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BELL HELICOPTER TEXTRON FORT WORTH TEX
GROUND VIBRATION TEST OF OH-58A TAILBOOM FAILURE DURING AUTOROT--ETC(U)
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DAAJ01-70-C-0057

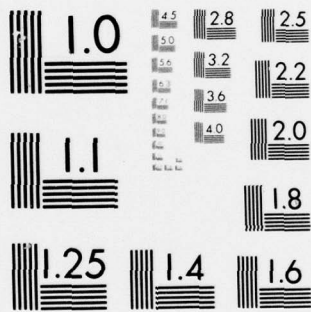
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USAAVSCOM
REPORT - TR 77-10

**GROUND VIBRATION TEST OF OH-58A
TAILBOOM FAILURE DURING AUTOROTATION
LANDINGS**

**D. R. Baker
BELL HELICOPTER COMPANY
POST OFFICE BOX 482
FORT WORTH, TEXAS 76101**

15 August 1974

Final Report



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Prepared for

**U.S. ARMY AVIATION SYSTEMS COMMAND
Maintenance Engineering Division
Post Office Box 209
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Objectives, Vehicle Description, Excitation Force, Test Set-Up, Test Results		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report contains the results of a ground tiedown and flight test to inves- tigate OH58A tailboom buckling failures. Tailboom damage incurred during autorotation landings could not be duplicated in the ground vibration test with the techniques employed and available equipment.		

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TAILBOOM FAILURE DURING AUTOROTATION
LANDINGS

PREPARED UNDER CONTRACT DAAJ01-70-C-0057(2E)

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1.0 SUMMARY

As part of a multi-phased program to investigate tailboom buckling failures of the OH-58A helicopter occurring during autorotational landings, a ground vibration test was conducted as described herein. BHC Report 206-194-134, "Flight Test Evaluation of OH-58A Tailboom Failure During Autorotation Landing," presents the results of the ground tiedown and flight test portion of the tailboom bucking failure investigation.

These tests were conducted under Contract DAAJ01-70-C-0057(2E) Task 69-45, and covered by BHC Work Order 6287, Engineering Work Authorization 206GJ25.2. The tests were initiated on September 14, 1971, and completed on October 21, 1971.

2.0 OBJECTIVES

The objectives of the test were as follows:

- 1) Define fundamental vertical fuselage natural frequency and damping.
- 2) Determine pylon pitch and roll natural frequencies and damping as a function of gross weight.
- 3) Determine forced response characteristics of pylon and fuselage from 2 to 12 Hertz, and the longeron and tailboom stresses per unit hub shear.
- 4) Determine linearity of forced response with hub shear force magnitude.
- 5) Determine effect of sweep rate on the forced response.
- 6) Determine if the damage incurred during landing could be duplicated in the laboratory by forcing the pylon to large amplitudes at various frequencies, taking a close look at a) those frequencies which are seen in the flight test data, and b) impacting the pylon stop pin against the pylon pitch stops.

3.0 VEHICLE DESCRIPTION

A standard Model OH-58A helicopter, ship number 40611, was used for the test. The tail boom of Ship 40611 was removed and replaced with the instrumented tail boom from Ship 41080, a standard OH-58A helicopter used for the flight evaluation. The weight and balance data is shown in Section 8.

4.0 INSTRUMENTATION AND DATA ACQUISITION

The following instrumentation was used in general. The specific instrumentation for each test is shown on the instrumentation test set-up sheets, Section 10.

1. Hub Force
2. Hub Acceleration in Direction of Excitation
3. Pylon Position
4. Longeron Stress
5. Tailboom Stress
6. Acceleration, Vertical, 90° Gear Box
7. Acceleration, Lateral, 90° Gear Box

The control for the Model C-10 exciter and method of data acquisition are shown in Figure 1. Data acquisition was essentially the same when the hydraulic actuator was used.

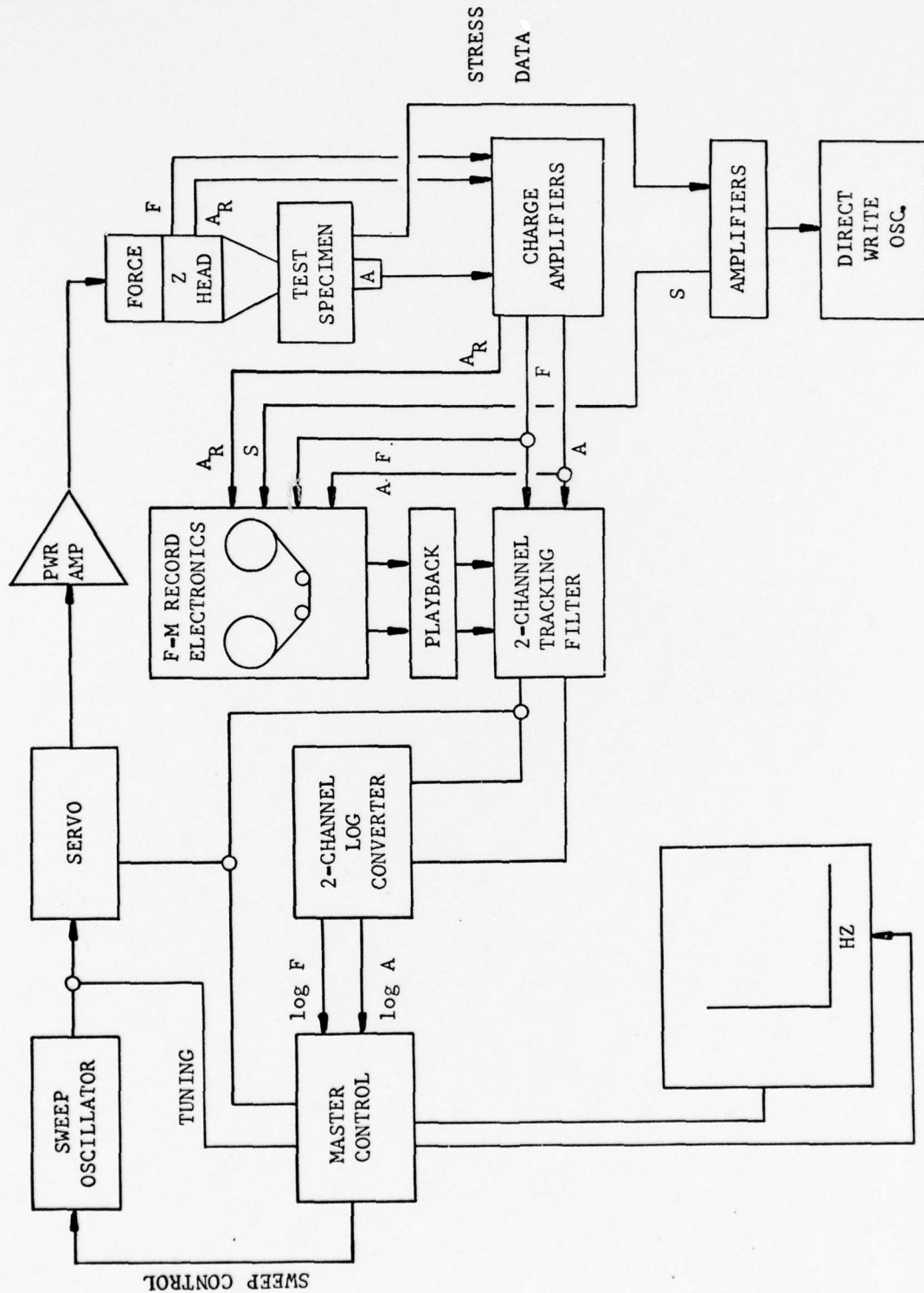


Figure 1. Block Diagram of Ground Vibration Test Data Acquisition System

5.0 TEST SET-UP AND PROCEDURE

Most of the tests were conducted with the ship suspended by a cable attached to the rotor mast, but some were done with the full vehicle weight on the landing gear, and others with partial vehicle weight on the gear simulating an autorotation touchdown. Also, variations of gross weight, tailboom and tail fin ballast, and a tailboom impact damper were evaluated.

The excitation force was applied at three locations: 1) the main rotor hub (fore-and-aft and lateral), 2) the main rotor mast just above the swashplate driver, 3) at the aft jackpoint in the vertical direction. Two different methods of excitation were used. The first was a Model C-10 MB electromagnetic exciter attached near the rotor hub to induce pylon pitch motion. The pylon response obtainable with this set-up was limited by exciter travel, limits of approximately ± 0.50 inches. The C-10 exciter was then attached to a higher impedance point near the swashplate so that higher C-10 force could be applied without exceeding exciter travel.

The second method used was a Model 204.11 MTS servo hydraulic actuator operating through a lever to provide increased force and motion.

Photos of the test set-up are presented in Figures 2 and 3. The strain gauge measuring tailboom lower skin stress at Station 219 is shown in Figure 4. The 90 degree gear box vertical acceleration transducer is shown in Figure 5. Tail ballast is shown in Figure 6, and an impact damper which was evaluated is shown in Figure 7.

The test log is presented in Section 9.

