

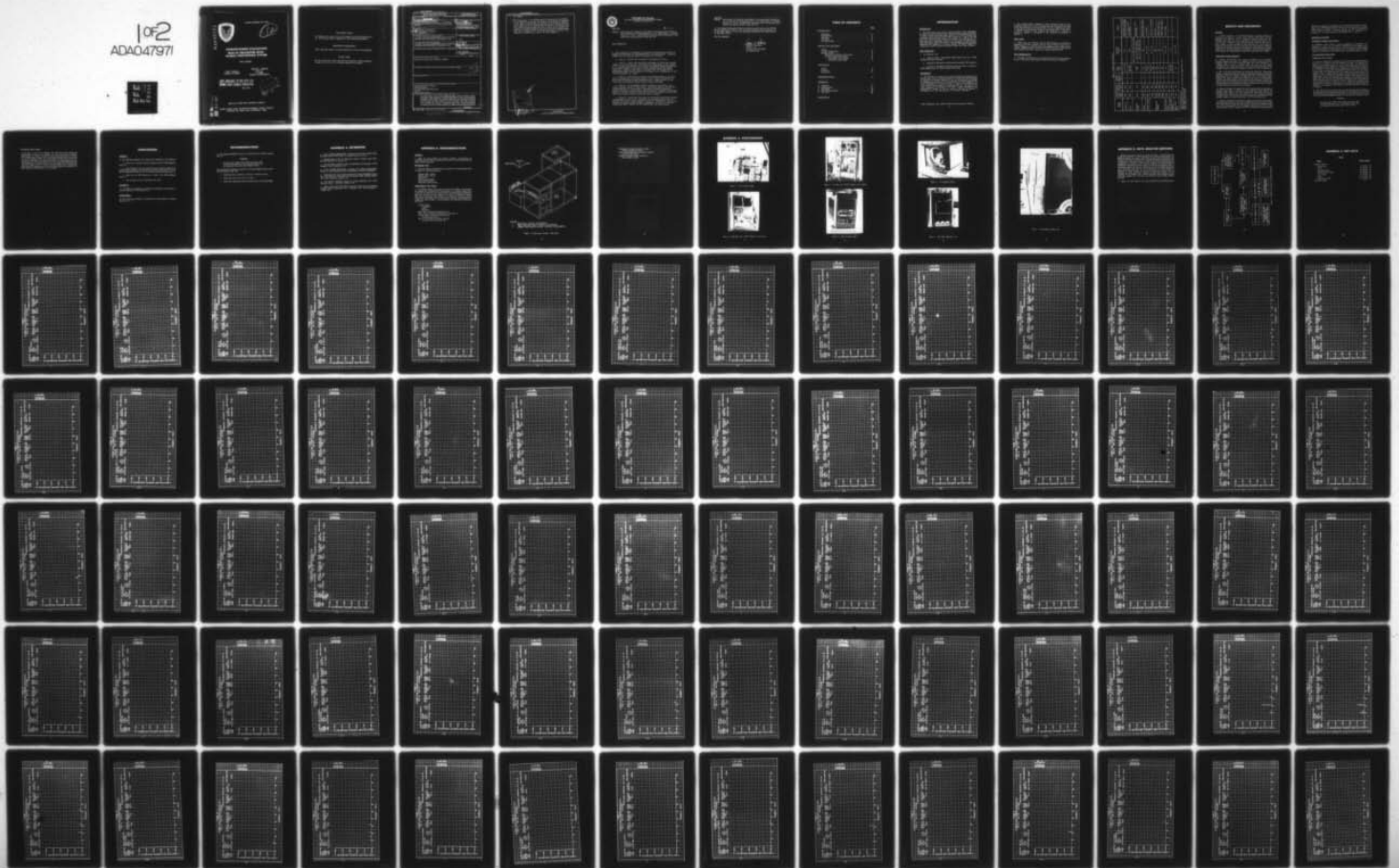
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ARMY AVIATION ENGINEERING FLIGHT ACTIVITY EDWARDS AF--ETC F/G 1/3  
AIRWORTHINESS EVALUATION NUH-1H HELICOPTER WITH GLOBAL POSITION--ETC(U)  
MAY 77 C L THOMAS, T P BENSON  
USAAEFA-76-13

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USAAEFA PROJECT NO. 76-13

*P.S. 12*

**AIRWORTHINESS EVALUATION  
NUH-1H HELICOPTER WITH  
GLOBAL POSITIONING SYSTEM**

**FINAL REPORT**

**TOM P. BENSON  
PROJECT ENGINEER**

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MAJ, CE  
US ARMY  
PROJECT OFFICER/PILOT**

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**UNITED STATES ARMY AVIATION ENGINEERING FLIGHT ACTIVITY  
EDWARDS AIR FORCE BASE, CALIFORNIA 93523**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  The United States Army Aviation Engineering Flight Activity conducted a limited airworthiness flight evaluation of an NUH-1H helicopter in which a prototype global positioning system (GPS) was installed. Flight tests were conducted at Edwards Air Force Base, California, between 18 and 27 January 1977. Nine test flights were conducted for a total of 11 productive flight hours. Testing was performed to determine the effect of GPS installation on vibration and pilot-induced oscillation  (continued)		

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20. Abstract

→ (PIO) characteristics of the NUH-1H helicopter. During this test, one deficiency and one shortcoming were noted. The deficiency was insufficient aft longitudinal control margin in rearward flight. The shortcoming was insufficient directional control margin in hover and low-speed flight. The deficiency and the shortcoming were a result of the gross weight and center of gravity of the helicopter after installation of the GPS, although both were within normal UH-1H operating limits. There was no significant effect on vibration characteristics or increase in PIO tendencies of the NUH-1H as a result of the GPS installation. ↑

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BDC	Buff Section <input type="checkbox"/>
UNANNOUNCED	<input type="checkbox"/>
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**DEPARTMENT OF THE ARMY**  
**HQ. US ARMY AVIATION RESEARCH AND DEVELOPMENT COMMAND**  
**P O BOX 209, ST. LOUIS, MO 63166**

DRDAV-EQA

OCT 27 1977

**SUBJECT: Directorate for Research, Development and Engineering Position on the Conclusions and Recommendations of the Final Report on USAAEFA Project No. 76-13, Airworthiness Evaluation NUH-1H Helicopter with Global Positioning System, dated May 1977**

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1. The Directorate for Research, Development and Engineering position on USAAEFA's conclusions and recommendations are provided herein. Paragraph numbers from the subject report are provided for reference.

a. Para 16. Concur with the general conclusions set forth.

b. Para 17. Concur with the stated deficiency for this test aircraft however it is noted that the insufficient aft longitudinal control margin is not a result attributable to the Global Positioning System installation but a characteristic of the basic UH-1H for forward center-of-gravity conditions. Numerous other data is available from the original UH-1D development program which indicates the aircraft to be satisfactory at the current published c.g. limits.

c. Para 18. Concur with the stated shortcoming however it is noted that the insufficient left pedal margin is not a result attributable to the Global Positioning System installation but a characteristic of the basic UH-1H at high gross weights and/or density altitudes.

d. Para 19. No operational problem is known to exist due to the control problem defined in this report. Additional analysis and specific testing dedicated to the purpose of defining a suitable operational envelope in terms of gross weight, center-of-gravity location and rearward flight or downwind hovering is required and will be planned for early 1978. Until this is done, current limits will not be changed.

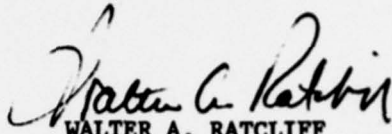
e. Para 20. Concur with the intent of the stated restrictions however an alternative to the 10 knot limitation for downwind hover is that of limiting the forward center-of-gravity location. Additionally the current operation's manual contains adequate information in terms of a caution, warning and charts relative to the insufficient left pedal margin.

DRDAV-EQI

SUBJECT: Directorate for Research, Development and Engineering Position on the Conclusions and Recommendations of the Final Report on USAAEFA Project No. 76-13, Airworthiness Evaluation NUH-1H Helicopter with Global Positioning System, dated May 1977.

2. The Global Positioning System as installed and tested on the NUH-1H had no significant effect on the flying and handling characteristics and is therefore subject to the same operating information and restrictions as the basic UH-1H.

FOR THE COMMANDER:



WALTER A. RATCLIFF  
Colonel, GS  
Director of Development  
and Engineering

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# INTRODUCTION

## BACKGROUND

1. The United States Army Aviation Engineering Flight Activity (USAAEFA) was directed by the United States Army Aviation Systems Command (AVSCOM)\* to conduct a limited airworthiness flight evaluation of an NUH-1H helicopter with a prototype global positioning system (GPS) installed (ref 1, app A). The GPS tested was a prototype system designed for evaluation of the GPS concept. The final design will be significantly reduced in size and weight. The GPS project is under the guidance of the United States Air Force Headquarters, Space and Missile Organization (Hq SAMSO) at Los Angeles, California. The GPS was designed and constructed by General Dynamics Electronics Division, San Diego, California.

## TEST OBJECTIVES

2. Test objectives were:
- a. Evaluate vibration characteristics during ground runs and in flight, including GPS pallet resonances.
  - b. Determine if GPS pallets cause pilot-induced oscillation (PIO) tendencies.
  - c. Conduct an airworthiness evaluation which will serve as a basis for a safety-of-flight release for future prototype GPS testing.

## DESCRIPTION

3. The NUH-1H test helicopter, serial number 66-60869, was manufactured by Bell Helicopter Textron. A detailed description of the standard UH-1H helicopter is contained in the operator's manual (ref 2, app A). The test aircraft was modified for installation and operation of the prototype GPS. A detailed description of the aircraft modification is contained in reference 3. Most of the modification was to the aircraft electrical system for powering the GPS and to the interior of the cargo compartment for installation of the GPS. A detailed description of test instrumentation installed in the test aircraft is presented in appendix B. Photographs of the test instrumentation are contained in appendix C.

\*Since redesignated Army Aviation Research and Development Command.

4. The prototype GPS is composed of three components, with the main component located forward of the transmission housing. The approximate weight of the main component is 1336 pounds. The other two components are located on each side of the transmission housing with a combined weight of 496 pounds. A detailed description of the prototype GPS components is contained in reference 3, appendix A. Photographs of the installation are presented in appendix C.

#### TEST SCOPE

5. Flight testing of the NUH-1H with the GPS installation was conducted at Edwards Air Force Base, California, between 18 and 27 January 1977. Nine test flights consisting of 11 productive hours were conducted at the conditions shown in table 1. Flight limitations contained in the UH-1H operator's manual and the safety-of-flight release (ref 4, app A) were observed during the test.

#### TEST METHODOLOGY

6. The flight test methods used are described briefly in the Results and Discussion section of this report. Data analysis methods are discussed in appendix D.

Table 1. Flight Test Conditions.

Flight Regime	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Ambient Temperature (°C)	Rotor Speed (rpm)	Calibrated Airspeed <sup>1</sup> (kt)	Remarks
Ground run	8550	2220	14	192 to 330	Zero	Ground-idle to flight-idle (192 to 370 rpm)
Hover <sup>2</sup>	8900	2160	14	314, 319, and 324	Zero	5, 10, and 15-foot skid heights
Low-speed flight	8900	1500	6	314 and 324	Zero to 30 KTAS <sup>3</sup> left and right	Skid height 10 and 20 feet
					Zero to 30 KTAS forward	
Climb	8780	4100	8	324	Zero to 13 KTAS rearward	Maximum engine power
					80	
Forward flight	8900	4000	7	314 and 324	40 to 110	Level flight
					40 to 110	Pushovers to pull-ups
Maneuvering flight <sup>4</sup>	8600	5000	8	314 and 324	40 to 110	Pushovers to pull-ups
	9100	5000	8	324	100	Pull-outs
	9240	4220	9	324	80	Windup turns, left
Autorotational entry	8640	4120	8	324	80	Windup turns, right
					50 to 100	Level flight
Autorotational descent	9080	5000	6	324	50 to 100	Level flight
Nap-of-the-earth	8760	5000	6	314, 319, and 324	60	---
					Zero to 100	---
	9160	1520	4	324	Zero to 100	---

<sup>1</sup>Unless otherwise noted.  
<sup>2</sup>Step and pulse control inputs in lateral and longitudinal axes.  
<sup>3</sup>KTAS: Knots true airspeed.  
<sup>4</sup>Load factors 0.25 to 2.0.

## RESULTS AND DISCUSSION

### GENERAL

7. A limited evaluation of the NUH-1H helicopter with GPS installed was performed to determine if increased aircraft vibration characteristics and PIO tendencies were associated with the installation. Results of these tests were compared with results from earlier evaluations of the UH-1H helicopter (refs 5 and 6, app A). Vibration levels recorded during this evaluation were low and had no effect on safety of flight. No PIO tendencies were noted during the evaluation. One deficiency and one shortcoming were noted during the evaluation which were the result of the change in aircraft gross weight and center of gravity (cg) because of the GPS installation. The deficiency was insufficient longitudinal control margin. The shortcoming was insufficient directional control margin.

### VIBRATION CHARACTERISTICS

8. Vibration characteristics were evaluated throughout the test program. Particular emphasis was placed on evaluating the data recorded during hover, low-speed, climb, cruise, and maneuvering flight. Tests were conducted at the conditions listed in table 1. Vibration data were sensed by four triaxial accelerometers, one biaxial accelerometer, and two uniaxial accelerometers for the ten flight conditions presented. Transducer locations are shown in appendix B.

9. Due to the heavy internal load, the aircraft was tested only at heavy gross weight at a forward cg in the clean, doors-on configuration. Figures 1 through 80, appendix E, indicate that vibration amplitudes were low at all transducer locations during ground runs (at ground- and flight-idle), hover, and low-speed flight. Generally, the highest vibration levels recorded were those of the transmission, with the 4-per-rotor-revolution (4/rev) frequency being the highest (0.145g). The vibration levels of the main pallet and power converter chassis of the main pallet were generally less than 0.05g at all frequencies analyzed. There were no ground resonance tendencies noted during the evaluation.

10. Figures 81 through 128, appendix E, indicate that vibrations at all transducer locations during flights at 90 and 110 knots calibrated airspeed (KCAS) and maximum power climb at 80 KCAS were generally higher than those of the low-speed flight envelope, but still relatively low. The maximum vibrations encountered were those recorded from the transmission-located transducers. The maximum vibration recorded was 0.258g at 2/rev in the lateral axis.

11. Figures 129 through 160, appendix E, indicate that vibrations at all transducer locations during right and left 2g turns were higher than any other condition tested, but overall levels were less than 0.4g and much less than the maximum design level of the prototype GPS (1.5g). The highest vibrations recorded for the main pallet and power converter chassis were 0.145 and 0.150g for the longitudinal and

lateral axes, respectively. The vibrations of the main pallet and power converter chassis of the GPS installed equipment appear to be low and well below the GPS design level of 1.5g. Within the scope of this test, the vibration characteristics of the NUH-1H helicopter with GPS installed met the requirements of paragraph 3.7 of military specification MIL-H-8501A (ref 7, app A).

## HANDLING QUALITIES

### Pilot-Induced Oscillation Characteristics

12. Oscillatory control inputs of various amplitudes and frequencies were performed in a hover and at 90 KCAS to simulate PIO. All oscillations of the pallets were convergent and upon removal of the excitation were rapidly damped to the normal flight level. There appeared to be no condition where the natural frequency of the pallet was excited from either normal aircraft vibrations or PIO.

### Low-Speed Flight Characteristics

#### Longitudinal Control Margin:

13. Tests were conducted by stabilizing in forward and rearward flight at airspeeds from zero to 35 KTAS in 5-knot increments by reference to a calibrated pace vehicle. At zero airspeed (hover over a fixed point) there were 4.64 inches of aft longitudinal control remaining (36 percent of total longitudinal control travel). At 10 KTAS in rearward flight, the aft longitudinal control margin was reduced to 2.19 inches (17 percent of total longitudinal control travel). At 13 KTAS in rearward flight, the longitudinal control was against the aft stop (zero control margin). A plot of control positions versus airspeed is presented in figure 161, appendix E. The insufficient aft longitudinal control margin at the test cg and weight greatly reduces the downwind hover capability of the NUH-1H. The test weight and cg are within the approved flight envelope of the UH-1H. This finding reflects a deficiency in the basic UH-1H approved flight envelope. This deficiency was previously reported in references 5 and 6, appendix A. Downwind hover should not be conducted in winds greater than 10 knots with GPS installed. The insufficient aft longitudinal control margin in rearward flight above 10 KTAS is a deficiency.

14. The UH-1H operator's manual does not warn the pilot that at forward cg and heavy gross weight combinations insufficient aft longitudinal control may exist. The operator's manual presently limits the pilot to a rearward airspeed of 30 knots or less. The following WARNING should be incorporated in the operator's manual.

#### WARNING

At heavy gross weights with forward cg locations while hovering downwind, loss of aft longitudinal control may be experienced with winds greater than 10 knots.

**Directional Control Margin:**

15. In hover at zero wind conditions, left directional control margin was approximately 20 percent. At airspeeds less than translational lift airspeed (approximately 15 knots), left directional control margin was reduced even further. In a low-speed flight condition such as nap-of-the-earth flight, should a rapid right yaw rate be generated, there may be insufficient left pedal to stop the yaw. Additionally, with rapid power applications in hover or low-speed flight, directional control margin may be reduced to zero. For safety of flight, the NUH-1H helicopter with GPS installed should be restricted from rapid pedal turns to the right and from rapid power applications in hover or low-speed flight. The insufficient left pedal margin in low-speed flight is a shortcoming.

## **CONCLUSIONS**

### **GENERAL**

16. The following conclusions were reached upon completion of the evaluation:

a. There were no ground resonance tendencies with the GPS installation (para 10).

b. The vibrations of the main pallet and power converter chassis of the prototype GPS equipment were low and well below the design level of 1.5g and did not significantly amplify or affect the helicopter inherent vibrations (para 11).

c. There were no PIO tendencies as a result of the GPS installation (para 12).

d. One deficiency and one shortcoming were noted.

### **DEFICIENCY**

17. The deficiency identified was insufficient aft longitudinal control margin in rearward flight above 10 KTAS (para 13).

### **SHORTCOMING**

18. The shortcoming identified was insufficient left pedal margin in low-speed flight (para 15).

## **RECOMMENDATIONS**

19. The following **WARNING** should be incorporated in the operator's manual (para 14):

### **WARNING**

At heavy gross weights with forward cg locations while hovering downwind, loss of aft longitudinal control may be experienced with winds greater than 10 knots.

20. Incorporate the following restrictions in the safety-of-flight release for future NUH-1H prototype GPS tests:

- a. Downwind hover is limited to 10 knots of relative tail wind.
- b. Rapid right pedal turns will not be made.
- c. Rapid power applications will not be made in hover or in low-speed flight.

## APPENDIX A. REFERENCES

1. Letter, AVSCOM, DRSAV-EQI, 15 December 1976, subject: UH-1H Global Positioning System (GPS) Flight Test Program, Project No. 76-13.
2. Technical Manual, TM 55-1520-210-10, *Operator's Manual, Army Model UH-1D/H Helicopter*, 25 August 1971.
3. Technical Manual, D001155, *Class II Modification Documentation, UH-1H Helicopter, Part II*, September 1976.
4. Letter, AVSCOM, DRSAV-EQI, 14 January 1977, subject: Safety-of-Flight Release for Global Positioning System (NAVSTAR), JUH-1H S/N 66-00869.
5. Final Report, US Army Aviation Systems Test Activity (USAASTA), Project No. 71-18, *Tail Rotor Performance and Translational Flight Handling Qualities Test, UH-1H Helicopter*, January 1972.
6. Final Report, USAASTA, Project No. 66-04, *Engineering Test, UH-1H Helicopter, Phase D (Limited)*, November 1970.
7. Military Specification, MIL-H-8501A, *Helicopter Flying and Ground Handling Qualities; General Requirements For*, 7 September 1961, with Amendment 1, 3 April 1962.

## **APPENDIX B. INSTRUMENTATION**

### **GENERAL**

1. Flight test instrumentation was installed, calibrated, and maintained by USAAEFA personnel. This instrumentation was used to record vibration data and flight condition parameters.

### **Pilot/Engineer Panel**

2. Sensitive calibrated instrumentation was installed on the pilot/engineer panel to display the following parameters:

- Airspeed (ship's system)
- Altitude (ship's system)
- Rotor speed
- Normal cg acceleration
- Time encoding display
- Directional control position

### **Analog Magnetic Tape System**

3. An FM-FM magnetic tape system was used to record flight control positions and vibration data. Vibration data were analyzed over a frequency range of zero to 100 Hz. The transducers were triaxial, biaxial, and uniaxial linear accelerometers which were mounted at seven locations for a total of 16 channels of vibration data. The accelerometers were bonded to the component of interest with the accelerometer axis aligned with the aircraft axis. The main pallet accelerometer locations are shown in figure 1. Control positions and accelerometer locations are listed below.

Control position:

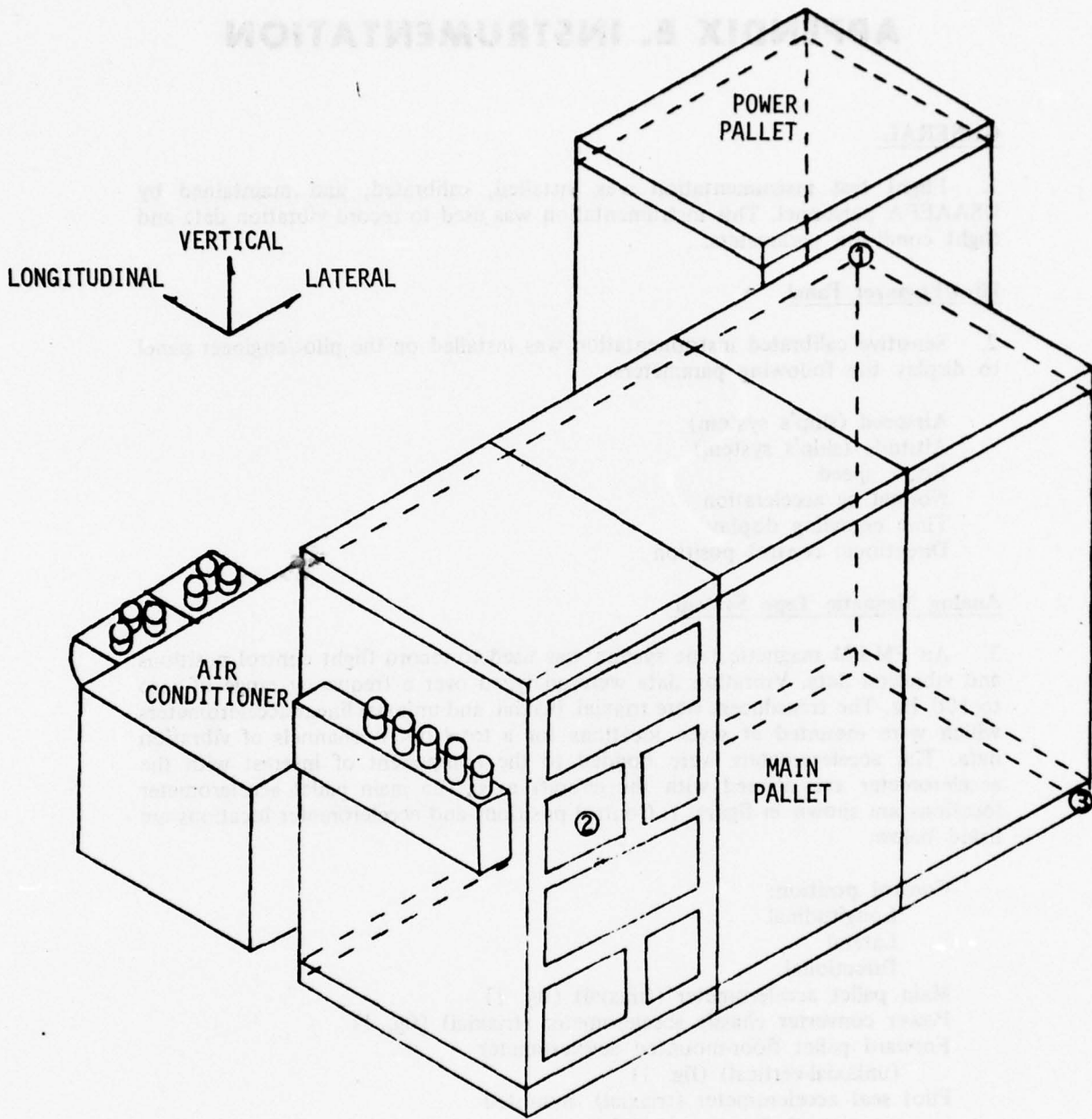
- Longitudinal
- Lateral
- Directional

Main pallet accelerometer (triaxial) (fig. 1)

Power converter chassis accelerometer (triaxial) (fig. 1)

Forward pallet floor-mounted accelerometer  
(uniaxial-vertical) (fig. 1)

Pilot seat accelerometer (triaxial), mounted  
on aircraft floor under pilot seat

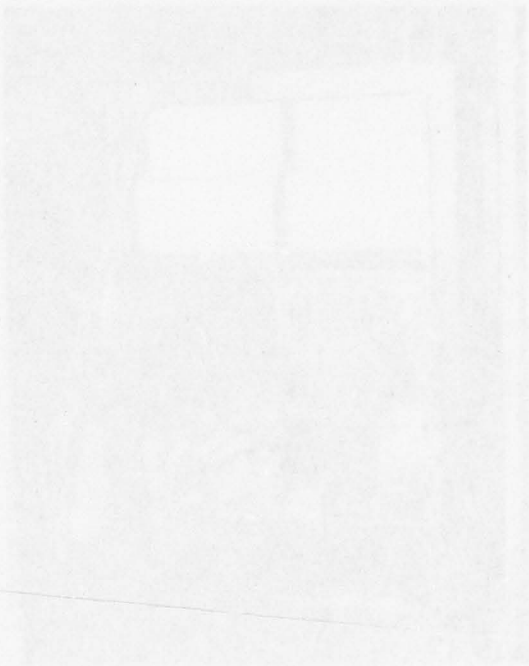
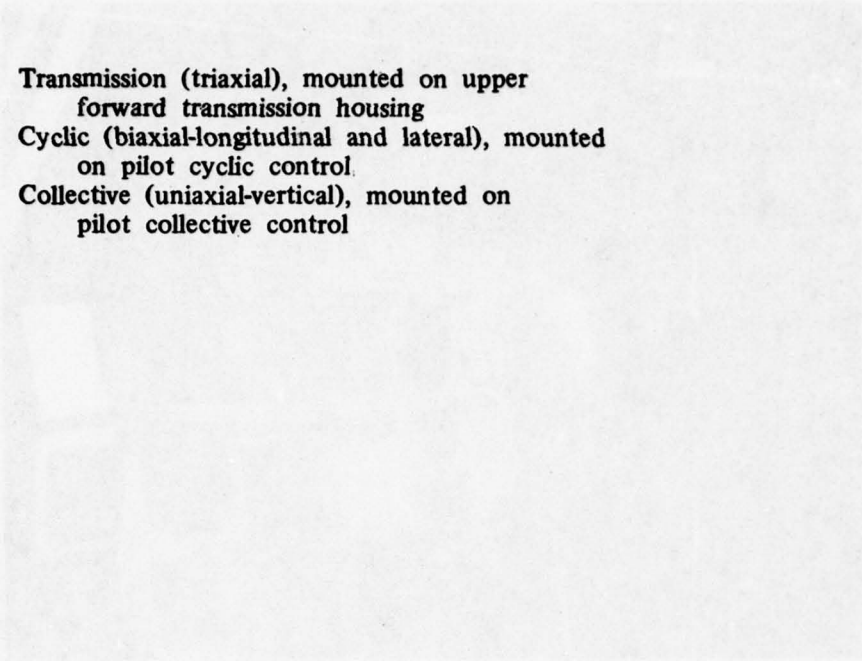


**LOCATION**

- 1 MAIN PALLET TRIAXIAL ACCELEROMETER
- 2 POWER CONVERTER CHASSIS TRIAXIAL ACCELEROMETER
- 3 FORWARD FLOOR MOUNTED UNIAXIAL (VERTICAL) ACCELEROMETER

**Figure 1. Accelerometer Location - Main Pallet.**

Transmission (triaxial), mounted on upper  
forward transmission housing  
Cyclic (biaxial-longitudinal and lateral), mounted  
on pilot cyclic control  
Collective (uniaxial-vertical), mounted on  
pilot collective control



## APPENDIX C. PHOTOGRAPHS

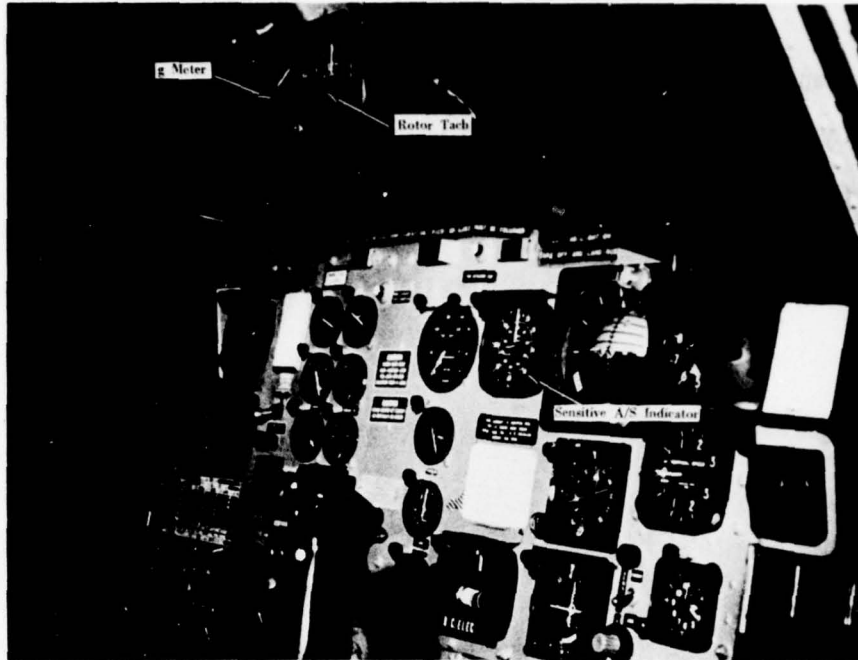


Photo 1. Test Aircraft Cockpit.

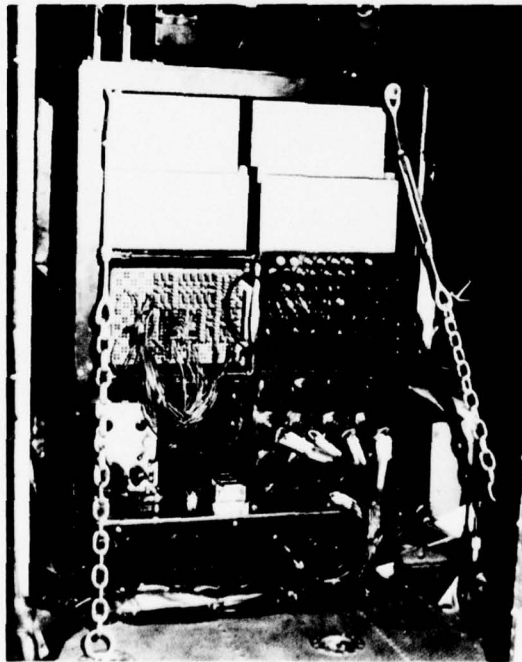


Photo 2. Right-Side View, FM-FM Magnetic Tape System.

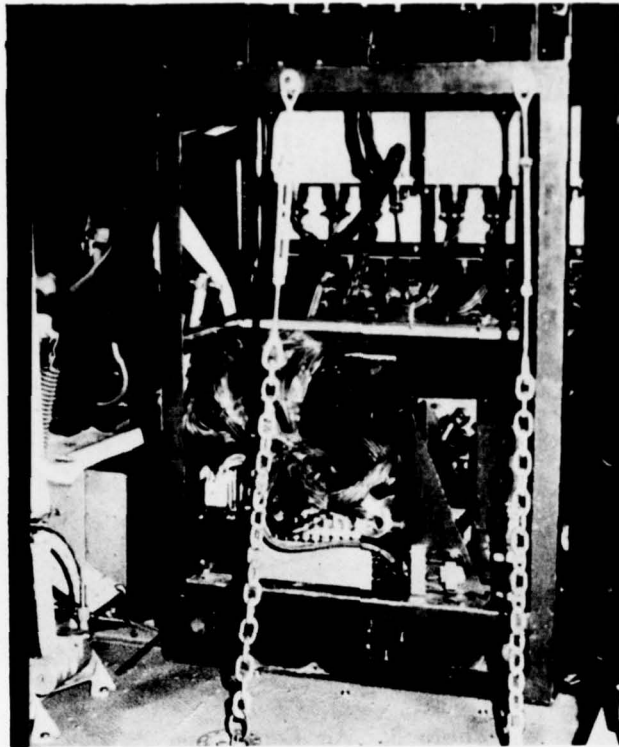


Photo 3. Left-Side View, FM-FM Magnetic Tape System.

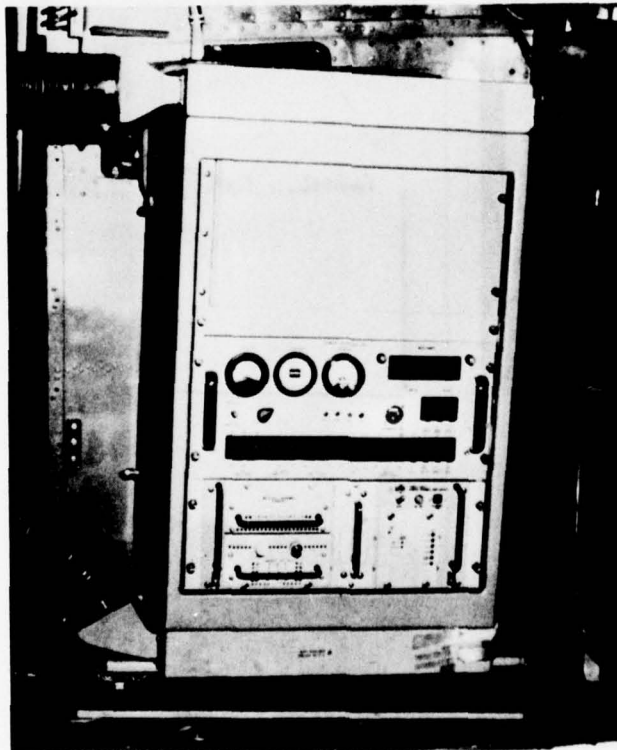


Photo 4. Power Converter Pallet.

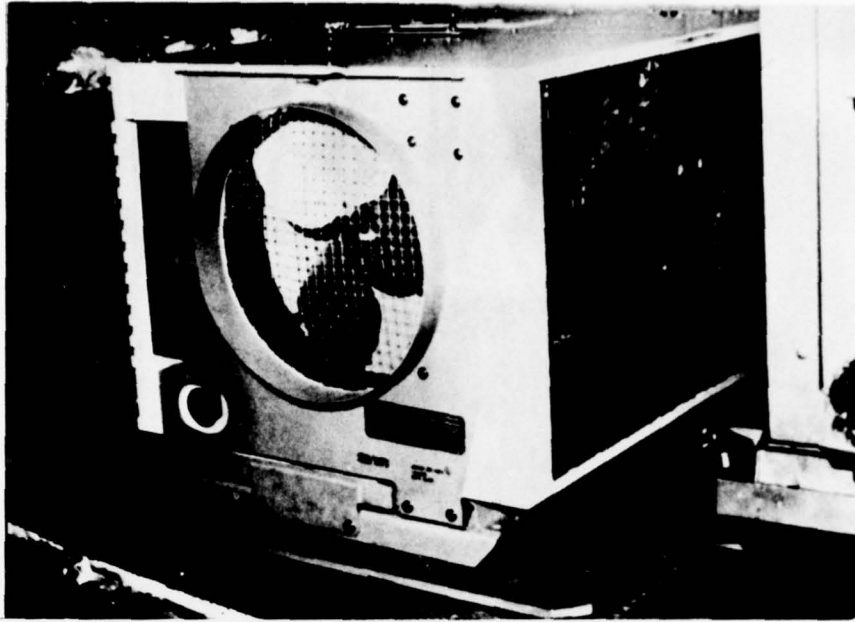


Photo 5. Air Conditioner Pallet.

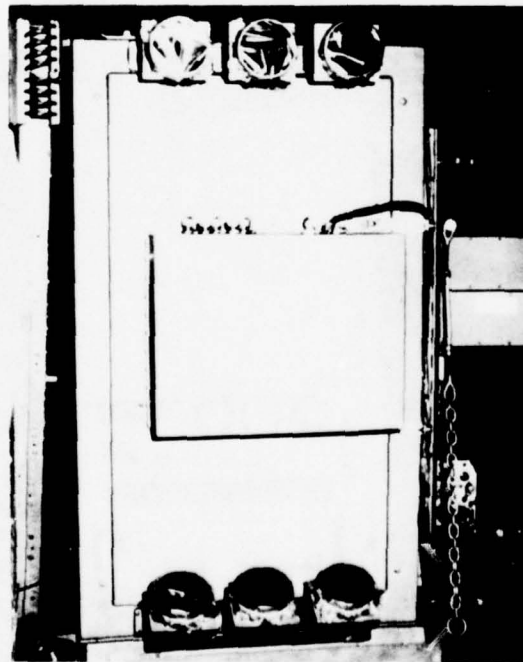


Photo 6. Main Pallet Right-Side View.

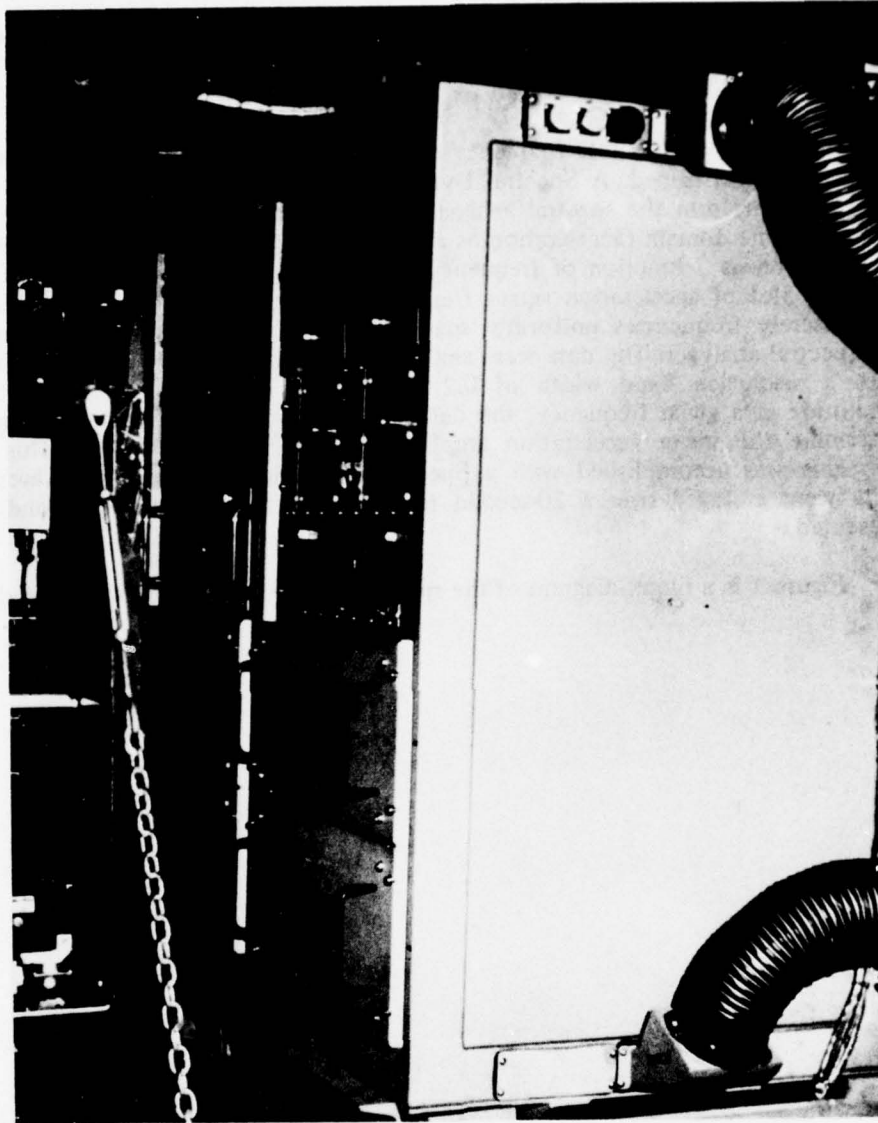


Photo 7. Main Pallet Left-Side View.

## **APPENDIX D. DATA ANALYSIS METHODS**

1. Because of the discrete frequency content of the data, a narrow-band spectral analysis was performed. A Spectral Dynamics 301 real time spectral analyzer was utilized to perform the spectral analysis. This spectral analysis converted the data from the time domain (acceleration as a function of time) to the frequency domain (acceleration as a function of frequency). The output of the spectral analysis was a digital plot of acceleration versus frequency composed of acceleration values at 500 discrete frequencies uniformly spaced over the selected frequency range of the spectral analyzer. The data were analyzed on the zero- to 100-Hz analysis range with a resolution band width of 0.2 Hz. Because of the random variation in amplitude at a given frequency, the data were averaged over a period of time to determine the mean acceleration amplitude for each test condition. This data averaging was accomplished with a Spectral Dynamics 302B ensemble averager. Data were averaged over a 20-second time interval for all the flight conditions presented.

2. Figure 1 is a block diagram of the spectral analysis data processing procedures.

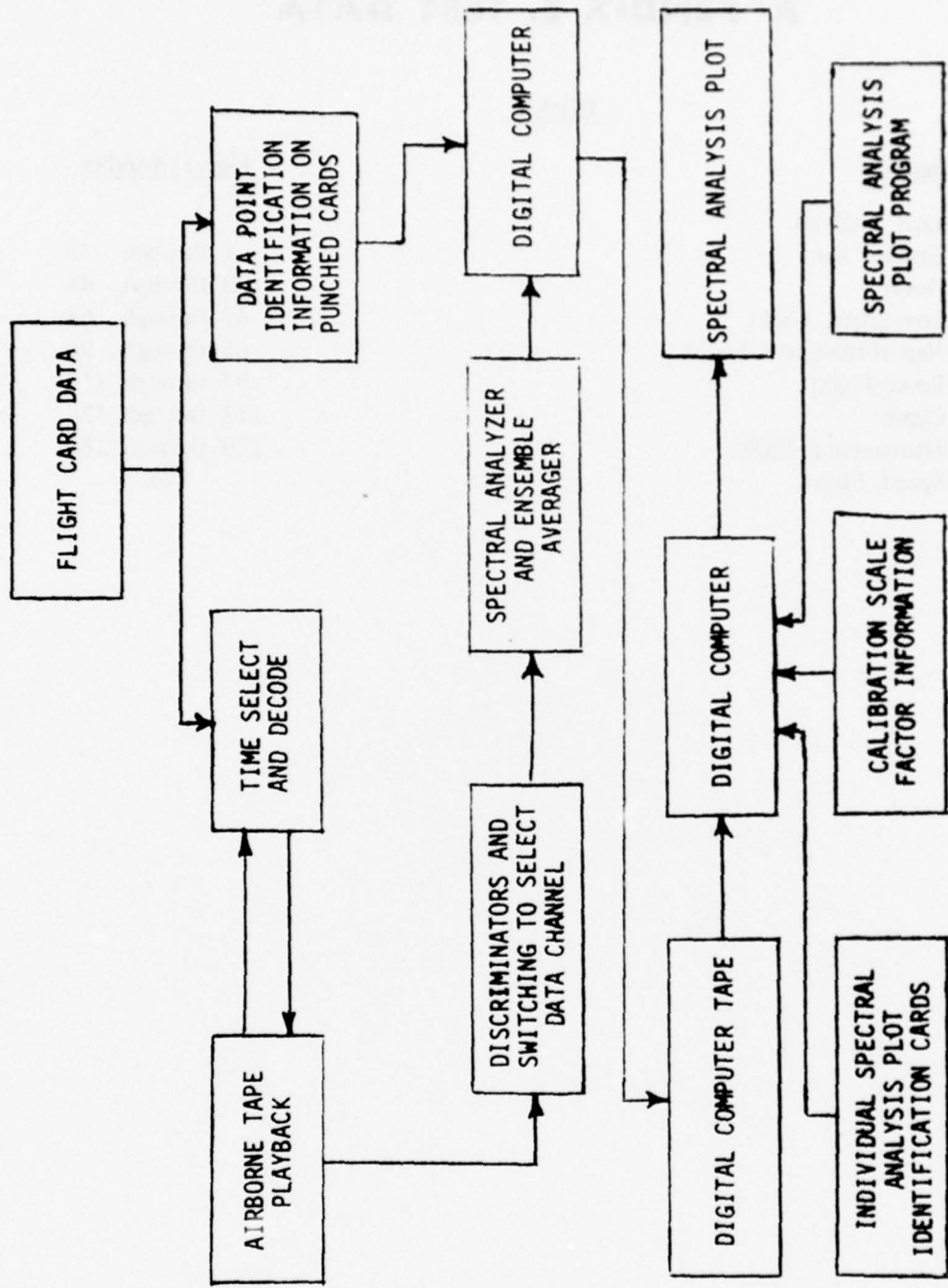


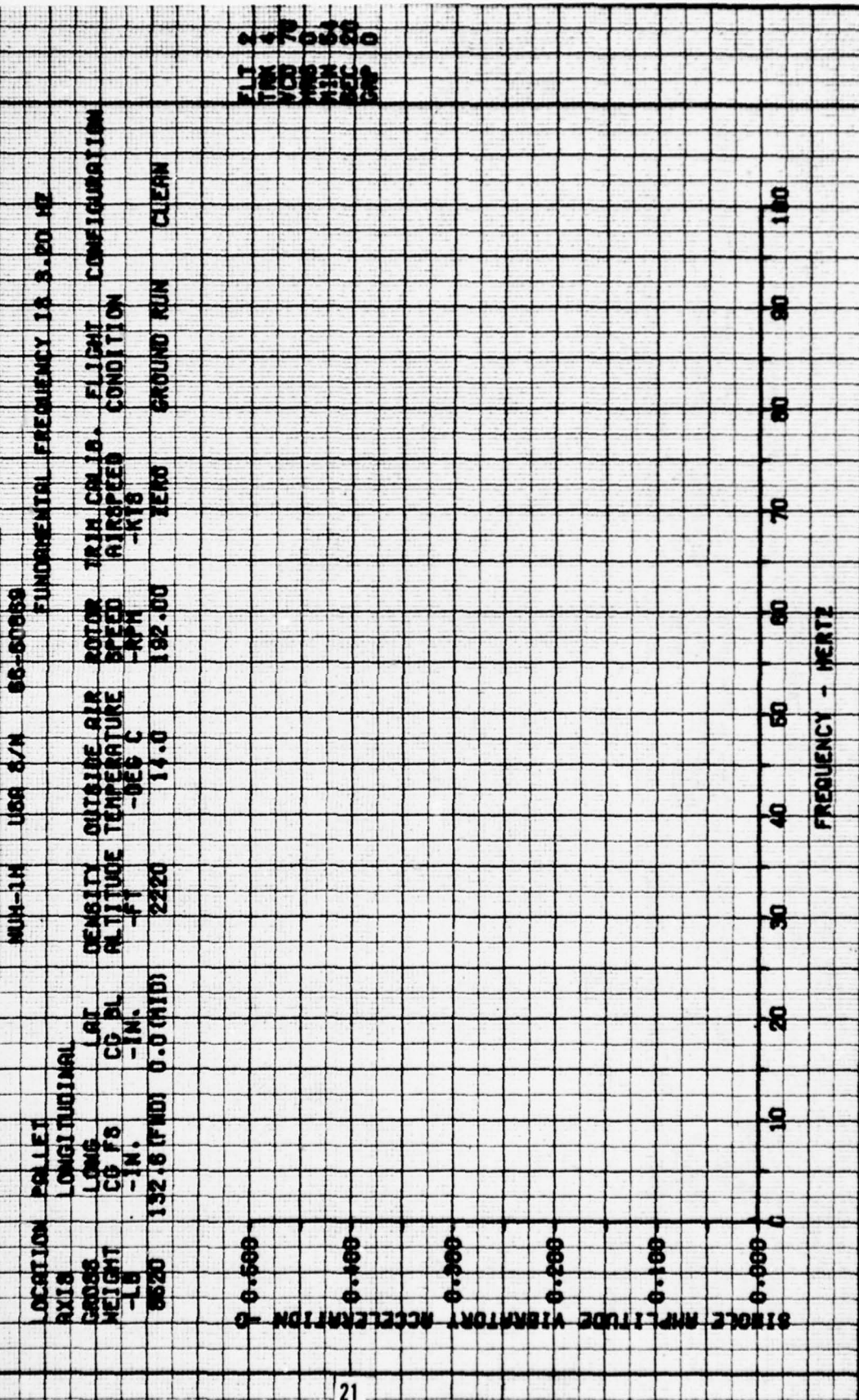
Figure 1. Vibration Data Spectral Analysis Procedure.

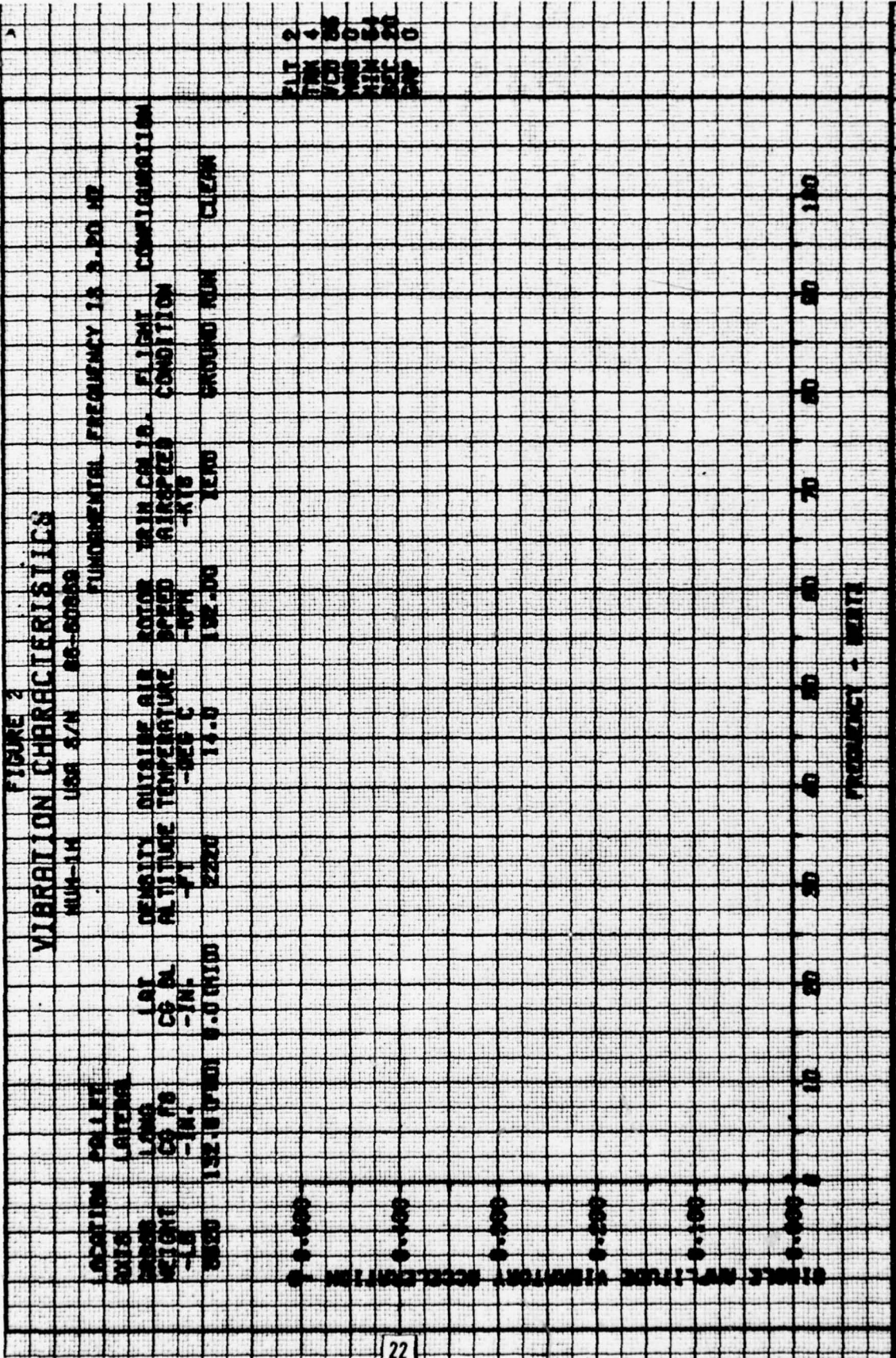
## APPENDIX E. TEST DATA

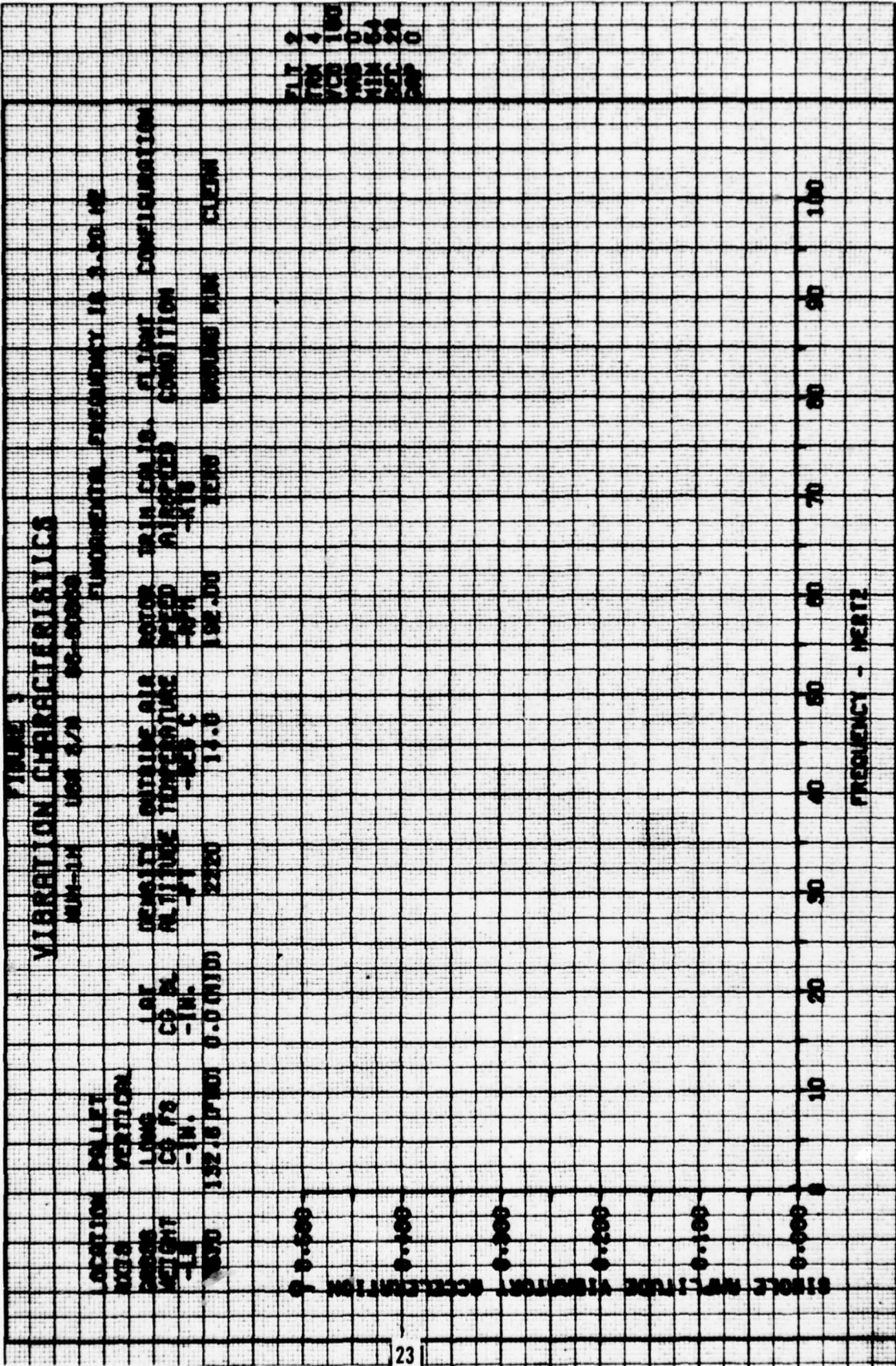
### INDEX

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Nap-of-the-Earth Flight	65 through 96
Level Flight	97 through 112
Climb	113 through 128
Maneuvering Flight	129 through 160
Low-Speed Flight	161

**FIGURE 1**  
**VIBRATION CHARACTERISTICS**







FLT 2  
 STX 1  
 VCS 100  
 WBS 0  
 MIN 04  
 DEL 28  
 END 0

FIGURE 4

VIBRATION CHARACTERISTICS

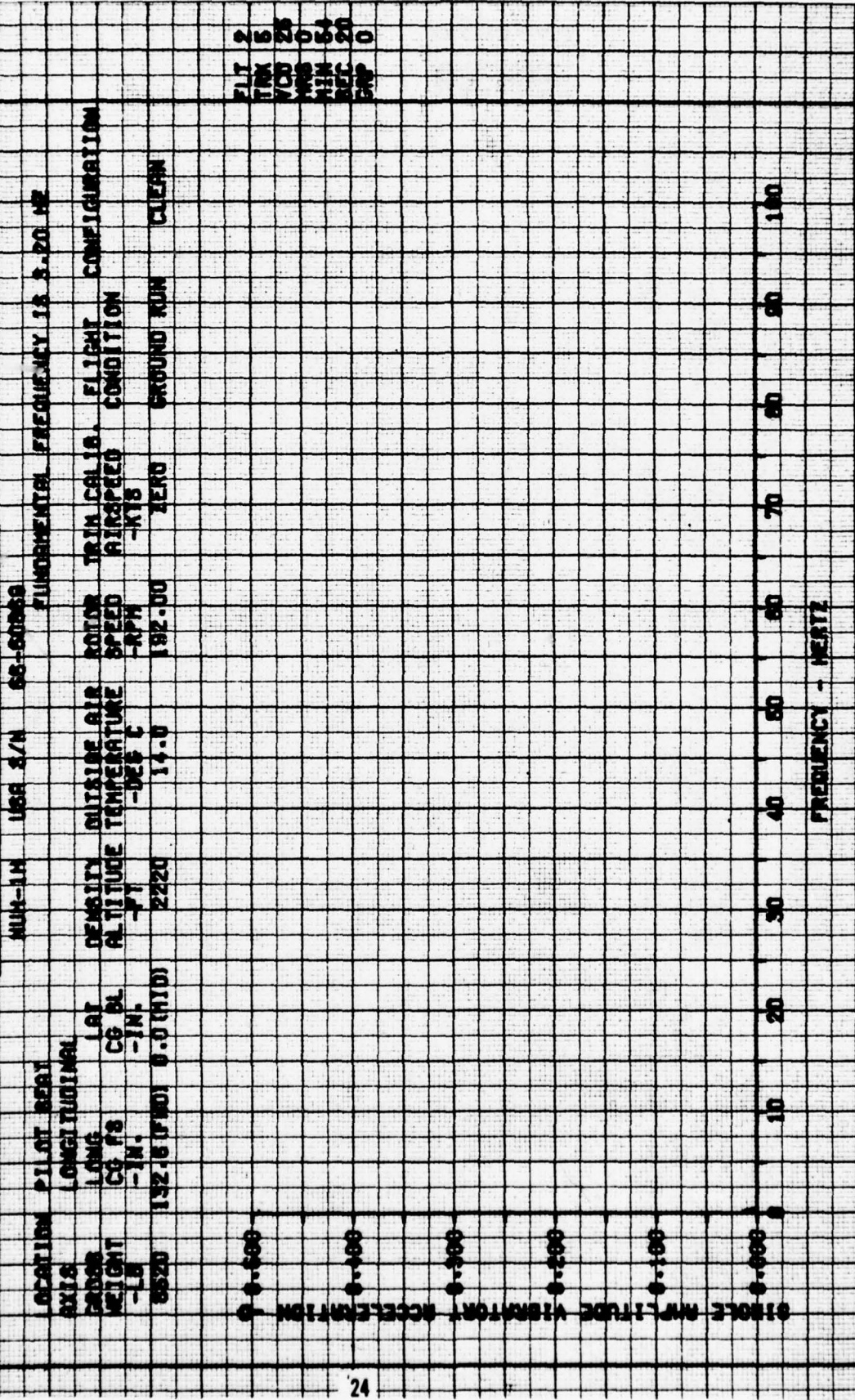


FIGURE 3

VIBRATION CHARACTERISTICS

MU4-14 USA 8/A 66-60869

LOCATION PILOT SEAT  
 AXIS LATERAL  
 CROSS LONG  
 HEIGHT CG FS  
 -LB 8520 152.8 (FWO) 0.0 (HID)

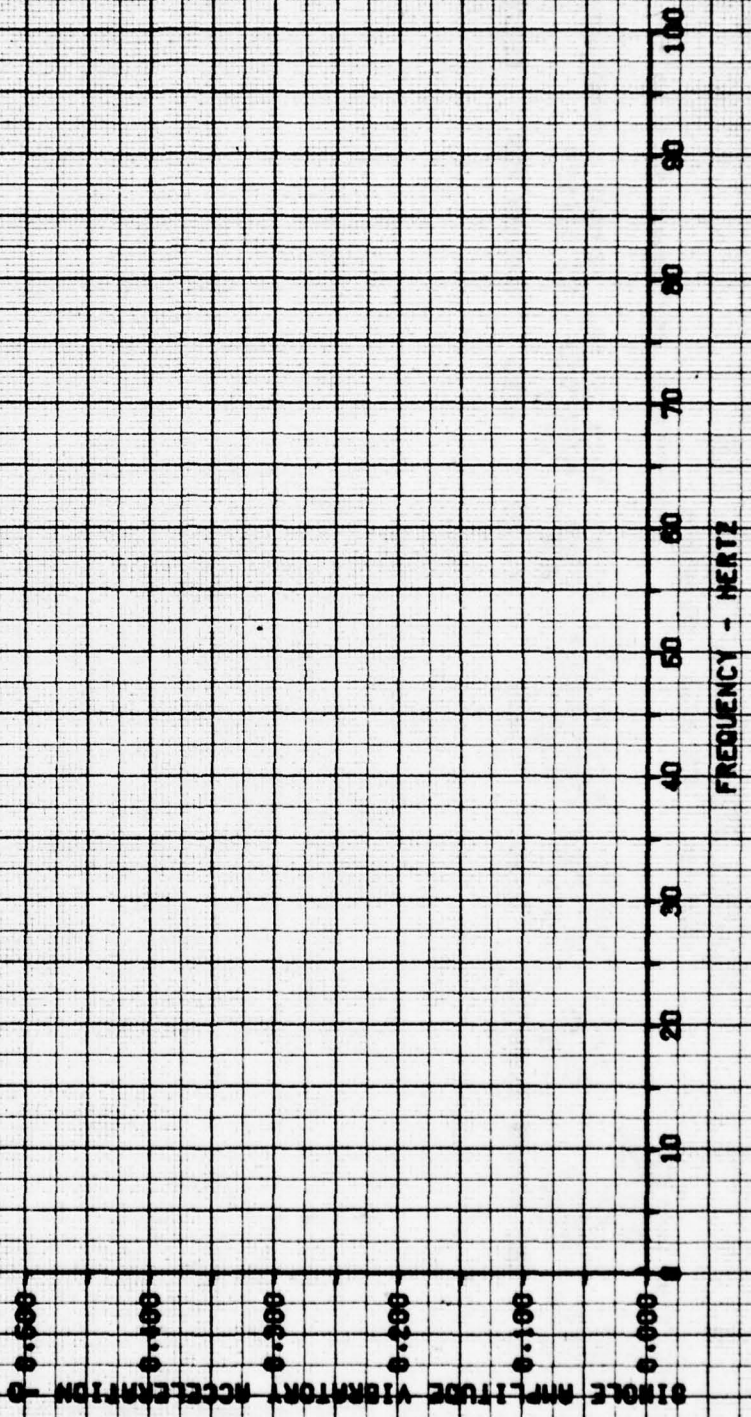
LAT CG SA  
 -IN. 2220

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT COMBINATION  
 ALTITUDE TEMPERATURE SPEED AIRCRAFT CONDITION  
 -FT -DEG C -RPM -KIT

FUNDAMENTAL FREQUENCY IS 3.20 Hz

ZERO GROUND RUN CLEAN

FLT 2  
 TRN 6  
 VCS 48  
 WOB 0  
 HIN 64  
 HIC 24  
 WOP 0



**FIGURE 6**  
**VIBRATION CHARACTERISTICS**

MUM-1M USA 2/M 66-60869

FUNDAMENTAL FREQUENCY IS 3.20 HZ

LOCATION PALET  
AXIS VERTICAL

WEIGHT 8520  
-LB

8520 132.8 (PND) 0.0 (NID)

CG FB  
-IN.

14.0

192.00

ZERO

GROUND RUN

CLEAN

2220

14.0

192.00

ZERO

GROUND RUN

CLEAN

2220

14.0

192.00

ZERO

GROUND RUN

CLEAN

2220

14.0

192.00

ZERO

GROUND RUN

CLEAN

2220

14.0

192.00

ZERO

GROUND RUN

CLEAN

2220

14.0

192.00

ZERO

GROUND RUN

CLEAN

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION

ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION

-FT -DEG C -RPM -KTS

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

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2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

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2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

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2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

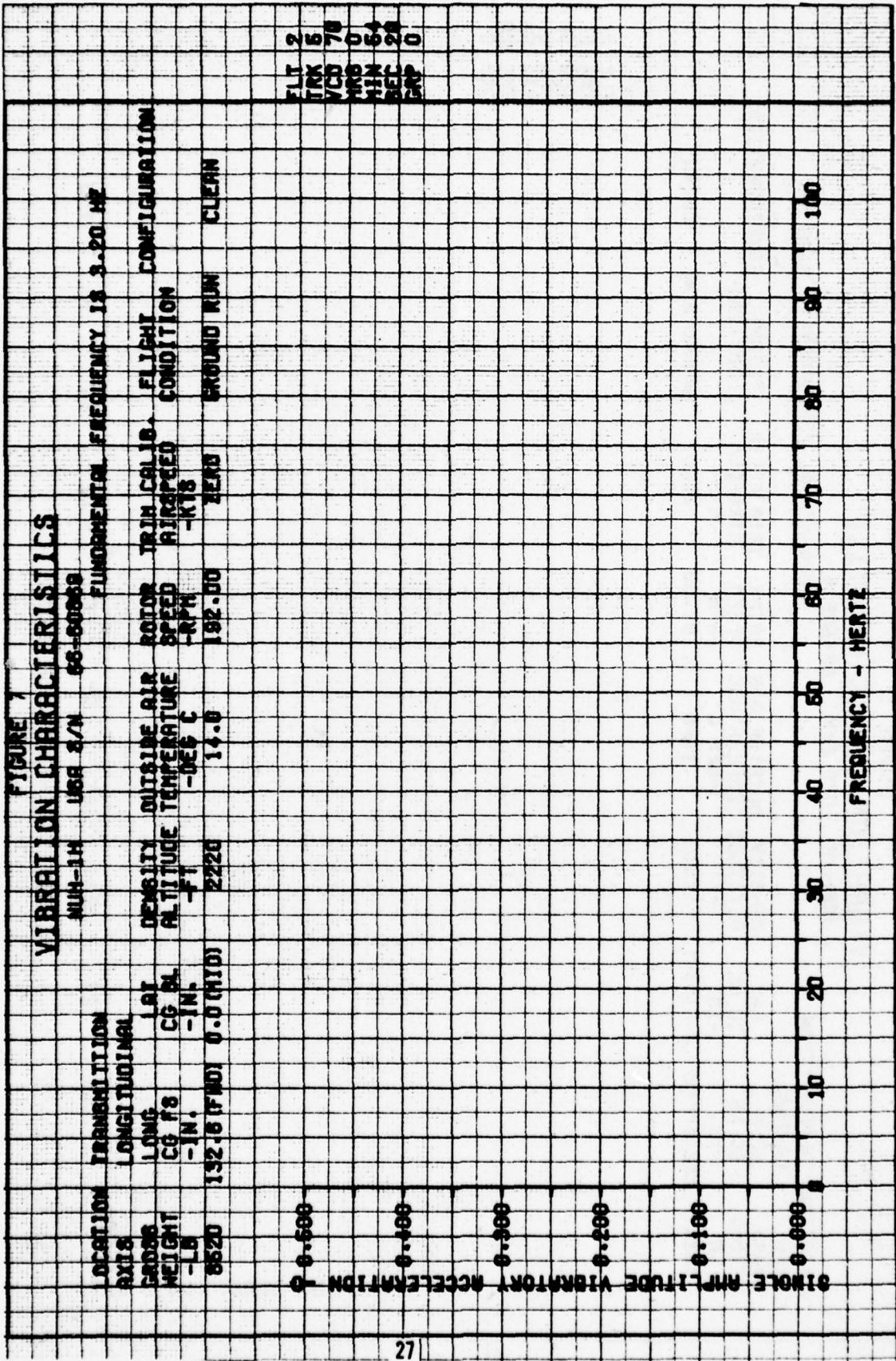
2220 14.0 192.00 ZERO GROUND RUN CLEAN

2220 14.0 192.00 ZERO GROUND RUN CLEAN

FLT 2  
TRK 5  
VCS 55  
MCS 0  
MIN 54  
SEC 20  
END 0

DISHOLE AMPLITUDE VIBRATION ACCELERATION  
0 0.500  
0 0.100  
0 0.200  
0 0.250  
0 0.100  
0 0.500

FREQUENCY - HERTZ



FLT 2  
 TRK 5  
 VCD 70  
 WRS 0  
 MIN 64  
 SEC 28  
 CAP 0

FIGURE 8

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LATERAL  
 CROSS LONG  
 WEIGHT CG F8  
 -IN.  
 8520 192.6 (FWD) 0.0 (MID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2220 14.0 192.00 ZERO GROUND RUN CLEAN

FUNDAMENTAL FREQUENCY IS 3.20 HZ

FLT 2  
 TRK 6  
 VCD 86  
 MKS 0  
 MIN 64  
 SEC 20  
 END 0

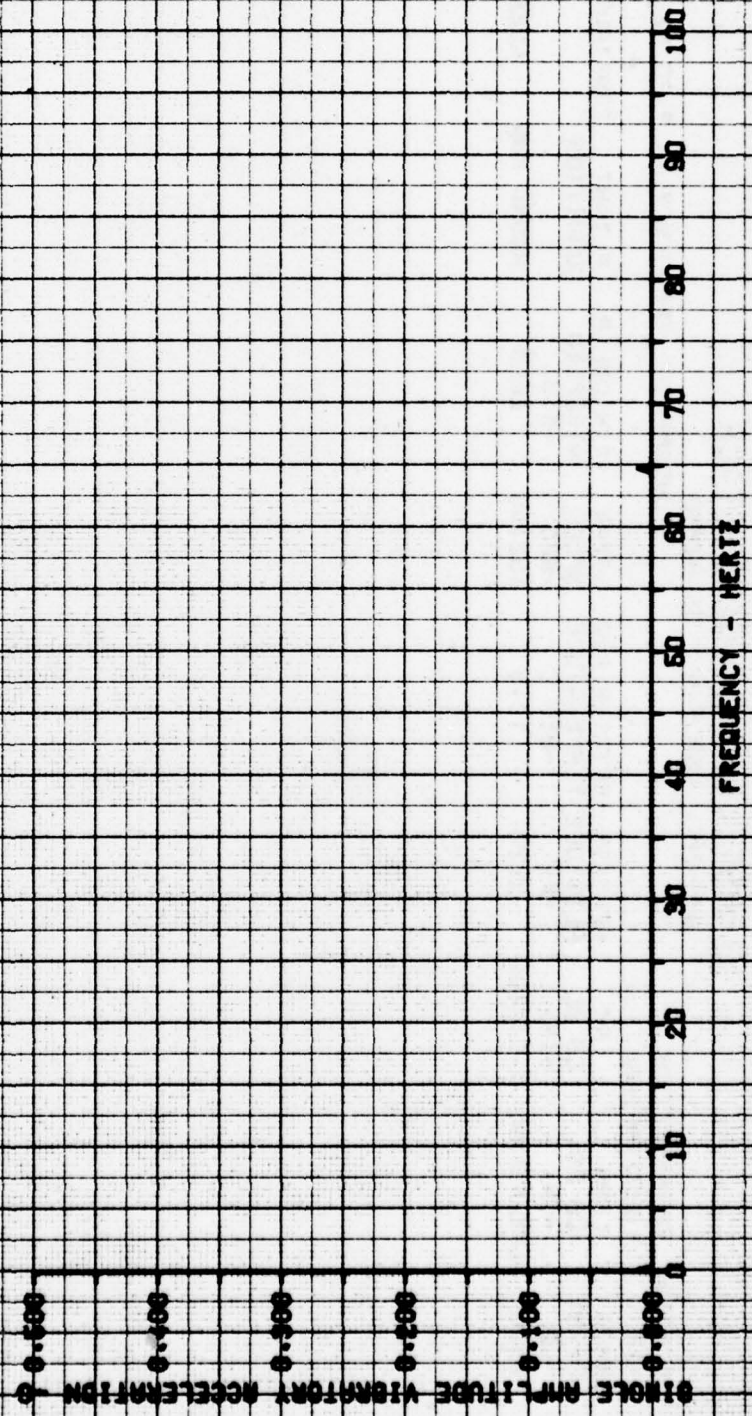
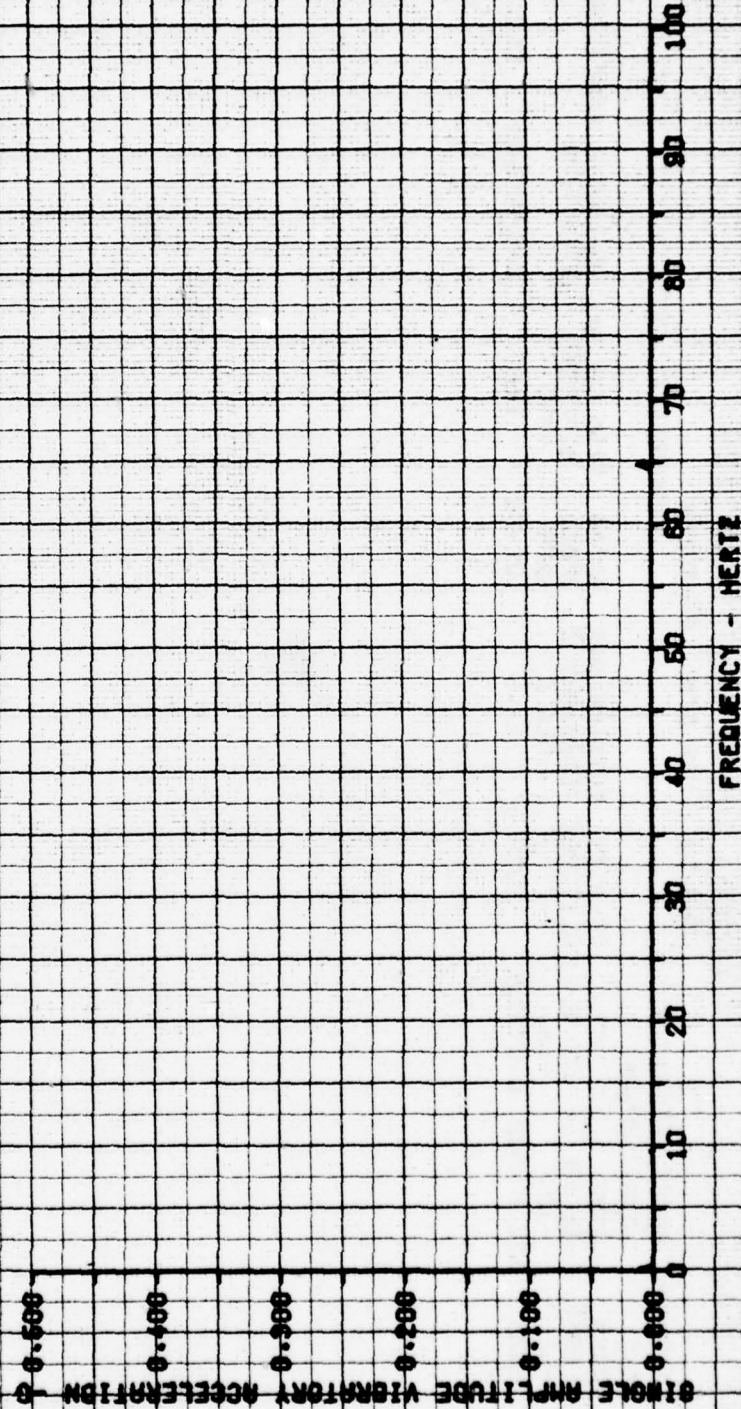


FIGURE 9

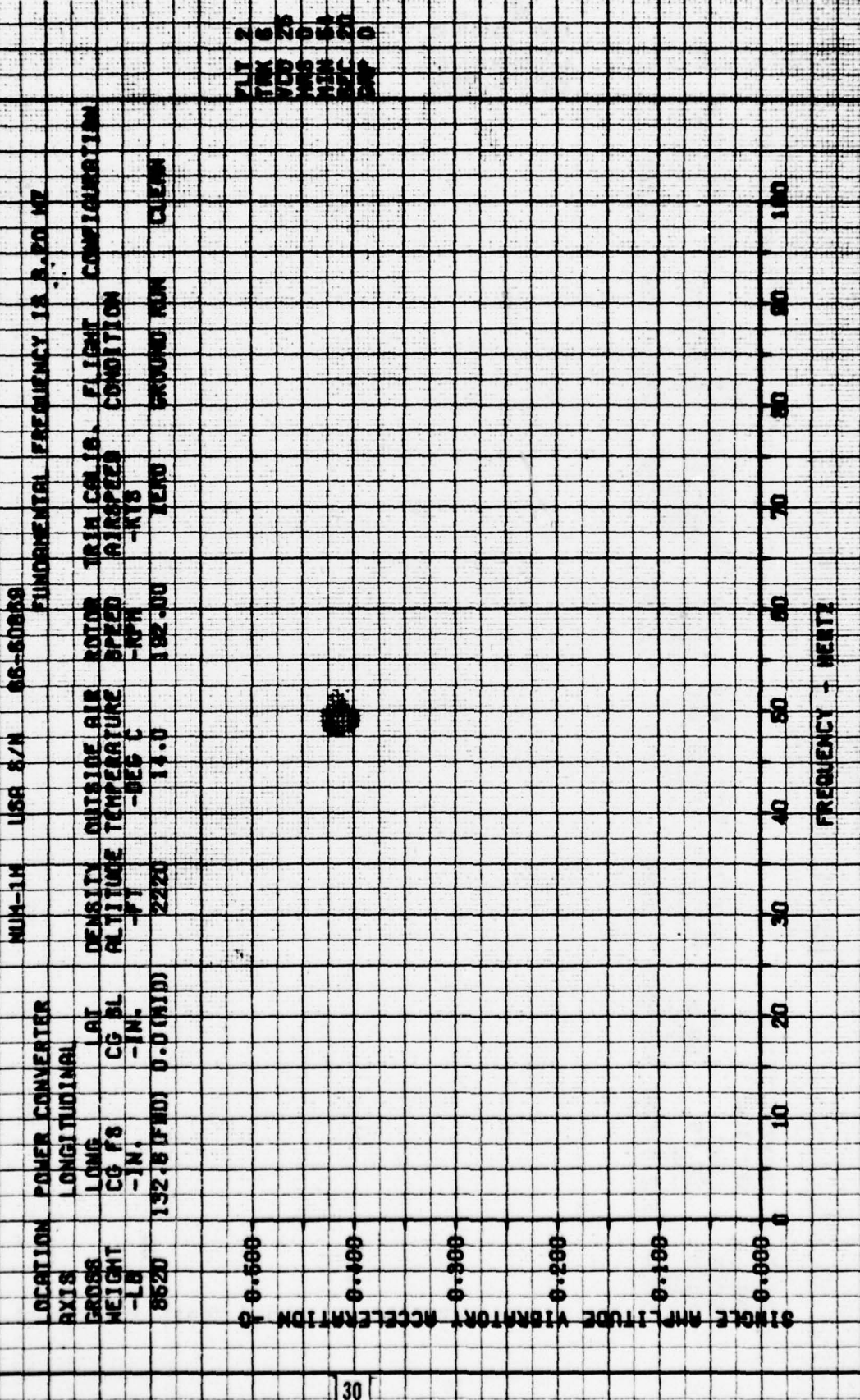
VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 GROSS WEIGHT 8520 132.6 (FWD) 0.0 (HTD)  
 CG FS -1N.  
 CG BL -1N.  
 LAI 2220  
 DENSITY 14.0  
 ALTITUDE TEMPERATURE 192.00  
 -RPM ZERO  
 ROTOR TRIM CALIB. EIGHT CONFIGURATION  
 SPEED AIRSPEED CONDITION  
 -KTS ZERO GROUND RUN CLEAN  
 FUNDAMENTAL FREQUENCY IS 3.20 HZ

