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UNCLASSIFIED

AD NO.
TECOM Project No. 7-CO-R89-AVO-004

METHODOLOGY INVESTIGATION

FINAL REPORT

OF

AVIATION ACOUSTICAL NOISE MEASUREMENT

RON SMITH
HUMAN FACTORS ENGINEERING

U.S. ARMY AVIATION DEVELOPMENT TEST ACTIVITY

FORT RUCKER, ALABAMA

FEBRUARY 1990

Prepared For:
U.S. Army Test & Evaluation Command
Aberdeen Proving Ground, MD 21005-5055

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005 – 5055

REPLY TO ATTENTION OF

AMSTE-TC-M (70-10p)

MEMORANDUM FOR Commander, U.S. Army Aviation Development Test Activity, ATTN: STEBG-MP-P, Fort Rucker, AL 36362-5276

SUBJECT: Final Report, Methodology Investigation of Aviation Acoustical Noise Measurement, TECOM Project No. 7-CO-R89-AVO-004

1. Subject report is approved.

2. Point of contact at this headquarters is Mr. Roger L. Williamson, AMSTE-TC-M, amstetcm@apg-emh4.apg.army.mil, AUTOVON 298-3677/2170.

FOR THE COMMANDER:

GROVER H. SHELTON
Chief, Meth Imprv Div
Directorate for Technology

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

U.S. Army Aviation Development Test Activity investigated methodology for planning, collecting, analyzing, and reporting steady-state acoustical noise parameters of U.S. Army aviation systems. It was concluded that: Planning for development of future aviation systems should incorporate extensive acoustical analysis to minimize the negative impact of environmental noise on personnel. Acoustical analysis should be incorporated as early as possible during the development process so that appropriate corrective action can be initiated. Previous experience has demonstrated that system design which incorporates appropriate acoustical protection is less expensive than to develop noise reduction programs after the system is operational.

It was recommended that a formal Test Operations Procedure (TOP) be developed which describes standardized procedures for the planning, execution, collection, analysis, and reporting of steady-state acoustical noise parameters within current/future U.S. Army aviation systems.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL Mr. Ron Smith	22b. TELEPHONE (Include Area Code) (205) 255-2766 22c. OFFICE SYMBOL STEBG-MP-P

DD Form 1473, JUN 86 Previous editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE
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SECTION 1. SUMMARY

1.1 BACKGROUND.

a. Currently, no document exists which provides standardized methodology for acoustical noise measurement of U.S. Army aviation systems.

b. The goal of acoustical noise measurement is to provide objective physical measurements by which the user can verify acoustical noise conformance to standards/specifications during aviation system development and testing. These measurements can then be used as a basis for noise reduction/hearing protection programs in current and future U.S. Army aviation systems.

1.2 PROBLEM. Excessive aviation noise increases aircrew workload, inhibits adequate aircrew communications, and can cause temporary/permanent hearing damage to personnel. The combination of these characteristics can produce a negative impact on aircrew performance during critical phases of tactical flight operations.

1.3 OBJECTIVE. To investigate methodology for planning, collecting, analyzing, and reporting steady-state acoustical noise parameters of U.S. Army aviation systems.

1.4 PROCEDURE. The first step of an acoustical noise measurement program will be to clearly define program objectives, determine specific data requirements, and select analysis techniques that will successfully translate raw acoustical data into useful operational information. These requirements will determine the specific instrumentation configuration required to accurately complete program objectives.

1.5 RESULTS. If the measurement of the ambient environment indicates the steady-state noise level is greater than 85 decibels (A-Weighted) (dB(A)), distance and direction from the sound pressure origin will be mapped to determine the noise contour parameters. The noise map is considered a reasonably accurate sketch which describes the relative position of all sound pressure sources. This type of map will indicate the ambient sound distribution and is the starting point by which steps can be developed to reduce the sound level.

1.6 ANALYSIS. Sound pressure variation data will be analyzed in octave band, one-third octave band, A-weighted, and C-weighted sound pressure levels of the measurement location. The purpose of the analysis process will be to identify potential hazards to personnel required to operate, service, or maintain the aircraft. In addition, the analysis process will determine the effectiveness of person-to-person and electrically aided voice communications.