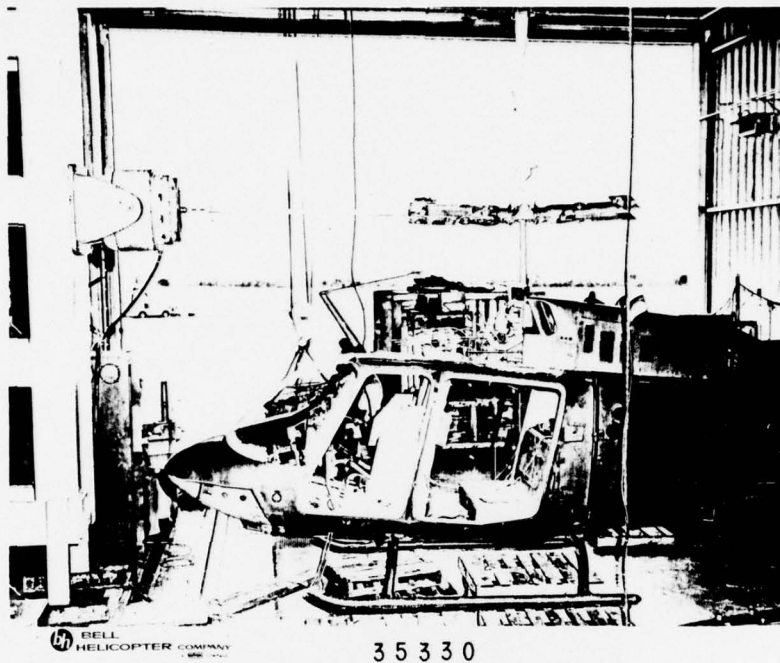


Figure 2. OH-58A Test Set-Up Using Electromagnetic
Exciter Attached at Rotor Hub

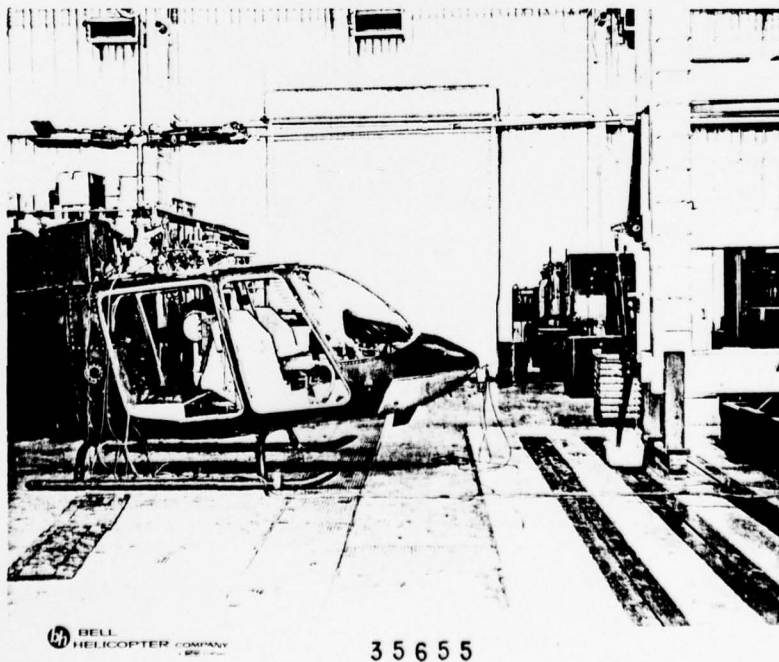
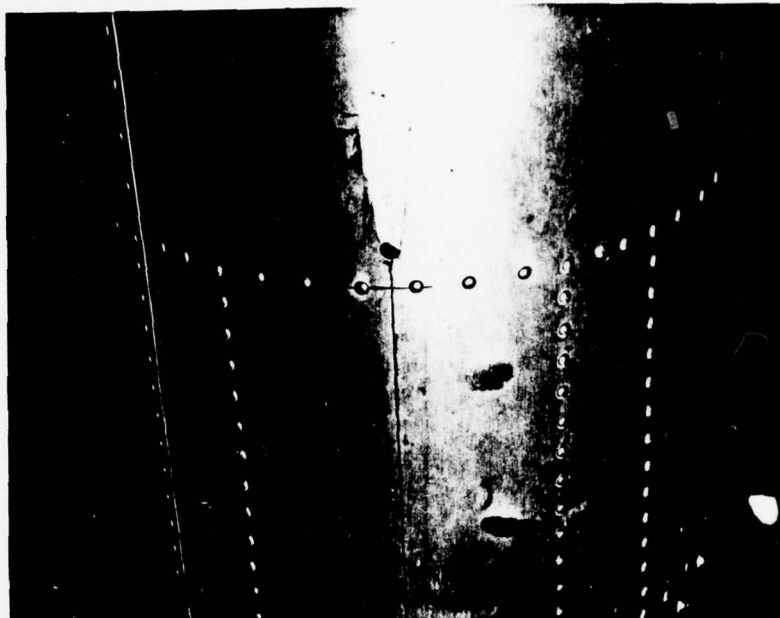


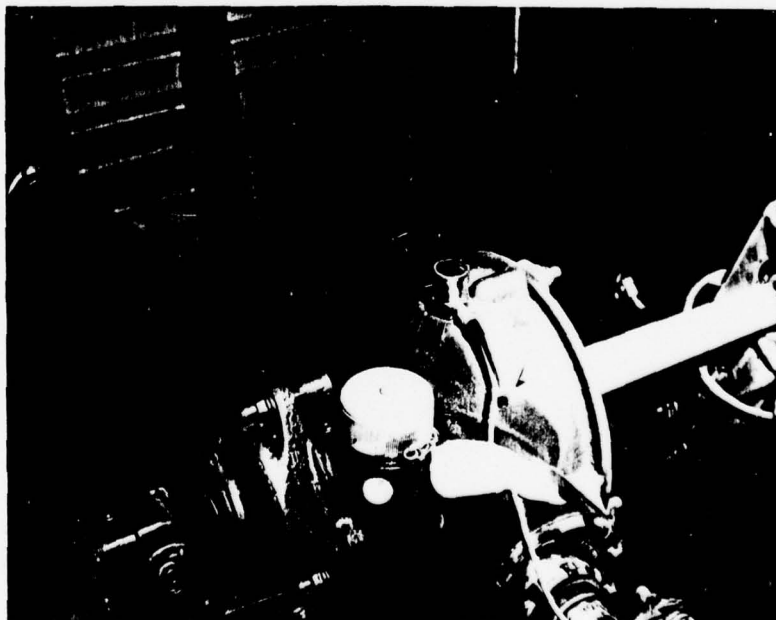
Figure 3. OH-58A Test Set-Up Using Hydraulic Actuator
Attached at Rotor Hub



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3 5 3 2 8

Figure 4. Strain Gauge Measuring Tailboom Lower Surface
Skin Stress at Station 219, Bottom View



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3 5 3 2 9

Figure 5. Transducer Measuring Vertical Acceleration
at 90 Degree Gear Box

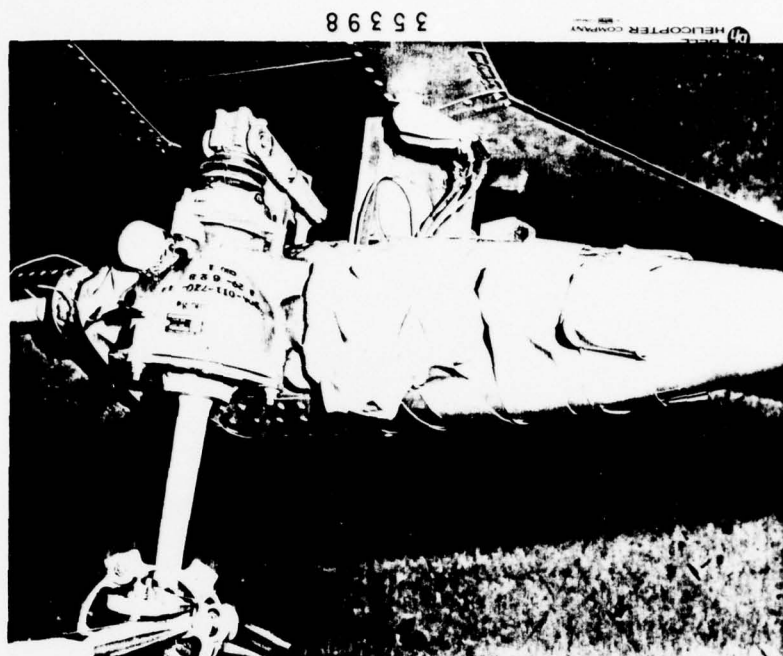
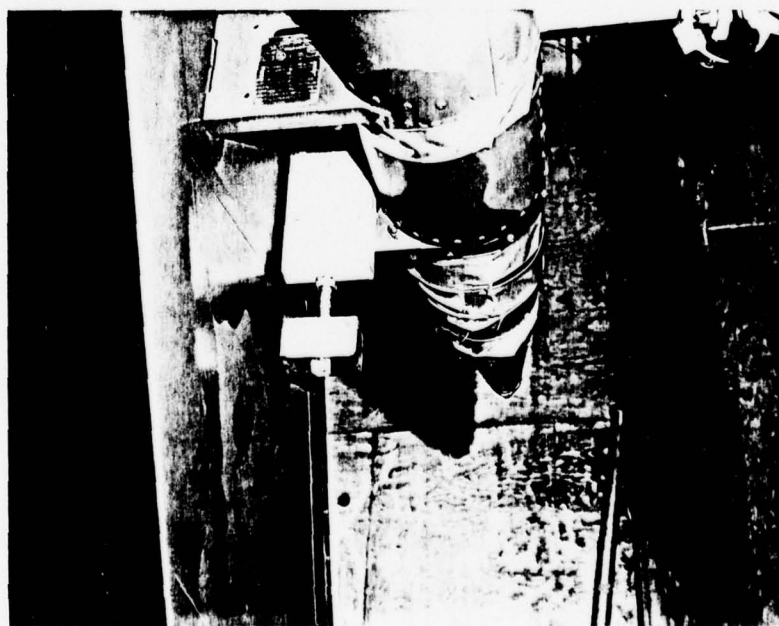


Figure 6. Added Ballast on Aft Tailboom, Top View



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Figure 7. Impact Damper Mounted on Tail Fin Support Bracket

6.0 TEST RESULTS

6.1 GENERAL

During the first phase of the tests, the following were determined:

- Pylon fore-and-aft frequencies and damping
- Fuselage first vertical mode and damping
- Pylon lateral frequency and damping
- Mast bending frequency against pylon stop
- Skid modes
- Effect of gross weight
- Effect of tailboom ballast
- Effect of pylon/skid coupling

The second phase of the tests accomplished the following:

- Force vs frequency for full throw of pylon
- Force-displacement linearity
- Stress when contacting stops
 - at various frequencies
 - from various mean positions

6.2 TEST DATA

The pertinent results of the test are shown in the subsequent figures and tables in this section.

