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63-4-5

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TRANSPORTATION RESEARCH COMMAND

FORT EUSTIS, VIRGINIA

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414553
AS AD NO.

TRECOM TECHNICAL REPORT 63-10

Automatic Light Aircraft Readiness Monitor

Project ALARM

VOLUME II

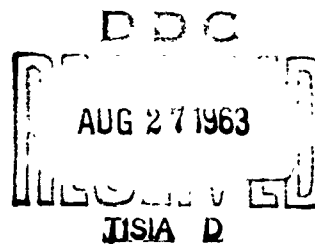
Project 9R89-02-015-16

Contract DA 44-177-TC-641

January 1963

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**Task 1D141812D18416
(Formerly Task 9R89-02-015-16)
Contract DA 44-177-TC-641
TRECOM Technical Report 63-10
January 1963**

**Project ALARM
AUTOMATIC LIGHT AIRCRAFT READINESS MONITOR
Phase II Test Program**

**VOLUME II
APPENDICES**

**Prepared by:
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CONTENTS

	Page
APPENDIX I - Installation Drawings, ALARM	1
APPENDIX II - Operational Test Data	2
A. Transmission Top Vibration	3
B. Transmission Base Vibration	9
C. Aft Engine Vibration	15
D. Forward Engine Vibration	21
E. Tail Vibration	27
APPENDIX III - Malfunction Test Data	33
A. Transmission Top Vibration	34
B. Transmission Base Vibration	45
C. Aft Engine Vibration	57
D. Forward Engine Vibration	69
E. Tail Vibration	80
F. Low Frequency Mast Vibration	97
APPENDIX IV - Oil Sample Analysis	107
APPENDIX V - Project History, Dynamic Aircraft Components	110
APPENDIX VI - Engineering Specification	116
DISTRIBUTION	127

APPENDIX I

INSTALLATION DRAWINGS, ALARM

1. **E1676475 - Installation, Interlocks, Control Display Box, Power Supply Supply**
2. **E1676492 - Installation, Engine Oil Level Sensors**
3. **C1676474 - Installation, Fuel Filter**
4. **C1676468 - Installation, XMSN Pressure Relief Valve**
5. **D1676466 - Installation, 42⁰ Gear Box Sensors**
6. **D1676465 - Installation, 90⁰ Gear Box Sensors**
7. **C1676487 - Installation, Engine Sensors**
8. **D1676467 - Installation, XMSN Accessory Gear Box Sensors**
9. **D1676469 - Installation, XMSN Temperature & Vibration Sensors**
10. **C1677335 - Installation, Tail Vibration Sensor**
11. **C1677334 - Installation, Low Frequency Vibration Sensor**
12. **C1677339 - Installation, Engine Oil Flowmeter**
13. **D1677336 - Installation, XMSN Input Quill Temperature Sensor**
14. **C1676470 - Installation, Swashplate Bearing Temperature Sensor**
15. **C1676464 - Installation, Hanger Bearing Temperature Sensor**

These drawings will be furnished by USATRECOM upon written request to those agencies on the distribution list.

APPENDIX II

OPERATIONAL TEST DATA *

- A. Transmission Top Vibration**
- B. Transmission Base Vibration**
- C. Aft Engine Vibration**
- D. Forward Engine Vibration**
- E. Tail Vibration**

*** All operational test data were recorded during the period of March 3, 1961, to June 16, 1961.**

SECTION A

HEIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION						DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL			
3/3	Ground Run 5800 RPM *	4.6	8.5	8.8	9.6	5.3	2.8	14			
3/8	Ground Run 5800 RPM	4.0	8.0	8.7	8.7	5.7	3.1	14.0			
3/10	Straight & Level 70K	5.3	14.0	18.0	13.0	10.5	8.0	30.0			
3/11	Straight & Level 80K	4.4	13.0	17.0	14.0	11.5	8.7	27.0			
3/11	Climb 500'/Minute	5.3	13.0	14.0	14.0	12.0	8.4	28.0			
3/11	Climb 500'/Minute	4.4	12.0	15.0	14.0	13.0	8.7	28.0			
3/11	Climb 2500'/Minute							31.0			
4/21	Straight & Level 70K	4.4	13.0	15.7	16.6	8.8	7.0	26.0			
4/21	Hover	4.7	13.0	14.0	13.0	10.5	7.0	26.0			
4/24	Ground Run 6000 RPM	4.6	9.2	14.0	11.2	8.3	4.1	22.5			
4/24	Straight & Level 70K	9.2	12.5	16.5	13.0	9.6	7.0	26.0			

* Mounted Vertically

SECTION A (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
5/4	Straight & Level 70K **	4.8	15.8	12.6	7.0	3.4	2.2	23.5		
5/5	Climb 500'/Minute	5.5	17.0	18.0	9.7	5.4	3.3	28.0		
5/5	Hover	5.3	18.3	15.0	9.6	6.1	2.6	25.5		
5/6	Hover	5.7	20	16.6	11.3	6.1	8.7	30.0		
5/6	Auto-Rotation							13.0		
5/6	Maximum Takeoff							34.5		
5/6	Right Turn							29		
5/6	Left Turn							29		
5/6	Straight & Level 105K							30.5		
5/9	Ground Run 6000 RPM	7.4	16.6	11.0	8.3	4.2	2.0	23.5		
5/9	Auto-Rotation							22.0		

** Accelerometer Mounted @ 45°

CP 11802

SECTION A (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
5/9	Right Turn							24.5		
5/9	Left Turn							24.5		
5/9	Straight & Level 100K							28.0		
6/5	Straight & Level 70K	5.6	18.2	15.8	9.6	5.4	3.5	28.0		
6/5	Straight & Level 100K							30.5		
6/5	Straight & Level 70K	5.7	17.5	15.8	11.4	6.2	3.5	29.0		
6/6	Ground Run (6000)	5.7	18.5	13	8.8	4.1	2	25.5		
6/6	Ground Run (6400)	6.6	24	14	10	5.4	2.7	32.0		
6/6	Straight & Level 80K	6.1	17.4	17.4	10.0	6.6	3.7	28.0		
6/6	Climb 500'/Minute	6	17.5	16.5	12.0	6.5	4.0	31.0		
6/6	Climb 2500'/Minute							37.0		

SECTION A (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)				
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL			
6/6	Hover	5.7	17.5	14	10.5	5.7	3.5	27			
6/7	Hover	5.3	15.8	13	9.6	5.3	3.2	26			
6/6	Hover W 1000 # Load	7.9	18	17	12.2	6.6	4.0	29			
6/7	Hover W 1000 # Load	6.1	17.5	17.5	12.2	6.6	3.7	30			
6/7	Straight & Level - 70K	5.3	17.5	16	11.8	6.1	3.5	30			
6/7	Straight & Level - 90K	5.3	18.3	17	8.5	7.0	4.2	32.5			
6/8	Straight & Level - 70-80K	5.3	16.7	15	9.6	5.3	3.7	27			
6/8	Straight & Level - 100K	6.1	18.3	17.5	11.3	6.5	3.5	31.5			
6/8	Ground Run 6400 RPM	6.3	24.5	13.5	9.6	5.3	2.8	31.5			
6/9	Ground Run 6400 RPM	6.1	21.8	12.6	8.8	4.4	2.3	28			
6/7	Right Turn							28			

SECTION A (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)				
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL			
6/7	Left Turn							28			
6/7	Maximum Takeoff							36			
6/7	Auto-Rotation							24.5			
6/9	Maximum Takeoff							38.5			
6/9	Climb 2500'/Minute							38.5			
6/13	Hover W 1000 # Load	6.0	16.5	15	12.2	6.3	3.5	30.5			
6/14	Straight & Level - 70-80K							29			
6/14	Straight & Level - 90-100K							32			
6/14	Climb 500'/Minute							33			
6/14	Climb 2500'/Minute							45			
6/14	Maneuver Right Turn							29			

CP 11000

SECTION A (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION TOP VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)				
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL			
6/14	Maneuver Left Turn							28			
6/14	Auto-Rotation							24.5			
6/14	Maximum Takeoff							41			
6/14	Straight & Level - 70-80K							29			
6/14	Straight & Level - 90-100K							32			
6/16	Ground Run 6400 RPM							30.5			
6/16	Hover							28			
6/16	Hover W 1000 # Load							30.5			
6/16	Hover @ 2000' MSL							30			

SECTION B

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION						DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL			
3/3	Ground Run 5800 RPM	2.7	7.5	9.7	6.0	2.9	1.6				
3/8	Ground Run 5800 RPM	1.5	6.7	6.7	5.0	3.0	2.0	10.1			
3/10	Straight & Level - 70K	1.0	4.0	8.3	7.2	4.1	2.7	10.5			
3/11	Straight & Level - 80K	3.8	8.2	13.0	8.2	4.5	2.6	25.0			
3/11	Climb 500'/Minute	3.8	8.2	12.0	7.5	5.0	2.6	18.0			
3/11	Climb 500'/Minute	3.8	7.5	13.0	7.5	4.5	2.7	16.0			
3/11	Climb 2500'/Minute							15.0			
4/21	Straight & Level - 70K	3.4	8.2	12.8	7.5	4.9	3.0	15.8			
4/21	Hover	3.3	7.5	13.5	7.5	4.5	3.0	16.4			
4/24	Ground Run 6000 RPM	3.1	8.2	9.5	5.8	3.4	2.0	15.0			
4/24	Straight & Level - 70K	4.5	7.5	13.5	7.5	4.6	3.0	18.0			

SECTION B (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
5/4	Straight & Level - 70K	3.0	7.5	7.5	5.1	2.7	1.5	11.2		
5/5	Climb 500'/Minute	1.9	5.3	9.0	6.8	3.8	2.8	12.6		
5/5	Hover	2.0	5.0	9.7	7.0	3.4	2.0	12.8		
5/6	Hover	1.6	5.3	9.7	6.8	7.4	6.8	11.2		
5/6	Auto-Rotation							12.8		
5/6	Maximum Takeoff							12.0		
5/6	Right Turn							7.5		
5/6	Left Turn							9.8		
5/6	Straight & Level - 105K							14.2		
5/9	Ground Run 6000 RPM	2.8	7.4	8.6	5.6	3.4	2.2	13.5		
5/9	Auto-Rotation							15.0		

GP 10000

SECTION B (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
5/9	Right Turn							18.0		
5/9	Left Turn							17.2		
5/9	Straight & Level - 100K							18.0		
6/5	Straight & Level - 70K	3.4	7.5	12.8	7.5	4.6	3.4	18.0		
6/5	Straight & Level - 100K							19.5		
6/5	Straight & Level - 70K	3.6	7.5	13.2	7.5	5.1	3.4	16.5		
6/6	Ground Run (6000)	3.0	7.5	9.0	5.9	3.9	2.65	14.0		
6/6	Ground Run (6400)	3.2	8.5	11.0	7.1	4.1	2.85	16.0		
6/6	Straight & Level - 80K	3.6	7.3	12.0	7.5	4.5	3.4	17.0		
6/6	Climb 500'/Minute	3.8	8.4	11.0	7.1	4.1	3.3	17.5		
6/6	Climb 2500'/Minute							19.0		

SECTION B (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
6/6	Hover	3.6	7.5	13	7.5	4.5	3.4	17		
6/7	Hover	3.4	7.1	12	6.4	3.8	2.5	15.8		
6/6	Hover W 1000 # Load	3.8	7.5	12.8	7.5	4.5	2.85	18		
6/7	Hover W 1000 # Load	3.8	7.5	16.3	7.5	4.5	2.85	20		
6/7	Straight & Level - 70-80K	3.4	7.5	11.2	7.5	4.5	3.8	17		
6/7	Straight & Level - 90K	3.8	7.8	12.3	7.5	4.5	3.4	18		
6/8	Straight & Level - 70-80K	3.5	7.5	12	7.5	4.5	3.4	17.5		
6/8	Straight & Level - 100K	3.8	7.5	12.3	7.5	4.9	3.2	18		
6/8	Ground Run 6400 RPM	3.15	7.8	10.5	6.8	3.8	3.0	15.8		
6/9	Ground Run 6400 RPM	3.15	8.2	12	7.5	4.2	2.85	17		
6/7	Right Turn							18		

SECTION B (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
6/7	Left Turn							16.5		
6/7	Maximum Takeoff							24		
6/7	Auto-Rotation							15		
6/9	Maximum Takeoff							22.5		
6/9	Climb 2500'/Minute							18.7		
6/13	Hover W 1000 # Load	3.5	7.5	14.2	7.5	4.1	2.6	16.5		
6/14	Straight & Level - 70-80K							16.5		
6/14	Straight & Level - 90-100K							18.7		
6/14	Climb 500'/Minute							18		
6/14	Climb 2500'/Minute							17.2		
6/14	Maneuver Right Turn							18		

SECTION B (Cont'd.)

FLIGHT TEST DATA - ALARM		TRANSMISSION BASE VIBRATION (Cont'd.)					DATA RECORDED IN G's (PK)			
DATE	ATTITUDE	1-2KC	2-4KC	4-8KC	8-12KC	12-16KC	16-20KC	ALL		
6/14	Maneuver Left Turn							17.2		
6/14	Auto-Rotation							15		
6/14	Maximum Takeoff							19.5		
6/14	Straight & Level - 70-80K							17.2		
6/14	Straight & Level - 90-100K							18.7		
6/16	Ground Run 6400 RPM							16.5		
6/16	Hover							15.8		
6/16	Hover W 1000 # Load							19.5		
6/16	Hover @ 2000' MSL							18		

SECTION C

FLIGHT TEST DATA - ALARM			AFT ENGINE VIBRATION					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL				
3/3	Ground Run 5800 RPM	0.2	0.30	0.15	0.1	0.3	0.27	0.73				
3/8	Ground Run 5800 RPM	0.49	0.44	0.30	0.25	0.3	0.4	0.8				
3/10	Straight & Level - 70K	0.29	0.48	0.29	0.19	0.68	0.37	1.2				
3/11	Straight & Level - 80K	0.19	0.48	0.24	0.19	0.29	0.73	0.89				
3/11	Climb 500'/Minute	0.24	0.34	0.20	0.22	0.82	0.98	1.5				
3/11	Climb 500'/Minute	0.24	0.39	0.17	0.20	0.70	1.0	1.5				
3/11	Climb 2500'/Minute							2.0				
4/21	Straight & Level - 70K	0.39	0.54	0.49	0.44	0.59	0.78	1.4				
4/21	Hover	0.49	0.54	0.44	0.44	0.78	1.02	1.8				
4/24	Ground Run 6000 RPM	0.17	0.32	0.11	0.10	0.27	0.32	0.7				
4/24	Straight & Level - 70K	0.29	0.54	0.29	0.17	0.63	1.04	1.57				

CPN882

SECTION C (Cont'd.)

FLIGHT TEST DATA - ALARM		AFT ENGINE VIBRATION (Cont'd)				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL	
5/4	Straight & Level - 70K	0.39	0.37	0.29	0.22	0.59	0.83	1.6	
5/5	Climb 500'/Minute	0.22	0.42	0.17	0.21	0.68	0.93	1.56	
5/5	Hover	0.27	0.39	0.17	0.24	0.77	0.49	1.7	
5/6	Hover	0.32	0.44	0.39	0.29	0.73	1.0	1.6	
5/6	Auto-Rotation							0.73	
5/6	Maximum Takeoff							1.95	
5/6	Right Turn							1.22	
5/6	Left Turn							1.22	
5/6	Straight & Level - 100K							1.7	
5/9	Ground Run 6000 RPM	0.135	0.27	0.105	0.155	0.32	0.28	0.66	
5/9	Auto-Rotation							0.83	

CP11802

SECTION C (Cont'd.)

FLIGHT TEST DATA - ALARM		AFT ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL			
5/9	Right Turn							1.6			
5/9	Left Turn							1.4			
5/9	Straight & Level - 100K							1.65			
6/5	Straight & Level - 70K	0.24	0.23	0.22	0.29	0.61	0.85	1.35 1.45			
6/5	Straight & Level - 100K							1.65			
6/6	Ground Run 6000 RPM	< 0.1	0.11	0.1	0.15	0.31	0.31	0.54			
6/6	Ground Run 6400 RPM	0.1	0.14	0.1	0.19	0.46	0.44	0.80			
6/6	Straight & Level - 80K	0.15	0.2	0.16	0.22	0.68	0.78	1.3			
6/6	Straight & Level - 80K	0.15	0.22	0.18	0.23	0.68	0.88	1.35			
6/6	Climb 500'/Minute	0.13	0.22	0.15	0.20	0.70	0.92	1.5			
6/6	Climb 2500'/Minute							1.2			

SECTION C (Cont'd.)

FLIGHT TEST DATA - ALARM		AFT ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL			
6/6	Hover	0.49	0.195	0.1	0.22	0.68	0.98	1.35			
6/7	Hover	0.12	0.17	0.11	0.195	0.7	0.98	1.4			
6/6	Hover W 1000 # Load	0.29	0.195	0.125	0.24	0.62	0.98	1.4			
6/7	Hover W 1000 # Load	0.195	0.195	0.12	0.22	0.65	1.08	1.65			
6/7	Straight & Level - 70K	< 0.1	0.17	0.17	0.24	0.63	0.78	1.3			
6/7	Straight & Level - 90K	< 0.1	0.27	0.17	0.24	0.73	1.02	1.57			
6/5	Straight & Level - 70-80K	0.195	0.195	0.17	0.245	0.65	0.83	1.35			
6/5	Straight & Level - 100K							1.7			
6/5	Ground Run 6400 RPM	0.1	0.1	< 0.1	0.195	0.34	0.34	0.66			
6/9	Ground Run 6400 RPM	< 0.1	0.12	0.11	0.195	0.365	0.34	0.65			
6/7	Right Turn							1.45			

SECTION C (Cont'd.)

SECTION C (Cont'd)										
FLIGHT TEST DATA - ALARM		AFT ENGINE VIBRATION (Cont'd)				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL		
6/7	Left Turn							1.45		
6/7	Maximum Takeoff							1.85		
6/7	Auto-Rotation							0.83		
6/9	Maximum Takeoff							1.6		
6/9	Climb 2500'/Minute							1.22		
6/13	Hover W 1000 # Load	C.29	0.17	0.145	0.195	0.64	0.98	1.45		
6/14	Straight & Level - 70-80K							1.45		
6/14	Straight & Level - 90-100K							1.65		
6/14	Climb 500'/Minute							1.5		
6/14	Climb 2500'/Minute							1.21		
6/14	Right Turn							1.31		

SECTION C (Cont'd.)