1.7 CONCLUSION. Planning for development of future aviation systems should incorporate extensive acoustical analysis to minimize the negative impact of environmental noise on personnel. Acoustical analysis should be incorporated as early as possible during the development process so that appropriate corrective action can be initiated. Previous experience has demonstrated that system design which incorporates appropriate acoustical protection is less expensive than to develop noise reduction programs after the system is operational.

1.8 RECOMMENDATION. The recommendation of this methodology investigation is to develop a formal Test Operations Procedure (TOP) which describes standardized procedures for the planning, execution, collection, analysis, and reporting of steady-state acoustical noise parameters within current/future U.S. Army aviation systems.

SECTION 2. DETAILS OF INVESTIGATION

2.1 GENERAL.

a. Sound is defined as the stimulation of the organs of hearing by pressure variations through which energy is transferred away from a source point by sound waves. The physical characteristics of sound pressure signals are defined by amplitude and frequency parameters.

b. Sound pressure variation levels are a function of distance and azimuth from the receiver, temperature/velocity gradients within the medium, and current environmental conditions (i.e., wind, temperature, humidity, and precipitation). Absorption, reflection, and diffraction varables also impact the sound pressure variation level.

c. Sound pressure levels are classified within the parameters of steady versus nonsteady. Steady-state noise parameters are divided into sound pressure levels with audible discrete tones and those without audible discrete tones. Nonsteady-state noise parameters are divided into sound pressure levels defined as fluctuating, intermittent, or impulsive bursts. In addition, impulsive sound pressure levels are divided into isolated bursts and quasi-steady parameters.

d. Acoustical noise measurement is the determination of sound pressure variation levels. The decibel represents a relative numerical value by which to express sound pressure variation levels. Sound pressure variation levels are divided into two main areas: sound generated from a specific source and sound generated from a combination of sources.

e. Currently, three different methods are used to determine ambient sound pressure level variations. The survey method utilizes a hand-held sound-level meter which provides general acoustical information concerning the ambient sound environment. This method does not provide the information required to generate a weighted sound pressure level. The field method utilizes acoustical measurement instrumentation which allows frequency-band analysis of raw sound pressure level variation data. This method allows the ambient environment to be partially controlled to reduce the environmental effects on the sound pressure level measurements. The laboratory method requires utilization of laboratory grade acoustical instrumentation and a completely controlled sound environment. This method is used primarily for source sound pressure level measurements. The specific method required for acoustical sound pressure level measurements will be a function of the type of sound to be measured, nature and location of source(s), and the instrumentation available for the project.

f. The correlation between the measured physical sound pressure variation level and the human aural perception of the same sound pressure level can be difficult to determine because humans are rarely exposed to an isolated individual sound. Sound pressure variation parameters may be narrow band, wide band, pure tone, steady, intermittent, impulsive, etc., thus creating an infinite number of possible sound pressure combinations.

2.2 INSTRUMENTATION.

a. The first step of any acoustical sound pressure measurement program will be to clearly define program objectives, determine specific data requirements, and select analysis techniques that will successfully translate raw acoustical data into useful operational information. These requirements will determine the specific instrumentation configuration required to accurately complete program objectives.

b. Current acoustical sound pressure measurement systems use a transducer (microphone) to translate sound pressure fluctuations to electrical voltage variation. The electrical signal is amplified, measured, and analyzed by electronic instruments. In general, acoustical instrumentation consists of an omnidirectional microphone, calibrated attenuator, weighting networks, stabilized amplifier, squarer, averaging circuit, and indicator.

c. The basic requirements of acoustical instrumentation include precision calibration, frequency response characteristics, microphone performance specifications, filter characteristics, and magnetic tape recorder characteristics, frequency response, and signal-to-noise ratio which meet or exceed American National Standard Specifications.

d. The selection of specific acoustical instrumentation will be determined by the level of diagnostic information required from the collection of raw sound pressure level variation data. The survey method requires only a sound-level meter to display the ambient sound pressure level variation as compared to the field method which utilizes octave band analyzers and provides a complete frequency analysis of the ambient acoustical environment. The laboratory method, used primarily for source measurements, requires precision octave or narrow band analyzers which provide a complete frequency analysis of the source generated within a free field acoustical environment.

e. All acoustical instrumentation specifications, sound pressure measurement techniques, and raw data analysis requirements must be reviewed to determine if they meet or exceed referenced military, technical society, and technical association standards and specifications.