Fuselage and pylon natural frequencies were identified as shown in Figure 8. The pylon pitch and roll modes were determined both on the ground, as a function of rotor thrust, and airborne.

The tailboom stress, longeron stress, pylon motion, and 90 degree gear box accelerations, determined with the pylon against the stop, are shown in Table I. No tailboom damage could be induced.

Table II shows the data acquired with the helicopter on the skids with varying thrust, and the estimated force required to drive the pylon to the pitch stop as a function of frequency.

Table III and Figure 9 show the pylon displacement as a function of force and frequency.

All test data is on file at the BHC vibration test facility, Plant 6, Arlington, Texas. The data is filed under Test No. V0129, magnetic tape 1800, 1820, 1832 and 1873.

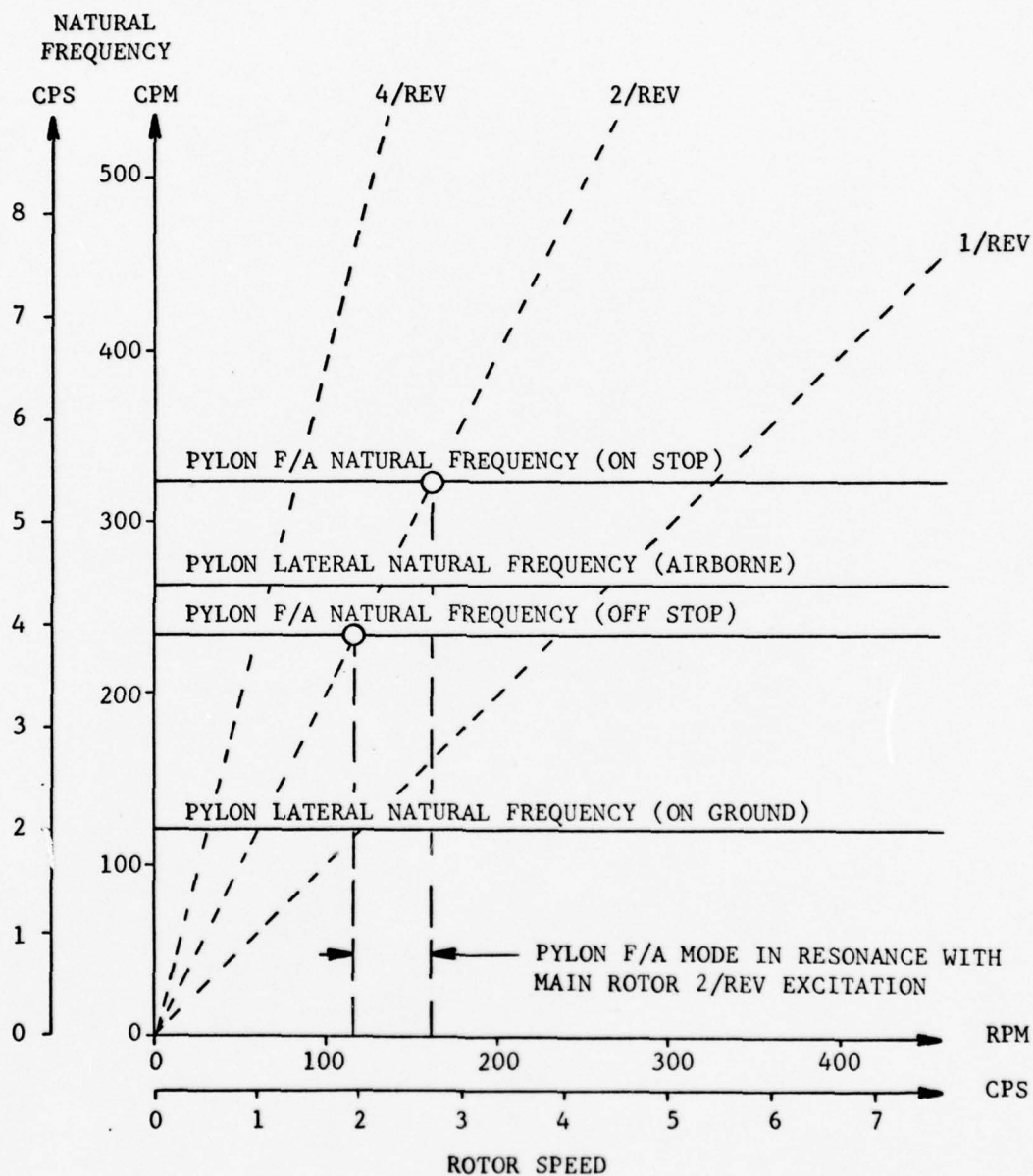


Figure 8. Frequency Placement Determined by Shake Test.

TABLE I.
GROUND VIBRATION TAIL BOOM INVESTIGATION (MAST BOTTOMED)

Ctr. No.	Type Of Input	Force		Stress			Pylon Motion		Vibration	
		~ ± LB	Peak ± LB	Tail Boom ± psi	L/H Long ± psi	R/H Long ± psi	F/A ± IN.	Lat. ± IN.	M/R Hub ± g's	T/R 90° G/B ± g's
029		53.4		854.5	742.0	969	.044	.016	.86	.72
030		41.4		-	371.0	969	.029	.008	.29	.25
031		104.8		1367.0	1113.1	1453	.023	.016	1.30	>1.0
032		INPUT > BAND EDGE > 300 LBS								
033		20.6		-	371.0	-	.009	-	.11	.04
034		20.6		341.8	371.0	969	-	.008	.12	.07
035		9.2		341.8	371.0	969	-	.008	.21	.19
036		28.8		1367.0	1484.0	1453	-	.008	1.02	>1.0
037		22.6		1367.0	1299.0	969	-	.008	.88	>1.0
038		20.6		341.8	371.0	969	-	.008	.36	.40
039		20.6		341.8	371.0	969	.009	.008	.30	.24
040		20.6		341.8	371.0	969	-	.008	.20	.22
041		20.6		341.8	371.0	969	-	.008	.19	.42
042		20.6		341.8	371.0	969	-	.008	.36	.41

TABLE I - Continued

Ctr. No.	Type Of Input	Force		Stress			Pylon Motion		Vibration	
		~ ± LB	Peak ± LB	Tail Boom ± psi	L/H Long ± psi	R/H Long ± psi	F/A ± IN.	Lat. ± IN.	M/R Hub ± g's	T/R 90° G/B ± g's
043	~	32.9		1367.0	1484	1453	.006	.008	1.10	>1.0
044	~	37.0		1367.0	1484	1453	.006	.008	1.13	>1.0
045	~	37.0		1025.0	1295	1453	.006	.009	.857	1.345
046	~	41.0		1025.0	925	969	-	-	.509	1.146
047	~	12.0		342.0	370	969	-	-	.250	.121
048	~	14.0		342.0	370	969	-	-	.357	.233
049	~	25.0		684.0	925	969	-	-	.527	.578
050	~		199.3	2222.0	1855	2422	.026	.008	>1.0	>1.0

Thrust LB	Frequency CPS	Period SEC	Applied Force - LB										Est. Force to Drive Pylon Stop To Stop - LB
			50	75	100	125	150	175	200	250	300	400	
	3.0	.3333	X		X	(Limited by Excessive Skid Motion)							425
			VO 129.140										
	3.5	.2857	X	X		(Limited by Excessive Skid Motion)							89
			VO 129.141										
	3.75	.2667	X	X									
			VO 129.163										
	4.0	.2500	X	X		(Limited by Excessive Skid Motion)							317
			VO 129.142										
400	4.5	.2222	X	X	X	X	X	X	X	X	(Limited by Excessive Skid Motion)		492
			VO 129.143										
550	5.0	.2000	X	X	X	X	X	(X)	X				735
			VO 129.144										
Recalib. F/A Pylon Stops													
750	5.5	.1818	X	X	X	X	X	X	X	X			987
			VO 129.145										
850	6.0	.1667	X		X		X		X				1400
			VO 129.146										
900	6.5	.1538	X		X		X		X	X	X	X	1605
			VO 129.147										
			VO 129.166										1.167-.168 (W/Mast Bending)

TABLE II. Continued

Thrust LB	Frequency CPS	Period SEC	Applied Force - LB										Est. Force to Drive Pylon Stop To Stop - LB
			50	75	100	125	150	175	200	250	300	400	
1050	7.0	.1429	X		X		X		X				
			VO 129.148										
1200	7.5	.1333	X	X	X	X	X	X	X	X			
			VO 129.149 Node About the Leading Edge of Elevator										
1200	7.75	.1290	X	X	X	X	X	X	X	X			
			VO 129.150 Node Same as 7.5 cps										
1200	8.0	.1250	X	X	X	X	X	X	X	X			
			VO 129.151										
X DATA ACQUIRED (X) NO OSC. REC.													

