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ANALYSIS OF FLEXIBLE AIRCRAFT LONGITUDINAL DYNAMICS AND HANDLING QUALITIES

VOLUME II - DATA

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LIST OF SYMBOLS

Symbol	Meaning
$\mathbf{A}_{(\cdot)}$	plant matrices
$\mathbf{B}_{(\cdot)}$	control matrices
$\tilde{\mathbf{B}}$	modal controllability matrix
BW	bandwidth frequency
$\mathbf{C}$	output matrix (for states)
$\tilde{\mathbf{C}}$	modal observability matrix
$\mathbf{D}_{(\cdot)}$	disturbance matrices
$\tilde{\mathbf{D}}$	modal disturbability matrix
$\mathbf{E}$	output matrix (for controls)
$\mathbf{F}$	output matrix (for disturbances)
$\mathbf{G}_{(\cdot)}$	control matrices
G(s)	plant transfer functions
H(s)	pilot transfer function
J_p	pilot objective functional
K_p	pilot gain (feedforward)
K_x	optimal control gains
ΔK	incremental change in pilot gain K_p
OCM	Optimal Control Model of the pilot
PC	pilot compensation
$\mathbf{Q}$	weighting matrix for output vector
$R_{(\cdot)}$	impulse residue
SP	sensitivity parameter
$\mathbf{T}$	modal matrix
$\bar{V}_{(\cdot)}$	intensity of white noise $(\cdot)$
g	weighting on pilot input rate $(\dot{u}_p)$
l_x	distance from c.g. to pilot station

Symbol	Meaning
n_z	plunge acceleration (g's)
$p_{(\,)}$	pole of a transfer function
$\underline{q}$	modal state vector
r	weighting on pilot input (u_p)
u	perturbed forward velocity (ft/sec)
$\underline{u}$	input vector
v_m	motor noise
v_y	observation noise
w	Gaussian white noise
$\underline{w}$	disturbance vector
$\underline{x}$	state vector
$\dot{\underline{x}}$	state estimate vector
$\underline{y}$	output vector
$z_{(\,)}$	zero of a transfer function
$\Phi_{(\cdot)}$	phase of impulse residue, $R_{(\cdot)}$
α	angle of attack, (rad)
γ	flight path angle, (rad)
$\delta_{(\cdot)}$	control surface deflection
ϵ	attitude tracking error ($\theta - \theta_C$)
ζ	damping ratio
η	generalized deflection, (dimensionless)
$\theta_{(\,)}$	attitude angle, (rad)
$\lambda_{(\cdot)}$	eigenvalue
$\nu_{(\cdot)}$	eigenvector
ξ	damping ratio
σ	real part of eigenvalue, λ
τ	time delay, (sec)
τ_n	neuro-motor lag, (sec)
$\phi_{(\,)}$	mode shape, (ft)
$\phi'_{(\,)}$	mode slope, (ft/ft)
ω	imaginary part of eigenvalue, λ

Symbol	Meaning
	operations
$E\{\cdot\}$	expected value operator
$\lvert\cdot\rvert$	magnitude of $(\cdot)$
$\overline{(\cdot)}$	complex conjugate of $(\cdot)$
$\angle(\cdot)$	phase angle of $(\cdot)$
$\dot{(\cdot)}$	time derivative of $(\cdot)$
	subscripts
C	commanded
R	rigid-body
T	total (rigid-body + elastic)
g	gust
p	pilot
v	vehicle
y	output or measurement

SUMMARY

As aircraft become larger and lighter due to design requirements for increased payload and improved fuel efficiency, they may also become much more flexible. For highly flexible vehicles, the handling qualities may not be accurately predicted by conventional methods. This study applies two analysis methods to a family of flexible aircraft in order to investigate how and when structural (especially dynamic aeroelastic) effects affect the dynamic characteristics of aircraft. The first type of analysis is an open-loop modal analysis technique. This method considers the effect of modal residue magnitudes on determining vehicle handling qualities. The second method is a pilot-in-the-loop analysis procedure that considers several closed-loop system characteristics. Both analyses indicated how dynamic aeroelastic effects can cause a degradation in vehicle tracking performance, based on the evaluation of some simulation results.

This report is divided into two volumes. Volume I consists of the development and application of the two analysis methods described above. Volume II consists of the presentation of the state variable models of the flexible aircraft configurations used in the analysis applications, mode shape plots for the structural modes, numerical results from the modal analysis, frequency response plots from the pilot-in-the-loop analysis and a listing of the modal analysis computer program.

Appendix A.3
Vehicle Configurations
and
Modal Analysis Results

The vehicle configurations are presented in state variable form using the following state and output definitions.

$$\underline{x}_v^T \triangleq [\alpha, \dot{\theta}_R, u, \theta_R, \eta_1, \eta_2, \eta_3, \eta_4, \dot{\eta}_1, \dot{\eta}_2, \dot{\eta}_3, \dot{\eta}_4], \tag{A.3.1}$$

$$\underline{y}^T \triangleq [u, \theta_R, \dot{\theta}_R, \gamma, \theta_T, \dot{\theta}_T, n_z]. \tag{A.3.2}$$

- where all angles are expressed in radians, all angular rates in radians per second, the forward velocity perturbation, u, has units of feet per second and the generalized elastic deflections, η, are dimensionless. The matrices which describe the vehicle configurations are defined in the following equations.

$$\dot{\underline{x}}_v = [\mathbf{AV}]\underline{x}_v + [\mathbf{B}]\underline{x}_p + [\mathbf{D}]\underline{x}_g$$

$$\underline{y} = [\mathbf{C}]\underline{x}_v + [\mathbf{E}]\underline{x}_p + [\mathbf{F}]\underline{x}_g \tag{A.3.3}$$

The vectors, x_p and x_g, are defined Chapter 4.

The results of the modal analysis consist of several parameters which are presented in matrix form. The equations which follow present the definitions of these modal analysis resuits.

The similarity transformation which was used to scale the eigenvectors, as described in Appendix A.1, has the following definition.

$$\mathbf{T} = \text{SCALING MATRIX}$$

$$\triangleq \text{diag}\left[1,\ 1,\ \frac{1}{U_0},\ 1,\ \phi'_1,\ \phi'_2,\right.$$

$$\left.\phi'_3,\ \phi'_4,\ \phi'_1,\ \phi'_2,\ \phi'_3,\ \phi'_4\right] \tag{A.3.4}$$

The scaled system is therefore described by the following set of equations.

$$\tilde{x}_v = \mathbf{T}\, x_v \tag{A.3.5}$$

$$\dot{\tilde{x}}_v = \mathbf{T}[\mathbf{AV}]\mathbf{T}^{-1}\tilde{x}_v + \mathbf{T}[\mathbf{B}]x_p + \mathbf{T}[\mathbf{D}]x_g$$

$$= [\mathbf{AV\text{-}SCALED}]\tilde{x}_v$$

$$+ [\mathbf{B\text{-}SCALED}]x_p + [\mathbf{D\text{-}SCALED}]x_g \tag{A.3.6}$$

$$y = [\mathbf{C}]\mathbf{T}^{-1}\tilde{x}_v + [\mathbf{E}]x_p + [\mathbf{F}]x_g$$

$$= [\mathbf{C\text{-}SCALED}]\tilde{x}_v + [\mathbf{E}]x_p + [\mathbf{F}]x_g \tag{A.3.7}$$

The pilot lag states and gust states are defined in the following equations.

$$\dot{x}_p = [\mathbf{AP}]x_p + [\mathbf{G}_p]\eta_p \tag{A.3.8}$$

$$\dot{x}_g = [\mathbf{AG}]x_g + [\mathbf{G}_g]\eta_g \tag{A.3.9}$$

The complete aircraft system state model used in the modal analysis is defined in the following equations.

$$x^T \triangleq [x_p{}^T,\ x_g{}^T,\ x_v{}^T] \tag{A.3.10}$$

$$\dot{\underline{x}} = \begin{bmatrix} [\mathbf{AP}] & 0 & 0 \\ 0 & [\mathbf{AG}] & 0 \\ [\mathbf{B\text{-}SCALED}] & [\mathbf{D\text{-}SCALED}] & [\mathbf{AV\text{-}SCALED}] \end{bmatrix} \underline{x} + \begin{bmatrix} \mathbf{G_p} \\ 0 \\ 0 \end{bmatrix} \eta_p + \begin{bmatrix} 0 \\ \mathbf{G_g} \\ 0 \end{bmatrix} \eta_g$$

$$= [\mathbf{AA}]\,\underline{x} + [\mathbf{GP}]\,\eta_p + [\mathbf{GG}]\,\eta_g \qquad \text{(A.3.11)}$$

$$\underline{y} = \Big[[\mathbf{E}]\ [\mathbf{F}]\ [\mathbf{C\text{-}SCALED}] \Big] \underline{x}$$

$$= [\mathbf{CC}]\,\underline{x} \qquad \text{(A.3.12)}$$

The modal controllability, disturbability and observability matrices are defined in the following equations.

$$[\mathbf{EE}] \triangleq \text{modal matrix of } [\mathbf{AA}] \qquad \text{(A.3.13)}$$

The modal controllability matrix,

$$[\mathbf{CON}] \triangleq [\mathbf{EE}]^{-1}[\mathbf{GP}]. \qquad \text{(A.3.14)}$$

The modal disturbability matrix,

$$[\mathbf{DIST}] \triangleq [\mathbf{EE}]^{-1}[\mathbf{GG}]. \qquad \text{(A.3.15)}$$

And, the modal observability matrix,

$$[\mathbf{OBS}] \triangleq [\mathbf{CC}]\,[\mathbf{EE}]. \qquad \text{(A.3.16)}$$

The residues for the complete aircraft model are defined as follows. The

residues of the vehicle due to the ith control input are described by,

$$[\mathbf{C\text{–}IMP\ RES}]_i \triangleq \left[[\mathbf{OBS}]\,[\mathbf{CON}]_i\right]^T \qquad \text{(A.3.17)}$$

- where $[\mathbf{CON}]_i$ is the diagonal matrix formed by the ith column of the modal controllability matrix and [**OBS**] is the modal observability matrix. Each kj element of $[\mathbf{C\text{–}IMP\ RES}]_i$ corresponds to the residue of the kth mode for the jth output due to an impulse in the ith control input. Similarly, for the disturbance residues,

$$[\mathbf{D\text{–}IMP\ RES}]_i \triangleq \left[[\mathbf{OBS}]\,[\mathbf{DIST}]_i\right]^T \qquad \text{(A.3.18)}$$

Here, $[\mathbf{DIST}]_i$ is the diagonal matrix formed by the ith column of the modal disturbability matrix and so each kj element of $[\mathbf{D\text{–}IMP\ RES}]_i$ corresponds to the residue of the kth mode for jth output due to an impulse in the ith disturbance input.

The remainder of Appendix A.3 contains the numerical results of the modal analysis and the vehicle matrices for eight data base configurations as described above.

CONFIGURATION 1

THE AU MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	-1.774E+02	-1.568E+01
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	1.407E+01	-5.081E+02
10	1.300E+03	1.833E+01	0.	0.	6.990E+00	3.458E+01
11	7.577E+02	5.595E+01	-3.900E-03	0.	1.623E-02	-5.700E-02
12	1.688E+00	3.990E-02	0.	0.		

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-05
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.983E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	1.000E+00
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	9.159E-01	-1.977E-01
9	-1.540E+01	2.088E+01	-1.139E+00	-2.770E-01	9.131E-01	1.120E-01
10	6.593E+00	-1.124E+01	2.351E-01	-6.596E+00	1.131E-01	1.120E-01
11	-4.555E+02	3.457E+00	-1.219E-01	3.784E+00	-6.485E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.754E-04	-4.080E-01

THE AG MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.258E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.505E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	1.611E+00	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	2.456E-02	3.636E-02
7	2.911E+00	1.672E+00	1.742E-03	1.103E-01	2.627E-03	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

GP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE SCALING MATRIX (12 BY 12)

	1	2	3	4	5	6
1	1.000E+00	0.	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.	0.
3	0.	0.	1.054E-03	0.	0.	0.
4	0.	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	0.	-2.640E-02	0.
6	0.	0.	0.	0.	0.	-3.300E-02
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.
12	0.	0.	0.	0.	0.	0.

