

BIO-ENVIRONMENTAL ENGINEERING

TECHNICAL REPORT

AC-130A AND AC-119 NOISE LEVEL SURVEYS

LOCKBOURNE AFB, OHIO

16-18 September 1968



No. 0295108

**OFFICE OF THE STAFF SURGEON
SHAW AIR FORCE BASE
SOUTH CAROLINA**

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NOISE LEVEL SURVEYS
OF THE
AC-130A and AC-119 "GUNSHIP" AIRCRAFT

4413 CCTS
LOCKBOURNE AIR FORCE BASE, OHIO

16-18 September 1968

Surveyed by:

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Office of the Staff Surgeon
Headquarters Ninth Air Force
Shaw Air Force Base, SC 29152

REPORT:

Noise Level Survey

DATE:

16-18 September 1968

PLACE:

4413 CCTS, Lockbourne AFB, Ohio

SURVEYED BY:

**Captain Donald A. Kane, USAF, BSC
Bioenvironmental Engineer
Office of the Staff Surgeon
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1. As requested by the 840 Tactical Hospital, an inflight noise level survey was performed for the two aircraft (AC-119 and AC-130A) involved in the "Gunship" program. The purpose of the survey was to measure the noise level in these specially modified aircraft. The survey was also concerned with the noise levels generated by the onboard weapon systems.

2. Personnel contacted were as follows:

Colonel Rogers Hederick, Hospital Commander

Lt Colonel Steven A. Barbier, 4413 CCTS, Executive Officer

Major Justus F. Rose, Brodynamics and Bionics Division

6570 Aerospace Medicine Research Laboratory
Wright Patterson AFB, Ohio

Major James E. Joseph, 4413 CCTS, Scheduling Officer

Captain Joseph M. Hazel, Chief of Aerospace Medicine, 840 Tac Hosp

MSgt Herbert W. Farley, NCOIC, Military Public Health, 840 Tac Hosp

3. A General Radio Octave Band Analyzer, Type 1558-DP, was used for the survey.

4. AC-119 "Gunship" Noise Levels:

a. Positions surveyed: All the cargo compartment crew positions and seating areas were surveyed. All measurements were taken at head level. See Figure 1, AC-119 Layout Drawing for specific positions surveyed and station numbers.

b. Exposure Time: For purposes of hazard evaluation, average crew exposure time will be assumed to average 5 hours per day.

c. Noise Sources: The noise sources on the AC-119 and the medical significance of each are listed as follows:

(1) Aircraft Engines: Due to the absence of insulation and the door and gun port openings, the engine noise is the most medically significant noise source.

(2) Auxiliary Power Unit (APU): The APU is operated only about 1/2 to 2/3 of the mission flight time. While the noise is noticed because of the high frequency whine, it contributes very little to the noise problem.

(3) Illuminator: The illuminator is only operated at night and for about 1/4 of the flight time. Tests indicate that the illuminator does not contribute anything to the overall noise problem.

(4) Guns: Gun firing time is very short compared to the overall mission length. Firing one gun at a time, the maximum total gun noise exposure time would be about ten minutes per mission. The gun noise does add to the overall noise problem.

d. Gun Firing: Because of the short firing time, a complete octave band analysis could not be accomplished. All gun noise level readings reported are overall readings. Due to the nature of the weapon system, the noise emitted will be a broad band noise.

e. Octave Band Analysis: (See Data Sheet #1)

f. Ear Protection: At present, all crew members wear the H-133 headset and mike. Their headset is worn for the duration of the flight. In addition, some crew members wear the standard ear plugs under the headset. Table #1 shows the sound attenuation that can be achieved with the use of earplugs or one of two standard headsets.

g. Findings and Recommendations:

(1) As can be seen from Table #2, the use of earplugs and/or a headset will reduce the overall noise level below the danger level. For this reason, a headset is mandatory for all crew members. For crew members, headset plus plugs will insure added protection. For passengers, a headset (if available) or earplugs are required.

(2) The AC-119 has only one intercom system. All crew members must use this single channel or take their headsets off and shout at each other. The removal of the headset in order to communicate without monopolizing the intercom was observed frequently. Therefore, the possibility of installing an additional intercom channel on the AC-119 should be investigated. A second channel, as is the case for the AC-130, would allow for easy communication and instruction not now possible without removing the headset and shouting.