2.2.1 SOUND LEVEL METER REQUIREMENTS.

a. The basic design objective of the sound level meter is to be equally sensitive to sound pressure level variations arriving from different angles. The sound level meter will provide accurate weighting networks and contain an indicating instrument with standardized performance characteristics. Basic indicating instrument characteristics will include a scaling system graduated in decibels, rule of combination for complex sounds potential, fast dynamic characteristic, and slow dynamic characteristic.

b. The measurement of weighted sound pressure variation levels will require various degrees of accuracy and precision to collect accurate acoustical data. Therefore, published standards and specifications should be reviewed to assure the selected sound level meter meets or exceeds instrument tolerance requirements. Specific sound level meter tolerance characteristics are internal noise, dynamic distortion range, omnidirectional response, random incidence response, and instrument diffraction effects. The sound level meter instruction manual will indicate referenced sound pressure level scale, weighting scale, system calibration procedures, equipment positions, dynamic characteristics, sensitivity parameters, environmental limitations, and correction factors.

2.2.2 MICROPHONE REQUIREMENTS.

a. Selection of a microphone will be based on its ability to perform accurately within a wide range of diverse environmental conditions such as humidity, temperature, and wind. Technical characteristics such as frequency response, dynamic range, directivity, and instrument stability are required to collect accurate and repeatable sound pressure measurements.

b. The directional response of a specific microphone is defined as the response generated from a given frequency as a function of the angle of incidence. Published standards and specifications indicate the microphone response characteristics will be independent of the sound pressure direction. Manufacturers rate their microphone systems based on random incidence, perpendicular incidence, grazing incidence, and pressure response. These technical requirements provide the critical design information required for microphones to operate at a relatively flat response versus frequency for the rated incidence.

c. Current acoustic measuring systems utilize three basic types of microphones: electret-condenser, ceramic, and air-condenser.

(1) Electret-condenser microphones are designed to provide an excellent frequency response coupled with low

sensitivity to external vibration. This type of microphone is relatively free from noise within a humid environment. The directional impact at a specific frequency indicates the smaller microphone size is the optimal choice.

(2) Ceramic microphones are designed to provide a smooth frequency response and are not affected by normal temperature and humidity changes. Research indicates the 1-inch-size microphone provides the adequate combination of characteristics with respect to sensitivity, frequency response, and omnidirectionality.

(3) Condenser microphones are designed to provide high frequency response and are utilized for wide-frequency-range acoustical analysis. The directional characteristics are more uniform within the audio range which allows accurate measurements to be collected within a sound field that is not well defined. The increased degree of sensitivity and frequency range allow a greater range of acoustical measurements to be collected.

d. The actual selection of a specific microphone will depend on variables such as wind, temperature, humidity, low sound pressure levels, high sound pressure levels, low-frequency noise, high-frequency noise, and hum.

e. The impact of wind on the microphone will generate a low-frequency noise that decreases the validity of acoustical measurements. Use of a microphone windscreen will be required to decrease the negative influence of wind on accurate measurements.

f. Long term exposure to temperature and humidity changes will generate negative variations in the microphone sensitivity. Most microphones are calibrated at normal room temperature which will require a correction factor to be applied to increase the equipment sensitivity parameters when used at other temperatures. Extensive precautions will be required to protect the microphone from long-term exposure to high levels of humidity. Research indicates the microphone should be stored at a temperature greater than the ambient level to decrease the possibility of electrical leakage. Technical limitations of the equipment should be reviewed when acoustical measurement requirements expose the microphone to high or varying temperature environments.

g. The induction of undesired electrical signals generated from the external magnetic field of the acoustical equipment will produce hum. This situation will require the microphone to be located within the ambient sound field, with the observer and instruments absent from the sound environment. Sensitivity degradation will require a correction factor to be applied when the microphone is utilized directly with an extension cable.

h. The actual position of the microphone will be a function of the samples required to accurately map the ambient environment. The total number of microphone positions will be a function of the sound pressure characteristics with the distance between locations a function of the precision required to describe the ambient environment. A multi-directional sound source may require several positions while a nondirectional source may require only a minimum number of microphone positions to accurately map the ambient environment.