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	-3.456E-02	0.	0.	0.	0.	0.
8	0.	-3.636E-02	0.	0.	0.	0.
9	0.	0.	-2.640E-02	0.	0.	0.
10	0.	0.	0.	-3.300E-02	0.	0.
11	0.	0.	0.	0.	-3.456E-02	0.
12	0.	0.	0.	0.	0.	-3.636E-02

THE AV-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.380E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.762E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-1.774E+02	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+0.
12	-5.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-1.139E+00	-2.216E-01	6.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.590E+00	1.080E-01	1.017E-01
11	-4.565E+02	3.286E+00	-1.596E-01	3.583E+00	-8.405E-01	-2.410E-01
12	7.482E-03	-4.649E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00
11	-2.190E+01
12	[illegible]

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-8.103E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-8.424E+01	-4.599E+01	-6.597E-02	-3.342E+00	-7.602E-02	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-1.774E+02
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.385E-01	0.	0.	1.759E+01
14	-2.129E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.188E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-1.139E+00	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-8.556E+00	1.080E-01	1.017E-01
14	3.621E+01	-4.565E+02	3.286E+00	-1.596E-01	3.963E+00	-8.495E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-6.103E+01	-9.740E+01	-8.424E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	-6.597E-02	-3.342E+00	-7.602E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.47603E+00	2.20486E+01	3.58072E+00	.19894977	2.23412E-01
3	-6.55694E-01	1.33471E+01	2.12681E+00	.04906728	1.525!0E+00
5	-4.70193E-01	2.12609E+01	3.38461E+00	.02210715	2.127062+00
7	-2.03801E-01	2.20195E+01	3.50407E+00	.00925507	4.90674E+00
9	-1.31501E+00	2.43707E+00	4.40754E-01	.47486775	7.60451E-01
11	-5.79127E-04	9.69502E-02	1.58389E-02	.00600029	1.72074E+03
13	-6.06667E+00	0.	0.	1.00000000	1.50000E-01
15	-9.59000E+00	0.	0.	1.00000000	1.05263E-01
[illegible]	[illegible]	0.	0.	1.00000000	[illegible]

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-7.909E-03, 7.464E-04)	(-7.909E-03,-7.464E-04)	(9.685E-04,-3.129E-03)	(9.685E-04, 3.129E-03)
5	(-9.447E-03,-6.303E-02)	(-9.447E-03, 6.303E-02)	(4.184E-02,-1.081E-03)	(4.184E-02, 1.081E-03)
6	(-4.917E-06,-1.255E-05)	(-4.917E-06, 1.255E-05)	(1.415E-05, 6.471E-07)	(1.415E-05,-6.471E-07)
7	(-2.662E-03, 9.688E-04)	(-2.662E-03,-9.688E-04)	(-2.344E-04,-3.123E-03)	(-2.344E-04, 3.123E-03)
8	(4.696E-04, 1.964E-03)	(4.696E-04,-1.964E-03)	(3.458E-02, 6.583E-02)	(3.458E-02,-6.583E-02)
9	(1.718E-02, 3.596E-02)	(1.718E-02,-3.596E-02)	(2.022E-03, 3.840E-03)	(2.022E-03,-3.840E-03)
10	(-1.164E-02,-1.536E-02)	(-1.164E-02, 1.536E-02)	(7.181E-04, 3.092E-03)	(7.181E-04,-3.092E-03)
11	(1.520E-05,-2.171E-05)	(1.520E-05, 2.171E-05)	(2.202E-06, 3.839E-06)	(2.202E-06,-3.839E-06)
12	(-4.539E-02, 1.566E-03)	(-4.539E-02,-1.566E-03)	(-9.014E-01, 4.184E-01)	(-9.014E-01,-4.184E-01)
13	(-8.698E-01, 2.178E-01)	(-8.698E-01,-2.178E-01)	(-5.258E-02, 2.447E-02)	(-5.258E-02,-2.447E-02)
14	(3.907E-01,-1.879E-01)	(3.907E-01, 1.879E-01)	(-4.173E-02, 7.557E-03)	(-4.173E-02,-7.557E-03)
15	(4.107E-04, 4.324E-04)	(4.107E-04,-4.324E-04)	(-5.268E-05, 2.687E-05)	(-5.268E-05,-2.687E-05)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-1.990E-04,-1.142E-03)	(-1.990E-04, 1.142E-03)	(-3.071E-06, 1.554E-04)	(-3.071E-06,-1.554E-04)
5	(1.572E-02,-9.252E-03)	(1.572E-02, 9.252E-03)	(-3.066E-03, 4.699E-03)	(-3.066E-03,-4.699E-03)
6	(2.558E-06,-1.020E-06)	(2.559E-06, 1.020E-06)	(-3.947E-07, 3.303E-07)	(-3.947E-07,-3.303E-07)
7	(-4.513E-04,-7.295E-04)	(-4.513E-04, 7.295E-04)	(2.147E-04, 1.372E-04)	(2.147E-04,-1.372E-04)
8	(-2.991E-03, 2.045E-03)	(-2.991E-03,-2.045E-03)	(2.566E-03,-7.441E-04)	(2.566E-03, 7.441E-04)
9	(-1.191E-03, 1.565E-03)	(-1.191E-03,-1.565E-03)	(-9.133E-04, 1.584E-03)	(-9.133E-04,-1.584E-03)
10	(-4.485E-02,-1.331E-02)	(-4.485E-02, 1.331E-02)	(1.159E-02,-1.751E-03)	(1.159E-02, 1.751E-03)
11	(-1.294E-05,-1.489E-06)	(-1.294E-05, 1.489E-06)	(-4.346E-02,-4.657E-03)	(-4.346E-02, 4.657E-03)
12	(-4.207E-02,-6.456E-02)	(-4.207E-02, 6.456E-02)	(1.586E-02, 5.666E-02)	(1.586E-02,-5.666E-02)
13	(-3.271E-02,-2.605E-02)	(-3.271E-02, 2.605E-02)	(-3.470E-02,-2.043E-02)	(-3.470E-02, 2.043E-02)
14	(3.041E-01,-9.473E-01)	(3.041E-01, 9.473E-01)	(3.619E-02, 2.756E-01)	(3.619E-02,-2.556E-01)
15	(3.773E-05,-2.744E-04)	(3.773E-05, 2.744E-04)	(1.114E-01,-9.559E-01)	(1.114E-01, 9.559E-01)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-8.461E-02, 3.264E-01)	(-8.461E-02,-3.264E-01)	(-1.164E-02, 1.484E-01)	(-1.164E-02,-1.484E-01)
5	(-9.003E-01,-3.465E-01)	(-8.003E-01, 3.465E-01)	(-4.280E-03,-7.984E-02)	(-4.280E-03, 7.984E-02)
6	(-6.390E-03, 2.846E-03)	(-6.390E-03,-2.846E-03)	(3.247E-02,-3.526E-01)	(3.247E-02, 3.526E-01)
7	(2.714E-02, 3.133E-01)	(2.714E-02,-3.133E-01)	(-9.179E-01, 5.534E-02)	(-9.179E-01,-5.534E-02)
8	(-2.774E-02, 3.275E-02)	(-2.774E-02,-3.275E-02)	(-1.462E-03, 1.609E-02)	(-1.462E-03,-1.609E-02)
9	(6.567E-03,-2.747E-02)	(6.567E-03, 2.747E-02)	(9.313E-04,-1.205E-02)	(9.313E-04, 1.205E-02)
10	(9.008E-03,-1.841E-02)	(9.008E-03, 1.841E-02)	(7.476E-04,-8.906E-03)	(7.476E-04, 8.906E-03)
11	(1.134E-05,-3.282E-05)	(1.134E-05, 3.282E-05)	(1.230E-06,-1.529E-05)	(1.230E-06, 1.529E-05)
12	(-4.333E-02,-1.107E-01)	(-4.333E-02, 1.107E-01)	(-1.398E-03,-1.364E-04)	(-1.398E-03, 1.364E-04)
13	(5.832E-02, 5.213E-02)	(5.832E-02,-5.213E-02)	(1.047E-03, 8.795E-05)	(1.047E-03,-8.795E-05)

14	(3.303E-02, 4.617E-02)	(3.303E-02,-4.617E-02)	(7.740E-04, 7.016E-05)	(7.740E-04,-7.016E-05)
15	(6.508E-05, 7.079E-05)	(6.508E-05,-7.079E-05)	(1.328E-06, 1.158E-07)	(1.328E-06,-1.158E-07)

	13	14	15
1	(3.161E-01, 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(9.146E-01, 0.)
3	(0. , 0.)	(5.106E-01, 0.)	(-2.063E-01, 0.)
4	(-1.043E-01, 0.)	(1.007E-06, 0.)	(2.741E-04, 0.)
5	(7.103E-01, 0.)	(5.398E-01, 0.)	(-2.203E-01, 0.)
6	(-9.580E-04, 0.)	(-2.035E-04, 0.)	(8.559E-05, 0.)
7	(-1.065E-01, 0.)	(-5.682E-02, 0.)	(2.344E-02, 0.)
8	(8.887E-02, 0.)	(4.962E-02, 0.)	(-2.020E-02, 0.)
9	(1.557E-02, 0.)	(-4.189E-02, 0.)	(1.694E-02, 0.)
10	(-8.650E-03, 0.)	(-2.562E-02, 0.)	(1.039E-02, 0.)
11	(8.287E-06, 0.)	(-4.496E-05, 0.)	(1.821E-05, 0.)
12	(-5.925E-01, 0.)	(-4.714E-01, 0.)	(1.899E-01, 0.)
13	(-1.038E-01, 0.)	(3.980E-01, 0.)	(-1.592E-01, 0.)
14	(5.768E-02, 0.)	(2.434E-01, 0.)	(-9.770E-02, 0.)
15	(-5.525E-05, 0.)	(4.271E-04, 0.)	(-1.711E-04, 0.)

THE CON VECTOR (15 BY 1)

	1
1	(-9.304E-03, 7.780E-02)
2	(-9.304E-03,-7.780E-02)
3	(-1.725E+00, 1.214E+00)
4	(-1.725E+00,-1.214E+00)
5	(-5.224E-01,-7.787E-02)
6	(-5.224E-01, 7.787E-02)
7	(-1.818E-05,-8.475E-06)
8	(-1.818E-05, 8.475E-06)
9	(9.815E-01,-7.601E-01)
10	(9.815E-01, 7.601E-01)
11	(1.096E-01, 5.935E-03)
12	(1.096E-01,-5.935E-03)
13	(3.164E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(7.835E-02, 9.682E+01)
2	(7.835E-02,-9.682E+01)
3	(2.109E+00, 1.449E+02)
4	(2.109E+00,-1.449E+02)
5	(5.281E-01,-1.715E+02)
6	(5.281E-01, 1.715E+02)
7	(2.006E-05,-1.550E+02)
8	(2.006E-05, 1.550E+02)
9	(1.241E+00,-3.775E+01)
10	(1.241E+00, 3.775E+01)
11	(1.097E-01, 3.101E+00)
12	(1.097E-01,-3.101E+00)
13	(3.164E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(4.942E-03,-3.728E-03)
2	(4.942E-03, 3.728E-03)
3	(-3.764E-03, 7.477E-04)
4	(-3.764E-03,-7.477E-04)
5	(-5.511E-03,-1.547E-03)
6	(-5.511E-03, 1.547E-03)
7	(-4.359E-06,-6.243E-06)
8	(-4.359E-06, 6.243E-06)
9	(1.542E-03,-6.891E-05)
10	(1.542E-03, 6.891E-05)
11	(3.274E-06, 2.545E-05)
12	(3.274E-06,-2.545E-05)
13	(0. , 0.)
14	(4.529E-01, 0.)
15	(1.093E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(6.190E-03,-3.703E+01)
2	(6.190E-03, 3.703E+01)
3	(3.838E-03, 1.688E+02)
4	(3.838E-03,-1.688E+02)
5	(5.724E-03,-1.643E+02)
6	(5.724E-03, 1.643E+02)
7	(7.614E-06,-1.249E+02)
8	(7.614E-06, 1.249E+02)
9	(1.543E-03,-2.559E+00)
10	(1.543E-03, 2.559E+00)
11	(2.566E-05, 8.267E+01)
12	(2.566E-05,-8.267E+01)
13	(0. , 0.)
14	(4.529E-01, 0.)
15	(1.093E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-4.666E-03,-1.191E-02)	(-4.666E-03, 1.191E-02)	(1.342E-02, 6.141E-04)	(1.342E-02,-6.141E-04)
2	(-2.662E-03, 9.688E-04)	(-2.662E-03,-9.688E-04)	(-2.344E-04,-3.123E-03)	(-2.344E-04, 3.123E-03)
3	(-9.447E-03,-6.303E-02)	(-9.447E-03, 6.303E-02)	(4.184E-02,-1.081E-03)	(4.184E-02, 1.081E-03)
4	(5.247E-03, 2.224E-04)	(5.247E-03,-2.224E-04)	(-1.203E-03, 6.319E-06)	(-1.203E-03,-6.319E-06)
5	(-8.687E-03,-2.156E-02)	(-8.687E-03, 2.156E-02)	(-3.758E-02,-7.589E-02)	(-3.758E-02, 7.589E-02)
6	(5.146E-01,-9.495E-02)	(5.146E-01, 9.495E-02)	(1.038E+00,-4.515E-01)	(1.038E+00, 4.515E-01)
7	(2.097E+00,-2.947E+00)	(2.057E+00, 2.947E+00)	(-2.179E+00,-4.790E+00)	(-2.179E+00, 4.790E+00)

	5	6	7	8
1	(2.428E-03,-9.683E-04)	(2.428E-03, 9.683E-04)	(-3.745E-04, 3.135E-04)	(-3.745E-04,-3.135E-04)
2	(-4.513E-04,-7.295E-04)	(-4.513E-04, 7.295E-04)	(2.147E-04, 1.372E-04)	(2.147E-04,-1.372E-04)
3	(1.572E-02,-9.252E-03)	(1.572E-02, 9.252E-03)	(-3.066E-03, 4.699E-03)	(-3.066E-03,-4.699E-03)
4	(-2.523E-04, 4.128E-04)	(-2.523E-04,-4.128E-04)	(2.177E-04,-1.814E-05)	(2.177E-04, 1.814E-05)
5	(4.859E-02, 8.973E-03)	(4.859E-02,-8.973E-03)	(3.043E-02, 5.705E-03)	(3.043E-02,-5.705E-03)
6	(-2.136E-01, 1.029E+00)	(-2.136E-01,-1.029E+00)	(-1.316E-01, 6.688E-01)	(-1.318E-01,-6.688E-01)
7	(4.142E+00, 1.010E+00)	(4.142E+00,-1.010E+00)	(1.070E+00, 2.966E-01)	(1.070E+00,-2.966E-01)

	9	10	11	12
1	(-6.064E+00, 2.700E+00)	(-6.064E+00,-2.700E+00)	(3.082E+01,-3.346E+02)	(3.082E+01, 3.346E+02)
2	(2.714E-02, 3.138E-01)	(2.714E-02,-3.138E-01)	(-9.179E-01, 5.534E-02)	(-9.179E-01,-5.534E-02)
3	(-8.003E-01,-3.465E-01)	(-8.003E-01, 3.465E-01)	(-4.280E-03,-7.984E-02)	(-4.280E-03, 7.984E-02)
4	(1.117E-01,-1.260E-02)	(1.117E-01, 1.260E-02)	(-9.062E-01,-9.307E-02)	(-9.062E-01, 9.307E-02)
5	(3.925E-02, 3.269E-01)	(3.929E-02,-3.269E-01)	(-9.181E-01, 6.021E-02)	(-9.181E-01,-6.021E-02)
6	(-8.494E-01,-3.342E-01)	(-8.484E-01, 3.342E-01)	(-4.704E-03,-7.986E-02)	(-4.704E-03, 7.986E-02)
7	(3.410E-01, 5.624E+00)	(3.410E-01,-5.624E+00)	(2.679E-01,-2.324E+00)	(2.679E-01, 2.324E+00)

