Surface-Blowing Model. NASA TN D-8386, 1977.

## VII. STRUCTURAL RESPONSE

Some of the topics covered in this section are as follows:

Noise and Sonic Boom Induced Responses of Panels, Beams,  
Windows, Walls, Cavities, Ground Buildings, Aircraft  
Structures, and Acoustic Materials

Deflections, Accelerations, Stresses, and Crack Growth

Damage Minimization

Modal Density Concepts

Acoustic Loads Prediction

Test Facilities, Equipment, and Methods

## VII. STRUCTURAL RESPONSE

- London, Albert: Principles, Practice, and Progress of Noise Reduction in Airplanes. NACA TN 748, January 1940.
- Rzhevkin, S. N.: Resonance Sound Absorber with Yielding Wall. NACA TM 1273, May 1951.
- Sperry, William C.: Noise and Vibration Control for Wind Tunnels. Master's Thesis, University of Virginia, June 1953.
- Hess, Robert W.; Lassiter, Leslie W.; and Hubbard, Harvey H.: A Study of the Response of Panels to Random Acoustic Excitation. NACA RM L55E13c, July 15, 1955.
- Regier, Arthur A.: Noise, Vibration, and Aircraft Structures. Aeronautical Engineering Review, vol. 15, no. 8, August 1956, pp. 56-61.
- Lassiter, Leslie W.; Hess, Robert W.; and Hubbard, Harvey H.: An Experimental Study of the Response of Simple Panels to Intense Acoustic Loading, J. Aeronautical Sciences, vol. 24, no. 1, January 1957, pp. 19-24.
- Hubbard, Harvey H.; and Hess, Robert W.: Acoustic Fatigue Problem of Aircraft and a Discussion of Some Recent Related Laboratory Studies. Proceedings of the 24th Shock and Vibration Symposium, San Francisco, California, November 13 and 14, 1956.
- Hess, Robert W.; Fralich, Robert W.; and Hubbard, Harvey H.: Studies of Structural Failure due to Acoustic Loading. NACA TN 4050, July 1957.
- Lassiter, L. W.; and Hess, R. W.: Calculated and Measured Stresses in Simple Panels Subject to Intense Random Acoustic Loading Including the Near Noise Field of a Turbojet Engine. NACA TN 4076, 1958.
- Houbolt, John C.: On the Response of Panels Subject to a Flow Field Containing Random Disturbances. Proceedings of the 26th Shock and Vibration Symposium, Naval Training Center, San Diego, California, May 21 and 22, 1958.
- Regier, A. A.; and Hubbard, H. H.: Noise Induced Structural Fatigue. Noise Control, July 1959.
- Hess, Robert W.; Herr, Robert W.; and Mayes, William H.: A Study of the Acoustic Fatigue Characteristics of Some Flat and Curved Aluminum Panels Exposed to Random and Discrete Noise. NASA TN D-1, August 1959.
- Regier, Arthur A.; and Hubbard, Harvey H.: Response of Structures to High Intensity Noise. Noise Control, vol. 5, no. 5, September 1959, pp. 13-19.



- Clevenson, Sherman A.; and Brooks, George W.: Considerations of Vibration Environments in Space Flight Systems. Proceedings of the 1960 National Meeting of the Institute of Environmental Sciences, Los Angeles, California, April 6-8, 1960.
- Kantarges, G. T.: Some Measurements of Noise Transmission and Stress Response of a 0.020-Inch Duralumin Panel in the Presence of Air Flow. NASA TN D-459, September 1960.
- Hubbard, H. H.; and Houbolt, J. C.: Vibration Induced by Acoustic Waves. Shock and Vibration Handbook, vol. 3, chapter 48, 1961, edited by C. M. Harris and C. E. Crede.
- Hubbard, H. H.; Edge, P. M., Jr.; and Modlin, C. T., Jr.: Design Considerations for Minimizing Acoustic Fatigue in Aircraft Structures. (Proceedings of WADC - University of Minnesota Conference on Acoustical Fatigue, September 30 - October 2, 1959) WADC Technical Report 59-676, March 1961.
- Clevenson, S. A.; Hilton, D. A.; and Lauten, W. T., Jr.: Vibration and Noise Environmental Studies of Project Mercury. Proceedings of the Institute of Environmental Sciences, National Meeting, April 5-7, 1961, Washington, D.C.
- Edge, P. M., Jr.: Acoustic Fatigue Tests Relating to the Design of Structures for Elevated Temperatures. Proceedings of Symposium on Structural Dynamics of High Speed Flight, vol. 1, Los Angeles, California, April 24-26, 1961.
- Mayes, W. H.; and Edge, P. M., Jr.: Application of a Blowdown Wind Tunnel for Large-Scale Acoustic Environmental Testing. Sound - Its Uses and Control, March-April 1962.
- Parrott, T. L.: Experimental Studies of Glass Breakage Due to Sonic Booms. Sound - Its Uses and Control, May-June 1962.
- Maidanik, Gideon: Response of Ribbed Panels to Reverberant Acoustic Fields. J. Acous. Soc. Amer., vol. 34, no. 6, June 1962, pp. 809-826.
- Lyon, Richard H.: Sound Radiation from a Beam Attached to a Plate. J. Acous. Soc. Amer., vol. 34, no. 9 (part 1), September 1962, pp. 1265-1268.
- Heckl, Manfred: Vibrations of Point Driven Cylindrical Shells. J. Acous. Soc. Amer., vol. 34, no. 10, October 1962, pp. 1553-1557.
- Regier, A. A.; Mayes, W. H.; and Edge, P. M., Jr.: Some Noise Problems Associated with the Launching of Large Space Vehicles. Sound - Its Uses and Control, November-December 1962.

- Smith, Preston W.: Resonances of a Periodically Supported Beam and Its Coupling to Sound. Bolt Beranek and Newman, Inc. Report No. 976, February 28, 1963.
- Freyrik, H. S., Jr.: Response of Windows to Random Noise. Sound - Its Uses and Control, vol. 2 no. 3, May-June 1963.
- Lyon, Richard H.: Noise Reduction of Rectangular Enclosures with One Flexible Wall. J. Acous. Soc. Amer., vol. 35, no. 11, November 1963.
- Mayes, W. H.: The Response of a Model Structure to Jet Noise. Master's Thesis, Institute of Sound and Vibration, Univ. of Southampton, England, June 1964.
- Cheng, David H.: Some Dynamic Effects of Sonic Booms on Building Structural Elements. LWP No. 25, August 14, 1964.
- Mayes, William H.; and Edge, Philip M., Jr.: Effects of Sonic Boom and Other Shock Waves on Buildings. Materials Research and Standards, vol. 4, no. 11, November 1964, pp. 588-593.
- Copeland, W. Latham; and Mayes, William H.: Measurements of Far-Field Noise and Associated Building Vibrations During Scout Vehicle Launches. LWP No. 62, January 5, 1965.
- Bennett, R. V.: Investigation of the Fatigue Performance of Visco-Elastic Panels at Elevated Temperatures. NASA CR-162, February 1965.
- Smith, Preston W., Jr.; and Lyon, Richard H.: Sound and Structural Vibration. NASA CR-160, March 1965.
- Clark, Buhr, and Nexen, Inc.: Report of Architect and Engineer Services for Studies of Sonic Boom Induced Damage. NASA CR-227, 1965.
- Mueller, Arnold W.; and Edge, Philip M., Jr.: Laboratory Simulation of the Combined Acoustic-Vibration Environment of Launch Vehicle Onboard Electronic Equipment. Proceedings of Institute of Environmental Sciences 1965 Annual Technical Meeting, Chicago, Illinois, April 21-23, 1965, pp. 299-303.
- Edge, Philip M., Jr.; and Mayes, William H.: Some Initial Results of Low-Frequency Noise Research. Proceedings of NASA Conference on Langley Research Related to Apollo Mission, Langley Research Center, June 22-24, 1965, pp. 179-188.