TABLE III. PYLON DISPLACEMENT CHECK

Frequency CPS	Period SEC	Applied Force ± LB	Pylon Displacement - IN			Average	Appl Force Av Displ. ± LB/IN
			+ δ_p	- δ_p	Total		
3.0	.3333	120	.58	-.25	.83	.415	289
3.5	.2857	130	1.0	-1.0	2.0	1.0	< 130
4.0	.2500	100	.49	-.21	.70	.35	286
4.5	.2222	200	.55	-.42	.97	.485	412
5.0	.2000	200	.40	.18	.58	.29	690
5.5	.1818	200	.33	-.08	.41	.205	976
6.0	.1667	200	.28	-.03	.31	.155	1290
6.5	.1538	200	.25	.0	.25	.125	1600
7.0	.1429	200	.22	.02	.20	.10	2000
7.5	.1333	200	.20	.05	.15	.075	2667
7.75	.1290	200	.20	.06	.14	.07	2857
8.0	.1250	200	.19	.06	.13	.065	3077

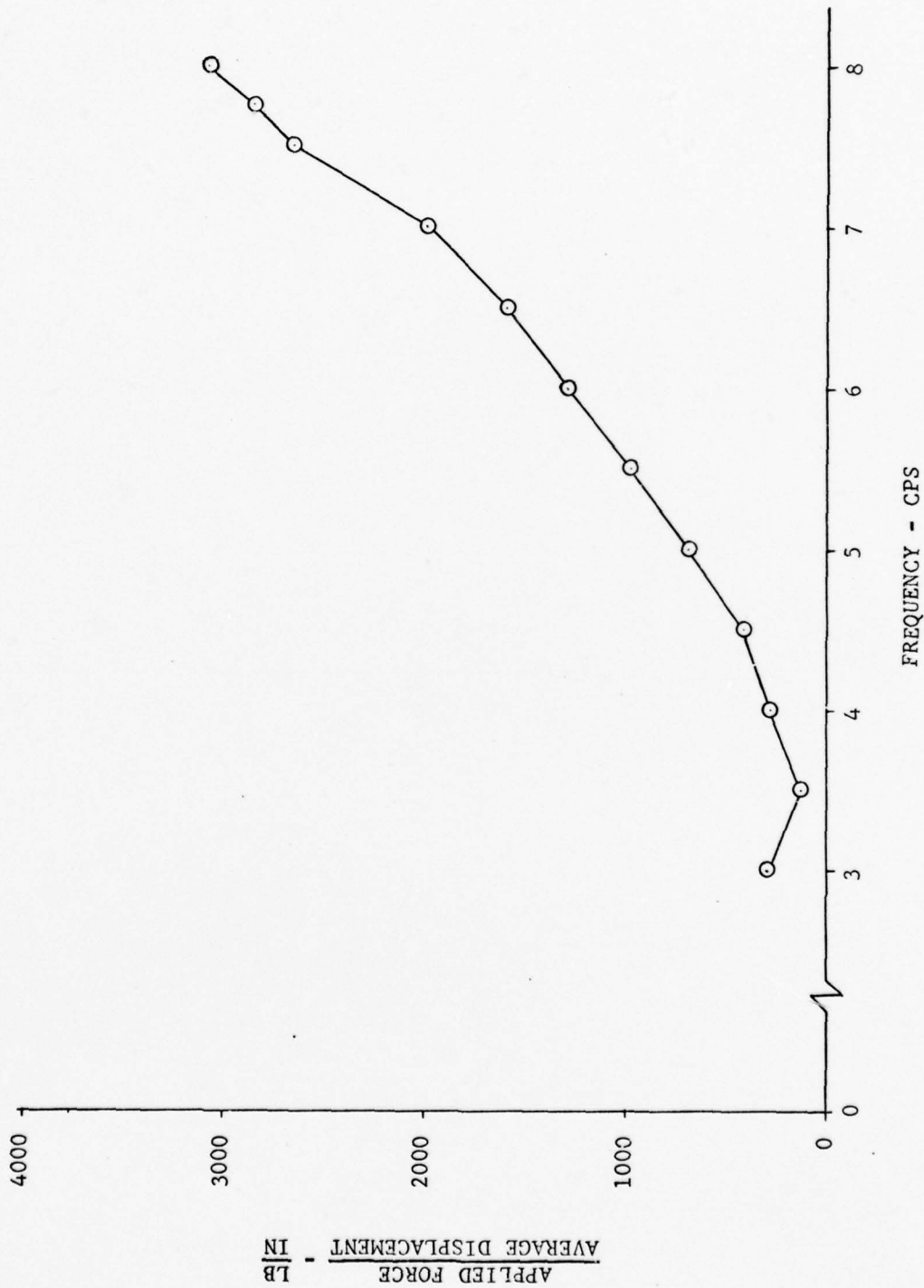


Figure 9. Pylon Displacement Check

7.0 CONCLUSIONS

- 1.0 The fundamental vertical fuselage natural frequency is located at approximately 9.5 cps and exhibits characteristic structural damping, approximately 2 percent of critical.
- 2.0 The pylon roll natural frequency shifts significantly from approximately 2.0 cps when on the ground with no rotor thrust to approximately 4.4 cps when airborne.
- 3.0 The pylon pitch natural frequency shifts significantly from 3.9 cps when off the pylon stop to 5.4 cps when on the pylon stop.
- 4.0 Typically mild response nonlinearities with force magnitudes were observed within the pylon stop limits. This nonlinearity does not appear significant to the subject investigation.
- 5.0 Typical variations in dynamic response with sweep rate of the excitation frequency were observed. These variations do not appear significant to the subject investigation.
- 6.0 The tailboom damage incurred on the OH-58A helicopter during autorotational landings could not be duplicated in the ground vibration test with the techniques employed and the available equipment; however, it is believed that these constraints did not alter the results.
- 7.0 When viewed from the standpoint of accepted practice and knowledge of the catalog of known instabilities, the principal modes of the helicopter are well placed.

SECTION 8
WEIGHT AND BALANCE DATA

BY _____	BELL HELICOPTER COMPANY	MODEL _____ PAGE 20
CHECKED _____		RPT 206-194-181

CENTER OF GRAVITY CALCULATION

PURPOSE: Shake Tests	HELICOPTER NO: 40611
	FLIGHT NO:
CONFIGURATION:	DATE:

ITEM	LONGITUDINAL			LATERAL	
	WEIGHT (lb)	ARM. (in.)	MOMENT (in.lb)	ARM. (in.)	MOMENT (in.lb)
REFERENCE WEIGHT SHEET DATED:					
Left Fwd Jack Point	328	55.2			
Right Fwd Jack Point	373	55.2			
Aft Jack Point	602.5	180.6			
As Weighed:					
Changes: (a)					
(b)					
(c)					
(d)					
Fuel:	400	115.5			
Pilot:	200	65			
Co-Pilot:					
Crew:					
Ballast: (a)	150	150			
(b)	150	85			
(c)	200	104			
(d)					
ENGINE START WEIGHT and CENTER OF GRAVITY	2403.5	109.3			

ACTUAL WEIGHT RECORD - MODEL 206A
HELICOPTER CONFIGURATION FOR WEIGHING

Page 21

RPT 206-194-181

1. Hyd. Fluid Yes ☒ No ☐
2. Fuel, Trapped: Yes ☐ No ☐
3. Xmsn & GB Oil Yes ☒ No ☐
4. Oil, Trapped: Yes ☒ No ☐
5. Oil, Tank: 6 QTS.

6. Battery: Yes ☒ No ☐
7. Ballast: LBS. F.S.
8. Blade Wt: LBS.
9. Paint: Yes ☐ No ☐

10. Upholstery: Custom
Seat Cushions Yes ☐ No ☒
Rugs: Yes ☐ No ☐
Interior: Yes ☐ No ☒

BELL STD. ☒
BALLAST
BALLAST
BALLAST

KITS (CHECK SALES ORDER)	YES	NO	PART NUMBER (IF YES)
11. Dual Controls	☒	☐	<u> </u>
12. Cargo Hook	☐	☒	<u> </u>
13. Hourmeter	☐	☒	<u> </u>
14. Heater	☐	☒	<u> </u>
15. Fire Extinguisher	☒	☐	<u> </u>
16. First Aid	☒	☐	<u> </u>
17. Cargo Platform	☐	☒	<u> </u>
18. Radio	☒	☐	<u> </u>
19. Blind Flying	☐	☒	<u> </u>
20. Night Flying	☒	☐	<u> </u>
21. UHF Radio Removed	☐	☐	<u> </u>

22. Spray Lac: Bubble Yes ☐ No ☒ Doors Yes ☐ No ☒

OTHER ITEMS ADDED TO HELICOPTER

Pilot and Copilot's
Armor Plate Kit

ITEMS OMITTED FROM HELICOPTER

1. M/R Hub and Blade Removed
2. Cabin Doors (4) Removed
3. L/R Armor Plate of
Engine Removed

23. Helicopter Level: Fore & Aft Lateral
24. Remove: Handling wheels, Blade Tie-Down, Hoist Ring

	SCALE READING	TARE	NET
FWD LEFT	<u>362.0</u>	<u>34.0</u>	<u>328.0</u>
FWD RIGHT	<u>407.0</u>	<u>34.0</u>	<u>373.0</u>
			<u>602.5</u>
TOTAL			<u>1303.5</u>

ighed By Quality Control DMIR
MODEL OH58A CUSTOMER SERIAL NO. BELL SERIAL NO. 40611

DATE 9/10/71

(SEND ORIGINAL COPY TO WEIGHT CONTROL GROUP, ENGINEERING DEPT.)

