NASA Contractor Report 178160

SUMMARY OF AH-1G FLIGHT VIBRATION DATA FOR VALIDATION OF COUPLED ROTOR-FUSELAGE ANALYSES

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R.V. Dompka and J.D. Cronkhite

Bell Helicopter TEXTRON
A Subsidiary of Textron Inc.
Fort Worth, TX 76101

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Langley Research Center
Hampton, Virginia 23665-5225

FOREWORD

Bell Helicopter Textron Inc. (BHTI) has been conducting a study of finite element modeling of helicopter airframes to predict vibration. This work is being performed under U.S. Government Contract NAS1-17496. The contract is monitored by the NASA Langley Research Center, Structures Directorate.

This report summarizes the AH-1G flight vibrations data which was prepared to provide a basis for evaluating extant analysis methods for predicting coupled rotor-fuselage vibrations. Key NASA and BHTI personnel are listed below:

NASA Langley

Michael F. Cavelli, Contracting Officer
Joseph W. Owens, Contract Specialist
John Cline, Technical Representative
Raymond G. Kvaternik, Leader, Rotorcraft Structural Dynamics Group

Bell Helicopter Textron

W. Young, Chief, Research
J. D. Cronkhite, Group Engineer, Research Structures
V. L. Berry, Senior Research Engineer
R. V. Dompka, Senior Research Engineer
J. Yen, Manager Flight Technology
G. Sadler, Chief, Rotor Dynamics
J. Corrigan, Rotor Dynamics Engineer
J. Rogers, Rotor Dynamics Engineer

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SECTION 1. INTRODUCTION

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The NASA Langley Research Center is sponsoring a rotorcraft structural dynamics program with the overall objective to establish in the United States a superior capability to utilize finite element analysis models for calculations to support industrial design of helicopter airframe structures. Viewed as a whole, the program is planned to include efforts by NASA, universities, and the U.S. helicopter industry. In the initial phase of the program, teams from the major U.S. manufacturers of helicopter airframes will apply extant finite element analysis methods to calculate static internal loads and vibrations of helicopter airframes of both metal and composite construction, conduct laboratory measurements of the structural behavior of these airframes, and perform correlations between analysis and measurements to build up a basis upon which to evaluate the results of the applications. To maintain the necessary scientific observation and control, emphasis throughout these activities will be on advance planning, documentation of methods and procedures, and thorough discussion of results and experiences, all with industry-wide critique to allow maximum technology transfer between companies. The finite element models formed in this phase will then serve as the basis for the development, application, and evaluation of both improved modeling techniques and advanced analytical and computational techniques, all aimed at strengthening and enhancing the technology base which supports industrial design of helicopter airframe structures. Here again, procedures for mutual critique have been established, and these procedures call for a thorough discussion among the program participants of each method prior to the applications and of the results and experiences after the applications. The aforementioned rotorcraft structural dynamics program has been given the acronym DAMVIBS (Design Analysis Methods for VIBrationS). Under the DAMVIBS program, the four industry participants (BHTI, Boeing-Vertol, McDonnell-Douglas Helicopter, and Sikorsky Aircraft) are to apply existing company methods for coupled rotor-fuselage analysis to calculate vibrations of the AH-1G helicopter and to correlate with data available from an Operational Load Survey (OLS) flight test program (References 1 and 2). In support of this common activity, BHTI, the manufacturer of the subject aircraft, was tasked to prepare and provide to the other participants the data needed to independently make these analyses and correlations. Specifically, BHTI was tasked to:

1. Present a detailed description of the modeling rationale and techniques used to develop the AH-1G NASTRAN fuselage vibration model under previous contract (Reference 3). A NASTRAN data deck of this model was provided to all participating manufacturers.

2. Present a detailed description of all previous correlation work used to verify the fuselage vibration model (two versions - stick and built-up tailboom), including the following:

   a. Ground vibration tests (GVT), static deflection tests and in-flight excitation simulation (References 4 and 5).

b. Application of the built-up tailboom model predictions to the previous static and vibration ground tests of Reference 4.

c. Correlation of both models with other prior AH-1G GVT results contained in References 6 and 7.

3. Describe the OLS flight-test program on the AH-1G and assemble the vibration data to be used in the correlations.

4. Present the AH-1G rotor system mechanical and aerodynamic coefficient data to all participants.

This report addresses items 3 and 4, i.e., describes the OLS flight test program conducted with the AH-1G, summarizes the mechanical and aerodynamic characteristics of the rotor system, and identifies the vibration data to be used in the correlations.

SECTION 2. DESCRIPTION OF THE AH-1G OPERATIONAL LOAD SURVEY (OLS) HELICOPTER

AH-1G OPERATIONAL LOAD SURVEY (OLS) HELICOPTER

The subject helicopter of this contract is a U.S. Army AH-1G helicopter, Serial No. 20391. This model was picked because both a well-documented fuselage model and flight-test data exist from previous contract work. A large-scale Operational Load Survey (OLS) flight-test program was conducted in 1975 by BHTI under contract to the Army using an extensively instrumented AH-1G. The OLS program produced an enormous library of consistent, well-documented test data suited for investigations with rotorcraft simulation programs. The OLS data base is presented in this report for use by all participating analysts to correlate the proposed rotor-fuselage vibration predictions.

In addition to the standard equipment on the helicopter, the following items were installed on the fuselage:

1. A 28-track, AR-728 tape recorder, stationary multiplex, telemetry transmitter (TM) and power supplies, all mounted on an equipment rack in the ammo bay.

2. 23 accelerometers mounted on the fuselage.

3. A rotating multiplex (R-MUX), mounted on the trunnion.

4. A nose boom, mounted forward of the ship for airspeed measurements.

5. A hot-wire fault indicator, mounted in the cockpit.

Minor fuselage modifications were necessary to facilitate instrumentation routing. These modifications were made in low-load or nonstructural areas to ensure that fuselage structural integrity was not compromised.

AH-1G OPERATIONAL LOAD SURVEY (OLS) HELICOPTER

OF POOR QUALITY

AH-1G OLS ROTOR ENVIRONMENT TEST INSTRUMENTATION

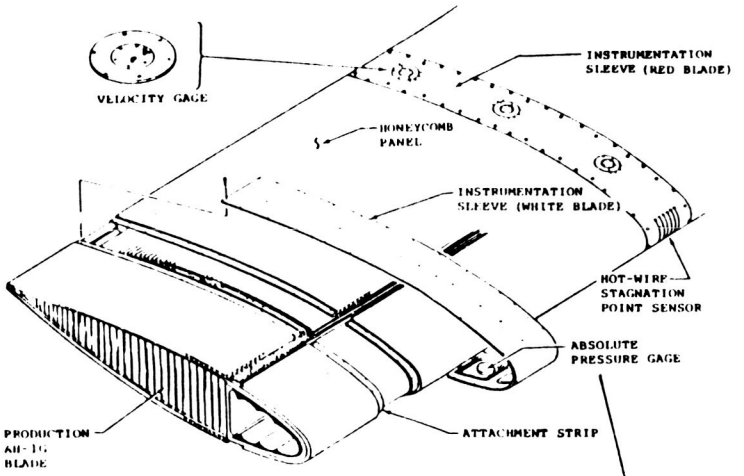
The production version of the AH-1G helicopter uses a BHT-developed 540 main rotor. This rotor was modified using a "gloved blade" approach during instrumentation to maintain structural integrity and a smooth aerodynamic surface for the OLS main rotor (see figure). Due to the large quantity of wiring needed for the 314 rotating sensors used on the OLS rotor system, a rotating electronics/multiplex (R-MUX) was used to provide a reliable means of interfacing between rotating and stationary system instrumentation.

New main rotor blades were manufactured for the OLS program to accommodate the extensive instrumentation installed in the fiberglass sleeve attached to the exterior of the production 540 blades. The midspan and tip tuning weights were reduced from the 540 to retune the main rotor blades with the additional mass and stiffness of the sleeve. A detailed description of the OLS rotor changes appears in Reference 2, pages 66-78. However, for the AH-1G FEM, the analyst must only consider the total weight of the OLS system shown in Appendix B, page 1, to be 504.298 lb_f/blade. This weight is placed at the main rotor cg (grid 200153) and R-MUX instrumentation locations (grids 200155 and 200162) to simulate main rotor weights which includes the multiplexor equipment rotating and flapping with the blade.

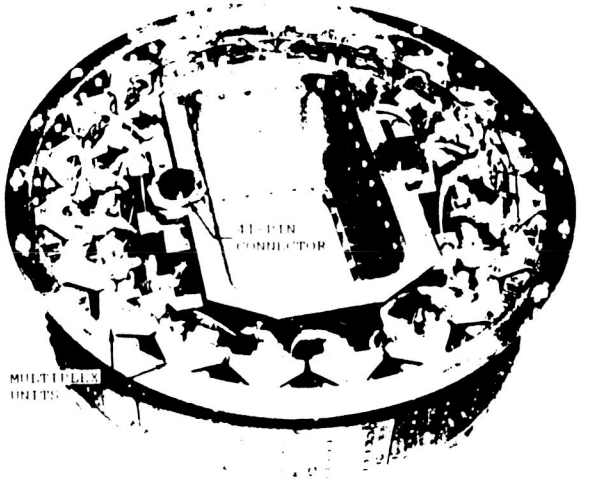
The OLS instrumentation weight additions are described below:

		Weight (lb)	
Instrumented package in ammo bay		246.5	
Main rotor slip ring		15.0	
Tail rotor slip ring		3.5	
Main rotor stand pipe		5.0	
Main rotor mast nut		8.5	
Telemetry transmitter		2.5	
Hub accelerometer and azimuth blipper		5.5	
Yaw boom		12.0	
Yaw boom yaps head		4.5	
R-MUX box		56.0	
Wiring		41.0	
Main rotor blade instrumentation		29.0	
Useful loads for Flight 35A tailboom ballast		100.0	(to achieve desired location of cg)
OLS instrumentation weights (for all configurations)	Total	529.0	

AH-1G OLS ROTOR ENVIRONMENT TEST INSTRUMENTATION

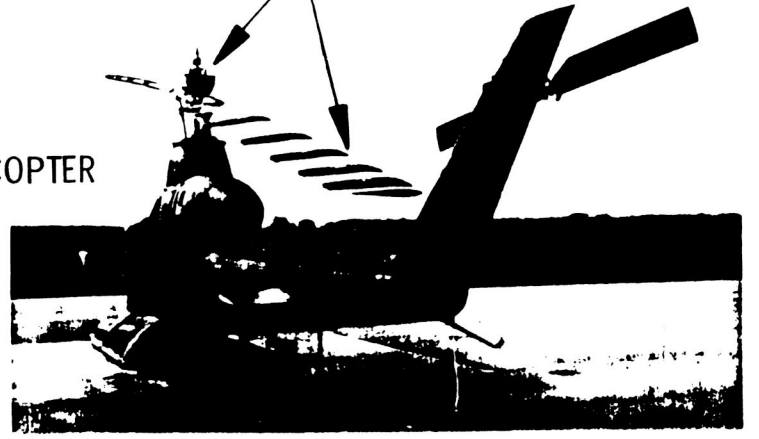


INSTRUMENTATION SLEEVE



ROTATING MULTIPLEX UNIT (R-MUX)

AH-1G OLS HELICOPTER



OLS DATA REDUCTION PROCEDURE

This section of the report describes the effort to select and retrieve portions of an existing body of data applicable to the coupled rotor/fuselage vibration analysis. The OLS data base is very extensive and represents flight vibration levels of the AH-1G helicopter under several flight conditions. An outline is presented below of the steps used to obtain the proper OLS flight-test data.

1. Identify flights of interest

    a. Straight-and-level flights with available data identified from Reference 1

        (1) 45C, 43, 35A, 35B, 36A, 37A

2. Data item availability was verified

    a. 45C, 43 - no fuselage vibrations exist (written over by acoustical data)

    b. 35B - no hub accelerations exist

    c. 35A, 36A, 37A - all data items of interest available

        *Flight 35A sanctioned by NASA as target flight configuration

3. Time-history stripouts

    a. Entire data records (≈10 sec) produced for each item of interest in Flight 35A

    b. "Gross" data characteristics evaluated (i.e., glitches, blossoms, spikes, etc.)

    c. Data "window" (0.5 to 2.5 sec range) selected based on "gross" characteristics

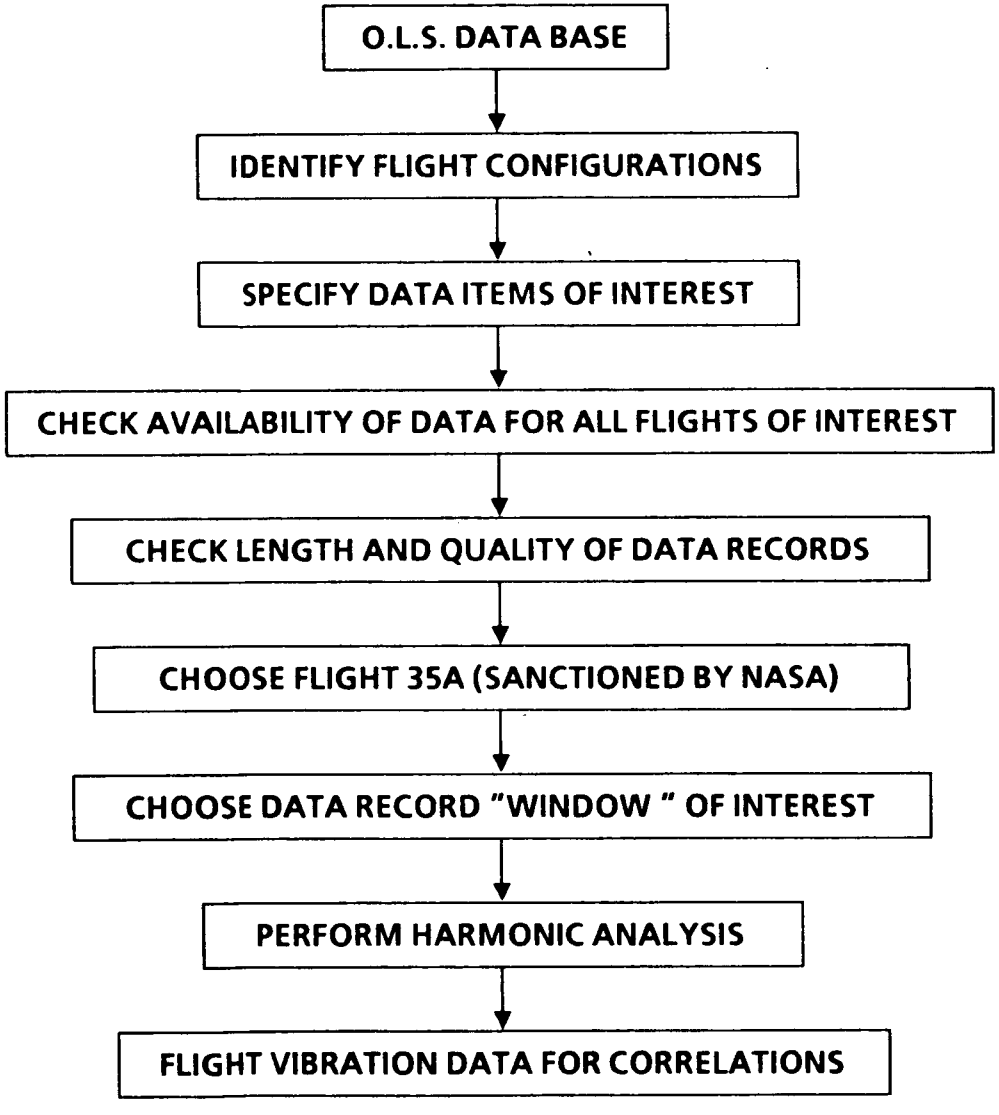
    d. Airspeed values and rotor pulses checked to verify test identification

4. Perform harmonic analysis

    a. Automated data processing using BHT-developed program "FFAE04"

5. Provide correlation data for all participants

OLS DATA REDUCTION PROCEDURE



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SECTION 3. FLIGHT CONDITION OF INTEREST

FLIGHT CONDITIONS FROM THE BASIC OLS PROGRAM

Proper identification of data items within the OLS data base begins with specification of the flight number and hence the flight configuration of interest. Flight 35A represents the OLS straight-and-level, clean-wing, aft cg flight configuration chosen for this study. There are 6 counter numbers, 610 through 615, associated with Flight 35A and its six target airspeeds. V_h is defined as the maximum speed attainable (powerplant limited) at maximum continuous power and corresponds to a true airspeed of 142 knots for Flight 35A.

FLIGHT CONDITIONS FROM THE BASIC OLS PROGRAM

G.W.:	8100 lb (clean wing)			9000 lb (wing stores)		
C.G.:	Fwd	Mid	Aft	Fwd	Mid	Aft
Flight Condition	Flt/Ctr	Flt/Ctr	Flt/Ctr	Flt/Ctr	Flt/Ctr	Flt/Ctr
Normal start	-	45C 1084	-	-	-	-
Normal shutdown	-	45A 1053	-	-	-	-
Normal takeoff	-	45C 1085	-	-	-	-
Normal acceleration	-	45C 1087	-	-	-	-
Normal deceleration	-	45A 1048	-	-	-	-
Normal landing	-	45C 1099	-	-	-	-
Hover, IGE (4 ft)	-	45C 1098	-	-	-	-
Hover, OGE (100 ft)	-	45B 1078	-	-	31A 535	-
Forward flight, 0.5 V_h	45C 1088	43 860	35A 611	35B 618	37B 685	-
Forward flight, 0.6 V_h	1089	863	612	619	36A 636	37A 676
Forward flight, 0.7 V_h	1090	864	613	620	637	677
Forward flight, 0.8 V_h	1091	865	614	621	638	678
Forward flight, 0.9 V_h	1092	868	615	622	639	679
Forward flight, 1.0 V_h	45C 1093	43 869	35A 610	35B 617	640	680
Climb at 1100 shp	-	22A 367	-	-	36A 635	37A 675
Maximum level flight acceleration	-	22A 377	-	-	-	-
Pullups	-	32A 562	-	-	-	-
Pushovers	-	563	-	-	-	-
Gunnery dive	-	568	-	-	-	-
Gunnery dive, left pullout	-	569	-	-	35C 626	-
Gunnery drive, right pullout	-	571	-	-	625	-
Gunnery drive, symmetrical pullout	-	32A 567	-	-	35C 627	-
Power to autorotation	-	45C 1094	-	-	31 538	-
Autorotation to power	-	45C 1095	-	-	-	-
Partial power descent	-	45A 1047	-	-	-	-

OLS AIRSPEED CALIBRATION CHART

Most transducer calibration values have linear relationships to the engineering units in question. Therefore, the structural analyst never deals with instrumentation calibration because the electronic signals are directly converted to engineering units during digitization. Airspeed calibration, however, often has a nonlinear calibration curve and requires the analyst to convert the measured value to a desired format. The boom airspeed measured by instrument #B1698 during the OLS program was recorded in knots squared. The square root of the mean value of the measured boom airspeed is indicated airspeed (IAS) and was compared with velocities recorded on the pilot card from Flight 35A to verify test conditions. All velocities checked well with pilot card information. IAS is converted to calibrated airspeed (CAS) via the graph below. The diagonal curve represents instrument calibration due to installation error. The nonlinear curve was obtained from calibration tests done during flights 24 and 25 of the OLS flight-test program. IAS is converted to CAS by projecting a straight line from the IAS diagonal curve to the CAS curve as shown by the dotted line. Assuming no compressibility effects exist at these low airspeeds, the desired value of true airspeed (TAS) in knots is determined by dividing CAS by the square root of the density ratio (σ) to account for altitude and outside air temperature (OAT) conditions. The following information was obtained from the pilot card of Flight 35A and the equations used to determine σ are shown below.

Pressure altitude = H_D = 5000 ft

Density altitude = H_p = 2900 ft

Pressure ratio $\equiv \delta$ = 0.9005 (from aerodynamic tables)

Temperature ratio (absolute) $\equiv \theta$ = 1.045

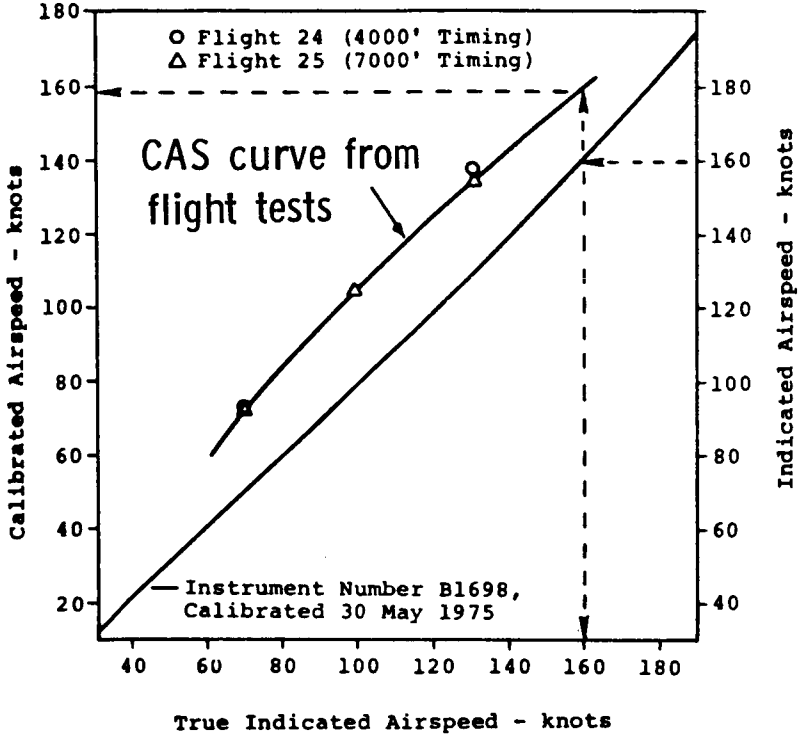
Density ratio $\equiv \sigma = \frac{\delta}{\theta}$ = 0.8617

TAS $= \frac{CAS}{\sqrt{\sigma}}$ values for all counter numbers (target airspeeds) shown on figure below.

T = 28°C = 82.4°F (from pilot card)

$$\theta = \frac{^\circ F + ^\circ R}{^\circ F_o + ^\circ R} = \frac{82.4 + 460}{59 + 460} = 1.045$$

OLS AIRSPEED CALIBRATION CHART

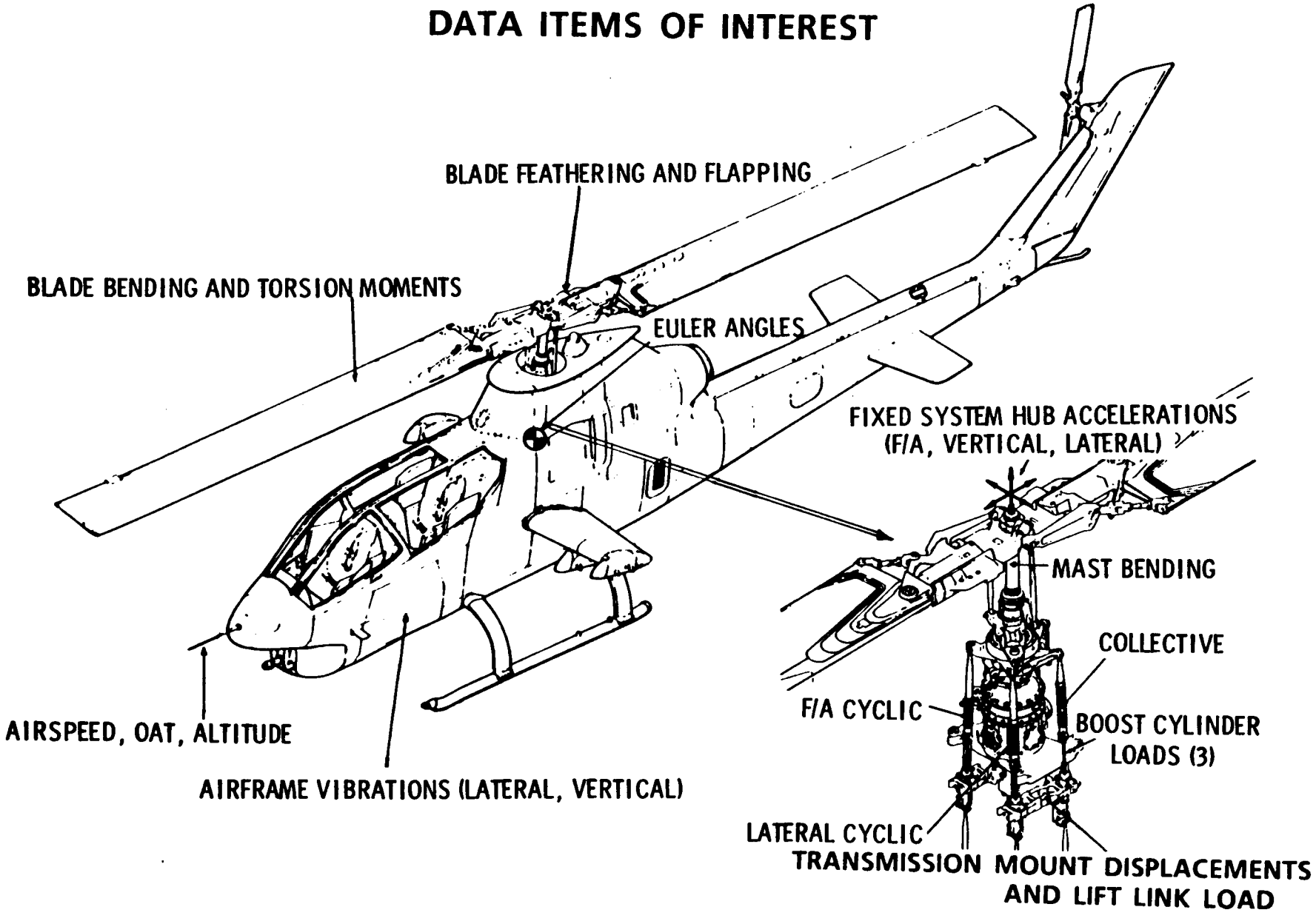


FLIGHT	COUNTER	IAS	CAS	DENSITY RATIO	TAS
35A	611	62.7	62.2	.8617	67
35A	612	76.8	78.8	.8617	85
35A	613	91.3	93.8	.8617	101
35A	614	103.2	105.5	.8617	114
35A	615	115.3	119.1	.8617	128
35A	610	128.8	131.6	.8617	142

DATA ITEMS OF INTEREST

Approximately 60 data items were selected from the OLS data base to provide correlation points for the coupled rotor/fuselage vibration analysis. Fuselage vibrations, control system loads, blade moments, transmission mount displacements, and vehicle performance information are all represented. The availability and accessibility of each of these data items for Flight 35A was determined by producing time-history stripouts for each item. From these stripout charts a "window" was picked which provided consistent quality data records for each data item of interest. A two-second range of interest (0.5 to 2.5 sec) was specified which encompasses approximately 10 cycles of data at the 324 nominal rpm used during the test. None of the data items exhibited faulty data patterns or excessive glitches, spikes, or blossoms during this specified range of interest. The following two figures show the physical locations of fuselage accelerometers and blade strain gages used during the OLS test program.

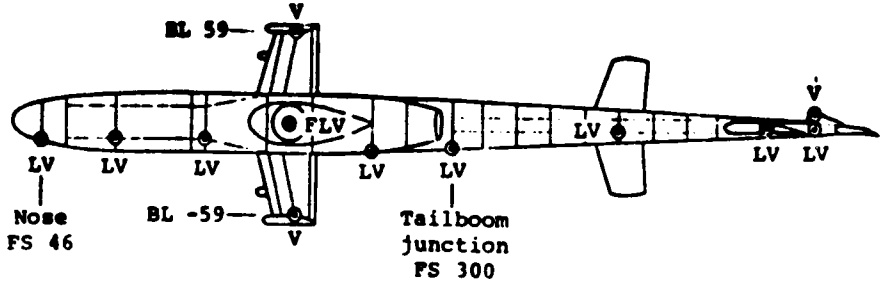
DATA ITEMS OF INTEREST

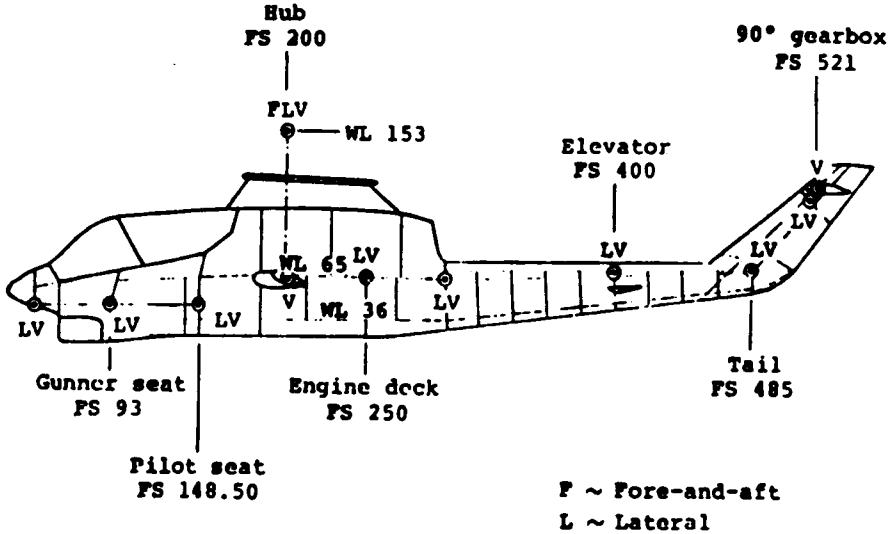


FUSELAGE ACCELEROMETER LOCATIONS

Fuselage accelerometer locations for the OLS flight-test program are shown in this figure. Fixed system primary harmonics are 2 (10.8 Hz), 4 (21.6 Hz), and 6 (32.4 Hz) per rev for the two-bladed teetering rotor used in the OLS program. These harmonics represent the predominant excitation frequencies through at least a 30 Hz frequency range of interest as prescribed under this contract.

FUSELAGE ACCELEROMETER LOCATIONS



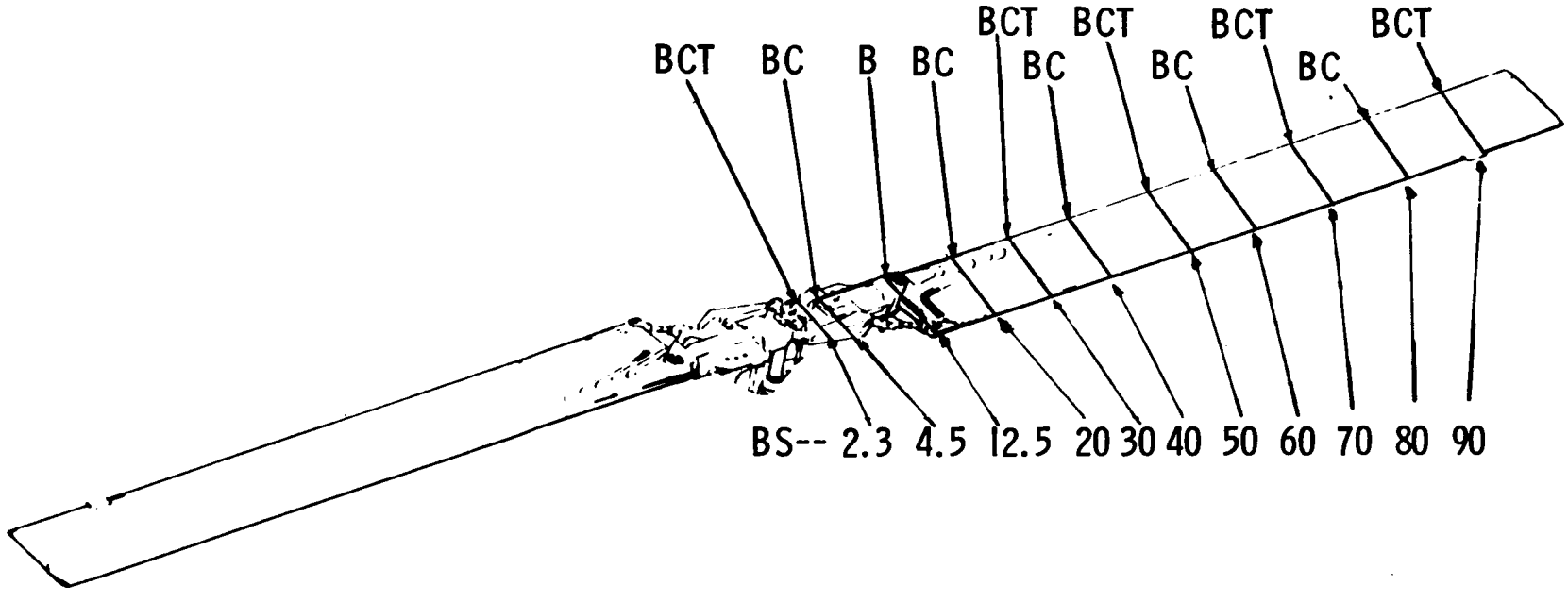


F ~ Fore-and-aft
L ~ Lateral
V ~ Vertical
FS ~ Fuselage station
WL ~ Waterline
BL ~ Buttline

BLADE AND YOKE STRAIN GAGE LOCATIONS

The radial locations of the blade strain gages used to monitor blade beam, chord, and torsion moments are specified in this figure. 1 (5.4 Hz), 3 (16.2 Hz), and 5 (27 Hz) per rev harmonics are the predominant excitation frequencies for the chord (inplane) and torsion moments and 2, 4, and 6 per rev harmonics for the beam (out-of-plane) moments. Again, these harmonics represent the low frequency range through at least 30 Hz.

BLADE AND YOKE STRAIN GAGE LOCATIONS



B- BEAM BENDING MOMENT
C- CHORD BENDING MOMENT
T- TORSIONAL MOMENT
BS-BLADE STATION (% RADIUS)

DATA ITEM DESCRIPTION

The attached table contains a listing of all the data items presented with this report for Flight 35A. Each data item listed in the table has a specific description to enable all participating manufacturers to identify a particular item for use during correlation. The harmonic data reduction values are presented in Appendix A.