- Cheng, David H.: Dynamic Response of Structural Elements to Traveling N-Shaped Pressure Waves. LWP No. 147, September 15, 1965.
- Hart, F. D.: Statistical Methods in Sound and Structural Vibration Analysis. LWP No. 169, December 3, 1965.
- Mayes, William H.; and Newman, James W.: Analytical Study of the Response of a Single-Degree-of-Freedom System to Sonic-Boom Type Loadings. LWP No. 154, February 16, 1966.
- Moskal, B. J.: Investigation of the Sonic Fatigue Characteristics of Randomly Excited Aluminum Viscoelastic Panels at Ambient Temperatures. NASA CR-425, April 1966.
- Baron, Melvin L.; Bleich, Hans H.; and Wright, Joseph P.: An Investigation of Ground Shock Effects Due to Rayleigh Waves Generated by Sonic Booms. NASA CR-451, May 1966.
- Zumwalt, Glen W.: Computation of the Pressure-Time History of a Sonic Boom Shock Wave Acting on a Window Glass in a Building. NASA CR-66169, June 1966.
- Lowery, Richard L.; and Andrews, Don K.: Acoustical and Vibrational Studies Relating to an Occurrence of Sonic Boom Induced Damage to a Window Glass in a Store Front. NASA CR-66170, July 1966.
- Findley, Donald S.; Huckel, Vera; and Henderson, Herbert R.: Vibration Responses of Test Structure No. 1 During the Edwards Air Force Base Phase of the National Sonic Boom Program. LWP No. 259, August 1966. (Superseded by NASA TM X-72706, June 1975.)
- Lyon, R. H.; Dietrich, C. W.; Ungar, E. E.; Pyle, R. W.; and Apfel, R. E.: Low-Frequency Noise Reduction of Spacecraft Structures. NASA CR-589, September 1966.
- Findley, Donald S.; Huckel, Vera; and Hubbard, Harvey H.: Vibration Response of Test Structure No. 2 During the Edwards Air Force Base Phase of the National Sonic Boom Program. LWP No. 288, September 1966. (Superseded by NASA TM X-72704, June 1975.)
- Bies, David Alan: A Review of Flight and Wind Tunnel Measurements of Boundary Layer Pressure Fluctuations and Induced Structural Response. NASA CR-626, October 1966.
- Anderson, Henry; and Parrott, Tony L.: Static and Dynamic Strain Responses of Simply Supported Beams of Fiber Metal. LWP No. 342, December 1966.

- Whitehouse, G. D.: Coupled and Uncoupled Panel Response to Sonic Boom Type Inputs. Ph.D. Thesis, Oklahoma State University, May 1967.
- Reddy, N. N.: Response Spectra of Coupled Acoustical Resonators to Transient Excitation. Ph.D. Thesis, Oklahoma State University, May 1967.
- Mueller, Arnold W.; and Mayes, William H.: Low Frequency Acoustic Environmental Tests of Some Apollo Mobile Launcher Equipment. LWP No. 406, May 1, 1967.
- Miller, David K.; and Hart, Franklin D.: Modal Density of Thin Circular Cylinders. NASA CR-897, December 1967.
- Carden, Huey D.; Findley, Donald S.; and Dibble, Andrew C., Jr.: Vibration Response Measurements on Two Types of Residential Buildings. LWP No. 519, December 1967.
- Cheng, David H.; and Benveniste, Jacques E.: Sonic Boom Effects on Structures — A Simplified Approach. Transactions of the New York Academy of Sciences, series II, vol. 30, no. 3, January 1968, pp. 457-478.
- Findley, Donald S.; Carden, Huey D.; and Dibble, Andrew C., Jr.: Further Vibration Studies of House Structures with Special Reference to the Rattling of Wall Mounted Objects. LWP No. 538, January 1968.
- Robert W. Benson and Associates: Evaluation of Simulation Procedures for High Intensity Noise Fields. NASA CR-66576, April 1968.
- Seshadri, T. V.: Transient Response of Mechano-Acoustical Networks. Ph.D. Thesis, Oklahoma State University, May 1968.
- Rucker, Carl E.: Tensile and Reversed Bending Fatigue Life Properties of Three Densities of 347 Stainless Steel Fibermetal - A Possible Noise Reduction Material. LWP No. 621, July 8, 1968.
- Crandall, Stephen H.; and Kurzweil, Leonard: On the Rattling of Windows by Sonic Booms. J. Acous. Soc. Amer., vol. 44, no. 2, August 1968, pp. 464-472.
- Mueller, Arnold W.: Static and Dynamic Response of a Specially Designed Window Pane of the Saturn V Launch Control Center. LWP No. 654, September 1968.
- Bailey, J. Ronald; and Hart, Franklin D.: Noise Reduction Shape Factors in the Low-Frequency Range. NASA CR-1155, September 1968.
- Craggs, Anthony: The Response of a Simply Supported Plate to Transient Forces. Part I - The Effect of N-Waves at Normal Incidence. NASA CR-1175, September 1968.

- Craggs, Anthony: The Response of a Simply Supported Plate to Transient Forces. Part II - The Effect of N-Waves at Oblique Incidence. NASA CR-1176, September 1968.
- Mayes, William H.; Findley, Donald S.; and Carden, Huey D.: House Vibrations Significant for Indoor Subjective Response. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Craggs, Anthony: Transient Vibration Analysis of Linear Systems Using Transition Matrices. NASA CR-1237, November 1968.
- Lowery, R. L.: Critical Structural Response to the Sonic Boom. NASA CR-66750, December 1968.
- Rucker, Carl E.: Tensile and Reversed Bending Fatigue Life Properties of Three Thicknesses of 347 Stainless Steel Fibermetal - A Possible Noise Reduction Material. LWP No. 696, December 26, 1968.
- Popplewell, Neil: Response of Box-Type Structures to Sonic Booms. Ph.D. Thesis, University of Southampton, Institute of Sound and Vibration Research, 1969.
- Rucker, Carl E.: Tensile and Reversed Bending Fatigue Life Properties of Three Fiber Diameters of 347 Stainless Steel Fibermetal - A Possible Noise Reduction Material. LWP No. 702, January 16, 1969.
- Carden, Huey D.; and Mayes, William H.: Experimental Forced Vibration Responses of Two Test Houses Used During the Inwards Air Force Base Phase of the National Sonic Boom Test Program. LWP No. 714, February 4, 1969. (Superseded by NASA TM X-72705, June 1975.)
- Parnes, Raymond: Effects of Boundary Restraints on the Dynamic Response of Circular Plates Subjected to Transients Such as Sonic Booms. LWP No. 716, February 11, 1969.
- Cheng, David H.; and Benveniste, Jacques E.: Dynamic Response of Structural Elements Exposed to Sonic Booms. NASA CR-1281, March 1969.
- McDonald, John A.; and Goforth, Tom T.: Seismic Effects of Sonic Booms: Empirical Results. J. Geophysical Research, vol. 74, no. 10, May 15, 1969.
- Henderson, Herbert R.; and Huckel, Vera: Sonic Boom Measurements Relating to Seismic Studies at the Payson, Arizona, and Vernal, Utah, Seismological Sites. LWP No. 428, June 9, 1969.

- Rucker, Carl E.: Effects of Surface Reinforcing Screens on the Tensile and Reversed Bending Fatigue Life Properties of 347 Stainless Steel Fibermetal - A Possible Noise Reduction Material. LWP No. 750, June 9, 1969.
- Pierce, Harold B.; and Mayes, W. H.: Description of Hypersonic Boundary Layer Noise Flight Measurement Program. Presented at Basic Aerodynamic Noise Research Conference, NASA Headquarters, Washington, D.C., July 14 and 15, 1969. NASA SP-207.
- Craggs, A.: The Transient Response of Coupled Acousto-Mechanical Systems. NASA CR-1421, August 1969.
- Runkel, Charles J.; and Hart, Franklin D.: The Radiation Resistance of Cylindrical Shells. NASA CR-1437, October 1969.
- Mueller, Arnold W.: Model Studies to Determine Low Frequency Noise Reduction of Spacecraft. Proceedings of the 40th Shock and Vibration Symposium, Hampton, Virginia, October 21-23, 1969.
- Carden, Huey D.; Findley, Donald S.; and Mayes, William H.: Building Vibrations Due to Aircraft Noise and Sonic-Boom Excitation. Proceedings of Symposium on Machinery Noise Held in Connection with the 1969 ASME Annual Meeting, Los Angeles, California, November 16-21, 1969.
- Runkel, C. J.; and Hart, F. D.: The Radiation Resistance of Cylindrical Shells Exhibiting Axisymmetric Mode Shapes. The Shock and Vibration Bulletin, Bulletin 40, part 3, December 1969, pp. 23-30.
- Crandall, Stephen H.: Distribution of Maxima in the Response of an Oscillator to Random Excitation. J. Acous. Soc. Amer., vol. 47, no. 3 (part 2), March 1970, pp. 838-845.
- Miller, David K.; and Hart, Franklin D.: The Density of Eigenvalues in Thin Circular Conical Shells. NASA CR-1497, March 1970.
- Knapp, Lawrence J.; and Cheng, David H.: Linear and Nonlinear Response of a Rectangular Plate Subjected to Lateral and Inplane Sonic Boom Disturbances. NASA CR-66936, April 1970.
- Carden, Huey D.; and Mayes, William H.: Measured Vibration Response Characteristics of Four Residential Structures Excited by Mechanical and Acoustical Loadings. NASA TN D-5776, April 1970.
- Nelson, Thomas F.: An Investigation of the Effects of Surrounding Structure on Sonic Fatigue. NASA CR-1536, May 1970.
- Young, J. R.: Attenuation of Aircraft Noise by Wood-Sided and Brick-Veneered Frame Houses. NASA CR-1637, 1970.
- Goforth, Tom T.; and McDonald, John A.: A Physical Interpretation of Seismic Waves Induced by Sonic Booms. J. Geophysical Research, vol. 75, no. 26, September 10, 1970, pp. 5087-5092.