FLIGHT TEST DATA - ALARM		AFT ENGINE VIBRATION (Cont'd)				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL	
6/14	Left Turn							1.35	
6/14	Auto-Rotation							0.83	
6/14	Maximum Takeoff							1.65	
6/14	Straight & Level - 70-80K							1.31	
6/14	Straight & Level - 90-100K							1.65	
6/16	Ground Run 6400 RPM							0.83	
6/16	Hover							1.22	
6/16	Hover W 1000 # Load							1.45	
6/16	Hover @ 2000' MSL							1.45	

CPH802

SECTION D

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL	
3/3	Ground Run 5800 RPM	0.15	0.25	0.1	0.12	0.22	0.3	1.0	
3/8	Ground Run 5800 RPM	0.44	0.3	0.25	0.25	0.3	0.34	0.59	
3/10	Straight & Level - 70K	0.97	0.53	0.29	0.17	0.44	0.34	0.63	
3/11	Straight & Level - 80K	0.54	0.48	0.19	0.15	0.15	0.34	0.54	
3/11	Climb 500'/Minute	0.64	0.49	0.12	0.17	0.49	0.59	1.5	
3/11	Climb 500'/Minute	0.64	0.49	0.15	0.17	0.44	0.54	1.5	
3/11	Climb 2500'/Minute							1.9	
4/21	Straight & Level - 70K	0.88	0.64	0.44	0.44	0.49	0.49	1.2	
4/21	Hover	0.98	0.49	0.49	0.44	0.54	0.64	1.46	
4/24	Ground Run 6000 RPM	0.11	0.17	0.11	0.17	0.24	0.365	0.64	
4/24	Straight & Level - 70K	0.68	0.48	0.165	0.195	0.44	0.63	1.45	

SECTION D (Cont'd)

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL			
5/4	Straight & Level - 70K	0.44	0.44	0.32	0.195	0.39	0.48	1.1			
5/5	Climb 500'/Minute	0.59	0.39	0.145	0.23	0.47	0.63	1.2			
5/5	Hover	0.22	0.29	0.13	0.21	0.46	0.63	1.0			
5/6	Hover	0.49	0.34	0.39	0.34	0.39	0.54	0.73			
5/6	Auto-Rotation							0.63			
5/6	Maximum Takeoff							1.6			
5/6	Right Turn							0.63			
5/6	Left Turn							1.6			
5/6	Straight & Level - 100K							1.31			
5/9	Ground Run 6000 RPM	0.1	0.145	0.1	0.17	0.29	0.37	0.59			
5/9	Auto-Rotation							0.54			

CP 11802

SECTION D (Cont'd.)

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL		
5/9	Right Turn							1.2		
5/9	Left Turn							1.1		
5/9	Straight & Level - 100K							1.35		
6/5	Straight & Level - 70K	0.83	0.54	0.19	0.22	0.34	0.44	1.45 1.55		
6/5	Straight & Level - 100K							2.3		
6/6	Ground Run (6000)	< 0.1	< 0.1	0.11	0.17	0.22	0.32	0.49		
6/6	Ground Run (6400)	0.1	0.12	0.12	0.21	0.22	0.24	0.49		
6/6	Straight & Level - 80K	0.88	0.49	0.16	0.22	0.44	0.49	1.6		
6/6	Straight & Level - 80K	0.88	0.56	0.17	0.22	0.44	0.59	1.65		
6/6	Climb 500'/Minute	0.88	0.34	0.15	0.21	0.44	0.56	1.4		
6/6	Climb 2500'/Minute							1.3		

SECTION D (Cont'd)

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL			
6/6	Hover	0.44	0.195	0.120	0.21	0.44	0.56	0.98			
6/7	Hover	0.195	0.145	0.11	0.195	0.46	0.58	0.98			
6/6	Hover W 1000 # Load	0.24	0.22	0.117	0.185	0.41	0.62	1.18			
6/7	Hover W 1000 # Load	0.24	0.195	0.12	0.195	0.52	0.78	1.25			
6/7	Straight & Level - 70K	0.73	0.49	0.155	0.22	0.39	0.49	1.45			
6/7	Straight & Level - 90K	0.98	0.69	0.17	0.22	0.46	0.63	1.95			
6/8	Straight & Level 70-80K	0.78	0.49	0.137	0.205	0.44	0.58	1.57			
6/8	Straight & Level - 100K							2.2			
6/8	Ground Run 6400 RPM	<0.1	0.1	0.12	0.195	0.205	0.265	0.56			
6/9	Ground Run 6400 RPM	<0.1	0.1	0.11	0.18	0.215	0.28	0.49			
6/7	Right Turn							1.45			

CPH002

SECTION D (Cont'd)

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL			
6/7	Left Turn							1.35			
6/7	Maximum Takeoff							1.65			
6/7	Auto-Rotation							0.54			
6/9	Maximum Takeoff							1.47			
6/9	Climb 2500' /Minute							1.12			
6/12	Hover W 1000 # Load	0.29	0.195	0.13	0.17	0.46	0.69	1.12			
6/14	Straight & Level - 70-80K							1.21			
6/14	Straight & Level - 90-100K							1.85			
6/14	Climb 500' /Minute							1.95			
6/14	Climb 2500' /Minute							1.6			
6/14	Right Turn							1.31			

CPN802

SECTION D (Cont'd)

FLIGHT TEST DATA - ALARM		FWD ENGINE VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL		
6/14	Left Turn							1.55		
6/14	Auto-Rotation							0.49		
6/14	Maximum Takeoff							1.7		
6/14	Straight & Level - 70-80K							1.45		
6/14	Straight & Level - 90-100K							1.95		
6/15	Ground Run 6400 RPM							0.52		
6/16	Hover							0.78		
6/16	Hover W 1000 # Load							1.08		
6/16	Hover @ 2000' MSL							1.31		

CP 11802

SECTION E

FLIGHT TEST DATA - ALARM		TAIL VIBRATION				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL		
3/3	Ground Run 5800 RPM	0.24	0.39	1.0	0.9	0.5	0.39	1.5		
3/8	Ground Run 5800 RPM	0.49	0.49	0.54	0.64	0.44	0.39	1.2		
3/10	Straight & Level - 70K	0.77	1.2	1.5	1.5	0.73	0.44	2.4		
3/11	Straight & Level - 80K	0.48	1.2	1.5	1.5	0.64	0.39	1.9		
3/11	Climb 500'/Minute	0.49	0.88	1.2	1.5	0.64	0.49	2.4		
3/11	Climb 500'/Minute	0.49	0.59	1.1	1.5	0.64	0.39	2.6		
3/11	Climb 2500'/Minute							2.4		
4/21	Straight & Level - 70K	0.49	1.02	1.21	1.7	0.73	0.54	2.4		
4/21	Hover	0.49	0.98	0.98	1.37	1.18	0.68	2.53		
4/24	Ground Run 6000 RPM	0.13	0.34	0.78	0.78	0.49	0.32	1.2		
4/24	Straight & Level - 70K	0.54	0.98	1.17	1.55	0.63	0.44	2.3		

SECTION E (Cont'd)

FLIGHT TEST DATA - ALARM		TAIL VIBRATION (Cont'd)				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL	
5/4	Straight & Level 70K	0.48	0.73	0.83	1.27	0.48	0.38	1.95	
5/5	Climb 500'/Minute	0.44	0.78	1.03	1.45	0.63	0.37	2.4	
5/5	Hover	0.34	0.59	0.85	1.45	0.77	0.54	2.4	
5/6	Hover	0.24	0.44	0.97	1.45	0.73	0.73	2.4	
5/6	Auto-Rotation							1.95	
5/6	Maximum Takeoff							1.95	
5/6	Right Turn							2.2	
5/6	Left Turn							2.43	
5/6	Straight & Level 100K							2.7	
5/9	Ground Run 6000 RPM	0.11	0.32	0.63	0.86	0.56	0.27	1.3	
5/9	Auto-Rotation							1.95	

CP 1002

SECTION E (Cont'd)

FLIGHT TEST DATA - ALARM		TAIL VIBRATION (Cont'd)				DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL	
5/9	Right Turn							2.05	
5/9	Left Turn							2.45	
5/9	Straight & Level - 100K							2.4	
6/5	Straight & Level - 70K	0.59	0.61	0.78	1.2	0.56	0.42	2.2	
6/5	Straight & Level - 100K							2.2	
6/5	Straight & Level - 70K	<0.1	0.63	0.83	1.2	0.48	0.34	1.9	
6/6	Ground Run (6000)	0.11	0.27	0.61	0.78	0.59	0.44	1.35	
6/6	Ground Run (6400)	0.15	0.34	0.76	1.0	0.49	0.44	1.45	
6/6	Straight & Level - 80K	0.41	0.68	0.88	1.2	0.56	0.34	2.0	
6/6	Straight & Level - 80K	0.44	0.68	0.88	1.1	0.56	0.39	2.0	
6/6	Climb 500'/Minute	0.39	0.73	0.75	1.2	0.54	0.32	1.8	

SECTION E (Cont'd)

FLIGHT TEST DATA - ALARM		TAIL VIBRATION (Cont'd)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20~	20-40~	40-80~	80-160	160-320	320-500	ALL			
6/6	Climb 2500'/Minute							2.6			
6/6	Hover	0.17	0.29	0.8	1.45	0.78	0.49	2.2			
6/7	Hover	0.22	0.39	0.78	1.2	0.73	0.49	1.95			
6/6	Hover W 1000 # Load	0.32	0.29	0.98	1.95	1.25	0.78	2.9			
6/7	Hover W 1000 # Load	0.17	0.34	0.88	1.93	1.25	0.73	2.4			
6/7	Straight & Level - 70K	0.39	0.59	0.73	1.2	0.54	0.34	1.95 - 2.4			
6/7	Straight & Level - 90K	0.39	0.83	0.83	1.3	0.58	0.34	1.95 - 2.4			
6/8	Straight & Level - 70-80K	0.44	0.58	0.78	1.3	0.58	0.34	2.2			
6/8	Straight & Level - 100K							2.4			
6/8	Ground Run 6400 RPM	<0.1	0.22	0.59	0.93	0.49	0.34	1.36			
6/9	Ground Run 6400 RPM	0.12	0.24	0.68	1.02	0.54	0.44	1.45			

SECTION E (Cont'd.)

FLIGHT TEST DATA - ALARM		TAIL VIBRATION (Cont'd.)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)			
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL		
6/7	Right Turn							1.95		
6/7	Left Turn							2.2		
6/7	Maximum Takeoff							2.4		
6/7	Auto-Rotation							1.45		
6/9	Maximum Takeoff							2.2		
6/9	Climb 2500'/Minimum							2.1		
6/13	Hover W 1000 # Load	0.34	0.39	0.78	1.57	0.93	0.59	2.2		
6/14	Straight & Level 70-80K							1.95		
6/14	Straight & Level - 90-100K							2.2		
6/14	Climb 500'/Minute							1.8		
6/14	Climb 2500'/Minute							2.2		

SECTION E (Cont'd.)

FLIGHT TEST DATA - ALARM		TAIL VIBRATION (Cont'd.)					DATA RECORDED AS VECTOR VELOCITY (IN/SEC)				
DATE	ATTITUDE	10-20 ~	20-40 ~	40-80 ~	80-160	160-320	320-500	ALL			
6/14	Right Turn							2.2			
6/14	Left Turn							2.2			
6/14	Auto-Rotation							1.95			
6/14	Maximum Takeoff							2.6			
6/14	Straight & Level - 70-80K							1.95			
6/14	Straight & Level - 90-100K							2.2			
6/16	Ground Run 6400 RPM							1.57			
6/16	Hover							1.95			
6/16	Hover W 1000 # Load							2.2			
6/16	Hover @ 2000' MSL							2.9			
6/16	Hover @ 3000' MSL							2.45			

CP 41302

APPENDIX III

MALFUNCTION TEST DATA *

- A. Transmission Top Vibration
- B. Transmission Base Vibration
- C. Aft Engine Vibration
- D. Forward Engine Vibration
- E. Tail Vibration
- F. Low Frequency Mast Vibration

* All malfunction test data were recorded during the period of June 6, 1961, to November 9, 1961.

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION**

SECTION A

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
6/6	1	Reference			6.6	24.0	14.0	10.0	5.4	2.7	32.0
6/8	1	Reference			6.3	24.5	13.5	9.6	5.3	2.8	31.5
6/9	1	Reference			6.1	21.8	12.6	8.8	4.4	2.3	28.9
6/16	1	Reference									30.5
6/28	1	Reference									29.0
6/29	1	Reference									29.0
6/29	1	Main Rotor Out of Track (2 Flats)									30.0
6/29	1	Main Rotor Out of Track (3 Flats)									28-29
6/29	1	Main Rotor Unbalance (1w. W/Y)									27.0

CP11005

MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

SECTION A (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)											
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL				
6/29	1	Main Rotor Unbalance (3w. W/Y)													27.0
6/29	1	Main Rotor Unbalance (5w. W/Y)													27.0
6/30	1	Reference													28.0
6/30	1	Damper Out of Time (12 seconds)					No Change								
6/30	1	Damper Out of Time (< 1 second)					No Change								
6/30	1	R. Rear Pylon Mount @ 1/2 Torque (480"*)													26-27
6/30	1	Right Rear and Right Front Pylon Mounts @ 1/2 Torque (480"*)													27-28
6/30	1	Short Shaft Misalignment: 15 Shims (≈ .035") Re- moved, L. Rear Eng. Mount													28-29
6/30	1	Reference													29-30

CP-1000

MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

SECTION A (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
7/3	1	Reference									28-29
7/5	1	Reference									29
7/11	1	Reference									30.5
7/15	1	Reference **		1.76	5.1	17.5	24.5	6.6	2.28	1.58	28.1
7/25	1	Reference		2.2	5.73	17.5	22.0	6.15	2.29	1.67	29.0
7/25	1	Reference ***		4.85	15.8	6.15	9.7	16.7	9.7	4.4	21.1
7/25	1	Reference ****		2.64	7.05	8.35	12.3	6.15	3.52	2.2	17.6
7/27	1	Reference		2.2	6.16	7.92	11.9	6.6	3.96	2.29	17.6
7/27	1	Reference		2.46	7.05	8.35	11.9	6.16	3.96	2.2	17.6

CP111003

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)**

SECTION A (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
8/10	1	Main Rotor Unbalance (3w. W/Y) ***		3.34	10.6	4.23	7.9	9.7	5.72	2.90	18.5
8/15	2	Reference **	Yes	1.06	3.88	13.2	13.2	9.67	9.25	6.15	24.6
8/15	2	Reference	Reset Sens.								25.5
8/15	2	Reference									27.3
8/15	2	Reference									27.3
8/22	3	Reference		1.19	4.58	17.6	17.6	10.6	3.7	1.94	33.5
8/22	3	Reference ***		2.29	6.16	6.0	13.7	9.25	5.45	2.91	20.2
8/22	3	Reference ****		1.85	5.28	7.93	15.9	10.1	5.28	2.73	20.2
8/31	4	Reference **		1.2	4.0	15.8	14.3	11.8	9.7	6.2	30.0

CP11003

SECTION A (Cont'd)

MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
8/31	4	Short Shaft Misalignment .011" Shims Rem. Right Rear Engine Mount		1.2	3.9	15.0	14.0	12.2	8.8	5.7	28.0
8/31	4	Short Shaft Misalignment .023" Shims Rem. Right Rear Engine Mount									28.0
9/5	4	Short Shaft Misalignment .023" Shims Rem. Right Rear Engine Mount		1.15	3.8	14.0	13.5	11.0	8.8	5.1	27.0
9/5	4	Short Shaft Misalignment .037" Shims Rem. Right Rear Engine Mount		1.1	3.8	14.0	14.0	11.5	9.0	5.7	28.0
9/5	4	V-Band Coupling (Engine) Loss of Torque to 150"#									28.0
9/5	4	V-Band Coupling (Engine) Loss of Torque to 100"#									28.0
9/5	4	V-Band Coupling (Engine) Loss of Torque to 50"#									28.0
9/6	4	Reference		1.15	3.9	14.0	15.0	12.0	8.8	5.6	28.0
9/7	4	V-Band Coupling (Engine) Loss of Torque to 0"#									31.0

CP11003

SECTION A (Cont'd) MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
9/12	4	Engine NII Turbine Unbalance									27.0
9/14	4	Engine NII Turbine Unbalance									28.0
10/12	4	Reference		1.06	4.8	8.8	7.9	3.5	8.0	4.0	40.0
10/13	4	Reference		1.15	4.2	17.4	16.7	13.0	8.8	5.3	32.0
10/13	4	Reference		1.24	4.6	17.4	17.4	14.0	9.6	5.3	31.5
10/16	4	Reference		1.24	4.6	17.4	17.4	13.0	9.6	5.7	34.0
10/16	4	Reference		1.24	4.0	17.4	15.7	13.0	8.8	5.3	31.5
10/16	4	Reference		1.15	4.0	17.4	16.7	12.2	8.8	4.8	32.0
10/17	4	Reference		1.15	4.4	17.4	15.7	12.2	8.8	4.6	30.0

CP-10000

SECTION A (Cont'd)

MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/18	4	Reference		1.15	3.65	15.0	15.0	14.0	9.6	6.6	30.0
10/18	4	Reference		1.5	4.6	14.0	15.7	12.2	8.8	5.7	28.0
10/18	4	Short Shaft Misalignment .060" Shims Rem. R. Rear Engine Mount		1.32	4.2	14.0	15.3	14.8	9.6	6.2	30.5
10/19	4	#1 XMSN Oil Jet Clogged		1.15	4.2	12.2	15.0	11.3	7.5	5.3	25.3
10/20	4A	Annealed Gear and Bearing in XMSN Input Quill		1.2	3.65	13.0	13.5	13.5	11.3	9.6	31.5
10/21	4A	Annealed Gear and ~~Bearing in XMSN~~ Input Quill		1.15	4.8	15.7	17.4	14.8	11.3	7.9	36.5
10/23	4A	Annealed Gear and Bearing in XMSN Input Quill		1.24	4.2	12.2	15.7	11.3	10.5	9.6	29.0
10/24	4A	Annealed Gear and Bearing in XMSN Input Quill		1.15	4.2	14.0	15.0	14.0	11.3	7.0	29.0
10/24	4A	Annealed Gear and Bearing in XMSN Input Quill		1.15	4.2	12.2	15.0	13.0	11.3	9.6	31.5