	13	14	15
1	(-9.092E-01, 0.)	(-1.931E-01, 0.)	(8.123E-02, 0.)
2	(-1.065E-01, 0.)	(-5.682E-02, 0.)	(2.344E-02, 0.)
3	(7.103E-01, 0.)	(5.398E-01, 0.)	(-2.203E-01, 0.)
4	(-2.238E-03, 0.)	(-5.682E-02, 0.)	(2.315E-02, 0.)
5	(-2.023E-01, 0.)	(-3.888E-02, 0.)	(1.629E-02, 0.)
6	(1.349E+00, 0.)	(3.694E-01, 0.)	(-1.531E-01, 0.)
7	(-7.071E+00, 0.)	(5.859E+00, 0.)	(-2.382E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.279E-02,-1.114E+02)	(1.279E-02, 1.114E+02)	(1.344E-02, 2.619E+00)	(1.344E-02,-2.619E+00)
2	(2.833E-03, 1.600E+02)	(2.833E-03,-1.600E+02)	(3.132E-03,-9.429E+01)	(3.132E-03, 9.429E+01)
3	(6.373E-02,-9.652E+01)	(6.373E-02, 9.652E+01)	(4.185E-02,-1.481E+00)	(4.185E-02, 1.481E+00)
4	(5.252E-03, 2.427E+00)	(5.252E-03,-2.427E+00)	(1.203E-03, 1.797E+02)	(1.203E-03,-1.797E+02)
5	(2.326E-02,-1.119E+02)	(2.326E-02, 1.119E+02)	(8.468E-02,-1.163E+02)	(8.468E-02, 1.163E+02)
6	(5.233E-01,-1.045E+01)	(5.233E-01, 1.045E+01)	(1.132E+00,-2.352E+01)	(1.132E+00, 2.352E+01)
7	(3.017E+00,-5.456E+01)	(3.017E+00, 5.456E+01)	(5.262E+00,-1.145E+02)	(5.262E+00, 1.145E+02)

	5	6	7	8
1	(2.614E-03,-2.174E+01)	(2.614E-03, 2.174E+01)	(4.884E-04, 1.401E+02)	(4.884E-04,-1.401E+02)
2	(8.578E-04,-1.217E+02)	(8.578E-04, 1.217E+02)	(2.548E-04, 3.259E+01)	(2.548E-04,-3.259E+01)
3	(1.824E-02,-3.048E+01)	(1.824E-02, 3.048E+01)	(5.610E-03, 1.231E+02)	(5.610E-03,-1.231E+02)
4	(4.838E-04, 1.214E+02)	(4.838E-04,-1.214E+02)	(2.185E-04,-4.763E+00)	(2.185E-04, 4.763E+00)
5	(4.941E-02, 1.046E+01)	(4.941E-02,-1.046E+01)	(3.096E-02, 1.062E+01)	(3.096E-02,-1.062E+01)
6	(1.051E+00, 1.017E+02)	(1.051E+00,-1.017E+02)	(6.817E-01, 1.012E+02)	(6.817E-01,-1.012E+02)
7	(4.264E+00, 1.370E+01)	(4.264E+00,-1.370E+01)	(1.111E+00, 1.549E+01)	(1.111E+00,-1.549E+01)

	9	10	11	12
1	(6.638E+00, 1.560E+02)	(6.638E+00,-1.560E+02)	(3.360E+02,-8.474E+01)	(3.360E+02, 8.474E+01)
2	(3.149E-01, 8.508E+01)	(3.149E-01,-8.508E+01)	(9.198E-01, 1.765E+02)	(9.198E-01,-1.765E+02)
3	(8.721E-01,-1.566E+02)	(8.721E-01, 1.566E+02)	(7.996E-02,-9.307E+01)	(7.996E-02, 9.307E+01)
4	(1.125E-01,-6.431E+00)	(1.125E-01, 6.431E+00)	(9.110E-01,-1.741E+02)	(9.110E-01, 1.741E+02)
5	(3.293E-01, 8.315E+01)	(3.293E-01,-8.315E+01)	(9.201E-01, 1.782E+02)	(9.201E-01,-1.782E+02)
6	(9.119E-01,-1.585E+02)	(9.119E-01, 1.585E+02)	(8.000E-02,-9.337E+01)	(8.000E-02, 9.337E+01)
7	(5.634E+00, 8.653E+01)	(5.634E+00,-8.653E+01)	(2.339E+00,-8.342E+01)	(2.339E+00, 8.342E+01)

	13	14	15
1	(9.092E-01, 1.800E+02)	(1.931E-01, 1.800E+02)	(8.123E-02, 0.)
2	(1.065E-01, 1.800E+02)	(5.982E-02, 1.800E+02)	(2.344E-02, 0.)
3	(7.103E-01, 0.)	(5.398E-01, 0.)	(2.203E-01, 1.800E+02)
4	(2.238E-03, 1.800E+02)	(5.682E-02, 1.800E+02)	(2.316E-02, 0.)
5	(2.023E-01, 1.800E+02)	(3.828E-02, 1.800E+02)	(1.629E-02, 0.)
6	(1.348E+00, 0.)	(3.694E-01, 0.)	(1.531E-01, 1.800E+02)
7	(7.071E+00, 1.800E+02)	(5.859E+00, 0.)	(2.362E+00, 1.800E+02)

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**************************************
**        RESIDUE MATRICES          **
**************************************
***   ROWS CORRESPOND TO MODES     ***
*** COLUMNS CORRESPOND TO OUTPUTS  ***
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IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(9.703E-04,-2.522E-04)	(-5.061E-05,-2.161E-04)	(4.991E-03,-1.486E-04)	(-6.612E-05, 4.062E-04)
2	(9.703E-04, 2.522E-04)	(-5.061E-05, 2.161E-04)	(4.991E-03, 1.486E-04)	(-6.612E-05,-4.062E-04)
3	(-2.390E-02, 1.524E-02)	(4.195E-03, 5.102E-03)	(-7.085E-02, 5.265E-02)	(2.067E-03,-1.471E-03)
4	(-2.390E-02,-1.524E-02)	(4.195E-03,-5.102E-03)	(-7.085E-02,-5.265E-02)	(2.067E-03, 1.471E-03)
5	(-1.344E-03, 3.167E-04)	(1.789E-04, 4.162E-04)	(-8.933E-03, 3.609E-03)	(1.640E-04,-1.960E-04)
6	(-1.344E-03,-3.167E-04)	(1.789E-04,-4.162E-04)	(-8.933E-03,-3.609E-03)	(1.640E-04, 1.960E-04)
7	(9.465E-09,-2.524E-09)	(-2.739E-09,-4.314E-09)	(9.555E-08,-5.943E-08)	(-4.112E-09,-1.516E-09)
8	(9.465E-09, 2.524E-09)	(-2.739E-09, 4.314E-09)	(9.555E-08, 5.943E-08)	(-4.112E-09, 1.516E-09)
9	(-3.895E+00, 7.259E+00)	(2.651E-01, 2.873E-01)	(-1.049E+00, 2.682E-01)	(1.001E-01,-9.730E-02)
10	(-3.899E+00,-7.259E+00)	(2.651E-01,-2.873E-01)	(-1.049E+00,-2.682E-01)	(1.001E-01, 9.730E-02)
11	(5.362E+00,-3.647E+01)	(-1.009E-01, 6.148E-04)	(4.969E-06,-8.772E-03)	(-9.873E-02,-1.557E-02)
12	(5.362E+00, 3.647E+01)	(-1.009E-01,-6.148E-04)	(4.969E-06, 8.772E-03)	(-9.873E-02, 1.557E-02)
13	(-2.876E+00, 0.)	(-3.371E-01, 0.)	(2.247E+00, 0.)	(-7.080E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(1.759E-03,-4.751E-04)	(2.599E-03, 4.092E-02)	(2.097E-01, 1.906E-01)
2	(1.759E-03, 4.751E-04)	(2.599E-03,-4.092E-02)	(2.097E-01,-1.906E-01)
3	(1.569E-01, 8.531E-02)	(-1.242E+00, 2.038E+00)	(9.572E+00, 5.617E+00)
4	(1.569E-01,-8.531E-02)	(-1.242E+00,-2.038E+00)	(9.572E+00,-5.617E+00)
5	(-2.468E-02,-8.471E-03)	(1.917E-01,-5.208E-01)	(-2.085E+00,-8.500E-01)
6	(-2.468E-02, 8.471E-03)	(1.917E-01, 5.208E-01)	(-2.085E+00, 8.500E-01)
7	(-5.047E-07,-3.616E-07)	(8.065E-06,-1.104E-05)	(-1.694E-05,-1.446E-05)
8	(-5.047E-07, 3.616E-07)	(8.065E-06, 1.104E-05)	(-1.694E-05, 1.446E-05)
9	(2.870E-01, 2.910E-01)	(-1.087E+00, 3.169E-01)	(4.609E+00, 5.260E+00)
10	(2.870E-01,-2.910E-01)	(-1.087E+00,-3.169E-01)	(4.609E+00,-5.260E+00)
11	(-1.009E-01, 1.148E-03)	(-4.134E-05,-8.777E-03)	(4.314E-02,-2.530E-01)
12	(-1.009E-01,-1.148E-03)	(-4.134E-05, 8.777E-03)	(4.314E-02, 2.530E-01)
13	(-6.402E-01, 0.)	(4.268E+00, 0.)	(-2.237E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.002E-03,-1.457E+01)	(2.220E-04,-1.032E+02)	(4.994E-03,-1.705E+00)	(4.115E-04, 9.925E+01)
2	(1.002E-03, 1.457E+01)	(2.220E-04, 1.032E+02)	(4.994E-03, 1.705E+00)	(4.115E-04,-9.925E+01)
3	(2.834E-02, 1.475E+02)	(6.605E-03, 5.057E+01)	(8.827E-02, 1.434E+02)	(2.537E-03,-3.544E+01)
4	(2.834E-02,-1.475E+02)	(6.605E-03,-5.057E+01)	(8.827E-02,-1.434E+02)	(2.537E-03, 3.544E+01)
5	(1.380E-03, 1.667E+02)	(4.530E-04, 6.674E+01)	(9.634E-03, 1.580E+02)	(2.555E-04,-5.009E+01)
6	(1.380E-03,-1.667E+02)	(4.530E-04,-6.674E+01)	(634E-03,-1.580E+02)	(2.555E-04, 5.009E+01)
7	(9.[illegible]E-09,-1.493E+01)	(5.110E-09,-1.224E+02)	(125E-07,-3.188E+01)	(4.382E-09,-1.598E+02)
8	(9.798E-09, 1.493E+01)	(5.110E-09, 1.224E+02)	(1.125E-07, 3.188E+01)	(4.382E-09, 1.598E+02)
9	(8.240E+00, 1.182E+02)	(3.909E-01, 4.730E+01)	(1.083E+00, 1.657E+02)	(1.396E-01,-4.418E+01)
10	(8.240E+00,-1.182E+02)	(3.909E-01,-4.730E+01)	(1.083E+00,-1.657E+02)	(1.396E-01, 4.418E+01)
11	(3.687E+01,-8.164E+01)	(1.009E-01, 1.797E+02)	(8.772E-03,-8.987E+01)	(9.995E-02,-1.710E+02)
12	(3.687E+01, 8.164E+01)	(1.009E-01,-1.797E+02)	(8.772E-03, 8.987E+01)	(9.995E-02, 1.710E+02)
13	(2.87EE+00, 1.800E+02)	(3.371E-01, 1.800E+02)	(2.247E+00, 0.)	(7.080E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(1.822E-03,-1.511E+01)	(4.100E-02, 8.637E+01)	(2.834E-01, 4.226E+01)
2	(1.822E-03, 1.511E+01)	(4.100E-02,-8.637E+01)	(2.834E-01,-4.226E+01)
3	(1.788E-01, 2.853E+01)	(2.387E+00, 1.213E+02)	(1.110E+01, 3.046E+01)
4	(1.788E-01,-2.853E+01)	(2.387E+00,-1.213E+02)	(1.110E+01,-3.046E+01)
5	(2.610E-02,-1.611E+02)	(5.550E-01,-6.979E+01)	(2.252E+00,-1.578E+02)
6	(2.610E-02, 1.611E+02)	(5.550E-01, 6.979E+01)	(2.252E+00, 1.578E+02)
7	(6.209E-07,-1.444E+02)	(1.367E-05,-5.385E+01)	(2.227E-05,-1.395E+02)
8	(6.209E-07, 1.444E+02)	(1.367E-05, 5.385E+01)	(2.227E-05, 1.395E+02)
9	(4.088E-01, 4.539E+01)	(1.132E+00, 1.637E+02)	(6.994E+00, 4.878E+01)
10	(4.088E-01,-4.539E+01)	(1.132E+00,-1.637E+02)	(6.994E+00,-4.878E+01)
11	(1.099E-01, 1.793E+02)	(8.777E-03,-9.027E+01)	(2.568E-01,-8.032E+01)
12	(1.009E-01,-1.793E+02)	(8.777E-03, 9.027E+01)	(2.568E-01, 8.032E+01)
13	(6.402E-01, 1.800E+02)	(4.269E+00, 0.)	(2.237E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

IMPULSE RESIDUE MATRIX FOR DISTURBANCE - 1

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-6.747E-05,-4.147E-05)	(-9.542E-06, 1.471E-05)	(-2.816E-04,-2.762E-04)	(2.676E-05,-1.846E-05)
2	(-6.747E-05, 4.147E-05)	(-9.542E-06,-1.471E-05)	(-2.816E-04, 2.762E-04)	(2.676E-05, 1.8[illegible]-05)
3	(-5.099E-05, 7.726E-06)	(3.218E-06, 1.158E-05)	(-1.567E-04, 3.535E-05)	(4.523E-06,-9.232E-07)
4	(-5.099E-05,-7.726E-06)	(3.218E-06,-1.158E-05)	(-1.567E-04,-3.535E-05)	(4.523E-06, 9.232E-07)
5	(-1.486E-05, 1.580E-06)	(1.358E-06, 4.718E-06)	(-1.010E-04, 2.606E-05)	(2.029E-06,-1.884E-06)
6	(-1.486E-05,-1.580E-05)	(1.358E-06,-4.718E-06)	(-1.010E-04,-2.606E-05)	(2.029E-06, 1.884E-06)
7	(3.590E-09, 9.718E-10)	(-7.903E-11,-1.938E-09)	(4.270E-08,-1.345E-09)	(-1.062E-09,-1.280E-09)
8	(3.590E-09,-9.718E-10)	(-7.903E-11, 1.938E-09)	(4.270E-08, 1.345E-09)	(-1.062E-09, 1.280E-09)
9	[illegible].163E-03, 4.581E-03)	(6.345E-05, 4.818E-04)	(-1.258E-03,-4.750E-04)	(1.714E-04,-2.712E-05)
10	(-9.163E-03,-4.581E-03)	(6.345E-05,-4.818E-04)	(-1.258E-03, 4.790E-04)	(1.714E-04, 2.712E-05)
11	(8.615E-03,-3.113E-04)	(-4.413E-06,-2.317E-05)	(2.018E-06,-3.703E-07)	(-5.986E-07,-2.330E-05)
12	(8.615E-03, 3.113E-04)	(-4.413E-06, 2.317E-05)	(2.018E-06, 3.703E-07)	(-5.986E-07, 2.330E-05)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-8.745E-02, 0.)	(-2.573E-02, 0.)	(2.445E-01, 0.)	(-2.573E-02, 0.)
15	(8.881E-02, 0.)	(2.562E-02, 0.)	(-2.409E-01, 0.)	(2.532E-02, 0.)