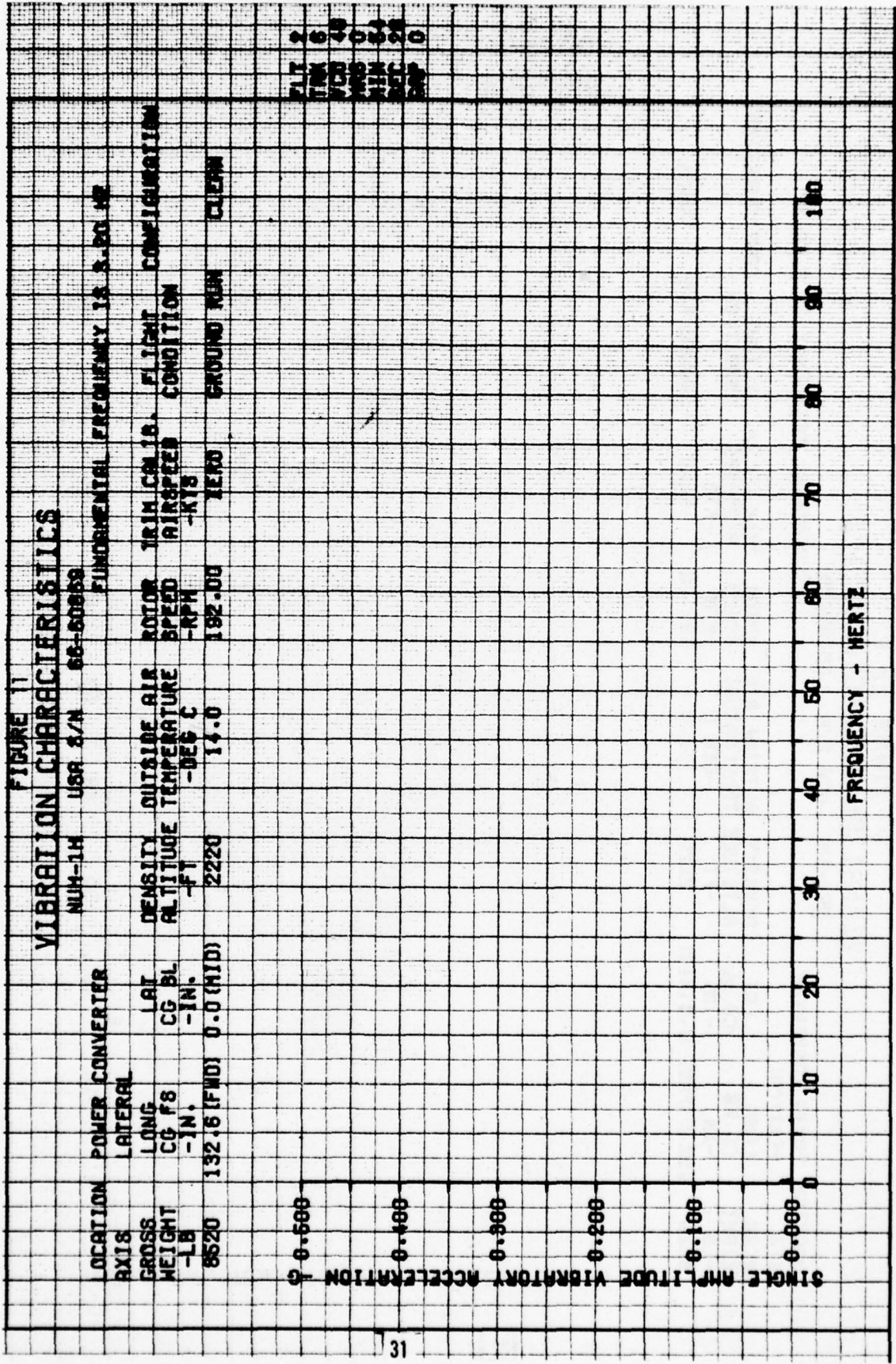
FLT 2  
 TRK 6  
 VCB 100  
 WOB 0  
 MIN 64  
 DEL 20  
 SRS 0



**FIGURE 10**  
**VIBRATION CHARACTERISTICS**



ZLT 2  
 TPK 6  
 VDO 28  
 VMS 0  
 MIN 54  
 SEC 20  
 DWP 0



PLT 2  
 TPA 6  
 VCA 48  
 MAG 0  
 MIN 84  
 SEC 24  
 SWP 0

FIGURE 12

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS VERTICAL  
 ORDER LONG  
 WEIGHT CG FS  
 -IN.  
 3520 132.15 (PMO) 0.0 (HID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2220 14.0 192.00 ZERO GROUND RUN CLEAN

FUNDAMENTAL FREQUENCY IS 3.20 HZ

FLT 2  
 TRK 6  
 WCD 56  
 MNS 0  
 MIN 54  
 SEC 20  
 GRP 0

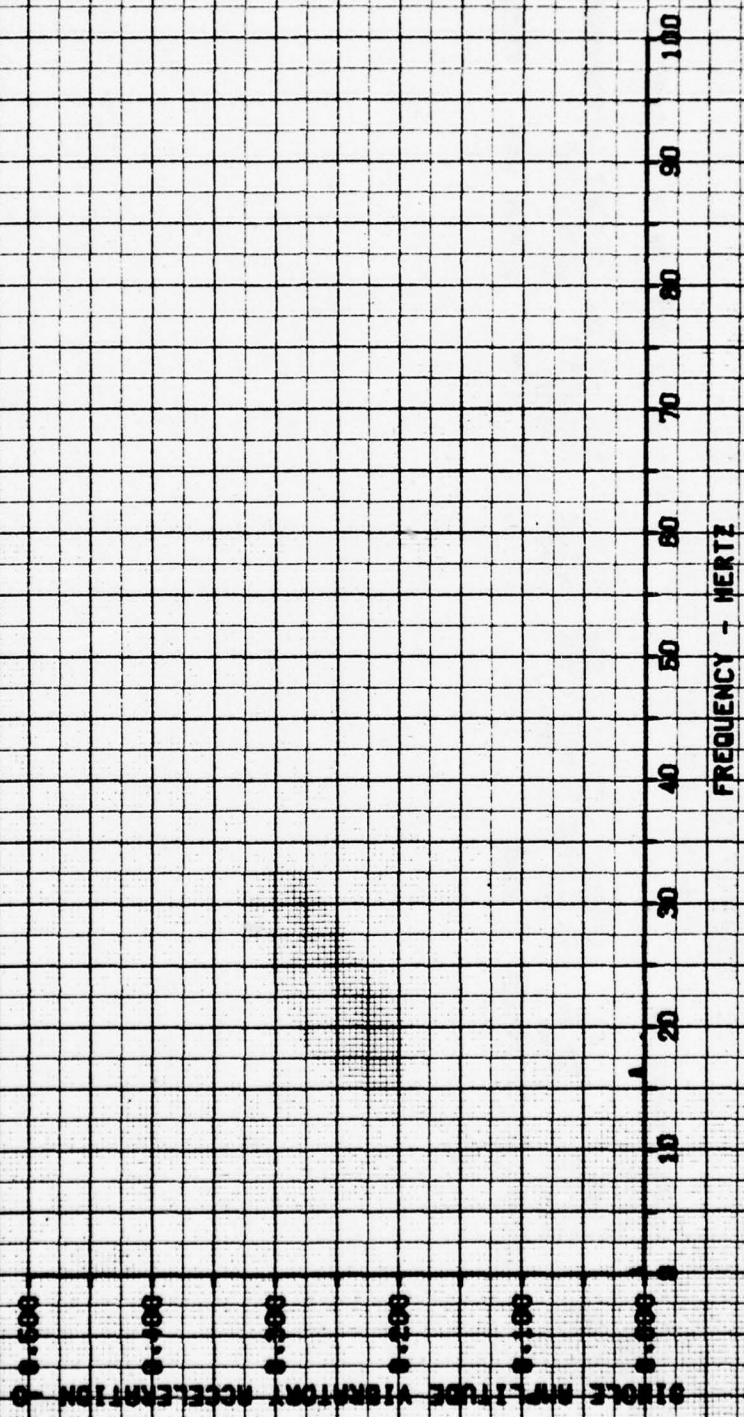


FIGURE 13

VIBRATION CHARACTERISTICS

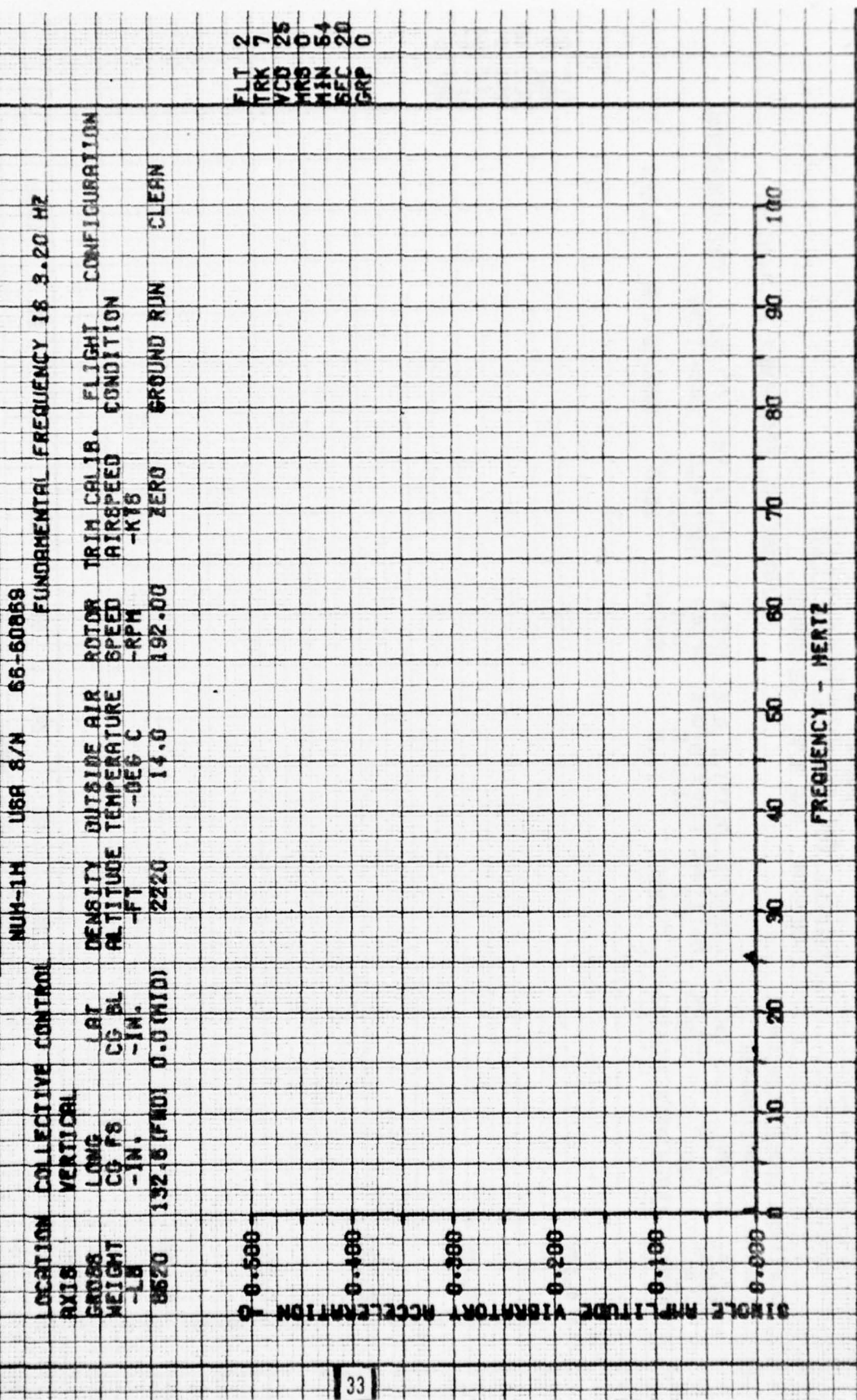


FIGURE 14

VIBRATION CHARACTERISTICS

LOCATION CYCLIC CONTROL  
 AXIS LONGITUDINAL  
 FLOOR LONG LAT  
 WEIGHT CG FS CG BL  
 -LB -IN. -IN.  
 3520 132.5 (FWD) 0.0 (MID) 2220  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2220 14.0 192.0J ZERO GROUND RUN CLEAN  
 FUNDAMENTAL FREQUENCY IS 3.20 HZ

FLT 2  
 TRK 7  
 VCO 40  
 MRS 0  
 MIN 54  
 SEC 20  
 DWP 0

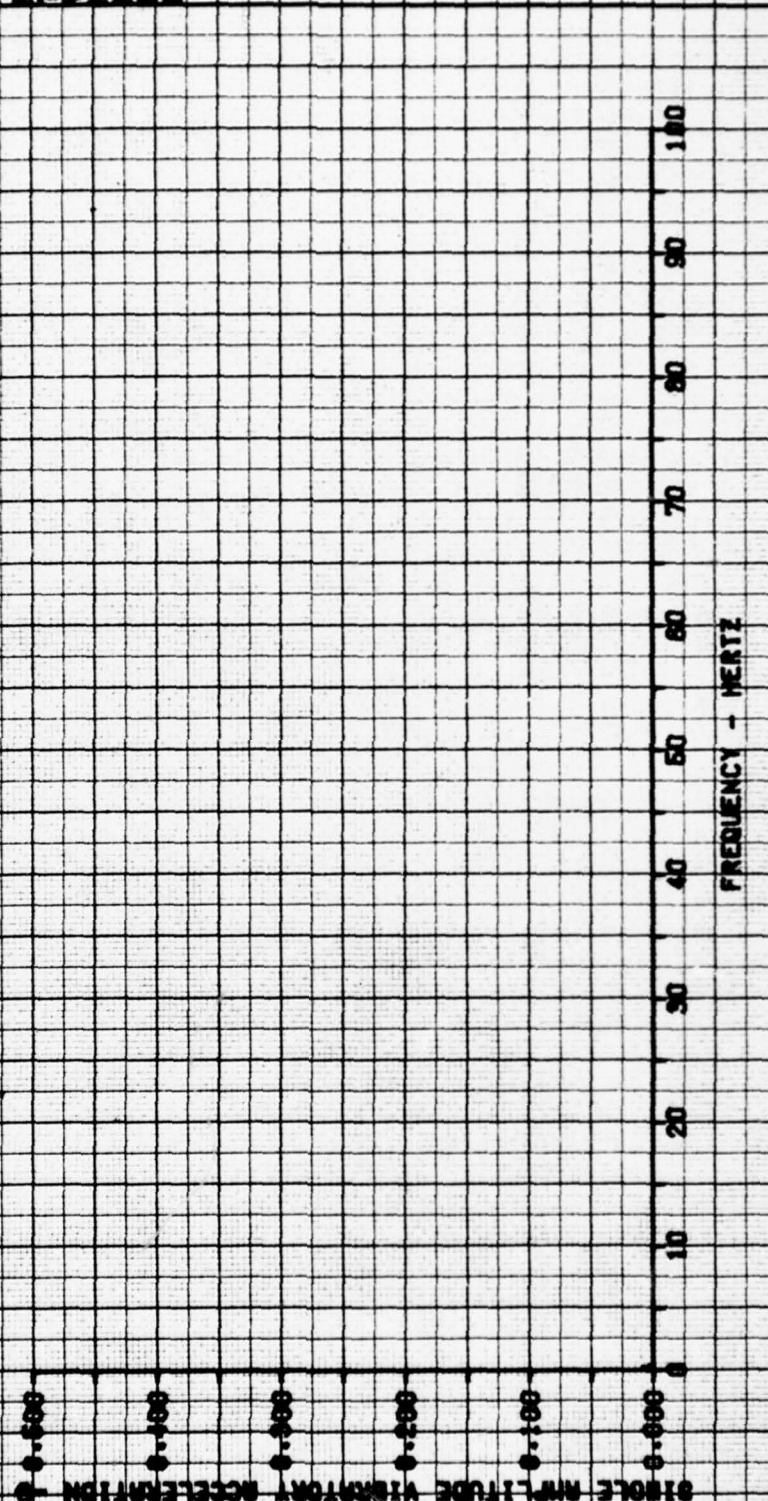


FIGURE 15

VIBRATION CHARACTERISTICS

LOCATION CYCLIC CONTROL  
 AXIS LATERAL  
 CROSS LONG  
 WEIGHT CG FS  
 -LB -IN.  
 8520 132.6 (FWD) 0.0 (HD)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPH -KTS  
 2220 14.0 192.00 ZERO GROUND RUN CLEAN

NUM-14 USA 2/N 66-60868 FUNDAMENTAL FREQUENCY IS 3.20 HZ

FLT 2  
 TRK 7  
 VCO 66  
 WTS 0  
 MIN 84  
 DEL 20  
 CAP 0

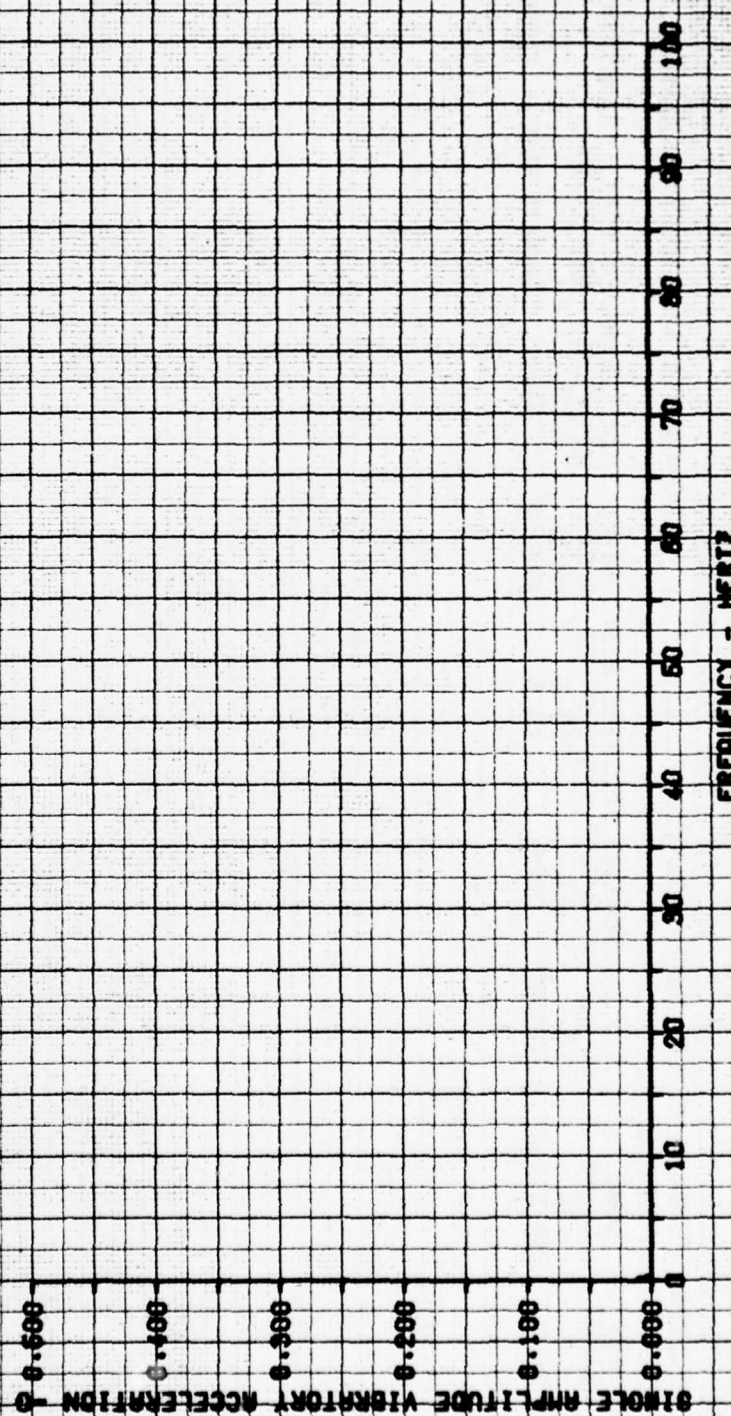
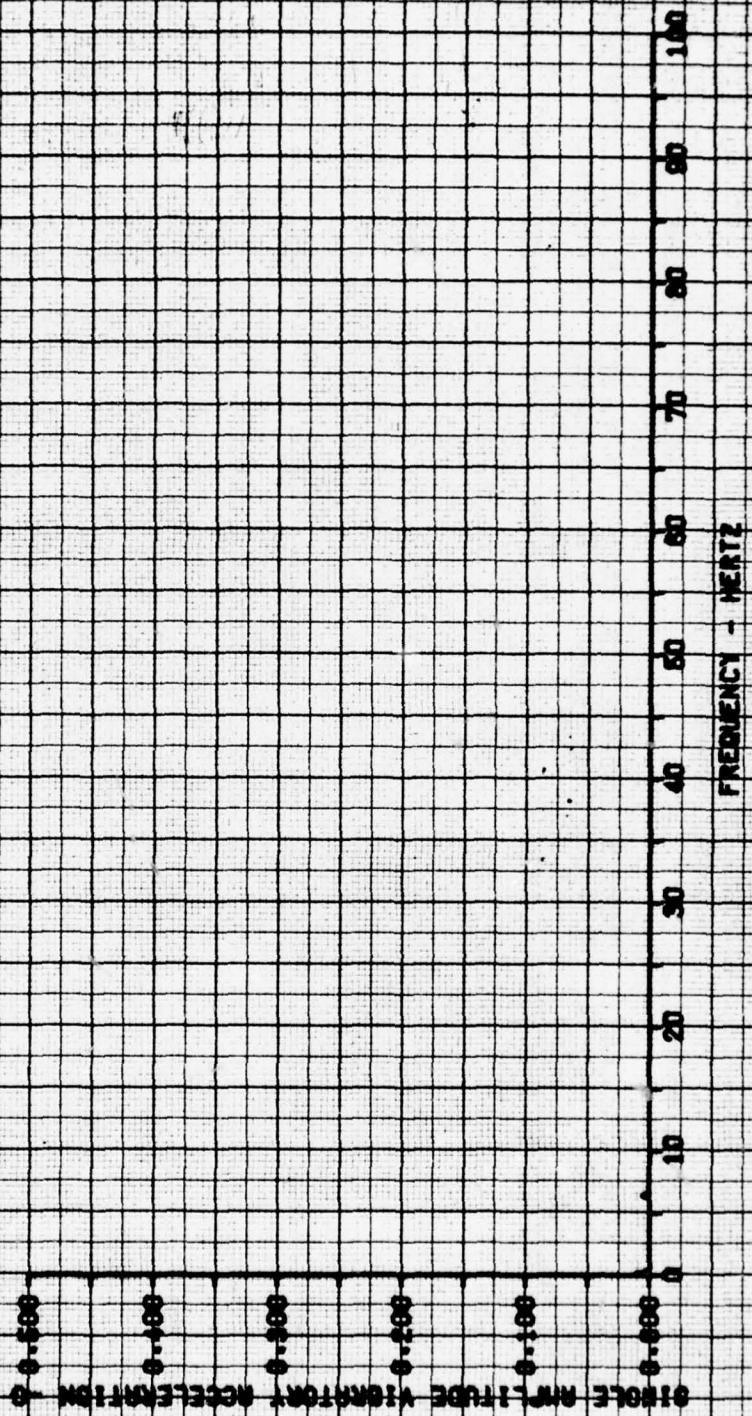


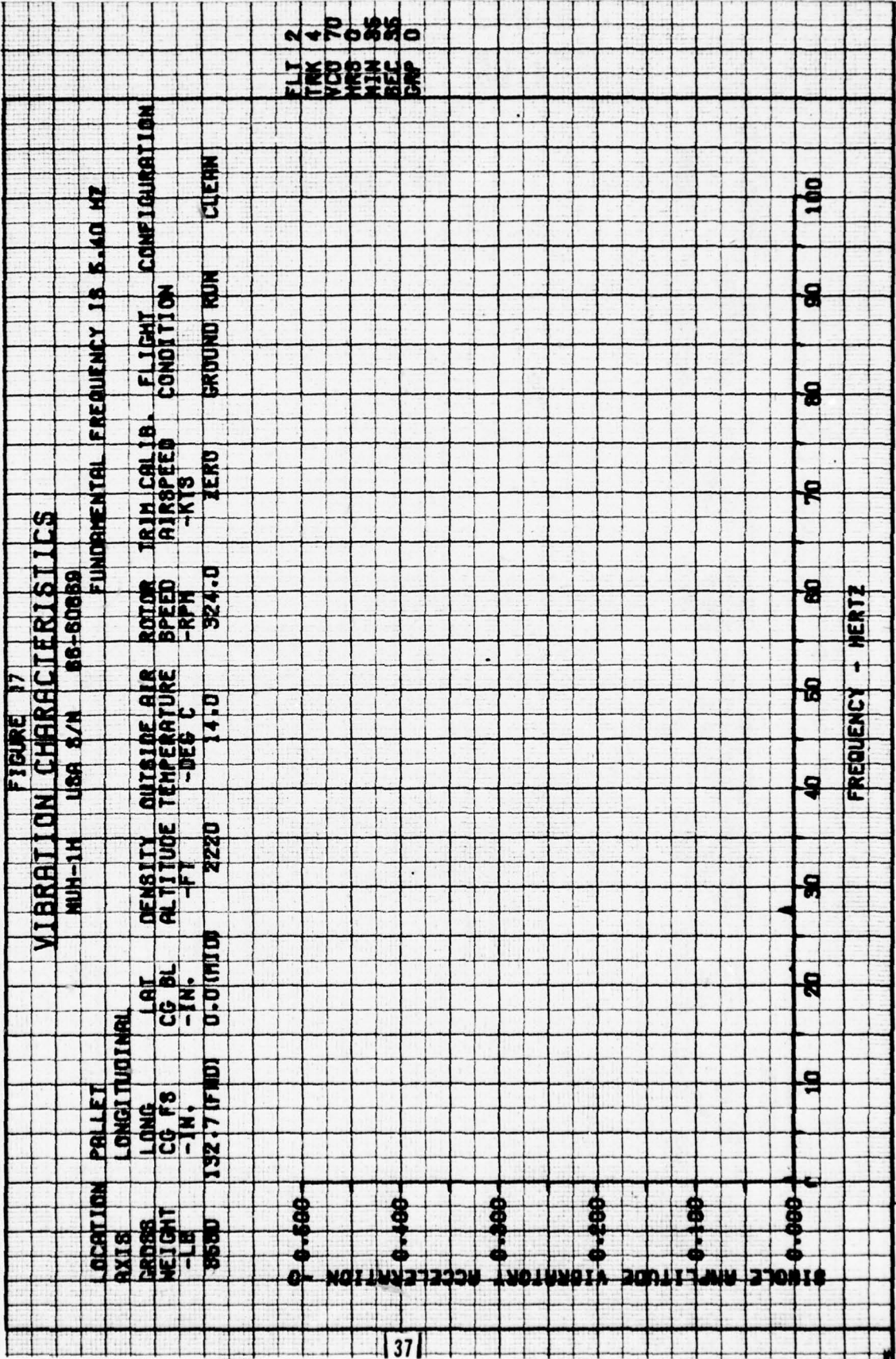
FIGURE 16

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 FLOOR LONG  
 WEIGHT CG FS  
 -IN.  
 8520 132.8 (FWD) 8.0 (A100)  
 DIM-IN UBR 2/N 86-80868  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2220 14.0 192.00 ZERO GROUND RUN CLEAR  
 FUNDAMENTAL FREQUENCY IS 3.20 HZ

FLT 2  
 FMA 7  
 FCS 70  
 MGS 0  
 MIN 64  
 SEC 28  
 DRP 0





FLT 2  
TRK 4  
VCO 70  
MRO 0  
MIN 86  
REC 26  
GRP 0

FIGURE 18

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS LATERAL  
 WEIGHT 8620 LB  
 CO FS -12.7 (FWD)  
 CO BL -12.7 (AFT)  
 CO RL 0.0 (MID)  
 LAT 0.0 (MID)  
 CO BL -12.7 (AFT)  
 ALTITUDE 2220 FT  
 TEMPERATURE -14.0 DEG C  
 OUTSIDE AIR SPEED 324.0 KTS  
 ROTOR SPEED 324.0 RPM  
 TRIM CALIB. ZERO  
 FLIGHT CONDITION CLEAN  
 FUNDAMENTAL FREQUENCY 18.5-140 HZ

FLT 2  
 TRK 4  
 VCO 86  
 MAG 0  
 MIN 96  
 SEC 36  
 CRP 0

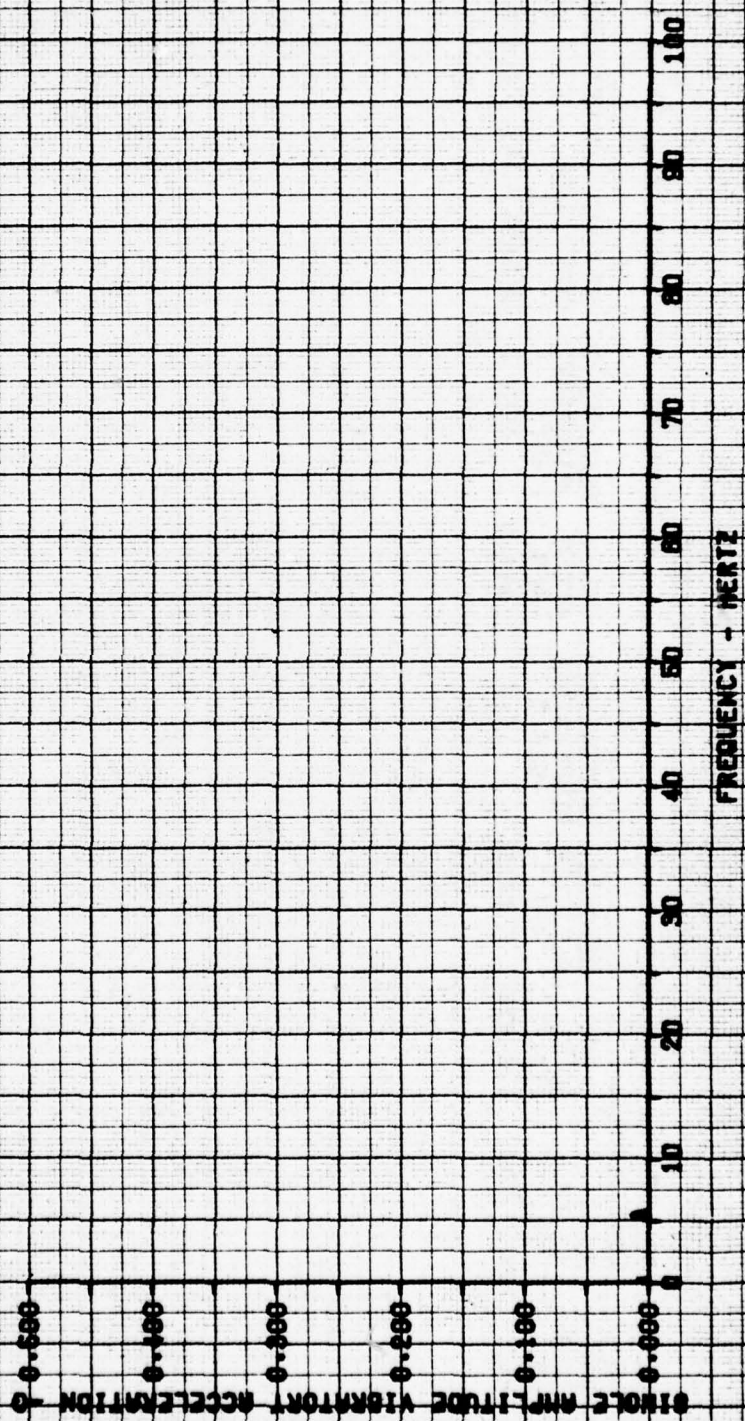
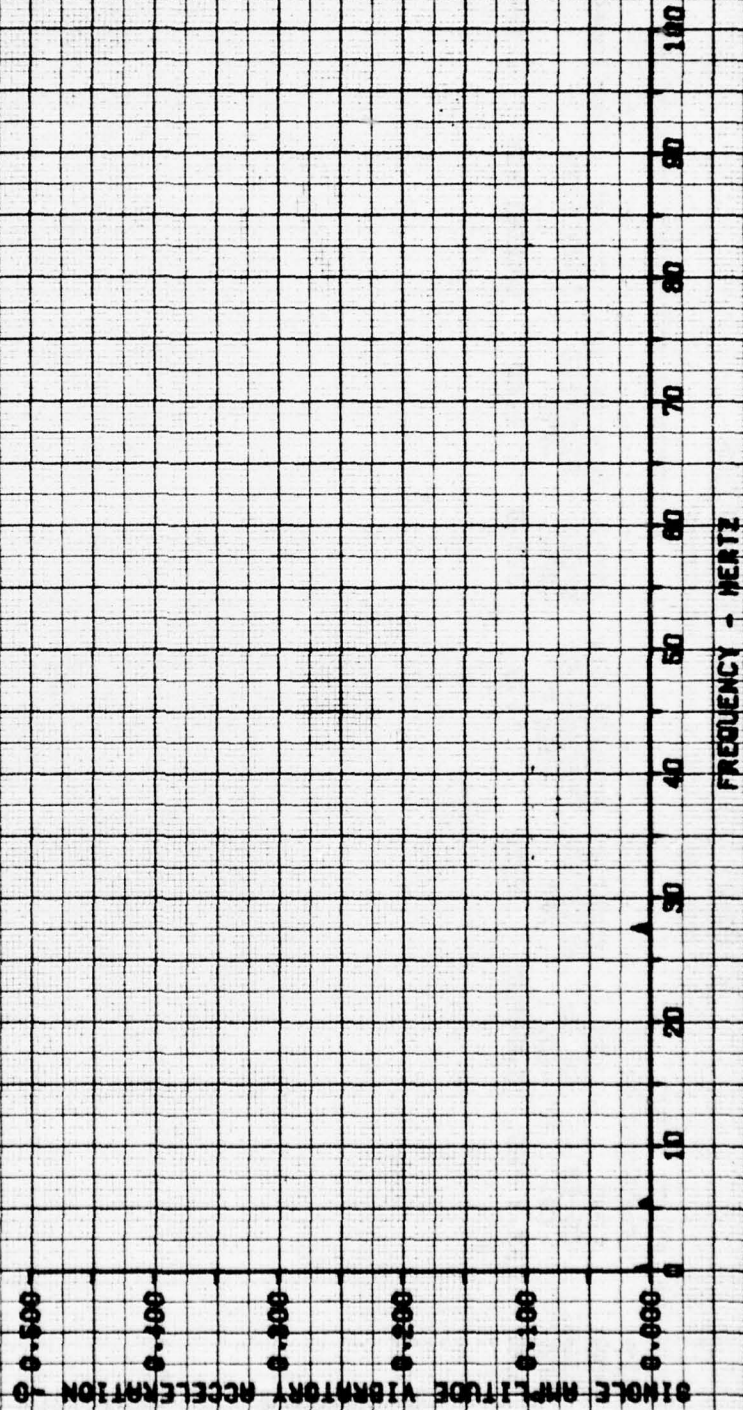


FIGURE 19

VIBRATION CHARACTERISTICS

MUH-1H USA 4/N 88-80889

LOCATION PALLET  
 AXIS VERTICAL  
 CROSS WEIGHT  
 -LB 8800  
 LONG CO FS 132.7 (FWD)  
 -IN. 0.0 (MID)  
 CO BL -IN. 0.0 (MID)  
 LAI 0.0 (MID)  
 DENSITY 2220  
 ALTITUDE -FT 14.0  
 OUTSIDE AIR TEMPERATURE -DEG C 324.0  
 ROTOR SPEED -RPM ZERO  
 IRM CALIB. AIRSPEED -KTS ZERO  
 FLIGHT CONDITION GROUND RUN  
 CONFIGURATION CLEAN



FLT 2  
 TRK 4  
 VCS 100  
 MMS 0  
 MIN 55  
 REC 55  
 SWP 0

FIGURE 20

VIBRATION CHARACTERISTICS

LOCATION	PILOT SEAT	NUM-14	USA 2/N	88-60869	FUNDAMENTAL FREQUENCY IS 5.10 HZ
AXIS	LONGITUDINAL	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION
FROM	LONG	ALTITUDE	TEMPERATURE	SPEED	CONDITION
WEIGHT	CG FS	-FT	-DEG C	-RPH	-KTS
	-IN.	2220	14.0	324.0	ZERO
	132.7 (FWD)	0.0 (DOWN)			GROUND RUN
					CLEAN

ZLT 2  
 TRA 5  
 VCO 25  
 HRS 0  
 MIN 35  
 SEC 35  
 DRP 0

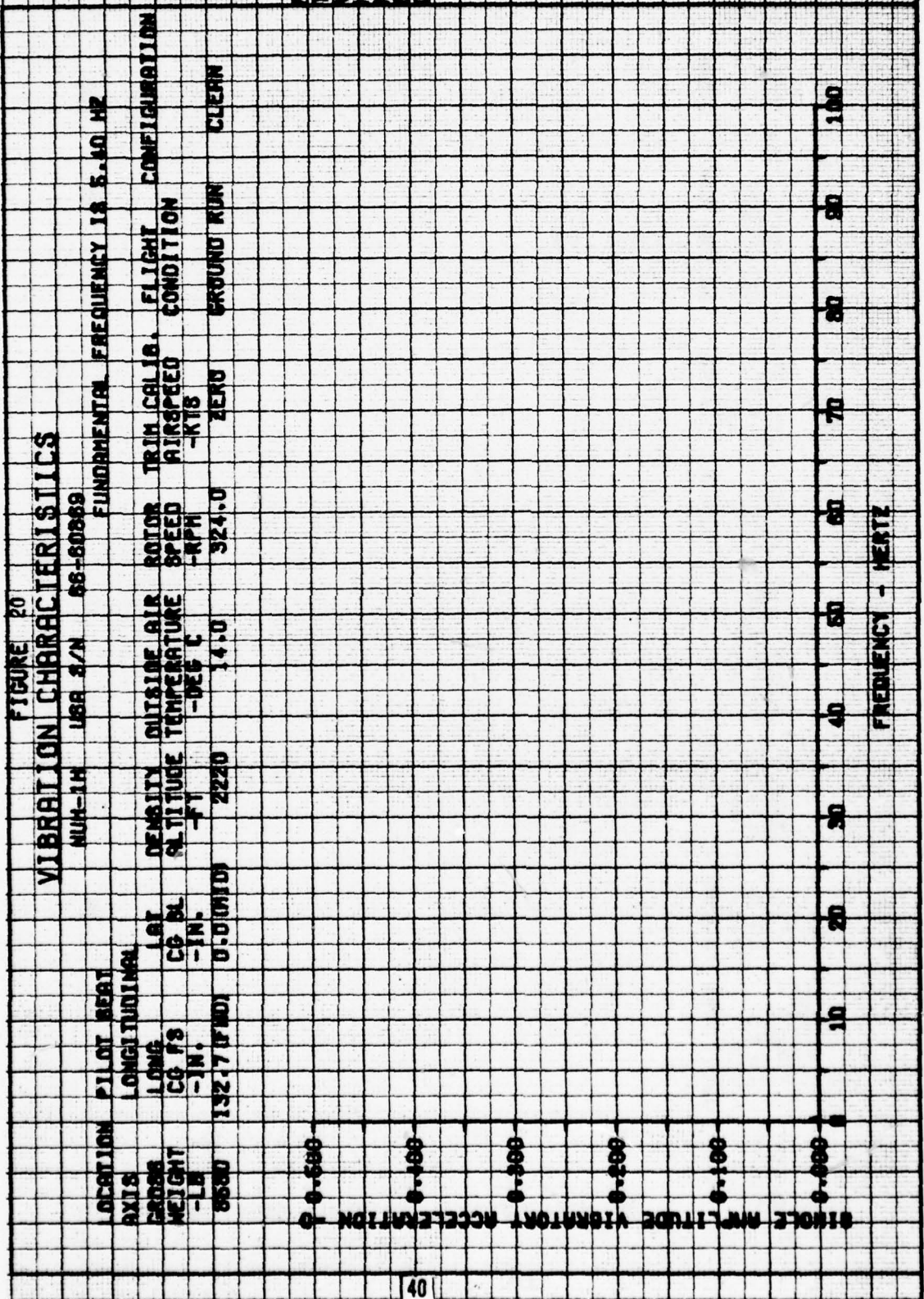


FIGURE 21

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LATERAL  
 GROSS WEIGHT 8550  
 CG FB 152.7 (FWD)  
 CG BL -IN.  
 LAT CG BL U-D (MID)  
 DENSITY 2220  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE 14.0  
 -DEG C  
 ROTOR SPEED 324.0  
 -RPM  
 IRIM CALIB. ZERO  
 FLIGHT CONFIGURATION CLEAN  
 AIRSPEED -KTS  
 GROUND RUN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

ZLT 2  
 TANK 5  
 VCO 40  
 AWS 0  
 MIN 30  
 SEC 30  
 SWP 0

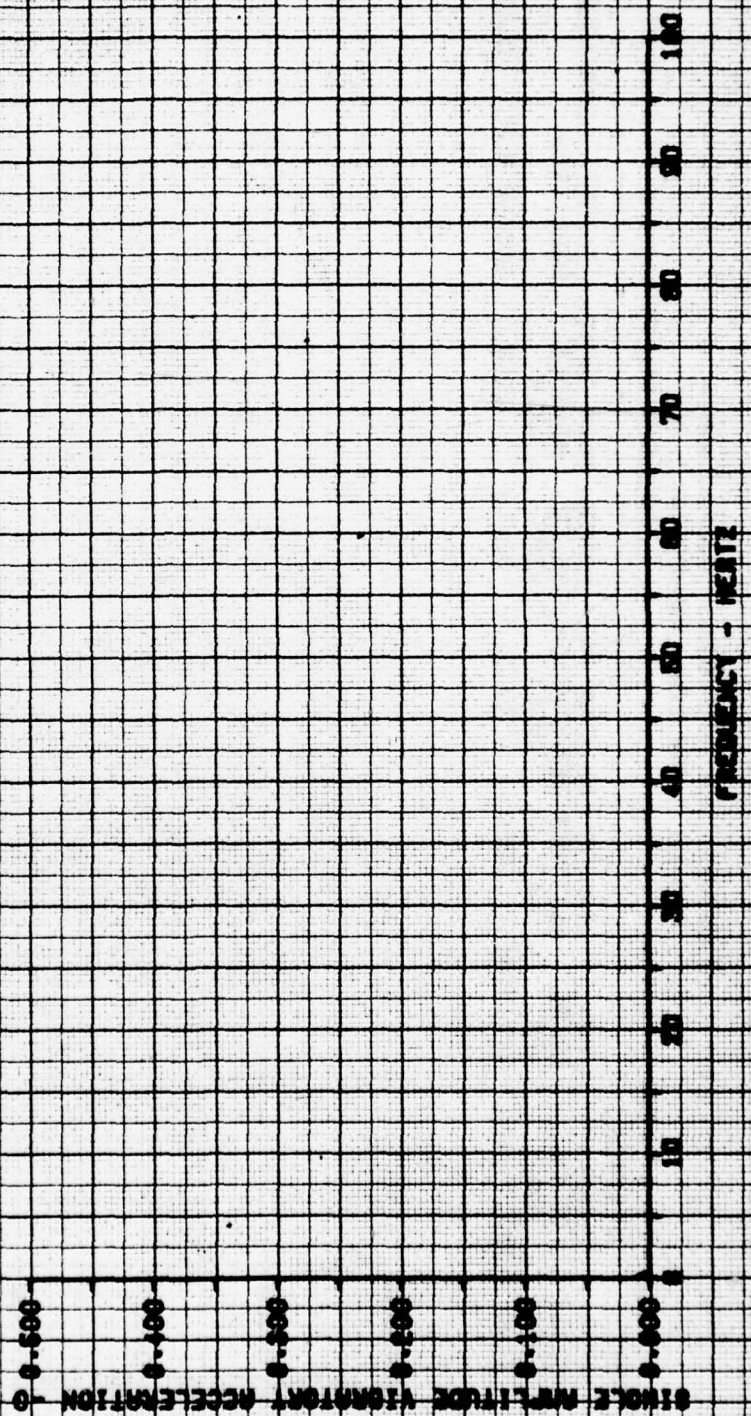


FIGURE 22

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS VERTICAL  
 WEIGHT 132.7 (LBS)  
 CG FB -IN.  
 CG BL -IN.  
 LAT 0.0 (10 IN)  
 DENSITY 2220  
 ALTITUDE 14.0  
 OUTSIDE AIR SPEED 324.0  
 AIRSPEED -RPH  
 TRIM CALIB. ZERO  
 FLIGHT CONDITION GROUND RUN  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 2  
 TRK 5  
 YCD 55  
 MRD 0  
 MIN 55  
 RET 55  
 CAP 0

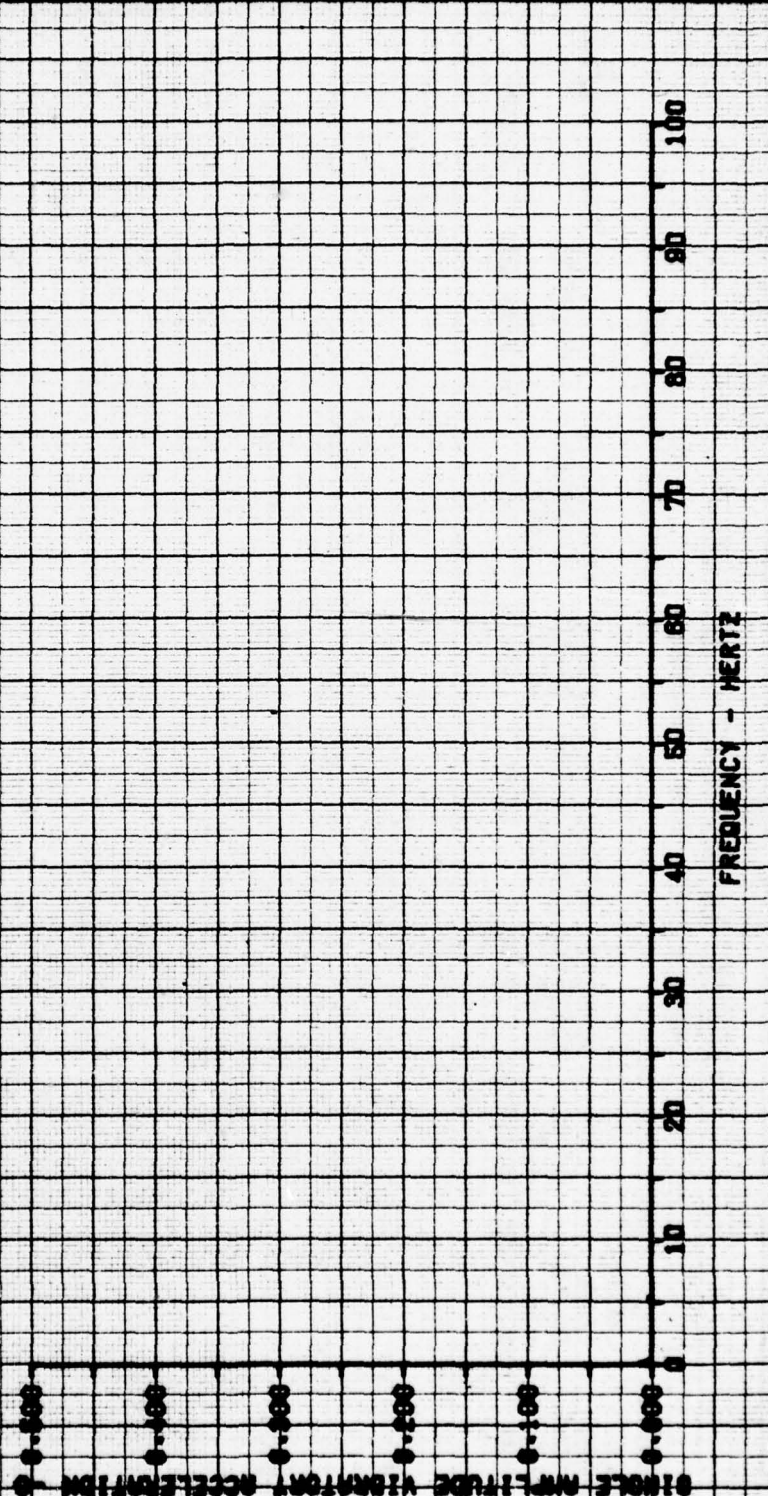


FIGURE 23

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LONGITUDINAL  
 CROSS LONG LAY  
 WEIGHT CO FB CO DL  
 -LB -IN. -IN.  
 8500 132.7(FND) 0.0(MID) 2220 14.0 2270 2270 2270 2270 2270 2270  
 DENSITY OUTSIDE AIR DENSE TRM CALS. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE WIND AIRSPEED CONDITION  
 -FT -26.0 C -1074 -KTS  
 FUNDAMENTAL FREQUENCY IS 3.10 HZ  
 WINDING RUN CLEW

217 2  
 218 3  
 219 74  
 220 0  
 221 36  
 222 0

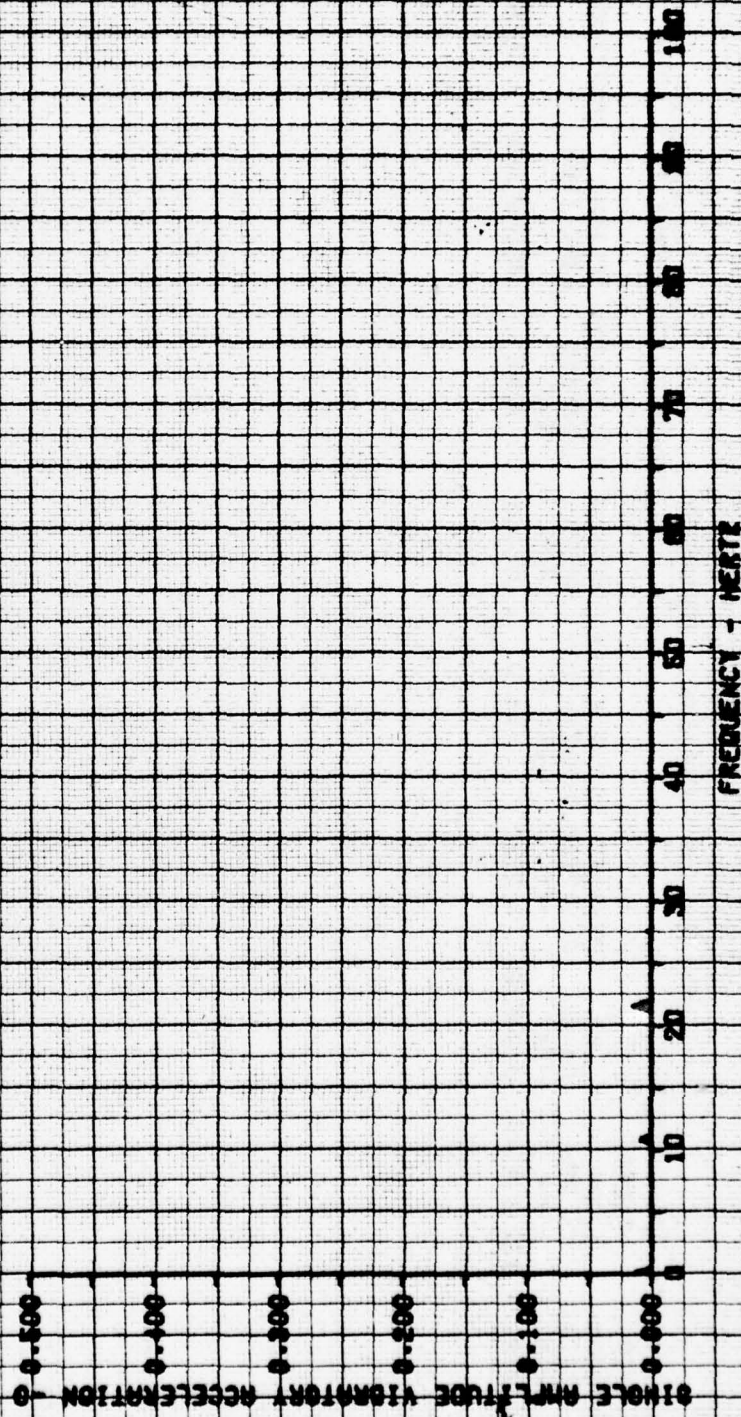


FIGURE 24

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LATERAL  
 GROSS WEIGHT -LB 3680  
 LONG CG FB -IN 152.7 (FWD)  
 LAT CG BL -IN 0.0 (AHD)  
 DENSITY ALTITUDE TEMPERATURE -FT 2220  
 OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 TEMPERATURE SPEED -DEG C 14.0 324.0 ZERO  
 -IN. -KTS -KTS  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ  
 GROUND RUN CLEAN

FLT 2  
 TRX 5  
 VCU 85  
 MRB 0  
 MIN 95  
 SEC 35  
 CRP 0

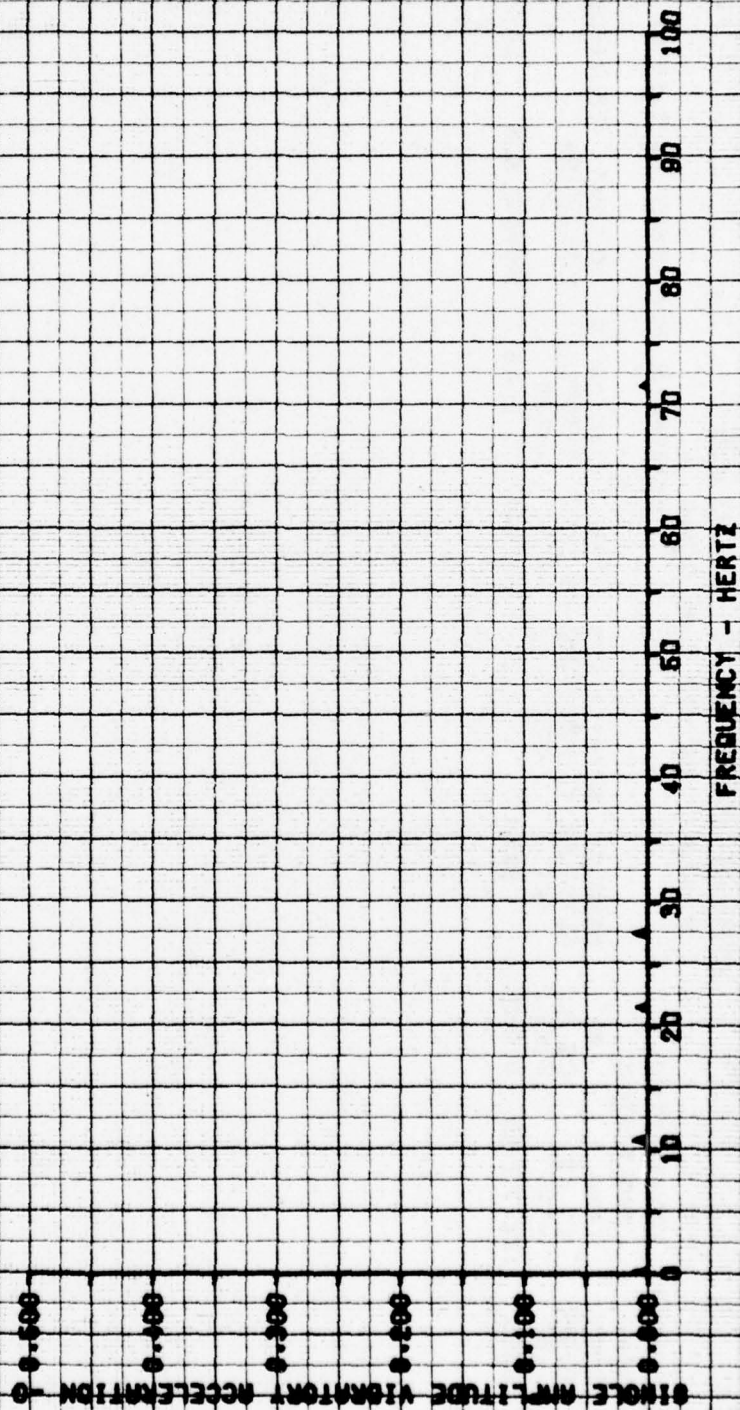


FIGURE 25

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 GROSS WEIGHT 8580  
 CG FB 132.7 (FWD)  
 CG FL -2IN.  
 CG BL 0.0 (MID)  
 DENSITY 14.0  
 ALTITUDE 2220  
 OUTSIDE AIR SPEED 324.0  
 AIR TEMPERATURE -14.0  
 TRIM CALIB. ZERO  
 FLIGHT CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 3.10 HZ

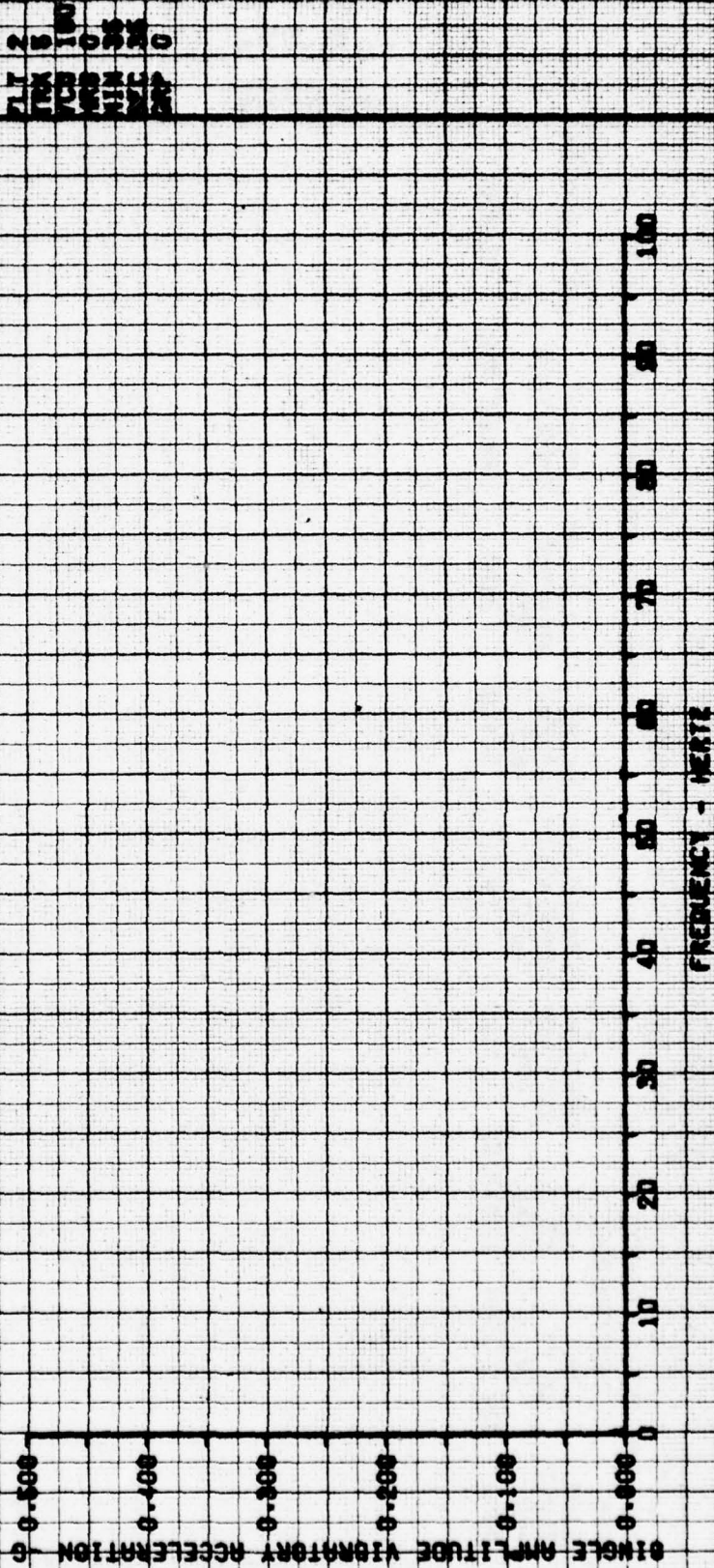
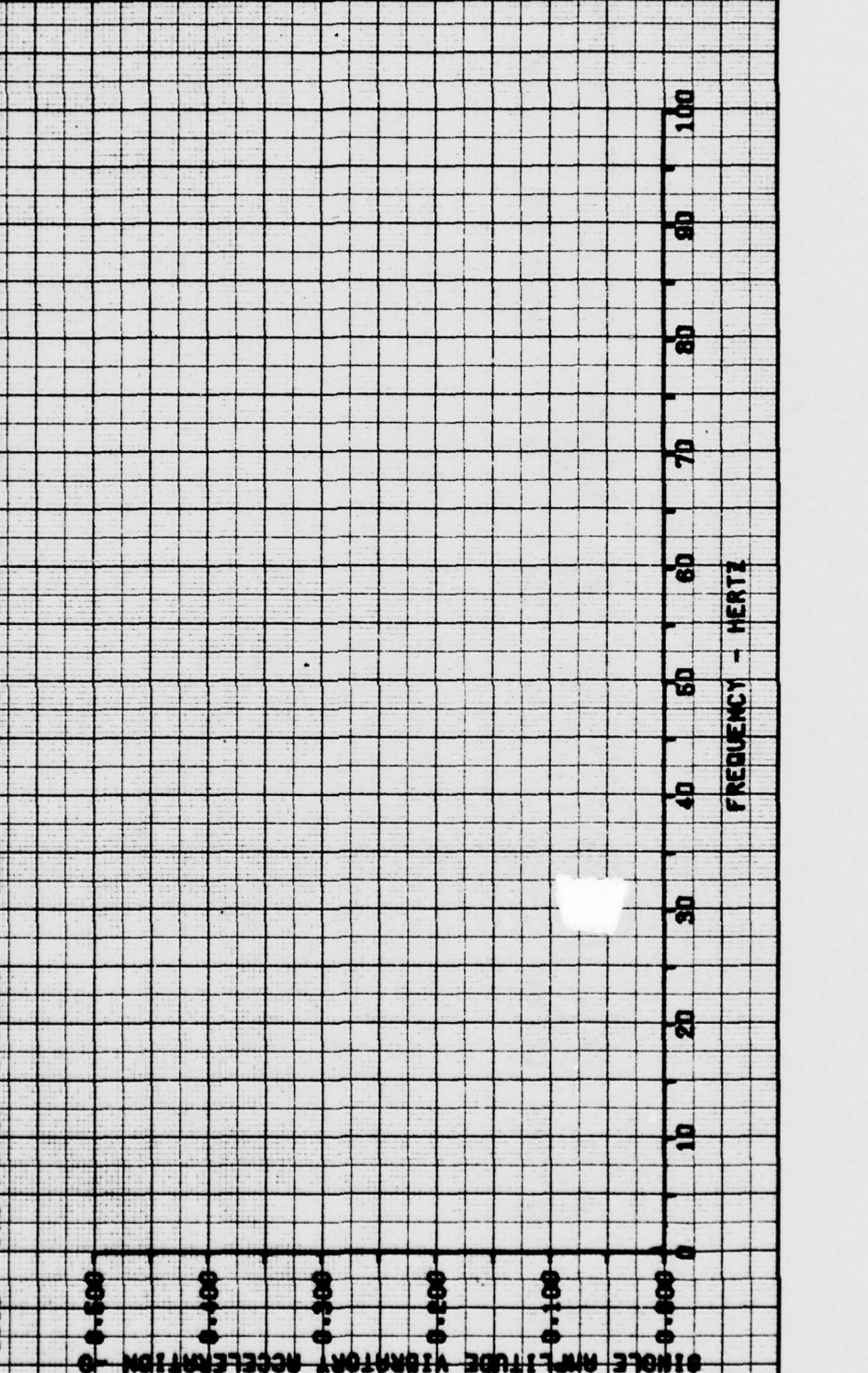


FIGURE 25

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS LONGITUDINAL  
 MODEL 132.7 (P101)  
 WEIGHT 132.7 (P101)  
 CG FB 132.7 (P101)  
 CG BL 132.7 (P101)  
 CG BR 132.7 (P101)  
 DENSITY 132.7 (P101)  
 ALTITUDE 132.7 (P101)  
 TEMPERATURE 132.7 (P101)  
 SPEED 132.7 (P101)  
 ROTOR TRIM CALIB. 132.7 (P101)  
 FLIGHT CONFIGURATION 132.7 (P101)  
 AIRSPEED 132.7 (P101)  
 CONDITION 132.7 (P101)  
 -KTS 132.7 (P101)  
 ZERO 132.7 (P101)  
 GROUND RUN 132.7 (P101)  
 CLEAN 132.7 (P101)



FLT 2  
 TRK 6  
 VCB 25  
 WBS 0  
 WIM 55  
 WEL 55  
 DRP 0

FIGURE 27

VIBRATION CHARACTERISTICS

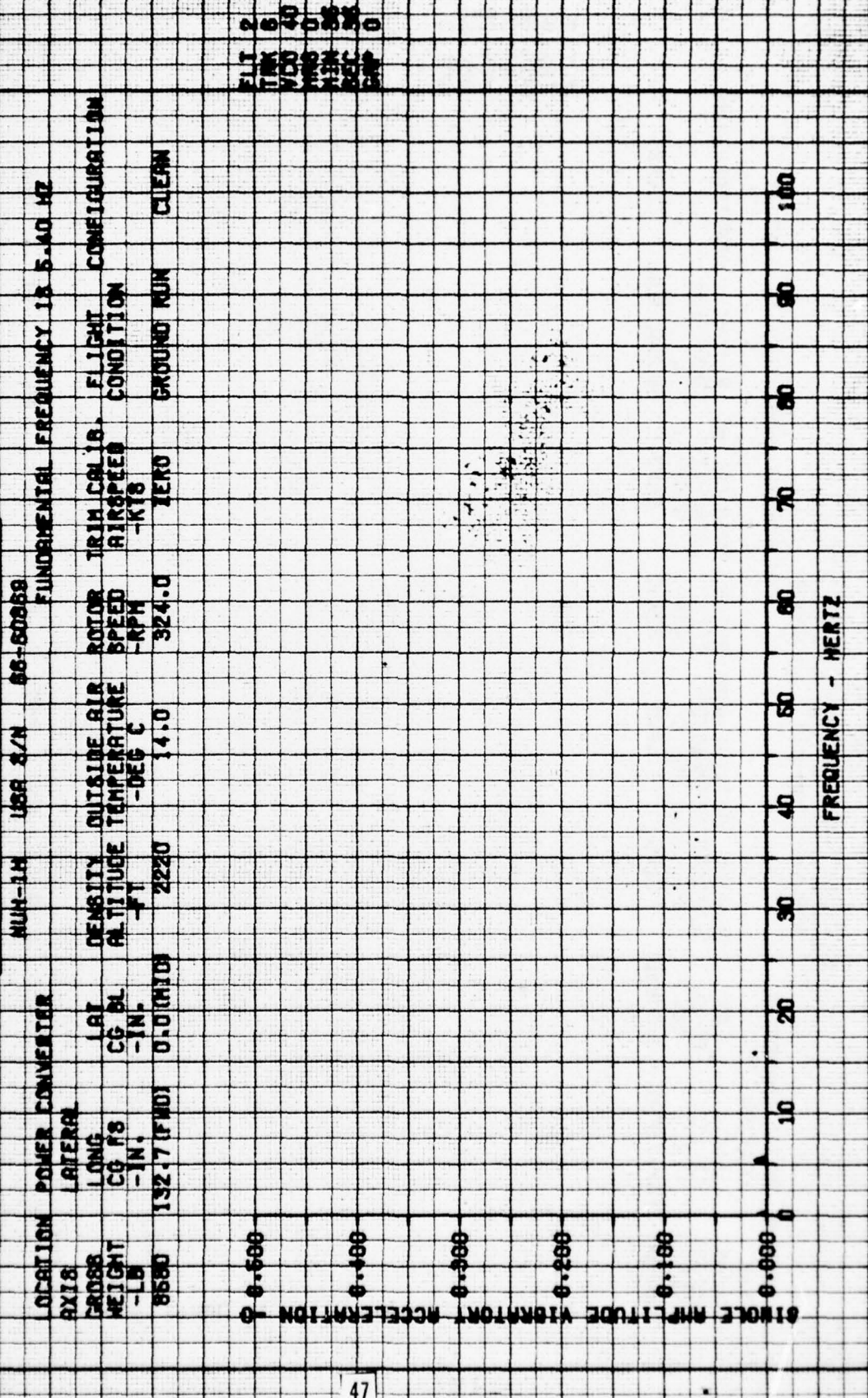


FIGURE 28

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS VERTICAL  
 GROSS WEIGHT 8580  
 LONG CG F8 132.7 (FWD)  
 CG BL -IN. 0.0 (MID)  
 LAI 2220  
 DENSITY OUTSIDE AIR 14.0  
 ALTITUDE TEMPERATURE -DEG C 324.0  
 ROTOR SPEED -RPM 324.0  
 TRIM CALIB. AIRSPEED -KTS ZERO  
 FLIGHT CONDITION GROUND RUN CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 2  
 TRK 6  
 VCD 55  
 MRD 0  
 MIN 36  
 SEC 36  
 GRP 0

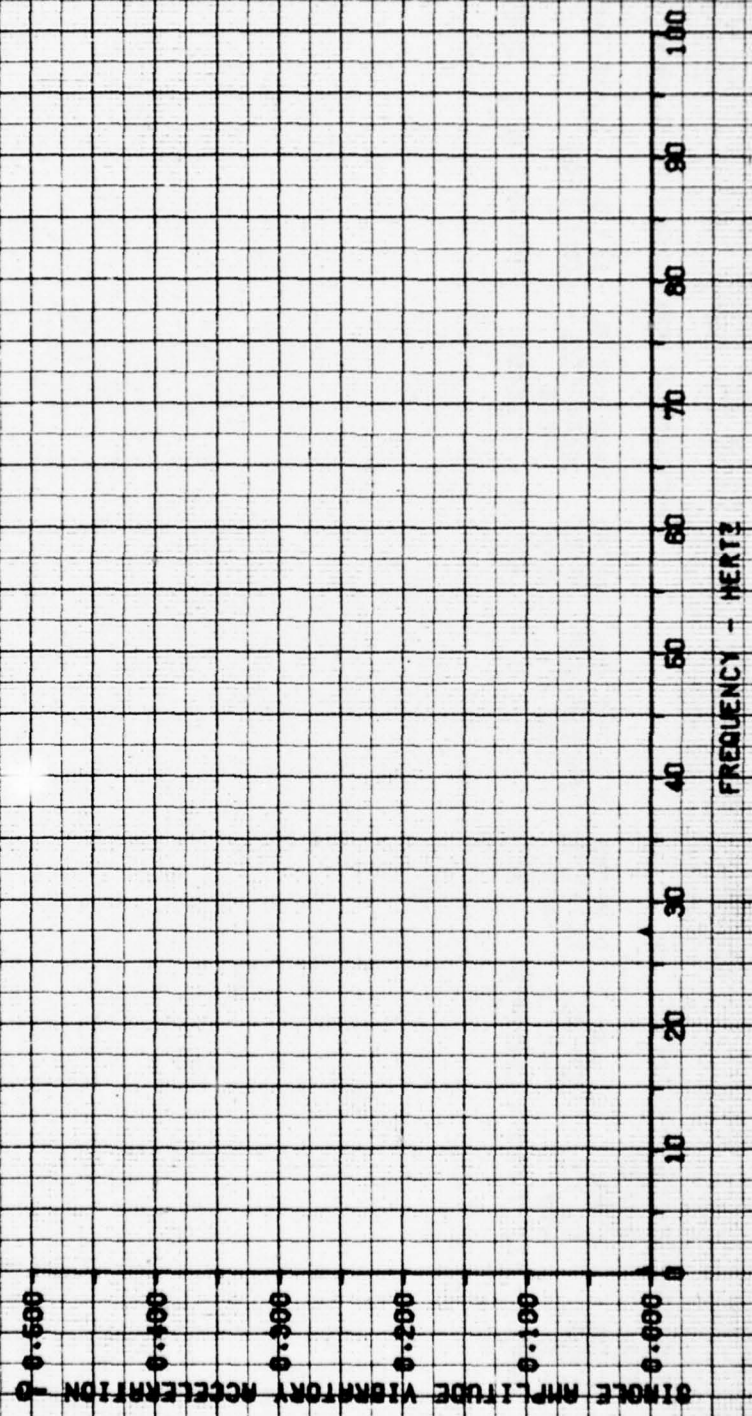


FIGURE 29

VIBRATION CHARACTERISTICS

LOCATION COLLECTIVE CONTROL  
 AXIS VERTICAL  
 GROSS HEIGHT 8580  
 CG F8  
 -IN.  
 132.7 (FWD)  
 LAI  
 CG BL  
 -IN.  
 0.0 (MID)  
 DENSITY 14.0  
 OUTSIDE AIR ROTOR  
 TEMPERATURE SPEED  
 -DEG C -RPM  
 324.0  
 MUH-1H USA S/N 66-60869  
 FUNDAMENTAL FREQUENCY 18 5.40 HZ  
 TRIM CALIB. FLIGHT CONFIGURATION  
 AIRSPEED CONDITION  
 -KT6 ZERO GROUND RUN CLEAN

FLT 2  
 TNK 7  
 VCS 25  
 MAG 0  
 MIN 56  
 SEC 54  
 SWP 0

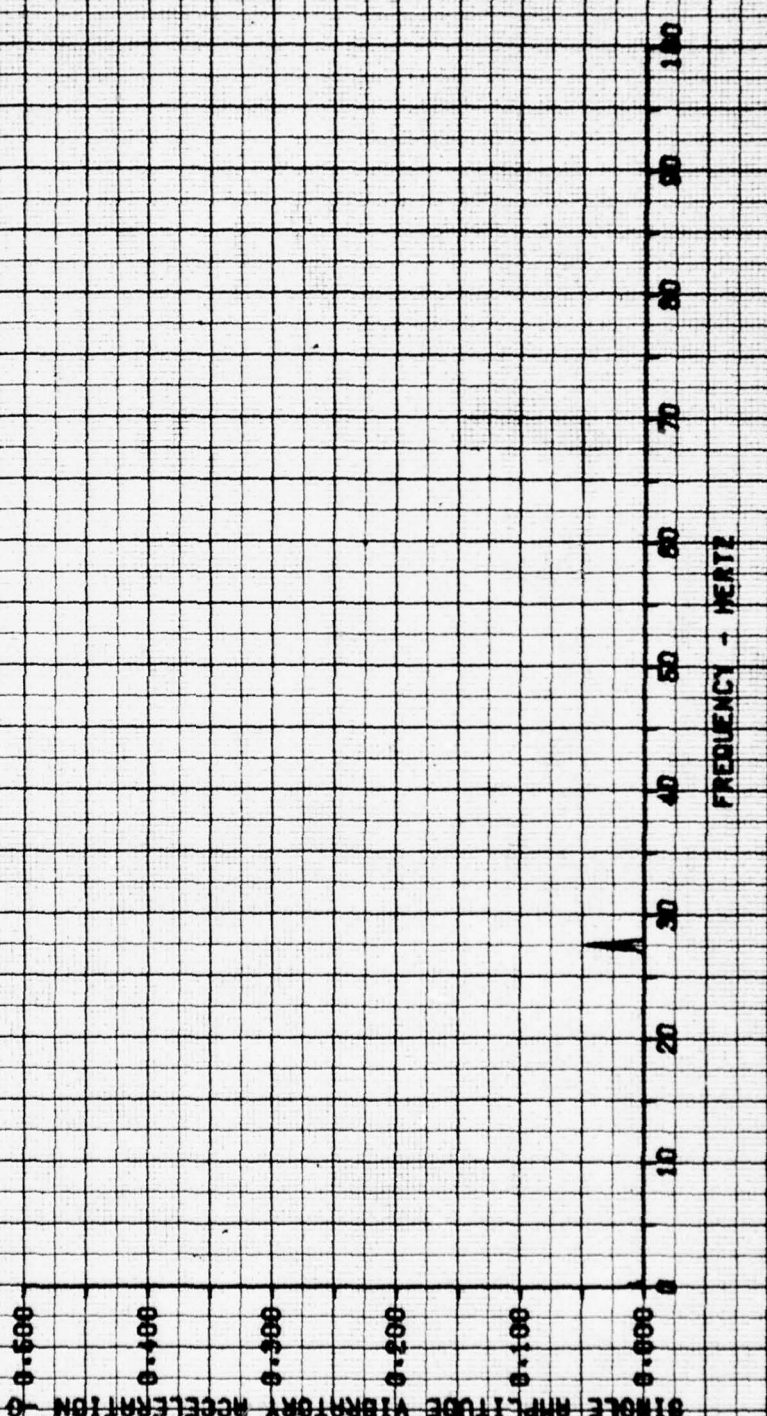


FIGURE 30

# VIBRATION CHARACTERISTICS

NUH-1H USA 3/74 66-60000

FUNDAMENTAL FREQUENCY IS 5-10 HZ

LOCATION CYCLIC CONTROL

AXIS LONGITUDINAL

MODE LONG

WEIGHT 60 LB

-LN -IN.

