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A COMPREHENSIVE BIBLIOGRAPHY OF LITERATURE ON HELICOPTER NOISE TECHNOLOGY

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16. Abstract

The basic purposes of this report are to provide a comprehensive BIBLIOGRAPHY of Helicopter Noise Technology literature covering the period 1975 through calendar 1980, to present this bibliography arranged by helicopter NOISE TECHNOLOGY AREAS, and to provide ABSTRACTS on literature that appear to make a significant contribution to the field of helicopter noise technology.

The helicopter is recognized as a complex noise generator, with significant contributions from the rotors, the engine and the gearbox. Much progress continues to be made in the noise areas of: (a) Formulations, Math Models and Analytical Procedures; (b) Noise Prediction Methodology; (c) Noise Reduction Techniques; and (d) Subjective Response to helicopter noise. The body of information, data and knowledge has use in many applications, including the reduction of helicopter noise in a cost effective manner and in minimizing annoyance to the civil populace.

This report has been arranged with the objective of being most useful to those having an interest in the individual areas of helicopter noise technology, as well as those having an overall interest in the field. It is intended that this report will be of particular use to those persons involved in: (a) the Formulation, Math Modeling and Analysis related to helicopter noise technology; (b) Prediction Methodology associated with helicopter noise; (c) Helicopter Noise Reduction Techniques; and (d) the Subjective Response to helicopter noise, both from a helicopter certification and community reaction standpoint.

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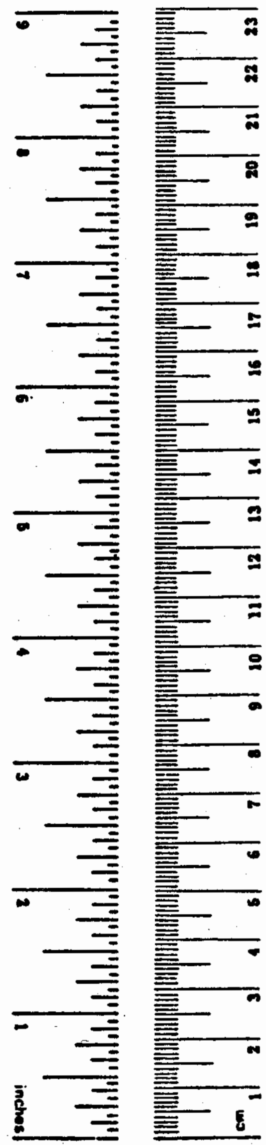
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

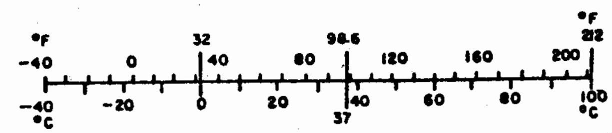
Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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SECTION I

INTRODUCTION

There has been a recognized need for a comprehensive bibliography of literature and reports related to the complex field of Helicopter Noise Technology, and identified in detail to the specific areas of:

a. Formulations, Mathematical Modeling, and Analytical Procedures;
b. Noise Prediction Methodology;
c. Noise Reduction Techniques; and
d. Subjective Response to Helicopter Noise.

Such a bibliography titled "A Comprehensive Review of Helicopter Noise Literature," Report No. FAA-RD-75-79 was published by the Federal Aviation Administration in June, 1975, and covered reports published through 1974.

This bibliography is intended to include helicopter noise technology literature published in 1975 through the calendar year 1980.

An extensive effort has been made to probe technology data bases such as are maintained by NTIS and NASA; to contact appropriate U.S. governmental agencies, universities, professional societies, and helicopter design and manufacturing companies. In addition, inquiries were directed to foreign companies, societies, and universities evidencing an interest in helicopter noise technology.

Recognition should be given to the many contributors of literature data whose responsiveness resulted in the comprehensive bibliography contained herein.

SECTION II

SUMMARY

The basic purpose of this report is to provide a comprehensive BIBLIOGRAPHY of Helicopter Noise Technology reports and literature covering the period 1975 through calendar 1980, to present this bibliography arranged by Helicopter NOISE TECHNOLOGY AREAS, and to provide ABSTRACTS on literature that appear to make a significant contribution to the field of helicopter noise technology.

The helicopter is recognized as a complex noise generator, with significant contributions from the rotors, the engine and the gearbox. Much progress continues to be made in the noise areas of:

a. Formulations, Math Models and Analytical Procedures;
b. Noise Prediction Methodology;
c. Noise Reduction Techniques; and
d. Subjective Response to Helicopter Noise.

The body of information, data, and knowledge has use in many applications, including the reduction of helicopter noise in a cost effective manner and in minimizing annoyance to the civil populace.

The report has been arranged with the objective of being most useful to those having an interest in the individual areas of helicopter noise technology, as well as those having an overall interest in the field.

Section III contains ABSTRACTS of those reports in the bibliography that appear to be the most significant in analyzing and/or advancing the state-of-the-art in helicopter noise technology.

Section IV contains the reports listed in the bibliography rearranged or GROUPED BY NOISE AREAS. It is expected that this section will be of particular use to one interested in a specific noise area, such as "Subjective Response."

Section V contains a comprehensive BIBLIOGRAPHY of helicopter noise technology literature. It is basically arranged alphabetically by author. An added feature is the inclusion of NOISE AREA CODES (NAC's) by which each report is coded to the NOISE AREAS to which it relates. The definitions of these codes are on page 18.

It is intended that this report will be of particular use to those persons involved in:

a. The Formulation, Math Modeling and Analysis related to helicopter noise technology;
b. Prediction Methdology associated with helicopter noise;
c. Helicopter Noise Reduction Techniques; and
d. The Subjective Response to helicopter noise, both from a helicopter certification and community reaction standpoint.

SECTION III

ABSTRACTS

Helicopter Noise Technology Reports

Bowes, M.A.
"Anticipated Benefits and Costs of Applying Current Helicopter Noise Reduction Technology"
1978; 6 pp.
Inter-Noise 78: Designing for Noise Control: Proceedings of the International Conference, San Francisco, California, May 8-10, 1978
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH (See page 18 for Noise Area Code - NAC definitions)

An analytical study was carried out to determine the possible impact of applying current noise reduction technology to future helicopter designs. The noise and cost characteristics of several existing helicopters were calculated as a baseline reference. Vehicle design parameters were then used to calculate basic performance capabilities in terms of range, out-of-ground effect hover ceiling and main rotor stall margin at maximum payload. The effects of specific changes in selected vehicle design parameters were assessed, where the changes were chosen to reflect currently available helicopter noise reduction methodology. The results indicate that small though meaningful reductions in helicopter noise can be obtained by treating the turbine engine exhaust duct, and that these reductions do not result in excessive life cycle cost penalities. However, the currently available main rotor noise reduction methodology is inadequate and excessively costly.

Bowes, M.A.
"Helicopter Noise Reduction Design Trade-off Study"
January, 1977; 252 pp.
Report No.: R-1493; Contract: DOT-FA76WA-3791
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH, P.

A study was performed to determine the noise reduction benefits and economic costs associated with applying state-of-the-art noise reduction methods to future design of civil helicopters. As part of this study, a survey of the make-up of the Civil fleet was performed, and this fleet make-up was projected to the 1980 time frame. Analytical methods were developed and/or adopted for calculating helicopter component noise, and these methods were incorporated into a unified total vehicle noise calculation model. Analytical methods were also developed for calculating the effects of noise reduction methodology on helicopter design, performance and cost. The analytical methods were used to calculate baseline noise and cost characteristics of several existing civil helicopters. These methods were also used to calculate changes in noise, design, performance and cost due to the incorporation of engine and main rotor noise reduction methods. All noise reduction techniques were evaluated in the context of an established mission performance criterion which included consideration of hover ceiling, forward flight range/speed/payload and rotor stall margin.

Charles, B.D.
"Acoustic Effects of Rotor-Wake Interaction During Low Power Descent"
March, 1975
Report No.: None
Bell Helicopter Company, Fort Worth, Texas
NAC: FO, FOI, FOR

Helicopter blade-vortex interaction noise has been measured in partial-power descent using a microphone array mounted external to the vehicle. The array was designed to permit spatial location of dominant slap noise sources while mapping intensity levels with forward speed and descent rate. Vortex interactions were predicted using a free-wake aerodynamic analysis, and show good trend correlation with noise intensity variations with descent rate. However, the predicted intersection azimuth positions yield only fair agreement with position data. Vortex interaction aerodynamics are modeled simply by two-dimensional, quasi-static theory and indicate that shock formation and stall may be responsible for intense slap noise.

Clevenson, S.A.; Shepherd, W.T.
"Time-of-Day Corrections to Aircraft Noise Metrics"
March, 11-12, 1980
Report No.: FAA-EE-80-3; NASA Conference Publication 2135
NASA Scientific and Technical Information Office
NAC: S, P

The objective of the Workshop was to develop information on noise metrics needed to guide government policy and rulemaking decisions. Time-of-day corrections to cumulative metrics were the primary concern. The participants were asked to focus on two areas: background/applications and research. In the first area, discussion topics included the technical bases for time-of-day corrections, needs and criteria, current practice and experience, government policy and regulation, and economic, social, and other impacts of using corrections. Research discussions dealt with past research, statements of current problems, needed research areas, and specific research approaches.

Edwards, R.G.; Broderson, A.B.; Barbour, R.W.; McCoy, D.F.; Johnson, C.W.
"Assessment of the Environmental Compatibility of Differing Helicopter Noise Certification Standards"
June, 1979
Report No.: FAA-AEE-79-13; Contract: DOT-FA78WA-4194
Federal Aviation Administration,, Washington, D.C.
NAC: S

Areas having the heaviest helicopter activity in the U.S. were visited and environmental noise measurements made in order to evaluate the impact of possible relaxed noise emission standards for helicopters restricted to remote regions. Measurement results showed that an average of 10 flyovers per hour produced a one-hour energy-averaged sound level (Leq) of 54.5 dBA, a level 2.5 dBA above ambient. An average of 34 events per hour adjacent to heliports produced a one-hour Leq of 63.1 dBA, which was 13.3 dBA above ambient. If emission levels were increased by 10 dBA, projected Leq values of 57.0 and 71.2 dBA resulted for the flyover and heliport conditions respectively. Sixty-four percent of those responding to a questionnaire stated that they had not experienced a problem from helicopter noise. The degree to which the remaining respondents were bothered ranged from "slightly" to "very annoyed" with no significant preference for either category.

Edwards, R.G.; Broderson, A.B.; Johnson, C.W.
"Helicopter Noise Impact"
March, 1980
Watkins and Associates, Inc., Box 951, Lexington, Kentucky 40501/Sound and Vibration Magazine
NAC: FH, S

To evaluate the environmental noise impact of civil helicopters, areas along the Gulf Coast of Louisiana and Texas, identified as those in the U.S. characterized by the "heaviest of helicopter activity," were visited and environmental noise measurements taken. Results showed an average of 10 flyovers per hour produced a one-hour energy-averaged sound level Leq of 54.5 dBA, a level 2.5 dBA above ambient. An average of 34 events per hour adjacent to heliports produced a one-hour Leq of 63.1 dBA, which was 13.3 dBA above ambient. Based on these results it appears that both source noise reduction and operational control of helicopters could best be applied to areas nearby heliports, and that dispersed over-flights minimally impact man.

Farassat, F.; Brown, T.J.
"A New Capability for Predicting Helicopter Rotor and Propeller Noise Including the Effect of Forward Motion"
June, 1977; 25 pp.
Report No.: NASA-TM-X-74037
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P, S, R

The governing equation and computing technique for the prediction of helicopter rotor and propeller noise are described. The method which gives both the acoustic pressure time history and spectrum of the noise includes the thickness and the loading noise. It was adapted to computers resulting in a new capability in noise prediction by removing many of the restrictions and limitations of previous theories. The capability results from the fact that the theory is developed entirely in the time domain. The formulation and the technique used are not limited to compact sources, steady level flight or to the far-field. In addition, the inputs to the computer program are normally available or are amenable to experimental measurements. This program can be used to study rotor and propeller noise with the aim of minimizing the radiated noise to reduce annoyance to the public. Several examples demonstrating the features and capability of the computer program are presented.

Federal Aviation Administration
"Noise Standards for Helicopters in the Normal, Transport, and Restricted Categories"
July 19, 1979
Vol. 44, No. 140; 14 CFR Parts 21 & 36; Docket No. 13410; Notice No. 79-13
Federal Register, Federal Aviation Administration
NAC: S, R, P, FH

This notice proposes regulations growing out of FAA's review of preliminary proposals for regulating noise of civil "short-haul," including rotary wing, aircraft contained in an advance notice of proposed rule making and is based on review of recent tests and studies of helicopter noise characteristics. These proposals apply to civil helicopters certificated in the normal, transport, and restricted categories. For purposes of this notice, "helicopters" include other aircraft for which lift is furnished, in whole or part, by an engine-driven rotor during takeoff, hover, or landing. The proposals provide noise levels and test procedures for the issuance of new type certificates and of original standard airworthiness certificates and restricted category airworthines certificates for newly produced helicopters of older design types. They also include a prohibition of certain changes in the type design of helicopters that might increase their noise levels beyond prescribed limits. The FAA believes that the rules are necessary to provide current and future relief and protection to the public health and welfare from the noise of the affected helicopters, but that it should not propose rule making at this time for the other aircraft covered by the advance notice.

Federal Interagency Committee on Urban Noise
"Guidelines for Considering Noise in Land Use Planning and Control"
June, 1980
Report No.: None
EPA, HUD, DOT, DOD; Virginia
NAC: S

In recent years noise has become a recognized factor in the community planning process: Some significant advancements are being made in the reduction of noise at its source; however, noise cannot be eliminated completely. Local, state, and federal agencies, in recognition of this fact, have developed guidelines and procedures to deal with noise in the community land use planning process. The purpose of this document is to put the various federal agency policy and guidance packages into perspective. Although this document does not replace the individual federal agency material, it can serve as the departure point for dealing with each Agency's programs and facilitate the consideration of noise in all land use planning and interagency/intergovernmental coordination processes. Section 1 presents consolidated federal agency land use compatibility guidelines. Section 2 overviews techniques by which the guidelines can be implemented. Section 3 briefly overviews the major federal agency noise control policies and programs. The Appendices contain brief descriptions of environmental noise descriptors and annotated bibliographies of selected federal documents.

Galloway, W.J.
"Helicopter Noise Level Functions for Use in Community Noise Analyses"
January, 1979; 47 pp.
Report No.: BBN-3713; Contract: F33615-76-C-0528
Bolt, Beranek and Newman, Inc., Canoga Park, California/USAF Aerospace Medical Research Laboratory, Dayton, Ohio
NAC: S, FH

Acoustical data obtained from helicopters in level flight and during 6 degree approaches are used to obtain the variation of A-weighted sound exposure level and effective perceived noise level with distance. These functions are normalized to a reference airspeed which differs for individual helicopter types. Sound level functions at airspeeds different from the reference airspeed, either higher or lower, are obtained by adding a decibel increment to the reference functions. This increment is obtained by multiplying a constant, different for each helicopter, times the square of the difference between the airspeed of interest and the reference airspeed. These data are provided for the following aircraft: CH-3C, CH-47C, CH-54B, HH-53B/C, OH-6A, TH-55A, UH-1N, UH-13. Maximum A-weighted sound levels and perceived noise levels at a distance of 76 meters (250 feet) are also provided as a function of angle around the aircraft during stationary hover conditions.

George, A.R.
"Helicopter Noise-State of the Art"
October 3-5, 1977
Grant: DAHC04-75-6-0120; AIAA Fourth Aeroacoustics Conference
American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, New York 10019
NAC: FO, FOR, P, R, S

Helicopter external noise is reviewed with particular emphasis on the noise due to helicopter main and tail rotors. The bases for annoyance and audibility are discussed. It is found that a variety of different helicopter noise mechanisms can be important to annoyance or audibility depending upon flight conditions and observer location. The full range of mechanisms which can contribute to rotor noise through blade volume, force, and Lighthill stresses (quadrupoles) is reviewed. Some of the more important mechanisms are understood in general but not sufficiently to be used for prediction and design. Other potentially important mechanisms such as drag forces, Lighthill stresses due to flow gradients, and unsteady shock waves are only beginning to be understood. Noise prediction and reduction are discussed in the light of our understanding of noise mechanisms.

George, A.R.; Kim, Y.N.
"High Frequency Broadband Rotor Noise"
April, 1977; pp. 538-545
AIAA Journal, Vol. 15, No. 4
NAC: FOB, FOR

A method has been developed to find the absolute spectral level of high frequency far field sound of a rotor in terms of random load fluctuations on the rotor blades. The analysis deals with frequencies where the radiated sound spectrum is smooth, i.e., above 300 to 400 Hz for a typical helicopter. This is in contrast to the low frequency regions where the spectrum is continuous but peaked near bladed passing harmonics. We first show that the smooth, broadband part of the spectrum corresponds to load fluctuations which are uncorrelated between blade passages. Then the spectral intensities from the individual blades are additive. A point load approximation with spanwise loading corrections is used and the blade loading spectrum is specifically derived for upwash fluctuations due to inflow turbulence. Analytic approximations are made to simplify the evaluation of certain integrals and series. The method is compared to the more general method of Homicz and George, where practical, and to published experimental data. The agreement between the two theories is excellent. The comparison to the experiments is good although it is not clear how to estimate the increase in intensity of atmospheric turbulence as it is distorted while being drawn into the rotor. The results indicate that atmospheric turbulence is perhaps the major contribution to broadband noise in hover. The approach is also applicable to other load fluctuation mechanisms.

Goff, R.J.; Novak, E.W.
"Environmental Noise Impact Analysis for Army Military Activities: User Manual"
November, 1977; 120 pp.
Report No.: CERL-TR-N-30
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S, P

This manual presents the most current techniques for evaluating the environmental impact of noise emissions from proposed and ongoing Army activities. It is designed for use in conjunction with the CERL-developed computer systems to produce an integrated approach to environmental impact assessment. The manual provides the methodology for determining and documenting environmental noise levels, procedures for interpreting these levels in terms of impact on the human environment, methods by which these impacts might be mitigated, and finally procedures to prepare comprehensive environmental noise impact assessments or statements in accordance with the Council on Environmental Quality (CEQ) Guidelines and AR 200-1.

Homans, B.; Little, L.; Schomer, D.
"Rotary-Wing Aircraft Operational Noise Data"
February, 1978; 70 pp.
Report No.: CERL-TR-N-38
Construction Engineering Research Lab (Army), Champaign, Illinois
NAC: S, P, F, H

This report presents Sound Exposure Level (SEL) vs. distance curves for eight models of Army rotary-wing aircraft (OH-58, AH-1G, UH-1M, UH1-1H, UH-1B, CH-47B, CH-54, and TH-55) performing dynamic operations, and Equivalent Sound Level contours for the same aircraft in static operations. The dynamic operations consisted of level flyovers, ascents, descents, turns, takeoffs, and landings; static operations included in-ground and out-of-ground effect hovers. Results are grouped according to model and type of operation and are suitable for use in manual or computerized programs for predicting noise impact from rotary-wing aircraft.

Kim, Y.N.: George A.R.
"Trailing Edge Noise from Hovering Rotors"
May, 1980
36th Annual Forum of the American Helicopter Society, Preprint No. 80-60
American Helicopter Society, 1325 - 18th Street, N.W., Washington, D.C. 20036
NAC: P, FOB

A method has been developed to predict the high frequency broadband noise due to the trailing edges of a hovering rotor. The trailing edge noise from each blade was modeled as point dipole noise with spanwise loading corrections. This point dipole approximation was checked by applying the concept to a stationary airfoil in a moving medium with excellent results. In order to estimate the strength of the point dipole, the trailing edge noise theory of Amiet was used. The method was applied specifically to blade boundary layer turbulence and compared to incident atmospheric turbulence noise. The results indicate that the relative importance of these two mechanisms is related to the magnitudes of the intensity and of the length scales of the inflow and boundary layer turbulence. The results tend to fall below some available experimental data indicating that in those experiments other broadband noise sources were stronger than boundary layer-trailing edge noise. The approach which was developed is also applicable to blade-turbulence interaction mechanisms such as local stall and tip noise.

King, R.; Gupta, B.
"Effective Perceived Noise Level for Future Civil Helicopters"
June, 1980
Contract: DOTFA01-80-C-10017
Hughes Helicopters, Culver City, California
NAC: R, P, FH, S

The objective of this program is to present the detailed acoustic results of the future helicopter noise trends developed under the Reference 1 contract which assessed future civil aircraft noise reduction alternatives. That study dealt with air carrier and general aviation aircraft as well as helicopters. As a consequence of the large scope of that study, results were limited to a summary format and noise details were not presented. Additionally, acoustic results for the helicopter case were presented in terms of "A" weighted Sound Pressure Level (SPLA). This unit provides a valid basis for comparison of external noise generation and allows evaluation of acoustic changes. However, it does not allow direct comparison with the regulatory data base which is normally presented in EPNL units. This study, therefore, expands the detail of the reference study acoustic data by adding 1/3 octave band noise levels as a function of time for each helicopter configuration and microphone location, presents time-history data also in terms of Perceived Noise Level (PNL) and Tone-Corrected Perceived Noise Level (PNLT), presents integrated EPNl data, shows correlation between predicted and measured Hughes Helicopters 500C noise levels in PNdB and EPNdB units, and indicates trends for noise and the cost of noise control.

Lawton, B.W.
"Subjective Assessment of Simulated Helicopter Blade-Slap Noise"
December, 1976; 55 pp.
Report No.: NASA-TN-D-8359; L-11137
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: S, FOI

The effects of several characteristics of helicopter blade slap upon human annoyance are examined. Blade slap noise was simulated by using continuous and impulsive noises characterized by five parameters: the number of sine waves in a single impulse; the frequency of the sine waves; the impulse repetition frequency; the sound pressure level (SPL) of the continuous noise; and the idealized crest factor of the impulses. Ten second samples of noise were synthesized with each of the five parameters at representative levels. The annoyance of each noise was judged by 40 human subjects. Analysis of the subjective data indicated that each of the five parameters had a statistically significant effect upon the annoyance judgments. The impulse crest factor and SPL of the continuous noise had very strong positive relationships with annoyance. The other parameters had smaller, but still significant, effects upon the annoyance judgments. Psychacoustic annoyance rating for impulsive noise characteristics variables include number of sine waves, frequency of sine waves, impulse frequency, sound pressure level, and impulse peak ratios. Forty-eight figures and seven tables are included.

Lynn, R.R.; Cox, C.R.
"Helicopter Noise Standards - Another Point of View, A Rational Approach to Rotorcraft Noise Regulation"
September, 1978
Fourth European Rotorcraft and Powered Lift Aircraft Forum, Paper No. 55
Associazione Italiana di Aeronautica ed Astronautica Associazione Industrie Aerospaziali, Stresa, Italy
NAC: FO, FH, S, R, P

This paper discusses and assesses the impact of proposed noise standards for rotorcraft and presents an alternate approach. The pattern followed in developing transport aircraft noise standards is reviewed. It is noted that a much shorter time is being proposed for rotorcraft noise standards development, even though helicopter technology is not as advanced. It is pointed out that this lack of regard for or understanding of the state of technology can have serious adverse consequences.

Contrasts between subsonic CTOL and rotorcraft regarding operational characteristics, economic base, and state of technology are then highlighted. These differences suggest that experience gained during the past decade in CTOL noise control cannot be transferred to rotorcraft.

Noise requirements being considered for helicopters within the United States and the International Civil Aviation Organization are summarized. The economic and safety consequences of these requirements are then discussed for new and derivative designs. It is shown that the economic penalty for noise reduction is significant for new aircraft and not economically reasonable for derivative machines.

A noise index is defined and used to compare the relative impact of noise produced by various transportation systems. This comparison shows that for high-density scheduled carrier use a helicopter produces no more annoyance than a bus. An alternate approach to noise regulation is suggested that makes use of a maximum noise index and the use of flight path and operational controls to achieve it.