GPMSS

SECTION A (Cont'd)
MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)									
				5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL		
10/25	4A	Blocked Input Quill Oil Jet		1.15	4.2	13.0	14.0	12.2	8.8	5.3	26.0		
10/26	4A	14# Torque by Collective Pitch		1.4	4.6	21.0	17.4	14.8	9.6	5.4	36.5		
10/26	4A	Normal Torque		1.15	4.2	18.3	15.7	14.0	9.6	5.1	32.0		
10/30	4A	All XMSN Oil Jets Blocked		1.15	4.0	17.4	15.0	13.0	8.3	4.8	34.0		
10/30	4A	N/C		1.15	4.0	17.4	15.0	12.2	8.6	4.8	31.5		
10/30	4A	N/C		1.32	4.2	17.4	15.7	12.2	7.5	4.2	30.0		
10/30	4A	#1 and #2 XMSN Oil Jets Blocked		1.15	3.85	17.4	15.0	13.0	8.8	4.9	33.0		
10/31	4A	#1 and #2 XMSN Oil Jets Blocked		1.06	4.0	17.4	15.0	11.3	8.3	4.7	30.5		
10/31	4A	N/C		1.24	4.2	16.7	14.0	12.2	8.3	4.8	27.0		

SECTION A (Cont'd) MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/31	4A	#1, #2, #3 - Jets Blocked		1.32	4.2	17.4	16.7	14.0	8.8	5.1	30.5
11/1	4A	N/C		1.24	4.1	17.4	15.7	13.0	8.8	5.3	29.0
11/1	4A	N/C		1.24	4.2	17.4	14.0	13.0	8.8	5.3	31.5
11/1	4A	N/C		1.15	3.85	17.4	15.0	14.0	9.1	4.9	30.5
11/2	4B	.015" Flat on Lower Mast Bearing		1.32	3.6	17.4	15.0	13.0	8.3	4.1	30.0
11/2	4B	.015" Flat + 15# Torque for 3 Min. Prior to Data		1.32	4.8	14.0	14.0	13.0	8.8	4.9	29.0
11/3	4B	Extremely Low XMSN Oil Level	Yes	1.93	5.7	24.5	28.0	28.0	16.5	15.0	57.0
11/3	4B	Extremely Low XMSN Oil Level	Yes	2.0	7.5	20.0	20.0	21.0	14.0	17.4	42.0
11/3	4B	Above Just Prior to Bearing Failure	Yes	2.63- 5.3							

CPWSS

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION TOP VIBRATION (Cont'd)**

SECTION A (Cont'd)

SECTION A		CONT. G		SECTION B		SECTION C		SECTION D		SECTION E		SECTION F		SECTION G		SECTION H		SECTION I		SECTION J		SECTION K		SECTION L		SECTION M		SECTION N		SECTION O		SECTION P		SECTION Q		SECTION R		SECTION S		SECTION T		SECTION U		SECTION V		SECTION W		SECTION X		SECTION Y		SECTION Z		SECTION AA		SECTION AB		SECTION AC		SECTION AD		SECTION AE		SECTION AF		SECTION AG		SECTION AH		SECTION AI		SECTION AJ		SECTION AK		SECTION AL		SECTION AM		SECTION AN		SECTION AO		SECTION AP		SECTION AQ		SECTION AR		SECTION AS		SECTION AT		SECTION AU		SECTION AV		SECTION AW		SECTION AX		SECTION AY		SECTION AZ		SECTION BA		SECTION BB		SECTION BC		SECTION BD		SECTION BE		SECTION BF		SECTION BG		SECTION BH		SECTION BI		SECTION BJ		SECTION BK		SECTION BL		SECTION BM		SECTION BN		SECTION BO		SECTION BP		SECTION BQ		SECTION BR		SECTION BS		SECTION BT		SECTION BU		SECTION BV		SECTION BW		SECTION BX		SECTION BY		SECTION BZ		SECTION CA		SECTION CB		SECTION CC		SECTION CD		SECTION CE		SECTION CF		SECTION CG		SECTION CH		SECTION CI		SECTION CJ		SECTION CK		SECTION CL		SECTION CM		SECTION CN		SECTION CO		SECTION CP		SECTION CQ		SECTION CR		SECTION CS		SECTION CT		SECTION CU		SECTION CV		SECTION CW		SECTION CX		SECTION CY		SECTION CZ		SECTION DA		SECTION DB		SECTION DC		SECTION DD		SECTION DE		SECTION DF		SECTION DG		SECTION DH		SECTION DI		SECTION DJ		SECTION DK		SECTION DL		SECTION DM		SECTION DN		SECTION DO		SECTION DP		SECTION DQ		SECTION DR		SECTION DS		SECTION DT		SECTION DU		SECTION DV		SECTION DW		SECTION DX		SECTION DY		SECTION DZ		SECTION EA		SECTION EB		SECTION EC		SECTION ED		SECTION EE		SECTION EF		SECTION EG		SECTION EH		SECTION EI		SECTION EJ		SECTION EK		SECTION EL		SECTION EM		SECTION EN		SECTION EO		SECTION EP		SECTION EQ		SECTION ER		SECTION ES		SECTION ET		SECTION EU		SECTION EV		SECTION EW		SECTION EX		SECTION EY		SECTION EZ		SECTION FA		SECTION FB		SECTION FC		SECTION FD		SECTION FE		SECTION FF		SECTION FG		SECTION FH		SECTION FI		SECTION FJ		SECTION FK		SECTION FL		SECTION FM		SECTION FN		SECTION FO		SECTION FP		SECTION FQ		SECTION FR		SECTION FS		SECTION FT		SECTION FU		SECTION FV		SECTION FW		SECTION FX		SECTION FY		SECTION FZ		SECTION GA		SECTION GB		SECTION GC		SECTION GD		SECTION GE		SECTION GF		SECTION GG		SECTION GH		SECTION GI		SECTION GJ		SECTION GK		SECTION GL		SECTION GM		SECTION GN		SECTION GO		SECTION GP		SECTION GQ		SECTION GR		SECTION GS		SECTION GT		SECTION GU		SECTION GV		SECTION GW		SECTION GX		SECTION GY		SECTION GZ		SECTION HA		SECTION HB		SECTION HC		SECTION HD		SECTION HE		SECTION HF		SECTION HG		SECTION HH		SECTION HI		SECTION HJ		SECTION HK		SECTION HL		SECTION HM		SECTION HN		SECTION HO		SECTION HP		SECTION HQ		SECTION HR		SECTION HS		SECTION HT		SECTION HU		SECTION HV		SECTION HW		SECTION HX		SECTION HY		SECTION HZ		SECTION IA		SECTION IB		SECTION IC		SECTION ID		SECTION IE		SECTION IF		SECTION IG		SECTION IH		SECTION II		SECTION IJ		SECTION IK		SECTION IL		SECTION IM		SECTION IN		SECTION IO		SECTION IP		SECTION IQ		SECTION IR		SECTION IS		SECTION IT		SECTION IU		SECTION IV		SECTION IW		SECTION IX		SECTION IY		SECTION IZ		SECTION JA		SECTION JB		SECTION JC		SECTION JD		SECTION JE		SECTION JF		SECTION JG		SECTION JH		SECTION JI		SECTION JJ		SECTION JK		SECTION JL		SECTION JM		SECTION JN		SECTION JO		SECTION JP		SECTION JQ		SECTION JR		SECTION JS		SECTION JT		SECTION JU		SECTION JV		SECTION JW		SECTION JX		SECTION JY		SECTION JZ		SECTION KA		SECTION KB		SECTION KC		SECTION KD		SECTION KE		SECTION KF		SECTION KG		SECTION KH		SECTION KI		SECTION KJ		SECTION KK		SECTION KL		SECTION KM		SECTION KN		SECTION KO		SECTION KP		SECTION KQ		SECTION KR		SECTION KS		SECTION KT		SECTION KU		SECTION KV		SECTION KW		SECTION KX		SECTION KY		SECTION KZ		SECTION LA		SECTION LB		SECTION LC		SECTION LD		SECTION LE		SECTION LF		SECTION LG		SECTION LH		SECTION LI		SECTION LJ		SECTION LK		SECTION LL		SECTION LM		SECTION LN		SECTION LO		SECTION LP		SECTION LQ		SECTION LR		SECTION LS		SECTION LT		SECTION LU		SECTION LV		SECTION LW		SECTION LX		SECTION LY		SECTION LZ		SECTION MA		SECTION MB		SECTION MC		SECTION MD		SECTION ME		SECTION MF		SECTION MG		SECTION MH		SECTION MI		SECTION MJ		SECTION MK		SECTION ML		SECTION MM		SECTION MN		SECTION MO		SECTION MP		SECTION MQ		SECTION MR		SECTION MS		SECTION MT		SECTION MU		SECTION MV		SECTION MW		SECTION MX		SECTION MY		SECTION MZ		SECTION NA		SECTION NB		SECTION NC		SECTION ND		SECTION NE		SECTION NF		SECTION NG		SECTION NH		SECTION NI		SECTION NJ		SECTION NK		SECTION NL		SECTION NM		SECTION NN		SECTION NO		SECTION NP		SECTION NQ		SECTION NR		SECTION NS		SECTION NT		SECTION NU		SECTION NV		SECTION NW		SECTION NX		SECTION NY		SECTION NZ		SECTION OA		SECTION OB		SECTION OC		SECTION OD		SECTION OE		SECTION OF		SECTION OG		SECTION OH		SECTION OI		SECTION OJ		SECTION OK		SECTION OL		SECTION OM		SECTION ON		SECTION OO		SECTION OP		SECTION OQ		SECTION OR		SECTION OS		SECTION OT		SECTION OU		SECTION OV		SECTION OW		SECTION OX		SECTION OY		SECTION OZ		SECTION PA		SECTION PB		SECTION PC		SECTION PD		SECTION PE		SECTION PF		SECTION PG		SECTION PH		SECTION PI		SECTION PJ		SECTION PK		SECTION PL		SECTION PM		SECTION PN		SECTION PO		SECTION PP		SECTION PQ		SECTION PR		SECTION PS		SECTION PT		SECTION PU		SECTION PV		SECTION PW		SECTION PX		SECTION PY		SECTION PZ		SECTION QA		SECTION QB		SECTION QC		SECTION QD		SECTION QE		SECTION QF		SECTION QG		SECTION QH		SECTION QI		SECTION QJ		SECTION QK		SECTION QL		SECTION QM		SECTION QN		SECTION QO		SECTION QP		SECTION QQ		SECTION QR		SECTION QS		SECTION QT		SECTION QU		SECTION QV		SECTION QW		SECTION QX		SECTION QY		SECTION QZ		SECTION RA		SECTION RB		SECTION RC		SECTION RD		SECTION RE		SECTION RF		SECTION RG		SECTION RH		SECTION RI		SECTION RJ		SECTION RK		SECTION RL		SECTION RM		SECTION RN		SECTION RO		SECTION RP		SECTION RQ		SECTION RR		SECTION RS		SECTION RT		SECTION RU		SECTION RV		SECTION RW		SECTION RX		SECTION RY		SECTION RZ		SECTION SA		SECTION SB		SECTION SC		SECTION SD		SECTION SE		SECTION SF		SECTION SG		SECTION SH		SECTION SI		SECTION SJ		SECTION SK		SECTION SL		SECTION SM		SECTION SN		SECTION SO		SECTION SP		SECTION SQ		SECTION SR		SECTION SS		SECTION ST		SECTION SU		SECTION SV		SECTION SW		SECTION SX		SECTION SY		SECTION SZ		SECTION TA		SECTION TB		SECTION TC		SECTION TD		SECTION TE		SECTION TF		SECTION TG		SECTION TH		SECTION TI		SECTION TJ		SECTION TK		SECTION TL		SECTION TM		SECTION TN		SECTION TO		SECTION TP		SECTION TQ		SECTION TR		SECTION TS		SECTION TT		SECTION TU		SECTION TV		SECTION TW		SECTION TX		SECTION TY		SECTION TZ		SECTION UA		SECTION UB		SECTION UC		SECTION UD		SECTION UE		SECTION UF		SECTION UG		SECTION UH		SECTION UI		SECTION UJ		SECTION UK		SECTION UL		SECTION UM		SECTION UN		SECTION UO		SECTION UP		SECTION UQ		SECTION UR		SECTION US		SECTION UT		SECTION UV		SECTION UW		SECTION UX		SECTION UY		SECTION UZ		SECTION VA		SECTION VB		SECTION VC		SECTION VD		SECTION VE		SECTION VF		SECTION VG		SECTION VH		SECTION VI		SECTION VJ		SECTION VK		SECTION VL		SECTION VM		SECTION VN		SECTION VO		SECTION VP		SECTION VQ		SECTION VR		SECTION VS		SECTION VT		SECTION VU		SECTION VV		SECTION VW		SECTION VX		SECTION VY		SECTION VZ		SECTION WA		SECTION WB		SECTION WC		SECTION WD		SECTION WE		SECTION WF		SECTION WG		SECTION WH		SECTION WI		SECTION WJ		SECTION WK		SECTION WL		SECTION WM		SECTION WN		SECTION WO		SECTION WP		SECTION WQ		SECTION WR		SECTION WS		SECTION WT		SECTION WU		SECTION WV		SECTION WY		SECTION WZ		SECTION XA		SECTION XB		SECTION XC		SECTION XD		SECTION XE		SECTION XF		SECTION XG		SECTION XH		SECTION XI		SECTION XJ		SECTION XK		SECTION XL		SECTION XM		SECTION XN		SECTION XO		SECTION XP		SECTION XQ		SECTION XR		SECTION XS		SECTION XT		SECTION XU		SECTION XV		SECTION VX		SECTION VY		SECTION VZ		SECTION YA		SECTION YB		SECTION YC		SECTION YD		SECTION YE		SECTION YF		SECTION YG		SECTION YH		SECTION YI		SECTION YJ		SECTION YK		SECTION YL		SECTION YM		SECTION YN		SECTION YO		SECTION YP		SECTION YQ		SECTION YR		SECTION YS		SECTION YT		SECTION YU		SECTION YV		SECTION YW		SECTION YX		SECTION YY		SECTION YZ		SECTION ZA		SECTION ZB		SECTION ZC		SECTION ZD		SECTION ZE		SECTION ZF		SECTION ZG		SECTION ZH		SECTION ZI		SECTION ZJ		SECTION ZK		SECTION ZL		SECTION ZM		SECTION ZN		SECTION ZO		SECTION ZP		SECTION ZQ		SECTION ZR		SECTION ZS		SECTION ZT		SECTION ZU		SECTION ZV		SECTION ZW		SECTION ZX		SECTION ZY		SECTION ZZ		SECTION AA		SECTION AB		SECTION AC		SECTION AD		SECTION AE		SECTION AF		SECTION AG		SECTION AH		SECTION AI		SECTION AJ		SECTION AK		SECTION AL		SECTION AM		SECTION AN		SECTION AO		SECTION AP		SECTION AQ		SECTION AR		SECTION AS		SECTION AT		SECTION AU		SECTION AV		SECTION AW		SECTION AX		SECTION AY		SECTION AZ		SECTION BA		SECTION BB		SECTION BC		SECTION BD		SECTION BE		SECTION BF		SECTION BG		SECTION BH		SECTION BI		SECTION BJ		SECTION BK		SECTION BL		SECTION BM		SECTION BN		SECTION BO		SECTION BP		SECTION BQ		SECTION BR		SECTION BS		SECTION BT		SECTION BU		SECTION BV		SECTION BW		SECTION BX		SECTION BY		SECTION BZ		SECTION CA		SECTION CB		SECTION CC		SECTION CD		SECTION CE		SECTION CF		SECTION CG		SECTION CH		SECTION CI		SECTION CJ		SECTION CK		SECTION CL		SECTION CM		SECTION CN		SECTION CO		SECTION CP		SECTION CQ		SECTION CR		SECTION CS		SECTION CT		SECTION CU		SECTION CV		SECTION CW		SECTION CX		SECTION CY		SECTION CZ		SECTION DA		SECTION DB		SECTION DC		SECTION DD		SECTION DE		SECTION DF		SECTION DG		SECTION DH		SECTION DI		SECTION DJ		SECTION DK		SECTION DL		SECTION DM		SECTION DN		SECTION DO		SECTION DP		SECTION DQ		SECTION DR		SECTION DS		SECTION DT		SECTION DU		SECTION DV		SECTION DW		SECTION DX		SECTION DY		SECTION DZ		SECTION EA		SECTION EB		SECTION EC		SECTION ED		SECTION EE		SECTION EF		SECTION EG		SECTION EH		SECTION EI		SECTION EJ		SECTION EK		SECTION EL		SECTION EM		SECTION EN		SECTION EO		SECTION EP		SECTION EQ		SECTION ER		SECTION ES		SECTION ET		SECTION EU		SECTION EV		SECTION EW		SECTION EX		SECTION EY		SECTION EZ		SECTION FA		SECTION FB		SECTION FC		SECTION FD		SECTION FE		SECTION FG		SECTION FH		SECTION FI		SECTION FJ		SECTION FK		SECTION FL		SECTION FM		SECTION FN		SECTION FO		SECTION FP		SECTION FQ		SECTION FR		SECTION FS		SECTION FT		SECTION FU		SECTION FV		SECTION FW		SECTION FX		SECTION FY		SECTION FZ		SECTION GA		SECTION GB		SECTION GC		SECTION GD		SECTION GE		SECTION GF		SECTION GG		SECTION GH		SECTION GI		SECTION GJ		SECTION GK		SECTION GL		SECTION GM		SECTION GN		SECTION GO		SECTION GP		SECTION GQ		SECTION GR		SECTION GS		SECTION GT		SECTION GU		SECTION GV		SECTION GW		SECTION GX		SECTION GY		SECTION GZ		SECTION HA		SECTION HB		SECTION HC		SECTION HD		SECTION HE		SECTION HF		SECTION HG		SECTION HI		SECTION HJ		SECTION HK		SECTION HL		SECTION HM		SECTION HN		SECTION HO		SECTION HP		SECTION HQ		SECTION HR		SECTION HS		SECTION HT		SECTION HU		SECTION HV		SECTION HW		SECTION HX		SECTION HY		SECTION HZ		SECTION IA		SECTION IB		SECTION IC		SECTION ID		SECTION IE		SECTION IF		SECTION IG		SECTION IH		SECTION II		SECTION IJ		SECTION IK		SECTION IL		SECTION IM		SECTION IN		SECTION IO		SECTION IP		SECTION IQ		SECTION IR		SECTION IS		SECTION IT		SECTION IU		SECTION IV		SECTION IW		SECTION IX		SECTION IY		SECTION IZ		SECTION JA		SECTION JB		SECTION JC		SECTION JD		SECTION JE		SECTION JF		SECTION JG		SECTION JH		SECTION JI		SECTION JJ		SECTION JK		SECTION JL		SECTION JM		SECTION JN		SECTION JO		SECTION JP		SECTION JQ		SECTION JR		SECTION JS		SECTION JT		SECTION JU		SECTION JV		SECTION JW		SECTION JX		SECTION JY		SECTION JZ		SECTION KA		SECTION KB		SECTION KC		SECTION KD		SECTION KE		SECTION KF		SECTION KG		SECTION KH		SECTION KI		SECTION KJ		SECTION KK		SECTION KL		SECTION KM		SECTION KN		SECTION KO		SECTION KP		SECTION KQ		SECTION KR		SECTION KS		SECTION KT		SECTION KU		SECTION KV		SECTION KW		SECTION KX		SECTION KY		SECTION KZ		SECTION LA		SECTION LB		SECTION LC		SECTION LD		SECTION LE		SECTION LF		SECTION LG		SECTION LH		SECTION LI		SECTION LJ		SECTION LK		SECTION LL		SECTION LM		SECTION LN		SECTION LO		SECTION LP		SECTION LQ		SECTION LR		SECTION LS		SECTION LT		SECTION LU		SECTION LV		SECTION LW		SECTION LX		SECTION LY		SECTION LZ		SECTION MA		SECTION MB		SECTION MC		SECTION MD		SECTION ME		SECTION MF		SECTION MG		SECTION MH		SECTION MI		SECTION MJ		SECTION MK		SECTION ML		SECTION MM		SECTION MN		SECTION MO		SECTION MP		SECTION MQ		SECTION MR		SECTION MS		SECTION MT		SECTION MU		SECTION MV		SECTION MW		SECTION MX		SECTION MY		SECTION MZ		SECTION NA		SECTION NB		SECTION NC		SECTION ND		SECTION NE		SECTION NF		SECTION NG		SECTION NH		SECTION NI		SECTION NJ		SECTION NK		SECTION NL		SECTION NM		SECTION NN		SECTION NO		SECTION NP		SECTION NQ		SECTION NR		SECTION NS		SECTION NT		SECTION NU		SECTION NV		SECTION NW		SECTION NX		SECTION NY		SECTION NZ		SECTION OA		SECTION OB		SECTION OC		SECTION OD		SECTION OE		SECTION OF		SECTION OG		SECTION OH		SECTION OI		SECTION OJ		SECTION OK		SECTION OL		SECTION OM		SECTION ON		SECTION OO		SECTION OP		SECTION OQ		SECTION OR		SECTION OS		SECTION OT		SECTION OU		SECTION OV		SECTION OW		SECTION OX		SECTION OY		SECTION OZ		SECTION PA		SECTION PB		SECTION PC		SECTION PD		SECTION PE		SECTION PF		SECTION PG		SECTION PH		SECTION PI		SECTION PJ		SECTION PK		SECTION PL		SECTION PM		SECTION PN		SECTION PO		SECTION PP		SECTION PQ		SECTION PR		SECTION PS		SECTION PT		SECTION PU		SECTION PV		SECTION PW		SECTION PX		SECTION PY		SECTION PZ		SECTION QA		SECTION QB		SECTION QC		SECTION QD		SECTION QE		SECTION QF		SECTION QG		SECTION QH		SECTION QI		SECTION QJ		SECTION QK		SECTION QL		SECTION QM		SECTION QN		SECTION QO		SECTION QP		SECTION QQ		SECTION QR		SECTION QS		SECTION QT		SECTION QU		SECTION QV		SECTION QW		SECTION QX		SECTION QY		SECTION QZ		SECTION RA		SECTION RB		SECTION RC		SECTION RD		SECTION RE		SECTION RF		SECTION RG		SECTION RH		SECTION RI		SECTION RJ		SECTION RK		SECTION RL		SECTION RM		SECTION RN		SECTION RO		SECTION RP		SECTION RQ		SECTION RR		SECTION RS		SECTION RT		SECTION RU		SECTION RV		SECTION RW		SECTION RX		SECTION RY		SECTION RZ		SECTION SA		SECTION SB		SECTION SC		SECTION SD		SECTION SE		SECTION SF		SECTION SG		SECTION SH		SECTION SI		SECTION SJ		SECTION SK		SECTION SL		SECTION SM		SECTION SN		SECTION SO		SECTION SP		SECTION SQ		SECTION SR		SECTION SS		SECTION ST		SECTION SU		SECTION SV		SECTION SW		SECTION SX		SECTION SY		SECTION SZ		SECTION TA		SECTION TB		SECTION TC		SECTION TD		SECTION TE		SECTION TF		SECTION TG		SECTION TH		SECTION TI		SECTION TJ		SECTION TK		SECTION TL		SECTION TM		SECTION TN		SECTION TO		SECTION TP		SECTION TQ		SECTION TR		SECTION TS		SECTION TT		SECTION TU		SECTION TV		SECTION TW		SECTION TX		SECTION TY		SECTION TZ		SECTION UA	
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MALFUNCTION TEST DATA -ALARM
TRANSMISSION TOP VIBRATION (Cont'd)