132.7 DNDI 0.01010

2230 14.0 524.0

ZERO GROUND RUN CLEAN

DENSITY OUTSIDE AIR MOTOR TRIM CALIB. FLIGHT CONFIGURATION

ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION

-IN. -IN. -KTS

ZERO GROUND RUN CLEAN

SINGLE AMPLITUDE VIBRATORY ACCELERATION

FREQUENCY - HERTZ

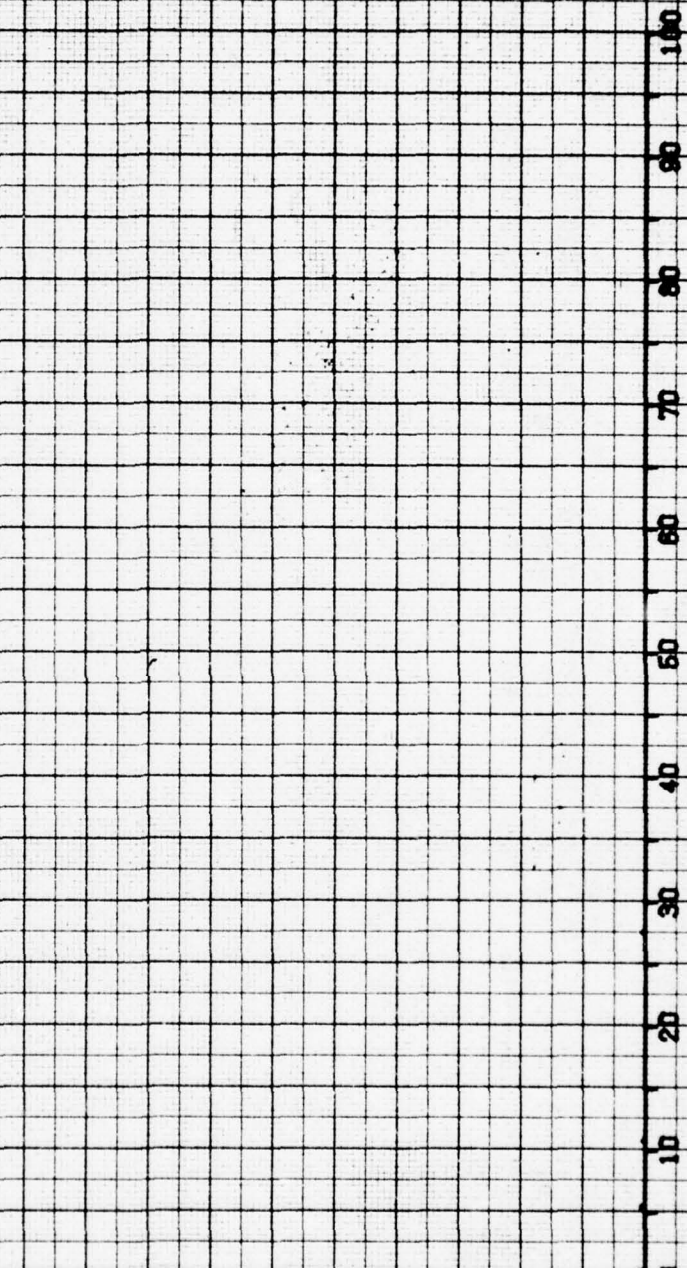
FILT 2  
TNR 7  
VCR 48  
WVS 0  
HIN 36  
SAC 36  
DAP 0

FIGURE 31

VIBRATION CHARACTERISTICS

LOCATION	CYCLIC CONTROL	NUM-14	USA S/N	66-50869	FUNDAMENTAL FREQUENCY IS	5.10 HZ
AXIS	LATERAL					
CROSS	LONG	LAI	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION
HEIGHT	CG FB	CG BL	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED
-LB	-IN.	-IN.	-FT	-DEG C	-RPM	CONDITION
8580	132.7 (FWD)	0.0 (MID)	2220	14.0	324.0	ZERO
						GROUND RUN
						CLEAN

SINGLE AMPLITUDE VIBRATION ACCELERATION



FREQUENCY - HERTZ

FLT 2  
 TRIM 7  
 VCS 0  
 MIN 0  
 SEC 0  
 DWP 0

FIGURE 32

VIBRATION CHARACTERISTICS

LOCATION FORWARDED PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 ORDER LONG  
 WEIGHT 8500  
 -LB  
 132.7 (7/101)  
 0.0 (11/10)  
 2220  
 14.0  
 324.0  
 ZERO  
 GROUND RUN  
 CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 2  
 TRX 7  
 VCD 78  
 WRS 0  
 HIN 36  
 SEC 36  
 ZRP 0

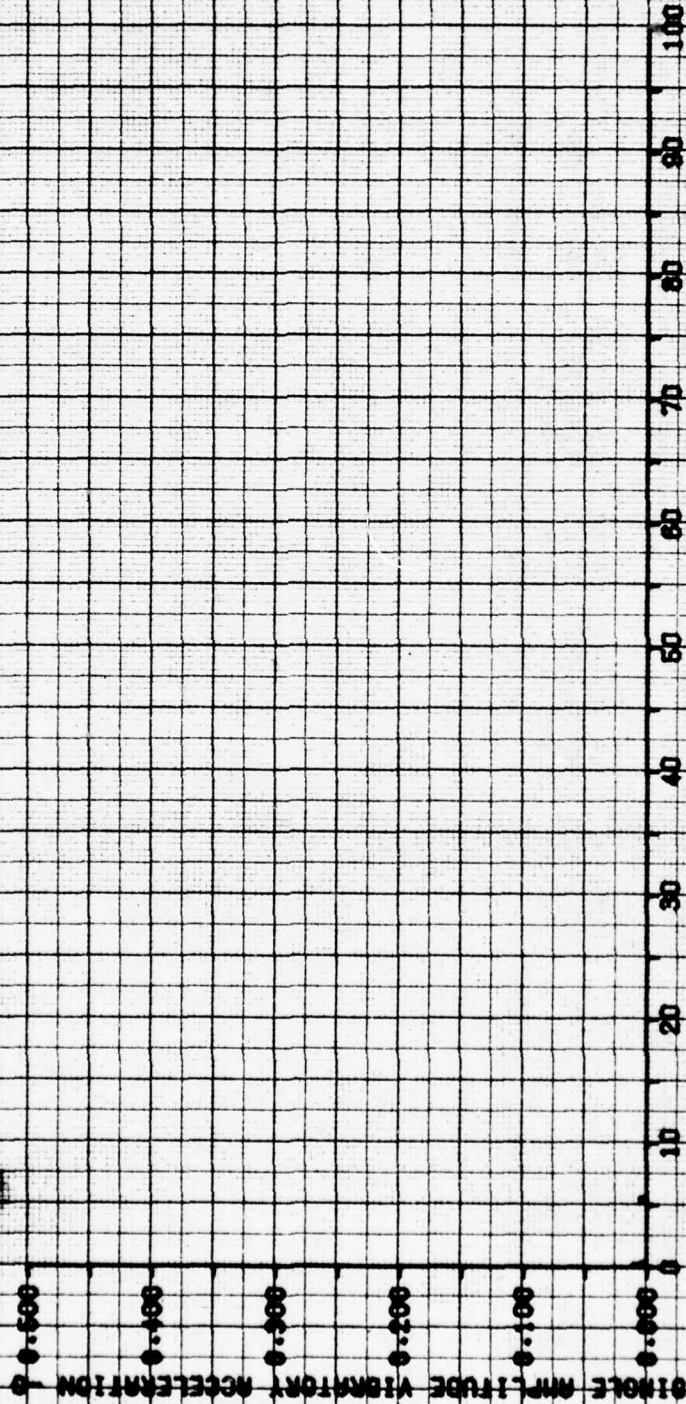


FIGURE 33

VIBRATION CHARACTERISTICS

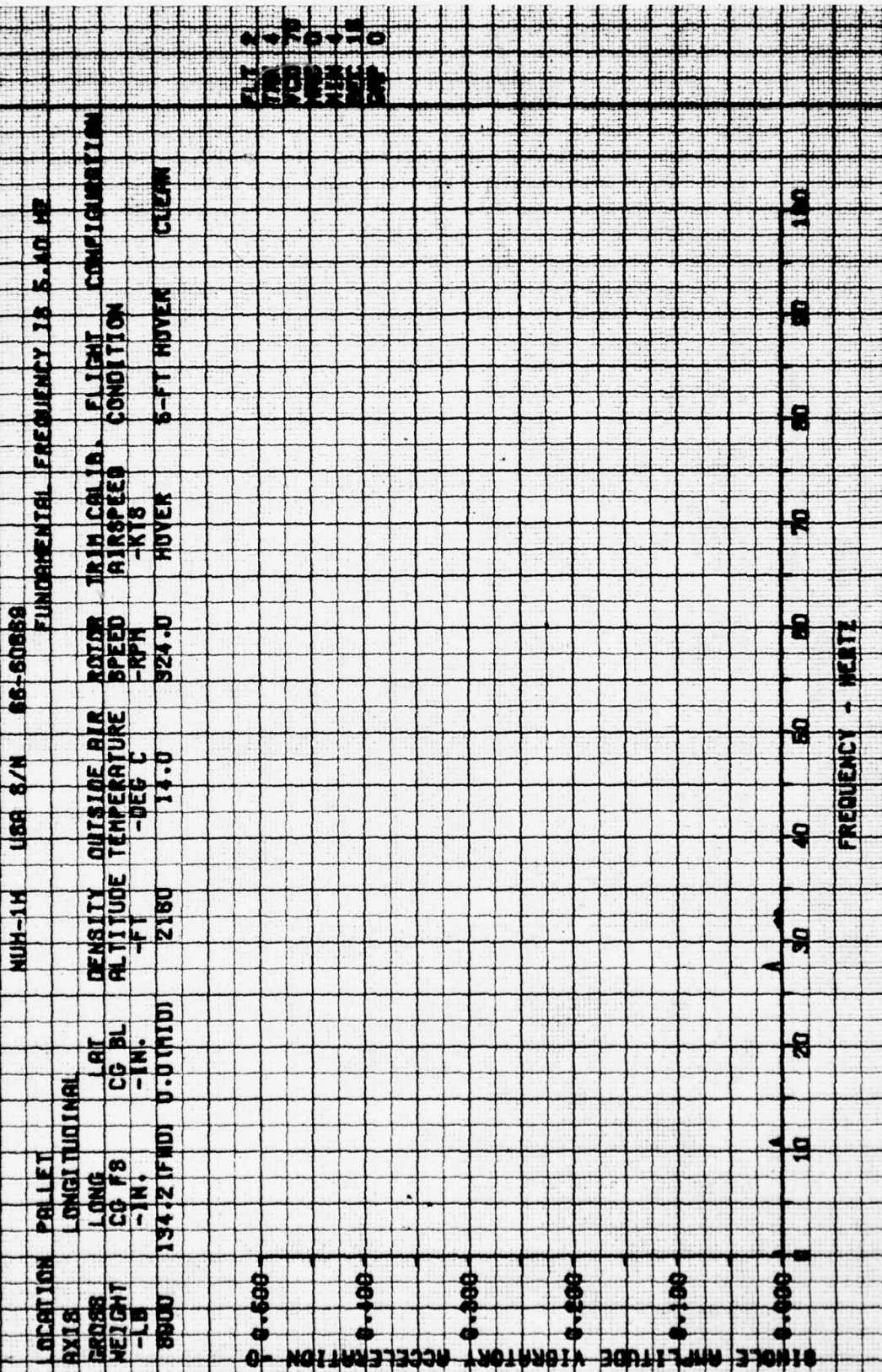
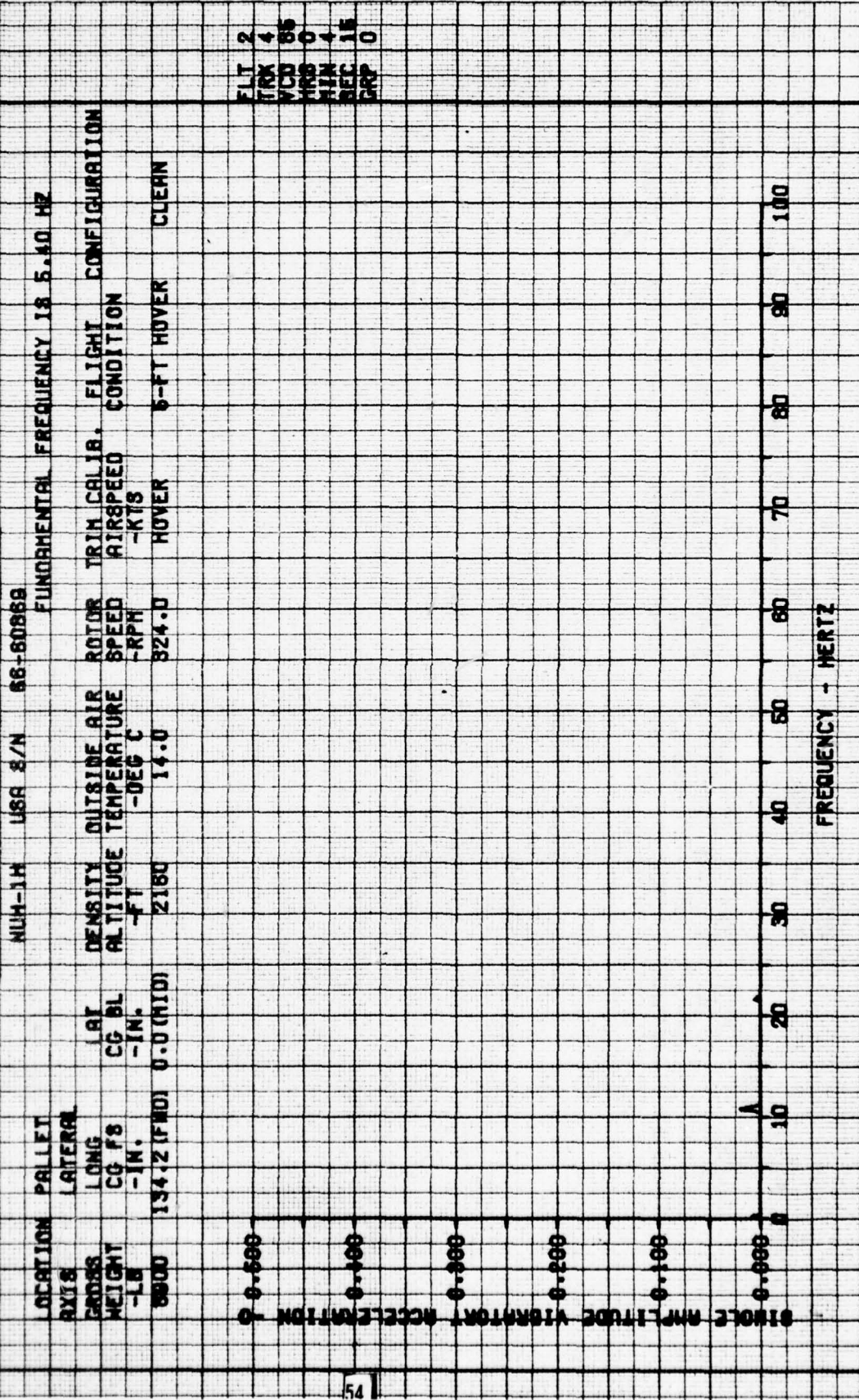


FIGURE 34

VIBRATION CHARACTERISTICS



LOCATION PALLET  
 AXIS LATERAL  
 CROSS LONG  
 HEIGHT CG FS  
 -IN. 134.2 (FWD) 0.0 (AID)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPH -KTS HOVER 6-FT HOVER CLEAN  
 2180 14.0 324.0

NUH-1H USA S/N 66-80868  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 2  
 TRX 4  
 VCD 86  
 HRS 0  
 MIN 4  
 SEC 16  
 GRP 0

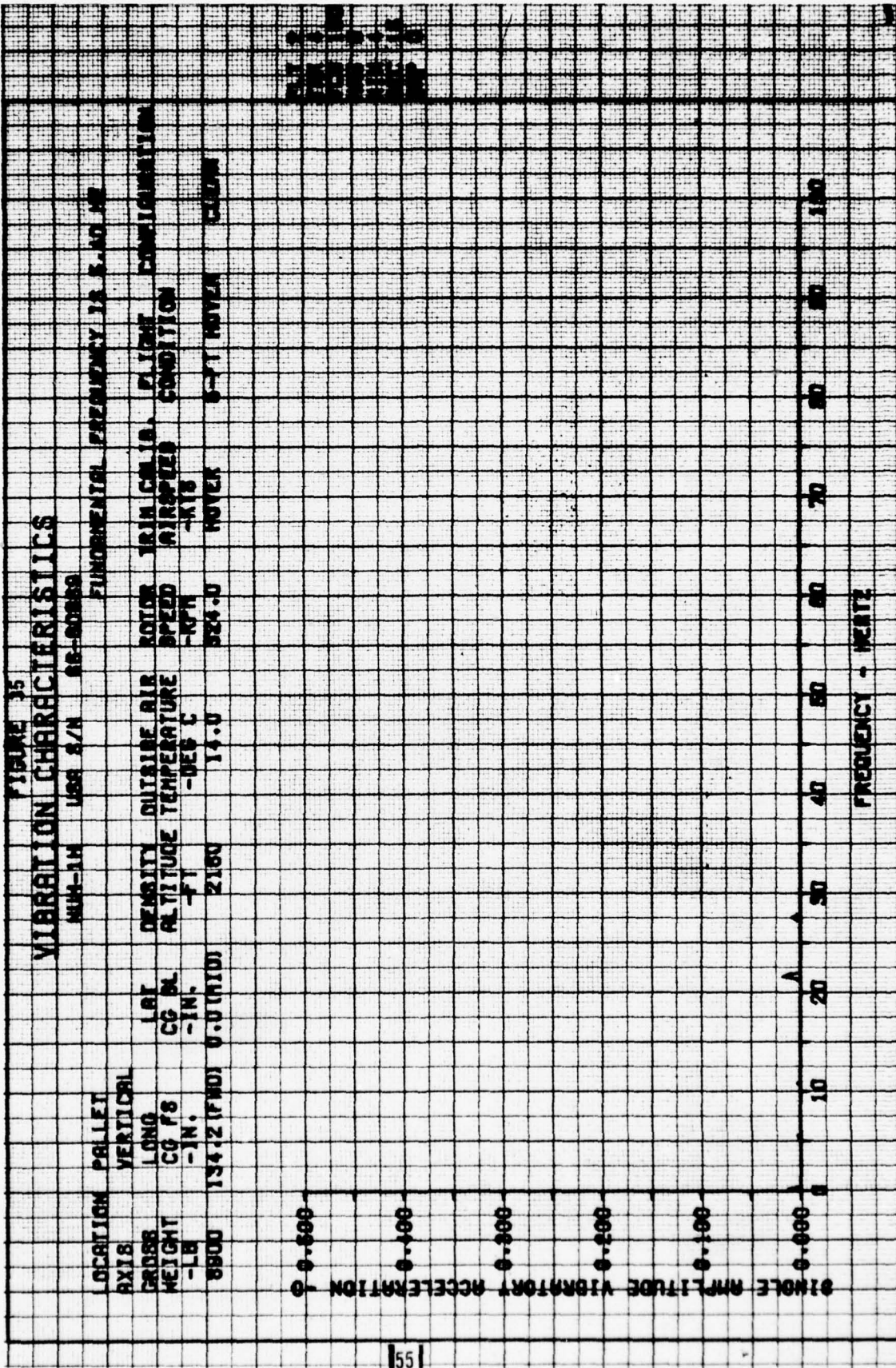


FIGURE 36

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 CROSS LONG LAY  
 WEIGHT CG FS CG BL  
 -LB -IN.  
 8800 134.2 (FWD) 0.0 (MID) 2180  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 14.0 324.0 HOVER 6-FT HOVER CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 2  
 TRK 6  
 VCU 26  
 MSB 0  
 MIN 4  
 DEC 15  
 DRP 0

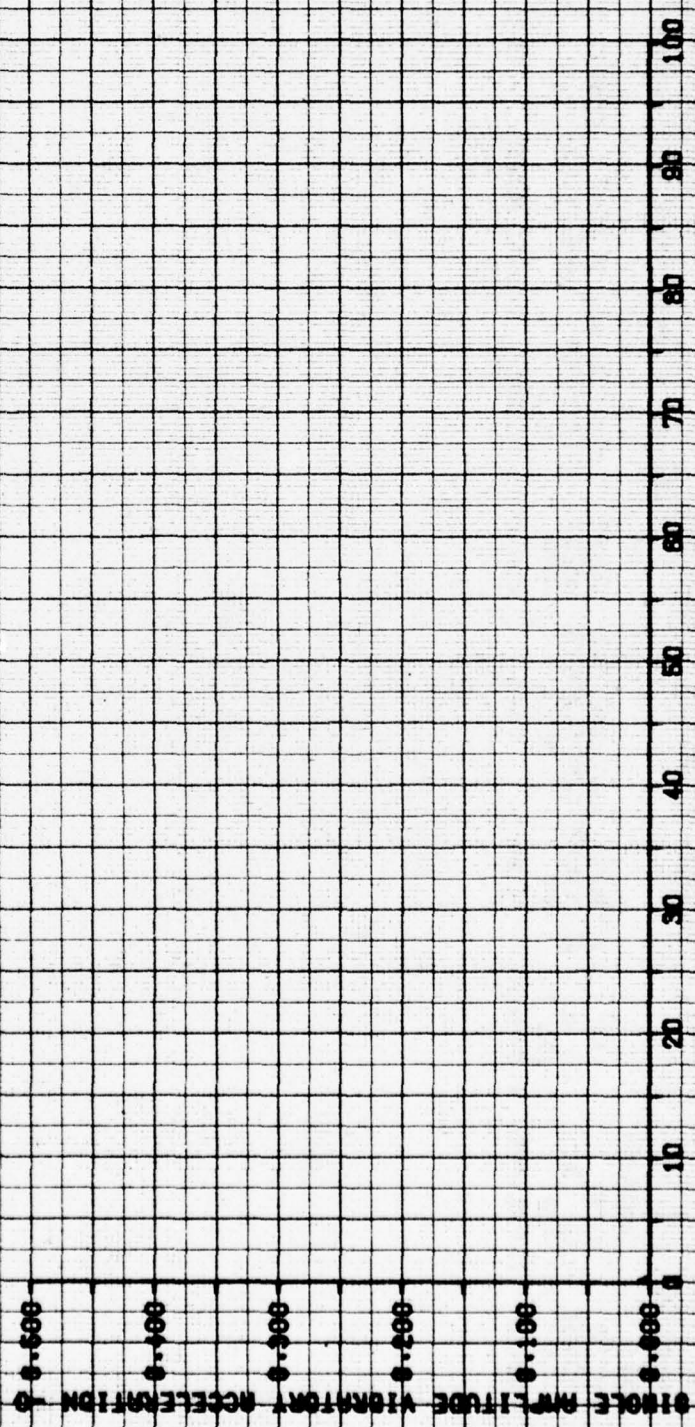


FIGURE 37

VIBRATION CHARACTERISTICS

LOCATION: PILOT SEAT  
 AXIS: LATERAL  
 GROSS WEIGHT: 154.2 (FWD) 0.0 (AID)  
 CG FB: -IN.  
 CG BL: -IN.  
 DENSITY: 2180  
 ALTITUDE: 14.0  
 OUTSIDE AIR TEMPERATURE: -DEG C  
 ROTOR SPEED: 524.0  
 TRI-CALIB. AIR SPEED: HOVER  
 FLIGHT CONDITION: 6-PT HOVER  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

NUH-1A USA 2/N 66-80868

0-0.500  
 0-1.00  
 0-2.00  
 0-4.00  
 0-1.00  
 0-0.500

SINGLE AMPLITUDE VIBRATION ACCELERATION

10 20 30 40 50 60 70 80 90 100

FREQUENCY - HERTZ

FLY 2  
 FLY 3  
 FLY 4  
 FLY 5  
 FLY 6

# VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXES VERTICAL  
 GROSS WEIGHT - LB 3000  
 LONG CG F8 -IN. 154.2 (FWD)  
 LAT CG BL -IN. 0.0 (AID)  
 DENSITY 2160  
 ALTITUDE -FT 14.0  
 OUTSIDE AIR TEMPERATURE -DEG C 14.0  
 ROTOR SPEED -RPM 524.0  
 TRIM CALIB. FLIGHT CONFIGURATION  
 AIRSPEED -KTS HOVER  
 5-FT HOVER CLEAN  
 FUNDAMENTAL FREQUENCY 12.5-10 HZ

FLT 2  
 TRM 8  
 VCS 55  
 WGS 0  
 MIN 4  
 MAX 15  
 SUP 0

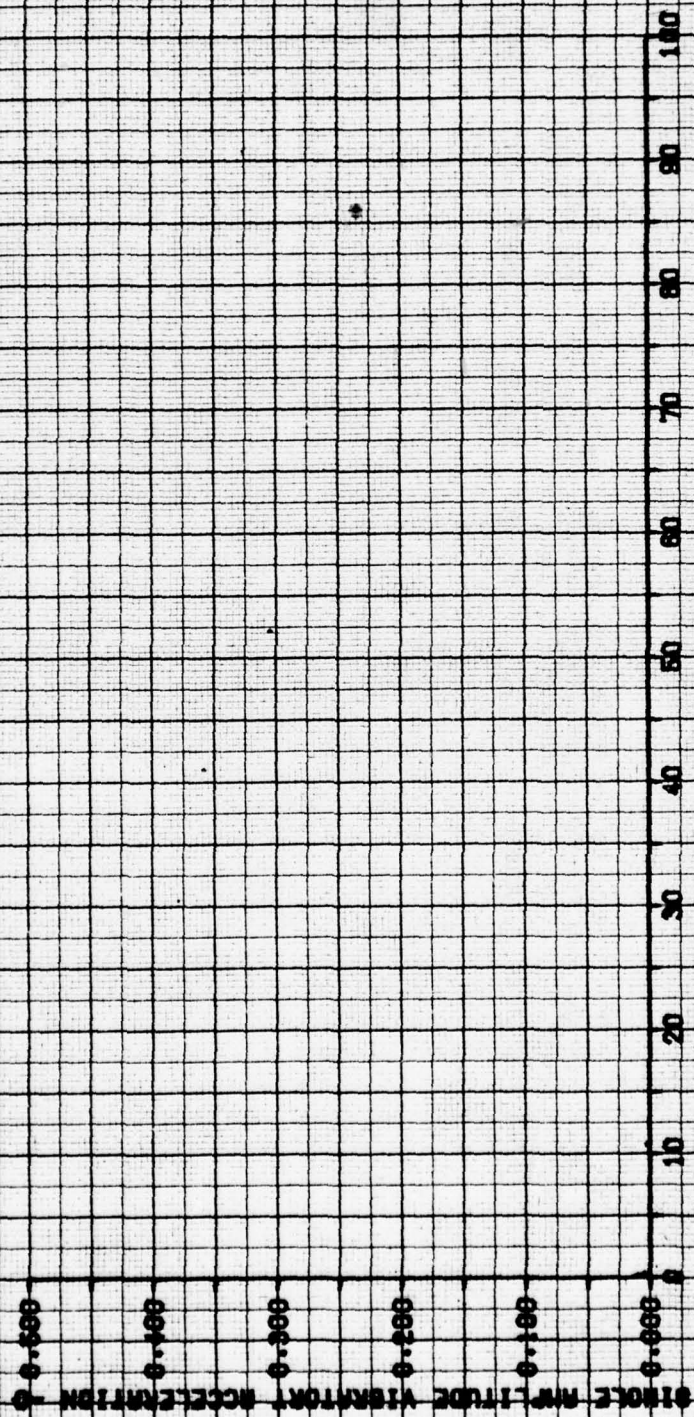
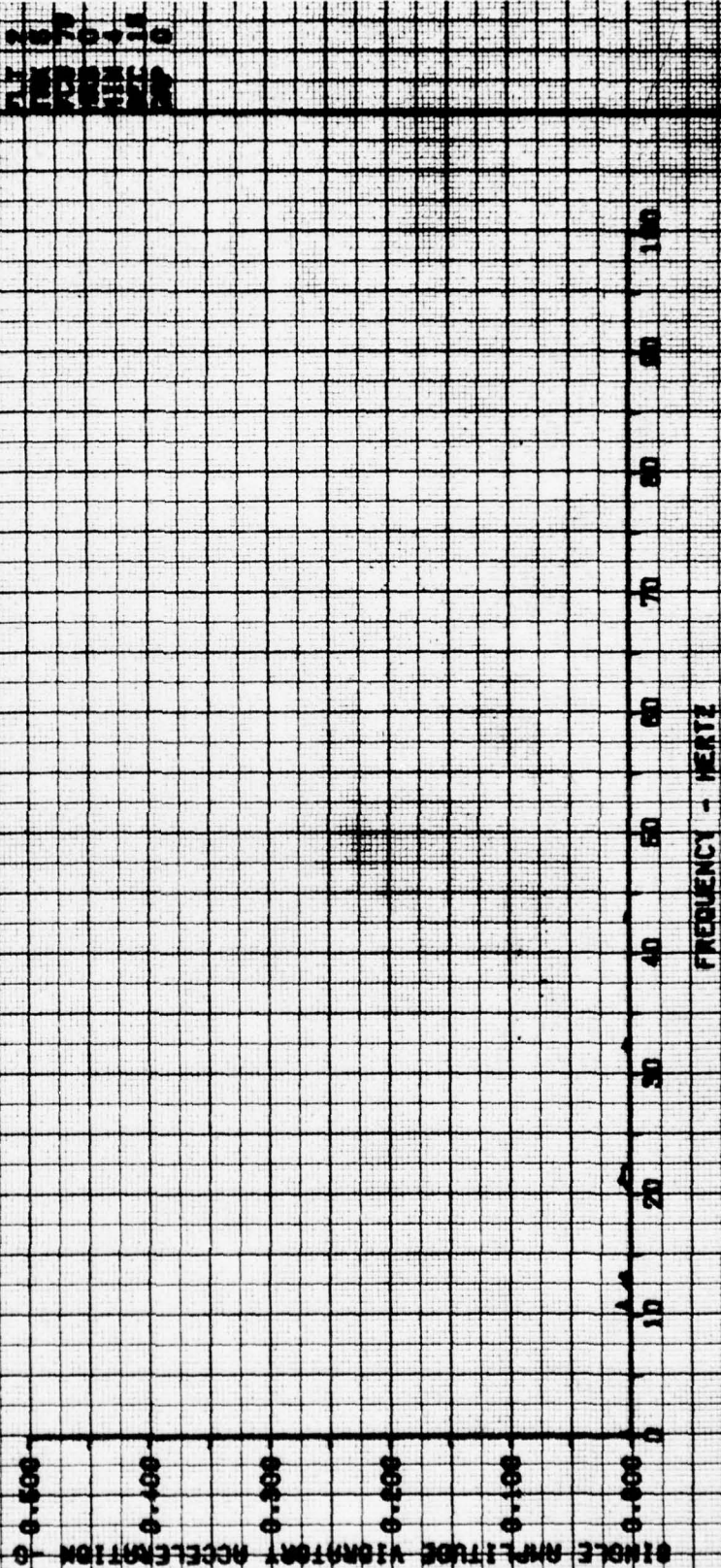


FIGURE 19

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LONGITUDINAL  
 WEIGHT 134.2 (PM) 0.0 (HM)  
 CG FB -2 IN.  
 CG BL -1 IN.  
 LRI  
 DENSITY OUTSIDE AIR ROTOR TRIM CAL IS. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 8900 154.2 (PM) 0.0 (HM) 2180 14.0 524.0 HOVER 6-FT HOVER CLEAN  
 MUH-1H 1000 2/1 80-8000 FUNDAMENTAL FREQUENCY IS 5.10 ME



21.7 2  
 22.8 3  
 23.9 4  
 25.0 5  
 26.1 6  
 27.2 7

**FIGURE 40**  
**VIBRATION CHARACTERISTICS**

LOCATION TRANSMISSION  
 AXIS LATERAL  
 ORDER LONG  
 WEIGHT CO FS  
 -LN.  
 8000 134.2 (740) 0.000100  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2180 14.8 824.0 HOVER 5-FT HOVER CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 2  
 TRK 5  
 VCU 08  
 MS 0  
 MIN 4  
 SEC 15  
 DRP 0

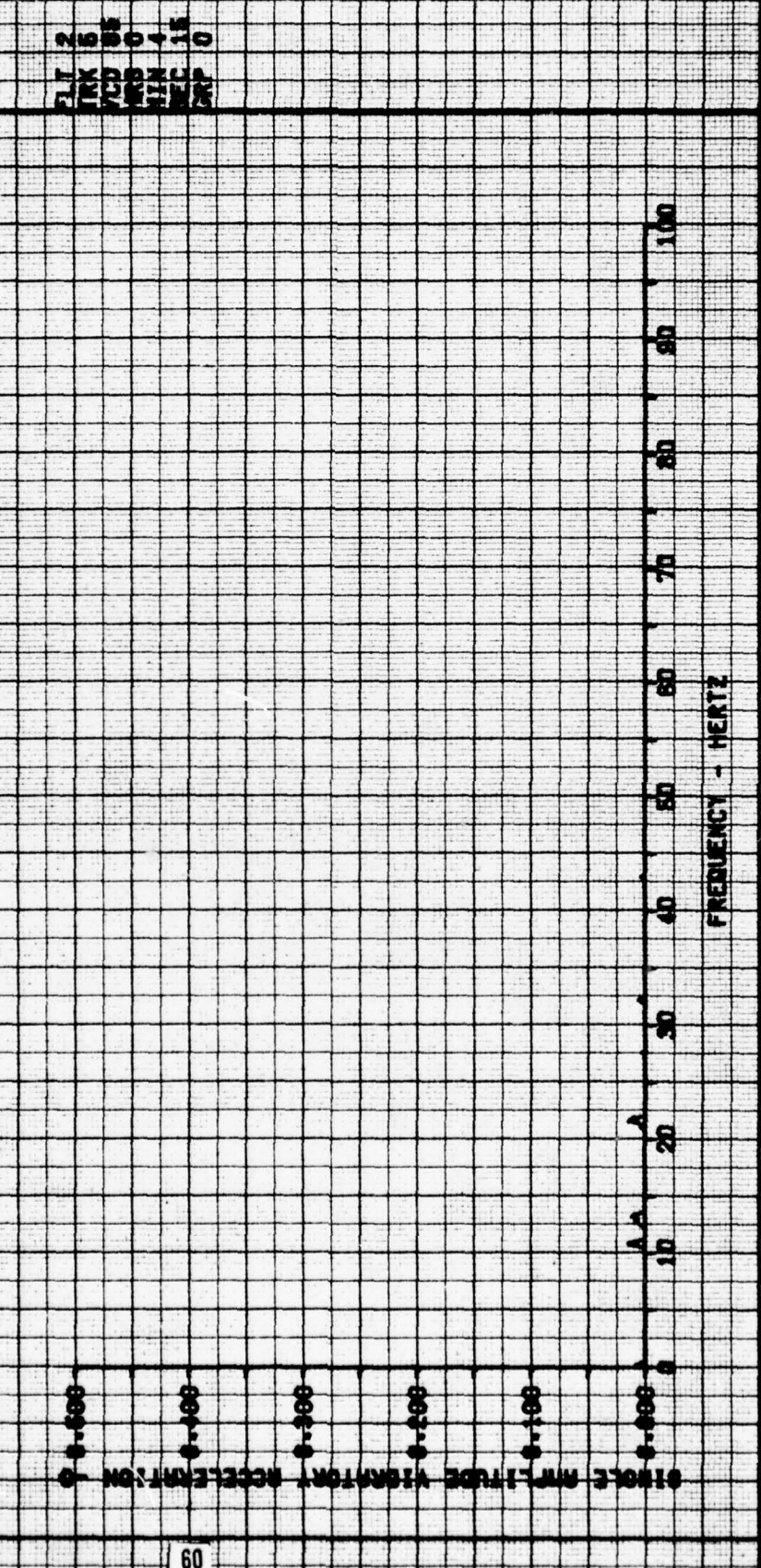


FIGURE 41

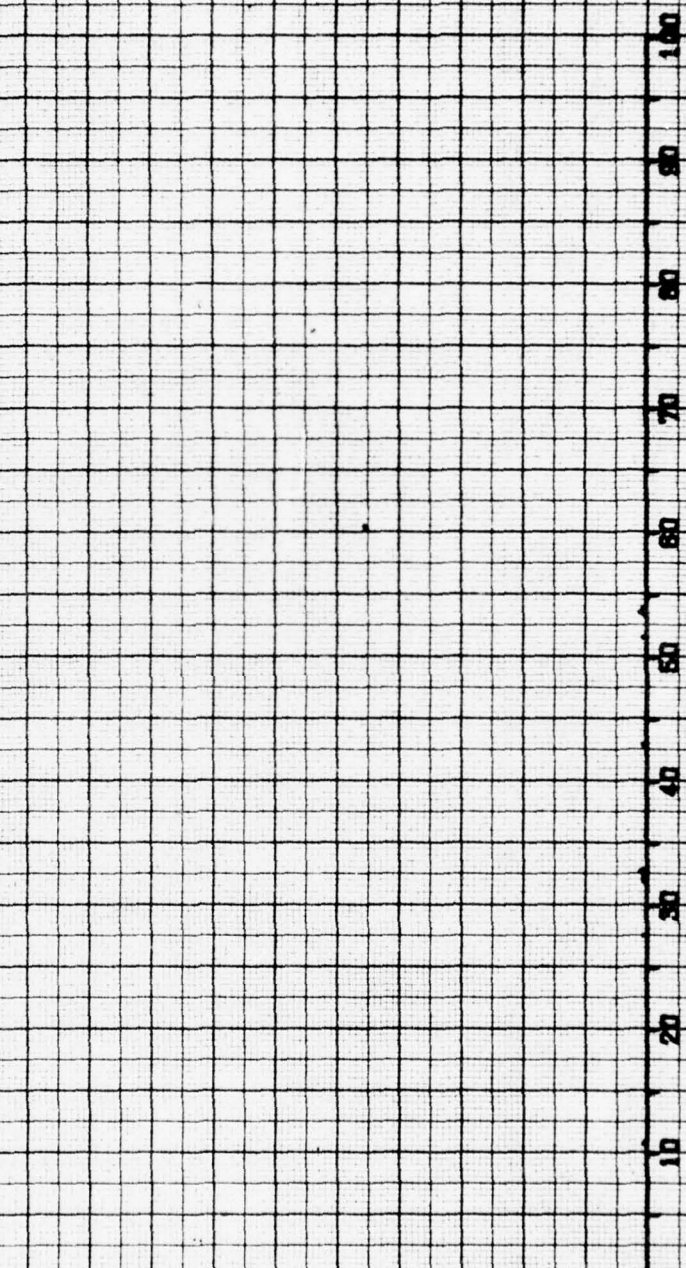
VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 ORDER LONG LAY  
 HEIGHT CG F8 CG 6L  
 -LB -IN.  
 8900 134.2 (FWD) 0.0 (MID)

MUH-1H USA 8/N 68-80869  
 FUNDAMENTAL FREQUENCY 12 5.40 Hz

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2160 14.0 324.0 HOVER 6-FT HOVER CLEAN

SINGLE AMPLITUDE VIBRATION ACCELERATION  
 0 0.100  
 0.200  
 0.300  
 0.400  
 0.500



FLT 2  
 FTK 6  
 FCR 100  
 MWS 0  
 MIM 4  
 MET 18  
 SWP 0

FIGURE 42

VIBRATION CHARACTERISTICS

LOCATION	POWER CONVERTER	MUM-1M	USA S/N	68-60869	FUNDAMENTAL FREQUENCY IS 5.10 HZ
AXIS	LONGITUDINAL				
GRDSR	LONG	DENSITY	OUTSIDE AIR	ROTOR TRIM	CALIB. FLIGHT CONFIGURATION
WEIGHT	CG F6	ALTITUDE	TEMPERATURE	SPEED	AIRSPED. CONDITION
-LB	-IN.	-FT	-DEG C	-RPH	-KTS
6800	134.2 (FWD)	0.0 (MID)	14.0	324.0	HOVER
					5-FT HOVER
					CLEARN

FLT 2  
 BRK 6  
 YCD 26  
 HNB 0  
 MIN 4  
 DET 15  
 SRP 0

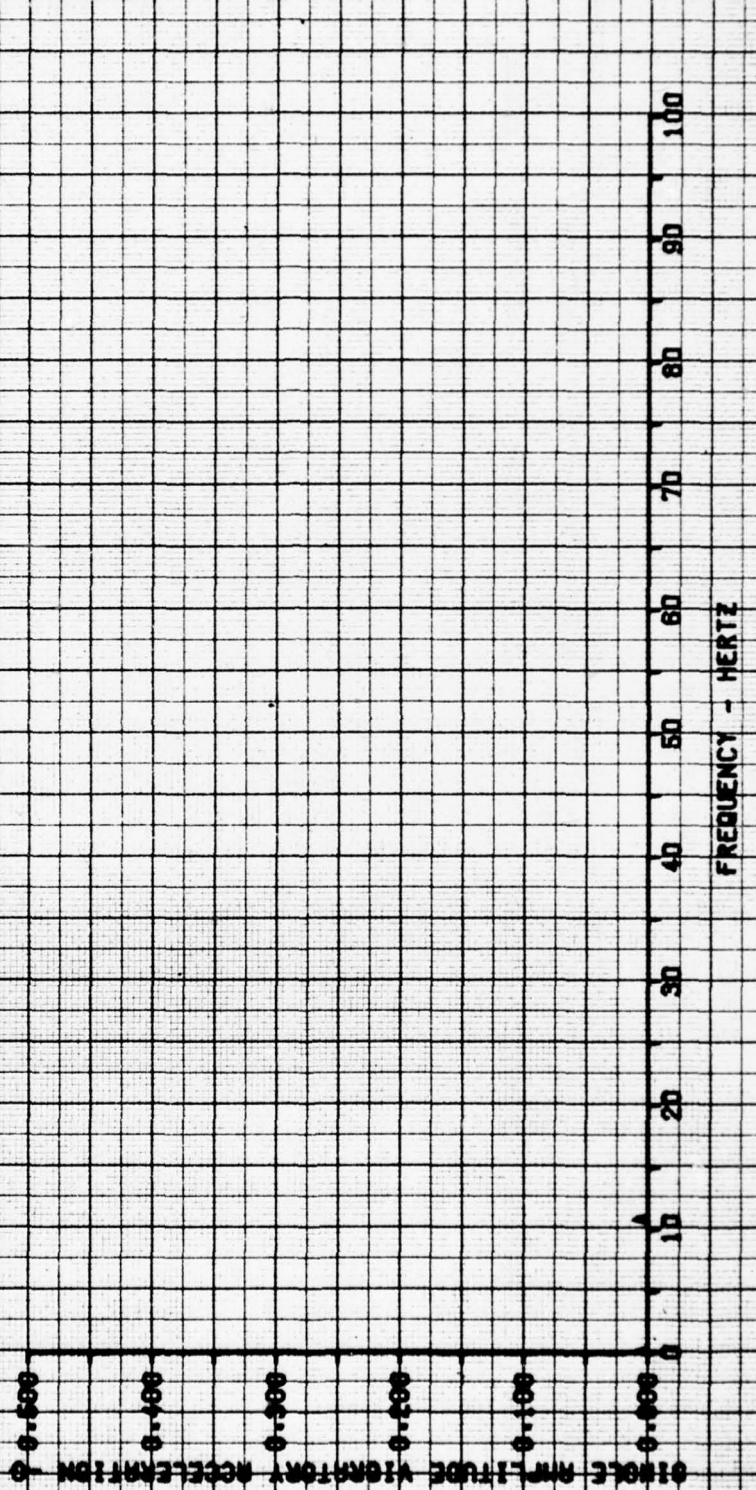
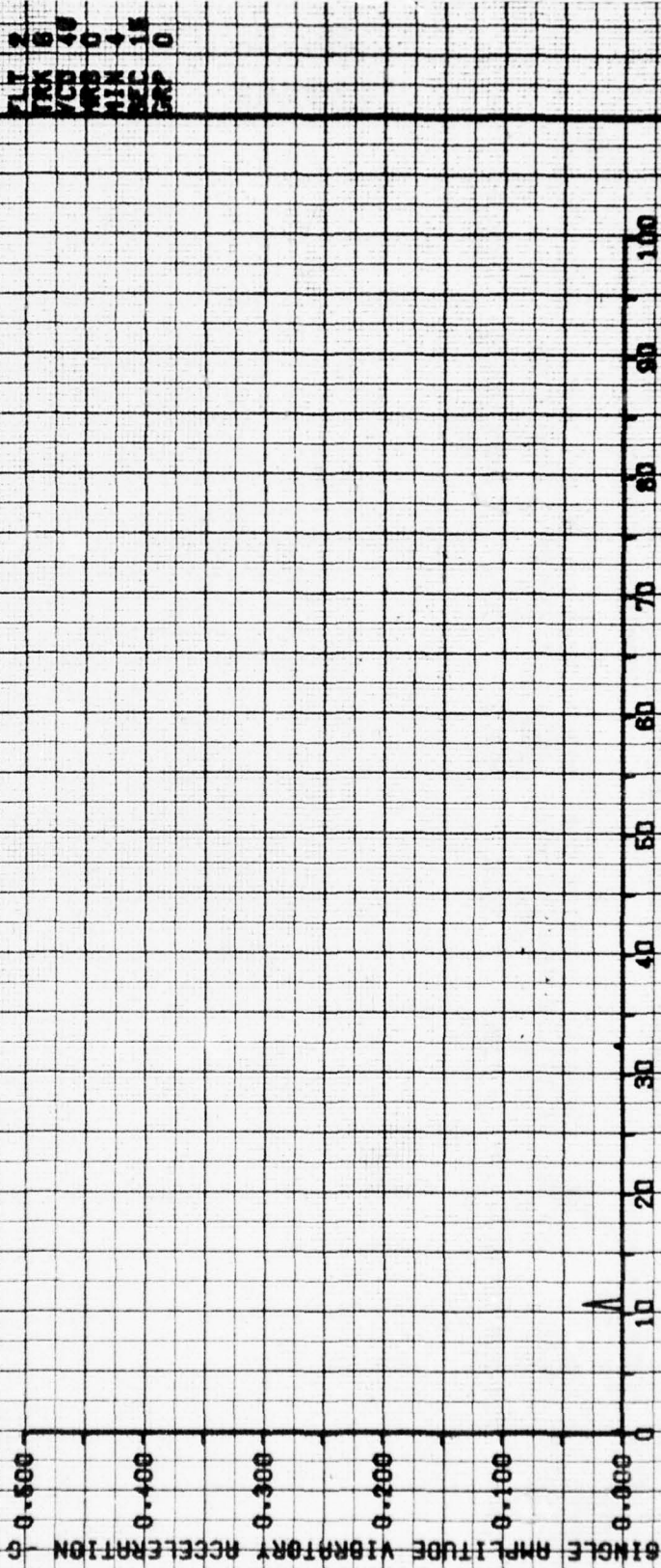


FIGURE 43

VIBRATION CHARACTERISTICS

MUH-1H UBA 8/N 68-60868 FUNDAMENTAL FREQUENCY IS 5.10 HZ

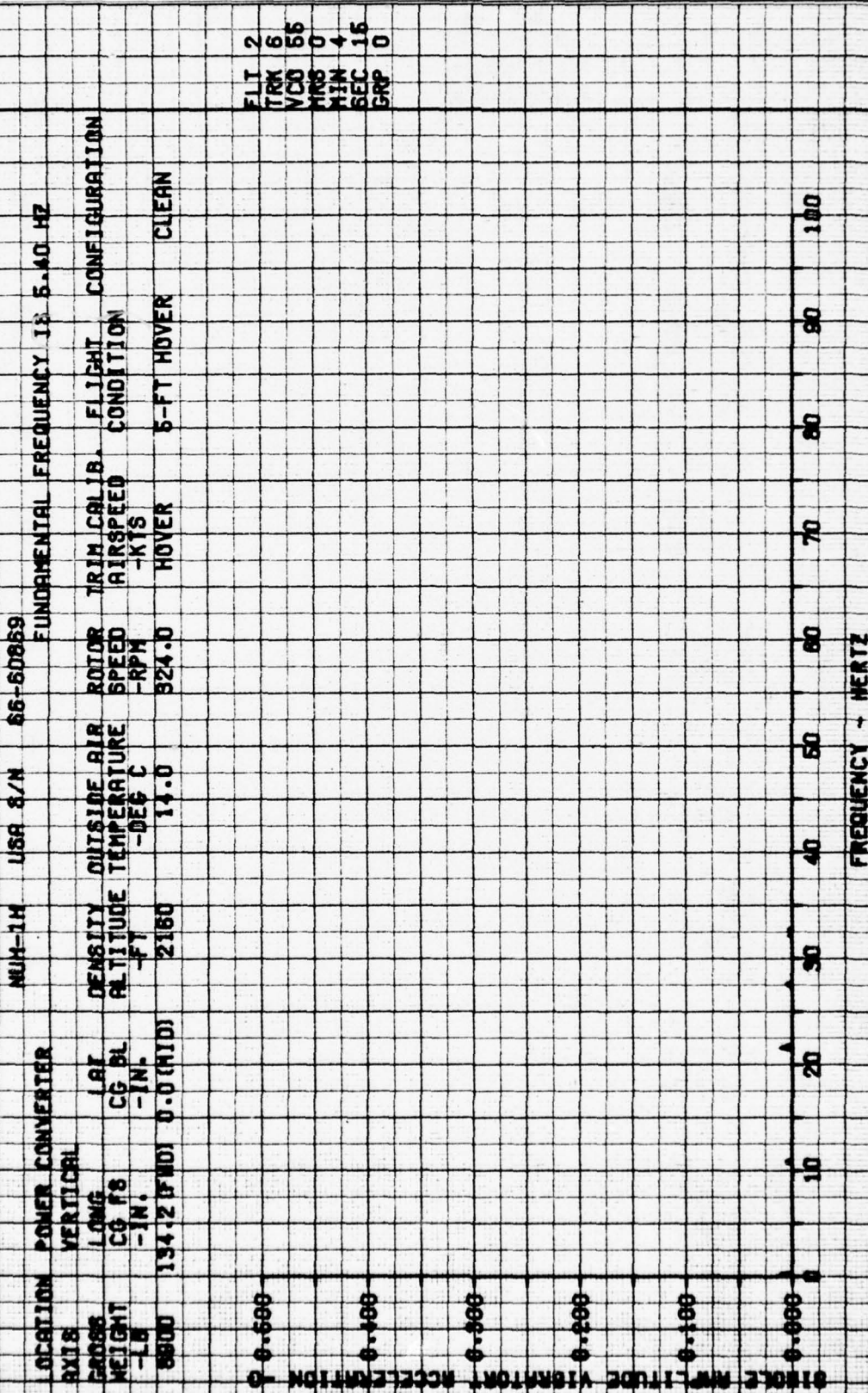
LOCATION	POWER CONVERTER	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	FLIGHT	CONFIGURATION
AXIS	LATERAL	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION	
GROSS	LONG	-FT	-DEG C	-RPH	-KTS		
WEIGHT	CG BL						
-LB	-IN.						
8900	134.2 (FWD)	0.0 (MID)	14.0	924.0	HOVER	5-FY HOVER	CLEAN



FLT 2  
 FRX 6  
 YCG 40  
 WRS 0  
 MIN 4  
 SEC 18  
 CRP 0

FIGURE 4A

VIBRATION CHARACTERISTICS



LOCATION POWER CONVERTER  
 AXIS VERTICAL  
 CROSS LONG  
 WEIGHT CG F8  
 -IN.  
 8900 134.2 (FWD) 0.0 (AID)

NUM-1M USA S/N 86-60859  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 2160 14.0 924.0 HOVER 5-FT HOVER CLEAN

CG BL  
 -IN.  
 0.0 (AID)

FLT 2  
 TRK 6  
 VCO 55  
 MINS 0  
 MIN 4  
 SEC 15  
 GRP 0

FIGURE #5  
**VIBRATION CHARACTERISTICS**

NUM-1H USA S/N 66-60868 FUNDAMENTAL FREQUENCY IS 5.50 HZ

LOCATION COLLECTIVE CONTROL  
 AXIS VERTICAL  
 GROSS WEIGHT 8900  
 LONG CG FS -IN. 134.2 (FWD)  
 LAI CG BL -IN. 0.0 (MID)  
 DENSITY 2160  
 ALTITUDE -FT 14.0  
 OUTSIDE AIR TEMPERATURE -DEG C 14.0  
 ROTOR SPEED -RPM 824.0  
 TRIM CALIB. HOVER  
 AIRSPEED -KTS HOVER  
 FLIGHT CONDITION 6-FT HOVER  
 CONFIGURATION CLEAN

FLT 2  
 STX 7  
 VCS 26  
 WBS 0  
 HIN 4  
 SEC 18  
 SWP 0

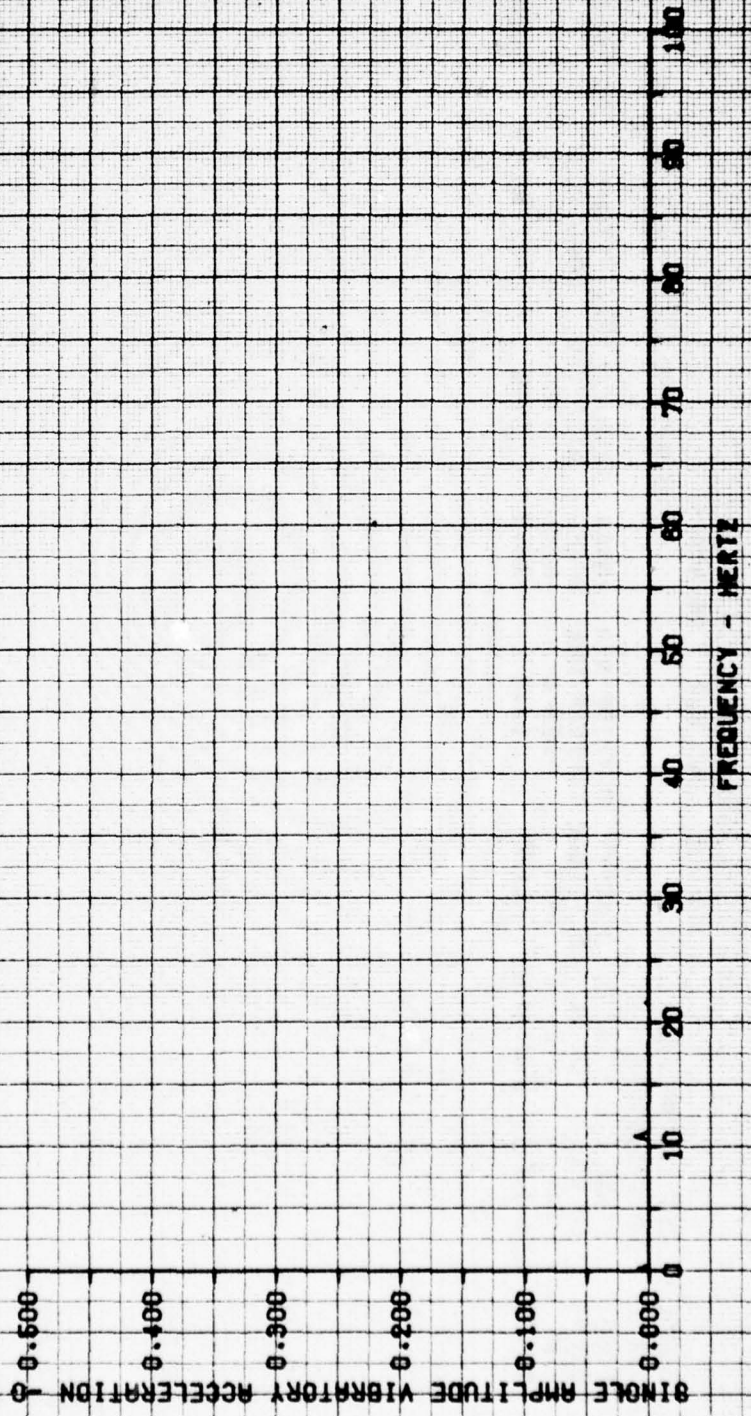


FIGURE 16

VIBRATION CHARACTERISTICS

LOCATION: CYCLIC CONTROL  
 AXIS: LONGITUDINAL  
 PROBE: LONG  
 WEIGHT: CG F8  
 -IN, -IN,  
 2800 134.2 (FWD) 0.0 (MID)

DENSITY: 2160  
 ALTITUDE: 14.0  
 -DEG C  
 ROTOR SPEED: 524.0  
 -RPM  
 HOVER: 6-FT HOVER  
 CLEAN

USA S/N: 68-60869  
 FUNDAMENTAL FREQUENCY: 18.5-40 HZ

TRIM CALIB.: FLIGHT CONFIGURATION  
 AIRSPEED CONDITION  
 -KTS

FLT 2  
 TRK 7  
 VCB 40  
 HNS 0  
 HIN 4  
 SEC 15  
 GRP 0

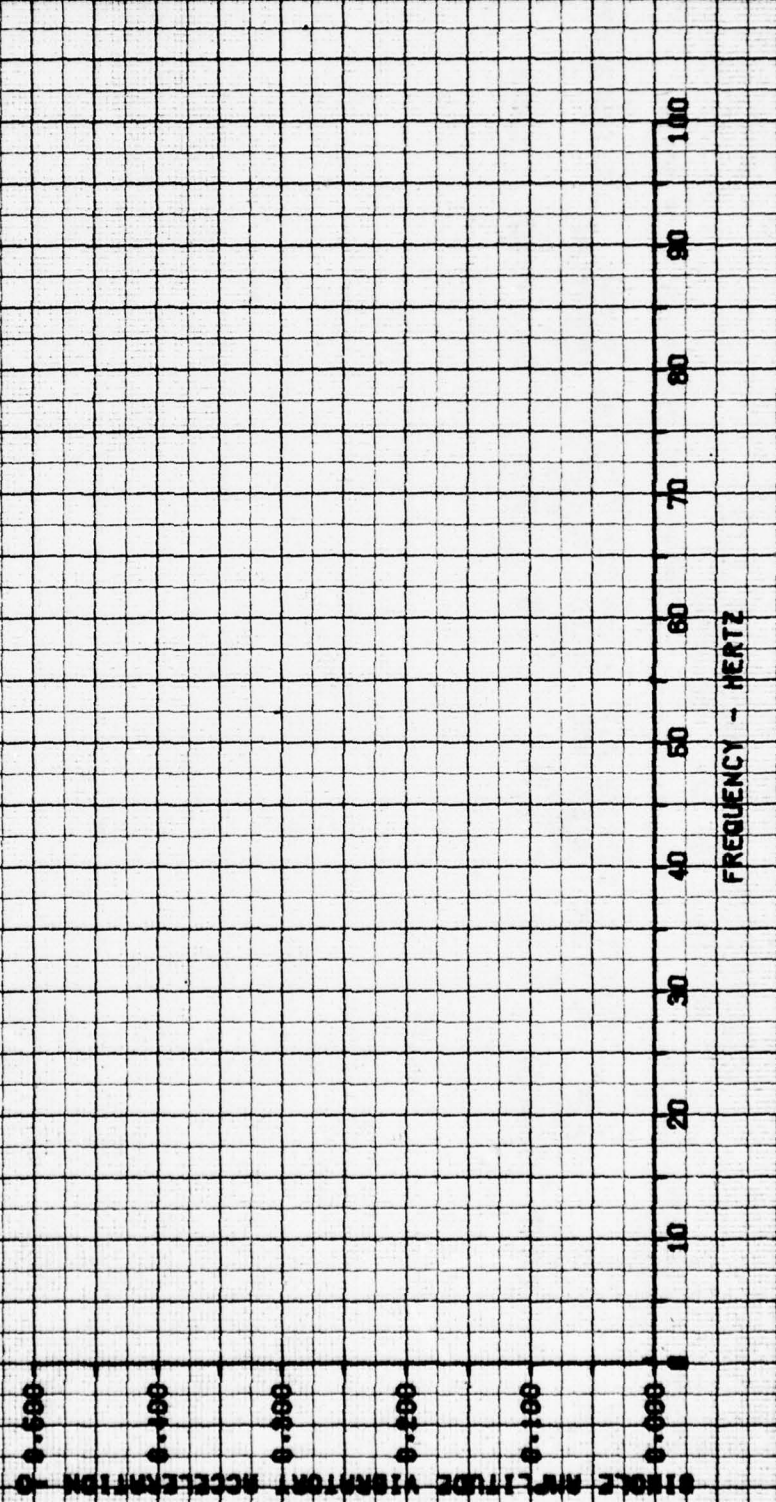


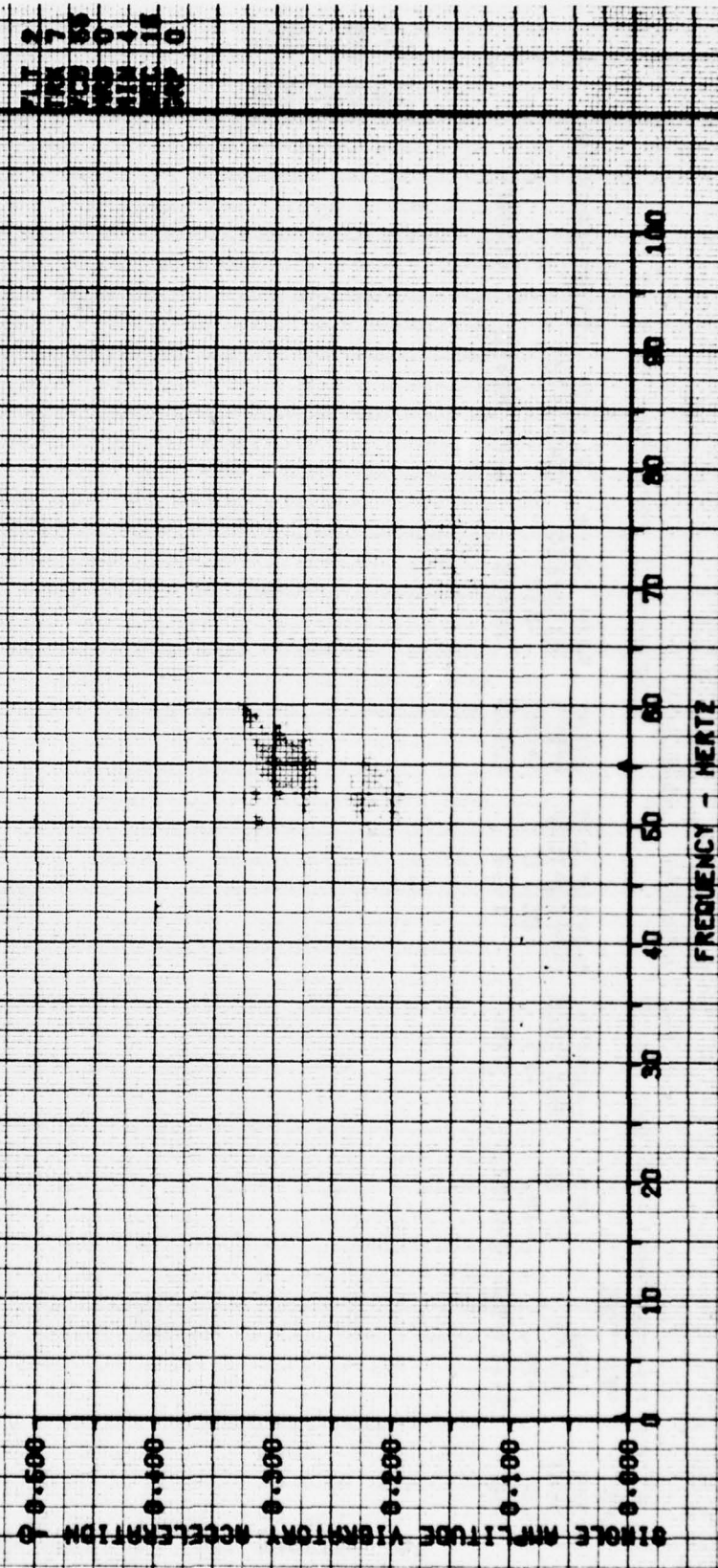
FIGURE 47

VIBRATION CHARACTERISTICS

LOCATION CYCLIC CONTROL  
 AXIS LATERAL  
 GROSS WEIGHT 8800  
 LONG CG FB -134.2 (FWD)  
 LAI CG BL -1.0 (HD)  
 DENSITY 0.0 (HD)  
 ALTITUDE 2180  
 TEMPERATURE -14.0  
 OUTSIDE AIR SPEED 324.0  
 AIRBORNE CONDITION HOVER  
 TRIM CALIB. -K18  
 FLIGHT CONDITION 5-PT HOVER  
 CLEAN

MUH-1H USA S/N 66-60869

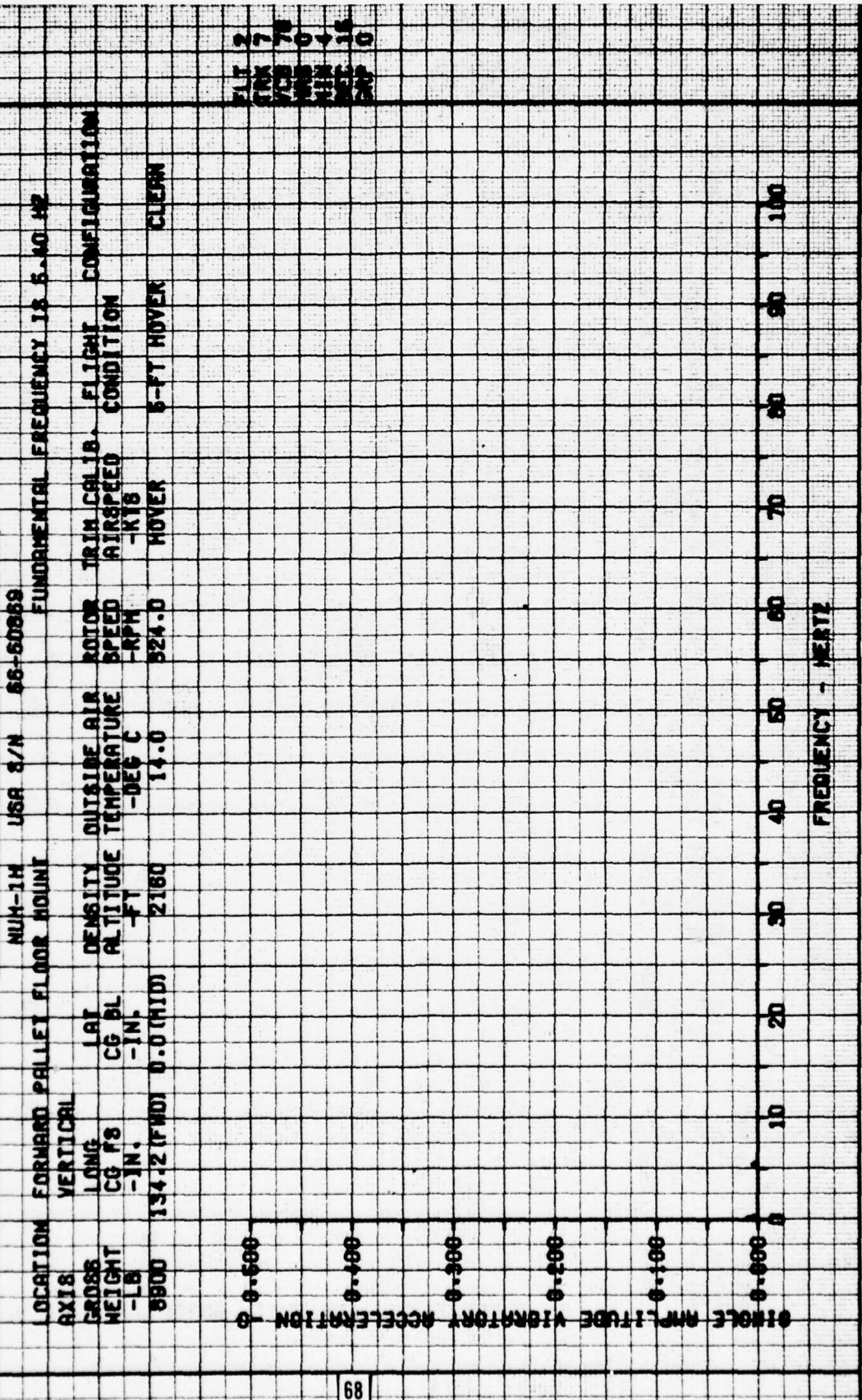
FUNDAMENTAL FREQUENCY IS 5.30 HZ

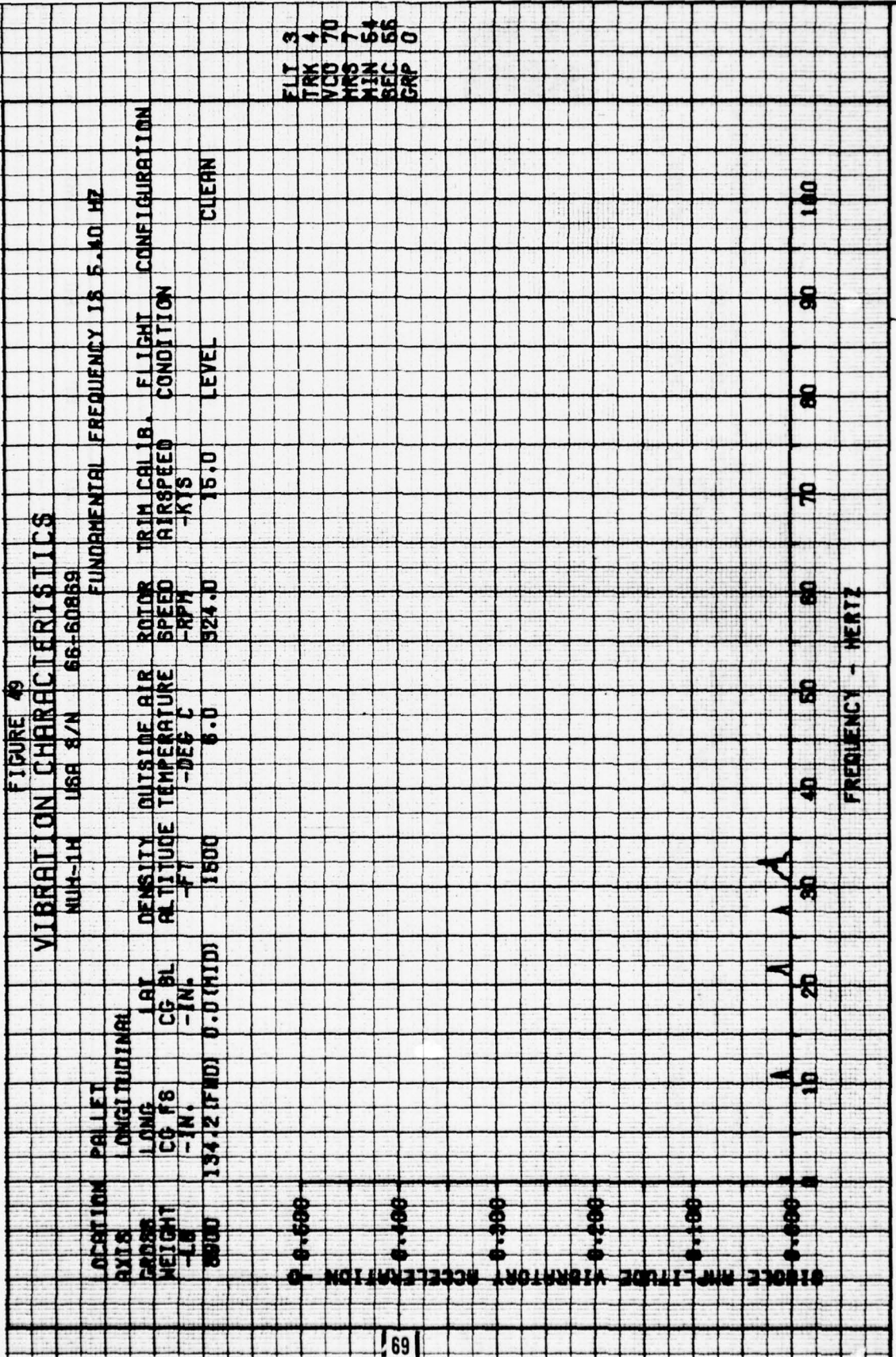


ZLT 2  
 TNA 7  
 YCS 85  
 MGS 0  
 HIN 4  
 SEC 18  
 SWP 0

FIGURE 48

VIBRATION CHARACTERISTICS





FLT 3  
 TRK 4  
 VCO 70  
 MRS 7  
 MIN 54  
 SEC 55  
 GRP 0

FIGURE 50

VIBRATION CHARACTERISTICS

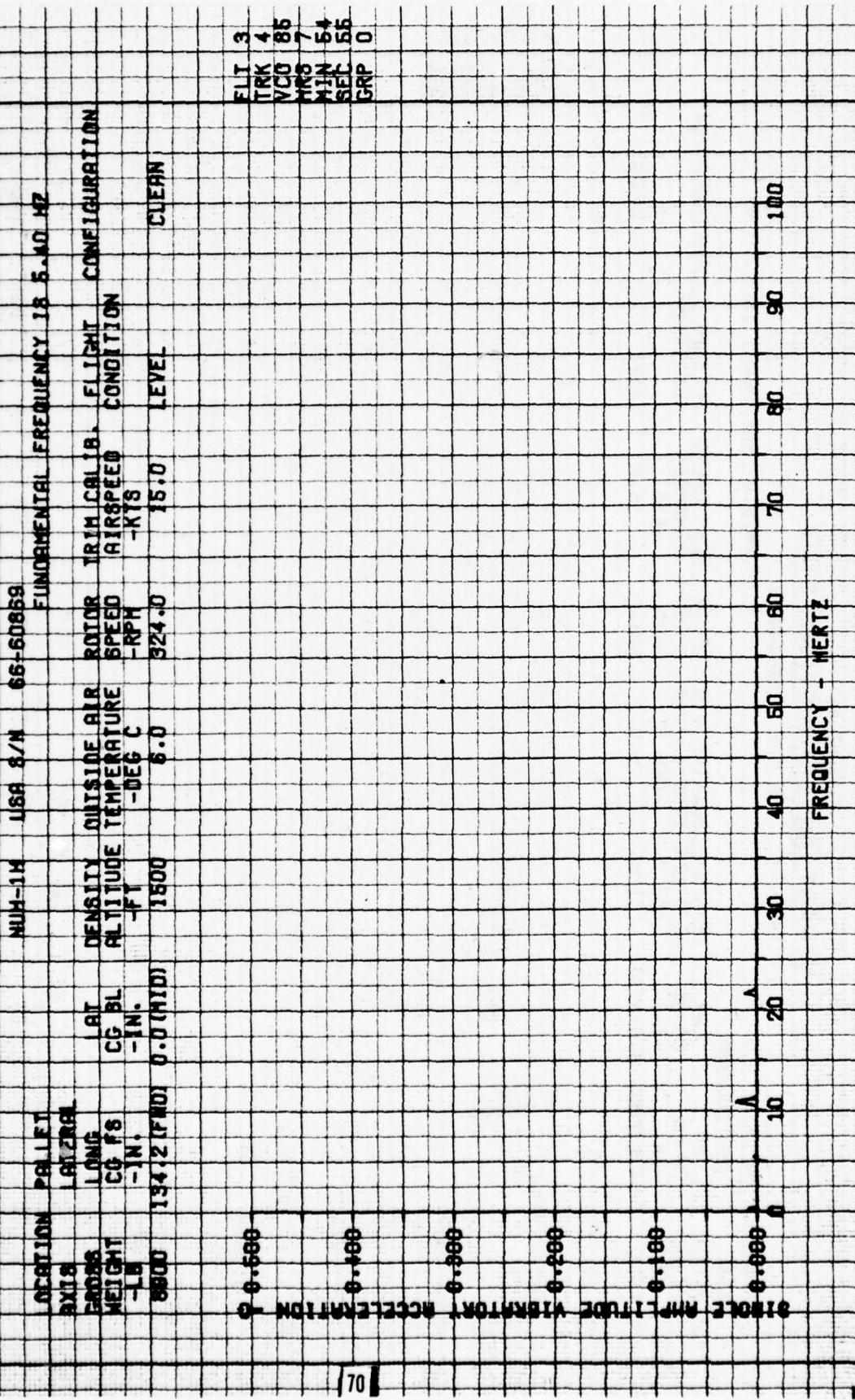
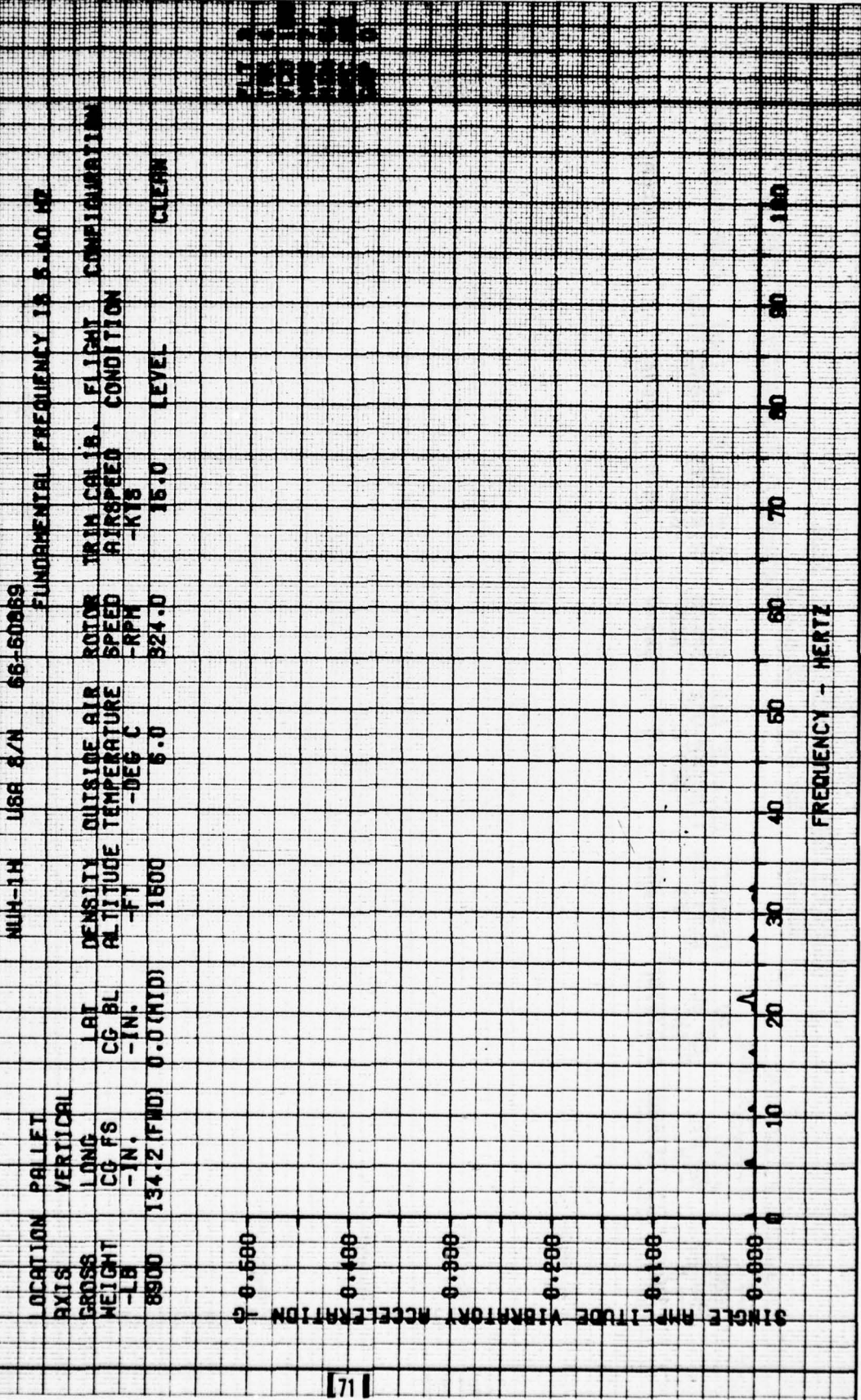