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume I. Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology"
May, 1976; 145 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, FH, FO, FE, FG, R

The propulsion systems of current and future V/STOL vehicles can be defined as combinations of free-air propellers, shrouded propellers, variable pitch fans, fixed pitch fans, tilt rotors, helicopter rotors, lift fans, gearboxes, and drive engines. In this report, noise sources for each of these propulsors, gearboxes, and drive engines are identified and rank ordered. The noise generating mechanisms for each of the propulsor noise sources identified are defined and systematically catalogued. Three approaches to reduction of propulsor noise are discussed: changes in physical geometry, changes in design operating conditions, and the use of acoustic treatments. Computerized and graphical procedures based on methodology from the open literature and at United Technologies Corporation, are presented for predicting aerodynamic performance of and noise from the V/STOL propulsors identified in this study. The developed methodology allows the user to estimate the achieved noise reduction as well as the incurred performance penalities of noise reduction design features and noise attenuation devices such as partly sonic inlets and acoustic treatment. It is shown that much of the noise generating mechanism substantiation data and prediction methodology are based on static operation. Forward flight effects have recently been recognized as having a significant effect on the noise sources. Therefore, forward flight effect corrections are included in the methodology, but these have not been fully substantiated due to lack of data.

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume II. Graphical Prediction Methods"
May, 1976; 299 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, R, FH, FO, FE, FG

Graphical procedures for estimating noise and performance of free-air propellers, variable pitch fans with inlet guide vanes, variable pitch fans with outlet guide vanes, fixed pitch fans, helicopter rotors, tilt rotors, and lift fans are presented. Noise prediction methods for drive engines, gearboxes, jets with and without bypass flow, as well as noise reduction and performance losses for partly sonic inlets and duct linings are also presented. These graphical methods are parallel to those developed for the computer program discussed in Volume 3 of this report to the extent possible without their becoming too involved and tedious to use. The procedures are extensive and applicable to a wide variety of V/STOL propulsor systems, including present and future V/STOL vehicles. The methods have been validated with available data wherever possible. However, high quality data for isolated propulsors which is free from contamination by other sources and ground reflections is somewhat limited, particularly for forward flight conditions.

Magliozzi, B.
"V/STOL Rotary Propulsion Systems - Noise Prediction and Reduction. Volume III. Computer Program User's Manual"
May, 1976; 300 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division
NAC: P, FE, FR, FH, FG

A computer program is presented which allows a user to make performance and far-field acoustic noise predictions for free-air propellers, variable pitch fans with inlet guide vanes, variable pitch fans with outlet guide vanes, fixed pitch fans, helicopter rotors, tilt rotors, fixed pitch lift vanes with remote, integral, and tip-turbine drives, and variables pitch lift fans with remote and integral drives. Noise prediction methodology for drive engines, single stream and coaxial jets, and gearboxes are also included, as well as noise reduction and performance losses of partly sonic inlets and duct acoustic treatment. A description of the program, detailed instructions for its use, required inputs, and sample cases are presented. Related documents include Volume 1 - Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology and Volume 2 - Graphical Prediction Methods.

Magliozzi, B.; Metzger, F.B.; Bausch, W.; King, R.J.
"A Comprehensive Review of Helicopter Noise Literature"
June, 1975; 188 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connectcut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: F, P, R, S

This report summarizes the state-of-the-art in helicopter noise. It includes a biblography of reports on all components of helicopter noise including main rotor, tail rotor, engine and gearbox. Literature on helicopter noise reduction and subjective evaluation of helicopter noise were also included. Capsule summaries of important reports are included which describe the purpose of the report, summarizes the important results, compares the report with others on the same subject, and provides a critical evaluation of the work presented. It is concluded that the available prediction methodology provides a means for estimating helicopter sources on a gross basis. However, the mechanisms of noise generation are still not fully understood, although the experimental and theoretical tools are now available to conduct the definitive experiments and establish the mathematical models needed for accurate definition of helicopter noise generation mechanisms. Spectrum analyses of helicopter noise show that main rotor, tail rotor, and engine sources contribute significantly to annoyance. In cases where these sources have been heavily suppressed, gearbox noise will also appear as a significant contributor to annoyance. Therefore, quieter helicopters must include suppression of all of these components.

National Aeronautics and Space Administration
"Helicopter Acoustics: Proceedings of an International Specialists Symposium"
1978; 402 pp.
Conference Publication 2052
National Aeronautics and Space Administration, Scientific and Technical Information Office, Springfield, Virginia
NAC: F, FH, P, R

Part I of this book of proceedings contains four overview papers and fifteen technical papers related to rotor noise. The overview papers are very interesting and by themselves justify a reading of the book. The initial paper outlines the FAA views with regard to external noise certification and gives an insight into the background used in preparation of the recently issued NPRM. Specific reference is made to the potential gains from the application of new technological innovations, and it is stated that this will lead to reduced noise and lower fuel consumption. This statement is not justified, and none of the other papers give this encouraging view. The proposed certification concepts are outlined. The second paper, giving an industrial perspective, puts forth a pessimistic view, highlighting the complexities of noise reduction and the fact that although the FAA approach is based on "fixed wing" concepts, there are significant differences between the two forms of transport. The primitive state-of-the-art in noise prediction is mentioned. The paper also discussed the implication of applying the certification standards to remote area operations. The next paper, the military (U.S. Army) point of view is given; it is interesting to note that in essence it states that external noise of military helicopters should be comparable to that of civil helicopters, providing there are no performance penalties--impossible in a practical sense. Reference is also made to internal noise, and it is clear that communications are being impaired by high noise levels, but there is no reference to trading off weight/performance for a better environment. The final paper in this set discusses the impact of helicopter operations on an urban environment, and implies that very quiet helicopters will have to be developed if the potential growth of this market is not to be inhibited. This paper appears to give undue weight to community reactions and pressure groups, without any consideration to "acceptable criteria."

Newman, J. S.
"Correlations of Helicopter Noise Levels with Physical and Performance Characteristics"
September, 1980
Report No.: DOT-FAA-EE-80-42
Federal Aviation Administration/National Technical Information Services, Springfield, VA
NAC: S, P, FH

This report investigates the correlation between physical and performance characteristics of helicopters and the noise levels which they generate in various operational modes. The analysis is generally empirical although several theoretical functions described in the literature have been examined. The EPNL is the acoustical metric employed in this study. One, two, and three-step multiple regression analyses are conducted for takeoff, approach, and level flyover operations. Plots are provided for the three best single variable regression models for each mode of flight.

Newman, J. S.; Rickley, E.J.
"Noise Levels and Flight Profiles of Eight Helicopters Using Proposed International Certification Procedures"
March, 1979; 298 pp.
Report No.: FAA-AEE-79-03
Federal Aviation Administration, Washington, D.C., Office of Environment and Energy
NAC: S, P

This document reports the findings of helicopter noise tests conducted at the FAA National Aviation Facility Experimental Center (NAFEC), located in Atlantic City, New Jersey. The tests were conducted with the following objectives: first, determine the feasibility of a takeoff procedure for helicoopter noise certification; second, establish a data base of helicopter noise levels to be used in defining noise standards; and, third, acquire helicopter acoustical spectral data for a variety of acoustical angles for use in the FAA Integrated Noise Model. This report addresses the first two objectives.

Schomer, P.D.; Homans, B.L.
"Technical Background: Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns, and Siting Noise-Sensitive Land Uses"
September, 1976; 17 pp.
Report No.: CERL-IR-N-9
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

This report presents interim criteria for locating rotary-wing aircraft traffic patterns and ingress and egress corridors into an airfield/heliport to avoid conflict with noise-sensitive land uses, and provides criteria for planners to site noise-sensitive land uses with respect to the established airfield/heliport and established flight corridors. These interim criteria are required because the exact Air Force technique for predicting fixed-wing aircraft noise cannot currently be used due to the unpredictability of helicopter flight patterns; these criteria are the basis for interim procedures established in a companion report, User Manual: Interim Procedure for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses (Construction Engineering Research Laboratory Interim Report N-10,1976)

Schomer, P.D.; Homans, B.L.
"User Manual: Interim Procedure for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976; 40 pp.
Report No.: CERL-IR-N-10
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

This report presents (1) interim procedures for determining the location of rotary-wing aircraft traffic patterns and ingress and egress corridors into an airfield/heliport area to avoid conflict with noise-sensitive land uses, and (2) criteria for siting noise-sensitive land uses with respect to established airfield or heliport plans. The procedures are based on interim criteria established in a companion report, Technical Background: Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses (Construction Engineering Research Laboratory Interim Report N-9 1976) impact measures, a background of the development of noise contours, and tables for finding the noise impact. A complete descriptive example of the use of the procedures is presented as an aid to the reader.

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.; Schaeffer, E.G.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume I. Technical Report"
March, 1978; 307 pp.
Report No.: D210-11236-1; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FG, P, R

The objective of the Helicopter Transmission Vibration/Noise Reduction Program was to generate analytical tools for the prediction and reduction of helicopter transmission vibration/noise that provide the capability to perform trade studies during the design stage of a program. Application of this optimization capability yields drive train components that are dynamically quiet with reduced vibration/noise levels and inherently longer life.

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume II. User's Manual"
March, 1978; 431 pp.
Report No.: D210-11236-2; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Phildelphia, Pennsylvania
NAC: FG, P, R

The objective of the Helicopter Transmission Vibration/Noise Reduction Program was to generate analytical tools for the prediction and reduction of helicopter transmission vibration/noise that provide the capability to perform trade studies during the design stage of a program. Application of this optimization capability yields drive train components that are dynamically quiet with reduced vibration/noise levels and inherently longer life. The work conducted under this program is highly computer-oriented and makes extensive use of several computer programs as indicated in the technical report (Volume I). This User's Manual describes these computer programs, presents rationale for their use, and discusses their application.

Spencer, R.H.; Sternfeld, H., Jr.
"Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications"
January, 1980; 128 pp.
Contract: DOT-FA78WA-4161
Boeing Vertol Company, Philadelphia, Pennsylvania/Federal Aviation Administration, Washington, D.C.
NAC: R, F, H, FO, P

This study investigated cost/benefit tradeoffs using the case histories of four helicopters for which design and development were complete, and in three cases, have undergone substantial flight testing. The approach to quieting each helicopter was an incremental reduction of each source as required to obtain reductions in flyover noise with modifications to other secondary systems only as necessary. The methodology used to predict the effects of the design modifications on acquisition, maintenance, and operating costs were typical of those employed by rotorcraft manufacturers. The reduction of helicopter flyover noise generally was achieved through reductions in rotor tip speed. Performance characteristics were maintained to specified minimums for each aircraft in the study.

Sternfeld, H.
"Helicopter Rotor Noise Control"
December 16, 1974
Report No.: None
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: FO, FOI, FOR, P, R, S

This article reviews the sources of helicopter noise and describes several design changes which produced a low noise helicopter. It is hopeful that even quieter helicopters can be designed in the future. In addition, the noise criteria which should be used to certify new helicopters as well as those criteria which should assure acceptance in the community are discussed.

Sternfeld, H.
"Recent Developments in Helicopter Noise Reduction"
September, 1978
Paper A4-04/Proceedings of the XI Congress of the International Council of the Aeronautical Sciences/Republished in the Aeronautical Journal of the Royal Aeronautical Society August, 1979
NAC: R, FO

This paper reports on research activities directed at understanding and reducing interior and exterior noise of modern helicopters. Impending regulatory criteria for external noise are discussed, along with some of the newer understandings of the sources of rotor noise. The effect of rotor design on generated noise and methods for reducing the noise are presented. The paper also explains the application of finite element analytical techniques to optimizing the dynamic response of helicopter transmissions in order to minimize interior noise.

Sternfeld, H.; Doyle, L.
"The Effects of Engine Noise and Rotor Broadband Noise on Civil Helicopter Operations"
June, 1978
Report No.: NASA CR145085
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: R, S, FE, FEC

The purpose of this program was to identify the noise reduction research which is required to permit continued growth of civil helicopter operations while observing community noise constraints such as those forecast by a previous study. Since active programs have already been established for some time in the area of harmonic rotor noise (particularly the impulsive types), this study considered only broadband rotor noise, engine noise and dynamic component noise.

A measurement program was conducted to evaluate the levels associated with a representative group of current helicopters; the Bell Model 204B, Sikorsky SH-3A and S-65, Boeing Vertol CH-47B and a ground test rig of a large rotor and drive system designed for the Boeing Vertol Heavy Lift Helicopter. The results indicate that additional noise reduction of future models will be required to maintain Effective Perceceived Noise Levels below 95 EPNdB at heliport boundaries.

Broadband rotor noise was found to be the major contributor when compared with broadband noise from the engine inlet of combustor. Pure tones from the engine compressors on the larger helicopters, however, were found to be significant.

Sternfeld, H., Jr.; Wiedersum, C.W.
"Study of Design Constraints on Helicopter Noise"
July, 1979; 91 pp.
Report No.: NASA-CR-159118
Contract: NAS1-15226
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO, P, S

A means of estimating the noise generated by a helicopter main rotor using information which is generally available during the preliminary design phase of aircraft development is presented. The method utilizes design charts and tables which do not require an understanding of acoustical theory or computational procedures in order to predict the perceived noise level, a weighted sound pressure level, or C-weighted sound pressure level of a single hovering rotor. A method for estimating the effective perceived noise level in forward flight is also included. In order to give the designer an assessment of the relative rotor performance, which may be traded off against noise, an additional chart for estimating the percent of available rotor thrust which must be expended in lifting the rotor and drive system, is included as well as approach for comparing the subjective acceptability of various rotors once the absolute sound pressure levels are predicted.

Tangler, J.L.
"Schlieren and Noise Studies of Rotors in Forward Flight"
May, 1977
Preprint No. 77.33-05, Presented at 33rd Annual National Forum of the American Helicopter Society
American Helicopter Society, Washington, D.C.
NAC: FO, FOI, R

A wind-tunnel investigation of model rotors operating at full-scale Mach numbers in simulated partial power descent and high-speed flight is described. Schlieren flow visualization aided by full-scale blade pressure measurements helped identify seven blade/vortex intersections that occur during partial power descent. Two of the lst-quadrant intersections have the potential of inducing bow shocks. Observation of the high-speed crescent-shaped shock which results from transonic flow over the advancing blade has provided new insight into its structure and directivity. Correlation of the flow visualization results with acoustic measurements gives clarification of the relationship between aerodynamic events that occur on the blade and the various components of the slap signature. Comparisons of rotors having different twist, airfoil profile, and thickness show qualitative differences that suggest means of alleviating this noise.

True, H.C.; Rickley, E.J.
"Noise Characteristics of Eight Helicopters"
July, 1977; 167 pp.
Report No.: FAA-RD-77-94
Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: S, P

This report describes the noise characteristics of eight helicopters during level flyovers, simulated approaches, and hover. The data were obtained during an FAA/DOT Helicopter Noise Program to acquire a data base for possible helicopter noise regulatory action. The helicopter models tested were the Bell 47G, 206L, and 212 (UHIN), the Hughes 300C and 500C, the Sikorsky S-61 (SH-3B) and S-64 (CH-54B) and the Vertol CH-47C. The acoustic data is presented as Effective Perceived Noise Level, A-weighted sound pressure level and 1/3 octave band sound pressure level with a slow meter characteristic per FAR Part 36. Selected waveforms and narrow band spectra are also shown. Proposed methods to quantify impulsive noise ("blade slap") are evaluated for a level flyover for each of the helicopters. The tested helicopters can be grouped into classes depending upon where the maximum noise occurs during a level flyover. Helicopters with the higher main rotor tip speeds propagate highly impulsive noise ahead of the helicopter. The maximum noise for most of the helicopters occurs near the overhead position and appears to originate from the tail rotor. Unmuffled reciprocating engine helicopters appear to have significant engine noise behind the helicopter. Noise levels, when compared as a function of gross weight and flown at airspeeds to minimize "Compressibility slap" from a band 7 EPNdB wide with a slope directly proportional to gross weight. The quieter helicopters have multibladed rotors and tipspeeds below 700 fps.

SECTION IV

HELICOPTER NOISE TECHNOLOGY REPORTS GROUPED BY NOISE AREAS

Introduction

This section contains the reports listed in Section V - Bibliography grouped in the appropriate noise areas identified below:

Noise Areas				(NAC's) Noise Area Codes
A.	Formulations, Math Models, Analytical Procedures			F
	1.	Rotors		FO
		a.	Rotational	FOR
		b.	Broadband	FOB
		c.	Impulsive	FOI
	2.	Engine		FE
		a.	Combustion	FEC
		b.	Turbine	FET
		c.	Jet	FEJ
		d.	Compressor	FER
	3.	Gearbox		FG
	4.	Complete Helicopter		FH
B.	Helicopter Noise Prediction Methodology			P
C.	Helicopter Noise Reduction Techniques			R
D.	Subjective Response to Helicopter Noise			S

In the noise area coding, the primary area of involvement is noted first, with secondary areas following. Where a report content is associated with more than one noise area, the report is listed in this section in the primary area of involvement.

Formulations, Math Models, Analytical Procedures

NAC: F

Jones, D.S., F.R.S.
"The Scattering of Sound by a Simple Shear Layer"
February 18, 1977; pp. 287-315
Philosophical Transactions Series A Vol. 284 Part 1323
Department of Mathematics, The University, Dundee, London
NAC: F

Magliozzi, B.; Metzger, F.B.; Bausch, W.; King, R.J.
"A Comprehensive Review of Helicopter Noise Literature"
June, 1975; 188 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connectcut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: F, P, R, S

Melnikov, B.N.
"Experimental Investigation of Helicopter Flight Modes on Helicopter Generated Noise"
June, 1979; pp. 450-453
Akusticheskii Zhurnal, Vol. 25, May-June, 1979. In Russian.
Gosudarstvennyi Nauchno-Issledovatel'skii Institut Grazhdanskoi, Aviatsil, Moscow, USSR
NAC: F, P

National Aeronautics and Space Administration
"Helicopter Acoustics: Proceedings of an International Specialists Symposium"
1978; 402 pp.
Conference Publication 2052
National Aeronautics and Space Administration, Scientific and Technical Information Office, Springfield, VA
NAC: F, FH, P, R

Rotor Noise

NAC: FO

Amiet, R.K.
"Noise Due to Rotor-Turbulence Interaction"
1978; pp. 109-126
NASA Conference Publication 2052
United Technologies Research Center, East Hartford, Connecticut, 06108
NAC: FO, P

Amiet, R.K.
"Noise Produced by Turbulent Flow into a Propeller or Helicopter Rotor"
1976
AIAA Paper No. 76-560/AIAA Journal, Vol. 15, No. 3, March 1977, pp. 307-308
United Technologies Research Center, East Hartford, Connecticut 06108
NAC: FO, P

Aravamudan, K.S.; Harris, W.L.
"Experimental and Theoretical Studies on Model Helicopter Rotor Noise"
January, 1978; 158 pp.
Report No.: 78-1; 83852-1; Contract: DAAG29-76-C-0027
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab/Army Research Office, Research Triangle Park, North Carolina
NAC: FO, FOR, FOB, P

Charles, B.D.
"Acoustic Effects of Rotor-Wake Interaction During Low Power Descent"
March, 1975
Report No.: None
Bell Helicopter Company, Fort Worth, Texas
NAC: FO, FOI, FOR

Cox, C.R.
"Helicopter Rotor Aerodynamic and Aeroacoustic Environments"
October, 1977
Preprint 77.1338
Presented at the Fourth Aeroacoustic Conference of the American Institute of Aeronautics and Astronautics, Atlanta, Georgia
Bell Helicopter Textron, Fort Worth, Texas
NAC: FO, FOR, FOB, FOI, P

Dahan, C.; Gratieux, E.
"Helicopter Rotor Thickness Noise"
June 4-6, 1980; 11 pp.
Report No.: AIAA Paper 80-1012/ONERA TP No. 1980-45
American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 6th, Hartford, CT
NAC: FO

Damongeot, A.
"Helicopter Tail Rotor Noise Generated by Aerodynamic Interactions"
1978; 13 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings Volume 2
Societe Nationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France
NAC: FO, P

Engineering Sciences Data Unit Limited
"Estimation of the Maximum Discrete Frequency Noise from Isolated Rotors and Propellers"
September, 1976; 12 pp.
Report No.: ISBN-0-85679-157-1
Engineering Sciences Data Unit Limited, London, England
NAC: FO, P

Farassat, F.
"A Bound on Thickness of Rotating Blades"
1977
Published in the Proceedings of 14th Annual Meeting of the Society of Engineering Science, Inc.
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: FO

Farassat, F.
"The Derivation of a Thickness Noise Formula for the Far-Field by Isom"
1979; pp. 159-160
Published letter to the Editor, Journal of Sound and Vibration (1979)64(1)
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.
"Theory of Noise Generation from Moving Bodies with an Application to Helicopter Rotors"
December, 1975; 61 pp.
Report No.: NASA-TR-R-451; L-10379
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P

Farassat, F.; Brown, T.J.
"A New Capability for Predicting Helicopter Rotor and Propeller Noise Including the Effect of Forward Motion"
June, 1977; 25 pp.
Report No.: NASA-TM-X-74037
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P, S, R

Farassat, F.; Brown, T.J.
"A New Formula for the Determination of the Acoustic Pressure Signature of Helicopter Rotors"
October 7-8, 1975
Presented Review of Research Theme "Helicopter and V/STOL Aircraft Research," Moffett Field, CA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Brown, T.J.
"Development of a Noncompact Source Theory with Applications to Helicopter Rotors"
July, 1976
AIAA Paper 76-563/Presented at AIAA Third Aeroacoustics Conference, Palo Alto, CA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Morris, C.E.K., Jr.; Nystrom, P.A.
"A Comparison of Linear Acoustic Theory with Experimental Noise Data for a Small-Scale Hovering Rotor"
March 12-14, 1979
AIAA Paper No. 79-1608/Presented at AIAA Fifth Aeroacoustics Conference, Seattle, WA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Pegg, R.J.; Hilton, D.A.
"Thickness Noise of Helicopter Rotors at High Tip Speeds"
March, 1975
Paper No. AIAA 75-453/Presented at AIAA Second Aeroacoustics Conference
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Gangwani, S.T.
"The Effect of Helicopter Main Rotor Blade Phasing and Spacing on Performance, Blade Loads and Acoustics"
September, 1976; 100 pp.
Report No.: NASA-CR-2737; SRL-3169-0014; Contract: NAS1-13705
Systems Research Labs, Inc., Newport News, Virginia
NAC: FO

George, A.R.
"Helicopter Noise--State of the Art"
October 3-5, 1977
Grant: DAHC04-75-6-0120; AIAA Fourth Aeroacoustics Conference
American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, N.Y.
NAC: FO, FOR, P, R, S

George, A.R.
"Research on Helicopter Rotor Noise"
February 10, 1975; 17 pp.
Contract: DAHC04-74-C-0001
Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York/Army Research Office, Durham, North Carolina
NAC: FO, P

George, A.R.; Najjar, F.E.; Kim, Y.N.
"Noise Due to Tip Vortex Formation on Lifting Rotors"
June 4-6, 1980
Report No.: AIAA-80-1010/AIAA Sixth Aeroacoustics Conference, Hartford, CT
American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, N.Y.
NAC: FO, FOR, FOB, P

Gottlier, J.J.
"Simulation of a Travelling Sonic Boom in a Pyramidal Horn"
July, 1974
Report No.: None
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: FO

Greene, G.C.
"An Overview of NASA's Propeller and Rotor Noise Research"
June, 1980; 7 pp.
Report No.: AIAA Paper 80-0992
NASA Langley Research Center, Hampton, Virginia/American Institute of Aeronautics and Astronautics Aeroacoustics Conference, 6th, Hartford, Connecticut
NAC: FO

Hartman, W.F.
"Potential Applications of Acoustic Emission Technology as a Nondestructive Evaluation Method for Naval Aviation Ground Support"
July 5, 1978; 19 pp.
Contract: N68335-77-M-5735
Hartman (William F.), Knoxville, Tennessee
NAC: FO, P