SECTION A (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK) .												
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL					
		4. XMSN Replaced (XMSN SN A12-78)														
		4A. XMSN Input Quill Replaced (Annealed Gear & Bearing)														
		4B. .015" Flat Introduced on Lower Mast Bearing (Inner Race)														
		4C. Original Input Quill Re- installed; Upper Plane- tary Gear Ass'y Repl.														

CP1000

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)**

SECTION B

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)						
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc ALL
6/6	1	Reference			3.2	8.5	11.0	7.1	4.1	2.85 16.0
6/8	1	Reference			3.15	7.8	10.5	6.8	3.8	3.0 15.8
6/9	1	Reference			3.15	8.2	12.0	7.5	4.2	2.85 17.0
6/16	1	Reference								16.5
6/28	1	Reference								15.8
6/29	1	Reference								15.4
6/29	1	Main Rotor Out of Track (1 Flat)					No Change			-----
6/29	1	Main Rotor Out of Track (2 Flats)								15.8
6/29	1	Main Rotor Out of Track (3 Flats)								15.8- 16.5

CP11008

SECTION B (Cont'd)

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)								
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL	
6/29	1	Main Rotor Unbalance (1w. W/Y)										15.4
6/29	1	Main Rotor Unbalance (3w. W/Y)										15.4
6/29	1	Main Rotor Unbalance (5w. W/Y)										15.0
6/30	1	Reference										15.8
6/30	1	Damper Out of Time (12 Sec.)					No Change					-----
6/30	1	Damper Out of Time (< 1 Sec.)					No Change					-----
6/30	1	R. Rear Pylon Mount @ 1/2 Torque (480"#)										15.0- 15.8
6/30	1	R. Front & Rear Pylon Mounts @ 1/2 Torque (480"#)										15.0- 15.8
6/30	1	Short Shaft Misalignment: 15 Shims Removed (≈ 035") L. Rear Eng. Mount	Yes									17.2- 18.0

CPH000

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)								ALL	
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc			
6/30	1	Reference											16.1- 16.5
7/3	1	Reference											16.5- 17.2
7/5	1	Reference											16.5
7/11	1	Reference											16.5- 17.2
7/16	1	Reference		1.35	3.6	10.5	15.0	7.5	4.5	8.15	17.3		
7/28	1	Reference		1.12	3.38	9.0	11.2	6.75	4.5	3.14	15.7		
8/7	1	Reference		0.975	2.85	6.74	10.5	5.24	3.15	2.1	15.0		
8/8	1	Reference		1.05	2.85	6.75	9.75	5.4	3.38	2.25	15.0		
8/9	1	Reference		0.975	3.0	8.62	10.5	5.62	3.60	2.62	15.7		

CP1000

SECTION B (Cont'd)

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK) *							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
8/15	2	Reference (Note Condition Code)	Yes	2.55	4.88	9.0	12.0	8.25	5.1	3.0	20.3
8/15	2	Reference	Reset Sens.								18.0
8/15	2	Reference									18.8
8/22	3	Reference		3.3	5.4	9.0	13.5	7.88	5.25	3.0	21.0
8/31	4	Reference		0.75	2.25	6.7	8.6	6.75	3.9	2.4	15.0
8/31	4	Short Shaft Misalignment; (.011") Shims Removed, R. Rear Engine Mount		0.72	1.5	7.1	9.5	7.0	4.1	2.25	14.5
8/31	4	Short Shaft Misalignment; (.023") Shims Removed R. Rear Engine Mount									14.5
9/5	4	Short Shaft Misalignment; (.023") Shims Removed, R. Rear Engine Mount		0.90	2.9	6.2	8.2	6.8	4.2	2.4	14.5
9/5	4	Short Shaft Misalignment; (.037") Shims Removed, R. Rear Engine Mount		0.83	2.5	6.4	8.2	6.6	4.4	2.4	14.5

CP11000

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

SECTION B (Cont'd)

DATE		CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK) .							
					.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
9/5		4	V-Band Coupling (Engine) Loss of Torque to 150" #									14.0
9/5		4	V-Band Coupling (Engine) Loss of Torque to 100" #									14.0
9/5		4	V-Band Coupling (Engine) Loss of Torque to 50" #									14.0
9/6		4	Reference		0.95	2.65	6.4	8.5	6.5	4.2	2.4	14.5
9/7		4	V-Band Coupling (Engine) Loss of Torque to 0" #	Yes								~~15.5~~
9/12		4	NII Turbine Unbalance									14.5
9/14		4	NII Turbine Unbalance									14.5
10/12		4	Reference		0.68	2.85	0.98	2.25	0.68	0.345	0.225	18.0
10/13		4	Reference		0.83	2.35	6.0	9.4	7.3	4.5	2.35	15.0

CP11000

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/13	4	Reference		0.83	2.4	5.6	9.4	6.8	4.05	2.1	15.0
10/16	4	Reference		0.90	2.65	7.1	12.3	7.1	3.9	2.1	15.0
10/16	4	Reference		0.90	2.4	6.8	11.2	6.8	3.8	2.1	15.0
10/16	4	Reference		0.83	2.55	6.8	9.8	6.4	4.1	2.85	15.0
10/17	4	Reference		0.83	2.4	6.8	9.0	6.4	3.8	2.25	13.5
10/18	1	Reference		0.75	2.25	7.5	11.2	6.8	3.9	2.35	15.0
10/18	4	Short Shaft Misalignment; .040" Shims Removed, R. Rear Engine Mount		0.90	2.85	7.1	11.2	7.1	4.1	2.2	15.8
10/18	4	Short Shaft Misalignment; .040" Shims Removed, R. Rear Engine Mount		0.83	2.4	6.8	9.8	6.4	3.6	2.03	15.0
10/18	4	Reference		0.75	2.25	6.4	9.8	6.3	3.8	1.95	15.0

CP11000

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/18	4	Short Shaft Misalignment; .060" Shims Removed, R. Rear Engine Mount		0.72	2.35	6.8	10.5	6.4	3.9	1.95	15.8
10/18	4	Short Shaft Misalignment; .060" Shims Removed, R. Rear Engine Mount		0.75	2.1	6.6	9.8	6.6	3.6	2.1	15.8
10/18	4	Short Shaft Misalignment; .080" Shims Removed, R. Rear Engine Mount		0.68	2.25	7.1	10.5	6.3	3.45	1.6	15.0
10/18	4	Short Shaft Misalignment; .100" Shims Removed, R. Rear Engine Mount		0.72	2.5	6.3	9.8	6.4	3.45	1.9	15.0
10/18	4	Short Shaft Misalignment; .123" Shims Removed, R. Rear Engine Mount		0.64	2.2	6.0	9.8	6.4	3.8	1.95	15.0
10/18	4	Reference		0.83	2.4	4.9	9.8	6.8	3.9	2.03	15.0
10/19	4	XMSN Oil Jet #1 Blocked		0.90	2.7	6.8	9.0	6.8	3.8	2.1	15.0
10/20	4A	XMSN Input Quill Re- placed; Annealed Gear and Bearing	Yes	0.90	2.2	6.8	9.8	7.5	5.3	3.15	16.5
10/20	4A	Condition as Above	Yes	0.83	2.35	6.8	11.2	7.5	5.3	3.3	16.5

CP11008

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)**

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/20	4A	Condition as Above	Yes	1.05	2.5	7.1	9.8	8.0	5.4	3.4	17.2
10/20	4A	Condition as Above	Yes	0.83	2.25	6.8	10.9	7.5	5.4	3.15	17.2
10/21	4A	Condition as Above	Yes	1.13	3.3	9.4	11.2	9.8	6.6	4.05	19.5
10/23	4A	Condition as Above	Yes	1.35	3.0	8.3	9.8	8.6	6.4	3.8	18.8
10/24	4A	Condition as Above	Yes	1.05	2.85	8.3	10.5	9.0	7.1	3.8	18.0
10/24	4A	Condition as Above	Yes	0.98	2.55	8.3	11.2	9.0	6.4	3.8	18.0
10/24	4A	Condition as Above	Yes	1.05	3.0	8.3	12.0	9.4	6.6	3.9	18.7
10/25	4A	Input Quill Oil Jet Blocked	Yes	0.98	2.55	7.1	10.0	8.3	5.5	3.15	16.5
10/26	4A	#1, #2, Input Quill Jets and Line to Ring Jets Blocked	Yes	1.2	2.7	7.5	10.5	8.6	5.6	3.0	18.0

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Contd)**

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
10/30	4A	All XMSN Oil Jets Blocked	Yes	0.90	2.4	6.8	10.5	8.0	5.3	3.0	16.5
10/30	4A	N/C	Yes	1.2	2.8	8.3	10.9	9.0	6.8	3.6	18.7
10/30	4A	N/C	Yes	1.2	3.15	8.3	11.2	9.8	7.5	3.9	18.7
10/30	4A	#1 & #2 Oil Jets Blocked	Yes	1.06	3.0	8.3	11.2	9.8	7.5	4.2	20.2
10/31	4A	#1 & #2 Oil Jets Blocked	Yes	0.98	2.7	8.3	10.5	9.0	6.8	4.05	18.7
10/31	4A	N/C	Yes	1.13	2.7	7.5	10.5	8.3	5.6	3.0	16.5
10/31	4A	#1, #2, #3 Jets Blocked	Yes	1.05	2.85	8.3	11.2	9.4	6.4	3.6	18.7
11/1	4A	N/C	Yes	1.13	3.15	8.3	12	9.0	6.4	3.6	18.7
11/1	4A	N/C	Yes	1.05	2.7	8.0	10.5	9.8	6.4	3.8	18.7

**MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)**

SECTION B (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK)							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
11/1	4A	N/C	Yes	1.05	3.15	8.3	11.2	10	7.5	4.5	19.5
11/2	4B	.015" Flat on Lower Mast Bearing	Yes	1.05	3.0	8.6	13.5	11.6	8.0	4.05	21
11/2	4B	.015" Flat +15# Torque for 3 mins. Prior	Yes	2.55	3.8	8.3	10.5	9.0	6.4	3.4	19.5
11/3	4B	Extremely Low XMSN Oil Level	Yes	1.5	4.7	15.8	25.5	14.2	9.0	5.1	37.5
11/3	4B	Extremely Low XMSN Oil Level	Yes	1.5	6.4	9.8	20.2	13.5	8.3	9.0	30
11/6	4C	XMSN Output Quill Disconnected		1.05	3.4	8.3	12	6.4	3.3	1.9	17.2
11/6	4C	XMSN Output Quill Disconnected		0.90	2.5	5.9	9.8	5.6	2.8	1.7	14.2
11/6	4C	XMSN Output Quill Disconnected		0.83	2.4	5.3	9.0	5.3	3.0	1.7	14.2
11/6	4C	Reference Tail Rotor (Output Quill Connected)		0.83	2.65	7.1	10.5	6.4	3.6	2.25	15.8

CP1000

SECTION B (Cont'd)

MALFUNCTION TEST DATA-ALARM
TRANSMISSION BASE VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED IN G'S (PK) .							
				.5-1kc	1-2kc	2-4kc	4-8kc	8-12kc	12-16kc	16-20kc	ALL
11/7	4C	Reference		0.90	2.7	7.1	11.2	6.0	3.4	2.1	-----
11/8	4C	Reference		0.98	2.85	7.5	11.2	7.1	4.1	2.25	17.2
		CODE DESIGNATIONS									
	1.	Flight Test Components (XMSN SN A12-20)									
	2.	XMSN & Main Mast Re- placed (XMSN SN A-12- 142)									
	3.	Engine Replaced									
	4.	XMSN Replaced (XMSN SN A12-78)									
	4A.	XMSN Input Quili Re- placed (Annealed Gear & Bearing									
	4B.	.015" Flat Introduced on Lower Mast Bearing (Inner Race)									

CP11003

SECTION B (Cont'd)

[illegible]

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION

SECTION C

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								
				20-40~	40-80~	80-160	160-320	320-500	500-1k	1-2 kc	ALL	
6/28	1	Reference										0.59 **
6/30	1	Reference										0.56 **
6/30	1	Short Shaft Misalignment: 15 Shim Removed L. Rear Engine Mount. ($\approx .035''$)										0.68- ** 0.73
6/30	1	Reference										0.56- ** 0.59
7/3	1	Reference										0.59- ** 0.64
7/3	1	Reference										0.64 **
7/5	1	Reference										0.64 **
7/11	1	Reference										0.59- ** 0.64
7/11	1	Tail Rotor Out of Track (4-1/2 Turns)										0.59- ** 0.68