DATA ITEM DESCRIPTION

PERTINENT INFORMATION FOR EXTRACTING DATA FROM THE
DIGITIZED GDC TAPES AT BELL HELICOPTER TEXTRON

DATA GROUP	GDC TAPE #	SAMPLING RATE(SAMPLES/SEC)/BREAK FREQUENCY(Hz)
A	F2270202	512 / 50
B	F1800131	2048 / 200
C	F2230205	4096 / 400
D	F1930601	2048 / 200
E	F2040202	512 / 50

GROUP #	DATA ITEM #	UNITS	ITEM DESCRIPTION	HARMONICS OF INTEREST
A	A005	G	C. G. LOAD FACTOR	2, 4, 6
A	F050	LB	LIFT LINK AXIAL FORCE	2, 4, 6
A	F100	LB	F/A CYCLIC BOOST TUBE AXIAL FORCE	2, 4, 6
A	F101	LB	LATERAL CYCLIC BOOST TUBE AXIAL FORCE	2, 4, 6
A	F102	LB	COLLECTIVE BOOST TUBE AXIAL FORCE	2, 4, 6
A	F103	LB	MR RED PITCH LINK AXIAL FORCE	1, 3, 5
A	F104	LB	MR WHITE PITCH LINK AXIAL FORCE	1, 3, 5
A	D009	DEG	ROLL ATTITUDE	1, 2, 3, 4, 5, 6
A	D010	DEG	PITCH ATTITUDE	1, 2, 3, 4, 5, 6
A	D011	DEG	YAW ATTITUDE	1, 2, 3, 4, 5, 6
A	D051	IN	LEFT FORWARD PYLON VERTICAL DISP.	2, 4, 6
A	D052	IN	RIGHT FORWARD PYLON VERTICAL DISP.	2, 4, 6
A	D053	IN	LEFT AFT PYLON VERTICAL DISP.	2, 4, 6
A	D054	IN	RIGHT AFT PYLON VERTICAL DISP.	2, 4, 6
A	D110	DEG.	MR HUB FLAPPING ANGLE	1, 3, 5
A	D111	DEG	MR HUB FEATHERING ANGLE	1, 3, 5
A	M107	IN-LB	MR MAST TORQUE	1, 2, 3, 4, 5, 6

DATA ITEM DESCRIPTION (CONTINUED)

GROUP #	DATA ITEM #	UNITS	ITEM DESCRIPTION	HARMONICS OF INTEREST
B	A019	G	PILOT VERTICAL VIBRATION STA 148.5	2, 4, 6
B	A02B	G	GUNNER VERTICAL VIBRATION STA 93.0	2, 4, 6
B	A60B	G	LEFT WING VERTICAL VIBRATION STA 204.0	2, 4, 6
B	A601	G	RIGHT WING VERTICAL VIBRATION STA 204.0	2, 4, 6
B	A302	G	PILOT LATERAL VIBRATION STA 148.5	2, 4, 6
B	A304	G	GUNNER LATERAL VIBRATION STA 93.0	2, 4, 6
B	A306	G	NOSE LATERAL VIBRATION STA 46.0	2, 4, 6
B	A307	G	ENGINE DECK LATERAL VIBRATION STA 250.0	2, 4, 6
B	A308	G	TB JUNCTION LATERAL VIBRATION STA 298.7	2, 4, 6
B	A309	G	ELEVATOR LATERAL VIBRATION STA 401.33	2, 4, 6
B	A311	G	VERTICAL FIN LATERAL VIBRATION STA 515.43	2, 4, 6
B	A315	G	NOSE VERTICAL VIBRATION STA 46.0	2, 4, 6
B	A316	G	ENGINE DECK VERTICAL VIBRATION STA 250.0	2, 4, 6
B	A317	G	TB JUNCTION VERTICAL VIBRATION STA 298.7	2, 4, 6
B	A318	G	ELEVATOR VERTICAL VIBRATION STA 401.32	2, 4, 6
B	A319	G	TAIL FIN JUNCTION VERT. VIBRATION STA 488.93	2, 4, 6
B	A320	G	VERTICAL FIN VERTICAL VIBRATION STA 515.43	2, 4, 6
B	A321	G	TB 90° GEAR BOX VERTICAL VIBRATION STA 520.67	2, 4, 6
B	F105	LB	MR RED DRAG BRACE AXIAL FORCE	1, 3, 5
B	B122	IN-LB	50%R MR RED BLADE BEAM BENDING	2, 4, 6
B	B123	IN-LB	50%R MR RED BLADE CHORD BENDING	1, 3, 5
B	B126	IN-LB	30%R MR RED BLADE BEAM BENDING	2, 4, 6
C	A886	G	MAST TOP(HUB) F/A VIBRATION STA 200	2, 4, 6
C	A887	G	MAST TOP(HUB) LATERAL VIBRATION STA 200	2, 4, 6
C	A888	G	MAST TOP(HUB) VERTICAL VIBRATION STA 200	2, 4, 6
C	A150	IN-LB	30% MR RED BLADE TORSION MOMENT	1, 3, 5
C	T004	DEG C	OUTSIDE AIR TEMPERATURE	
C	P002	KT**2	AIRSPEED-BOOM SYSTEM	
D	B108	IN-LB	MR MAST PARALLEL BENDING STA 18.5	1, 3, 5
D	B109	IN-LB	MR MAST PERPENDICULAR BENDING STA 18.5	1, 3, 5
D	B127	IN-LB	30%R MR RED BLADE CHORD BENDING	1, 3, 5
D	B132	IN-LB	70%R MR RED BLADE BEAM BENDING	2, 4, 6
D	B133	IN-LB	70%R MR RED BLADE CHORD BENDING	1, 3, 5

DATA ITEM DESCRIPTION (CONCLUDED)

GROUP #	DATA ITEM #	UNITS	ITEM DESCRIPTION	HARMONICS OF INTEREST
D	B134	IN-LB	90%R MR RED BLADE BEAM BENDING	2, 4, 6
D	M935	IN-LB	50%R MR RED BLADE TORSIGN MOMENT	1, 3, 5
D	M936	IN-LB	70%R MR RED BLADE TORSION MOEMNT	1, 3, 5
D	M937	IN-LB	90%R MR RED BLADE TORSION MOMENT	1, 3, 5
E	R992	PULSES	M/R AZIMUTH	1
E	B882	IN-LB	MR MAST PARALLEL BENDING STA 6.5	1, 3, 5
E	B883	IN-LB	MR MAST PERPENDICULAR BENDING STA 5.0	1, 3, 5

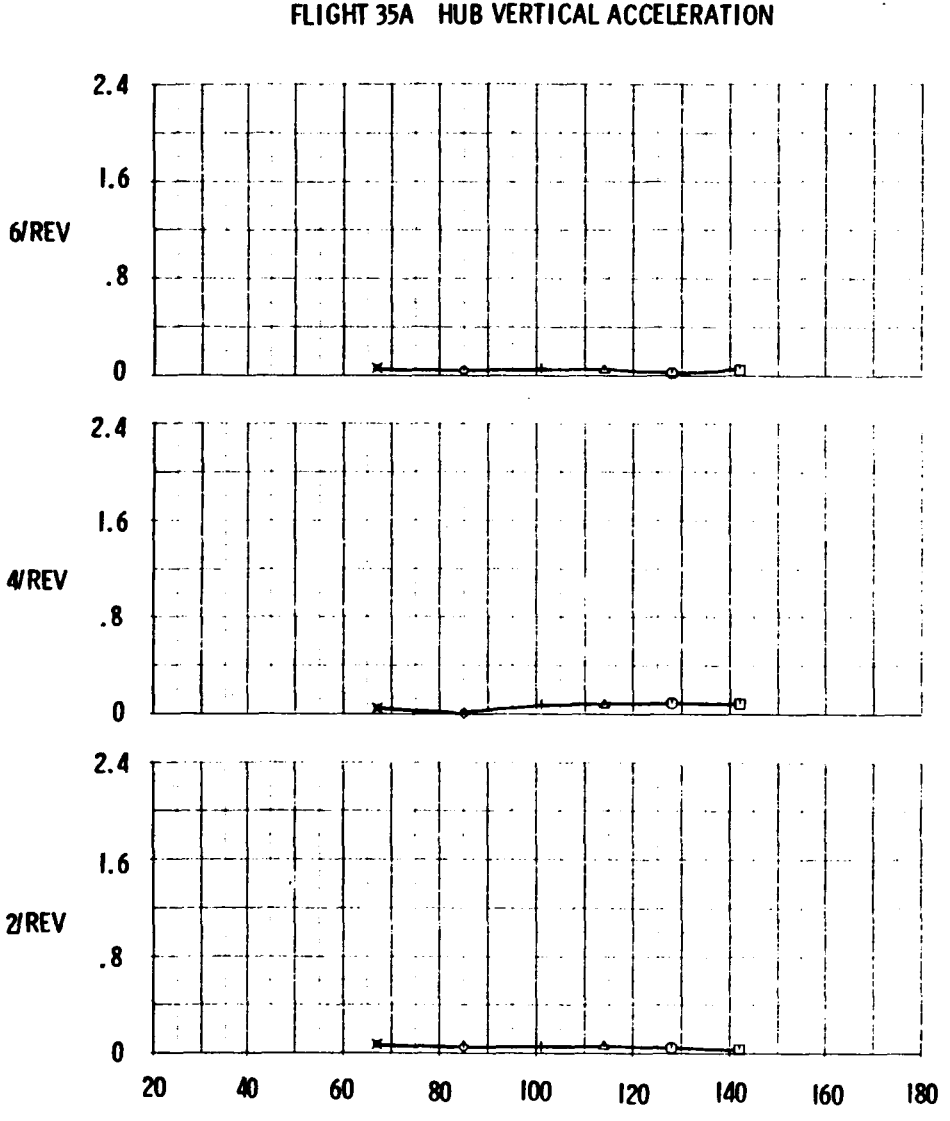
SAMPLE HARMONIC OUTPUT

Sample plots of selected data items are presented on the following nine pages as an example of the final result of the OLS data reduction procedure. These plots show sample 2, 4, and 6p hub and fuselage accelerations in G's as a function of airspeed. Tabular listings for all data items appear in Appendix A. This data presentation marks the end of the descriptive section on the OLS data base.

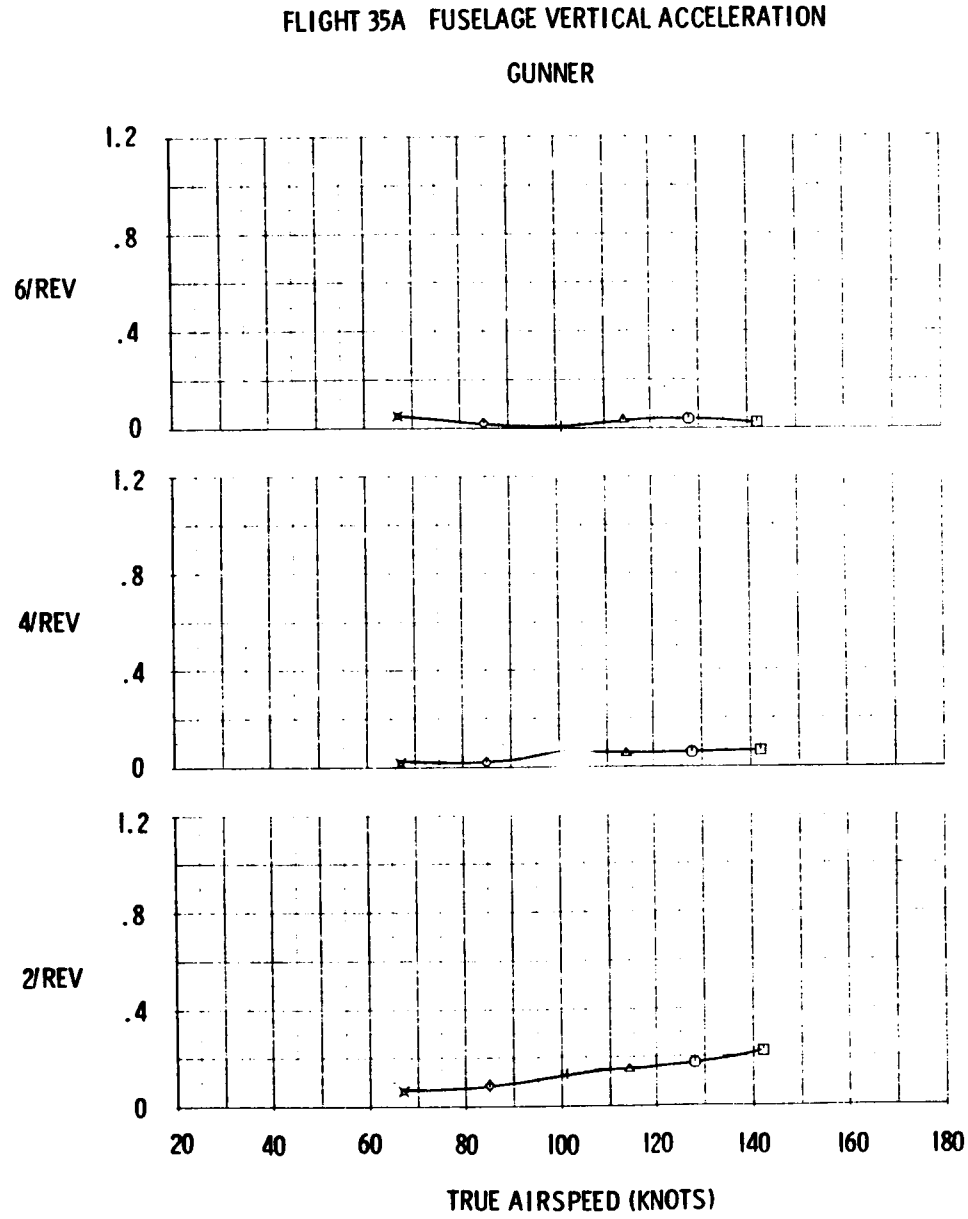
Example plots of harmonically reduced data versus airspeed for Flight 35A include:

1. Hub vertical accelerations
2. Gunner vertical accelerations
3. Pilot vertical accelerations
4. 90° gearbox vertical accelerations
5. Hub lateral accelerations
6. Gunner lateral accelerations
7. Pilot lateral accelerations
8. Tailboom lateral accelerations
9. Hub longitudinal accelerations

SAMPLE HARMONIC OUTPUT

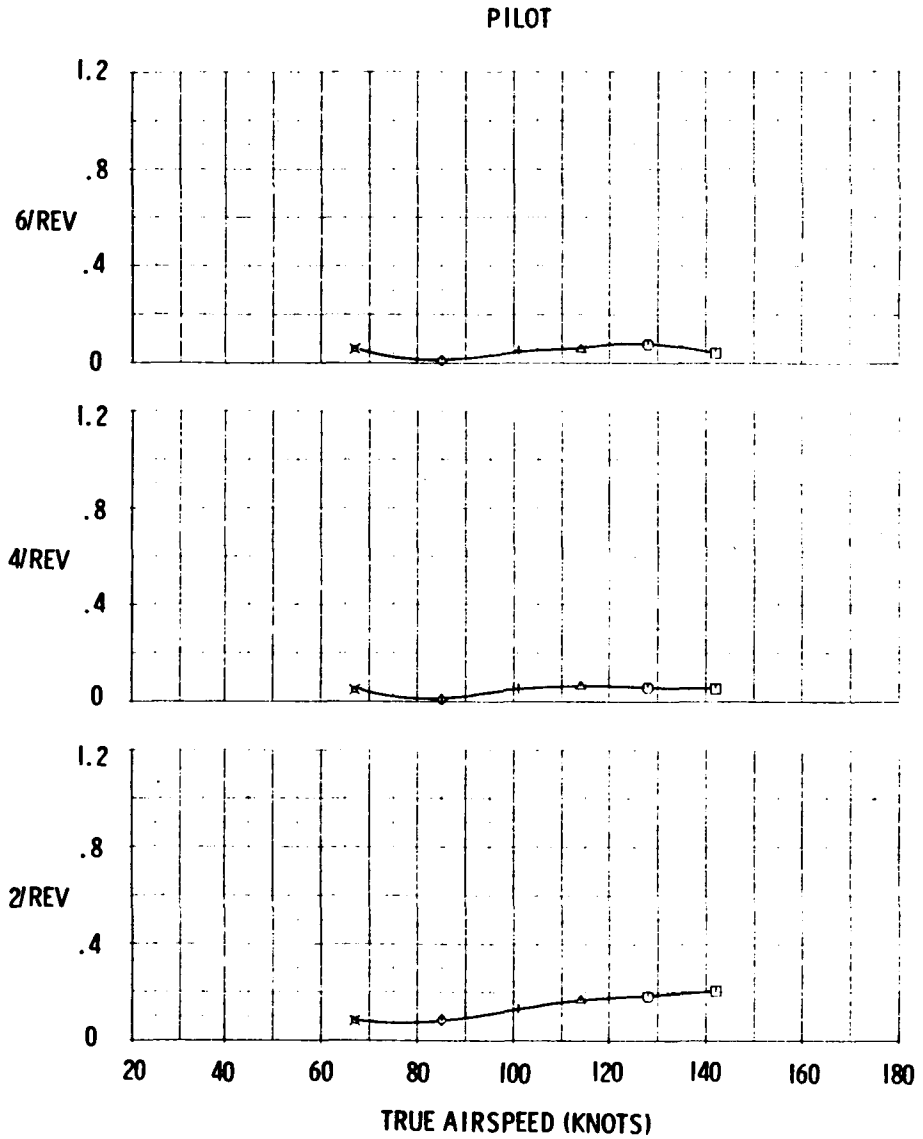


SAMPLE HARMONIC OUTPUT (CONTINUED)



SAMPLE HARMONIC OUTPUT (CONTINUED)

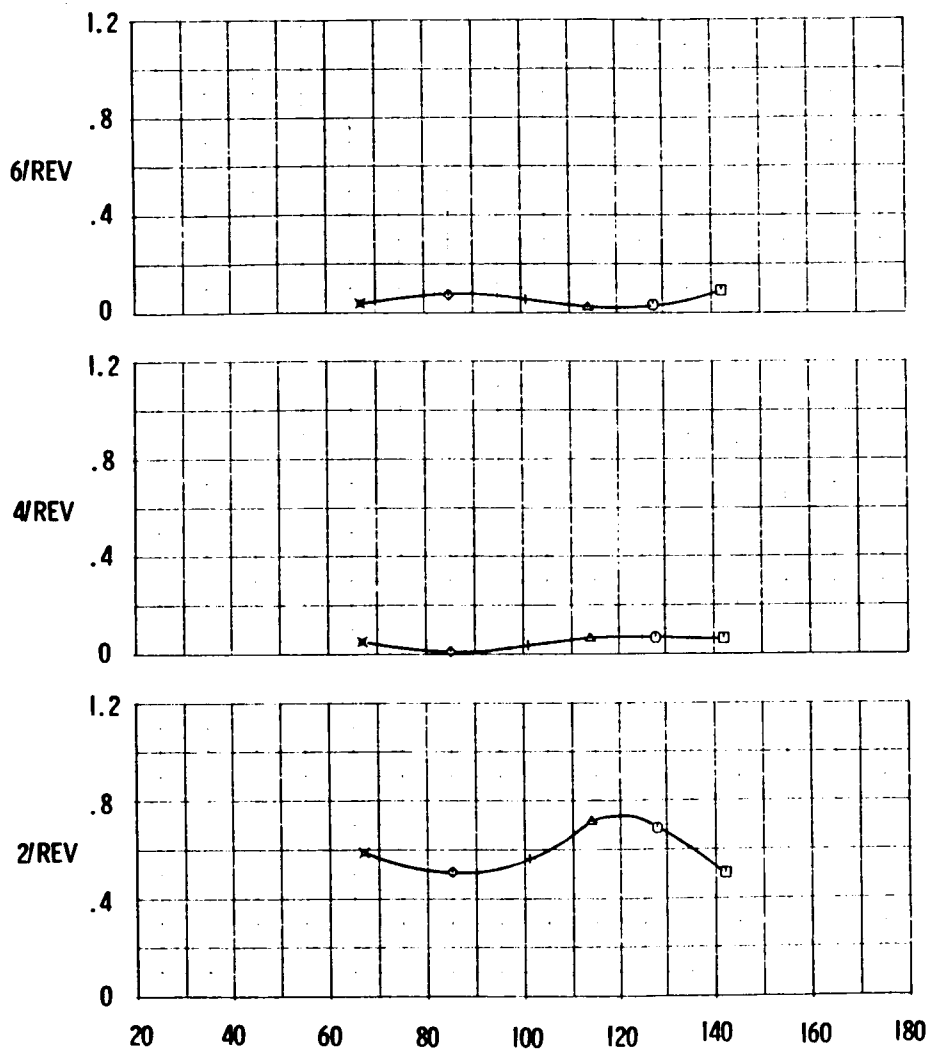
FLIGHT 35A FUSELAGE VERTICAL ACCELERATION



SAMPLE HARMONIC OUTPUT (CONTINUED)

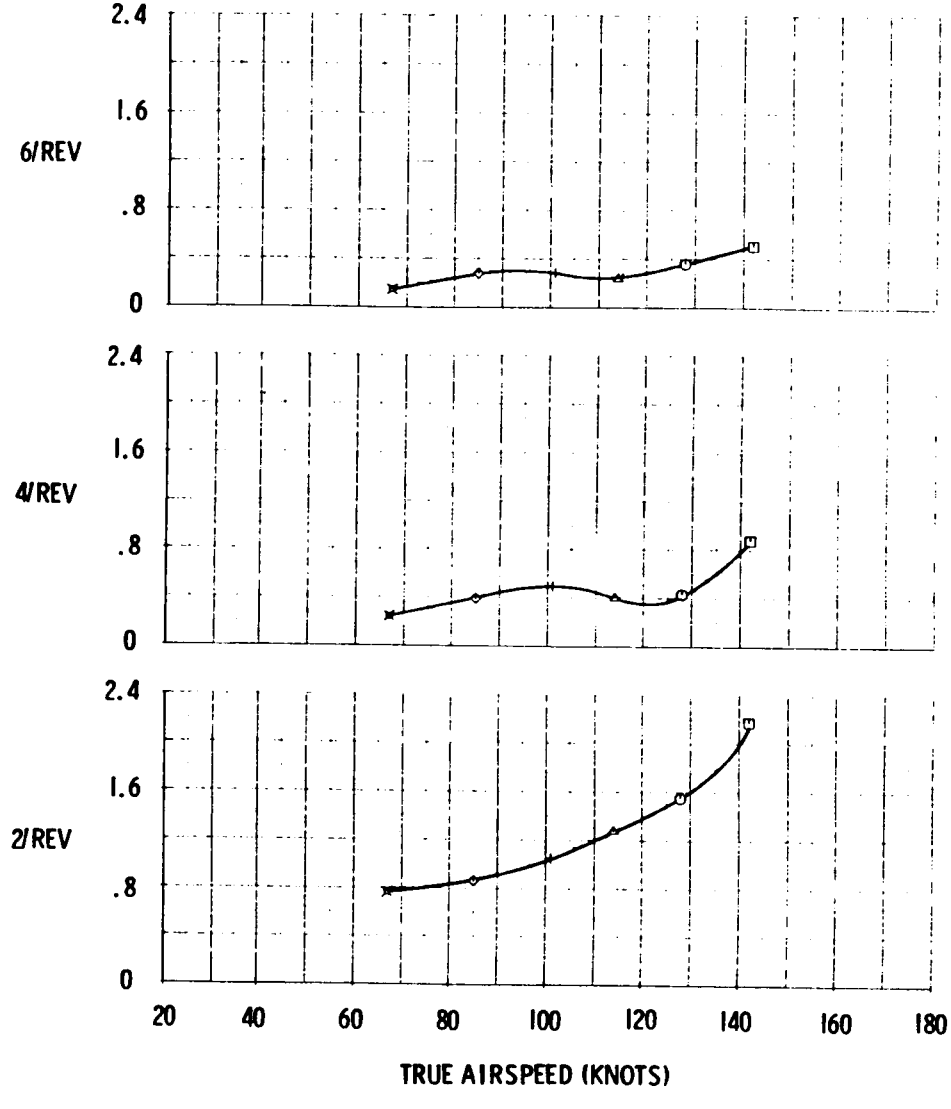
FLIGHT 35A FUSELAGE VERTICAL ACCELERATION

90° GEAR BOX



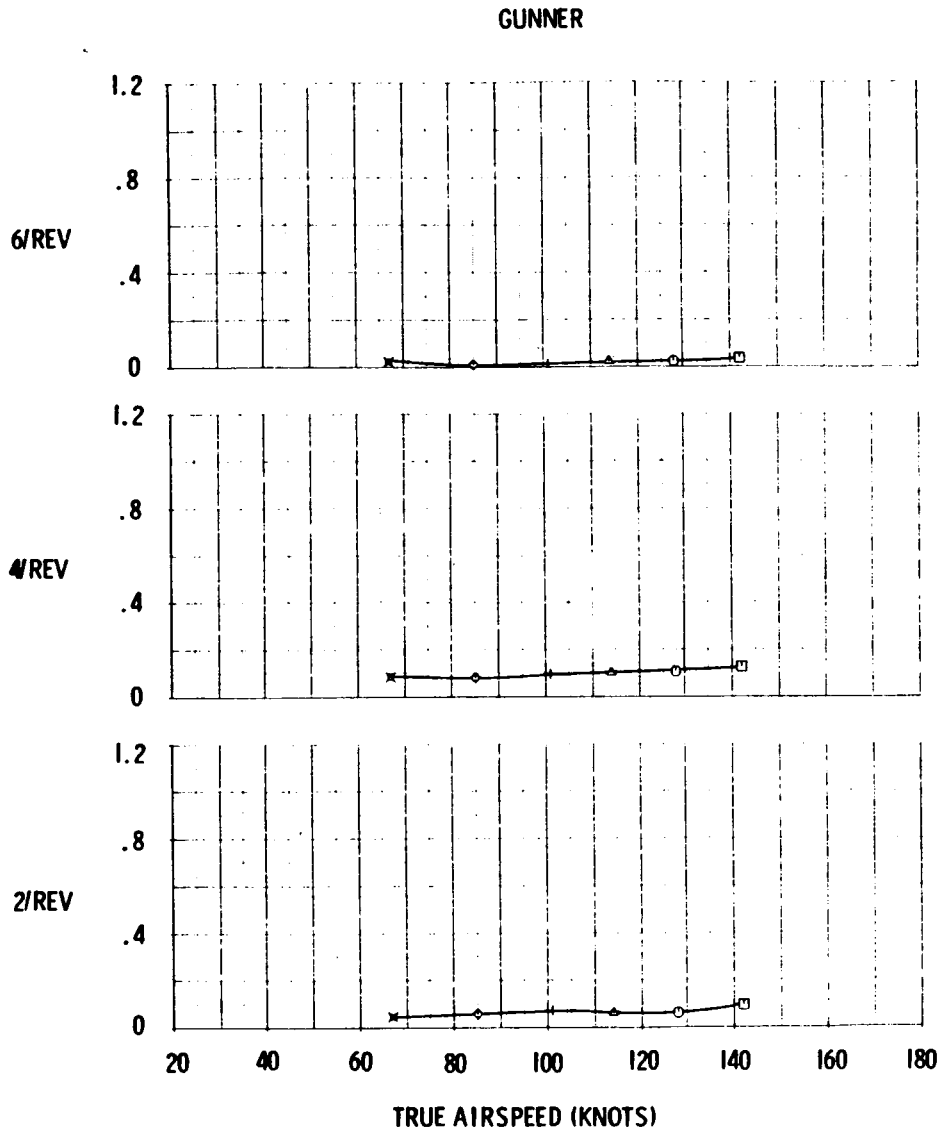
SAMPLE HARMONIC OUTPUT (CONTINUED)

FLIGHT 35A HUB LATERAL ACCELERATION



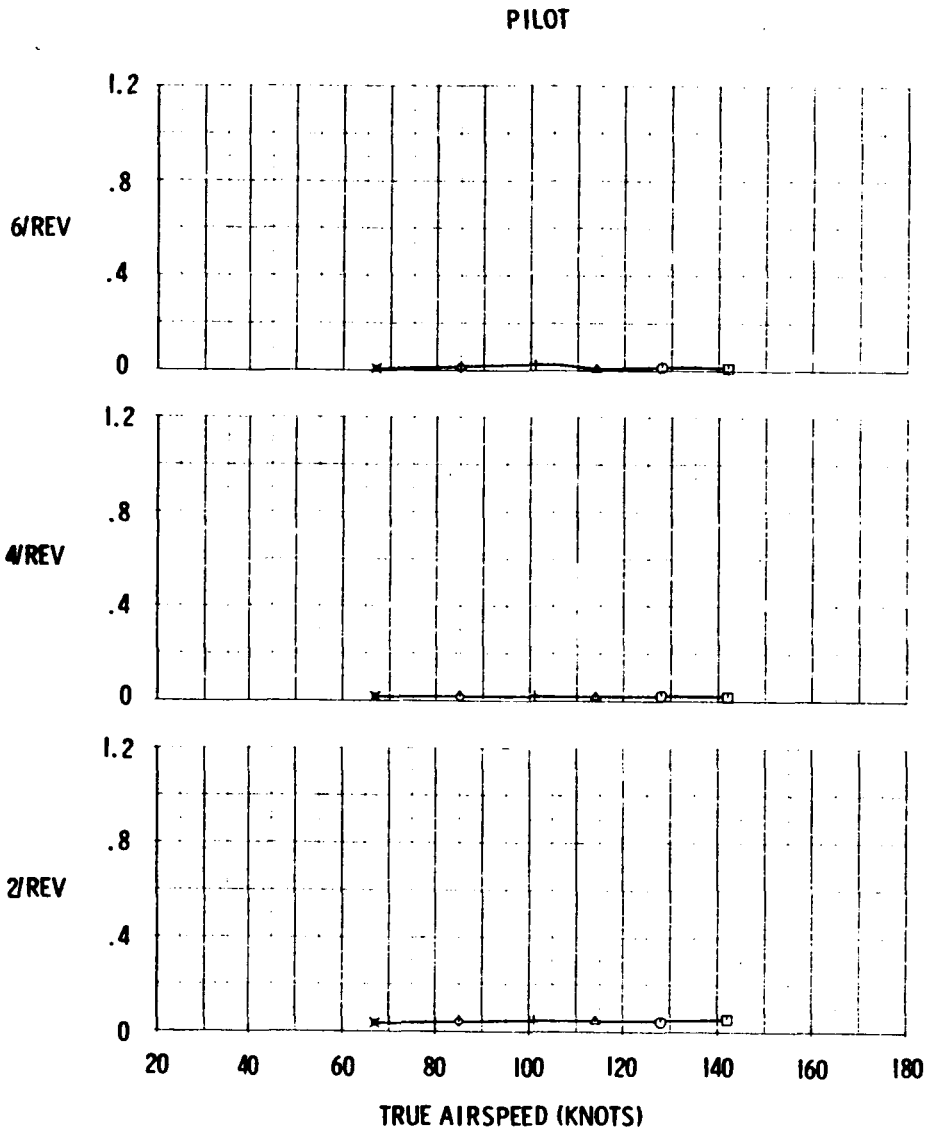
SAMPLE HARMONIC OUTPUT (CONTINUED)

FLIGHT 35A FUSELAGE LATERAL ACCELERATION



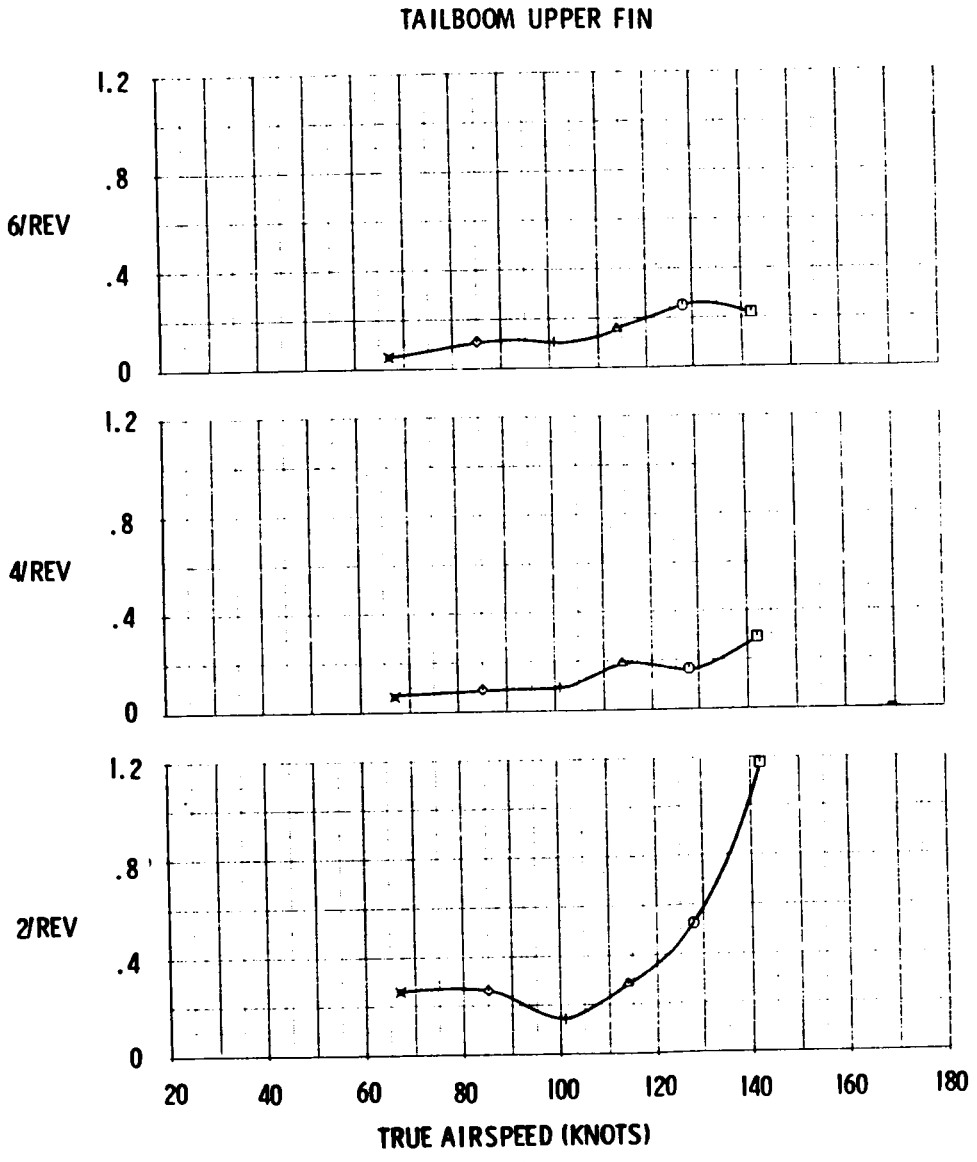
SAMPLE HARMONIC OUTPUT (CONTINUED)

FLIGHT 35A FUSELAGE LATERAL ACCELERATION



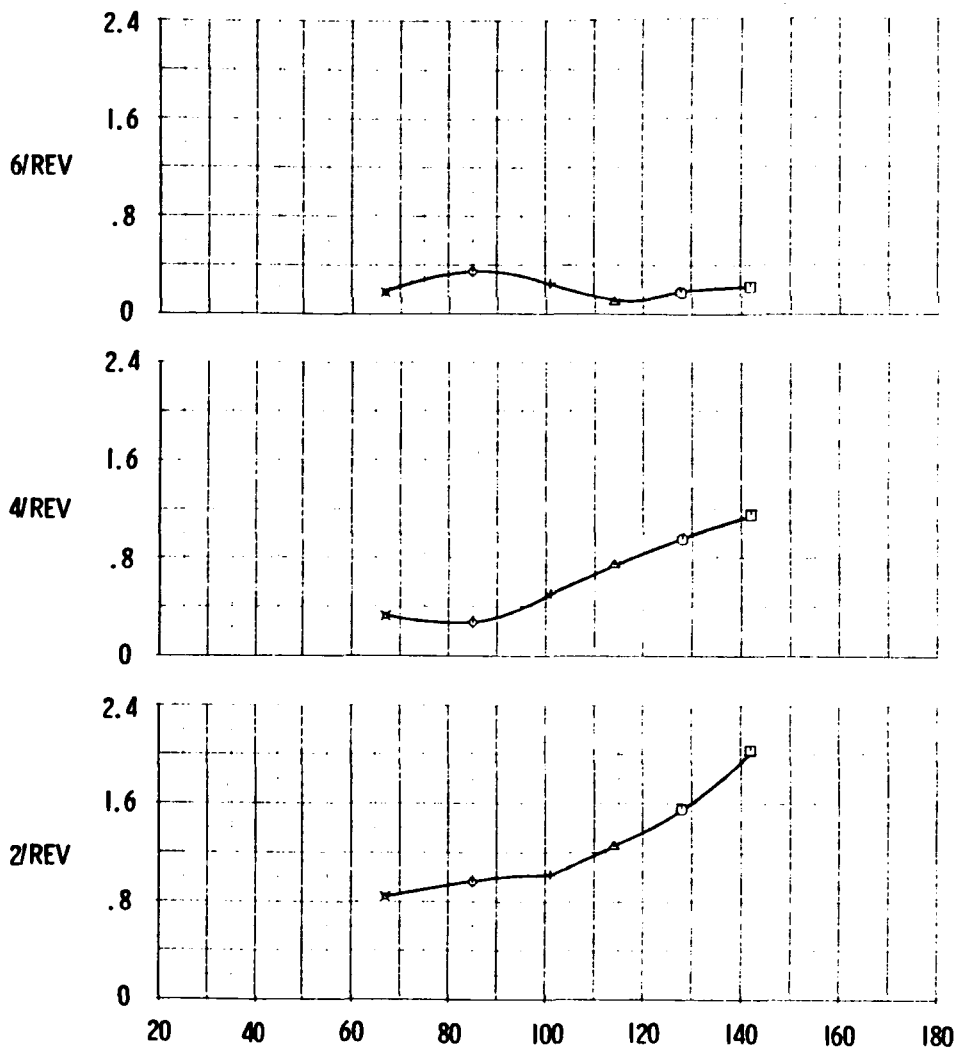
SAMPLE HARMONIC OUTPUT (CONTINUED)

FLIGHT 35A FUSELAGE LATERAL ACCELERATION



SAMPLE HARMONIC OUTPUT (CONCLUDED)

FLIGHT 35A HUB LONGITUDINAL ACCELERATION



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SECTION 4. FINITE ELEMENT ANALYSIS MODEL OF THE AH-1G AIRFRAME

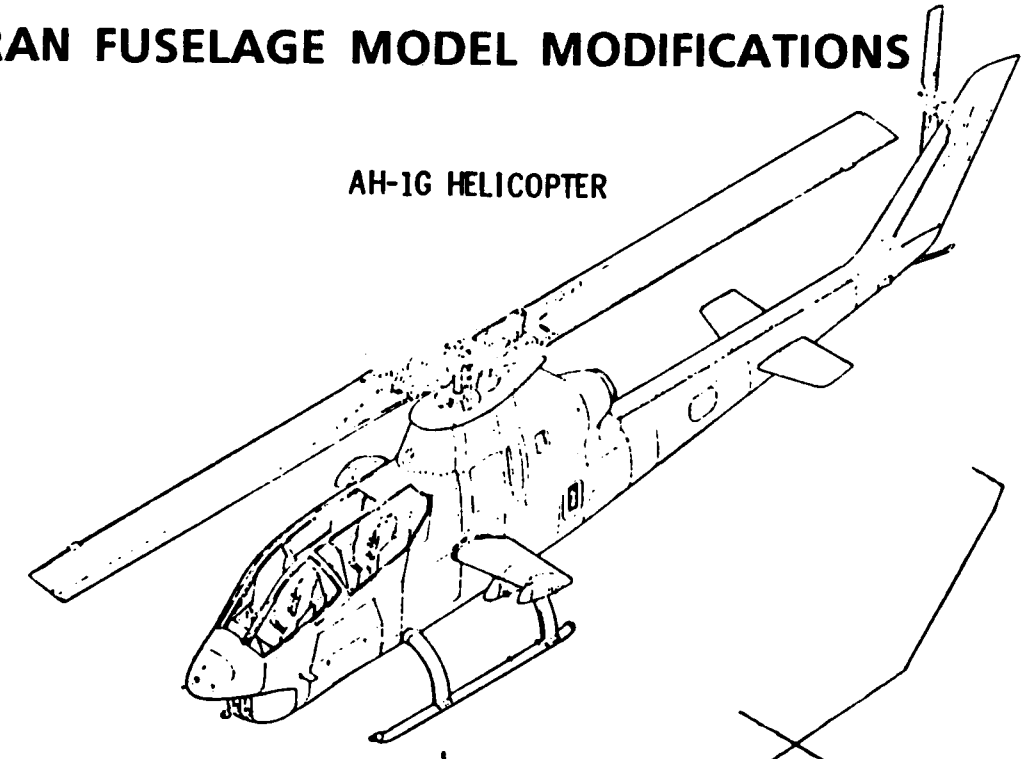
AH-1G NASTRAN FUSELAGE MODEL MODIFICATIONS

The NASTRAN finite element model of the AH-1G (OLS) fuselage with a stick, elastic-line tailboom representation is shown below. Details of model formulation and verification are presented in References 3 through 5. The original model (reference 3) for the production AH-1G helicopter did not contain a control system representation or OLS modifications. The NASTRAN airframe model provided to all participants was modified to reflect these changes and are compiled in this section for reference. The OLS instrumentation weight additions are listed below. The control system model required 14 additional grid points.