BY _____	BELL HELICOPTER COMPANY	MODEL _____ PAGE 22
CHECKED _____		RPT. 206-194-181

CENTER OF GRAVITY CALCULATION

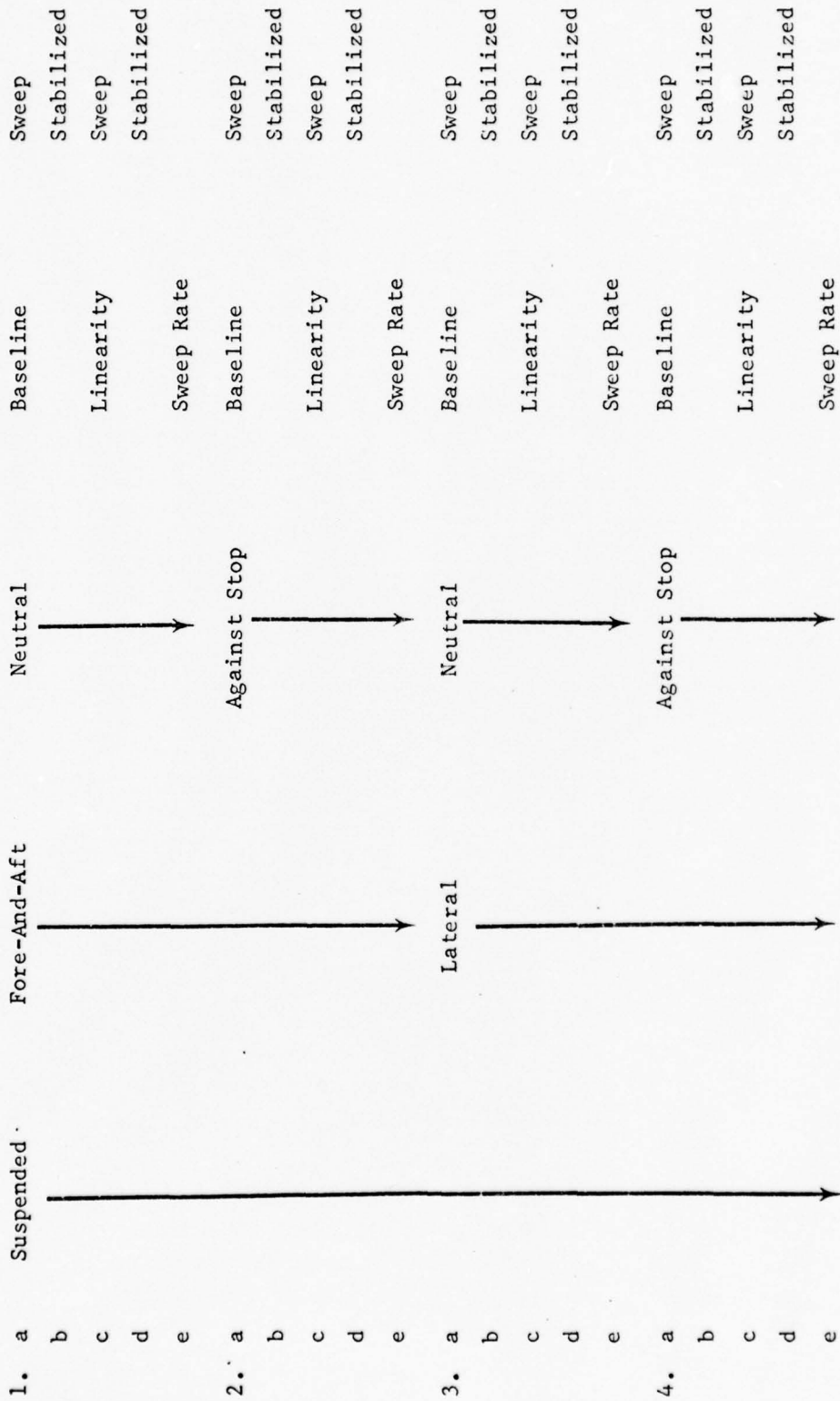
PURPOSE:	HELICOPTER NO:
	FLIGHT NO:
CONFIGURATION:	DATE:

ITEM	LONGITUDINAL			LATERAL	
	WEIGHT (lb)	ARM. (in.)	MOMENT (in.lb)	ARM. (in.)	MOMENT (in.lb)
REFERENCE WEIGHT SHEET DATED:					
Left Fwd Jack Point	328	55.2			
Right Fwd Jack Point	373	55.2			
Aft Jack Point	602.5	180.6			
As Weighed:					
Changes: (a) Dummy Hub	280	107.1			
(b)					
(c)					
(d)					
Fuel:	400	115.5			
Pilot:	200	65			
Co-Pilot:					
Crew:					
Ballast: (a)	125	150			
(b)	100	85			
(c)					
(d)					
ENGINE START WEIGHT and CENTER OF GRAVITY	2408.5	109.5			

SECTION 9

TEST LOG

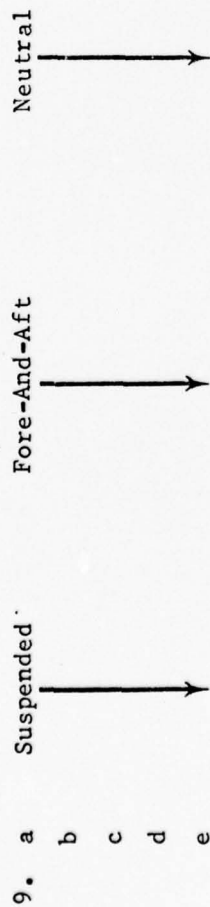
SCHEDULE OF TESTS - OH-58A SHAKE TEST PROGRAM



SCHEDULE OF TESTS - Cont'd



SCHEDULE OF TESTS - Cont'd



**INSTRUMENTATION LABORATORY
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Test Vibration Test 206 Tailboom Test No. V0129
Engineer Pitt/Sakowski Technician Grimes Sheet 1 of
Model 206 Ship No. 40611 EWA 206GJ25.2
DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1800	0	Calibrations Charg Amps.	9/14/71	232	3 3/4
	065				
	065	DC Tuning			
	114				
	149	V0129.001 1-12 Hz (0.05 Hz/Sec)	9/15/71		
	202	25 lbs Force (Manual Servo)			
	203	V0129.002 3.8 Hz (0.2005 Sec)			
	229	25 lbs Force			
	230	V0129.003 4.1 Hz (0.2464 Sec)			
	242	25 lbs Force			
	243	V0129.004 4.3 Hz (0.2299 Sec)			
	250	25 lbs Force			
	251	V0129.005 7.9 Hz (0.1270 Sec)			
	263	25 lbs Force			
	264	V0129.006			
	277	Void			
	272	V0129.006 3-12 Hz			
	312	50 lbs Force			
	313	V0129.007 (3.9 Hz)			
	341	Increasing Force From 50 to 75 lbs.			
	342	V0129.008 (3.9 Hz)			
	357	50 lbs Force (0.2629 Sec)			
	358	V0129.009 7.9 Hz			
	372	50 lbs Force (0.1280 Sec)			
	373	V0129.010 3-12 Hz			
	406	75 lbs Force			
	407	V0129.011 Decay 3.9 Hz			
	427	30 lbs Force (0.2610 Sec)			

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Test Vibration Test 206 Tailboom Test No. V0129
 Engineer Pitt/Sakowski Technician Grimes/Abel Sheet 2 of
 Model 206 Ship No. 40611 EWA 206GJ25.2
 DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1800	428	V0129.012 7.8 Hz	9/15/71	232	3 3/4
	441	75 lbs Force (0.1284 Sec)			
	442	V0129.013 7.8 Hz (w/bungee)			
	458	75 lbs Force (0.1282 Sec)			
	459	V0129.014 3.9 Hz			
	477	75 lbs Force (0.2625 Sec)			
	478	V0129.015 3-12 Hz	9/16/71		
	493	50 lbs Force			
	494	V0129.015 3-12 Hz			
	532	15 lbs Force			
	533	V0129.016 3-12 Hz			
	570	30 lbs Force Sweep Rate 0.05 Hz/Sec			
	571	V0129.017 Sweep Rate 1/2 Hz/Sec			
	583	30 lbs Force Manual Control			
	584	V0129.018			
	606	Repeat of Run .017			
	607	V0129.019 3-12 Hz			
	622	15 lbs Force			
	623	V0129.020 3-12 Hz			
	635	15 lbs Force			
	636	V0129.021 3-12 Hz			
	648	15 lbs Force			
	649	V0129.022 12-3 Hz			
	664	15 lbs			
	665	V0129.023 3-12 Hz (0.05 Hz/Sec)			
	703	30 lbs (10# Shot on Tailboom)			
	704	V0129.024 12-3 Hz (0.5 Hz/Sec)			
	720	30 lbs (10# Shot on Tailboom)			

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Test Vibration Test 206 Tailboom Test No. V0129
 Engineer Pitt/Sakowski Technician Grimes Sheet 3 of
 Model 206 Ship No. 40611 EWA 206GJ25.2
 DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1800	721	V0129.025 12-3 Hz (.5 Hz/Sec)	9/16/71	232	3 3/4
	739	30 lbs (10# Shot on Tailboom)			
	740	V0129.026 30-50 Hz (.5 Hz/Sec)	9/16/71	232	
	756	50 lbs (10# Shot on Tailboom)			
	757	V0129.027 30-50 Hz (.5 Hz/Sec)			
	773	200 lbs (10# Shot on Tailboom)			
	774	V0129.028 30-50 Hz (.5 Hz/Sec)			
	790	200 lbs (Removed 10# Shot from Tailboom)			
	791	Void			
	807	Void			
	808	V0129.029 3-12 Hz			
	850	25 lbs (Hitting Metal Strip @ Stop)			
	851	V0129.030 12-3 Hz (.5 Hz/Sec)			
	865	25 lbs Force (Hitting Stop Strip)			
	866	V0129.031 3-12 Hz (0.05 Hz/Sec)			
	903	30 lbs Force Added Ballast			
	904	V0129.032 5.4 Hz 50 lbs			
	929	1900 psi 5.2 Hz 35 lbs			
	930	V0129.033 3.0 Hz 15 lbs			
	947				
	948	V0129.034 4.0 Hz 15 lbs			
	975				
	976	V0129.035 5.0 Hz 15 lbs			
	994				
	995	V0129.036 $\tau = .1809$ Sec 15 lbs			
	1023				
	1024	V0129.037 5.7 Hz 15 lbs			
	1046				