CPI1005

* Pick-up Output Directly into Meter (No Circuit Load) ** All Data: 10-500 CPS

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
7/11	1	Reference									0.59- 0.64
7/11	1	Tail Rotor Unbalance (1 Wrap)									0.64 **
7/11	1	Tail Rotor Unbalance (2 Wraps)	Yes								0.78- 0.83
7/24	1	Reference *		0.123	0.147	0.27	0.343	0.368	0.416	0.515	0.93
7/25	1	Reference *		0.147	0.128	0.27	0.343	0.343	0.343	0.44	0.88
8/7	1	Reference		0.147	0.10	0.196	0.245	0.265	0.270	0.367	0.686
8/8	1	Reference		0.10	<.1	0.196	0.245	0.294	0.255	0.343	0.735
8/15	2	Reference		0.10	<.1	0.162	0.264	0.255	0.270	0.343	0.635
8/22	3(x)	Reference		<.1	<.1	0.113	0.196	0.176	0.152	0.206	0.44

* Pick-up Output Directly into Meter (No Circuit Load) ** All Data: 10-500 CPS

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
8/31	4(x)	Reference		0.12	0.107	0.12	0.22	0.185	0.15	0.18	0.46
8/31	4(x)	Short Shaft Misalignment; (.011") Shims Removed, R. Rear Engine Mount		0.12	0.10	0.12	0.195	0.165	0.145	0.18	0.46
8/31	4(x)	Short Shaft Misalignment; (.023") Shims Removed R. Rear Engine Mount		0.10	0.09	0.12	0.21	0.17	0.145	0.17	0.46
9/5	4(x)	Short Shaft Misalignment; (.023") Shims Removed, R. Rear Engine Mount		0.09	0.085	0.12	0.21	0.17	0.145	0.175	0.44
9/5	4(x)	Short Shaft Misalignment; (.037") Shims Removed, R. Rear Engine Mount		0.10	0.08	0.11	0.195	0.18	0.145	0.18	0.44
9/5	4(x)	V-Band Coupling(Engine) Loss of Torque to 150"#.		0.145	0.10	0.12	0.195	0.16	0.14	0.17	0.44
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 100"#.		0.12	0.10	0.12	0.205	0.17	0.145	0.17	0.46
9/5	4(x)	V-Band, Coupling (Engine) Loss of Torque to 50"#.		0.12	0.09	0.11	0.195	0.185	0.145	0.16	0.44
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 0"#.									0.46

CPH088

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1ke	1-2ke	ALL
9/6	4(x)	Reference ("Bishop's Hat" Installed)		0.10	0.075	0.10	0.215	0.21	0.16	0.17	0.46
9/6	4(x)	"Bishop's Hat" Mounting Bolt @ 0 Torque.									0.49
9/7	4(x)	V-Band Coupling (Engine) Loss of Torque to 0"#, Free Turning		0.105	0.085	0.10	0.22	0.195	0.145	0.160	0.46
9/12	4	III Turbine Unbalance (180° Orientation)		0.09	0.085	0.11	0.18	0.185	0.145	0.16	0.44
9/14	4	III Turbine Unbalance (90° Orientation)		0.10	0.08	0.107	0.22	0.195	0.145	0.17	0.46
9/18	4	III Turbine Rebalanced (Reference)		0.09	0.08	0.09	0.17	0.15	0.145	0.165	0.44
10/12	4	Reference		-----	-----	0.098	0.22	0.205	0.165	0.185	0.46
10/12	4	Reference		0.098	0.098	0.106	0.22	0.205	0.155	0.11	0.44- 0.49
10/12	4	Tail Rotor Unbalance (2 Wraps)	Yes								0.78

CP1100

**MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)**

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/13	4	Tail Rotor Unbalance (1 Wrap)		0.215	0.11	0.11	0.245	0.22	0.175	0.17	0.64
10/13	4	Reference		0.106	0.098	0.125	0.225	0.205	0.14	0.185	0.54
10/16	4	Reference		0.12	0.117	0.106	0.235	0.27	0.17	0.17	0.56
10/16	4	Misaligned 42° Gear Box		0.12	0.098	0.098	0.22	0.22	0.17	0.17	0.54
10/16	4	Reference		----	----	0.098	0.22	0.22	0.155	0.165	0.49
10/17	4	Reference		0.106	----	0.098	0.22	0.195	0.155	0.17	0.54
10/18	4	Reference		0.098	0.098	0.10	0.245	0.225	0.16	0.17	0.54
10/18	4	Short Shaft Misalignment; .040" Shims Removed, R. Rear Engine Mount		0.10	0.098	0.098	0.215	0.17	0.15	0.155	0.49
10/18	4	Reference (Shims Reinstalled)		0.098	----	0.098	0.205	0.195	0.145	0.155	0.49

CP1000

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/18	4	Short Shaft Misalignment; .060" Shims Removed, R. Rear Engine Mount.		----	0.098	0.098	0.22	0.195	0.136	0.155	0.54
10/18	4	Short Shaft Misalignment; .100" Shims Removed, R. Rear Engine Mount		0.098	0.106	0.098	0.215	0.195	0.14	0.165	0.54
10/18	4	Short Shaft Misalignment; .123" Shims Removed, R. Rear Engine Mount		----	----	0.098	0.235	0.205	0.14	0.165	0.54
10/18	4	Reference (Shims Reinstalled)		----	0.098	----	0.245	0.22	0.145	0.155	0.54
10/19	4	Reference		----	0.098	0.098	0.24	0.205	0.15	0.16	0.54
10/20	4	Reference (Annealed Input Grill - XMSN)		----	0.098	0.106	0.245	0.205	0.15	0.155	0.51
10/21	4	Reference		----	0.106	0.106	0.205	0.37	0.155	0.155	0.51
10/23	4	Reference		----	0.098	0.106	0.225	0.22	0.155	0.16	0.51
10/24	4	Reference		----	0.098	0.117	0.22	0.22	0.145	0.17	0.54

CPH000

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

SECTION C (Cont'd)

DATE		CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
					20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/24	4		Cycling, Audible Noise- Not Present		----	----	0.106	0.22	0.195	0.145	0.155	0.54
10/24	4		Cycling, Audible Noise- Present	Yes	----	----	0.106	0.39	0.33	0.22	0.22	0.98
10/24	4		Reference *		0.098	----	----	0.195	0.195	0.145	0.17	0.51
10/25	4		Reference		----	0.098	0.11	0.225	0.205	0.145	0.155	0.51
10/25	4		Tail Rotor Unbalance (2 Wraps)	Yes	0.34	0.117	0.10	0.27	0.205	0.15	0.165	0.68
10/25	4		Tail Rotor Unbalance (1 Wrap)	Yes	0.215	0.098	0.098	0.22	0.215	0.14	0.155	0.62
10/25	4		Tail Rotor Unbalance (1/2 Wrap)		0.145	0.098	0.117	0.235	0.205	0.145	0.165	0.56
10/25	4		Reference		0.098	0.098	0.098	0.215	0.195	0.145	0.155	0.49
10/26	4		Reference (Unexplained Vib. Increase) *	Yes	0.145	0.098	----	0.215	0.175	0.145	0.17	0.49

* Tail Rotor Torque Applied for Short Period During Run.

CP11005

SECTION C (Cont'd)

MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40~	40-80~	80-160	160-320	320-500	500-1kg	1-2kg ALL
10/30	4	Reference *		0.11	-----	0.10	0.22	0.22	0.145	0.17 0.44
10/30	4	Short Shaft Unbalance ($\approx$ 20 grams)	Yes	0.12	0.098	0.165	0.235	0.245	0.155	0.165 0.62
10/30	4	Reference		-----	0.098	0.117	0.22	0.195	0.13	0.165 0.51
10/30	4	Reference (420 GB Failure)		-----	0.098	0.117	0.225	0.205	0.14	0.165 0.54
10/30	4	Reference		-----	0.098	0.11	0.22	0.205	0.145	0.165 0.51
10/31	4	Reference		-----	0.117	0.106	0.215	0.185	0.136	0.17 0.51
10/31	4	Reference (Low Oil Level - 90° GB)		-----	-----	0.10	0.22	0.195	0.136	0.16 0.51
10/31	4	Reference		-----	-----	0.11	0.22	0.195	0.145	0.165 0.51
11/1	4	Reference		0.098	0.098	0.117	0.22	0.195	0.145	0.165 0.51

* Tail Rotor Torque Applied for Short Period During Run

**MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)**

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2 kc	ALL
11/1	4	Tail Rotor Unbalance (1 Wrap)	Yes	0.22	0.11	0.106	0.22	0.215	0.136	0.125	0.51
11/1	4	Tail Rotor Unbalance (1/2 Wrap)	Yes	0.22	0.106	0.106	0.22	0.21	0.136	0.145	0.54
11/1	4	Tail Rotor Unbalance (1/2 Wrap)		0.145	0.098	0.125	0.245	0.205	0.136	0.15	0.54
11/1	4	Reference		0.13	0.098	0.117	0.235	0.22	0.136	0.155	0.54
11/1	4	Reference		0.12	0.106	0.11	0.225	0.18	0.136	0.15	0.51
11/1	4	Reference (Low Oil Level - 90° GB)		0.11	0.098	0.117	0.245	0.195	0.136	0.155	0.54
11/2	4	Reference (.015" Flat, Lower Mast Bearing)	Yes	0.12	0.098	0.117	0.29	0.27	0.145	0.15	0.59
11/2	4	Reference (.015" Flat, +15# Torque Prior)	Yes	0.098	0.098	0.117	0.27	0.215	0.14	0.16	0.56
11/3	4	Extremely Low Oil Level - XMSN	Yes	0.098	0.098	0.117	0.29	0.245	0.115	0.165	0.59

CPH005

**MALFUNCTION TEST DATA-ALARM.
AFT ENGINE VIBRATION (Cont'd)**

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2 kc	ALL
11/4	4	Short Shaft (XMSN Drive) Disconnected		----	----	0.12	0.32	0.12	0.117	0.145	0.37
11/4	4	Short Shaft (XMSN Drive) Disconnected		----	----	0.155	0.27	0.12	0.12	0.145	0.37
11/4	4	As Above + Audible Noise Present									0.44
11/6	4	XMSN Output Quill (T/R Drive) Disconnected; Short Shaft Connected		----	----	0.09	0.275	0.22	0.155	0.155	0.54
11/6	4	As Above		----	----	0.09	0.27	0.22	0.145	0.155	0.54
11/6	4	Reference	Yes**	0.098	0.098	0.098	0.32	0.29	0.145	0.155	0.64
11/7	4	Engine Mount Pillow Ass'y's @ 0 Torque	Yes	0.145	0.098	0.10	0.32	0.29	0.17	0.155	0.62
11/7	4	Reference	Yes	0.125	0.098	0.098	0.30	0.27	0.16	0.155	0.64
11/8	4	Reference (Re-Annealed 90° GB I/Q Gear)	Yes	0.11	0.098	0.098	0.29	0.245	0.136	0.155	0.59

** Unexplained Nominal Increase Noted This Date

CPIH003

**MALFUNCTION TEST DATA-ALARM
AFT ENGINE VIBRATION (Cont'd)**

SECTION C (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
11/8	4	Reference (Re-Annealed 90° GB I/Q Gear)	Yes	0.12	0.098	0.10	0.29	0.26	0.16	0.155	0.64
11/9	4	Reference	Yes	0.136	0.098	0.12	0.37	0.32	0.17	0.155	0.66
10/16	4	Cycling, Audible Noise-N/ Present		----	----	0.17	0.22	0.22	0.155	0.17	0.49-0.54
10/16	4	Cycling, Audible Noise-Present	Yes	----	----	0.17	0.39	0.39	0.22	0.22	0.78-0.83
10/23	4	Cycling, Audible Noise-N/Present							0.145	0.155	0.51
10/23	4	Cycling, Audible Noise-Present	Yes							0.22	0.78
		CONDITION CODE DESIGNATION									
		1. Flight Test Components. (Eng. SN 00346) (XMSN SN A12-20)									
		2. XMSN and Main Mast Replaced. (XMSN SN A12-142)									

CPH008

SECTION C (Cont'd)

[illegible]

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION**

SECTION D

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL	
6/28	1	Reference										0.59*
6/30	1	Reference										0.64*
6/30	1	Short Shaft Misalignment; 15 Shims Removed (≈.035") L. Rear Engine Mount.										0.59- 0.64
6/30	1	Reference										0.64*
6/30	1	Reference										0.54- 0.59
7/3	1	Reference										0.59*
7/5	1	Reference										0.64*
7/11	1	Reference										0.59*
7/11	1	Tail Rotor Out of Track (4-1/2 Turns)										0.49- 0.59

* All Data: 10-500 CPS ** Original Pickup Mount (With Cantilever Resonance)

CP/SEC

MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL	
7/11	1	Reference										0.56*
7/11	1	Tail Rotor Unbalance (1 Wrap)										0.54- 0.59
7/11	1	Tail Rotor Unbalance (2 Wraps)	Yes									0.59*
7/18	1	Reference	**	0.367	0.318	0.392	0.416	0.49	1.27	1.42	2.20	
7/24	1	Reference	**	0.122	0.127	0.245	0.245	0.392	1.37	1.67	2.45	
7/25	1	Reference		0.108	0.118	0.177	0.343	0.49	0.49	0.44	0.98	
7/28	1	Reference		<.1	0.10	0.147	0.27	0.343	0.44	0.392	0.833	
8/7	1	Reference		0.1	<.1	0.137	0.245	0.318	0.392	0.416	0.857	
8/8	1	Reference		<.1	<.1	0.127	0.235	0.294	0.392	0.44	0.833	

* All Data: 10-500 CPS

** Original Pickup Mount (With Cantilever Resonance)

CPA/MS

MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40	40-80	80-160	160-320	320-500	500-1kc	1-2kc	ALL
8/15	2	Reference		<.1	<.1	0.118	0.216	0.294	0.49	0.392	0.835
8/22	3(x)	Reference		<.1	<.1	<.1	0.118	0.167	0.245	0.392	0.54
8/31	4(x)	Reference		0.06	0.06	0.06	0.11	0.16	0.22	0.32	0.49
8/31	4(x)	Short Shaft Misalignment; .011" Shims Removed, R. Rear Engine Mount		0.1	0.07	0.06	0.10	0.155	0.23	0.32	0.49
8/31	4(x)	Short Shaft Misalignment; .023" Shims Removed, R. Rear Engine Mount		0.05	0.065	0.06	0.11	0.16	0.23	0.34	0.49
9/5	4(x)	Short Shaft Misalignment; .023" Shims Removed, R. Rear Engine Mount		0.057	0.057	0.053	0.11	0.145	0.21	0.32	0.45
9/5	4(x)	Short Shaft Misalignment; .037" Shims Removed, R. Rear Engine Mount		0.06	0.05	0.05	0.11	0.16	0.22	0.32	0.49
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 150"#		0.09	0.058	0.053	0.10	0.13	0.205	0.31	0.46
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 100"#		0.062	0.062	0.053	0.11	0.16	0.22	0.32	0.49

SECTION D (Cont'd)

MALFUNCTION TEST DATA-ALARM.
FORWARD ENGINE VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40	40-80	80-160	160-320	320-500	500-1kc	1-2kc ALL
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 50" #		0.062	0.058	0.053	0.09	0.12	0.22	0.32 0.46
9/5	4(x)	V-Band Coupling (Engine) Loss of Torque to 0" #								0.49
9/6	4(x)	Reference ("Bishop's Hat" Installed)		0.053	0.05	0.05	0.10	0.135	0.23	0.32 0.46
9/6	4(x)	"Bishop's Hat" Mounting Bolt @ 0 Torque								0.49
9/7	4(x)	V-Band Coupling (Engine); Loss of Torque to 0" # Free Turning		0.053	0.05	0.05	0.10	0.13	0.195	0.31 0.44
9/12	4	NII Turbine Unbalance (180° Orientation)		0.058	0.05	0.05	0.10	0.135	0.22	0.32 0.46
9/14	4	NII Turbine Unbalance (90° Orientation)	Yes	0.073	0.053	0.05	0.145	0.205	0.245	0.33 0.56
9/18	4	Reference (NII Turbine in Balance)		0.053	0.058	<.05	0.10	0.157	0.195	0.295 0.46
10/12	4	Reference		----	----	----	0.155	0.175	0.225	0.32 0.49

CP1000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/12	4	Reference		----	----	----	0.136	0.175	0.205	0.235	0.49-0.54
10/12	4	Tail Rotor Unbalance (2 Wraps)		0.39	0.117	0.10	0.22	0.44	0.44	0.44	0.64
10/13	4	Tail Rotor Unbalance (1 Wrap)		0.098	----	----	0.136	0.185	0.235	0.37	0.59
10/13	4	Reference		----	----	----	0.125	0.17	0.235	0.37	0.54
10/16	4	Reference		0.12	----	----	0.125	0.195	0.22	0.34	0.54
10/16	4	Reference		0.098	----	----	0.12	0.22	0.195	0.29	0.39
10/16	4	Reference		----	----	----	0.12	0.165	0.22	0.34	0.54
10/17	4	Reference		0.098	----	----	0.117	0.155	0.205	0.34	0.54
10/18	4	Reference		----	----	----	0.125	0.17	0.215	0.33	0.56

CPH0000

MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/18	4	Short Shaft Misalignment; .040" Shim Removal, R. Rear Engine Mount		----	----	----	0.117	0.136	0.195	0.34	0.54
10/18	4	Reference (Shims Re-Installed)		----	----	----	0.12	0.145	0.22	0.34	0.54
10/18	4	Short Shaft Misalignment; .060"Shim Removal, R. Rear Engine Mount		----	----	----	0.12	0.15	0.235	0.34	0.54
10/18	4	Short Shaft Misalignment; .080" Shim Removal, R. Rear Engine Mount		----	----	----	0.22	0.165	0.205	0.34	0.54
10/18	4	Short Shaft Misalignment; .100" Shim Removal, R. Rear Engine Mount.		----	----	----	0.12	0.175	0.235	0.35	0.54
10/18	4	Short Shaft Misalignment; .123"Shim Removal, R. Rear Engine Mount		----	----	----	0.117	0.165	0.235	0.33	0.54
10/18	4	Reference (Shims Re-Installed)		----	----	----	0.13	0.165	0.215	0.34	0.54
10/19	4	Reference		----	----	----	0.12	0.155	0.215	0.37	0.54
10/20	4A	Reference (Annealed XMSN Input Quill Installed)		----	----	----	0.136	0.16	0.205	0.34	0.54