- Vaidya, P. G.: The Transmission of Sonic Boom Signals into Rooms Through Open Windows - Part I; The Steady State Solution. NASA CR-111786, October 1970.
- Vaidya, P. G.: The Transmission of Sonic Boom Signals into Rooms Through Open Windows - Part II; The Time Domain Solutions. NASA CR-111787, October 1970.
- Vaidya, P. G.: The Transmission of Sonic Boom Signals into Rooms Through Open Windows - Part III; Experimental Work and General Discussion. NASA CR-111788, October 1970.
- Clarkson, Brian L.; and Mayes, William H.: Sonic Boom Induced Building Structure Responses Including Damage. J. Acous. Soc. Amer., vol. 51, no. 2 (part E), February 1972, pp. 742-758.
- Rudder, F. F., Jr.: Study of Effects of Design Details on Structural Response to Acoustic Excitation. NASA CR-1959, 1971.
- Kurzweil, Leonard G.: Seismic Excitation of Footings and Footing-Supported Structures. Ph.D. Thesis, MIT, 1971.
- Crandall, Stephen H.; and Lotz, Robert: On the Coupling Loss Factor in Statistical Energy Analysis. J. Acous. Soc. Amer., vol. 49, no. 1 (part 2), January 1971, pp. 352-356.
- Pescke, W.; and SanLorenzo, E.; and Abele, M.: Experimental Determination of Acoustic and Structural Behavior of Wall Panel-Cavity Configurations Exposed to Sonic Booms. NASA CR-111925, 1971.
- Craggs, A.: The Transient Response of a Coupled Plate-Acoustic System Using Plate and Acoustic Finite Elements. J. Sound Vib., vol. 15, no. 4, April 1971, pp. 509-528.
- Coe, Charles F.; Dods, Jules B., Jr.; Robinson, Robert C.; and Mayes, William H.: Preliminary Measurements and Flow Visualization Studies of Pressure Fluctuations on Space Shuttle Configurations. NASA TM X-2274, April 1971.
- Maestrello, Lucio; and Linden, Thomas L.: Measurements of the Response of a Panel Excited by Shock Boundary-Layer Interaction. J. Sound Vib., vol. 16, no. 3, June 1971, pp. 385-391.
- Hart, F. D.; and Shah, K. C.: Compendium of Modal Densities for Structures. NASA CR-1773, July 1971.
- Clarkson, B. L.: Aircraft Structural Response and Fatigue in a High Intensity Noise Environment. Proceedings of Purdue Noise Control Conference, Lafayette, Indiana, July 14-16, 1971.
- Crandall, S. H.; Kurzweil, L. G.; and Nigam, A. K.: On the Measurement of Poisson's Ratio for Modeling Clay. Experimental Mechanics, vol. 11, no. 9, September 1971, pp. 402-407.

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- Rucker, Carl E.; and Grandle, Robert E.: A Technique for Closed-Loop Computer-Controlled Reversed-Bending Fatigue Tests of Acoustic Treatment Material. Proceedings of 42nd Shock and Vibration Symposium, Key West, Florida, November 2-4, 1971.
- Hubbard, Harvey H.: Aero Space Vehicle Noise-Induced Structural Vibrations. Sound and Vibration, vol. 5, no. 12, December 1971.
- Clarkson, B. L.; and Mayes, W. H.: Sonic-Boom-Induced Building Structure Responses Including Damage. J. Acous. Soc. Amer., vol. 51, no. 2 (part 3), February 1972, pp. 742-758.
- Seshadri, T. V.; and Lowery, R. L.: Low Frequency Damping Mechanisms in Mechano-Acoustical Networks. J. Sound Vibr., vol. 29, no. 1, March 1972, pp. 65-72.
- Schoenster, James A.; and Pierce, Harold B.: Effects of Experimentally Measured Pressure Oscillations on the Vibration of a Solid Rocket Motor. NASA TN D-6931, 1972.
- Vaicaitis, R.: Generalized Random Forces for Rectangular Panels. AIAA Journal, vol. 11, no. 7, July 1972, pp. 984-988.
- Rudder, Fred F., Jr.: Study of Effects of Design Details on Structural Response to Acoustics Excitation. NASA CR-1956, 1972.
- Lansing, D. L.; Drischler, J. A.; Brown, T. J.; and Mixson, J. S.: Dynamic Loading of Aircraft Surfaces Due to Jet Exhaust Impingement. Proceedings of the AGARD Specialists' Meeting on "Acoustic Fatigue," September 1972.
- Clarkson, B. L.: Estimates of the Response of Box Type Structures to Acoustic Loading. Proceedings of AGARD Symposium on Acoustic Fatigue, Toulouse, France, September 26 and 27, 1972.
- Aupperle, F. A.; and Lambert, R. F.: On the Utilization of a Flexible Beam as a Spatial Filter. J. Sound and Vibr., vol. 24, no. 2, 1972, pp. 259-267.
- Rucker, Carl E.; and Grandle, Robert E.: Testing of Space Shuttle Thermal Protection System Panels Under Simulated Reentry Thermal Acoustic Conditions. Proceedings of 7th Conference on Space Simulation. NASA SP-336, 1973.
- Smith, Wayne F.: Investigation on the Statistics of Pure Tone Sound Power Injection from Low Frequency, Finite Sized Sources in a Reverberant Room. Master's Thesis, North Carolina State University, May 1973.
- Rucker, Carl E.; and Grandle, Robert E.: Thermoacoustic Fatigue Testing Facility for Space Shuttle Thermal Protection System Panels. ASTM STP 520 Fatigue at Elevated Temperatures, August 1973.



- Bayles, D. Jack; Lowery, Richard L.; and Boyd, Donald E.: **Nonlinear Vibrations of Rectangular Plates.** J. Structural Division, ASCE, vol. 99, no. ST5, May 1973, pp. 853-864.
- Holmer, Curtis I.: **Investigation of Acoustic Properties of a Rigid Foam with Application to Noise Reduction in Light Aircraft.** NASA CR-1322333, 1973.
- Heller, Hanno H.; and Clemente, Anthony R.: **Fluctuating Surface-Pressure Characteristics on Slender Cones in Subsonic, Supersonic, and Hypersonic Mach-Number Flow.** NASA CR-2449, 1974.
- Schoenster, James A.: **Acoustic Loads on an Externally Blown Flap System Due to Impingement of a TF-34 Jet Engine Exhaust.** NASA TM X-71950, 1974.
- Ojalvo, I. U.; Austin, F.; and Levy, A.: **Vibration and Stress Analysis of Soft-Bonded Shuttle Insulation Tiles. Modal Analysis with Compact Widely Spaced Stringers.** NASA CR-132553, 1974.
- Ogilvie, P. L.; Levy, A.; Austin, F.; and Ojalvo, I. U.: **Programmer's Manual for Static and Dynamic Reusable Surface Insulation Stresses (RESIST).** NASA CR-132607, 1975. (NAS1-10635-17, T19 Grumman Aerospace Corporation).
- Wiley, J. F.; and Scharon, T. D.: **Acoustic Transmission Through a Fuselage Sidewall.** NASA CR-132602, 1975. (NAS1-11839 Bolt Beranek and Newman, Inc.)
- Howlett, James T.; and Clevenson, Sherman A.: **A Study of Helicopter Interior Noise Reduction.** Presented at the 31st Annual National Forum of the American Helicopter Society, May 1975.
- Findley, Donald S.; Huckel, Vera; and Henderson, Herbert R.: **Vibration Responses of Test Structure No. 1, During the Edwards Air Force Base Phase of the National Sonic Boom Program.** NASA TM X-72706, 1975.
- Findley, Donald S.; Huckel, Vera; and Hubbard, Harvey H.: **Vibration Responses of Test Structures No. 2, During the Edwards Air Force Base Phase of the National Sonic Boom Program.** NASA TM X-72704, 1975.
- Yen, D. H. Y.; Maestrello, L.; and Padula, S. L.: **On an Integro-Differential Equation Model for the Study of the Response of an Acoustically Coupled Panel.** Presented at the AIAA Second Aeroacoustics Specialists Conference, Marcy 1975. Paper No. 75-508.
- Vaicaitis, R.: **Random Input and Response Study of Multi-Component Panels.** TR No. 1, Department of Civil Engineering and Engineering Mechanics. Columbia University, prepared under NSG-1054, July 1975.