	5	6	7
1	(-1.234E-04,-7.424E-05)	(2.189E-03,-2.388E-03)	(-6.196E-04,-2.238E-02)
2	(-1.234E-04, 7.424E-05)	(2.189E-03, 2.388E-03)	(-6.196E-04, 2.238E-02)
3	(1.981E-04, 2.576E-04)	(-3.568E-03, 2.475E-03)	(1.178E-02, 1.640E-02)
4	(1.981E-04,-2.576E-04)	(-3.568E-03,-2.475E-03)	(1.178E-02,-1.640E-02)
5	(-2.539E-04,-1.246E-04)	(2.769E-03,-5.339E-03)	(-2.127E-02,-1.197E-02)
6	(-2.539E-04, 1.246E-04)	(2.769E-03, 5.339E-03)	(-2.127E-02, 1.197E-02)
7	(-9.702E-08,-2.148E-07)	(4.750E-06,-2.093E-06)	(-2.814E-06,-7.974E-06)
8	(-9.702E-08, 2.148E-07)	(4.750E-06, 2.093E-06)	(-2.814E-06, 7.974E-06)
9	(8.310E-05, 5.013E-04)	(-1.331E-03,-4.567E-04)	(9.133E-04, 8.646E-03)
10	(8.310E-05,-5.013E-04)	(-1.331E-03, 4.567E-04)	(9.133E-04,-8.646E-03)
11	(-4.539E-05,-2.316E-05)	(2.017E-06,-3.811E-07)	(6.000E-[illegible],-7.900E-07)
12	(-4.539E-06, 2.316E-05)	(2.017E-06, 3.811E-07)	(6.000E-05, 7.900E-07)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-1.761E-02, 0.)	(1.673E-01, 0.)	(2.653E+00, 0.)
15	(1.781E-02, 0.)	(-1.674E-01, 0.)	(-2.583E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.920E-05,-1.484E+02)	(1.753E-05, 1.230E+02)	(3.945E-04,-1.356E+02)	(3.251E-05,-3.460E+01)
2	(7.920E-05, 1.484E+02)	(1.753E-05,-1.230E+02)	(3.945E-04, 1.356E+02)	(3.251E-05, 3.460E+01)
3	(5.157E-05, 1.714E+02)	(1.202E-05, 7.447E+01)	(1.606E-04, 1.673E+02)	(4.616E-06,-1.154E+01)
4	(5.157E-05,-1.714E+02)	(1.202E-05,-7.447E+01)	(1.606E-04,-1.673E+02)	(4.616E-06, 1.154E+01)
5	(1.496E-05, 1.739E+02)	(4.910E-06, 7.394E+01)	(1.044E-04, 1.652E+02)	(2.769E-06,-4.288E+01)
6	(1.496E-05,-1.739E+02)	(4.910E-06,-7.394E+01)	(1.044E-04,-1.652E+02)	(2.769E-06, 4.288E+01)
7	(3.719E-09, 1.515E+01)	(1.940E-09,-9.233E+01)	(4.272E-08,-1.804E+00)	(1.664E-09,-1.297E+02)
8	(3.719E-09,-1.515E+01)	(1.940E-09, 9.233E+01)	(4.272E-08, 1.804E+00)	(1.664E-09, 1.297E+02)
9	(1.024E-02, 1.534E+02)	(4.860E-04, 8.250E+01)	(1.346E-03,-1.592E+02)	(1.735E-04,-8.990E+00)
10	(1.024E-02,-1.534E+02)	(4.860E-04,-8.250E+01)	(1.346E-03, 1.592E+02)	(1.735E-04, 8.990E+00)
11	(8.621E-03,-2.069E+00)	(2.359E-05,-1.008E+02)	(2.051E-06,-1.040E+01)	(2.337E-05,-9.147E+01)
12	(8.621E-03, 2.069E+00)	(2.359E-05, 1.008E+02)	(2.051E-06, 1.040E+01)	(2.337E-05, 9.147E+01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(8.745E-02, 1.800E+02)	(2.573E-02, 1.800E+02)	(2.445E-01, 0.)	(2.573E-02, 1.800E+02)
15	(8.881E-02, 0.)	(2.562E-02, 0.)	(2.409E-01, 1.800E+02)	(2.532E-02, 0.)

	5	6	7
1	(1.440E-04,-1.490E+02)	(3.239E-03,-4.748E+01)	(2.239E-02,-9.159E+01)
2	(1.440E-04, 1.490E+02)	(3.239E-03, 4.748E+01)	(2.239E-02, 9.159E+01)
3	(3.250E-04, 5.244E+01)	(4.342E-03, 1.452E+02)	(2.019E-02, 5.431E+01)
4	(3.250E-04,-5.244E+01)	(4.342E-03,-1.452E+02)	(2.019E-02,-5.431E+01)
5	(2.828E-04,-1.539E+02)	(6.015E-03,-6.259E+01)	(2.440E-02,-1.506E+02)
6	(2.828E-04, 1.539E+02)	(6.015E-03, 6.259E+01)	(2.440E-02, 1.506E+02)
7	(2.357E-07,-1.143E+02)	(5.190E-06,-2.378E+01)	(8.456E-06,-1.094E+02)
8	(2.357E-07, 1.143E+02)	(5.190E-06, 2.378E+01)	(8.456E-06, 1.094E+02)
9	(5.082E-04, 8.059E+01)	(1.407E-03,-1.611E+02)	(8.654E-03, 8.397E+01)
10	(5.082E-04,-8.059E+01)	(1.407E-03, 1.611E+02)	(8.654E-03,-8.397E+01)
11	(2.360E-05,-1.011E+02)	(2.052E-06,-1.070E+01)	(6.001E-05,-7.543E-01)
12	(2.360E-05, 1.011E+02)	(2.052E-06, 1.070E+01)	(6.001E-05, 7.543E-01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(1.761E-02, 1.800E+02)	(1.673E-01, 0.)	(2.653E+00, 0.)
15	(1.781E-02, 0.)	(1.674E-01, 1.800E+02)	(2.583E+00, 1.800E+02)

THE AV MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-7.680E+01	-1.568E+01
10	1.200E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.990E+00	3.458E+01
12	1.686E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.615E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-9.622E-01	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-4.565E+02	3.457E+00	-1.219E-01	3.784E+00	-8.485E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.080E-01

THE AG MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.13EE+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	5.198E-01	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	3.456E-02	3.636E-02
7	2.911E+00	1.672E+00	-1.764E-04	1.103E-01	2.627E-03	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	1.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AU-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E-01	3.519E+00	3.595E-02	0.	-7.680E+01	-1.254E+01
10	-4.230E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.062E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-9.622E-01	-2.216E-01	6.936E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
11	-4.565E+02	3.286E+00	-1.596E-01	3.963E+00	-8.485E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-1.969E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-8.424E+01	-4.599E+01	6.684E-03	-3.342E+00	-7.602E-02	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-7.680E+01
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-9.622E-01	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
14	3.621E+01	-4.565E+02	3.286E+00	-1.556E-01	3.963E+00	-8.485E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-1.969E+01	-9.740E+01	-8.424E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	6.684E-03	-3.342E+00	-7.602E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.47741E+00	2.20532E+01	3.58149E+00	.19896825	2.23343E-01
3	-4.63559E-01	2.12668E+01	3.38552E+00	.02179211	2.15722E+00
5	-2.03802E-01	2.20195E+01	3.50467E+00	.00925509	4.90673E+00
7	-7.17925E-01	8.82912E+00	1.40984E+00	.08104592	1.39290E+00
9	-1.17125E+00	2.23513E+00	4.01614E-01	.46415110	8.53792E-01
11	1.09577E-03	7.73189E-02	1.23069E-02	-.01417072	-9.12600E+02
13	-6.66667E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-9.423E-04,-7.895E-03)	(-9.423E-04, 7.895E-03)	(7.649E-04,-8.843E-04)	(7.649E-04, 8.843E-04)
5	(6.280E-02,-1.112E-02)	(6.280E-02, 1.112E-02)	(1.737E-02, 6.164E-03)	(1.737E-02,-6.164E-03)
6	(1.243E-05,-5.235E-06)	(1.243E-05, 5.235E-06)	(2.435E-06, 1.331E-06)	(2.435E-06,-1.331E-06)
7	(-1.039E-03,-2.637E-03)	(-1.039E-03, 2.637E-03)	(2.719E-04,-8.226E-04)	(2.719E-04, 8.226E-04)
8	(-1.573E-03, 2.371E-04)	(-1.573E-03,-2.371E-04)	(-2.558E-03,-7.079E-04)	(-2.558E-03, 7.079E-04)
9	(-3.555E-02, 1.803E-02)	(-3.555E-02,-1.803E-02)	(-1.877E-03, 1.810E-05)	(-1.877E-03,-1.810E-05)
10	(1.511E-02,-1.196E-02)	(1.511E-02, 1.196E-02)	(-1.819E-02,-4.316E-02)	(-1.819E-02, 4.316E-02)
11	(2.210E-05, 1.474E-05)	(2.210E-05,-1.474E-05)	(-6.834E-06,-1.061E-05)	(-6.834E-06, 1.061E-05)
12	(1.814E-03,-3.575E-02)	(1.814E-03, 3.575E-02)	(1.624E-02,-5.406E-02)	(1.624E-02, 5.406E-02)
13	(-2.383E-01,-8.648E-01)	(-2.383E-01, 8.648E-01)	(4.851E-04,-3.992E-02)	(4.851E-04, 3.992E-02)
14	(1.961E-01, 3.867E-01)	(1.961E-01,-3.867E-01)	(9.264E-01,-3.668E-01)	(9.264E-01, 3.668E-01)
15	(-4.240E-04, 4.214E-04)	(-4.240E-04,-4.214E-04)	(2.288E-04,-1.404E-04)	(2.288E-04, 1.404E-04)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(1.524E-04,-7.654E-05)	(1.524E-04, 7.654E-05)	(4.455E-03, 1.057E-02)	(4.455E-03,-1.057E-02)
5	(5.882E-03, 5.668E-04)	(5.882E-03,-5.668E-04)	(-7.743E-02, 5.936E-02)	(-7.743E-02,-5.936E-02)
6	(5.053E-07, 2.141E-07)	(5.053E-07,-2.141E-07)	(-5.930E-05, 4.633E-05)	(-5.930E-05,-4.633E-05)
7	(2.327E-05,-2.673E-04)	(2.327E-05, 2.673E-04)	(7.387E-03, 8.169E-03)	(7.387E-03,-8.169E-03)
8	(-1.453E-03,-1.415E-03)	(-1.453E-03, 1.415E-03)	(-9.853E-02,-5.202E-02)	(-9.853E-02, 5.202E-02)
9	(1.878E-03, 5.092E-05)	(1.878E-03,-5.092E-05)	(-4.605E-03,-3.250E-03)	(-4.605E-03, 3.250E-03)
10	(-7.135E-03,-9.708E-03)	(-7.135E-03, 9.708E-03)	(-2.587E-03,-2.689E-03)	(-2.587E-03, 2.689E-03)
11	(1.629E-02, 4.049E-02)	(1.629E-02,-4.049E-02)	(-4.969E-06,-3.278E-06)	(-4.969E-06, 3.278E-06)
12	(3.146E-02,-3.170E-02)	(3.146E-02, 3.170E-02)	(5.301E-01,-8.326E-01)	(5.301E-01, 8.326E-01)
13	(-1.504E-03, 4.134E-02)	(-1.504E-03,-4.134E-02)	(3.200E-02,-3.832E-02)	(3.200E-02, 3.832E-02)
14	(2.152E-01,-1.551E-01)	(2.152E-01, 1.551E-01)	(2.560E-02,-2.091E-02)	(2.560E-02, 2.091E-02)
15	(-8.950E-01, 3.504E-01)	(-8.950E-01,-3.504E-01)	(3.251E-05,-4.152E-05)	(3.251E-05, 4.152E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(3.284E-01,-1.251E-01)	(3.284E-01, 1.251E-01)	(-1.755E-01, 6.856E-02)	(-1.755E-01,-6.856E-02)
5	(1.976E-01, 7.996E-01)	(1.976E-01,-7.996E-01)	(5.948E-02,-3.585E-02)	(5.948E-02, 3.585E-02)
6	(6.847E-03, 4.068E-03)	(6.847E-03,-4.068E-03)	(3.630E-01,-1.360E-01)	(3.630E-01, 1.360E-01)
7	(2.443E-01,-2.164E-01)	(2.443E-01, 2.164E-01)	(-4.527E-01,-7.758E-01)	(-4.527E-01, 7.758E-01)
8	(1.059E-01, 6.883E-03)	(1.059E-01,-6.883E-03)	(-4.536E-02, 1.719E-02)	(-4.536E-02,-1.719E-02)
9	(-2.506E-02, 1.116E-02)	(-2.506E-02,-1.116E-02)	(1.336E-02,-5.244E-03)	(1.336E-02, 5.244E-03)
10	(-1.968E-02, 4.032E-03)	(-1.968E-02,-4.032E-03)	(1.007E-02,-3.882E-03)	(1.007E-02, 3.882E-03)
11	(-3.228E-05, 1.060E-05)	(-3.228E-05,-1.060E-05)	(1.716E-05,-6.675E-06)	(1.716E-05, 6.675E-06)
12	(-1.394E-01, 2.286E-01)	(-1.394E-01,-2.286E-01)	(-1.379E-03,-3.488E-03)	(-1.379E-03, 3.488E-03)
13	(4.407E-03,-6.909E-02)	(4.407E-03, 6.909E-02)	(1.201E-04, 1.027E-03)	(4.201E-04,-1.027E-03)

```
14 (  .404E-02,-4.871E-02) ( 1.404E-02, 4.871E-02) ( 3.112E-04, 7.746E-04) ( 3.112E-04,-7.746E-04)
15 ( 1.411E-05,-8.456E-05) ( 1.411E-05, 8.456E-05) ( 5.349E-07, 1.320E-06) ( 5.349E-07,-1.320E-06)

                          13                                14                                15
 1 ( 2.372E-01, 0.       ) ( 0.       , 0.       ) ( 0.       , 0.       )
 2 ( 0.       , 0.       ) ( 0.       , 0.       ) ( 8.904E-01, 0.       )
 3 ( 0.       , 0.       ) ( 4.417E-01, 0.       ) (-2.009E-01, 0.       )
 4 (-7.126E-02, 0.       ) ( 1.123E-03, 0.       ) (-2.722E-04, 0.       )
 5 ( 4.786E-01, 0.       ) ( 4.514E-01, 0.       ) (-2.071E-01, 0.       )
 6 (-6.494E-04, 0.       ) (-1.670E-04, 0.       ) ( 7.898E-05, 0.       )
 7 (-7.179E-02, 0.       ) (-4.752E-02, 0.       ) ( 2.203E-02, 0.       )
 8 ( 1.237E-01, 0.       ) ( 6.950E-02, 0.       ) (-3.198E-02, 0.       )
 9 ( 1.295E-02, 0.       ) (-3.555E-02, 0.       ) ( 1.617E-02, 0.       )
10 (-5.450E-03, 0.       ) (-2.164E-02, 0.       ) ( 9.874E-03, 0.       )
11 ( 8.016E-06, 0.       ) (-3.789E-05, 0.       ) ( 1.726E-05, 0.       )
12 (-8.247E-01, 0.       ) (-6.603E-01, 0.       ) ( 3.006E-01, 0.       )
13 (-8.633E-02, 0.       ) ( 3.377E-01, 0.       ) (-1.520E-01, 0.       )
14 ( 3.634E-02, 0.       ) ( 2.056E-01, 0.       ) (-9.282E-02, 0.       )
15 (-5.344E-05, 0.       ) ( 3.600E-04, 0.       ) (-1.622E-04, 0.       )
```