	Weight (lb)	NASTRAN Grid Points	
Instrumented package in ammo bay	246.5	11700	
Main rotor slip ring	15.0	200153	
Tail rotor slip ring	3.5	520057	
Main rotor stand pipe	5.0	200112	
Main rotor mast nut	8.5	200162	
Telemetry transmitter	2.5	26825	
Hub accelerometer and azimuth blipper	5.5	200162	
Yaw boom	12.0	3339	
Yaw boom yaps head	4.5	3331	
R-MUX box	56.0	200155	
Wiring	41.0	21361	
Main rotor blade instrumentation	29.0	200153	
Useful loads for Flight 35A tailboom ballast	100.0		(to achieve desired location of cg)
OLS instrumentation weights (for all configurations) Total	529.0		

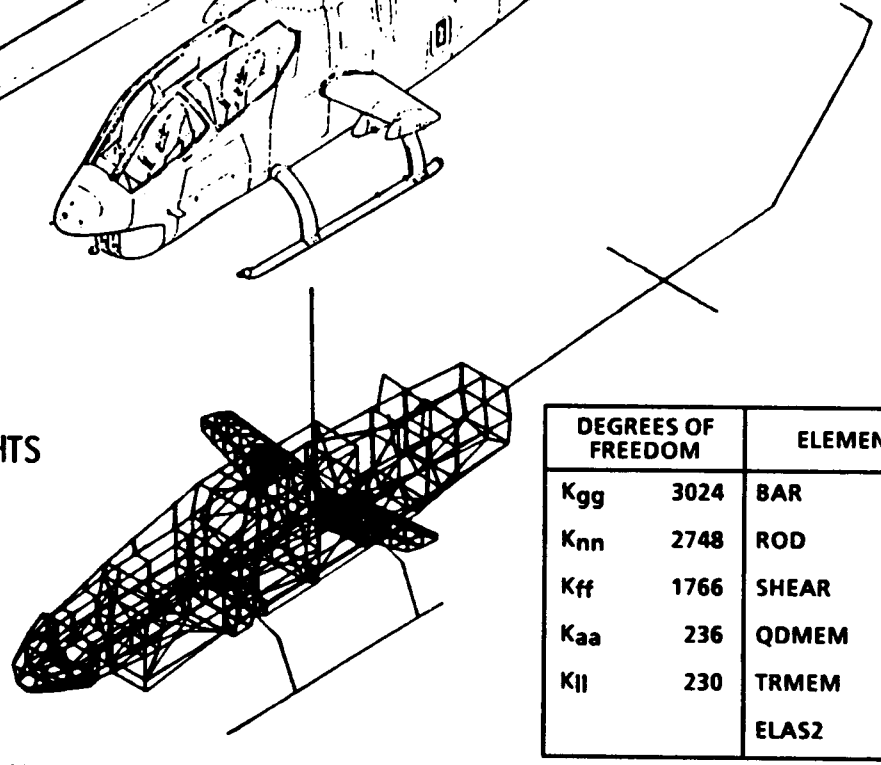
AH-1G NASTRAN FUSELAGE MODEL MODIFICATIONS

AH-1G HELICOPTER



MODIFICATIONS

CONTROL SYSTEM MODELING
OLS INSTRUMENTATION WEIGHTS



NASTRAN AIRFRAME MODEL

DEGREES OF FREEDOM		ELEMENTS	
K_{gg}	3024	BAR	197
K_{nn}	2748	ROD	2012
K_{ff}	1766	SHEAR	340
K_{aa}	236	QDMEM	160
K_{ll}	230	TRMEM	243
		ELAS2	13

NASTRAN GRID POINTS FOR OLS CORRELATION

In order to facilitate the use of the NASTRAN fuselage vibration model with a minimal need to delve into model documentation, the next figure is presented which shows the grid points corresponding to the OLS accelerometer locations. The actual coordinates for these grid points are given here.

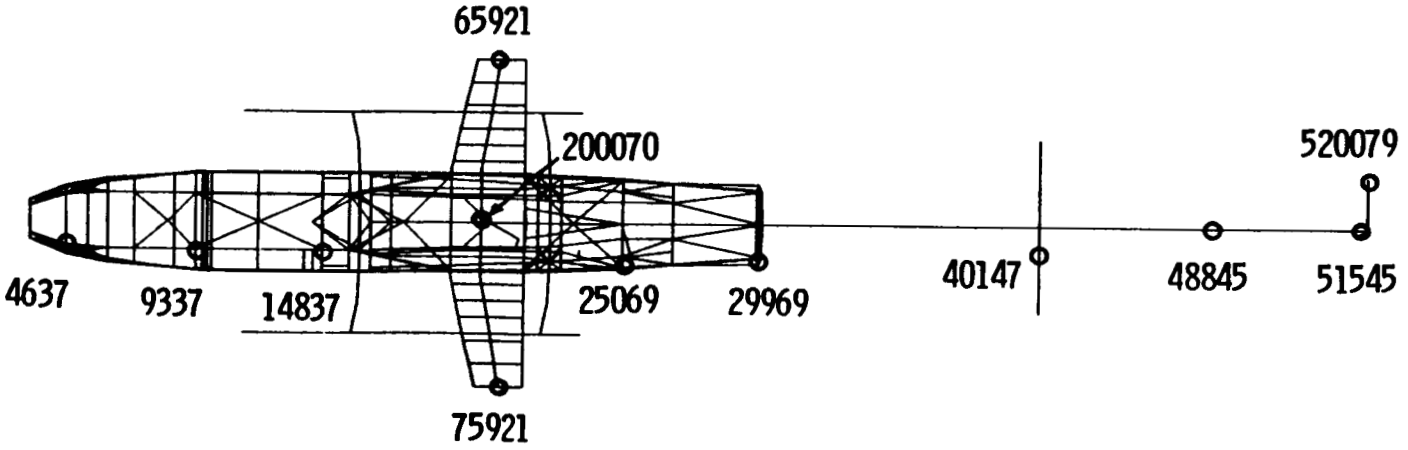
ACCELEROMETER COORDINATE LOCATIONS
OLS (AH-1G - Flight 35A)

Accelerometer	FS	BL	WL	Corresponding NASTRAN Grid Point ID
Nose (LV)	46.00	-9.07	46.00	4637
Gunner (LV)	93.00	-10.00	46.00	9337
Pilot (LV)	148.50	-10.00	46.00	14837
CG (V)	200.00	0.0	70.00	200070
Hub (FLV)	200.00	0.0	152.76	200153
Engine (LV)	250.00	-16.20	64.07	25069
T/B junc (LV)	298.70	-12.29	62.80	29969
Elevator (LV)	401.33	-9.68	55.91	40147
Tail (LV)	488.93	0.00	83.82	48845
Fin (LV)	515.43	0.00	109.46	51545
Gearbox (V)	520.67	7.90	118.27	520079
Left wing (V)	204.04	-59.00	63.95	75921
Right wing (V)	204.04	59.00	63.95	65921

23 fuselage accelerometers used in flight tests

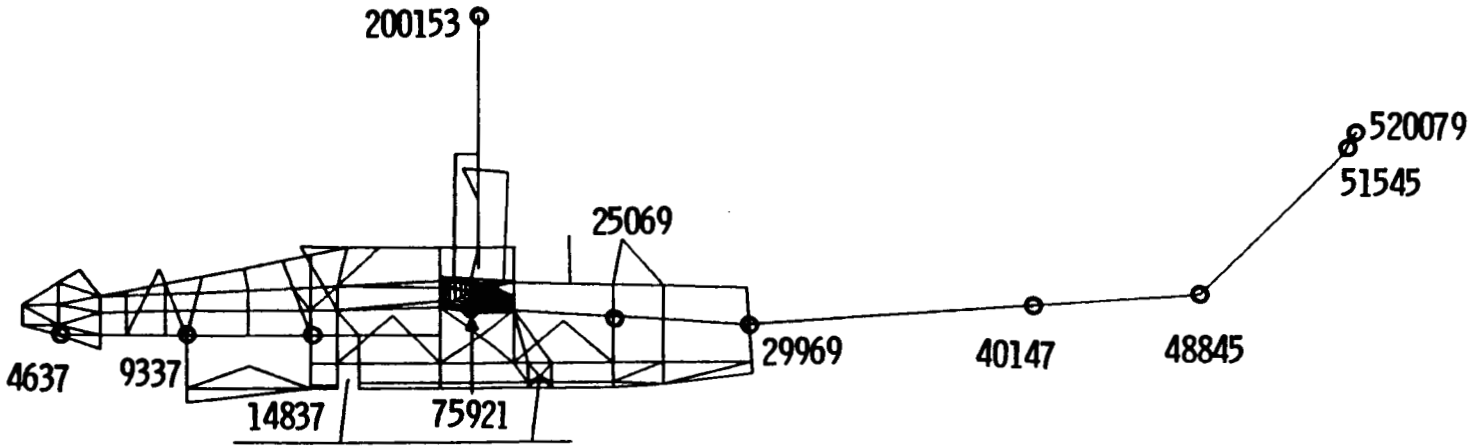
L - lateral
V - vertical
F - fore and aft

NASTRAN GRID POINTS FOR OLS CORRELATION



TOP VIEW

O- GRID POINT LOCATIONS

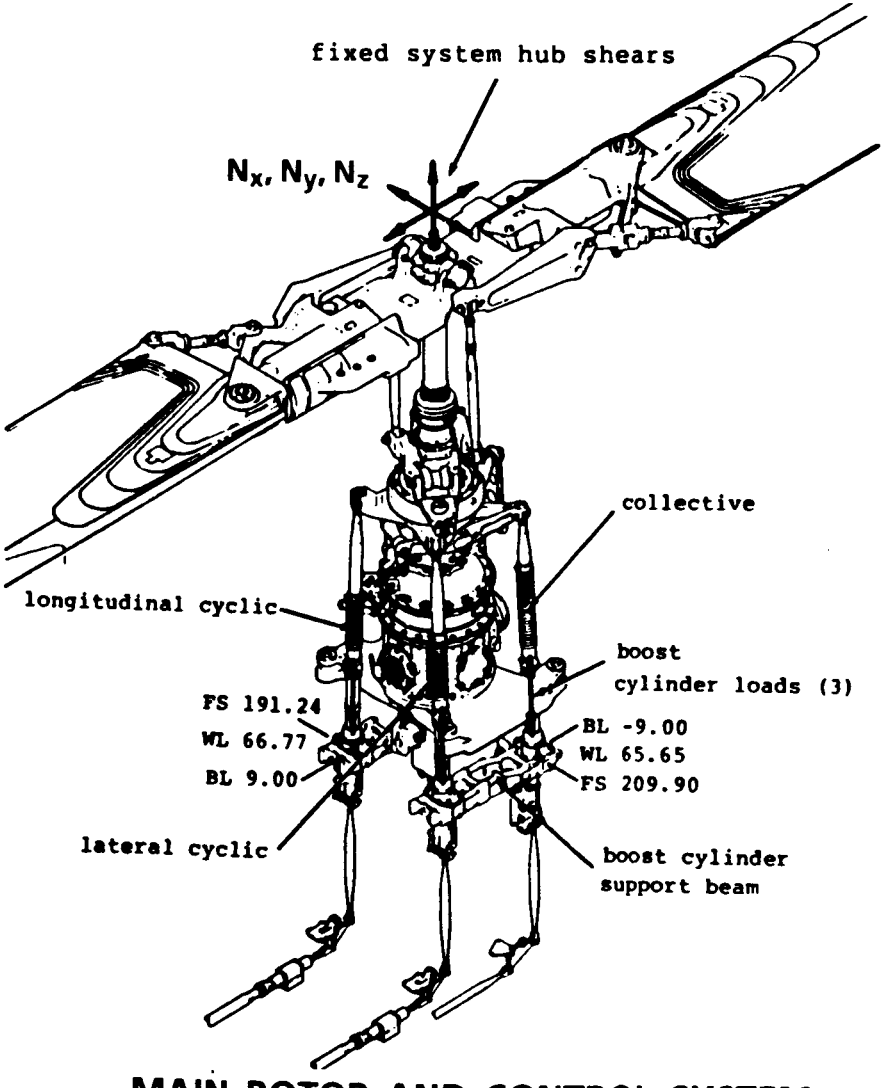


SIDE VIEW

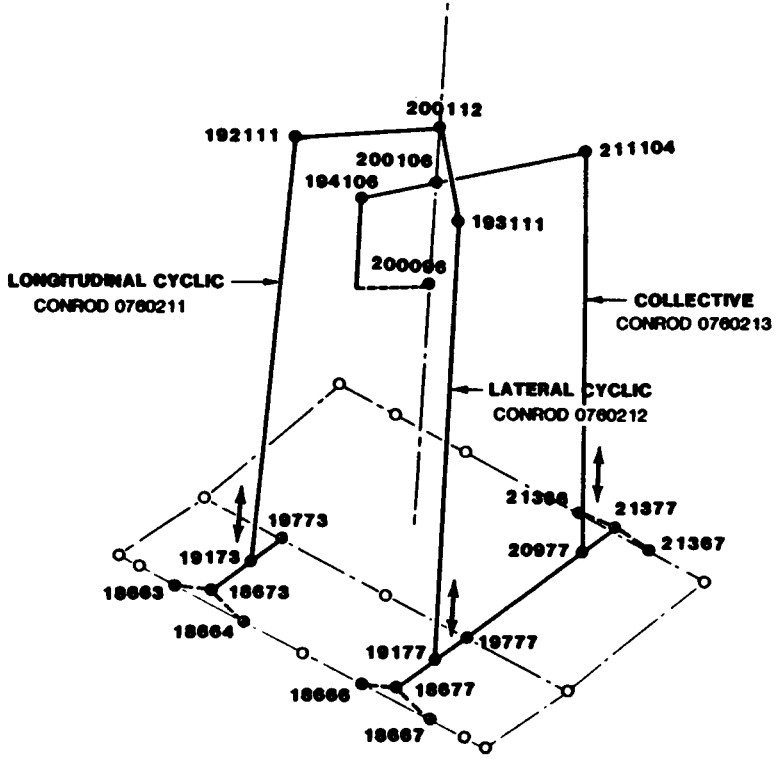
APPLIED MAIN ROTOR AND CONTROL SYSTEM LOADS

The applied loads from the main rotor to the fuselage are represented by hub shears (N_x, N_y, N_z) and vertically applied control loads through the boost cylinder fuselage reaction locations shown in the figure. The hub shears are derived from the coupled rotor/fuselage analysis. The applied control loads are obtained from the 2, 4, and 6 per rev control load harmonic OLS test data listed in Appendix A.

APPLIED MAIN ROTOR AND CONTROL SYSTEM LOADS



MAIN ROTOR AND CONTROL SYSTEM



NASTRAN MODEL

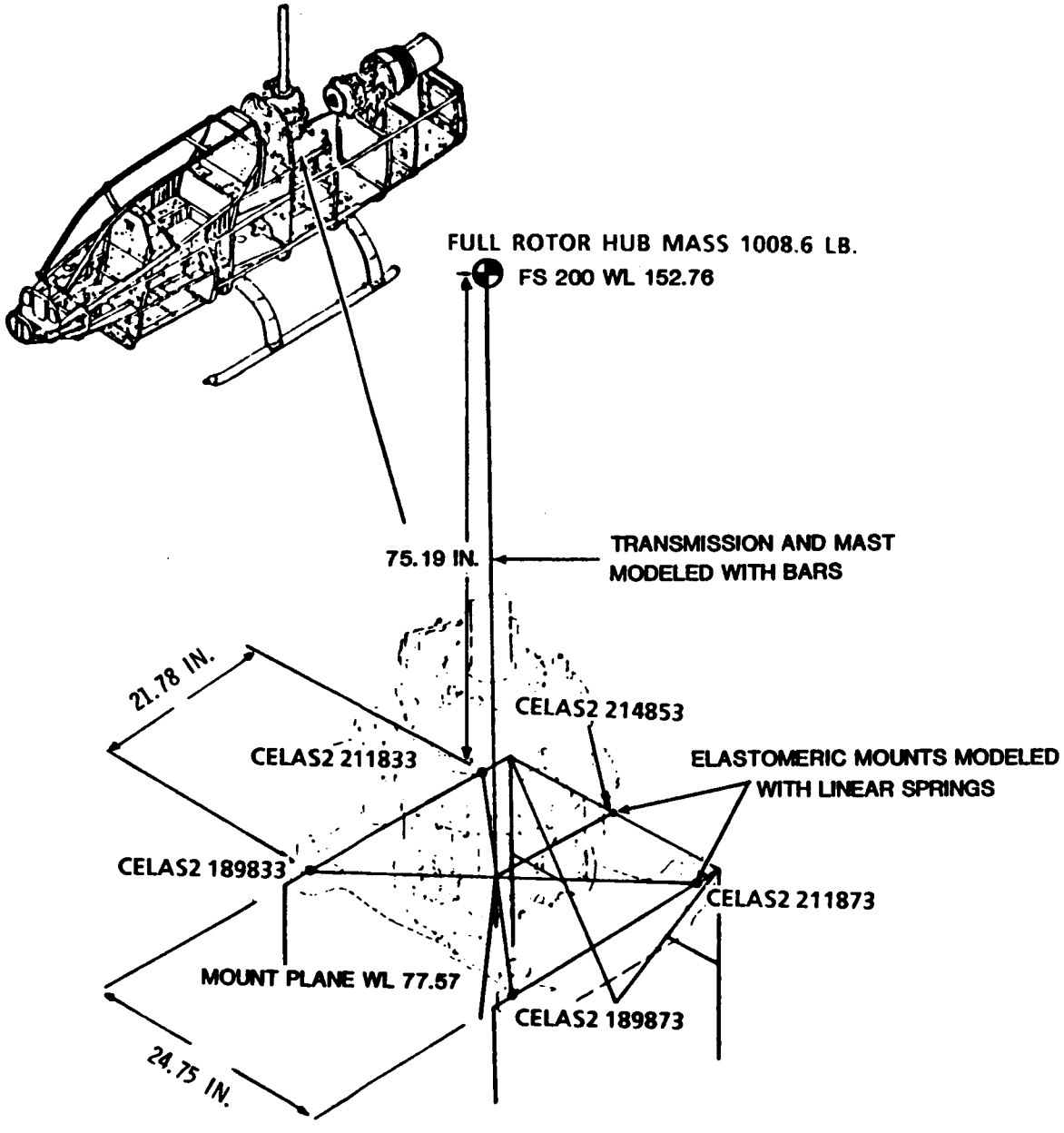
MAIN ROTOR PYLON MODELING

The AH-1G main rotor transmission and mast (pylon) are idealized as simple bar elements in the NASTRAN fuselage model. These elements are mounted on the fuselage model with five vertical springs located at the base of the transmission. Transmission mount deflections are available in the OLS reduced data contained in Appendix A. These displacements can be used for correlation with the model spring elements indicated in the figure. The OLS pylon displacements can also be used to determine pylon rocking motions, both longitudinal and lateral, by using the relative difference between F/A and lateral mount displacements.

Note that the full rotor mass is included in the AH-1G NASTRAN fuselage model given to all participants. If other than full rotor mass is required for the rotor/fuselage coupling analysis, some of this mass would need to be removed and the NASTRAN model reanalyzed prior to coupling with the rotor analysis. The main rotor weight is lumped at grid point 200153 located at the rotor cg (FS 200, WL 153, BL 0). The breakdown of total rotor weight contributions are shown below. Rotor flapping interias (mr^2 terms) are not included with the rotor weights because the Bell teetering hinge rotor system does not transfer flapping moments to the airframe.

Blade Inertia Weights	= 110.0 lb_f
Blade Assembly Weight	= 348.0 lb_f
Hub Assembly Weight	= 489.5 lb_f
OLS Instrumentation Weight	= 61.1 lb_f
	1008.6 lb_f

MAIN ROTOR PYLON MODELING



IMPORTANT NORMAL MODES

For the rotor-fuselage analysis, a modal analysis of the fuselage is often used which requires the analyst to provide a rotor simulation program with calculated fuselage natural frequency and mode shape information. The normal modes that are listed represent the important modes needed to describe AH-1G fuselage response. These elastic modes must be augmented by the six rigid body modes. The entire low frequency range of interest (0 to 30 Hz) is represented. Note that these modes consider the full rotor mass of 1008.6 lb lumped at the rotor hub. An input data tape listing of input data, and samples of normal mode and forced response analyses were provided to NASA and all the helicopter fuselage manufacturers participating in the rotor-fuselage coupling analysis program.

IMPORTANT NORMAL MODES

	Mode	Natural Frequency, Hz
		3768 kg-clean wing-aft cg
(1) *	Main rotor pylon fore-and-aft rocking (pylon pitch)	2.987
(2) *	Main rotor pylon lateral rocking (pylon roll)	3.866
(3) *	First fuselage lateral bending	7.121
(4) *	First fuselage vertical bending	7.969
	Skid	14.572
(5) *	First fuselage torsion	16.032
(6) *	Second fuselage vertical bending	17.221
(7) *	Second fuselage lateral bending	17.783
(8) *	Fuselage roll/engine lateral	19.273
	Skid	19.834
	Fuselage torsion/wing yaw	21.879
	Wing asymmetric torsion	-
	Skid	23.431
	Third fuselage vertical bending	25.153
(9) *	Main rotor mast lateral bending	25.591
	Third fuselage lateral bending	26.529
(10) *	Main rotor mast fore-and-aft bending	27.099
	Wing symmetric torsion	-
	Skid	29.104
	Fourth fuselage vertical bending	32.264
	Fuselage torsion	34.013

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SECTION 5. AH-1G OLS ROTOR SYSTEM

AH-1G OLS ROTOR SYSTEM GEOMETRY

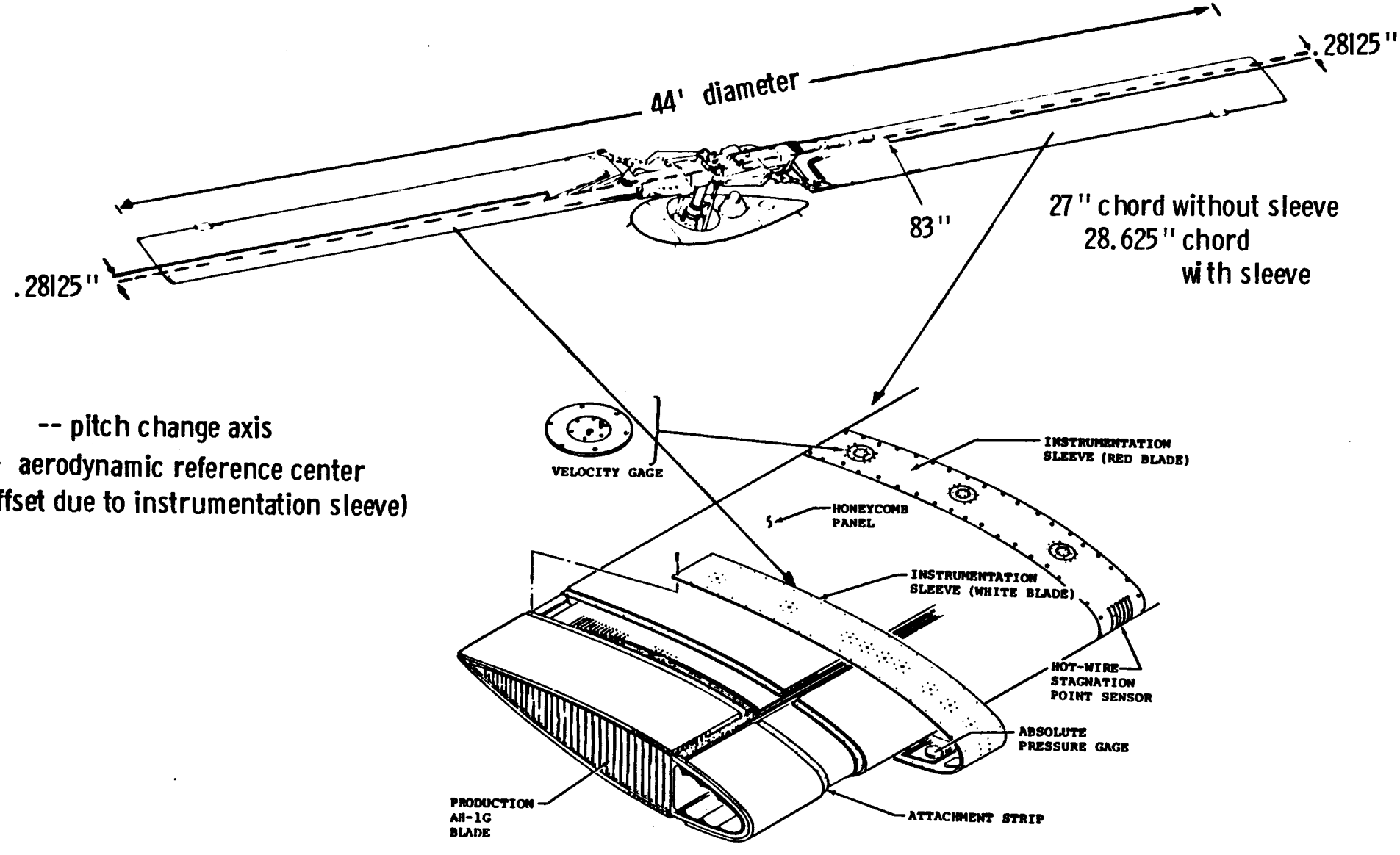
The production version of the AH-1G helicopter uses a BHT-developed 540 main rotor. This rotor was modified using a "gloved blade" approach during instrumentation to maintain structural integrity and a smooth aerodynamic surface for the OLS main rotor (see figure). The rotor parameters are summarized in Appendix B.

This section of the report marks the beginning of information provided to each of the participating manufacturers to enable them to develop a representative model of the AH-1G rotor used during the OLS flight-test program. Tabular listings of rotor modeling parameters are contained in Appendix B and include the following:

1. EI_b, EI_c, GJ distributions
2. Weight, cg, and inertia distributions
3. C_L, C_D, C_M airfoil data
4. Rotor geometry and miscellaneous parameters

This figure depicts the location of the blade feathering, or pitch-change, axis and aerodynamic reference center for the modified OLS main rotor blade. Note the shift in the aerodynamic reference center beyond blade station 83 (in) due to the fiberglass sleeve used to attach instrumentation. The application of the sleeve extended the leading edge of the airfoil 0.125 inch and the trailing edge 1.5 inches. Therefore, the aerodynamic reference center (1/4 chord) was shifted aft (-0.28125 inch).

AH-1G OLS ROTOR SYSTEM GEOMETRY



AH-1G OLS ROTOR HUB PARAMETERS

A list of pertinent structural and aerodynamic information for the AH-1G OLS rotor is given below to facilitate rotor model development. The teetering rotor has an inherent undersling distance and built-in precone angle to eliminate or reduce the first harmonic variation of Coriolis induced forces. The control system spring rate of the AH-1G is also shown to facilitate model development. Note should be taken of the (R-MUX) rotating multiplexor instrumentation housing aerodynamic effects which affect the overall drag component of the hub. The R-MUX unit can be seen on the picture of the instrumented rotor configuration shown in Section 2. The pitch horn offset was taken to be 14.1 inches, as it was assumed that the shears and moments in the pitch link are reacted at the inner feather bearing.

Rotor pitch-lag coupling = 0°

Rotor pitch-flap coupling (δ_3) = 0°

Rotor lead-lag damper (stiff inplane) = none

C_D hub = 0.13

Hub length = 3.4 ft = 40.8 inches

Main rotor nacelle flat plate drag area = 2.0 ft^2 — consisting of R-MUX and control components between transmission cowling and hub

located at -0.759 ft (below) mast pivot point — location of M/R nacelle aerodynamic reference center

Pitch-cone coupling ratio = -0.682 (for inelastic modeling of rotor)

Control phasing or mast tilt = none

Prelag = none

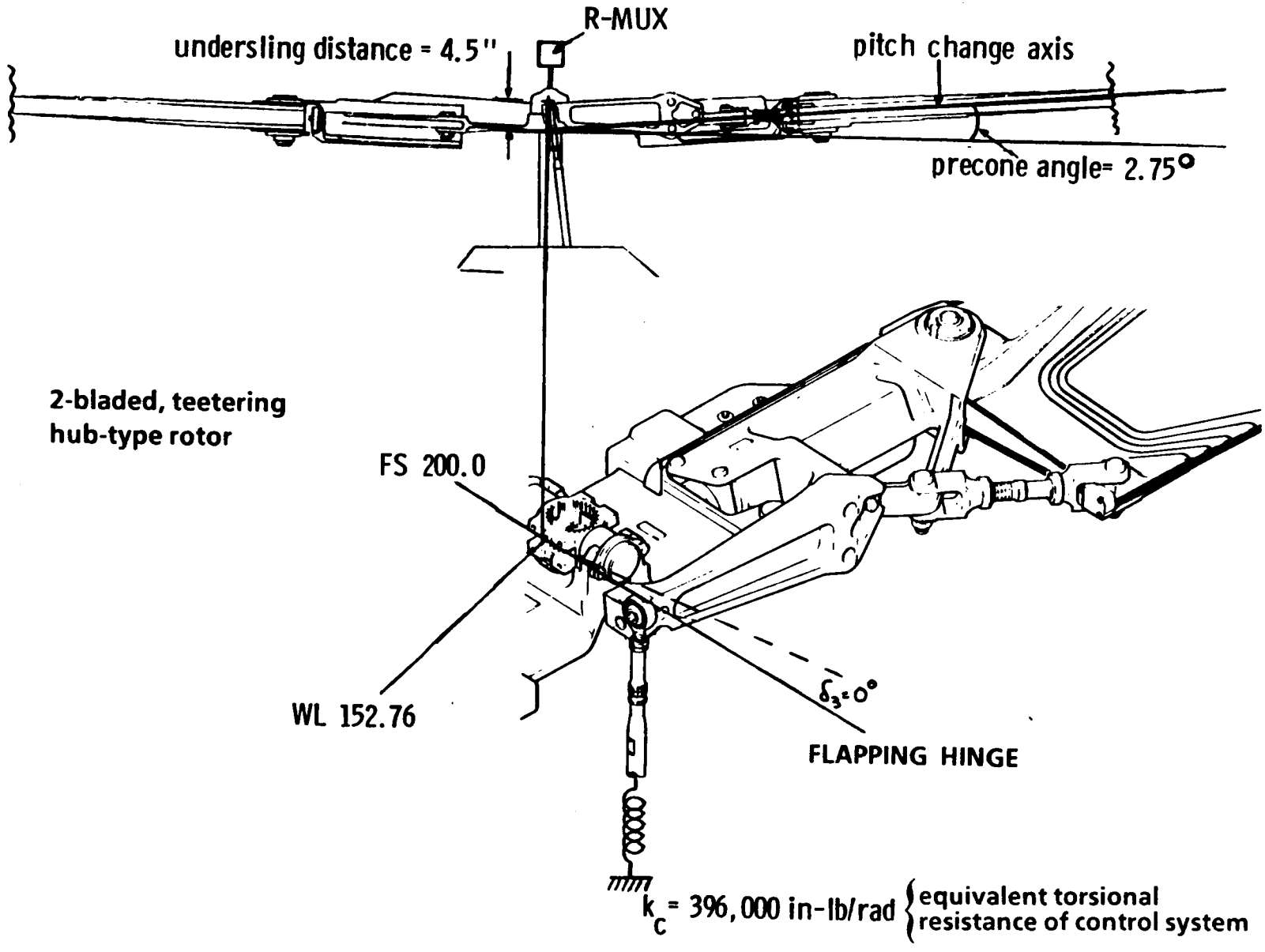
Precone = 2.75°

Underslinging = 4.5 inches (PCA intersection below mast pivot axis)

Control system torsional spring rate, K_c = 396,000 (in-lb/rad)

PHOFF = 14.1 inches

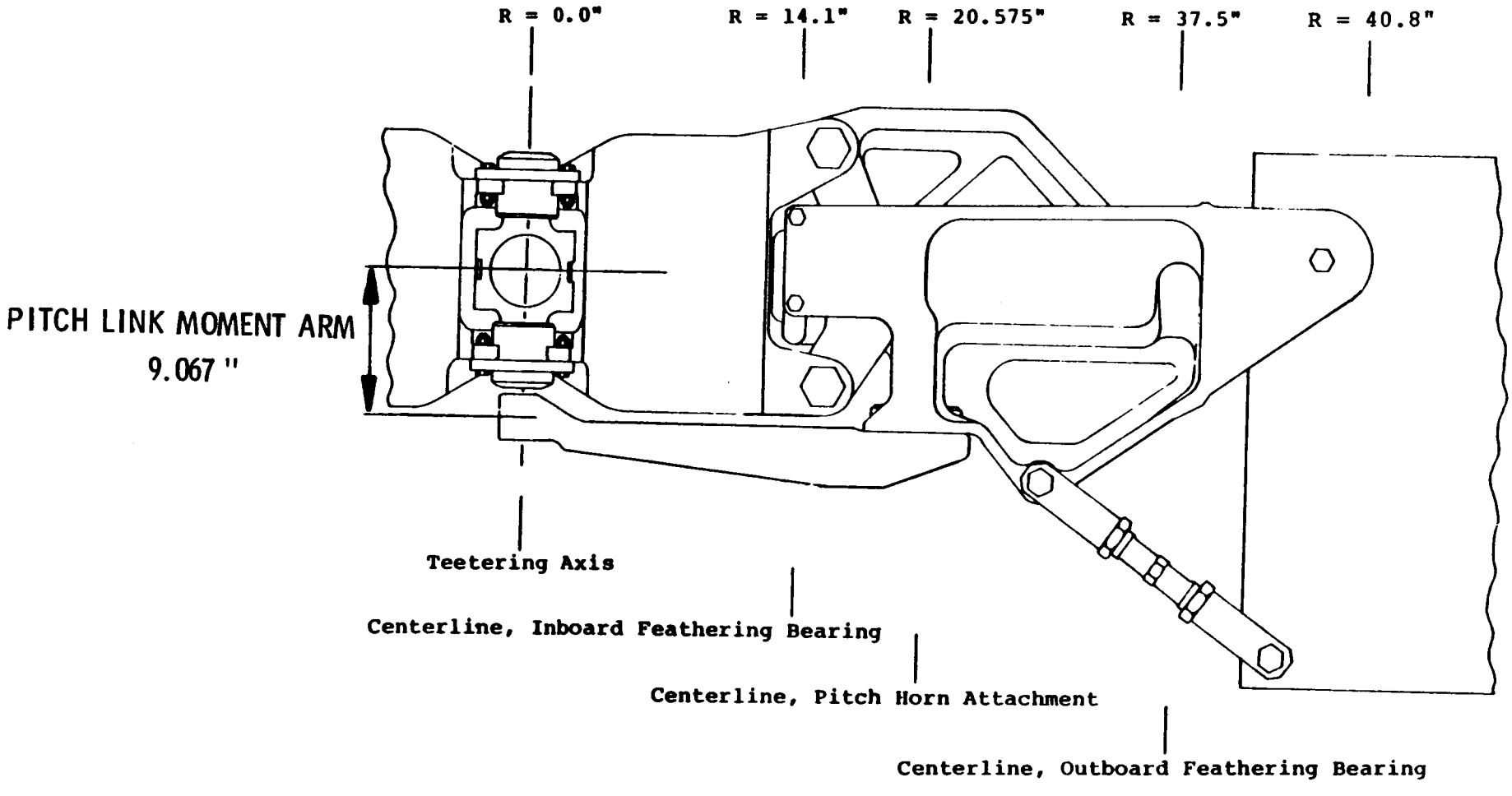
AH-1G OLS ROTOR HUB PARAMETERS



AH-1G OLS MAIN ROTOR HUB GEOMETRY

The geometry of the two-bladed, teetering rotor hub of the AH-1G helicopter is shown in the figure below. This hub contains teflon bearings with a tension/torsion strap between the inboard and outboard feathering bearings. This arrangement is considered to be infinitely stiff in the radial direction. The tension/torsion strap has a torsional stiffness of $K_\theta = 170 \frac{\text{in-lb}}{\text{deg}}$ at 100% rpm. This torsional spring rate is much smaller than the control system spring rate for this rotor $K_c = 6911.5 \frac{\text{in-lb}}{\text{deg}}$ but can be significant when calculating steady or 1 p pitch link loads. Note that the tension/torsion strap has zero twist (null point) at 50.4° nose up attitude.

