

AD-A033 642

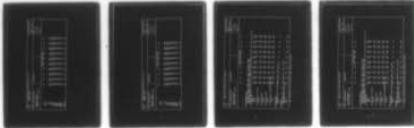
AEROSPACE MEDICAL RESEARCH LAB WRIGHT-PATTERSON AFB OHIO F/G 1/3
USAF BIOENVIRONMENTAL NOISE DATA, VOLUME 59, QU-22B IN-FLIGHT C--ETC(U)
NOV 75 J F ROSE, N A FARINACCI

UNCLASSIFIED

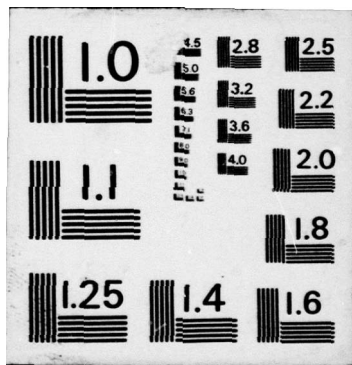
AMRL-TR-75-50-VOL-59

NL

1 OF 1
AD-A
033 642



END
DATE
FILMED
2-4-77
NTIS



U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

AD-A033 642

USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK
VOLUME 59. QU-22B IN-FLIGHT CREW NOISE

AEROSPACE MEDICAL RESEARCH LABORATORY,
WRIGHT-PATTERSON AIR FORCE BASE, OHIO

NOVEMBER 1975

364120

AMRL-78-50
Volume 59



ADA033642

**USAF BIOENVIRONMENTAL NOISE DATA
HANDBOOK**

**Volume 59
QU-22B IN-FLIGHT CREW NOISE**

NOVEMBER 1975

DDC
RECEIVED
NOV 20 1975
C

Approved for public release; distribution unlimited

AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

REPRODUCED BY
**NATIONAL TECHNICAL
INFORMATION SERVICE**
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

NOTICE

When US Government drawings, specifications, or other data are used for any purpose other than a definitely related Government procurement operation, the Government thereby incurs no responsibility for any other use whatsoever, and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data, is not to be regarded by implication or otherwise, as in any way constituting a license, the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Please do not request copies of this report from Aerospace Medical Research Laboratory. Additional copies may be purchased from:

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia 22161

Federal Government agencies and their contractors registered with Defense Documentation Center should direct requests for copies of this report to:

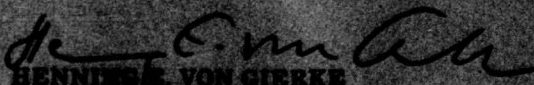
Defense Documentation Center
Cameron Station
Alexandria, Virginia 22314

TECHNICAL REVIEW AND APPROVAL

This report has been reviewed by the Information Office (OI) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER


BENNING E. VON GIERKE
Director
Biodynamics and Bionics Division
Aerospace Medical Research Laboratory

AIR FORCE - 1 SEPTEMBER 74 - 300



The stamp is tilted and contains several fields, some with checkboxes. The text is difficult to read due to the angle and low resolution, but it appears to be a formal approval or routing stamp. It includes fields for 'APPROVED', 'DATE', and 'BY', along with a large signature area at the bottom.

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER AMRL-TR-75-50, Vol. 59	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) USAF BIOENVIRONMENTAL NOISE DATA HANDBOOK: QU-22B In-flight Crew Noise	5. TYPE OF REPORT & PERIOD COVERED Volume 59 of a series	
	6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) Justus F. Rose, Jr., Col, USAF Nick A. Farinacci, Capt, USAF, BSC	8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS Aerospace Medical Research Laboratory Aerospace Medical Division, Air Force Systems Command, Wright-Patterson AFB, OH 45433	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 62202F 7231-04-18	
11. CONTROLLING OFFICE NAME AND ADDRESS Same as above	12. REPORT DATE November 1975	
	13. NUMBER OF PAGES 15	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Noise Noise Environments Bioenvironmental Noise In-flight Crew Noise QU-22B Aircraft		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The QU-22B is a USAF light utility aircraft used for infiltration surveillance. 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.

ia

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.

Table of Contents

	<i>Page</i>
INTRODUCTION	3
IN-FLIGHT NOISE	4

List of Tables

1. Measurement Location and Test Conditions for Noise Measurements	4-5
2. Measured Sound Pressure Level 1/3 Octave Band	6-7
Octave Band	8-9
3. Measures of Human Noise Exposure	10-11

INTRODUCTION

The QU-22B is a USAF light utility aircraft used for infiltration surveillance. This aircraft, which is manufactured by the Beech Aircraft Corporation, is powered by one GTSIO-520-G reciprocating engine rated at 375 hp at 3,400 rpm maximum take-off power. The engine drives a Hartzell three-blade constant-speed, slow-turning, quiet, 2.29 m diameter propeller through a 0.6667 gear reduction. The engine is manufactured by the Teledyne Continental Motors Corporation.