CPW000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc ALL
10/20	4A	Reference		0.106	-----	-----	0.12	0.16	0.195	0.34 0.59
10/21	4A	Reference		-----	-----	-----	0.117	0.265	0.205	0.34 0.54
10/23	4A	Reference		-----	-----	-----	0.14	0.17	0.215	0.34 0.54
10/24	4A	Reference		-----	-----	-----	0.136	0.155	0.205	0.33 0.54
10/24	4A	Reference		-----	-----	-----	0.12	0.155	0.205	0.34 0.54
10/25	4A	Reference		-----	-----	-----	0.125	0.15	0.195	0.34 0.54
10/25	4A	Tail Rotor Unbalance (2 Wraps)		0.145	-----	0.098	0.165	0.195	0.205	0.34 0.59
10/25	4A	Tail Rotor Unbalance (1 Wrap)		0.106	-----	-----	0.125	0.15	0.205	0.34 0.56
10/25	4A	Tail Rotor Unbalance (1/2 Wrap)		-----	-----	-----	0.125	0.15	0.205	0.34 0.54

CP11000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
10/25	4A	Reference		0.106	-----	-----	0.12	0.165	0.205	0.32	
10/30	4A	Reference		0.098	0.098	0.098	0.12	0.17	0.215	0.34	0.49
10/30	4A	Short Shaft Unbalance (≈ 20 Grams)		-----	0.125	0.195	0.136	0.17	0.22	0.37	0.66
10/30	4A	Reference		0.098	0.098	0.098	0.12	0.15	0.22	0.34	0.62
10/30	4A	Reference		-----	0.098	0.098	0.117	0.15	0.235	0.34	0.62
10/30	4A	Reference		-----	0.098	0.098	0.11	0.155	0.225	0.34	0.59
10/31	4A	Reference		-----	0.10	0.10	0.117	0.145	0.215	0.39	0.64
10/31	4A	Reference		-----	0.098	0.098	0.117	0.145	0.205	0.32	0.59
10/31	4A	Reference		-----	0.098	0.098	0.117	0.145	0.215	0.32	0.56

CP-1000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
11/1	4A	Reference		----	0.098	0.10	0.12	0.165	0.22	0.32	0.59
11/1	4A	Tail Rotor Unbalance (1 Wrap)		0.106	0.11	0.10	0.16	0.185	0.195	0.22	0.59
11/1	4A	Tail Rotor Unbalance (1/2 Wrap)		0.106	0.106	0.10	0.125	0.16	0.22	0.32	0.59
11/1	4A	Reference		0.098	0.106	0.098	0.125	0.165	0.235	0.32	0.59
11/1	4A	Reference		----	0.10	0.10	0.106	0.145	0.215	0.34	0.56
11/2	4B	Reference (.015" Flat, Lower Mast Bearing)		0.098	0.098	0.098	0.11	0.12	0.205	0.32	0.54
11/3	4B	Reference (Loss of Oil, XMSN)		----	0.098	0.10	0.12	0.136	0.205	0.29	0.54
11/4	4B	Short Shaft (XMSN Drive) Disconnected		----	----	----	0.22	0.12	0.17	0.225	0.39
11/4	4B	Short Shaft (XMSN Drive) Disconnected		----	----	----	0.098	0.098	0.155	0.22	0.34

CP10000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1kc	1-2kc	ALL
11/6	4C	XMSN Output Quill (T/R Drive) Disconnected.		----	----	0.09	0.106	0.117	0.205	0.29	0.49
11/6	4C	XMSN Output Quill (T/R Drive) Disconnected.		----	----	0.09	0.098	0.11	0.195	0.29	0.46
11/6	4C	Reference		----	0.098	0.10	0.125	0.145	0.18	0.29	0.54
11/7	4C	Engine Mount Pillow Ass'ys @ O Torque		0.098	0.098	0.098	0.13	0.145	0.205	0.29	0.54
11/7	4C	Reference (Eng. Mounts Re-Torqued)		0.098	0.098	0.098	0.145	0.16	0.205	0.32	0.54
11/8	4C	Reference		----	0.098	0.098	0.136	0.12	0.205	0.32	0.54
11/9	4C	Reference		----	0.098	0.098	0.155	0.17	0.205	0.29	0.54
		CONDITION CODE									
		1. Flight Test Components: (Eng. SN-00346)(XMSN SN-A12-20)									

CP-1000

**MALFUNCTION TEST DATA-ALARM
FORWARD ENGINE VIBRATION (Cont'd)**

SECTION D (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)					
				20-40~	40-80~	80-160	160-320	320-500	500-1kg 1-2kg ALL
		2. XMSN and Main Mast Replaced: (XMSN SN-A12-142)							
		3. Engine Replaced: (Eng. SN LE-00112)							
		4. XMSN Replaced: (XMSN SN A12-78)							
		(x) NII Turbine Power Shaft Thru Bolt @ O Torque							
		4A. XMSN Input Quill Replaced (Annealed Gear & Bearing)							
		4B. .015" Flat Introduced on Lower Mast Bearing (Inner Race)							
		4C. Original Input Quill Installed; Upper Planetary Gear Assy Replaced.							

SECTION E		MALFUNCTION TEST DATA-ALARM TAIL VIBRATION										
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							ALL	
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC		
6/28	1	Reference *										1.45- 1.6
6/30	1	Reference										1.45
7/3	1	5 Shaft-Bearing Coupling Clamps in Line										1.36
7/3	1	9 Shaft-Bearing Coupling Clamps in Line										1.36
7/3	1	Tail Rotor Out of Track (1/2 Turn-PCL)									"ALL" Reading 10-500 CPS	1.37- 1.42
7/3	1	Tail Rotor Out of Track (2 Turns-PCL)										1.36- 1.42
7/3	1	Tail Rotor Out of Track (3 Turns-PCL)										1.36- 1.42
7/3	1	Tail Rotor Out of Track (6 Turns-PCL)										1.42- 1.51
7/3	1	Tail Rotor Out of Track (7-1/2 Turns-PCL)	Yes									1.57- 1.6

CPH000

CPS

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40	40-80	80-160	160-320	320-500	50-1KC	1-2KC
7/5	1	Tail Rotor Unbalance (1 Wrap 2" Tape)								1.36- 1.42
7/5	1	Tail Rotor Unbalance (2 Wrap 2" Tape)	Yes							1.45- 1.57
7/5	1	Reference								1.37
7/11 -12	1	Reference	**							1.12- 1.18
7/11 -12	1	Tail Rotor Unbalance (1 Wrap)	Yes							1.36
7/11 -12	1	Tail Rotor Unbalance (2 Wraps)	Yes							1.75
7/11 -12	1	Reference	***							4.4- 4.85
7/11 -12	1	Tail Rotor Unbalance (1 Wrap)								4.85- 5.30
		Vibration Pick-Up Orientation								

81

* 45° Lateral
** Vertical *** Fore/AFT

CPW000

SECTION E (Cont'd.)		MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							ALL
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	
7/11-12	1	Tail Rotor Unbalance (2 Wraps)	Yes								6.8-7.2
7/11-12	1	Reference ****									2.45
7/11-12	1	Tail Rotor Unbalance (1 Wrap)									2.53
7/11-12	1	Tail Rotor Unbalance (2 Wraps)	Yes								3.50
7/11-12	1	Reference **									1.12-1.18
7/11-12	1	Tail Rotor Out of Track (4-1/2 Turns)									1.12-1.18
7/11-12	1	Reference ***									4.4-4.05
7/11-12	1	Tail Rotor Out of Track (4-1/2 Turns)									4.4-4.05
7/11-12	1	Reference ****									2.45

SECTION F (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							ALL	
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC		
7/11-12	1	Tail Rotor Out of Track (4-1/2 Turns)									"ALL" Reading 10-500 CPS	2.45
7/13	1	Reference										
7/18	1	Reference (No Circuit Load) ***		0.44	1.96	5.9	2.2	0.59	0.343	0.294	6.4	
7/24	1	Reference (No Circuit Load) **		0.186	0.59	0.49	0.685	0.38	0.132	0.1	1.22	
7/25	1	Reference (No Circuit Load)		0.27	0.54	0.49	0.636	0.344	0.142	0.1	1.27	
7/25	1	Reference (No Circuit Load) ****		0.197	0.59	0.59	0.49	0.245	0.167	0.142	1.22	
7/25	1	Reference ***		0.294	2.06	5.4	2.45	0.68	0.22	0.1	6.37	
7/28	1	Reference		0.294	2.06	5.15	2.16	0.54	0.176	0.1	5.4	
8/7	1	Reference		0.294	1.96	5.4	2.85	0.54	0.157	0.1	6.35	

CPS/008

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL
8/8	1	Reference		0.270	1.96	5.4	2.2	0.49	0.172		6.36
8/15	2	Reference		0.206	1.32	3.18	1.52	0.392	0.147		3.92
8/15	2	Tail Rotor Unbalance (2 Wraps)	Yes	0.637	3.18	4.41	1.86	0.49	0.137		6.38
8/22	3	Reference		0.226	1.57	3.18	1.57	0.392	0.137		4.2
8/22	3	Tail Rotor Unbalance (2 Wraps)	Assumed	0.588	3.14	4.9	2.25	0.54	0.142		7.1
8/22	3	Reference	**	0.147	0.392	0.353	0.465	0.23			0.98
8/23	3	Reference		0.167	0.44	0.416	0.565	0.269	0.108		1.32
8/23	3	Tail Rotor Unbalance (2 Wraps)	Assumed	0.785	0.49	0.44	0.637	0.343	0.108		1.47
8/23	3	Reference	****	0.108	0.269	0.245	0.173	0.103	0.107		0.54

CP1100

SECTION E (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL	
8/23	3	Tail Rotor Unbalance (2 Wraps)	Assumed	0.588	0.882	0.735	0.245	0.157	0.108		1.23	
8/31	4	Reference		0.14	0.34	0.29	0.22	0.11	0.12	0.14	0.70	
8/31	4	Reference		0.137	0.39	0.34	0.29	0.12	0.11	0.11	0.69	
8/31	4	Short Shaft Misalignment (0.011")		0.145	0.49	0.365	0.27	0.145	0.125	0.125	0.73	
8/31	4	Short Shaft Misalignment (0.023")		0.14	0.34	0.29	0.22	0.11	0.12	0.14	0.70	
9/5	4	Short Shaft Misalignment (0.23")		0.115	0.34	0.255	0.22	0.11	0.1	0.11	0.60	
9/5	4	V-Band Coupling, Loss of Torque (150")									0.64	
9/5	4	V-Band Coupling, Loss of Torque (0")									0.68	
9/6	4	Reference ("Bishop's Hat" Installed)		0.12	0.29	0.29	0.22	0.11	0.11	0.12	0.64	

CPH008

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC ALL
9/6	4	'Bishop's Hat' Mounting Bolt @ O Torque.								0.59
9/7	4	V-Band Coupling, O Torque								0.64
9/12	4	NII Turbine Unbalance (180° Orientation)								0.59- 0.64
9/14	4	NII Turbine Unbalance (90° Orientation)								0.64
9/18	4	Tail Rotor Drive Shaft Unbalance	Invalid Data	0.46	0.495	0.495	0.54	0.22	0.185	0.175 0.64
10/12	4	Reference		0.11	0.34	0.245	0.33	0.195	0.12	0.117 0.73- 0.78
10/12	4	Reference		0.12	0.29	0.27	0.29	0.155	0.13	0.117 0.68
10/12	4	Tail Rotor Unbalance (2 Wraps)	Yes	0.49	0.62	0.54	0.37	0.185	0.12	0.117 1.46
10/13	4A	Tail Rotor Unbalance (1 Wrap)	Yes	0.29	0.49	0.39	0.34	0.195	0.125	0.106 0.98

CP11000

SECTION E (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								ALL
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC		
10/13	4A	Reference		0.106	0.34	0.34	0.28	0.175	0.125	0.117	0.73	
10/16	4B	Reference		0.136	0.39	0.32	0.37	0.195	0.12	0.12	0.83	
10/16	4B	42° Gear Box Misaligned (1/2")		0.132	0.29	0.245	0.43	0.42	0.40	0.39	0.73	
10/16	4B	42° Gear Box Misaligned (1/2")		0.12	0.29	0.245	0.29	0.235	0.255	0.175	0.49	
10/16	4B	Reference		0.136	0.42	0.32	0.37	0.17	0.125	0.13	0.88	
10/17	4B	Reference		0.136	0.37	0.29	0.44	0.185	0.11	0.106	0.83	
10/18	4C	Plugged Oil Collector, 42° Gear Box		0.145	0.48	0.255	0.29	0.15	0.12	0.12	0.85	
10/18	4C	Short Shaft Misalign- ment		0.165	0.42	0.27	0.33	0.145	0.125	0.12	0.83	
10/19	4C	Reference		0.136	0.39	0.29	0.46	0.165	0.13	0.117	0.98	

CPH:008

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (cont'd.)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL
10/20	4C	Reference		0.145	0.39	0.29	0.39	0.145	0.12	0.125	0.83
10/21	4C	SAE #30 Oil in 42° Gear Box		0.136	0.46	0.32	0.37	0.98	0.106	0.117	0.93
10/23	4D	Annealed Input Quill Gear and Bearing in 42° & 90° Gear Boxes		0.14	0.42	0.28	0.29	0.15	0.136	0.106	0.93
10/23	4D	High Frequency Tail Vibration		1-2KC 0.106	2-4KC --	4-8KC --	2-20KC --				
10/24	4D	***** New Pick-up Location									
10/24	4D	Annealed Input Quill Gear and Bearing in 42° & 90° Gear Boxes	Yes	0.195	0.49	0.49	0.29	0.125	0.195	0.29	0.98
10/24	4D	Annealed Input Quill Gear and Bearing in 42° & 90° Gear Boxes	Yes	0.215	0.44	0.49	0.27	0.106	0.195	0.29	1.02
10/24	4D	High Frequency Tail Vibration	--	2-20KC --							

***** CEC-4-118 Vibration Pick-Up Installed ≈ 300 From Vertical on 90° Gear Box

CP11808

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

DATE		CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
					20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL
10/24		4D	Annealed Input Quill Gear and Bearing in 42° and 90° Gear Boxes	Reset Sens.	0.195	0.34	0.42	0.27	0.125	0.28	0.32-0.73	0.98
10/24		4D	Annealed Input Quill Gear and Bearing in 42° & 90° Gear Boxes		0.195	0.37	0.42	0.27	0.125	0.28	0.32-0.73	0.98
10/25		4D	Annealed Input Quill Gear and Bearing in 42° & 90° Gear Boxes		0.195	0.37	0.42	0.28	0.12	0.245	0.49	0.98
10/25		4D	Tail Rotor Unbalance (2 Wraps)	Yes	1.18	0.98	0.78	0.34	0.145	0.195	0.39	1.21
10/25		4D	Tail Rotor Unbalance (1 Wrap)	Yes	0.64	0.54	0.54	0.30	0.125	0.215	0.34	1.21
10/25		4D	Tail Rotor Unbalance (1/2 Wrap)	Yes	0.49	0.49	0.49	0.225	0.12	0.195	0.34	1.02
10/25		4D	Reference		0.205	0.42	0.49	0.34	0.125	0.235	0.34	0.98
10/30		4D	42° Gear Box Failure (1)	Yes	0.225	0.31	0.78	0.44	0.165	0.32	0.54	0.88
10/30		4D	42° Gear Box Failure (2)	Yes	0.235	0.34	0.78	0.44	0.136	0.32	0.54	1.18

GP/MS

SECTION E (Cont'd.) MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC ALL
10/30	4D	42° Gear Box Failure (3)	Yes	0.245	0.34	0.78	0.44	0.165	0.27	0.54 1.21
10/30	4D	42° Gear Box Failure (4)	Yes	0.22	0.34	0.85	0.49	0.155	0.28	0.54 1.21
10/30	4D	42° Gear Box Failure (5)	Yes	0.245	0.34	0.85	0.49	0.155	0.34	0.59 1.36
10/30	4E	Reference (42° GB Replaced)		0.245	0.59	0.44	0.22	0.098	0.195	0.27 0.98
10/31	4E	Reference		0.26	0.54	0.54	0.225	0.098	0.17	0.27 1.03
10/31	4E	Reference		0.245	0.54	0.54	0.22	0.098	0.17	0.29 1.08
10/31	4E	Tail Rotor Drive Shaft Unbalance		0.22	0.46	0.46	0.245	0.098	0.27	0.49 0.98
10/31	4E	Tail Rotor Drive Shaft Unbalance		0.22	0.42	0.49	0.22	0.098	0.27	0.37 0.93
10/31	4E	Main Rotor Out of Track		0.22	0.54	0.54	0.22	0.098	0.195	0.27 0.98

CP1003

SECTION E (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							ALL	
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC		
10/31	4E	Main Rotor Out of Track		0.22	0.54	0.46	0.195	0.195	0.205	0.205	0.93	
10/31	4E	Drive Shaft Unbalance (23 Grams)	Yes	0.39	1.18	0.68	0.27	0.106	0.22	0.37	1.7	
10/31	4E	Drive Shaft Unbalance (23 Grams)	Yes	0.37	1.12	0.68	0.274	0.10	0.22	0.37	1.7	
10/31	4E	Tail Rotor Out of Track (2 Turns-PCL)		0.205	0.54	0.46	0.22	0.11	0.185	0.27	1.08	
10/31	4E	Tail Rotor Out of Track (2 Turns-PCL)		0.215	0.54	0.49	0.225	0.098	0.185	0.27	1.02	
10/31	4E	Tail Rotor Out of Track (2 Turns-PCL)		0.195	0.54	0.44	0.22	---	0.195	0.27	0.98	
10/31	4E	Loss of Oil - 90° Gear Box	Yes	0.29	0.39	0.42	0.32	0.155	0.44	0.59	1.18	
10/31	4E	Loss of Oil - 90° Gear Box	Yes	0.195	0.46	0.44	0.245	0.12	0.37	0.54	1.18	
10/31	4E	Loss of Oil - 90° Gear Box	Yes	0.22	0.46	0.44	0.235	0.117	0.34	0.54	1.08	

GPMSS

JECT (Cont.)