Hoad, D.R.
"Evaluation of Helicopter Noise Due to Blade-Vortex Interaction for Five Tip Configuration"
December, 1979; 80 pp.
Report No.: NASA-TP-1608; AVRADCOM-TR-80-B1; Contract: DA PROJ. 1L2-62209-AH-76
National Aeronautics and Space Administration, Langley Station, Virginia, Langley Research Center
NAC: FO, FOI, R

Isom, M.P.
"Some Nonlinear Problems in Transonic Helicopter Acoustics"
May, 1979; 64 pp.
Report No.: POLY-M/AE-79-19
Polytechnic Institute of New York, Brooklyn Department of Mechanical and Aerospace Engineering/Army Research Office, Research Triangle Park, North Carolina
NAC: FO, P

Kasper, P.K.
"Determination of Rotor Harmonic Blade Loads from Acoustic Measurements"
October, 1975; 66 pp.
Report No.: NASA-CR-2580; Contract: NAS1-12390
Wyle Labs, Inc., Hampton, Virginia
NAC: FO, P

Lee, A.
"An Acoustical Study of Circulation Control Rotor"
January, 1979
NASA-CR-152209/NAS2-9865
Beam Engineering, Inc., Sunnyvale, California
NAC: FO

Leverton, J.W.; Southwood, B.J.; Pike, A.C.; Woodward, M.A.
"A Revaluation of Helicopter Main Rotor Noise"
September, 1976; 10 pp.
Report No.: None
Westland Helicopters, Ltd., Yeovil, Somerset, England
NAC: FO

Liebowitz, H.; Farassat, F.
"Research on Helicopter Rotor Noise"
October, 1979; 13 pp.
Grant: DAAG29-78-G-0152; DAAG29-76-G-0259
George Washington University, Washington, D.C., School of Engineering and Applied Science/Army Research Office, Research Triangle Park, North Carolina
NAC: FO, P

Lynn, R.R.; Cox, C.R.
"Helicopter Noise Standards - Another Point of View, A Rational Approach to Rotorcraft Noise Regulation"
September, 1978
Fourth European Rotorcraft and Powered Lift Aircraft Forum, Paper No. 55
Associazione Italiana di Aeronautica ed Astronautica Associazione Industrie Aerospaziali, Stresa, Italy
NAC: FO, FH, S, R, P

Magee, J.P.; Alexander, H.R.
"A Hingeless Rotor XV-15 Design Integration Feasibility Study. Volume I: Engineering Design Studies"
March, 1978; 473 pp.
Report No.: NASA-CR-152310; D210-11360-1-V-1; Contract: NAS2-9015
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO, R

Magliozzi, B.
"V/STOL Rotary Propulsor Noise Prediction Model Update and Evaluation"
December, 1979; 233 pp.
Update to Report Nos.: FAA-RD-76-49-1 through FAA-RD-76-49-3 dated May 76
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: FO, P

Mall, G.H.; Farassat, F.
"A Computer Program for the Determination of the Acoustic Pressure Signature of Helicopter Rotors Due to Blade Thickness"
January, 1976
Report No.: NASA TM X-3323
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: FO

Morris, C.E.K.; Farassat, F.; Nystrom, P.A.
"An Evaluation of Linear Acoustic Theory for a Hovering Rotor"
May, 1979
Report No.: NASA TM 80059
The George Washington University/Joint Institute for Advancement of Flight Sciences Washington, D.C.
NAC: FO

Nakamura, Y.
"The Analysis of Helicopter Rotor Noise"
September, 1977; pp. 111-151
Report No. 549, Vol. 42
University of Tokyo, Institute of Space and Aeronautical Science
NAC: FO, P

Nakamura, Y.; Azuma, A.
"Improved Methods for Calculating the Thickness Noise"
August, 1978; pp. 323-337
Tokyo University/NASA Langley Research Center, Helicopter Acoustics, (See N78-32816 23-71)
NAC: FO

Nakamura, Y.; Azuma A.
"Rotational Noise of Helicopters Rotors"
1979; pp. 293-316
Vertica, Vol. 3, No. 3-4, 1979
University of Tokyo, Japan
NAC: FO, FOI

National Aeronautics and Space Administration
"Flutter Testing Techniques"
1976; 483 pp.
Report No.: NASA-SP-415
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P

National Aeronautics and Space Administration
"Predesign Study for an Aero/Acoustic Research Rotor System"
September, 1976
Report No.: NASA CR 145017; NAS1-13980
Boeing Vertol Company
NAC: FO

National Aeronautics and Space Administration
"Predesign Study for an Aero/Acoustic Research Rotor System. Volume II - Funding Estimate"
September, 1976
Report No.: NASA CR 145018; NAS1-13980
Boeing Vertol Company
NAC: FO

Nelson, P.A.; Halliwell, N.A.
"A Physical Description of a Vortex Noise Source"
1978
Institute of Acoustics Spring Conference
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FO

North Carolina State University
"Interagency Symposium on University Research in Transportation Noise (2nd) Held at North Carolina State University, Raleigh on June 5-7, 1974. Book of Proceedings, Volume I"
June, 1974, 469 pp.
Contract: DOT-OS-40040
North Carolina State University, Raleigh, North Carolina/Office of the Secretary of Transportation, Washington, D.C. Office of Noise Abatement/National Aeronautics and Space Administration, Washington, D.C./Department of Defense, Washington, D.C./National Science Foundation, Washington, D.C.
NAC: FO, FH, P, R

Parks, C.L.
"A Computer Program for Helicopter Rotor Noise Using Lowson's Formula in the Time Domain"
July 22, 1975; 92 pp.
Report No.: NASA-TM-X-727559
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia
NAC: FO, P

Paterson, R.W.: Amiet, R.K.
"Acoustic Radiation and Surface Pressure Characteristics of an Airfoil due to Incident Turbulence"
September, 1976
Report No.: NASA CR-2733; NAS1-13823; AIAA Paper No. 76-571
United Technologies Research Center, East Hartford, Connecticut/NASA, Washington, D.C.
NAC: FO, P

Paterson, R.W.; Amiet, R.K.
"Noise of a Model Helicopter Rotor Due to Ingestion of Turbulence"
November, 1979; 131 pp.
Report No.: NASA-CR-3213; Contract: NASl-15094
United Technologies Research Center, East Hartford, Connecticut/NASA, Washington, D.C.
NAC: FO, P

Patterson, R.; Amiet R.; Schlinker, R.
"An Investigation of the Effect of the Ingestion of Main Rotor Tip Vortices on Tail Rotor Noise"
September 5, 1980/November 19, 1981
Contract: NASl-16392
NASA Langley Research Center, Hampton, Virginia/United Technologies Research Center, East Hartford, CT
NAC: FO

Pegg, R.J.; Hosier, R.N.; Balcerak, J.C.; Johnson, H.K.
"Design and Preliminary Tests of a Blade Tip Air Mass Injection System for Vortex Modification and Possible Noise Reduction on a Full-Scale Helicopter Rotor"
December, 1975; 39 pp.
Report No.: NASA-TM-X-3314; L-10428
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, R

Petit, G.; Dambra, M.; Marze, M.
"Propagation of Noise Generated by Helicopter Rotors"
November, 1975; 15 pp.
Report No.: None
Societe Nationale Industrielle Aerospatiale, Marignane, Bouches-du-Rhone, France
NAC: O, P

Pike, A.C.; Southwood, B.J.
"Helicopter Rotor Noise Research--Analysis of Recorded Data"
August, 1976
Contract: K/A12/646/CB/A12bl; Research Paper: 521-Part 3
Westland Helicopters Limited, Yeovil, Somerset
NAC: FO, P, FOB

Rusnak, R.M.; Yee, H.C.; Sen, J.K.
"Acoustic Emission Investigation--Helicopter Rotor System"
November, 1976
USAAMRDL TR 76-11; DAAJ02-73-C-0066; AD A033571
Bendix Research Laboratories/USAAMRDL
NAC: FO

Schlegel, R.G.; Bausch, W.E.
"Helicopter Rotor Rotational Noise Prediction and Correlation. Volume II. Documentation of Noise Prediction Computer Program"
November, 1970; 82 pp.
Contract: DA-44-177-AMC-448(T)
United Aircraft Corporation, Stratford, Connecticut, Sikorsky
NAC: FO, P

Sternfeld, H.
"Helicopter Rotor Noise Control"
December 16, 1974
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: FO, FOI, FOR, P, R, S

Sternfeld, H.
"Investigation of Rotor Harmonic Noise"
September 30, 1980
Contract: NAS2-10767
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO

Sternfeld, H., Jr.; Wiedersum, C.W.
"Study of Design Constraints on Helicopter Noise"
July, 1979; 91 pp.
Report No.: NASA-CR-159118; Contract: NAS1-15226
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO, P, S

Tangler, J.L.
"Schlieren and Noise Studies of Rotors in Forward Flight"
May, 1977
Preprint No. 77.33-05, Presented at 33rd Annual National Forum of the American Helicopter Society
American Helicopter Society, Washington, D.C.
NAC: FO, FOI, R

Widnall, S.W.; Harris, W.L.: Lee, Y.C.A.; Drees, H.M.
"The Development of Experimental Techniques for the Study of Helicopter Rotor Noise"
November, 1974; 89 pp.
Report No.: NASA-CR-137684; Contract: NAS2-7684
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FO, FOR, FOI

Rotor Rotational Noise

NAC: FOR

Aravamudan, K.S.; Lee, A.; Harris, W.L.
"A Simplified Mach Number Scaling Law for Helicopter Rotor Noise"
April, 22, 1978; 16 pp.
Contract: DAAG29-C-027 NSG-2095
Journal of Sound and Vibration, Vol. 57, pp. 555-570
NAC: FOR, FOB

Balcerak, J.C.
"Parametric Study of the Noise Produced by the Interaction of the Main Rotor Wake with the Tail Rotor"
1976; 70 pp.
Report No.: NASA-CR-145001; Contract: NAS1-13690
Systems Research Llabs, Inc., Newport News, Virginia, RASA Division
NAC: FOR, P

Barger, R.L.
"Theoretical Prediction of Nonlinear Propagation Effects on Noise Signatures Generated by Subsonic or Supersonic Propeller or Rotor-Blade Tips"
May, 1980; 18 pp.
Report No.: NASA-TP-1660; L-13388
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FOR, P, R

Lee, A.; Harris, W.L.; Widnall, S.E.
"An Experimental Study of Helicopter Rotor Rotational Noise in a Wind Tunnel"
July, 1976
Report No.: AIAA Paper 76-564; Contract: NAS2-7684
American Institute of Aeronautics and Astronautics, Aero-Acoustics Conference, 3rd, Palo Alto, CA
Massachusetts Institute of Technology, Cambridge, Massachusetts
NAC: FOR

Ramakrishnan, R.; Randall, D.; Hosier, R.N.
"A Computer Program to Predict Rotor Rotational Noise of a Stationary Rotor from Blade Loading Coefficient"
February, 1976; 164 pp.
Report No.: NASA-TM-X-3281; L-9796
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FOR, P

Southwood, B.J.
"Helicopter Rotor Noise Research--Analysis of Recorded Data"
October, 1976
Contract: K/A12/646/CB/A1261; Research Paper: 521-Part 2
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: FOR, FO, P

Widnall, S.E.; Wolf, T.L.
"Effect of Tip Vortex Structure on Helicopter Noise Due to Blade-Vortex Interaction"
October, 1980; 7 pp.
Contract: NSG-2142
Massachusetts Institute of Technology, Cambridge Massachusetts
NAC: FOR, P

Rotor Broadband Noise

NAC: FOB

Aravamudan, K.S.; Harris, W.L.
"Low-Frequency Broadband Noise Generated by a Model Rotor"
August, 1979; pp. 522-533
Contract: DAAG29-C-027 NSG-2095
Massachusetts Institute of Technology, Cambridge, Massachusetts/Acoustical Society of America, Journal, Vol. 66
NAC: FOB, FO

George, A.R.; Kim, Y.N.
"High Frequency Broadband Rotor Noise"
April, 1977; pp. 538-545
AIAA Journal, Vol. 15, No. 4
Cornell University, Ithaca, New York
NAC: FOB, FOR

Lee, A.; Aravamudan, K.S.; Bauer, P.; Harris, W.L.
"An Experimental Investigation of Helicopter Rotor High Frequency Broadband Noise"
October, 1977; 11 pp.
Report No.: AIAA Paper 77-1339; Contract: DAAG29-C-027 NSG-2095
Massachusetts Institute of Technology, Cambridge, Massachusetts
NAC: FOB, P

Leverton, J.W.; Woodward, M.C.A.
"Helicopter Rotor Noise Research - Analysis of Recorded Data. Broadband Noise Study"
July, 1976
Research Paper No.: 521 - Part I; Contract: K/A12/646/CB/A12bl
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: FOB, P

Munch, C.L.; Patterson, R.W.; Day, H.
"Rotor Broadband Noise Resulting from Tip Vortex/Blade Interaction"
February, 1975; 98 pp.
Report No.: SER-50909; Contract: DAHC04-72-C-0040
United Technologies Corporation, Stratford, Connecticut, Sikorsky Aircraft Division/Army Research Office, Research Triangle Park, North Carolina
NAC: FOB

Rotor Impulsive Noise

NAC: FOI

Galloway, W.J.
"Physical Analysis of the Impulsive Aspects of Helicopter Noise"
April, 1977; 394 pp.
Report No.: BBN-3425; Contract: WI-77-3683-1
Bolt, Beranek and Newman, Inc., Canoga Park, California
NAC: FOI, S, P

Hall, G.F.
"Transient Airload Computer Analysis for Simulating Wind Induced Impulsive Noise Conditions of a Hovering Helicopter Rotor"
October, 1975; 48 pp.
Report No.: NASA-CR-137772; Contract: NAS2-7025
United Technologies Research Center, East Hartford, Connecticut
NAC: FOI, P

Hoad, D.R.: Scheiman, J.
"Investigation of Blade Impulsive Noise on a Scaled Fully Articulated Rotor System"
June, 1977
Report No.: NASA TM X-3528
Structures Laboratory, AVRADCOM, Moffett Field, California
NAC: FOI

Hubbard, J.E., Jr.; Humbad, N.G.; Bauer, P.; Harris, W.L.
"Parametric Studies of Model Helicopter Blade Slap and Rotational Noise"
February, 1979; 79 pp.
Report No.: 79-1; Contract: DAAG29-79-C-0027
Massachusetts Institute of Technology, Cambridge Fluid Dynamics Research Lab/Army Research Office, Research Triangle Park, North Carolina
NAC: FOI, P

Johnson, W.; Lee A.
"Comparison of Measured and Calculated Helicopter Rotor Impulsive Noise"
March, 1978; 29 pp.
Report No.: NASA-TM-78473; A-7355; Contract: NAS2-9399
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA
NAC: FOI, FO, P

Lee, A.
"A Computer Program for the Identification of Helicopter Impulsive Noise Sources"
January, 1977; 28 pp.
Report No.: NASA-CR-151997
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FOI, P

Lee, A.
"Acoustic Effects of Blade Tip Shape Changes on a Full Scale Helicopter Rotor in a Wind Tunnel"
April, 1978; 59 pp.
Report No.: NASA-CR-152082; Contract: NAS2-9399
Beam Engineering, Inc., Sunnyvale, California
NAC: FOI, P, R

Lee, A.
"High Speed Helicopter Noise Sources"
January, 1977; 47 pp.
Report No.: NASA-CR-151996
Massachusetts Institute of Technology, Camabridge, Fluid Dynamics Research Lab
NAC: FOI, P

Powell, C.A.
"A Subjective Field Study of Helicopter Blade-Slap Noise"
July, 1978; 88 pp.
Report No.: NASA-TM-78758
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia
NAC: FOI, P, S

Schmitz, F.H.; Boxwell, D.A.; Vause, C.R.
"Acoustically Swept Rotor"
September 8, 1977; 36 pp.
Report No.: PAT-APPl-831-633; NASA-CASW-ARC-11106-1
National Aeronatuics and Space Administration, Ames Research Center, Moffett Field, CA
NAC: FOI, R

Schmitz, F.H.; Yu, Y.H.
"Theoretical Modeling of High-Speed Helicopter Impulsive Noise"
January, 1979; pp. 10-19
Journal Volume 24, January 1979, American Helicopter Society
U.S. Army, Aeromechanics Laboratory, Moffett Field, California
NAC: FOI

Vause, C.R.; Schmitz, F.H.; Boxwell, D.A.
"High-Speed Helicopter Impulsive Noise"
1976; 13 pp.
U.S. Army Air Mobility Research and Development Laboratory, Moffett Field, CA
NAC: FOI, S

Wolf, T.L.: Widnall, S.E.
"The Effect of the Tip Vortex Structure on Helicopter Noise Due to Blade/Vortex Interaction"
March, 1978; 94 pp.
Report No.: NASA-CR-152150; MIT-78-2
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FOI, P

Yu, Y.H.; Caradonna, F.X.; Schmitz, F.H.
"The Influence of the Transonic Flow Field on High-Speed Helicopter Impulsive Noise"
1978; 17 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings, Volume 2
U.S. Army Aeromechanics Laboratory, Moffett Field, California
NAC: FOI, P

Engine Noise

NAC: FE

Hodder, B.K.
"Further Studies of Static to Flight Effects on Fan Tone Noise Using Inlet Distortion Control for Source Identification"
December, 1976
Report No.: NASA TM X-73,183
Aeromechanics Laboratory, AVRACOM, Moffett Field, California
NAC: FE, P

Semple, R.D.
"Research Requirements for Development of Regenerative Engines for Helicopters"
December, 1976; 36 pp.
Report No.: NASA-CR-145112; Contract: NAS1-13624
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FE, P

Engine Jet Noise

NAC: FEJ

Glegg, S.A.L.
"Jet Noise Source Location"
1979
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Head, R.W.
"Jet/Surface Interaction Noise: Experimental Determination of the Edge Noise Source"
1977
ISVR Contract Report No.: 77/19
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Howell, G.P.
"The Sound Power Spectrum of Shock-free Jets"
1979
AIAA Paper 79-0595
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Szewczyk, V.M.
"Jet Noise Modelling by Geometric Acoustics. Part I: Theory and Prediction Outside the Cone of Silence"
1977
ISVR Technical Report No. 91
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Szewczyk, V.M.
"Jet Noise Modelling by Geometric Acoustics. Part II: Theory, and Prediction Inside the Cone of Silence"
1977
ISVR Technical Report No. 92
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Szewczyk, V.M.
"Jet Noise Modelling by Geometric Acoustics. Part III: A Computer Program for the Prediction of Jet Mixing Noise"
1977
ISVR Technical Report No. 93
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morgan, J.D.
"The Interaction of Sound with a Subsonic Cylindrical Vortex Layer"
1975; pp. 341-362
Proc. R. Soc. Lond. A. 344
The University of Dundee, Department of Mathematics, DD1 4HN, London, England
NAC: FEJ

Richarz, W.
"Direct Correlation of Noise and Flow of a Jet Using Laser Doppler"
June, 1978
Report No.: None
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: FEJ

Stimpert, D.L.; Clemons, A.
"Acoustic Analysis of Aft Noise Reduction Techniques Measured on a Subsonic Tip Speed 50.8 cm (Twenty Inch) Diameter Fan"
January, 1977; 149 pp.
Report No.: NASA-CR-134891; R75AEG368; Contract: NAS3-18021
General Electric Company, Cincinnati, Ohio
NAC: FEJ, R, P

Strout, Frank G.
"Flight Effects on Noise Generated by the JT8D-17 Engine in a Quiet Nacelle and a Conventional Nacelle as Measured in the NASA-AMES 40x80-Foot Wind Tunnel"
June, 1976
Report No.: NASA CR-2576
Ames Directorate, NASA, Moffett Field, California
NAC: FEJ

Szewczyk, V.M.
"The Role of Flow Acoustic Interaction in Jet Noise Studies"
1977
Ph.D. Thesis
University of Southampton, Instiute of Sound and Vibration Research
NAC: FEJ

Engine Compressor Noise

NAC: FER

Howe, M.S.: Williams, J.E.F.
"On the Noise Generated by an Imperfectly Expanded Supersonic Jet"
May 2, 1977; pp. 272-313
Vol. 289, A1358
University Engineering Department, Trumpington Street, Cambridge, London
NAC: FER

Gearbox Noise

NAC: FG

Bossler, R.B., Jr.; Bowes, M.A.; Royal, A.C.
"An Analytical Method for Designing Low Noise Helicopter Transmissions"
August, 1978; pp. 657-677
NASA, Langley Research Center Helicopter Acoustics, Pt. 2
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: FG

Bowes, M.A.; Giansante, N.; Bossler, R.B., Jr; Berman, A.
"Helicopter Transmission Vibration and Noise Reduction Program"
June, 1977; 155 pp.
Report No.: R-1495; Contract: DAAJ02-74-C-0039
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: FG, P

Howells, R.W.; Sciarra, J.J.
"Finite Element Analysis Using NASTRAN Applied to Helicopter Transmission Vibration/Noise Reduction"
September, 1975; 20 pp.
Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FG, P, R

Mayer, T.C.; Covill, E.F.; George, J.A.; Harrington, J.T.
"Shock Pulse Meter Analysis"
October 15, 1974; 159 pp.
Contract: DAAJ01072-A-0027
Parks College of Saint Louis University, Cahokia, Illinois
NAC: FG, FO

Pollard, J.S.
"A Preliminary Study of Helicopter (Cabin) Noise"
March, 1976
Contract: K/A12/902; Research Paper: 514
Westland Helicopters Limited, Yeovil, Somerset
NAC: FG, S

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.; Schaeffer, E.G.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume I. Technical Report"
March, 1978; 307 pp.
Report No.: D210-11236-1; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FG, P, R

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume II. User's Manual"
March, 1978; 431 pp.
Report No.: D210-11236-2; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Phildelphia, Pennsylvania
NAC: FG, P, R

Zaretsky, E.V.; Townsend, D.P.; Coy, J.J.
"NASA Gear Research and Its Probable Effect on Rotorcraft Transmission Design"
November, 1979; 19 pp.
Report No.: NASA-TM-79292; E-236
National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
NAC: FG, R

Complete Helicopter Noise

NAC: FH

Cunningham, T.B.; Nuan, E.C.
"Helicopter High Gain Control"
July, 1979; 171 pp.
Report No.: NASA-CR-159052; HONEYWELL-79SRC33; Contract: NAS1-14789
Honeywell Systems and Research Center, Minneapolis, Minnesota
NAC: FH, FO

Edwards, R.G.; Broderson, A.B.; Johnson, C.W.
"Helicopter Noise Impact"
March, 1980
Watkins and Associates, Inc., Box 951, Lexington, Kentucky 40501/Sound and Vibration Magazine
NAC: FH, S

Federal Aviation Administration
"Helicopter Operations Development Plan"
September, 1978; 116 pp.
Report No.: FAA-RD-78-101
Federal Aviation Administration, Washington, D.C.
NAC: FH, P, R

Hanson, H.W.; Balke, R.W.; Edwards, B.D.; Riley, W.W.; Downs, B.D.
"Engine/Airframe/Drive Train Dynamic Interface Documentation"
October, 1978; 204 pp.
Contract: DAAJ02-77-C-0045
Bell Helicopter Textron, Fort Worth, Texas/Army Research and Technology Labs, Fort Eustis, VA
NAC: FH, P

Jester, J.; Lane, T.E.; Chambers, H.W.; Forsyth, R.F.
"Engineering Flight Test of the YCH-47C Medium Transport Helicopter Army; Preliminary Evaluation II"
February, 1969; 204 pp.
Report No.: USAAVNTA-66-28-2
Army Aviation Systems Test Activity, Edwards AFB, California
NAC: FH

Lince, D.L.
"A Technique for Measuring the External Noise of a Moving Helicopter"
September, 1973; 74 pp.
Report No.: AD-773687 HEL-TM-16-73
Human Engineering Labs, Aberdeen Proving Ground, Maryland
NAC: FH, P