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 QU-22B 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.

-
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 QU-22B aircraft during typical speed, altitude, and flight maneuver conditions. These levels describe the standard QU-22B 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 QU-22B 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

QU-22B, Eglin AFB, 29 Jul 1971
Serial # 69-7704

LOCATION	POSITION	HEIGHT ABOVE DECK
1	Right Seat	Seated Head Level
CONDITION	DESCRIPTION	
A	Engine start, right door open.	
B	Taxiing — 20" Hg. Manifold Pressure, 1500-2000 RPM, doors closed.	
C	Engine check — 23" Hg. Manifold Pressure, 2100 RPM.	
D	Takeoff — 37" Hg. Manifold Pressure, 3400 RPM.	
E	Initial acceleration — gear and flaps up, 37" Hg. Manifold Pressure, 3400 RPM.	
F	Climb — 37" Hg. Manifold pressure, 3400 RPM, 100 KIAS, 800' / , 4-500'/min rate of climb.	
G	Same as F — 3500' / , 300'/min rate of climb.	
H	Climb — 35" Hg. Manifold Pressure, 3400 RPM, 8.0M PA /.	
I	Normal cruise — 32" Hg. Manifold Pressure, 2900 RPM, 130 KIAS, 9.5M PA.	
J	Orbit cruise — 29" Hg. Manifold Pressure, 2900 RPM, 130 KIAS, 9.5M PA.	
K	Gear down descent — 25" Hg. Manifold Pressure, 2500 RPM, 150 KIAS, 9.5M PA \ , 2000'/min rate of descent.	
L	Clean descent — 29" Hg. Manifold Pressure, 2900 RPM, 200 KIAS, 4000'/min rate of descent.	
M	140 KIAS, 31" Hg. Manifold Pressure, 2900 RPM, 5.0M PA.	

TABLE 1 (Continued)

MEASUREMENT LOCATION AND TEST CONDITIONS

QU-22B, Eglin AFB, 29 Jul 1971
Serial # 69-7704

<i>POSITION</i>	<i>DESCRIPTION</i>
N	Dog Leg to GCA pattern — 31" Hg. Manifold Pressure, 3400 RPM, 140 KIAS, 4.0M PA.
P	GCA pattern, base turn — 26" Hg. Manifold Pressure, 3400 RPM, 2.3M PA, 130 KIAS.
Q	Glide path — 32" Hg. Manifold Pressure, 3400 RPM, 105 KIAS, gear down, flaps 20%.
R	GCA final approach — 27" Hg. Manifold Pressure, 3400 RPM, 110 KIAS, 1.3M PA, gear down, flaps 20%.
S	VFR overhead traffic pattern — 32" Hg. Manifold Pressure, 3400 RPM (bleed to 23" Hg. in nitchout).
T	VFR final approach — 15" Hg. Manifold Pressure, 2800 RPM, gear down, flaps 20%.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:										
2 1/3 OCTAVE BAND		OMEGA 3.2										
		TEST 71-014-056										
		RUN 01										
		10 JAN 75										
		PAGE F1										
NOISE SOURCE/SUBJECT:		OPERATION:										
QU-22B AIRCRAFT												
INFLIGHT NOISE LEVELS												
		LOCATION/CONDITION										
FREQ (HZ)	1/A	1/B	1/C	1/D	1/E	1/F	1/G	1/H	1/I	1/J		
25	96	94	104	99	94	95	94	94	91	91		
31.5	103	103	104	105	99	99	99	98	97	96		
40	105	107	106	108	101	98	98	97	93	93		
50	96	96	100	96	95	95	93	92	90	91		
63	95	94	99	95	92	93	92	91	93	93		
80	94	96	94	100	100	102	101	102	104	100		
100	96	93	109	104	105	108	108	106	116	109		
125	100	103	96	101	100	105	103	100	103	101		
160	89	95	99	105	107	103	102	98	103	102		
200	90	93	91	97	99	99	100	96	104	104		
250	88	87	94	103	103	104	107	100	98	97		
315	79	81	84	95	94	93	93	93	94	91		
400	77	77	83	96	93	93	93	90	93	90		
500	79	78	80	89	90	90	91	90	92	90		
630	76	76	78	90	92	91	91	91	92	89		
800	75	71	76	87	89	89	89	88	88	86		
1000	73	70	75	81	83	85	84	84	85	84		
1250	71	68	73	79	81	83	81	81	82	81		
1600	69	66	70	78	79	83	79	80	81	79		
2000	69	67	72	79	80	83	81	81	83	82		
2500	66	65	68	76	77	79	78	78	82	79		
3150	64	63	66	74	75	79	77	77	81	79		
4000	63	63	66	74	75	78	77	77	83	80		
5000	61	62	64	73	74	75	75	76	80	77		
6300	60	60	62	70	72	73	73	74	79	76		
8000	60	60	62	71	71	73	73	73	80	77		
10000	59	60	61	69	69	70	70	72	78	75		
12500	59	59	60	69	68	69	70	72	78	74		
16000	61	61	62	69	69	70	71	73	78	75		
OVERALL	109	110	113	113	112	113	113	110	117	112		

