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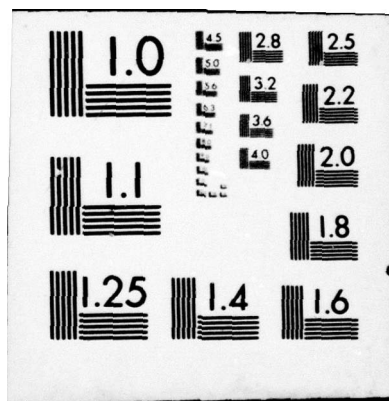
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VOLUME 58. U-10B IN-FLIGHT CREW NOISE

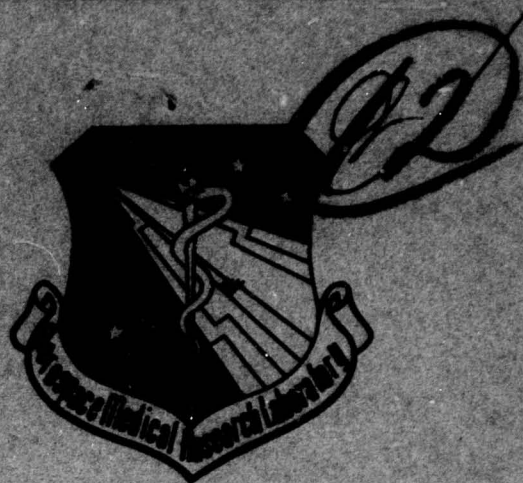
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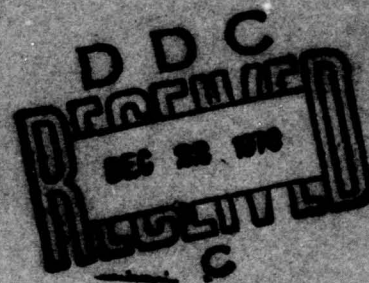
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Volume 58



**USAF BIOENVIRONMENTAL NOISE DATA
HANDBOOK**

**Volume 58
U-10B IN-FLIGHT CREW NOISE**

NOVEMBER 1975



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**AEROSPACE MEDICAL RESEARCH LABORATORY
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The U-10B is a USAF short-range, light cargo STOL aircraft used in counter-insurgency operations. This report provides measured data defining the bioacoustic environments at flight crew locations inside this aircraft during normal flight operations. Data are reported for one location in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for		

total daily exposure of personnel with and without standard Air Force ear protectors. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application", AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

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PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 72310418, Measurement of Noise and Vibration Environments of Air Force Operations. Col Justus F. Rose, Jr. conducted the field measurements and performed the data analysis; Capt Nick Farinacci prepared this report.

The authors acknowledge the efforts of Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report, and Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton who assisted in the mechanics of data processing.

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INTRODUCTION

The U-10B is a USAF short-range, light cargo STOL aircraft used in counterinsurgency operations. This aircraft, which is manufactured by the Helio Aircraft Corporation, is powered by one GO-480-G1D6 reciprocating engine rated at 295 hp at 3,400 rpm maximum take-off power. The engine drives a Hartzell three-blade constant-speed, 2.44 m diameter propeller through a 0.642 gear reduction. The engine is manufactured by the AVCO Corporation, Lycoming Division.

This volume provides measured data defining the bioacoustic environments produced inside this aircraft. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the U-10B aircraft.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and aerospace ground equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, aerospace ground equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Refer to *Volume 1* (reference 1) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., in-flight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published. This index is periodically updated as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

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1. Cole, John N., *USAF Bioenvironmental Noise Data Handbook, Volume 1: Organization, Content and Application*, AMRL-TR-75-50 (1), Aerospace Medical Research Laboratory, Wright-Patterson Air Force Base, Ohio, 1975.

IN-FLIGHT NOISE

MEASUREMENTS

All noise measurements were made on-board a standard-configured U-10B aircraft during typical speed, altitude, and flight maneuver conditions. These levels describe the standard U-10B environments, but may not be representative of those levels encountered if the aircraft has been configured differently (e.g., major equipment or structural changes).