Magee, J.P.; Clark R.; Alexander, H.R.
"Conceptual Design Studies of 1985 Commercial VTOL Transports that Utilized Rotors, Volume 1"
November, 1974; 459 pp.
Report No.: NASA-CR-137599; DZ10-10858-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, P

Magee, J.P.; Clark, R.; Alexander, H.R.
"Conceptual Design Studies of 1985 Commercial VTOL Transports that Utilize Rotors, Volume 2"
November, 1974; 407 pp.
Report No.: NASA-CR-137600; D210-10858-2; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, P

McIntosh, V.C.; Bolds, P.G.
"Vibration and Acoustic Environment of AH-1G Helicopter"
April, 1975; 224 pp.
Report No.: AFFDL-TR-75-17
Air Force Flight Dynamics Lab, Wright-Patterson AFB, Ohio
NAC: FH, P

Melnikov, B.N.
"Experimental Studies of Helicopter Flight Conditions and Noise"
June, 1979, pp. 450-453
Akusticheskii Zhurnal, Vol. 25, May-June, 1979, Physics - Acoustics, Vol. 25, May-June, 1979, pp. 255-257. Translation.
Gosudarstvennyi Nauchno-Issledovatel'skii Institut Grazhdanskoi, Aviatsii, Moscow, USSR
NAC: FH, P

National Aeronautics and Space Administration
"Helicopter Acoustics"
August, 1978; 399 pp.
Report No.: NASA-CP-2052-PT-1; L-12339
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FH

National Aeronautics and Space Administration
"Helicopter Acoustics, Part 2"
August, 1978; 438 pp.
Report No.: NASA-CP-2052-PT-2; L-12339-PT-2
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FH, P, R

Sneckenberger, J.E.; Butler, H.W.; Heou, I.
"Experimental Synchronization Study of the Gyroscopic Vibration Absorber"
September, 1973
Paper No.: ASME 73-DET-132
West Virginia University, Department of Mechanical Engineering and Mechanics, Morgantown, WV
NAC: FH, R

Sneckenberger, J.E.; Clise, R.A.
"Active Synchronization Control of the Gyroscopic Vibration Absorber"
May, 1976
Paper No. ASME 75-DET-11
West Virginia University, Department of Mechanical Engineering and Mechanics, Morgantown, WV
NAC: FH, R

Sperry UNIVAC
"Drone Control and Data Retrieval System (DCDRS). Preliminary Design Study Final Report. Volume III. Trade Studies and Analyses. Part XVIII. Human Operator Environment Trade Study"
April, 1974; 36 pp.
Contract: F33657-73-C-0665
Sperry UNIVAC, St. Paul, Minnesota Defense Systems Division
NAC: FH

Widdison, C.A.; Magee, J.P.; Alexander, H.R.
"Conceptual Design Study of a 1985 Commercial STOL Tilt Rotor Transport"
November, 1974; 256 pp.
Report No.: NASA-CR-137601; D210-10873-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, FO, P

Wright, S.E.
"High Forward Speed Helicopter Noise"
July, 1976; 10 pp.
Report No.: AIAA Paper 76-562
American Institute of Aeronautics and Astronautics
NAC: FH, FO

Helicopter Noise Prediction Methodology

NAC: P

Bolton, J.S.
"On the Use of a Local Reaction Boundary Condition in Theories of Sound Propagation Outdoors"
1978
Institute of Acoustics Spring Meeting, Cambridge
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Bolton, J.S.
"Sources of Variability in Sound Propagation Outdoors"
1978
Institute of Acoustics Meeting on Statistical Aspects of Sound Propagation Outdoors/
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Bowes, M.A.
"Development and Evaluation of a Method for Predicting the Vibration and Noise Characteristics of Helicopter Transmissions"
1977; 12 pp.
Report No: AHS77-33-76; Contract: DAAJ02-74-C-0039
American Helicopter Society, Annual National Forum, 33rd, Washington, D.C., May 9-11, 1977 Proceedings
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: P, FG

Brown, T.J.; Farassat, F.
"A New Capability for Predicting Helicopter Rotor Noise in Hover and in Flight"
1976; 14 pp.
Grant: NGR-09-010-085
Army Air Mobility Research and Development Lab, Hampton, Virginia
NAC: P, FO

Control Data Corporation
"Predesign of the Second-Generation Comprehensive Helicopter Analysis System"
October, 1978; 160 pp.
Contract: DAAJ02-77-C-0058
Control Data Corporation, Hampton, Virginia/Army Research and Technology Labs, Fort Eustis, VA
NAC: P, FH

Davis, S.J.; Egolf, T.A.
"An Evaluation of a Computer Code Based on Linear Acoustic Theory for Predicting Helicopter Main Rotor Noise - CH-53A and S-76 Helicopters"
July, 1980; 290 pp.
Report No.: NASA-CR-159339 SER-510038
Sikorsky Aircraft, Stratford, Connecticut
NAC: P, FOR

Fink, M.R.
"Minimum On-axle Noise for a Propeller or Helicopter Rotor"
October, 1978; pp. 700-702
Journal of Aircraft, Vol. 15
United Technologies Research Center, East Hartford, Connecticut
NAC: P, FOB

George, A.R.
"Research on Helicopter Rotor Noise"
August 15, 1978; 19 pp.
Grant: DAHC04-75-G-0120
Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York
NAC: P, FO, FOB, FOI

Greene, G.C.
"Validation of Helicopter Noise Prediction Techniques"
March 28, 1980
Contract: NASl-15740
Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts
NAC: P

Gupta, B.P.
"Helicopter External Noise Prediction and Correlation with Flight Test"
August, 1978; pp. 263-275
NASA Langley Research Center Helicopter Acoustics
Textron Bell Helicopter, Fort Worth, Texas
NAC: P

Hamrick, T.; Copeland, D.; Tarzanin, F.; Staley, J.; Hunt, L.
"Predesign of the Second Generation Comprehensive Helicopter Analysis System"
December, 1978; 149 pp.
Contract: DAAJ02-77-C-0059
Science Applications, Inc., McLean, Virginia/Army Research and Technology Labs, Fort Eustis, VA
NAC: P, FH

Hawkings, D.
"Noise Generation by Transonic Open Rotors"
June, 1979
Contract: K/A12/1156; Research Paper: 599
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FO

Hayden, R.E.; Aravamudan, K.S.
"Prediction and Reduction of Rotor Broadband Noise"
August, 1978; pp. 61-87
Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts/NASA Langley Research Center, Helicopter Acoustics
NAC: P, R

Hosier, R.N.; Ramakrishnan, R.
"Helicopter Rotor Rotational Noise Predictions Based on Measured High-Frequency Blade Loads"
December, 1974; 86 pp.
Report No.: NASA-TN-D-7624; L-9358
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: P, FO

Howell, G.P.; Morfey, C.L.
"Non-linear Propagation of Noise Spectra"
1978
Institute of Acoustics Spring Conference, Cambridge
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Kim, Y.N.: George A.R.
"Trailing Edge Noise from Hovering Rotors"
May, 1980
36th Annual Forum of the American Helicopter Society, Preprint No. 80-60
American Helicopter Society, 1325 - 18th Street, N.W., Washington, D.C. 20036
NAC: P, FOB

Large, J.B.; House, M.E.
"The Status of Airport Noise Prediction"
1979
Internoise 79 Proceedings, Warsaw, Poland
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Levine, L.S.; DeFelice, J.J.
"A Practical Approach to Helicopter Internal Noise Prediction"
May 22-24, 1978
NASA Conference Publication 2052, Part II
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: P

Levine, L.S.; DeFelice, J.J.
"Civil Helicopter Research Aircraft Internal Noise Prediction"
April 1, 1977
Contract: NASA CR-145146
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: P, FH

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume I. Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology"
May, 1976; 145 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, FH, FO, FE, FG, R

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume II. Graphical Prediction Methods"
May, 1976; 299 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, R, FH, FO, FE, FG

Magliozzi, B.
"V/STOL Rotary Propulsion Systems - Noise Prediction and Reduction. Volume III. Computer Program User's Manual"
May, 1976; 300 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division
NAC: P, FE, FR, FH, FG

Owen, S.
"ICAO/CAN Working Group B. Helicopter Noise Comparison Test Programme"
September, 1976
Contract: AE/145/038; Research Paper No.: 529
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FH

Owen, S.
"ICAO/CAN Working Group B. Helicopter Noise Comparison Test Programme. Further Study of Lynx Data and Comparative Study of Other Data"
May, 1977
Contract: AE/145/038 (DOI); Research Paper No.: 549
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FH, FO

Pegg, R.J.
"A Summary and Evaluation of Semi-Empirical Methods for the Prediction of Helicopter Rotor Noise"
December, 1979; 96 pp.
Report No.: NASA-TM-80200
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: P, FO

Putmam, T.W.
"Review of Aircraft Noise Propagation"
September, 1975; 61 pp.
Report No.: TM-X-56033
NASA Flight Research Center, Edwards AF Base
NAC: P, S

Ralph, M.A.
"A Preliminary Study of Tail Rotor Noise"
March, 1976
Contract: K/A12/770/CB/A12b; Research Paper: 516
Westland Helicopters Limited, Yeovil, Somerset
NAC: P, FO

Saulpic, C.
"Non-linear Effects of Sound Propagation"
1978
MS.c. Dissertation
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P, F

Schauer, J.J.; Hoffman, E.P.; Guyton, R.E.
"Sound Trnasmission Through Ducts"
May, 1978; 163 pp.
Report No.: AFAPL-TR-78-25
University of Dayton, School of Engineering, Dayton, Ohio 45469
NAC: P, FE

Schlegel, R.G.; Bausch, W.E.
"Helicopter Rotor Rotational Noise Prediction and Correlation. Volume I. Rotational Noise Prediction and Correlation Under Nonuniform Inflow Conditions"
November, 1970; 105 pp.
Contract: DA-44-177-AMC-448(T)
United Aircraft Corporation, Stratford, Connecticut, Sikorsky Aircraft Division
NAC: P, FO, FH

True, H.C.; Letty, R.M.
"Helicopter Noise Measurements Data Report. Volume I. Helicopter Models: Hughes 300-C. Hughes 500-C. Bell 47-G. Bell 206L."
April, 1977; 384 pp.
Report No.: FAA-RD-77-57-1
Federal Aviation Administration, Washington, D.C./Systems Research and Development Service
NAC: P, FH, R

True, H.C.; Letty, R.M.
"Helicopter Noise Measurements Data Report. Volume II. Helicopter Models: Bell 212 (UH-1N). Sikorsky S-61 (SH-3A). Sikorsky S-64 'Skycrane' (CH-54B). Boeing Vertol 'Chinook' (CH-47C)"
April, 1977; 420 pp.
Report No.: FAA-RD-77-57-2
Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, FH, R

Williams, J.; Law, M.R.P.
"Helicopter Flight-Path and Acoustic-Signal Repeatability for Noise-Diagnosis and Noise-Certification"
1978; 13 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings, Volume 2
Royal Aircraft Establishment, Aerodynamics Department, Farnborough, Hants, England
NAC: P, R. S

Wills, C.R.
"Acoustic Evaluation of a Tail Rotor with an Improved Aerofoil Section"
Date: None
Research Paper: 567; Contract: K/Ai2/857
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FO

NAC: R

Army Aviation Research and Development Command
"Aeronautical Noise Limits in Helicopters - Aeronautical Design STD #22"
June 6, 1980
Project No. 1520-0025
U.S. Army Aviation Research and Development Command
NAC: R

Bowes, M.A.
"Anticipated Benefits and Costs of Applying Current Helicopter Noise Reduction Technology"
1978; 6 pp.
Inter-Noise 78: Designing for Noise Control: Proceedings of the International Conference, San Francisco, California, May 8-10, 1978
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH

Bowes, M.A.
"Helicopter Noise Reduction Design Trade-off Study"
January, 1977; 252 pp.
Report No.: R-1493; Contract: DOT-FA76WA-3791
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH, P.

Bowes, M.A.
"The Cost of Applying Current Helicopter External Noise Reduction Methods while Maintaining Realistic Vehicle Performance"
August, 1978; pp. 563-582
NASA Langley Research Center Helicopter Acoustics, Pt. 2
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R

Brown, E.L.; Cox, C.R.; Halwes, D.R.
"A Preliminary Design Study of a Quiet Light Observation Helicopter"
December, 1969; 165 pp.
Report No.: Bell Helicopter-299-099-526; Contract: DAAJ02-68-C-0095
Bell Helicopter Company, Fort Worth, Texas
NAC: R

Charalambakis, J.B.; Large, J.B.
"The Development of Aircraft Noise Control Strategies"
1980
Annual Report 1980, Institute of Sound and Vibration Research
University of Southampton, Institute of Sound and Vibration Research, England
NAC: R, S

Conner, D.W.; Vaughan, J.C. III
"Technology Requirements and Readiness for Very Large Aircraft"
March, 1980; 14 pp.
Report No.: NASA-TM-81783
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: R

Defelice, J.J.; Nashif, A.D.
"Damping of an Engine Exhaust Stack"
September, 1978
The Shock and Vibration Bulletin, Part 2
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: R

Deutsche Gesellschaft fuer Luft-und Raumfahrt
"Contributions to Helicopter Technology"
November 21, 1975; 185 pp.
Report No.: DLR-MITT-75-24
Deutsche Gesellschaft fuer Luft-und Raumfahrt, Cologne, West Germany
NAC: R, FO

Farassat, F.; Nystrom, P.A.; Brown, T.J.
"Bounds on Thickness and Loading Noise of Rotating Blades and the Favorable Effect of Blade Sweep on Noise Reduction"
May 22-24, 1978
Presented at International Specialist Symposium, Helicopter Acoustics, Langley Research Center
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: R, FO

Hoad, D.R.
"An Experimental Investigation of the Effect of Rotor Tip Shape on Helicopter Blade-Slap Noise"
May, 1979; 464 pp.
Report. No.: NASA-TM-80066
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: R, FOI

Janakiram, D.S.
"Experimental Evaluation of Active and Passive Means of Alleviating Rotor Impulsive Noise in Descent Flight"
November, 1979; 86 pp.
Report No.: NASA-CR-159188; RASA/SRL-14-79-04; Contract: NAS1-15337
Systems Research Labs, Inc., Newport News, Virginia, RADA Division
NAC: R, FOI

King, R.; Gupta, B.
"Effective Perceived Noise Level for Future Civil Helicopters"
June, 1980
Contract: DOTFA01-80-C-10017
Hughes Helicopters, Culver City, California
NAC: R, P, FH, S

Langenbucher, V.
"Noise Phenomena with Helicopter Rotors and Possibilities of Noise Reduction"
February, 1976; 27 pp.
Translated into English from "Triebwerkslaerm" DGLR, Cologne Report DLR--Mitt-74-21, 1974, pp. 259-274
European Space Agency, Paris, France
NAC: R, FOR

Langenbucher, V.; Laudien, E.
"Possibilities and Problems of Helicopter Noise Reduction"
November 21, 1975; pp. 53-100
Contribution to Helicopter Technology
Messerchmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany)
NAC: R

Lenski, J.W.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume III. Evaluation of Fiber FP Metal-Matrix Housing Specimens"
January, 1979; 99 pp.
Report No.: D210-11442-1; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania/Army Research and Technology Labs, Fort Eustis, VA
NAC: R, P, FG

Leverton, J.W.
"Interim Report on Progress of Quiet Helicopter Feasibility Study"
April, 1977
Contract: K/A12/1258
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: R, FO

Levine, L.S.
"Analytic Investigation of Techniques to Reduce Tail Rotor Noise"
July 1, 1976
Report No.: NASA CR-145014
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: R, FO

Marinelli, J.L.
"Informal Evaluation of the Sikorsky S-62 Amphibious, Turbine-Powered Helicopter"
February 5, 1959, 6 pp.
Report No. ATBG-DT-AVN-5058
Army Aviation Test Board, Fort Rucker, Alabama
NAC: R, FH

Noise Control Foundation
"Inter-Noise Proceedings"
Annual Report
Noise Control Foundation, P.O.B. 3469, Arlington Branch, Poughkeepsie, New York
NAC: R, P, S

Olson, J.R.
"Helicopter Mission Optimization Study"
December, 1978; 122 pp.
Report No.: NASA-CR-3060; Contract: NAS1-1498
United Technologies Corporation, Stratford, Connecticut, Sikorsky Division
NAC: R, FH

Schaeffer, E.G.
"Design of Helicopter Rotors in Noise Constraints"
August, 1978; pp. 551-561
NASA, Langley Research Center Helicopter Acoustics, Pt. 2
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: R, FO

Schmitz, F.H.; Boxwell, D.A.; Vause, R.
"Acoustically Swept Rotor"
September 25, 1979 (patented); 23 pp.
Report No.: PATENT-4 168 939; PAT-APPL-831 633
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, FOI

Scruggs, B.W., Jr.; Hampton, K.D.
"An Analytical Investigation of the Effect of Varying Rotor Tip Speed to Reduce Helicopter Acoustic Detection"
August, 1979; 34 pp.
Report No.: USARTL-TN-37
Army Research and Technology Labs, Fort Eustis, Virginia
NAC: R, S

Shahady, P.A.; Lyon, C.A.; Chopin, M.H.; Ewing, M.S.; McGregor, R.M.
"Quiet Propeller Concept Evaluation"
October, 1977; 140 pp.
Report No.: AFAPL-TR-77-56
Air Force Aero Propulsion Lab, Wright-Patterson, AFB, Ohio
NAC: R, P

Shovlin, M.D.; Gambucci, B.J.
"Effect of High Lift Flap Systems on the Conceptual Design on a 1985 Short-Haul Commercial STOL Tilt Rotor Transport"
April, 1978; 29 pp.
Report No.: NASA-TM-78474; A-7364
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, FH

Spencer, R.H.; Sternfeld, H., Jr.
"Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications"
January, 1980; 128 pp.
Contract: DOT-FA78WA-4161
Boeing Vertol Company, Philadelphia, Pennsylvania/Federal Aviation Administration, Washington, D.C.
NAC: R, F, H, FO, P

Sternfeld, H.
"Advanced Rotorcraft Noise"
May, 1980
Paper AIAA-80-0857/AIAA International Meeting and Technical Display "Global Technology 2000"
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: R, S

Sternfeld, H.
"Helicopter Rotor Noise Control"
May-June, 1975
Vol. 4, No.3, Noise Control Engineering
NAC: R, S

Sternfeld, H.
"Recent Developments in Helicopter Noise Reduction"
September, 1978
Paper A4-04/Proceedings of the XI Congress of the International Council of the Aeronautical Sciences/Republished in the Aeronautical Journal of the Royal Aeronautical Society August, 1979
NAC: R, FO

Sternfeld, H.; Doyle, L.
"The Effects of Engine Noise and Rotor Broadband Noise on Civil Helicopter Operations"
June, 1978
Report No.: NASA CR145085
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: R, S, FE, FEC

Stimpert, D.L.
"Demonstration of Short-Haul Aircraft Aft Noise Reduction Techniques on a Twenty Inch (50.8) Diameter Fan, Volume 2"
April, 1975; 307 pp.
Report No.: NASA-CR-134850; R75AEG2521; Contract: NAS3-18021
General Electric Company, Washington, D.C.; Aircraft Engine Group
NAC: R, FO

Stroub, R.H.
"An Investigation of a Full-Scale Rotor with Four Blade Tip Planform Shapes"
May, 1979; 72 pp.
Report No.: NASA-TM-78580; AVRADCOM-TR-79-14
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, P, FO

White R.P., Jr.
"Wind Tunnel Tests of a Two Bladed Model Rotor to Evaluate the Tami System in Descending Forward Flight"
May, 1977; 53 pp.
Report No.: NASA-CR-145195; SRL-14-76-2; Contract: NAS1-14129
Systems Research Labs, Inc., Newport News, Virginia, Rasa Division
NAC: R

Wilby, J.F.; Smullin, J.I.
"Interior Noise of STOL Aircraft and Helicopters"
May-June, 1979
Noise Control Engineering, P.O.B. 3206, Arlington Branch, Poughkeepsie, NY
NAC: R

Williams, R.W.; Cheeseman, I.C.
"Potential Acoustic Benefits of Circulation Control Rotors"
August, 1978; pp. 149-179
Naval Ship Research and Development Center, Bethesda, Maryland/NASA Langley Research Center, Helicopter Acoustics, (See N78-32816 23-71)
NAC: R

Wyle Laboratories
"System Analysis to Develop Future Civil Aircraft Noise Reduction Alternatives"
November, 1979
Contract: DOT-FA77-WA3990
Wyle Laboratories, Huntsville, AL
NAC: R

Subjective Response to Helicopter Noise

NAC: S

Abrahamson, A. L.
"Correlation of Actual and Analytical Helicopter Aural Detection Criteria. Volume I"
January, 1975; 135 pp.
Contract: DAAJ02-73-C-0057
Wyle Labs, Hampton, Virginia
NAC: S, FH

Acton, W.I.
"Some Technical Difficulties in Making Noise Regulations"
1977; pp. 103-109
Proceedings of the Ninth International Congress on Acoustics, Seville Satellite Meeting University of Southampton, Institute of Sound and Vibration Research
NAC: S

Army Aviation Test Board
"Product-Improvement Test of OH-6A Cargo Compartment Soundproofing Installation"
June 21, 1968; 37 pp.
Report No.: None
Army Aviation Test Board, Fort Rucker, Alabama
NAC: S

Boll, Steven F.
"Noise Suppression Methods for Robust Speech Processing"
October, 1977; 127 pp.
Report No.: UTEC-CSC-77-202; Contract: N00173-77-C-0041, ARPA Order-3301
Utah University, Salt Lake City, Department of Computer Science
NAC: S, R

Bollinger, Ralph R.; Crigler, Joseph C.; Hartman, Bryce O.
"Crew Stress and Fatigue in Prolonged Helicopter Missions. The Crested Rooster Program"
June, 1975; 28 pp.
Report No.: SAM-TR-75-15
School of Aerospace Medicine, Brooks AFB, Texas
NAC: S

Bowes, M.A.
"Test and Evaluation of a Quiet Helicopter Configuration HH-43B"
January, 1972; 110 pp.
Report No.: R-914; Contract: DAAJ02-70-C-0004
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: S, R, FH

Boxwell, D.A.; Schmitz, F.H.
"In-Flight Far-Field Measurement of Helicopter Impulsive Noise"
1976; 15 pp.
Report No.: None
Army Air Mobility Research and Development Lab, Moffett Field, California
NAC: S, FOI

Broderson, A.B.; Edwards, R.G.
"Environmental Noise Impact of Army Helicopters"
May/June, 1976; pp. 9-18
Journal of Environmental Sciences, V6, N3
Watkins and Associates, Inc.
NAC: S

Brouns, A.J.; Ely, R.A.
"Analysis of Noise in U.S. Army Aircraft"
November, 1978; 240 pp.
Report No.: ATC-94100/8CR-41; Contract: DAAB07-76-C-1746
Vought Corporation Advanced Technology Center, Inc., Dallas, Texas
NAC: S, FH

Brown, D.
"Baseline Noise Measurements of Army Helicopters. Volume I. Program Study and Field Tests"
July, 1971; 74 pp.
Report No.: WR071-4-Vol-1; Contract: DAAJ02-70-C-0025
Wyle Labs, Hampton, Virginia
NAC: S, P

Clevenson, S.A.; Leatherwood, J.D.
"Effect of Helicopter Noise on Passenger Annoyance"
June, 1979; 18 pp.
Report No.: NASA-TM-80106
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: S

Clevenson, S.A.; Leatherwood, J.D.
"Effect of Noise Spectra and a Listening Task Upon Passenger Annoyance in a Helicopter Interior Noise Environment"
December, 1979; 26 pp.
Report No.: NASA-L-13233
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia/National Aeronautics and Space Administration, Washington, D.C.
NAC: S, P

Clevenson, S.A.; Shepherd, W.T.
"Time-of-Day Corrections to Aircraft Noise Metrics"
March, 11-12, 1980
Report No.: FAA-EE-80-3; NASA Conference Publication 2135
NASA Scientific and Technical Information Office
NAC: S, P