THE CON VECTOR (15 BY 1)

	1
1	(9.681E-02, 1.501E-02)
2	(9.681E-02,-1.501E-02)
3	(-3.734E-01, 3.362E-01)
4	(-3.734E-01,-3.362E-01)
5	(2.081E-06,-7.658E-06)
6	(2.081E-06, 7.658E-06)
7	(2.922E+00, 4.880E-01)
8	(2.922E+00,-4.880E-01)
9	(7.499E-02, 9.574E-01)
10	(7.499E-02,-9.574E-01)
11	(4.762E-02,-9.076E-02)
12	(4.762E-02, 9.076E-02)
13	(4.215E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(9.797E-02, 8.812E+00)
2	(9.797E-02,-8.812E+00)
3	(5.024E-01, 1.380E+02)
4	(5.024E-01,-1.380E+02)
5	(7.936E-06,-7.480E+01)
6	(7.936E-06, 7.480E+01)
7	(2.962E+00, 9.481E+00)
8	(2.962E+00,-9.481E+00)
9	(9.604E-01, 8.552E+01)
10	(9.604E-01,-8.552E+01)
11	(1.025E-01,-6.231E+01)
12	(1.025E-01, 6.231E+01)
13	(4.215E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(-3.570E-03,-4.992E-03)
2	(-3.570E-03, 4.992E-03)
3	(-4.636E-03, 3.237E-03)
4	(-4.636E-03,-3.237E-03)
5	(7.567E-06,-9.417E-07)
6	(7.567E-06, 9.417E-07)
7	(3.306E-03, 2.978E-03)
8	(3.306E-03,-2.978E-03)
9	(-6.785E-04, 1.117E-03)
10	(-6.785E-04,-1.117E-03)
11	(2.216E-05, 6.871E-06)
12	(2.216E-05,-6.871E-06)
13	(0. , 0.)
14	(5.235E-01, 0.)
15	(1.123E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(6.137E-03,-1.256E+02)
2	(6.137E-03, 1.256E+02)
3	(5.654E-03, 1.451E+02)
4	(5.654E-03,-1.451E+02)
5	(7.625E-06,-7.094E+00)
6	(7.625E-06, 7.094E+00)
7	(4.450E-03, 4.201E+01)
8	(4.450E-03,-4.201E+01)
9	(1.307E-03, 1.213E+02)
10	(1.307E-03,-1.213E+02)
11	(2.320E-05, 1.723E+01)
12	(2.320E-05,-1.723E+01)
13	(0. , 0.)
14	(5.235E-01, 0.)
15	(1.123E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(1.180E-02,-4.968E-03)	(1.180E-02, 4.968E-03)	(2.311E-03, 1.263E-03)	(2.311E-03,-1.263E-03)
2	(-1.039E-03,-2.637E-03)	(-1.039E-03, 2.637E-03)	(2.719E-04,-8.226E-04)	(2.719E-04, 8.226E-04)
3	(6.280E-02,-1.112E-02)	(6.280E-02, 1.112E-02)	(1.737E-02, 6.164E-03)	(1.737E-02,-6.164E-03)
4	(-9.715E-05, 5.259E-03)	(-9.715E-05,-5.259E-03)	(-4.930E-04, 6.177E-05)	(-4.930E-04,-6.177E-05)
5	(2.096E-02,-8.955E-03)	(2.096E-02, 8.955E-03)	(2.290E-02, 4.304E-02)	(2.290E-02,-4.304E-02)
6	(1.037E-01, 5.023E-01)	(1.037E-01,-5.023E-01)	(-9.259E-01, 4.671E-01)	(-9.259E-01,-4.671E-01)
7	(2.905E+00, 2.049E+00)	(2.905E+00,-2.049E+00)	(1.677E+00, 3.793E+00)	(1.677E+00,-3.793E+00)

	5	6	7	8
1	(4.795E-04, 2.031E-04)	(4.795E-04,-2.031E-04)	(-5.627E-02, 4.397E-02)	(-5.627E-02,-4.397E-02)
2	(2.327E-05,-2.673E-04)	(2.327E-05, 2.673E-04)	(7.387E-03, 8.169E-03)	(7.387E-03,-8.169E-03)
3	(5.682E-03, 5.668E-04)	(5.882E-03,-5.668E-04)	(-7.743E-02, 5.936E-02)	(-7.743E-02,-5.936E-02)
4	(-1.291E-04,-1.908E-04)	(-1.291E-04, 1.908E-04)	(2.932E-03,-2.400E-03)	(2.932E-03, 2.400E-03)
5	(-9.555E-03,-2.969E-02)	(-9.555E-03, 2.969E-02)	(1.131E-01, 6.614E-02)	(1.131E-01,-6.614E-02)
6	(6.557E-01,-2.044E-01)	(6.557E-01, 2.044E-01)	(-6.651E-01, 9.512E-01)	(-6.651E-01,-9.512E-01)
7	(-3.166E-01,-1.151E+00)	(-3.166E-01, 1.151E+00)	(2.650E+00, 1.708E+00)	(2.650E+00,-1.708E+00)

	9	10	11	12
1	(6.458E+00, 3.861E+00)	(6.498E+00,-3.861E+00)	(3.445E+02,-1.290E+02)	(3.445E+02, 1.290E+02)
2	(2.443E-01,-2.164E-01)	(2.443E-01, 2.164E-01)	(-4.527E-01,-7.758E-01)	(-4.527E-01, 7.758E-01)
3	(1.976E-01, 7.995E-01)	(1.976E-01,-7.996E-01)	(5.948E-02,-3.585E-02)	(5.948E-02, 3.585E-02)
4	(-8.409E-02,-9.132E-02)	(-8.409E-02, 9.132E-02)	(-2.772E-01,-8.443E-01)	(-2.772E-01, 8.443E-01)
5	(1.832E-01,-2.385E-01)	(1.832E-01, 2.385E-01)	(-4.308E-01,-7.838E-01)	(-4.308E-01, 7.838E-01)
6	(3.168E-01, 6.888E-01)	(3.168E-01,-6.889E-01)	(6.013E-02,-3.417E-02)	(6.013E-02, 3.417E-02)
7	(4.877E+00,-3.554E+00)	(4.877E+00, 3.554E+00)	(1.922E+00,-6.505E-01)	(1.922E+00, 6.505E-01)

	13	14	15
1	(-6.163E-01, 0.)	(-1.585E-01, 0.)	(7.495E-02, 0.)
2	(-7.179E-02, 0.)	(-4.752E-02, 0.)	(2.203E-02, 0.)
3	(4.786E-01, 0.)	(4.514E-01, 0.)	(-2.071E-01, 0.)
4	(-5.315E-04, 0.)	(-4.964E-02, 0.)	(2.231E-02, 0.)
5	(-2.030E-01, 0.)	(-5.979E-02, 0.)	(2.796E-02, 0.)
6	(1.353E+00, 0.)	(5.680E-01, 0.)	(-2.628E-01, 0.)
7	(-3.746E+00, 0.)	(6.232E+00, 0.)	(-2.830E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.280E-02,-2.284E+01)	(1.280E-02, 2.284E+01)	(2.634E-03, 2.866E+01)	(2.634E-03,-2.866E+01)
2	(2.834E-03,-1.115E+02)	(2.834E-03, 1.115E+02)	(8.663E-04,-7.171E+01)	(8.663E-04, 7.171E+01)
3	(6.375E-02,-1.004E+01)	(6.378E-02, 1.004E+01)	(1.843E-02, 1.954E+01)	(1.843E-02,-1.954E+01)
4	(5.260E-03, 9.106E+01)	(5.260E-03,-9.106E+01)	(4.969E-04, 1.729E+02)	(4.969E-04,-1.729E+02)
5	(2.279E-02,-2.314E+01)	(2.279E-02, 2.314E+01)	(4.875E-02, 6.198E+01)	(4.875E-02,-6.198E+01)
6	(5.129E-01, 7.834E+01)	(5.129E-01,-7.834E+01)	(1.037E+00, 1.532E+02)	(1.037E+00,-1.532E+02)
7	(3.555E+00, 3.519E+01)	(3.555E+00,-3.519E+01)	(4.147E+00, 6.615E+01)	(4.147E+00,-6.615E+01)

	5	6	7	8
1	(5.207E-04, 2.296E+01)	(5.207E-04,-2.296E+01)	(7.141E-02, 1.420E+02)	(7.141E-02,-1.420E+02)
2	(2.684E-04,-8.503E+01)	(2.684E-04, 8.503E+01)	(1.101E-02, 4.788E+01)	(1.101E-02,-4.788E+01)
3	(5.909E-03, 5.504E+00)	(5.909E-03,-5.504E+00)	(9.757E-02, 1.425E+02)	(9.757E-02,-1.425E+02)
4	(2.304E-04,-1.241E+02)	(2.304E-04, 1.241E+02)	(3.790E-03,-3.930E+01)	(3.790E-03, 3.930E+01)
5	(3.119E-02,-1.078E+02)	(3.119E-02, 1.078E+02)	(1.310E-01, 3.031E+01)	(1.310E-01,-3.031E+01)
6	(6.868E-01,-1.731E+01)	(6.868E-01, 1.731E+01)	(1.161E+00, 1.250E+02)	(1.161E+00,-1.250E+02)
7	(1.194E+00,-1.054E+02)	(1.194E+00, 1.054E+02)	(3.153E+00, 3.280E+01)	(3.153E+00,-3.280E+01)

	9	10	11	12
1	(7.558E+00, 3.072E+01)	(7.558E+00,-3.072E+01)	(3.678E+02,-2.054E+01)	(3.678E+02, 2.054E+01)
2	(3.264E-01,-4.154E+01)	(3.264E-01, 4.154E+01)	(8.982E-01,-1.203E+02)	(8.982E-01, 1.203E+02)
3	(8.237E-01, 7.612E+01)	(8.237E-01,-7.612E+01)	(6.945E-02,-3.108E+01)	(6.945E-02, 3.108E+01)
4	(1.241E-01,-1.326E+02)	(1.241E-01, 1.326E+02)	(8.887E-01,-1.082E+02)	(8.887E-01, 1.082E+02)
5	(3.008E-01,-5.248E+01)	(3.008E-01, 5.248E+01)	(8.944E-01,-1.188E+02)	(8.944E-01, 1.188E+02)
6	(7.590E-01, 6.518E+01)	(7.590E-01,-6.518E+01)	(6.916E-02,-2.961E+01)	(6.916E-02, 2.961E+01)
7	(6.034E+00,-3.608E+01)	(6.034E+00, 3.608E+01)	(2.030E+00,-1.869E+01)	(2.030E+00, 1.869E+01)