- Fahmy, Abdel A.; and Cunningham, Thomas G.: Investigation of Thermal Fatigue in Fiber Composite Materials. NASA CR-2641, 1976. (NGR 34-002-180 NC State University)
- Getline, G. L.: Low-Frequency Noise Reduction of Lightweight Airframe Structures. NASA CR-145104, 1976. (NAS1-13910 General Dynamics Corporation)
- Guinn, Wiley A.; Balena, Frank J.; and Soovere, Jaak: Sonic Environment of Aircraft Structure Immersed in a Supersonic Jet Flow Stream. NASA CR-144996, 1976. (NAS1-13978 Lockheed Aircraft Corporation)
- Ojalvo, Irving U.; and Ogilvie, Patricia L.: Modal Analysis and Dynamic Stresses for Acoustically Excited Shuttle Insulation Tiles. NASA CR-144958, 1976. (NAS1-10635-1 Grumman Aerospace Corporation)
- Lin, Y. K.; Maekawa, S.; Nijim, H.; and Maestrello, L.: Response of Periodic Beam to Supersonic Boundary-Layer Pressure Fluctuations. Presented at the IUTAM Symposium on Stochastic Problems in Dynamics, 1976.
- Yen, D. H. Y.; Maestrello, L.; and Padula, S. L.: The Dynamic Response of an Acoustically Coupled Panel. AIAA Progress in Astronautics and Aeronautics, 1976, vol. 45.
- Maestrello, L.; Monteith, J. H.; Manning, J. C.; and Smith, D.: Measured Response of a Complex Structure to Supersonic Turbulent Boundary Layers. Presented at the AIAA 14th Aerospace Sciences Meeting. January 1976. Paper No. 76-83.
- Rucker, Carl E.; and Mixson, John S.: Vibroacoustic Testing of Space Shuttle Thermal Protection System Panels. Presented at the AIAA/ASME/SAE 17th Structures, Structural Dynamics and Materials Conference, May 1976.
- Schoenster, James A.; Willis, Conrad M.; Schroeder, James C.; and Mixson, John S.: Acoustic-Loads Research for Powered-Lift Configurations. Presented at the 1976 Conference on Powered-Lift Aerodynamics and Acoustics, May 1976.
- Vaicaitis, R.; and Dowell, E. M.: Response of Reusable Surface Insulation Panels to Random Pressure, Proceedings AIAA/ASME/SAE 17th Structure, Structural Dynamics and Materials Conference, May 1976.
- Vaicaitis, R.: Response of Space Shuttle Insulation Panels to Acoustic Noise Pressure. NASA CR-148201, June 1976.

Mixon, John S.; Mayes, William H.; and Willis, Conrad M.: Effects of Aircraft Noise On Flight and Ground Structures. Presented at the NASA Conference on Aircraft Safety and Operating Problems, October 1976.

Staff-Langley Research Center: Concorde Noise Induced Building Vibrations for Sully Plantation, Chantilly, Virginia. NASA TM X-73919, June 1976.

Staff-Langley Research Center: Concorde Noise Induced Building Vibrations for Sully Plantation, Report No. 2, Chantilly, Virginia, NASA TM X-73926, July 1976.

Staff-Langley Research Center: Concorde Noise Induced Building Vibrations-Montgomery County, MD - Report No. 3, TM X-73947, August 1976.

Schoenster, James A.; Willis, Conrad M.: Part III, Temperature and Vibration Characteristics. Wind Tunnel Investigation of Aerodynamic Performance Steady and Vibratory Loads, Surface Temperatures, and Acoustic Characteristics of a Large-Scale Twin-Engine Upper-Surface Blown Jet-Flap Configuration. NASA TN D-8235, November 1976.

Jackson, Robert L.; Taylor, Allan H.; and Rucker, Carl E.: Sonic Environment Tests of an Insulator/Ablator Material. NASA TM X-74022, 1977.

Howlett, James T.; Clevenson, Sherman A.; Rupf, John A.; and Snyder, William J.: Interior Noise Reduction in a Large Civil Helicopter. NASA TN D-8477, 1977.

Abrahamson, A. L.; and Osinski, John: Resonance Testing of Space Shuttle Thermoacoustic Structural Specimens. NASA CR-145154, 1977.

Mixon, John S.; Barton, C. Kearney; and Vaicaitis, Rimas: Interior Noise Analysis and Control for Light Aircraft. Presented at the 1977 Business Aircraft Meeting of SAE. SAE Preprint No. 770445.

Bhat, R. B.; Sobieszczanski, J.; and Mixson, J. S.: Reduction of Cabin Noise by Fuselage Structural Optimization. Proceedings of the National Noise and Vibration Control Conference and Exhibition, Chicago, IL, March 14-17, 1977.

Vaicaitis, R.: Noise Transmission by Visoelastic Sandwich Panels. Proceedings of the 15th Midwestern Mechanics Conference, vol. 8, University of Illinois at Chicago Circle, March 1977.

- Vaicaitis, R.; and McDonald W.: Noise Transmission into an Enclosure. Proceedings of the Second Annual Engineering Mechanics Division, ASCE, Speciality Conference, NC State University, Raleigh, NC, May 1977.
- Schoenster, James A.; and Schroeder, James C.: Fluctuating Loads on the Flap Surfaces of the Externally-Blown Flap Powered-Lift Configuration. Presented at the AIAA/NASA Ames V/STOL Conference June 1977.

## VIII . HUMAN RESPONSE

Some of the topics covered in this section are as follows:

Aircraft Noise, Sonic Boom, and Vibration Environments

Psychoacoustic and Psychophysiological Responses Such as  
Annoyance, Noisiness, Loudness, Speech Interference, Task  
Performance, Muscle Tension, Startle, Sleep Awakening

Research Methods, Equipment, and Facilities

Measurements, Analysis, and Prediction

## VIII. HUMAN RESPONSE

- Elwell, Fred S.: Experiments to Determine Neighborhood Reactions to Light Airplanes With and Without External Noise Reduction. NACA Report 1156, 1953.
- Stevens, Kenneth N.: A Survey of Background and Aircraft Noise in Communities Near Airports. NACA TN 3379, December 1954.
- Borsky, Paul N.: Community Reactions to Sonic Booms. NASA CR-57022, August 1962.
- Kryter, Karl D.; and Fearsons, Karl S.: Some Effects of Spectral Content and Duration on Perceived Noise Level. NASA TN D-1873, April 1963.
- Kryter, K. D.; and Pearsons, K. S.: Effects of Spectral Components, Duration, and Rise Time of Sound on Perceived Noise Level. Presented at 64th Meeting of the Acoustical Society of America, Seattle, Washington, November 7-9, 1962. J. Acous. Soc. Amer., vol. 35, no. 6, June 1963.
- Hubbard, H. H.; and Maglieri, D. J.: Factors Affecting Community Acceptance of the Sonic Boom. Proceedings of NASA Conference on Supersonic-Transport Feasibility Studies and Supporting Research, September 17-19, 1963. NASA TM X-905, 1963.
- Kryter, Karl D.; and Pearsons, Karl S.: Modification of Noy Tables. J. Acous. Soc. Amer., vol. 36, no. 2, February 1964.
- Pearsons, K. S.; and Kryter, K. D.: Laboratory Tests of Subjective reactions to Sonic Boom. NASA CR-187, March 1965.
- Nixon, Charles W.; and Hubbard, Harvey H.: Results of USAF-NASA-FAA Flight Program to Study Community Responses to Sonic Booms in the Greater St. Louis Area. NASA TN D-2705, May 1965.
- Hubbard, Harvey H.; Cawthorn, Jimmy M.; and Copeland, W. Latham: Factors Relating to the Airport-Community Noise Problem. Presented at Conference on Aircraft Operating Problems, Langley Research Center, May 10-12, 1965. NASA SP-83.
- Kryter, K. D.; and Pearsons, K. S.: Judged Noisiness of a Band of Random Noise Containing an Audible Pure Tone. J. Acous. Soc. Amer., vol. 38, no. 1, July 1965, pp. 106-112.
- Kryter, K. D.; and Pearsons, K. S.: Subjective Response to Noise Containing Amplitude and Frequency Modulation Tones. Proceedings of the 5th International Congress on Acoustics, Liege, Belgium, September 7-14, 1965.