Cox, C.R.
"Design Considerations for Acceptable Cabin Noise Levels in Light Helicopters"
November, 1970
Preprint No.: SW-70-23
Presented at the Environmental Effects on VTOL Designs Symposium, Arlington, TX
American Helicopter Society, 30 East 42nd Street, New York, New York 10017
NAC: S

Cox, C.R.
"Helicopter Noise Rules - Are They Appropriate and Reasonable"
October, 1979; pp. 16-21
Vertiflite, Vol. 25, No. 5, September-October, 1979
Bell Helicopter Textron, Fort Worth, Texas
NAC: S

Dambra, F.; Damongeot A.
"Annoyance of Helicopter Impulsive Noise"
August, 1978; pp. 439-462
NASA Langley Research Center Helicopter Acoustics, Pt. 2
Societe Nationale Industrielle Aerospatiale, Paris, France
NAC: S, FOI

Damongeot, A.
"A Psychacoustic Study of Impulsive Helicopter Noise"
May 29-31, 1978; 10 pp.
Colleque Acoustique - Aerodynamique, 6th, Paris, France
Societe Nationale Industrielle Aerospatiale, Marignana, Bouches-du-Rhone, France
NAC: S, FOI

Defense Documentation Center
"Environmental Pollution. Noise Polution-Noise Effects on Human Performance"
June, 1977; 324 pp.
Report No.: DDC/BIB-77-07
Defense Documentation Center, Alexandria, Virginia
NAC: S

Edwards, B.D.
"AH-1G Helicopter Flight Optimization for Minimum Noise"
August, 1975
USAAMRDL TR 75-20; DAAJ02-74-C-0007; AD C003360L
Bell Helicopter Company/USAAMDRL, Eustis Directorate, Ft. Eustis, Virginia
NAC: S

Edwards, R.G.; Broderson, A.B.; Barbour, R.W.; McCoy, D.F.; Johnson, C.W.
"Assessment of the Environmental Compatibility of Differing Helicopter Noise Certification Standards"
June, 1979
Report No.: FAA-AEE-79-13; Contract: DOT-FA78WA-4194
Federal Aviation Administration, Washington, D.C.
NAC: S

Federal Aviation Administration
"Helicopter Noise Contour Development Techniques and Directivity Analysis"
September, 1980
Report No.: FAA-EE-80-41
Federal Aviation Administration (DOT)
NAC: S

Federal Aviation Administration
"Helicopter Noise Exposure Level Data"
July, 1980
Report No.: FAA-AEE-80-34
Federal Aviation Administration, Washington, D.C.
NAC: S

Federal Aviation Administration
"Noise Standards for Helicopters in the Normal, Transport, and Restricted Categories"
July 9, 1979
Vol. 44, No. 140; 14 CFR Parts 21 & 36; Docket No. 13410; Notice No. 79-13
Federal Register, Federal Aviation Administration
NAC: S, R, P, FH

Federal Interagency Committee on Urban Noise
"Guidelines for Considering Noise in Land Use Planning and Control"
June, 1980
Report No.: None
EPA, HUD, DOT, DOD; Virginia
NAC: S

Fields, J.M.; Walker, J.G.
"Comparing Reactions to Transportation Noises from Different Surveys: A Railway Noise Versus Aircraft and Road Traffic Comparison"
1978
Paper presented at Third International Congress on Noise as a Public Health Problem: Biological and Behavioural Effects, Freiburg, Germany
University of South Hampton, Institute of Sound and Vibration Research, England
NAC: S

Foster, C.R.
"Helicopter External Noise Requirements - FAA Perspective"
May 22-24, 1978; pp. 1-16, Part 1
NASA Conference Publication 2052
Proceedings of International Specialists Symposium on Helicopter Acoustics
NAC: S

Galloway, W.J.
"Helicopter Noise Level Functions for Use in Community Noise Analyses"
January, 1979; 47 pp.
Report No.: BBN-3713; Contract: F33615-76-C-0528
Bolt, Beranek and Newman, Inc., Canoga Park, California/USAF Aerospace Medical Research Laboratory, Dayton, Ohio
NAC: S, FH

Galloway, W.J.; Schultz, T.J.
"Interim Noise Assessment Guidelines"
October, 1979
BBN Report No.: 4003R
U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington, D.C. 20410
NAC: S

Gasaway, D.C.
"A-Weighted Sound Levels in Cockpits of Fixed- and Rotary-Wing Aircraft"
August, 1975; 27 pp.
Report No.: SAM-TR-75-22
School of Aerospace Medicine, Brooks, AFB, Texas
NAC: S

Goff, R.J.; Novak, E.W.
"Environmental Noise Impact Analysis for Army Military Activities: User Manual"
November, 1977; 120 pp.
Report No.: CERL-TR-N-30
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S, P

Hilton, D.A.; Henderson, H.R.; Maglieri, D.J.; Bigler, W.B. II
"The Effect of Operations on the Ground Noise Footprints Associated with a Large Multibladed Nonbanging Helicopter"
August, 1978; pp. 519-533
Helicopter Acoustics, Pt. 2.
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: S

Homans, B.; Little, L.; Schomer, D.
"Rotary-Wing Aircraft Operational Noise Data"
February, 1978; 70 pp.
Report No.: CERL-TR-N-38
Construction Engineering Research Lab (Army), Champaign, Illinois
NAC: S, P, F, H

Hosier, R.N.; Hilton, D.A.
"Some Effects of the Atmosphere and Microphone Placement on Aircraft Flyover Noise Measurements"
November, 1975
Contract: NASA TM X-72791
National Aeronautics and Space Administration
NAC: S

Howlett, J.T.; Clevenson, S.A.; Rypf, J.A.; Snyder, W.J.
"Interior Noise Reduction in a Large Civil Helicopter"
July, 1977; 43 pp.
Report No.: NASA-TN-D-8477; L-11349
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: S, R

ICAO
"Analysis of Recent Outdoor Helicopter Psychoacoustic Tests"
September 25-28, 1978
Report No.: None
ICAO Committee on Aircraft Noise (CAN), Working Group B
NAC: S

Johnson, G.W.; Haasz, A.A.
"The Influence of Background Noise Level and Signal Duration of the Judged Annoyance of Aircraft Noise"
August, 1978
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: S

Klumpp, R.G.; Schmidt, D.R.
"Annoyance of Helicopter Bladeslap"
July, 3, 1978; 37 pp.
Report No.: NOSC/TR-247
Naval Ocean Systems Center, San Diego, California
NAC: S, P, FOI

Knapp, Stanley C.
"Annual Progress Report, Fiscal Year 1978"
July 30, 1979; 116 pp.
Project: 3E162773A819, 3A16110A91C
Army Aeromedical Research Lab, Fort Rucker, Alabama
NAC: S

Large, J.B.
"Airport Noise"
1978
British Airports Authority Planning Seminar/The Environmental Acceptability of Airport Development in the 1980's
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Large, J.B.
"Economic Impact of Noise Certification"
1977
Proceedings of Internoise 77, Zurich
University of Southampton, Institute of Sound and Vibration Research
NAC: S

Large, J.B.
"Environmental Noise - Methods of Assessing Community Response to Environmental Noise"
August, 1977
Royal Society of Health
University of Southampton, Institute of Sound and Vibration
NAC: S

Large, J.B.
"Noise Effects: Prospects for the Future"
1979
Institute of Acoustics Spring Conference Proceedings
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Large, J.B.; Jones, D.K.
"Examples of Some Low-Cost Noise Abatement Techniques"
1977
Report No.: 34444/Organization for Economic Co-Operation and Development, Paris
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S, R

Lawton, B.W.
"Subjective Assessment of Simulated Helicopter Blade-Slap Noise"
December, 1976; 55 pp.
Report No.: NASA-TN-D-8359; L-11137
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: S, FOI

Leverton, J.W.
"A Study of Helicopter Noise with Particular Reference to Transient Effects"
1978
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Leverton, J.W.; Southwood, B.J.; Pike, A.C.
"Rating Helicopter Noise"
August, 1978; pp. 419-438
NASA Langley Research Center Helicopter Acoustics, Part 2, Westland Helicopters Ltd., Yeovil, England
NAC: S

Magee, J.P.; Clark, R.D.; Widdison, C.A.
"Conceptual Engineering Design Studies of 1985-Era Commercial VTOL and STOL Transports that Utilize Rotors"
May, 1975; 123 pp.
Report No.: NASA-CR-2545; D210-10918-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: S, FH, P

Man-Acoustics and Noise, Inc.
"Noise Certification Considerations for Helicopters Based on Laboratory Investigations"
July, 1976; 108 pp.
Report No.: MAN-1014; Contract: DOT-FA744WAI-490
Man Acoustics and Noise, Inc., Seattle, Washington
NAC: S, FOI, FH

Mark, W.D.
"Analysis of Vibratory Excitation of Gear Systems as a Contributor to Aircraft Interior Noise"
February, 1979; 97 pp.
Report No.: NASA-CR-159088; TM-502; Contract: NAS1-14611
Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts/National Aeronautics and Space Administration, Washington, D.C.
NAC: S, P, FG

Mattmuller, N.A.; Yamakawa, G.M.; Dugan, D.C.; Chambers, H.W.
"Engineering Flight Test of the YCH-47B Helicopter, Army Preliminary Evaluation I, II and III"
January, 1969; 166 pp.
Report No.: USAAVNTA-66-26
Army Aviation Systems Test Activity, Edwards AFB, California
NAC: S

McIntosh, V.C.; Bolds, P.G.
"Vibration and Acoustic Environment of UH-1C Helicopter Configured with and Using M-5 and Xm-21 Armament"
February, 1974; 237 pp.
Report No.: AFFDL-TR-73-160
Air Force Flight Dynamics Lab, Wright-Patterson AFB, Ohio
NAC: S

Mueller, M.W.
"Evaluation of Environmental Impact of Noise from Rotary-Wing Aircraft Operations. New Jersey Army National Guard Support Facility. Mercer County Airport, West Trenton, New Jersey"
September, 1974; 59 pp.
Report No.: AD-B0026321/USAEHA-34-052-73/75
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland
NAC: S, R

Mueller, M.W.
"Evaluation of the Environmental Impact and Recommended Control Measures to Reduce the Noise Generated from Military Helicopter Operations at the McGuire Veterans Administration Hospital, Richmond, Virginia"
October, 1974; 41 pp.
Report No.: USAEHA-34-018-75
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland
NAC: S, R

Newman, J. S.
"Correlations of Helicopter Noise Levels with Physical and Performance Characteristics"
September, 1980
Report No.: DOT-FAA-EE-80-42
Federal Aviation Administration/National Technical Information Services, Springfield, VA
NAC: S, P, FH

Newman, J. S.; Rickley, E.J.
"Noise Levels and Flight Profiles of Eight Helicopters Using Proposed International Certification Procedures"
March, 1979; 298 pp.
Report No.: FAA-AEE-79-03
Federal Aviation Administration, Washington, D.C., Office of Environment and Energy
NAC: S, P

Newman, J.S.; Rickley, E.J.
"Noise Levels and Flight Profiles of Eight Helicopter Wing Proposed International Certification Procedures"
August, 1978
Report No.: FAA-AEQ-78-21
Federal Aviation Administration, Washington, D.C.
NAC: S

Patterson, J.H., Jr.; Mozo, B.; Schomer, R.D.; Camp, R.T., Jr.
"Subjective Ratings of Annoyance Produced by Rotary-Wing Aircraft Noise"
May, 1977; 36 pp.
Report No.: USAARL-77-12
Army Aeromedical Research Lab, Fort Rucker, Alabama
NAC: S

Pike, A.C.; Southwood, B.J.
"Helicopter Noise Certification--Evaluation of Proposed Noise Rating Methods. Part I: Rating of Helicopter Noise"
March, 1978
Contract: AE/145/038 (DOI); Research Paper: 570
Westland Helicopters Limited, Yeovil, Somerset
NAC: S, FO

Pike, A.C., Southwood, B.J.; Leverton, J.W.
"Helicopter Noise Certification Evaluation of ICAO Working Group B Proposals"
April, 1978
Contract: AE/145/038 Extension 2; Research Paper: 574
Westland Helicopters Limited, Yeovil, Somerset
NAC: S

Pollard, J.S.
"Internal Noise--Noise and Vibration Survey During Flight"
August, 1979
Contract: K/A12/1154; Research Paper: 585
Westland Helicopters Limited, Yeovil, Somerset
NAC: S

Rice, C.G.
"Development of Cumulative Noise Measure for the Prediction of General Annoyance in an Average Population"
1977; pp. 345-364
Journal of Sound and Vibration 52
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Rice, C.G.
"Investigation of the Trade-off Effects of Aircraft Noise and Number"
1977; pp. 325-344
Journal of Sound and Vibration 52
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Riggins, T.H.
"A Unifying Theory for Determining Human Response to Sound--Aircraft Noise"
1979; pp. 144-147
Community Noise: Proceedings of the Symposium, Kansas City, Missouri, May 24-26, 1978 Philadelphia, Pennsylvania/American Society for Testing and Materials
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 39. UH-1F In-Flight Crew Noise"
September, 1975; 12 pp.
Report No.: AMRL-TR-75-50-Vol-39
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 50. HH-43B In-Flight Crew Noise"
October, 1975; 15 pp.
Report No.: AMRL-TR-75-50-Vol-50
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 53. AC-119G In-Flight Crew Noise"
November, 1975, 13 pp.
Report No.: AMRL-TR-75-50-Vol-53
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 60. UH-1N In-Flight Crew Noise"
November, 1975; 15 pp.
Report No.: AMRL-TR-75-50-Vol-60
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 61. HH-3E In-Flight Crew Noise"
November, 1975
Report No.: AMRL-TR-75-50-Vol-61
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Sames, J.
"Evaluation of the Annoyance Due to Helicopter Rotor Noise"
March 8, 1978
Contract: NAS1-14192
National Aeronautics Space Administration
NAC: S

Samra, S.S.
"Hovercraft Noise Annoyance in the Solent"
1978
MS.c. Dissertation
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Schaeffer, E.; Sternfeld, H.
"Design of Helicopter Rotors to Noise Constraints"
May, 1978
Paper 30, NASA Conference Publication 2052
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: S

Schomer, P.D.; Homans, B.L.
"Technical Background: Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns, and Siting Noise-Sensitive Land Uses"
September, 1976; 17 pp.
Report No.: CERL-IR-N-9
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

Schomer, P.D.; Homans, B.L.
"User Manual: Interim Procedure for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976; 40 pp.
Report No.: CERL-IR-N-10
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

Scofield, T.C.
"Helicopter Aeromedical Research: The Need"
June 10, 1977; 115 pp.
Report No.: None
Army Command and General Staff College, Fort Leavenworth, Kansas
NAC: S

Shepherd, K.P.
"A Laboratory Study of the Subjective Response to Helicopter Blade-Slap Noise"
December, 1978; 21 pp.
Report No.: NASA-CR-158973; Contract: NAS1-14970
Bionetics Corporation, Hampton, Virginia
NAC: S, P

Shepherd, K.P.
"The Effect of the Duration of Aircraft Sounds on Judged Annoyance"
1979
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Simpson, J.
"Helicopter Noise Planning in London"
1977; 4 pp.
Proceedings of the Sixth International Conference, Zurich, Switzerland, March 1-3, 1977
NAC: S

Southwood, B.J.
"Helicopter Noise Certification Evaluation of Proposed Noise Rating Methods Part 2--The Subjective Assessment of Tail Rotor Noise"
Date: None
Contract: AE/145/038 (DOI) Extension 3; Research Paper 576
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S, FO

Southwood, B.J.
"Helicopter Noise Certification--Evaluation of Take-off Procedures"
December, 1978
Contract: AE/145/038 Extension 5 (Data Analysis Only); Research Paper: 590
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Southwood, B.J.
"Helicopter Noise Certification--Re-examination of NASA Subjective Study Recordings"
June, 1979
Contract: AE/145/038 Extension 6; Research Paper: 596
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Spector, S.R.
"The Impact of Urban Operations on Helicopter Noise Requirements"
August, 1978; pp. 45-59
NASA Langley Research Center, Helicopter Acoustics
Hughes Helicopters, Culver City, California
NAC: S

Stephens, D.G.; Leatherwood, J.D.
"Physical and Subjective Studies of Aircraft Interior Noise and Vibration"
April, 1979; 16 pp.
Report No.: NASA-TM-80084
National Aeronautics and Space Administraiton, Langley Research Center, Hampton, VA
NAC: S

Sternfeld, H.; Doyle L.
"A Method for Determining Internal Noise Criteria Based on Practical Speech Communication, Applied to Helicopters"
May, 1978
Paper 25, NASA Conference Publication 2052
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: S

Sternfeld, H.; Doyle L.
"Evaluation of Current Helicopter Internal Noise Level Design Criteria"
December, 1976
Contract: DAAJ01-74-C-1054
U.S. Army Aviation Systems Command
NAC: S

Sternfeld, H., Jr.; Doyle, L.B.
"Evaluation of the Annoyance Due to Helicopter Rotor Noise"
June, 1978; 74 pp.
Report No.: NASA-CR-3001; Contract: NAS1-14192
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: S, FOI, FOB, P

Tomassoni, M.E.
"The Economic Impact of Air Pollution and Aircraft Noise on Residential Property Values: A Selected Bibliography, 1969-1977"
May, 1978
The John Hopkins University, Department of Geography and Environmental Engineering, Baltimore, MD
NAC: S

True, H.C.; Rickley, E.J.
"Noise Characteristics of Eight Helicopters"
July, 1977; 167 pp.
Report No.: FAA-RD-77-94
Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: S, P

U.S. Army Construction Engineering Research Laboratory
"Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976
Report No.: Interim Report N-9
U.S. Army Consruction Engineering Research Laboratory
NAC: S

U.S. Army Construction Engineering Research Laboratory
"Interim Procedures for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976
Report No.: Interim Report No-10
U.S. Army Construction Engineering Research Laboratory
NAC: S

Van Niekerk, C.G.
"Assessment of Noise Exposure Around Heliports"
September, 1978; 9 pp.
International Council of the Aeronautical Sciences, Congress, 11th, Lisbon, Portugal
Council for Scientific and Industrial Research, Pretoria, Republic of South Africa
NAC: S

Wagner, R.A.
"Helicopter Noise Regulations: An Industry Perspective"
May 22-24, 1978; pp. 17-32
Proceedings of International Specialists Symposium on Helicopter Acoustics/NASA Conference
Publication 2052, Part 1
National Aeronautics Space Administration
NAC: S

Wills, C.R.
"Vibration Transmission Paths"
June, 1976
Research Paper: 523; Contract: K/A12/1025/CB/A12b
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Wills, C.R.
"Vibration Transmission Paths (Additional WHL Funded Tests)"
August, 1976
Research Paper: 527
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

SECTION V

BIBLIOGRAPHY

Introduction

This section contains a comprehensive listing of reports, literature, books and articles concerning helicopter noise technology. The listing is alphabetically by author, and includes the source and/or publisher, report identification numbers, contract or grant number, and date of the report. To increase the usability of this bibliography, the following standard format has been followed:

a. Author
b. Title of report, book, article, paper, etc.
c. Date of report, and number of pages
d. Report identification numbers, contract number, etc.
e. Name of source or publishers, and geographical location or address
f. Noise Area Codes for the report

The Noise Area Codes are defined and discussed in Section IV. It should be noted that each report in the Bibliography is listed in Section IV under the first Noise Area Code listed for each report in this Section. This first Noise Area Code is considered the primary area of involvement of the report.

Listing

Abrahamson, A. L.
"Correlation of Actual and Analytical Helicopter Aural Detection Criteria. Volume I"
January, 1975; 135 pp.
Contract: DAAJ02-73-C-0057
Wyle Labs, Hampton, Virginia
NAC: S, FH

Acton, W.I.
"Some Technical Difficulties in Making Noise Regulations"
1977; pp. 103-109
Proceedings of the Ninth International Congress on Acoustics, Seville Satellite Meeting University of Southampton, Institute of Sound and Vibration Research
NAC: S

Amiet, R.K.
"Noise Due to Rotor-Turbulence Interaction"
1978; pp. 109-126
NASA Conference Publication 2052
United Technologies Research Center, East Hartford, Connecticut, 06108
NAC: FO, P

Amiet, R.K.
"Noise Produced by Turbulent Flow into a Propeller or Helicopter Rotor"
1976
AIAA Paper No. 76-560/AIAA Journal, Vol. 15, No. 3, March 1977, pp. 307-308
United Technologies Research Center, East Hartford, Connecticut 06108
NAC: FO, P

Aravamudan, K.S.; Harris, W.L.
"Experimental and Theoretical Studies on Model Helicopter Rotor Noise"
January, 1978; 158 pp.
Report No.: 78-1; 83852-1; Contract: DAAG29-76-C-0027
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab/-Army Research Office, Research Triangle Park, North Carolina
NAC: FO, FOR, FOB, P

Aravamudan, K.S.; Harris, W.L.
"Low-Frequency Broadband Noise Generated by a Model Rotor"
August, 1979; pp. 522-533
Contract: DAAG29-C-027 NSG-2095
Massachusetts Institute of Technology, Cambridge, Massachusetts/Acoustical Society of America, Journal, Vol. 66
NAC: FOB, FO

Aravamudan, K.S.; Lee, A.; Harris, W.L.
"A Simplified Mach Number Scaling Law for Helicopter Rotor Noise"
April, 22, 1978; 16 pp.
Contract: DAAG29-C-027 NSG-2095
Journal of Sound and Vibration, Vol. 57, pp. 555-570
NAC: FOR, FOB

Army Aviation Research and Development Command
"Aeronautical Noise Limits in Helicopters - Aeronautical Design STD #22"
June 6, 1980
Project No. 1520-0025
U.S. Army Aviation Research and Development Command
NAC: R

Army Aviation Test Board
"Product-Improvement Test of OH-6A Cargo Compartment Soundproofing Installation"
June 21, 1968; 37 pp.
Report No.: None
Army Aviation Test Board, Fort Rucker, Alabama
NAC: S

Balcerak, J.C.
"Parametric Study of the Noise Produced by the Interaction of the Main Rotor Wake with the Tail Rotor"
1976; 70 pp.
Report No.: NASA-CR-145001; Contract: NASl-13690
Systems Research Labs, Inc., Newport News, Virginia, RASA Division
NAC: FOR, P

Barger, R.L.
"Theoretical Prediction of Nonlinear Propagation Effects on Noise Signatures Generated by Subsonic or Supersonic Propeller or Rotor-Blade Tips"
May, 1980; 18 pp.
Report No.: NASA-TP-1660; L-13388
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FOR, P, R

Boll, Steven F.
"Noise Suppression Methods for Robust Speech Processing"
October, 1977; 127 pp.
Report No.: UTEC-CSC-77-202; Contract: N00173-77-C-0041, ARPA Order-3301
Utah University, Salt Lake City, Department of Computer Science
NAC: S, R

Bollinger, Ralph R.; Crigler, Joseph C.; Hartman, Bryce O.
"Crew Stress and Fatigue in Prolonged Helicopter Missions. The Crested Rooster Program"
June, 1975; 28 pp.
Report No.: SAM-TR-75-15
School of Aerospace Medicine, Brooks AFB, Texas
NAC: S

Bolton, J.S.
"On the Use of a Local Reaction Boundary Condition in Theories of Sound Propagation Outdoors"
1978
Institute of Acoustics Spring Meeting, Cambridge
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Bolton, J.S.
"Sources of Variability in Sound Propagation Outdoors"
1978
Institute of Acoustics Meeting on Statistical Aspects of Sound Propagation Outdoors/
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Bossler, R.B., Jr.; Bowes, M.A.; Royal, A.C.
"An Analytical Method for Designing Low Noise Helicopter Transmissions"
August, 1978; pp. 657-577
NASA, Langley Research Center Helicopter Acoustics, Part 2
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: FG

Bowes, M.A.
"Anticipated Benefits and Costs of Applying Current Helicopter Noise Reduction Technology"
1978; 6 pp.
Inter-Noise 78: Designing for Noise Control: Proceedings of the International Conference, San Francisco, California, May 8-10, 1978
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH

Bowes, M.A.
"Development and Evaluation of a Method for Predicting the Vibration and Noise Characteristics of Helicopter Transmissions"
1977; 12 pp.
Report No: AHS77-33-76; Contract: DAAJ02-74-C-0039
American Helicopter Society, Annual National Forum, 33rd, Washington, D.C., May 9-11, 1977 Proceedings
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: P, FG

Bowes, M.A.
"Helicopter Noise Reduction Design Trade-off Study"
January, 1977; 252 pp.
Report No.: R-1493; Contract: DOT-FA76WA-3791
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R, FH, P.