Acoustic measurements were made at one flight crew location. Table 1 lists the measurement location and test conditions as numeric/alphabetic designators which are used on the data pages. The designator 1/A means measurement location 1 and test condition A.

The microphone was randomly moved external to the headgear in a region 0.2-0.3 meter from the head and the resultant samples analyzed using a 4- or 8-second integration time to obtain a power-averaged level that effectively smooths out short-duration fluctuations and best describes the exposure.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced inside the U-10B aircraft at the specified location. This table includes the overall, 1/3 octave band, and octave band levels. From these data, C-weighted and A-weighted sound levels, maximum permissible time for one exposure per day (AFR 161-35) with and without standard Air Force ear protectors, preferred speech interference level, and perceived noise level are calculated and presented in Table 3. These measures are widely used to assess the effects of noise on personnel and their performance.

TABLE 1
MEASUREMENT LOCATION AND TEST CONDITIONS

U-10B, Hurlburt Fld, 9 Aug 1971 Serial # 63-18090		
LOCATION	POSITION	HEIGHT ABOVE DECK
1	Between Pilot and Copilot	Seated Head Level
CONDITION	DESCRIPTION	
A	Taxiing — 1500-1900 RPM, 13" Manifold Pressure.	
B	Takeoff — 3400 RPM, 26-27" Manifold Pressure.	
C	Initial acceleration, flaps up.	
D	Climb — 2700 RPM, 27" Manifold Pressure, 80 KIAS.	
E	Cruise — 2500 RPM, 20" Manifold Pressure, 90 KIAS, 1100' PA.	
F	Descent — 2700 RPM, 10-15" Manifold Pressure, 80 KIAS, 1100' → 600' PA.	
G	VFR traffic pattern — downwind — 2700 RPM, 15" Manifold pressure, 60 KIAS, 1/2 flaps.	
H	VFR traffic pattern — base leg and turn to final — 2700 RPM, 15" Manifold Pressure, 60 KIAS, 1/2 flaps.	
I	VFR traffic pattern — final approach.	
J	Landing roll.	

MEASURES OF HUMAN NOISE EXPOSURE											IDENTIFICATION
											OMEGA 3.2
											TEST 71-014-060
											RUN 01
											10 JAN 75
											PAGE H1
NOISE SOURCE/SUBJECT: (OPERATION)											
U-10B AIRCRAFT ()											
INFLIGHT NOISE LEVELS ()											
LOCATION/CONDITION											
1/A	1/B	1/C	1/D	1/E	1/F	1/G	1/H	1/I	1/J		
HAZARD/PROTECTION											
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DBC) AT EAR											
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DBA) AT EAR											
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)											
NO PROTECTION											
OASLC	114	115	111	111	108	109	110	102	104	109	
OASLA	95	104	100	98	95	94	95	87	90	90	
T	71	15	30	42	71	85	71	285	170	170	
MINIMUM JPL EAR MUFFS											
OASLA*	93	92	88	89	86	87	88	78	82	87	
T	101	120	240	202	339	285	240	960	679	285	
V-51R EAR PLUGS											
OASLA*	77	83	78	76	73	72	73	66	69	71	
T	960	571	960	960	960	960	960	960	960	960	
FLENTS EAR PLUGS											
OASLA*	79	83	79	77	74	74	75	67	70	73	
T	960	571	960	960	960	960	960	960	960	960	
H-157 IN-FLIGHT COMMUNICATION UNIT											
OASLA*	92	92	83	89	86	87	88	78	81	87	
T	120	120	202	202	339	285	240	960	807	285	
COMMUNICATION											
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)											
PSIL	77	97	94	90	88	85	83	80	81	76	
ANNOYANCE											
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)											
TONE CORRECTION (C IN DB)											
PNLT	115	120	116	116	114	113	113	102	109	109	
C	3	2	2	1	2	2	2	0	2	2	

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.