- Edge, Philip M.; and Mayes, William H.: Description of Langley Low-Frequency Noise Facility and Study of Human Response to Noise Frequencies Below 50 CPS. NASA TN D-3204, January 1966.
- Kryter, Karl D.: Review of Research and Methods for Measuring the Loudness and Noisiness of Complex Sounds. NASA CR-422, April 1966.
- Mueller, Arnold W.; and Mayes, William H.: Acoustic Exposure Tests of Squirrel Monkeys in the Langley Low-Frequency Noise Facility. LWP No. 412, May 11, 1967.
- Maglieri, Domenic J.; Hilton, David A.; and Henderson, Herbert R.: Overall Description of the NASA Airplane Flyover Noise Study for Evaluation of Subjective Reactions. LWP No. 539, January 1968.
- Kryter, K. D.: Concepts of Perceived Noisiness, Their Implementation and Application. J. Acous. Soc. Amer., vol. 43, no. 2, February 1968, pp. 344-361.
- Pearsons, Karl S.: Laboratory Studies of the Effects of Duration and Spectral Complexity on the Subjective Ratings of Noise. Proceedings of the National Conference on Noise as a Public Health Hazard, June 13 and 14, 1968, Washington, D.C.
- Lukas, Jerome S.; and Kryter, Karl D.: A Preliminary Study of the Awakening and Startle Effects of Simulated Sonic Booms. NASA CR-1193, September 1968.
- Shepherd, L. J.; and Sutherland, W. W.: Relative Annoyance and Loudness Judgments of Various Simulated Sonic Boom Waveforms. NASA CR-1192, September 1968.
- Hinterkeuser, Ernest G.: Synthesis of Aircraft Noise. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Kryter, Karl D.: Prediction of Effects of Noise on Man. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley October 8-10, 1968. NASA SP-189.
- Kryter, Karl D.; Johnson, Paul J.; and Young, James R.: Judgment Tests of Aircraft Noise. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.

- Pearson, Richard G.; and Hart, Franklin D.: Studies Relating to the Individual Characteristics of People with Their Responses to Noise. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Pearsons, Karl S.: Assessment of the Validity of Pure Tone Corrections to Perceived Noise Level. Presented at Conference on Progress of NASA Research Relating to Noise Alleviation of Large Subsonic Jet Aircraft, Langley, October 8-10, 1968. NASA SP-189.
- Pearsons, Karl S.: Combination Effects of Tone and Duration Parameters on Perceived Noisiness. NASA CR-1283, February 1969.
- Borsky, Paul N.: The Use of Social Surveys for Measuring Community Response to Noise Environments. Proceedings of National Symposium on Acceptability Criteria for Transportation Noise. University of Washington, Seattle, March 26-28, 1969.
- Kryter, Karl D.: The Effects of Noise on Man. Academic Press, New York, 1970.
- Lukas, Jerome S.; Peeler, Donald J.; and Kryter, Karl D.: Effects of Sonic Booms and Subsonic Jet Flyover Noise on Skeletal Muscle Tension and a Paced Tracing Task. NASA CR-1522, February 1970.
- Fidell, Sanford; and Pearsons, Karl S.: Study of the Audibility of Impulsive Sounds. NASA CR-1598, May 1970.
- Lukas, Jerome S.; and Kryter, Karl D.: Awakening Effects of Simulated Sonic Booms and Subsonic Aircraft Noise on Six Subjects, 7 to 72 Years of Age. NASA CR-1599, May 1970.
- Kryter, K. D.: Possible Modifications to the Calculation of Perceived Noisiness. NASA CR-1636, August 1970.
- Kryter, K. D.; Johnson, P. J.; and Young, J. R.: Judgment Tests of Flyover Noise from Various Aircraft. NASA CR-1635, August 1970.
- Tracor, Inc.: Public Reactions to Sonic Booms. NASA CR-1665, September 1970.
- Fidell, Sanford; Pearsons, Karl S.; Gringnette, Mario; and Green, David M.: The Noisiness of Impulsive Sounds. J. Acous. Soc. Amer., vol. 48, no. 6 (part 1), December 1970.
- Lindeman, H. H.; Ades, H. W.; Brødberg, G.; and Engstrom, H.: The Sensory Hairs and the Tectorial Membrane in the Development of the Cat's Organ of Corti. Acta Otolaryng 72, 1971, pp. 229-242.



- Hazard, W. R.: Predictions of Noise Disturbance Near Large Airports. J. Sound Vib., vol. 51, no. 4, April 1971, pp. 425-445.
- Edge, Philip M., Jr.; Hubbard, Harvey H.; and Chambers, Randall M.: Evaluation of Measures of Aircraft Noise. Presented at NASA Aircraft Safety and Operating Problems Conference, Langley Research Center, May 4-6, 1971. NASA SP-270.
- Lukas, J. S.; Dobbs, M. E.; and Peeler, D. J.: Effects of Muscle Tension and Tracing Task Performance of Simulated Sonic Booms with Low and High Intensity Vibrational Components. NASA CR-1781, June 1971.
- Lukas, Jerome S.; Dobbs, Mary E.; and Kryter, Karl D.: Disturbance of Human Sleep by Subsonic Jet Aircraft Noise and Simulated Sonic Booms. NASA CR-1780, July 1971.
- Pearsons, K. S.; Bennett, Ricarda; and Fidell, Sanford: Study of the Effects of the Doppler Shift on Perceived Noisiness. NASA CR-1779, July 1971.
- Becker, R. W.; Lukas, J. S.; Dobbs, M. E.; and Poza, F.: A Technique for Automatic Real-Time Scoring of Several Simultaneous Sleep Electro-Encephalograms. NASA CR-1840, August 1971.
- Kryter, Karl D.: Methods and Results of Some Recent Studies of Arousal from Sleep by Noise and Booms. Proceedings of 4th Karolinska Institute Symposium on Environmental Health, Stockholm, Sweden, August 30-September 4, 1971.
- Lukas, Jerome S.: Awakening Effects of Simulated Sonic Booms and Aircraft Noise on Men and Women. Proceedings of Symposium on Sonic Boom Exposure Effects - Methods and Criteria, Saltsjobaden, Sweden, September 7-9, 1971.
- Ollerhead, J. B.: An Evaluation of Methods for Scaling Aircraft Noise Perception. NASA CR-1883, October 1971.
- Lindeman, H. H.; and Bredberg, G.: Scanning Electron Microscopy of the Organ of Corti After Intense Auditory Simulation: Effects on Stereocilia and Cuticular Surface of Hair Cells. Arch. klin. exp. Ohr.-, Nas.-u. Kehlk. Heilk. 203, 1-15 (1972).
- Lukas, J. S.: Awakening Effects of Simulated Sonic Booms and Aircraft Noise on Men and Women. J. Sound and Vib., vol. 20, no. 4, 1972, pp. 457-466.
- Millar, A. E., Jr., Ed. in Chief: The Motion Commotion: Human Factors in Transportation. 1972 Summer ASEE-NASA Faculty Fellowship Program in Engineering System Design. Old Dominion University, 1972.

- Bregman, Howard L.; and Pearson, Richard G.: Development of a Noise Annoyance Sensitivity Scale. NASA CR-1954, February 1972.
- Borsky, P. N.: Annoyance Reactions. Presented at Workshop on Sonic Boom Exposure Effects, Saltsjobaden, Sweden, September 7-9, 1971. J. Sound Vib., vol. 20, no. 4, February 1972, pp. 527-530.
- LeVere, T. E.; Bartus, Raymond T.; and Hart, F. D.: Electroencephalographic and Behavioral Effects of Nocturnally Occurring Jet Aircraft Sounds. Aerospace Medicine, vol. 43, no. 4, April 1972, pp. 384-389.
- Lawton, Ben William: Effects of Noise on the Performance of a Memory-Decision-Response Task. NASA TN D-6675, April 1972.
- LeVere, T. E.; Bartus, Raymond T.; and Hart, F. D.: The Relation Between Time of Presentation and the Sleep Disturbing Effects of Nocturnally Occurring Jet Aircraft Flyovers. NASA CR-2036, May 1972.
- Lukas, J. S.; and Dobbs, M. E.: Effects of Aircraft Noises on the Sleep of Women. NASA CR-2041, June 1972.
- Sternfeld, Harry, Jr.; Hinterkeuser, Ernest G.; Hackman, Roy B.; and Advis, Jerry: Acceptability of VTOL Aircraft Noise Determined by Absolute Subjective Testing. NASA CR-2043, June 1972.
- Connor, William K.; and Patterson, Harrold P.: Community Reaction to Aircraft Noise Around Smaller Airports. NASA CR-2104, August 1972.
- Kryter, Karl D.; and Lukas, Jerome S.: Simulated Indoor Sonic Booms Judged Relative to Noise from Subsonic Aircraft. NASA CR-1206, August 1972.
- Clarke, Frank R.; and Kryter, Karl D.: The Methods of Paired Comparisons and Magnitude Estimation in Judging the Noisiness of Aircraft. NASA CR-2107, August 1972.
- Clarke, Frank R.; and Kryter, Karl D.: Perceived Noisiness Under Anechoic, Semi-Reverberant and Earphone Listening Conditions. NASA CR-2018, August 1972.
- Edge, P. M.; Cawthorn, J. M.; and Powell, C. A., Jr.: Factors Influencing Public Acceptance of STOL Noise. Presented at NASA STOL Technology Conference, Ames Research Center, October 17-19, 1972. NASA SP-307.
- Rash, L. C.; Barrett, R. F.; and Hart, F. D.: Development and Evaluation of a Device to Simulate Sonic Boom. NASA CR-112117, 1972.
- Edge, Philip M., Jr.; and Hubbard, Harvey H.: Review of Sonic-Boom Simulation Devices and Techniques. Jour. of Acous. Soc. Amer., vol. 51, no. 1, January 1972.