2.2.3 RECORDER REQUIREMENTS.

a. Recorders are designed to contain signal storage techniques which provide a permanent record of the acoustical measurement results. These data can be reproduced for various laboratory analysis techniques, decreasing the time required at the test site. The non-repeatability of various types of sound pressure level variations makes recording the acoustical data absolutely necessary.

b. The magnetic-tape recorder stores a signal as variations in the magnetic state of the particles on the tape. Currently, the magnetic-tape recorder is being utilized to perform the following functions within the field of noise measurements:

(1) Provide reproducible records of sound pressure level variations.

(2) Record sound pressure level variations for detailed analysis in the laboratory where complex instrumentation systems can be used.

(3) Record sound pressure level variations where samples can be selected for analysis to obtain the change in spectrum as a function of time.

(4) Record short-duration sound variations which can be played back repetitively to simplify the analysis process.

(5) Record sound variations that are erratic or intermittent which can be separated for laboratory analysis.

(6) Permit a subjective or objective comparison among sound pressure level variations recorded at different times.

2.3 GENERAL PLANNING PROCEDURES.

a. A detailed sketch of the test environment should be developed to indicate the situational dimensions, position of the sound source, microphone location, and any external factors that might influence the data collection process. The environment should then be surveyed to record the meteorological conditions such as temperature, humidity, barometric pressure, and wind intensity/direction. Program objectives, data requirements, and analysis techniques should be reviewed to assure the instrumentation configuration will record accurate sound pressure level variations.

b. Orientation measurements should be collected before noting actual values to determine the complexity of the ambient acoustical environment. Orientation measurements will determine if the instrumentation configuration can accurately describe the ambient acoustical environment.

c. It will be critical during the data collection process to generate accurate records which describe unusual test events, equipment-setting variations, environmental variations, and equipment calibration checks. Accurate test records will be required during the analysis process to assure adequate interpretation of raw acoustical data.

d. All instrumentation configurations, measurement techniques, and analysis methodology are required to meet or exceed referenced military, technical society, and technical association standards and specifications.

2.4 MEASUREMENT REQUIREMENTS.

a. Sound pressure measurements, instrumentation, and aircraft operating parameters need to be established prior to testing to assure uniformity of measurement within multiple aircraft configurations. A systematic approach for collection and analysis of sound pressure variation can be divided into three basic steps:

(1) Sound Pressure Measurement.

(2) Noise Mapping.

(3) Noise Reduction.

b. Prior to the start of actual data collection procedures, the complete instrumentation system will be calibrated utilizing an acoustic sound level calibrator. This process will generate electrical signals through the entire configuration to determine if all components from the microphone to level recorder can collect accurate raw sound pressure variation data.

c. Sound pressure measurements will be collected from the following aircraft configurations:

(1) Ground measurements with the doors, windows, and vents open.

(2) Ground measurements with the doors, windows, and vents closed.

(3) Flight measurements during standard operations.

(4) Flight measurements during armament delivery operations.

d. Sound pressure data will be acquired by utilizing an automatic graphical recording system. Automated recording of the ambient sound pressure environment allows the raw data to be evaluated after the measurement and filed for comparison with later measurements. Acoustical measurements will include an on-site unweighted octave band analysis with A- and C-weighted levels. Sample size will be determined by the complexity of the ambient sound pressure environment. The instrumentation configuration will depend on the location, noise source, and whether the primary objective is to determine a specific noise source or describe the ambient acoustical environment. Accuracy of the measurement process can be determined by verifying that no octave band level is greater than the recorded decibel (C-weighted) (dB(C)) value.

e. Ground measurements will be collected from within an open area of equal grade and relatively free of reflecting surfaces within a distance of 100 feet. Microphones containing an essentially flat response at grazing incidence (90 degrees) will be used with the microphone placed at the measurement location vertically with the sensitive element up. The aircraft equipment and subsystems will be operated within normal system operation parameters. The ambient sound pressure environment will be recorded continuously for a minimum of 5 minutes at a rated capacity. The raw sound pressure data collected will be reported in dB(A), dB(C), and octave band pressure levels.