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 4 of

Model 206 Ship No. 40611 EWA 206GJ25.2

DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1800	1047	V0129.038 6.0 Hz 15 lbs			
	1063				
	1064	V0129.039 6.5 Hz 15 lbs			
	1078				
	1079	V0129.040 7.0 Hz 15 lbs			
	1090				
	1091	V0129.041 7.6 Hz 15 lbs			
	1102				
	1103	V0129.042 3-12 Hz 15 lbs			
	1150				
	1151	V0129.043 $\tau = .1809$ 20 lbs			
	1167				
	1168	V0129.044 $\tau = .1809$ 25 lbs			
	1181				
	1182	V0129.045 $\tau = .1809$ 25 lbs			
	1203	With 10 lb wt			
	1204	V0129.046 $\tau = .1391$ 30 lbs			
	1219	With 10 lb wt			
	1220	V0129.047 $\tau = .1935$ 5 lbs			
	1240	With 10 lb wt on tail			
	1241	V0129.048 $\tau = .1935$ 10 lbs			
	1254	With 10 lb wt on tail			
	1255	V0129.049 $\tau = .1935$ 20 lbs			
	1266	10 lb wt on tail			
	1267	V0129.050 $\tau = .1935$ 20 lbs			
	1549				
	1550	V0129.051 4-12 Hz	9/20/71	233	
	1594	50 lbs			

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Test Vibration Test 206 Tailboom

Test No. V0129

Engineer Pitt/Sakowski

Technician Grimes

Sheet 5 of

Model 206

Ship No. 40611

EWA 206GJ25.2

DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
	1595	V0129.052	9/20/71	233	
	1620	65 lbs 4 Hz			
	1621	V0129.053		233	
	1674	30 lbs 4-12 Hz			
	1675	V0129.054			
	1719	60 lbs 4-12 Hz			
	1720	Void			
	1756	Void			
	1757	V0129.055 0.05 Hz/Sec			
	1772	60 lbs 4.5 Hz → 3 Hz			
	1773	V0129.056 7-12 Hz			
	1806	175 lbs 0.05 Hz/Sec			
	1807	V0129.057 12-3 Hz			
	1825	60 lbs 0.5 Hz/Sec			
	1826	V0129.058 2600 lb gross wt			
	1878	30 lb 3-12 Hz 0.05 Hz/Sec			
1800	1879	Void			
	End	Void			
1820	0000	V0129.059			
	0031	50 lbs 3-12 Hz 0.05 Hz/Sec			
	0032	V0129.060			
	0060	50 lbs 3-12 Hz 0.05 Hz/Sec			
	0061	V0129.061			
	0069	60 lbs 12-3 Hz 0.5 Hz/Sec			
	0070	175 lb 7-12 Hz .05 Hz/Sec			
	0092	V0129.062			
	0093	V0129.063 6-12 Hz .05 Hz/Sec			
		175 lbs Force			

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 6 of

Model 206 Ship No. 40611 EWA 206GJ25.2

DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1820	0124	V0129.064 Decay at 4.1 Hz	9/21/71	233	
	0130	60 lbs Force Prior to Cutting Fuse			
	0131	V0129.065 Decay at 7.0 Hz			
	0138	60 lbs Force Prior to Cutting Fuse			
	0139	V0129.066 Lat. Excit. 30 lbs			
	0167	2150 lbs gross wt 10# on 90° Box 3-12 Hz			
	0168	V0129.067 Lat. Excit. 50 lbs			
	0193	4-12 Hz .05 Hz/Sec			
	0194	V0129.068 Lat. Excit. 50 lbs			
	0224	3.5-12 Hz .05 Hz/Sec			
	0225	V0129.069 Lat. Excit. 30 lbs			
	0235	3.5-12 Hz .5 Hz/Sec			
	0236	V0129.070 Lat. Excit. 30 lbs			
	0265	3.5-12 Hz .05 Hz/Sec			
	0266	V0129.071 Lat. Excit. 60 lbs			
	0294	3.5-12.0 Hz .05 Hz/Sec			
	0295	V0129.072 Lat. 60 lbs			
	0306	12.0-3.5 Hz .5 Hz/Sec			
	0307	V0129.073 Lat. 175 lbs			
	0331	6.0-12.0 Hz .05 Hz/Sec			
	0332	V0129.074 Lat. 175 lbs			
	0358	5.0-12.0 Hz .05 Hz/Sec			
	0359	V0129.075 10# Force Lat. Ship on Skids			Exciter over travel
	0376	1.0-12.0 Hz .05 Hz/Sec			
	0376	V0129.076 5# Force Lat. Ship on			
	0422	Skids 1.0-2.0 10# Force 2.0 - 12.0 Hz			
	0423	V0129.077 30# Force Lat. Ship on Skids			
	0457	3.0- 12.0 Hz .05 Hz/Sec			

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Engineer Pitt/Sakowski Technician Grimes Sheet 7 of
Model 206 Ship No. 40611 EWA 206GJ25.2
DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1820	0458	V0129.078 80# Force Lat on Skids	9/21/71	233	
	0493	3.0-12.0 Hz .05 Hz/Sec			
	0494	V0129.079 120# Force Lat on Skids		233	
	0533	3.0-12.0 Hz .05 Hz/Sec			
	0534	V0129.080 60# Force Lat on Skids		233	
	0566	3.0-12.0 Hz .05 Hz/Sec			
	0567	V0129.081 60# Force Lat on Skids	9/21/71	233	
	0580	12.0-3.0 Hz .5 Hz/Sec			
	0581	V0129.082 Hand Excit.	9/22/71	233	
	0600	Checking Damping			
	0601	V0129.083 Shaker Excit.		233	
	0609	Fuse Cut (4.0 Hz 60 lbs)			
	0610	V0129.084 Shaker Excit.		233	
	0618	Fuse Cut (4.0 Hz 60 lbs)			
	0619	V0129.085 (2-12 Hz) 0.05 Hz/Sec		233	
	0657	60 lbs Force (500 lbs Thrust)			
	0658	V0129.086 (2-12 Hz) 0.05 Hz/Sec		233	
	0697	60 lbs Force (1000 lbs Thrust)			
	0698	V0129.087 12-2 Hz	9/22/74	233	
	0713	60 lbs Force (1000 lbs Thrust) 0.5 Hz/Sec			
	0714	V0129.088 2-8.2 Hz 0.05 Hz/Sec			
	0736	60 lbs Force 2050 lb Thrust W/Leak			
	0737	V0129.089 2-12 Hz 0.05 Hz/Sec			
	0816	60 lbs Force Ship on Aft Portion of Skids			
	0817	V0129.090 2-12 Hz 0.05 Hz/Sec			
		Barely Off Front of Skids			
	0861	60 lbs Force Ship on Aft Portion of Skids			
	0862	Void			
	0872	Void		232	

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 8 of

Model 206 Ship No. 40611 EWA 206GJ25.2

DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1820	0873	V0129.091 F&A 0.05 Hz/Sec	9/22/71	232	
	0918	200 lbs 2-12 Hz Ship on Skids			
		4" x 4" Under Rear Skids			
	0919	V0129.092 Various Frequencies	9/23/71	232	
	1024	and Various Forces	9/23/71	232	
	1025	V0129.093 F&A 0 lb Thrust (on Skids)			
	1077	15 lbs 2-12 Hz 0.05 Hz/Sec	9/23/71	232	
	1078	Void			
	1095	Void	9/23/71	232	
	1096	V0129.094 F&A 0 lb Thrust			
	1148	30 lbs 2-12 Hz 0.05 Hz/Sec On Skids	9/23/71	232	
	1150	V0129.095 F&A 0 lb Thrust			
	1161	30 lbs 12-2 Hz 0.5 Hz/Sec	9/23/71	232	
	1162	V0129.096 F&A 500 lbs Thrust			
	1207	15 lbs 2-12 Hz 0.05 Hz/Sec	9/23/71	232	
	1208	V0129.097 F&A 500 lbs Thrust			
	1251	30 lbs 2-12 Hz 0.05 Hz/Sec	9/23/71	232	
	1252	V0129.098 F&A 500 lbs Thrust			
	1262	30 lbs 12-2 Hz 0.5 Hz/Sec	9/23/71	232	
	1263	V0129.099 F&A 1000 lbs Thrust			
	1306	15 lbs 2-12 Hz 0.05 Hz/Sec	9/23/71	232	
	1307	V0129.100 F&A 1000 lbs Thrust			
	1352	30 lbs 2-12 Hz 0.05 Hz/Sec	9/23/71	232	
	1353	V0129.101 F&A 1000 lbs Thrust			
	1364	30 lbs 12-2 Hz 0.5 Hz/Sec	9/23/71	232	
	1365	V0129.102 F&A Ship Lightly on Aft			
		Skids	9/23/71	232	
	1421	15 lbs 2-12 Hz 0.05 Hz/Sec			
	1422	V0129.103 F&A Ship Lightly on Aft Skids	9/23/71	232	
	1469	30 lbs 2-12 Hz 0.05 Hz/Sec			