- LeVere, T. E.; Bartus, Raymond T.; Morlock, Gerald, W.; and Hart, F. D.: Arousal from Sleep: Responsiveness to Different Auditory Frequencies Equated for Loudness. *Psychology and Behavior*, 1973, vol. 10, pp. 53-57 (NASA Grant 34-002-095, NC State University)
- Powell, Clemans A.: A Subjective Evaluation of Synthesized STOL Airplane Noises. NASA TN D-7702, January 1973.
- Borsky, Paul N.: A New Field-Laboratory Methodology for Assessing Human Response to Noise. NASA CR-2221, March 1973.
- Borsky, Paul N.; and Leonard, Skipton: A Comparative Study of Annoyance Judgments of Three 727 Airplanes in Landing Approaches One a Standard Aircraft and Two With Acoustically Treated Nacelles. NASA CR-2261, 1973.
- Lukas, J. S.; Peeler, D. J.; and Dobbs, M. E.: Arousal From Sleep by Noises From Aircraft With and Without Acoustically Treated Nacelles. NASA CR-2279, 1973.
- Stave, Allan M.: Effects of Helicopter Noise and Vibration on Pilot Performance (As Measured in a Fixed-Base Flight Simulator). NASA CR-132347, 1973.
- Gunn, Walter J.: Loudness Changes Resulting From an Electrically Induced Middle-Ear Reflex. *J. Acous. Soc. Amer.*, vol. 54, no. 2, 1973.
- Sternfeld, Harry, Jr.; Hinterkeuser, Ernest G.; Hackman, Roy B.; and David, Jerry: A Study of the Effect of Flight Density and Background Noise on V/STOL Acceptability. NASA CR-2197.
- Pearsons, Karl S.; and Bennett, Ricarda L.: Handbook of Noise Ratings. NASA CR-2376, 1974.
- Gunn, Walter J.; and Fletcher, John L.: The Effect of Number of Flights Prior to Judgment on Annoyance to Aircraft Flyover Noise. Proceedings of the Second Interagency Symposium on University Research in Transportation Noise, June 1974.
- Fletcher, John L.; and Gunn, Walter J.: Annoyance of Aircraft Flyover Noise as a Function of the Presence of Strangers. Proceedings of the Second Interagency Symposium on University Research in Transportation Noise, June 1974.
- Cohen, H. Harvey; Conrad, Donald W.; O'Brien, John F.; and Pearson, Richard G.: Effects of Noise Upon Human Information Processing. NASA CR-132469, 1974.
- Pearsons, Karl S.; Fidell, Sanford; Bennett, Ricarda L.; Friedmann, Joyce; and Globus, Gordon: Effect of Cessation of Late-Night Landing Noise on Sleep Electrophysiology in the Home. NASA CR-132543, 1974.
- Lawton, Ben William: The Noisiness of Low Frequency Bands of Noise. Presented at the 88th Meeting of the Acoustical Society of America, November 1974. NASA TM X-72649, 1974.

- Dempsey, Thomas K.: A Model and Predictive Scale of Passenger Ride Discomfort. NASA TM X-72623, 1974.
- Gunn, Walter J.: Greater Cochlear Excitation in Subjects Listening to Faint Auditory Signals. Journal of Auditory Research, July 1974.
- Gunn, Walter J.: Possible Involvement of the Acoustic Reflex in Loudness Shifts Resulting from a Remote Masker, Journal of Auditory Research, July 1974.
- Powell, Clemans A.; and Rice, C. G.: Effects of a Traffic Noise Background on Judgments of Aircraft Noise, NASA TM X-71938, 1974.
- Stephens, David G.: Development and Application of Ride-Quality Criteria. NASA TM X-72008, 1974.
- Dempsey, Thomas K.: A Model and Predictive Scale of Passenger Ride Discomfort. NASA TM X-72623, 1974.
- Jacobson, Ira D.: Environmental Criteria for Human Comfort - A Study of the Related Literature. NASA CR-132424, February 1974. (NASA Grant NGL-47-005-151).
- Powell, Clemans A.; and Rice, C. G.: Effects of a Traffic Noise Background on Judgments of Aircraft Noise. Presented at the 27th Meeting of the Acoustical Society of America, April 1974.
- Powell, C. A.; and Rice, C. G.: Judgments of Aircraft Noise in a Traffic Noise Background. Journal of Sound and Vibration, vol. 38, no. 1, 1975, pp. 39-40.
- Catherines, John J.; Mixson, John S.; and Scholl, Harland F.: Vibrations Measured in the Passenger Cabins of Two Jet Transport Aircraft. NASA TN D-7923, 1975.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Methodological Considerations in the Study of Human Discomfort to Vibration. J. High Speed Ground Transportation, vol. 8, pp. A67-A80, 1975.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Vibration Simulator Studies for the Development of Passenger Ride Comfort Criteria. NASA TM X-3295, pp. 601-614, 1975.
- Kirby, Raymond H.; Coates, Glynn D.; Mikulka, Peter J.; Dempsey, Thomas K.; and Leatherwood, Jack D.: Effects of Vibration in Combined Axes on Subjective Evaluation of Ride Quality. NASA TM X-3295, pp. 353-373, 1975.

- Dempsey, Thomas K.; and Leatherwood, Jack D.: Experimental Studies for Determining Human Discomfort Response to Vertical Sinsoidal Vibration. NASA TN D-8041, 1975.
- Lawton, Ben W.: The Noisiness of Low-Frequency One-Third Octave Bands of Noise. NASA TN D-8037, 1975.
- Leatherwood, Jack D.: Vibrations Transmitted to Human Subjects Through Passenger Seats and Considerations of Passenger Comfort. NASA TN D-7929, 1975.
- Borsky, Paul N.: Special Analysis of Community Annoyance with Aircraft Noise Reported on Residents in the Vicinity of JFK Airport-1972. NASA CR-132678, 1975. (NAS1-13663 Columbia University).
- Klaus, Patsy A.: Emotionality in Response to Aircraft Noise: A Report of Developmental Work. NASA CR-2600, 1975. (L-88318 National Bureau of Standards)
- Lukas, J. S.; Peeler, D. J.; and Davis, J. E.: Effects of Sleep of Noise from Two Proposed STOL Aircraft. NASA CR-132564, 1975. (NAS1-12378 Stanford Research Institute)
- Pearson, Richard G.; Hart, Franklin D.; and O'Brien, John F.: Individual Differences in Human Annoyance Response to Noise. NASA CR-144921, 1975. (NGR 34-002-055 North Carolina State University).
- Barton, Kearney: Internal Noise Considerations for Powered-Lift STOL Aircraft. NASA TM X-72675, 1975.
- Catherines, John J.; and Mayes, William H.: Interior Noise Levels of Two Propeller-Driven Light Aircraft. NASA TM X-72716, 1975.
- Gunn, Walter J.; Patterson, Harrold P.; Cornog, June; Klaus, Patsy; and Connor, William K.: A Model and Plan for a Longitudinal Study of Community Response to Aircraft Noise. NASA TM X-72690, 1975.
- Gunn, Walter J.; Shepherd, W. T.; and Fletcher, John L.: Effects of Three Activities on Annoyance Response to Recorded Flyovers. NASA TM X-72673, 1975.