f. Flight measurements will be collected at each crew position and at a representative number of passenger stations. Microphones containing an essentially flat response at grazing incidence (90 degrees) will be used with the microphone placed at the measurement location vertically with the sensitive element up. Measurements will be collected at a distance of 6 inches from the location of the ear. The ambient sound pressure environment will be recorded continuously for a minimum of 5 minutes at a rated capacity. The raw sound pressure data collected will be reported in dB(A), dB(C), and octave band pressure levels.

g. If the measurement of the ambient environment indicates the steady-state noise level is greater than 85 dB(A), sound intensity and sound power measurements will be required to determine the cause and identify the source(s). Sound intensity distinguishes between active (propagating) sound and reactive (non-propagating) sound. Sound power is not affected by background noise and can be used for source mapping and source location.

h. Complete and accurate test documentation will be required during the analysis process to assure adequate interpretation of raw sound pressure data. Specific documentation of the measurement process will include:

(1) Type of sound signal.

(2) Instrumentation configuration.

(3) Calibration requirements.

(4) Source description.

(5) Meter response.

(6) Background noise levels in octaves.

(7) Noise levels in octaves.

(8) Weighting networks utilized.

(9) Environmental conditions.

(10) Unusual test events.

(11) Sketch of the test site.

(12) Time and date of measurement.

2.5 ANALYSIS AND REPORT REQUIREMENTS.

a. Sound pressure variation data will be analyzed in octave band, one-third octave band, A-weighted, and C-weighted sound pressure levels of the measurement location utilizing the frequency range in table 1. The analysis process will identify potential hazards to personnel required to operate, service, or maintain the aircraft. In addition, the analysis process will determine the effectiveness of person-to-person and electrically aided voice communications.

Table 1
Helicopter Sound Pressure Level (dB) Design Limits*

Octave Band Center Frequency (Hz)	Design Gross Weight Less Than 20,000 pounds (9070 Kilograms) Design Limit	Design Gross Weight Greater Than 20,000 pounds (9070 Kilograms) Design Limit	Extreme Design Limit
63	116	116	120
125	106	106	110
250	99	99	103
500	91	93	97
1000	87	90	94
2000	82	89	93
4000	80	89	93
8000	85	91	95
16000	89	95	99

*MIL-STD-1294A, 12 August 1985.

b. Following the data analysis, a noise level assessment report will be prepared to present the measured sound pressure levels of each operating configuration. This report will compare the results generated from each operating configuration and determine if noise reduction procedures will be required to reduce potential hazards to personnel.

2.6 NOISE REDUCTION.

a. The basic objective of noise reduction and hearing conservation programs is to protect personnel from permanent loss of hearing within the speech frequency range resulting from long-term exposure to high sound pressure levels. The frequency spectrum of the ambient acoustical environment utilizing one-third octave and narrow band filters can identify specific sources of high sound pressure and track high sound pressure sources generated by vibration. Graphic level recorders can plot the frequency spectra on preprinted charts, which reduces the probability of error. The Office of Safety and Health Administration (OSHA) requires implementation of sound pressure reduction programs for personnel exposed to 85 dB(A) or above for 8 hours. A comprehensive hearing conservation program will require implementation of the following tasks: noise surveys, periodic hearing tests, interpretation of hearing tests, and accurate documentation regarding noise exposure and audiometric test requirements.

b. Sound pressure reduction can be accomplished by two methods: reduce the sound pressure level at the source and reduce the sound pressure level at the ear by changing the path from the source. Reduction of the sound pressure level at the source can be accomplished by the following techniques:

(1) Reduce energy available for producing noise.

(2) Improve balance and alignment procedures.

(3) Require precision components, gears, and bearings.

(4) Increase lubrication of components.

(5) Reduce the velocity of flow (air, gas, and liquid).

(6) Incorporate damping to absorb energy.

(7) Incorporate resilient materials to reduce impact.

(8) Distribute energy over time to reduce peaks.

(9) Isolate components with soft mounts.

(10) Fasten external parts at vibration nodes.