AH-1G OLS MAIN ROTOR HUB GEOMETRY



AH-1G OLS ROTOR BLADE STIFFNESS DISTRIBUTION

Tabular listings of rotor blade and hub stiffness and weight distributions appear in Appendix B. The stiffness distributions (EI_b, EI_c, GJ) are plotted versus blade station on the following three figures. Overall blade mass properties are listed below:

MASS/BLADE = 504.298 lb_F (includes OLS instrumentation and hub weights)

First blade moment of inertia = 110.787 slug-ft/blade

I_β = flapping inertia = 1499.704 slug-ft^2/blade

γ = Lock number = 5.078 (SLSTD)

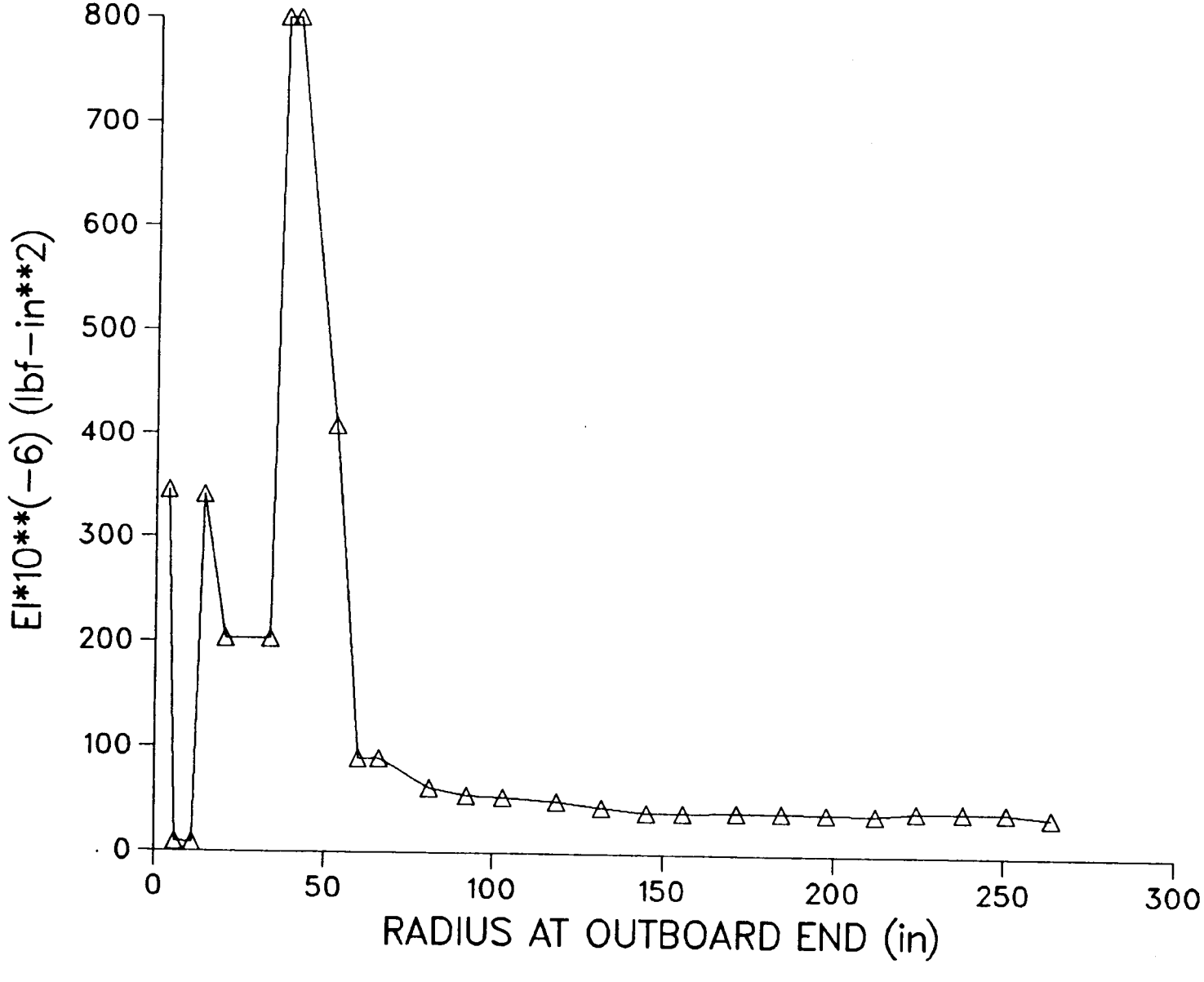
Effective blade cg = -0.156 inch (forward from pitch-change axis)

Effective blade and hub cg = -0.155 inch (forward from pitch-change axis)

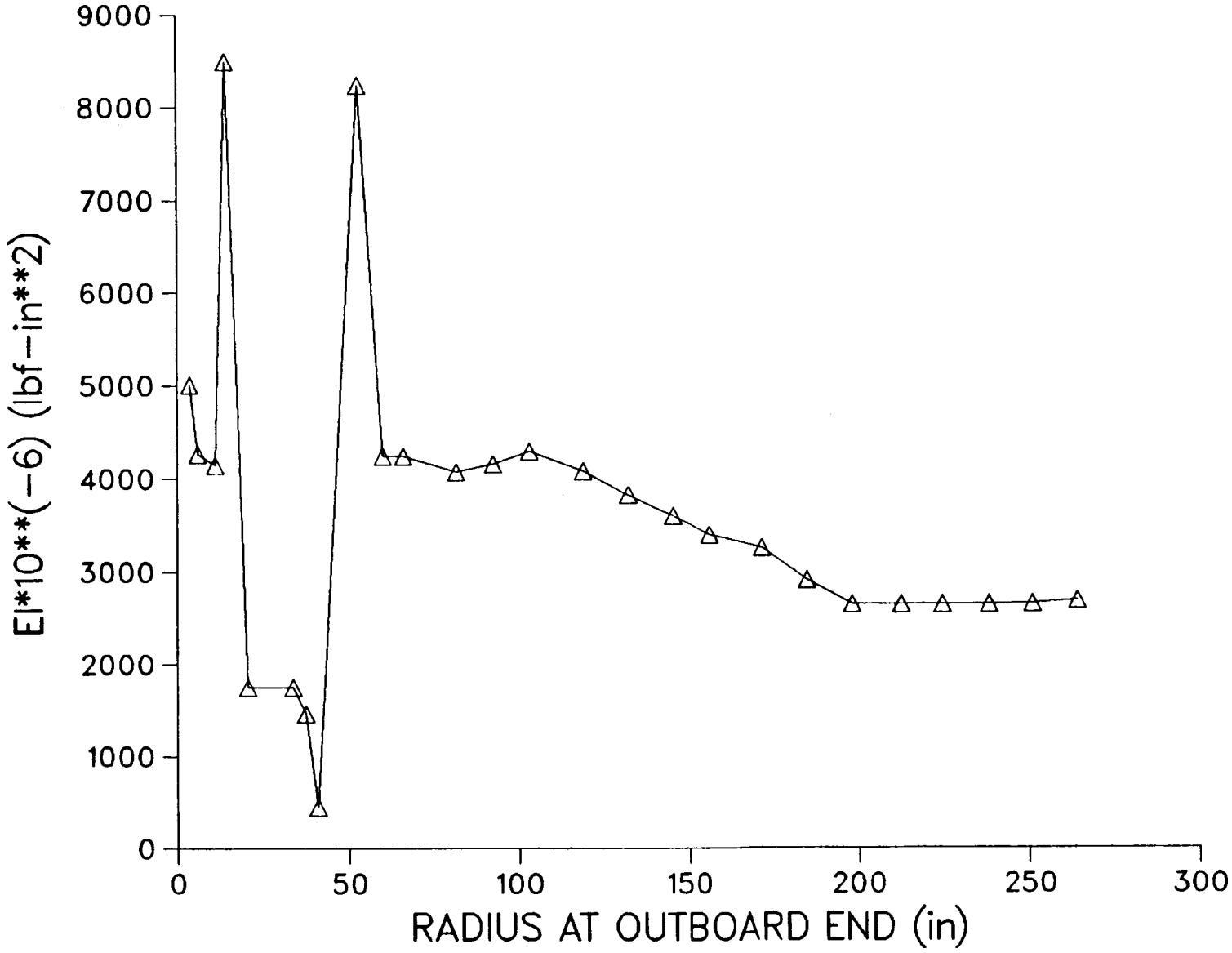
Clamped torsional frequency = 15.341 Hz

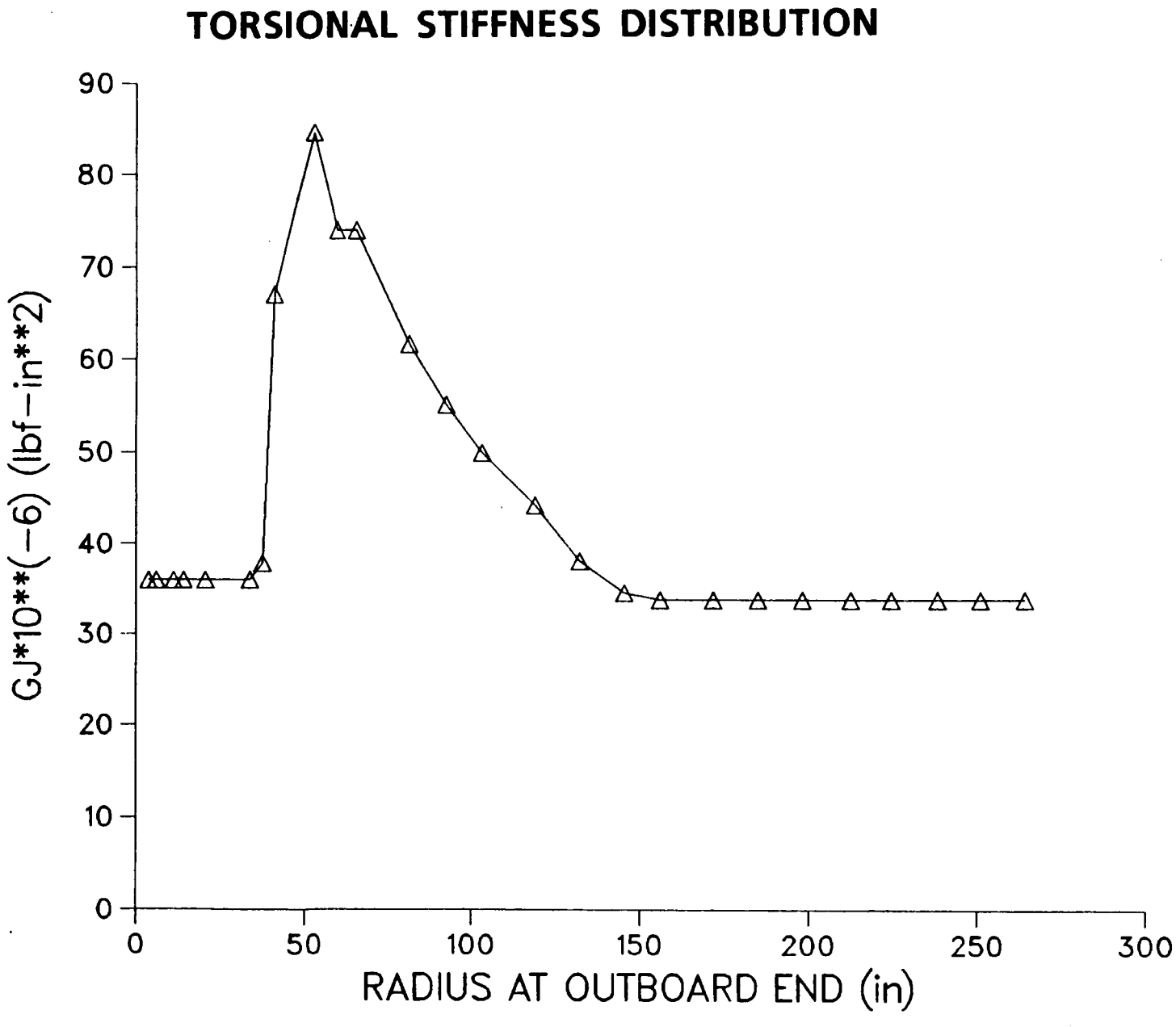
J_{BLADE} = torsional inertia about PCA = 42.62 in-lb/sec^2

BEAMWISE STIFFNESS DISTRIBUTION



CHORDWISE STIFFNESS DISTRIBUTION

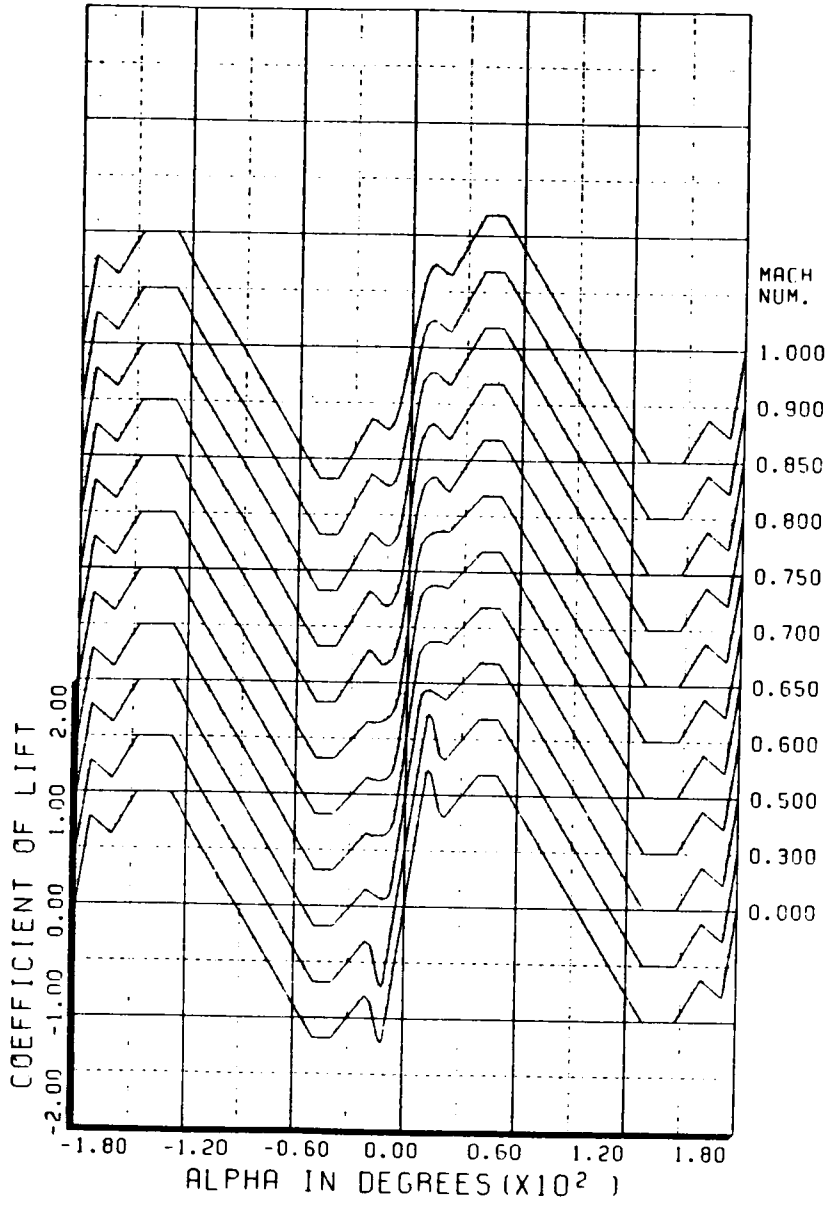



TORSIONAL STIFFNESS DISTRIBUTION
GJ*10**(-6) (lbf-in**2)
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
RADIUS AT OUTBOARD END (in)

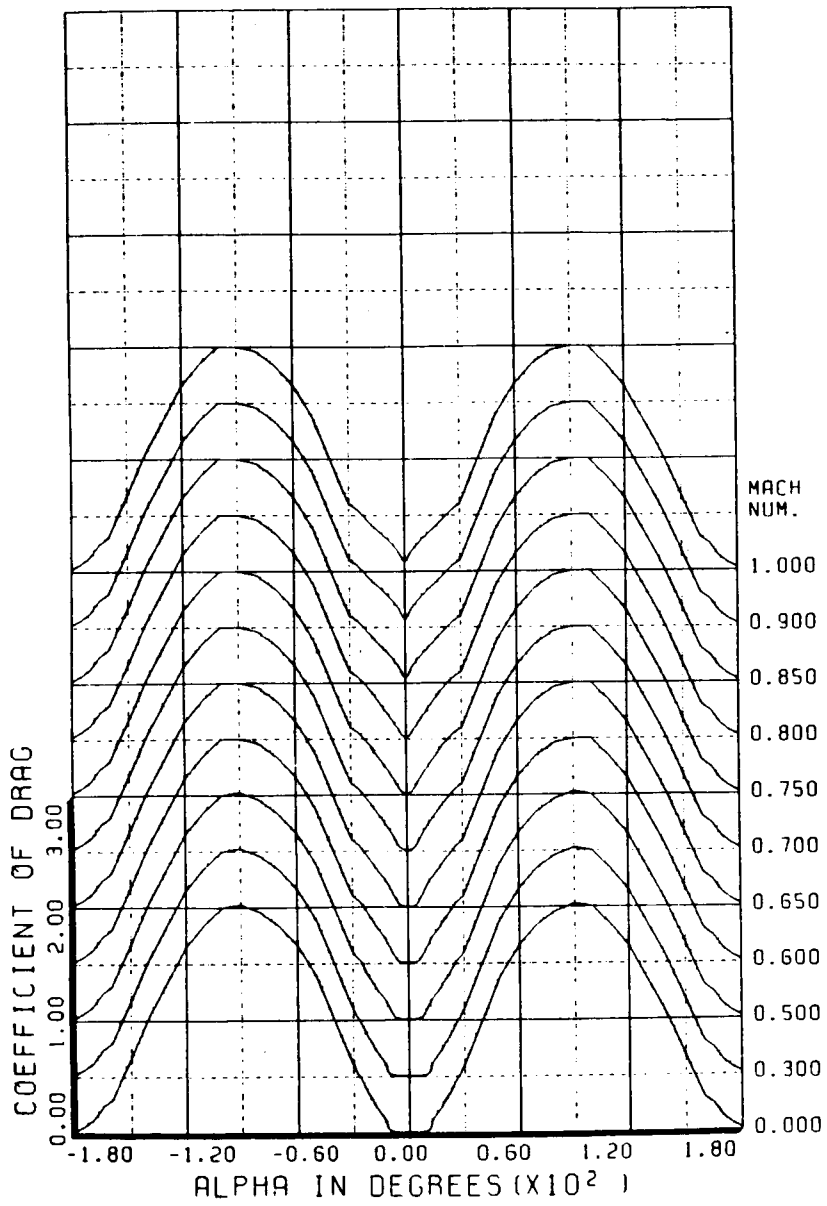
ROTOR AERODYNAMIC COEFFICIENT DATA

The rotor aerodynamic coefficient data is presented in tabular form in Appendix B. C_L, C_D, C_M versus angle of attack (α) and Mach number are plotted in the following three figures from C81 data storage file CLCD5474.

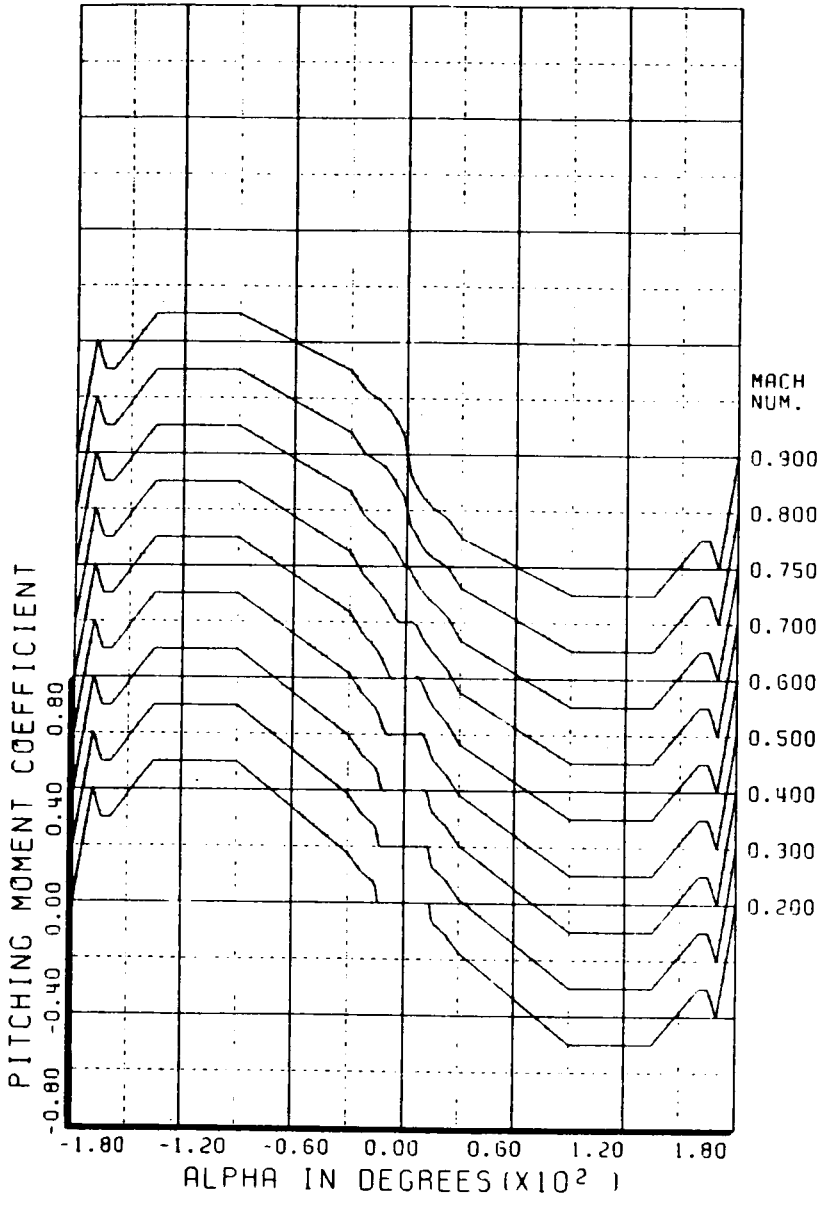
ROTOR AERODYNAMIC COEFFICIENT DATA



ROTOR AERODYNAMIC COEFFICIENT DATA (CONT'D)



ROTOR AERODYNAMIC COEFFICIENT DATA (CONCLUDED)



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SECTION 6. REFERENCES

REFERENCES

1. Shockey, G. A., Williamson, J. W., Cox, C. R., "AH-1G Helicopter Aerodynamics and Structural Loads Survey," USAAMRDL-TR-76-39, April 1976.

2. Van Gaasbeek, J. R., "Validation of the Rotorcraft Flight Simulation Program (C81) Using Operational Loads Survey Flight Test Data," USAAVRADCOM-TR-80-D-4, November 1979.

3. Cronkhite, J. D., Berry, V. L., Brunken, J. E., "A NASTRAN Vibration Model of the AH-1G Helicopter Airframe," U.S. Army Armament Command Report No. R-TR-74-045, June 1974.

4. Cronkhite, J. D., Berry, V. L., "Correlation of AH-1G Airframe Test Data with a NASTRAN Mathematical Model," NASA CR-145119, February 1976.

5. Cronkhite, J. D., Wilson, H. E., Berry, V. L., "Correlation of AH-1G Helicopter Flight Vibration Data and Tailboom Static Test Data with NASTRAN Results," NASA CR-145120, 1978.

6. Giansante, N., Berman, A., Flannelly, W. G., and Nagy, E. J., "Structural System Identification Technology Verification," USAAVRADCOM-TR-81-D-28, November 1981.

7. Jones, R., Flannelly, W. G., Nagy, E. J., Fabunmi, J. A., "Experimental Verification of Force Determination and Ground Flying of a Full-Scale Helicopter, USAAVRADCOM-TR-81-D-11, May 1981.

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APPENDIX A - OLS HARMONIC DATA FOR CORRELATION

APPENDIX A - TABLE OF CONTENTS

The reduced operational load survey (OLS) flight test data for the data items described on pages A-6 through A-77 for main rotor harmonics 1p-6p are shown in this appendix. The data is separated into functional groups for ease of retrieval.

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APPENDIX A - TABLE OF CONTENTS (Continued)

APPENDIX A - TABLE OF CONTENTS (Concluded)

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.3 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	MAST TOP F/A MEAN -0.022		ITEM CODE A886 MAX OSC. 7.024	UNITS: G'S	
1	0.127	5.39	-0.102	-0.076	-126.525
2	2.031	10.78	-1.445	-1.428	-134.653
3	0.067	16.16	0.067	-0.004	93.668
4	1.153	21.55	-0.122	-1.147	-173.903
5	0.072	26.94	0.064	-0.033	117.361
6	0.219	32.33	0.209	0.067	72.207
	MAST TOP LATERAL MEAN -0.005		ITEM CODE A887 MAX OSC. 5.782	UNITS: G'S	
1	0.147	5.39	-0.073	-0.128	-150.334
2	2.174	10.78	1.740	-1.304	126.854
3	0.102	16.16	0.022	0.099	12.774
4	0.879	21.55	0.767	0.430	60.719
5	0.092	26.94	0.087	0.031	70.568
6	0.505	32.33	-0.233	0.448	-27.456
	MAST TOP VERTICAL MEAN 0.848		ITEM CODE A888 MAX OSC. 1.904	UNITS: G'S	
1	0.046	5.39	-0.011	-0.045	-166.353
2	0.031	10.78	0.024	0.021	49.306
3	0.065	16.16	0.064	-0.014	102.258
4	0.085	21.55	0.084	0.010	82.917
5	0.028	26.94	-0.027	0.007	-75.092
6	0.043	32.33	0.009	0.043	11.412

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 324.0 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
MAST TOP F/A	MEAN 0.006		ITEM CODE A886	MAX OSC. 6.754	UNITS: G'S
1	0.146	5.40	-0.095	-0.111	-139.630
2	1.555	10.80	-0.671	-1.403	-154.455
3	0.051	16.20	0.047	0.020	66.734
4	0.948	21.60	0.549	-0.773	144.631
5	0.047	27.00	0.006	0.046	7.299
6	0.177	32.40	-0.019	0.176	-6.102
MAST TOP LATERAL	MEAN 0.039		ITEM CODE A887	MAX OSC. 5.633	UNITS: G'S
1	0.116	5.40	-0.011	-0.116	-174.708
2	1.548	10.80	1.468	-0.491	108.488
3	0.074	16.20	-0.027	0.069	-21.643
4	0.431	21.60	0.243	0.356	34.344
5	0.026	27.00	-0.024	0.011	-66.384
6	0.359	32.40	-0.351	-0.077	-102.334
MAST TOP VERTICAL	MEAN 0.842		ITEM CODE A888	MAX OSC. 1.610	UNITS: G'S
1	0.031	5.40	-0.000	-0.031	-179.380
2	0.044	10.80	0.017	0.041	22.438
3	0.050	16.20	0.040	0.030	52.704
4	0.091	21.60	0.083	0.037	66.048
5	0.027	27.00	-0.019	-0.019	-134.990
6	0.019	32.40	0.016	0.010	58.374

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 614
ROT SPEED 323.3

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 114.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	MAST TOP F/A MEAN 0.027		ITEM CODE A886 MAX OSC.	UNITS: 6.173	G'S
1	0.143	5.39	-0.098	-0.104	-136.685
2	1.252	10.78	-0.773	-0.984	-141.842
3	0.021	16.16	0.018	-0.012	123.868
4	0.740	21.55	0.169	-0.721	166.825
5	0.059	26.94	0.013	0.057	13.193
6	0.095	32.33	-0.004	0.095	-2.305
	MAST TOP LATERAL MEAN 0.033		ITEM CODE A887 MAX OSC.	UNITS: 5.022	G'S
1	0.123	5.39	0.000	-0.123	179.968
2	1.273	10.78	1.076	-0.680	122.298
3	0.054	16.16	0.038	0.038	44.933
4	0.400	21.55	0.374	0.141	69.285
5	0.050	26.94	0.041	-0.029	125.647
6	0.235	32.33	-0.183	0.147	-51.243
	MAST TOP VERTICAL MEAN 0.857		ITEM CODE A888 MAX OSC.	UNITS: 2.186	G'S
1	0.018	5.39	-0.004	-0.018	-167.163
2	0.055	10.78	0.023	0.050	24.718
3	0.048	16.16	0.037	0.031	50.332
4	0.077	21.55	0.062	-0.047	127.192
5	0.035	26.94	-0.034	-0.011	-107.890
6	0.043	32.33	0.016	-0.040	158.451

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.6 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	MAST TOP F/A MEAN 0.038		ITEM CODE A886 MAX OSC. 5.919	UNITS: G'S	
1	0.141	5.38	-0.102	-0.097	-133.593
2	1.016	10.75	-0.761	-0.674	-131.545
3	0.039	16.13	0.024	0.030	39.335
4	0.508	21.51	0.364	-0.354	134.220
5	0.020	26.88	-0.006	0.019	-17.631
6	0.246	32.26	0.221	0.108	64.034
	MAST TOP LATERAL MEAN 0.023		ITEM CODE A887 MAX OSC. 4.880	UNITS: G'S	
1	0.138	5.38	0.018	-0.136	172.392
2	1.047	10.75	0.833	-0.634	127.256
3	0.062	16.13	0.031	0.054	29.665
4	0.497	21.51	0.420	0.264	57.813
5	0.057	26.88	0.013	-0.055	167.038
6	0.280	32.26	-0.023	0.279	-4.780
	MAST TOP VERTICAL MEAN 0.870		ITEM CODE A888 MAX OSC. 1.880	UNITS: G'S	
1	0.029	5.38	-0.016	-0.024	-146.360
2	0.056	10.75	0.026	0.049	28.209
3	0.027	16.13	0.025	0.010	67.750
4	0.077	21.51	0.059	-0.049	129.824
5	0.030	26.88	-0.014	-0.026	-152.411
6	0.062	32.26	0.032	-0.053	149.159

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 323.3

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	MAST TOP F/A MEAN 0.059		ITEM CODE A886 MAX OSC.	UNITS: 5.092	G'S
1	0.138	5.39	-0.121	-0.066	-118.781
2	0.959	10.78	-0.814	-0.508	-121.992
3	0.034	16.16	0.025	-0.023	133.138
4	0.272	21.55	0.223	-0.156	124.946
5	0.010	26.94	-0.009	0.004	-67.750
6	0.344	32.33	0.311	0.147	64.672
	MAST TOP LATERAL MEAN 0.002		ITEM CODE A887 MAX OSC.	UNITS: 4.007	G'S
1	0.090	5.39	0.010	-0.089	173.773
2	0.860	10.78	0.597	-0.619	136.003
3	0.073	16.16	0.042	0.059	35.518
4	0.388	21.55	0.325	0.211	56.987
5	0.037	26.94	-0.031	-0.019	-121.194
6	0.280	32.33	0.164	0.226	35.903
	MAST TOP VERTICAL MEAN 0.845		ITEM CODE A888 MAX OSC.	UNITS: 1.529	G'S
1	0.038	5.39	-0.015	-0.035	-157.094
2	0.052	10.78	0.045	0.026	60.328
3	0.041	16.16	0.041	0.003	85.161
4	0.006	21.55	0.000	-0.006	178.430
5	0.032	26.94	-0.011	-0.030	-159.586
6	0.038	32.33	-0.030	-0.024	-128.428

HARMONIC ANALYSIS: HUB ACCELERATIONS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.6 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	MAST TOP F/A MEAN 0.053		ITEM CODE A886 MAX OSC.	UNITS: 4.920	G'S
1	0.130	5.38	-0.110	-0.069	-121.913
2	0.837	10.75	-0.647	-0.532	-129.430
3	0.029	16.13	-0.026	0.013	-62.803
4	0.324	21.51	-0.036	-0.322	-173.595
5	0.048	26.88	0.034	0.033	45.619
6	0.175	32.26	0.063	0.163	21.108
	MAST TOP LATERAL MEAN 0.015		ITEM CODE A887 MAX OSC.	UNITS: 3.529	G'S
1	0.097	5.38	0.025	-0.094	164.856
2	0.764	10.75	0.545	-0.535	134.442
3	0.012	16.13	-0.009	-0.008	-131.631
4	0.243	21.51	0.236	0.057	76.472
5	0.079	26.88	0.017	-0.077	167.745
6	0.146	32.26	-0.019	0.145	-7.651
	MAST TOP VERTICAL MEAN 0.859		ITEM CODE A888 MAX OSC.	UNITS: 1.296	G'S
1	0.040	5.38	-0.017	-0.037	-154.901
2	0.072	10.75	0.051	0.051	45.349
3	0.034	16.13	0.032	0.012	69.595
4	0.044	21.51	-0.041	-0.014	-108.541
5	0.012	26.88	0.005	0.011	23.583
6	0.058	32.26	-0.057	0.011	-79.455

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 610
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 142.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.977		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.752	
1	0.061	5.39	0.049	-0.036	126.036
2	0.225	10.77	-0.176	-0.141	-128.793
3	0.014	16.16	-0.011	0.010	-47.064
4	0.073	21.55	-0.009	-0.073	-173.210
5	0.034	26.93	0.032	-0.009	106.052
6	0.035	32.32	0.035	-0.007	101.711
	GUNNER STATION 100 MEAN 0.962		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.576	
1	0.050	5.39	0.044	-0.023	117.463
2	0.223	10.77	-0.214	-0.064	-106.790
3	0.008	16.16	0.001	-0.008	169.996
4	0.066	21.55	-0.066	-0.003	-92.656
5	0.008	26.93	0.008	0.001	84.198
6	0.021	32.32	-0.016	-0.014	-131.631
	PILOT STATION 146 MEAN 0.977		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.625	
1	0.040	5.39	0.036	-0.017	115.097
2	0.206	10.77	-0.206	-0.003	-90.841
3	0.014	16.16	0.006	-0.012	152.410
4	0.054	21.55	-0.054	-0.005	-94.885
5	0.007	26.93	-0.002	0.006	-20.895
6	0.039	32.32	-0.023	-0.031	-143.622
	ENGINE DECK STA 249 MEAN 0.954		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.994	
1	0.030	5.39	0.026	-0.013	116.674
2	0.332	10.77	-0.300	0.142	-64.755
3	0.009	16.16	-0.004	-0.008	-154.001
4	0.130	21.55	-0.036	-0.125	-163.792
5	0.024	26.93	0.016	0.018	40.805
6	0.024	32.32	0.024	0.001	88.104
	TAIL BOOM STA 297 MEAN 0.928		ITEM CODE A317 MAX OSC.	UNITS: G'S 2.186	
1	0.024	5.39	0.021	-0.011	117.967
2	0.328	10.77	-0.295	0.142	-64.340
3	0.026	16.16	-0.025	-0.003	-97.218
4	0.102	21.55	-0.024	-0.099	-166.134
5	0.013	26.93	0.001	0.013	2.952
6	0.035	32.32	0.002	-0.034	176.713
	TAIL BOOM STA 400 MEAN 0.971		ITEM CODE A318 MAX OSC.	UNITS: G'S 4.016	
1	0.032	5.39	0.028	-0.017	121.323
2	0.308	10.77	-0.185	0.246	-36.825
3	0.079	16.16	-0.070	0.038	-61.611
4	0.177	21.55	0.158	0.079	63.558
5	0.092	26.93	-0.089	0.021	-76.898
6	0.117	32.32	-0.097	-0.066	-124.170

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391

FLT. 35-A
DATE 8-20-75

G.W. 8320 LB.
C.G. 200.6 IN.