	13	14	15
1	(5.163E-01, 1.800E+02)	(1.585E-01, 1.800E+02)	(7.495E-02, 0.)
2	(7.179E-02, 1.800E+02)	(4.752E-02, 1.800E+02)	(2.203E-02, 0.)
3	(4.786E-01, 0.)	(4.514E-01, 0.)	(2.071E-01, 1.800E+02)
4	(5.315E-04, 1.800E+02)	(4.864E-02, 1.800E+02)	(2.231E-02, 0.)
5	(2.030E-01, 1.800E+02)	(5.979E-02, 1.800E+02)	(2.796E-02, 0.)
6	(1.353E+00, 0.)	(5.680E-01, 0.)	(2.628E-01, 1.800E+02)
7	(3.745E+00, 1.800E+02)	(6.232E+00, 0.)	(2.830E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.217E-03,-3.039E-04)	(-6.106E-05,-2.708E-04)	(6.246E-03,-1.340E-04)	(-8.833E-05, 5.076E-04)
2	(1.217E-03, 3.039E-04)	(-6.106E-05, 2.708E-04)	(6.246E-03, 1.340E-04)	(-8.833E-05,-5.076E-04)
3	(-1.288E-03, 3.053E-04)	(1.750E-04, 3.985E-04)	(-8.557E-03, 3.537E-03)	(1.633E-04,-1.888E-04)
4	(-1.288E-03,-3.053E-04)	(1.750E-04,-3.985E-04)	(-8.557E-03,-3.537E-03)	(1.633E-04, 1.888E-04)
5	(2.553E-09,-3.249E-09)	(-1.999E-09,-7.344E-10)	(1.658E-08,-4.387E-08)	(-1.730E-09, 5.918E-10)
6	(2.553E-09, 3.249E-09)	(-1.999E-09, 7.344E-10)	(1.658E-08, 4.387E-08)	(-1.730E-09,-5.918E-10)
7	(-1.859E-01, 1.010E-01)	(1.760E-02, 2.748E-02)	(-2.552E-01, 1.357E-01)	(9.740E-03,-5.583E-03)
8	(-1.859E-01,-1.010E-01)	(1.760E-02,-2.748E-02)	(-2.552E-01,-1.357E-01)	(9.740E-03, 5.583E-03)
9	(-3.209E+00, 6.511E+00)	(2.256E-01, 2.177E-01)	(-7.507E-01, 2.492E-01)	(8.113E-02,-8.736E-02)
10	(-3.209E+00,-6.511E+00)	(2.256E-01,-2.177E-01)	(-7.507E-01,-2.492E-01)	(8.113E-02, 8.736E-02)
11	(4.694E+00,-3.741E+01)	(-9.196E-02, 4.140E-03)	(-4.209E-04,-7.106E-03)	(-8.983E-02,-1.505E-02)
12	(4.694E+00, 3.741E+01)	(-9.196E-02,-4.140E-03)	(-4.209E-04, 7.106E-03)	(-8.983E-02, 1.505E-02)
13	(-2.598E+00, 0.)	(-3.026E-01, 0.)	(2.017E+00, 0.)	(-2.241E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.163E-03,-5.524E-04)	(2.497E-03, 5.018E-02)	(2.505E-01, 2.419E-01)
2	(2.163E-03, 5.524E-04)	(2.497E-03,-5.018E-02)	(2.505E-01,-2.419E-01)
3	(-2.302E-02,-8.370E-03)	(1.887E-01,-4.857E-01)	(-1.901E+00,-8.524E-01)
4	(-2.302E-02, 8.370E-03)	(1.887E-01, 4.857E-01)	(-1.901E+00, 8.524E-01)
5	(-2.472E-07, 1.140E-08)	(-2.006E-07,-5.447E-06)	(-9.473E-06, 2.999E-08)
6	(-2.472E-07,-1.140E-08)	(-2.006E-07, 5.447E-06)	(-9.473E-06,-2.999E-08)
7	(2.982E-01, 2.484E-01)	(-2.408E+00, 2.455E+00)	(6.910E+00, 6.284E+00)
8	(2.982E-01,-2.484E-01)	(-2.408E+00,-2.455E+00)	(6.910E+00,-6.284E+00)
9	(2.421E-01, 1.575E-01)	(-6.356E-01, 3.567E-01)	(3.768E+00, 4.403E+00)
10	(2.421E-01,-1.575E-01)	(-6.356E-01,-3.567E-01)	(3.768E+00,-4.403E+00)
11	(-9.165E-02, 1.768E-03)	(-2.371E-04,-7.084E-03)	(3.252E-02,-2.055E-01)
12	(-9.165E-02,-1.768E-03)	(-2.371E-04, 7.084E-03)	(3.252E-02, 2.055E-01)
13	(-8.557E-01, 0.)	(5.705E+00, 0.)	(-1.575E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.254E-03,-1.402E+01)	(2.776E-04,-1.027E+02)	(6.248E-03,-1.229E+00)	(5.153E-04, 9.987E+01)
2	(1.254E-03, 1.402E+01)	(2.776E-04, 1.027E+02)	(6.248E-03, 1.229E+00)	(5.153E-04,-9.987E+01)
3	(1.323E-03, 1.667E+02)	(4.353E-04, 6.629E+01)	(9.259E-03, 1.575E+02)	(2.496E-04,-4.914E+01)
4	(1.323E-03,-1.667E+02)	(4.353E-04,-6.629E+01)	(9.259E-03,-1.575E+02)	(2.496E-04, 4.914E+01)
5	(4.132E-09,-5.184E+01)	(2.130E-09,-1.598E+02)	(4.689E-08,-6.930E+01)	(1.828E-09, 1.611E+02)
6	(4.132E-09, 5.184E+01)	(2.130E-09, 1.598E+02)	(4.689E-08, 6.930E+01)	(1.828E-09,-1.611E+02)
7	(2.116E-01, 1.515E+02)	(3.263E-02, 5.736E+01)	(2.890E-01, 1.520E+02)	(1.123E-02,-2.982E+01)
8	(2.116E-01,-1.515E+02)	(3.263E-02,-5.736E+01)	(2.890E-01,-1.520E+02)	(1.123E-02, 2.932E+01)
9	(7.259E+00, 1.162E+02)	(3.135E-01, 4.398E+01)	(7.910E-01, 1.616E+02)	(1.192E-01,-4.712E+01)
10	(7.259E+00,-1.162E+02)	(3.135E-01,-4.398E+01)	(7.910E-01,-1.616E+02)	(1.192E-01, 4.712E+01)
11	(3.770E+01,-8.285E+01)	(9.209E-02, 1.774E+02)	(7.118E-03,-9.339E+01)	(9.108E-02,-1.705E+02)
12	(3.770E+01, 8.285E+01)	(9.206E-02,-1.774E+02)	(7.118E-03, 9.339E+01)	(9.108E-02, 1.705E+02)
13	(2.598E+00, 1.800E+02)	(3.026E-01, 1.800E+02)	(2.017E+00, 0.)	(2.241E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.233E-03,-1.433E+01)	(5.024E-02, 8.715E+01)	(3.483E-01, 4.400E+01)
2	(2.233E-03, 1.433E+01)	(5.024E-02,-8.715E+01)	(3.483E-01,-4.400E+01)
3	(2.450E-02,-1.600E+02)	(5.211E-01,-6.877E+01)	(2.084E+00,-1.559E+02)
4	(2.450E-02, 1.600E+02)	(5.211E-01, 6.877E+01)	(2.084E+00, 1.559E+02)
5	(2.475E-07, 1.774E+02)	(5.450E-06,-9.211E+01)	(9.473E-06, 1.798E+02)
6	(2.475E-07,-1.774E+02)	(5.450E-06, 9.211E+01)	(9.473E-06,-1.798E+02)
7	(3.882E-01, 3.975E+01)	(3.439E+00, 1.344E+02)	(9.340E+00, 4.228E+01)
8	(3.882E-01,-3.979E+01)	(3.439E+00,-1.344E+02)	(9.340E+00,-4.228E+01)
9	(2.888E-01, 3.305E+01)	(7.289E-01, 1.507E+02)	(5.795E+00, 4.944E+01)
10	(2.888E-01,-3.305E+01)	(7.289E-01,-1.507E+02)	(5.795E+00,-4.944E+01)
11	(9.167E-02, 1.789E+02)	(7.088E-03,-9.192E+01)	(2.080E-01,-8.101E+01)
12	(9.167E-02,-1.789E+02)	(7.088E-03, 9.192E+01)	(2.080E-01, 8.101E+01)
13	(9.557E-01, 1.800E+02)	(5.705E+00, 0.)	(1.579E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-6.692E-05,-4.115E-05)	(-9.449E-06, 1.460E-05)	(-2.797E-04,-2.738E-04)	(2.660E-05,-1.829E-05)
2	(-6.692E-05, 4.115E-05)	(-9.449E-06,-1.460E-05)	(-2.797E-04, 2.738E-04)	(2.660E-05, 1.829E-05)
3	(-1.480E-05, 1.624E-06)	(1.402E-06, 4.693E-06)	(-1.005E-04, 2.763E-05)	(2.086E-06,-1.882E-06)
4	(-1.480E-05,-1.624E-06)	(1.402E-06,-4.693E-06)	(-1.005E-04,-2.763E-05)	(2.086E-06, 1.882E-06)
5	(3.820E-09, 1.086E-09)	(-7.570E-11,-2.045E-09)	(4.504E-08,-1.250E-09)	(-1.157E-09,-1.322E-09)
6	(3.820E-09,-1.086E-09)	(-7.570E-11, 2.045E-09)	(4.504E-08, 1.250E-09)	(-1.157E-09, 1.322E-09)
7	(-3.170E-04,-2.220E-05)	(9.435E-08, 4.901E-05)	(-4.328E-04,-3.435E-05)	(1.684E-05, 7.974E-07)
8	(-3.170E-04, 2.220E-05)	(9.435E-08,-4.901E-05)	(-4.328E-04, 3.435E-05)	(1.684E-05,-7.974E-07)
9	(-8.721E-03, 4.637E-03)	(7.594E-05, 4.198E-04)	(-1.027E-03,-3.219E-04)	(1.591E-04,-3.194E-05)
10	(-8.721E-03,-4.637E-03)	(7.594E-05,-4.198E-04)	(-1.027E-03, 3.219E-04)	(1.591E-04, 3.194E-05)
11	(8.513E-03,-4.923E-04)	(-4.701E-06,-2.030E-05)	(1.564E-06,-3.857E-07)	(-3.403E-07,-2.061E-05)
12	(8.513E-03, 4.923E-04)	(-4.701E-06, 2.030E-05)	(1.564E-06, 3.857E-07)	(-3.403E-07, 2.061E-05)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-8.295E-02, 0.)	(-2.487E-02, 0.)	(2.363E-01, 0.)	(-2.546E-02, 0.)
15	(8.410E-02, 0.)	(2.475E-02, 0.)	(-2.326E-01, 0.)	(2.505E-02, 0.)

	5	6	7
1	(-1.195E-04,-7.264E-05)	(2.137E-03,-2.311E-03)	(-1.467E-04,-2.182E-02)
2	(-1.195E-04, 7.264E-05)	(2.137E-03, 2.311E-03)	(-1.467E-04, 2.182E-02)
3	(-2.455E-04,-1.254E-04)	(2.781E-03,-5.162E-03)	(-2.005E-02,-1.216E-02)
4	(-2.455E-04, 1.254E-04)	(2.781E-03, 5.162E-03)	(-2.005E-02, 1.216E-02)
5	(-1.003E-07,-2.157E-07)	(4.769E-06,-2.164E-06)	(-3.480E-06,-8.411E-06)
6	(-1.003E-07, 2.157E-07)	(4.769E-06, 2.164E-06)	(-3.480E-06, 8.411E-06)
7	(1.770E-04, 5.556E-04)	(-5.032E-03, 1.164E-03)	(3.675E-03, 1.354E-02)
8	(1.770E-04,-5.556E-04)	(-5.032E-03,-1.164E-03)	(3.675E-03,-1.354E-02)
9	(1.421E-04, 3.665E-04)	(-9.855E-04,-1.117E-04)	(6.593E-04, 7.858E-03)
10	(1.421E-04,-3.665E-04)	(-9.855E-04, 1.117E-04)	(6.593E-04,-7.858E-03)
11	(-4.160E-06,-2.033E-05)	(1.567E-06,-3.439E-07)	(4.707E-05,-1.205E-06)
12	(-4.160E-06, 2.033E-05)	(1.567E-06, 3.439E-07)	(4.707E-05, 1.205E-06)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-3.130E-02, 0.)	(2.973E-01, 0.)	(3.252E+00, 0.)
15	(3.140E-02, 0.)	(-2.951E-01, 0.)	(-3.176E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.856E-05,-1.484E+02)	(1.739E-05, 1.229E+02)	(3.914E-04,-1.356E+02)	(3.228E-05,-3.452E+01)
2	(7.856E-05, 1.494E+02)	(1.739E-05,-1.229E+02)	(3.914E-04, 1.356E+02)	(3.228E-05, 3.452E+01)
3	(1.489E-05, 1.737E+02)	(4.898E-06, 7.337E+01)	(1.042E-04, 1.646E+02)	(2.809E-06,-4.206E+01)
4	(1.489E-05,-1.737E+02)	(4.858E-06,-7.337E+01)	(1.042E-04,-1.646E+02)	(2.809E-06, 4.206E+01)
5	(3.971E-05, 1.587E+01)	(2.046E-09,-9.212E+01)	(4.506E-08,-1.590E+00)	(1.757E-09,-1.312E+02)
6	(3.971E-05,-1.587E+01)	(2.046E-09, 9.212E+01)	(4.506E-08, 1.590E+00)	(1.757E-09, 1.312E+02)
7	(3.178E-04,-1.760E+02)	(4.901E-05, 8.989E+01)	(4.342E-04,-1.755E+02)	(1.686E-05, 2.710E+00)
8	(3.178E-04, 1.760E+02)	(4.901E-05,-8.989E+01)	(4.342E-04, 1.755E+02)	(1.685E-05,-2.710E+00)
9	(9.877E-03, 1.520E+02)	(4.266E-04, 7.975E+01)	(1.078E-03,-1.626E+02)	(1.622E-04,-1.135E+01)
10	(9.877E-03,-1.520E+02)	(4.266E-04,-7.975E+01)	(1.078E-03, 1.626E+02)	(1.622E-04, 1.135E+01)
11	(8.533E-03,-3.308E+00)	(2.084E-05,-1.030E+02)	(1.611E-06,-1.385E+01)	(2.062E-05,-9.095E+01)
12	(8.533E-03, 3.308E+00)	(2.084E-05, 1.030E+02)	(1.611E-06, 1.385E+01)	(2.062E-05, 9.095E+01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(6.298E-02, 1.800E+02)	(2.487E-02, 1.800E+02)	(2.363E-01, 0.)	(2.546E-02, 1.800E+02)
15	(6.418E-02, 0.)	(2.452E-02, 0.)	(2.326E-01, 1.800E+02)	(2.505E-02, 0.)