(11) Reduce radiating area.

(12) Reduce resonant buildup.

(13) Reduce the mass of moving elements.

(14) Increase the mass of stationary elements.

Reduction of the sound pressure level at the ear by changing the path from the source can be accomplished by the following techniques:

(1) Change the position of the source.

(2) Isolate the component with vibration mounts.

(3) Isolate the component by partial or complete enclosures.

(4) Utilize absorptive treatment facing the source and within ventilating ducts.

Reduction of the sound pressure level at the source is considered the ideal approach for hearing conservation.

SECTION 3. APPENDICES

APPENDIX A. METHODOLOGY INVESTIGATION PROPOSAL AND DIRECTIVE

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005-[illegible]

REPLY TO
ATTENTION OF

2 6 SEP 1988

AMSTE-TC-M (70-10p)

MEMORANDUM FOR: Commander, U.S. Army Aviation Development Test Activity, ATTN: STEBG-MP-P, Fort Rucker, AL 36362-5276

SUBJECT: FY 89 RDTE Methodology Improvement Program Grant

1. This memorandum advises that grants have been made for the investigations listed in enclosure 1 under the TECOM Methodology Improvement Program 1W665702D628.

2. The MIPs submitted in the FY 89-95 SOLID MIND are the basis for headquarters approval of the investigations.

3. Special instructions:

a. Although it is expected that literature searches were conducted prior to submitting a methodology investigation proposal (MIP) to ensure that the MIP did not duplicate work already performed, further searches should be made prior to investigation initiation to ensure that recent work performed by others will not change or obviate the need for the investigation about to begin.

b. All reporting, including final technical reports prepared by contractors, will be in consonance with paragraph 2-6 of the reference. The final report will be submitted to this headquarters, ATTN: AMSTE-TC-M, in consonance with Test Event 570/580. Each project shall be completed in FY 89 as reflected in the scheduling.

c. Recommendations for new TOPs or revisions to existing TOPs will be included as part of the recommendation section of the final technical report. Final decision on the scope of the TOP effort will be made by this headquarters as part of the final technical report approval process.

d. The addressee will determine whether any classified information is involved, and will assure that proper security measures are taken when appropriate. All OPSEC guidance will be followed strictly during each investigation.

e. Prior to investigation execution, the test activity will verify that no safety or potential health hazards to humans participating in testing exist. If safety or health hazards do exist, the test activity will provide a safety/health hazards assessment statement to this headquarters prior to investigation initiation.

AMSTE-TC-M
SUBJECT: FY 89 RDTE Methodology Improvement Program Grant

f. Environmental documentation for support tests or special studies is the responsibility of the test activity and will be accomplished prior to initiation of the investigation.

g. Upon receipt of this grant notification, test milestone schedules as established in TRMS II data base will be reviewed in light of other known work load and projected available resources. If rescheduling is necessary and the sponsor nonconcurs, a letter citing particulars, together with recommendations, will be forwarded to Commander, U.S. Army Test and Evaluation Command, ATTN: AMSTE-TC-M, with an information copy to AMSTE-TA-O, no later than 15 calendar days from the date of this memorandum. Reschedules concurred in by the sponsor can be entered directly along with a properly coded narrative by your installation/test activity.

h. All work shall be performed such that energy conservation is considered throughout the effort.

i. FY 89 RDTE funds authorized for the investigations are listed on enclosure 1. GOA Form 1006 will be forwarded by the TECOM Resource Management Directorate. A cost estimate shall be submitted within 30 days following receipt of this grant notification.

4. Reference Draft TECOM Regulation 70-12, dated 27 June 1988, TECOM Methodology Improvement and Standardization Programs.

5. Point of contact, this headquarters, is Mr. Roger Williamson, AMSTE-TC-M, amstetcm@apg-4.apg.army.mil, AUTOVON 298-2170/3677.