DATE CODE		CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL
10/31	4E	Reference (90° GB Reserved)	Yes	0.32	0.64	0.59	0.215	--	0.22	0.42	1.2
10/31	4E	Reference	Yes	0.28	0.59	0.54	0.22	--	0.215	0.39	1.2
11/1	4E	Tail Rotor Re-Tracked		0.245	0.54	0.49	0.22	0.098	0.185	0.37	1.18
11/1	4E	Reference		0.245	0.54	0.54	0.245	0.12	0.175	0.27	1.18
11/1	4E	Tail Rotor Unbalance (1 Wrap)	Yes	0.83	0.78	0.64	0.245	0.117	0.145	0.215	1.56
11/1	4E	Tail Rotor Unbalance (1/2 Wrap)	Yes	0.49	0.59	0.49	0.235	0.34	0.185	0.34	1.2
11/1	4E	Tail Rotor Unbalance (1/2 Wrap)	Yes	0.49	0.59	0.49	0.215	--	0.195	0.37	1.2
11/1	4E	Reference		0.235	0.49	0.46	0.22	--	0.225	0.42	1.12
11/1	4E	Reference		0.245	0.54	0.46	0.21	--	0.20	0.42	1.12

CP1000

SECTION E (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)								
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)							
				20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL
11/1	4E	Reference		0.245	0.54	0.46	0.29	--	0.20	0.37	1.12
11/1	4E	Loss of Oil - 90° Gear Box		0.245	0.54	0.44	0.235	0.106	0.32	0.54	1.12
11/1	4E	Loss of Oil - 90° Gear Box		0.225	0.49	0.44	0.245	0.125	0.29	0.49	1.08
11/1	4E	Loss of Oil - 90° Gear Box	Yes	0.205	0.42	0.49	0.34	0.22	0.49	0.54	1.31
11/1	4E	90° Gear Box Re-Serviced		0.22	0.49	0.49	0.245	0.098	0.165	0.32	1.02
11/2	4E	Reference		0.245	0.54	0.54	0.32	0.106	0.145	0.29	1.18
11/3	4E	Low Oil Level - XMSN		0.22	0.49	0.54	0.28	0.136	0.17	0.34	1.08
11/6	4F	42° Gear Box (Annealed I/Q) Installed		0.225	0.54	0.59	0.39	0.145	0.22	0.34	1.18
11/7	4F	Reference		0.22	0.49	0.54	0.44	0.17	0.22	0.37	1.21

CPN088

SECTION V (Cont)			MALFUNCTION TEST DATA-ALARM TABLE VIBRATION (Cont.)									
DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)								
				20-40~	40-80~	80-160	160-320	320-500	500-1KC1	2KC ALL		
11/8	4G	Re-Annealed 90° Gear Box I/Q Gear		0.185	0.39	0.44	0.32	0.205	0.34	0.54	1.12	
11/8	4G	Re-Annealed 90° Gear Box I/Q Gear		0.195	0.37	0.42	0.275	0.205	0.32	0.64	1.12	
11/8	4G	Loss of Oil - 90° Gear Box (1)	Yes	0.195	0.39	0.44	0.34	0.195	0.34	0.68	1.21	
11/8	4G	Loss of Oil - 90° Gear Box (2)	Yes	0.235	0.39	0.44	0.29	0.195	0.34	0.73	1.21	
11/8	4G	Loss of Oil - 90° Gear Box (3)	Yes	0.205	0.39	0.44	0.32	0.195	0.34	0.68	1.21	
11/8	4H	Annealed Input Quill Gear Replaced		0.195	0.32	0.37	0.37	0.32	0.46	0.49	1.12	
		<u>CONDITION CODE DESIGNATION:</u>										
		1. Flight Test Components (45° GB-SNA13-12) (90° GB-SNA13-15)										
		2. XMSN & Main Mast Replaced										

SECTION E (Cont'd.)			MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)																
DATE CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)																
			20-40~	40-80~	80-160	160-320	320-500	500-1KC	1-2KC	ALL"									
	3. Engine Replaced																		
	4. XMSN Replaced																		
	4A. 42° GB-SNA13-68 Installed																		
	4B. 42° GB-SNA13-12 Installed.																		
	4C. 42° GB-SNA13-68 Installed (Plugged Oil Collector)																		
	4D. 42° GB-SNA13-68, 90° GB-SNA13-90 Installed (Annealed Input Quill Gear & Bearing, Both Gear Boxes.)																		
	4E. 42° GB Failure (SNA13-68) SNA13-12 Installed																		
	4F. 42° GB SNA13-68 Installed																		

MALFUNCTION TEST DATA-ALARM TAIL VIBRATION (Cont'd.)

[illegible]

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION**

SECTION F

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				.2-3	3-6	6-12	12-25	25-50	50-100	ALL
8/7	1	Reference		0.135	0.135	0.189	0.162	0.108	0.243	0.54
8/8	1	Reference		<.10	0.139	0.278	0.203	0.134	0.267	0.588
8/9	1	Reference		----	0.107	0.214	0.182	0.107	0.160	0.374
8/10	1	Reference		<.10	0.118	0.214	0.187	0.134	0.241	0.428
8/10	1	Main Rotor Unbalance (1 Wrap - 2" Tape- W/Y)		<.10	0.128	0.161	0.134	0.107	0.171	0.374
8/10	1	Main Rotor Unbalance (1 Wrap-2" Tape-R/Y)	Yes	<.10	0.188	0.209	0.134	0.107	0.171	0.428
8/10	1	Main Rotor Unbalance (2 Wrap-2" Tape R/Y)	Yes	0.107	0.348	0.321	0.187	0.118	0.161	0.643
8/10	1	Main Rotor Unbalance (3 Wrap-2" Tape R/Y)	Yes	0.107	0.386	0.332	0.187	0.107	0.161	0.803
8/15	2	Reference (XMSN & Main Mast Replaced)	Yes	.10	0.193	0.268	0.145	0.134	0.268	0.535

CP-10000

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)**

SECTION F (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				2-3	3-6	6-12	12-25	25-50	50-100	ALL
8/15	2	Reference	Reset Sens.	0.107	0.193	0.241	0.134	0.134	0.268	----
8/15	2	Main Rotor Unbalance (3 Wraps-W/Y)		0.107	0.161	0.225	0.187	0.107	0.241	0.535
8/15	2	Main Rotor Unbalance (3 Wraps-R/Y)		<.10	0.268	0.236	0.187	0.171	0.268	0.59
8/15	2	Tail Rotor Unbalance (2 Wraps)	Yes	<.10	0.139	0.241	0.214	0.246	0.375	0.59
8/22	2	Reference (Lo Pass Filter Installed)		<.10	0.118	0.107	<.10	<.10	<.10	0.193
8/23	2	Tail Rotor Unbalance (2 Wraps)		<.10	0.107	<0.10	<.10	<.10	<.10	0.203
9/23	2	Main Rotor Unbalance (2 Wraps-R/Y)								0.294
10/12	3	Reference			0.22	0.13	----	----	----	0.30
10/12	3	Reference			0.175	0.12	----	----	----	0.30

CP11003

SECTION F (Cont'd)
MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				.2-3	3-6	6-12	12-25	25-50	50-100	ALL
10/12	3	Reference			0.175	0.12	----	----	----	0.30
10/12	3	Main Rotor Unbalance (2 w-W/Y)			0.16	0.11	----	----	----	0.225
10/12	3	Main Rotor Unbalance (2w. - R/Y)	Yes		0.25	0.14				0.35
10/12	3	Main Rotor Unbalance (3w. - R/Y)	Yes		0.275	0.22				0.375- 0.40
10/13	3	Reference			0.175	0.10				0.25
10/13	3	Reference			0.20	0.10				0.275
10/16	3	Reference			0.20	0.125				0.25
10/16	3	Reference			0.20	0.115				0.30
10/17	3	Reference			0.175	0.10				0.275

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)**

SECTION F (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)					
				.2-3	3-6	6-12	12-25	25-50	50-100 ALL
10/18	3	Reference			0.20	0.11			0.275
10/18	3	Reference			0.19	0.10			0.275
10/19	3	Reference			0.10	0.11			0.15
10/20	3	Main Rotor Unbalance (2w. - W/Y)			0.125- 0.16	0.10			0.175
10/20	3	Reference			0.125	<0.10			0.20
10/23	3	Reference			0.15	0.12			0.225
10/24	3	Reference			0.15	0.105			0.225
10/24	3	Reference			0.17	0.105			0.225
10/25	3	Reference			0.16	0.10			0.225

CP-1000

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)**

SECTION F (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				2-3	3-6	6-12	12-25	25-50	50-100	ALL
10/25	3	Uncentered Cyclic Control	Yes		0.25	0.125				0.30
10/30	3	Blade Set (Overtight Weekend Tie-Down)	Yes		0.24	0.105				0.325
10/30	3	Blade Set (2nd Run)	Yes		0.225	0.13				0.32
10/30	3	Uncentered Cyclic Control	Yes		0.30	0.13				0.35
10/30	3	Main Rotor Unbalance (2w. -R/Y)	Yes		0.30	0.14				0.35
10/30	3	Uncentered Cyclic Control	Yes		0.25	0.12				0.35
10/31	3	Reference			0.15	0.115				0.225
10/31	3	Main Rotor Unbalance (1w. -R/Y)	Yes		0.375	0.17				0.45
10/31	3	Main Rotor Unbalance (1w. -R/Y)	Yes		0.375	0.17				0.45

CP11008

SECTION F (Cont'd)
MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)					
				2-3	3-6	6-12	12-25	25-50	50-100
10/31	3	Main Rotor Out of Track-4 Flats	Yes		0.475	0.175			ALL
10/31	3	Main Rotor Out of Track-4 Flats	Yes		0.45	0.17			0.475
10/31	3	Main Rotor Out of Track-1 Flat	Yes		0.35	0.14			0.40
10/31	3	Main Rotor Out of Track-1 Flat	Yes		0.34	0.145			0.425
10/31	3	Reference			0.225	0.11			0.30
10/31	3	Reference			0.20	0.10			0.25
10/31	3	Reference			0.165	0.10			0.20
11/1	3	Reference			0.175	0.105			0.225
11/1	3	Reference			0.19	0.11			0.23

CP11055

MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)

SECTION F (Cont'd)

DATE			CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
						2-3	3-6	6-12	12-25	25-50	50-100	ALL
11/1	3	Cyclic Beat			Yes		0.35	0.14				0.475
11/1	3	Cyclic Beat			Yes		0.26	0.15				0.30
11/1	3	Main Rotor Unbalance (2w. - R/Y)			Yes		0.425	0.15				0.475
11/1	3	Main Rotor Unbalance (2w. - R/Y)			Yes		0.425	0.15				0.475
11/1	3	Main Rotor Unbalance (1w. - R/Y)			Yes		0.325	0.14				0.425
11/1	3	Main Rotor Unbalance (2w. - W/Y)					0.17	0.10				0.225
11/1	3	Main Rotor Unbalance 2w.-W/Y)					0.20	0.10				0.275
11/1	3	Main Rotor Unbalance 2w.-W/Y 1w.-R/Y			Yes		0.44	0.17				0.55
11/1	3	Main Rotor Unbalance 2w.-W/Y 1w.-R/Y			Yes		0.55	0.20				0.60

CPW003

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)**

SECTION F (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)					
				2-3	3-6	6-12	12-25	25-50	50-100 ALL
11/1	3	Main Rotor Unbalance 2w. -W/Y 1/2w. -R/Y	Yes		0.35	0.13			0.35
11/1	3	Main Rotor Unbalance 2w. -W/Y 1/2w. -R/Y	Yes		0.325	0.12			0.34
11/1	3	2 Balance Wraps-W/Y Blade			0.22	0.10			0.225
11/1	3	2 Balance Wraps-W/Y Blade			0.24	0.10			0.24
11/1	3	2 Balance Wraps-W/Y; Out of Track - 1 Flat, PCL	Yes		0.425	0.21			0.55
11/1	3	As Above	Yes		0.425	0.19			0.55
11/3	3A	2 Balance Wraps - W/Y Blade			0.225	0.105			0.25
11/6	3B	2 Balance Wraps - W/Y Blade			0.15	0.10			0.20
11/7	3B	Balance Wraps Removed 1w. R/Y Blade			0.175	0.10			0.225

CP11505

**MALFUNCTION TEST DATA-ALARM
LOW FREQUENCY MAST VIBRATION (Cont'd)**

SECTION F (Cont'd)

DATE	CODE	CONDITION(S)	INDIC NOTED	DATA RECORDED AS VECTOR VELOCITY (IN/SEC)						
				2-3	3-6	6-12	12-25	25-50	50-100	ALL
11/8	3B	1 w. - R/Y; 1/2 w-W/Y			0.10	<0.1				0.16
11/8	3B	No Tape, Reference			0.125	0.105				0.185
11/9	3B	Reference: $\approx$ in-Balance			0.15	0.10				0.175
11/9	3B	Reference: $\approx$ in-Balance			0.14	0.10				0.175
11/9	3B	1/2 Wrap Tape - Unbalance	Yes		0.25	0.145				0.295
11/9	3B	1/2 Wrap Tape - Unbalance	Yes		0.24	0.15				0.30
11/9	3B	1 Wrap Tape - Unbalance	Yes		0.355	0.195				0.55
11/9	3B	1 Wrap Tape - Unbalance	Yes		0.35	0.19				0.55

CP-1005

SECTION F (Cont'd)

[illegible]

APPENDIX IV

OIL SAMPLE ANALYSES

The following samples of oil were filtered, and any material which was trapped on the filter paper was studied and tested.

Sample	Date Taken	Source of Sample	Observation of the Residue on Filter Paper	Magnetic Particles
A	9/6/61 A.M.	Transmission before ground runs	Numerous black spots and some metallic flakes	None
B	9/6/61	Transmission after 2 runs	Some black particles	None
C	9/6/61	Engine before ground runs	No particles visible	None
D	9/6/61	Engine	No particles visible	None
E	9/7/61	Transmission	Some black spots	None
F	9/13/61	Engine	No deposits visible	None
G	9/13/61	Transmission	Some black particles and metallic flakes	None
H	9/15/61	Engine	No deposits visible	None
I	9/15/61	Transmission	Some black particles	None
J	9/25/61	Engine	No particles visible	None
K	9/25/61	Transmission	Some black particles	None
L	10/13/61	Engine	Some black particles	None
M	10/13/61	Transmission	Many black particles and some metallic particles	None
N	10/19/61	Engine	Some black particles	None
O	10/19/61	Transmission	Some black particles	None

Sample	Date Taken	Source of Sample	Observation of the Residue on Filter Paper	Magnetic Particles
P	10/20/61 2:00 P. M.	Engine	Some black particles	None
Q	10/20/61	Transmission	Some black particles	None
R	10/24/61	Engine	No particles visible	None
S	10/24/61	Transmission	Numerous black particles	None
T	10/26/61 9:30 A. M.	Transmission	Numerous black particles	None
U	10/26/61	Engine	No particles visible	None
V	10/26/61	42° - 90° Gear Box Detector Residue	Numerous black particles	None
W	10/26/61 11:00 A. M.	42° Gear Box	Many yellow non-magnetic particles. Spot tests show copper present. Black particles are magnetic and give test for iron.	Black magnetic particles
X	10/26/61 11:00 A. M.	42° Gear Box Flushings	Same as Sample W	Same as Sample W
Y	10/27/61	42° Gear Box Serviceable Flushings	Many black particles and some metallic flakes	None
Z	10/27/61	90° Gear Box Flushings	Many black particles and some yellow particles. Spot tests for iron and copper were negative	Few
101	11/3/61 7:34 A. M.	Transmission	Some small black particles	None
102	11/4/61	90° Gear Box Flushings	Black gummy deposits	None

Sample	Date Taken	Source of Sample	Observation of the Residue on Filter Paper	Magnetic Particles
103	11/7/61	42 ⁰ Gear Box	Many metallic chips. Spot test shows iron present.	None
104	11/8/61	90 ⁰ Gear Box	Black deposit. Metallic chips. Spot test shows iron present.	None

APPENDIX V

PROJECT HISTORY - DYNAMIC AIRCRAFT COMPONENTS

I. Transmissions:

A. S/N A12-20 - Serviceable as Received

All flight tests were performed with this gear box installed in A/C SN 57-6103. Total flight time can be referenced in flight records for this A/C.

Approximately 20 hours dynamic ground testing performed with this transmission installed.

No tests were performed that could be considered detrimental to the flight status of this component.

B. S/N A12-142 - Crash Damaged as Received

Installed for approximately 2 hours ground run time - vibration reference only.

Later disassembled for removal and use of various component parts in tests listed as follows:

1. Input Quill - Removed and annealed to approximately 1/2 hardness. Installed and tested for vibration and temperature in transmission S/N A12-78. Later removed from S/N A12-78 and will be shipped as a separate unit, painted red for purpose of identification.

2. Lubricating Jets Nos. 1, 2, & 4 - Removed and silver-soldered shut (jet holes and slots). Installed in transmission S/N A12-78 for specific tests and later removed. Note: These jets were not returned to normal condition and will be retained by BxY for possible future testing.

3. Upper Planetary Gear Assembly - Removed and installed in transmission S/N A12-78 as a result of bearing retainer failure in the gear assembly from that transmission. This original gear assembly from S/N A12-142 was not removed from S/N A12-78.

4. Sump Oil Drain Line - Removed and modified for installation of electrical chip detector in transmission S/N A12-78. Miscellaneous parts will be packed and shipped separately.

5. Pressure Relief Valve - Removed and installed in transmission S/N A12-78 for operational testing. Later reinstalled in S/N A12-142.

C. S/N A12-78 - 307 Hours as Received

This transmission presently installed on A/C S/N 57-6103. All potentially destructive tests were performed on this gear box. Specific tests performed and components effected as follows:

1. Approximately 6 hours ground run time with from 1 to 5 lubricating jets clogged. Original, unclogged jets are now reinstalled.
2. 0.015 inch flat filed on lower mast bearing inner race (Main Mast S/N C12-50). This mast is presently in this condition and installed in this transmission.
3. Approximately 30-minute ground run time with excessively low oil level for purpose of accelerated wear and resulting temperature and vibration effects.
4. Upper planetary gear assembly failure (bearing retainer) was an assumed direct result of tests outlined in paragraphs 1 and 3 above. This gear assembly was removed and replaced by an assembly from transmission S/N A12-142 for continuation of testing. The removed gear assembly will be shipped separately and painted red for purpose of identification.
5. Input quill assembly was removed and replaced by one which had gear and bearing annealed to 1/2 hardness. Upon completion of testing in this area, the original input quill was reinstalled.
6. Iron filings and chips were introduced in small increments as a quantitative evaluation of electrical chip detector operation. The total amount introduced in this manner is considered negligible in comparison to the particles present as a result of the bearing retainer failure outlined in paragraph 4 above.
7. Oil filter screen assembly was removed during a series of tests but has now been reinstalled.