Bowes, M.A.; Giansante, N.; Bossler, R.B., Jr; Berman, A.
"Helicopter Transmission Vibration and Noise Reduction Program"
June, 1977; 155 pp.
Report No.: R-1495; Contract: DAAJ02-74-C-0039
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: FG, P

Bowes, M.A.
"Test and Evaluation of a Quiet Helicopter Configuration HH-43B"
January, 1972; 110 pp.
Report No.: R-914; Contract: DAAJ02-70-C-0004
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: S, R, FH

Bowes, M.A.
"The Cost of Applying Current Helicopter External Noise Reduction Methods while Maintaining Realistic Vehicle Performance"
August, 1978; pp. 563-582
NASA Langley Research Center Helicopter Acoustics, Part 2
Kaman Aerospace Corporation, Bloomfield, Connecticut
NAC: R

Boxwell, D.A.; Schmitz, F.H.
"In-Flight Far-Field Measurement of Helicopter Impulsive Noise"
1976; 15 pp.
Report No.: None
Army Air Mobility Research and Development Lab, Moffett Field, California
NAC: S, FOI

Broderson, A.B.; Edwards, R.G.
"Environmental Noise Impact of Army Helicopters"
May/June, 1976; pp. 9-18
Journal of Environmental Sciences, V6, N3
Watkins and Associates, Inc.
NAC: S

Brouns, A.J.; Ely, R.A.
"Analysis of Noise in U.S. Army Aircraft"
November, 1978; 240 pp.
Report No.: ATC-94100/8CR-41; Contract: DAAB07-76-C-1746
Vought Corporation Advanced Technology Center, Inc., Dallas, Texas
NAC: S, FH

Brown, D.
"Baseline Noise Measurements of Army Helicopters. Volume I. Program Study and Field Tests"
July, 1971; 74 pp.
Report No.: WR071-4-Vol-1; Contract: DAAJ02-70-C-0025
Wyle Labs, Hampton, Virginia
NAC: S, P

Brown, E.L.; Cox, C.R.; Halwes, D.R.
"A Preliminary Design Study of a Quiet Light Observation Helicopter"
December, 1969; 165 pp.
Report No.: Bell Helicopter-299-099-526; Contract: DAAJ02-68-C-0095
Bell Helicopter Company, Fort Worth, Texas
NAC: R

Brown, T.J.; Farassat, F.
"A New Capability for Predicting Helicopter Rotor Noise in Hover and in Flight"
1976; 14 pp.
Grant: NGR-09-010-085
Army Air Mobility Research and Development Lab, Hampton, Virginia
NAC: P, FO

Charalambakis, J.B.; Large, J.B.
"The Development of Aircraft Noise Control Strategies"
1980
Annual Report 1980, Institute of Sound and Vibration Research
University of Southampton, Institute of Sound and Vibration Research, England
NAC: R, S

Charles, B.D.
"Acoustic Effects of Rotor-Wake Interaction During Low Power Descent"
March, 1975
Report No.: None
Bell Helicopter Company, Fort Worth, Texas
NAC: FO, FOI, FOR

Clevenson, S.A.; Leatherwood, J.D.
"Effect of Helicopter Noise on Passenger Annoyance"
June, 1979; 18 pp.
Report No.: NASA-TM-80106
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: S

Clevenson, S.A.; Leatherwood, J.D.
"Effect of Noise Spectra and a Listening Task Upon Passenger Annoyance in a Helicopter Interior Noise Environment"
December, 1979; 26 pp.
Report No.: NASA-L-13233
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia/National Aeronautics and Space Administration, Washington, D.C.
NAC: S, P

Clevenson, S.A.; Shepherd, W.T.
"Time-of-Day Corrections to Aircraft Noise Metrics"
March, 11-12, 1980
Report No.: FAA-EE-80-3; NASA Conference Publication 2135
NASA Scientific and Technical Information Office
NAC: S, P

Conner, D.W.; Vaughan, J.C. III
"Technology Requirements and Readiness for Very Large Aircraft"
March, 1980; 14 pp.
Report No.: NASA-TM-81783
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: R

Control Data Corporation
"Predesign of the Second-Generation Comprehensive Helicopter Analysis System"
October, 1978; 160 pp.
Contract: DAAJ02-77-C-0058
Control Data Corporation, Hampton, Virginia/Army Research and Technology Labs, Fort Eustis, VA
NAC: P, FH

Cox, C.R.
"Design Considerations for Acceptable Cabin Noise Levels in Light Helicopters"
November, 1970
Preprint No.: SW-70-23
Presented at the Environmental Effects on VTOL Designs Symposium, Arlington, TX
American Helicopter Society, 30 East 42nd Street, New York, New York 10017
NAC: S

Cox, C.R.
"Helicopter Noise Rules - Are They Appropriate and Reasonable"
October, 1979; pp. 16-21
Vertiflite, Vol. 25, No. 5, September-October, 1979
Bell Helicopter Textron, Fort Worth, Texas
NAC: S

Cox, C.R.
"Helicopter Rotor Aerodynamic and Aeroacoustic Environments"
October, 1977
Preprint 77.1338
Presented at the Fourth Aeroacoustic Conference of the American Institute of Aeronautics and Astronautics, Atlanta, Georgia
Bell Helicopter Textron, Fort Worth, Texas
NAC: FO, FOR, FOB, FOI, P

Cunningham, T.B.; Nuan, E.C.
"Helicopter High Gain Control"
July, 1979; 171 pp.
Report No.: NASA-CR-159052; HONEYWELL-79SRC33; Contract: NAS1-14789
Honeywell Systems and Research Center, Minneapolis, Minnesota
NAC: FH, FO

Dahan, C.; Gratieux, E.
"Helicopter Rotor Thickness Noise"
June 4-6, 1980; 11 pp.
Report No.: AIAA Paper 80-1012/ONERA TP No. 1980-45
American Institute of Aeronautics and Astronautics, Aeroacoustics Conference, 6th, Hartford, CT
NAC: FO

Dambra, F.; Damongeot A.
"Annoyance of Helicopter Impulsive Noise"
August, 1978; pp. 439-462
NASA Langley Research Center Helicopter Acoustics, Part 2
Societe Nationale Industrielle Aerospatiale, Paris, France
NAC: S, FOI

Damongeot, A.
"A Psychacoustic Study of Impulsive Helicopter Noise"
May 29-31, 1978; 10 pp.
Colleque Acoustique - Aerodynamique, 6th, Paris, France
Societe Nationale Industrielle Aerospatiale, Marignana, Bouches-du-Rhone, France
NAC: S, FOI

Damongeot, A.
"Helicopter Tail Rotor Noise Generated by Aerodynamic Interactions"
1978; 13 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings Volume 2
Societe Nationale Industrielle Aerospatiale, Division Helicopteres, Marignane, Bouches-du-Rhone, France
NAC: FO, P

Davis, S.J.; Egolf, T.A.
"An Evaluation of a Computer Code Based on Linear Acoustic Theory for Predicting Helicopter Main Rotor Noise - CH-53A and S-76 Helicopters"
July, 1980; 290 pp.
Report No.: NASA-CR-159339 SER-510038
Sikorsky Aircraft, Stratford, Connecticut
NAC: P, FOR

Defelice, J.J.; Nashif, A.D.
"Damping of an Engine Exhaust Stack"
September, 1978
The Shock and Vibration Bulletin, Part 2
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: R

Defense Documentation Center
"Environmental Pollution. Noise Polution-Noise Effects on Human Performance"
June, 1977; 324 pp.
Report No.: DDC/BIB-77-07
Defense Documentation Center, Alexandria, Virginia
NAC: S

Deutsche Gesellschaft fuer Luft-und Raumfahrt
"Contributions to Helicopter Technology"
November 21, 1975; 185 pp.
Report No.: DLR-MITT-75-24
Deutsche Gesellschaft fuer Luft-und Raumfahrt, Cologne, West Germany
NAC: R, FO

Edwards, B.D.
"AH-1G Helicopter Flight Optimization for Minimum Noise"
August, 1975
USAAMRDL TR 75-20; DAAJ02-74-C-0007; AD C003360L
Bell Helicopter Company/USAAMDRL, Eustis Directorate, Ft. Eustis, Virginia
NAC: S

Edwards, R.G.; Broderson, A.B.; Barbour, R.W.; McCoy, D.F.; Johnson, C.W.
"Assessment of the Environmental Compatibility of Differing Helicopter Noise Certification Standards"
June, 1979
Report No.: FAA-AEE-79-13; Contract: DOT-FA78WA-4194
Federal Aviation Administration, Washington, D.C.
NAC: S

Edwards, R.G.; Broderson, A.B.; Johnson, C.W.
"Helicopter Noise Impact"
March, 1980
Watkins and Associates, Inc., Box 951, Lexington, Kentucky 40501/Sound and Vibration Magazine
NAC: FH, S

Engineering Sciences Data Unit Limited
"Estimation of the Maximum Discrete Frequency Noise from Isolated Rotors and Propellers"
September, 1976; 12 pp.
Report No.: ISBN-0-85679-157-1
Engineering Sciences Data Unit Limited, London, England
NAC: FO, P

Farassat, F.
"A Bound on Thickness of Rotating Blades"
1977
Published in the Proceedings of 14th Annual Meeting of the Society of Engineering Science, Inc.
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: FO

Farassat, F.
"The Derivation of a Thickness Noise Formula for the Far-Field by Isom"
1979; pp. 159-160
Published letter to the Editor, Journal of Sound and Vibration (1979)64(1)
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.
"Theory of Noise Generation from Moving Bodies with an Application to Helicopter Rotors"
December, 1975; 61 pp.
Report No.: NASA-TR-R-451; L-10379
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P

Farassat, F.; Brown, T.J.
"A New Capability for Predicting Helicopter Rotor and Propeller Noise Including the Effect of Forward Motion"
June, 1977; 25 pp.
Report No.: NASA-TM-X-74037
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P, S, R

Farassat, F.; Brown, T.J.
"A New Formula for the Determination of the Acoustic Pressure Signature of Helicopter Rotors"
October 7-8, 1975
Presented Review of Research Theme "Helicopter and V/STOL Aircraft Research," Moffett Field, CA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Brown, T.J.
"Development of a Noncompact Source Theory with Applications to Helicopter Rotors"
July, 1976
AIAA Paper 76-563/Presented at AIAA Third Aeroacoustics Conference, Palo Alto, CA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Morris, C.E.K., Jr.; Nystrom, P.A.
"A Comparison of Linear Acoustic Theory with Experimental Noise Data for a Small-Scale Hovering Rotor"
March 12-14, 1979
AIAA Paper No. 79-1608/Presented at AIAA Fifth Aeroacoustics Conference, Seattle, WA
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Farassat, F.; Nystrom, P.A.; Brown, T.J.
"Bounds on Thickness and Loading Noise of Rotating Blades and the Favorable Effect of Blade Sweep on Noise Reduction"
May 22-24, 1978
Presented at International Specialist Symposium, Helicopter Acoustics, Langley Research Center
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: R, FO

Farassat, F.; Pegg, R.J.; Hilton, D.A.
"Thickness Noise of Helicopter Rotors at High Tip Speeds"
March, 1975
Paper No. AIAA 75-453/Presented at AIAA Second Aeroacoustics Conference
The George Washington University/Joint Institute for Advancement of Flight Sciences, Hampton, VA
NAC: FO

Federal Aviation Administration
"Helicopter Noise Contour Development Techniques and Directivity Analysis"
September, 1980
Report No.: FAA-EE-80-41
Federal Aviation Administration (DOT)
NAC: S

Federal Aviation Administration
"Helicopter Noise Exposure Level Data"
July, 1980
Report No.: FAA-AEE-80-34
Federal Aviation Administration, Washington, D.C.
NAC: S

Federal Aviation Administration
"Helicopter Operations Development Plan"
September, 1978; 116 pp.
Report No.: FAA-RD-78-101
Federal Aviation Administration, Washington, D.C.
NAC: FH, P, R

Federal Aviation Administration
"Noise Standards for Helicopters in the Normal, Transport, and Restricted Categories"
July 9, 1979
Vol. 44, No. 140; 14 CFR Parts 21 & 36; Docket No. 13410; Notice No. 79-13
Federal Register, Federal Aviation Administration
NAC: S, R, P, FH

Federal Interagency Committee on Urban Noise
"Guidelines for Considering Noise in Land Use Planning and Control"
June, 1980
Report No.: None
EPA, HUD, DOT, DOD; Virginia
NAC: S

Fields, J.M.; Walker, J.G.
"Comparing Reactions to Transportation Noises from Different Surveys: A Railway Noise Versus Aircraft and Road Traffic Comparison"
1978
Paper presented at Third International Congress on Noise as a Public Health Problem: Biological and Behavioural Effects, Freiburg, Germany
University of South Hampton, Institute of Sound and Vibration Research, England
NAC: S

Fink, M.R.
"Minimum On-axle Noise for a Propeller or Helicopter Rotor"
October, 1978; pp. 700-702
Journal of Aircraft, Vol. 15
United Technologies Research Center, East Hartford, Connecticut
NAC: P, FOB

Foster, C.R.
"Helicopter External Noise Requirements - FAA Perspective"
May 22-24, 1978; pp. 1-16, Part 1
NASA Conference Publication 2052
Proceedings of International Specialists Symposium on Helicopter Acoustics
NAC: S

Galloway, W.J.
"Helicopter Noise Level Functions for Use in Community Noise Analyses"
January, 1979; 47 pp.
Report No.: BBN-3713; Contract: F33615-76-C-0528
Bolt, Beranek and Newman, Inc., Canoga Park, California/USAF Aerospace Medical Research Laboratory, Dayton, Ohio
NAC: S, FH

Galloway, W.J.
"Physical Analysis of the Impulsive Aspects of Helicopter Noise"
April, 1977; 394 pp.
Report No.: BBN-3425; Contract: WI-77-3683-1
Bolt, Beranek and Newman, Inc., Canoga Park, California
NAC: FOI, S, P

Galloway, W.J.; Schultz, T.J.
"Interim Noise Assessment Guidelines"
October, 1979
BBN Report No.: 4003R
U.S. Department of Housing and Urban Development, Office of Policy Development and Research, Washington, D.C. 20410
NAC: S

Gangwani, S.T.
"The Effect of Helicopter Main Rotor Blade Phasing and Spacing on Performance, Blade Loads and Acoustics"
September, 1976; 100 pp.
Report No.: NASA-CR-2737; SRL-3169-0014; Contract: NAS1-13705
Systems Research Labs, Inc., Newport News, Virginia
NAC: FO

Gasaway, D.C.
"A-Weighted Sound Levels in Cockpits of Fixed- and Rotary-Wing Aircraft"
August, 1975; 27 pp.
Report No.: SAM-TR-75-22
School of Aerospace Medicine, Brooks, AFB, Texas
NAC: S

George, A.R.
"Helicopter Noise--State of the Art"
October 3-5, 1977
Grant: DAHC04-75-6-0120; AIAA Fourth Aeroacoustics Conference
American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, N.Y.
NAC: FO, FOR, P, R, S

George, A.R.
"Research on Helicopter Rotor Noise"
February 10, 1975; 17 pp.
Contract: DAHC04-74-C-0001
Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York/Army Research Office, Durham, North Carolina
NAC: FO, P

George, A.R.
"Research on Helicopter Rotor Noise"
August 15, 1978; 19 pp.
Grant: DAHC04-75-G-0120
Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York
NAC: P, FO, FOB, FOI

George, A.R.; Kim, Y.N.
"High Frequency Broadband Rotor Noise"
April, 1977; pp. 538-545
AIAA Journal, Vol. 15, No. 4
Cornell University, Ithaca, New York
NAC: FOB, FOR

George, A.R.; Najjar, F.E.; Kim, Y.N.
"Noise Due to Tip Vortex Formation on Lifting Rotors"
June 4-6, 1980
Report No.: AIAA-80-1010/AIAA Sixth Aeroacoustics Conference, Hartford, CT
American Institute of Aeronautics and Astronautics, 1290 Avenue of the Americas, New York, N.Y.
NAC: FO, FOR, FOB, P

Glegg, S.A.L.
"Jet Noise Source Location"
1979
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Goff, R.J.; Novak, E.W.
"Environmental Noise Impact Analysis for Army Military Activities: User Manual"
November, 1977; 120 pp.
Report No.: CERL-TR-N-30
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S, P

Gottlier, J.J.
"Simulation of a Travelling Sonic Boom in a Pyramidal Horn"
July, 1974
Report No.: None
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: FO

Greene, G.C.
"An Overview of NASA's Propeller and Rotor Noise Research"
June, 1980; 7 pp.
Report No.: AIAA Paper 80-0992
NASA Langley Research Center, Hampton, Virginia/American Institute of Aeronautics and Astronautics Aeroacoustics Conference, 6th, Hartford, Connecticut
NAC: FO

Greene, G.C.
"Validation of Helicopter Noise Prediction Techniques"
March 28, 1980
Contract: NAS1-15740
Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts
NAC: P

Gupta, B.P.
"Helicopter External Noise Prediction and Correlation with Flight Test"
August, 1978; pp. 263-275
NASA Langley Research Center Helicopter Acoustics
Textron Bell Helicopter, Fort Worth, Texas
NAC: P

Hall, G.F.
"Transient Airload Computer Analysis for Simulating Wind Induced Impulsive Noise Conditions of a Hovering Helicopter Rotor"
October, 1975; 48 pp.
Report No.: NASA-CR-137772; Contract: NAS2-7025
United Technologies Research Center, East Hartford, Connecticut
NAC: FOI, P

Hamrick, T.; Copeland, D.; Tarzanin, F.; Staley, J.; Hunt, L.
"Predesign of the Second Generation Comprehensive Helicopter Analysis System"
December, 1978; 149 pp.
Contract: DAAJ02-77-C-0059
Science Applications, Inc., McLean, Virginia/Army Research and Technology Labs, Fort Eustis, VA
NAC: P, FH

Hanson, H.W.; Balke, R.W.; Edwards, B.D.; Riley, W.W.; Downs, B.D.
"Engine/Airframe/Drive Train Dynamic Interface Documentation"
October, 1978; 204 pp.
Contract: DAAJ02-77-C-0045
Bell Helicopter Textron, Fort Worth, Texas/Army Research and Technology Labs, Fort Eustis, VA
NAC: FH, P

Hartman, W.F.
"Potential Applications of Acoustic Emission Technology as a Nondestructive Evaluation Method for Naval Aviation Ground Support"
July 5, 1978; 19 pp.
Contract: N68335-77-M-5735
Hartman (William F.), Knoxville, Tennessee
NAC: FO, P

Hawkings, D.
"Noise Generation by Transonic Open Rotors"
June, 1979
Contract: K/A12/1156; Research Paper: 599
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FO

Hayden, R.E.; Aravamudan, K.S.
"Prediction and Reduction of Rotor Broadband Noise"
August, 1978; pp. 61-87
Bolt, Beranek and Newman, Inc., Cambridge, Massachusetts/NASA Langley Research Center, Helicopter Acoustics
NAC: P, R

Head, R.W.
"Jet/Surface Interaction Noise: Experimental Determination of the Edge Noise Source"
1977
ISVR Contract Report No.: 77/19
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Hilton, D.A.; Henderson, H.R.; Maglieri, D.J.; Bigler, W.B. II
"The Effect of Operations on the Ground Noise Footprints Associated with a Large Multibladed Nonbanging Helicopter"
August, 1978; pp. 519-533
Helicopter Acoustics, Part 2
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: S

Hoad, D.R.
"An Experimental Investigation of the Effect of Rotor Tip Shape on Helicopter Blade-Slap Noise"
May, 1979; 464 pp.
Report. No.: NASA-TM-80066
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: R, FOI

Hoad, D.R.
"Evaluation of Helicopter Noise Due to Blade-Vortex Interaction for Five Tip Configuration"
December, 1979; 80 pp.
Report No.: NASA-TP-1608; AVRADCOM-TR-80-B1; Contract: DA PROJ. 1L2-62209-AH-76
National Aeronautics and Space Administration, Langley Station, Virginia, Langley Research Center
NAC: FO, FOI, R

Hoad, D.R.: Scheiman, J.
"Investigation of Blade Impulsive Noise on a Scaled Fully Articulated Rotor System"
June, 1977
Report No.: NASA TM X-3528
Structures Laboratory, AVRADCOM, Moffett Field, California
NAC: FOI

Hodder, B.K.
"Further Studies of Static to Flight Effects on Fan Tone Noise Using Inlet Distortion Control for Source Identification"
December, 1976
Report No.: NASA TM X-73,183
Aeromechanics Laboratory, AVRACOM, Moffett Field, California
NAC: FE, P

Homans, B.; Little, L.; Schomer, D.
"Rotary-Wing Aircraft Operational Noise Data"
February, 1978; 70 pp.
Report No.: CERL-TR-N-38
Construction Engineering Research Lab (Army), Champaign, Illinois
NAC: S, P, F, H

Hosier, R.N.; Hilton, D.A.
"Some Effects of the Atmosphere and Microphone Placement on Aircraft Flyover Noise Measurements"
November, 1975
Contract: NASA TM X-72791
National Aeronautics and Space Administration
NAC: S

Hosier, R.N.; Ramakrishnan, R.
"Helicopter Rotor Rotational Noise Predictions Based on Measured High-Frequency Blade Loads"
December, 1974; 86 pp.
Report No.: NASA-TN-D-7624; L-9358
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: P, FO

Howe, M.S.: Williams, J.E.F.
"On the Noise Generated by an Imperfectly Expanded Supersonic Jet"
May 2, 1977; pp. 272-313
Vol. 289, A1358
University Engineering Department, Trumpington Street, Cambridge, London
NAC: FER

Howell, G.P.; Morfey, C.L.
"Non-linear Propagation of Noise Spectra"
1978
Institute of Acoustics Spring Conference, Cambridge
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Howells, R.W.; Sciarra, J.J.
"Finite Element Analysis Using NASTRAN Applied to Helicopter Transmission Vibration/Noise Reduction"
September, 1975; 20 pp.
Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FG, P, R

Howlett, J.T.; Clevenson, S.A.; Rypf, J.A.; Snyder, W.J.
"Interior Noise Reduction in a Large Civil Helicopter"
July, 1977; 43 pp.
Report No.: NASA-TN-D-8477; L-11349
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: S, R

Hubbard, J.E., Jr.; Humbad, N.G.; Bauer, P.; Harris, W.L.
"Parametric Studies of Model Helicopter Blade Slap and Rotational Noise"
February, 1979; 79 pp.
Report No.: 79-1; Contract: DAAG29-79-C-0027
Massachusetts Institute of Technology, Cambridge Fluid Dynamics Research Lab/Army Research Office, Research Triangle Park, North Carolina
NAC: FOI, P

ICAO
"Analysis of Recent Outdoor Helicopter Psychoacoustic Tests"
September 25-28, 1978
Report No.: None
ICAO Committee on Aircraft Noise (CAN), Working Group B
NAC: S

Isom, M.P.
"Surface Radiation Integrals in Aerodynamic Sound"
November, 1974; 26 pp.
Report No.: POLY-AE/AM-74-20
Polytechnic Institute of New York, Brooklyn Department of Aerospace Engineering and Applied Mechanics
NAC: FO, P