5. AC-130A "Gunship" Noise Levels:

a. Positions Surveyed: All the cargo compartment crew positions and seating areas were surveyed. All measurements were taken at head level. See Figure 2, AC-130A Layout Drawing for specific positions surveyed.

b. For purposes of hazard evaluation, average crew exposure time will be assumed to average 6 hours per day.

c. Noise Sources: The noise sources on the AC-130A and the medical significance of each are listed below:

(1) Aircraft Engines: Due to the absence of insulation and the fact that two troop doors and the ramp are open, the engine noise is the most medically significant noise source.

(2) Guns: The effect of gun firing on the overall noise levels could not be measured because the flight was not a firing mission. However, the heavy felt curtains around the weapons should provide considerable sound attenuation.

d. Octave Band Analysis: (See Data Sheet #2)

e. Ear Protection: All crew members wear the H-133 headset throughout the flight. Some crew members also wear the standard ear-plugs under the headset. Table #1 shows the ear protection that can be achieved with the use of ear-plugs or one of several standard headsets.

g. Findings and Recommendations: As can be seen from Table #2, the use of earplugs/or a headset will reduce the overall noise level below the danger level. For this reason, a headset is mandatory for all crew members. The use of ear-plugs with the headset will provide additional protection. For passengers, a headset (if available) or ear-plugs are required.

DATA SHEET #1

AC-119 OCTAVE BAND ANALYSIS

Octave-Band Analyzer Reading (db)
Frequency (Hz)

Test Nr.	Measurement Station and Operating Conditions	Overall	63	125	250	500	1000	2000	4000	8000	16000
1	Station 106 Cruise - <u>APU On</u>	115	108	110	110	103	94	91	90	90	92
2	Station 106 Cruise - <u>APU Off</u>	114	108	112	106	106	94	90	88	85	82
	Difference (Due to APU)	+1		-2	+4	-3		+1	+2	+5	+10
3	Station 179, Cruise, <u>APU On</u>	115	107	110	105	106	96	92	93	93	99
4	Station 179, Cruise, <u>APU Off</u>	114	107	106	105	107	97	91	90	87	83
	Difference (Due to APU)	+1		+4		-1	-1	+1	+3	+6	+16
5	Station 226, Cruise, <u>APU On</u>	117	107	113	113	105	95	92	91	91	95
6	Station 226, Cruise, <u>APU Off</u>	117	105	113	110	105	95	90	88	87	83
	Difference (Due to APU)		+2	+3			+2	+3	+4	+12	+15
7	Middle of Cargo Compartment Four Feet Aft of Guns - <u>APU Off</u>	115	108	109	110	102	95	93	92	90	86
8	Illuminator Position - <u>APU On</u>	116	109	109	111	102	98	97	102	103	96
9	Station 179, 1 gun firing	128									
10	Station 179, 2 guns firing	130									
11	At #1 gun, 1 gun firing	135									

DATA SHEET #2AC-130A OCTAVE BAND ANALYSIS

Octave-Band Analyzer Reading (db)
Frequency (Hz)

Test Nr.	Measurement Station and Operation Conditions	Overall	512	125	250	500	1000	2000	4000	8000	16000	
1	Center Seat of the 5 Seats Forward of Flair-Radar Module; Engines Running, Prior to Taxi	108	98	104	98	101	96	94	90	88	92	82
2	Same Position as above; Cruise Speed	123	114	119	119	113	109	106	103	99	95	84
3	NOD Position	123	107	115	115	116	111	106	102	99	95	83
4	Single Elevated Scanner Seat just Forward of Flair-Radar Module; Cruise	122	117	118	116	112	107	103	102	98	94	83
5	Position just Forward of Rear Jump Door	120	114	114	111	109	107	104	105	102	97	93
6	Illuminators Position on Rear Ramp	121	113	118	115	108	108	105	105	101	94	86
7	Radar Operator's Seat, Inside Flair-Radar Module	110	108	107	101	95	91	87	81	76	70	57

TABLE #1
EAR PROTECTION ATTENUATION (db)

Type Protector	Frequency (Hz)						
	125	250	500	1000	2000	4000	8000
A - Earplugs (Inserts)							
1 V-51R	25	24	26	28	36	34	38
2 Fluenta (Disposable Wax Impregnated Cotton)	25	23	26	29	35	40	36
B - Communication Units							
1 H-133 Muff & Mike	19	23	37	38	31	42	35
2 Roanwell H-157	8	13	23	30	30	36	33