- Howlett, James T.; and Clevenson, Sherman A.: A Study of Helicopter Interior Noise Reduction. NASA TM X-72655, 1975.
- Lawton, Ben William: The Noisiness of Low Frequency Bands of Noise. NASA TM X-72649, 1975.
- Shepherd, William T., Editor: Noise and Speech Interference - Proceedings of Minisymposium. NASA TM X-72696, 1975.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Methodological Considerations in the Study of Human Discomfort to Vibration. Presented at the International Conference on High Speed Ground Transportation, January 1975.
- Barton, C. Kearney: Interior Noise Considerations for Powered-Lift STOL Aircraft. Presented at the 89th Meeting of the Acoustical Society of America, April 1975.
- Gunn, Walter J.: A Program for the Study of Community Response to Aircraft Noise. Presented at the National Noise and Vibration Control Conference and Exhibition, April 1975.
- Gunn, Walter J.; Shepherd, William T.; and Fletcher, J. L.: Effects of Three Activities on Annoyance Responses to Recorded Flyovers. Presented at the 89th Meeting of the Acoustical Society of America, April 1975.
- Gunn, Walter J.: The Psychological Aspects of Noise. Presented at the University of Virginia Graduate Level Course on "Noise Exposure," May 1975.
- Kirby, Raymond H.; Coates, Glynn D.; Mikulka, Peter J.; Dempsey, Thomas K.; and Leatherwood, Jack D.: Effect of Vibration in Combined Axes on Subjective Evaluation of Ride Quality. Presented at 1975 Ride Quality Symposium, August 1975.
- Klauder, Louis P., Jr.; and Clevenson, Sherman A.: Evaluation of Ride Quality Measurement Procedures by Subjective Experiments Using Simulators. Presented at 1975 Ride Quality Symposium, August 1975.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Vibration Simulator Studies for the Development of Passenger Ride Comfort Criteria. Presented at 1975 Ride Quality Symposium, August 1975.
- Stephens, David G.: Review of Measured Vibrations and Noise Environment Experienced by Passengers in Aircraft and in Ground Transportation Systems. Presented at 1975 Ride Quality Symposium, August 1975.
- Stephens, David G.; and Mayes, William H.: Study of General Aviation Interior Noise. Presented at the AIAA General Aviation Technology-fest, November 1975.

- Cawthorn, Jimmy M.; and Mayes, William H.: Human Response to Aircraft Noise. Presented at the Third Interagency Symposium on University Research In Transportation Noise, November 1975.
- Clevenson, Sherman A.: Subjective Response to Combined Noise and Vibration During Flight of a Large Twin-Jet Airplane. NASA TM X-3406, 1976.
- Edge, Philip M., Jr.; and Cawthorn, Jimmy M.: Selected Methods for Quantification of Community Exposure to Aircraft Noise. NASA TN D-7977, 1976.
- Lawton, Ben W.: Subjective Assessment of Simulated Helicopter Blade-Slap Noise. NASA TN D-8359, 1976.
- Leatherwood, Jack D.; and Dempsey, Thomas K.: Psychophysical Relationships Characterizing Human Response to Whole-Body Sinusoidal Vertical Vibration. NASA TN D-8188, 1976.
- Leatherwood, Jack D.; Dempsey, Thomas K.; and Clevenson, Sherman A.: An Experimental Study for Determining Human Discomfort Response to Roll Vibration. NASA TN D-8266, 1976.
- Catherines, John J.; and Jha, Sunil K.: Sources and Characteristics of Interior Noise in General Aviation Aircraft. NASA TM X-72839, 1976.
- Cawthorn, Jimmy M.; and Mayes, William H.: Review of Subjective Measures of Human Response to Aircraft Noise. NASA TM X-72807, 1976.
- Dempsey, Thomas K.; Coates, Glynn D.; and Leatherwood, Jack D.: A Parametric Investigation of Ride Quality Rating Scales. NASA TM X-73946, 1976.
- Gunn, W. J.; Shigehisa, T.; and Shepherd, W. T.: Relative Effectiveness of Several Simulated Jet Engine Noise Spectral Treatments in Reducing Annoyance in a TV Viewing Situation. NASA TM X-72828, 1976.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Prediction of Passenger Ride Quality in a Multifactor Environment. NASA TM X-72945, 1976.
- Dempsey, Thomas K.; Leatherwood, Jack D.; and Clevenson, Sherman A.: Noise and Vibration Ride Comfort Criteria. NASA TM X-73975, 1976.
- Dempsey, Thomas K.; Leatherwood, Jack D.; and Drezek, Arlene B.: Passenger Ride Quality Within a Noise and Vibration Environment. NASA TM X-72841, 1976.
- Leatherwood, Jack D.; and Dempsey, Thomas K.: A Model for Prediction of Ride Quality in a Multifactor Environment. NASA TM X-72842, 1976.

- Shepherd, Kevin P.: The Subjective Evaluation of Noise from Light Aircraft. NASA CR-2773, 1976. (NSG-1160 University of Utah)
- LeVere, T. E.; David, N.; Mills, Jeanne; and Berger, Elliott H.: Arousal from Sleep: The Effects of the Cognitive Value of Auditory Stimuli, *Physiological Psychology*, 1976 (NASA Grant 34-002-095, NC State University).
- LeVere, T. E.; Davis, N.; Mills, Jeanne; Berger, Elliott H.; and Reiter, William F.: Arousal from Sleep: The Effects of the Rise-Time of Auditory Stimuli. *Physiological Psychology*, 1976, vol. 4(2), 213-218. (NASA Grant 34-002-095, NC State University).
- LeVere, T. E.; Morlock, Gerald W.; Thomas, L. P.; and Hart, F. D.: Arousal from Sleep: The Differential Effect of Frequencies Equated for Loudness; *Psychology and Behavior*, 1974, vol. 12, pp. 573-582. (NASA Grant 34-002-095, NC State University).
- Winne, Peter S.; Morgan, Ben B.; Kirby, Raymond H.; Dempsey, Thomas K.; and Leatherwood, Jack D.: Combined Effects of Vibration and Noise on the Subjective Evaluation of Ride Discomfort. Presented at the Southeastern Psychological Associated Conference, March 1976.
- Stephens, David G.: General Aviation Interior Noise and Vibration Studies. Presented at the SAE Business Aircraft Meeting, April 1976.
- Shigehisa, T.; and Gunn, W. J.: Ambient Illumination, Personality, and Annoyance Response to Noise. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Jha, S. K.; and Catherines, J. J.: Sources and Characteristics of Interior Noise in General Aviation Aircraft. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Leatherwood, Jack D.; and Dempsey, Thomas K.: A Model for Prediction of Ride Quality in a Multifactor Environment. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Kirby, Raymond H.; Coates, Glynn D.; Mikulka, Peter J.; Dempsey, Thomas K.; and Leatherwood, Jack D.: Effect of Vibration in Combined Axes on Subjective Evaluation of Ride Quality. Presented at the American Industrial Hygiene Association Conference, May 1976.



- Dempsey, Thomas K.; Leathwood, Jack D.; and Drezek, Arlene: Passenger Ride Quality Within a Noise and Vibration Environment. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Gunn, W. J.; Shigehisa, T.; and Shepherd, W. T.: Relative Effectiveness of Several Simulated Jet Engine Spectral Treatments in Reducing Annoyance Response of Test Subjects Engaged in a TV-Viewing Task. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Vibration Ride Comfort Criteria. Presented at the 6th Congress of the International Ergonomics Association, July 1976.
- Dempsey, Thomas K.; and Leatherwood, Jack D.: Prediction of Passenger Ride Quality in a Multifactor Environment. Presented at the 84th Annual Convention of the American Psychological Association, September 1976.
- Dempsey, Thomas K.; Leatherwood, Jack D.; and Coates, Glynn D.: A Parametric Investigation of Ride Quality Rating Scales. Presented at the 84th Annual Convention of the American Psychological Association, September 1976.
- Dempsey, Thomas K.; Leatherwood, Jack D.; and Clevenson, Sherman A.: Noise and Vibration Ride Comfort Criteria. Presented at the 92nd Meeting of the Acoustical Society of America, November 1976.
- Shepherd, Kevin P.: The Subjective Evaluation of Noise from Light Aircraft. NASA CR-2773 (NASA Grant NSG-1160) University of Utah, December 1976.
- Borksy, Paul N.: A Comparison of a Laboratory and Field Study of Annoyance and Acceptability of Aircraft Noise Exposures, February 1977 (NASA Grant NSG-1164, Columbia University).
- Powell, Clemens A.: Judgments of Relative Noisiness of a Supersonic Transport and Several Commercial-Service Aircraft. NASA TN D-8434, June 1977.
- Shigehisa, T.; and Gunn, W. J.: Effects of Level of Indoor Illumination on the Judged Annoyance of Aircraft Noise. Presented at the 93d Meeting of the Acoustical Society of America, June 1977.