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 0.938		ITEM CODE A319 MAX OSC.	UNITS: G'S 2.431	
1	0.052	5.39	0.043	-0.030	124.519
2	0.159	10.77	0.094	-0.128	143.676
3	0.062	16.16	-0.061	0.009	-82.034
4	0.287	21.55	0.229	0.172	53.041
5	0.130	26.93	-0.125	-0.037	-106.451
6	0.028	32.32	-0.010	-0.026	-159.994
	90 DEG GEAR BOX 518 MEAN 0.952		ITEM CODE A321 MAX OSC.	UNITS: G'S 4.201	
1	0.056	5.39	0.047	-0.030	122.426
2	0.504	10.77	0.325	-0.385	139.767
3	0.035	16.16	0.033	-0.012	110.670
4	0.063	21.55	0.062	0.010	80.765
5	0.043	26.93	-0.042	-0.008	-100.817
6	0.091	32.32	0.014	0.090	9.059
	T/B FIN LOAD STA 521 MEAN 0.507		ITEM CODE A320 MAX OSC.	UNITS: G'S 16.048	
1	0.061	5.39	0.053	-0.030	119.607
2	0.471	10.77	0.316	-0.349	137.899
3	0.009	16.16	-0.005	0.007	-35.692
4	0.086	21.55	0.079	0.036	65.549
5	0.082	26.93	-0.033	0.075	-23.563
6	0.131	32.32	0.008	0.131	3.333
	LFT WING-TIP STA 195 MEAN 0.934		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.865	
1	0.051	5.39	0.051	-0.003	93.810
2	0.447	10.77	-0.445	0.042	-84.559
3	0.034	16.16	0.021	-0.027	142.139
4	0.172	21.55	-0.172	-0.008	-92.559
5	0.031	26.93	0.001	0.031	2.107
6	0.138	32.32	-0.030	-0.134	-167.563
	RT WING-TIP STA 195 MEAN 0.892		ITEM CODE A601 MAX OSC.	UNITS: G'S 1.541	
1	0.051	5.39	-0.007	-0.050	-172.409
2	0.151	10.77	0.111	0.102	47.440
3	0.029	16.16	-0.025	0.016	-57.045
4	0.212	21.55	0.167	-0.130	127.891
5	0.022	26.93	0.001	-0.022	176.604
6	0.115	32.32	0.074	0.088	39.889

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 615
ROT SPEED 323.9

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 128.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.998		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.669	
1	0.057	5.40	0.036	-0.044	140.786
2	0.174	10.80	-0.159	-0.070	-113.805
3	0.009	16.19	0.002	-0.009	169.945
4	0.017	21.59	-0.004	0.016	-14.789
5	0.047	26.99	0.011	-0.045	166.092
6	0.114	32.39	0.101	-0.054	118.353
	GUNNER STATION 100 MEAN 0.992		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.513	
1	0.047	5.40	0.033	-0.034	136.033
2	0.176	10.80	-0.175	0.023	-82.478
3	0.011	16.19	-0.001	-0.011	-174.259
4	0.058	21.59	-0.058	0.005	-84.882
5	0.011	26.99	-0.009	-0.005	-118.578
6	0.038	32.39	-0.031	0.021	-55.725
	PILOT STATION 146 MEAN 1.003		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.599	
1	0.037	5.40	0.027	-0.026	133.370
2	0.183	10.80	-0.162	0.085	-62.246
3	0.010	16.19	-0.001	-0.009	-172.404
4	0.059	21.59	-0.051	-0.028	-118.745
5	0.014	26.99	-0.011	0.009	-51.107
6	0.074	32.39	-0.074	0.004	-86.550
	ENGINE DECK STA 249 MEAN 0.984		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.939	
1	0.028	5.40	0.022	-0.017	127.970
2	0.347	10.80	-0.222	0.266	-39.815
3	0.009	16.19	0.001	-0.009	174.681
4	0.132	21.59	-0.059	-0.118	-153.633
5	0.015	26.99	0.014	0.005	69.061
6	0.024	32.39	-0.023	0.004	-80.801
	TAIL BOOM STA 297 MEAN 0.992		ITEM CODE A317 MAX OSC.	UNITS: G'S 1.866	
1	0.022	5.40	0.019	-0.012	121.220
2	0.364	10.80	-0.236	0.277	-40.424
3	0.002	16.19	-0.002	-0.001	-116.524
4	0.091	21.59	-0.038	-0.083	-155.178
5	0.012	26.99	0.006	0.010	31.399
6	0.010	32.39	-0.008	-0.006	-124.986
	TAIL BOOM STA 400 MEAN 0.995		ITEM CODE A318 MAX OSC.	UNITS: G'S 3.263	
1	0.025	5.40	0.024	-0.004	99.112
2	0.343	10.80	-0.093	0.330	-15.765
3	0.040	16.19	-0.014	0.038	-20.017
4	0.232	21.59	0.156	0.171	42.450
5	0.076	26.99	-0.009	0.075	-6.700
6	0.022	32.39	0.000	-0.022	178.905

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 1.005		ITEM CODE A319 MAX OSC.	UNITS: G'S 2.362	
1	0.043	5.40	0.043	-0.003	94.221
2	0.256	10.80	0.142	-0.213	146.232
3	0.060	16.19	-0.038	0.047	-39.046
4	0.361	21.59	-0.027	0.360	-4.292
5	0.099	26.99	-0.099	-0.001	-90.470
6	0.038	32.39	0.037	-0.005	97.433
	90 DEG GEAR BOX 518 MEAN 1.082		ITEM CODE A321 MAX OSC.	UNITS: G'S 3.029	
1	0.050	5.40	0.046	-0.020	113.689
2	0.687	10.80	0.407	-0.553	143.612
3	0.019	16.19	-0.003	0.018	-10.668
4	0.066	21.59	0.027	0.060	24.320
5	0.049	26.99	-0.047	-0.011	-103.549
6	0.032	32.39	-0.012	-0.030	-158.685
	T/B FIN LOAD STA 521 MEAN 0.645		ITEM CODE A320 MAX OSC.	UNITS: G'S 17.045	
1	0.045	5.40	0.042	0.016	68.736
2	0.733	10.80	0.436	-0.589	143.481
3	0.054	16.19	-0.018	0.051	-19.304
4	0.091	21.59	0.042	0.080	27.680
5	0.022	26.99	-0.018	-0.013	-127.156
6	0.065	32.39	-0.004	-0.065	-176.400
	LFT WING-TIP STA 195 MEAN 1.029		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.977	
1	0.040	5.40	0.038	-0.014	110.340
2	0.401	10.80	-0.384	0.113	-73.592
3	0.015	16.19	0.007	-0.013	152.919
4	0.150	21.59	-0.107	-0.105	-134.333
5	0.011	26.99	-0.005	0.010	-29.041
6	0.141	32.39	-0.049	-0.133	-159.837
	RT WING-TIP STA 195 MEAN 1.017		ITEM CODE A601 MAX OSC.	UNITS: G'S 1.546	
1	0.021	5.40	0.007	-0.020	159.693
2	0.097	10.80	0.052	0.082	32.289
3	0.007	16.19	0.001	0.007	7.381
4	0.196	21.59	0.185	-0.066	109.756
5	0.031	26.99	-0.025	-0.018	-125.118
6	0.049	32.39	-0.012	0.047	-14.397

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 614
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 114.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 1.023		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.616	
1	0.048	5.39	0.038	-0.029	127.451
2	0.138	10.77	-0.119	-0.070	-120.265
3	0.003	16.16	0.002	-0.001	121.635
4	0.012	21.55	0.004	0.011	18.778
5	0.050	26.93	0.047	0.017	70.294
6	0.099	32.32	0.093	-0.036	111.121
	GUNNER STATION 100 MEAN 1.014		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.378	
1	0.037	5.39	0.031	-0.021	123.642
2	0.151	10.77	-0.150	0.014	-84.530
3	0.005	16.16	-0.005	-0.002	-109.357
4	0.053	21.55	-0.050	-0.017	-108.433
5	0.008	26.93	-0.007	0.003	-68.392
6	0.032	32.32	-0.009	0.031	-15.640
	PILOT STATION 146 MEAN 1.025		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.482	
1	0.030	5.39	0.025	-0.016	122.411
2	0.167	10.77	-0.150	0.075	-63.470
3	0.007	16.16	-0.007	-0.003	-112.007
4	0.063	21.55	-0.049	-0.040	-129.475
5	0.022	26.93	-0.022	-0.004	-99.222
6	0.056	32.32	-0.054	0.013	-76.527
	ENGINE DECK STA 249 MEAN 1.016		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.868	
1	0.024	5.39	0.020	-0.014	124.793
2	0.333	10.77	-0.221	0.249	-41.633
3	0.012	16.16	0.000	-0.012	179.073
4	0.089	21.55	-0.063	-0.064	-135.256
5	0.013	26.93	-0.000	0.013	-1.380
6	0.039	32.32	-0.038	-0.006	-98.676
	TAIL BOOM STA 297 MEAN 0.997		ITEM CODE A317 MAX OSC.	UNITS: G'S 1.899	
1	0.022	5.39	0.020	-0.011	118.357
2	0.357	10.77	-0.242	0.263	-42.523
3	0.008	16.16	0.003	-0.007	155.082
4	0.069	21.55	-0.046	-0.052	-138.201
5	0.019	26.93	0.004	0.018	11.058
6	0.009	32.32	-0.007	-0.005	-125.906
	TAIL BOOM STA 400 MEAN 1.002		ITEM CODE A318 MAX OSC.	UNITS: G'S 2.846	
1	0.033	5.39	0.028	-0.018	122.715
2	0.312	10.77	-0.103	0.294	-19.374
3	0.010	16.16	0.010	0.001	86.699
4	0.169	21.55	0.144	0.090	58.015
5	0.043	26.93	-0.022	0.037	-30.282
6	0.050	32.32	0.047	-0.017	109.930

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 1.011		ITEM CODE A319 MAX OSC.	UNITS: G'S 2.038	
1	0.041	5.39	0.041	-0.003	93.507
2	0.280	10.77	0.081	-0.269	163.261
3	0.026	16.16	0.004	0.025	8.420
4	0.251	21.55	0.183	0.172	46.828
5	0.111	26.93	-0.105	-0.035	-108.604
6	0.026	32.32	-0.002	0.026	-3.591
	90 DEG GEAR BOX 518 MEAN 1.122		ITEM CODE A321 MAX OSC.	UNITS: G'S 2.486	
1	0.045	5.39	0.045	-0.004	95.206
2	0.715	10.77	0.261	-0.665	158.580
3	0.011	16.16	-0.011	0.004	-69.953
4	0.062	21.55	0.058	-0.022	110.697
5	0.103	26.93	-0.059	-0.085	-145.382
6	0.021	32.32	-0.012	0.017	-35.169
	T/B FIN LOAD STA 521 MEAN 0.708		ITEM CODE A320 MAX OSC.	UNITS: G'S 13.117	
1	0.037	5.39	0.036	-0.008	102.072
2	0.784	10.77	0.299	-0.725	157.613
3	0.028	16.16	0.011	0.025	23.764
4	0.072	21.55	0.069	-0.020	106.296
5	0.108	26.93	-0.080	-0.072	-132.066
6	0.026	32.32	-0.008	0.025	-18.935
	LFT WING-TIP STA 195 MEAN 1.040		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.218	
1	0.020	5.39	0.018	-0.008	113.415
2	0.351	10.77	-0.299	0.183	-58.505
3	0.017	16.16	-0.017	-0.005	-106.506
4	0.142	21.55	-0.136	-0.040	-106.579
5	0.027	26.93	-0.025	-0.010	-111.135
6	0.113	32.32	-0.112	-0.013	-96.714
	RT WING-TIP STA 195 MEAN 1.007		ITEM CODE A601 MAX OSC.	UNITS: G'S 1.346	
1	0.029	5.39	0.015	-0.024	148.760
2	0.117	10.77	0.072	0.093	37.739
3	0.019	16.16	0.018	0.006	70.560
4	0.124	21.55	0.085	-0.090	136.896
5	0.016	26.93	-0.015	-0.003	-102.794
6	0.060	32.32	0.033	0.050	33.295

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 1.030		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.567	
1	0.047	5.38	0.031	-0.036	139.392
2	0.134	10.75	-0.107	-0.081	-127.330
3	0.021	16.13	0.017	0.011	56.804
4	0.072	21.50	-0.016	-0.071	-167.508
5	0.052	26.88	0.046	-0.024	118.189
6	0.128	32.25	0.127	0.021	80.750
	GUNNER STATION 100 MEAN 1.022		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.372	
1	0.035	5.38	0.024	-0.025	137.204
2	0.129	10.75	-0.129	-0.012	-95.249
3	0.013	16.13	0.012	0.005	67.587
4	0.063	21.50	-0.035	-0.052	-146.098
5	0.010	26.88	-0.002	-0.010	-165.900
6	0.007	32.25	-0.003	0.006	-24.462
	PILOT STATION 146 MEAN 1.037		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.466	
1	0.027	5.38	0.019	-0.020	136.521
2	0.129	10.75	-0.123	0.040	-71.917
3	0.008	16.13	0.008	-0.000	90.667
4	0.052	21.50	-0.017	-0.049	-160.897
5	0.016	26.88	-0.016	-0.002	-96.918
6	0.049	32.25	-0.044	-0.023	-117.700
	ENGINE DECK STA 249 MEAN 1.018		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.814	
1	0.020	5.38	0.013	-0.015	139.142
2	0.252	10.75	-0.177	0.179	-44.652
3	0.012	16.13	0.011	-0.004	110.944
4	0.099	21.50	-0.030	-0.094	-162.182
5	0.005	26.88	-0.004	-0.004	-137.435
6	0.033	32.25	-0.033	-0.001	-91.881
	TAIL BOOM STA 297 MEAN 0.981		ITEM CODE A317 MAX OSC.	UNITS: G'S 1.823	
1	0.017	5.38	0.014	-0.011	128.723
2	0.271	10.75	-0.186	0.197	-43.343
3	0.013	16.13	0.013	0.003	76.611
4	0.067	21.50	-0.015	-0.065	-167.393
5	0.017	26.88	0.017	0.003	79.742
6	0.023	32.25	-0.015	0.018	-40.362
	TAIL BOOM STA 400 MEAN 1.010		ITEM CODE A318 MAX OSC.	UNITS: G'S 3.139	
1	0.029	5.38	0.021	-0.020	134.279
2	0.243	10.75	-0.080	0.229	-19.210
3	0.019	16.13	0.015	0.011	54.971
4	0.223	21.50	0.097	0.201	25.697
5	0.092	26.88	0.075	0.053	54.635
6	0.083	32.25	0.078	-0.030	111.251

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 1.051		ITEM CODE A319 MAX OSC.	UNITS: G'S 1.918	
1	0.038	5.38	0.037	-0.010	105.118
2	0.207	10.75	0.050	-0.201	165.952
3	0.040	16.13	-0.020	0.035	-30.360
4	0.315	21.50	0.091	0.301	16.887
5	0.145	26.88	-0.057	0.133	-23.283
6	0.091	32.25	0.050	-0.076	146.588
	90 DEG GEAR BOX 518 MEAN 1.099		ITEM CODE A321 MAX OSC.	UNITS: G'S 2.461	
1	0.050	5.38	0.045	-0.021	115.185
2	0.561	10.75	0.199	-0.525	159.220
3	0.021	16.13	-0.021	0.001	-88.303
4	0.035	21.50	0.034	0.009	74.341
5	0.117	26.88	-0.117	-0.007	-93.483
6	0.052	32.25	-0.005	-0.052	-174.065
	T/B FIN LOAD STA 521 MEAN 0.782		ITEM CODE A320 MAX OSC.	UNITS: G'S 8.772	
1	0.080	5.38	0.061	-0.052	130.143
2	0.632	10.75	0.185	-0.604	162.996
3	0.035	16.13	-0.030	-0.017	-118.690
4	0.058	21.50	0.058	-0.001	90.995
5	0.139	26.88	-0.139	0.004	-88.370
6	0.103	32.25	-0.033	-0.097	-160.995
	LFT WING-TIP STA 195 MEAN 1.087		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.328	
1	0.025	5.38	0.018	-0.017	134.588
2	0.283	10.75	-0.260	0.111	-66.977
3	0.016	16.13	0.014	-0.008	119.499
4	0.133	21.50	-0.089	-0.098	-137.914
5	0.009	26.88	-0.006	-0.006	-132.546
6	0.094	32.25	-0.093	0.004	-87.412
	RT WING-TIP STA 195 MEAN 1.059		ITEM CODE A601 MAX OSC.	UNITS: G'S 1.111	
1	0.032	5.38	0.029	-0.012	112.822
2	0.112	10.75	0.074	0.084	41.388
3	0.018	16.13	-0.017	0.008	-65.582
4	0.117	21.50	0.113	-0.027	103.532
5	0.033	26.88	-0.032	0.005	-80.503
6	0.069	32.25	0.019	-0.066	163.634

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.985		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.618	
1	0.020	5.39	0.015	-0.013	130.287
2	0.106	10.77	-0.085	-0.063	-126.480
3	0.011	16.16	-0.010	-0.005	-113.952
4	0.084	21.55	0.019	-0.082	167.245
5	0.056	26.93	0.006	0.055	6.265
6	0.052	32.32	0.048	-0.020	112.641
	GUNNER STATION 100 MEAN 0.978		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.357	
1	0.016	5.39	0.010	-0.013	142.235
2	0.085	10.77	-0.085	0.003	-88.182
3	0.009	16.16	-0.005	-0.007	-145.583
4	0.021	21.55	-0.014	-0.016	-139.915
5	0.015	26.93	-0.014	-0.005	-108.017
6	0.020	32.32	0.014	-0.014	133.653
	PILOT STATION 146 MEAN 0.992		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.384	
1	0.014	5.39	0.008	-0.011	145.653
2	0.084	10.77	-0.067	0.051	-52.778
3	0.007	16.16	0.001	-0.007	175.506
4	0.007	21.55	-0.000	0.007	-2.506
5	0.026	26.93	-0.014	-0.022	-148.299
6	0.009	32.32	-0.008	-0.004	-118.266
	ENGINE DECK STA 249 MEAN 0.974		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.645	
1	0.008	5.39	0.005	-0.007	147.070
2	0.196	10.77	-0.057	0.188	-16.760
3	0.006	16.16	0.004	-0.004	137.130
4	0.079	21.55	0.073	-0.029	111.679
5	0.013	26.93	-0.007	0.011	-33.252
6	0.020	32.32	0.004	0.020	10.827
	TAIL BOOM STA 297 MEAN 0.942		ITEM CODE A317 MAX OSC.	UNITS: G'S 1.700	
1	0.005	5.39	0.004	-0.003	131.363
2	0.227	10.77	-0.060	0.219	-15.333
3	0.007	16.16	-0.007	-0.002	-106.853
4	0.045	21.55	0.041	-0.018	113.856
5	0.036	26.93	-0.027	0.024	-48.170
6	0.022	32.32	0.020	0.009	67.038
	TAIL BOOM STA 400 MEAN 0.966		ITEM CODE A318 MAX OSC.	UNITS: G'S 2.947	
1	0.012	5.39	0.011	-0.005	115.613
2	0.203	10.77	0.031	0.201	8.846
3	0.034	16.16	-0.034	0.003	-84.274
4	0.114	21.55	-0.108	0.035	-71.794
5	0.133	26.93	-0.124	0.046	-69.622
6	0.099	32.32	0.062	-0.078	141.366

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 0.990		ITEM CODE A319 MAX OSC.	UNITS: G'S 1.646	
1	0.026	5.39	0.026	-0.002	93.487
2	0.208	10.77	-0.008	-0.208	-177.913
3	0.023	16.16	-0.022	0.004	-78.933
4	0.151	21.55	-0.145	0.041	-74.271
5	0.173	26.93	-0.123	-0.121	-134.518
6	0.036	32.32	0.033	0.015	65.664
	90 DEG GEAR BOX 518 MEAN 1.102		ITEM CODE A321 MAX OSC.	UNITS: G'S 2.320	
1	0.036	5.39	0.035	-0.004	96.360
2	0.507	10.77	0.006	-0.507	179.268
3	0.011	16.16	0.010	-0.004	111.354
4	0.010	21.55	-0.009	0.004	-62.897
5	0.129	26.93	0.070	-0.108	147.049
6	0.074	32.32	-0.068	0.029	-67.059
	T/B FIN LOAD STA 521 MEAN 0.767		ITEM CODE A320 MAX OSC.	UNITS: G'S 7.936	
1	0.054	5.39	0.041	-0.036	131.615
2	0.562	10.77	-0.021	-0.562	-177.900
3	0.014	16.16	0.011	-0.009	129.545
4	0.006	21.55	-0.005	0.003	-59.720
5	0.198	26.93	0.065	-0.187	160.802
6	0.098	32.32	-0.085	0.048	-60.249
	LFT WING-TIP STA 195 MEAN 1.034		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.498	
1	0.020	5.39	-0.001	-0.020	-178.005
2	0.206	10.77	-0.160	0.129	-51.183
3	0.010	16.16	-0.005	-0.009	-152.409
4	0.022	21.55	-0.018	0.013	-53.203
5	0.030	26.93	-0.008	-0.028	-163.594
6	0.023	32.32	0.015	0.017	40.087
	RT WING-TIP STA 195 MEAN 0.997		ITEM CODE A601 MAX OSC.	UNITS: G'S 0.917	
1	0.024	5.39	0.024	-0.004	100.435
2	0.142	10.77	0.121	0.074	58.323
3	0.017	16.16	0.002	0.017	7.195
4	0.119	21.55	0.118	-0.016	97.613
5	0.018	26.93	-0.010	-0.015	-146.376
6	0.041	32.32	-0.040	-0.008	-100.878

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 611
ROT SPEED 322.5

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 67.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.987		ITEM CODE A315 MAX OSC.	UNITS: G'S 0.715	
1	0.032	5.38	0.014	-0.028	153.384
2	0.079	10.75	-0.053	-0.058	-137.778
3	0.020	16.13	0.001	-0.020	177.296
4	0.076	21.50	0.040	-0.065	148.745
5	0.071	26.88	-0.036	-0.061	-149.292
6	0.081	32.25	-0.018	-0.079	-166.992
	GUNNER STATION 100 MEAN 0.982		ITEM CODE A020 MAX OSC.	UNITS: G'S 0.352	
1	0.023	5.38	0.008	-0.022	159.832
2	0.063	10.75	-0.062	0.012	-78.984
3	0.011	16.13	0.001	-0.011	175.140
4	0.018	21.50	-0.016	0.010	-58.716
5	0.018	26.88	0.007	-0.017	156.069
6	0.051	32.25	0.037	0.035	45.903
	PILOT STATION 146 MEAN 0.992		ITEM CODE A019 MAX OSC.	UNITS: G'S 0.435	
1	0.018	5.38	0.006	-0.017	161.877
2	0.081	10.75	-0.050	0.064	-37.911
3	0.005	16.13	0.001	-0.005	166.906
4	0.049	21.50	-0.022	0.044	-26.549
5	0.016	26.88	0.015	0.005	71.609
6	0.056	32.25	0.009	0.056	9.272
	ENGINE DECK STA 249 MEAN 0.978		ITEM CODE A316 MAX OSC.	UNITS: G'S 0.707	
1	0.013	5.38	0.003	-0.013	167.597
2	0.215	10.75	-0.041	0.211	-10.936
3	0.003	16.13	0.000	-0.003	176.493
4	0.116	21.50	0.082	0.082	45.170
5	0.029	26.88	-0.028	-0.007	-104.594
6	0.031	32.25	0.030	0.007	77.193
	TAIL BOOM STA 297 MEAN 0.937		ITEM CODE A317 MAX OSC.	UNITS: G'S 1.493	
1	0.012	5.38	0.008	-0.010	141.695
2	0.251	10.75	-0.049	0.246	-11.313
3	0.004	16.13	-0.000	-0.004	-178.784
4	0.069	21.50	0.055	0.042	52.519
5	0.041	26.88	-0.006	-0.041	-172.270
6	0.045	32.25	0.044	0.009	78.004
	TAIL BOOM STA 400 MEAN 0.957		ITEM CODE A318 MAX OSC.	UNITS: G'S 2.642	
1	0.014	5.38	0.011	-0.008	126.026
2	0.230	10.75	0.052	0.224	13.156
3	0.006	16.13	-0.002	-0.006	-164.623
4	0.215	21.50	-0.015	-0.214	-175.879
5	0.170	26.88	0.124	-0.117	133.311
6	0.033	32.25	0.022	-0.024	137.530

HARMONIC ANALYSIS: FUSELAGE VERTICAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 485 MEAN 0.988		ITEM CODE A319 MAX OSC.	UNITS: G'S 1.628	
1	0.031	5.38	0.026	-0.017	122.764
2	0.253	10.75	0.012	-0.253	177.322
3	0.014	16.13	0.009	-0.010	138.789
4	0.254	21.50	0.008	-0.254	178.229
5	0.253	26.88	0.235	0.094	68.111
6	0.022	32.25	-0.017	0.014	-51.895
	90 DEG GEAR BOX 518 MEAN 1.037		ITEM CODE A321 MAX OSC.	UNITS: G'S 2.485	
1	0.029	5.38	0.028	-0.007	103.587
2	0.587	10.75	0.002	-0.587	179.850
3	0.006	16.13	-0.006	-0.002	-105.876
4	0.051	21.50	-0.051	-0.008	-98.667
5	0.160	26.88	-0.014	0.159	-5.031
6	0.037	32.25	-0.037	0.002	-87.106
	T/B FIN LOAD STA 521 MEAN 0.794		ITEM CODE A320 MAX OSC.	UNITS: G'S 7.931	
1	0.032	5.38	0.032	-0.000	90.840
2	0.632	10.75	-0.000	-0.632	-179.998
3	0.013	16.13	-0.009	0.010	-44.270
4	0.063	21.50	-0.063	-0.001	-90.532
5	0.223	26.88	-0.005	0.223	-1.254
6	0.076	32.25	-0.075	0.012	-80.728
	LFT WING-TIP STA 195 MEAN 1.008		ITEM CODE A600 MAX OSC.	UNITS: G'S 1.413	
1	0.015	5.38	-0.010	-0.012	-140.288
2	0.195	10.75	-0.136	0.140	-44.257
3	0.008	16.13	-0.006	-0.005	-132.464
4	0.115	21.50	-0.041	0.108	-20.761
5	0.013	26.88	0.007	0.011	30.384
6	0.064	32.25	0.003	0.064	2.976
	RT WING-TIP STA 195 MEAN 0.961		ITEM CODE A601 MAX OSC.	UNITS: G'S 1.366	
1	0.034	5.38	0.033	-0.007	101.423
2	0.153	10.75	0.119	0.095	51.450
3	0.016	16.13	0.008	0.014	31.164
4	0.093	21.50	0.089	0.027	72.947
5	0.015	26.88	0.001	0.015	3.408
6	0.067	32.25	-0.002	0.067	-1.513

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 610
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 142.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.018		ITEM CODE A306 MAX OSC.	UNITS: G'S 0.836	
1	0.012	5.39	-0.002	0.011	-9.077
2	0.144	10.77	0.069	-0.126	151.468
3	0.072	16.16	0.066	-0.027	112.499
4	0.223	21.55	0.222	-0.015	93.812
5	0.005	26.93	0.004	0.003	53.009
6	0.052	32.32	0.044	0.028	57.045
	GUNNER STATION 100 MEAN 0.024		ITEM CODE A304 MAX OSC.	UNITS: G'S 0.336	
1	0.005	5.39	-0.003	0.005	-33.273
2	0.095	10.77	0.071	-0.063	131.667
3	0.025	16.16	0.024	-0.006	104.349
4	0.125	21.55	0.122	-0.030	103.784
5	0.011	26.93	-0.006	0.009	-34.304
6	0.035	32.32	0.026	-0.023	131.467
	PILOT STATION 146 MEAN 0.034		ITEM CODE A302 MAX OSC.	UNITS: G'S 0.325	
1	0.005	5.39	-0.004	0.002	-62.416
2	0.053	10.77	0.052	-0.008	98.279
3	0.004	16.16	-0.001	0.004	-12.247
4	0.018	21.55	0.012	-0.013	136.964
5	0.011	26.93	-0.010	0.005	-60.803
6	0.010	32.32	-0.001	-0.010	-176.786
	ENGINE DECK STA 249 MEAN -0.029		ITEM CODE A307 MAX OSC.	UNITS: G'S 0.935	
1	0.008	5.39	-0.008	-0.001	-98.037
2	0.149	10.77	0.119	-0.089	126.865
3	0.010	16.16	0.005	0.009	31.432
4	0.027	21.55	0.026	0.007	74.102
5	0.023	26.93	-0.008	0.021	-21.533
6	0.042	32.32	0.019	0.037	27.631

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 297 MEAN -0.037		ITEM CODE A308 MAX OSC.	UNITS: G'S 1.417	
1	0.010	5.39	-0.008	0.006	-52.636
2	0.118	10.77	0.093	-0.074	128.604
3	0.028	16.16	-0.018	0.021	-40.790
4	0.031	21.55	0.027	-0.014	117.927
5	0.052	26.93	-0.051	0.011	-77.333
6	0.090	32.32	0.003	0.090	1.890
	TAIL BOOM STA 400 MEAN 0.085		ITEM CODE A309 MAX OSC.	UNITS: G'S 5.133	
1	0.014	5.39	0.014	0.004	72.024
2	0.192	10.77	0.018	-0.191	174.591
3	0.111	16.16	0.111	0.001	89.604
4	0.057	21.55	-0.051	0.025	-63.979
5	0.145	26.93	-0.021	0.143	-8.503
6	0.166	32.32	0.161	-0.037	102.803
	T/B FIN LOAD STA 521 MEAN 0.324		ITEM CODE A311 MAX OSC.	UNITS: G'S 19.146	
1	0.051	5.39	-0.036	0.036	-45.436
2	1.176	10.77	0.707	-0.940	143.079
3	0.212	16.16	-0.207	0.047	-77.229
4	0.291	21.55	-0.148	-0.251	-149.397
5	0.944	26.93	-0.142	-0.934	-171.325
6	0.220	32.32	-0.127	-0.180	-144.788

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 615
ROT SPEED 323.9

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 128.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.024		ITEM CODE A306 MAX OSC.	UNITS: G'S 0.692	
1	0.027	5.40	-0.012	0.024	-27.187
2	0.061	10.80	0.055	-0.027	116.524
3	0.069	16.19	0.040	-0.056	144.763
4	0.195	21.59	0.167	0.102	58.608
5	0.007	26.99	0.007	-0.001	98.637
6	0.033	32.39	-0.010	0.032	-17.421
	GUNNER STATION 100 MEAN 0.039		ITEM CODE A304 MAX OSC.	UNITS: G'S 0.329	
1	0.016	5.40	-0.008	0.014	-29.089
2	0.060	10.80	0.058	-0.014	104.002
3	0.026	16.19	0.017	-0.019	138.108
4	0.105	21.59	0.100	0.031	72.600
5	0.010	26.99	0.002	0.009	10.204
6	0.021	32.39	0.015	-0.015	134.451
	PILOT STATION 146 MEAN 0.038		ITEM CODE A302 MAX OSC.	UNITS: G'S 0.271	
1	0.008	5.40	-0.005	0.007	-37.404
2	0.043	10.80	0.043	0.002	87.967
3	0.003	16.19	0.001	0.003	14.748
4	0.022	21.59	0.016	-0.015	131.735
5	0.006	26.99	-0.004	0.005	-36.609
6	0.013	32.39	0.002	-0.012	171.761
	ENGINE DECK STA 249 MEAN -0.017		ITEM CODE A307 MAX OSC.	UNITS: G'S 0.805	
1	0.011	5.40	-0.008	0.008	-44.129
2	0.113	10.80	0.102	-0.047	114.766
3	0.016	16.19	0.013	-0.009	124.410
4	0.020	21.59	0.018	0.008	64.757
5	0.026	26.99	0.003	0.026	6.409
6	0.027	32.39	-0.026	0.007	-74.448

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
TAIL BOOM STA 297	MEAN 0.004		ITEM CODE A308 MAX OSC.	UNITS: G'S 1.406	
1	0.016	5.40	-0.010	0.013	-37.426
2	0.094	10.80	0.084	-0.043	117.303
3	0.011	16.19	0.004	0.010	23.339
4	0.026	21.59	0.016	-0.021	142.926
5	0.048	26.99	-0.035	0.034	-45.699
6	0.028	32.39	-0.025	0.013	-63.059
TAIL BOOM STA 400	MEAN -0.011		ITEM CODE A309 MAX OSC.	UNITS: G'S 3.734	
1	0.017	5.40	0.014	-0.009	123.336
2	0.052	10.80	-0.010	-0.052	-169.544
3	0.114	16.19	0.086	-0.074	130.382
4	0.075	21.59	-0.045	0.060	-36.927
5	0.108	26.99	0.049	0.096	27.028
6	0.055	32.39	0.032	-0.045	144.391
T/B FIN LOAD STA 521	MEAN 0.077		ITEM CODE A311 MAX OSC.	UNITS: G'S 20.376	
1	0.162	5.40	0.066	-0.148	156.130
2	0.523	10.80	0.294	-0.432	145.757
3	0.105	16.19	-0.011	0.105	-5.781
4	0.164	21.59	0.082	-0.142	149.935
5	0.803	26.99	-0.311	-0.740	-157.184
6	0.251	32.39	0.099	0.230	23.385

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 614 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 114.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.018		ITEM CODE A306 MAX OSC.	UNITS: G'S 0.631	
1	0.018	5.39	-0.010	0.015	-33.174
2	0.062	10.77	0.053	-0.031	119.916
3	0.051	16.16	-0.027	-0.043	-148.137
4	0.195	21.55	0.184	0.065	70.603
5	0.010	26.93	0.003	0.010	18.852
6	0.015	32.32	-0.004	0.015	-14.625
	GUNNER STATION 100 MEAN 0.036		ITEM CODE A304 MAX OSC.	UNITS: G'S 0.260	
1	0.010	5.39	-0.006	0.007	-40.854
2	0.061	10.77	0.059	-0.017	106.531
3	0.019	16.16	-0.009	-0.017	-151.016
4	0.100	21.55	0.100	0.012	83.247
5	0.003	26.93	0.002	0.003	34.064
6	0.022	32.32	0.004	-0.022	170.682
	PILOT STATION 146 MEAN 0.041		ITEM CODE A302 MAX OSC.	UNITS: G'S 0.231	
1	0.005	5.39	-0.005	0.002	-62.912
2	0.046	10.77	0.046	-0.001	91.595
3	0.002	16.16	0.001	0.002	33.453
4	0.019	21.55	0.011	-0.015	143.855
5	0.005	26.93	0.000	-0.005	179.976
6	0.003	32.32	-0.003	-0.001	-112.650
	ENGINE DECK STA 249 MEAN -0.022		ITEM CODE A307 MAX OSC.	UNITS: G'S 0.671	
1	0.006	5.39	-0.004	0.005	-41.201
2	0.101	10.77	0.082	-0.060	126.133
3	0.014	16.16	-0.009	-0.011	-140.293
4	0.015	21.55	0.014	0.004	72.930
5	0.019	26.93	-0.015	0.012	-50.161
6	0.007	32.32	-0.005	0.005	-42.857