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Test Vibration Test 206 Tailboom Test No. V0129
Engineer Pitt/Sakowski Technician Grimes Sheet 9 of
Model 206 Ship No. 40611 EWA 206GJ25.2
DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1820	1470	V0129.104 Ship Lightly on Aft Skids	9/23/71	232	3 3/4
	1486	F&A 30 lbs 12-2 Hz 0.05 Hz/Sec			
1820	1487	CALS	9/30/71	232	3 3/4
	1820	TRS 1-3 1000 Hz; TRS 4-8 100 K			
1832	0000	V0129.105 Decay @ $\tau = .2734$	9/24/71	232	3 3/4
	0010	30# Force Applies, 500# Lift			
1832	0011	V0129.106 Decay @ $\tau = .2734$			
	0021	30# Force Applied "0" Lift Suspension Disconnected			
1832	0022	V0129.107 12 Hz - 30 Hz			
	0076	@ .05 Hz/Sec 100# Force Ship on Skids			
1832	0077	V0129.108 12 Hz - 30 Hz			
	0132	@ .05 Hz/Sec 300# Force Ship on Skids			
1832	0132	V0129.109 2-12 Hz			
	0168	@ .05 Hz/Sec 30# Force			
1832	0169	V0129.110, 2-12 Hz, 100# Force			
	0203	@ .05 Hz/Sec F&A			
1832	0204	V0129.111 235# - 250#			
	0218	Force 3.8 Hz			
1832	0219	V0129.112 3-12 Hz 200# Force	9/27/71	232	3 3/4
	0251	@ .05 Hz/Sec F&A on Mast Ship Suspended on Bungee			
1832	0252	V0129.113 $\tau = .2698$ 115#			
	0262	3.7 Hz F&A on Mast Ship Suspended on Bungee			
1832	0263	V0129.114 $\tau = .1360$ 200#			
	0273	7.35 Hz F&A on Mast Ship Suspended on Bungee			
1832	0274	V0129.115 12-3 Hz 100# Force			
	0287	@ .5 Hz/Sec F&A on Mast			
1832	0288	V0129.116 3-12 Hz 100# Force			
	0321	@ .05 Hz/Sec F&A on Mast (Added 200# to Copilot's Seat)			

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Test Vibration Test 206 Tailboom Test No. V0129
 Engineer Pitt/Sakowski Technician Grimes Sheet 10 of
 Model 206 Ship No. 40611 EWA 206GJ25.2
 DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1832	0322	V0129.117 $\tau = .2688$ F&A	9/27/71	232	3 3/4
	0356	80# $\rightarrow$ 120# Hitting Stop			
	0357	V0129.118 3-12 Hz 120# Force			
	0388	F&A on Mast			
	0389	V0129.119 3-5 Hz 120# Force			
	0426	F&A on Mast .01 Hz/Sec			
	0427	V0129.120 $\tau = .1447$ 400# Force		234	3 3/4
	0446				
1832	0447	Calibrations 1000 Hz TKS 1-3			
	0449	(100 K Cals on TKS 4-8) (Sweep 3-12 Hz (DC))			
	0500	Tuning Freq Added to TK 12		235	3 3/4
	0562	100 K TK 4			
	0579	100 K TK 5		235	
	0600	100 K TK 6			
	0626	100 K TK 7		235	
	0653	100 K TK 8			
	0674	V0129.121 (F&A) 0.05 Hz/Sec		235	
	0714	200 lbs Force 3-12 Hz 5 lb Damper			
	0715	V0129.122 (F&A) 0.05 Hz/Sec		235	
	0729	150 lbs (3-6 Hz) 5 lb Damper			
	0730	V0129.123		235	
	0761	400 lbs (6-12 Hz)			
	0762	V0129.124 (5 lb Damper Restrained)		235	
	0808	(150 lbs 3-6 Hz) (400 lbs 6-12 Hz)			
	0809	Void		235	
	0819	Void			
	0820	V0129.125 Damper Active	9/28/71	235	
	0891	400 lbs 10-30 Hz 0.05 Hz/Sec			

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 11 of

Model 206 Ship No. 40611 EWA 206GJ25.2

DLN 683582

*Note: Trk 5 is not good for Runs 131-167.

Reel No.	CTR No.	* Condition	Date	Setup S/N	Tape Speed
1832	0892	V0129.126 Damper Active	9/28/71	235	3 3/4
	0967	400 lbs 10-30 Hz @ .05 Hz/Sec			
1832	0968	1000 Cycle Cals on Tracks	9/29/71	236	3 3/4
	1011	1,2,3,9 & 10. 2.0 Hz & 12 Hz			
1832	1012	V0129.127 Damper Locked Vert Excit.			
	1055	@ Aft Jack Pt. .05 Hz/Sec 2-12 Hz Force = 50#			
1832	1056	V0129.128 12-20 Hz Same as			
	1099	Above			
1832	1100	V0129.129 Force = 100# Damper Locked Vert Excit.			
	1174	2-20 Hz @ .05 Hz/Sec			
1832	1175	Void	9/29/71		
	1207	Void			
1832	1208	V0129.130 Force = 100# Damper Operative Vert Excit.	9/29/71		
	1285	2-20 Hz @ .05 Hz/Sec			
	1286	Last Run on This	9/29/71		
1873	0041	1000 Cycle Cals on	10/15/71	237	3 3/4
	0125	Tape and 100 K Cals on			
		TKS 4, 5, 6, 7 & 8			
1873	0228	V0129.131 @ 4.0 Hz			
	0240	Small Force			
	0241	V0129.132 50# @ 4.0 Hz			
	0248				
	0249	V0129.133 75# @ 4.0 Hz			
	0256				
	0257	V0129.134 25# @ 4.0 Hz			
	0263				

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 12 of

Model 206 Ship No. 40611 EWA 206GJ25.2

*Note: Trk 5 is not good for Runs 131-167.

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Reel No.	CTR No.	* Condition	Date	Setup S/N	Tape Speed
1873	0264	V0129.135 25# @ $\tau = .2224$		237	
	0270				
	0271	V0129.136 50# @ $\tau = .2224$			
	0278				
	0279	V0129.137 100# @ $\tau = .2224$			
	0291				
	0292	V0129.138 150# @ $\tau = .2224$			
	0300				
	0301	V0129.139 200# @ $\tau = .2224$			
	0307				
1873	0311	Calibration of F&A Pylon Pot	10/18/71	237	
	0327	for Travel			
	0328	1000 Cycle Cals on TKS 1,2 & 3			
	0395	100 K Cals on TKS 4,5,6,7 & 8			
	0396	V0129.140 50-100# @ 3.0 Hz			
	0416				
	0417	V0129.141 $\tau = .2863$			
	0434				
	0435	V0129.142 $\tau = .2500$			
	0458				
	0459	V0129.143 $\tau = .2224$			
	0512				
	0513	V0129.144 $\tau = .2000$			
	0514				
	0600	V0129.145 $\tau = .1820$			
	0657				
	0658	V0129.146 $\tau = .1666$			
	0699				

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Test Vibration Test 206 Tailboom Test No. V0129
 Engineer Pitt/Sakowski Technician Grimes Sheet 13 of
 Model 206 Ship No. 40611 EWA 206GJ25.2
 *Note: Trk 5 is not good for Runs 131-167. DLN 683582

Reel No.	CTR No.	* Condition	Date	Setup S/N	Tape Speed
1873	0700 0728	V0129.147 $\tau = .1540$			
1873	0729 0778	V0129.148 $\tau = .1430$	10/19/71		
1873	0779 0836	V0129.149 $\tau = .1333$			
1873	0837 0893	V0129.150 $\tau = .1290$			
1873	0894 0957	V0129.151 $\tau = .1250$			
1873	0958 1001	V0129.152 $\tau = .1250$ 150 - 200 Look for Transient			
1873	1001	V0129.153 $\tau = .1250$ 1200# Thrust (200# - 175# Excit)			
1873	1019 1029	V0129.154 $\tau = .1250$ 1200# Thrust, 200# Excit.			
1873	1030 1041	V0129.155 $\tau = .1290$ 1200# Thrust 200 Excit.			
1873	1042 1048	V0129.156 $\tau = .1333$ 1200# Thrust, 200# Excit.			
1873	1049 1059	V0129.157 $\tau = .1430$ 1050# Thrust, 200# Excit.			
1873	1060 1081	V0129.158 $\tau = .1540$ 900# Thrust, 200# Excit.			
1873	1082 1093	V0129.159 $\tau = .1666$ 850# Thrust, 200# Excit.			
1873	1094 1103	V0129.160 $\tau = .1820$ 750# Thrust, 200# Excit.	10/19/71		

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Test Vibration Test 206 Tailboom Test No. V0129

Engineer Pitt/Sakowski Technician Grimes Sheet 14 of

Model 206 Ship No. 40611 EWA 206GJ25.2

*Note: Trk 5 is not good for Runs 131-167.

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Reel No.	CTR No.	* Condition	Date	Setup S/N	Tape Speed
1873	1104	V0129.161 $\tau = .2000$	10/19/71	237	
	1114	550# Thrust, 200# Excit.			
	1115	V0129.162 $\tau = .2224$			
	1123	400# Thrust, 200# Excit.			
	1124	V0129.163 $\tau = .2670$			
	1156	"0" Thrust, 50# and 75#			
	1157	V0129.164 $\tau = .1666$			
	1180				
	1181	V0129.165 $\tau = .1666$		237	
	1198	200# - 250#			
1873	1199	V0129.166 $\tau = .1666$	10/19/71	238	
	1226	200# - 300#			
	1227	V0129.167 $\tau = .1666$	10/20/71	238	
	1240	400#			
		Note: Track 5 is Not Good		238	
		for Runs 131 - 167			
	1241	V0129.168 $\tau = .1666$		238	
	1253	400# Force			
	1254	Void		237	
	1311				
	1312	V0129.170 $\tau = .2863$		237	
	1338	50# - 90#			
	1339	V0129.171 $\tau = .2670$		237	
	1379	50# - 205			
	1380	V0129.172 $\tau = .2500$		237	
	1415	50# - 200#			
1873		Discovered Loose Pylon	10/20/71	237	
		Motion Pot.			