FOR THE COMMANDER:

Encl

GROVER H. SHELTON
Chief, Meth Imprv Div
Directorate for Technology

		($K) INITIAL FUNDING
	AVIATION DEVELOPMENT TEST ACTIVITY	
7-CO-R89-AV0-001	QUICK REACTION METHODOLOGY	10
7-CO-R89-AV0-002	TECHNICAL COMMITTEE SUPPORT	5
7-CO-R89-AV0-003	SITUATIONAL AWARENESS TECHNOLOGY	92
7-CO-R89-AV0-004	AVIATION ACOUSTICAL MEASUREMENTS	9

	TOTAL AVNDTA PROGRAM	115

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY TEST AND EVALUATION COMMAND
ABERDEEN PROVING GROUND, MARYLAND 21005 – 5055

REPLY TO ATTENTION OF

5 APR 1989

AMSTE-TC-M (70-10p)

MEMORANDUM FOR: Commander, U.S. Army Aviation Development Test Activity, ATTN: STEBG-MP-P, Fort Rucker, AL 36362-5276

SUBJECT: Amendment 1 to FY89 RDTE Methodology Improvement Program Grant

1. This memo, with list of investigations at enclosure 1, amends reference 2.

2. Reference memo, HQ TECOM, AMSTE-TC-M, 26 Sep 88, subject: FY89 RDTE Methodology Improvement Program Grant.

3. Point of contact, this headquarters, is Ms. Cynthia Vincenti, AMSTE-TC-M, amstetcm@apg-emh4.apg.army.mil, AV 298-2170/3677.

FOR THE COMMANDER:

Grover H. Shelton

Encl

GROVER H. SHELTON
Chief, Meth Imprv Div
Directorate for Technology

MFR: Realignment of funding was requested by AVNDTA for more effective use of the FY89 Methodology Improvement Program funding. Realignment was approved and is forwarded on enclosure 1.

CYNDIE VINCENTI
Exts. 3677/2170

COORDINATION:

AMSTE-TA-O (P. McClung) ______________________ DATE 4/5/89

	AVIATION DEVELOPMENT TEST ACTIVITY	INITIAL FUNDING	REVISED FUNDING	PROJECT OFFICER	OBLI $	OBLI %	CMT $	%OBL &CMT	DISB $	DISB %	FINAL REPORT	AMEND #1
7-CO-R89-AVO-001	QUICK REACTION METHODOLOGY	10.0	5.0	RW	0.0	0	0.0	0	0.0	0		-5.0
7-CO-R89-AVO-002	TECHNICAL COMMITTEE SUPPORT	5.0	5.0	RW	5.0	100	0.0	100	5.0	100		0.0
7-CO-R89-AVO-003	SITUATIONAL AWARENESS TECHNOLOGY	91.5	91.5	RW	31.0	34	0.0	34	26.0	28		0.0
7-CO-R89-AVO-004	AVIATION ACOUSTICAL MEASUREMENTS	8.5	8.5	RW	0.0	0	0.0	0	0.0	0		0.0
7-CO-R89-AVO-005	AIRCRAFT LOG BOOK DATA/ADACS AUTOMATION I	0.0	5.0	RW	0.0	0	0.0	0	0.0	0		5.0
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	TOTAL AVNDTA PROGRAM	115.0	115.0		36.0	31	0.0	31	31.0	27		0.0

APPENDIX B. DISTRIBUTION

ADDRESSEES	REPORT
Commander U.S. Army Test and Evaluation Command ATTN: STEBG-TC-M Aberdeen Proving Ground, MD 21005-5055	3
Director U.S. Army Material Systems Analysis Activity ATTN: AMXSY-MP Aberdeen Proving Ground, MD 21005-5071	1
President TEXCOM Aviation Board ATTN: ATCT-AVT-OT Fort Rucker, AL 36362-5064	1
Commander U.S. Army Human Engineering Laboratory ATTN: SLCHE-AD SLCHE-BR Aberdeen Proving Ground, MD 21005-5001	1 1
Commander U.S. Army Aeromedical Research Laboratory ATTN: SGRD-VAS Ft. Rucker, AL 36362-5292	1
Commander U.S. Army Aviation Engineering Flight Activity ATTN: SAVTE-T Edwards Air Force Base, CA 93523-5000	1
Commander U.S. Army Natick Research Development and Engineering Center ATTN: STRNC-E Natick, MA 01760-5019	1
Director Defense Technical Information Center ATTN: DDA Cameron Station Alexandria, VA 22314-6145	2