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:										
2 1/3 OCTAVE BAND		OMEGA 3.2 TEST 71-014-056 RUN 02										
NOISE SOURCE/SUBJECT:		OPERATION:										
QU-22B AIRCRAFT		10 JAN 75										
INFLIGHT NOISE LEVELS		PAGE F2										
		LOCATION/CONDITION										
FREQ (HZ)	1/K	1/L	1/M	1/N	1/P	1/Q	1/R	1/S	1/T	1/U	1/V	1/W
25	94	93	92	93	92	91	90	93	92	91	90	92
31.5	100	100	98	98	98	99	97	98	98	99	97	97
40	98	94	94	98	100	98	97	100	98	98	97	98
50	94	94	92	91	92	95	95	93	95	95	93	96
63	97	94	91	90	91	94	95	92	94	94	92	94
80	114	100	99	100	100	97	101	100	97	101	100	97
100	107	111	107	106	105	103	103	107	101	103	103	101
125	102	103	100	102	101	99	98	102	98	98	102	98
160	104	101	102	99	104	100	102	102	96	100	102	96
200	102	103	105	98	97	95	97	99	105	97	99	105
250	93	98	98	99	105	102	103	106	98	103	106	98
315	94	97	92	92	93	91	92	93	91	92	93	91
400	92	97	92	92	92	91	90	92	86	92	92	86
500	91	98	91	92	90	89	89	91	84	89	91	84
630	90	96	90	90	89	90	88	90	85	88	90	85
800	88	94	88	87	86	86	85	87	83	85	87	83
1000	86	92	85	84	83	82	81	84	79	82	81	84
1250	84	90	83	82	81	80	79	81	76	80	79	75
1600	82	89	82	81	79	78	78	79	75	78	78	75
2000	84	89	84	83	82	80	80	82	78	80	82	78
2500	84	89	82	81	79	77	78	80	76	77	78	76
3150	83	90	82	79	78	77	77	80	75	77	77	75
4000	84	91	84	81	80	77	78	80	76	77	78	75
5000	81	88	80	79	77	75	75	77	73	75	77	73
6300	81	89	79	77	75	73	73	75	72	73	75	72
8000	81	90	80	78	75	72	74	74	74	72	74	72
10000	79	88	78	76	75	71	72	73	69	72	73	69
12500	79	88	78	77	75	70	72	72	69	72	72	69
16000	79	87	77	76	75	70	72	72	69	72	72	69
OVERALL	116	114	111	110	111	109	110	112	109	110	112	109

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:										
2		OMEGA 3.2										
		TEST 71-014-056										
		RUN 02										
		10 JAN 75										
		PAGE J2										
NOISE SOURCE/SUBJECT:		OPERATION:										
QU-22B AIRCRAFT												
INFLIGHT NOISE LEVELS												
		LOCATION/CONDITION										
FREQ (HZ)		1/K	1/L	1/M	1/N	1/P	1/Q	1/R	1/S	1/T		
31.5	103	101	100	101	101	103	102	101	102	101	101	101
63	114	102	100	101	101	101	100	102	101	102	101	100
125	109	112	108	108	108	108	106	106	109	103	109	103
250	103	105	106	102	102	106	103	104	107	106	107	106
500	96	102	96	96	96	95	94	94	96	90	96	90
1000	91	97	91	89	89	88	88	87	89	85	89	85
2000	88	94	87	86	85	85	83	83	85	81	85	81
4000	88	94	87	84	83	83	81	82	83	80	83	80
8000	85	94	84	82	80	80	77	78	79	76	79	76
16000	82	90	81	79	78	78	73	75	75	72	75	72
OVERALL	116	114	111	110	111	111	109	110	112	109	112	109