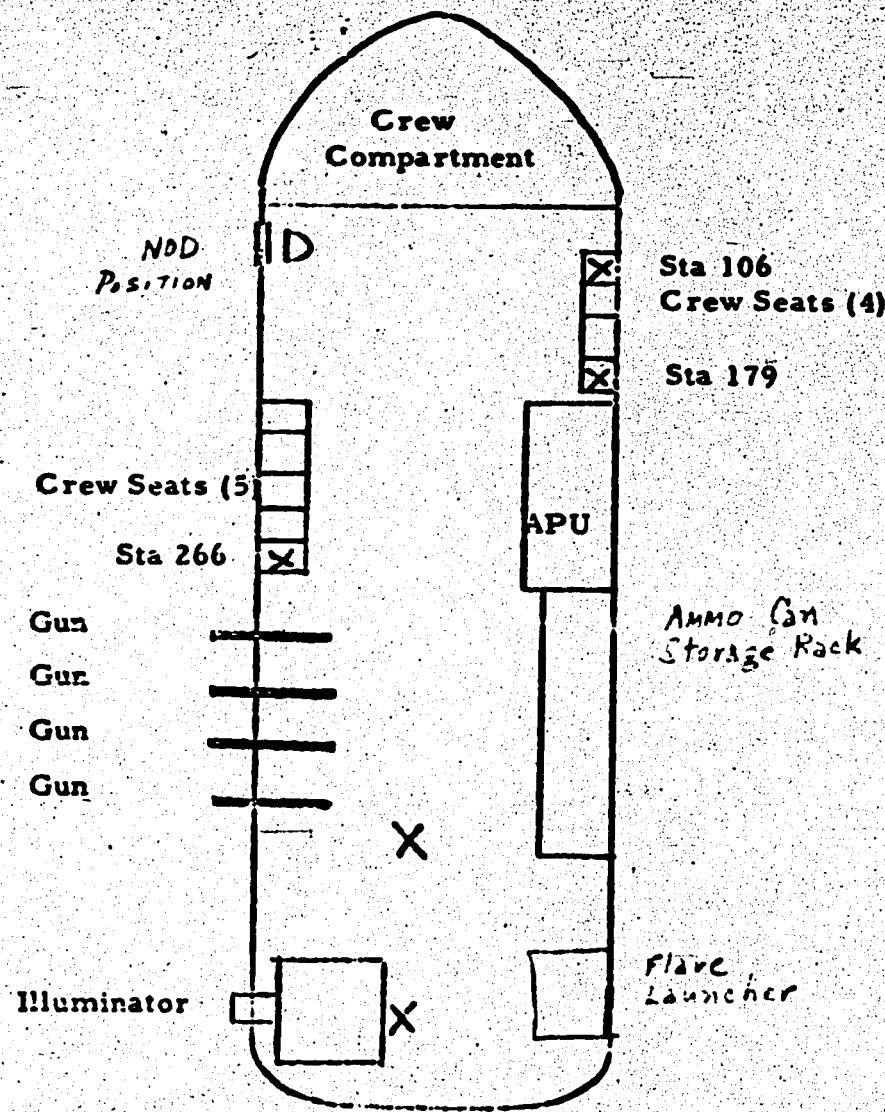
Atch #3

TABLE #2

**EAR PROTECTION ATTENUATION POSSIBLE WITH THE
H-133 HEADSET AND STANDARD EARPLUGS**

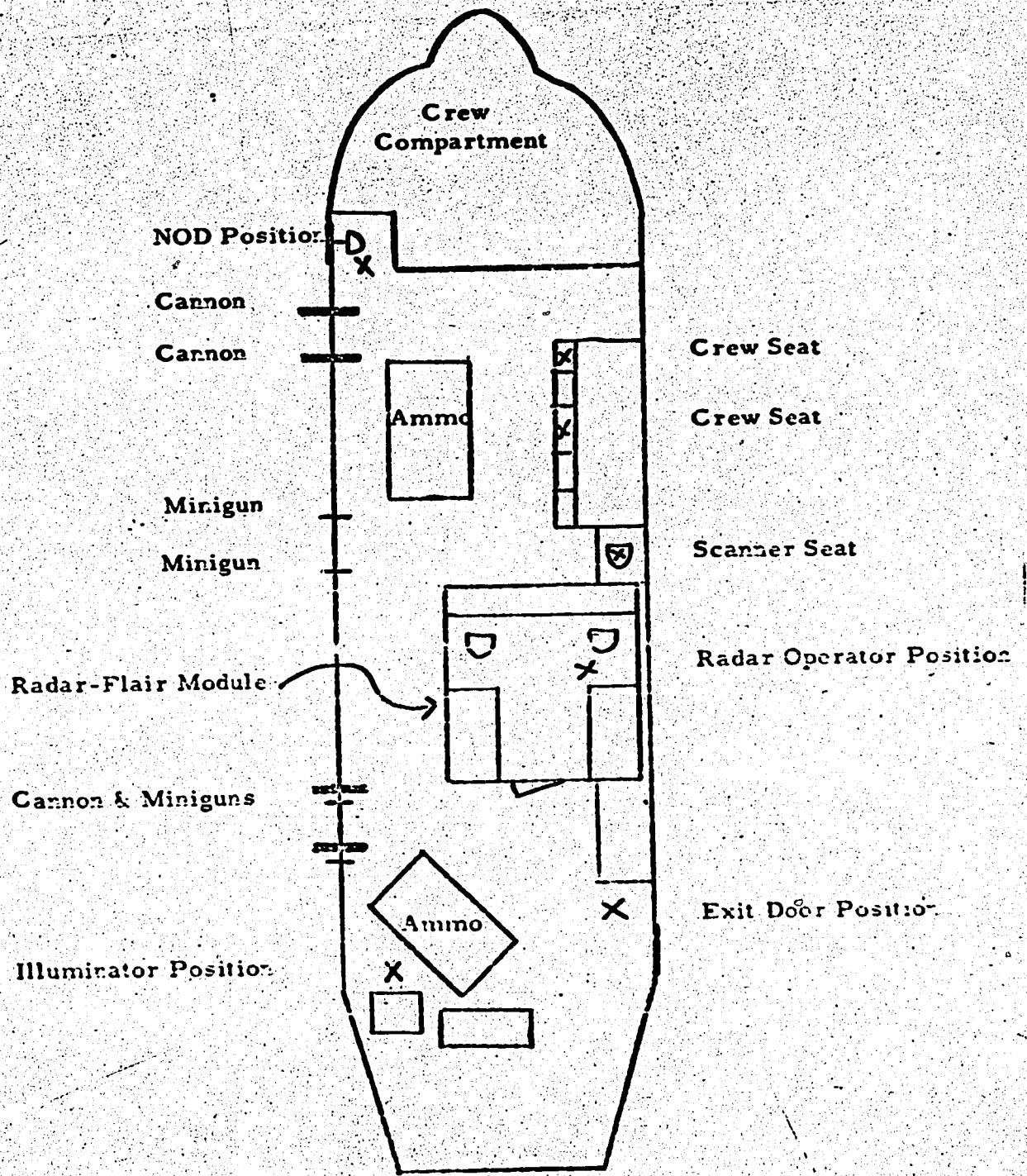
Type Protector	Frequency (Hz)						
	125	250	500	1000	2000	4000	8000
A - For the AC-119 Example: Noise at Sta 226 (See Data Sheet 1, Test 5)							
1 Effective Noise Level While Using the H-133 Headset	113	105	95	92	91	91	95
2 Effective Noise Level While Using the V-51R Earplugs	88	81	69	64	55	57	57
B - For the AC-130A Example: Noise at NOD Position (See Data Sheet 2, Test #3)							
1 Effective Noise Level While Using the H-133 Headset	115	116	111	106	102	99	95
2 Effective Noise Level While Using the V-51R Earplugs	96	93	74	68	71	57	60
	90	92	85	78	66	65	57

Atch #4



NOTE: An (X) indicates one of the survey positions.

FIGURE 1
AC-119 LAYOUT DRAWING



NOTE: An (X) indicates one of the survey positions.

FIGURE 2

AC-130A LAYOUT DRAWING

Distribution:

4413 CCTS - 4 cys

840 Tac Hosp (C & MPH) - 2 cys

TAC (SG) - 1 cy

TAC (DOPSSL) - 1 cy

AFLC (MCDPE) - 1 cy

6570 Aerospace Medical Research Laboratory (MRBAE) - 1 cy

377 USAF Disp (BSGMB), APO San Francisco 96307 - 1 cy

USAF Hosp-Eglir. (SGPE) - 1 cy