- Shigehisa, T.; and Gunn, W. J.: Relation of Some Personality Types to Annoyance Response to Noise. Presented at the 93d Meeting of the Acoustical Society of America, June 1977.
- LeVere, T. E.: Arousal from Sleep: The Uniqueness of an Individual's Response to Noise. Presented at 9th International Congress on Acoustics, July 4-8, 1977 (NASA Grant 34-002-095, NC State University).
- Dempsey, Thomas K.; and Coates, Glynn D.: Aircraft Noise Adaptation. Presented at the American Psychological Association Conference, August 1977.

## IX. AIRCRAFT NOISE PREDICTION

Items covered in this section are:

Programs and Methodology for predicting aircraft flyover noise

Technology relating to the noise generation, noise propagation or the effects of noise from components of flight vehicles

Validation of prediction methods

Key Technology Prediction Documents from NASA Research Centers other than Langley

## IX. AIRCRAFT NOISE PREDICTION

- Huff, R. G.; Clark, B. J.; and Dorsch, R. G.: Interim Prediction Method for Low Frequency Core Engine Noise. NASA TM X-71627, November 1974.
- Hardin, J. C.; Fratello, D. J.; Hayden, R. E.; Kadman, Y.; and Africk, S.: Prediction of Airframe Noise. NASA TN D-7821, February 1975.
- Raney, John P.: Development of a New Computer System for Aircraft Noise Prediction. Presented at the AIAA Second Aeroacoustics Specialists Conference, March 1975.
- Heidmann, M. F.: Interim Prediction Method for Fan and Compressor Source Noise. NASA TM X-71763, June 1975.
- Dorsch, R. G.; Clark, B. J.; and Reshotko, M.: Interim Prediction Method for Externally Blown Flap Noise. NASA TM X-71768, August 1975.
- Putnam, T. W.: Review of Aircraft Noise Propagation. NASA TM X-56003, September 1975.
- Stone, J. R.: Interim Prediction Method for Jet Noise. NASA TN D-71618, November 1975.
- Edge, P. M., Jr.; and Cawthorn, J. M.: Selected Methods for Quantification of Community Exposure to Aircraft Noise. NASA TN D-7977, February 1976.
- Raney, John P.: Development of a New Computer System for Aircraft Noise Prediction. AIAA Progress in Astronautics and Aeronautics, 1976.
- Levine, Larry S.; and D'Felice, Jon J.: Civil Helicopter Research Aircraft Internal Noise Prediction. NASA CR-145146, 1976.
- Anon: ANOPP Programming and Documentation Standards Document. NASA CR-144989, 1976. (13983 Control Data Corporation)
- Howlett, James T.; and Morales, David A.: Prediction of Aircraft Interior Noise. Presented at the 91st Meeting of the Acoustical Society of America, April 1976.

- Brown, Thomas J.; and Farassat, Feridoun: A New Capability for Predicting Helicopter Rotor Noise in Hover and In Flight. Presented at the 1976 Army Science Conference, June 1976, (Conference Proceedings, vol. II).
- Zorumski, W. E.; and Tester, B. J.: Prediction of the Acoustic Impedance of Duct Liners. NASA TM X-73951, September 1976.
- Gillian, Ronnie E.; Brown, Christine G.; Bartlett, Robert W.; and Baucom, Patricia H.: ANOPP Programmers' Reference Manual for the Executive System. NASA TM X-74029, April 1977.

## X. MISCELLANEOUS

Some of the topics covered in this section are:

Tutorial and survey articles

General purpose facilities and equipment

Procedures for measurement, data reduction  
and calibration

Analytical methods

Special items

## X. MISCELLANEOUS

- Lansing, D. L.; Watkins, C. E.; and Kantarges, G. T.: Oscillating Pressures Within a Cylindrical Chamber that has a Circular Piston in One End Wall. J. Acous. Soc. Amer., vol. 36, no. 11, November 1964, pp. 2222-2232.
- Arde, Inc. and Town and City, Inc.: A Study of the Optimum Use of Land Exposed to Aircraft Landing and Takeoff Noise. NASA CR-410, March 1966.
- Ver, Istvan L.; Malme, Charles T.; and Meyer, Eugene B.: Acoustical Evaluation of the NASA Langley Full-Scale Wind Tunnel. NASA CR-111868, January 1971.
- Ver, Istvan, L.: Acoustic Modeling of the Test Section of the NASA Langley Research Center's Full-Scale Wind Tunnel. Bolt Beranek and Newman, Inc., Report No. 2280, November 1971.
- Ver, Istvan, L.: Acoustical Evaluation of the NASA Langley V/STOL Wind Tunnel. Bolt Beranek and Newman, Inc., Report No. 2288, December 1971.
- Gonzaga, E. A.: On the Design of Pressure Gradient Condenser Microphone. Master's Thesis, George Washington University, September 1972. (NGR-09-010-064)
- Reethof, G.: and Karvelis, A. V.: Control Valve Noise and Its Reduction- State of the Art. Proceedings of the INTER NOISE 72, Washington, D. C., October 4-6, 1972.
- Hubbard, Harvey H.; and Maglieri, Domenic J.: A Brief Review of Air Transport Noise. Noise Control Engineering. November/December 1974.
- Abrahamson, A. L.; Kasper, P. K.; and Pappa, R. S.: Acoustical Characteristics of the NASA-Langley Full-Scale Wind Tunnel Test Section. NASA CR-132604, 1975. (NAS1-12841 Wyle Laboratories)
- Barna, P. S.; and Crossman, Gary R.: Power Requirements of Rotating Rods in Airflow. NASA CR-132556, 1975. (NAS1-11707 Old Dominion University)

- Goforth, Tom T.; and Rasmussen, Robert K.: Study of the Characteristics of Seismic Signals Generated by Natural and Cultural Phenomena. NASA CR-132606, 1975. (NAS1-11889 Teledyne Industries)
- Dingeldein, Richard C.; Connor, Andrew B.; and Hilton, David A.: Noise Reduction Studies of Several Aircraft to Reduce the Aural Detection Distance. NASA TM X-72644, 1975.
- Findley, Donald S.: Comparison of Measured and Calculated Aircraft Lift Generated Pressures. NASA TM X-72707, 1975.
- Hubbard, Harvey H.: Guidelines for the Planning and Preparation of Illustrated Technical Talks. NASA TM X-72783, 1975.
- Mueller, Arnold W.: A Description and Some Measured Acoustic Characteristics of the Langley 220 Cubic Meter Reverberation Chamber. NASA TM X-72775, 1975.
- Smith, Goldie C.; and LaNeave, Jean (Compilers): Publications in Acoustics and Noise Control from the NASA Langley Research Center During 1940-1974. NASA TM X-72710, 1975.
- Hardin, Jay C.; and Brown, Thomas J.: Further Results of Kendall's Autoregressive Series. Journal of Applied Probability, March 1975.
- Maciulaitis, Algirdas; Seiner, John M.; and Norum, Thomas D.: Sound Scattering by Rigid Oblate Spheroids with Implication to Pressure Gradient Microphones. NASA TN D-8140, 1976.
- Hubbard, Harvey H.; and Maglieri, Domenic J.: Aircraft Noise. 1976 McGraw-Hill Yearbook of Science and Technology, 1976.
- Hosier, Robert N.: Some Comparisons of the Flyover Noise Characteristics of DC-9 Aircraft Having Refanned and Hardwalled JT8D Engines, with Special Reference to Measurement and Analysis. Presented at the 91st Meeting of the Acoustical Society of America, April 1976, NASA TM X-72804.
- Pao, S. Paul: Acoustic Radiation from Sources Convected at Transonic Speeds. Presented at the AIAA 3rd Aeroacoustics Specialists Conference, July 1976. Preprint No. 76-488.
- Howlett, James T.; Williams, Louise H.; Catherines, John J.; and Jha, Sunil K.: Measurement, Analysis, and Prediction of Aircraft Interior Noise. Presented at the 3rd Aeroacoustics Specialists Conference, July 1976.



Norum, T. D.; and Liu, C. H.: The Acoustic Monopole in Motion. Presented at the 92nd Meeting of the Acoustical Society of America, November 1976. TM X-73985.

Hilton, David A.; and Henderson, Herbert R.: The Remotely Operated Multiple Array Acoustic Range (ROMAAR) for the Direct Measurement of Airplane Flyover Noise Footprints. Presented at the 92nd Meeting of the Acoustical Society of America, November 1976. TM X-73986.

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