II. Main Mast

A. S/N B12-39

Installed in transmission S/N A12-20 (Serviceable), used throughout flight testing and approximately 20 hours ground run time. Flight status of this mast has not been affected. Total flight time can be referenced in A/C flight records.

B. S/N C12-50

Presently installed in transmission S/N A12-78 which is now in the A/C, this mast was used in all tests conducted on that transmission (Ref. IC). Paragraph

I. C.2 should be specifically noted, where 0.015 inch flat had been filed on the lower mast bearing inner race. This was the only test performed that was specifically damaging to the mast itself.

III. Swashplate

A. S/N F19-12 - Serviceable as Received

Presently installed on A/C S/N 57-6103, this assembly was used throughout the testing program, both flight and dynamic ground tests. Just prior to the conclusion of testing, specific tests were performed to create an overheat condition by purging the swashplate bearing of as much lubricant as possible without complete disassembly. This attempt was unsuccessful, probably because of difficulty in removing sufficient lubricant by the method used. The bearing was not relubricated.

IV. Engines

A. S/N LE-00214 - Excessive Vibration as Received

This engine was never used during any phase of the test program. Presently canned and stored at NCGD.

B. S/N LE-00346 - Serviceable as Received

Used throughout flight tests and approximately 20 hours dynamic ground run time. Total flight time can be referenced in the flight log for A/C S/N 57-6103.

This engine came due for 200 hour inspection during the test program and is currently undergoing this inspection procedure at NCGD.

C. S/N LE-00112 - Due Overhaul as Received (500 Hour)

This engine is currently installed in the test bed A/C (S/N 57-6103) and was used for all tests which could be considered potentially damaging. Specific tests performed as follows:

1. Short-shaft misalignment - Shims removed from right and left rear engine mounts in different instances.
2. NII turbine unbalance, performed by rotation of NII wheel to out of balance positions at 90° and 180° from reference marks.
3. V band coupling (combustion chamber), loss of torque to the point of free rotation.

4. Short-shaft unbalance by the addition of a tape-attached weight to the outside of the shaft section.

The above specific tests involved ground runs of varying duration to reach the point of stable operation and then record applicable data.

One condition of unknown origin was noted during the course of testing. An intermittent, audible noise was present for 10 to 15 minutes after the start of a ground run from cold condition. This cycling noise was apparently caused by some abnormal condition in the aft section of the engine.

V. Gear Box (42°)

A. S/N A13-12 - Serviceable as Received

This gear box was retained as serviceable throughout flight tests and most of the dynamic ground test program. However, loss of the replacement gear box (S/N A13-68) due to extreme test conditions (to be listed in Paragraph VB) necessitated disassembly and reinstallation of the drive and driven gear quills into the modified housing of gear box S/N A13-68.

The housing from S/N A13-12 and the damaged component parts from S/N A13-68 have been packed and shipped as a unit.

B. S/N A13-68 - Due Overhaul as Received

All potentially damaging tests were performed on this gear box. Specific tests and components parts affected are as follows:

1. Gear box misalignment - Created by the installation of 1/2 inch spacers underneath the gear box at appropriate mounting points.

2. Input quill was removed and gear and bearing were annealed to approximately 1/2 hardness, then reinstalled and run for extended time intervals, noting resultant temperature and vibration changes.

3. Oil collector assembly has been removed and clogged in efforts to create an over-temperature condition. This condition was never cleared.

4. Two unexpected failures had occurred during the course of tests, probably resulting from repeated disassembly and extreme induced conditions as noted:

a. Input quill duplex bearing failure consisting of a cracked retainer and rough operation.

b. Loose input quill gear retainer nut allowed slippage of the input quill shaft.

5. Extreme low oil level condition created in efforts to accelerate wear on annealed components and fore valuation of resulting temperature increase.

All of the above noted tests involved ground runs of varying duration to allow A/C stabilization and accumulation of necessary data.

Cast quill retainers (external) were damaged on both input and output quills during the last of repeated disassembly and assembly operations. This necessitated disassembly and the use of quills from gear box S/N A13-12 for continuation of tests. (Note paragraph V. A.)

All internal components from this gear box have been removed and will be shipped along with the housing from S/N A13-12. The modified housing from this gear box and internal components from S/N A13-12 are presently installed on the A/C.

VI. Gear Box (90°)

A. S/N A13-15 - Serviceable as Received

It was the original intent to retain this gear box as a serviceable item. However, the input quill was removed by mistake and subsequent reassembly resulted in a cracked roller bearing. This bearing was removed and replaced by one from gear box S/N A13-90 and will be shipped in this condition.

B. S/N B13-510 - Due Overhaul as Received

This gear box was disassembled and the input quill gear and roller bearing removed and annealed to 1/2 hardness for installation and test in G/B S/N A13-90. The gear itself was later annealed for the second time to approximately 1/6 hardness and retested. Upon completion of this test, the gear was removed and will be shipped along with this donor gear box and the cracked roller bearing from S/N A13-15.

C. S/N A13-90 - Crash-Damaged as Received

All potentially damaging tests were performed on this gear box. Specific tests and component parts affected are as follows:

1. Input quill gear and roller bearing (removed from S/N B13-510), were annealed to 1/2 hardness and 1/6 hardness in separate tests and installed and run in this gear box. Gear was later removed (Ref. paragraph V.I.B.) and the original gear and heat treated bearing were reinstalled.

2. Metallic filings were introduced in small increments for quantitative analysis of chip detector operation. Upon test completion, the gear box was flushed and reserviced, however some residual particles may still be present.

3. Extreme low oil level tests were performed to accelerate wear on heat treated components and for over-temperature evaluation.

This gear box is presently installed on the A/C (S/N 57-6103). All original component parts have been reinstalled with the exception of the gear quill roller bearing which had previously been annealed.

APPENDIX VI
ENGINEERING SPECIFICATION

THE *Bendix* CORPORATION

YORK DIVISION · YORK, PENNSYLVANIA

SECURITY CLASSIFICATION
UNCLASSIFIED

"This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law."

ENGINEERING SPECIFICATION

CATEGORY Design (Preliminary)

SUBJECT Automatic Light Aircraft
Readiness Monitor (ALARM)

CHANGE NUMBER	SYM.	PAGE	PARA.	REVISION	ENG'D BY	CHK'D BY	DATE
				Revised			11-15-60 12-14-61
							1129982
NUMBER 1129982		ORIGINATED BY		DATE	PROJECT ENG.		DATE
					APPROVED BY		DATE PAGE OF PAGES 1 1 9

THE Bendix CORPORATION ENGINE DIVISION TORONTO, ONTARIO CANADA	SECURITY CLASSIFICATION UNCLASSIFIED						
1.0 Scope: This specification is issued to establish the design, fabrication and test of an automatic light aircraft readiness monitoring system. 2.0 Applicable Documents: 2.1 BxY Sales Order 616 (Statement of Work) 2.2 BxY Installation Drawings (ALARM) 2.3 Project ALARM Phase I Report 2.4 Project ALARM monthly progress reports 3.0 Requirements: 3.1 General 3.1.1 The system shall automatically indicate the Go/No-Go status of all aircraft components or operational conditions considered amenable to electronic measurement techniques. 3.1.2 The resultant equipment shall be installed in the aircraft as part of the normal instrument array, and conveniently operable and observable by the pilot or co-pilot of the aircraft. 3.1.3 Solid-state circuitry and miniature components shall be used throughout to minimize overall system weight and volume. 3.1.4 The system shall perform as specified throughout an anticipated ambient temperature range of -20° C to +40° C. 3.1.5 The system shall perform as specified when subjected to vibration as follows: a. 0 to 15 cps - .5 inch D. A. displacement b. 15 to 500 cps - 5 g 3.1.6 The equipment shall be operated from the aircraft non-essential bus (provided this voltage is 28 VDC $\pm$ 20% and/or 105-125V ac; 400 cycle power from the Main Inverter. Power conversion modules (DC to DC or AC to DC) shall be of minimum size and weight and mounted in the battery or inverter compartments.							
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NUMBER	PAGE OF	PAGES					
1129982	2	9					

3.1.7 Design shall be fail-safe wherever possible to the degree that failure will result in a No Go indication.

3.2 Detailed Requirements

3.2.1 Control/Display Section

- 3.2.1.1 The Control/Display section shall consist of all switching and indicating components necessary to control monitor operation and indicate aircraft status.
- 3.2.1.2 Each monitoring channel shall be an independent electrical configuration from sensor to indicator lamp.
- 3.2.1.3 Illuminated legends shall be employed for each channel to identify the particular aircraft component or operational condition being monitored.
- 3.2.1.4 The illuminated legend shall light to warn of a No Go condition.
- 3.2.1.5 A single rotary switch shall be employed to select the following system modes of operation:
 - a. Off
 - b. Self-Check
 - c. Static
 - d. Dynamic
 - e. In-Flight
- 3.2.1.6 A self check mode shall be provided in which all legends are illuminated to pass in self check "High" and all are extinguished in self check "Low".
- 3.2.1.7 The Self-Check "High-Low" selector shall be a spring loaded toggle arrangement to prevent leaving this switch in "High" or "Low".
- 3.2.1.8 A satisfactory system condition when in self check "High" or "Low" shall illuminate a green indicator lamp labeled Self Check "Go".

NUMBER

1129982

NUMBER
1129982

PAGE

3

OF

PAGES

9

- 3.2.1.9 The Static mode shall be used to interrogate all channels not requiring start-up of the aircraft power plant as part of their proper measurement.
- 3.2.1.10 Dynamic and In Flight modes shall be used for interrogation of all channels requiring start-up of the aircraft power plant as part of their proper measurement.
- 3.2.1.11 Dynamic and In Flight modes shall be identical with the singular exception that switching to In Flight changes No Go limits where necessary (See Para. 3.2.4.13).
- 3.2.1.12 Illumination of any legend indicating a channel No Go in any mode other than Self Check shall also cause the aircraft Master Caution light to illuminate.
- 3.2.1.13 Switching provision shall be provided to "lock-out" each individual channel separately at the operator's discretion to prevent the Master Caution light being energized by this channel.
- 3.2.1.14 Switching provision satisfying para. 3.2.1.13 requirement shall be capable of remaining in the "lock-out" position when subjected to shock approaching 50 g's, providing a record of switch positions if the aircraft crashes.

3.2.2 Interlocks/Continuity Channels

- 3.2.2.1 Channels indicating a No Go condition by operation of conventional switches shall be identified as Interlock channels.
- 3.2.2.2 If more than one switch is utilized in a particular channel to minimize wiring and/or number of separate indicator lamps, the maximum in such arrangements shall be six.
- 3.2.2.3 As a fail-safe consideration, operation of interlock switches shall be an open circuit indicating the No Go condition.

NUMBER
1129982

NUMBER
1129982

4

9

- 3.2.2.4 Channels indicating a No Go condition by providing continuity through sensing devices other than conventional switches shall be identified as Continuity Channels.
- 3.2.2.5 Each individual Continuity Channel shall have independent operation, including separate indicator lamp.
- 3.2.2.6 Self-Check of both Interlock and Continuity channels shall be such that complete continuity of wiring is checked and the indicator is energized by this continuity (may be independent of switch or sensor position).
- 3.2.2.7 The Go condition (complete continuity) shall hold a current sensitive DPDT relay energized; the contacts of this relay shall be utilized for controlling the illuminated legend.

3.2.3 Temperature Channels (Analog)

- 3.2.3.1 Channels indicating a No Go condition by operation of a thermostat or other temperature activated switching device shall be included as a Continuity Channel (See Para. 3.2.2).
- 3.2.3.2 Channels utilizing analog-type of temperature sensors such as thermocouples shall be identified as Temperature Channels.
- 3.2.3.3 All signal-conditioning circuitry and level detectors shall be of solid-state design and located in the main electronics chassis (with the Control/Display panel).
- 3.2.3.4 Detection levels of these channels shall be individually adjustable and of sufficient range to insure capability of measuring to any temperature above ambient required by the system.
- 3.2.3.5 Temperature detection levels shall be automatically adjusted $\pm 1^{\circ}\text{C}$ for every $\pm 2^{\circ}\text{C}$ change in ambient temperature.

NUMBER
1129982

NUMBER
1129982

PAGE	OF	PAGES
5		9

3.2.3.6 The output circuitry shall hold a current-sensitive DPDT relay energized until the pre-set detection level is exceeded; the contacts of this relay shall be utilized for controlling the illuminated legend.

3.2.3.7 Self checking of these channels shall be performed by control of the ambient temperature generator such that all channels are caused to indicate No Go in 'SC High' and Go in 'SC Low', where these two conditions are $\geq 5\%$ above the No Go condition and 25% below it, respectively.

3.2.4 Vibration Channels

3.2.4.1 Channels indicating a No Go condition by operation of an acceleration switch or other vibration-activated switching device shall be included as a Continuity Channel (See para. 3.2.2).

3.2.4.2 Channels utilizing analog-type of vibration transducers such as accelerometers shall be identified as Vibration Channels.

3.2.4.3 All signal-conditioning circuitry and level detectors shall be of solid-state design and located in the main electronics chassis (with the control/display panel).

3.2.4.4 There shall be provided Vibration Channels capable of detecting peak velocity in the 20 to 500 cycle per second range and adjustable to operate from .1 to at least 10 inches/second.

3.2.4.5 There shall be provided Vibration Channels capable of detecting peak velocity in the 100 to 500 cycle per second range and adjustable to operate from .1 to at least 10 inches/second.

3.2.4.6 There shall be provided Vibration Channels capable of detecting peak velocity in the 3 to 25 cycle per second range and adjustable to operate from .1 to at least 10 inches/second.

3.2.4.7 There shall be provided Vibration Channels capable of detecting peak acceleration in the 1 KC to 15 KC range, having a maximum sensitivity of .2 g at 15 KC and decreasing in sensitivity at the rate of 17 ± 1 db/octave below 15 KC and at the rate of 45 ± 2 db/octave above 15 KC.

NUMBER
1129982

NUMBER
1129982

PAGE	OF	PAGES
6		9

- 3.2.4.8 The characteristic provided per Para. 3.2.4.7 shall be capable of adjustment such that the 15 KC sensitivity can be varied from .2 g to at least 2g without affecting the specified attenuation characteristic.
- 3.2.4.9 Self-Check of channels specified in Para. 3.2.4.4 and 3.2.4.5 shall be accomplished by a 125 ± 5 cps signal introduced into the input in Self-Check High in place of the pick-up signal of an amplitude $\geq 5\%$ above that required for a No Go indication at that frequency.
- 3.2.4.10 Self Check of channels specified in Para. 3.2.4.6 shall also be accomplished as specified in Para. 3.2.4.9, with the exception that the signal shall be introduced into the channel immediately following the passive filter used to limit this channels upper frequency response limit to 25 cps.
- 3.2.4.11 Self-Check of channels specified in Para. 3.2.4.7 shall be accomplished by a 7.5 ± 5 KC signal introduced into the input in Self-Check High in place of the pick-up signal of an amplitude $\geq 5\%$ above that required for a No Go indication at that frequency.
- 3.2.4.12 Detection limits set into all vibration channels shall be held to within $\pm 3\%$ over the specified ranges of environmental vibration and temperature (Para. 3.1.4 and 3.1.5).
- 3.2.4.13 All vibration channels shall be capable of having their No Go sensitivity reduced when the Mode Switch is moved from Dynamic to In-Flight.
- 3.2.4.14 All vibration Channels shall be delayed a minimum of 10 seconds after the detection limit has been exceeded (except in Self-Check) before indicating No Go.
- 3.2.5 Flow Monitoring Channel
- 3.2.5.1 A channel shall be provided capable of monitoring liquid rate-of-flow such as oil in the range of 2 to 7 GPM, with the flowmeter introducing no more than .75 psi pressure drop at a rate of 5 GPM.

NUMBER
1129982

NUMBER
1129982

7

9

3.2.5.2 The channel shall be capable of detecting a decrease in flow rate equal to 3% of the nominal flow, or 1 pint per minute, whichever is greater.

3.2.5.3 Self Check shall be accomplished as described in Para. 3.2.4.9, with the exception that the 125 ± 5 cps signal shall be introduced during Self-Check Low and the channel shall not indicate No Go (assuming flowmeter output is a frequency proportional to flow rate).

3.2.6 Engine Speed Monitoring Channel

3.2.6.1 A channel shall be provided capable of detecting when the aircraft engine power shaft RPM exceeds the maximum specified by the manufacturer.

3.2.6.2 This channel shall receive its input signal from the power shaft tachometer generator used in the normal cockpit RPM indicating system.

3.2.6.3 Accuracy of this channel shall be $\pm 1\%$ of nominal RPM limit setting over the specified ranges of environmental vibration and temperature (Para. 3.1.4 and 3.1.5).

3.2.6.4 The channel shall be capable of retaining the No Go indication occurring as a result of engine over-speed until it is reset manually by operation of a Reset switch.

3.2.6.5 Self-Check shall be accomplished by introducing the 125 ± 5 cps signal into the input in place of the tachometer generator signal in Self-Check High to create the No Go indication (at this time the "lock-in" feature of Para. 3.2.6.4 shall be disabled.)

4.0 Materials and Workmanship

4.1 Materials used in the construction of the system shall be of a quality which is appropriate for the particular application.

NUMBER
1129982

NUMBER
1129982
PAGE 8 OF 9

- 4.2 Non-critical materials and standard parts shall be used whenever possible, provided such use in no way affects compliance with Para. 3.0 of this specification.
- 4.3 All items developed shall be fabricated and finished in a manner such that criteria of appearance, fit, and adherence to specified tolerances are observed.
- 4.4. Particular attention shall be given to neatness, thoroughness of soldering and wiring, plating, machine screw assemblage, and freedom of parts from burrs and sharp edges.

5.0 Inspection and Tests

- 5.1 Records of all inspection work and tests, giving the results of such tests, shall be available to the contracting agency at all times.

NUMBER
1129982

PAGE OF PAGES
9 9

NUMBER
1129982