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
TAIL BOOM STA 297 MEAN -0.014			ITEM CODE A308 MAX OSC.	UNITS: G'S 1.207	
1	0.009	5.39	-0.005	0.008	-31.896
2	0.091	10.77	0.072	-0.056	128.080
3	0.010	16.16	0.008	-0.006	127.245
4	0.015	21.55	0.006	-0.014	157.090
5	0.029	26.93	-0.028	-0.004	-98.704
6	0.009	32.32	-0.000	0.009	-1.710
TAIL BOOM STA 400 MEAN 0.032			ITEM CODE A309 MAX OSC.	UNITS: G'S 2.740	
1	0.001	5.39	-0.000	0.001	-9.674
2	0.047	10.77	-0.038	-0.027	-124.602
3	0.099	16.16	-0.070	-0.071	-135.645
4	0.044	21.55	-0.013	0.042	-17.535
5	0.073	26.93	-0.050	0.053	-43.351
6	0.069	32.32	-0.022	-0.065	-161.479
T/B FIN LOAD STA 521 MEAN -0.178			ITEM CODE A311 MAX OSC.	UNITS: G'S 13.990	
1	0.066	5.39	-0.034	0.056	-31.366
2	0.286	10.77	0.035	-0.284	173.002
3	0.119	16.16	0.113	0.037	71.888
4	0.191	21.55	-0.155	-0.112	-125.993
5	0.372	26.93	0.198	-0.315	147.816
6	0.157	32.32	-0.025	0.155	-9.004

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 613
ROT SPEED 322.5

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 101.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.022		ITEM CODE A306 MAX OSC.	UNITS: G'S 0.723	
1	0.006	5.38	-0.006	0.000	-87.615
2	0.085	10.75	0.084	0.013	80.976
3	0.036	16.13	0.035	0.005	81.518
4	0.193	21.50	0.128	0.145	41.400
5	0.014	26.88	-0.009	0.010	-41.368
6	0.035	32.25	-0.027	0.023	-49.454
	GUNNER STATION 100 MEAN 0.036		ITEM CODE A304 MAX OSC.	UNITS: G'S 0.268	
1	0.002	5.38	-0.001	-0.001	-127.191
2	0.072	10.75	0.071	0.010	81.643
3	0.013	16.13	0.013	0.003	74.759
4	0.097	21.50	0.083	0.049	59.504
5	0.011	26.88	-0.002	0.010	-12.798
6	0.012	32.25	-0.011	-0.005	-113.481
	PILOT STATION 146 MEAN 0.039		ITEM CODE A302 MAX OSC.	UNITS: G'S 0.195	
1	0.000	5.38	0.000	0.000	3.771
2	0.048	10.75	0.047	0.009	79.475
3	0.003	16.13	-0.002	0.002	-34.162
4	0.022	21.50	0.017	-0.014	128.691
5	0.004	26.88	0.002	0.004	20.498
6	0.024	32.25	-0.022	0.010	-65.562
	ENGINE DECK STA 249 MEAN -0.011		ITEM CODE A307 MAX OSC.	UNITS: G'S 0.487	
1	0.005	5.38	0.002	-0.004	152.580
2	0.089	10.75	0.083	-0.034	112.378
3	0.004	16.13	0.003	-0.002	119.790
4	0.015	21.50	0.014	0.002	82.779
5	0.012	26.88	-0.010	0.005	-62.615
6	0.020	32.25	0.015	-0.013	129.802

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	TAIL BOOM STA 297 MEAN -0.008		ITEM CODE A308 MAX OSC.	UNITS: G'S 1.028	
1	0.008	5.38	0.001	-0.008	171.581
2	0.085	10.75	0.074	-0.041	119.079
3	0.005	16.13	-0.004	-0.002	-117.532
4	0.027	21.50	0.014	-0.023	148.071
5	0.017	26.88	-0.017	0.002	-82.019
6	0.015	32.25	0.008	-0.013	149.012
	TAIL BOOM STA 400 MEAN 0.035		ITEM CODE A309 MAX OSC.	UNITS: G'S 3.103	
1	0.008	5.38	0.007	0.003	65.697
2	0.019	10.75	-0.019	-0.002	-94.980
3	0.058	16.13	0.057	0.007	83.026
4	0.062	21.50	-0.043	0.045	-43.368
5	0.049	26.88	-0.016	0.046	-19.291
6	0.056	32.25	-0.007	-0.056	-172.721
	T/B FIN LOAD STA 521 MEAN 0.008		ITEM CODE A311 MAX OSC.	UNITS: G'S 11.132	
1	0.038	5.38	-0.013	0.036	-20.044
2	0.143	10.75	0.142	0.021	81.666
3	0.088	16.13	-0.088	-0.004	-92.609
4	0.093	21.50	0.091	-0.022	103.464
5	0.092	26.88	0.007	-0.092	175.745
6	0.104	32.25	0.054	0.088	31.713

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 612 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 85.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	NOSE STATION 46 MEAN 0.013		ITEM CODE A306 MAX OSC.	UNITS: G'S 0.570	
1	0.004	5.39	-0.003	0.002	-55.228
2	0.063	10.77	0.059	-0.022	110.268
3	0.027	16.16	0.003	-0.027	173.041
4	0.123	21.55	0.119	0.031	75.316
5	0.014	26.93	-0.014	-0.004	-107.779
6	0.027	32.32	0.000	0.027	0.606
	GUNNER STATION 100 MEAN 0.021		ITEM CODE A304 MAX OSC.	UNITS: G'S 0.251	
1	0.001	5.39	0.000	0.001	0.474
2	0.059	10.77	0.059	-0.010	99.464
3	0.010	16.16	0.001	-0.010	174.561
4	0.080	21.55	0.080	0.004	87.011
5	0.003	26.93	0.003	-0.000	95.768
6	0.010	32.32	0.010	0.002	77.171
	PILOT STATION 146 MEAN 0.033		ITEM CODE A302 MAX OSC.	UNITS: G'S 0.195	
1	0.000	5.39	0.000	0.000	56.695
2	0.043	10.77	0.043	0.001	89.244
3	0.000	16.16	-0.000	0.000	-24.207
4	0.018	21.55	0.018	-0.004	103.747
5	0.010	26.93	0.009	-0.001	96.751
6	0.012	32.32	-0.000	0.012	-0.092
	ENGINE DECK STA 249 MEAN 0.006		ITEM CODE A307 MAX OSC.	UNITS: G'S 0.551	
1	0.004	5.39	0.003	-0.001	113.655
2	0.074	10.77	0.056	-0.049	131.443
3	0.005	16.16	0.000	-0.005	178.898
4	0.022	21.55	0.019	-0.012	122.739
5	0.013	26.93	0.002	-0.012	168.810
6	0.010	32.32	-0.005	-0.009	-151.853

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
TAIL BOOM STA 297	MEAN 0.013		ITEM CODE A308	MAX OSC. 0.918	UNITS: G'S
1	0.004	5.39	0.001	-0.004	162.204
2	0.074	10.77	0.053	-0.052	134.700
3	0.004	16.16	0.002	0.003	40.123
4	0.039	21.55	0.026	-0.029	137.808
5	0.025	26.93	0.023	-0.008	109.771
6	0.019	32.32	-0.016	-0.010	-121.562
TAIL BOOM STA 400	MEAN 0.040		ITEM CODE A309	MAX OSC. 2.766	UNITS: G'S
1	0.011	5.39	0.002	-0.010	167.983
2	0.054	10.77	-0.041	-0.034	-129.480
3	0.068	16.16	0.004	-0.067	176.275
4	0.064	21.55	-0.056	-0.031	-118.662
5	0.081	26.93	-0.018	-0.079	-167.300
6	0.008	32.32	-0.008	-0.002	-103.956
T/B FIN LOAD STA 521	MEAN -0.060		ITEM CODE A311	MAX OSC. 8.114	UNITS: G'S
1	0.015	5.39	-0.007	0.014	-26.598
2	0.262	10.77	0.160	-0.208	142.321
3	0.110	16.16	-0.055	0.095	-30.060
4	0.089	21.55	0.036	0.081	23.858
5	0.139	26.93	-0.002	0.139	-0.653
6	0.109	32.32	0.062	0.090	34.255

C-2

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 611
ROT SPEED 322.5

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 67.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
NOSE STATION 46 MEAN 0.014			ITEM CODE A306 MAX OSC.	UNITS: G'S 0.673	
1	0.008	5.38	-0.008	0.000	-89.911
2	0.040	10.75	0.039	-0.009	102.555
3	0.022	16.13	-0.008	-0.021	-158.428
4	0.150	21.50	0.148	-0.020	97.672
5	0.014	26.88	0.009	0.010	43.017
6	0.041	32.25	0.030	0.028	46.628
GUNNER STATION 100 MEAN 0.020			ITEM CODE A304 MAX OSC.	UNITS: G'S 0.201	
1	0.003	5.38	-0.002	0.001	-70.268
2	0.045	10.75	0.045	-0.001	90.647
3	0.009	16.13	-0.003	-0.008	-158.708
4	0.084	21.50	0.084	0.001	89.341
5	0.013	26.88	-0.001	0.013	-4.763
6	0.022	32.25	0.021	0.002	85.673
PILOT STATION 146 MEAN 0.027			ITEM CODE A302 MAX OSC.	UNITS: G'S 0.211	
1	0.002	5.38	-0.000	0.002	-17.036
2	0.035	10.75	0.034	0.006	79.935
3	0.000	16.13	-0.000	-0.000	-127.851
4	0.018	21.50	0.005	0.017	15.589
5	0.009	26.88	-0.002	0.008	-10.600
6	0.007	32.25	-0.002	0.007	-16.978
ENGINE DECK STA 249 MEAN -0.004			ITEM CODE A307 MAX OSC.	UNITS: G'S 0.474	
1	0.004	5.38	0.004	0.001	71.442
2	0.063	10.75	0.048	-0.041	130.709
3	0.004	16.13	-0.000	-0.004	-174.575
4	0.027	21.50	0.026	-0.007	104.104
5	0.015	26.88	-0.009	0.012	-35.039
6	0.007	32.25	0.004	-0.006	144.170

HARMONIC ANALYSIS: FUSELAGE LATERAL ACCELERATION
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
TAIL BOOM STA 297	MEAN -0.005		ITEM CODE A308 MAX OSC.	UNITS: G'S 0.956	
1	0.000	5.38	0.000	-0.000	120.055
2	0.062	10.75	0.051	-0.035	124.479
3	0.001	16.13	0.001	0.001	36.158
4	0.030	21.50	0.030	-0.001	92.097
5	0.035	26.88	-0.029	0.019	-56.829
6	0.018	32.25	0.001	-0.018	177.091
TAIL BOOM STA 400	MEAN 0.030		ITEM CODE A309 MAX OSC.	UNITS: G'S 2.511	
1	0.007	5.38	0.004	0.006	35.783
2	0.092	10.75	-0.085	-0.037	-113.344
3	0.036	16.13	-0.005	-0.035	-171.433
4	0.066	21.50	0.009	-0.065	172.531
5	0.085	26.88	0.041	0.074	29.275
6	0.035	32.25	-0.021	-0.028	-143.556
T/B FIN LOAD STA 521	MEAN -0.067		ITEM CODE A311 MAX OSC.	UNITS: G'S 9.223	
1	0.043	5.38	-0.043	-0.005	-96.516
2	0.259	10.75	-0.122	-0.229	-151.954
3	0.047	16.13	0.001	0.047	1.210
4	0.064	21.50	-0.047	0.044	-47.233
5	0.110	26.88	0.027	-0.107	165.979
6	0.048	32.25	0.005	0.048	6.278

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 610
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 142.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 ITEM CODE B127 UNITS: IN-LB				
	MEAN 107416.062		MAX OSC. 44838.469		
1	24773.523	5.39	-21730.398	11896.113	-61.302
2	3779.711	10.77	127.001	-3777.577	178.074
3	22171.613	16.16	-21996.934	-2777.729	-97.197
4	3563.491	21.55	1095.212	3391.014	17.899
5	922.943	26.93	896.102	220.964	76.148
6	4847.855	32.32	1799.781	-4501.391	158.207
	50% R STATION 132 ITEM CODE B123 UNITS: IN-LB				
	MEAN 95332.750		MAX OSC. 28629.937		
1	12303.184	5.39	-10741.129	5999.711	-60.813
2	2766.653	10.77	-1005.925	-2577.302	-158.679
3	14379.836	16.16	-14301.012	-1503.576	-96.002
4	3600.053	21.55	1094.933	3429.505	17.707
5	247.914	26.93	193.095	155.487	51.158
6	4140.547	32.32	1503.962	-3857.751	158.701
	70% R STATION 184.8 ITEM CODE B133 UNITS: IN-LB				
	MEAN 17564.117		MAX OSC. 14046.602		
1	4870.637	5.39	-4129.652	2582.458	-57.980
2	1514.228	10.77	-902.312	-1216.026	-143.424
3	6263.437	16.16	-6260.406	194.925	-88.217
4	2503.534	21.55	864.314	2349.605	20.196
5	206.008	26.93	-63.292	196.045	-17.893
6	2331.551	32.32	359.320	-2303.697	171.135

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.9 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN 99785.625		ITEM CODE B127 MAX OSC. 30918.031	UNITS: IN-LB	
1	16709.609	5.40	-14047.406	9048.836	-57.212
2	1946.896	10.80	-794.596	-1777.364	-155.912
3	13837.879	16.19	-12936.824	-4911.773	-110.790
4	2306.077	21.59	269.257	2290.304	6.705
5	714.195	26.99	-133.963	701.519	-10.811
6	5165.730	32.39	1983.008	-4769.953	157.426
	50% R STATION 132 MEAN 92019.125		ITEM CODE B123 MAX OSC. 20560.094	UNITS: IN-LB	
1	7925.703	5.40	-6873.449	3946.201	-60.139
2	2024.356	10.80	-1482.776	-1378.186	-132.906
3	8886.879	16.19	-7329.914	-5024.836	-124.432
4	2408.123	21.59	-625.114	2325.573	-15.045
5	641.656	26.99	-619.032	168.883	-74.740
6	4495.984	32.39	3587.474	-2709.964	127.067
	70% R STATION 184.8 MEAN 16964.953		ITEM CODE B133 MAX OSC. 10840.074	UNITS: IN-LB	
1	3422.061	5.40	-2458.144	2380.762	-45.916
2	1256.922	10.80	-1216.695	-315.447	-104.535
3	3851.265	16.19	-3849.738	108.474	-88.386
4	1802.464	21.59	681.040	1668.851	22.200
5	418.596	26.99	-175.604	379.981	-24.803
6	2473.527	32.39	-392.135	-2442.247	-170.878

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 614
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 114.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN 96634.250		ITEM CODE B127 MAX OSC. 26776.594	UNITS: IN-LB	
1	13311.086	5.39	-10955.945	7559.910	-55.393
2	1048.919	10.77	-851.286	-612.815	-125.749
3	11794.641	16.16	-10379.617	-5601.523	-118.354
4	1155.485	21.55	-214.031	1135.490	-10.675
5	1308.567	26.93	-1016.143	824.501	-50.944
6	5127.859	32.32	4126.988	-3043.505	126.407
	50% R STATION 132 MEAN 90522.062		ITEM CODE B123 MAX OSC. 17784.500	UNITS: IN-LB	
1	6395.203	5.39	-4660.051	4379.793	-46.776
2	1789.018	10.77	-1785.508	112.018	-86.410
3	7526.113	16.16	-7416.492	-1279.862	-99.791
4	1345.321	21.55	189.858	1331.857	8.113
5	1187.749	26.93	-789.534	887.346	-41.662
6	4444.047	32.32	1655.468	-4124.199	158.129
	70% R STATION 184.8 MEAN 16724.129		ITEM CODE B133 MAX OSC. 9304.508	UNITS: IN-LB	
1	2701.255	5.39	-1999.352	1816.417	-47.745
2	1087.480	10.77	-1068.330	-203.185	-100.768
3	3131.682	16.16	-3104.953	-408.291	-97.491
4	1057.428	21.55	297.600	1014.687	16.346
5	552.900	26.93	-346.293	431.022	-38.779
6	2442.521	32.32	1020.460	-2219.138	155.305

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 ITEM CODE B127 UNITS: IN-LB				
	MEAN 93225.687		MAX OSC. 24587.187		
1	10883.559	5.38	-5889.652	9152.258	-32.762
2	101.417	10.75	20.657	99.290	11.753
3	13081.910	16.13	-11333.770	-6533.152	-119.961
4	1815.274	21.50	224.511	1801.337	7.104
5	1373.513	26.88	-1273.057	515.621	-67.951
6	4281.711	32.25	3626.465	-2276.361	122.117
	50% R STATION 132 ITEM CODE B123 UNITS: IN-LB				
	MEAN 88961.687		MAX OSC. 15317.281		
1	4997.742	5.38	-2148.547	4512.336	-25.461
2	599.915	10.75	-534.254	272.892	-62.942
3	7968.016	16.13	-7098.824	-3618.839	-117.012
4	1918.226	21.50	225.120	1904.970	6.740
5	1289.278	26.88	-1173.492	533.998	-65.532
6	3774.947	32.25	3114.995	-2132.376	124.394
	70% R STATION 184.8 ITEM CODE B133 UNITS: IN-LB				
	MEAN 16252.289		MAX OSC. 7383.676		
1	1924.046	5.38	-842.749	1729.662	-25.977
2	425.350	10.75	-414.663	-94.745	-102.870
3	3162.613	16.13	-3054.539	-819.703	-105.022
4	1326.839	21.50	478.455	1237.572	21.137
5	635.092	26.88	-507.449	381.886	-53.036
6	2031.177	32.25	1185.943	-1649.007	144.277

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN 90562.125		ITEM CODE B127 MAX OSC. 19665.594	UNITS: IN-LB	
1	10516.770	5.39	-2982.091	10085.117	-16.473
2	899.876	10.77	-891.895	-119.588	-97.637
3	8359.379	16.16	-7197.043	-4252.270	-120.576
4	941.317	21.55	-480.353	809.530	-30.684
5	1453.568	26.93	-1398.134	397.594	-74.126
6	1555.372	32.32	1424.790	-623.825	113.646
	50% R STATION 132 MEAN 87870.500		ITEM CODE B123 MAX OSC. 14083.687	UNITS: IN-LB	
1	5055.625	5.39	-763.244	4997.684	-8.683
2	900.455	10.77	-727.763	530.264	-53.922
3	4988.914	16.16	-4272.773	-2575.403	-121.079
4	1133.989	21.55	-796.311	807.354	-44.605
5	1108.778	26.93	-1080.700	247.948	-77.078
6	1586.163	32.32	1563.736	-265.784	99.646
	70% R STATION 184.8 MEAN 16011.672		ITEM CODE B133 MAX OSC. 7896.195	UNITS: IN-LB	
1	1953.080	5.39	-298.084	1930.199	-8.779
2	494.605	10.77	-413.764	270.986	-56.778
3	1816.744	16.16	-1771.027	-404.996	-102.881
4	813.806	21.55	-315.090	750.332	-22.779
5	668.465	26.93	-601.869	290.859	-64.207
6	866.354	32.32	700.194	-510.195	126.079

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-CHORD BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN 89392.500		ITEM CODE B127 MAX OSC. 17017.344	UNITS: IN-LB	
1	11736.492	5.38	-2444.083	11479.187	-12.020
2	1587.338	10.75	-865.765	1330.448	-33.053
3	3160.705	16.13	-3151.661	-238.933	-94.335
4	639.553	21.50	-66.857	-636.049	-173.999
5	524.626	26.88	-433.620	-295.307	-124.256
6	715.968	32.25	45.207	714.539	3.620
	50% R STATION 132 MEAN 87693.312		ITEM CODE B123 MAX OSC. 14032.281	UNITS: IN-LB	
1	6482.465	5.38	-252.381	6477.551	-2.231
2	2644.058	10.75	-812.122	2516.248	-17.888
3	2314.982	16.13	-2314.935	14.802	-89.634
4	767.022	21.50	-356.096	-679.352	-152.338
5	322.646	26.88	-314.018	-74.117	-103.280
6	745.975	32.25	-179.535	724.049	-13.926
	70% R STATION 184.8 MEAN 15724.906		ITEM CODE B133 MAX OSC. 7622.043	UNITS: IN-LB	
1	2310.539	5.38	-129.285	2306.920	-3.208
2	1098.396	10.75	-353.462	1039.971	-18.772
3	1123.729	16.13	-942.267	612.292	-56.984
4	739.940	21.50	-541.225	-504.565	-132.992
5	221.429	26.88	-160.643	-152.396	-133.491
6	603.763	32.25	316.347	514.251	31.598

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5		ITEM CODE B126	UNITS:	IN-LB
	MEAN 918.017		MAX OSC.	15616.352	
1	10460.281	5.39	-9859.387	3494.280	-70.485
2	3806.534	10.77	3111.498	-2192.780	125.174
3	856.221	16.16	694.381	500.948	54.192
4	714.811	21.55	-25.082	714.371	-2.011
5	502.111	26.93	-241.497	-440.221	-151.252
6	155.942	32.32	74.618	-136.931	151.412
	50% R STATION 132		ITEM CODE B122	UNITS:	IN-LB
	MEAN -2166.566		MAX OSC.	10457.133	
1	7045.309	5.39	-6384.969	2978.010	-64.995
2	2950.532	10.77	2684.506	-1224.364	114.517
3	2392.755	16.16	2315.309	603.839	75.383
4	451.676	21.55	-2.364	451.669	-0.300
5	184.798	26.93	-27.217	182.783	-8.469
6	6.868	32.32	-6.727	-1.386	-101.642
	70% R STATION 184.8		ITEM CODE B132	UNITS:	IN-LB
	MEAN -3524.502		MAX OSC.	8752.105	
1	4942.512	5.39	-4773.641	1280.934	-74.979
2	2472.430	10.77	1971.378	-1492.174	127.123
3	3690.878	16.16	3689.575	98.072	88.477
4	306.996	21.55	109.678	-286.735	159.068
5	292.706	26.93	222.554	-190.122	130.506
6	94.570	32.32	15.953	93.215	9.712
	90% R STATION 238.1		ITEM CODE B134	UNITS:	IN-LB
	MEAN 859.568		MAX OSC.	3985.158	
1	1304.302	5.39	-1164.634	-587.225	-116.758
2	1023.648	10.77	821.341	-610.945	126.643
3	1483.557	16.16	1473.070	176.080	83.184
4	326.518	21.55	185.966	-268.385	145.282
5	278.385	26.93	131.620	-245.304	151.784
6	57.956	32.32	-28.640	50.386	-29.614

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.9 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -856.683		ITEM CODE B126 MAX OSC. 12918.148	UNITS: IN-LB	
1	8340.422	5.40	-8111.160	1942.089	-76.535
2	3427.606	10.80	3026.973	-1608.078	117.979
3	936.886	16.19	-571.542	742.359	-37.593
4	801.779	21.59	-311.494	738.797	-22.861
5	238.471	26.99	238.223	-10.852	92.608
6	234.347	32.39	186.041	142.504	52.549
	50% R STATION 132 MEAN -2542.590		ITEM CODE B122 MAX OSC. 9010.879	UNITS: IN-LB	
1	6131.844	5.40	-5881.285	1734.938	-73.564
2	2875.173	10.80	2693.591	-1005.580	110.472
3	1494.428	16.19	1158.020	944.619	50.795
4	346.073	21.59	-177.891	296.853	-30.932
5	108.144	26.99	-71.603	81.044	-41.461
6	34.436	32.39	-31.201	14.572	-64.965
	70% R STATION 184.8 MEAN -3990.693		ITEM CODE B132 MAX OSC. 7656.406	UNITS: IN-LB	
1	4220.008	5.40	-4107.918	966.181	-76.765
2	2505.413	10.80	1729.986	-1812.248	136.330
3	2545.374	16.19	2499.244	-482.399	100.925
4	524.499	21.59	-329.558	-408.032	-141.073
5	386.782	26.99	-386.009	-24.443	-93.623
6	215.705	32.39	-153.032	152.019	-45.190
	90% R STATION 238.1 MEAN 1158.425		ITEM CODE B134 MAX OSC. 3342.701	UNITS: IN-LB	
1	1030.751	5.40	-949.677	-400.701	-112.877
2	832.907	10.80	674.880	-488.130	125.878
3	1041.571	16.19	1041.563	4.310	89.763
4	278.912	21.59	-124.097	-249.783	-153.581
5	276.992	26.99	-272.365	-50.422	-100.488
6	233.804	32.39	-154.560	175.429	-41.381

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 614 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 114.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -1267.515		ITEM CODE B126 MAX OSC. 11266.023	UNITS: IN-LB	
1	6856.891	5.39	-6485.820	2225.110	-71.064
2	3143.190	10.77	2296.283	-2146.329	133.067
3	972.760	16.16	78.530	969.585	4.630
4	632.216	21.55	416.116	475.967	41.162
5	257.523	26.93	255.146	-34.909	97.791
6	285.643	32.32	284.903	20.549	85.875
	50% R STATION 132 MEAN -2975.998		ITEM CODE B122 MAX OSC. 8121.703	UNITS: IN-LB	
1	5243.723	5.39	-4912.480	1834.167	-69.526
2	2886.320	10.77	2224.794	-1838.786	129.574
3	1271.731	16.16	1255.640	201.668	80.876
4	281.800	21.55	139.606	244.788	29.697
5	78.715	26.93	75.680	-21.649	105.964
6	47.764	32.32	-27.016	39.390	-34.444
	70% R STATION 184.8 MEAN -4221.258		ITEM CODE B132 MAX OSC. 6937.355	UNITS: IN-LB	
1	3812.416	5.39	-3735.872	760.116	-78.499
2	2162.356	10.77	1700.074	-1336.239	128.167
3	1839.366	16.16	1826.208	-219.614	96.857
4	655.393	21.55	-590.992	-283.316	-115.613
5	535.156	26.93	-534.692	-22.292	-92.387
6	247.440	32.32	-220.827	111.632	-63.183
	90% R STATION 238.1 MEAN 990.134		ITEM CODE B134 MAX OSC. 3041.814	UNITS: IN-LB	
1	884.272	5.39	-819.359	-332.547	-112.090
2	647.925	10.77	605.115	-231.609	110.944
3	766.505	16.16	764.212	59.241	85.567
4	326.974	21.55	-231.881	-230.529	-134.832
5	331.330	26.93	-326.971	-53.566	-99.304
6	224.723	32.32	-139.016	176.564	-38.215

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5		ITEM CODE B126	UNITS:	IN-LB
	MEAN -1173.192		MAX OSC. 9356.523		
1	5364.715	5.38	-5105.754	1646.653	-72.125
2	2264.346	10.75	1803.831	-1368.742	127.191
3	1903.077	16.13	487.663	1839.535	14.848
4	727.207	21.50	61.534	724.599	4.854
5	553.122	26.88	308.221	459.286	33.865
6	345.050	32.25	200.365	280.916	35.499
	50% R STATION 132		ITEM CODE B122	UNITS:	IN-LB
	MEAN -3187.332		MAX OSC. 6745.848		
1	4572.508	5.38	-4307.754	1533.328	-70.407
2	2016.485	10.75	1459.514	-1391.414	133.632
3	1110.422	16.13	985.629	511.444	62.575
4	165.407	21.50	113.197	120.606	43.185
5	275.475	26.88	-48.184	-271.228	-169.926
6	75.600	32.25	-47.018	-59.200	-141.542
	70% R STATION 184.8		ITEM CODE B132	UNITS:	IN-LB
	MEAN -4370.012		MAX OSC. 5675.055		
1	3341.745	5.38	-3230.084	856.632	-75.147
2	1462.723	10.75	1004.483	-1063.284	136.629
3	1471.625	16.13	1455.914	-214.465	98.380
4	381.061	21.50	-339.177	-173.685	-117.116
5	669.588	26.88	-666.894	59.999	-84.859
6	265.685	32.25	-234.368	125.141	-61.900
	90% R STATION 238.1		ITEM CODE B134	UNITS:	IN-LB
	MEAN 793.892		MAX OSC. 2683.555		
1	734.488	5.38	-675.846	-287.585	-113.051
2	393.411	10.75	365.312	-146.012	111.786
3	637.500	16.13	637.376	-12.546	91.128
4	217.550	21.50	-109.003	-188.273	-149.931
5	363.205	26.88	-358.919	55.636	-81.189
6	257.506	32.25	-109.841	232.904	-25.249

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 323.2

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -1106.180		ITEM CODE B126 MAX OSC. 7887.043	UNITS: IN-LB	
1	4638.109	5.39	-4368.148	1559.275	-70.355
2	1870.317	10.77	732.404	-1720.950	156.946
3	1627.719	16.16	124.743	1622.932	4.395
4	587.428	21.55	-587.383	-7.246	-90.707
5	692.906	26.93	191.104	666.031	16.010
6	224.670	32.32	131.901	181.876	35.951
	50% R STATION 132 MEAN -3125.109		ITEM CODE B122 MAX OSC. 5978.141	UNITS: IN-LB	
1	3788.803	5.39	-3477.091	1504.949	-66.596
2	2028.343	10.77	514.414	-1962.028	165.309
3	707.411	16.16	612.161	354.527	59.923
4	219.238	21.55	188.693	-111.625	120.607
5	476.463	26.93	-332.391	-341.370	-135.764
6	140.464	32.32	-119.004	-74.621	-122.089
	70% R STATION 184.8 MEAN -4386.289		ITEM CODE B132 MAX OSC. 4438.578	UNITS: IN-LB	
1	2628.511	5.39	-2479.450	872.583	-70.612
2	1717.273	10.77	410.644	-1667.453	166.165
3	917.231	16.16	668.238	-628.307	133.236
4	376.546	21.55	175.725	-333.028	152.181
5	458.603	26.93	-380.789	-255.571	-123.868
6	184.504	32.32	61.065	174.106	19.327
	90% R STATION 238.1 MEAN 716.174		ITEM CODE B134 MAX OSC. 2731.600	UNITS: IN-LB	
1	529.269	5.39	-461.583	-258.973	-119.295
2	472.644	10.77	271.471	-386.905	144.945
3	498.753	16.16	367.480	-337.214	132.541
4	314.505	21.55	65.259	-307.660	168.024
5	113.110	26.93	-105.514	-40.750	-111.117
6	372.239	32.32	269.572	256.696	46.401

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-BEAM BENDING MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 611
ROT SPEED 322.5

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 67.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -764.962		ITEM CODE B126 MAX OSC. 6633.418	UNITS: IN-LB	
1	3632.090	5.38	-3589.817	552.535	-81.250
2	2061.304	10.75	760.498	-1915.885	158.350
3	537.184	16.13	-222.867	488.771	-24.512
4	1078.182	21.50	-401.851	-1000.496	-158.117
5	376.648	26.88	-96.313	364.126	-14.816
6	189.071	32.25	145.023	-121.310	129.912
	50% R STATION 132 MEAN -2969.832		ITEM CODE B122 MAX OSC. 5403.992	UNITS: IN-LB	
1	2971.727	5.38	-2885.739	709.702	-76.183
2	2390.539	10.75	570.472	-2321.474	166.194
3	607.598	16.13	595.707	-119.620	101.354
4	351.513	21.50	201.352	-288.131	145.053
5	408.493	26.88	-6.989	-408.434	-179.020
6	221.737	32.25	171.049	141.101	50.480
	70% R STATION 184.8 MEAN -4537.430		ITEM CODE B132 MAX OSC. 5148.973	UNITS: IN-LB	
1	2143.048	5.38	-2040.981	653.493	-72.246
2	2156.764	10.75	483.730	-2101.818	167.039
3	1475.924	16.13	694.868	-1302.118	151.914
4	867.456	21.50	851.612	165.035	79.032
5	67.274	26.88	6.826	-66.926	174.177
6	385.246	32.25	-296.154	246.388	-50.241
	90% R STATION 238.1 MEAN 602.158		ITEM CODE B134 MAX OSC. 3339.234	UNITS: IN-LB	
1	407.459	5.38	-352.066	-205.117	-120.225
2	544.581	10.75	287.200	-462.693	148.171
3	818.263	16.13	376.547	-726.476	152.601
4	408.968	21.50	383.949	-140.847	110.145
5	201.293	26.88	63.140	191.134	18.281
6	356.667	32.25	-153.443	321.973	-25.481

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.3 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -7276.148		ITEM CODE M150 MAX OSC. 8188.879	UNITS: IN-LB	
1	3662.685	5.39	879.755	3555.460	13.898
2	3648.027	10.78	499.489	-3613.670	172.130
3	1389.281	16.16	946.210	1017.246	42.928
4	458.857	21.55	-196.884	-414.472	-154.591
5	571.247	26.94	-353.781	448.511	-38.266
6	386.831	32.33	-380.130	71.690	-79.320
	50% R STATION 132 MEAN -4739.230		ITEM CODE M935 MAX OSC. 5843.926	UNITS: IN-LB	
1	3487.352	5.39	996.873	3341.836	16.610
2	2657.580	10.77	-268.189	-2644.013	-174.208
3	844.574	16.16	532.760	655.341	39.109
4	513.313	21.55	-274.071	-434.023	-147.729
5	373.707	26.93	-103.333	359.137	-16.052
6	387.501	32.32	-354.562	156.344	-66.205
	70% R STATION 184.8 MEAN -4030.463		ITEM CODE M936 MAX OSC. 4464.453	UNITS: IN-LB	
1	3031.551	5.39	1395.022	2691.508	27.398
2	1755.551	10.77	-622.785	-1641.371	-159.222
3	354.392	16.16	15.383	354.058	2.488
4	351.609	21.55	-223.712	-271.259	-140.487
5	251.841	26.93	-44.205	247.931	-10.109
6	316.549	32.32	-298.026	106.695	-70.302
	90% R STATION 238.1 MEAN 398.396		ITEM CODE M937 MAX OSC. 2441.820	UNITS: IN-LB	
1	1912.917	5.39	779.496	1746.894	24.047
2	667.509	10.77	-571.434	-345.009	-121.122
3	246.575	16.16	-246.574	-0.764	-90.178
4	166.788	21.55	-164.660	26.563	-80.836
5	202.438	26.93	-22.341	201.201	-6.336
6	104.492	32.32	-102.701	19.262	-79.377

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 324.0 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -6147.176		ITEM CODE M150 MAX OSC. 7816.914	UNITS: IN-LB	
1	3171.758	5.40	296.811	3157.840	5.370
2	3370.700	10.80	1226.852	-3139.500	158.655
3	1256.153	16.20	365.558	1201.786	16.919
4	712.558	21.60	-3.477	-712.550	-179.720
5	599.971	27.00	-577.697	-161.963	-105.661
6	280.519	32.40	-212.193	-183.480	-130.849
	50% R STATION 132 MEAN -4008.883		ITEM CODE M935 MAX OSC. 5494.262	UNITS: IN-LB	
1	2984.146	5.40	934.221	2834.142	18.244
2	2426.304	10.80	-462.447	-2381.826	-169.012
3	764.601	16.19	620.084	447.336	54.193
4	685.206	21.59	-483.131	-485.892	-135.163
5	427.951	26.99	-280.823	322.925	-41.011
6	263.770	32.39	-248.356	88.849	-70.315
	70% R STATION 184.8 MEAN -3447.066		ITEM CODE M936 MAX OSC. 3971.871	UNITS: IN-LB	
1	2632.129	5.40	1265.644	2307.867	28.741
2	1555.976	10.80	-717.848	-1380.491	-152.526
3	257.800	16.19	188.914	175.420	47.121
4	463.124	21.59	-377.265	-268.618	-125.451
5	272.575	26.99	-136.697	235.820	-30.099
6	205.261	32.39	-204.166	21.178	-84.078
	90% R STATION 238.1 MEAN 676.328		ITEM CODE M937 MAX OSC. 2060.104	UNITS: IN-LB	
1	1586.971	5.40	654.843	1445.565	24.371
2	653.381	10.80	-559.183	-337.966	-121.148
3	161.310	16.19	-135.120	-88.111	-123.108
4	181.208	21.59	-179.686	23.432	-82.570
5	152.396	26.99	-1.911	152.384	-0.719
6	56.194	32.39	-37.680	-41.690	-137.892