**INSTRUMENTATION LABORATORY
MAGNETIC TAPE DATA RUN SHEET**

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Test Vibration Test 206 Tailboom

Test No. V0129

Engineer Pitt/Sakowski

Technician Grimes

Sheet 15 of

Model 206

Ship No. 40611

EWA 206GJ25.2

DLN 683582

Reel No.	CTR No.	Condition	Date	Setup S/N	Tape Speed
1873	1416	V0129.173 $\tau = .2224$	10/20/71	238	
	1453	200# $\rightarrow$			
1873	1454	V0129.174 $\tau = .2110$		238	
	1499	200# $\rightarrow$			
1873	1500	V0129.175 $\tau = .2110$	10/20/71	238	
	1545	40-300# Mean Load on Mast to Get Near Stop			
1873	1546	V0129.176 $\tau = .2000$	10/21/71	238	
	1603	50# - 400#			
1873	1604	V0129.177 $\tau = .2000$		238	
	1682	100# osc (Increasing steady to hit Stop)			
1873	1683	V0129.178 $\tau = .2000 - .1850$		238	
	1826	100# osc Vary Freq. 200-.2500			
1873	1827	V0129.179 No damper		237	
	1837	50# $\tau = .2000$			
1873	1838	V0129.180 No damper		237	
	1847	100# $\tau = .2000$			
1873	1848	V0129.181 No damper		237	
	1859	150# $\tau = .2000$			
1873	1860	V0129.182 No damper		237	
	1869	200# $\tau = .2000$			
1873	1870	V0129.183 No damper		237	
	1881	25# $\tau = .2863$			
1873	1882	V0129.184 No damper		237	
	1891	50# $\tau = .2863$			
1873	1892	V0129.185 No damper		237	
	1908	75# $\tau = .2863$			
1873	1909	V0129.186 No damper	10/21/71	237	
	1924	100# $\tau = .2863$			

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[illegible]

SECTION 10

INSTRUMENTATION SET-UP IDENTIFICATION

VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 232

Test No. _____

Test VO129 Vibration Test 206 Tail Boom

Reel No. 1800

Engineer Pitt/Sakowski Technician Grimes

Date 9-13-71

Model 206 Serial No. 40611

Sheet 1 of _____

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Hub Force	YB-11	M/R Hub	± 5 Volts ±300 lbs	volts		
2	2	Hub Acc	YB-11		± 5 Volts ±1.0 gs	volts		
3	3	Vertical Tail Rotor 90° Gearbox	LA-82		± 5 Volts ±1.0 gs	volts		
4	TL100 1A	F&A Pylon Disp.			2.61 100K = .24	volts	0 = 0.00 2.61	
5	TL100 2B	Lat Pylon Disp			1.34 100K = .26	volts in	0 = 2.41 3.75	OV = mast full left
6	TL100 3A	L/H Longeron Stress			2.64 100K = 17438 PSI	volts PSI	0 = .02 2.66	10,000 psi safe limit
7	TL100 4B	R/H Longeron Stress			1.32 100K = 17438 PSI	volts PSI	0 = .00 1.32	
8	TL100 5A	Tail Boom Stress			2.67 100K = 17774 PSI	volts PSI	0 = .00 2.67	
9						volts		
10						volts		
11						volts		
12						volts		
13		Audio				volts		
14		DC α Freq				volts		

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VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 233

Test No.

Test V0129

Reel No. 1800

Engineer Pitt/Sakowski Technician Grimes

Date 9-20-71

Model 206 Serial No. 40611

Sheet 2 of

EWA 206GJ25.2

DLN 683582

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1					volts		
2	2					volts		
3	3	Lateral	LA82		± 5.0 volts ± 3.0 G	volts		
4						volts		
5						volts		
6						volts		
7						volts		
8						volts		
9						volts		
10						volts		
11						volts		
12						volts		
13						volts		
14						volts		

VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 234

Test No. _____

Test VO129 Vibration Test 206 Tail Boom Reel No. 1800
 Engineer Pitt/Sakowski Technician Grimes EWA 206GJ25.2 Date 9-13-71
 Model 206 Serial No. 40611 DLN 683582 Sheet 3 of

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Force	YB-11	M/R Hub	± 5 Volts ±300 Lbs	volts		
2	2	Hub Acc	YB-11		± 5 Volts ±1.0 gs	volts		
3	3	Vertical Tail Rotor 90° Gearbox	LA-82		± 5 Volts ±1.0 gs	volts		
4	TL100 1A	F/A Pylon Disp.			2.61 100K = .24	volts	0 = 0.00 2.61	
5	TL100 2B	Lat Pylon Disp.			1.34 100K = .26	volts	0 = 2.41 3.75	OV = mast full left
6	TL100 3A	L/H Longeron Stress			2.64 100K = 17438	volts	0 = .02 2.66	10,000 psi safe limit
7	TL100 4B	R/H Longeron Stress			1.32 100K = 17438	volts	0 = .00 1.32	
8	TL100 5A	Tail Boom Stress			2.67 100K = 17774	volts	0 = .00 2.67	
9						volts		
10						volts		
11						volts		
12						volts		
13		Audio				volts		
14		DC ∝ Freq				volts		

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VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 235

Test No. _____

Test _____

Reel No. _____

Engineer _____

Technician _____

EWA _____

Date _____

Model _____

Serial No. _____

DLN _____

Sheet 4 of _____

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Force (Input)	YB-11	M/R Mast	± 5 volts ±600 lbs	volts		Set chg amp sens. @ 48.0
2	2	Input Acc	YB-11	M/R Mast	± 5 volts ±3.0 GS	volts		
3	3	Vert Acc T/R 90° Gear Box	LA-82		± 5 volts ±3.0 GS	volts		
4	TL100 1A	F&A Pylon Displ.			2.61 100K = .24	volts In.		
5	TL100 2B	Lat Pylon Displ.			1.34 100K = .26	volts In		
6	TL100 3A	L/H Longeron Stress			2.64 100K = 17438	volts PSI		
7	TL100 4B	R/H Longeron Stress			1.32 100K = 17438	volts PSI		
8	TL100 5A	T/B Stress			2.67 100K = 17774	volts PSI		
9						volts		
10						volts		
11						volts		
12		Tuning Freq.				volts		
13		Audio				volts		
14		Tuning DC & Freq				volts		

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VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 236

Test No. _____

Test Vol 29

Reel No. 1832

Engineer Pitt/Sakowski

Technician

Grimes

EWA 206GJ.25.2

Date 9-29-71

Model 206

Serial No.

40611

DLN 683582

Sheet 5 of

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Input Force	YB-11	Aft Jack	± 5 volts ±300 volts	volts		
2	2	Input Acc	YB-11	M/R Mast	± 5 volts ±3.0 GS	volts		
3	3	Vert Acc Tail Rotor 90° Gear Box			± 5 volts ±3.0 GS	volts		
4	TL100 1A	F&A Pylon Displ.	LA-82		2.61 100K = .24	volts Inches		
5	TL100 2B	Lat Pylon Displ.			1.34 100K = .26	volts Inches		
6	TL100 3A	L/H Longeron Stress			2.64 100K=17438	volts PSI		
7	TL100 4B	R/H Longeron Stress			1.32 100K=17438	volts PSI		
8	TL100 5A	T/B Stress			2.67 100K-17774	volts PSI		
9	4	Hub Force	LA-04		± 5 volts ±300 lbs	volts		
10	5	Hub Acc	LA-04		± 5 volts ±3.0 GS	volts		
11						volts		
12		Tuning Freq.				volts		
13		Audio				volts		
14		DC α Freq				volts		

VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 237

Test No. _____

Test VOL29

Reel No. 1873

Engineer Pitt Technician Kelly

Date 10-13-71

Model 206 Serial No. _____

DLN 683582 Sheet 6 of _____

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Input Force	VB-11	M/R Hub	± 5 300	volts lbs		
2	2	Input Acc	VB-11	M/R Hub	± 5 ± 10.0	volts G's		
3	3	Vert Acc T/R 90° Gear Box	LA-82		± 5 ± 10.0	volts		
4	TL100 1B	F&A Pylon Displ.			1.28 100K=.24	volts Inches		
5	TL100 2B	F&A Mast Bending	7921A		1.31 100K=7553	volts in-lb	5,760 in-lb/volt (± 2.61 volts) ($\pm 15,000$ in-lb)	
6	TL100 3A	L/H Longeron Stress			2.63 100K=17438	volts PSI	6,675 PSI/W	
7	TL100 4B	R/H Longeron Stress			1.29 100K=17438	volts PSI	13,550 PSI/W	
8	TL100 5A	T/B Stress			2.62 100K=17774	volts PSI	6,760 PSI/W	
9						volts		
10						volts		
11						volts		
12						volts		
13		Audio				volts		
14		Tuning Freq				volts		

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VIBRATION & SHAKE TEST

INSTRUMENTATION TAPE SETUP

S/N 238
Test No.

Test V0129 Reel No. 1873
Engineer Pitt Technician Kelly EWA Date 10-31-71
Model 206 Serial No. DLN 683582 Sheet 7 of

Track	AMPL No.	Item Measured	Lab No.	Sta No.	CE	Units	Sens/Volt	Remarks
1	1	Input Force	YB-11	M/R Hub	± 5 ±600	volts lbs		
2	2	Input Acc	YB-11	M/R Hub	± 5 ±10.0	volts G's		
3	3	Vert Acc T/R 90° Gear Box	LA-82		± 5 ±10.0	volts		
4	TL100 IB	F&A Pylon Displ.			1.28 100K=1.24	volts Inches		
5	TL100 2B	F&A Mast Bending	7921A		1.31 100K=7553	volts In-lb	5,760 in-lb/volt (±2.61 volts) (±15,000 in-lb)	
6	TL100 3A	L/H Longeron Stress			2.63 100K=17438	volts PSI	6,675 PSI/V	
7	TL100 4B	R/H Longeron Stress			1.29 100K=17438	volts PSI	13,550 PSI/V	
8	TL100 5A	T/B Stress			2.62 100K=17774	volts PSI	6,760 PSI/V	
9						volts		
10						volts		
11						volts		
12						volts		
13						volts		
14						volts		

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