Janakiram, D.S.
"Experimental Evaluation of Active and Passive Means of Alleviating Rotor Impulsive Noise in Descent Flight"
November, 1979; 86 pp.
Report No.: NASA-CR-159188; RASA/SRL-14-79-04; Contract: NAS1-15337
Systems Research Labs, Inc., Newport News, Virginia, RADA Division
NAC: R, FOI

Jester, J.; Lane, T.E.; Chambers, H.W.; Forsyth, R.F.
"Engineering Flight Test of the YCH-47C Medium Transport Helicopter Army; Preliminary Evaluation II"
February, 1969; 204 pp.
Report No.: USAAVNTA-66-28-2
Army Aviation Systems Test Activity, Edwards AFB, California
NAC: FH

Johnson, W.; Lee A.
"Comparison of Measured and Calculated Helicopter Rotor Impulsive Noise"
March, 1978; 29 pp.
Report No.: NASA-TM-78473; A-7355; Contract: NAS2-9399
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, CA
NAC: FOI, FO, P

Johnson, G.W.; Haasz, A.A.
"The Influence of Background Noise Level and Signal Duration of the Judged Annoyance of Aircraft Noise"
August, 1978
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: S

Jones, D.S., F.R.S.
"The Scattering of Sound by a Simple Shear Layer"
February 18, 1977; pp. 287-315
Philosophical Transactions Series A Vol. 284, Part 1323
Department of Mathematics, The University, Dundee, London
NAC: F

Kasper, P.K.
"Determination of Rotor Harmonic Blade Loads from Acoustic Measurements"
October, 1975; 66 pp.
Report No.: NASA-CR-2580; Contract: NAS1-12390
Wyle Labs, Inc., Hampton, Virginia
NAC: FO, P

Kim, Y.N.: George A.R.
"Trailing Edge Noise from Hovering Rotors"
May, 1980
36th Annual Forum of the American Helicopter Society, Preprint No. 80-60
American Helicopter Society, 1325 - 18th Street, N.W., Washington, D.C. 20036
NAC: P, FOB

King, R.; Gupta, B.
"Effective Perceived Noise Level for Future Civil Helicopters"
June, 1980
Contract: DOTFA01-80-C-10017
Hughes Helicopters, Culver City, California
NAC: R, P, FH, S

Klumpp, R.G.; Schmidt, D.R.
"Annoyance of Helicopter Bladeslap"
July, 3, 1978; 37 pp.
Report No.: NOSC/TR-247
Naval Ocean Systems Center, San Diego, California
NAC: S, P, FOI

Knapp, Stanley C.
"Annual Progress Report, Fiscal Year 1978"
July 30, 1979; 116 pp.
Project: 3E162773A819, 3A16110A91C
Army Aeromedical Research Lab, Fort Rucker, Alabama
NAC: S

Langenbucher, V.
"Noise Phenomena with Helicopter Rotors and Possibilities of Noise Reduction"
February, 1976; 27 pp.
Translated into English from "Triebwerkslaerm" DGLR, Cologne Report DLR--Mitt-74-21, 1974, pp. 259-274
European Space Agency, Paris, France
NAC: R, FOR

Langenbucher, V.; Laudien, E.
"Possibilities and Problems of Helicopter Noise Reduction"
November 21, 1975; pp. 53-100
Contribution to Helicopter Technology
Messerchmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany)
NAC: R

Large, J.B.
"Airport Noise"
1978
British Airports Authority Planning Seminar/The Environmental Acceptability of Airport Development in the 1980's
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Large, J.B.
"Economic Impact of Noise Certification"
1977
Proceedings of Internoise 77, Zurich
University of Southampton, Institute of Sound and Vibration Research
NAC: S

Large, J.B.
"Environmental Noise - Methods of Assessing Community Response to Environmental Noise"
August, 1977
Royal Society of Health
University of Southampton, Institute of Sound and Vibration
NAC: S

Large, J.B.
"Noise Effects: Prospects for the Future"
1979
Institute of Acoustics Spring Conference Proceedings
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Large, J.B.; House, M.E.
"The Status of Airport Noise Prediction"
1979
Internoise 79 Proceedings, Warsaw, Poland
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P

Large, J.B.; Jones, D.K.
"Examples of Some Low-Cost Noise Abatement Techniques"
1977
Report No.: 34444/Organization for Economic Co-Operation and Development, Paris
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S, R

Lawton, B.W.
"Subjective Assessment of Simulated Helicopter Blade-Slap Noise"
December, 1976; 55 pp.
Report No.: NASA-TN-D-8359; L-11137
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: S, FOI

Lee, A.
"A Computer Program for the Identification of Helicopter Impulsive Noise Sources"
January, 1977; 28 pp.
Report No.: NASA-CR-151997
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FOI, P

Lee, A.
"Acoustic Effects of Blade Tip Shape Changes on a Full Scale Helicopter Rotor in a Wind Tunnel"
April, 1978; 59 pp.
Report No.: NASA-CR-152082; Contract: NAS2-9399
Beam Engineering, Inc., Sunnyvale, California
NAC: FOI, P, R

Lee, A.
"An Acoustical Study of Circulation Control Rotor"
January, 1979
NASA-CR-152209/NAS2-9865
Beam Engineering, Inc., Sunnyvale, California
NAC: FO

Lee, A.
"High Speed Helicopter Noise Sources"
January, 1977; 47 pp.
Report No.: NASA-CR-151996
Massachusetts Institute of Technology, Camabridge, Fluid Dynamics Research Lab
NAC: FOI, P

Lee, A.; Aravamudan, K.S.; Bauer, P.; Harris, W.L.
"An Experimental Investigation of Helicopter Rotor High Frequency Broadband Noise"
October, 1977; 11 pp.
Report No.: AIAA Paper 77-1339; Contract: DAAG29-C-027 NSG-2095
Massachusetts Institute of Technology, Cambridge, Massachusetts
NAC: FOB, P

Lee, A.; Harris, W.L.; Widnall, S.E.
"An Experimental Study of Helicopter Rotor Rotational Noise in a Wind Tunnel"
July, 1976
Report No.: AIAA Paper 76-564; Contract: NAS2-7684
American Institute of Aeronautics and Astronautics, Aero-Acoustics Conference, 3rd, Palo Alto, CA
Massachusetts Institute of Technology, Cambridge, Massachusetts
NAC: FOR

Lenski, J.W.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume III. Evaluation of Fiber FP Metal-Matrix Housing Specimens"
January, 1979; 99 pp.
Report No.: D210-11442-1; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania/Army Research and Technology Labs, Fort Eustis, VA
NAC: R, P, FG

Leverton, J.W.
"A Study of Helicopter Noise with Particular Reference to Transient Effects"
1978
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Leverton, J.W.
"Interim Report on Progress of Quiet Helicopter Feasibility Study"
April, 1977
Contract: K/A12/1258
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: R, FO

Leverton, J.W.; Southwood, B.J.; Pike, A.C.; Woodward, M.A.
"A Revaluation of Helicopter Main Rotor Noise"
September, 1976; 10 pp.
Report No.: None
Westland Helicopters, Ltd., Yeovil, Somerset, England
NAC: FO

Leverton, J.W.; Southwood, B.J.; Pike, A.C.
"Rating Helicopter Noise"
August, 1978; pp. 419-438
NASA Langley Research Center Helicopter Acoustics, Pt. 2, Westland Helicopters Ltd., Yeovil, England
NAC: S

Leverton, J.W.; Woodward, M.C.A.
"Helicopter Rotor Noise Research - Analysis of Recorded Data. Broadband Noise Study"
July, 1976
Research Paper No.: 521 - Part I; Contract: K/A12/646/CB/A12b1
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: FOB, P

Levine, L.S.
"Analytic Investigation of Techniques to Reduce Tail Rotor Noise"
July 1, 1976
Report No.: NASA CR-145014
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: R, FO

Levine, L.S.; DeFelice, J.J.
"A Practical Approach to Helicopter Internal Noise Prediction"
May 22-24, 1978
NASA Conference Publication 2052, Part II
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: P

Levine, L.S.; DeFelice, J.J.
"Civil Helicopter Research Aircraft Internal Noise Prediction"
April 1, 1977
Contract: NASA CR-145146
Sikorsky Aircraft Company, Stratford, Connecticut
NAC: P, FH

Liebowitz, H.; Farassat, F.
"Research on Helicopter Rotor Noise"
October, 1979; 13 pp.
Grant: DAAG29-78-G-0152; DAAG29-76-G-0259
George Washington University, Washington, D.C., School of Engineering and Applied Science/Army Research Office, Research Triangle Park, North Carolina
NAC: FO, P

Lince, D.L.
"A Technique for Measuring the External Noise of a Moving Helicopter"
September, 1973; 74 pp.
Report No.: AD-773687 HEL-TM-16-73
Human Engineering Labs, Aberdeen Proving Ground, Maryland
NAC: FH, P

Lynn, R.R.; Cox, C.R.
"Helicopter Noise Standards - Another Point of View, A Rational Approach to Rotorcraft Noise Regulation"
September, 1978
Fourth European Rotorcraft and Powered Lift Aircraft Forum, Paper No. 55
Associazione Italiana di Aeronautica ed Astronautica Associazione Industrie Aerospaziali, Stresa, Italy
NAC: FO, FH, S, R, P

Magee, J.P.; Alexander, H.R.
"A Hingeless Rotor XV-15 Design Integration Feasibility Study. Volume I: Engineering Design Studies"
March, 1978; 473 pp.
Report No.: NASA-CR-152310; D210-11360-1-V-1; Contract: NAS2-9015
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO, R

Magee, J.P.; Clark R.; Alexander, H.R.
"Conceptual Design Studies of 1985 Commercial VTOL Transports that Utilized Rotors, Volume 1"
November, 1974; 459 pp.
Report No.: NASA-CR-137599; DZ10-10858-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, P

Magee, J.P.; Clark, R.; Alexander, H.R.
"Conceptual Design Studies of 1985 Commercial VTOL Transports that Utilize Rotors, Volume 2"
November, 1974; 407 pp.
Report No.: NASA-CR-137600; D210-10858-2; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, P

Magee, J.P.; Clark, R.D.; Widdison, C.A.
"Conceptual Engineering Design Studies of 1985-Era Commercial VTOL and STOL Transports that Utilize Rotors"
May, 1975; 123 pp.
Report No.: NASA-CR-2545; D210-10918-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: S, FH, P

Magliozzi, B.
"V/STOL Rotary Propulsor Noise Prediction Model Update and Evaluation"
December, 1979; 233 pp.
Update to Report Nos.: FAA-RD-76-49-1 through FAA-RD-76-49-3 dated May 76
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: FO, P

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume I. Identification of Sources, Noise Generating Mechanisms, Noise Reduction Mechanisms, and Prediction Methodology"
May, 1976; 145 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, FH, FO, FE, FG, R

Magliozzi, B.
"V/STOL Rotary Propulsion Systems Noise Prediction and Reduction. Volume II. Graphical Prediction Methods"
May, 1976; 299 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, R, FH, FO, FE, FG

Magliozzi, B.
"V/STOL Rotary Propulsion Systems - Noise Prediction and Reduction. Volume III. Computer Program User's Manual"
May, 1976; 300 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connecticut, Hamilton Standard Division
NAC: P, FE, FR, FH, FG

Magliozzi, B.; Metzger, F.B.; Bausch, W.; King, R.J.
"A Comprehensive Review of Helicopter Noise Literature"
June, 1975; 188 pp.
Contract: DOT-FA74WA-3477
United Technologies Corporation, Windsor Locks, Connectcut, Hamilton Standard Division/Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: F, P, R, S

Mall, G.H.; Farassat, F.
"A Computer Program for the Determination of the Acoustic Pressure Signature of Helicopter Rotors Due to Blade Thickness"
January, 1976
Report No.: NASA TM X-3323
The George Washington University/Joint Institute for Advancement of Flight Sciences, Washington, D.C.
NAC: FO

Man-Acoustics and Noise, Inc.
"Noise Certification Considerations for Helicopters Based on Laboratory Investigations"
July, 1976; 108 pp.
Report No.: MAN-1014; Contract: DOT-FA744WAI-490
Man Acoustics and Noise, Inc., Seattle, Washington
NAC: S, FOI, FH

Marinelli, J.L.
"Informal Evaluation of the Sikorsky S-62 Amphibious, Turbine-Powered Helicopter"
February 5, 1959, 6 pp.
Report No. ATBG-DT-AVN-5058
Army Aviation Test Board, Fort Rucker, Alabama
NAC: R, FH

Mark, W.D.
"Analysis of Vibratory Excitation of Gear Systems as a Contributor to Aircraft Interior Noise"
February, 1979; 97 pp.
Report No.: NASA-CR-159088; TM-502; Contract: NAS1-14611
Bolt, Beranek, and Newman, Inc., Cambridge, Massachusetts/National Aeronautics and Space Administration, Washington, D.C.
NAC: S, P, FG

Mattmuller, N.A.; Yamakawa, G.M.; Dugan, D.C.; Chambers, H.W.
"Engineering Flight Test of the YCH-47B Helicopter, Army Preliminary Evaluation I, II and III"
January, 1969; 166 pp.
Report No.: USAAVNTA-66-26
Army Aviation Systems Test Activity, Edwards AFB, California
NAC: S

Mayer, T.C.; Covill, E.F.; George, J.A.; Harrington, J.T.
"Shock Pulse Meter Analysis"
October 15, 1974; 159 pp.
Contract: DAAJ01072-A-0027
Parks College of Saint Louis University, Cahokia, Illinois
NAC: FG, FO

McIntosh, V.C.; Bolds, P.G.
"Vibration and Acoustic Environment of AH-1G Helicopter"
April, 1975; 224 pp.
Report No.: AFFDL-TR-75-17
Air Force Flight Dynamics Lab, Wright-Patterson AFB, Ohio
NAC: FH, P

McIntosh, V.C.; Bolds, P.G.
"Vibration and Acoustic Environment of UH-1C Helicopter Configured with and Using M-5 and Xm-21 Armament"
February, 1974; 237 pp.
Report No.: AFFDL-TR-73-160
Air Force Flight Dynamics Lab, Wright-Patterson AFB, Ohio
NAC: S

Melnikov, B.N.
"Experimental Investigation of Helicopter Flight Modes on Helicopter Generated Noise"
June, 1979; pp. 450-453
Akusticheskii Zhurnal, Vol. 25, May-June, 1979. In Russian.
Gosudarstvennyi Nauchno-Issledovatel'skii Institut Grazhdanskoi, Aviatsil, Moscow, USSR
NAC: F, P

Melnikov, B.N.
"Experimental Studies of Helicopter Flight Conditions and Noise"
June, 1979, pp. 450-453
Akusticheskii Zhurnal, Vol. 25, May-June, 1979, Physics - Acoustics, Vol. 25, May-June, 1979, pp. 255-257. Translation.
Gosudarstvennyi Nauchno-Issledovatel'skii Institut Grazhdanskoi, Aviatsii, Moscow, USSR
NAC: FH, P

Morfey, C.L.; Howell, G.P.
"The Sound Power Spectrum of Shock-free Jets"
1979
AIAA Paper 79-0595
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Szewczyk, V.M.
"Jet Noise Modelling by Geometric Acoustics. Part I: Theory and Prediction Outside the Cone of Silence"
1977
ISVR Technical Report No. 91
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morfey, C.L.; Szewczyk, V.M.
"Jet Noise Modelling by Geometric Acoustics. Part II: Theory, and Prediction Inside the Cone of Silence"
1977
ISVR Technical Report No. 92
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FEJ

Morgan, J.D.
"The Interaction of Sound with a Subsonic Cylindrical Vortex Layer"
1975; pp. 341-362
Proc. R. Soc. Lond. A. 344
The University of Dundee, Department of Mathematics, DD1 4HN, London, England
NAC: FEJ

Morris, C.E.K.; Farassat, F.; Nystrom, P.A.
"An Evaluation of Linear Acoustic Theory for a Hovering Rotor"
May, 1979
Report No.: NASA TM 80059
The George Washington University/Joint Institute for Advancement of Flight Sciences
Washington, D.C.
NAC: FO

Mueller, M.W.
"Evaluation of Environmental Impact of Noise from Rotary-Wing Aircraft Operations. New Jersey Army National Guard Support Facility. Mercer County Airport, West Trenton, New Jersey"
September, 1974; 59 pp.
Report No.: AD-B0026321/USAEHA-34-052-73/75
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland
NAC: S, R

Mueller, M.W.
"Evaluation of the Environmental Impact and Recommended Control Measures to Reduce the Noise Generated from Military Helicopter Operations at the McGuire Veterans Administration Hospital, Richmond, Virginia"
October, 1974; 41 pp.
Report No.: USAEHA-34-018-75
Army Environmental Hygiene Agency, Aberdeen Proving Ground, Maryland
NAC: S, R

Munch, C.L.; Patterson, R.W.; Day, H.
"Rotor Broadband Noise Resulting from Tip Vortex/Blade Interaction"
February, 1975; 98 pp.
Report No.: SER-50909; Contract: DAHC04-72-C-0040
United Technologies Corporation, Stratford, Connecticut, Sikorsky Aircraft Division/Army Research Office, Research Triangle Park, North Carolina
NAC: FOB

Nakamura, Y.
"The Analysis of Helicopter Rotor Noise"
September, 1977; pp. 111-151
Report No. 549, Vol. 42
University of Tokyo, Institute of Space and Aeronautical Science
NAC: FO, P

Nakamura, Y.; Azuma, A.
"Improved Methods for Calculating the Thickness Noise"
August, 1978; pp. 323-337
Tokyo University/NASA Langley Research Center, Helicopter Acoustics, (See N78-32816 23-71)
NAC: FO

Nakamura, Y.; Azuma A.
"Rotational Noise of Helicopters Rotors"
1979; pp. 293-316
Vertica, Vol. 3, No. 3-4, 1979
University of Tokyo, Japan
NAC: FO, FOI

National Aeronautics and Space Administration
"Flutter Testing Techniques"
1976; 483 pp.
Report No.: NASA-SP-415
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, P

National Aeronautics and Space Administration
"Helicopter Acoustics"
August, 1978; 399 pp.
Report No.: NASA-CP-2052-PT-1; L-12339
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FH

National Aeronautics and Space Administration
"Helicopter Acoustics, Part 2"
August, 1978; 438 pp.
Report No.: NASA-CP-2052-PT-2; L-12339-PT-2
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: FH, P, R

National Aeronautics and Space Administration
"Helicopter Acoustics: Proceedings of an International Specialists Symposium"
1978; 402 pp.
Conference Publication 2052
National Aeronautics and Space Administration, Scientific and Technical Information Office, Springfield, VA
NAC: F, FH, P, R

National Aeronautics and Space Administration
"Predesign Study for an Aero/Acoustic Research Rotor System"
September, 1976
Report No.: NASA CR 145017; NAS1-13980
Boeing Vertol Company
NAC: FO

National Aeronautics and Space Administration
"Predesign Study for an Aero/Acoustic Research Rotor System. Volume II - Funding Estimate"
September, 1976
Report No.: NASA CR 145018; NAS1-13980
Boeing Vertol Company
NAC: FO

Nelson, P.A.; Halliwell, N.A.
"A Physical Description of a Vortex Noise Source"
1978
Institute of Acoustics Spring Conference
University of Southampton, Institute of Sound and Vibration Research, England
NAC: FO

Newman, J. S.
"Correlations of Helicopter Noise Levels with Physical and Performance Characteristics"
September, 1980
Report No.: DOT-FAA-EE-80-42
Federal Aviation Administration/National Technical Information Services, Springfield, VA
NAC: S, P, FH

Newman, J. S.; Rickley, E.J.
"Noise Levels and Flight Profiles of Eight Helicopters Using Proposed International Certification Procedures"
March, 1979; 298 pp.
Report No.: FAA-AEE-79-03
Federal Aviation Administration, Washington, D.C., Office of Environment and Energy
NAC: S, P

Newman, J.S.; Rickley, E.J.
"Noise Levels and Flight Profiles of Eight Helicopter Wing Proposed International Certification Procedures"
August, 1978
Report No.: FAA-AEQ-78-21
Federal Aviation Administration, Washington, D.C.
NAC: S

Noise Control Foundation
"Inter-Noise Proceedings"
Annual Report
Noise Control Foundation, P.O.B. 3469, Arlington Branch, Poughkeepsie, New York
NAC: R, P, S

North Carolina State University
"Interagency Symposium on University Research in Transportation Noise (2nd) Held at North Carolina State University, Raleigh on June 5-7, 1974. Book of Proceedings, Volume I"
June, 1974, 469 pp.
Contract: DOT-OS-40040
North Carolina State University, Raleigh, North Carolina/Office of the Secretary of Transportation, Washington, D.C. Office of Noise Abatement/National Aeronautics and Space Administration, Washington, D.C./Department of Defense, Washington, D.C./National Science Foundation, Washington, D.C.
NAC: FO, FH, P, R

Olson, J.R.
"Helicopter Mission Optimization Study"
December, 1978; 122 pp.
Report No.: NASA-CR-3060; Contract: NAS1-1498
United Technologies Corporation, Stratford, Connecticut, Sikorsky Division
NAC: R, FH

Owen, S.
"ICAO/CAN Working Group B. Helicopter Noise Comparison Test Programme"
September, 1976
Contract: AE/145/038; Research Paper No.: 529
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FH

Owen, S.
"ICAO/CAN Working Group B. Helicopter Noise Comparison Test Programme. Further Study of Lynx Data and Comparative Study of Other Data"
May, 1977
Contract: AE/145/038 (DOI); Research Paper No.: 549
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FH, FO

Parks, C.L.
"A Computer Program for Helicopter Rotor Noise Using Lowson's Formula in the Time Domain"
July 22, 1975; 92 pp.
Report No.: NASA-TM-X-727559
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia
NAC: FO, P

Paterson, R.W.: Amiet, R.K.
"Acoustic Radiation and Surface Pressure Characteristics of an Airfoil due to Incident Turbulence"
September, 1976
Report No.: NASA CR-2733; NAS1-13823; AIAA Paper No. 76-571
United Technologies Research Center, East Hartford, Connecticut/NASA, Washington, D.C.
NAC: FO, P

Paterson, R.W.; Amiet, R.K.
"Noise of a Model Helicopter Rotor Due to Ingestion of Turbulence"
November, 1979; 131 pp.
Report No.: NASA-CR-3213; Contract: NAS1-15094
United Technologies Research Center, East Hartford, Connecticut/NASA, Washington, D.C.
NAC: FO, P

Patterson, J.H., Jr.; Mozo, B.; Schomer, R.D.; Camp, R.T., Jr.
"Subjective Ratings of Annoyance Produced by Rotary-Wing Aircraft Noise"
May, 1977; 36 pp.
Report No.: USAARL-77-12
Army Aeromedical Research Lab, Fort Rucker, Alabama
NAC: S

Patterson, R.; Amiet, R.; Schlinker, R.
"An Investigation of the Effect of the Ingestion of Main Rotor Tip Vortices on Tail Rotor Noise"
September 5, 1980/November, 19, 1981
Contract: NASl-16392
NASA Langley Research Center, Hampton, Virginia/United Technologies Research Center, East Hartford, Connecticut
NAC: FO

Pegg, R.J.
"A Summary and Evaluation of Semi-Empirical Methods for the Prediction of Helicopter Rotor Noise"
December, 1979; 96 pp.
Report No.: NASA-TM-80200
National Aeronautics and Space Administration, Langley Research Center, Hampton, VA
NAC: P, FO

Pegg, R.J.; Hosier, R.N.; Balcerak, J.C.; Johnson, H.K.
"Design and Preliminary Tests of a Blade Tip Air Mass Injection System for Vortex Modification and Possible Noise Reduction on a Full-Scale Helicopter Rotor"
December, 1975; 39 pp.
Report No.: NASA-TM-X-3314; L-10428
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FO, R