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 614 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.3 A/S 114.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -5786.234		ITEM CODE M150 MAX OSC. 6666.695	UNITS:	IN-LB
1	2850.656	5.39	543.390	2798.387	10.989
2	2960.261	10.78	514.905	-2915.136	169.983
3	1188.045	16.16	785.389	891.413	41.382
4	635.447	21.55	-406.694	-488.255	-140.207
5	437.939	26.94	-434.483	54.915	-82.796
6	198.276	32.33	-187.951	63.148	-71.428
	50% R STATION 132 MEAN -3757.018		ITEM CODE M935 MAX OSC. 4753.531	UNITS:	IN-LB
1	2714.716	5.39	647.564	2636.350	13.800
2	2084.238	10.77	-120.692	-2080.741	-176.680
3	698.073	16.16	528.965	455.524	49.266
4	633.957	21.55	-464.148	-431.820	-132.934
5	310.340	26.93	-291.976	105.170	-70.191
6	139.399	32.32	-137.038	25.547	-79.440
	70% R STATION 184.8 MEAN -3283.625		ITEM CODE M936 MAX OSC. 3439.520	UNITS:	IN-LB
1	2391.622	5.39	968.979	2186.535	23.901
2	1300.854	10.77	-465.751	-1214.618	-159.020
3	248.331	16.16	173.634	177.538	44.363
4	435.708	21.55	-350.099	-259.369	-126.533
5	164.389	26.93	-135.930	92.448	-55.780
6	55.855	32.32	-52.912	-17.892	-108.683
	90% R STATION 238.1 MEAN 764.108		ITEM CODE M937 MAX OSC. 1785.871	UNITS:	IN-LB
1	1414.081	5.39	495.666	1324.365	20.519
2	576.181	10.77	-422.392	-391.880	-132.854
3	114.898	16.16	-89.888	-71.567	-128.526
4	144.751	21.55	-144.386	10.279	-85.928
5	92.890	26.93	5.041	92.753	3.111
6	64.614	32.32	31.410	-56.466	150.914

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.6 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5		ITEM CODE M150	UNITS:	IN-LB
	MEAN -5334.336		MAX OSC. 5905.602		
1	2469.565	5.38	619.463	2390.610	14.527
2	2241.254	10.75	337.888	-2215.638	171.329
3	1006.977	16.13	826.153	575.737	55.128
4	681.954	21.51	-407.892	-546.521	-143.264
5	592.781	26.88	-587.772	76.896	-82.546
6	112.015	32.26	-102.306	45.616	-65.969
	50% R STATION 132		ITEM CODE M935	UNITS:	IN-LB
	MEAN -3378.090		MAX OSC. 4244.453		
1	2368.502	5.38	680.827	2268.541	16.705
2	1586.355	10.75	-189.104	-1575.043	-173.154
3	527.529	16.13	514.428	116.835	77.204
4	626.063	21.50	-443.289	-442.097	-134.923
5	394.720	26.88	-311.766	242.087	-52.171
6	84.621	32.25	-21.155	81.934	-14.478
	70% R STATION 184.8		ITEM CODE M936	UNITS:	IN-LB
	MEAN -2977.525		MAX OSC. 3198.943		
1	2058.987	5.38	943.195	1830.249	27.264
2	958.520	10.75	-339.826	-896.259	-159.235
3	180.026	16.13	175.641	-39.491	102.672
4	411.020	21.50	-323.941	-252.982	-127.988
5	267.981	26.88	-111.458	243.703	-24.577
6	81.639	32.25	43.175	69.288	31.928
	90% R STATION 238.1		ITEM CODE M937	UNITS:	IN-LB
	MEAN 860.695		MAX OSC. 1681.954		
1	1229.375	5.38	463.344	1138.717	22.141
2	404.579	10.75	-283.584	-288.556	-135.498
3	124.486	16.13	-89.324	-86.706	-134.148
4	136.928	21.50	-136.725	7.457	-86.878
5	111.844	26.88	17.615	110.448	9.062
6	60.887	32.25	44.948	-41.072	132.420

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 323.3

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5 MEAN -4908.402		ITEM CODE M150 MAX OSC. 4818.332	UNITS: IN-LB	
1	2125.971	5.39	640.523	2027.186	17.535
2	1610.539	10.78	-6.346	-1610.526	-179.774
3	859.320	16.16	818.824	260.685	72.340
4	420.982	21.55	-28.556	-420.012	-176.110
5	582.351	26.94	-575.816	87.003	-81.408
6	89.206	32.33	-75.453	47.587	-57.761
	50% R STATION 132 MEAN -3113.732		ITEM CODE M935 MAX OSC. 3366.437	UNITS: IN-LB	
1	2013.322	5.39	736.431	1873.803	21.456
2	1074.334	10.77	-218.458	-1051.889	-168.267
3	548.793	16.16	538.767	-104.424	100.969
4	358.567	21.55	-82.521	-348.943	-166.695
5	361.992	26.93	-278.865	230.808	-50.387
6	76.306	32.32	8.745	75.803	6.581
	70% R STATION 184.8 MEAN -2827.008		ITEM CODE M936 MAX OSC. 2765.891	UNITS: IN-LB	
1	1747.595	5.39	893.368	1501.993	30.744
2	542.948	10.77	-236.664	-488.654	-154.158
3	319.312	16.16	265.467	-177.447	123.760
4	239.241	21.55	-91.877	-220.895	-157.416
5	251.287	26.93	-68.121	241.878	-15.729
6	130.104	32.32	98.478	85.025	49.193
	90% R STATION 238.1 MEAN 1021.658		ITEM CODE M937 MAX OSC. 1414.540	UNITS: IN-LB	
1	1031.595	5.39	381.791	958.344	21.722
2	242.856	10.77	-219.186	-104.577	-115.506
3	43.928	16.16	-15.245	-41.198	-159.694
4	72.305	21.55	-66.977	27.242	-67.867
5	105.160	26.93	2.521	105.130	1.374
6	25.653	32.32	-3.314	-25.438	-172.577

HARMONIC ANALYSIS: MAIN ROTOR(RED BLADE)-TORSION MOMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 611
ROT SPEED 322.6

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 67.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	30% R STATION 81.5		ITEM CODE M150	UNITS: IN-LB	
	MEAN -4690.477		MAX OSC. 4051.518		
1	1779.225	5.38	618.932	1668.103	20.357
2	1351.555	10.75	-217.260	-1333.979	-170.750
3	800.191	16.13	791.762	115.836	81.677
4	92.255	21.51	68.619	61.664	48.056
5	228.835	26.88	-188.695	-129.458	-124.453
6	281.245	32.26	276.503	51.432	79.463
	50% R STATION 132		ITEM CODE M935	UNITS: IN-LB	
	MEAN -3022.338		MAX OSC. 2473.553		
1	1733.640	5.38	660.427	1602.917	22.392
2	878.328	10.75	-308.621	-822.322	-159.429
3	587.049	16.13	578.882	-97.584	99.569
4	201.327	21.50	171.941	104.731	58.654
5	104.088	26.88	-95.694	40.952	-66.832
6	201.681	32.25	200.578	-21.059	95.994
	70% R STATION 184.8		ITEM CODE M936	UNITS: IN-LB	
	MEAN -2762.869		MAX OSC. 2396.494		
1	1543.507	5.38	766.864	1339.528	29.791
2	395.631	10.75	-295.962	-262.546	-131.576
3	348.033	16.13	329.137	-113.118	108.967
4	141.578	21.50	127.356	61.846	64.098
5	139.139	26.88	4.059	139.080	1.672
6	137.676	32.25	132.885	-36.005	105.160
	90% R STATION 238.1		ITEM CODE M937	UNITS: IN-LB	
	MEAN 1031.461		MAX OSC. 1387.679		
1	885.465	5.38	302.700	832.119	19.990
2	232.654	10.75	-232.410	-10.669	-92.628
3	79.169	16.13	-0.001	79.169	-0.001
4	93.202	21.50	-28.142	88.852	-17.574
5	29.302	26.88	24.723	15.729	57.535
6	121.480	32.25	81.599	-89.995	137.801

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.7 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL MEAN -24.372		ITEM CODE F100 MAX OSC. 857.897	UNITS:	LB
1	61.263	5.38	-60.314	10.742	-79.901
2	721.545	10.76	581.274	-427.491	126.332
3	46.379	16.13	35.703	-29.602	129.662
4	69.044	21.51	5.579	-68.819	175.365
5	28.750	26.89	-2.491	-28.642	-175.030
6	57.914	32.27	-51.855	25.790	-63.556
	CYCLIC LAT BOOST CYL MEAN -644.436		ITEM CODE F101 MAX OSC. 908.384	UNITS:	LB
1	76.014	5.38	1.879	-75.991	178.584
2	815.807	10.76	40.701	-814.791	177.140
3	79.767	16.13	26.373	-75.281	160.693
4	45.217	21.51	-22.341	39.313	-29.610
5	7.719	26.89	-3.385	6.937	-26.014
6	113.331	32.27	57.577	97.616	30.534
	COLLECTIVE BOOST CYL MEAN 913.509		ITEM CODE F102 MAX OSC. 978.672	UNITS:	LB
1	36.578	5.38	-36.501	2.367	-86.290
2	972.826	10.76	184.317	955.206	10.922
3	9.686	16.13	9.513	-1.825	100.860
4	51.858	21.51	7.348	51.335	8.146
5	7.065	26.89	2.791	-6.490	156.727
6	71.841	32.27	-61.905	-36.455	-120.494
	M/R RED PITCH LINK MEAN 759.081		ITEM CODE F103 MAX OSC. 1179.742	UNITS:	LB
1	716.148	5.38	-219.159	-681.790	-162.180
2	689.599	10.76	408.959	555.247	36.373
3	43.869	16.13	21.034	-38.498	151.350
4	62.320	21.51	56.172	26.991	64.335
5	53.717	26.89	53.287	-6.784	97.255
6	35.792	32.27	24.963	25.650	44.222

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R WHITE PITCH LINK MEAN 635.590		ITEM CODE F104 MAX OSC. 1262.023	UNITS:	LB
1	712.550	5.38	164.534	693.294	13.351
2	818.189	10.76	383.588	722.699	27.958
3	27.715	16.13	-13.582	24.159	-29.344
4	91.124	21.51	70.470	57.772	50.655
5	64.288	26.89	-63.654	-9.011	-98.057
6	26.322	32.27	-14.031	22.271	-32.211
	LIFT LINK MEAN 5203.117		ITEM CODE F050 MAX OSC. 2300.443	UNITS:	LB
1	239.527	5.38	190.436	-145.284	127.340
2	1982.242	10.76	-1958.098	308.441	-81.048
3	115.655	16.13	-81.186	82.371	-44.585
4	325.212	21.51	-104.287	-308.037	-161.296
5	22.374	26.89	9.563	20.228	25.304
6	35.212	32.27	-35.212	-0.021	-90.034
	M/R RED DRAG BRACE MEAN 8754.395		ITEM CODE F105 MAX OSC. 3436.150	UNITS:	LB
1	1870.653	5.39	1542.531	-1058.273	124.453
2	328.531	10.77	-72.301	320.477	-12.713
3	1506.665	16.16	1498.461	157.018	84.018
4	138.995	21.55	-48.469	-130.271	-159.591
5	62.050	26.93	-61.617	-7.320	-96.775
6	217.902	32.32	-39.101	214.365	-10.337

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 615
ROT SPEED 323.4

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 128.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL MEAN 32.506		ITEM CODE F100 MAX OSC.	UNITS: 678.644	LB
1	15.809	5.39	-15.110	-4.647	-107.096
2	560.370	10.78	500.886	-251.254	116.639
3	31.863	16.17	31.847	-0.988	91.778
4	91.050	21.56	68.772	-59.671	130.947
5	16.588	26.95	15.888	-4.768	106.703
6	88.029	32.34	-58.327	-65.932	-138.502
	CYCLIC LAT BOOST CYL MEAN -505.016		ITEM CODE F101 MAX OSC.	UNITS: 773.938	LB
1	76.846	5.39	24.158	-72.950	161.677
2	728.312	10.78	143.312	-714.073	168.652
3	52.455	16.17	41.751	-31.755	127.255
4	74.374	21.56	-37.656	-64.136	-149.581
5	8.665	26.95	-8.417	2.059	-76.252
6	76.711	32.34	-49.126	58.918	-39.821
	COLLECTIVE BOOST CYL MEAN 690.145		ITEM CODE F102 MAX OSC.	UNITS: 952.798	LB
1	21.151	5.39	-17.622	11.698	-56.423
2	925.923	10.78	-99.653	920.545	-6.178
3	3.303	16.17	0.631	3.243	11.017
4	67.044	21.56	-20.139	63.948	-17.481
5	3.727	26.95	-3.716	-0.291	-94.473
6	45.755	32.34	-9.157	-44.829	-168.455
	M/R RED PITCH LINK MEAN 587.920		ITEM CODE F103 MAX OSC.	UNITS: 1123.833	LB
1	598.065	5.39	-171.174	-573.046	-163.369
2	660.340	10.78	217.688	623.427	19.248
3	53.987	16.17	-12.946	-52.411	-166.125
4	68.873	21.56	26.794	63.448	22.895
5	33.112	26.95	4.579	32.794	7.949
6	37.245	32.34	-10.099	35.850	-15.733

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.9 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R WHITE PITCH LINK MEAN 479.166		ITEM CODE F104 MAX OSC. 1158.026	UNITS: LB	
1	611.967	5.39	176.340	586.010	16.747
2	732.185	10.78	213.398	700.397	16.945
3	55.373	16.17	19.558	51.804	20.684
4	84.894	21.56	34.198	77.701	23.755
5	45.230	26.95	-15.726	-42.408	-159.654
6	21.942	32.34	-5.353	21.278	-14.122
	LIFT LINK MEAN 4988.840		ITEM CODE F050 MAX OSC. 1915.347	UNITS: LB	
1	179.272	5.39	136.942	-115.695	130.193
2	1611.748	10.78	-1602.529	172.134	-83.869
3	41.772	16.17	-41.509	-4.684	-96.438
4	240.302	21.56	-49.548	-235.139	-168.101
5	7.355	26.95	0.266	7.350	2.074
6	124.413	32.34	-123.350	-16.228	-97.495
	M/R RED DRAG BRACE MEAN 9597.301		ITEM CODE F105 MAX OSC. 2293.615	UNITS: LB	
1	1302.402	5.40	1078.727	-729.794	124.080
2	200.976	10.80	-39.287	197.098	-11.273
3	921.092	16.19	742.730	544.760	53.742
4	71.397	21.59	12.151	-70.356	170.202
5	34.974	26.99	26.894	-22.358	129.738
6	224.842	32.39	-163.321	154.532	-46.584

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 614
ROT SPEED 322.7

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 114.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL MEAN 104.634		ITEM CODE F100 MAX OSC.	UNITS: 565.898	LB
1	3.761	5.38	0.232	3.754	3.531
2	455.575	10.76	392.570	-231.165	120.492
3	27.657	16.13	26.382	-8.301	107.466
4	91.292	21.51	32.744	-85.218	158.981
5	12.735	26.89	10.580	-7.088	123.819
6	91.232	32.27	-90.227	-13.507	-98.514
	CYCLIC LAT BOOST CYL MEAN -403.133		ITEM CODE F101 MAX OSC.	UNITS: 732.328	LB
1	73.614	5.38	16.198	-71.810	167.288
2	640.447	10.76	-35.677	-639.453	-176.806
3	47.171	16.13	26.418	-39.079	145.941
4	129.093	21.51	-92.082	-90.475	-134.496
5	9.433	26.89	9.429	0.240	88.540
6	13.446	32.27	8.923	10.058	41.579
	COLLECTIVE BOOST CYL MEAN 588.047		ITEM CODE F102 MAX OSC.	UNITS: 826.898	LB
1	21.112	5.38	-10.616	18.249	-30.189
2	782.923	10.76	-23.245	782.578	-1.701
3	11.246	16.13	8.898	6.877	52.299
4	77.132	21.51	-16.124	75.428	-12.066
5	6.755	26.89	-5.603	3.773	-56.047
6	33.677	32.27	-19.448	-27.494	-144.726
	M/R RED PITCH LINK MEAN 514.798		ITEM CODE F103 MAX OSC.	UNITS: 984.970	LB
1	533.043	5.38	-219.650	-485.684	-155.665
2	564.314	10.76	217.428	520.745	22.662
3	80.859	16.13	-69.038	-42.095	-121.372
4	64.113	21.51	44.589	46.068	44.065
5	27.533	26.89	-0.493	27.529	-1.026
6	31.789	32.27	9.439	30.355	17.272

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 614 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 114.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R WHITE PITCH LINK MEAN 413.660		ITEM CODE F104 MAX OSC. 1035.758	UNITS:	LB
1	550.053	5.38	249.174	490.378	26.936
2	628.651	10.76	275.129	565.249	25.954
3	80.466	16.13	76.217	25.801	71.298
4	83.627	21.51	61.320	56.863	47.159
5	28.183	26.89	-15.386	-23.613	-146.911
6	22.779	32.27	9.296	20.795	24.087
	LIFT LINK MEAN 4987.043		ITEM CODE F050 MAX OSC. 1550.520	UNITS:	LB
1	158.974	5.38	119.616	-104.713	131.199
2	1330.245	10.76	-1240.769	479.631	-68.865
3	59.525	16.13	-58.822	9.116	-81.191
4	171.492	21.51	-148.334	-86.061	-120.122
5	15.848	26.89	-15.443	3.561	-77.015
6	195.123	32.27	-135.561	140.344	-44.007
	M/R RED DRAG BRACE MEAN 9848.641		ITEM CODE F105 MAX OSC. 1866.689	UNITS:	LB
1	1063.426	5.39	713.238	-788.776	137.879
2	132.438	10.77	6.817	132.262	2.950
3	770.058	16.16	750.939	170.525	77.206
4	16.150	21.55	-8.338	-13.832	-148.917
5	71.148	26.93	42.463	-57.088	143.358
6	216.241	32.32	-53.840	209.431	-14.417

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL		ITEM CODE F100	UNITS:	LB
	MEAN 139.446		MAX OSC. 533.375		
1	8.731	5.37	7.276	-4.826	123.558
2	416.807	10.73	353.058	-221.537	122.108
3	16.554	16.10	15.974	-4.345	105.216
4	111.034	21.47	17.948	-109.574	170.698
5	5.710	26.83	3.948	-4.125	136.254
6	114.714	32.20	-109.960	32.684	-73.446
	CYCLIC LAT BOOST CYL		ITEM CODE F101	UNITS:	LB
	MEAN -334.362		MAX OSC. 692.201		
1	66.167	5.37	9.313	-65.509	171.908
2	600.078	10.73	-164.578	-577.069	-164.082
3	31.913	16.10	12.964	-29.162	156.032
4	161.813	21.47	-139.582	-81.856	-120.389
5	4.827	26.83	4.347	-2.099	115.779
6	22.634	32.20	-4.131	-22.253	-169.484
	COLLECTIVE BOOST CYL		ITEM CODE F102	UNITS:	LB
	MEAN 491.648		MAX OSC. 606.705		
1	23.342	5.37	-0.828	23.327	-2.032
2	557.572	10.73	0.002	557.572	0.000
3	7.415	16.10	0.069	-7.415	179.469
4	39.458	21.47	-10.637	37.997	-15.640
5	7.708	26.83	-4.742	-6.076	-142.028
6	18.767	32.20	-12.222	-14.242	-139.363
	M/R RED PITCH LINK		ITEM CODE F103	UNITS:	LB
	MEAN 430.820		MAX OSC. 863.573		
1	498.543	5.37	-272.130	-417.721	-146.917
2	413.330	10.73	158.528	381.720	22.553
3	124.096	16.10	-123.665	-10.333	-94.776
4	32.562	21.47	9.728	31.075	17.383
5	55.242	26.83	-10.225	54.287	-10.667
6	22.210	32.20	20.934	7.422	70.479

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
M/R WHITE PITCH LINK MEAN	329.997		ITEM CODE F104 MAX OSC.	UNITS: 875.546	LB
1	536.214	5.37	258.440	469.824	28.814
2	455.599	10.73	113.463	441.244	14.421
3	114.300	16.10	111.514	25.081	77.324
4	45.912	21.47	8.644	45.090	10.853
5	38.502	26.83	15.080	-35.426	156.942
6	19.017	32.20	8.907	16.802	27.929
LIFT LINK MEAN	4906.352		ITEM CODE F050 MAX OSC.	UNITS: 1216.093	LB
1	134.306	5.37	81.060	-107.085	142.875
2	1010.330	10.73	-877.281	501.142	-60.263
3	20.397	16.10	-10.728	17.348	-31.734
4	198.011	21.47	-95.125	-173.665	-151.288
5	31.582	26.83	-19.881	24.540	-39.013
6	205.268	32.20	-106.944	175.208	-31.399
M/R RED DRAG BRACE MEAN	10160.211		ITEM CODE F105 MAX OSC.	UNITS: 1938.625	LB
1	947.812	5.38	427.957	-845.695	153.159
2	98.677	10.75	-69.722	69.828	-44.956
3	841.673	16.13	732.461	414.626	60.487
4	66.356	21.50	-19.450	-63.441	-162.956
5	92.493	26.88	92.352	-5.107	93.165
6	192.034	32.25	-140.850	130.531	-47.178

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 612 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.7 A/S 85.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL MEAN 128.617		ITEM CODE F100 MAX OSC. 467.136	UNITS:	LB
1	27.262	5.38	17.828	20.624	40.841
2	347.372	10.76	236.139	-254.766	137.173
3	24.732	16.13	5.666	-24.074	166.757
4	79.938	21.51	19.112	-77.620	166.168
5	4.953	26.89	-4.276	2.499	-59.697
6	65.653	32.27	-20.829	62.261	-18.497
	CYCLIC LAT BOOST CYL MEAN -298.409		ITEM CODE F101 MAX OSC. 744.811	UNITS:	LB
1	64.969	5.38	-19.081	-62.104	-162.921
2	570.114	10.76	-235.266	-519.307	-155.628
3	31.610	16.13	-14.946	-27.854	-151.783
4	135.318	21.51	-117.117	-67.783	-120.061
5	8.224	26.89	-7.177	-4.016	-119.229
6	102.813	32.27	-63.275	-81.037	-142.017
	COLLECTIVE BOOST CYL MEAN 370.715		ITEM CODE F102 MAX OSC. 436.683	UNITS:	LB
1	29.863	5.38	6.926	29.049	13.410
2	371.621	10.76	119.414	351.912	18.744
3	4.400	16.13	0.790	4.328	10.345
4	16.152	21.51	14.523	-7.070	115.957
5	10.807	26.89	-10.807	-0.021	-90.111
6	14.394	32.27	-9.180	11.086	-39.627
	M/R RED PITCH LINK MEAN 361.591		ITEM CODE F103 MAX OSC. 746.923	UNITS:	LB
1	452.079	5.38	-283.791	-351.907	-141.116
2	285.346	10.76	167.100	231.301	35.846
3	116.259	16.13	-116.049	-6.995	-93.450
4	4.263	21.51	3.400	-2.571	127.098
5	56.212	26.89	-2.402	56.161	-2.449
6	17.572	32.27	15.788	-7.715	116.043

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 612 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.2 A/S 85.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
M/R WHITE PITCH LINK	MEAN	268.949	ITEM CODE F104	MAX OSC.	782.673	UNITS: LB
1	484.167	5.38	282.812	392.982	35.741
2	336.780	10.76	191.582	276.979	34.671
3	106.766	16.13	101.334	33.620	71.645
4	17.404	21.51	12.861	-11.726	132.358
5	45.191	26.89	27.761	-35.659	142.099
6	18.284	32.27	16.592	-7.680	114.838
LIFT LINK	MEAN	4687.082	ITEM CODE F050	MAX OSC.	1152.258	UNITS: LB
1	85.978	5.38	41.976	-75.034	150.776
2	806.780	10.76	-418.990	689.450	-31.288
3	12.728	16.13	-4.667	11.842	-21.509
4	174.815	21.51	160.430	-69.444	113.406
5	27.225	26.89	1.142	27.201	2.405
6	188.287	32.27	94.534	162.835	30.137
M/R RED DRAG BRACE	MEAN	10394.691	ITEM CODE F105	MAX OSC.	1565.225	UNITS: LB
1	899.653	5.39	233.986	-868.692	164.925
2	76.603	10.77	15.910	74.933	11.987
3	542.212	16.16	433.756	325.346	53.128
4	58.643	21.55	-17.199	-56.064	-162.946
5	95.020	26.93	94.824	6.099	86.320
6	91.615	32.32	-55.785	72.673	-37.510

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	CYCLIC F/A BOOST CYL MEAN 168.923		ITEM CODE F100 MAX OSC. 392.777	UNITS:	LB
1	21.566	5.37	21.241	3.729	80.043
2	336.773	10.73	217.141	-257.422	139.852
3	12.935	16.10	2.547	-12.681	168.644
4	29.817	21.47	12.407	-27.113	155.411
5	7.852	26.83	-2.318	-7.502	-162.826
6	17.618	32.20	-14.451	10.079	-55.105
	CYCLIC LAT BOOST CYL MEAN -251.213		ITEM CODE F101 MAX OSC. 597.097	UNITS:	LB
1	50.525	5.37	-3.100	-50.430	-176.482
2	502.178	10.73	-168.581	-473.037	-160.385
3	16.763	16.10	-0.823	-16.742	-177.185
4	78.754	21.47	-28.080	-73.578	-159.112
5	8.060	26.83	8.009	-0.901	96.418
6	47.140	32.20	2.807	-47.057	176.586
	COLLECTIVE BOOST CYL MEAN 310.056		ITEM CODE F102 MAX OSC. 383.621	UNITS:	LB
1	30.160	5.37	6.900	29.360	13.226
2	294.550	10.73	80.055	283.462	15.771
3	10.325	16.10	-7.567	7.024	-47.132
4	25.969	21.47	25.026	6.933	74.516
5	7.905	26.83	-7.670	1.913	-75.996
6	9.956	32.20	8.446	5.271	58.032
	M/R RED PITCH LINK MEAN 353.125		ITEM CODE F103 MAX OSC. 687.246	UNITS:	LB
1	408.863	5.37	-270.621	-306.486	-138.556
2	265.712	10.73	177.213	197.986	41.831
3	78.854	16.10	-72.825	-30.240	-112.550
4	46.646	21.47	23.475	-40.309	149.785
5	26.611	26.83	-24.881	9.440	-69.223
6	23.939	32.20	-11.561	-20.962	-151.123

HARMONIC ANALYSIS: AXIAL FORCES
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.5 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R WHITE PITCH LINK MEAN 257.371		ITEM CODE F104 MAX OSC. 712.523	UNITS: LB	
1	453.318	5.37	272.192	362.504	36.902
2	301.856	10.73	179.175	242.927	36.411
3	70.145	16.10	52.523	46.493	48.485
4	48.404	21.47	38.630	-29.166	127.053
5	22.003	26.83	20.715	7.419	70.294
6	11.079	32.20	-6.558	-8.929	-143.704
	LIFT LINK MEAN 4711.414		ITEM CODE F050 MAX OSC. 1373.423	UNITS: LB	
1	117.939	5.37	28.146	-114.531	166.193
2	859.841	10.73	-329.027	794.398	-22.499
3	12.228	16.10	8.090	-9.170	138.580
4	282.489	21.47	183.822	214.497	40.596
5	42.856	26.83	-42.847	0.866	-88.842
6	165.425	32.20	73.305	148.296	26.304
	M/R RED DRAG BRACE MEAN 10508.988		ITEM CODE F105 MAX OSC. 1402.377	UNITS: LB	
1	935.650	5.38	215.432	-910.511	166.688
2	81.015	10.75	17.687	79.061	12.610
3	166.494	16.13	160.400	44.636	74.449
4	14.603	21.50	-11.160	9.418	-49.839
5	55.403	26.88	53.951	12.600	76.855
6	30.752	32.25	-9.372	-29.289	-162.256

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 610 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.7 A/S 142.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN 0.000		ITEM CODE D051 MAX OSC.	UNITS: 0.047	IN
1	0.003	5.38	0.003	0.002	57.286
2	0.037	10.76	-0.035	0.010	-73.809
3	0.002	16.13	0.002	-0.000	95.794
4	0.003	21.51	-0.001	0.002	-28.979
5	0.001	26.89	-0.000	0.001	-32.356
6	0.001	32.27	-0.001	0.000	-87.865
	RT FWD PYLON VER POS MEAN 0.049		ITEM CODE D052 MAX OSC.	UNITS: 0.030	IN
1	0.007	5.38	-0.003	-0.006	-151.518
2	0.015	10.76	0.011	-0.011	134.311
3	0.001	16.13	-0.001	0.001	-48.793
4	0.006	21.51	0.004	-0.005	138.161
5	0.000	26.89	-0.000	-0.000	-156.368
6	0.001	32.27	0.001	0.001	28.276
	LT AFT PYLON VER POS MEAN 0.061		ITEM CODE D053 MAX OSC.	UNITS: 0.036	IN
1	0.009	5.38	0.008	0.004	62.077
2	0.024	10.76	-0.006	0.023	-14.135
3	0.001	16.13	-0.001	-0.000	-122.338
4	0.005	21.51	0.001	0.005	11.212
5	0.001	26.89	0.000	-0.001	141.975
6	0.001	32.27	-0.000	0.001	-12.232
	RT AFT PYLON VER POS MEAN 0.104		ITEM CODE D054 MAX OSC.	UNITS: 0.036	IN
1	0.002	5.38	-0.001	-0.001	-143.700
2	0.026	10.76	0.017	-0.020	139.942
3	0.003	16.13	-0.001	0.003	-23.749
4	0.004	21.51	-0.004	-0.000	-95.846
5	0.000	26.89	-0.000	-0.000	-155.896
6	0.001	32.27	-0.001	-0.000	-108.675

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.4 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN 0.004		ITEM CODE D051 MAX OSC.	UNITS: 0.033	IN
1	0.001	5.39	0.001	-0.000	95.182
2	0.028	10.78	-0.028	0.004	-82.121
3	0.001	16.17	0.001	0.000	72.435
4	0.003	21.56	-0.002	0.002	-40.260
5	0.000	26.95	-0.000	0.000	-6.616
6	0.001	32.34	-0.001	0.000	-83.438
	RT FWD PYLON VER POS MEAN 0.025		ITEM CODE D052 MAX OSC.	UNITS: 0.017	IN
1	0.004	5.39	-0.001	-0.004	-162.129
2	0.010	10.78	0.009	-0.005	118.048
3	0.000	16.17	-0.000	-0.000	-144.656
4	0.003	21.56	0.003	0.000	85.625
5	0.000	26.95	0.000	-0.000	96.967
6	0.001	32.34	-0.000	0.001	-16.246
	LT AFT PYLON VER POS MEAN 0.094		ITEM CODE D053 MAX OSC.	UNITS: 0.026	IN
1	0.005	5.39	0.004	0.003	55.767
2	0.018	10.78	-0.006	0.017	-20.043
3	0.000	16.17	-0.000	0.000	-19.100
4	0.005	21.56	-0.004	0.003	-54.658
5	0.001	26.95	0.000	0.000	55.979
6	0.001	32.34	-0.001	0.001	-46.873
	RT AFT PYLON VER POS MEAN 0.104		ITEM CODE D054 MAX OSC.	UNITS: 0.025	IN
1	0.000	5.39	-0.000	0.000	-14.921
2	0.021	10.78	0.018	-0.011	121.204
3	0.001	16.17	-0.001	0.000	-55.637
4	0.005	21.56	-0.004	-0.003	-121.484
5	0.000	26.95	0.000	-0.000	134.486
6	0.000	32.34	-0.000	0.000	-27.835

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 614
ROT SPEED 322.7

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320. LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 114.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN -0.005		ITEM CODE D051 MAX OSC.	UNITS: 0.025	IN
1	0.000	5.38	-0.000	0.000	-11.133
2	0.023	10.76	-0.022	0.008	-69.354
3	0.000	16.13	0.000	0.000	51.264
4	0.002	21.51	-0.001	0.001	-31.390
5	0.000	26.89	-0.000	-0.000	-164.534
6	0.002	32.27	-0.000	0.002	-16.168
	RT FWD PYLON VER POS MEAN 0.026		ITEM CODE D052 MAX OSC.	UNITS: 0.015	IN
1	0.004	5.38	0.000	-0.004	177.271
2	0.008	10.76	0.007	-0.005	127.402
3	0.000	16.13	-0.000	0.000	-79.448
4	0.001	21.51	0.001	0.000	89.753
5	0.000	26.89	0.000	0.000	68.231
6	0.001	32.27	0.000	0.001	5.890
	LT AFT PYLON VER POS MEAN 0.098		ITEM CODE D053 MAX OSC.	UNITS: 0.021	IN
1	0.004	5.38	0.003	0.003	40.459
2	0.015	10.76	-0.001	0.015	-3.471
3	0.000	16.13	-0.000	-0.000	-141.410
4	0.003	21.51	-0.001	0.003	-24.274
5	0.000	26.89	0.000	-0.000	129.257
6	0.001	32.27	0.000	0.001	23.402
	RT AFT PYLON VER POS MEAN 0.115		ITEM CODE D054 MAX OSC.	UNITS: 0.021	IN
1	0.001	5.38	0.001	-0.001	117.602
2	0.017	10.76	0.014	-0.010	127.530
3	0.001	16.13	-0.001	0.001	-61.798
4	0.002	21.51	-0.002	-0.000	-91.000
5	0.001	26.89	0.001	0.000	72.945
6	0.000	32.27	0.000	0.000	65.456

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN -0.006		ITEM CODE D051 MAX OSC.	UNITS: 0.021	IN
1	0.001	5.37	-0.000	-0.000	-141.713
2	0.019	10.73	-0.017	0.009	-63.044
3	0.001	16.10	0.001	0.000	76.704
4	0.002	21.47	-0.002	-0.001	-117.538
5	0.000	26.83	0.000	-0.000	171.171
6	0.002	32.20	-0.001	0.002	-16.860
	RT FWD PYLON VER POS MEAN 0.017		ITEM CODE D052 MAX OSC.	UNITS: 0.012	IN
1	0.003	5.37	0.000	-0.003	175.732
2	0.008	10.73	0.005	-0.007	146.452
3	0.001	16.10	-0.001	-0.000	-107.158
4	0.002	21.47	0.001	-0.001	138.806
5	0.000	26.83	-0.000	0.000	-65.526
6	0.000	32.20	0.000	0.000	8.891
	LT AFT PYLON VER POS MEAN 0.110		ITEM CODE D053 MAX OSC.	UNITS: 0.016	IN
1	0.003	5.37	0.002	0.003	34.240
2	0.012	10.73	0.003	0.012	15.347
3	0.001	16.10	0.001	-0.001	147.250
4	0.002	21.47	0.000	0.002	12.834
5	0.000	26.83	0.000	0.000	51.539
6	0.001	32.20	0.001	0.000	77.110
	RT AFT PYLON VER POS MEAN 0.119		ITEM CODE D054 MAX OSC.	UNITS: 0.020	IN
1	0.002	5.37	0.002	0.000	86.328
2	0.016	10.73	0.012	-0.011	131.958
3	0.001	16.10	-0.001	0.000	-66.008
4	0.000	21.47	0.000	-0.000	130.842
5	0.001	26.83	0.001	0.000	58.398
6	0.000	32.20	-0.000	0.000	-81.074

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 322.7

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN -0.000		ITEM CODE D051 MAX OSC.	UNITS: 0.021	IN
1	0.002	5.38	-0.002	-0.001	-108.057
2	0.016	10.76	-0.012	0.011	-48.342
3	0.000	16.13	0.000	0.000	87.622
4	0.001	21.51	0.001	0.000	65.506
5	0.000	26.89	-0.000	-0.000	-177.978
6	0.001	32.27	0.001	0.001	50.045
	RT FWD PYLON VER POS MEAN 0.004		ITEM CODE D052 MAX OSC.	UNITS: 0.014	IN
1	0.002	5.38	0.001	-0.002	153.678
2	0.009	10.76	0.002	-0.008	163.625
3	0.000	16.13	-0.000	0.000	-64.144
4	0.001	21.51	0.000	-0.001	178.997
5	0.001	26.89	0.001	0.000	66.664
6	0.001	32.27	-0.000	0.001	-6.338
	LT AFT PYLON VER POS MEAN 0.121		ITEM CODE D053 MAX OSC.	UNITS: 0.019	IN
1	0.002	5.38	0.001	0.002	24.212
2	0.015	10.76	0.010	0.011	41.139
3	0.000	16.13	-0.000	-0.000	-90.409
4	0.002	21.51	0.002	-0.001	123.988
5	0.000	26.89	0.000	0.000	16.285
6	0.001	32.27	-0.000	-0.001	-136.319
	RT AFT PYLON VER POS MEAN 0.113		ITEM CODE D054 MAX OSC.	UNITS: 0.019	IN
1	0.003	5.38	0.003	-0.000	90.860
2	0.015	10.76	0.010	-0.011	137.890
3	0.001	16.13	-0.000	0.001	-9.899
4	0.001	21.51	-0.001	-0.000	-115.737
5	0.001	26.89	0.001	0.000	75.173
6	0.000	32.27	-0.000	-0.000	-107.342