FIGURE 51

VIBRATION CHARACTERISTICS



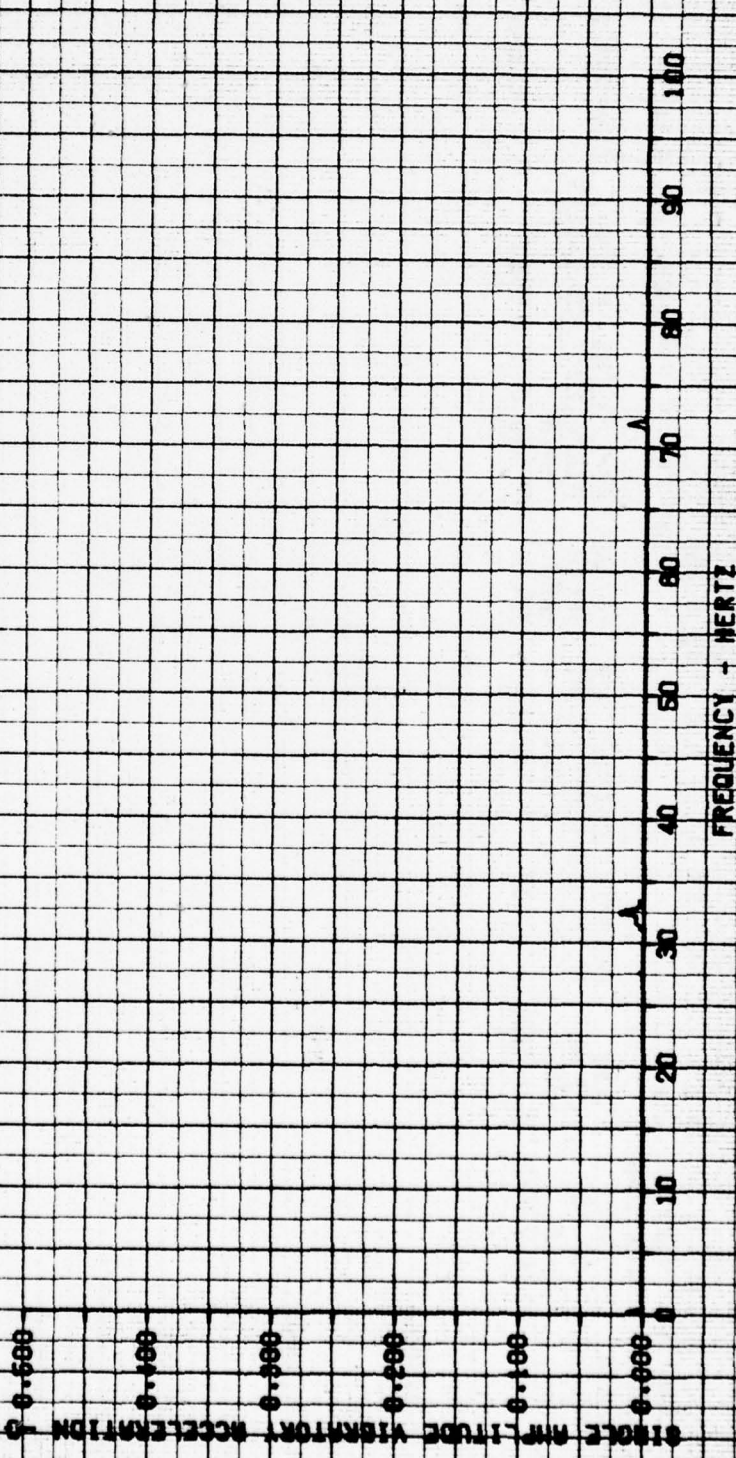
LOCATION PALLET  
 AXIS VERTICAL  
 GROSS WEIGHT - LB 8900  
 CG FS -1N, 134.2 (FWD)  
 CG BL -1N, 0.0 (MID)  
 LAI  
 DENSITY 1500  
 ALTITUDE -FT 1500  
 OUTSIDE AIR TEMPERATURE -DEG C 6.0  
 ROTOR SPEED -RPM 324.0  
 TRIM CALIB. AIRSPEED -KTS 15.0  
 FLIGHT CONDITION LEVEL  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 MP

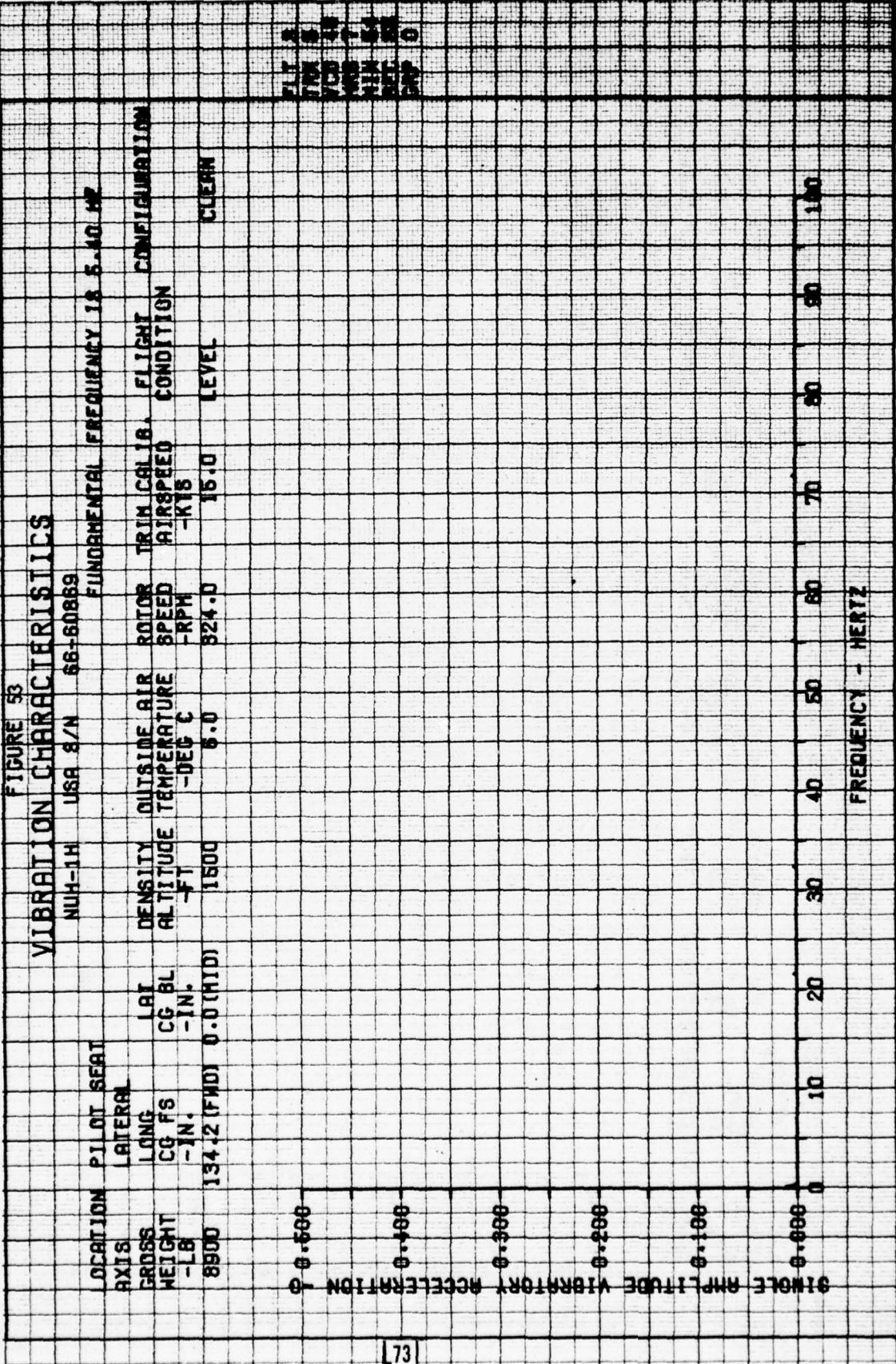
FIGURE 52

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 FLOOR WEIGHT - LB 134.2 (FWD) 0.0 (AID)  
 CG FS - IN. 1500  
 LAY CG BL - IN. 1600  
 DENSITY OUTSIDE AIR 6.0  
 ALTITUDE TEMPERATURE - DEG C 15.0  
 ROTOR SPEED -RPM 324.0  
 TRIM CALIB. FLIGHT CONDITION CLEAN  
 AIRSPEED -KTS 15.0  
 LEVEL  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

ELT 3  
 TRK 5  
 VCO 25  
 MRS 7  
 MIN 54  
 SEC 55  
 GRP 0





FLY 2  
TRX 6  
VCS 10  
VNS 1  
MIN 54  
DET 50  
SND 0

FIGURE 54

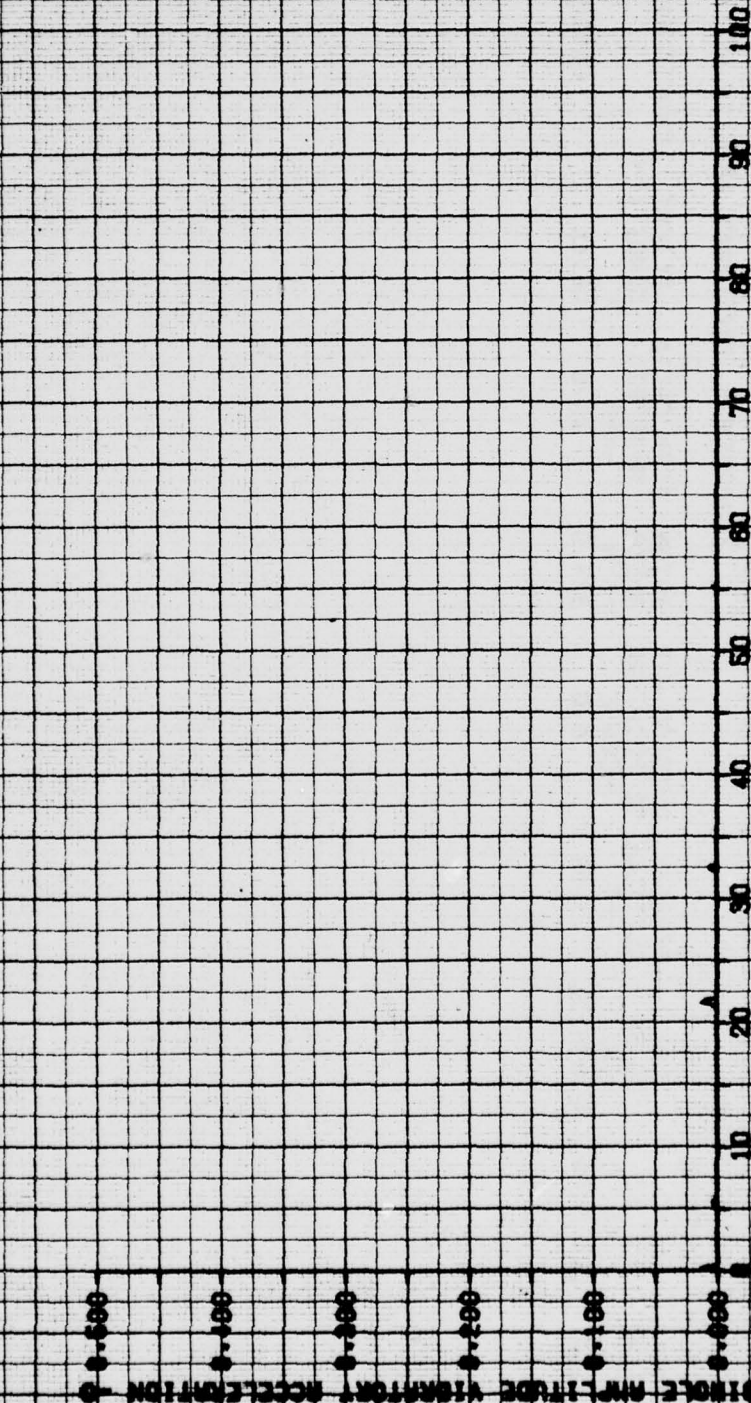
VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS VERTICAL  
 CROSS LONG  
 WEIGHT CG F8  
 -LB 134.2 (FWD) 0.0 (MID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 1500 -RPM 524.0 -KTS 15.0 LEVEL CUERN

FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 3  
 TRK 6  
 VCU 55  
 HRS 7  
 MIN 54  
 SEC 58  
 GRP 0



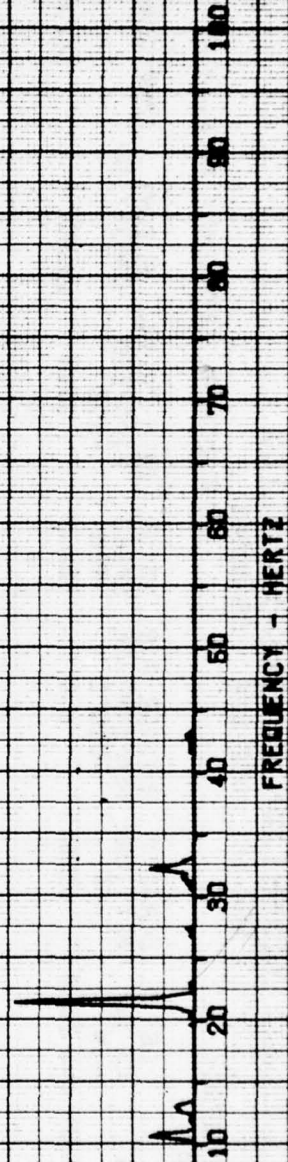
FREQUENCY - HERTZ

FIGURE 55

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LONGITUDINAL  
 GROSS WEIGHT - LB 8800  
 CG F8 - IN. 134.2 (FWD)  
 CG BL - IN. 0.0 (HD)  
 DENSITY - FT 1500  
 ALTITUDE - DEG C 6.0  
 ROTOR SPEED -RPH 824.0  
 TRIM CALIB. AIR SPEED -KTS 15.0  
 FLIGHT CONDITION CLEAN  
 FUNDAMENTAL FREQUENCY IS 3.10 Hz

SINGLE AMPLITUDE VIBRATORY ACCELERATION  
 0.500  
 0.400  
 0.300  
 0.200  
 0.100  
 0.000



FREQUENCY - HERTZ

71 3  
 72 6  
 73 7  
 74 1  
 75 5  
 76 8  
 77 0

FIGURE 56

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LATERAL  
 GROSS WEIGHT CG FS -IN.  
 8900 134.2 (FWD) 0.0 (MID)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 1600 8.0 324.0 16.10 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 3  
 TRK 6  
 VCD 88  
 HRS 7  
 MIN 54  
 SEC 58  
 CRP 0

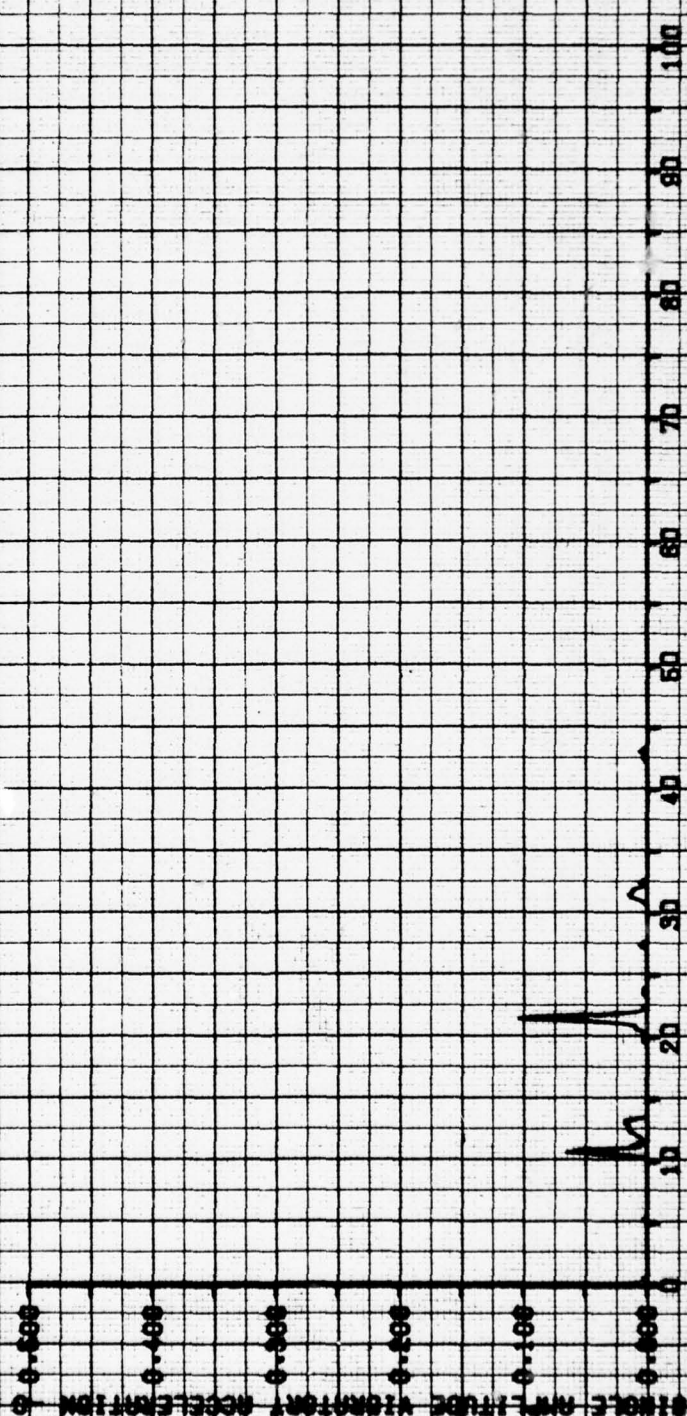
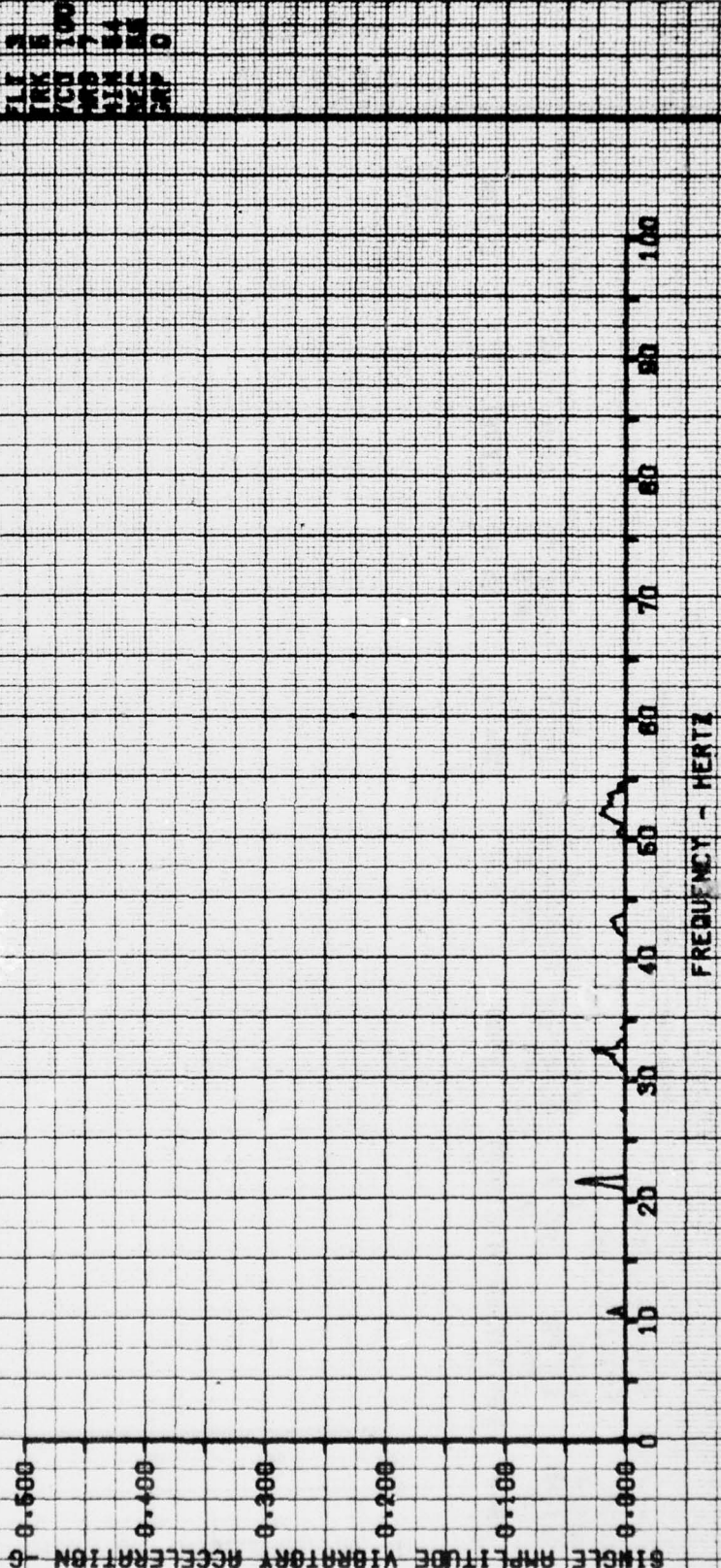


FIGURE 57

VIBRATION CHARACTERISTICS

MUM-1H USA S/N 66-60869 FUNDAMENTAL FREQUENCY IS 5.10 HZ

LOCATION	TRANSMISSION	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	FLIGHT	CONFIGURATION
AXIS	VERTICAL	ALTITUDE	TEMPERATURE	SPEED	AIRSPEED	CONDITION	
GROSS	LONG	-FT	-DEG C	-RPM	-KTS		
HEIGHT	CG SL						
-LB	-IN.						
8900	134.2 (FWD)	0.0 (MID)	1600	324.0	15.0	LEVEL	CLEAN



711 2  
711 5  
711 100  
711 7  
711 54  
711 54  
711 10

FIGURE 58

VIBRATION CHARACTERISTICS

LOCATION	POWER CONVERTER	MUM-1H	USA S/N	66-80889	FUNDAMENTAL FREQUENCY IS	5.10 HZ
AXIS	LONGITUDINAL					
ORDER	LONG	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	FLIGHT CONFIGURATION
WEIGHT	CG F8	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION
-LB	-IN.	-FT	-DEG C	-RPM	-KTS	
8900	134.2 (FWD)	1600	8.0	327.0	16.0	CLEAN
	0.0 (MID)					

FLT 3  
TRK 6  
VCD 25  
MRS 7  
MIN 54  
SEC 55  
GRP 0

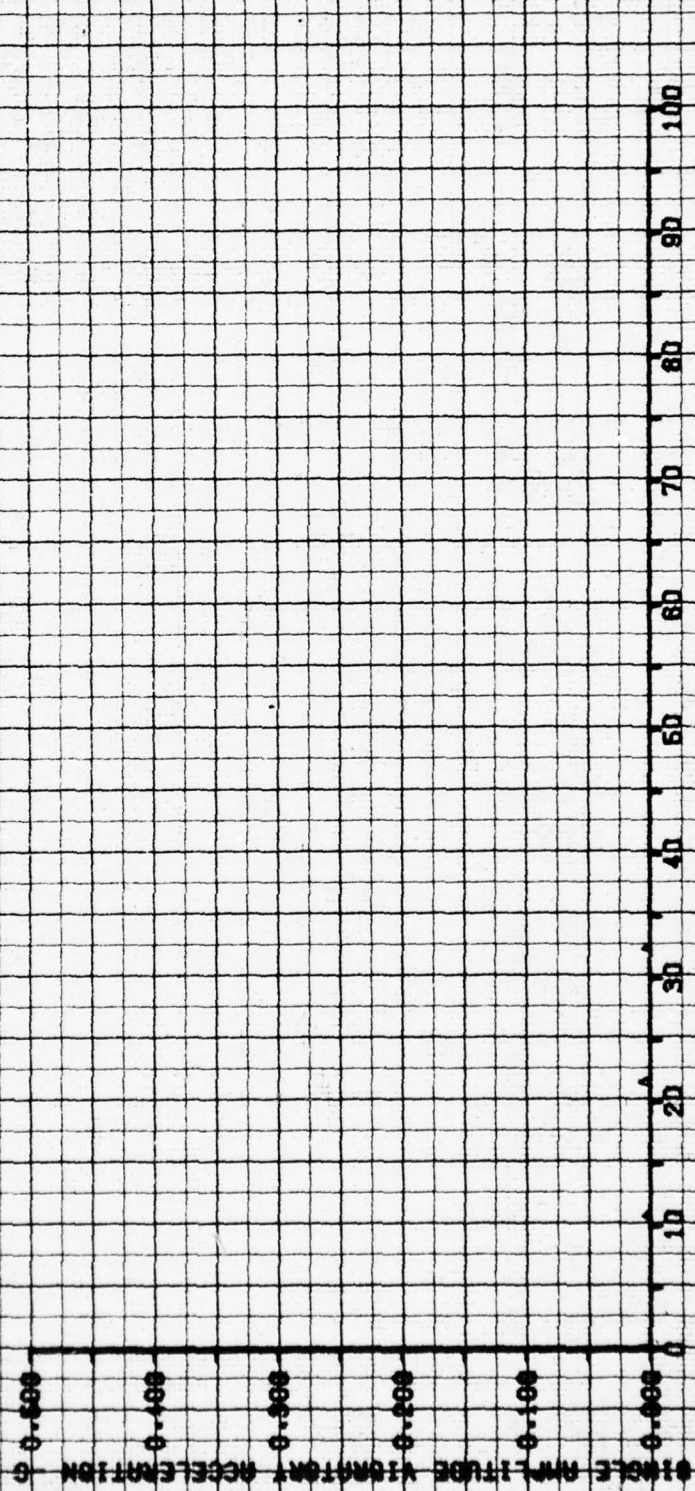
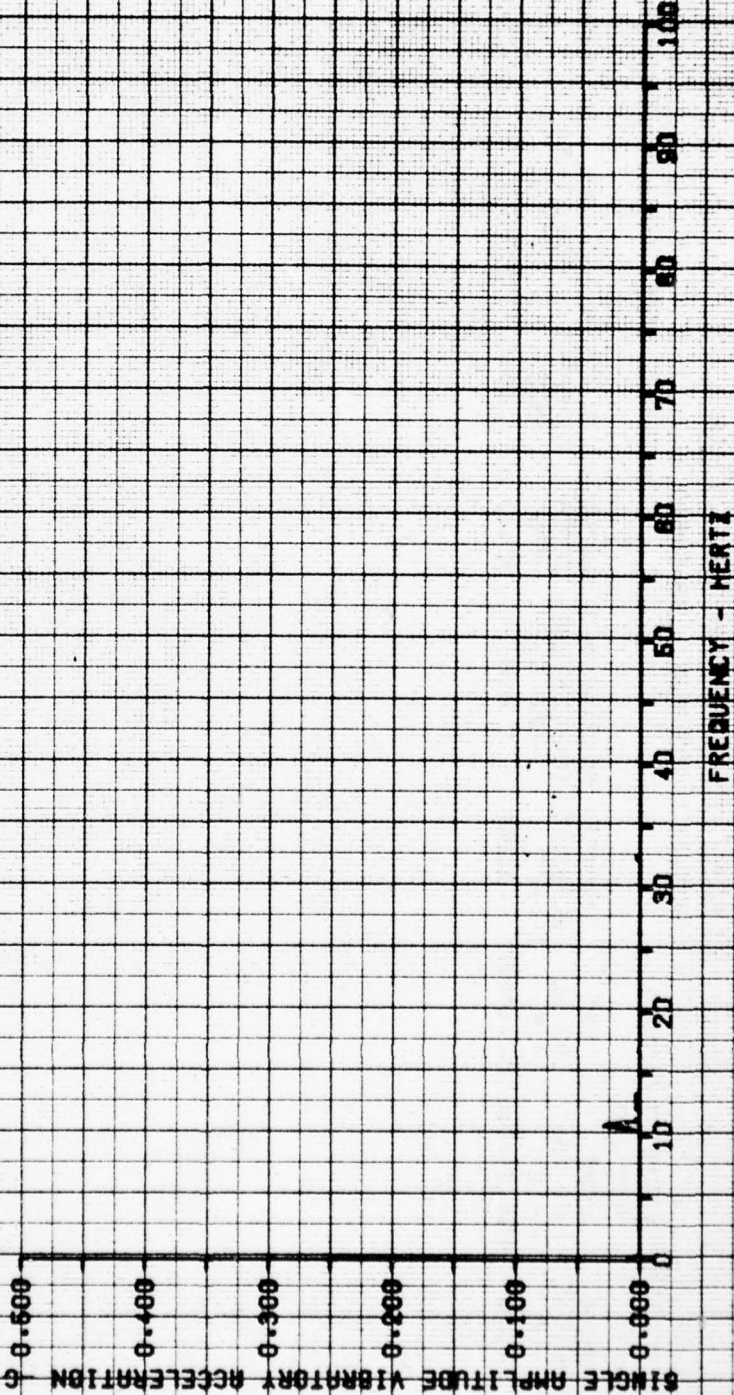


FIGURE 19

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
AXIS LATERAL  
GROSS WEIGHT - LB 8900  
CG FS -IN. 134.2 (FWD)  
CG BL -IN. 0.0 (MID)  
DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
ALTIMETER ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
-FT -IN. 1600 8.0 324.0 16.0 LEVEL CLEAN  
NUM-14 USA S/N 66-60889 FUNDAMENTAL FREQUENCY IS 5.10 HZ



717 5  
718 6  
719 40  
720 7  
721 54  
722 55  
723 0

FIGURE 60

VIBRATION CHARACTERISTICS

LOCATION: POWER CONVERTER  
 AXIS: VERTICAL  
 GRADE: LONG  
 WEIGHT: CG F8  
 -IN.  
 8900 134.2 (FAD) 0.0 (MID)

NUM-14 USA 8/N 86-60869  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

DENSITY: 1600  
 ALTITUDE: -FT  
 6.0  
 824.0  
 16.0  
 LEVEL: CLEAN

ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 SPEED AIRSPEED CONDITION

FLT 3  
 TRK 8  
 VCD 55  
 HRS 7  
 MIN 54  
 SEC 55  
 GRP 0

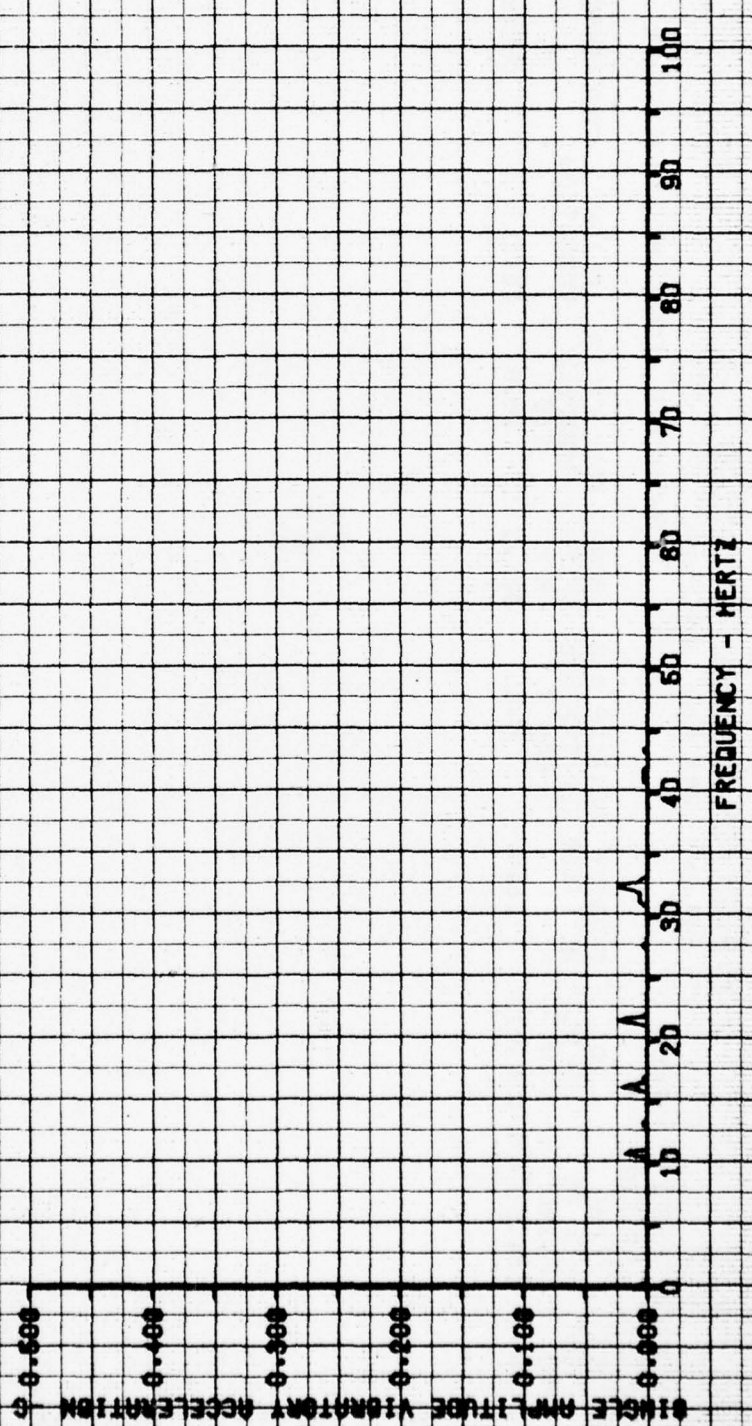
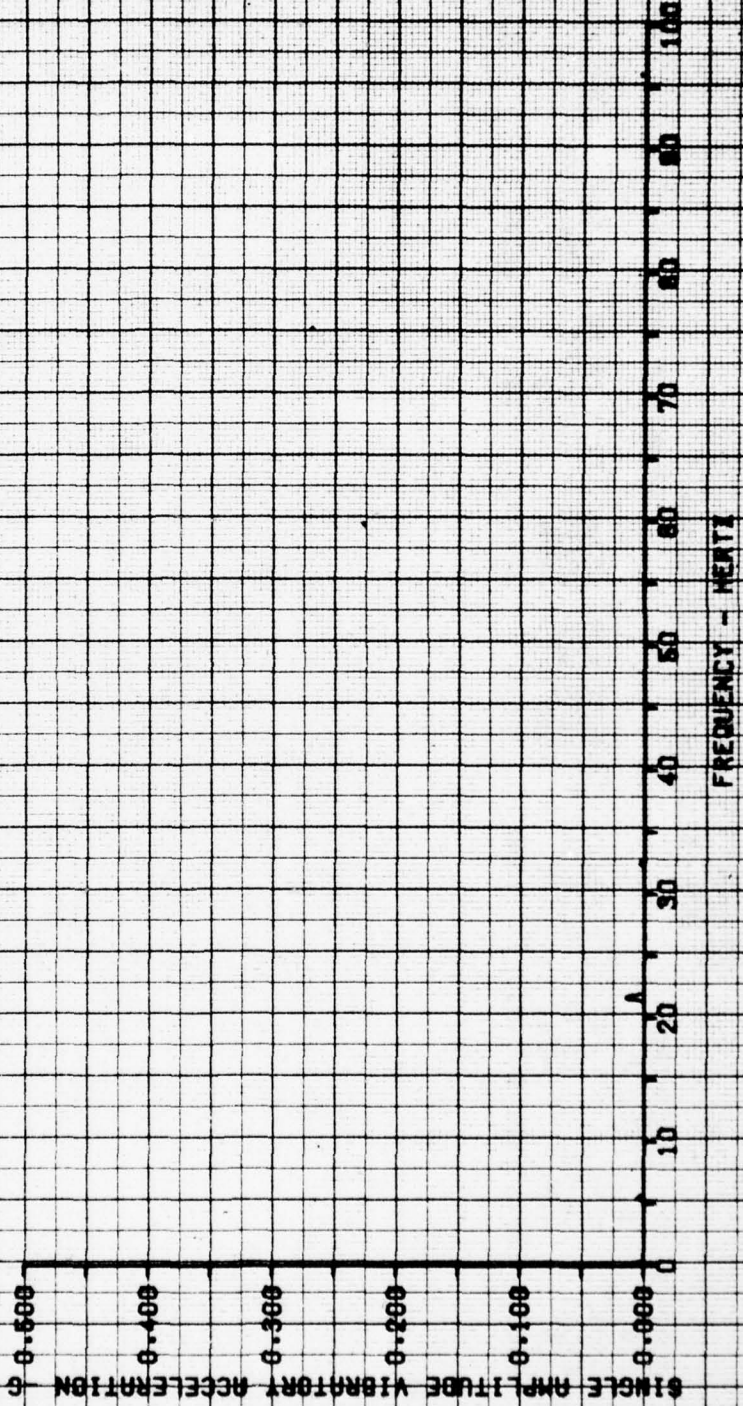


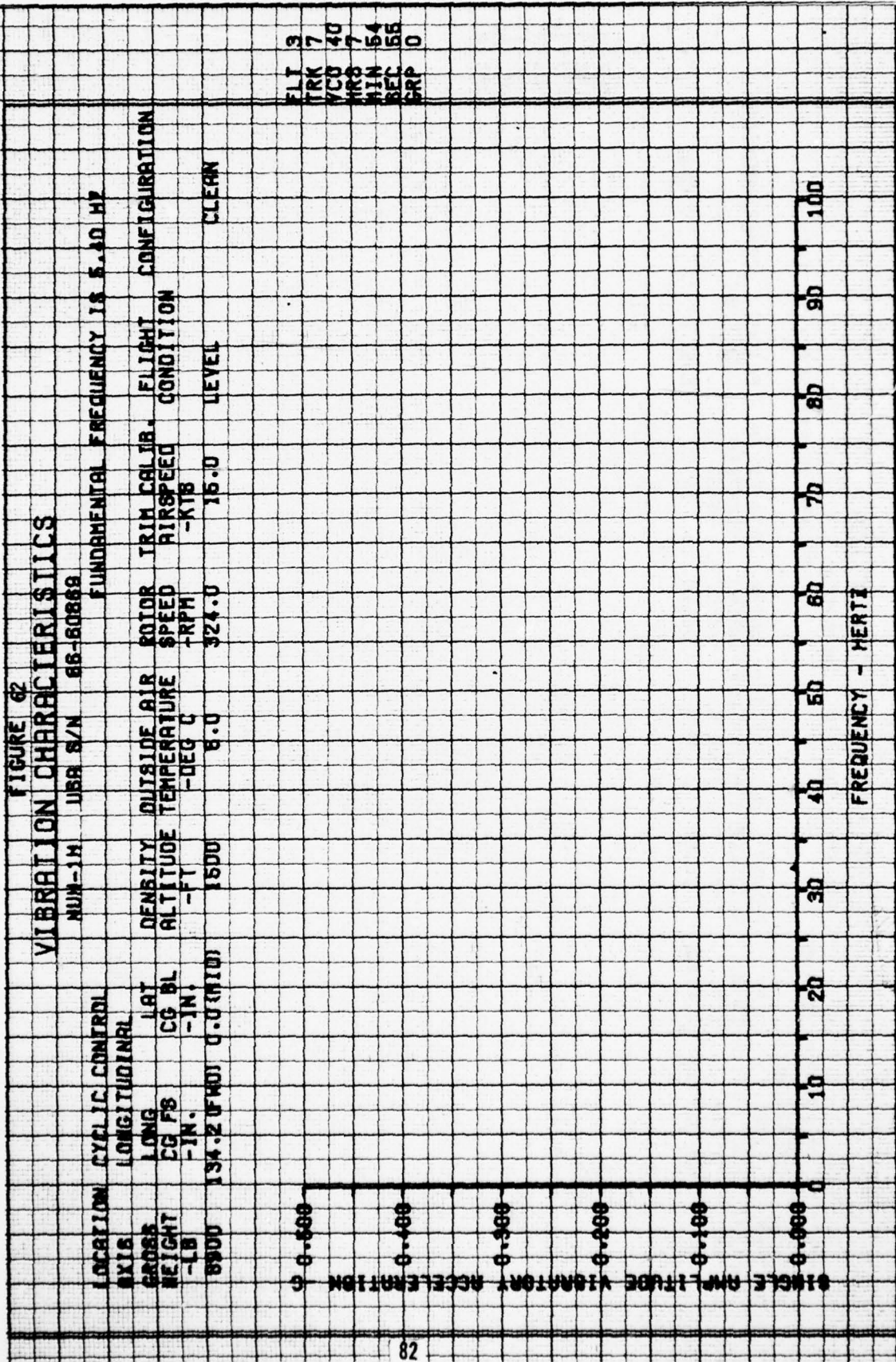
FIGURE 61

VIBRATION CHARACTERISTICS

LOCATION: B90D  
 AXIS: VERTICAL  
 COLLECTIVE CONTROL: 134.2 (FWD)  
 0.0 (MID)  
 LONG CG FS: -IN.  
 LAT CG BL: -IN.  
 DENSITY: 1600  
 ALTITUDE: 8.0  
 OUTSIDE AIR TEMPERATURE: 8.0  
 ROTOR SPEED: 324.0  
 TRIM CALIB. AIRSPEED: 16.0  
 FLIGHT CONDITION: CLEAN  
 FUNDAMENTAL FREQUENCY: 18 5.10 HZ



FLY 3  
 TAX 7  
 VCU 25  
 WBS 7  
 ALM 54  
 SZC 100  
 DRP 0

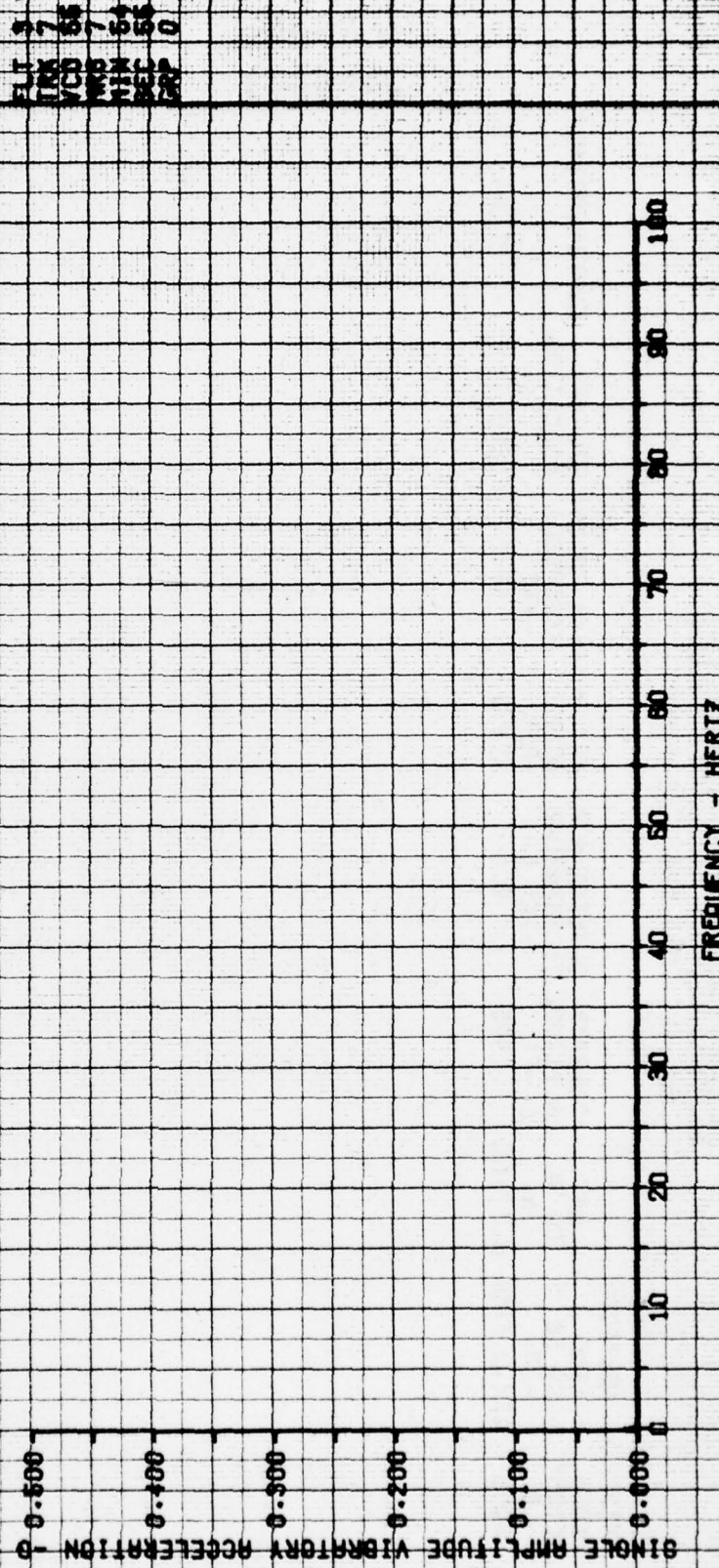


ELT 3  
TRK 7  
VCO 40  
KRS 7  
MIN 54  
SEC 55  
SRP 0

FIGURE 63

VIBRATION CHARACTERISTICS

LOCATION CYCLIC CONTROL  
 AXIS LATERAL  
 GROSS WEIGHT 8900  
 -LB 134.2 (FWD) 0.0 (MTD)  
 LAI  
 CG BL -IN.  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 1500 -DEG C 8.0 324.0 15.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5-10 HZ

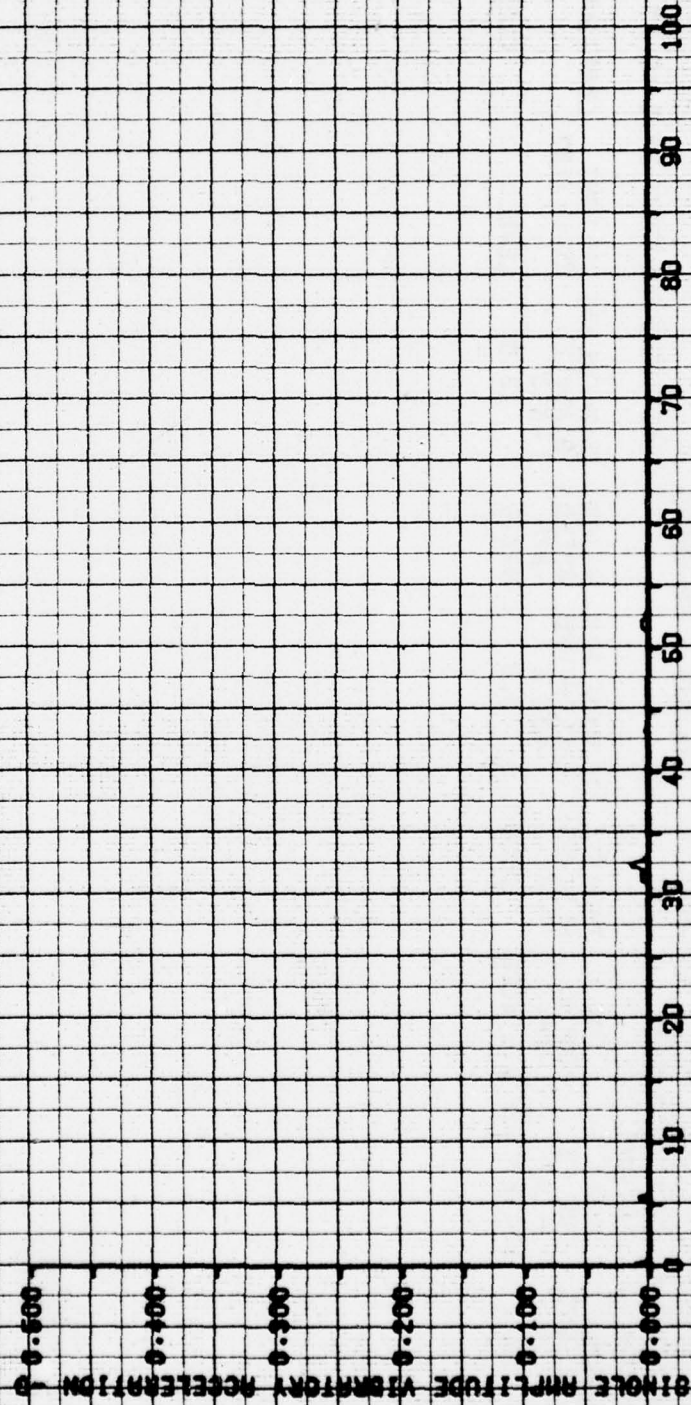


FLT 9  
 TRX 7  
 VCD 66  
 WWS 7  
 MIN 64  
 SEC 55  
 TRP 0

FIGURE 6A

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 CROSS LONG  
 HEIGHT 8900  
 -LB 134.2 (FWO) 0.0 (M10)
 LAI 1500  
 CG BL -IN.  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 1500 8.0 324.0 15.0 LEVEL CLEAN  
 FUNDORMENTAL FREQUENCY IS 5.40 HZ



FLT 3  
 TRK 7  
 VCD 70  
 HRS 7  
 MIN 54  
 SEC 55  
 GRP 0

FIGURE 65

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS LONGITUDINAL  
 GROSS WEIGHT - LB 9160  
 CG FS - IN. 135.2 (FWD)  
 LAT CG BL - IN. 0.0 (MTD)  
 DENSITY OUTSIDE AIR 1620  
 ALTITUDE TEMPERATURE - FT 4.0  
 ROTOR SPEED - RPM 324.0  
 TRIM CALIB. AIRSPEED - KTS 10.0  
 FLIGHT CONDITION MAP OF EARTH  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 8  
 TRK 4  
 VCB 76  
 MMS 8  
 MMH 27  
 MEC 1K  
 GWP 0

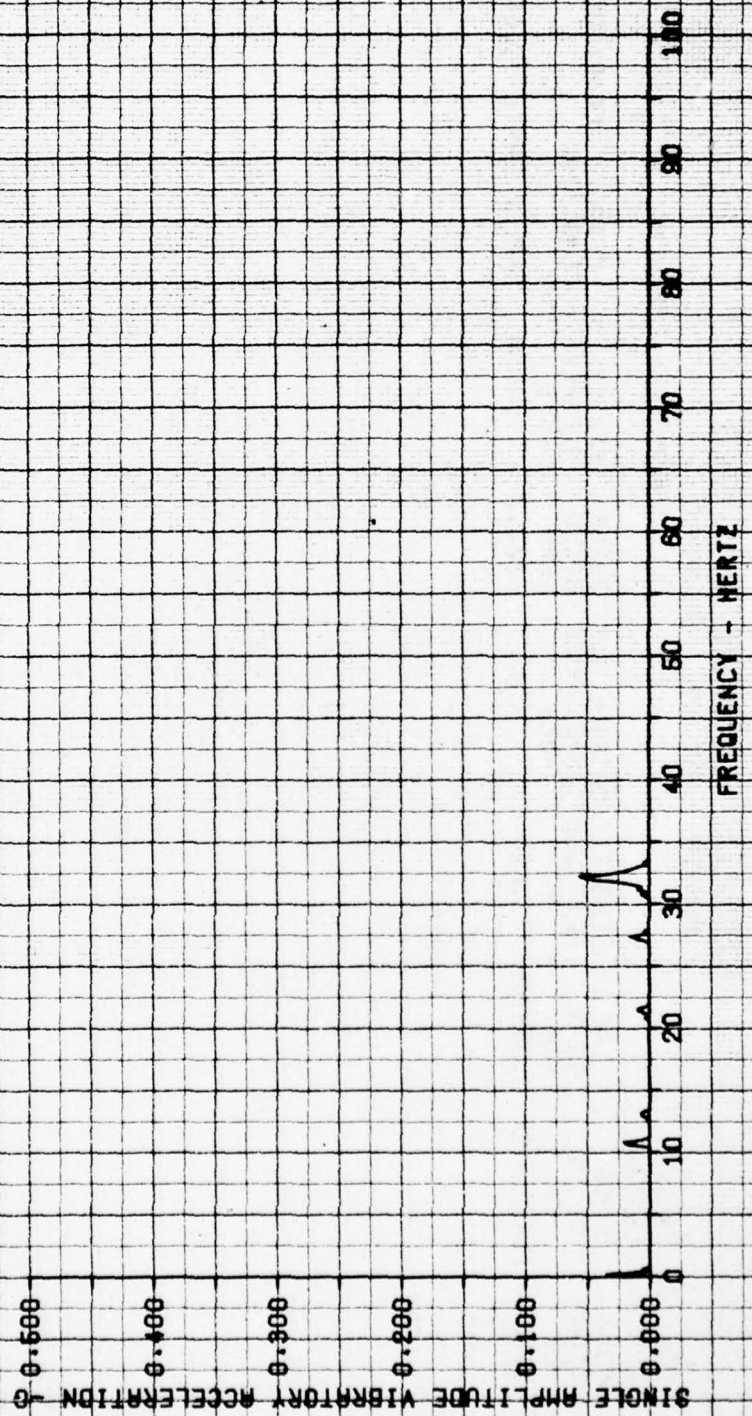


FIGURE 86

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS LATERAL  
 GROSS WEIGHT - LB 9100  
 CG FB - IN. 135.2 (FWD)  
 CG BL - IN. 0.0 (MID)  
 LAT 0.0 (MID)  
 DENSITY OUTSIDE AIR 4.0  
 ALTITUDE TEMPERATURE -DEG C 4.0  
 ROTOR TRIM CALIB. 10.0  
 SPEED -RPM 324.0  
 AIRSPEED -KTS 10.0  
 FLIGHT CONDITION MAP OF EARTH  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 8  
 TRK 4  
 VCO 86  
 MRS 8  
 MIN 27  
 SEC 16  
 GRP 0

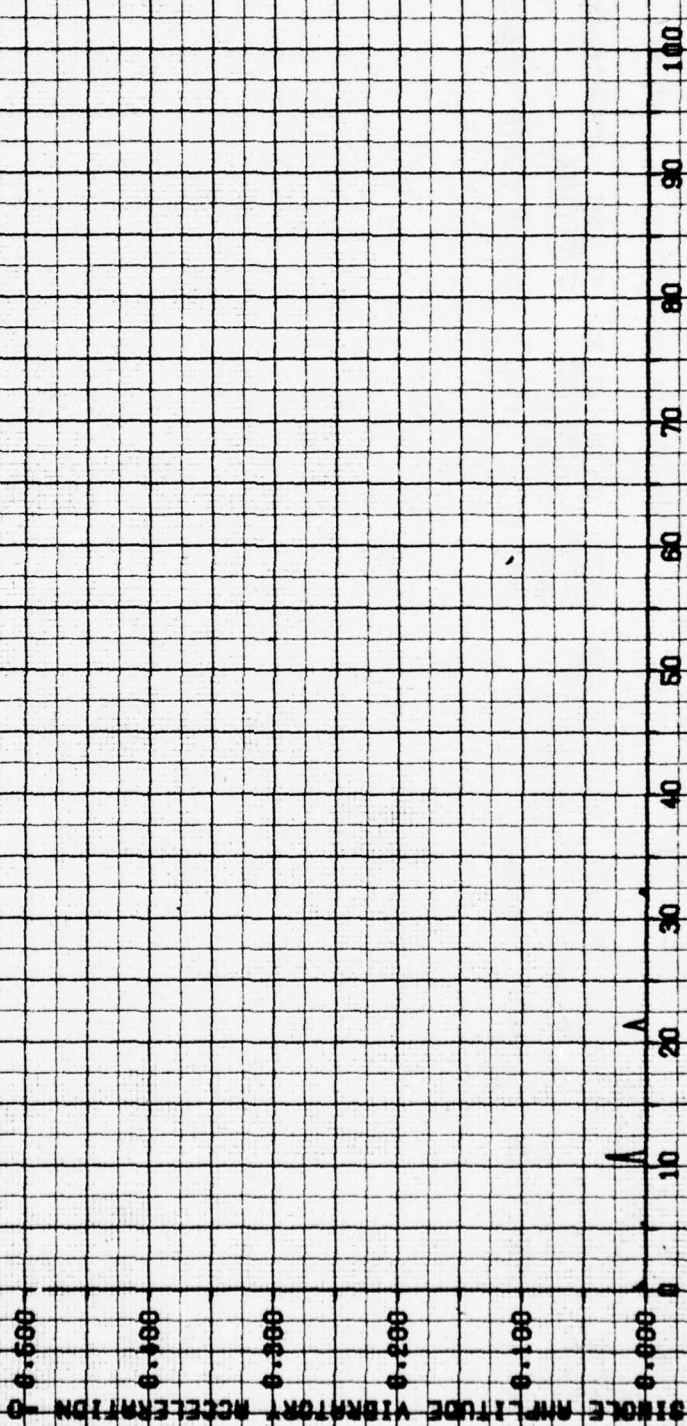


FIGURE 67

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS VERTICAL  
 GROSS WEIGHT - LB 9160  
 CG F8 -IN. 135.2 (FWD)  
 LCG BL -IN. 0.0 (MID)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 1620 -DEG C 4.0 -RPM 324.0 -KTS 10.0  
 MAP OF ERRTH CLEAN

FLT 2  
 LINK 4  
 VCD 100  
 WIND 0  
 MIN 27  
 MAX 11  
 SWP 0

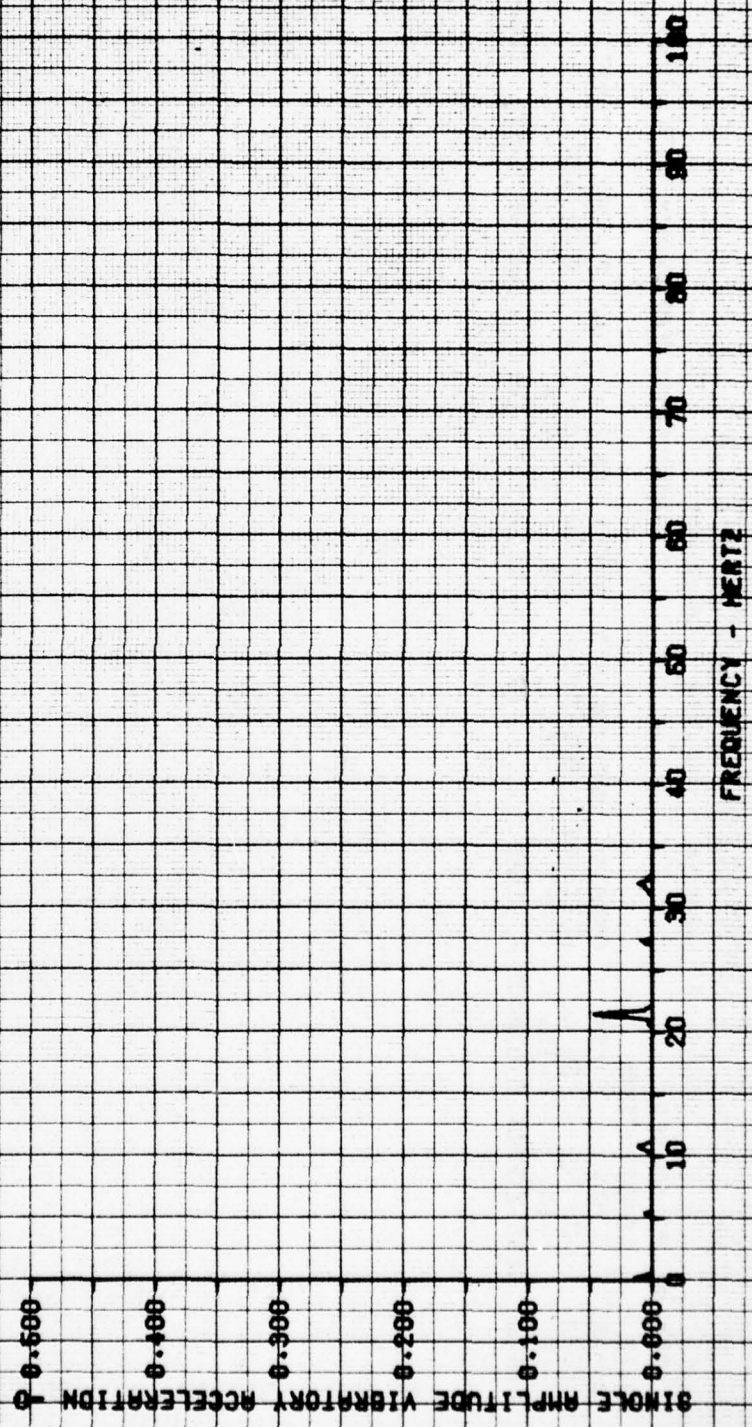


FIGURE 68

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 CROSS WEIGHT 9180  
 LONG CG FS 135.2 (FWD)  
 CG 3L 0.0 (MID)  
 CG 3R -IN.  
 DENSITY 1520  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE -DEG C 4.0  
 ROTOR SPEED -RPH 324.0  
 TRIM CALIB. AIRSPEED -KTS 10.0  
 FLIGHT CONFIGURATION MAP OF EARTH  
 CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

SINGLE AMPLITUDE VIBRATION ACCELERATION  
 0.600  
 0.400  
 0.200  
 0.100  
 0.000

FREQUENCY - HERTZ  
 0 10 20 30 40 50 60 70 80 90 100

FLT 8  
 TRX 5  
 VCO 26  
 HRS 8  
 MIN 27  
 SEC 15  
 GRP 0

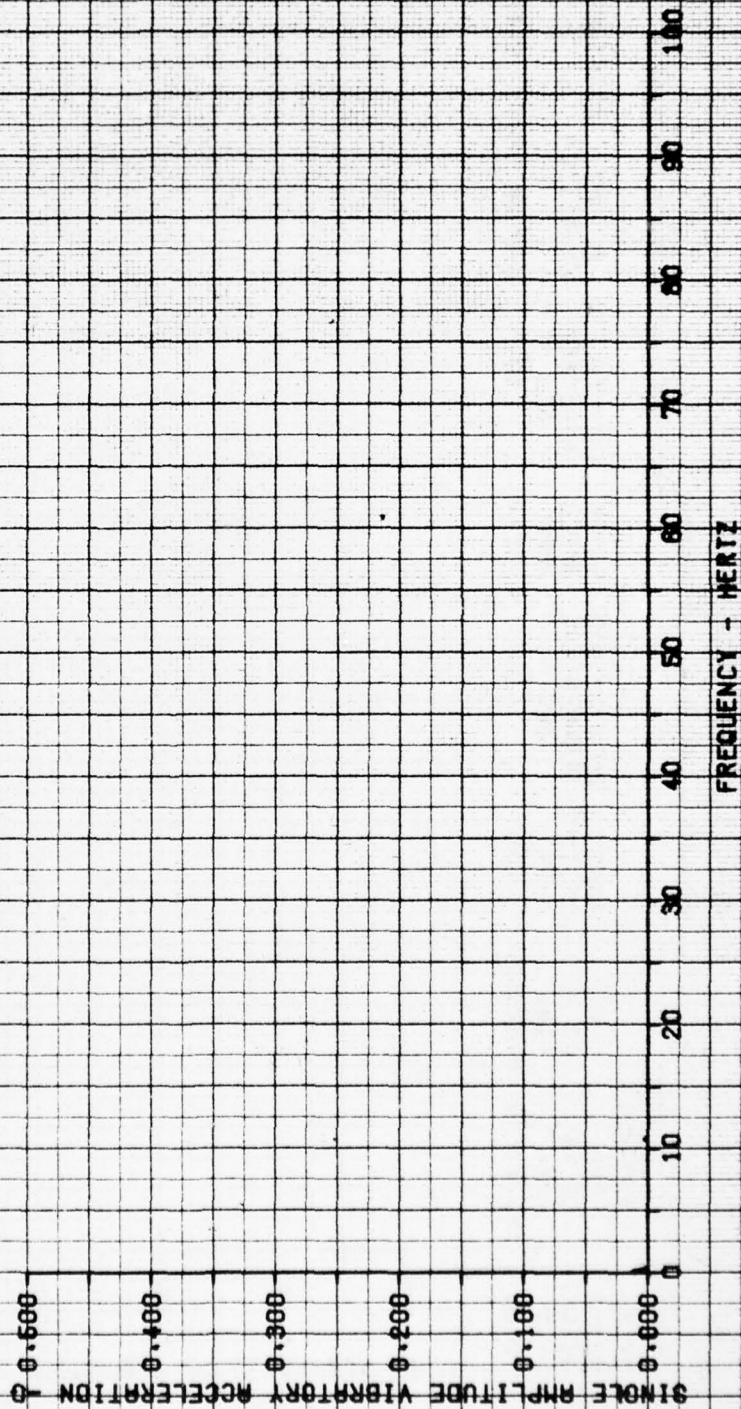
FIGURE 69

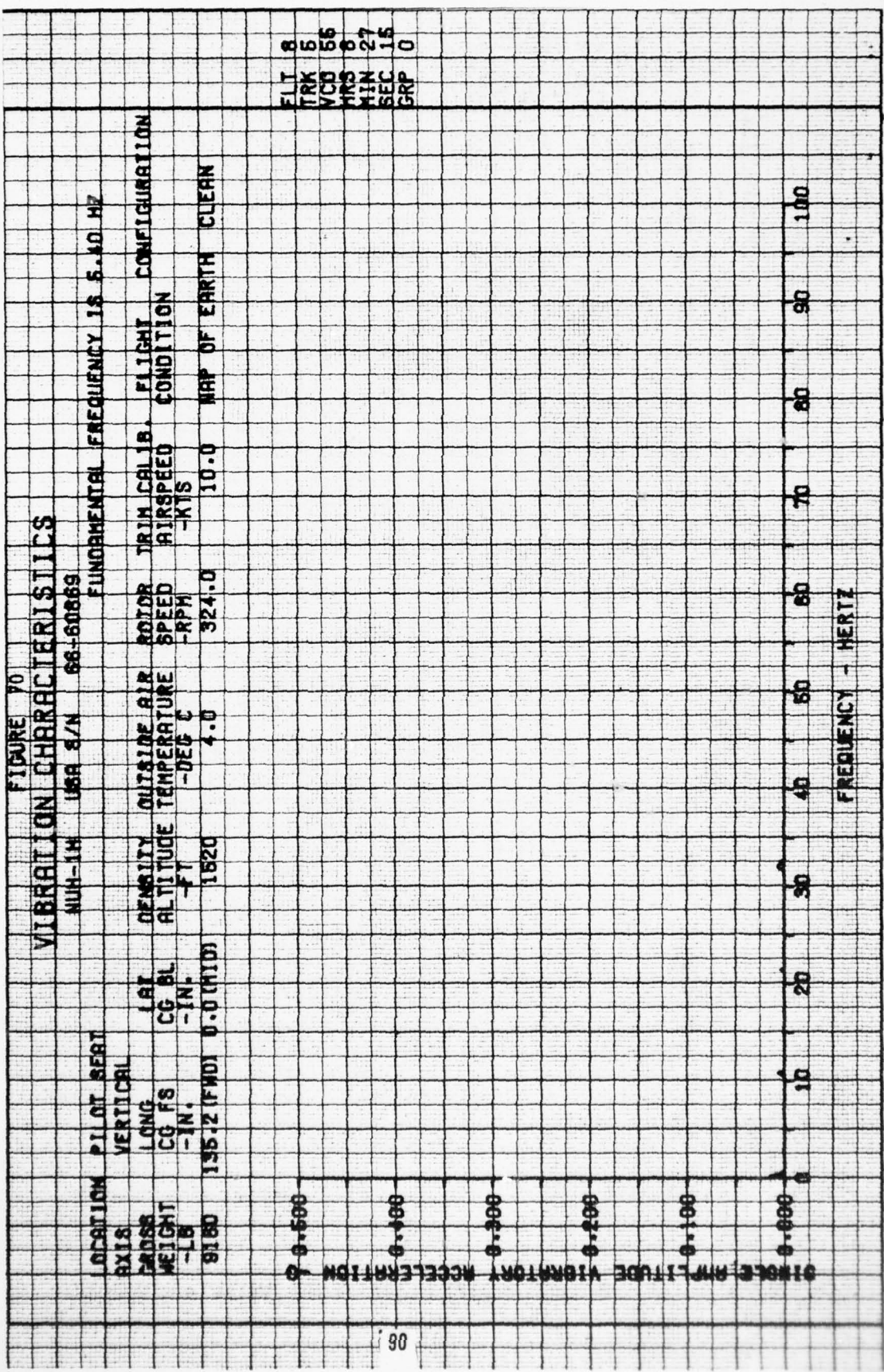
VIBRATION CHARACTERISTICS

NUM-1H USA 8/N 66-60869 FUNDAMENTAL FREQUENCY IS 5.10 HZ

LOCATION	PILOT SEAT	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	FLIGHT	CONFIGURATION
AXIS	LATERAL	ALTITUDE	TEMPERATURE	SPEED	AIRSPEED	CONDITION	
GROSS	LONG	-FT	-DEG C	-RPH	-KTS		
WEIGHT	CG FS						
-LB	-IN.						
9160	135.2 (FWD)	1520	4.0	324.0	10.0	MAP OF EARTH	CLEAN

FLT 8  
TRM 8  
VCO 48  
HNS 6  
MIN 27  
DET 18  
CRP 0





ELT 8  
TRK 6  
VCD 56  
HRS 6  
MIN 27  
SEC 15  
GRP 0

AD-A047 971

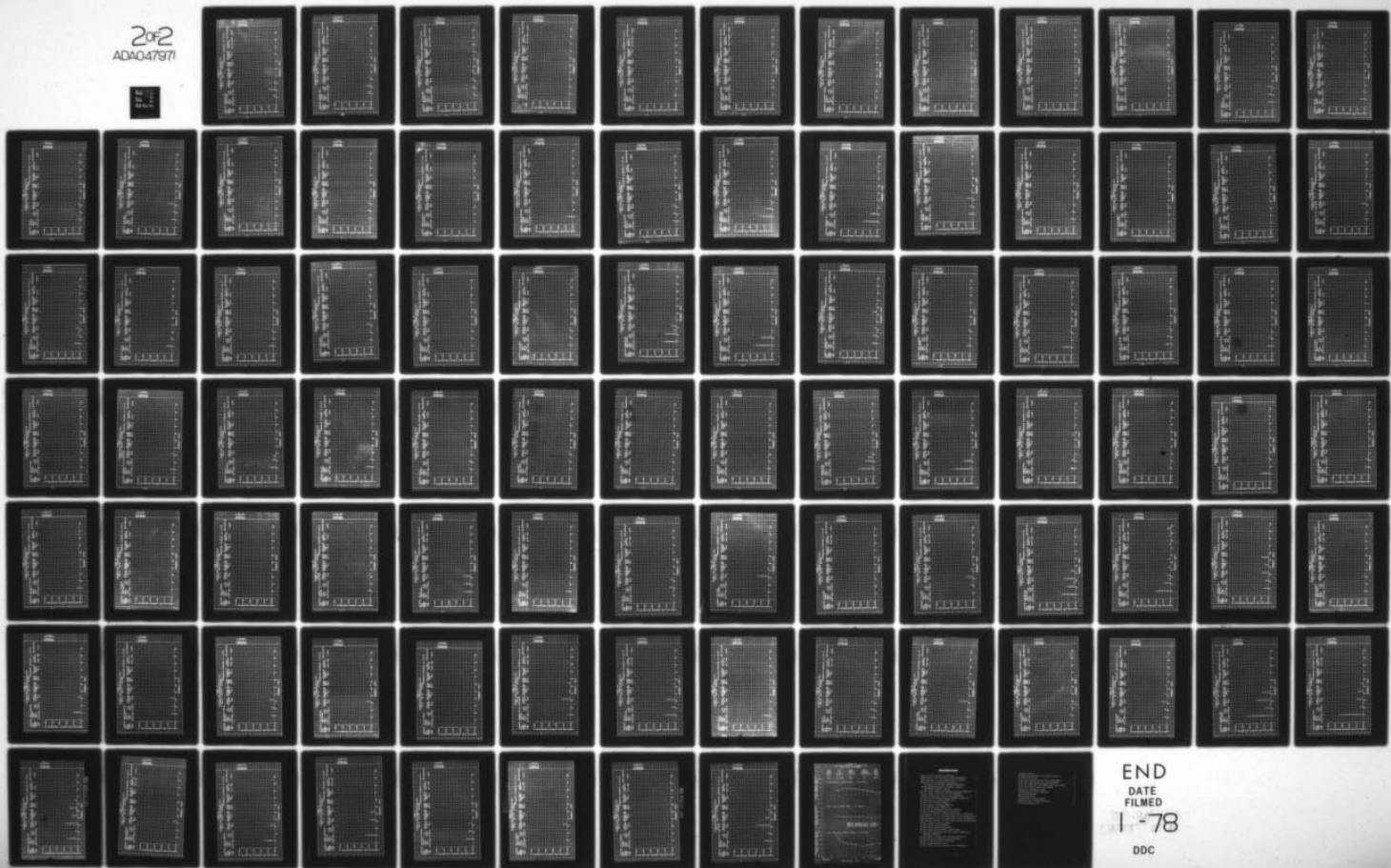
ARMY AVIATION ENGINEERING FLIGHT ACTIVITY EDWARDS AF--ETC F/G 1/3  
AIRWORTHINESS EVALUATION NUH-1H HELICOPTER WITH GLOBAL POSITION--ETC(U)  
MAY 77 C L THOMAS, T P BENSON

UNCLASSIFIED

USAAEFA-76-13

NL

2 of 2  
ADAO47971



END  
DATE  
FILMED  
1-78  
DDC



FIGURE 72

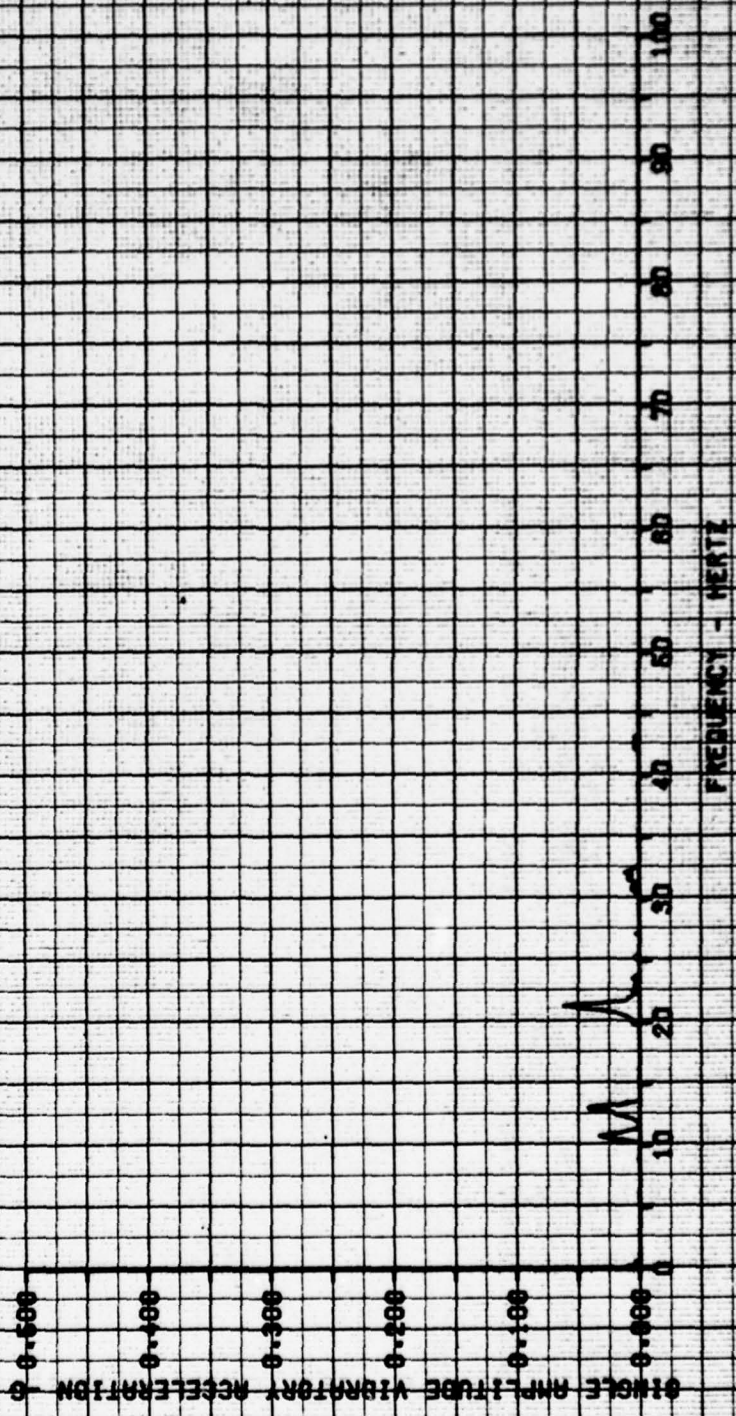
VIBRATION CHARACTERISTICS

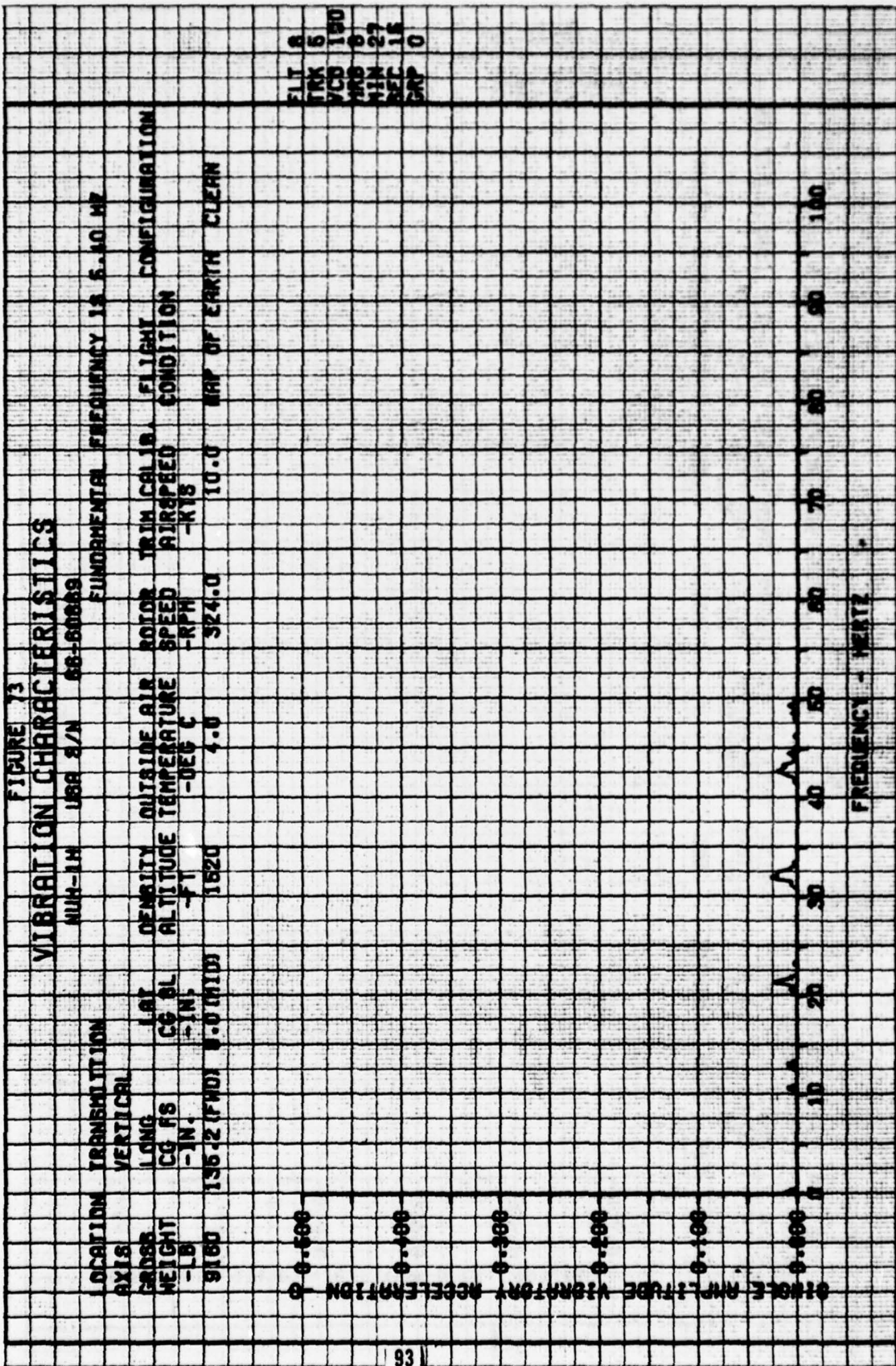
LOCATION TRANSMISSION  
 AXIS LATERAL  
 CROSS LONG  
 HEIGHT CG FS  
 -LB -IN.  
 9180 135.2 (FWD) 0.0 (MID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 1820 4.0 324.0 10.0 MAP OF EARTH CLEAN

FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 8  
 TRK 5  
 VCU 86  
 WWS 8  
 MIN 27  
 SEC 15  
 SWP 0



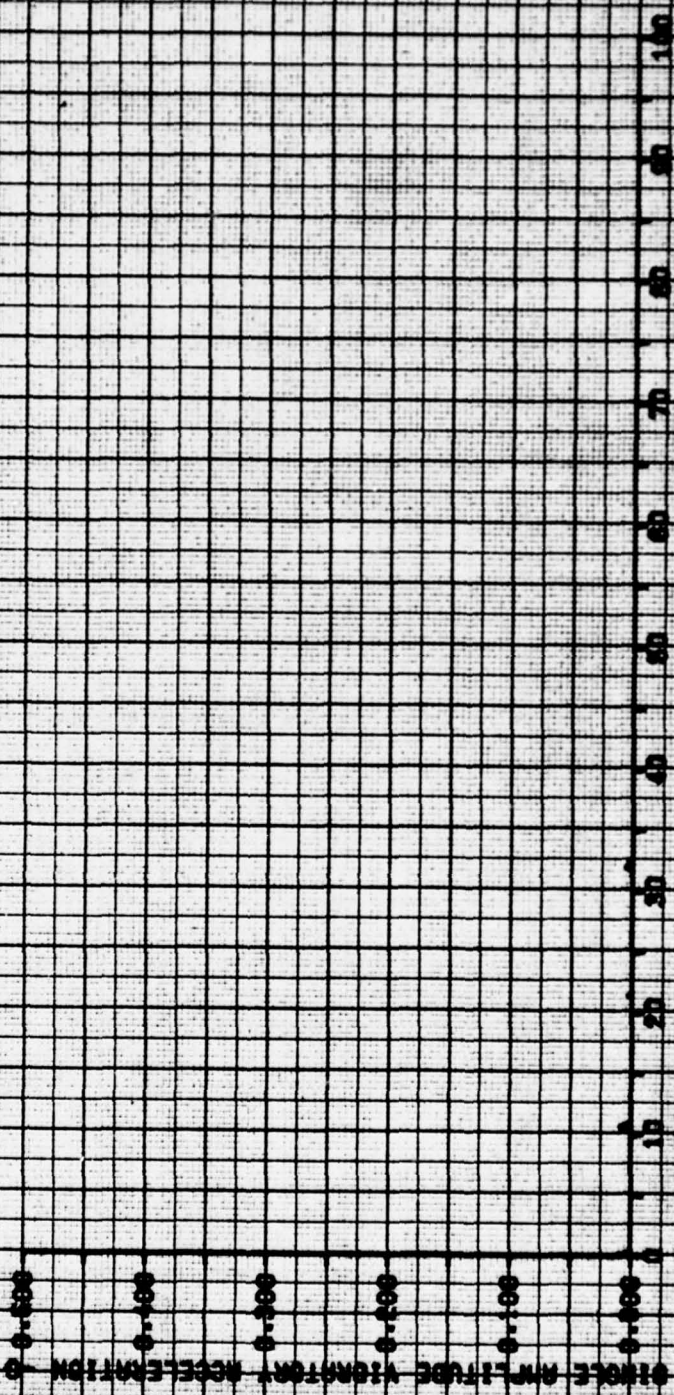


FLT 8  
TRK 6  
VCD 180  
MRB 0  
MIN 27  
SEC 15  
GRP 0

**FIGURE 74**  
**VIBRATION CHARACTERISTICS**

POWER CONVERTER  
 LONGITUDINAL  
 LONG  
 CG FS  
 -IN. 155.2 (FWD) 0.0 (MID)  
 ALTITUDE 1820  
 ALTITUDE TEMPERATURE -F 4.0  
 AIRBORNE AIRBORNE TRIM CALIB. FLIGHT CONFIGURATION  
 SPEED AIRSPEED -KTS 10.0 MAP OF EARTH CLEAN  
 -RPH 324.0  
 -DEG C  
 FUNDAMENTAL FREQUENCY IS 5.10 MZ  
 MIN-IN 158 5/N 88-60069

FLT 8  
 FAX 8  
 YCD 26  
 WGS 8  
 WLN 27  
 WTC 15  
 WXP 0



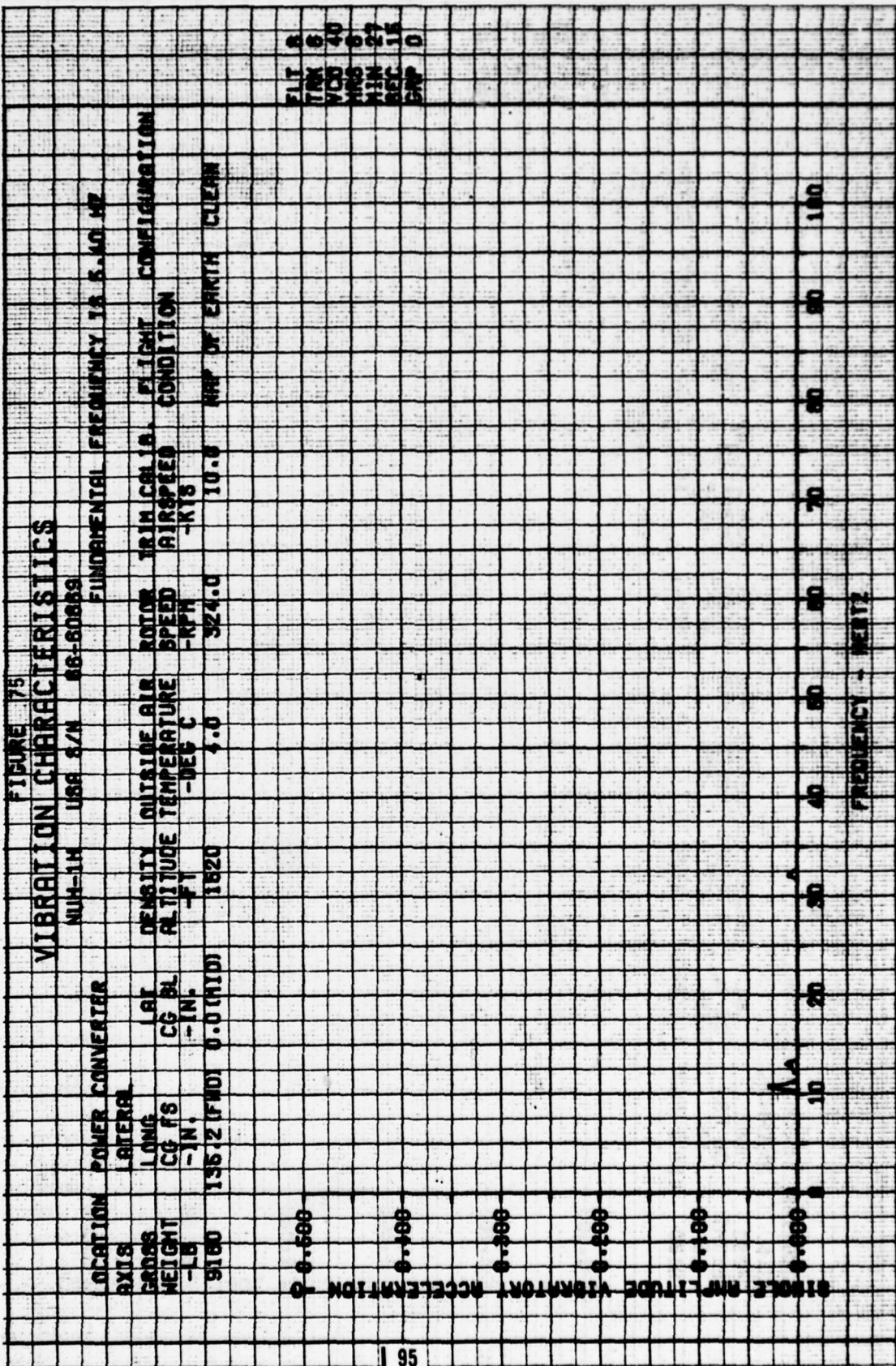
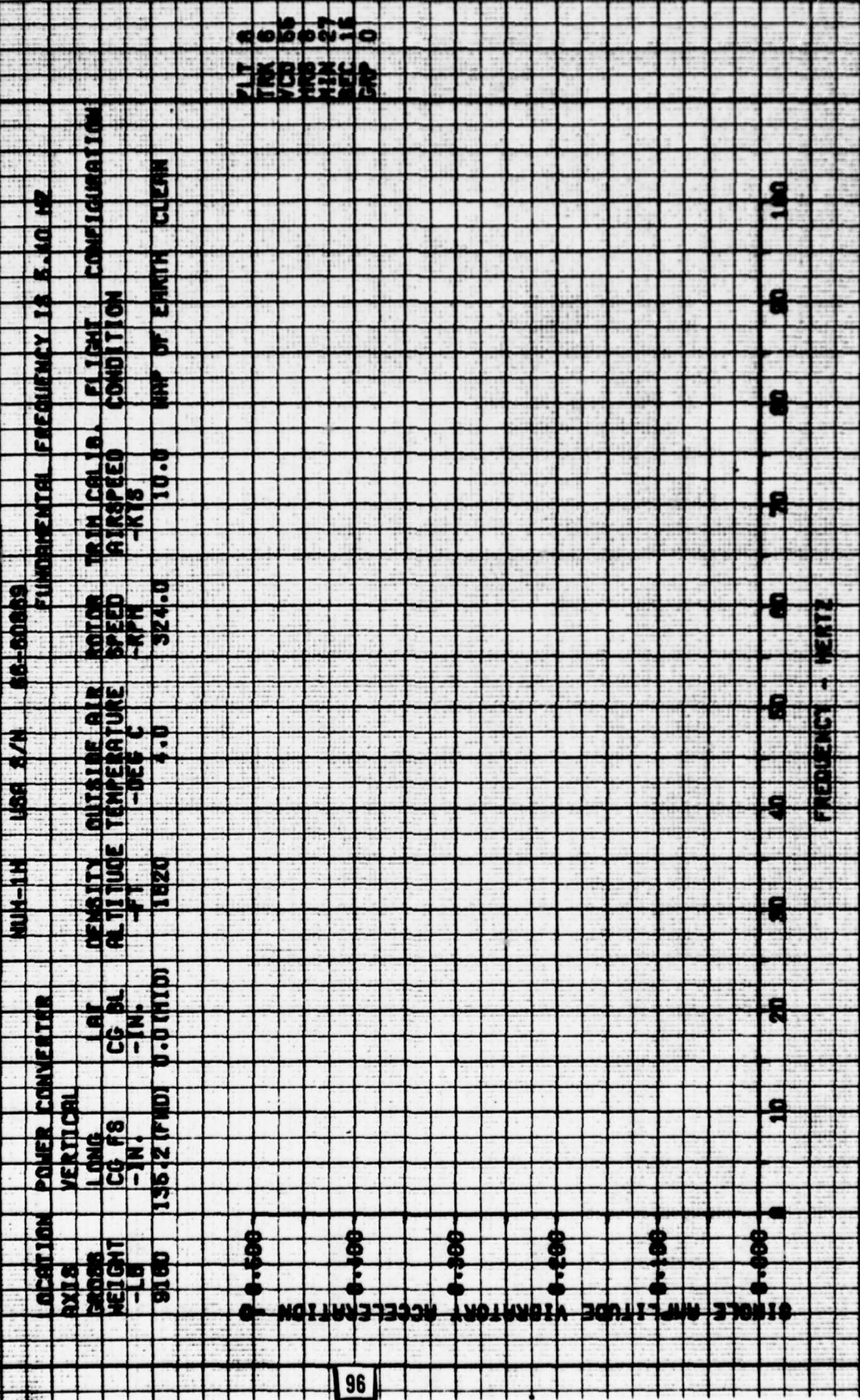
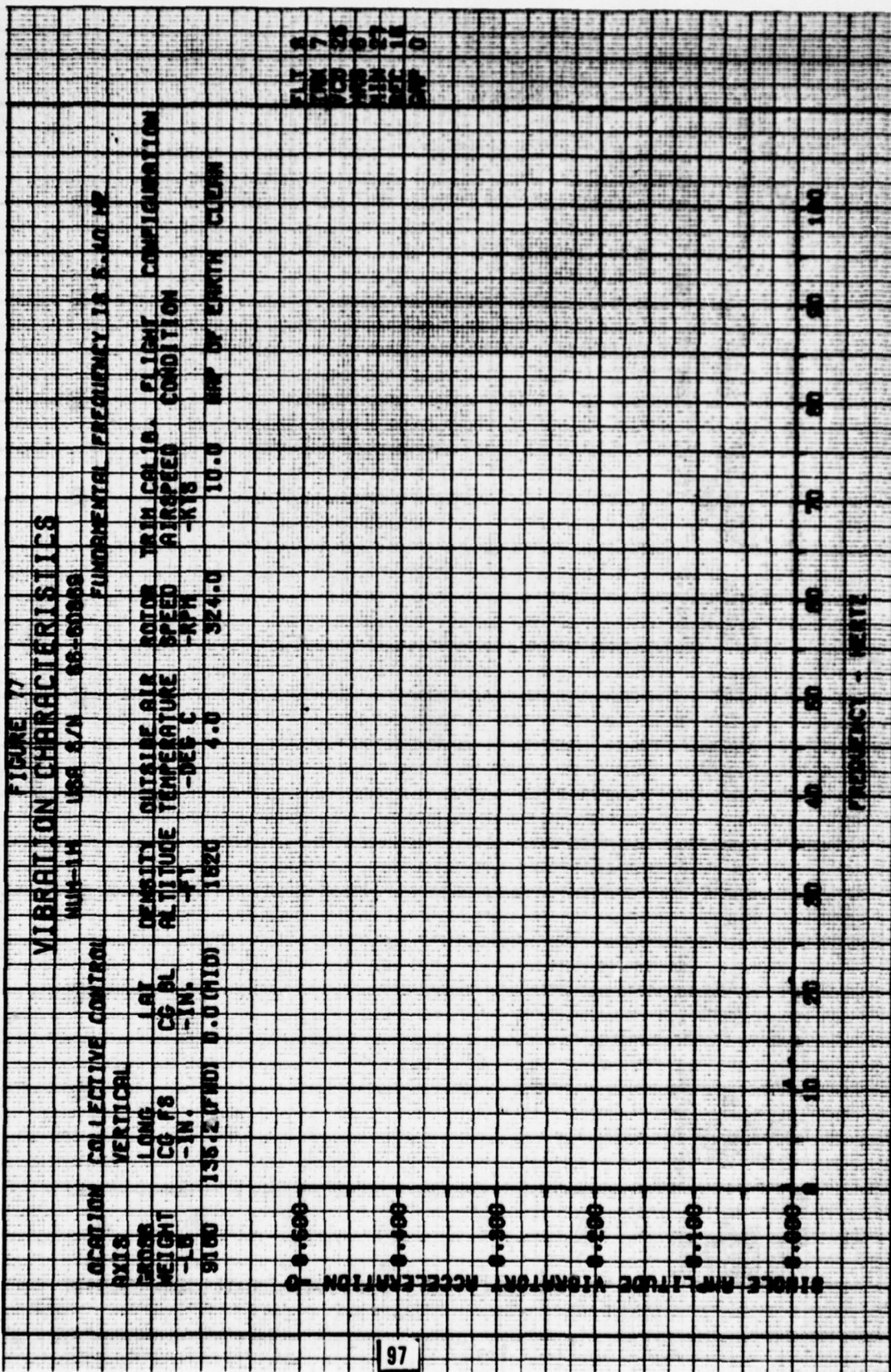


FIGURE 75

VIBRATION CHARACTERISTICS



ZLT 8  
 TRK 6  
 VCO 66  
 MAG 8  
 MIN 27  
 SEC 15  
 SWP 0



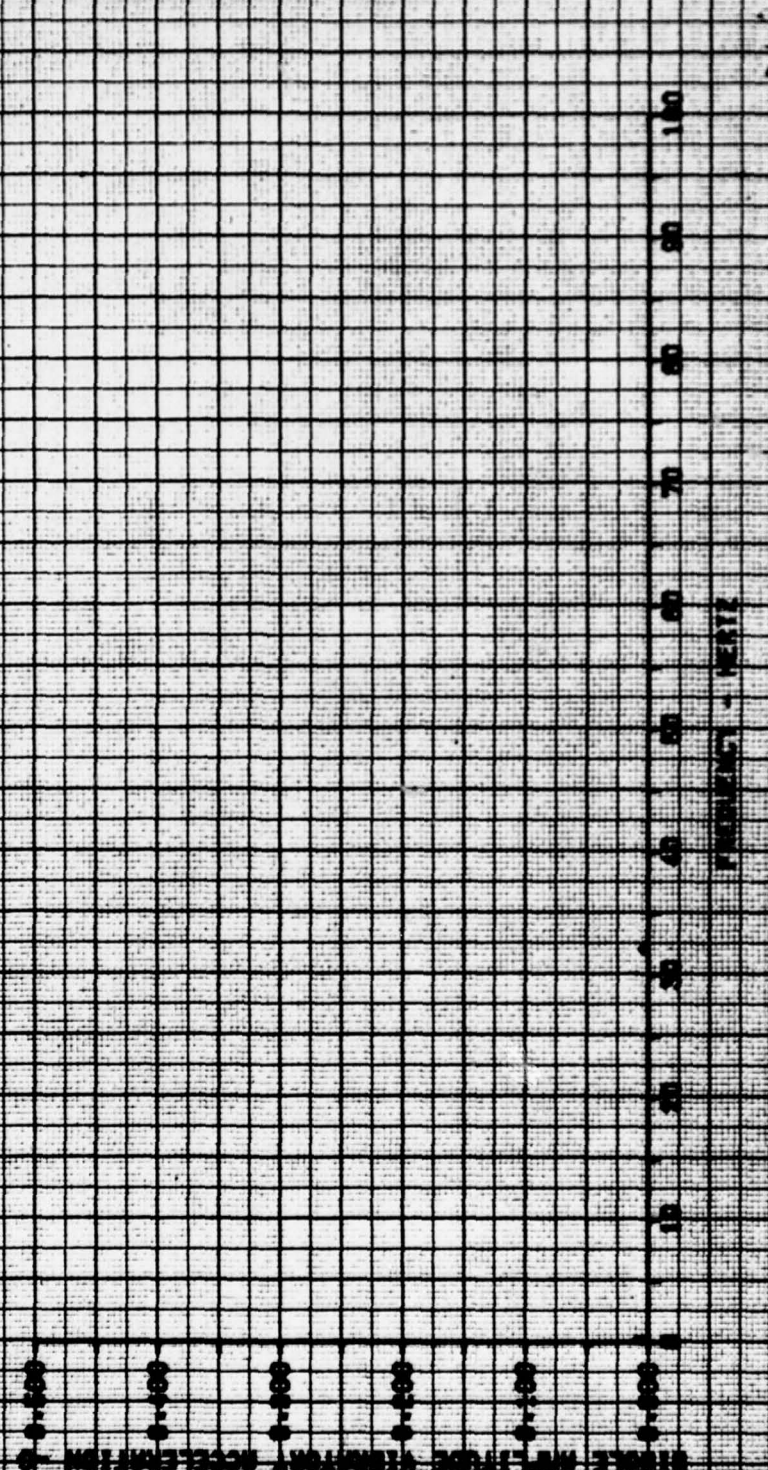
FLT 8  
 SW 7  
 VCS 26  
 WBS 9  
 HIN 27  
 SFC 14  
 SWP 0

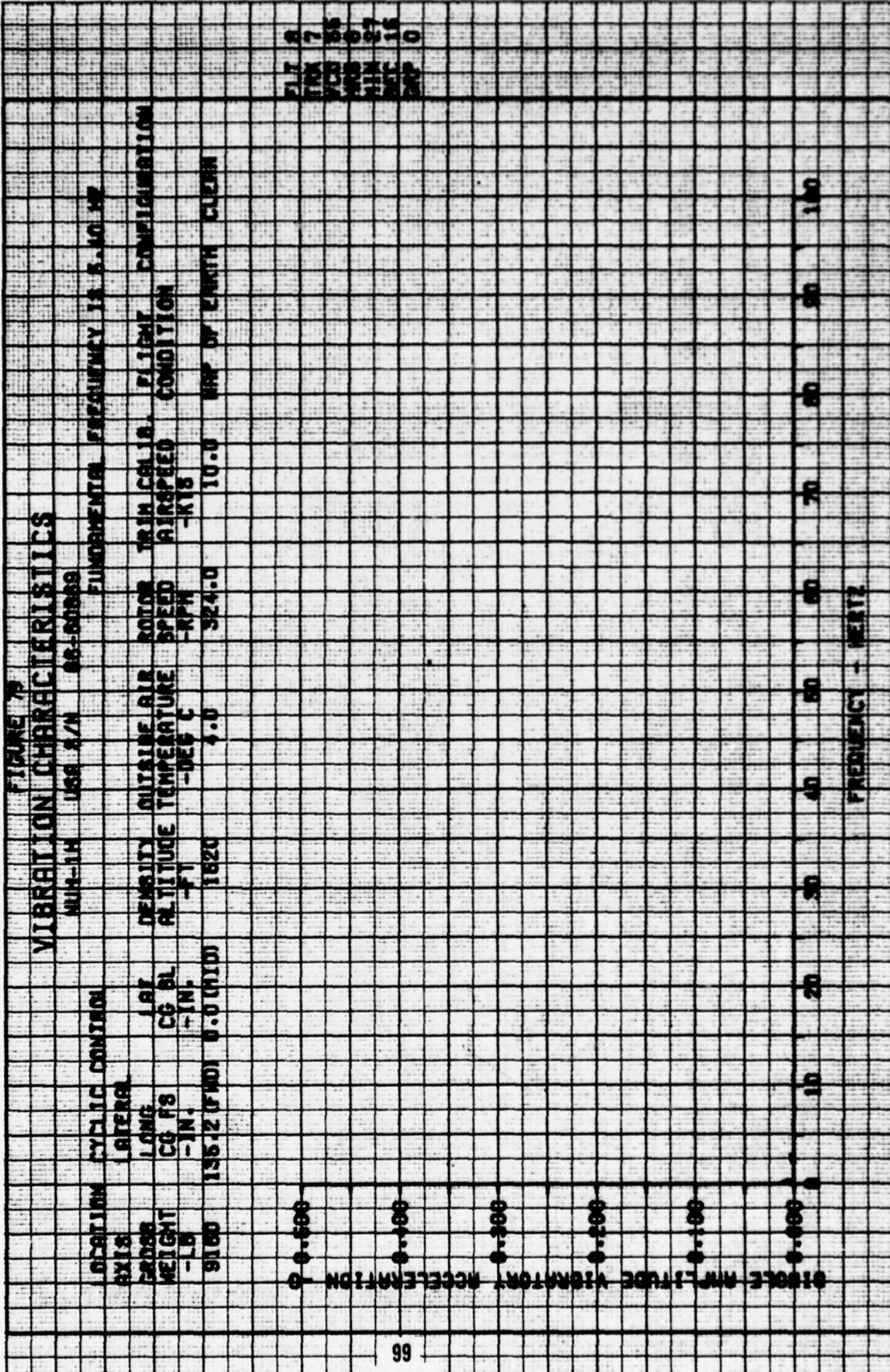
FIGURE 78

VIBRATION CHARACTERISTICS

MODEL Cyclic Control  
 LONGITUDINAL  
 LONG CO. 1.05  
 WEIGHT CO. 1.5  
 ALTITUDE 10000  
 DENSITY 0.001936  
 OUTSIDE AIR TEMP 4.0  
 ROTOR SPEED 324.0  
 TRIM CALIB. FLIGHT CONFIGURATION  
 AIRSPEED CONDITION -K18  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ  
 MAP OF TERRAIN CLEAN

FLT 8  
 TRK 7  
 VCD 48  
 WRS 8  
 MIN 27  
 REC 18  
 DWP 0

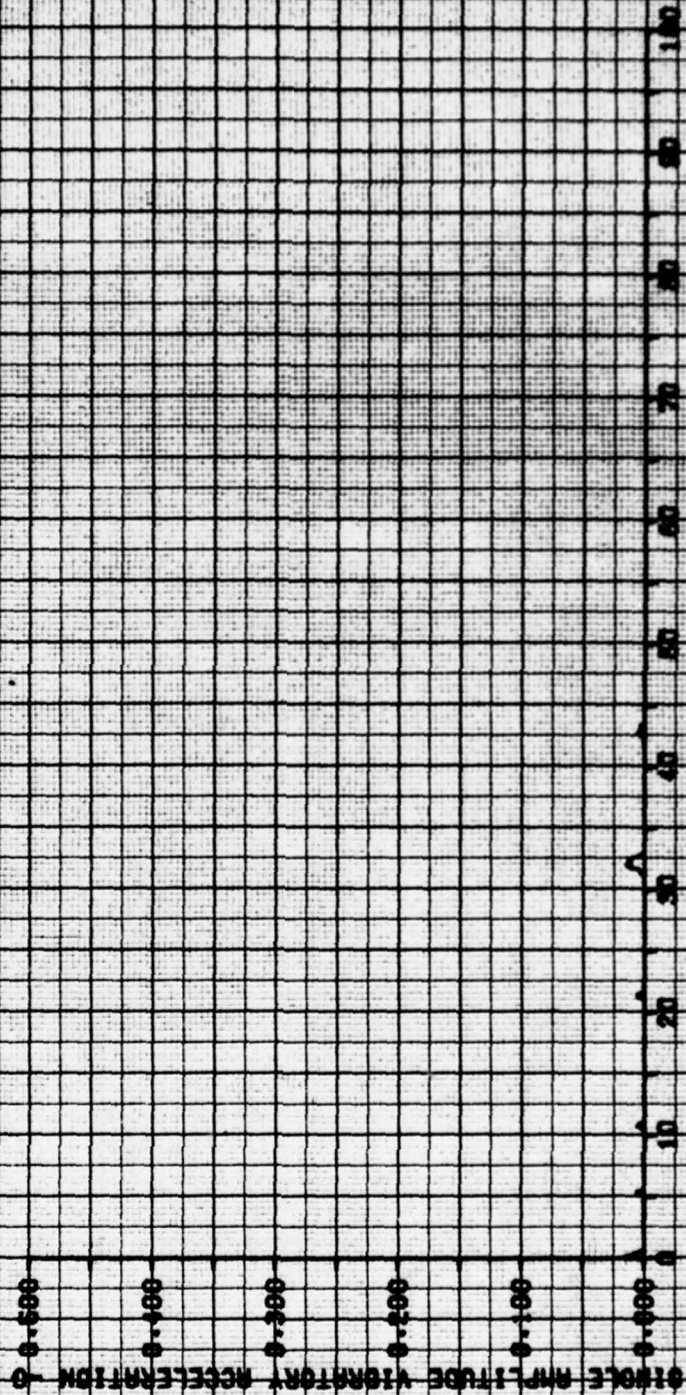




FLT 2  
 TRA 7  
 FCA 35  
 MAG 6  
 MIN 27  
 SEC 16  
 DEP 0

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 GROSS WEIGHT 9160  
 CG FS 135.2 (FWD) 0.0 (A/D)  
 CG BL -IN.  
 LAY CG BL -IN.  
 DENSITY 1820  
 ALTITUDE TEMPERATURE 4.0  
 OUTSIDE AIR SPEED 324.0  
 MOTOR TRIN CALIB. AIRSPEED 10.0  
 FLIGHT CONDITION -KTS  
 FUNDAMENTAL FREQUENCY 18.10 Hz



217 8  
 218 7  
 219 6  
 220 5  
 221 4  
 222 3  
 223 2  
 224 1



FIGURE 82

VIBRATION CHARACTERISTICS

LOCATION	PALET	NUM-14	158 2/N	86-80883	FUNDAMENTAL FREQUENCY IS 5.40 HZ
AXIS	LATERAL	DENSITY	OUTSIDE AIR	ROTOR	TRIM CAL 18. FLIGHT CONFIGURATION
CONDNS	LONG	ALTITUDE	TEMPERATURE	SPEED	AIRSPED CONDITION
WEIGHT	CG F8	-FT	-DEG C	-RPM	-KTS
-LB	134.2 (FWD)	0.0 (HYD)	7.0	824.0	80.0
					LEVEL
					CLEAN

FLT 4  
TRK 4  
VCO 85  
HRS 11  
MIN 58  
SEC 58  
GRP 0

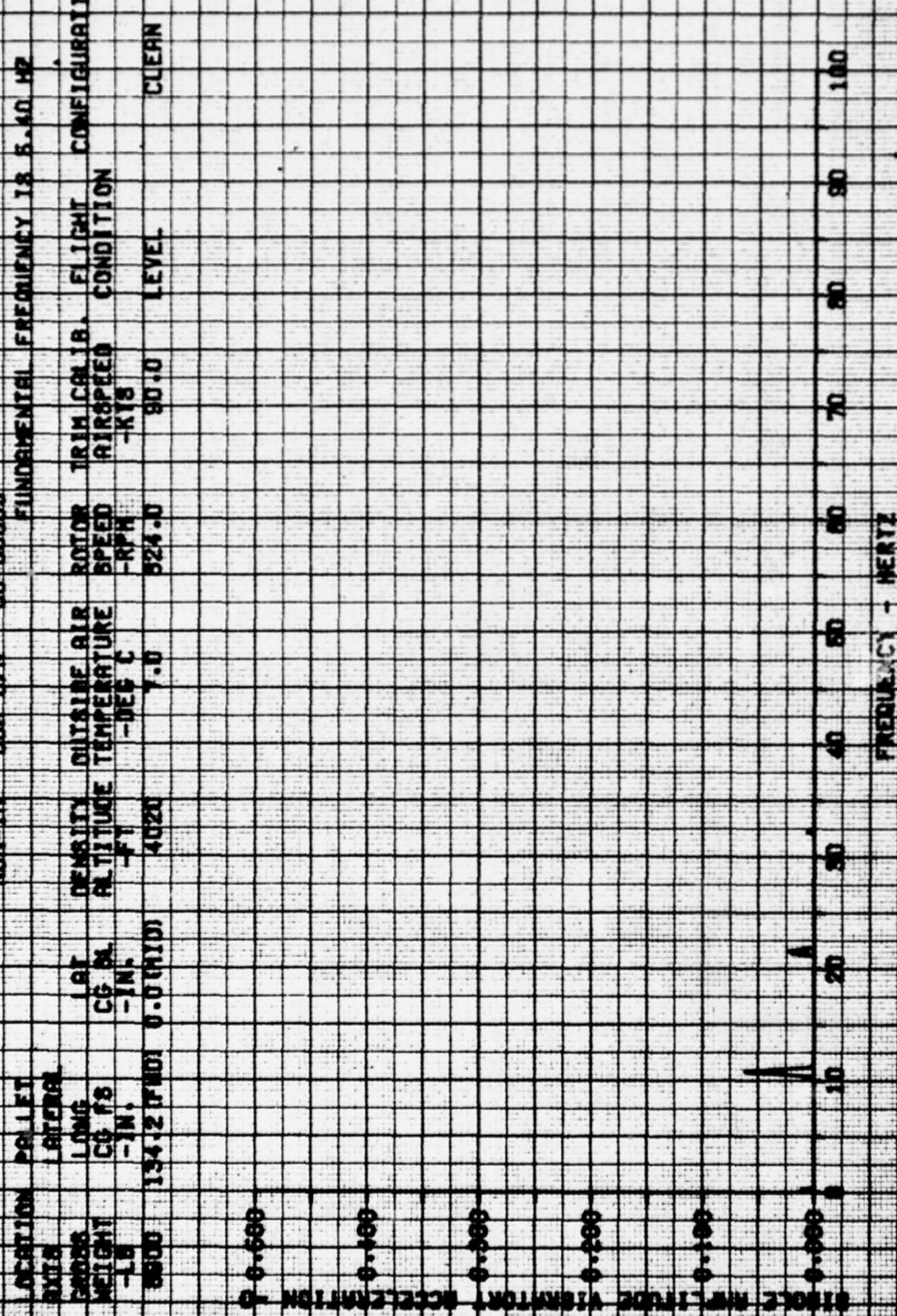


FIGURE 83

VIBRATION CHARACTERISTICS

NUM-14 USA S/N AB-50858A FUNDAMENTAL FREQUENCY IS 5.40 HZ

LOCATION PALLET  
 AXIS VERTICAL  
 GROSS WEIGHT - LB 8900  
 LONG CG FS - IN. 134.2 (FWD)  
 IBI CG BL - IN. 0.0 (AID)  
 DENSITY 4020  
 ALTITUDE - FT 7.0  
 OUTSIDE AIR TEMPERATURE - DEG C 7.0  
 ROTOR SPEED - RPM 924.0  
 TRIM CALIB. AIRSPEED - KTS 90.0  
 FLIGHT CONDITION LEVEL  
 CONFIGURATION CLEAN

FLT 4  
 TRK 4  
 VCO 108  
 HNS 11  
 MIN 56  
 SEC 50  
 GRP 0

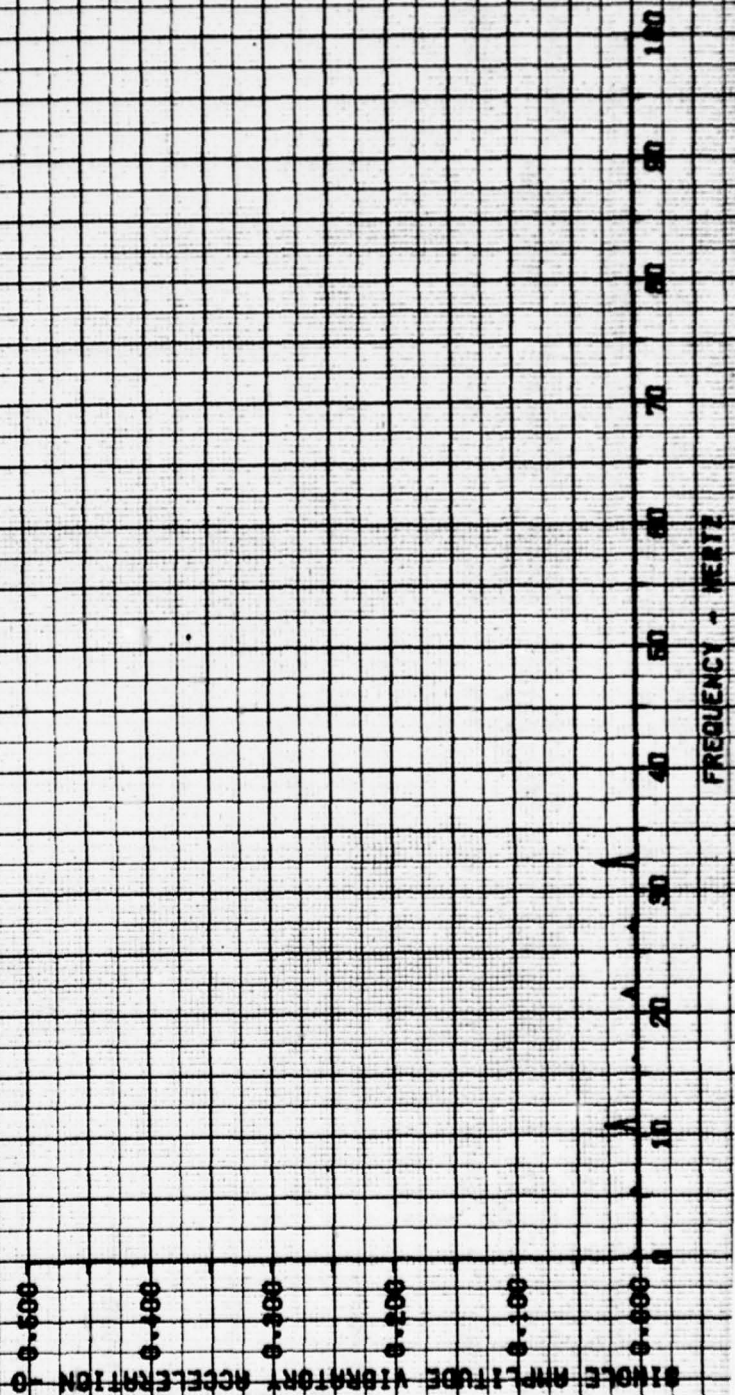
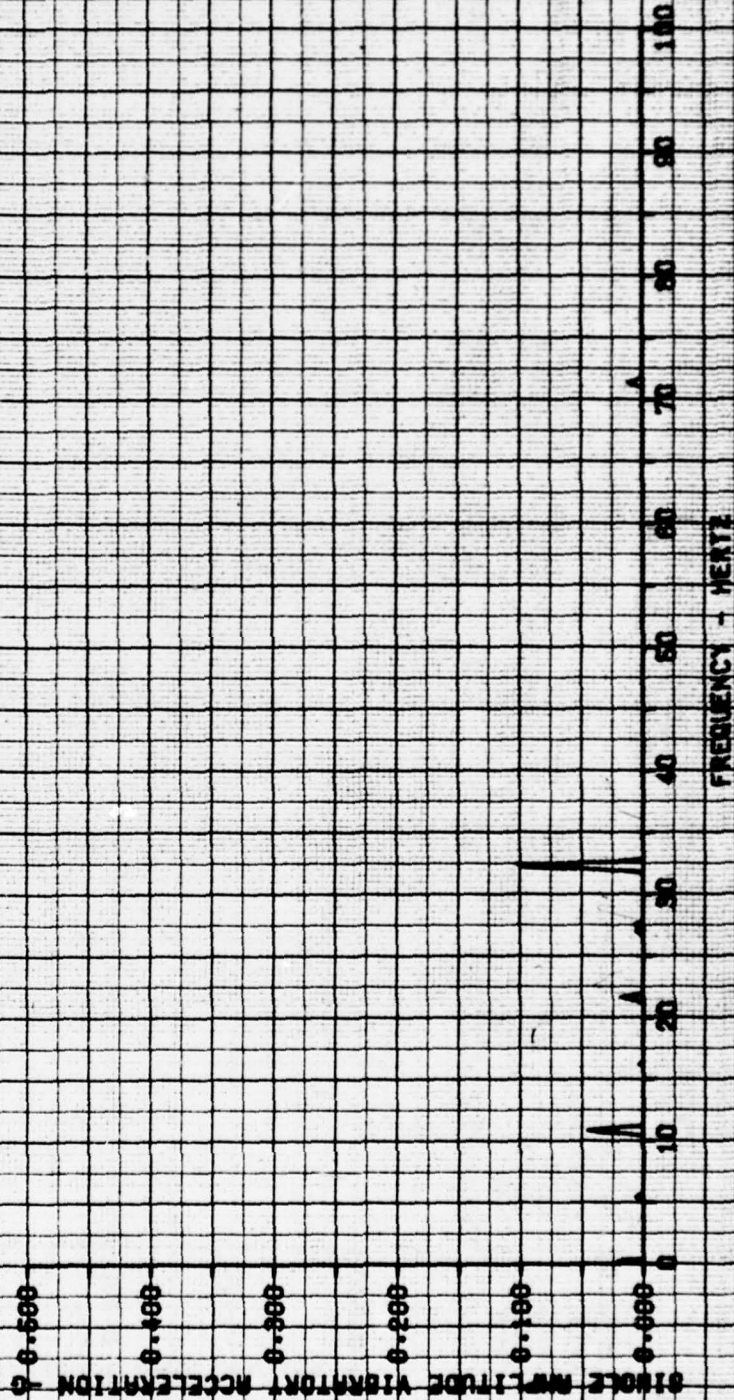


FIGURE 8A

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 CROSS WEIGHT 8900  
 LONG CG FS 134.2 (FWD)  
 CG BL 0.0 (HD)  
 LAT -IN.  
 DENSITY 4020  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE -DEG C 7.0  
 ROTOR SPEED -RPM 824.0  
 TRIM CALIB. FLIGHT CONDITION 80.0 LEVEL  
 AIRSPEED -KTS  
 FUNDAMENTAL FREQUENCY 14 5.40 HZ  
 CLEAN

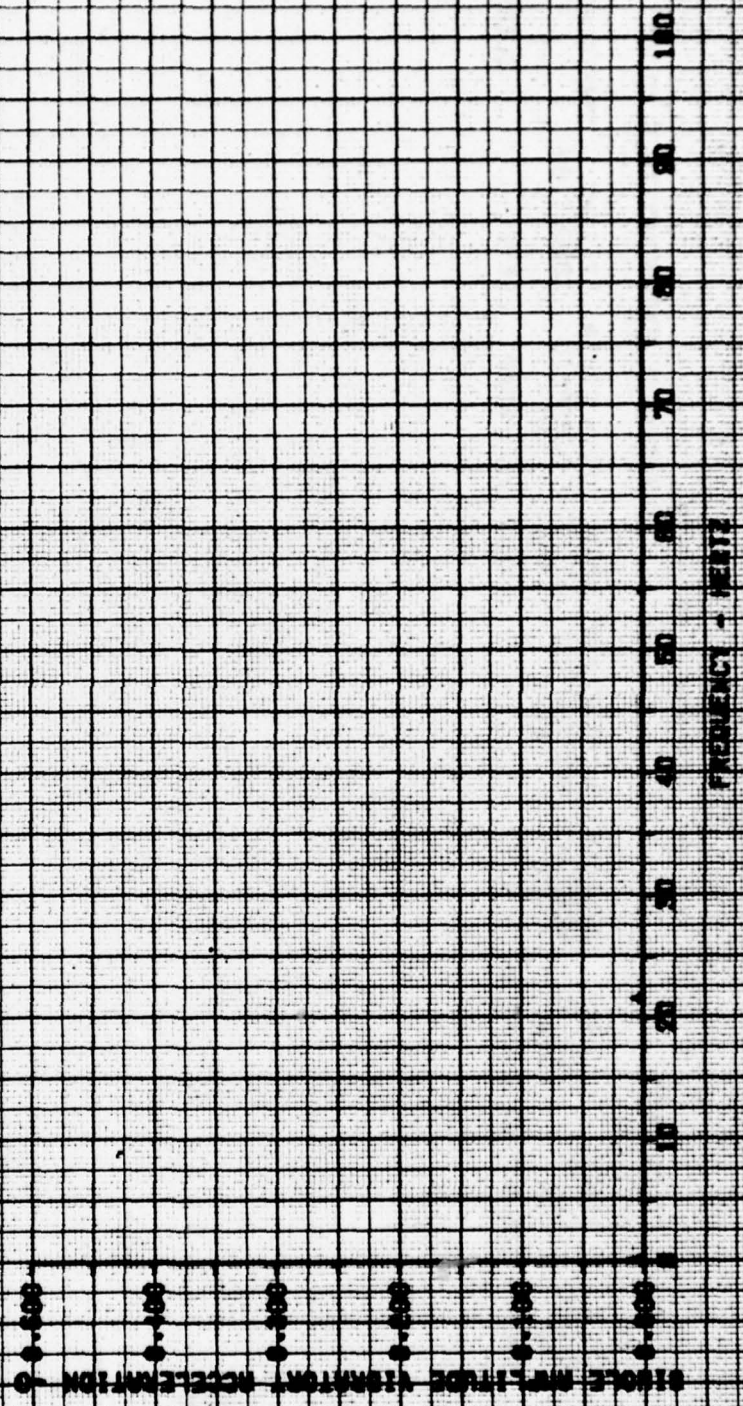
FLT 4  
 TRK 5  
 VCO 26  
 MDS 11  
 HIN 58  
 SEC 58  
 CRP 0



**FIGURE 05**  
**VIBRATION CHARACTERISTICS**

LOCATION PLANT BERT  
 AXIS LATERAL  
 MOTOR LONG  
 WEIGHT 8500  
 -LB  
 134.2 (P001) 1.0 (0101)  
 -IN.  
 CO #8  
 -IN.  
 LAI  
 CO BL  
 -IN.  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4020 7.0 324.0 90.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 4  
 TRK 6  
 VCU 40  
 HRS 11  
 MIN 56  
 SEC 50  
 GRP 0



**FIGURE 16**  
**VIBRATION CHARACTERISTICS**

LOCATION PILOT SEAT  
 AXIS VERTICAL  
 NUMBER LONG  
 WEIGHT 2800  
 CG IN. 134.2 (P01) 0.0 (P10)  
 CG IN. 0.0  
 LOT  
 DENSITY OUTSIDE AIR 1.0  
 ALTITUDE TEMPERATURE 7.0  
 SPEED -KPH 524.0  
 TRIM CALIB. FLIGHT CONFIGURATION  
 AIRSPEED CONDITION -KTB 30.0  
 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 4  
 TRX 5  
 WCD 55  
 WOB 11  
 MIN 50  
 REC 50  
 DRP 0

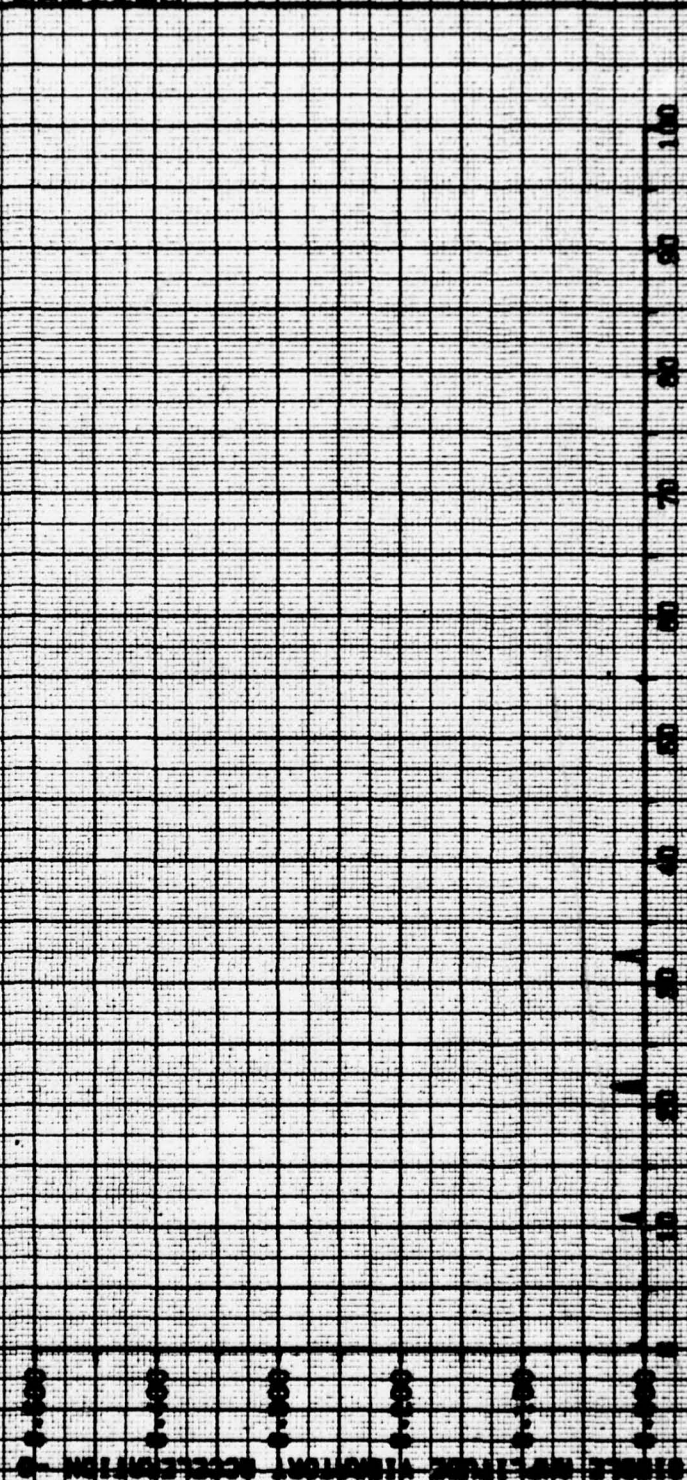
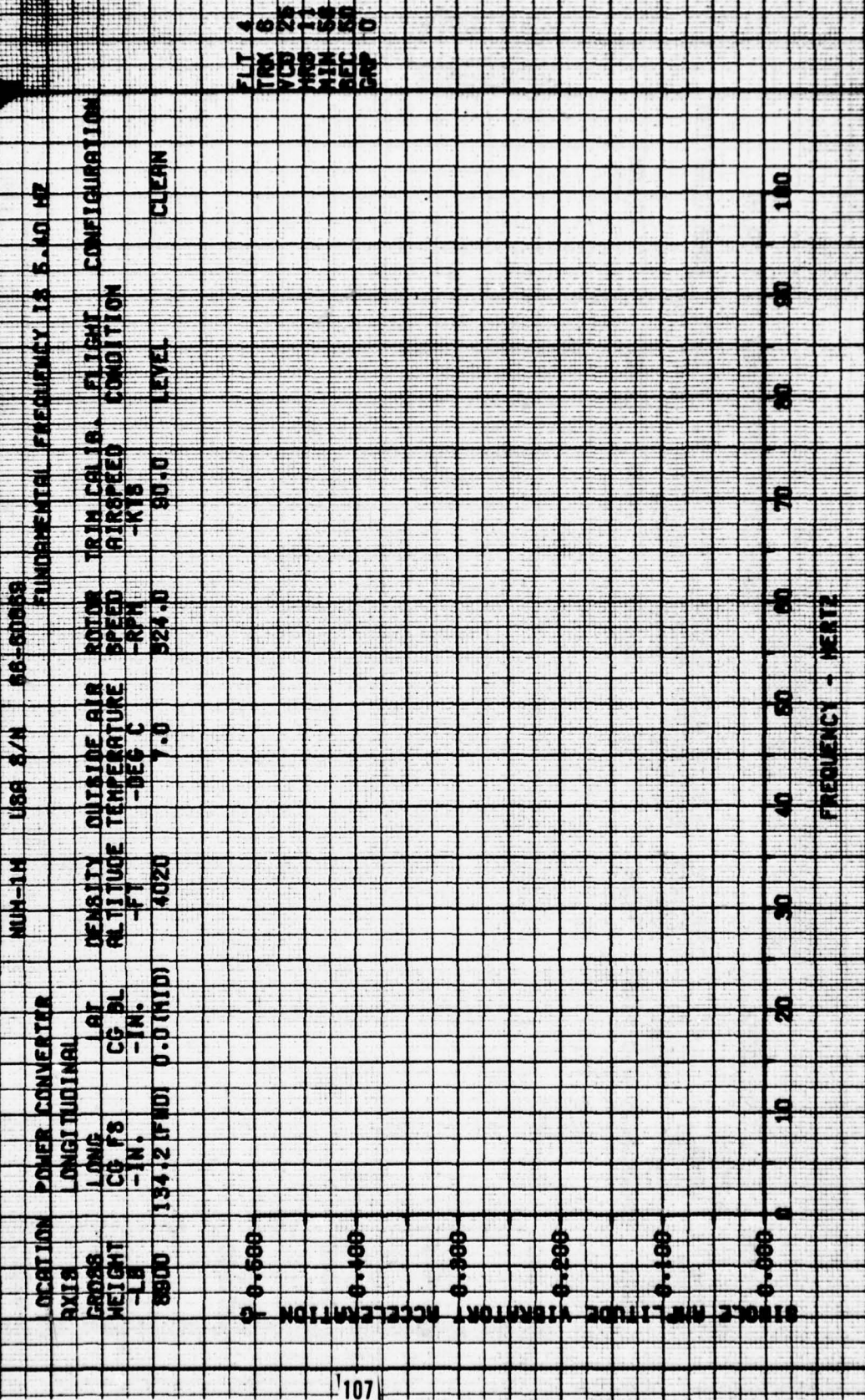


FIGURE 87

### VIBRATION CHARACTERISTICS



LOCATION POWER CONVERTER  
 AXIS LONGITUDINAL  
 CROSS LONG LAI  
 WEIGHT CG FS CG BL  
 -LB -IN. -IN.  
 8800 134.2 (FWD) 0.0 (MID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4020 7.0 924.0 90.0 LEVEL CLEAN

FUNDAMENTAL FREQUENCY IS 5.40 HZ

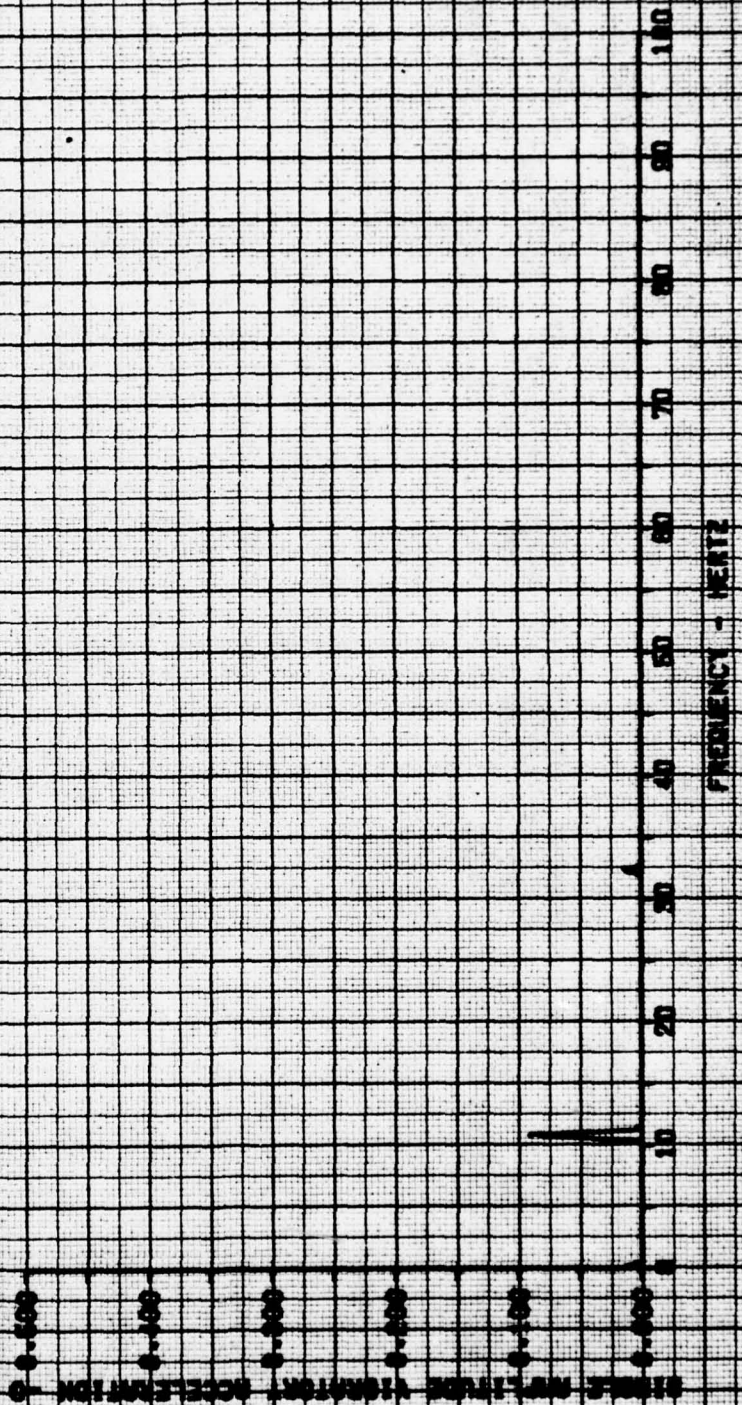
NUH-1H USA S/N 66-50553

FLT 4  
 TRK 6  
 VCS 25  
 MAG 11  
 MIN 50  
 REC 50  
 CAP 0

FIGURE B5  
**VIBRATION CHARACTERISTICS**

LOCATION	POWER CONVERTER	MIL-14	USA 2/A	86-80888	FUNDAMENTAL FREQUENCY IS 5.40 HZ	
WTS	LATERAL	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION	
WEIGHT	LONG	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION
-LB	CG FB	-FT	-DEG C	-RPM	-KTS	
8000	134.2 (FWD) 0.0 (RD)	4020	7.0	324.0	80.0	CLEAR
					LEVEL	

FLT 4  
 TRK 6  
 VCS 40  
 MRS 11  
 M/N 56  
 REC 50  
 EXP 0



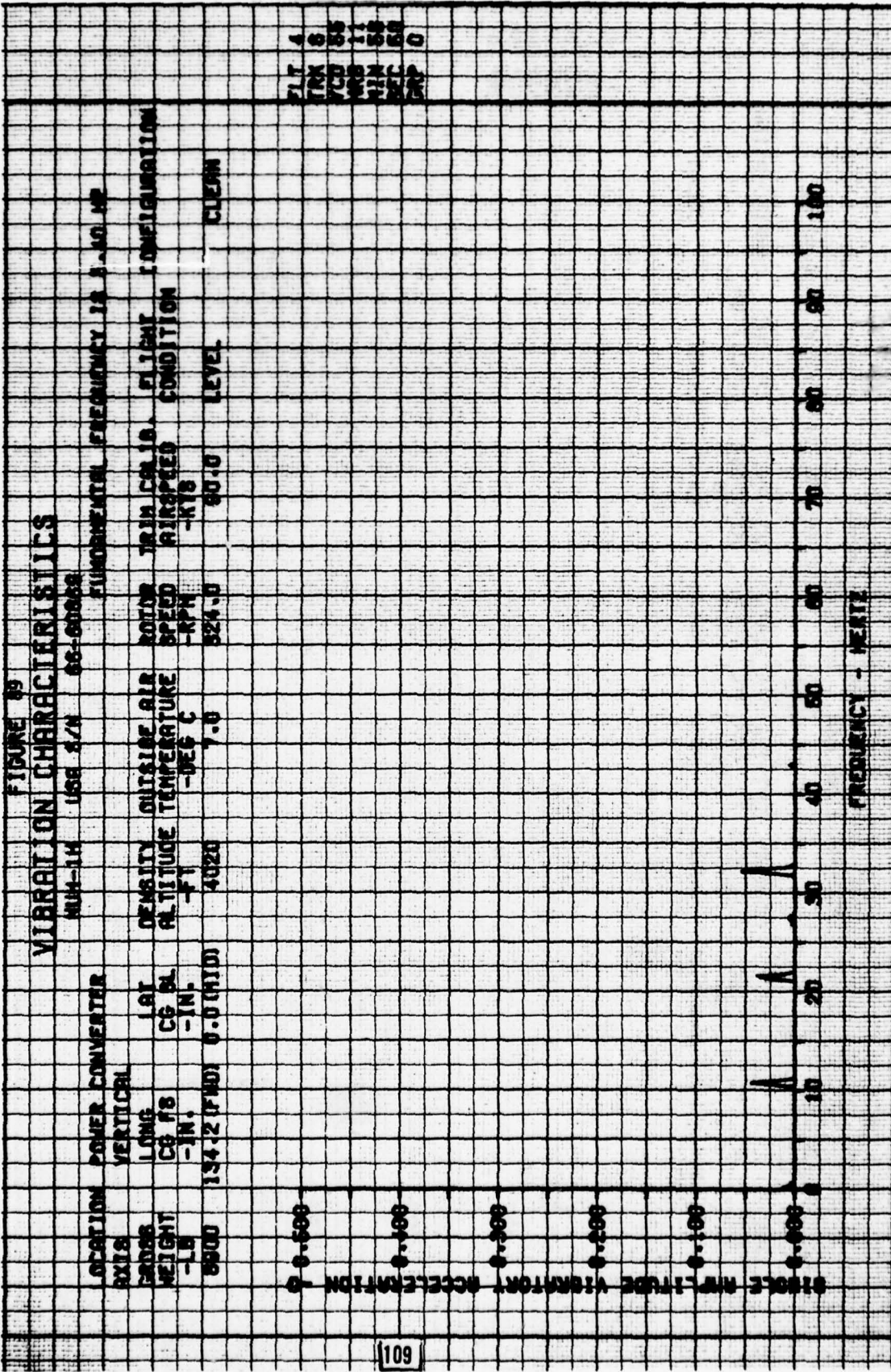
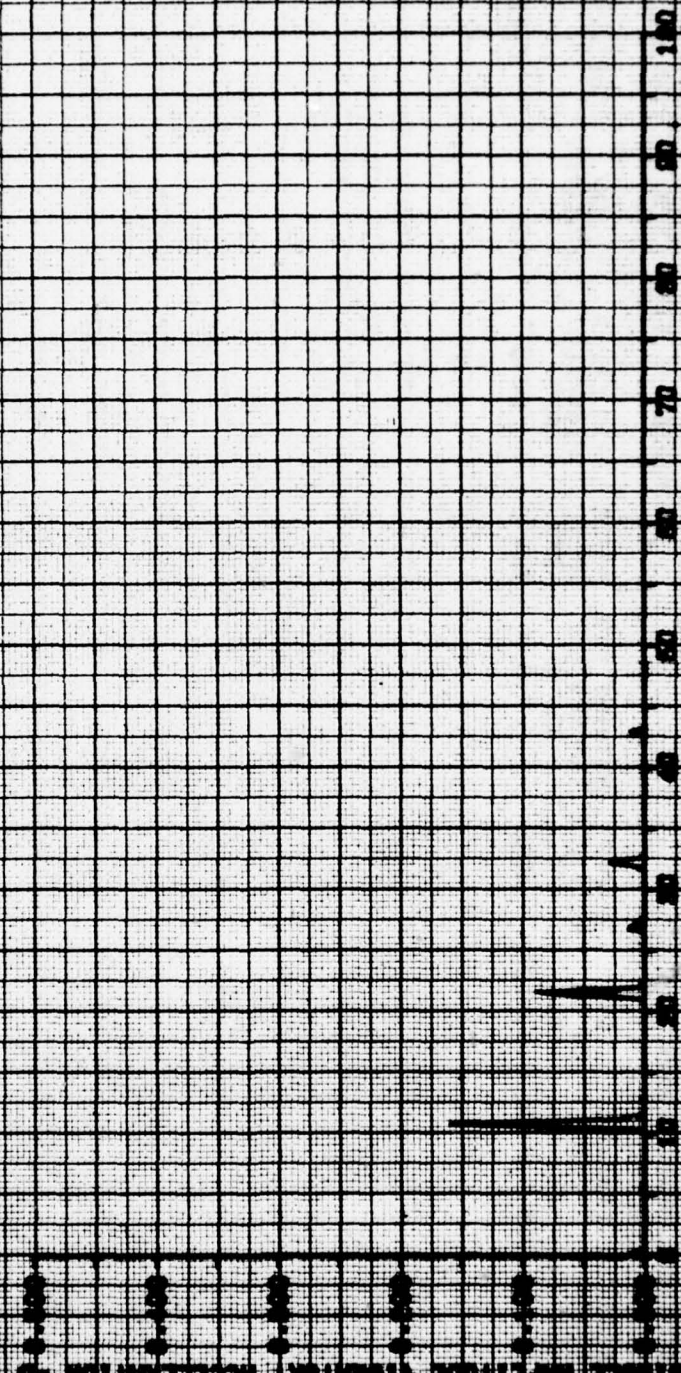


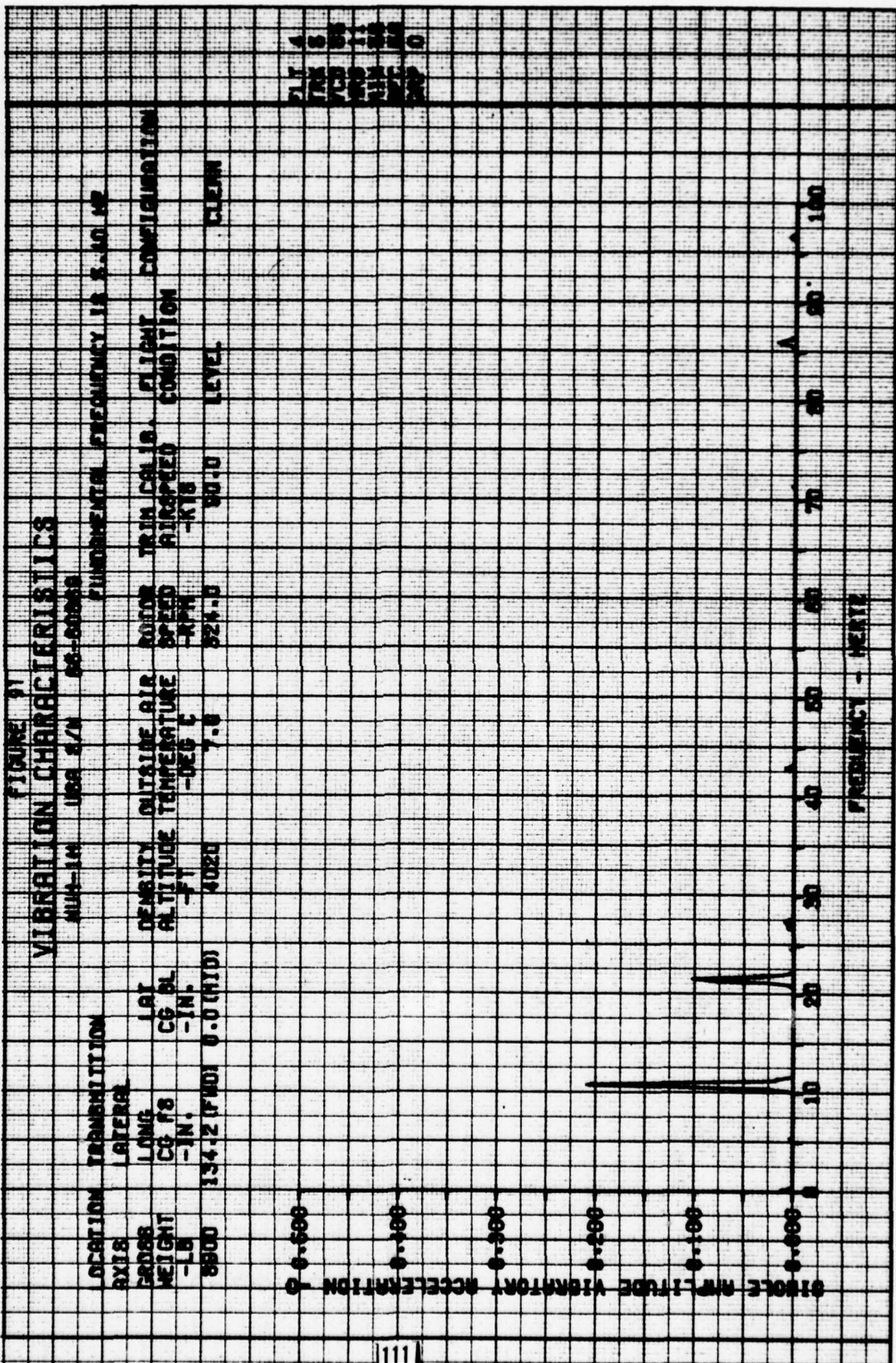
FIGURE 10

VIBRATION CHARACTERISTICS

MODEL TRANSMITTER  
 TYPE 1000  
 WEIGHT 1.0 LB  
 LENGTH 1.0 IN  
 WIDTH 1.0 IN  
 HEIGHT 1.0 IN  
 DENSITY 0.001875 G/CC  
 ALTITUDE 4000 FT  
 OUTSIDE AIR TEMPERATURE -100 F  
 ROTOR SPEED 324 RPM  
 TRIM CAL. AIR SPEED -KTAS  
 FLIGHT CONDITION CLEAN  
 FREQUENCY 18.5-40 MZ

FLT 4  
 TRK 5  
 WCD 70  
 MMS 11  
 MIN 50  
 SEC 50  
 CAP 0





211 4  
 733 85  
 733 85  
 733 85  
 733 85  
 733 85

FIGURE 92

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 BRIDGE LONG  
 HEIGHT CG FB  
 -18 -IN.  
 8900 154.2 (F740) 0.0 (G101)

HUB-14 108 2/4 82-50000  
 FUNDAMENTAL FREQUENCY 14.8-10.42

DENSITY OUTSIDE AIR 8000 TRIM CAL. 0. STIMUL CONDITION  
 ALTITUDE TEMPERATURE SPEED AIRCRAFT CONDITION  
 -FT -100 C -1000 -K18  
 4020 7.0 90.0 LEVEL C2000

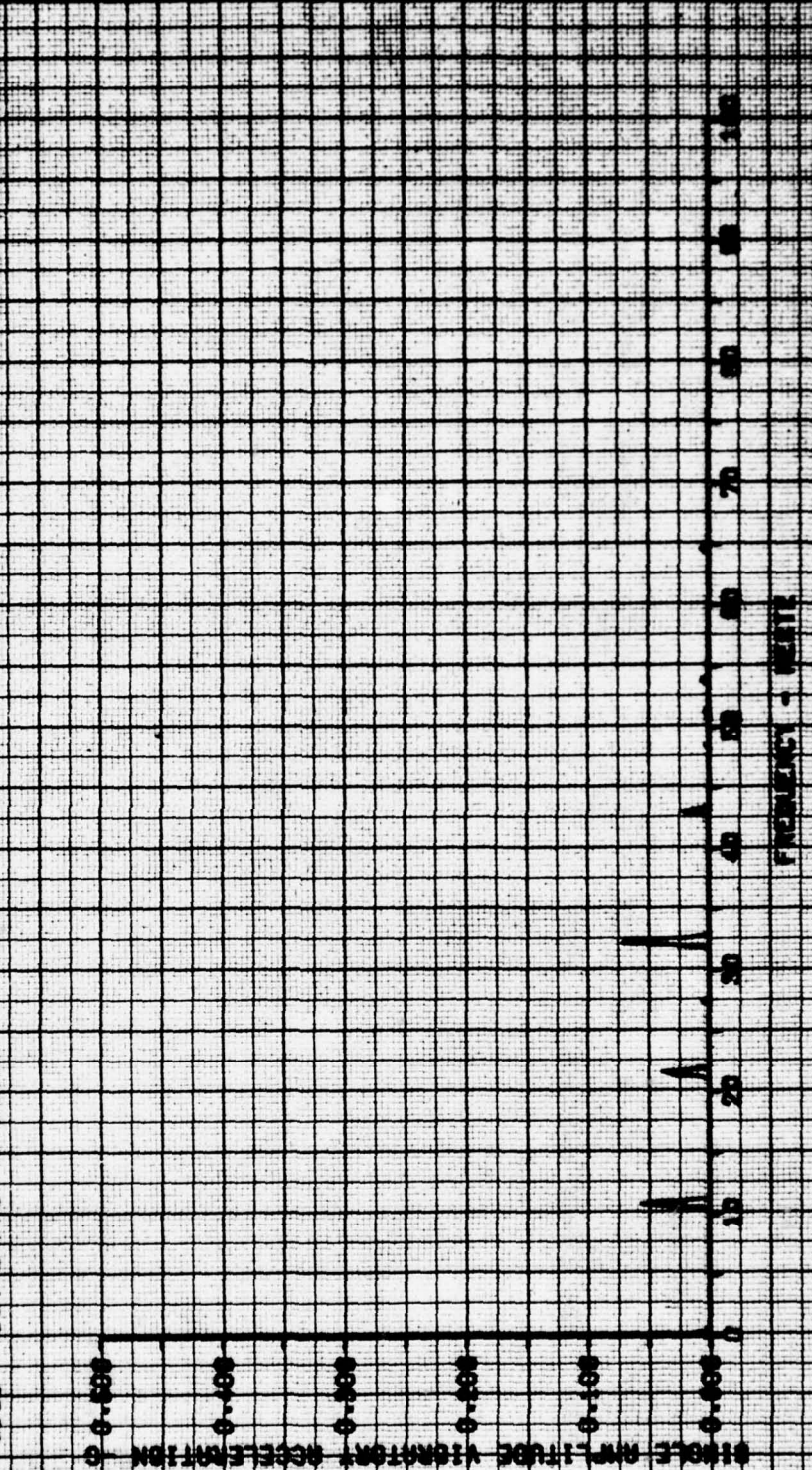


FIGURE 53

VIBRATION CHARACTERISTICS

LOCATION COLLECTIVE CONTROL  
 SILENCE VERTICALLY  
 MODEL LOWA  
 WEIGHT 134.2 (PND) 5.0 (TWO)  
 -LB  
 8800  
 MAINT-14 108 2/4 86-00888  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ  
 DENSITY OUTSIDE AIR ROTOR TRIN CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4020 7.0 524.0 80.0 LEVEL CLEAN

FLT 4  
 TRX 7  
 WCO 26  
 VRS 11  
 MIN 58  
 SEC 50  
 CRP 0

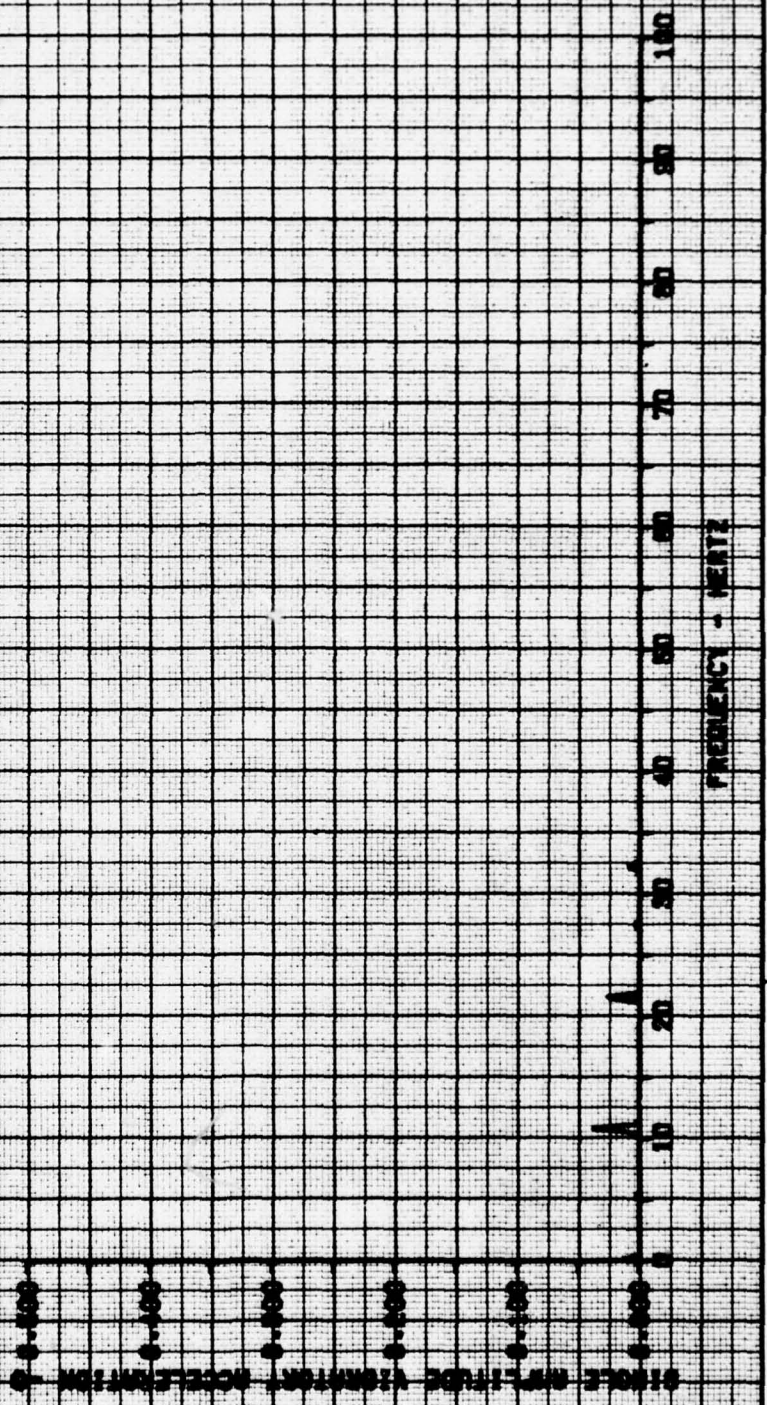
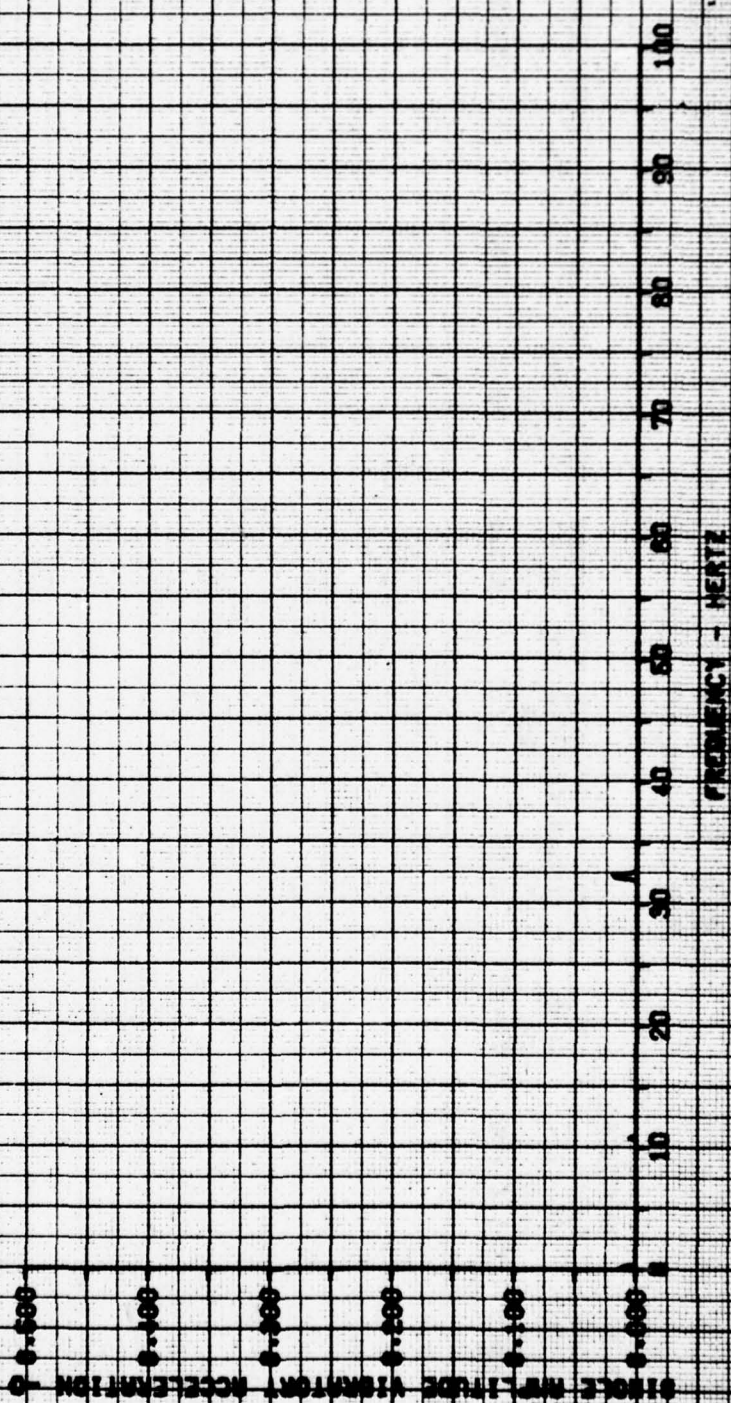


FIGURE 94

VIBRATION CHARACTERISTICS

LOCATION CYCLIC CONTROL  
 AXIS LONGITUDINAL  
 ROTOR LONG LAT  
 WEIGHT CG FB CG BL  
 -LB -IN. -IN.  
 8900 134.2 (FWD) 0.0 (MID)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4020 7.0 324.0 90.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 4  
 TRK 7  
 VCD 40  
 MRB 11  
 MIN 50  
 SEC 50  
 GRP 0



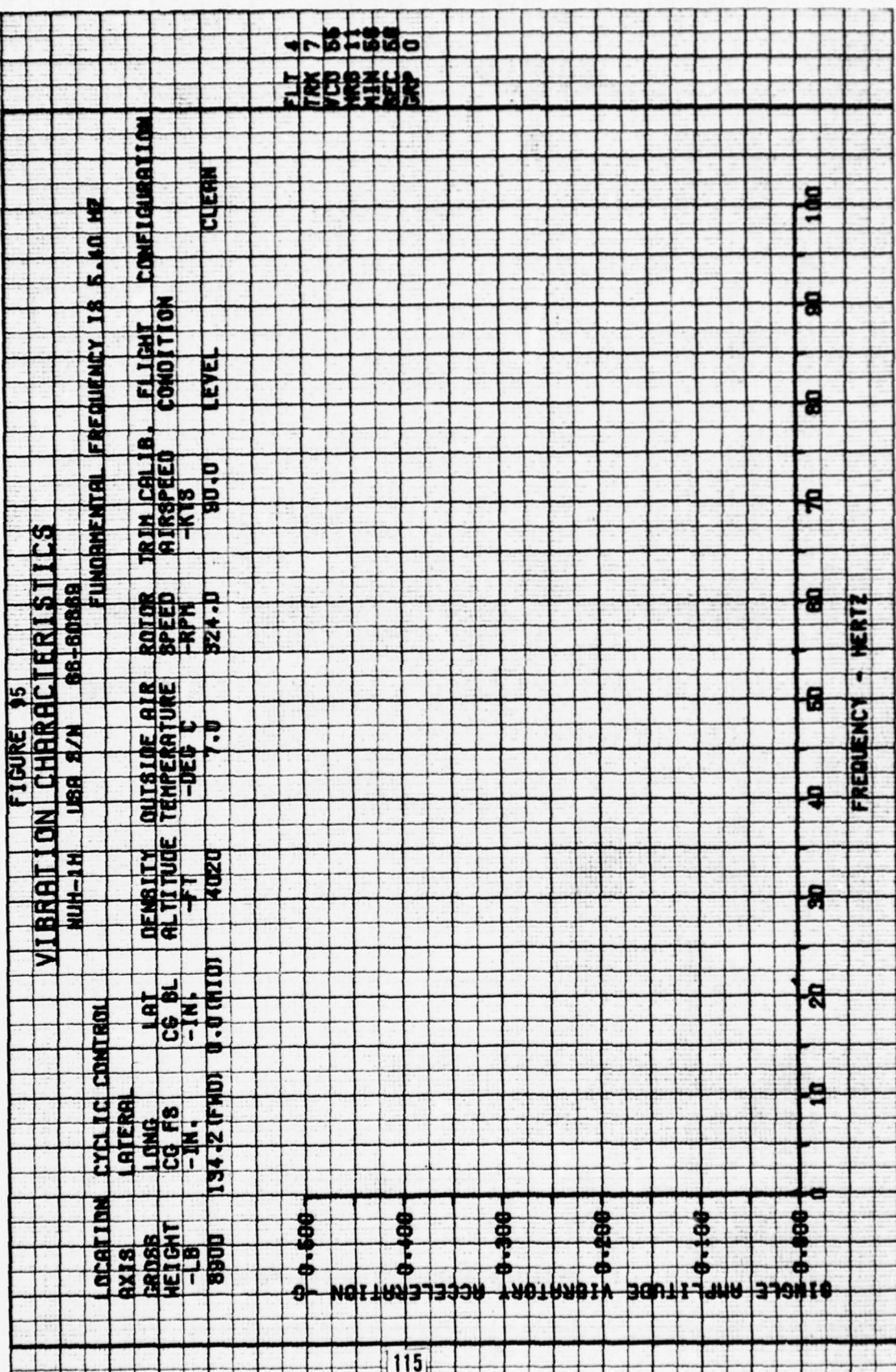
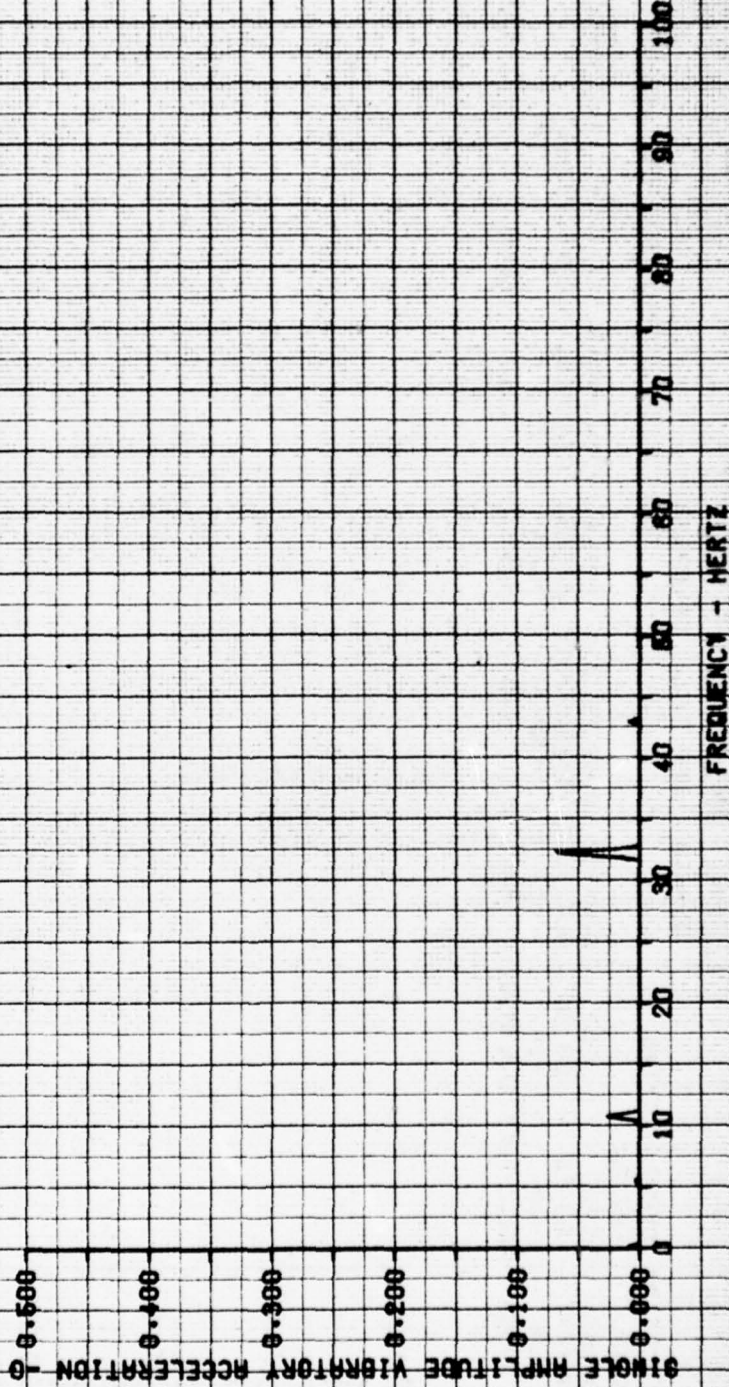


FIGURE 96

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 GROSS WEIGHT 8900  
 LONG CG FS -IN. 134.2 (FWO) 0.0 (MID)  
 LAI CG BL -IN. 0.0 (MID)  
 DENSITY OUTSIDE AIR 7.0  
 ALTITUDE TEMPERATURE -DEG C 4020  
 -FT 4020  
 ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 SPEED AIRSPED CONDITION  
 -RPH 324.0 80.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY 18 5.10 MF



FLT 4  
 FRX 7  
 YCU 70  
 WWS 11  
 MIN 50  
 SEC 500  
 SRP 0



FIGURE 98

VIBRATION CHARACTERISTICS

NUH-1H USA 8/N 66-50869

FUNDAMENTAL FREQUENCY IS 5.40 HZ

LOCATION PALLET

AXIS LATERAL

ORDER LONG

WEIGHT CG F'S

-IN.