	5	6	7
1	(1.399E-04,-1.487E+02)	(3.147E-03,-4.724E+01)	(2.182E-02,-9.039E+01)
2	(1.399E-04, 1.437E+02)	(3.147E-03, 4.724E+01)	(2.182E-02, 9.039E+01)
3	(2.757E-04,-1.529E+02)	(5.864E-03,-8.169E+01)	(2.345E-02,-1.468E+02)
4	(2.757E-04, 1.529E+02)	(5.864E-03, 8.169E+01)	(2.345E-02, 1.468E+02)
5	(2.378E-07,-1.145E+02)	(5.237E-06,-2.440E+01)	(9.103E-06,-1.125E+02)
6	(2.378E-07, 1.145E+02)	(5.237E-06, 2.440E+01)	(9.103E-06, 1.125E+02)
7	(5.831E-04, 7.232E+01)	(5.165E-03, 1.670E+02)	(1.403E-02, 7.481E+01)
8	(5.831E-04,-7.232E+01)	(5.165E-03,-1.670E+02)	(1.403E-02,-7.481E+01)
9	(3.931E-04, 6.881E+01)	(9.918E-04,-1.735E+02)	(7.886E-03, 8.520E+01)
10	(3.931E-04,-6.881E+01)	(9.918E-04, 1.735E+02)	(7.886E-03,-8.520E+01)
11	(2.075E-05,-1.016E+02)	(1.604E-06,-1.238E+01)	(4.708E-05,-1.487E+00)
12	(2.075E-05, 1.016E+02)	(1.604E-06, 1.238E+01)	(4.708E-05, 1.487E+00)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(3.130E-02, 1.800E+02)	(2.973E-01, 0.)	(3.262E+00, 0.)
15	(3.140E-02, 0.)	(2.991E-01, 1.800E+02)	(3.178E+00, 1.800E+02)

THE AU MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-3.066E+01	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.990E+00	3.458E+01
12	1.688E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-5.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.001E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-8.418E-01	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-4.565E+02	3.457E+00	-1.219E-01	3.784E+00	-8.435E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.080E-01

THE AC MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	1.917E-02	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	2.640E-02	3.300E-02	3.456E-02	3.636E-02
6	0.	0.	-1.483E-03	1.103E-01	2.627E-03	1.441E-04
7	2.911E+00	1.672E+00				

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.321E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AU-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-3.066E+01	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-8.418E-01	-2.216E-01	6.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
11	-4.565E+02	3.238E+00	-1.596E-01	3.963E+00	-8.485E-01	-2.410E-01
12	7.432E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00
11	2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-7.260E-01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-8.424E+01	-4.599E+01	5.616E-02	-3.342E+00	-7.602E-02	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-3.066E+01
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.846E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-3.418E-01	-2.216E-01	6.996E-01	-1.435E-01
13	-5.081E+02	6.295E+00	[illegible]0E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
14	3.621E+01	-4.565E+02	3.286E+00	-1.556E-01	3.963E+00	-8.485E-01	-2.410E-01
15	-1.059E-01	7.462E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-7.260E-01	-9.740E+01	-8.424E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	5.616E-02	-3.342E+00	-7.602E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.47811E+00	2.20547E+01	3.58173E+00	.19898534	2.23309E-01
3	-4.61593E-01	2.12686E+01	3.38579E+00	.02169795	2.16641E+00
5	-2.03802E-01	2.20195E+01	3.50467E+00	.00925509	4.90873E+00
7	-1.05452E+00	5.86292E+00	9.48087E-01	.17702179	9.48299E-01
9	-7.84790E-01	1.50233E+00	2.69761E-01	.46301446	1.27426E+00
11	-5.22323E-02	0.	0.	1.00000000	1.91452E+01
12	7.25518E-02	0.	0.	-1.00000000	-1.37832E+01
13	-6.66667E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-1.080E-03, 7.881E-03)	(-1.080E-03,-7.881E-03)	(-7.057E-04,-9.358E-04)	(-7.057E-04, 9.358E-04)
5	(-6.360E-02,-5.041E-03)	(-6.360E-02, 5.041E-03)	(9.643E-03,-1.577E-02)	(9.643E-03, 1.577E-02)
6	(-1.335E-05, 1.934E-06)	(-1.335E-05,-1.934E-06)	(1.813E-06,-2.109E-06)	(1.813E-06, 2.109E-06)
7	(3.428E-04, 2.814E-03)	(3.428E-04,-2.814E-03)	(-7.509E-04,-4.371E-04)	(-7.509E-04, 4.371E-04)
8	(1.432E-03, 2.009E-04)	(1.432E-03,-2.009E-04)	(-1.080E-03, 2.102E-03)	(-1.080E-03,-2.102E-03)
9	(3.896E-02,-8.466E-03)	(3.896E-02, 8.466E-03)	(-3.856E-04, 1.810E-03)	(-3.856E-04,-1.810E-03)
10	(-1.764E-02, 7.742E-03)	(-1.764E-02,-7.742E-03)	(-4.603E-02, 8.753E-03)	(-4.603E-02,-8.753E-03)
11	(-1.767E-05,-1.986E-05)	(-1.767E-05, 1.986E-05)	(-1.169E-05, 4.415E-06)	(-1.169E-05,-4.415E-06)
12	(-1.084E-02, 3.068E-02)	(-1.084E-02,-3.068E-02)	(-4.421E-02,-2.395E-02)	(-4.421E-02, 2.395E-02)
13	(1.228E-02, 8.971E-01)	(1.228E-02,-8.971E-01)	(-3.831E-02,-9.037E-03)	(-3.831E-02, 9.037E-03)
14	(-9.176E-02,-4.237E-01)	(-9.176E-02, 4.237E-01)	(-1.649E-01,-9.829E-01)	(-1.649E-01, 9.829E-01)
15	(5.172E-04,-3.007E-04)	(5.172E-04, 3.007E-04)	(-8.849E-05,-2.507E-04)	(-8.849E-05, 2.507E-04)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(1.637E-04, 6.252E-05)	(1.637E-04,-6.252E-05)	(-2.253E-02,-3.297E-02)	(-2.253E-02, 3.297E-02)
5	(3.601E-03, 4.803E-03)	(3.601E-03,-4.803E-03)	(1.743E-01,-1.555E-01)	(1.743E-01, 1.555E-01)
6	(1.846E-07, 5.281E-07)	(1.846E-07,-5.281E-07)	(2.318E-04,-3.206E-04)	(2.318E-04, 3.206E-04)
7	(2.166E-04,-1.655E-04)	(2.166E-04, 1.655E-04)	(-3.087E-02,-2.417E-02)	(-3.087E-02, 2.417E-02)
8	(3.781E-05,-1.826E-03)	(3.781E-05, 1.826E-03)	(1.441E-01, 7.017E-02)	(1.441E-01,-7.017E-02)
9	(1.244E-03, 1.429E-03)	(1.244E-03,-1.429E-03)	(7.517E-03, 5.835E-03)	(7.517E-03,-5.835E-03)
10	(2.381E-03,-1.191E-02)	(2.381E-03, 1.191E-02)	(4.098E-03, 4.913E-03)	(4.098E-03,-4.913E-03)
11	(-1.887E-02, 3.934E-02)	(-1.887E-02,-3.934E-02)	(8.119E-06, 6.778E-06)	(8.119E-06,-6.778E-06)
12	(4.020E-02, 1.205E-03)	(4.020E-02,-1.205E-03)	(-5.634E-01, 7.710E-01)	(-5.634E-01,-7.710E-01)
13	(-3.172E-02, 2.709E-02)	(-3.172E-02,-2.709E-02)	(-4.214E-02, 3.792E-02)	(-4.214E-02,-3.792E-02)
14	(2.619E-01, 5.485E-02)	(2.619E-01,-5.485E-02)	(-3.312E-02, 1.884E-02)	(-3.312E-02,-1.884E-02)
15	(-8.624E-01,-4.234E-01)	(-8.624E-01, 4.234E-01)	(-4.830E-05, 4.046E-05)	(-4.830E-05,-4.046E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-1.332E-01,-3.707E-01)	(-1.332E-01, 3.707E-01)	(4.297E-01, 0.)	(-3.306E-01, 0.)
5	(5.673E-01,-2.111E-01)	(5.673E-01, 2.111E-01)	(3.710E-02, 0.)	(-6.026E-02, 0.)
6	(6.121E-03,-1.142E-02)	(6.121E-03, 1.142E-02)	(-4.693E-01, 0.)	(3.782E-01, 0.)
7	(-2.654E-01,-2.390E-01)	(-2.654E-01, 2.390E-01)	(-7.103E-01, 0.)	(-8.306E-01, 0.)
8	(-1.711E-02,-2.989E-01)	(-1.711E-02, 2.989E-01)	(2.962E-01, 0.)	(-2.307E-01, 0.)
9	(1.106E-02, 2.174E-02)	(1.106E-02,-2.174E-02)	(-2.647E-02, 0.)	(2.024E-02, 0.)
10	(5.237E-03, 1.792E-02)	(5.237E-03,-1.792E-02)	(-2.109E-02, 0.)	(1.833E-02, 0.)
11	(1.132E-05, 2.923E-05)	(1.132E-05,-2.923E-05)	(-3.532E-05, 0.)	(2.721E-05, 0.)
12	(4.624E-01, 2.088E-01)	(4.624E-01,-2.088E-01)	(-1.547E-02, 0.)	(-1.674E-02, 0.)
13	(-4.133E-02,-4.492E-04)	(-4.133E-02, 4.[illegible]E-04)	(382E-03, 0.)	(1.469E-03, 0.)

14	(-3.102E-02,-6.193E-03)	(-3.102E-02, 6.193E-03)	(1.101E-03, 0.)	(1.184E-03, 0.)
15	(-5.279E-05,-5.937E-06)	(-5.279E-05, 5.937E-06)	(1.845E-06, 0.)	(1.974E-06, 0.)

	13	14	15
1	(1.635E-01, 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(8.557E-01, 0.)
3	(0. , 0.)	(3.744E-01, 0.)	(-1.930E-01, 0.)
4	(-4.240E-02, 0.)	(1.926E-03, 0.)	(-7.974E-04, 0.)
5	(2.778E-01, 0.)	(3.690E-01, 0.)	(-1.917E-01, 0.)
6	(-3.811E-04, 0.)	(-1.337E-04, 0.)	(7.158E-05, 0.)
7	(-4.167E-02, 0.)	(-3.884E-02, 0.)	(2.040E-02, 0.)
8	(1.397E-01, 0.)	(8.199E-02, 0.)	(-4.298E-02, 0.)
9	(1.014E-02, 0.)	(-2.953E-02, 0.)	(1.522E-02, 0.)
10	(-2.762E-03, 0.)	(-1.788E-02, 0.)	(9.247E-03, 0.)
11	(7.245E-06, 0.)	(-3.123E-05, 0.)	(1.612E-05, 0.)
12	(-9.317E-01, 0.)	(-7.789E-01, 0.)	(4.040E-01, 0.)
13	(-6.756E-02, 0.)	(2.805E-01, 0.)	(-1.431E-01, 0.)
14	(1.841E-02, 0.)	(1.699E-01, 0.)	(-8.692E-02, 0.)
15	(-4.828E-05, 0.)	(2.967E-04, 0.)	(-1.515E-04, 0.)

THE CON VECTOR (15 BY 1)

	1
1	(-1.038E-01, 9.252E-03)
2	(-1.038E-01,-9.252E-03)
3	(-4.006E-01,-2.906E-01)
4	(-4.006E-01, 2.906E-01)
5	(-6.106E-06,-2.496E-06)
6	(-6.106E-06, 2.496E-06)
7	(-3.818E+00,-1.001E+00)
8	(-3.818E+00, 1.001E+00)
9	(-1.083E-01, 1.693E-01)
10	(-1.082E-01,-1.693E-01)
11	(3.804E-02, 7.196E-31)
12	(5.303E-02, 7.217E-31)
13	(6.114E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(1.043E-01, 1.749E+02)
2	(1.043E-01,-1.749E+02)
3	(4.949E-01,-1.440E+02)
4	(4.949E-01, 1.440E+02)
5	(6.597E-06,-1.578E+02)
6	(6.597E-06, 1.578E+02)
7	(3.947E+00,-1.653E+02)
8	(3.947E+00, 1.653E+02)
9	(2.009E-01, 1.226E+02)
10	(2.009E-01,-1.226E+02)
11	(3.804E-02, 1.084E-27)
12	(5.303E-02, 7.798E-28)
13	(6.114E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(4.701E-03, 3.918E-03)
2	(4.701E-03,-3.918E-03)
3	(-4.121E-03,-3.842E-03)
4	(-4.121E-03, 3.842E-03)
5	(4.410E-06,-6.226E-06)
6	(4.410E-06, 6.226E-06)
7	(-2.992E-03,-4.009E-03)
8	(-2.992E-03, 4.009E-03)
9	(-5.985E-04,-2.691E-04)
10	(-5.985E-04, 2.691E-04)
11	(-1.499E-05,-1.189E-30)
12	(2.517E-05,-1.880E-30)
13	(0. , 0.)
14	(6.177E-01, 0.)
15	(1.169E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(6.120E-03, 3.981E+01)
2	(6.120E-03,-3.981E+01)
3	(5.634E-03,-1.370E+02)
4	(5.634E-03, 1.370E+02)
5	(7.629E-06,-5.469E+01)
6	(7.629E-06, 5.469E+01)
7	(5.003E-03,-1.267E+02)
8	(5.003E-03, 1.267E+02)
9	(6.562E-04,-1.558E+02)
10	(6.562E-04, 1.558E+02)
11	(1.499E-05,-1.809E+02)
12	(2.517E-05,-4.280E-24)
13	(0. , 0.)
14	(6.177E-01, 0.)
15	(1.169E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-1.267E-02, 1.835E-03)	(-1.267E-02,-1.835E-03)	(1.721E-03,-2.002E-03)	(1.721E-03, 2.002E-03)
2	(3.428E-04, 2.814E-03)	(3.428E-04,-2.814E-03)	(-7.509E-04,-4.371E-04)	(-7.509E-04, 4.371E-04)
3	(-6.360E-02,-5.041E-03)	(-6.360E-02, 5.041E-03)	(9.643E-03,-1.577E-02)	(9.643E-03, 1.577E-02)
4	(1.422E-03,-5.067E-03)	(1.422E-03, 5.067E-03)	(-4.514E-05, 4.987E-04)	(-4.514E-05,-4.987E-04)
5	(-2.239E-02, 3.357E-03)	(-2.239E-02,-3.357E-03)	(4.675E-02,-1.311E-02)	(4.675E-02, 1.311E-02)
6	(2.621E-02,-5.087E-01)	(2.621E-02, 5.087E-01)	(2.572E-01, 1.000E+00)	(2.572E-01,-1.000E+00)
7	(-2.264E+00,-2.710E+00)	(-2.264E+00, 2.710E+00)	(4.034E+00,-7.985E-01)	(4.034E+00, 7.985E-01)