Petit, G.; Dambra, M.; Marze, M.
"Propagation of Noise Generated by Helicopter Rotors"
November, 1975; 15 pp.
Report No.: None
Societe Nationale Industrielle Aerospatiale, Marignane, Bouches-du-Rhone, France
NAC: FO, P

Pike, A.C.; Southwood, B.J.
"Helicopter Noise Certification--Evaluation of Proposed Noise Rating Methods. Part I: Rating of Helicopter Noise"
March, 1978
Contract: AE/145/038 (DOI); Research Paper: 570
Westland Helicopters Limited, Yeovil, Somerset
NAC: S, FO

Pike, A.C.; Southwood, B.J.
"Helicopter Rotor Noise Research--Analysis of Recorded Data"
August, 1976
Contract: K/A12/646/CB/A12bl; Research Paper: 521-Part 3
Westland Helicopters Limited, Yeovil, Somerset
NAC: FO, P, FOB

Pike, A.C., Southwood, B.J.; Leverton, J.W.
"Helicopter Noise Certification Evaluation of ICAO Working Group B Proposals"
April, 1978
Contract: AE/145/038 Extension 2; Research Paper: 574
Westland Helicopters Limited, Yeovil, Somerset
NAC: S

Pollard, J.S.
"A Preliminary Study of Helicopter (Cabin) Noise"
March, 1976
Contract: K/A12/902; Research Paper: 514
Westland Helicopters Limited, Yeovil, Somerset
NAC: FG, S

Pollard, J.S.
"Internal Noise--Noise and Vibration Survey During Flight"
August, 1979
Contract: K/A12/1154; Research Paper: 585
Westland Helicopters Limited, Yeovil, Somerset
NAC: S

Powell, C.A.
"A Subjective Field Study of Helicopter Blade-Slap Noise"
July, 1978; 88 pp.
Report No.: NASA-TM-78758
National Aeronautics and Space Administration, Langley Research Center, Langley Station, Virginia
NAC: FOI, P, S

Putmam, T.W.
"Review of Aircraft Noise Propagation"
September, 1975; 61 pp.
Report No.: TM-X-56033
NASA Flight Research Center, Edwards AF Base
NAC: P, S

Ralph, M.A.
"A Preliminary Study of Tail Rotor Noise"
March, 1976
Contract: K/A12/770/CB/A12b; Research Paper: 516
Westland Helicopters Limited, Yeovil, Somerset
NAC: P, FO

Ramakrishnan, R.; Randall, D.; Hosier, R.N.
"A Computer Program to Predict Rotor Rotational Noise of a Stationary Rotor from Blade Loading Coefficient"
February, 1976; 164 pp.
Report No.: NASA-TM-X-3281; L-9796
National Aeronautics and Space Administration, Langley Research Center, Langley Station, VA
NAC: FOR, P

Rice, C.G.
"Development of Cumulative Noise Measure for the Prediction of General Annoyance in an Average Population"
1977; pp. 345-364
Journal of Sound and Vibration 52
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Rice, C.G.
"Investigation of the Trade-off Effects of Aircraft Noise and Number"
1977; pp. 325-344
Journal of Sound and Vibration 52
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Richarz, W.
"Direct Correlation of Noise and Flow of a Jet Using Laser Doppler"
June, 1978
Report No.: None
University of Toronto, Institute of Aerospace Studies, Toronto, Canada
NAC: FEJ

Riggins, T.H.
"A Unifying Theory for Determining Human Response to Sound--Aircraft Noise"
1979; pp. 144-147
Community Noise: Proceedings of the Symposium, Kansas City, Missouri, May 24-26, 1978 Philadelphia, Pennsylvania/American Society for Testing and Materials
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 39. UH-1F In-Flight Crew Noise"
September, 1975; 12 pp.
Report No.: AMRL-TR-75-50-Vol-39
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 50. HH-43B In-Flight Crew Noise"
October, 1975; 15 pp.
Report No.: AMRL-TR-75-50-Vol-50
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 53. AC-119G In-Flight Crew Noise"
November, 1975, 13 pp.
Report No.: AMRL-TR-75-50-Vol-53
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 60. UH-1N In-Flight Crew Noise"
November, 1975; 15 pp.
Report No.: AMRL-TR-75-50-Vol-60
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rose, J.F., Jr.; Farinacci, N.A.; Cole, J.N.; Mohlman, H.; Eilerman, D.
"USAF Bioenvironmental Noise Data Handbook. Volume 61. HH-3E In-Flight Crew Noise"
November, 1975
Report No.: AMRL-TR-75-50-Vol-61
Aerospace Medical Research Lab, Wright-Patterson, AFB, Ohio
NAC: S

Rusnak, R.M.; Yee, H.C.; Sen, J.K.
"Acoustic Emission Investigation--Helicopter Rotor System"
November, 1976
USAAMRDL TR 76-11; DAAJ02-73-C-0066; AD A033571
Bendix Research Laboratories/USAAMRDL
NAC: FO

Sames, J.
"Evaluation of the Annoyance Due to Helicopter Rotor Noise"
March 8, 1978
Contract: NAS1-14192
National Aeronautics Space Administration
NAC: S

Samra, S.S.
"Hovercraft Noise Annoyance in the Solent"
1978
MS.c. Dissertation
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Saulpic, C.
"Non-linear Effects of Sound Propagation"
1978
MS.c. Dissertation
University of Southampton, Institute of Sound and Vibration Research, England
NAC: P, F

Schaeffer, E.G.
"Design of Helicopter Rotors in Noise Constraints"
August, 1978; pp. 551-561
NASA, Langley Research Center Helicopter Acoustics, Pt. 2
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: R, FO

Schaeffer, E.; Sternfeld, H.
"Design of Helicopter Rotors to Noise Constraints"
May, 1978
Paper 30, NASA Conference Publication 2052
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: S

Schauer, J.J.; Hoffman, E.P.; Guyton, R.E.
"Sound Trnasmission Through Ducts"
May, 1978; 163 pp.
Report No.: AFAPL-TR-78-25
University of Dayton, School of Engineering, Dayton, Ohio 45469
NAC: P, FE

Schlegel, R.G.; Bausch, W.E.
"Helicopter Rotor Rotational Noise Prediction and Correlation. Volume I. Rotational Noise Prediction and Correlation Under Nonuniform Inflow Conditions"
November, 1970; 105 pp.
Contract: DA-44-177-AMC-448(T)
United Aircraft Corporation, Stratford, Connecticut, Sikorsky Aircraft Division
NAC: P, FO, FH

Schlegel, R.G.; Bausch, W.E.
"Helicopter Rotor Rotational Noise Prediction and Correlation. Volume II. Documentation of Noise Prediction Computer Program"
November, 1970; 82 pp.
Contract: DA-44-177-AMC-448(T)
United Aircraft Corporation, Stratford, Connecticut, Sikorsky
NAC: FO, P

Schmitz, F.H.; Boxwell, D.A.; Vause, C.R.
"Acoustically Swept Rotor"
September 8, 1977; 36 pp.
Report No.: PAT-APPl-831-633; NASA-CASW-ARC-11106-1
National Aeronatuics and Space Administration, Ames Research Center, Moffett Field, CA
NAC: FOI, R

Schmitz, F.H.; Boxwell, D.A.; Vause, R.
"Acoustically Swept Rotor"
September 25, 1979 (patented); 23 pp.
Report No.: PATENT-4 168 939; PAT-APPL-831 633
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, FOI

Schmitz, F.H.; Yu, Y.H.
"Theoretical Modeling of High-Speed Helicopter Impulsive Noise"
January, 1979; pp. 10-19
Journal Volume 24, January 1979, American Helicopter Society
U.S. Army, Aeromechanics Laboratory, Moffett Field, California
NAC: FOI

Schomer, P.D.; Homans, B.L.
"Technical Background: Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns, and Siting Noise-Sensitive Land Uses"
September, 1976; 17 pp.
Report No.: CERL-IR-N-9
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

Schomer, P.D.; Homans, B.L.
"User Manual: Interim Procedure for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976; 40 pp.
Report No.: CERL-IR-N-10
Construction Engineering Research Lab (Army) Champaign, Illinois
NAC: S

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.; Schaeffer, E.G.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume I. Technical Report"
March, 1978; 307 pp.
Report No.: D210-11236-1; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FG, P, R

Sciarra, J.J.; Howells, R.W.; Lenski, J.W., Jr.; Drago, R.J.
"Helicopter Transmission Vibration and Noise Reduction Program. Volume II. User's Manual"
March, 1978; 431 pp.
Report No.: D210-11236-2; Contract: DAAJ02-74-C-0040
Boeing Vertol Company, Phildelphia, Pennsylvania
NAC: FG, P, R

Scofield, T.C.
"Helicopter Aeromedical Research: The Need"
June 10, 1977; 115 pp.
Report No.: None
Army Command and General Staff College, Fort Leavenworth, Kansas
NAC: S

Scruggs, B.W., Jr.; Hampton, K.D.
"An Analytical Investigation of the Effect of Varying Rotor Tip Speed to Reduce Helicopter Acoustic Detection"
August, 1979; 34 pp.
Report No.: USARTL-TN-37
Army Research and Technology Labs, Fort Eustis, Virginia
NAC: R, S

Semple, R.D.
"Research Requirements for Development of Regenerative Engines for Helicopters"
December, 1976; 36 pp.
Report No.: NASA-CR-145112; Contract: NAS1-13624
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FE, P

Shahady, P.A.; Lyon, C.A.; Chopin, M.H.; Ewing, M.S.; McGregor, R.M.
"Quiet Propeller Concept Evaluation"
October, 1977; 140 pp.
Report No.: AFAPL-TR-77-56
Air Force Aero Propulsion Lab, Wright-Patterson, AFB, Ohio
NAC: R, P

Shepherd, K.P.
"A Laboratory Study of the Subjective Response to Helicopter Blade-Slap Noise"
December, 1978; 21 pp.
Report No.: NASA-CR-158973; Contract: NAS1-14970
Bionetics Corporation, Hampton, Virginia
NAC: S, P

Shepherd, K.P.
"The Effect of the Duration of Aircraft Sounds on Judged Annoyance"
1979
Ph.D. Thesis
University of Southampton, Institute of Sound and Vibration Research, England
NAC: S

Shovlin, M.D.; Gambucci, B.J.
"Effect of High Lift Flap Systems on the Conceptual Design on a 1985 Short-Haul Commercial STOL Tilt Rotor Transport"
April, 1978; 29 pp.
Report No.: NASA-TM-78474; A-7364
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, FH

Simpson, J.
"Helicopter Noise Planning in London"
1977; 4 pp.
Proceedings of the Sixth International Conference, Zurich, Switzerland, March 1-3, 1977
NAC: S

Sneckenberger, J.E.; Butler, H.W.; Heou, I.
"Experimental Synchronization Study of the Gyroscopic Vibration Absorber"
September, 1973
Paper No.: ASME 73-DET-132
West Virginia University, Department of Mechanical Engineering and Mechanics, Morgantown, WV
NAC: FH, R

Sneckenberger, J.E.; Clise, R.A.
"Active Synchronization Control of the Gyroscopic Vibration Absorber"
May, 1976
Paper No. ASME 75-DET-11
West Virginia University, Department of Mechanical Engineering and Mechanics, Morgantown, WV
NAC: FH, R

Southwood, B.J.
"Helicopter Noise Certification Evaluation of Proposed Noise Rating Methods Part 2--The Subjective Assessment of Tail Rotor Noise"
Date: None
Contract: AE/145/038 (DOI) Extension 3; Research Paper 576
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S, FO

Southwood, B.J.
"Helicopter Noise Certification--Evaluation of Take-off Procedures"
December, 1978
Contract: AE/145/038 Extension 5 (Data Analysis Only); Research Paper: 590
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Southwood, B.J.
"Helicopter Noise Certification--Re-examination of NASA Subjective Study Recordings"
June, 1979
Contract: AE/145/038 Extension 6; Research Paper: 596
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Southwood, B.J.
"Helicopter Rotor Noise Research--Analysis of Recorded Data"
October, 1976
Contract: K/A12/646/CB/A1261; Research Paper: 521-Part 2
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: FOR, FO, P

Spector, S.R.
"The Impact of Urban Operations on Helicopter Noise Requirements"
August, 1978; pp. 45-59
NASA Langley Research Center, Helicopter Acoustics
Hughes Helicopters, Culver City, California
NAC: S

Spencer, R.H.; Sternfeld, H., Jr.
"Study of Cost/Benefit Tradeoffs Available in Helicopter Noise Technology Applications"
January, 1980; 128 pp.
Contract: DOT-FA78WA-4161
Boeing Vertol Company, Philadelphia, Pennsylvania/Federal Aviation Administration, Washington, D.C.
NAC: R, F, H, FO, P

Sperry UNIVAC
"Drone Control and Data Retrieval System (DCDRS). Preliminary Design Study Final Report. Volume III. Trade Studies and Analyses. Part XVIII. Human Operator Environment Trade Study"
April, 1974; 36 pp.
Contract: F33657-73-C-0665
Sperry UNIVAC, St. Paul, Minnesota Defense Systems Division
NAC: FH

Stephens, D.G.; Leatherwood, J.D.
"Physical and Subjective Studies of Aircraft Interior Noise and Vibration"
April, 1979; 16 pp.
Report No.: NASA-TM-80084
National Aeronautics and Space Administraiton, Langley Research Center, Hampton, VA
NAC: S

Sternfeld, H.
"Advanced Rotorcraft Noise"
May, 1980
Paper AIAA-80-0857/AIAA International Meeting and Technical Display "Global Technology 2000"
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: R, S

Sternfeld, H.
"Helicopter Rotor Noise Control"
May-June, 1975
Vol. 4, No.3, Noise Control Engineering
NAC: R, S

Sternfeld, H.
"Helicopter Rotor Noise Control"
December 16, 1974
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: FO, FOI, FOR, P, R, S

Sternfeld, H.
"Investigation of Rotor Harmonic Noise"
September 30, 1980
Contract: NAS2-10767
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO

Sternfeld, H.
"Recent Developments in Helicopter Noise Reduction"
September, 1978
Paper A4-04/Proceedings of the XI Congress of the International Council of the Aeronautical Sciences/Republished in the Aeronautical Journal of the Royal Aeronautical Society August, 1979
NAC: R, FO

Sternfeld, H.; Doyle L.
"A Method for Determining Internal Noise Criteria Based on Practical Speech Communication, Applied to Helicopters"
May, 1978
Paper 25, NASA Conference Publication 2052
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: S

Sternfeld, H.; Doyle L.
"Evaluation of Current Helicopter Internal Noise Level Design Criteria"
December, 1976
Contract: DAAJ01-74-C-1054
U.S. Army Aviation Systems Command
NAC: S

Sternfeld, H., Jr.; Doyle, L.B.
"Evaluation of the Annoyance Due to Helicopter Rotor Noise"
June, 1978; 74 pp.
Report No.: NASA-CR-3001; Contract: NAS1-14192
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: S, FOI, FOB, P

Sternfeld, H.; Doyle, L.
"The Effects of Engine Noise and Rotor Broadband Noise on Civil Helicopter Operations"
June, 1978
Report No.: NASA CR145085
Boeing Vertol Company, P.O.B. 16858, Philadelphia, Pennsylvania 19142
NAC: R, S, FE, FEC

Sternfeld, H., Jr.; Wiedersum, C.W.
"Study of Design Constraints on Helicopter Noise"
July, 1979; 91 pp.
Report No.: NASA-CR-159118; Contract: NAS1-15226
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FO, P, S

Stimpert, D.L.
"Demonstration of Short-Haul Aircraft Aft Noise Reduction Techniques on a Twenty Inch (50.8) Diameter Fan, Volume 2"
April, 1975; 307 pp.
Report No.: NASA-CR-134850; R75AEG2521; Contract: NAS3-18021
General Electric Company, Washington, D.C.; Aircraft Engine Group
NAC: R, FO

Stimpert, D.L.; Clemons, A.
"Acoustic Analysis of Aft Noise Reduction Techniques Measured on a Subsonic Tip Speed 50.8 cm (Twenty Inch) Diameter Fan"
January, 1977; 149 pp.
Report No.: NASA-CR-134891; R75AEG368; Contract: NAS3-18021
General Electric Company, Cincinnati, Ohio
NAC: FEJ, R, P

Stroub, R.H.
"An Investigation of a Full-Scale Rotor with Four Blade Tip Planform Shapes"
May, 1979; 72 pp.
Report No.: NASA-TM-78580; AVRADCOM-TR-79-14
National Aeronautics and Space Administration, Ames Research Center, Moffett Field, California
NAC: R, P, FO

Strout, Frank G.
"Flight Effects on Noise Generated by the JT8D-17 Engine in a Quiet Nacelle and a Conventional Nacelle as Measured in the NASA-AMES 40x80-Foot Wind Tunnel"
June, 1976
Report No.: NASA CR-2576
Ames Directorate, NASA, Moffett Field, California
NAC: FEJ

Szewczyk, V.M.
"The Role of Flow Acoustic Interaction in Jet Noise Studies"
1977
Ph.D. Thesis
University of Southampton, Instiute of Sound and Vibration Research
NAC: FEJ

Tangler, J.L.
"Schlieren and Noise Studies of Rotors in Forward Flight"
May, 1977
Preprint No. 77.33-05, Presented at 33rd Annual National Forum of the American Helicopter Society
American Helicopter Society, Washington, D.C.
NAC: FO, FOI, R

Tomassoni, M.E.
"The Economic Impact of Air Pollution and Aircraft Noise on Residential Property Values: A Selected Bibliography, 1969-1977"
May, 1978
The John Hopkins University, Department of Geography and Environmental Engineering, Baltimore, MD
NAC: S

True, H.C.; Letty, R.M.
"Helicopter Noise Measurements Data Report. Volume I. Helicopter Models: Hughes 300-C. Hughes 500-C. Bell 47-G. Bell 206L."
April, 1977; 384 pp.
Report No.: FAA-RD-77-57-1
Federal Aviation Administration, Washington, D.C./Systems Research and Development Service
NAC: P, FH, R

True, H.C.; Letty, R.M.
"Helicopter Noise Measurements Data Report. Volume II. Helicopter Models: Bell 212 (UH-1N). Sikorsky S-61 (SH-3A). Sikorsky S-64 'Skycrane' (CH-54B). Boeing Vertol 'Chinook' (CH-47C)"
April, 1977; 420 pp.
Report No.: FAA-RD-77-57-2
Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: P, FH, R

True, H.C.; Rickley, E.J.
"Noise Characteristics of Eight Helicopters"
July, 1977; 167 pp.
Report No.: FAA-RD-77-94
Federal Aviation Administration, Washington, D.C., Systems Research and Development Service
NAC: S, P

U.S. Army Construction Engineering Research Laboratory
"Interim Criteria for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976
Report No.: Interim Report N-9
U.S. Army Consruction Engineering Research Laboratory
NAC: S

U.S. Army Construction Engineering Research Laboratory
"Interim Procedures for Planning Rotary-Wing Aircraft Traffic Patterns and Siting Noise-Sensitive Land Uses"
September, 1976
Report No.: Interim Report No-10
U.S. Army Construction Engineering Research Laboratory
NAC: S

Van Niekerk, C.G.
"Assessment of Noise Exposure Around Heliports"
September, 1978; 9 pp.
International Council of the Aeronautical Sciences, Congress, 11th, Lisbon, Portugal
Council for Scientific and Industrial Research, Pretoria, Republic of South Africa
NAC: S

Vause, C.R.; Schmitz, F.H.; Boxwell, D.A.
"High-Speed Helicopter Impulsive Noise"
1976; 13 pp.
U.S. Army Air Mobility Research and Development Laboratory, Moffett Field, California
NAC: FOI, S

Wagner, R.A.
"Helicopter Noise Regulations: An Industry Perspective"
May 22-24, 1978; pp. 17-32
Proceedings of International Specialists Symposium on Helicopter Acoustics/NASA Conference Publication 2052, Part 1
National Aeronautics Space Administration
NAC: S

White, R.P., Jr.
"Wind Tunnel Tests of a Two Bladed Model Rotor to Evaluate the Tami System in Descending Forward Flight"
May, 1977; 53 pp.
Report No.: NASA-CR-145195; SRL-14-76-2; Contract: NAS1-14129
Systems Research Labs, Inc., Newport News, Virginia, Rasa Division
NAC: R

Widdison, C.A.; Magee, J.P.; Alexander, H.R.
"Conceptual Design Study of a 1985 Commercial STOL Tilt Rotor Transport"
November, 1974; 256 pp.
Report No.: NASA-CR-137601; D210-10873-1; Contract: NAS2-8048
Boeing Vertol Company, Philadelphia, Pennsylvania
NAC: FH, FO, P

Widnall, S.W.; Harris, W.L.; Lee, Y.C.A.; Drees, H.M.
"The Development of Experimental Techniques for the Study of Helicopter Rotor Noise"
November, 1974; 89 pp.
Report No.: NASA-CR-137684; Contract: NAS2-7684
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FO, FOR, FOI

Widnall, S.E.; Wolf, T.L.
"Effect of Tip Vortex Structure on Helicopter Noise Due to Blade-Vortex Interaction"
October, 1980; 7 pp.
Contract: NSG-2142
Massachusetts Institute of Technology, Cambridge, Massachusetts
NAC: FOR, P

Wilby, J.F.; Smullin, J.I.
"Interior Noise of STOL Aircraft and Helicopters"
May-June, 1979
Noise Control Engineering, P.O.B. 3206, Arlington Branch, Poughkeepsie, NY
NAC: R

Williams, J.; Law, M.R.P.
"Helicopter Flight-Path and Acoustic-Signal Repeatability for Noise-Diagnosis and Noise-Certification"
1978; 13 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings, Volume 2
Royal Aircraft Establishment, Aerodynamics Department, Farnborough, Hants, England
NAC: P, R, S

Williams, R.M.; Cheeseman, I.C.
"Potential Acoustic Benefits of Circulation Control Rotors"
August, 1978; pp. 149-179
Naval Ship Research and Development Center, Bethesda, Maryland/NASA Langley Research Center, Helicopter Acoustics, (See N78-32816 23-71)
NAC: R

Wills, C.R.
"Acoustic Evaluation of a Tail Rotor with an Improved Aerofoil Section"
Date: None
Research Paper: 567; Contract: K/Ai2/857
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: P, FO

Wills, C.R.
"Vibration Transmission Paths"
June, 1976
Research Paper: 523; Contract: K/A12/1025/CB/A12b
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Wills, C.R.
"Vibration Transmission Paths (Additional WHL Funded Tests)"
August, 1976
Research Paper: 527
Westland Helicopters Limited, Yeovil, Somerset, England
NAC: S

Wolf, T.L.; Widnall, S.E.
"The Effect of the Tip Vortex Structure on Helicopter Noise Due to Blade/Vortex Interaction"
March, 1978; 94 pp.
Report No.: NASA-CR-152150; MIT-78-2
Massachusetts Institute of Technology, Cambridge, Fluid Dynamics Research Lab
NAC: FOI, P

Wright, S.E.
"High Forward Speed Helicopter Noise"
July, 1976; 10 pp.
Report No.: AIAA Paper 76-562
American Institute of Aeronautics and Astronautics
NAC: FH, FO

Wyle Laboratories
"System Analysis to Develop Future Civil Aircraft Noise Reduction Alternatives"
November, 1979
Contract: DOT-FA77-WA3990
Wyle Laboratories, Huntsville, AL
NAC: R

Yu, Y.H.; Caradonna, F.X.; Schmitz, F.H.
"The Influence of the Transonic Flow Field on High-Speed Helicopter Impulsive Noise"
1978; 17 pp.
European Rotorcraft and Powered Lift Aircraft Forum, 4th, Stresa, Italy, September 13-15, 1978, Proceedings, Volume 2
U.S. Army Aeromechanics Laboratory, Moffett Field, California
NAC: FOI, P

Zaretsky, E.V.; Townsend, D.P.; Coy, J.J.
"NASA Gear Research and Its Probable Effect on Rotorcraft Transmission Design"
November, 1979; 19 pp.
Report No.: NASA-TM-79292; E-236
National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
NAC: FG, R

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