8580 132.7 (FWD)

LAT

CG BL

-IN.

0.0 (MID)

DENSITY

ALTITUDE

-FT

5040

OUTSIDE AIR

TEMPERATURE

-DEG C

11.0

ROTOR

SPEED

-RPM

824.0

TRIM CALIB.

AIR SPEED

-KTS

110.0

FLIGHT

CONDITION

LEVEL

CLEAN

CONFIGURATION

CLEAN

0 0.500

0 0.100

0 0.000

0 0.200

0 0.100

0 0.000

SINGLE AMPLITUDE VIBRATION ACCELERATION

A

10 20 30 40 50 60 70 80 90 100

FREQUENCY - HERTZ

FLT 4  
TRK 4  
VCO 85  
MKS 12  
MIN 38  
SEC 10  
GRP 0

FIGURE 99

### VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS VERTICAL  
 CROSS WEIGHT - LB 8580  
 LONG CG FB - IN. 132.7 (FWD)  
 DENSITY OUTSIDE AIR 8040  
 ALTITUDE TEMPERATURE - FT 11.0  
 ROTOR SPEED -RPH 324.0  
 TRIM CALIB. AIRSPEED -KTS 110.0  
 FLIGHT CONDITION LEVEL  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 4  
 TRK 4  
 VCD 100  
 MRS 12  
 MIN 33  
 DEC 10  
 GRP 0

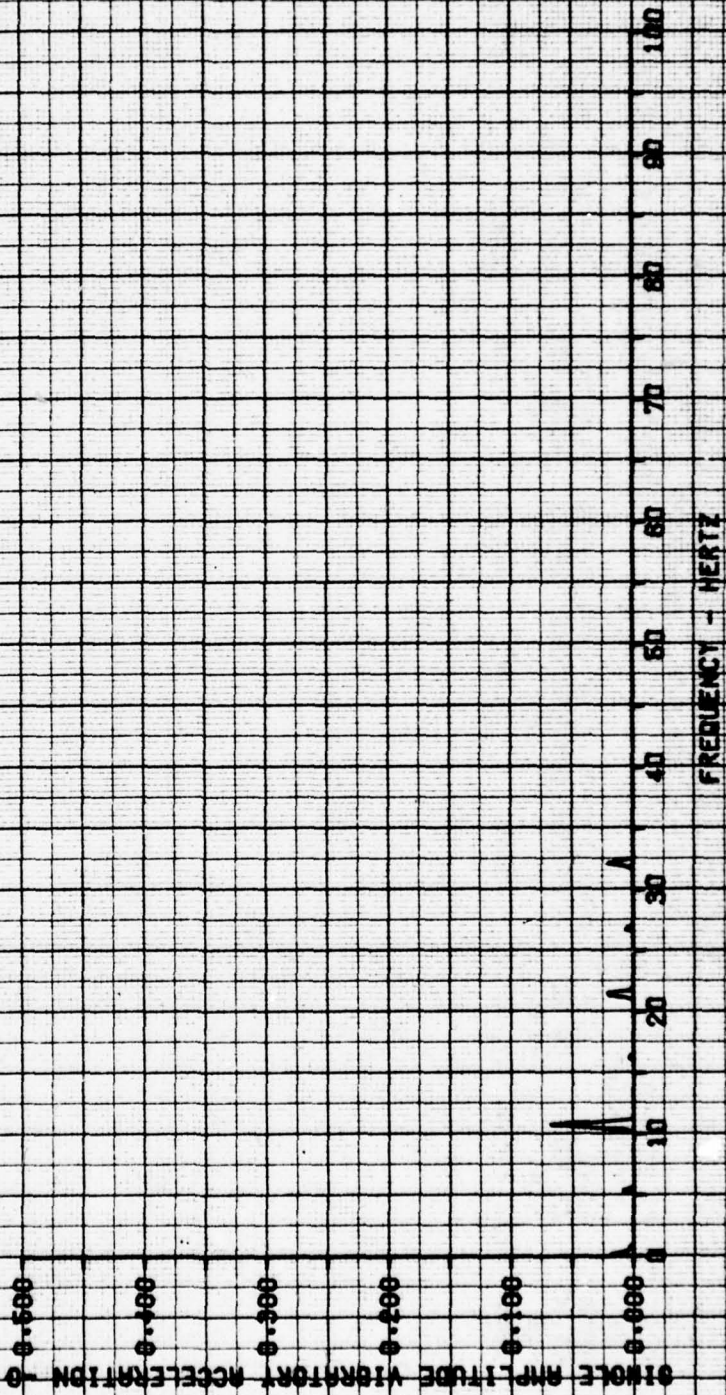


FIGURE 100

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 GROSS WEIGHT 8580  
 CG F8 -IN. 132.7 (FWD) 8.0 (AHD)  
 CG BL -IN. 5040  
 LAT 3040  
 DENSITY 11.0  
 ALTITUDE TEMPERATURE -066 C  
 OUTSIDE AIR SPEED 524.0  
 Rotor TRIM CALIB. FLIGHT CONFIGURATION  
 AIRSPEED -KTS 110.0  
 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 Hz

FLT 4  
 TAX 6  
 VCS 24  
 VAS 12  
 MIN 30  
 SEC 14  
 ENG 0

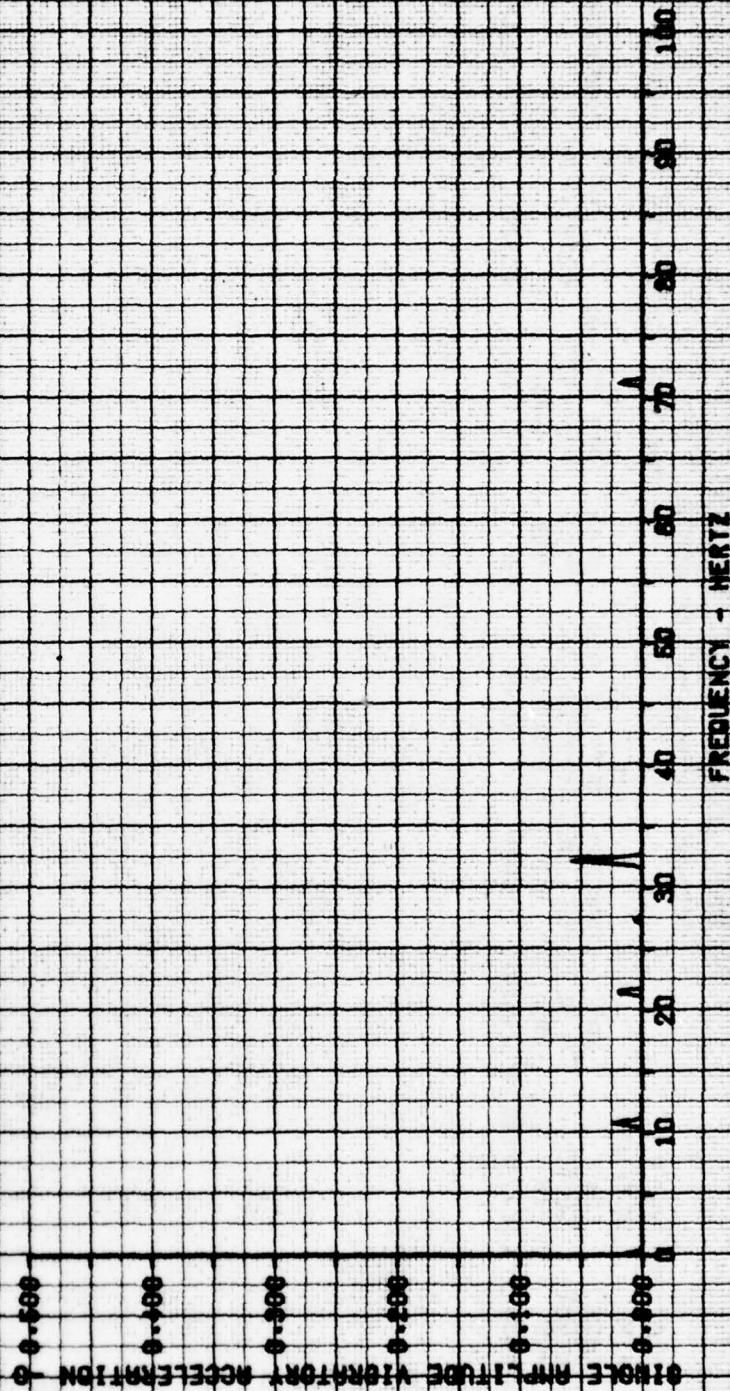
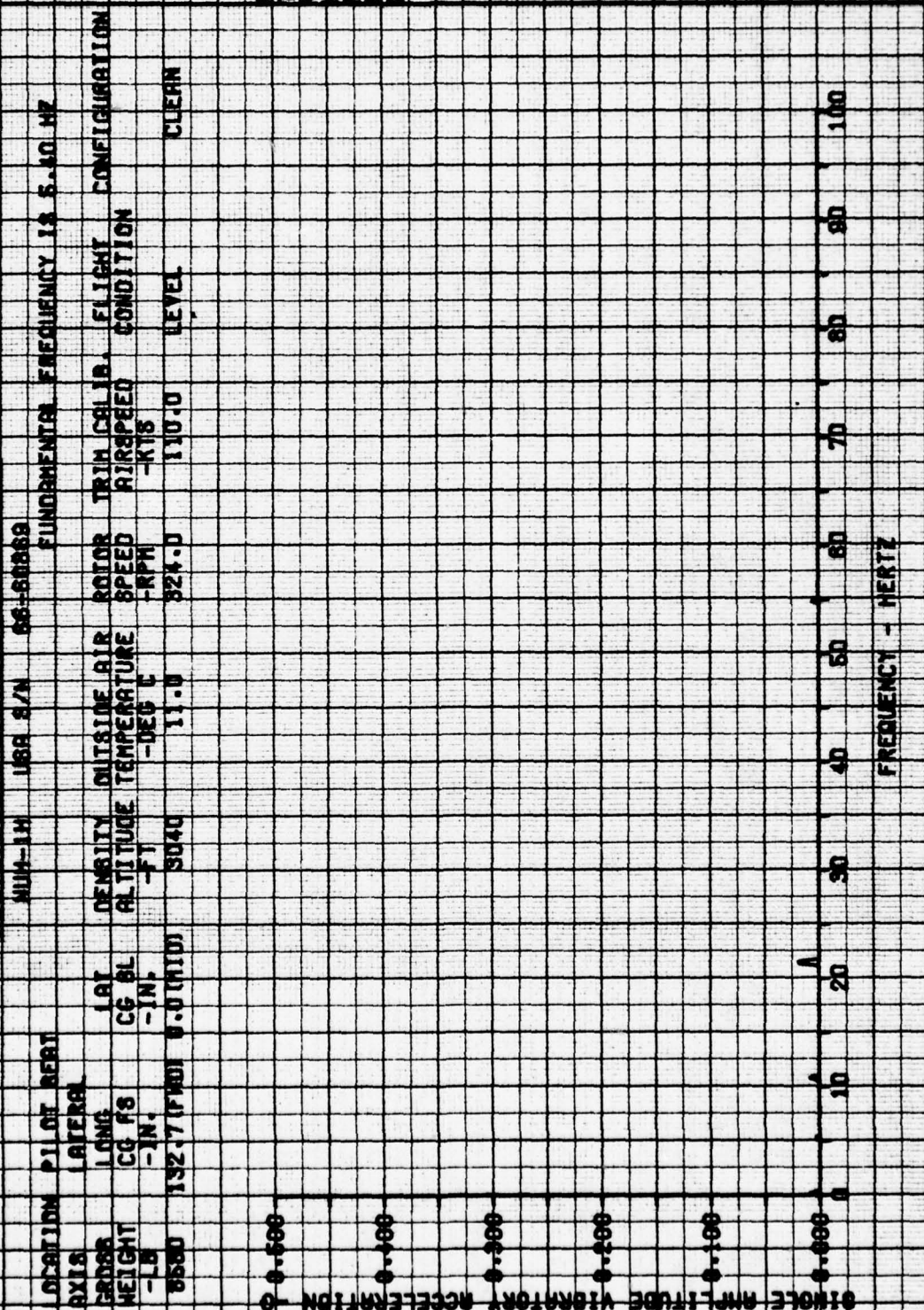


FIGURE 101

VIBRATION CHARACTERISTICS



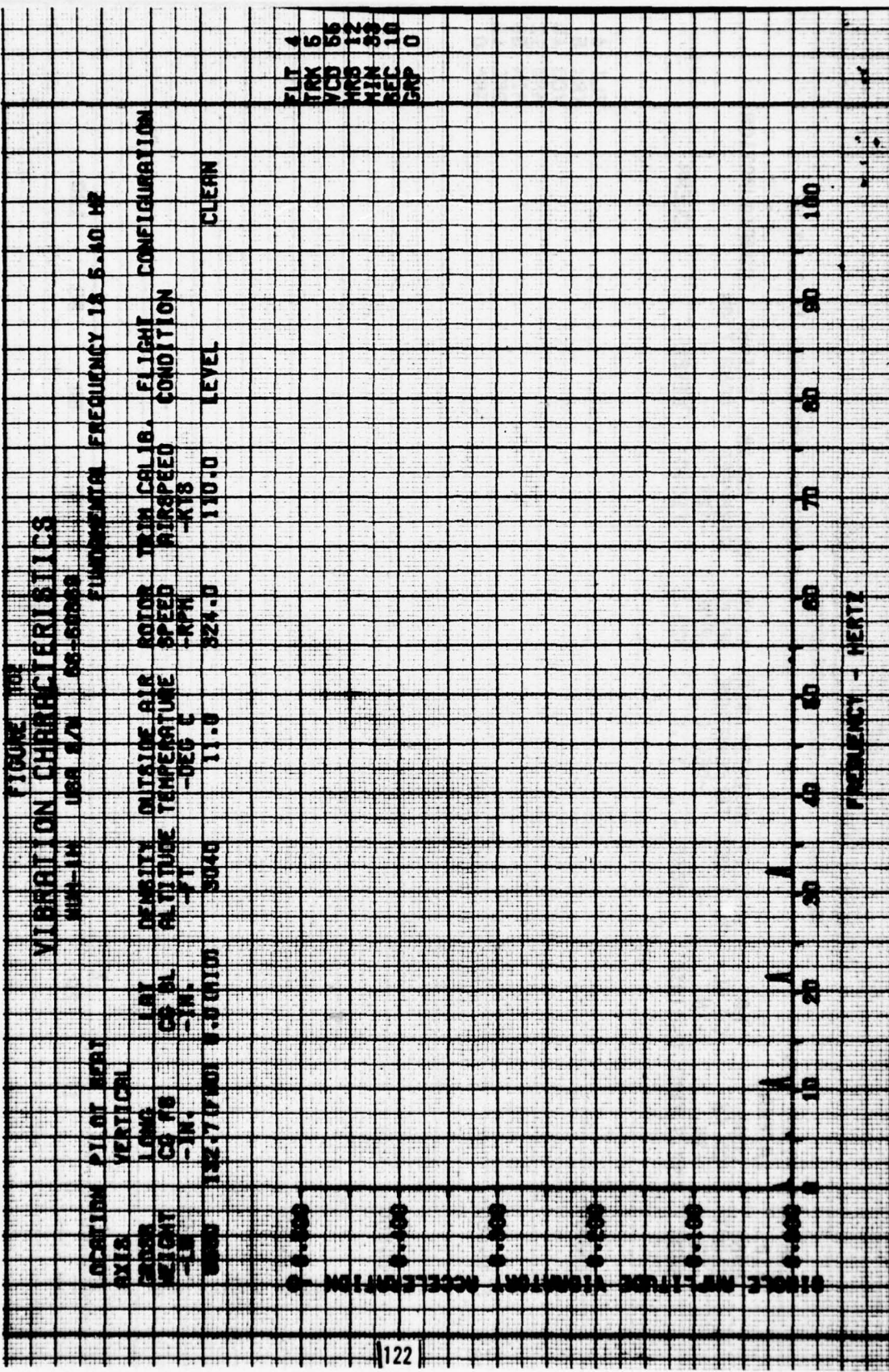
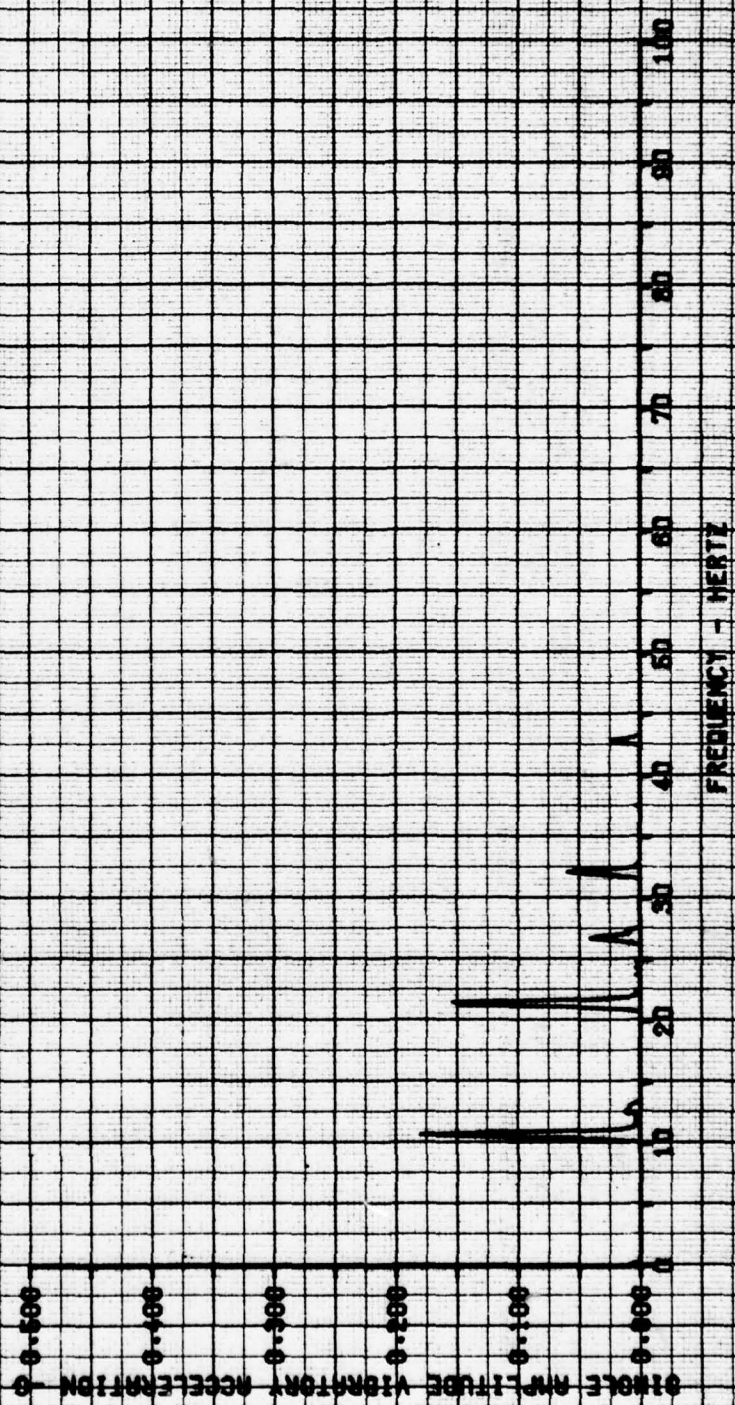


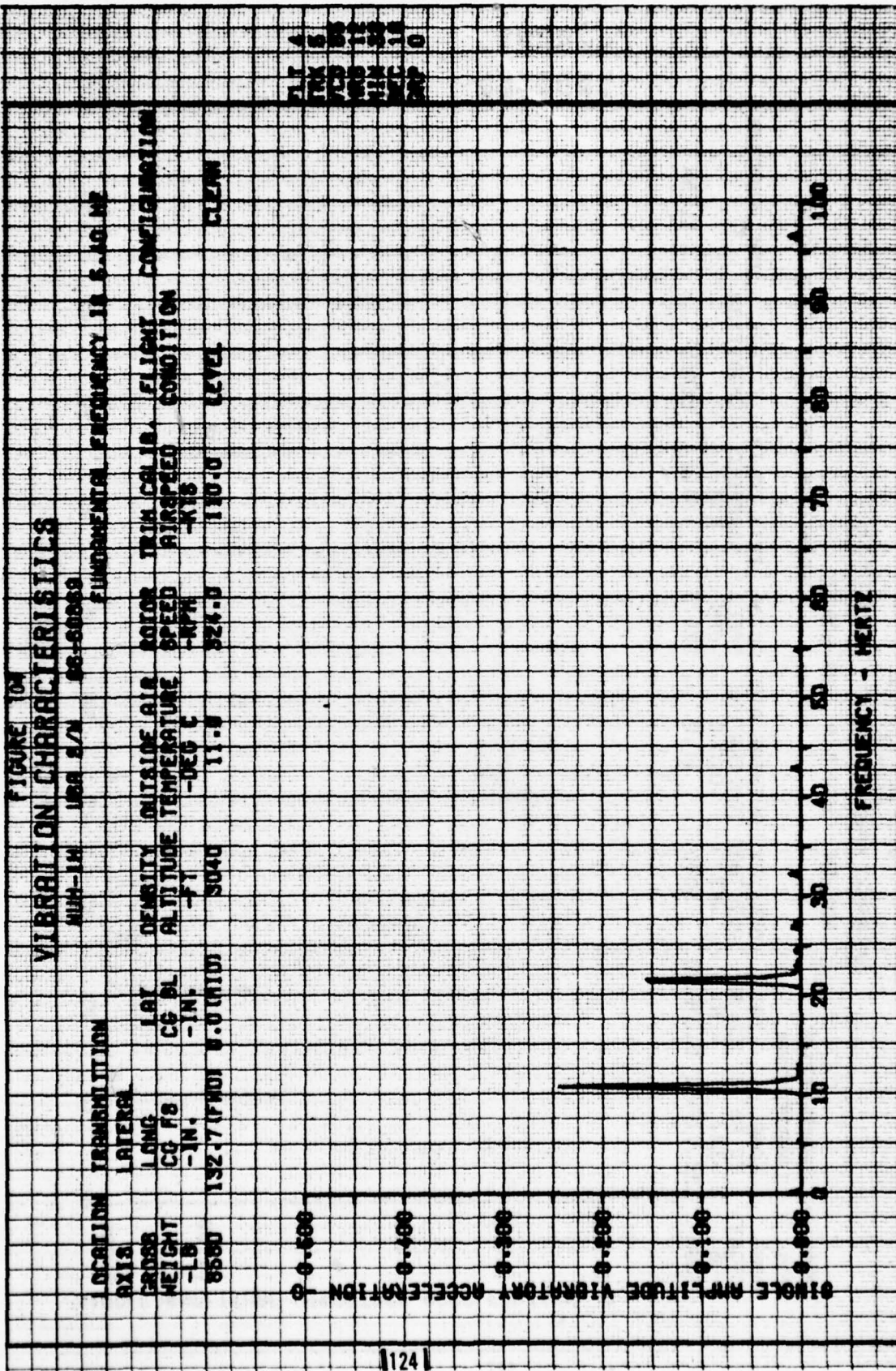
FIGURE 103

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LONGITUDINAL  
 CROSS LONG  
 WEIGHT CG F8  
 -LB 132.7 (FWD) 0.0 (A/D)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 3040 -RPM 324.0 -KTS 110.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ  
 8580 132.7 (FWD) 0.0 (A/D) 3040 11.0 324.0 110.0 CLEAN



FLT 4  
 TRK 5  
 VCS 70  
 ORG 12  
 MIN 30  
 SEC 10  
 SRP 0



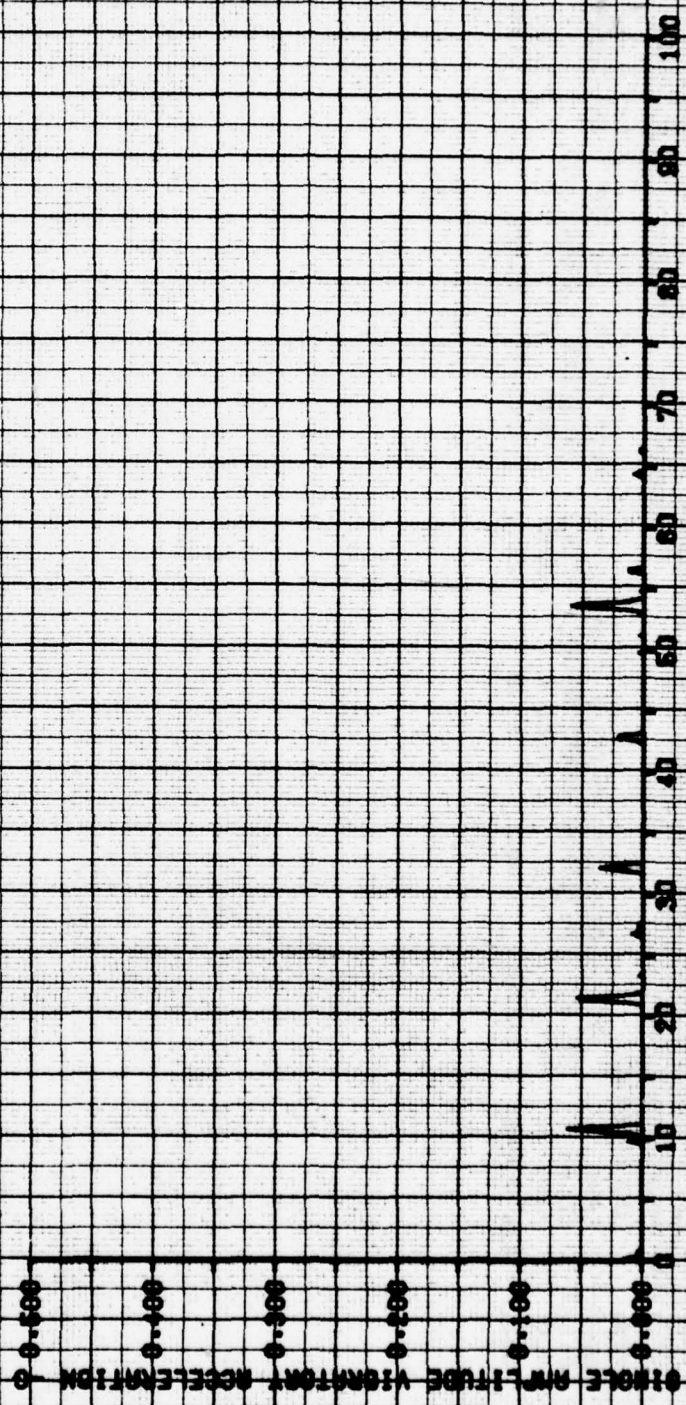
FLT A  
TRK 5  
FLD 06  
MIB 11  
MIM 34  
SEC 18  
DPP 0

FIGURE 105

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 GROSS WEIGHT 8580  
 CG FB 132.7 (PHOT) 0.0 (UNIT)  
 LONG CG 9L  
 CG 9L -IN.  
 1.8T  
 DENSITY ALTITUDE 3040  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE 11.0  
 -DEG C  
 ROTOR SPEED 324.0  
 -RPH  
 TRIM CALIB. AIRSPEED 110.0  
 FLIGHT CONFIGURATION  
 CONDITION -KTS  
 LEVEL CLEAN

NUM-14 188 2/4 88-80868  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ



FLT 4  
 TRK 5  
 WCD 100  
 WAB 12  
 MIN 33  
 SEC 10  
 CRP 0

FIGURE 106

VIBRATION CHARACTERISTICS

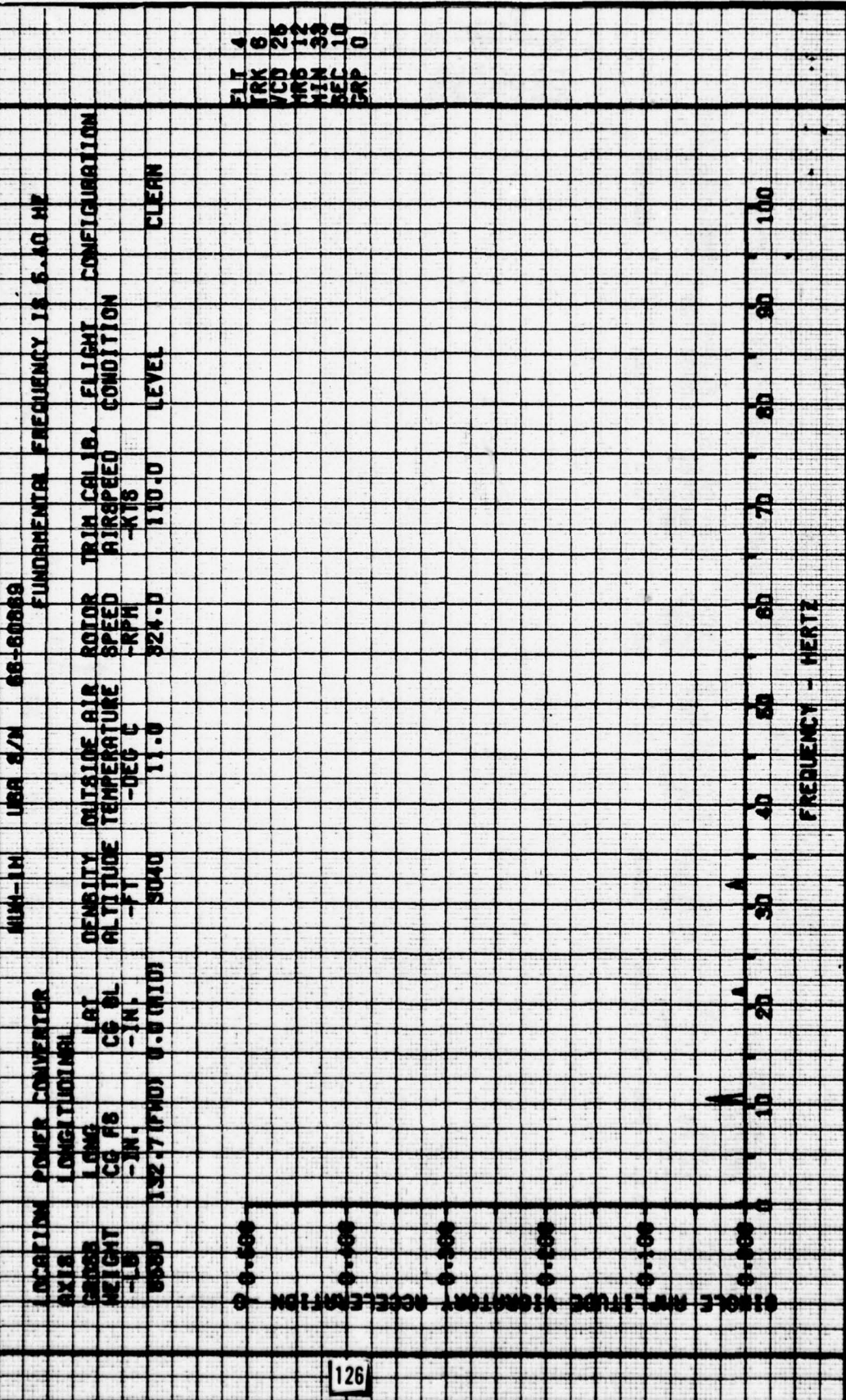
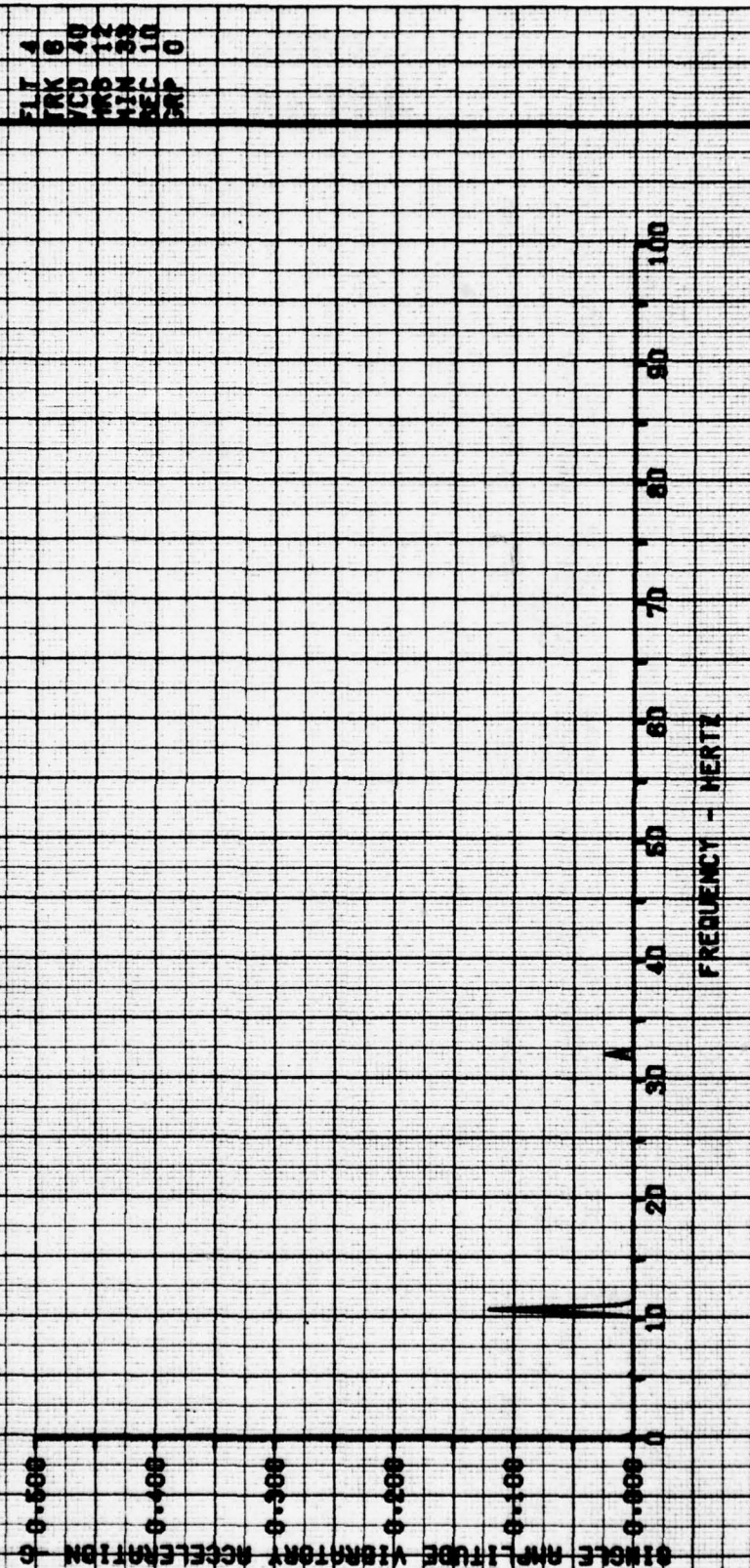


FIGURE 107

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS LATERAL  
 GROSS WEIGHT 132.7 (FWD) 0.0 (MID)  
 CG FB -IN.  
 CG BL -IN.  
 LAT 5040  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPH -KTS  
 11.0 324.0 110.0 LEVEL CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ



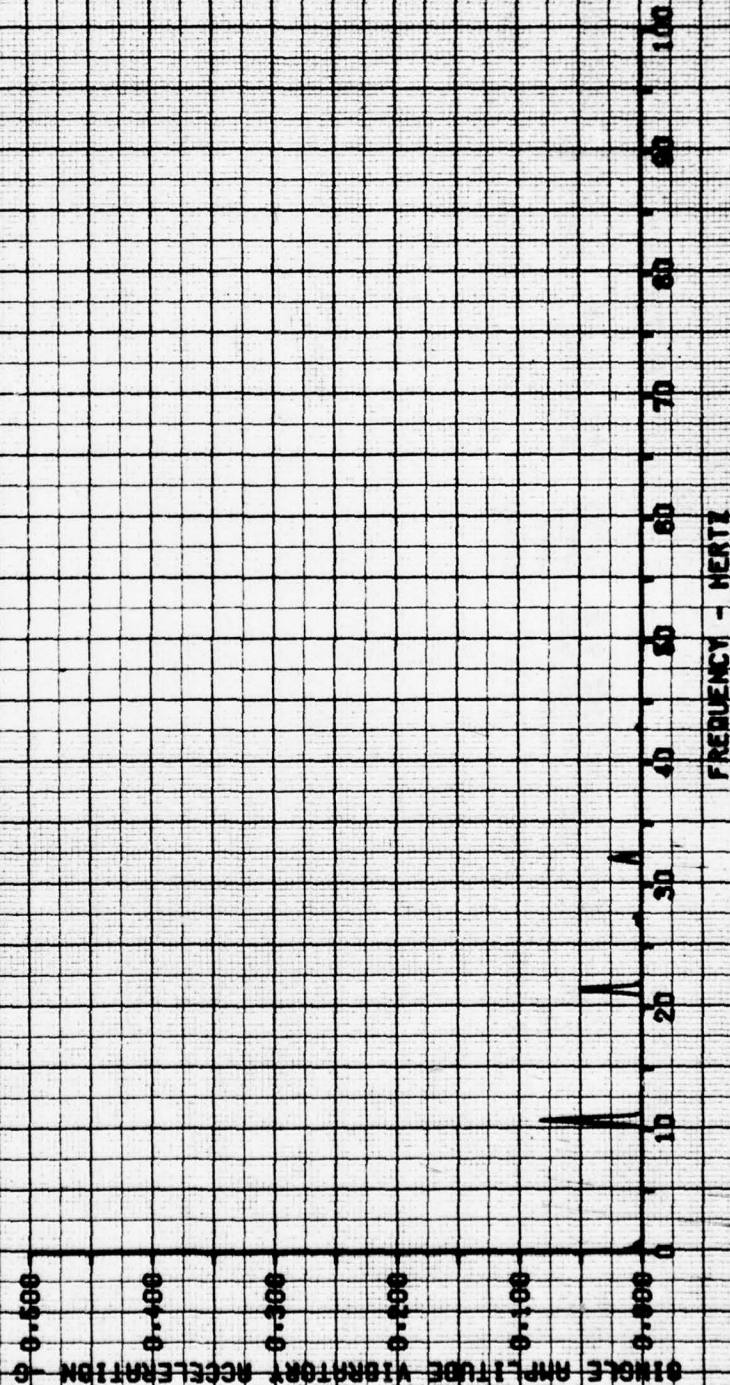
FLT 4  
 TRK 6  
 VCU 40  
 MRB 12  
 MIN 33  
 SEC 10  
 GRP 0

FIGURE 108

VIBRATION CHARACTERISTICS

LOCATION	POWER CONVERTER	WIND-111	UGA S/N	66-60869	FUNDAMENTAL FREQUENCY	18.5-20.0 HZ
AXIS	VERTICAL	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION	
GROSS	LONG	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION
HEIGHT	CG FB	-FT	-DEG C	-RPH	-KTS	
-LB	-IN.	3040	11.0	324.0	110.0	CLEAN
8580	132.7 (FWD)	0.0 (MID)			LEVEL	

FLY 4  
 FIX 6  
 VCB 66  
 WDB 112  
 HIN 30  
 SEC 10  
 PAP 0



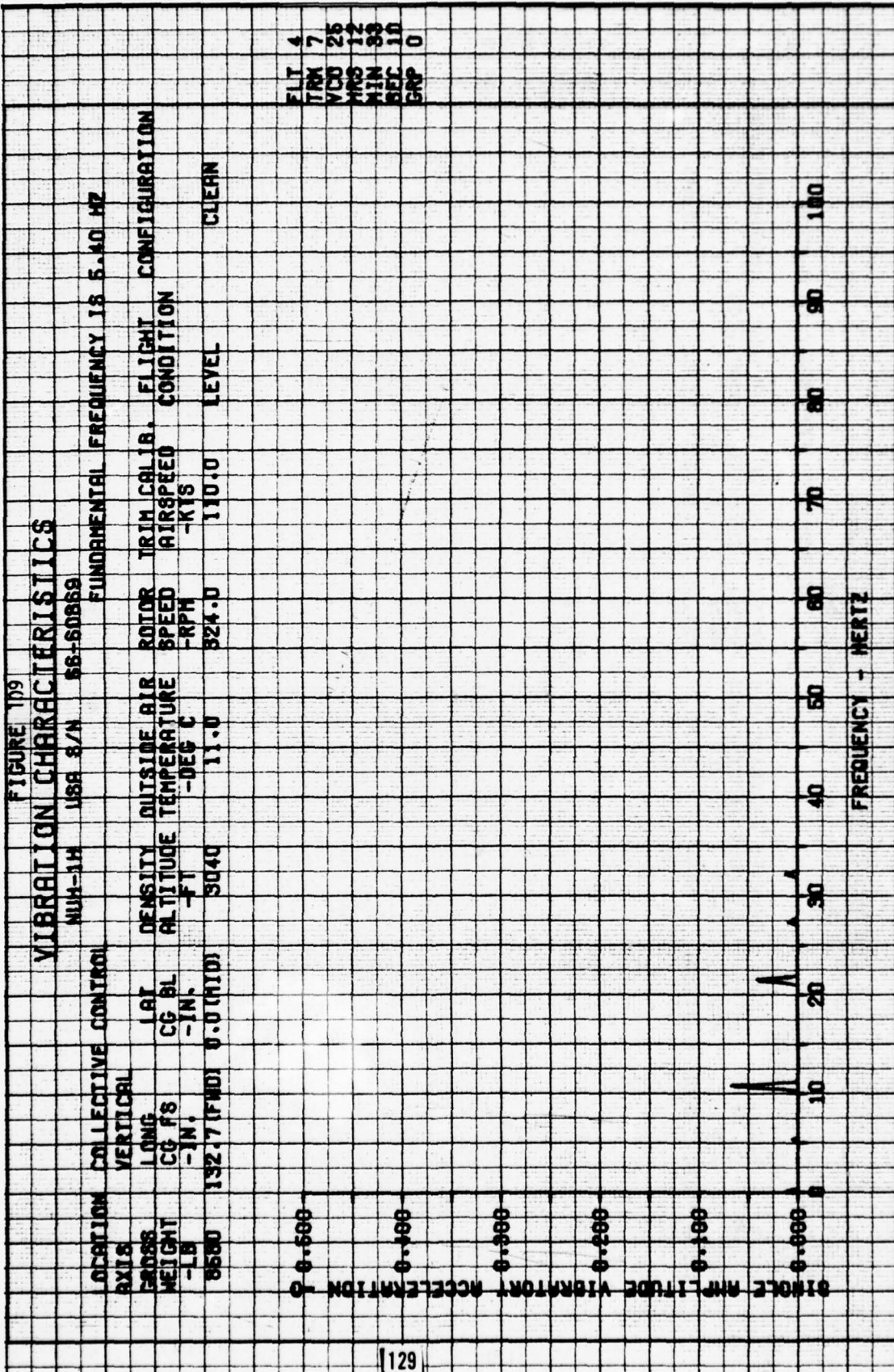
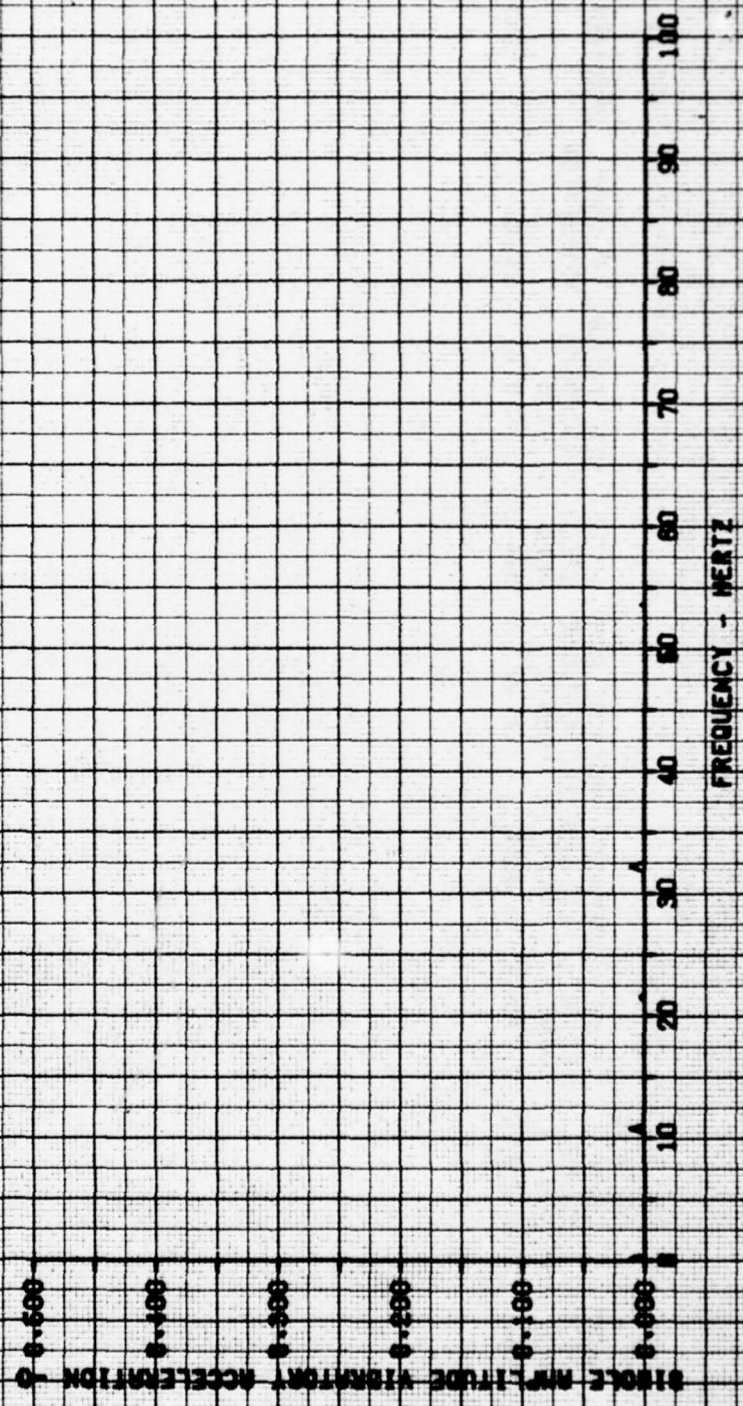


FIGURE NO

### VIBRATION CHARACTERISTICS

LOCATION	CYCLIC CONTROL	MUH-1H	USA S/N	66-60869	FUNDAMENTAL FREQUENCY IS	5.40 HZ
AXIS	LONGITUDINAL					
PROB	LONG	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT	CONFIGURATION
WEIGHT	CG F'S	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION
-LB	-IN.	-FT	-DEG C	-RPM	-KTS	
0680	132.7 (FWD)	0.0 (PID)	11.0	924.0	110.0	CLEAN

FLT 4  
 TRK 7  
 VCO 40  
 HNS 12  
 MIN 33  
 SEC 10  
 GRP 0





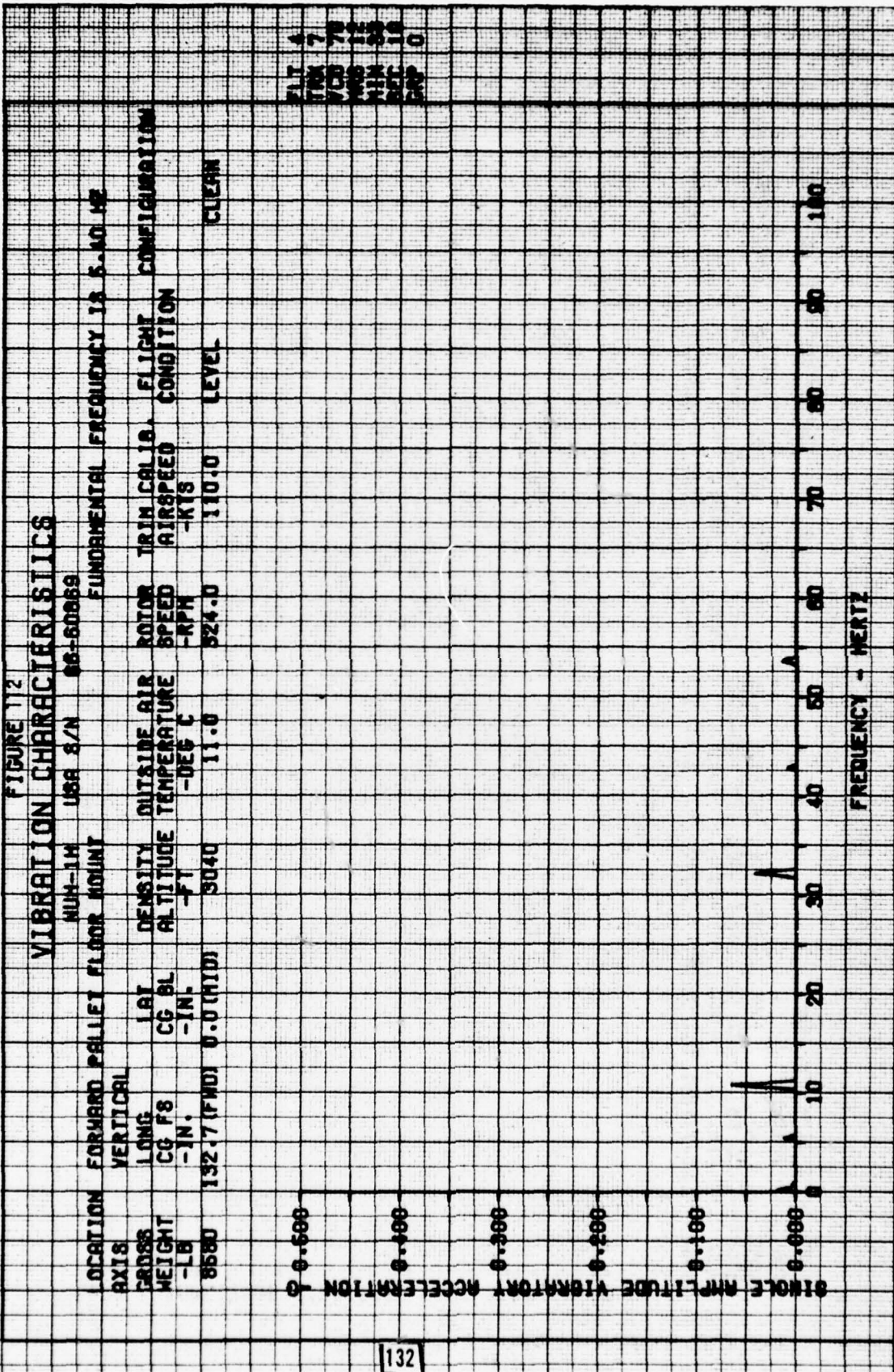


FIGURE 113

VIBRATION CHARACTERISTICS

MUH-1H USA S/N 66-60069

FUNDAMENTAL FREQUENCY IS 5.40 HZ

LOCATION PALLET

AXIS LONGITUDINAL

CROSS LONG

WEIGHT CG F8

-LB

8780

133.7 (FWD) 0.0 (MID)

DENSITY

ALTIUDE

TEMPERATURE

-FT

4100

8.0

80.0

524.0

80.0

CLIMB

CLEAN

FLIGHT CONDITION

TRIAL CALIB.

AIR SPEED

-KTS

80.0

CONFIGURATION

SINGLE AMPLITUDE VIBRATION ACCELERATION

FREQUENCY - HERTZ

FLT 5  
TRK 4  
VCO 70  
MRG 0  
MIN 9  
SEC 45  
GRP 0

FIGURE 114

VIBRATION CHARACTERISTICS

LOCATION	PALETT	UNIT	108 3/4	OR-50858	FUNDAMENTAL FREQUENCY IS 5.40 HZ		
DATE	INTERA	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	ELIMIT	CONFIGURATION
WEIGHT	LONG	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION	
-LB	-IN.	-FT	-DEG C	-RPM	-KTS		
3750	133.7 (140)	4100	0.0	324.0	80.0	CLIMB	CLEAN

FLT 5  
TRK 4  
VCO 86  
WRS 0  
MIN 9  
REC 45  
GAP 0

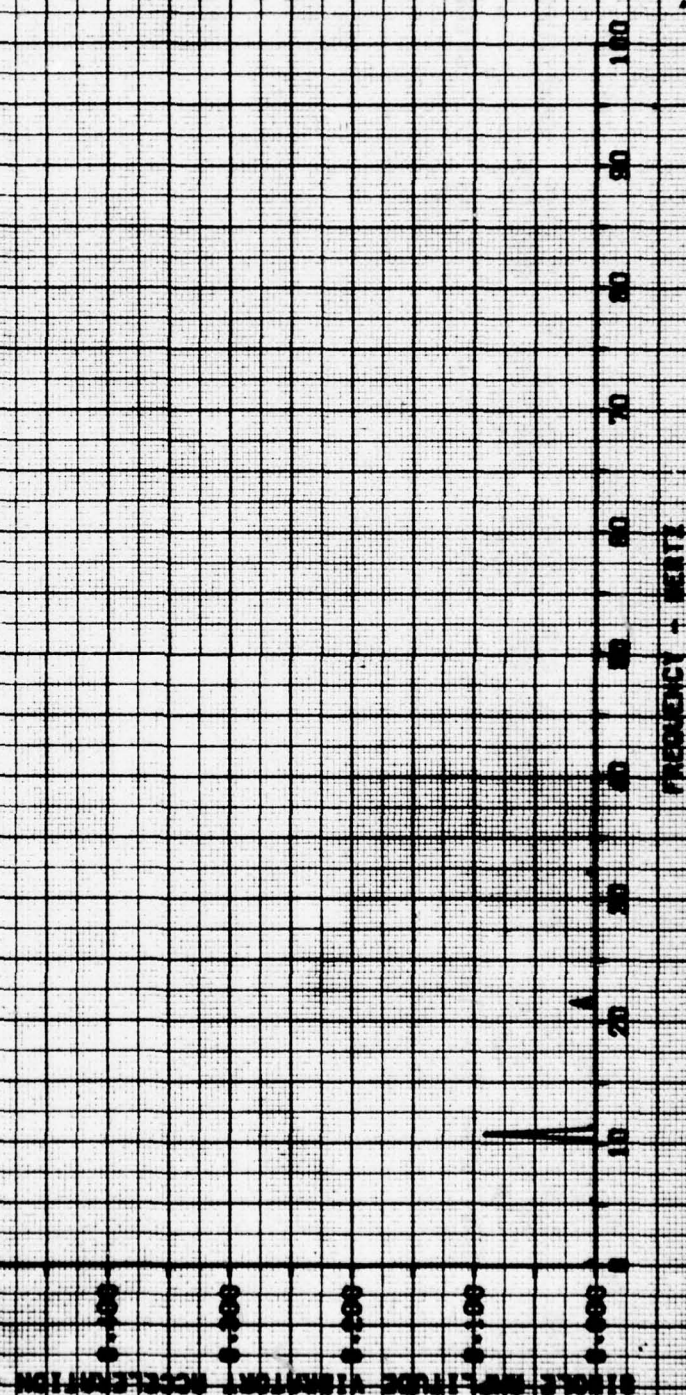


FIGURE 13

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS VERTICAL  
 GROSS WEIGHT 8760  
 CG FS -IN. 133.7 (FWD)  
 CG DL -IN. 0.0 (MID)  
 DENSITY 4100  
 ALTITUDE -FT. 4100  
 OUTSIDE AIR TEMPERATURE -DEG C 0.0  
 ROTOR SPEED -RPM 524.0  
 TRIM CALIB. AIRSPEED -KTS 80.0  
 FLIGHT CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 5  
 VCO 55  
 MAG 0  
 MIN 0  
 SEC 45  
 CRP 0

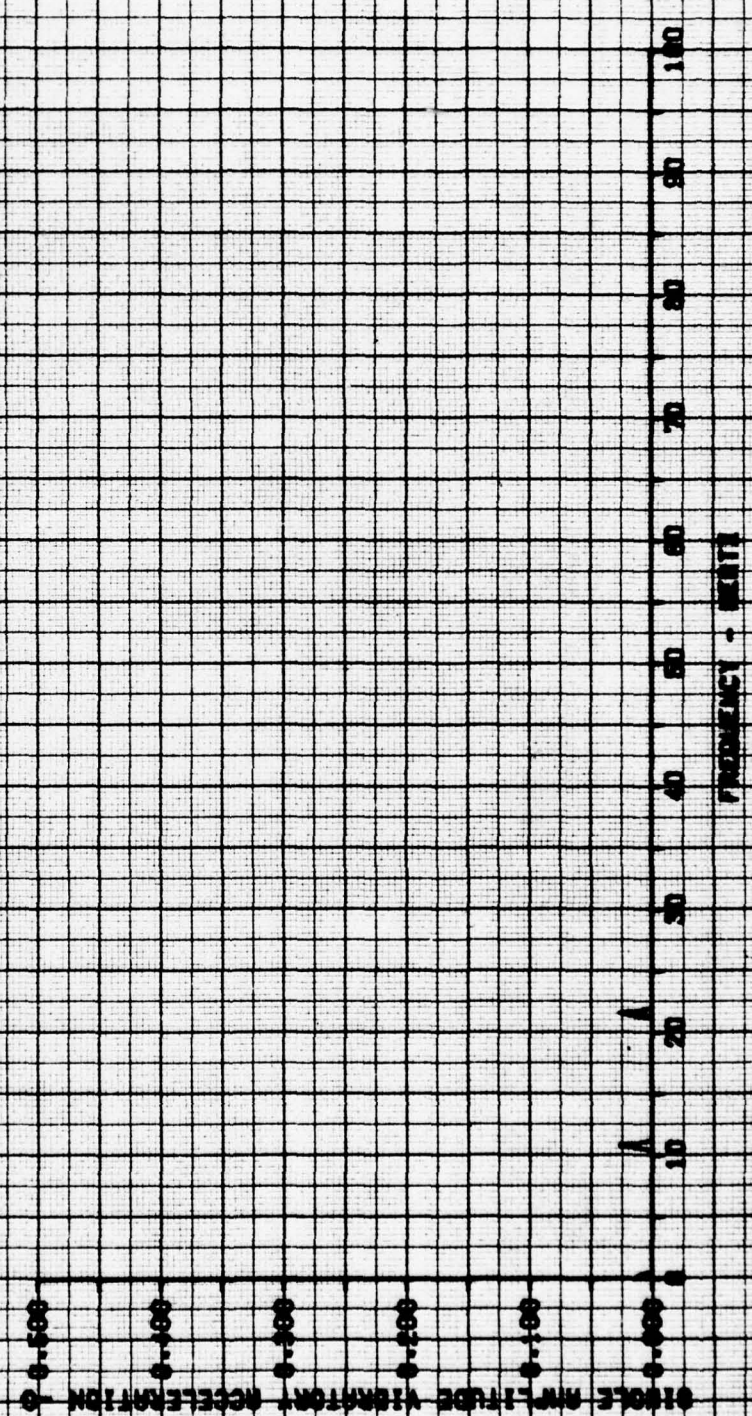
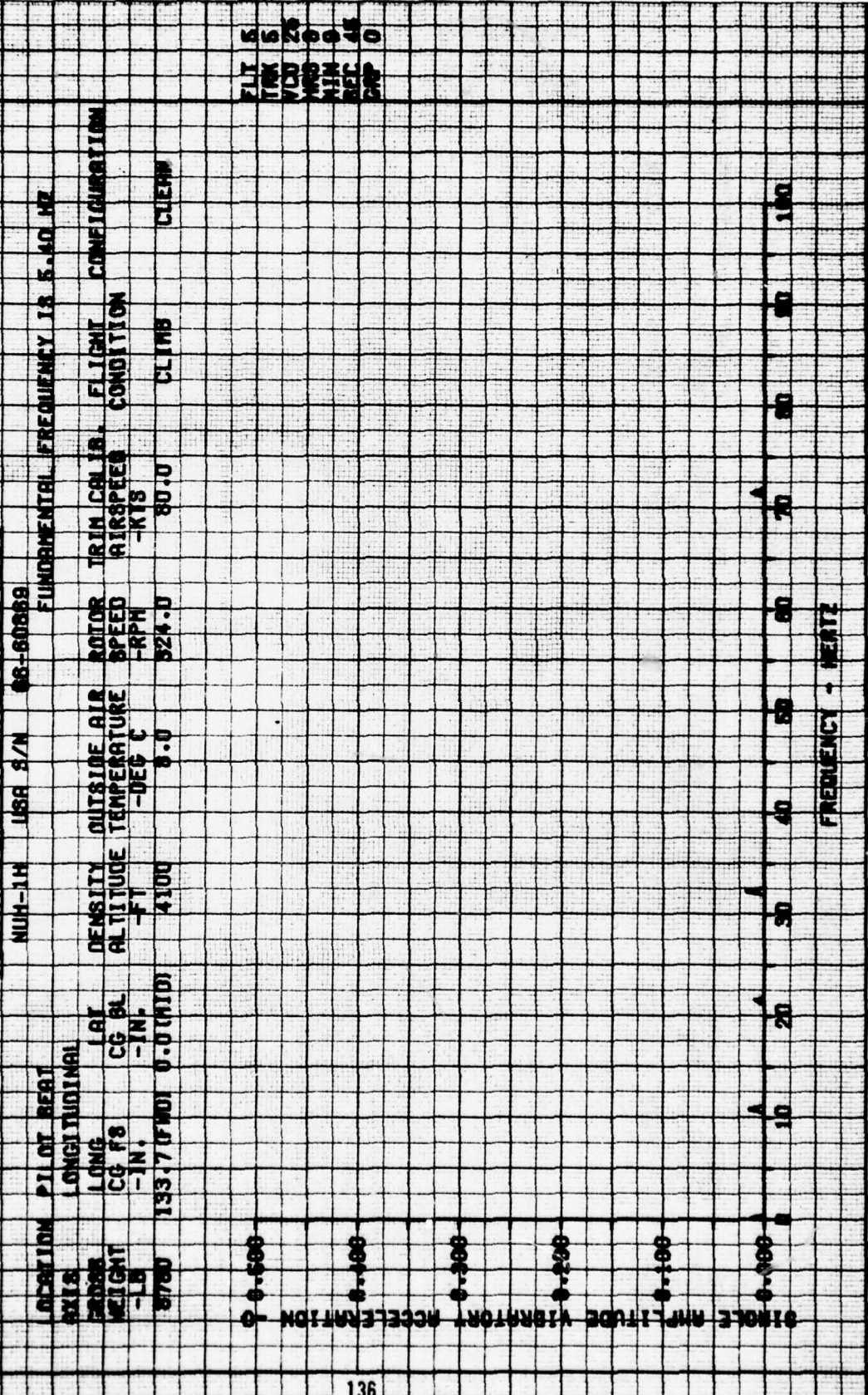


FIGURE 116

VIBRATION CHARACTERISTICS



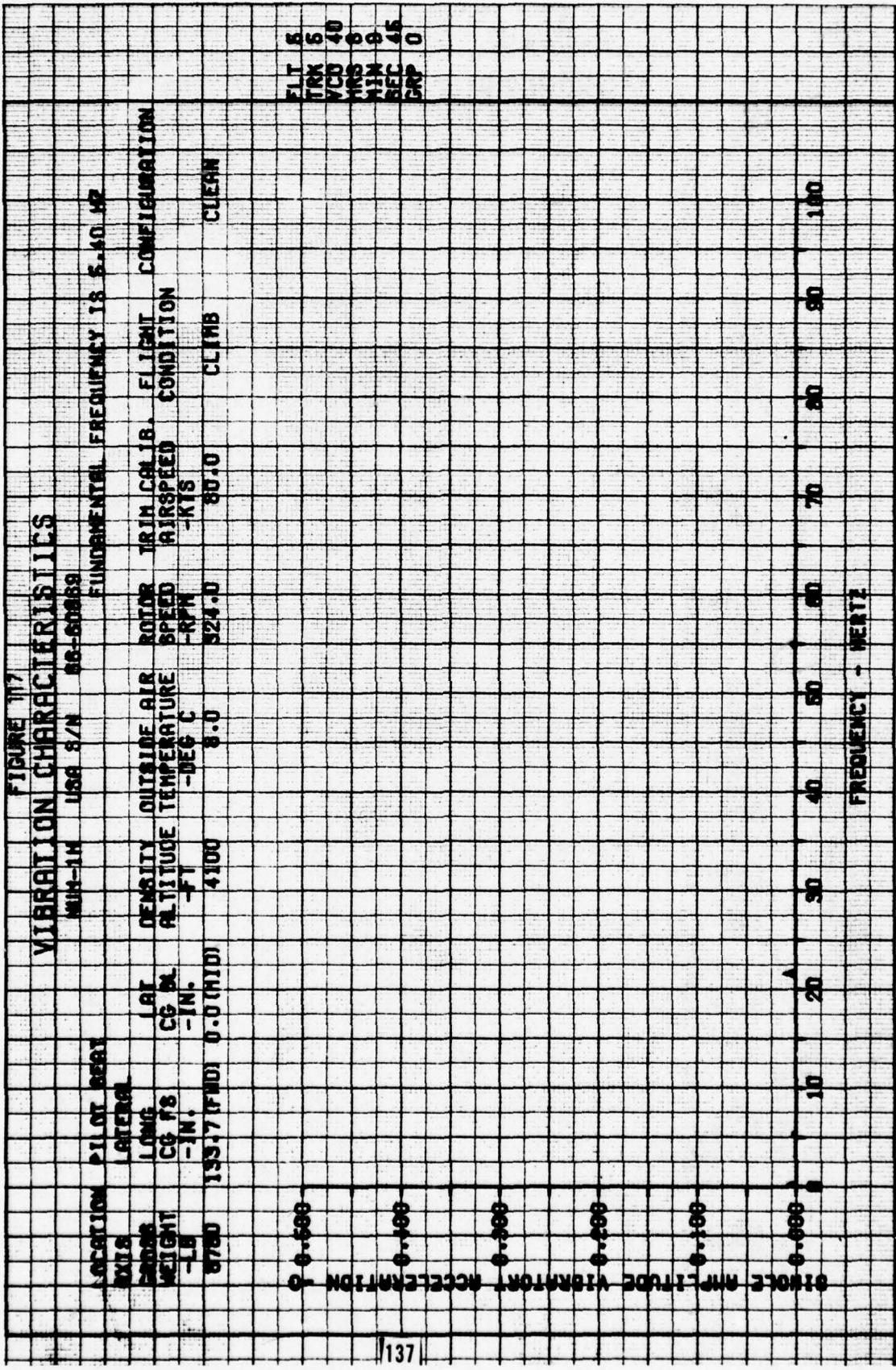


FIGURE 118

VIBRATION CHARACTERISTICS

LOCATION: PILOT SEAT  
 AXIS: VERTICAL  
 MODEL: LONG  
 WEIGHT: CG #8  
 -IN. -IN.  
 8780 133.7 (PND) 0.0 (NIDI)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -RPM -KTS  
 4100 0.0 0.0 80.0 CLIMB CLEAN

FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 4  
 WCD 100  
 MRS 0  
 MIN 0  
 SEC 45  
 GRP 0

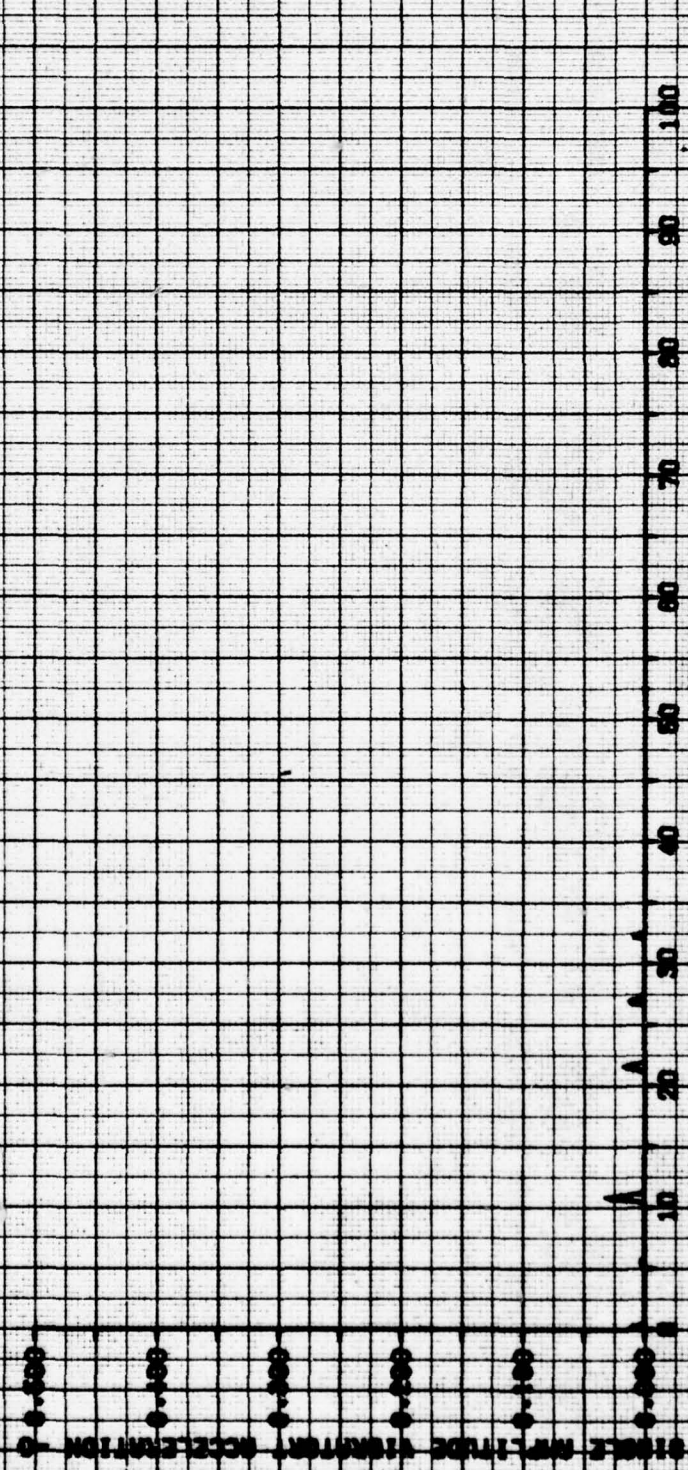


FIGURE 119

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LONGITUDINAL  
 CROSS LONG LAT  
 HEIGHT CG F/S CG PL  
 -IN. -IN.  
 8780 133.7 (FWD) 0.0 (MID)  
 DENSITY OUTSIDE AIR ROTOR TRIM CAL IS. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -KTS  
 4100 0.0 80.0 CLIMB CLIMB  
 MUH-1H USA S/N 86-60868 FUNDAMENTAL FREQUENCY IS 5.40 Hz