HARMONIC ANALYSIS: PYLON VERTICAL DISPLACEMENTS
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	LT FWD PYLON VER POS MEAN -0.004		ITEM CODE D051 MAX OSC.	UNITS: 0.018	IN
1	0.003	5.37	-0.003	-0.000	-91.764
2	0.014	10.73	-0.011	0.009	-48.874
3	0.000	16.10	-0.000	-0.000	-104.640
4	0.003	21.47	0.001	0.003	14.143
5	0.000	26.83	-0.000	-0.000	-170.160
6	0.001	32.20	0.001	0.001	39.185
	RT FWD PYLON VER POS MEAN 0.005		ITEM CODE D052 MAX OSC.	UNITS: 0.012	IN
1	0.003	5.37	0.002	-0.002	137.520
2	0.009	10.73	0.003	-0.008	161.048
3	0.000	16.10	0.000	-0.000	147.358
4	0.000	21.47	0.000	-0.000	143.865
5	0.000	26.83	-0.000	0.000	-49.268
6	0.000	32.20	0.000	0.000	79.347
	LT AFT PYLON VER POS MEAN 0.122		ITEM CODE D053 MAX OSC.	UNITS: 0.020	IN
1	0.003	5.37	-0.000	0.003	-7.956
2	0.016	10.73	0.010	0.012	41.066
3	0.000	16.10	0.000	0.000	5.870
4	0.002	21.47	0.001	-0.002	143.331
5	0.000	26.83	-0.000	0.000	-57.221
6	0.001	32.20	-0.000	-0.000	-145.305
	RT AFT PYLON VER POS MEAN 0.116		ITEM CODE D054 MAX OSC.	UNITS: 0.020	IN
1	0.004	5.37	0.003	-0.001	107.704
2	0.014	10.73	0.011	-0.009	127.225
3	0.000	16.10	0.000	-0.000	96.827
4	0.002	21.47	-0.002	-0.002	-136.500
5	0.000	26.83	0.000	-0.000	95.358
6	0.001	32.20	-0.001	0.000	-75.183

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO.- 610
ROT SPEED 322.7

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 142.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R HUB FLAPPING ANG MEAN -0.587		ITEM CODE D110 MAX OSC.	UNITS: 2.488	DEG
1	2.544	5.38	1.590	1.986	38.668
2	0.050	10.76	0.000	-0.050	179.588
3	0.179	16.13	-0.177	0.029	-80.818
4	0.044	21.51	0.032	0.031	45.552
5	0.018	26.89	-0.008	0.016	-25.988
6	0.031	32.27	-0.018	0.025	-34.635
	M/R HUB FEATHER ANG MEAN 16.731		ITEM CODE D111 MAX OSC.	UNITS: 10.457	DEG
1	10.363	5.38	-8.987	5.160	-60.137
2	0.961	10.76	-0.712	-0.645	-132.174
3	0.190	16.13	-0.188	0.021	-83.648
4	0.059	21.51	-0.013	-0.057	-167.565
5	0.100	26.89	-0.088	-0.047	-118.033
6	0.068	32.27	0.026	-0.063	157.283
	ROLL ATTITUDE MEAN -0.273		ITEM CODE D009 MAX OSC.	UNITS: 0.291	DEG
1	0.007	5.38	0.003	-0.007	154.377
2	0.034	10.76	0.032	0.013	68.071
3	0.015	16.13	-0.013	0.008	-57.054
4	0.028	21.51	0.020	-0.020	134.486
5	0.009	26.89	-0.009	0.003	-69.902
6	0.013	32.27	-0.009	-0.009	-134.379
	PITCH ATTITUDE MEAN -5.710		ITEM CODE D010 MAX OSC.	UNITS: 0.273	DEG
1	0.016	5.38	0.009	0.013	34.538
2	0.018	10.76	0.017	0.005	74.462
3	0.002	16.13	-0.001	0.002	-25.593
4	0.007	21.51	0.004	-0.006	144.648
5	0.017	26.89	0.006	0.015	22.371
6	0.012	32.27	-0.011	0.004	-72.364
	YAW ATTITUDE MEAN 0.251		ITEM CODE D011 MAX OSC.	UNITS: 0.680	DEG
1	0.005	5.38	0.001	0.005	13.001
2	0.005	10.76	-0.001	-0.005	-166.525
3	0.063	16.13	0.056	-0.029	117.049
4	0.041	21.51	-0.004	0.040	-6.044
5	0.031	26.89	0.030	0.006	78.922
6	0.048	32.27	-0.013	-0.046	-164.184

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 615 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 323.4 A/S 128.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
M/R HUB FLAPPING ANG MEAN -0.604			ITEM CODE D110 MAX OSC.	UNITS: 2.438	DEG
1	2.459	5.39	0.519	2.404	12.178
2	0.066	10.78	-0.048	0.045	-47.129
3	0.118	16.17	0.049	-0.107	155.358
4	0.064	21.56	0.022	-0.060	159.830
5	0.101	26.95	-0.096	-0.032	-108.400
6	0.048	32.34	-0.040	0.026	-56.937
M/R HUB FEATHER ANG MEAN 14.916			ITEM CODE D111 MAX OSC.	UNITS: 9.038	DEG
1	8.924	5.39	-8.661	2.149	-76.062
2	1.000	10.78	-0.269	-0.963	-164.393
3	0.098	16.17	-0.022	-0.096	-167.092
4	0.105	21.56	0.103	-0.016	98.775
5	0.074	26.95	0.051	-0.054	136.284
6	0.033	32.34	0.033	-0.005	98.521
ROLL ATTITUDE MEAN -1.152			ITEM CODE D009 MAX OSC.	UNITS: 0.383	DEG
1	0.021	5.39	0.018	0.011	59.732
2	0.031	10.78	0.027	0.016	59.714
3	0.021	16.17	-0.001	0.021	-2.620
4	0.012	21.56	0.011	0.004	69.264
5	0.005	26.95	0.005	0.001	83.130
6	0.004	32.34	-0.002	0.004	-26.627
PITCH ATTITUDE MEAN -3.628			ITEM CODE D010 MAX OSC.	UNITS: 0.183	DEG
1	0.004	5.39	-0.004	-0.001	-100.361
2	0.011	10.78	0.006	0.010	30.025
3	0.005	16.17	0.001	-0.005	173.843
4	0.005	21.56	-0.005	-0.003	-118.413
5	0.014	26.95	0.003	0.014	10.601
6	0.004	32.34	0.001	-0.004	170.498
YAW ATTITUDE MEAN 0.020			ITEM CODE D011 MAX OSC.	UNITS: 0.679	DEG
1	0.028	5.39	0.003	-0.028	173.721
2	0.032	10.78	0.010	-0.031	161.598
3	0.012	16.17	0.010	0.006	59.919
4	0.037	21.56	0.020	-0.031	146.795
5	0.032	26.95	-0.012	0.030	-22.331
6	0.096	32.34	0.038	0.088	23.507

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 614 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.7 A/S 114.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R HUB FLAPPING ANG MEAN -0.562		ITEM CODE D110 MAX OSC.	UNITS: 2.265	DEG
1	2.304	5.38	0.636	2.215	16.035
2	0.017	10.76	-0.003	0.017	-11.016
3	0.094	16.13	-0.020	-0.092	-167.892
4	0.014	21.51	-0.009	-0.011	-141.908
5	0.057	26.89	-0.056	0.007	-82.628
6	0.024	32.27	-0.011	0.022	-26.230
	M/R HUB FEATHER ANG MEAN 14.211		ITEM CODE D111 MAX OSC.	UNITS: 7.896	DEG
1	7.830	5.38	-7.395	2.572	-70.823
2	0.845	10.76	-0.323	-0.781	-157.552
3	0.047	16.13	0.007	-0.046	171.738
4	0.079	21.51	0.065	-0.044	124.159
5	0.055	26.89	0.025	-0.049	153.294
6	0.026	32.27	0.026	-0.002	94.544
	ROLL ATTITUDE MEAN -1.683		ITEM CODE D009 MAX OSC.	UNITS: 0.400	DEG
1	0.026	5.38	-0.020	-0.017	-130.158
2	0.017	10.76	0.006	-0.016	157.770
3	0.008	16.13	-0.006	-0.005	-133.065
4	0.021	21.51	0.016	-0.014	132.882
5	0.016	26.89	0.015	-0.004	104.808
6	0.008	32.27	0.007	0.004	61.308
	PITCH ATTITUDE MEAN -1.769		ITEM CODE D010 MAX OSC.	UNITS: 0.273	DEG
1	0.022	5.38	-0.022	-0.003	-97.839
2	0.006	10.76	0.004	0.003	51.039
3	0.014	16.13	-0.009	0.010	-41.004
4	0.017	21.51	0.013	0.012	47.308
5	0.013	26.89	0.007	-0.011	148.264
6	0.010	32.27	-0.002	0.009	-14.791
	YAW ATTITUDE MEAN 0.716		ITEM CODE D011 MAX OSC.	UNITS: 0.773	DEG
1	0.013	5.38	-0.005	0.012	-21.739
2	0.040	10.76	-0.033	0.023	-54.615
3	0.013	16.13	-0.010	0.009	-47.654
4	0.061	21.51	-0.035	0.050	-35.371
5	0.047	26.89	0.010	-0.046	167.427
6	0.026	32.27	-0.011	0.024	-24.257

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO. 613 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 101.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R HUB FLAPPING ANG MEAN -0.558		ITEM CODE D110 MAX OSC.	UNITS: 2.317	DEG
1	2.322	5.37	0.519	2.263	12.929
2	0.032	10.73	-0.001	0.032	-1.526
3	0.087	16.10	-0.060	-0.063	-136.280
4	0.037	21.47	-0.035	-0.012	-108.597
5	0.069	26.83	-0.023	0.065	-19.211
6	0.009	32.20	0.005	-0.007	143.578
	M/R HUB FEATHER ANG MEAN 13.293		ITEM CODE D111 MAX OSC.	UNITS: 6.869	DEG
1	6.771	5.37	-6.219	2.678	-66.702
2	0.572	10.73	-0.222	-0.527	-157.209
3	0.037	16.10	0.035	-0.010	105.853
4	0.071	21.47	0.064	-0.031	116.168
5	0.024	26.83	0.006	-0.024	165.309
6	0.028	32.20	0.026	0.010	69.107
	ROLL ATTITUDE MEAN -1.136		ITEM CODE D009 MAX OSC.	UNITS: 0.273	DEG
1	0.006	5.37	0.006	0.001	81.941
2	0.031	10.73	0.031	-0.001	92.222
3	0.009	16.10	0.008	0.001	83.433
4	0.021	21.47	0.001	-0.021	178.162
5	0.005	26.83	-0.004	0.004	-45.454
6	0.012	32.20	0.005	0.011	26.855
	PITCH ATTITUDE MEAN -1.096		ITEM CODE D010 MAX OSC.	UNITS: 0.330	DEG
1	0.035	5.37	-0.034	-0.007	-101.584
2	0.002	10.73	-0.002	-0.001	-111.945
3	0.010	16.10	-0.007	-0.007	-135.359
4	0.005	21.47	-0.003	0.003	-47.100
5	0.004	26.83	0.003	0.003	38.281
6	0.002	32.20	-0.001	0.002	-33.336
	YAW ATTITUDE MEAN 0.412		ITEM CODE D011 MAX OSC.	UNITS: 1.088	DEG
1	0.048	5.37	-0.043	0.021	-63.799
2	0.070	10.73	-0.007	-0.069	-174.160
3	0.036	16.10	0.002	0.036	3.630
4	0.005	21.47	-0.002	-0.004	-151.560
5	0.033	26.83	0.031	-0.011	109.465
6	0.091	32.20	0.029	0.087	18.655

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G
SHIP 20391
REC. NO. 612
ROT SPEED 322.7

FLT. 35-A
DATE 8-20-75
ALT. 5000. FT.

G.W. 8320 LB.
C.G. 200.6 IN.
TEST CONDITION: FORWARD FLIGHT
A/S 85.0 KTS--TAS

PROBLEM 1
REPORT

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R HUB FLAPPING ANG MEAN -0.563		ITEM CODE D110 MAX OSC.	UNITS: 2.378	DEG
1	2.318	5.38	0.660	2.222	16.541
2	0.070	10.76	0.021	0.067	17.539
3	0.137	16.13	-0.017	-0.136	-172.785
4	0.042	21.51	-0.039	-0.016	-112.098
5	0.080	26.89	0.028	0.075	20.702
6	0.036	32.27	0.020	-0.030	145.744
	M/R HUB FEATHER ANG MEAN 12.674		ITEM CODE D111 MAX OSC.	UNITS: 5.995	DEG
1	5.958	5.38	-5.186	2.933	-60.513
2	0.365	10.76	-0.275	-0.240	-131.077
3	0.030	16.13	0.019	0.023	39.821
4	0.052	21.51	0.050	-0.015	106.731
5	0.031	26.89	0.009	-0.030	163.362
6	0.010	32.27	0.009	0.005	62.842
	ROLL ATTITUDE MEAN 0.793		ITEM CODE D009 MAX OSC.	UNITS: 0.309	DEG
1	0.026	5.38	0.019	0.018	47.499
2	0.014	10.76	0.013	0.006	66.835
3	0.009	16.13	0.008	0.004	64.789
4	0.017	21.51	0.015	0.006	67.698
5	0.006	26.89	-0.004	0.004	-46.666
6	0.013	32.27	0.004	0.012	19.895
	PITCH ATTITUDE MEAN -0.271		ITEM CODE D010 MAX OSC.	UNITS: 0.433	DEG
1	0.041	5.38	0.036	0.019	62.580
2	0.041	10.76	0.026	0.032	39.022
3	0.001	16.13	0.001	0.000	84.397
4	0.013	21.51	0.003	0.013	13.505
5	0.008	26.89	-0.004	0.007	-32.253
6	0.012	32.27	-0.011	0.005	-64.352
	YAW ATTITUDE MEAN 0.359		ITEM CODE D011 MAX OSC.	UNITS: 1.223	DEG
1	0.021	5.38	-0.007	0.020	-18.982
2	0.033	10.76	0.003	0.032	4.969
3	0.046	16.13	0.045	-0.013	105.951
4	0.072	21.51	-0.064	-0.033	-117.622
5	0.022	26.89	-0.006	0.021	-16.011
6	0.016	32.27	0.010	-0.012	139.029

HARMONIC ANALYSIS: VEHICLE PERFORMANCE DATA
LEVEL FLIGHT SWEEP

MODEL AH-1G FLT. 35-A G.W. 8320 LB. PROBLEM 1
SHIP 20391 DATE 8-20-75 C.G. 200.6 IN. REPORT
REC. NO.- 611 ALT. 5000. FT. TEST CONDITION: FORWARD FLIGHT
ROT SPEED 322.0 A/S 67.0 KTS--TAS

HARM	AMP	HZ	SIN	COS	PHASE ANGLE
	M/R HUB FLAPPING ANG MEAN -0.468		ITEM CODE D110 MAX OSC.	UNITS: 2.086	DEG
1	2.025	5.37	0.428	1.979	12.193
2	0.101	10.73	0.025	0.098	14.467
3	0.077	16.10	0.021	-0.074	164.465
4	0.027	21.47	-0.026	0.008	-72.808
5	0.048	26.83	-0.048	0.003	-86.669
6	0.029	32.20	-0.004	-0.028	-172.373
	M/R HUB FEATHER ANG MEAN 12.462		ITEM CODE D111 MAX OSC.	UNITS: 5.098	DEG
1	5.071	5.37	-4.428	2.473	-60.818
2	0.299	10.73	-0.234	-0.187	-128.719
3	0.059	16.10	0.001	0.059	0.567
4	0.029	21.47	-0.002	0.029	-3.997
5	0.024	26.83	0.009	-0.022	156.567
6	0.015	32.20	0.009	0.012	37.808
	ROLL ATTITUDE MEAN 0.055		ITEM CODE D009 MAX OSC.	UNITS: 0.237	DEG
1	0.006	5.37	-0.001	-0.006	-175.462
2	0.008	10.73	0.006	-0.006	133.496
3	0.010	16.10	0.005	-0.008	148.088
4	0.002	21.47	-0.002	0.001	-59.053
5	0.005	26.83	0.004	-0.003	122.923
6	0.009	32.20	0.001	-0.009	170.395
	PITCH ATTITUDE MEAN -1.045		ITEM CODE D010 MAX OSC.	UNITS: 0.364	DEG
1	0.028	5.37	0.015	0.024	31.506
2	0.031	10.73	0.026	0.017	56.677
3	0.003	16.10	0.003	0.002	58.371
4	0.014	21.47	-0.006	0.012	-25.280
5	0.006	26.83	-0.006	0.001	-82.271
6	0.012	32.20	-0.011	0.004	-69.488
	YAW ATTITUDE MEAN 0.115		ITEM CODE D011 MAX OSC.	UNITS: 0.860	DEG
1	0.029	5.37	0.023	0.018	51.678
2	0.047	10.73	0.021	-0.042	152.868
3	0.011	16.10	-0.004	-0.010	-155.415
4	0.015	21.47	0.015	0.001	85.758
5	0.065	26.83	-0.001	-0.065	-178.714
6	0.058	32.20	0.049	0.032	56.493

APPENDIX B - AH-1G ROTOR PARAMETERS

DHT PROGRAM DNAM05 - COMPILED 03/20/79 09/10/79
NATURAL BLADE MODES 540279

26 SEG OLS MR PRECONE AND UNDERSLING

SEG	SEGMENT LENGTH (IN)	RADIUS AT OUTBD END	WT/IN (LBF/IN)	EI*10**(-6) (LBF*IN**2) BEAM	EI*10**(-6) (LBF*IN**2) CHORD	TWIST AT OUTBD END (DEG)	CENTER OF GRAVITY OFFSETS (IN) BEAM	CENTER OF GRAVITY OFFSETS (IN) CHORD	CF AT INBD END (LBF/RPM**2)
1	3.50	3.50	8.286	344.90	5003.10	0.0	0.0	0.0	1.21491
2	2.50	6.00 —	1.268	9.37	4262.10	0.0	0.0	0.0	1.21331
3	5.00	11.00	3.196	8.27	4144.10	0.0	0.0	0.0	1.21168
4	3.10	14.10	7.222	340.50	6492.10	-0.5341	0.0	0.0	1.20569
5	6.47	20.57 —	6.936	202.60	1750.00	-0.7794	0.0	0.120	1.19222
6	13.18	33.75	6.241	202.60	1750.00	-1.2784	0.0	3.610	1.15511
7	3.75	37.50 —	5.908	800.00	1463.60	-1.4205	0.0	3.610	1.10512
8	3.50	41.00	7.164	800.00	450.58	-1.5530	0.0	2.302	1.07998
9	11.80	52.80	4.127	407.89	8232.00	-2.0000	0.0	1.300	1.03706
10	7.20	60.00	0.952	89.50	4240.00	-2.2727	0.0	0.900	0.99544
11	6.00	66.00	0.952	89.50	4240.00	-2.5000	0.0	0.900	0.98474
12	15.50	81.50	0.775	61.75	4065.00	-3.0871	0.0	1.390	0.96814
13	10.90	92.40	0.858	55.00	4150.00	-3.5000	0.0	1.770	0.94343
14	10.60	103.00	0.836	53.30	4290.00	-3.9015	0.0	1.710	0.91955
15	15.80	118.80	0.869	49.66	4079.00	-4.5000	0.0	2.385	0.88653
16	13.20	132.00	0.762	44.50	3820.00	-5.0000	0.0	1.450	0.84643
17	13.20	145.20	0.726	40.10	3600.00	-5.5000	0.0	1.340	0.80964
18	10.60	155.80	0.875	40.00	3390.00	-5.9015	0.0	0.850	0.77078
19	15.80	171.60	1.098	40.83	3255.00	-6.5000	0.0	0.571	0.71192
20	13.20	184.80	1.062	41.00	2910.00	-7.0000	0.0	-0.550	0.63554
21	13.20	198.00	1.039	39.60	2650.00	-7.5000	0.0	0.010	0.56282
22	14.30	212.30	1.260	39.50	2650.00	-8.0417	0.0	-1.017	0.47366
23	12.10	224.40	1.186	42.00	2650.00	-8.5000	0.0	-1.870	0.37614
24	13.70	238.10	1.266	42.40	2655.00	-9.0189	0.0	-1.129	0.27522
25	12.70	250.80	1.189	42.40	2660.00	-9.5000	0.0	-1.970	0.16560
26	13.20	264.00	1.160	38.00	2690.00	-10.0000	0.0	-0.430	0.05736
BALANCE WEIGHT (99% R)			0.0 LBM				0.0	0.0	

4 HUB SEGMENTS
GIMBALED HUB TYPE
2.0 BLADES
28.63 INCH CHORD

ROTOR RPM	290.00	324.00	350.00
ROOT COLLECTIVE PITCH (DEG)	8.50	15.00	25.00
	INITIAL	INCREMENT	FINAL
FREQUENCY SWEEP PARAMETERS (CPM)	29.00	87.50	3500.00

MASS/BLADE	504.298	LBF/BLADE
(FIRST MASS MOMENT)/BLADE	110.787	SLUG-FT/BLADE
(FLAP INERTIA)/BLADE	1499.704	SLUG-FT**2/BLADE
LOCK NUMBER (SLSTD)	5.078	

26 SEG ULS MR PRECONE AND UNDERSLING

CK	CONTROL SYSTEM SPRING RATE	396000.0	IN-LBF/RAD
CDAMP	CONTROL SYSTEM DAMPING RATIO	6.000	
PHUFF	PITCH HORN ATTACHMENT RADIAL STATION	14.100	IN
PARM	PITCH HORN MOMENT ARM	-9.250	IN
PLSTA	PITCH LINK RADIAL STATION	0.0	IN
FHUFF	FLAPPING HINGE RADIAL STATION	0.0	IN
FLPSPR	FLAPPING SPRING RATE	0.0	FT-LBF/DEG
FHANGL	FLAPPING HINGE SKEW ANGLE	0.0	DEG
CHUFF	LAG HINGE RADIAL STATION	0.0	IN
SPRLG	LAGE SPRING RATE	0.0	FT-LBF/DEG
ALPHA1	LAG HINGE SKEW ANGLE FOR FLAP-LAG COUPLING	0.0	DEG
ALPHA3	LAG HINGE SKEW ANGLE FOR PITCH-LAG COUPLING	0.0	DEG
RPCONE	RADIUS WHERE PRECONE STARTS	0.0	IN
PRECON	PRECONE ANGLE	2.750	DEG
VUPCA	VERT OFFSET OF PCA AT R=RPCONE	-4.500	IN
RPLAG	RADIUS WHERE PRELAG STARTS	0.0	IN
PRELAG	PRELAG ANGLE	0.0	DEG
HUPCA	HORIZ OFFSET OF PCA AT R=RPLAG	0.0	IN
RBCS	RADIUS WHERE BLADE COORDINATE SYSTEM STARTS	0.0	IN
BCONE	BLADE CONING ANGLE RELATIVE TO PCA AT 0 DEG COLLECTIVE PITCH	0.0	DEG
VUBS	VERT OFFSET OF BLADE SYSTEM FROM PCA AT 0 DEG COLLECTIVE	0.0	IN
BUTSWP	BLADE SWEEP ANGLE RELATIVE TO PCA AT 0 DEG COLLECTIVE	0.0	DEG
HUBS	HORIZ OFFSET OF BLADE SYSTEM FROM PCA AT 0 DEG COLLECTIVE	0.0	IN

EFFECTIVE BLADE CG	-0.156	IN FWD FROM PCA
EFFECTIVE (BLADE PLUS HUB) CG	-0.155	IN FWD FROM PCA
CLAMPED TORSIONAL FREQUENCY	15.341	HERTZ
TORSIONAL INERTIA ABOUT PCA	42.62	IN-LB-SEC**2

SPECIAL OPTIONS INVOKED:
TORSION OPTION IS ON
UNEQUAL SEGMENTS ARE USED

26 SEG OLS MR PRECONE AND UNDERSLING

	IBB IN-LB-SEC**2/IN	BEAM RADIUS OF GYRATION - INCH	ICC IN-LB-SEC**2/IN	CHORD RADIUS OF GYRATION - INCH
1	0.000100	0.0683	0.06900	1.794
2	0.000100	0.1732	0.06900	4.550
3	0.000100	0.1100	0.06900	2.888
4	0.089800	2.1919	0.13880	2.725
5	0.089800	2.2367	0.13880	2.781
6	0.089800	2.3579	0.13880	2.931
7	0.089800	2.4235	0.04930	1.796
8	0.035600	1.3857	0.17440	3.067
9	0.006400	0.7741	0.24180	4.758
10	0.002400	0.9870	0.11830	6.929
11	0.002400	0.9870	0.11830	6.929
12	0.001700	0.9206	0.11890	7.699
13	0.001700	0.8750	0.14690	8.134
14	0.001700	0.8864	0.14530	8.195
15	0.001600	0.8946	0.15530	8.310
16	0.001400	0.8426	0.13570	8.295
17	0.001300	0.8318	0.13050	8.334
18	0.001400	0.7863	0.12800	7.518
19	0.002400	0.9190	0.14600	7.168
20	0.002400	0.9345	0.12900	6.851
21	0.001400	0.7216	0.11590	6.565
22	0.001200	0.6066	0.12550	6.204
23	0.001300	0.6508	0.10450	5.835
24	0.001500	0.6766	0.12260	6.117
25	0.001800	0.7648	0.11610	6.142
26	0.002700	0.9484	0.13990	6.827

26 SEG OLS MR PRECONE AND UNDERSLING

SEG	GJ(LBF-IN**2) (E-6)	SHEAR CENTER* OFFSET (IN) BEAM	CHORD	NEUTRAL AXIS* OFFSET (IN) BEAM	CHORD
1	36.000	0.0	0.0	0.0	0.0
2	36.000	0.0	0.0	0.0	0.0
3	36.000	0.0	0.0	0.0	0.0
4	36.000	0.0	0.0	0.0	0.0
5	36.000	0.0	0.0	0.0	0.0
6	36.000	0.0	0.0	0.0	0.0
7	37.850	0.0	0.0	0.0	0.0
8	67.000	0.0	0.773	0.0	0.773
9	84.600	0.0	1.050	0.0	1.050
10	74.000	0.0	0.560	0.0	0.560
11	74.000	0.0	0.560	0.0	0.560
12	61.700	0.0	0.730	0.0	0.730
13	55.200	0.0	1.200	0.0	1.200
14	50.000	0.0	1.160	0.0	1.160
15	44.200	0.0	1.000	0.0	1.000
16	38.100	0.0	0.750	0.0	0.750
17	34.500	0.0	0.530	0.0	0.530
18	33.800	0.0	0.290	0.0	0.290
19	33.800	0.0	-0.168	0.0	-0.168
20	33.800	0.0	-0.450	0.0	-0.450
21	33.800	0.0	-0.690	0.0	-0.690
22	33.800	0.0	-0.627	0.0	-0.627
23	33.800	0.0	-0.850	0.0	-0.850
24	33.800	0.0	-1.149	0.0	-1.149
25	33.800	0.0	-2.510	0.0	-2.510
26	33.800	0.0	-2.520	0.0	-2.520

FEATHERING BEARING HAS BEEN PUT IN SEGMENT 4

* SHEAR CENTER AND NEUTRAL AXIS WERE ASSUMED TO BE AT THE SAME LOCATION

SUPER 540 EXT*DSUPER 540 EXT*D CLCD DATA TABLES USED

CL

ALPHA/MACH	0.0	0.30000	0.50000	0.60000	0.65000	0.70000	0.75000	0.80000	0.85000	0.90000	1.00000
-180.00000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-172.00000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000	0.78000
-161.00000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000	0.62000
-147.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
-129.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
-49.00000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000
-39.00000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000	-1.18000
-21.00000	-0.40000	-0.81000	-0.85000	-0.85000	-0.85000	-0.85000	-0.71500	-0.68000	-0.66400	-0.64000	-0.64100
-18.00000	-0.85800	-0.85800	-0.88200	-0.87000	-0.87000	-0.86400	-0.75400	-0.72200	-0.69800	-0.67000	-0.66800
-14.00000	-1.17000	-1.17000	-0.92800	-0.87100	-0.87200	-0.85300	-0.84100	-0.80100	-0.76700	-0.72800	-0.72800
-12.00000	-1.22000	-1.22000	-0.93500	-0.86700	-0.86700	-0.83900	-0.84000	-0.81800	-0.77800	-0.74000	-0.73700
-11.00000	-1.18000	-1.18000	-0.93400	-0.86200	-0.86000	-0.82900	-0.83200	-0.81200	-0.77700	-0.74000	-0.72600
-10.00000	-1.07000	-1.07000	-0.93000	-0.85300	-0.85400	-0.81500	-0.82000	-0.80300	-0.77000	-0.73400	-0.70500
-9.00000	-0.96800	-0.96800	-0.92000	-0.83800	-0.84000	-0.80500	-0.80100	-0.78100	-0.75200	-0.71800	-0.67200
-8.00000	-0.86000	-0.86000	-0.89000	-0.81300	-0.81900	-0.77800	-0.78000	-0.75300	-0.73000	-0.69000	-0.63200
-7.00000	-0.75300	-0.75300	-0.83000	-0.78400	-0.78500	-0.75400	-0.74200	-0.72000	-0.70400	-0.65200	-0.58100
-6.00000	-0.64500	-0.64500	-0.71000	-0.74500	-0.72200	-0.72100	-0.67900	-0.67200	-0.66800	-0.60100	-0.52000
-4.00000	-0.43000	-0.43000	-0.47400	-0.52400	-0.55600	-0.58900	-0.56500	-0.56000	-0.52000	-0.45000	-0.36000
-2.00000	-0.21500	-0.21500	-0.23700	-0.26200	-0.27800	-0.29800	-0.31200	-0.31200	-0.26000	-0.22500	-0.18000
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2.00000	0.21500	0.21500	0.23700	0.26200	0.27800	0.29800	0.31200	0.31200	0.26000	0.22500	0.18000
4.00000	0.43000	0.43000	0.47400	0.52400	0.55600	0.58900	0.56500	0.56000	0.52000	0.45000	0.36000
6.00000	0.64500	0.64500	0.71000	0.74500	0.72200	0.72100	0.67900	0.67200	0.66800	0.60100	0.52000
7.00000	0.75300	0.75300	0.83000	0.78400	0.78500	0.75400	0.74200	0.72000	0.70400	0.65200	0.58100
8.00000	0.86000	0.86000	0.89000	0.81300	0.81900	0.77800	0.78000	0.75300	0.73000	0.69000	0.63200
9.00000	0.96800	0.96800	0.92000	0.83800	0.84000	0.80500	0.80100	0.78100	0.75200	0.71800	0.67200
10.00000	1.07500	1.07500	0.93000	0.85300	0.85400	0.81500	0.82000	0.80300	0.77000	0.73400	0.70500
11.00000	1.18400	1.18400	0.93400	0.86200	0.86000	0.82900	0.83200	0.81200	0.77700	0.74000	0.72600
12.00000	1.22000	1.22000	0.93500	0.86700	0.86700	0.83900	0.84000	0.81800	0.77800	0.74000	0.73700
14.00000	1.17200	1.17200	0.92800	0.87100	0.87200	0.85300	0.84100	0.80100	0.76700	0.72800	0.72800
18.00000	0.85800	0.85800	0.88200	0.87000	0.87000	0.86400	0.75400	0.72200	0.69800	0.67000	0.66800
21.00000	0.80000	0.81800	0.85000	0.85000	0.85000	0.85000	0.71500	0.68000	0.66400	0.64000	0.64100
39.00000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000
49.00000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000	1.18000
129.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
147.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000	-1.00000
161.00000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000	-0.62000
172.00000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000	-0.78000
180.00000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

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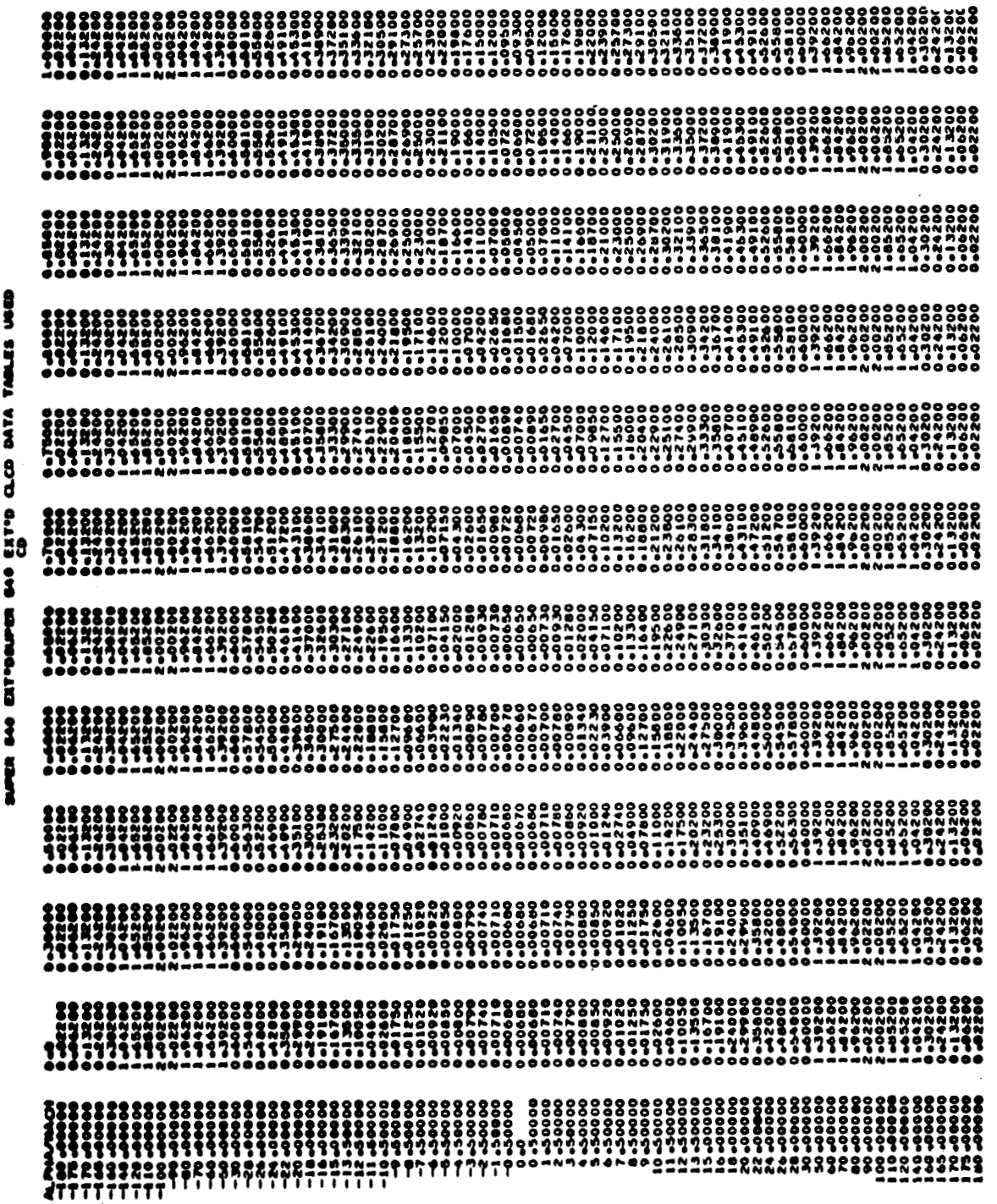

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16. Abstract

Under a NASA research program designated DAMVIBS (Design Analysis Methods for VIBrationS), four U. S. helicopter industry participants (Bell Helicopter, Boeing Vertol, McDonnell Douglas Helicopter, and Sikorsky Aircraft) are to apply existing analytical methods for calculating coupled rotor-fuselage vibrations of the AH-1G helicopter for correlation with flight test data from an AH-1G Operational Load Survey (OLS) test program. Bell Helicopter, as the manufacturer of the AH-1G, was tasked to provide pertinent rotor data and to collect the OLS flight vibration data needed to perform the correlations. The analytical representation of the fuselage structure is based on a NASTRAN finite element model (FEM) developed by Bell which has been extensively documented and correlated with ground vibration test. The AH-1G FEM was provided to each of the participants for use in their coupled rotor-fuselage analyses.
This report describes the AH-1G OLS flight test program and provides the flight conditions and measured vibration data to be used by each participant in their correlation effort. In addition, the mechanical, structural, inertial and aerodynamic data for the AH-1G two-bladed teetering main rotor system are presented. Furthermore, modifications to the NASTRAN FEM of the fuselage structure that are necessary to make it compatible with the OLS test article are described. The AH-1G OLS flight test data was found to be well documented and provides a sound basis for evaluating currently existing analysis methods used for calculation of coupled rotor-fuselage vibrations.

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