FLT 8  
 TMR 3  
 VCS 78  
 WWS 8  
 AIN 8  
 SWL 45  
 DWP 0

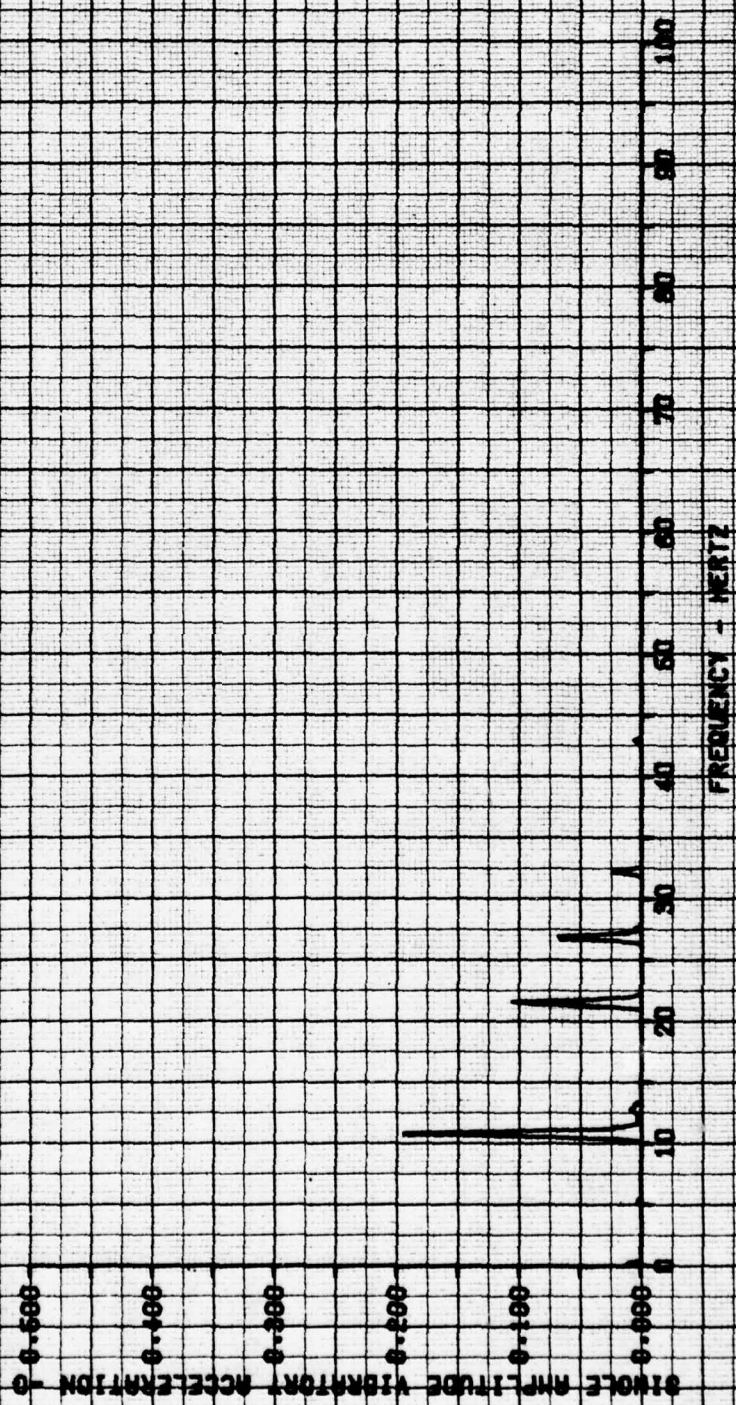


FIGURE 120

VIBRATION CHARACTERISTICS

NUM-IN 108 S/N 86-80869 FUNDAMENTAL FREQUENCY 18 5.10 MZ  
 LOCATION TRANSMISSION  
 AXIS LATERAL  
 GROSS WEIGHT 8760  
 CG F'S 133.7 (FWO) 0.0 (WID)  
 LAY CG BL -IN,  
 DENSITY 4100  
 ALTITUDE -FT 4100  
 OUTSIDE AIR TEMPERATURE 0.0  
 ROTOR SPEED -RPM 524.0  
 TRIM CALIB. AIRSPEED -KTS 80.0  
 FLIGHT CONDITION CLIMB  
 CONFIGURATION CLEAN

FLT 5  
 TRK 5  
 VCO 88  
 HRS 0  
 MIN 0  
 SEC 45  
 CRP 0

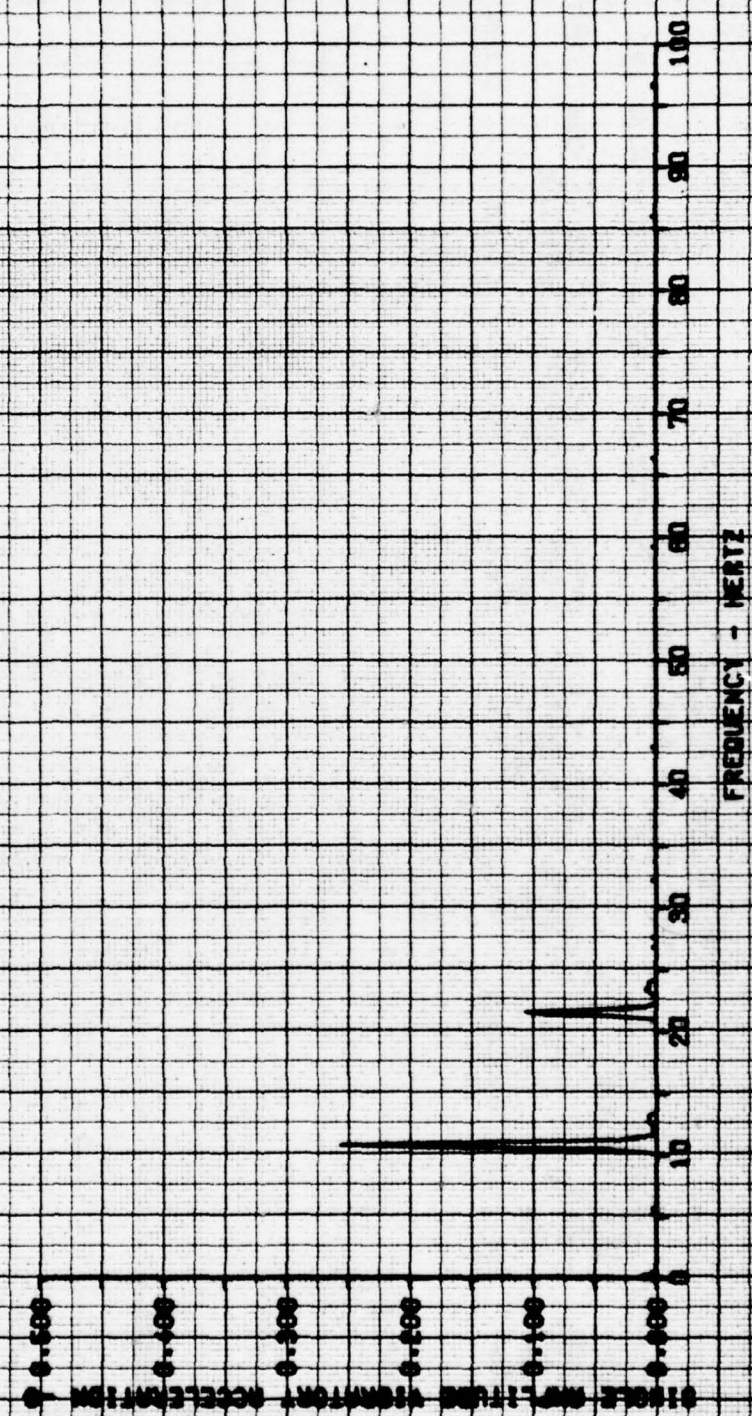


FIGURE 121

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 28000  
 WEIGHT CG F8  
 -IN. 133.7 (FWD) 0.0 (AID)  
 8780  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4100 0.0 524.0 80.0 CLIMB CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 5  
 VCD 100  
 WRS 6  
 MIN 9  
 SEC 45  
 CRP 0

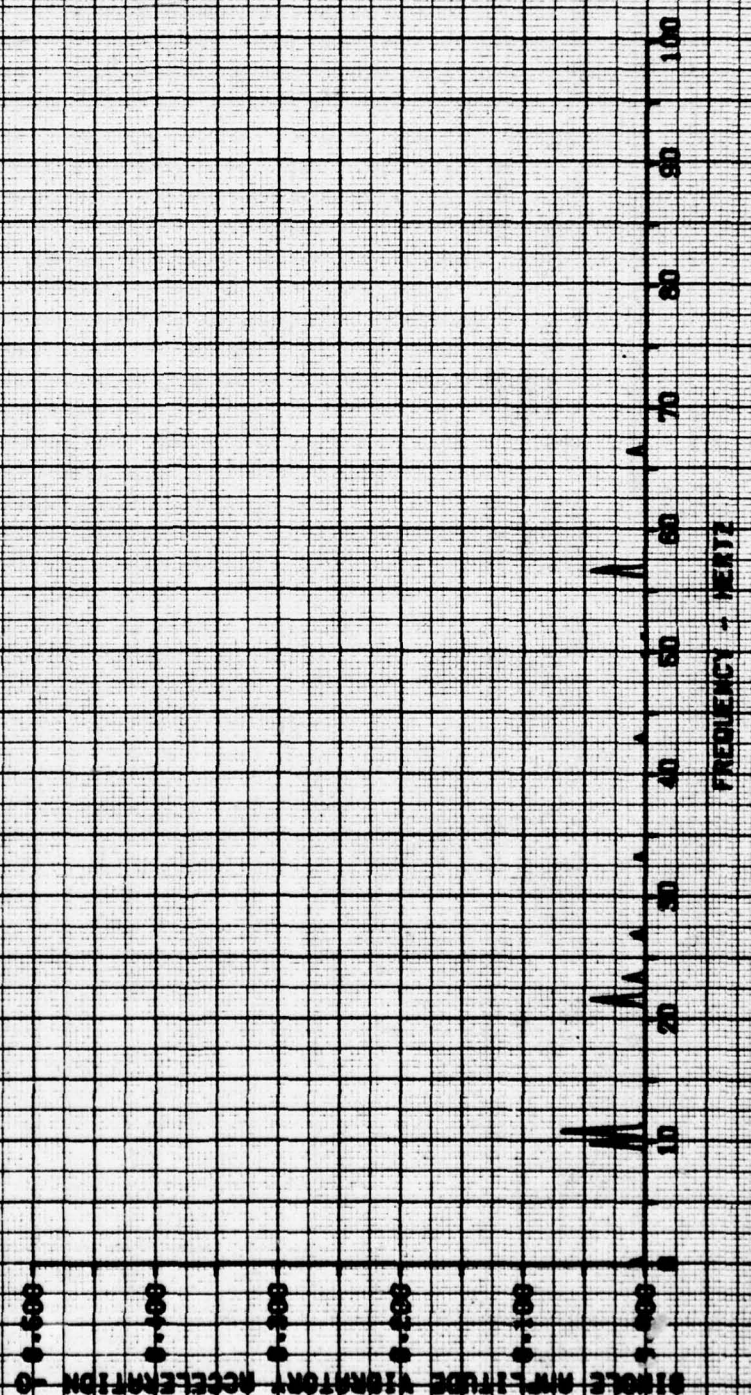


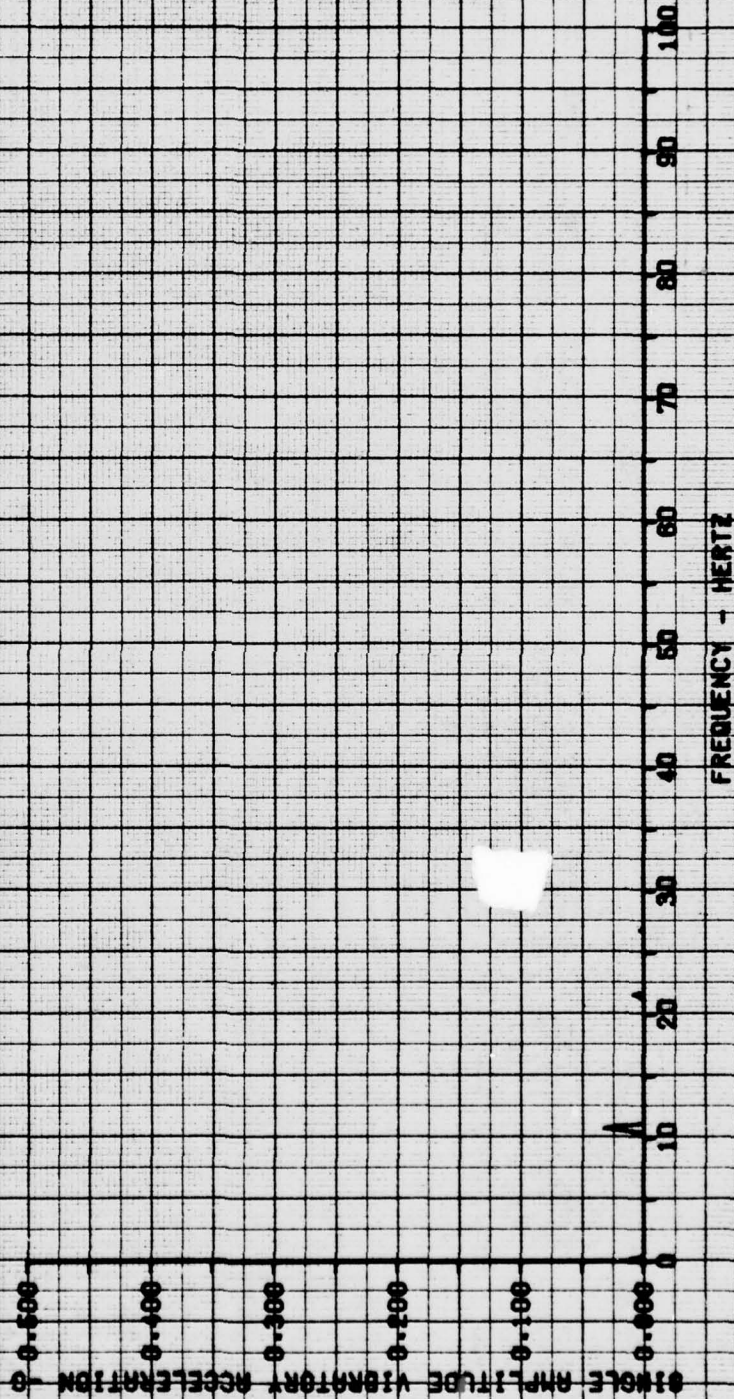
FIGURE 122

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS LONGITUDINAL  
 CROSS LONG LAT  
 WEIGHT CG F3 CG BL  
 -LB -IN. -IN.  
 6780 133.7 (FWD) 0.0 (MID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4100 8.0 324.0 60.0 CLIMB CLEAN

FUNDAMENTAL FREQUENCY IS 5.10 HZ



FLT 5  
 TRM 6  
 VCS 25  
 INB 0  
 HIN 0  
 MTC 45  
 CAP 0

FIGURE 123

VIBRATION CHARACTERISTICS

NUM-IN 158 2/4 88-80888 FUNDAMENTAL FREQUENCY IS 5.40 MP

LOCATION POWER CONVERTER

AXIS LATERAL

GROSS LONG

WEIGHT CG F8

-IN. -IN.

8780 133.7(F80) 0.0(10)

DENSITY OUTSIDE AIR

TEMPERATURE

-DEG C

0.0

ALTIITUDE

FT

4100

ROTOR TRIM CALIB.

FLIGHT CONFIGURATION

CLIMB

SPEED

824.0

AIRSPED CONDITION

-KTS

80.0

CLEAN

0.500

0.100

0.300

0.200

0.100

0.050

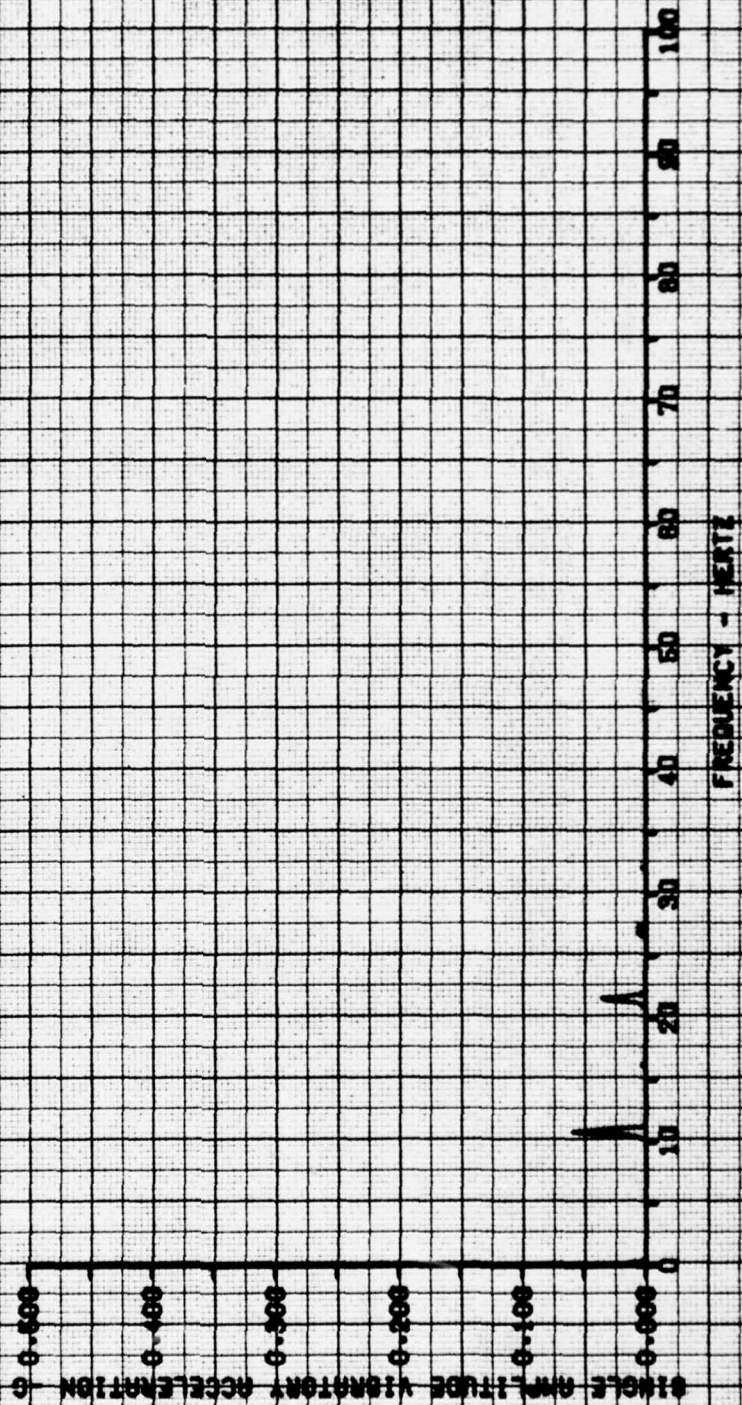
FLT 5  
TRK 6  
VCD 40  
MS 0  
MIN 0  
SEC 45  
SRP 0

FREQUENCY - HERTZ

FIGURE 124

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS VERTICAL  
 GROSS WEIGHT 8760  
 CG FS 155.71(FWD)  
 CG BL 0.0(UND)  
 -IN.  
 LAB 0.0(UND)  
 -IN.  
 DENSITY 8.0  
 ALTITUDE 4100  
 -FT  
 OUTSIDE AIR TEMPERATURE 8.0  
 -DEG C  
 ROTOR SPEED 324.0  
 -RPM  
 IRIN CAL. AIR SPEED 80.0  
 FLIGHT CONDITION CLEAN  
 FUNDAMENTAL FREQUENCY 1.8 5.10 HZ



FLT 6  
 TRX 8  
 VCO 68  
 WRS 8  
 MIN 9  
 SEC 45  
 CRP 0

FIGURE 125

VIBRATION CHARACTERISTICS

LOCATION: COLLECTIVE CONTROL  
 AXIS: VERTICAL  
 GROSS WEIGHT: 8750 LB  
 CG FB: 133.7 (FWD)  
 CG BL: 0.0 (NID)  
 LAY: -IN.  
 DENSITY: 4100  
 ALTITUDE: 8.0  
 OUTSIDE AIR TEMPERATURE: 324.0  
 ROTOR SPEED: 80.0  
 TRIM CALIB. AIRSPEED: CLIMB  
 FLIGHT CONDITION: CLEAN  
 FUNDAMENTAL FREQUENCY: 5.10 HZ

FLI 5  
 TRK 7  
 VCD 25  
 WRB 6  
 AIN 9  
 BEC 45  
 CRP 0

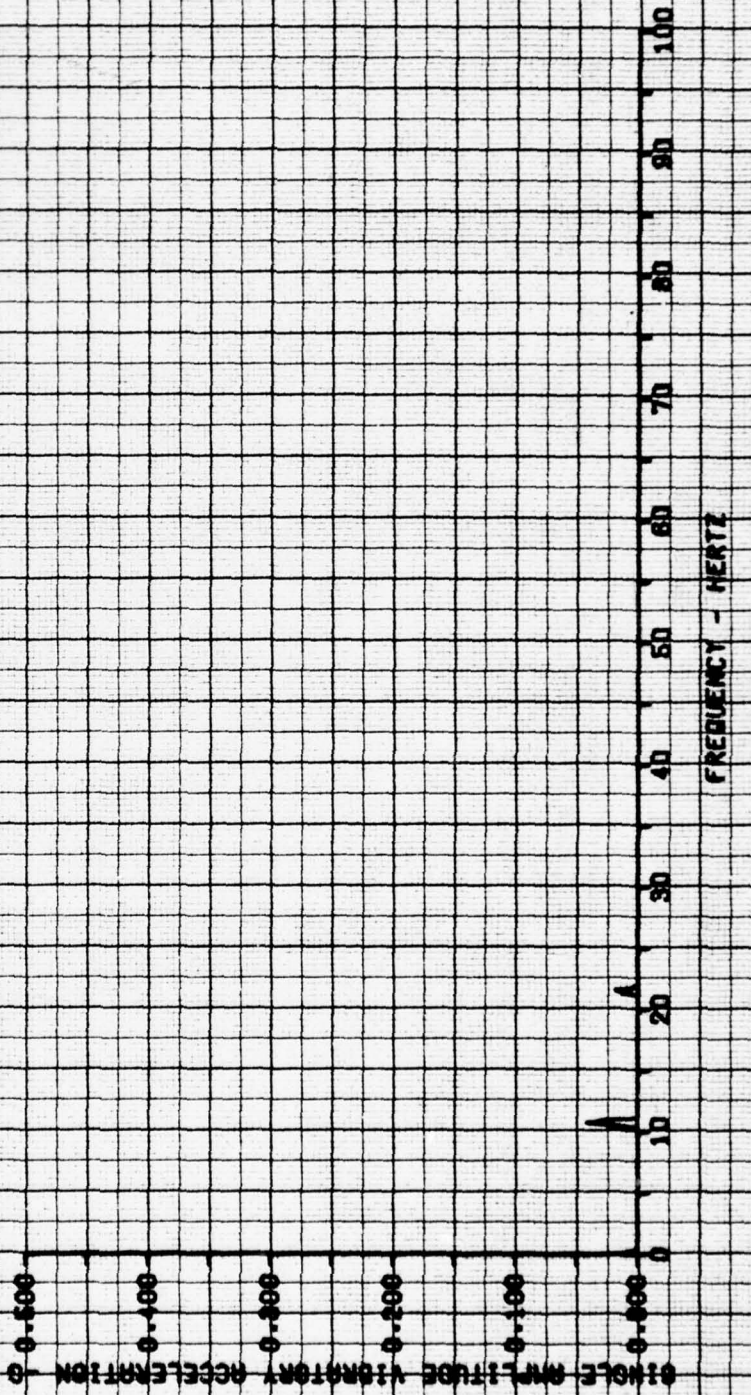
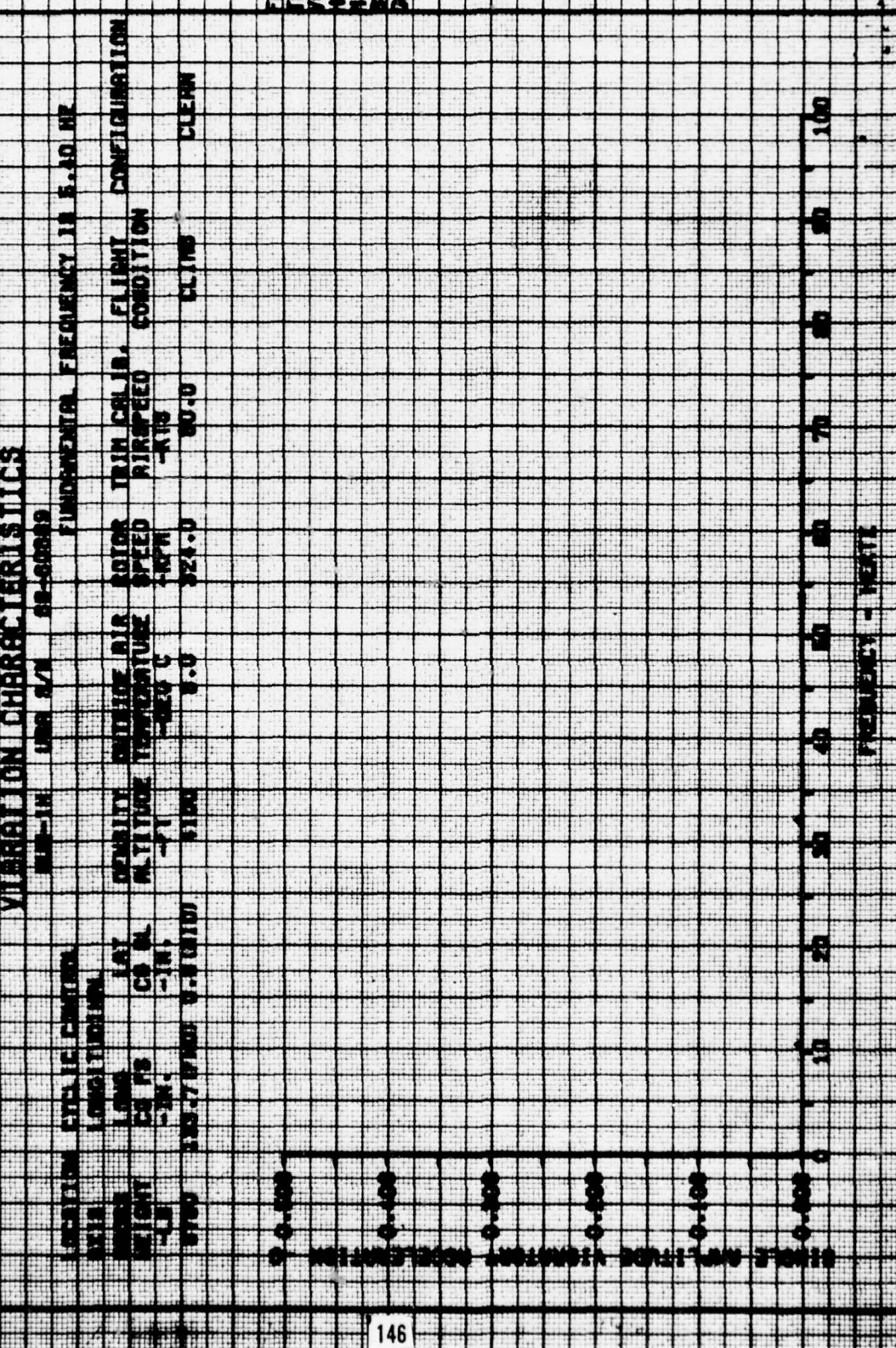


FIGURE 126  
**VIBRATION CHARACTERISTICS**



MIN-IN 1000 2/1 00-00000  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ  
 DENSITY INSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -PT -20.0 C 0.0 321.0 0.0 CLIMS CLEAN  
 0.0 0.0 0.0 0.0 0.0 0.0

FLT 5  
 TRK 7  
 YCD 40  
 MND 0  
 MIN 9  
 SEC 45  
 DEP 0

FIGURE 27

VIBRATION CHARACTERISTICS

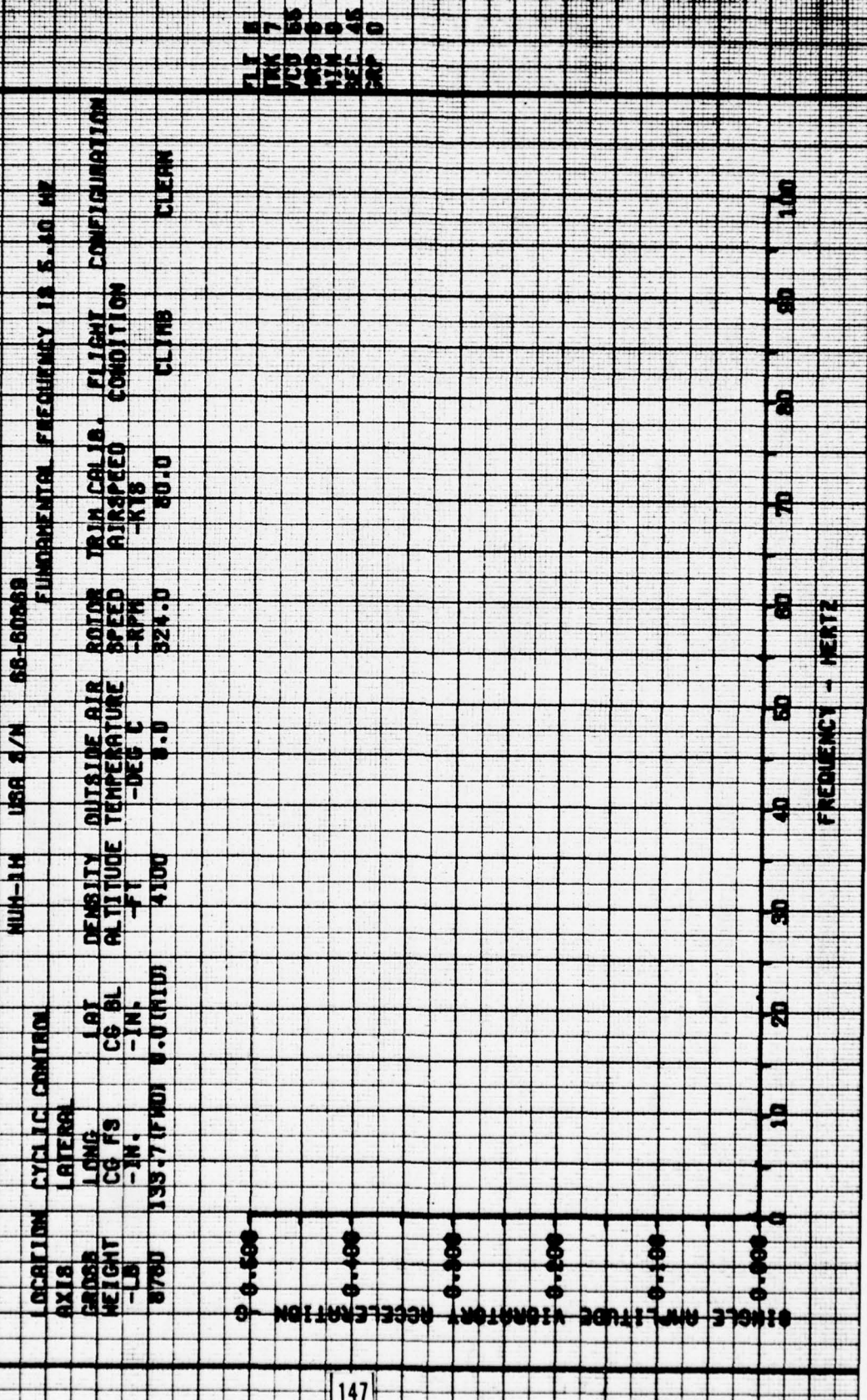


FIGURE 128

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 SECSB LONG  
 HEIGHT CG FS -IN.  
 8760 139.7(FWD) 9.0(WTD) 4100  
 DIM-1M 1000 8/1 88-82059 FUNDAMENTAL FREQUENCY IS 1.16 Hz  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONDITION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG F -RPM -KTS  
 8.0 324.0 80.0 CLIMB CLEAN

7.7 5  
 100 7  
 100 0  
 100 0  
 100 0  
 100 0

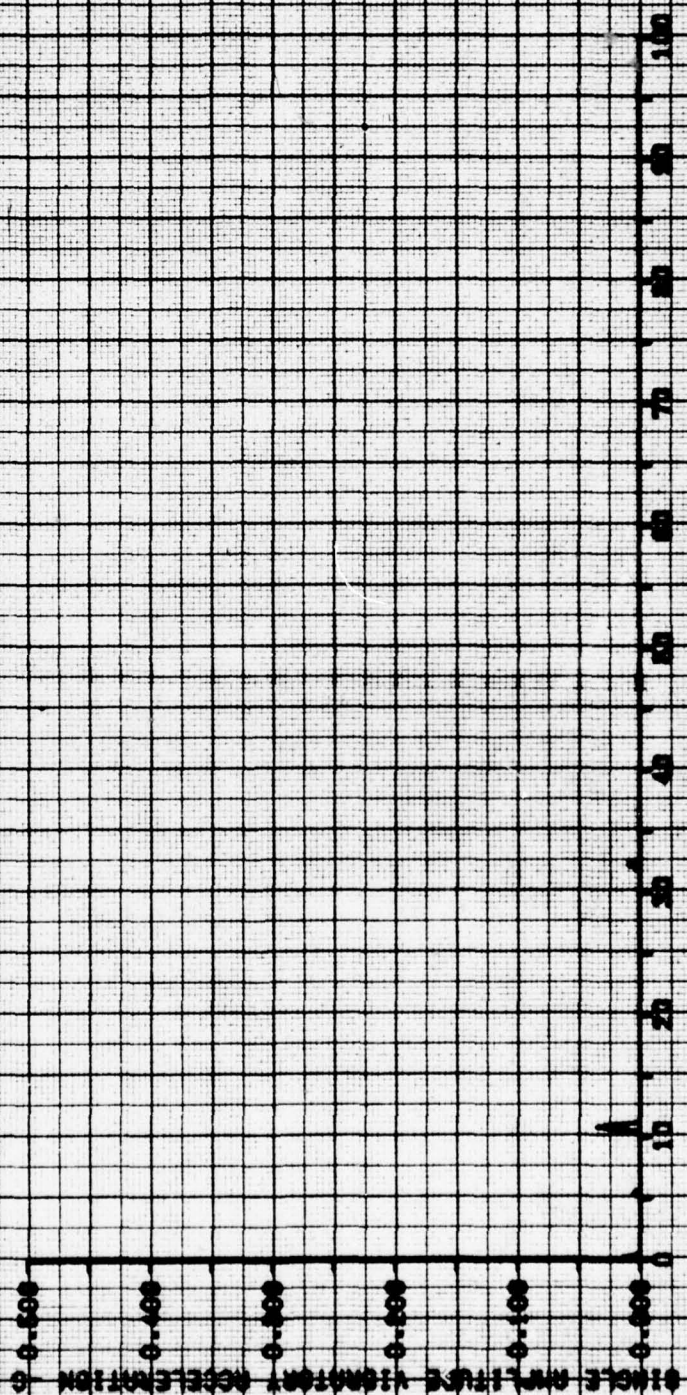


FIGURE 25

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXES LONGITUDINAL  
 GROSS WEIGHT 8640  
 CG FS -IN. 133.1 (FWD)  
 CG BL -IN. 0.0 (AID)  
 LAT 4120  
 DENSITY 8.0  
 ALTITUDE -FT. 8.0  
 OUTSIDE AIR TEMPERATURE -DEG C 80.0  
 ROTOR SPEED -RPM 524.0  
 TRIM CALIB. AIRSPEED -KTS 80.0  
 FLIGHT CONDITION RIGHT TURN  
 CLEAN

FLT 4  
 TRK 4  
 VCO 70  
 HNS 12  
 MIN 20  
 REC 50  
 BRP 0

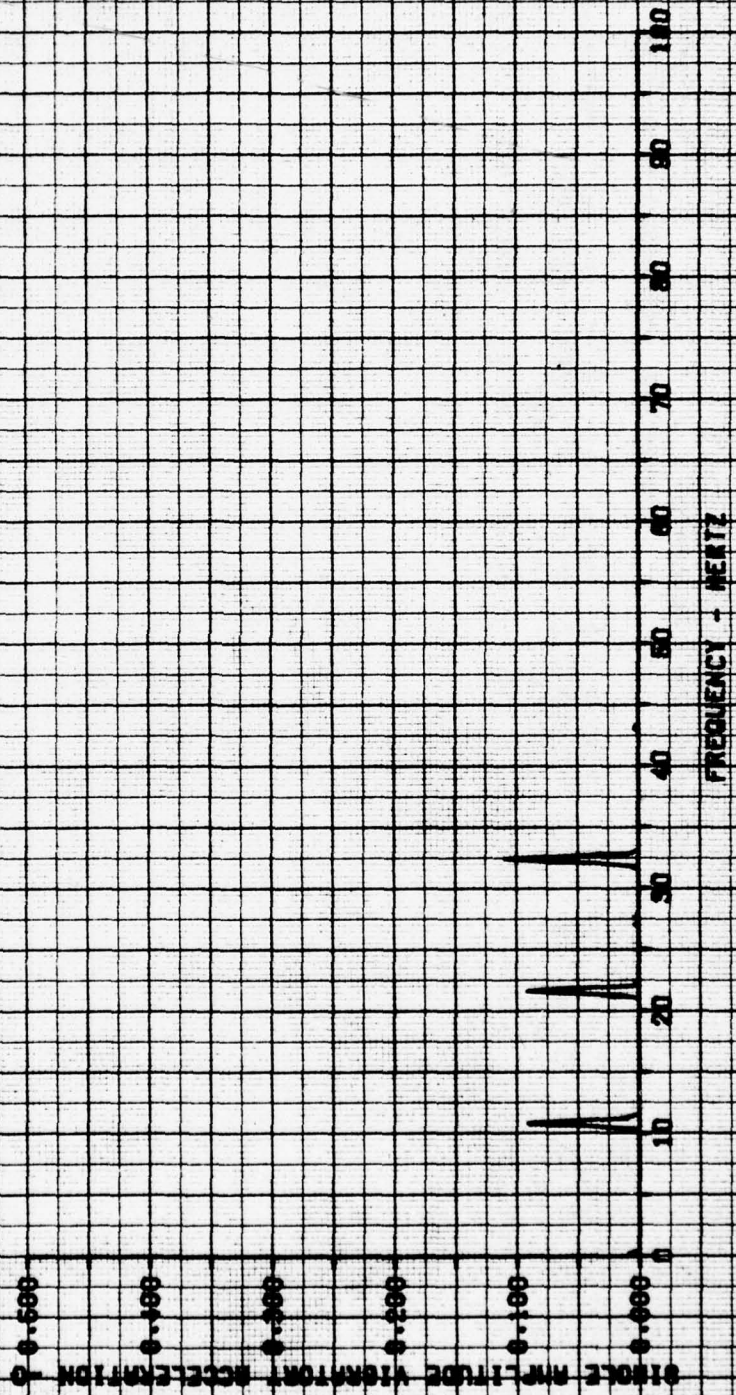


FIGURE 150

### VIBRATION CHARACTERISTICS

MIL-1H USA 2/A 86-80869

FUNDAMENTAL FREQUENCY IS 5.40 HZ

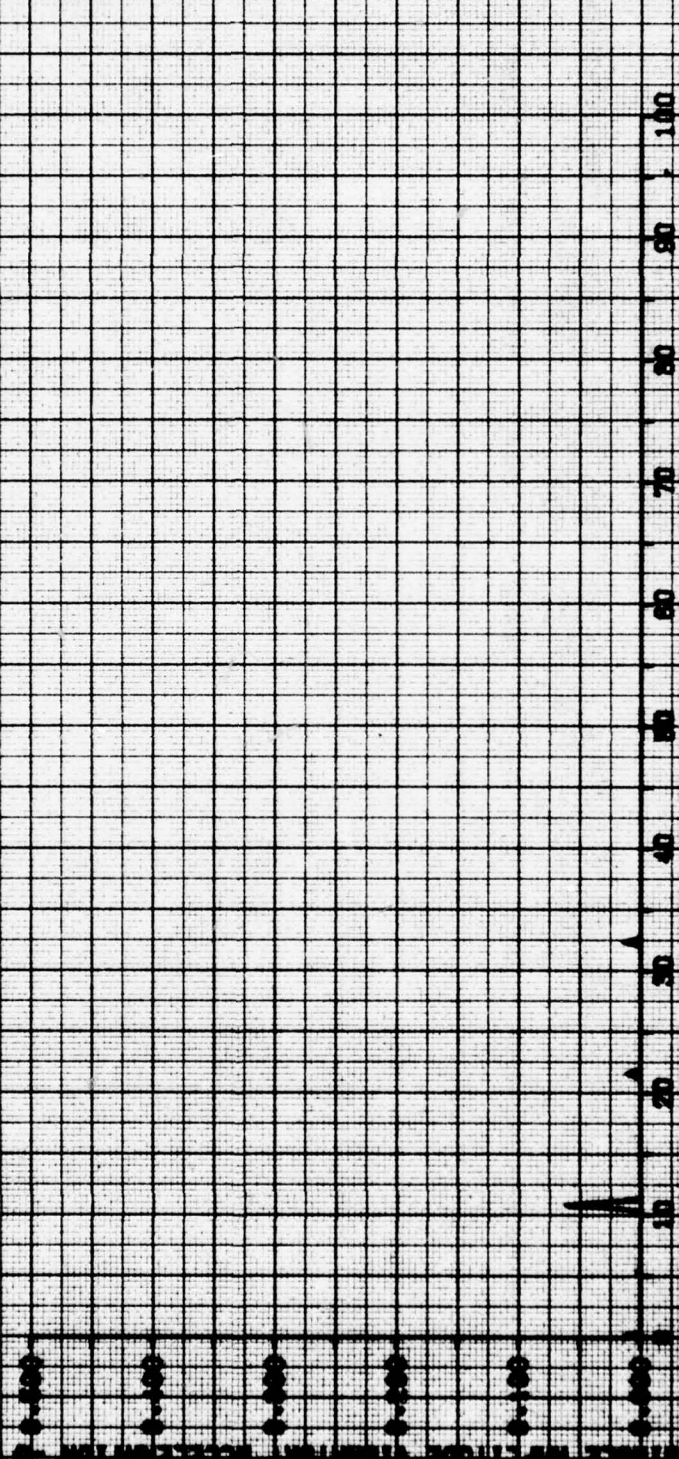
POSITION  
ROLL  
PITCH  
YAW  
LATERAL

CG M. -IN.  
LAT  
CG M. -IN.  
INST. WIND 0.0 (N/D)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
-FT -DEG C -RPH -KTS

4120 0.0 524.0 80.0 RIGHT TURN CLEAN

FLT 4  
TRK 4  
WCD 86  
MRS 12  
MIN 20  
SEC 50  
GRP 0



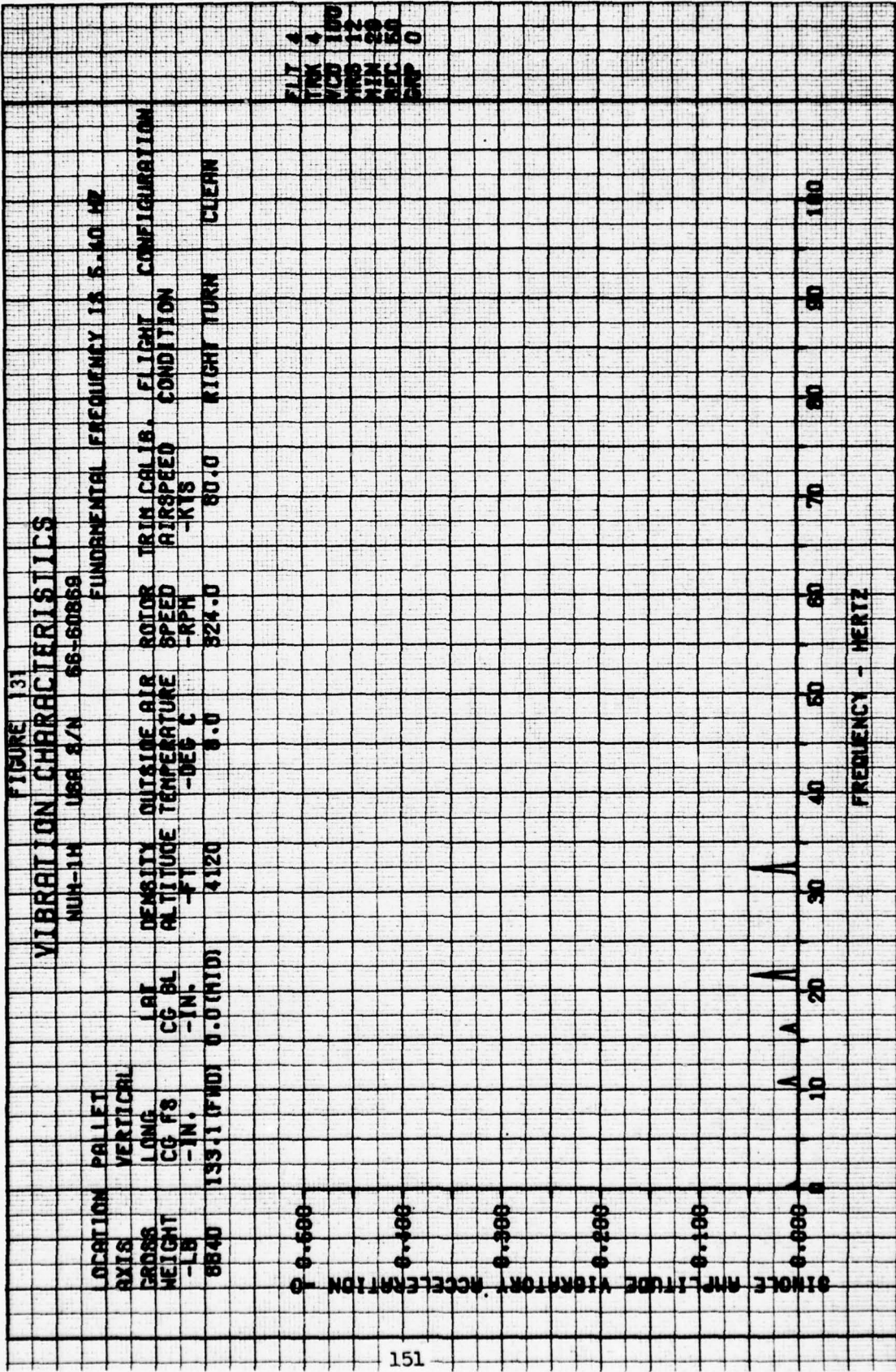
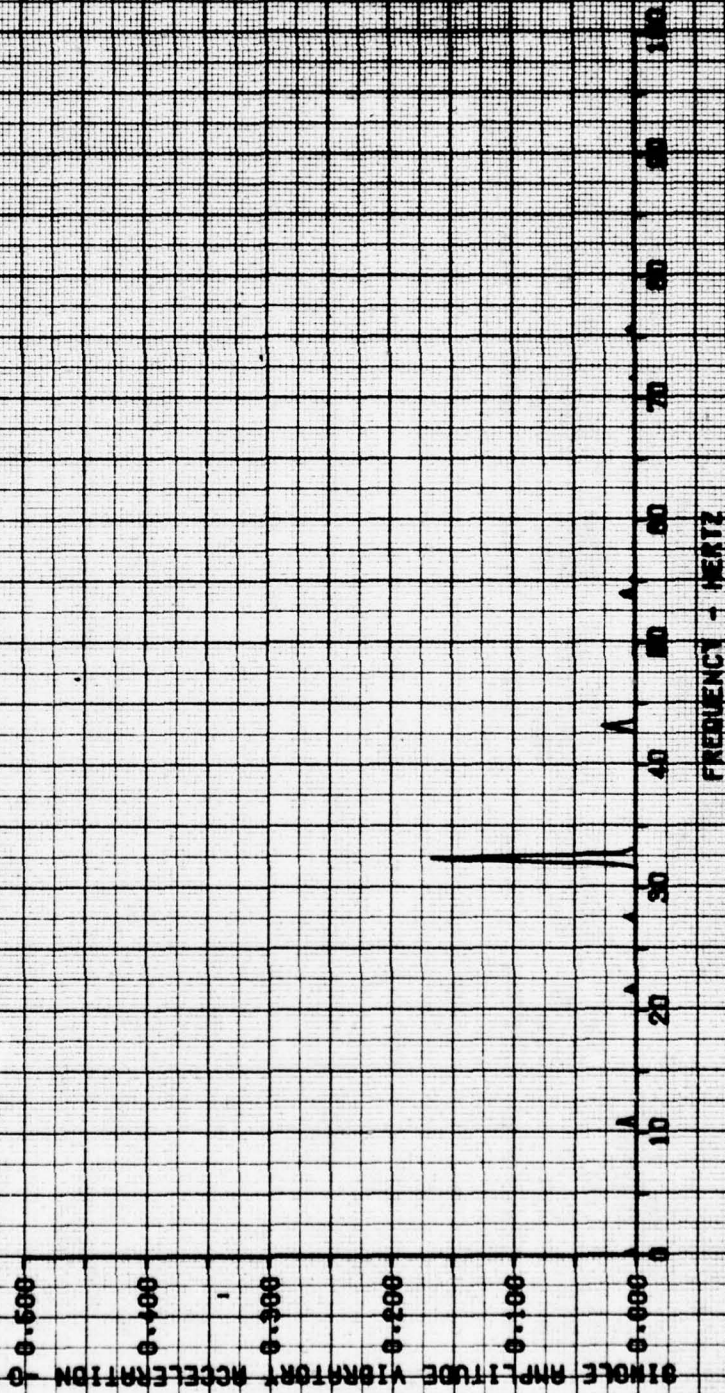


FIGURE 132

VIBRATION CHARACTERISTICS

LOCATION	PILLOT BEAT	NUM-1M	USA 8/N	66-60868	FUNDAMENTAL FREQUENCY IS 5.50 HZ
AXIS	LONGITUDINAL	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION
GROSS	LONG	ALTITUDE	TEMPERATURE	SPEED	AIROPPED CONDITION
HEIGHT	CG FS	-IN.	-DEG C	-RPM	-KIS
-LB	133.1 (FWD)	0.0 (AID)	0.0	824.0	80.0
					RIGHT TURN
					CLEW



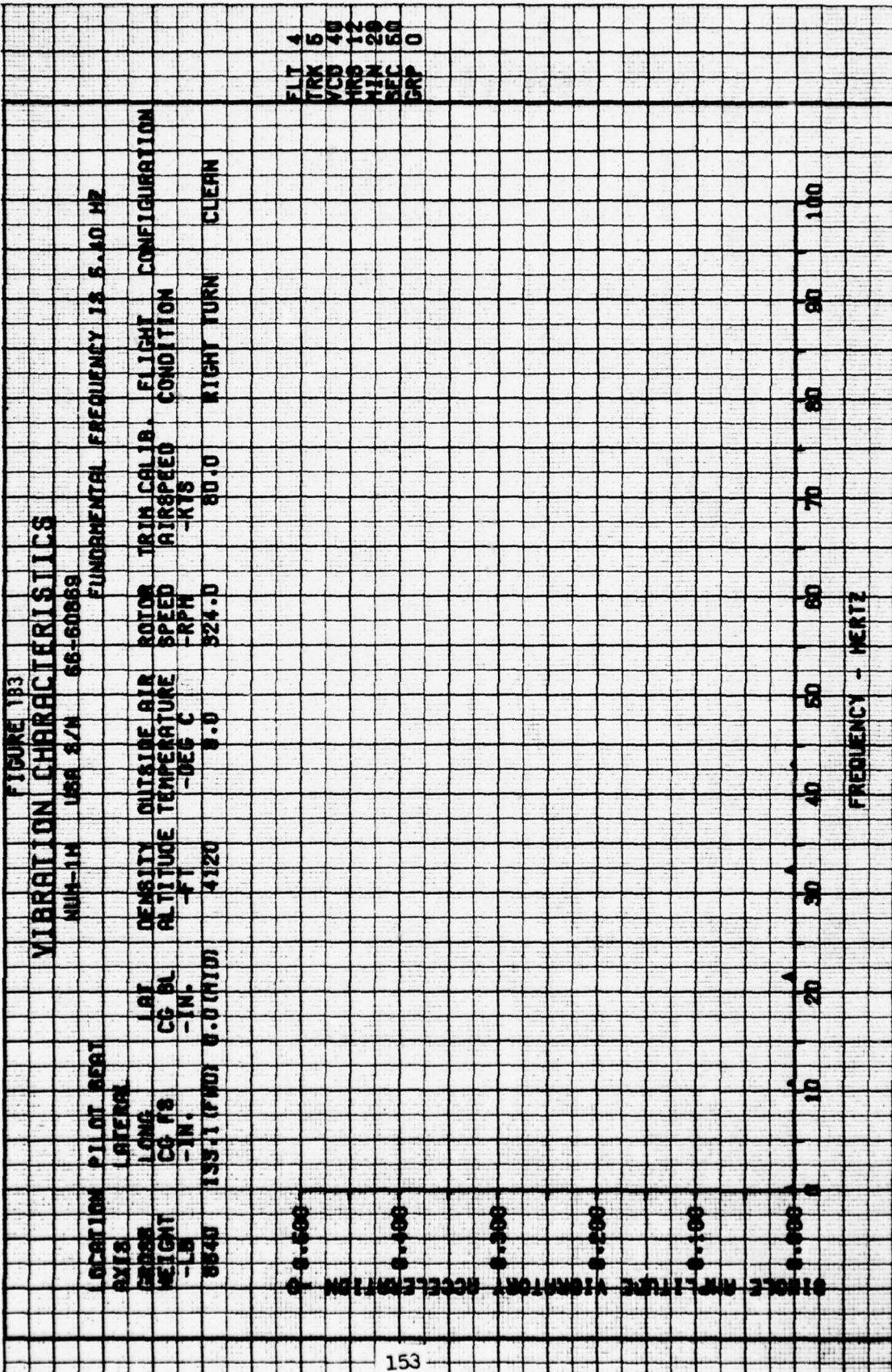
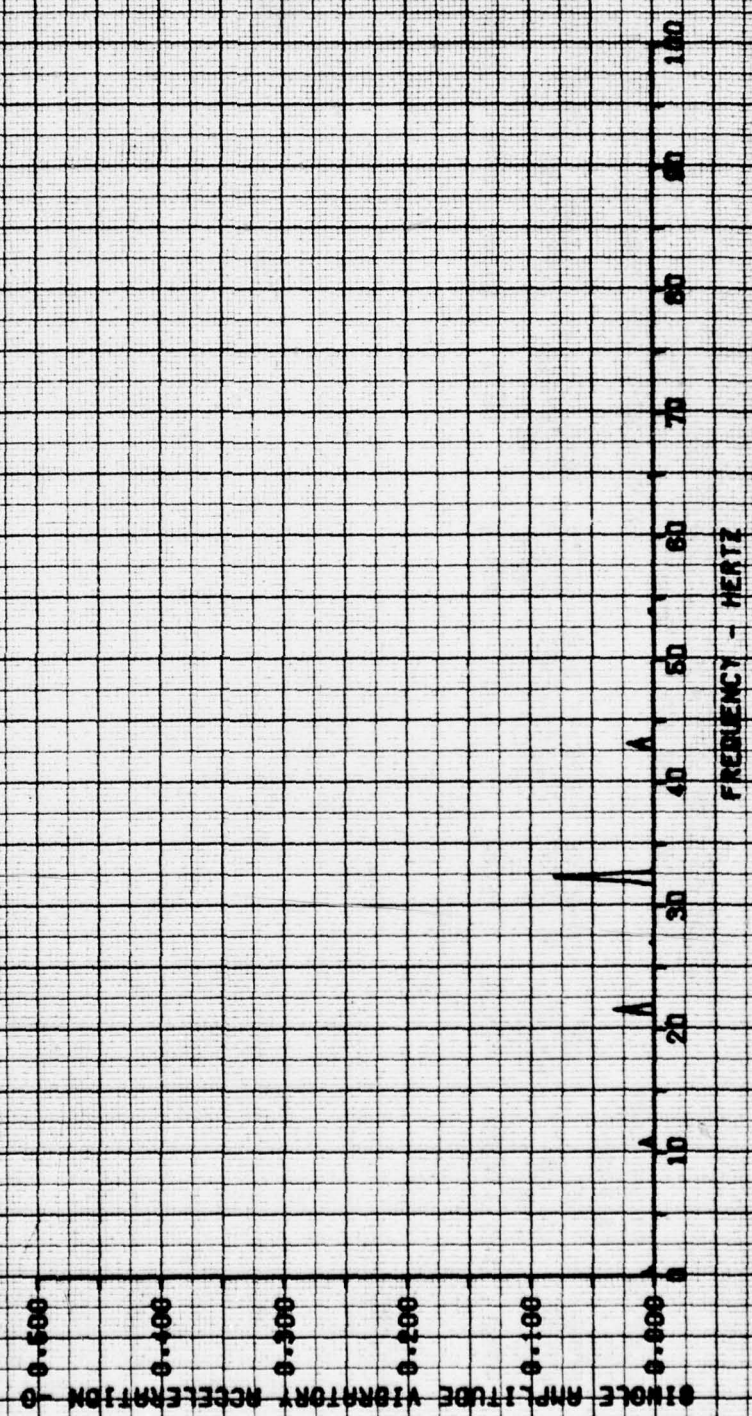


FIGURE 13A

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS VERTICAL  
 GROSS WEIGHT 8540  
 CG FS -IN.  
 CG BL -IN.  
 LAT 0.0 (HTD)  
 DENSITY 4120  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE 8.0  
 ROTOR SPEED -RPH 324.0  
 TRIM CALIB. AIRSPEED -KTS 80.0  
 FLIGHT CONDITION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 4  
 TRN 5  
 VCO 55  
 WRS 12  
 MIN 29  
 SEC 58  
 GWP 0



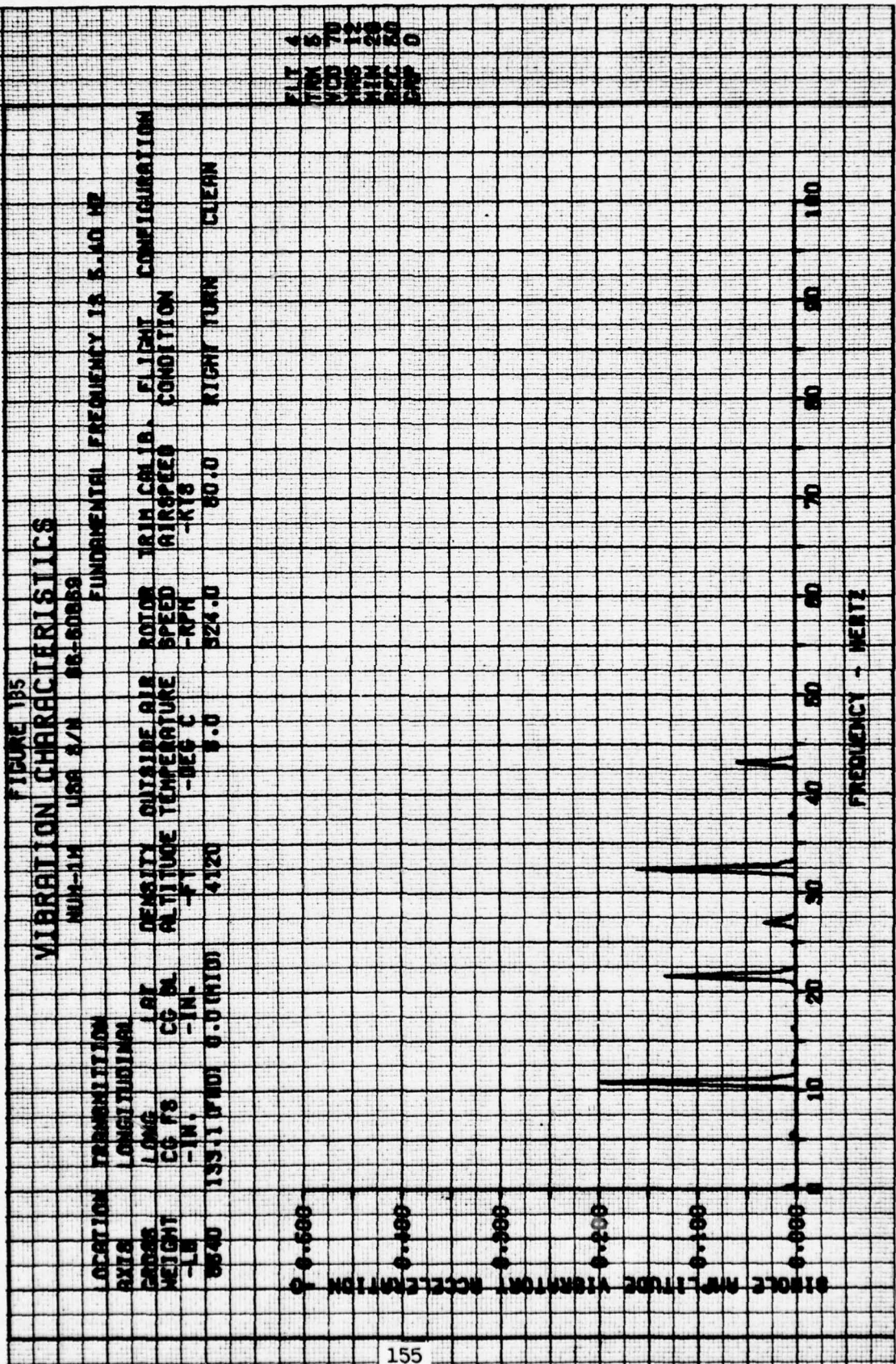


FIGURE 36

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LATERAL  
 80000  
 WEIGHT LONG  
 -LB -IN.  
 8840 133.1 (FWD) 0.0 (MID)  
 CG BL CG BL  
 -IN. -IN.  
 LAI  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -RPM -KTS  
 4120 0.0 824.0 60.0 RIGHT TURN CLEAR  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 4  
 TRX 5  
 VCD 86  
 HRS 12  
 MIN 29  
 SEC 58  
 GRP 0

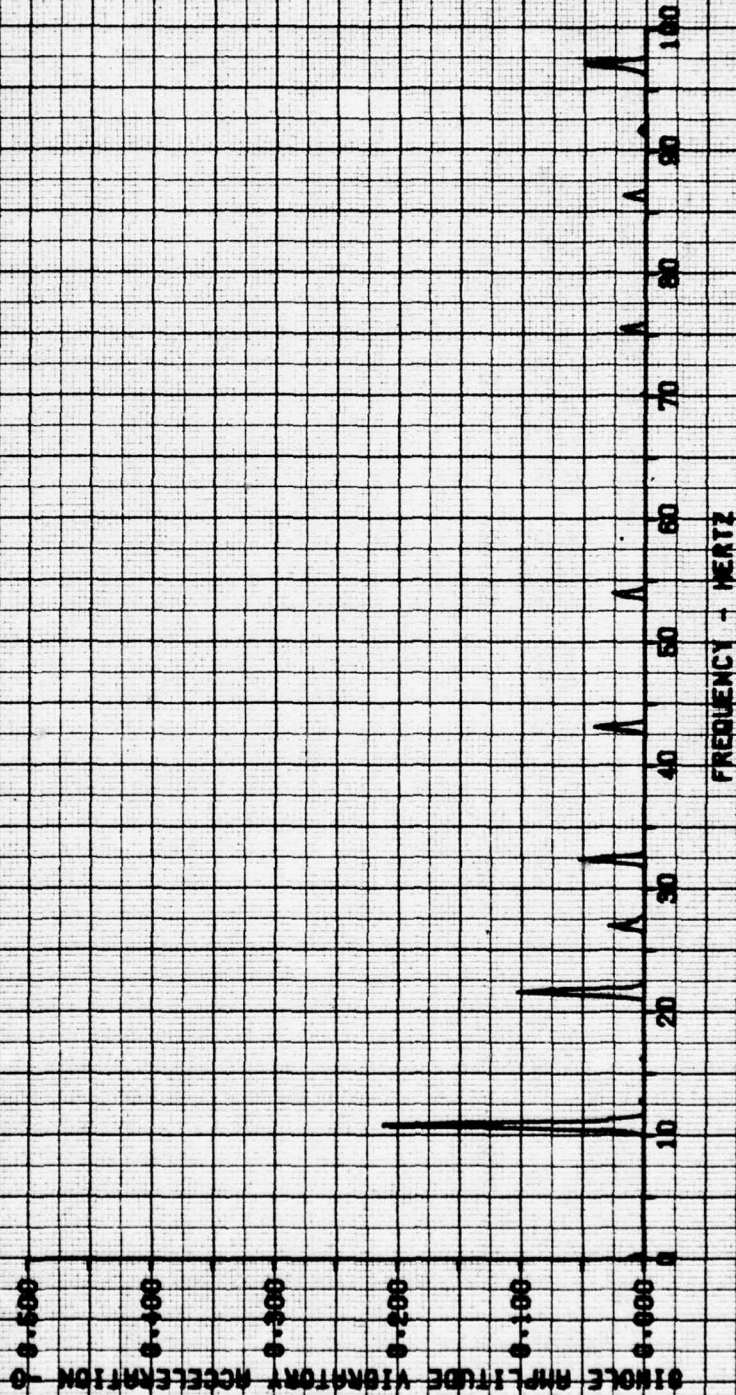
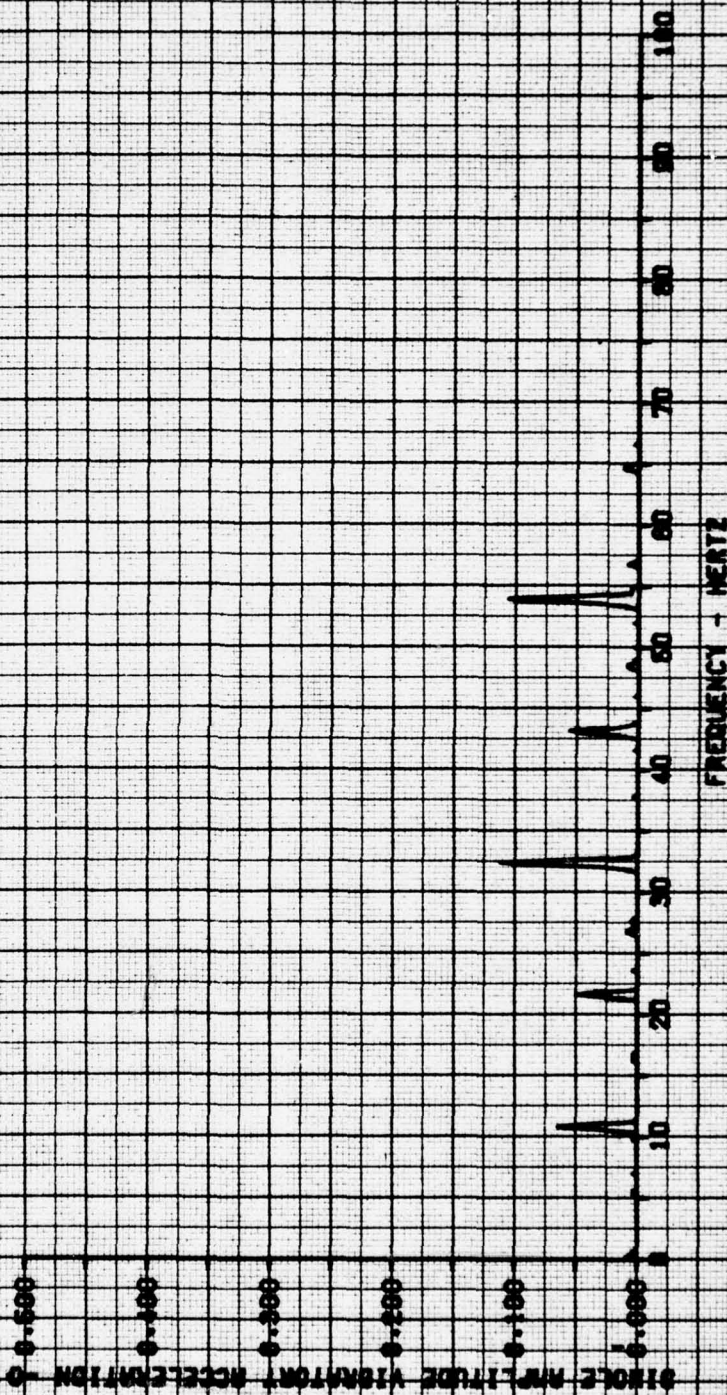


FIGURE 137

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS VERTICAL  
 GROSS WEIGHT 8640  
 -LB  
 133.1 (FWD) 0.0 (MID)  
 LONG CG IN. -IN.  
 LAL CG IN. -IN.  
 DENSITY 4120  
 ALTITUDE -FT  
 OUTSIDE AIR TEMPERATURE 0.0  
 -DEG C  
 ROTOR SPEED 524.0  
 -RPM  
 TRIM CALIB. 80.0  
 FLIGHT CONDITION CLEAN  
 AIRSPEED -KTS  
 NIGHT TURN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ



ZLT 4  
 TRK 5  
 VCO 100  
 MAG 12  
 MIN 20  
 SET 20  
 SWP 0

# VIBRATION CHARACTERISTICS

FIGURE 130

LOCATION POWER CONVERTER  
 AXIS LONGITUDINAL  
 MODEL LONG  
 WEIGHT CG FB  
 -LB 133.1 (100) 0.0 (100)

DENSITY OUTSIDE AIR MOTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 4120 0.0 524.0 80.0 NIGHT TURN CLEAN  
 -DEG C  
 -IN.  
 -IN.

FUNDAMENTAL FREQUENCY IS 5.50 Hz

FLT 4  
 TRK 6  
 WCD 28  
 WOB 12  
 MIN 28  
 DET 58  
 SWP 0

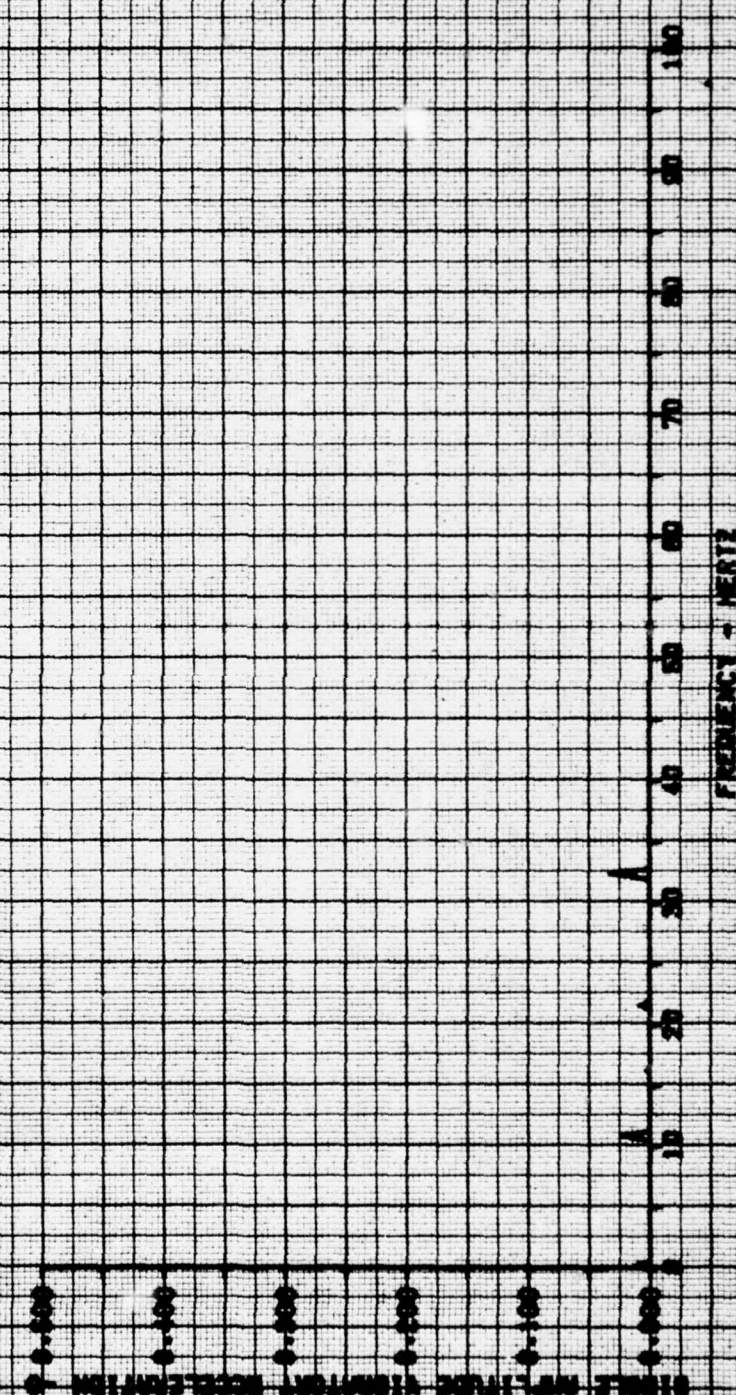
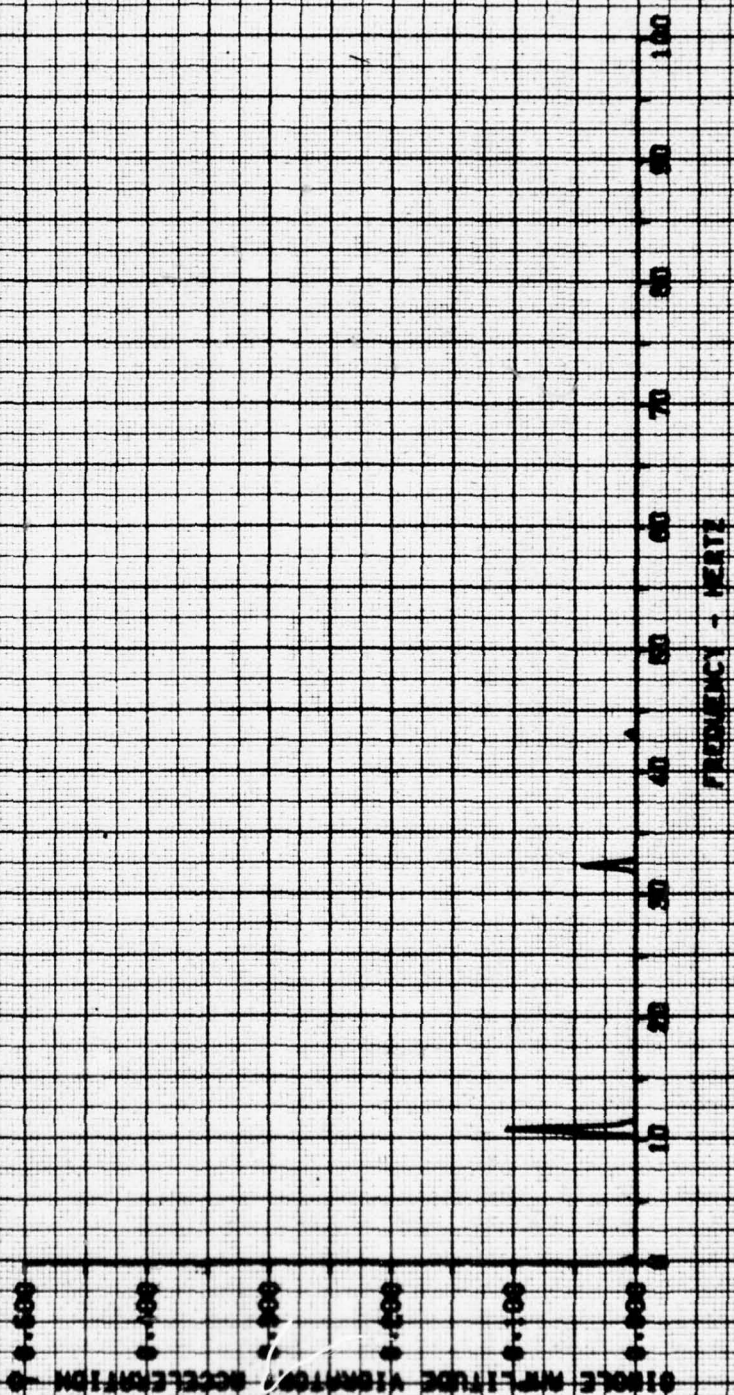


FIGURE 139

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS LATENS  
 BRIDGE LONG  
 WEIGHT CG FB  
 -LB 133.117(ND) 0.017(10)  
 LAT CG IN.  
 DENSITY OUTSIDE AIR MOTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4120 0.0 524.0 80.0 NIGHT TURN CLEAN  
 MIN-14 USE 2/4 00-00000 FUNDAMENTAL FREQUENCY IS 3.40 HZ



FLT 4  
 TRK 6  
 VLD 48  
 WTS 12  
 MIN 25  
 SFC 58  
 DRP 0

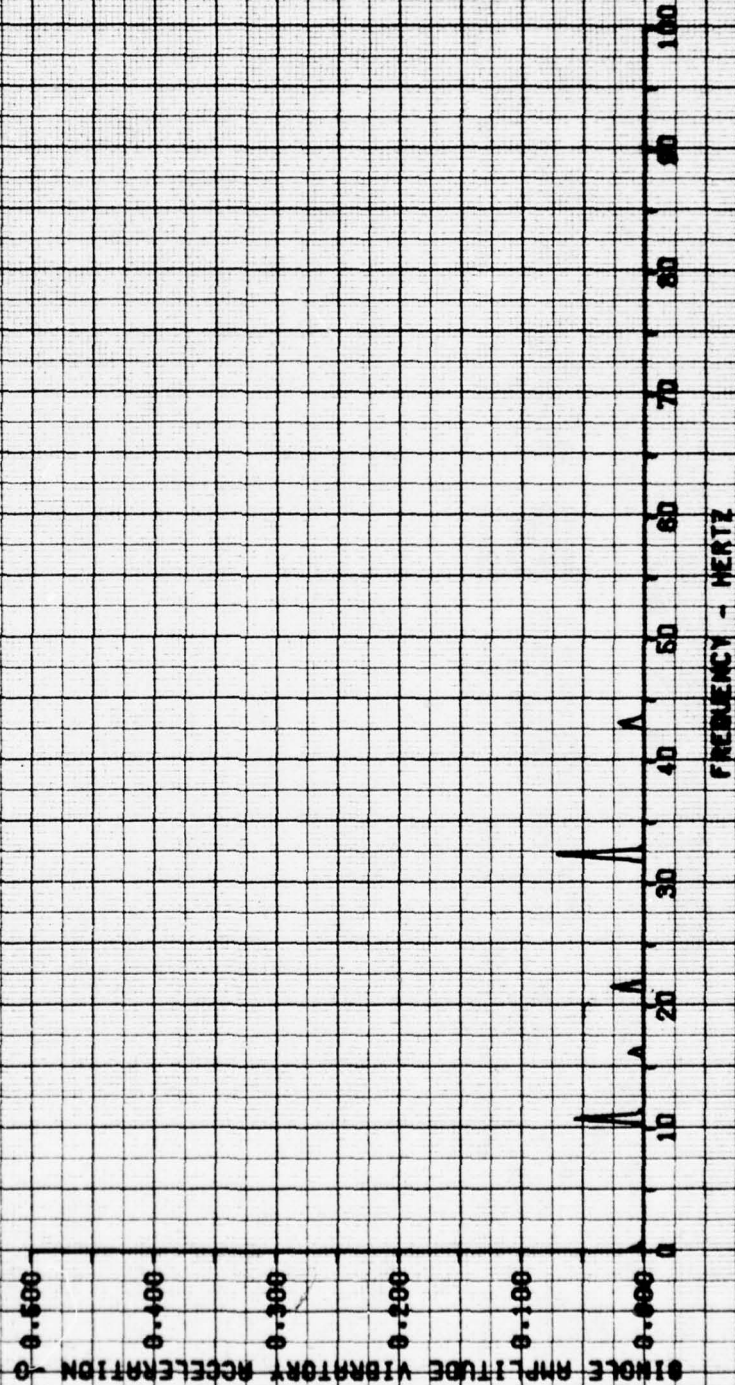
FIGURE 140

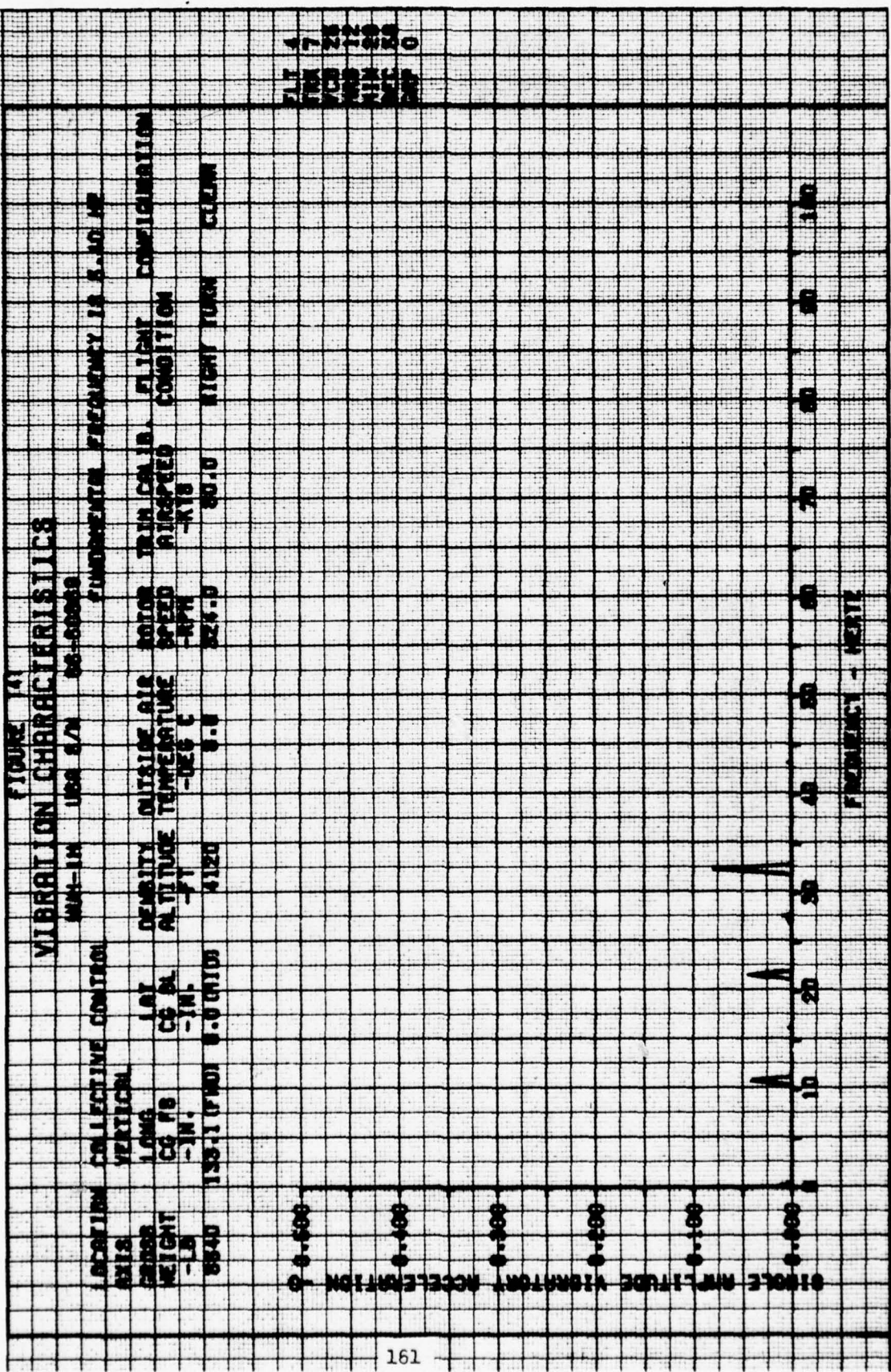
VIBRATION CHARACTERISTICS

LOCATION: POWER CONVERTER  
 AXIS: VERTICAL  
 GROSS WEIGHT: LONG CG FS  
 -LB: 133.1 (FWD) 0.0 (MID)

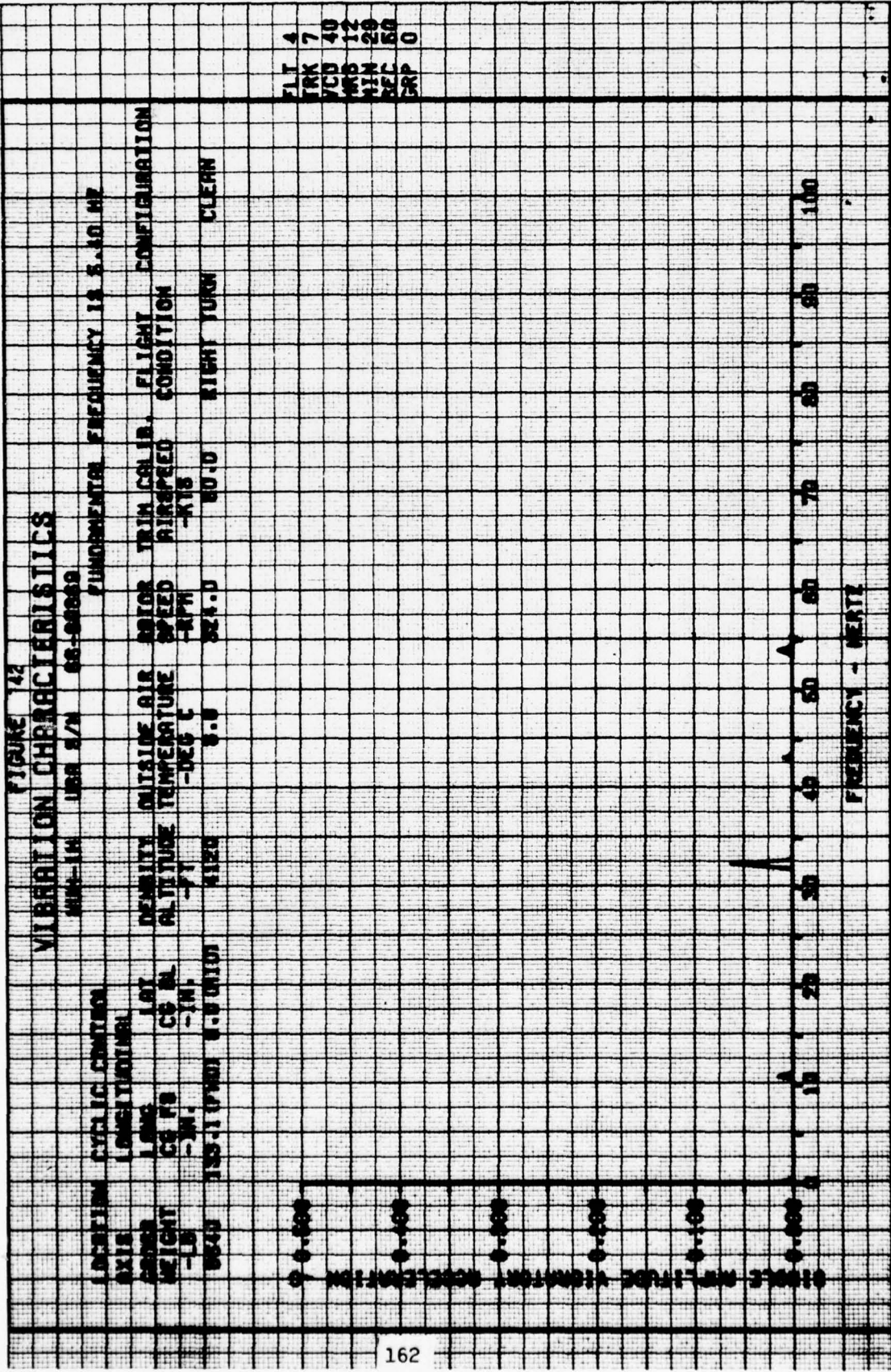
USA 8/A 66-60889  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ  
 DENSITY: 0.0  
 ALTITUDE: 4120  
 OUTSIDE AIR TEMPERATURE: 0.0  
 ROTOR SPEED: 824.0  
 TRIM CALIB.: 80.0  
 FLIGHT CONDITION: RIGHT TURN  
 CLEAN

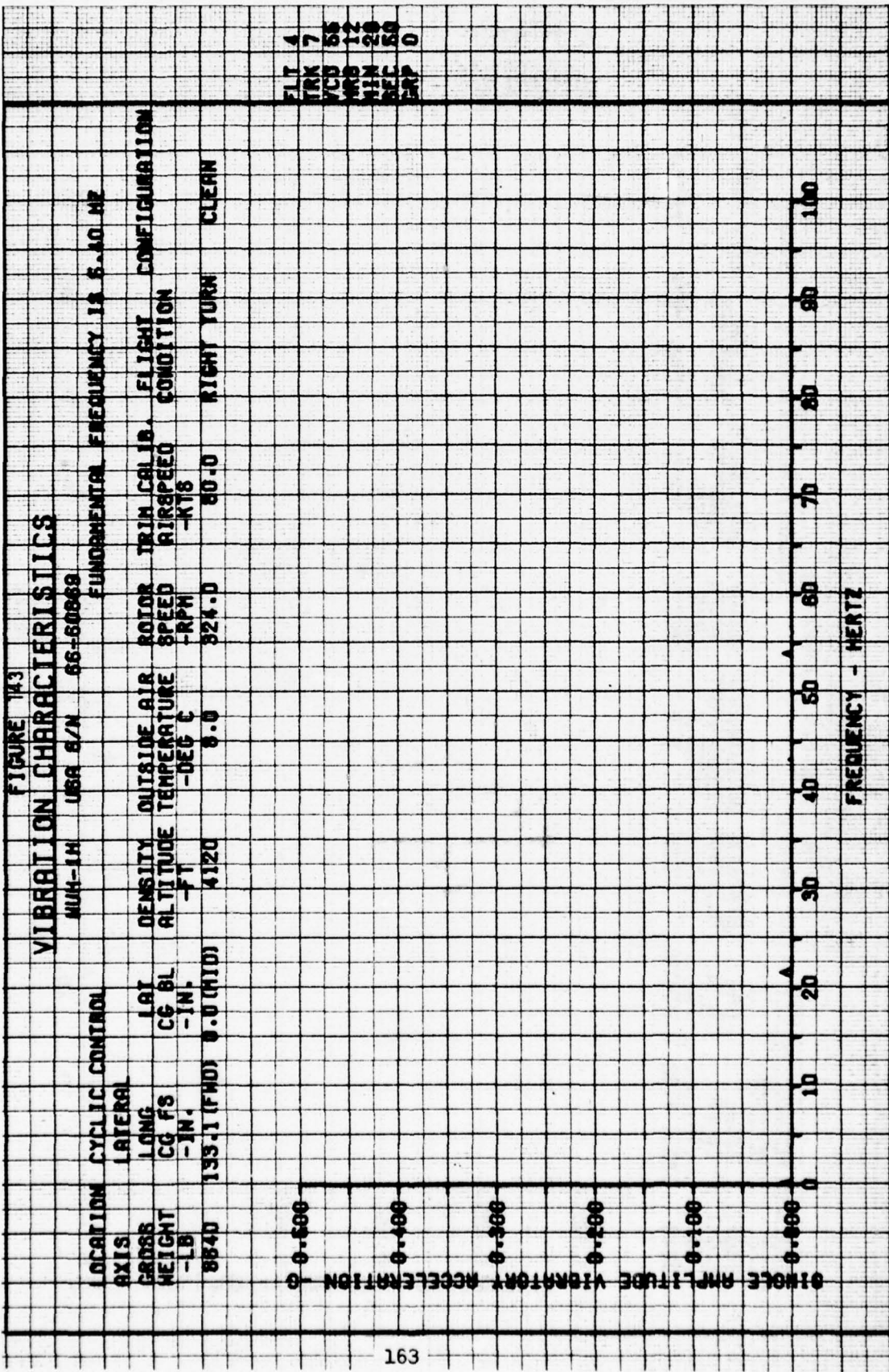
FLT 4  
 TRX 6  
 VCD 58  
 MRS 12  
 MIN 28  
 SEC 58  
 GRP 0





FLT 4  
 FUEL 78  
 OIL 12  
 MIN 20  
 MAX 20  
 WPT 0



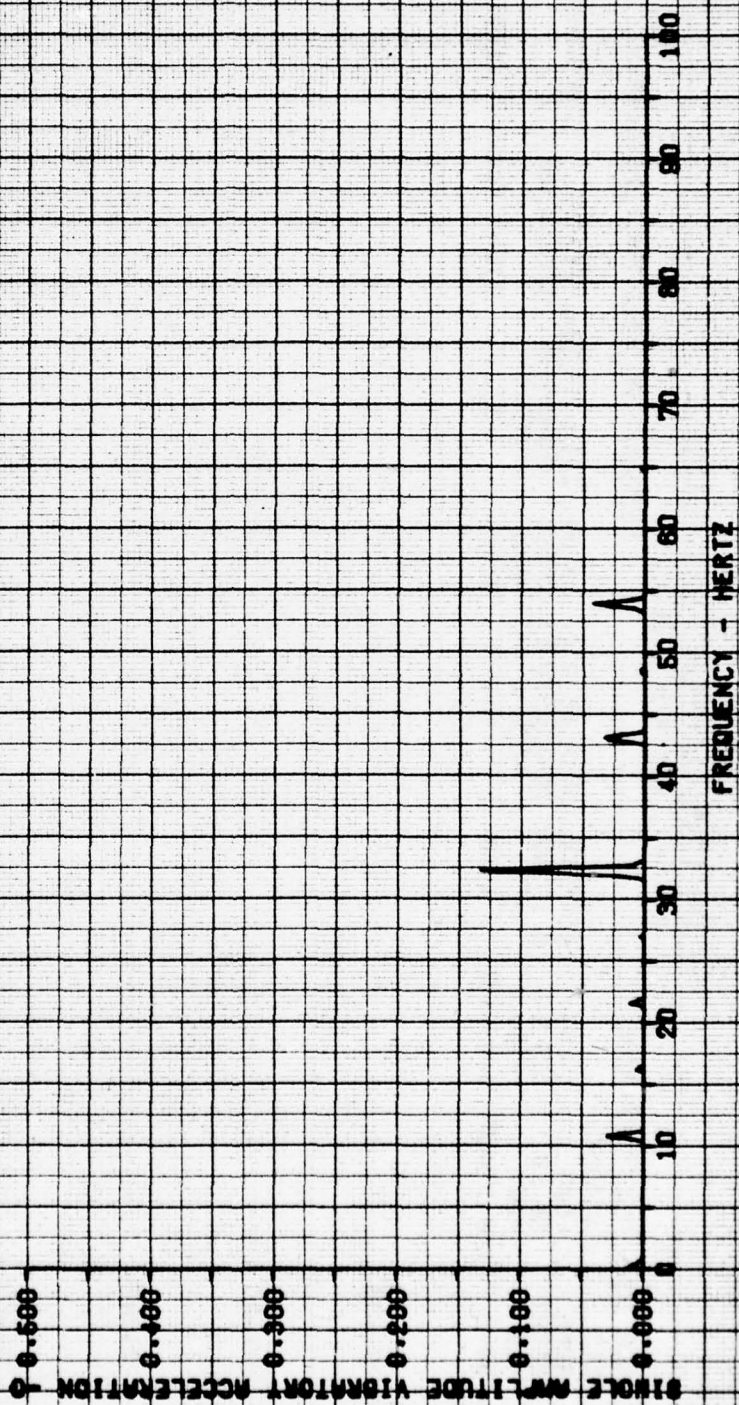


FLT 4  
TRK 7  
VCO 55  
MRB 12  
MIN 28  
SEC 59  
GRP 0

FIGURE 144

VIBRATION CHARACTERISTICS

LOCATION FORWARD PELLET FLOOR JOINT  
 AXIS VERTICAL  
 GROSS WEIGHT 8840  
 LONG CG FS -IN.  
 LAT CG BL -IN.  
 DENSITY 133.1 (FWD) 0.0 (MID)  
 ALTITUDE 4120  
 OUTSIDE AIR TEMPERATURE 0.0  
 ROTOR SPEED 324.0  
 AIRSPEED -KTS 80.0  
 TRIN CALIB. CONDITION RIGHT TURN CLEAN  
 FLIGHT CONFIGURATION  
 AIRSPEED -KTS  
 TRIN CALIB. CONDITION  
 FLIGHT CONFIGURATION



FLT 4  
 TRN 7  
 VCD 70  
 HRS 12  
 MIN 20  
 SEC 50  
 GRP 0

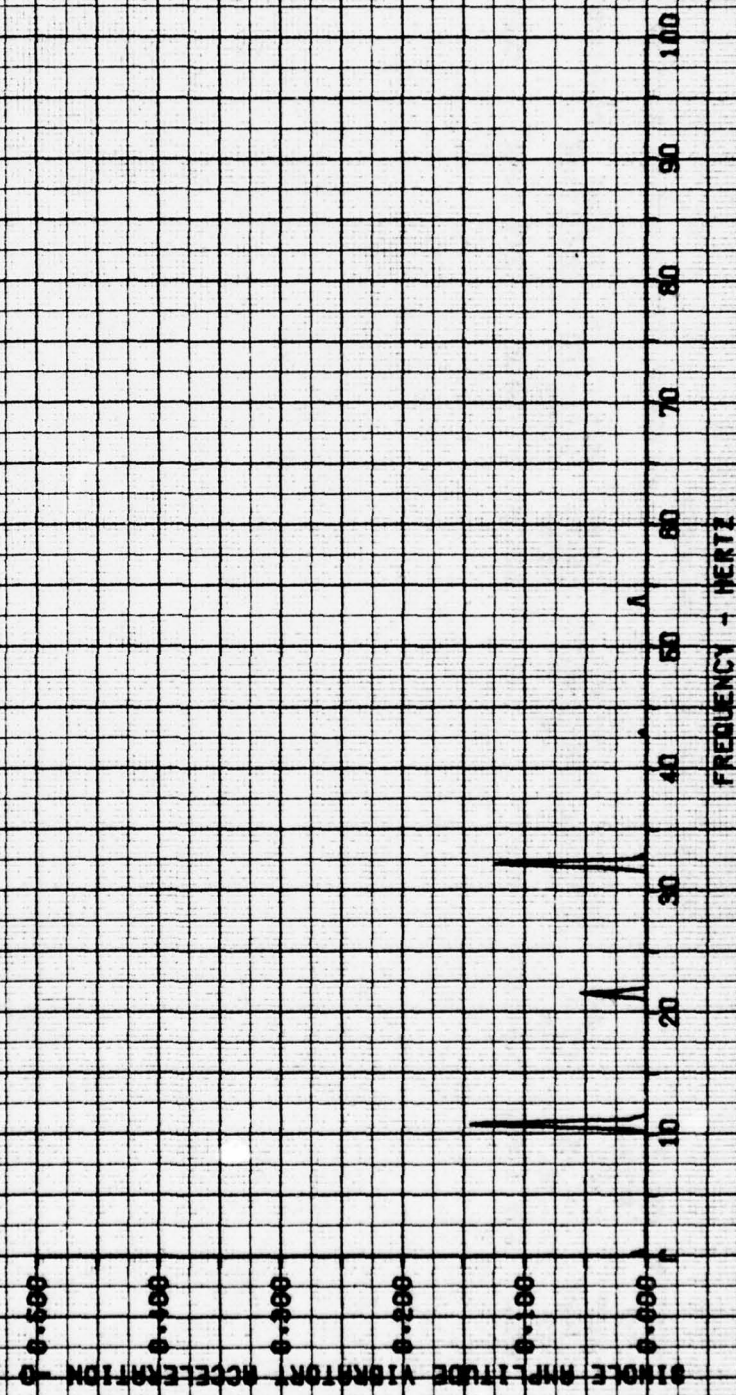
FIGURE 145

VIBRATION CHARACTERISTICS

LOCATION PALLET  
 AXIS LONGITUDINAL  
 CROSS LONG.  
 WEIGHT CG F8 CG BL  
 -LB -IN.  
 9240 136.4 (FWD) 0.0 (AID)

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4220 9.0 924.0 80.0 LEFT TURN CLEAN

FUNDAMENTAL FREQUENCY IS 5.40 MP



FLT 5  
 TRK 4  
 WCO 70  
 WRS 7  
 MIN 27  
 SEC 10  
 GRP 0

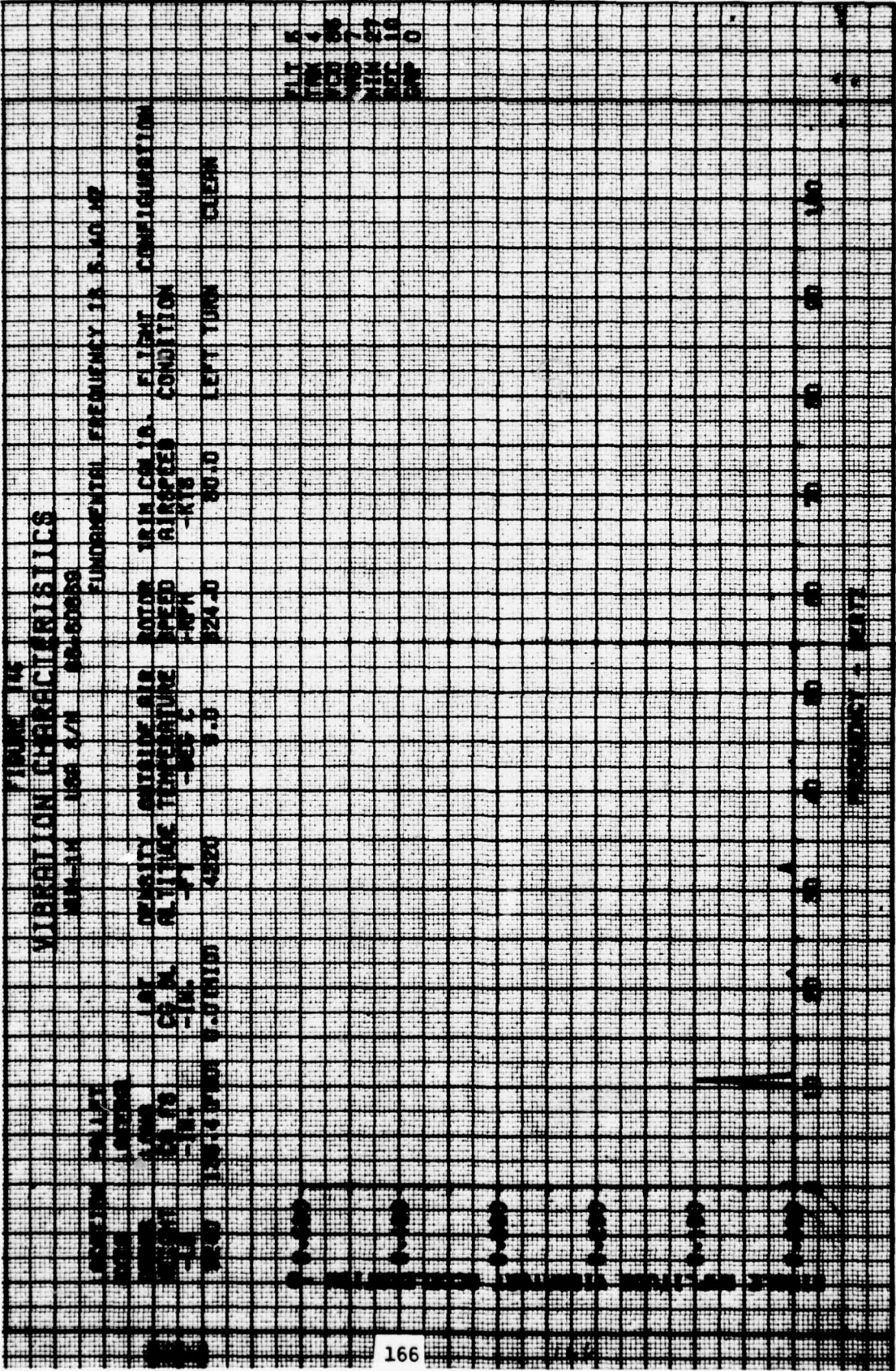


FIGURE 147

VIBRATION CHARACTERISTICS

MIL-1H USA S/N 66-50869

FUNDAMENTAL FREQUENCY IS 5.40 HZ

LOCATION	PALET	DENSITY	OUTSIDE AIR	ROTOR	TRIA CALIB.	FLIGHT	CONFIGURATION
AXIS	VERTICAL	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION	
GROSS	LONG	-FT	-DEG C	-RPM	-KTS		
WEIGHT	CG BL	4220	9.0	524.0	80.0	LEFT TURN	CLEAN
-LB	-IN.						
9240	135.4 (FWD)	0.0 (MID)					

FLT 5  
TRK 4  
VCO 100  
MRS 7  
MIN 27  
SEC 10  
GRP 0

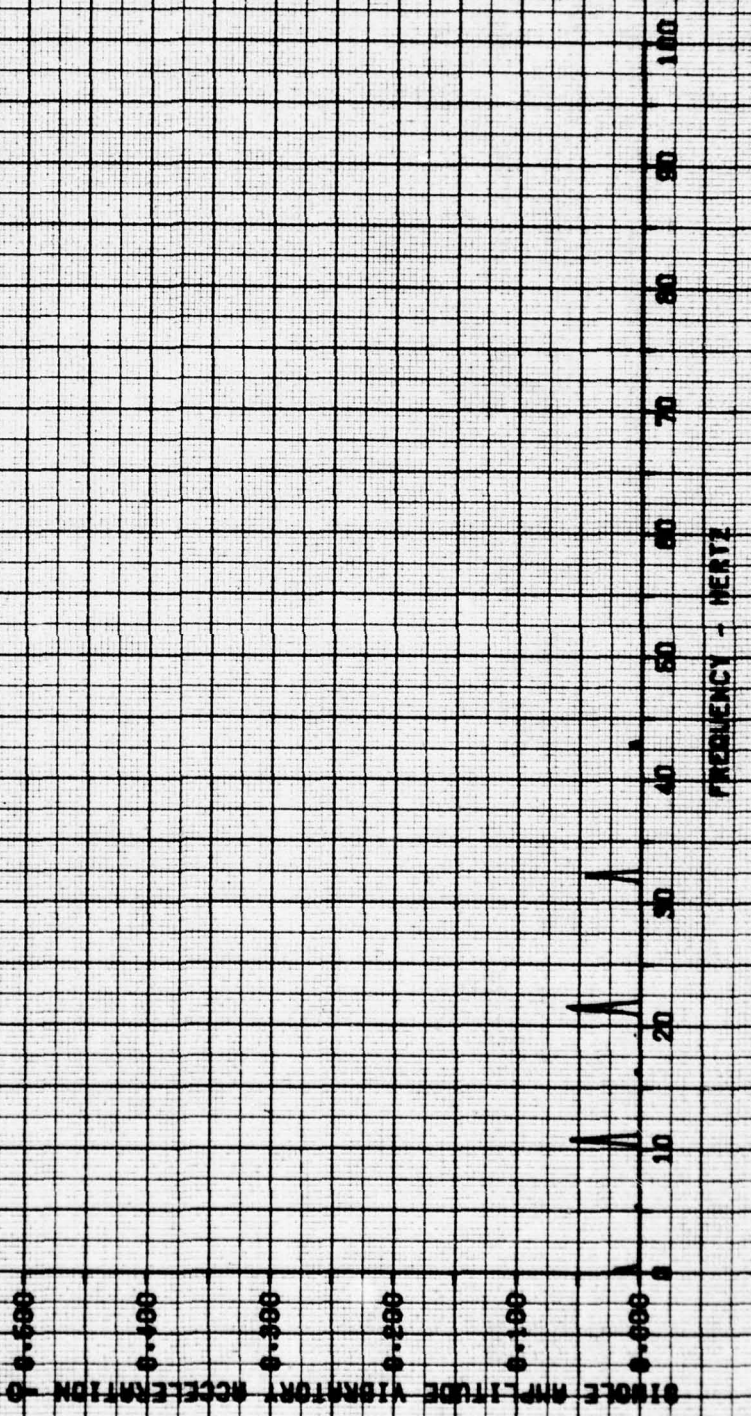


FIGURE 148

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LONGITUDINAL  
 GROSS WEIGHT CG FS -1.0  
 CG AL -1.0  
 LAT 0.0 (HYD)  
 DENSITY 4220  
 ALTITUDE -FT  
 TEMPERATURE -DEG C  
 ROTOR SPEED -RPM  
 AIRSPED -KTS  
 YRIM CALIB. FLIGHT CONDITION  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ  
 CLEAN

FLT 5  
 TRK 6  
 VCO 28  
 WWS 7  
 WLN 27  
 REC 10  
 SWP 0

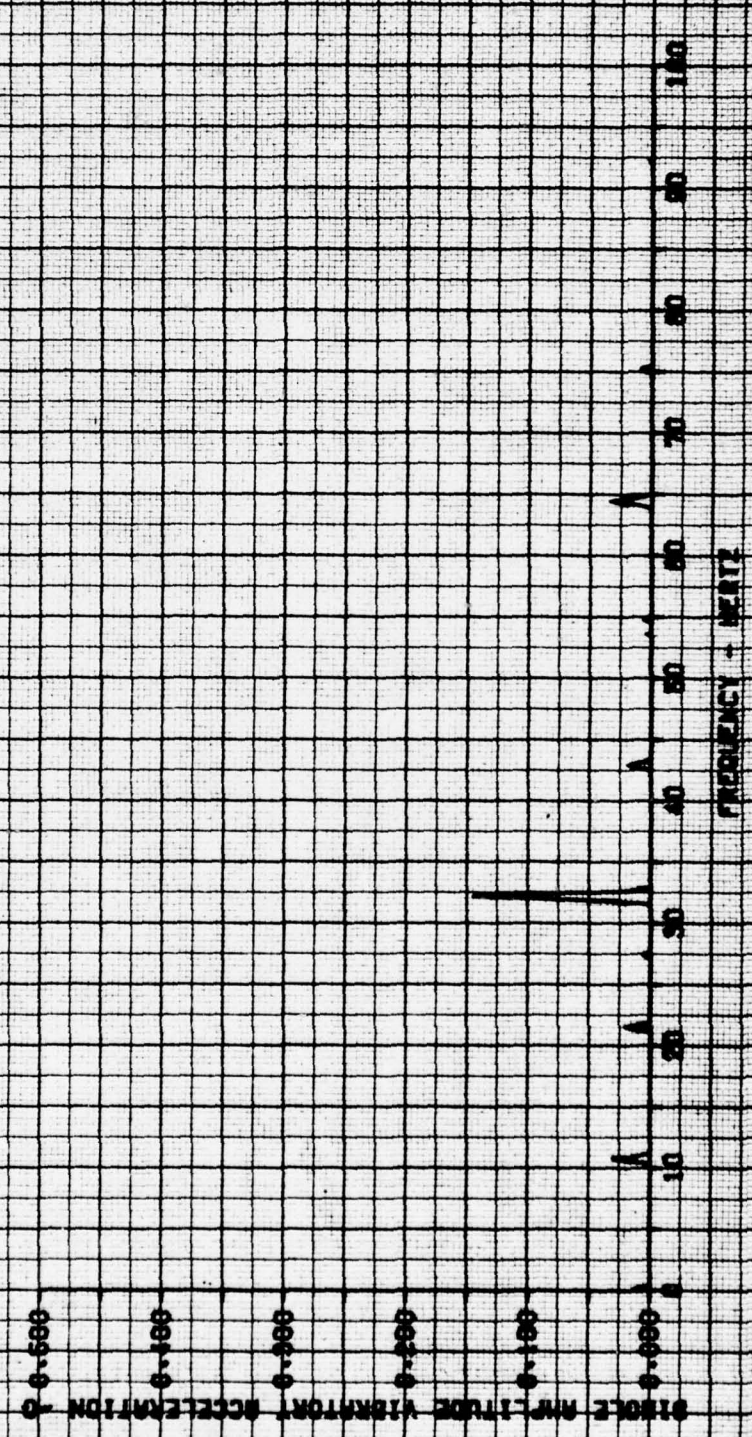


FIGURE 45

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS LATERAL  
 CROSS WEIGHT CG FB  
 -LB 135.4 (PHO) 0.0 (UID)  
 9240  
 DENSITY OUTSIDE AIR MOTOR TRIM CALIB. FLIGHT COMBINATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4220 0.0 524.0 80.0 LEFT TURN CLEAR  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 6  
 VCD 40  
 HRS 7  
 MIN 27  
 SEC 10  
 CRP 0

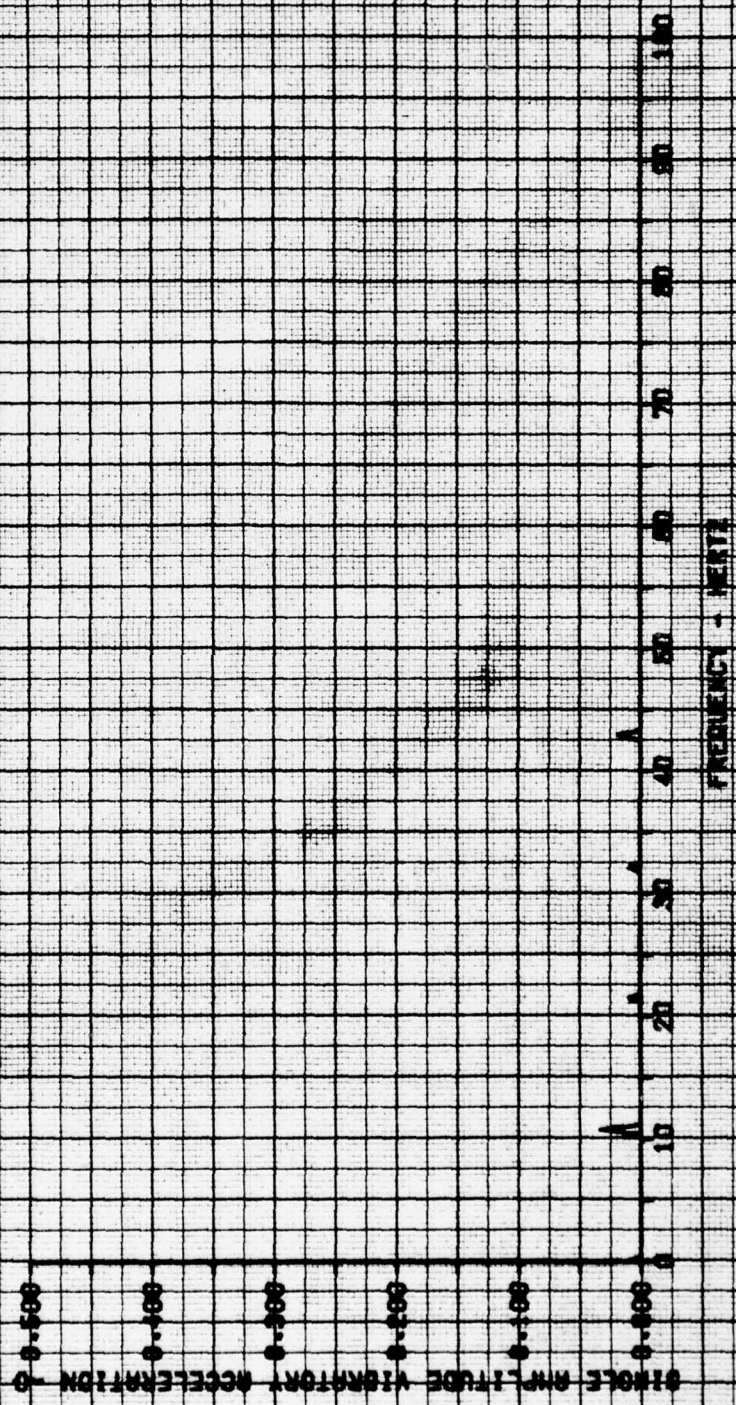


FIGURE 150

VIBRATION CHARACTERISTICS

LOCATION PILOT SEAT  
 AXIS VERTICAL  
 CROSS WEIGHT - LB 3240  
 LONG CG FS - IN. 135.4 (FWD)  
 LAT CG AL - IN. 0.0 (HD)  
 DENSITY OUTSIDE AIR 0.0  
 ALTITUDE TEMPERATURE - DEG C 0.0  
 Rotor SPEED - RPM 524.0  
 TRIM CALIB. FLIGHT CONDITION CLEAN  
 AIRSPEED - KTS 80.0  
 LEVEL  
 FUNDAMENTAL FREQUENCY IS 8.30 Hz

FLT 5  
 TRX 5  
 VCS 55  
 HNS 7  
 MIN 27  
 SEC 10  
 CRP 0

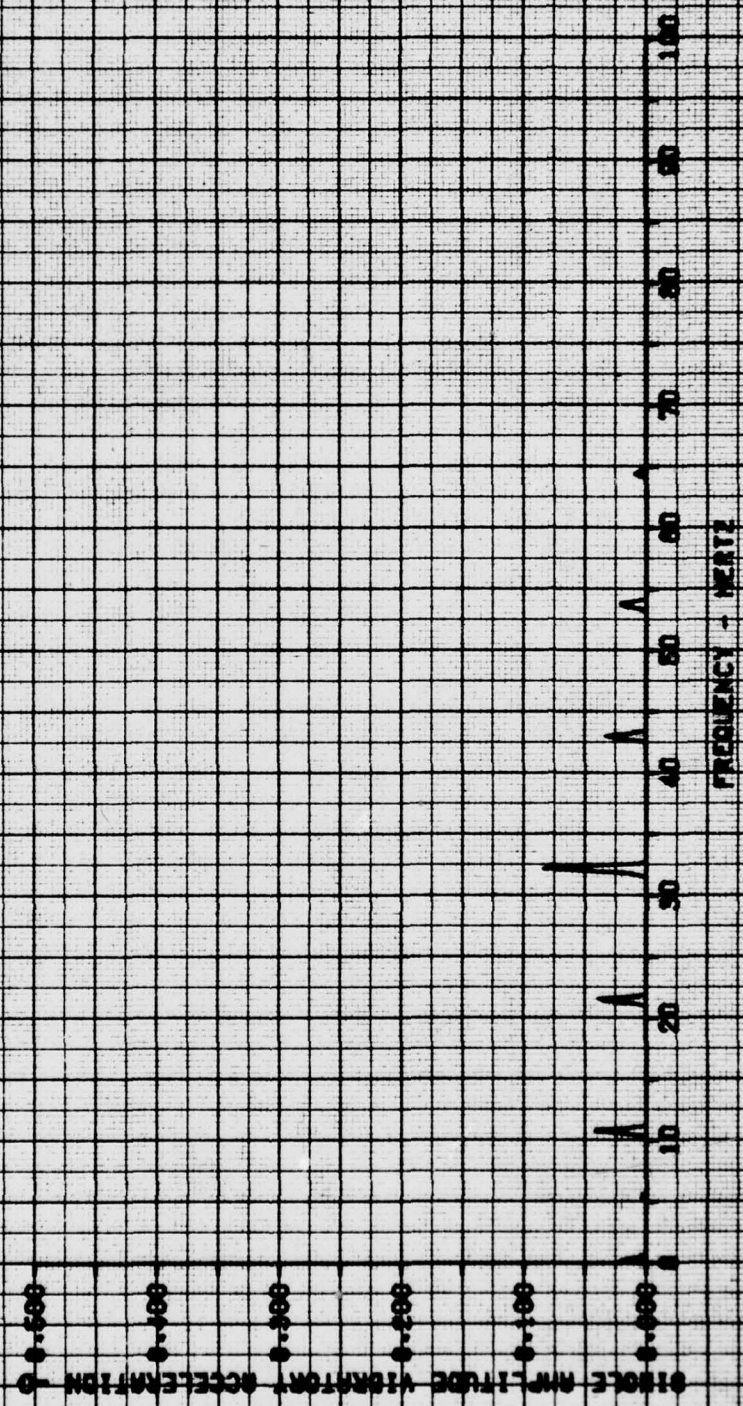


FIGURE 161

VIBRATION CHARACTERISTICS

LOCATION	TRANSITION	DENSITY	OUTSIDE AIR	ROTOR	TRIM CALIB.	FLIGHT	CONFIGURATION
AXIS	LONGITUDINAL	ALTITUDE	TEMPERATURE	SPEED	AIR SPEED	CONDITION	
CROSS	LONG	-FT	-DEG C	-RPH	-KTS		
HEIGHT	CG FS						
-LB	-IN.						
9240	135.4 (FWD)	0.0 (MID)	9.0	824.0	80.0	LEFT TURN	CLEAN

NUH-1H USA S/N 86-60869 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
TRK 5  
WCO 70  
MRS 7  
MIN 27  
SEC 10  
CMP 0

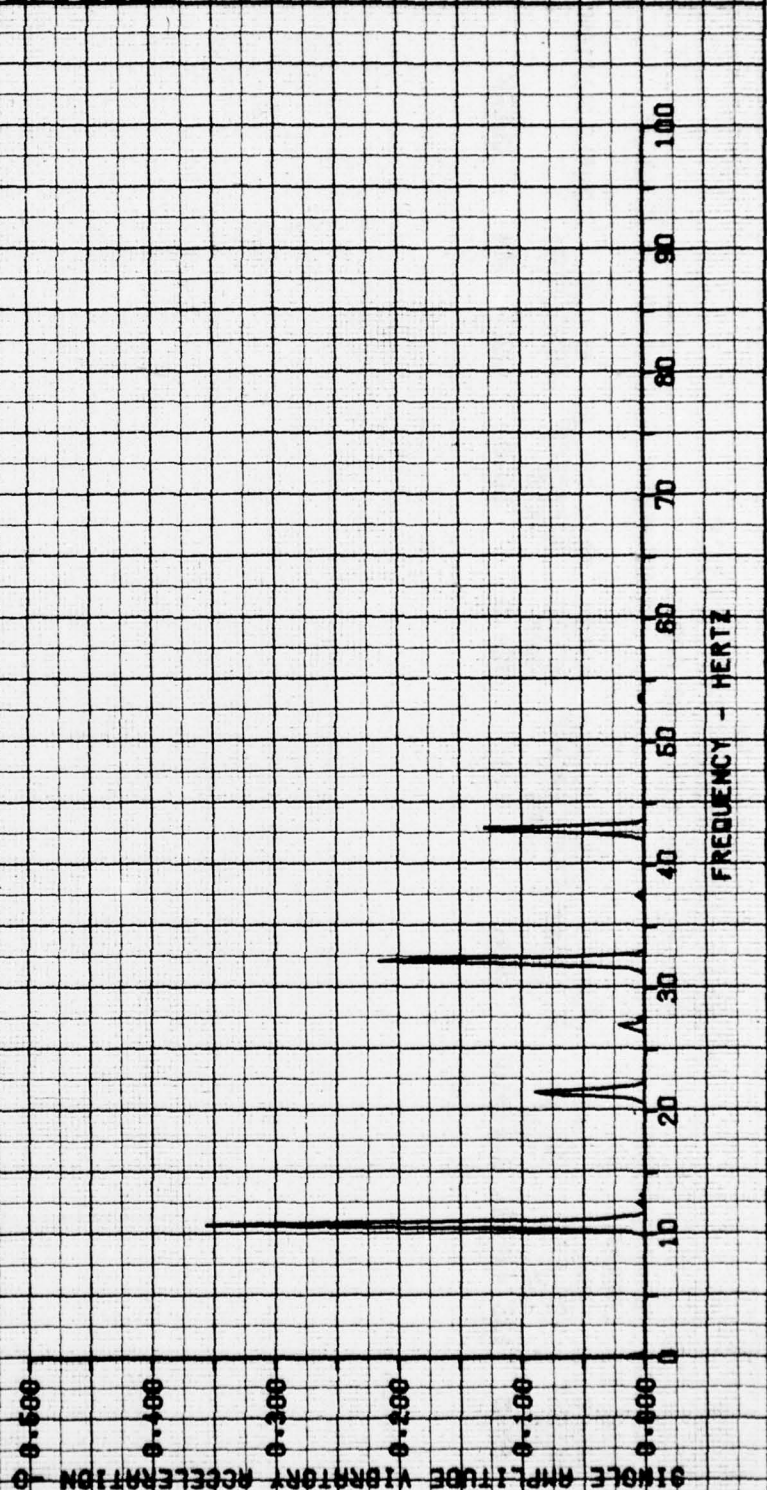


FIGURE 1B2

VIBRATION CHARACTERISTICS

LOCATION TRANSMISSION  
 AXIS LATERAL  
 CROSS LONG  
 HEIGHT CG FS  
 -LB -IN.  
 9240 135.4 (FWD) 0.0 (SID)

WEIGHT CG BL  
 -IN.  
 4220

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -KPH -KTS  
 0.0 0.0 324.0 80.0 LEFT TURN CLEAN

FUNDAMENTAL FREQUENCY IS 5.30 HZ

FLT 5  
 TRK 88  
 VIB 7  
 MIN 27  
 REF 18  
 POS 0

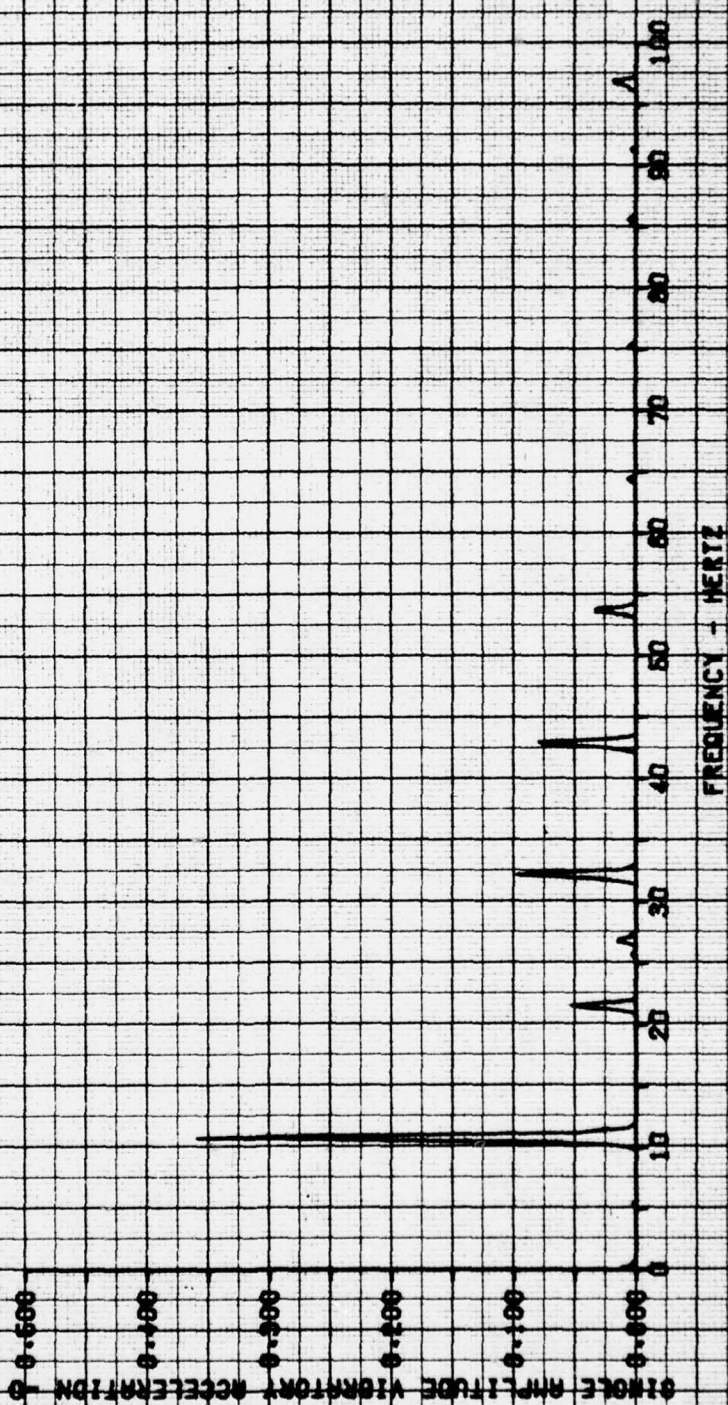
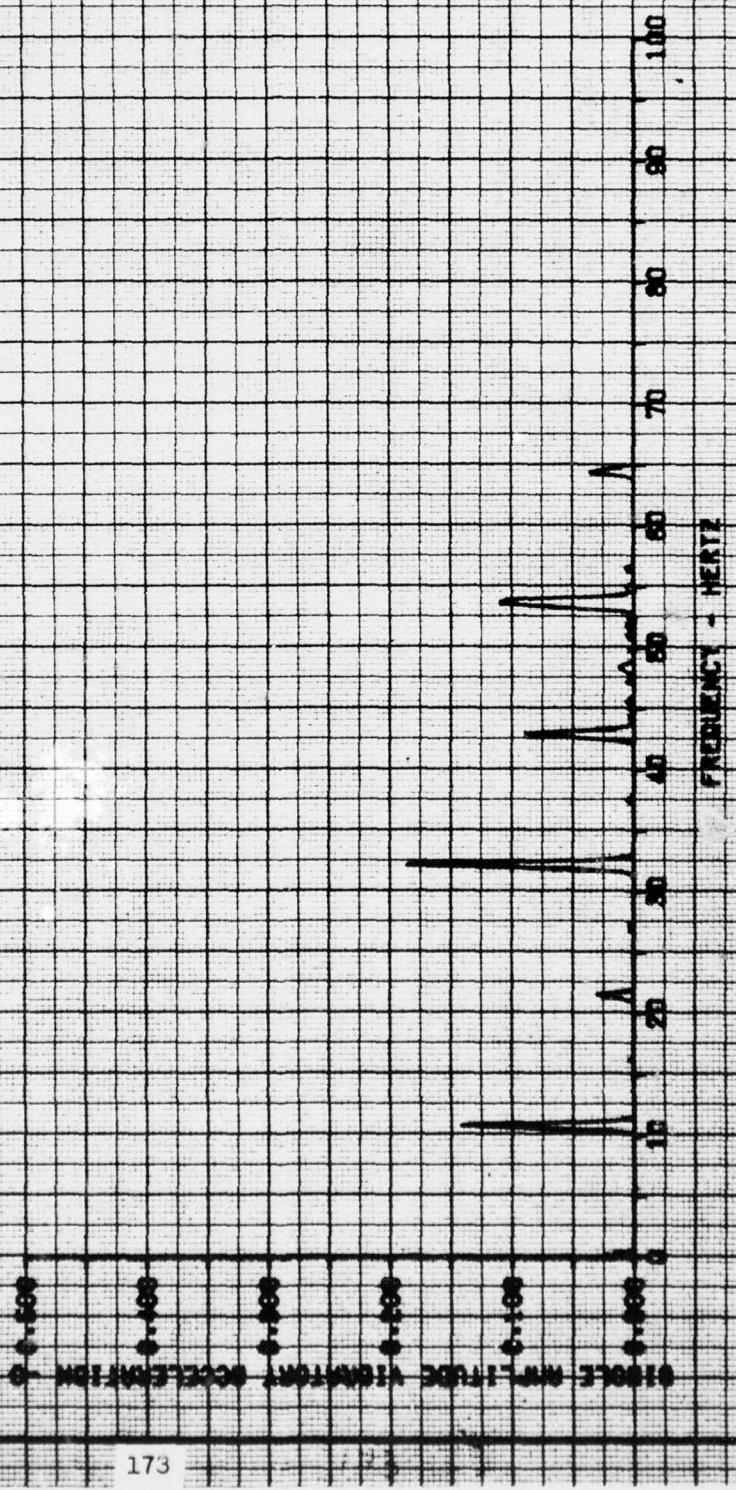


FIGURE 153

VIBRATION CHARACTERISTICS

LOCATION	IRBENTATION	MUN-14	USA 3/N	86-60869	FUNDAMENTAL FREQUENCY IS 5.10 HZ
AXIS	VERTICAL	DENSITY	OUTSIDE AIR	ROTOR TRIM CALIB.	FLIGHT CONFIGURATION
DRONE	LONG	ALTITUDE	TEMPERATURE	SPEED	AIRSPED
WEIGHT	CG #8	-FT	-DEG C	-RPH	-KTS
	-IN.	4220	0.0	324.0	80.0
	136.4 (PHD)	0.0 (MID)			LEVEL
					CLEAN

FLT 5  
TRK 5  
VCO 100  
MRS 7  
MIN 27  
SEC 10  
GRP 0



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FIGURE 154

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS LONGITUDINAL  
 CROSS LONG LAT  
 WEIGHT CG'S CG BL  
 -LB -IN. -IN.  
 9240 135.4 (FWO) 0.0 (HYD)  
 DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT -DEG C -RPM -KTS  
 4220 9.0 524.0 80.0 LEFT TURN CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.10 HZ

FLT 5  
 TRK 6  
 VCB 26  
 HNS 7  
 HIN 27  
 DCC 18  
 CAP 0

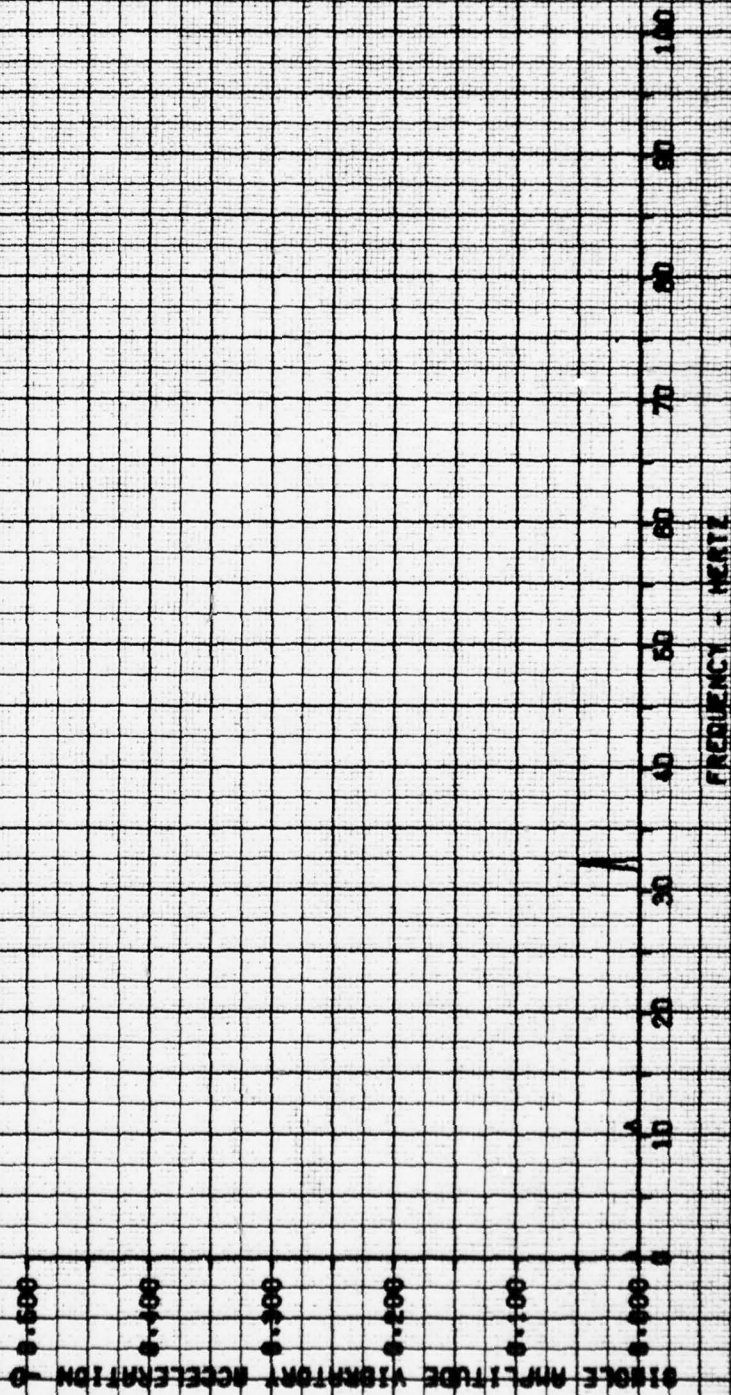
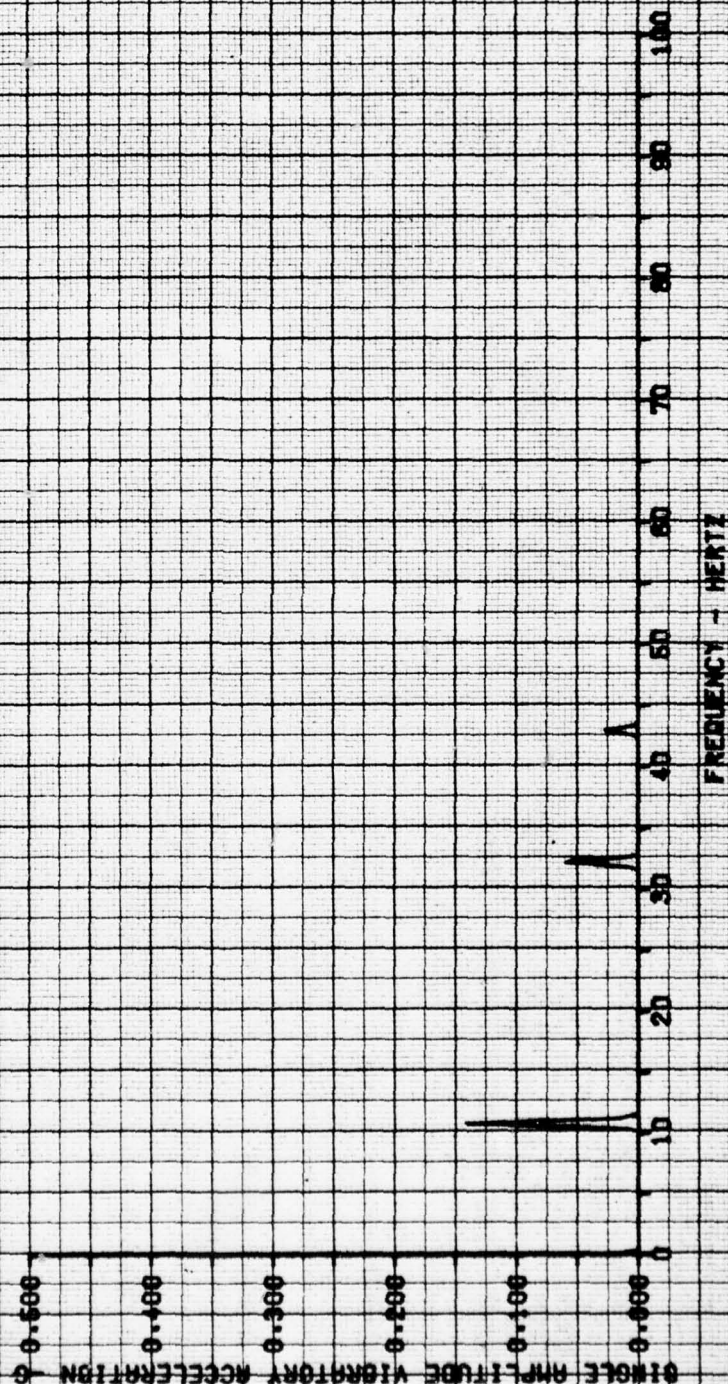


FIGURE 155

VIBRATION CHARACTERISTICS

LOCATION: POWER CONVERTER  
 AXIS: LATERAL  
 CROSS HEIGHT: 9240  
 LONG CG FS: 136.4 (FWD)  
 LAT CG BL: 0.0 (AID)  
 DENSITY: 4220  
 ALTITUDE: 9.0  
 TEMPERATURE: 824.0  
 OUTSIDE AIR SPEED: 80.0  
 ROTOR SPEED: LEFT TURN  
 TRIM CALIB. CONDITION: CLEAN  
 FLIGHT CONFIGURATION:



FLT 5  
 TRX 6  
 WCD 48  
 WAB 7  
 HIN 27  
 SEC 18  
 SWP 0

FIGURE 156

VIBRATION CHARACTERISTICS

LOCATION POWER CONVERTER  
 AXIS VERTICAL  
 GROSS WEIGHT 8240  
 CG FS 135.4 (FWD)  
 CG BL 0.0 (MID)  
 LAT 0.0 (MID)  
 DENSITY 9.0  
 ALTITUDE 4220  
 OUTSIDE AIR SPEED 324.0  
 TEMPERATURE -RPM  
 -DEG C  
 IRM CALIB. 80.0  
 FLIGHT CONDITION LEFT TURN  
 CONFIGURATION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 6  
 WCO 55  
 MAG 7  
 MIN 27  
 SEC 10  
 CRP 0

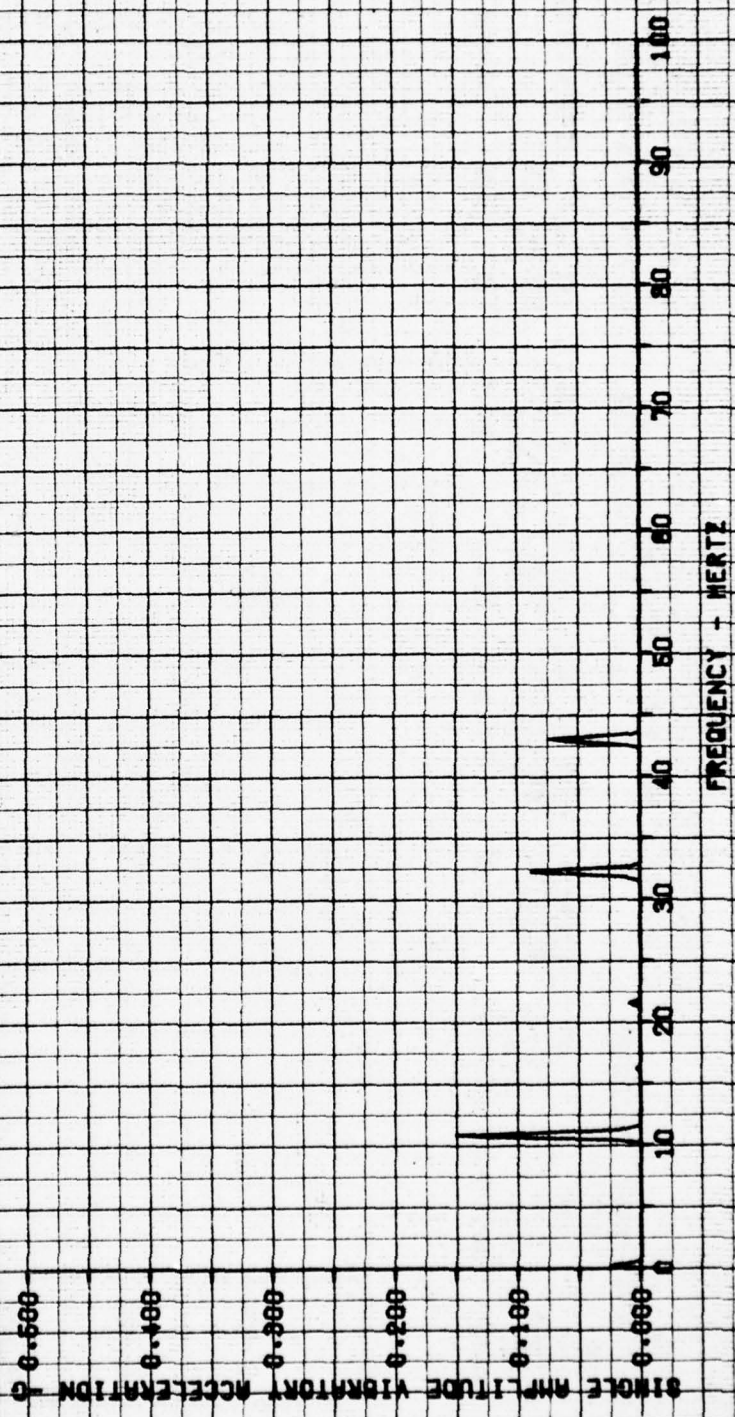


FIGURE 157

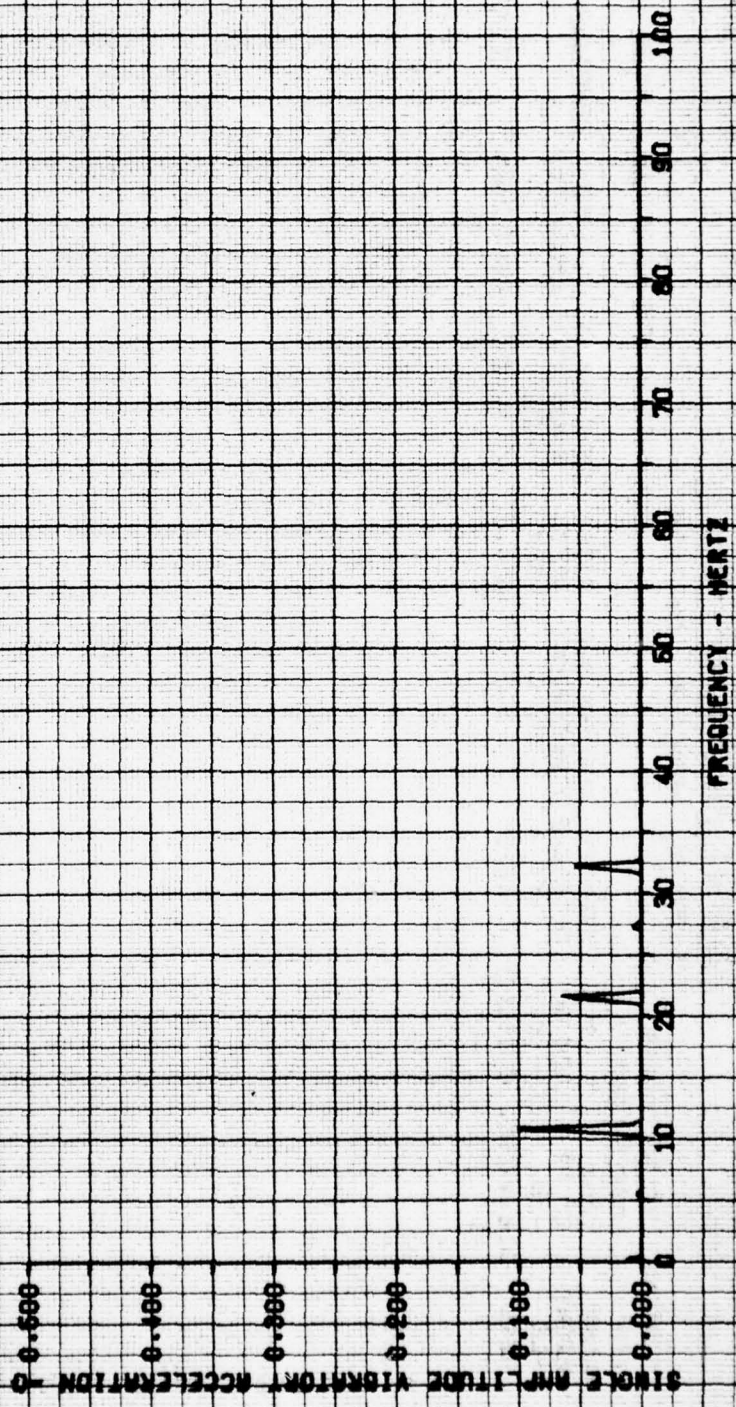
VIBRATION CHARACTERISTICS

LOCATION COLLECTIVE CONTROL  
 AXIS VERTICAL  
 NUMBER LONG  
 WEIGHT CG FS  
 -LB 135.4 (FWD) 0.0 (AID)

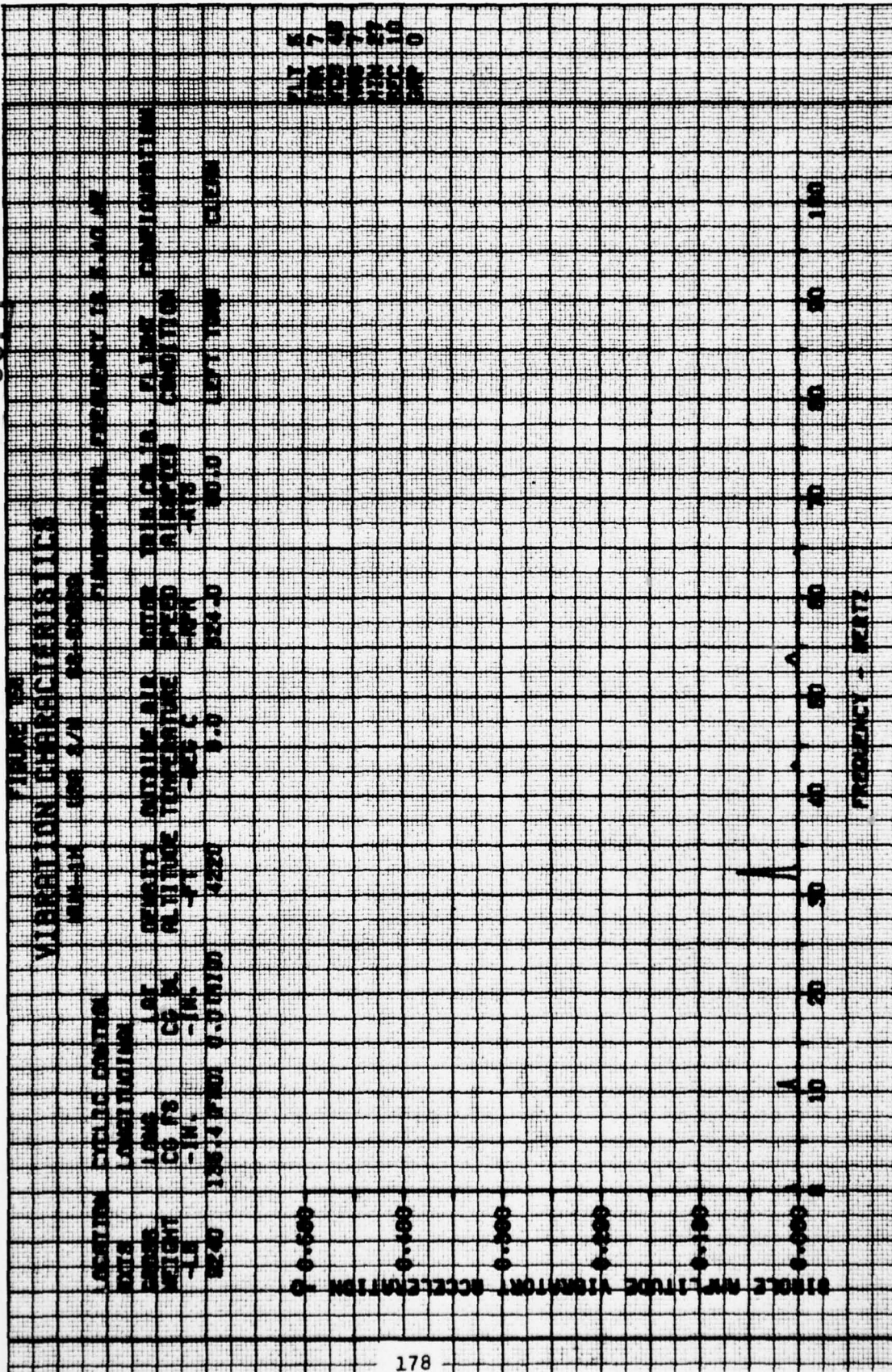
USA 8/N 88-80889  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

DENSITY OUTSIDE AIR ROTOR TRIM CALIB. FLIGHT CONFIGURATION  
 ALTITUDE TEMPERATURE SPEED AIRSPEED CONDITION  
 -FT 4220 -RPM 524.0 -KTS 80.0 LEFT TURN CLEAN

FLT 5  
 TNK 7  
 WDD 25  
 MRS 7  
 MIN 27  
 REC 10  
 GNP 0



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 JUN 48  
 JUN 7  
 JUN 27  
 JUL 10  
 JUN 0



FIGURE 160

VIBRATION CHARACTERISTICS

LOCATION FORWARD PALLET FLOOR MOUNT  
 AXIS VERTICAL  
 GROSS WEIGHT 9240  
 -LB  
 LONG CG FS 135.4 (FWD)  
 -IN. 0.0 (MTD)  
 LAT CG BL -IN. 4220  
 DENSITY OUTSIDE AIR 9.0  
 ALTITUDE TEMPERATURE -DEG C 524.0  
 ROTOR SPEED -RPM 80.0  
 TRIM CALIB. AIRSPEED -KTS LEFT TURN  
 FLIGHT CONDITION CLEAN  
 FUNDAMENTAL FREQUENCY IS 5.40 HZ

FLT 5  
 TRK 7  
 VCO 70  
 HRS 7  
 MIN 27  
 SEC 10  
 GRP 0

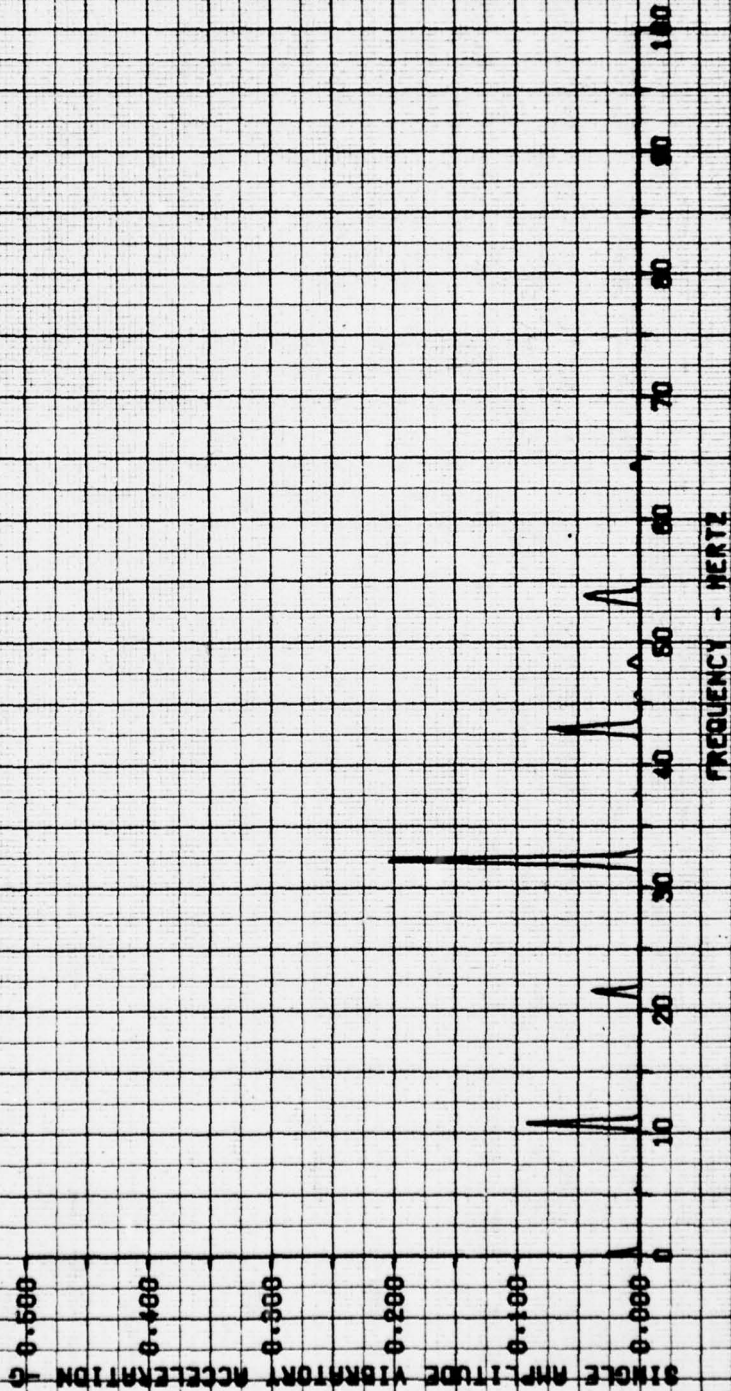
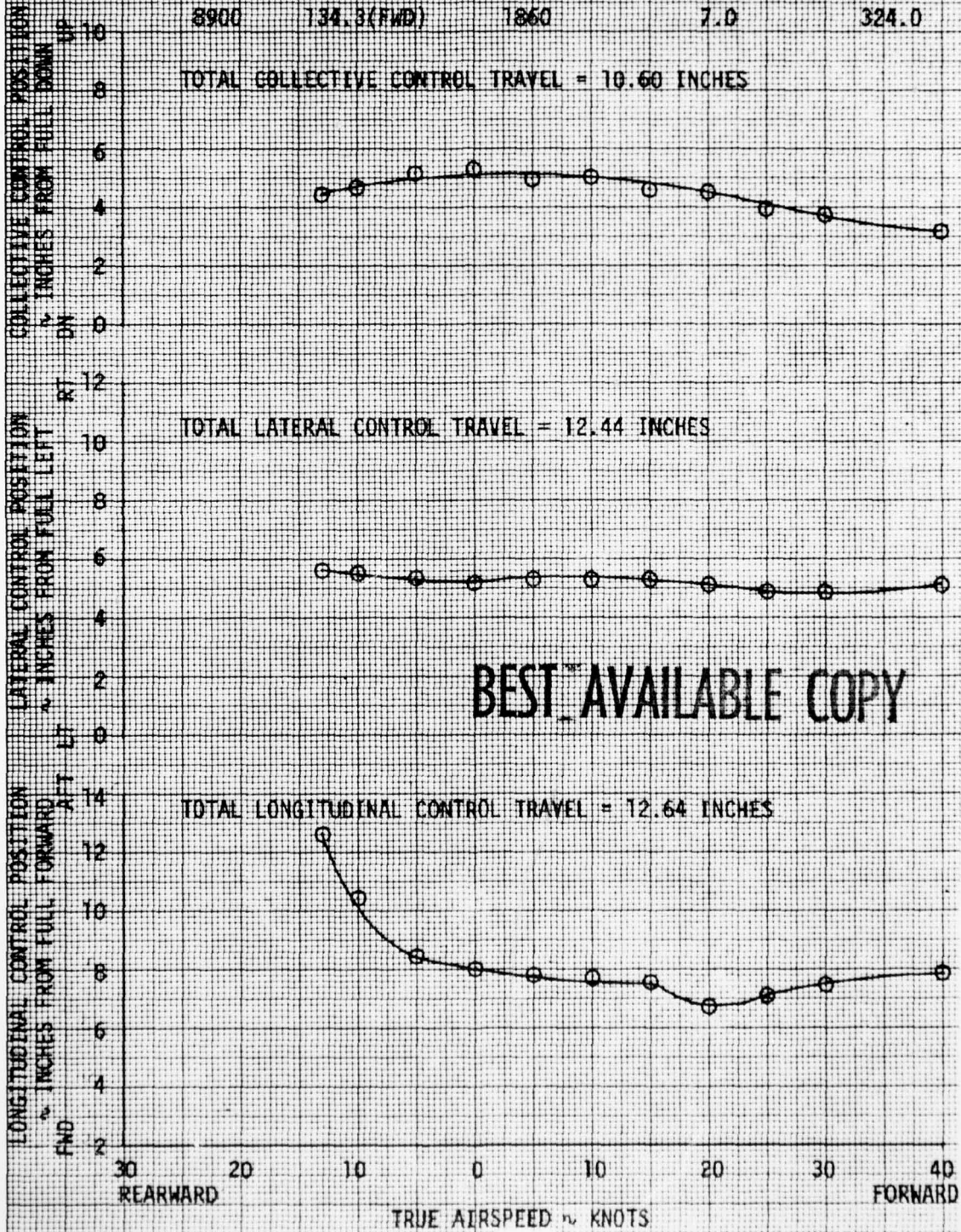


FIGURE 161  
 LOW-SPEED FORWARD AND REARWARD FLIGHT  
 NUH-1H USA S/N 65-60869

AVG GROSS WEIGHT ~ LB	AVG CG LOCATION ~ IN	AVG DENSITY ALTITUDE ~ FT	AVG AMBIENT TEMPERATURE ~ °C	AVG ROTOR SPEED ~ RPM
8900	134.3 (FWD)	1860	7.0	324.0



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