	5	6	7	8
1	(1.752E-04, 5.012E-04)	(1.752E-04,-5.012E-04)	(2.199E-01,-3.042E-01)	(2.199E-01, 3.042E-01)
2	(2.166E-04,-1.655E-04)	(2.166E-04, 1.655E-04)	(-3.087E-02,-2.417E-02)	(-3.087E-02, 2.417E-02)
3	(3.601E-03, 4.803E-03)	(3.601E-03,-4.803E-03)	(1.743E-01,-1.555E-01)	(1.743E-01, 1.555E-01)
4	(5.285E-05,-2.281E-04)	(5.285E-05, 2.281E-04)	(-8.337E-03, 8.797E-03)	(-8.337E-03,-8.797E-03)
5	(1.542E-02,-2.719E-02)	(1.542E-02, 2.719E-02)	(-1.866E-01,-1.051E-01)	(-1.866E-01, 1.051E-01)
6	(5.956E-01, 3.451E-01)	(5.956E-01,-3.451E-01)	(8.130E-01,-9.833E-01)	(8.130E-01, 9.833E-01)
7	(6.341E-01,-1.042E+00)	(6.341E-01, 1.042E+00)	(-1.521E+00,-1.213E+00)	(-1.521E+00, 1.213E+00)

	9	10	11	12
1	(5.808E+00,-1.084E+01)	(5.808E+00, 1.084E+01)	(-4.454E+02, 0.)	(3.589E+02, 0.)
2	(-2.654E-01,-2.390E-01)	(-2.654E-01, 2.390E-01)	(-7.103E-01, 0.)	(-8.306E-01, 0.)
3	(5.673E-01,-2.111E-01)	(5.673E-01, 2.111E-01)	(3.710E-02, 0.)	(-6.026E-02, 0.)
4	(-1.322E-01, 1.317E-01)	(-1.322E-01,-1.317E-01)	(-1.140E+00, 0.)	(-4.999E-01, 0.)
5	(-2.645E-01, 2.020E-02)	(-2.645E-01,-2.020E-02)	(-9.590E-01, 0.)	(-6.364E-01, 0.)
6	(1.773E-01,-4.133E-01)	(1.773E-01, 4.133E-01)	(5.009E-02, 0.)	(-4.618E-02, 0.)
7	(-3.290E+00,-6.712E+00)	(-3.290E+00, 6.712E+00)	(1.753E+00, 0.)	(-1.079E+00, 0.)

	13	14	15
1	(-3.617E-01, 0.)	(-1.269E-01, 0.)	(6.793E-02, 0.)
2	(-4.167E-02, 0.)	(-3.884E-02, 0.)	(2.040E-02, 0.)
3	(2.778E-01, 0.)	(3.690E-01, 0.)	(-1.917E-01, 0.)
4	(7.306E-04, 0.)	(-4.077E-02, 0.)	(2.119E-02, 0.)
5	(-1.888E-01, 0.)	(-7.339E-02, 0.)	(3.883E-02, 0.)
6	(1.259E+00, 0.)	(6.972E-01, 0.)	(-3.656E-01, 0.)
7	(-1.092E+00, 0.)	(6.292E+00, 0.)	(-3.247E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.280E-02, 1.718E+02)	(1.280E-02,-1.718E+02)	(2.640E-03,-4.932E+01)	(2.640E-03, 4.932E+01)
2	(2.835E-03, 8.305E+01)	(2.835E-03,-8.305E+01)	(8.688E-04,-1.498E+02)	(8.688E-04, 1.498E+02)
3	(6.380E-02,-1.755E+02)	(6.380E-02, 1.755E+02)	(1.848E-02,-5.855E+01)	(1.848E-02, 5.855E+01)
4	(5.262E-03,-7.432E+01)	(5.262E-03, 7.432E+01)	(5.007E-04, 9.517E+01)	(5.007E-04,-9.517E+01)
5	(2.264E-02, 1.715E+02)	(2.264E-02,-1.715E+02)	(4.855E-02,-1.566E+01)	(4.855E-02, 1.566E+01)
6	(5.094E-01,-8.705E+01)	(5.094E-01, 8.705E+01)	(1.033E+00, 7.558E+01)	(1.033E+00,-7.558E+01)
7	(3.532E+00,-1.299E+02)	(3.532E+00, 1.299E+02)	(4.113E+00,-1.120E+01)	(4.113E+00, 1.120E+01)

	5	6	7	8
1	(5.309E-04, 7.074E+01)	(5.309E-04,-7.074E+01)	(3.754E-01,-5.413E+01)	(3.754E-01, 5.413E+01)
2	(2.726E-04,-3.739E+01)	(2.726E-04, 3.739E+01)	(3.920E-02,-1.419E+02)	(3.920E-02, 1.419E+02)
3	(6.003E-03, 5.314E+01)	(6.003E-03,-5.314E+01)	(2.335E-01,-4.174E+01)	(2.335E-01, 4.174E+01)
4	(2.341E-04,-7.695E+01)	(2.341E-04, 7.695E+01)	(1.212E-02, 1.335E+02)	(1.212E-02,-1.335E+02)
5	(3.126E-02,-6.044E+01)	(3.126E-02, 6.044E+01)	(2.142E-01,-1.506E+02)	(2.142E-01, 1.506E+02)
6	(6.884E-01,-3.009E+01)	(6.884E-01,-3.009E+01)	(1.276E+00,-5.042E+01)	(1.276E+00, 5.042E+01)
7	(1.220E+00,-5.868E+01)	(1.220E+00, 5.868E+01)	(1.945E+00,-1.414E+02)	(1.945E+00, 1.414E+02)

	9	10	11	12
1	(1.230E+01,-6.182E+01)	(1.230E+01, 6.182E+01)	(4.454E+02, 1.800E+02)	(3.589E+02, 0.)
2	(3.571E-01,-1.380E+02)	(3.571E-01, 1.380E+02)	(7.103E-01, 1.800E+02)	(8.306E-01, 1.800E+02)
3	(6.053E-01,-2.041E+01)	(6.053E-01, 2.041E+01)	(3.710E-02, 0.)	(6.026E-02, 1.800E+02)
4	(1.866E-01, 1.351E+02)	(1.866E-01,-1.351E+02)	(1.140E+00, 1.800E+02)	(4.999E-01, 1.800E+02)
5	(2.653E-01, 1.756E+02)	(2.653E-01,-1.756E+02)	(9.590E-01, 1.800E+02)	(6.364E-01, 1.800E+02)
6	(4.497E-01,-6.678E+01)	(4.497E-01, 6.678E+01)	(5.009E-02, 0.)	(4.618E-02, 1.800E+02)
7	(7.475E+00,-1.161E+02)	(7.475E+00, 1.161E+02)	(1.753E+00, 0.)	(1.079E+00, 1.800E+02)

	13	14	15
1	(3.617E-01, 1.800E+02)	(1.269E-01, 1.800E+02)	(6.793E-02, 0.)
2	(4.167E-02, 1.800E+02)	(3.884E-02, 1.800E+02)	(2.040E-02, 0.)
3	(2.778E-01, 0.)	(3.690E-01, 0.)	(1.917E-01, 1.800E+02)
4	(7.306E-04, 0.)	(4.077E-02, 1.800E+02)	(2.119E-02, 0.)
5	(1.888E-01, 1.800E+02)	(7.339E-02, 1.800E+02)	(3.889E-02, 0.)
6	(1.259E+00, 0.)	(6.972E-01, 0.)	(3.656E-01, 1.800E+02)
7	(1.092E+00, 1.800E+02)	(6.292E+00, 0.)	(3.247E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.299E-03,-3.078E-04)	(-6.164E-05,-2.891E-04)	(6.651E-03,-6.495E-05)	(-1.008E-04, 5.393E-04)
2	(1.299E-03, 3.078E-04)	(-6.164E-05, 2.891E-04)	(6.651E-03, 6.495E-05)	(-1.008E-04,-5.393E-04)
3	(-1.271E-03, 3.019E-04)	(1.738E-04, 3.933E-04)	(-8.445E-03, 3.515E-03)	(1.630E-04,-1.867E-04)
4	(-1.271E-03,-3.019E-04)	(1.738E-04,-3.933E-04)	(-8.445E-03,-3.515E-03)	(1.630E-04, 1.867E-04)
5	(1.813E-10,-3.498E-09)	(-1.736E-09, 4.703E-10)	(-1.000E-08,-3.832E-08)	(-8.919E-10, 1.261E-09)
6	(1.813E-10, 3.498E-09)	(-1.736E-09,-4.703E-10)	(-1.000E-08, 3.832E-08)	(-8.919E-10,-1.261E-09)
7	(-1.144E+00, 9.415E-01)	(9.366E-02, 1.232E-01)	(-8.210E-01, 4.192E-01)	(4.064E-02,-2.525E-02)
8	(-1.144E+00,-9.415E-01)	(9.366E-02,-1.232E-01)	(-8.210E-01,-4.192E-01)	(4.064E-02, 2.525E-02)
9	(1.206E+00, 2.156E+00)	(6.916E-02,-1.905E-02)	(-2.566E-02, 1.189E-01)	(-7.992E-03,-3.662E-02)
10	(1.206E+00,-2.156E+00)	(6.916E-02, 1.905E-02)	(-2.566E-02,-1.189E-01)	(-7.992E-03, 3.662E-02)
11	(-1.694E+01,-3.205E-28)	(-2.702E-02,-5.112E-31)	(1.411E-03, 2.670E-32)	(-4.337E-02,-8.204E-31)
12	(1.903E+01, 2.590E-28)	(-4.404E-02,-5.994E-31)	(-3.195E-03,-4.343E-32)	(-2.651E-02,-3.608E-31)
13	(-2.211E+00, 0.)	(-2.546E-01, 0.)	(1.699E+00, 0.)	(4.467E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.294E-03,-5.557E-04)	(1.986E-03, 5.307E-02)	(2.602E-01, 2.605E-01)
2	(2.294E-03, 5.557E-04)	(1.986E-03,-5.307E-02)	(2.602E-01,-2.605E-01)
3	(-2.254E-02,-8.334E-03)	(1.877E-01,-4.755E-01)	(-1.848E+00,-8.523E-01)
4	(-2.254E-02, 8.334E-03)	(1.877E-01, 4.755E-01)	(-1.848E+00, 8.523E-01)
5	(-1.620E-07, 1.276E-07)	(-2.776E-06,-3.594E-06)	(-6.473E-06, 4.782E-06)
6	(-1.620E-07,-1.276E-07)	(-2.776E-06, 3.594E-06)	(-6.473E-06,-4.782E-06)
7	(6.074E-01, 5.831E-01)	(-4.088E+00, 2.941E+00)	(4.592E+00, 6.154E+00)
8	(6.074E-01,-5.831E-01)	(-4.089E+00,-2.941E+00)	(4.592E+00,-6.154E+00)
9	(2.521E-02,-4.696E-02)	(5.077E-02, 7.472E-02)	(1.492E+00, 1.695E-01)
10	(2.521E-02, 4.696E-02)	(5.077E-02,-7.472E-02)	(1.492E+00,-1.695E-01)
11	(-3.649E-02,-6.901E-31)	(1.906E-03, 3.605E-32)	(6.670E-02, 1.262E-30)
12	(-3.375E-02,-4.593E-31)	(-2.449E-03,-3.333E-32)	(-5.722E-02,-7.787E-31)
13	(-1.154E+00, 0.)	(7.696E+00, 0.)	(-6.875E+00, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.335E-03,-1.333E+01)	(2.956E-04,-1.020E+02)	(6.651E-03,-5.595E-01)	(5.486E-04, 1.006E+02)
2	(1.335E-03, 1.333E+01)	(2.956E-04, 1.020E+02)	(6.651E-03, 5.595E-01)	(5.486E-04,-1.006E+02)
3	(1.306E-03, 1.666E+02)	(4.300E-04, 6.616E+01)	(9.147E-03, 1.574E+02)	(2.478E-04,-4.887E+01)
4	(1.306E-03,-1.666E+02)	(4.300E-04,-6.616E+01)	(9.147E-03,-1.574E+02)	(2.478E-04, 4.887E+01)
5	(3.502E-09,-8.703E+01)	(1.798E-09, 1.648E+02)	(3.960E-08,-1.046E+02)	(1.544E-09, 1.253E+02)
6	(3.502E-09, 8.703E+01)	(1.799E-09,-1.648E+02)	(3.960E-08, 1.046E+02)	(1.544E-09,-1.253E+02)
7	(1.482E+00, 1.406E+02)	(1.548E-01, 5.275E+01)	(9.219E-01, 1.530E+02)	(4.784E-02,-3.185E+01)
8	(1.482E+00,-1.406E+02)	(1.548E-01,-5.275E+01)	(9.219E-01,-1.530E+02)	(4.784E-02, 3.185E+01)
9	(2.471E+00, 6.077E+01)	(7.174E-02,-1.540E+01)	(1.216E-01, 1.022E+02)	(3.748E-02,-1.023E+02)
10	(2.471E+00,-6.077E+01)	(7.174E-02, 1.540E+01)	(1.216E-01,-1.022E+02)	(3.748E-02, 1.023E+02)
11	(1.694E+01,-1.800E+02)	(2.702E-02,-1.800E+02)	(1.411E-03, 1.084E-27)	(4.337E-02,-1.800E+02)
12	(1.503E+01, 7.798E-28)	(4.404E-02,-1.800E+02)	(3.195E-03,-1.800E+02)	(2.651E-02,-1.800E+02)
13	(2.211E+00, 1.800E+02)	(2.548E-01, 1.800E+02)	(1.699E+00, 0.)	(4.467E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.360E-03,-1.362E+01)	(5.311E-02, 8.786E+01)	(3.682E-01, 4.503E+01)
2	(2.360E-03, 1.362E+01)	(5.311E-02,-8.786E+01)	(3.682E-01,-4.503E+01)
3	(2.403E-02,-1.597E+02)	(5.112E-01,-6.846E+01)	(2.035E+00,-1.552E+02)
4	(2.403E-02, 1.597E+02)	(5.112E-01, 6.846E+01)	(2.035E+00, 1.552E+02)
5	(2.062E-07, 1.416E+02)	(4.541E-06,-1.277E+02)	(8.048E-06, 1.435E+02)
6	(2.062E-07,-1.416E+02)	(4.541E-06, 1.277E+02)	(8.048E-06,-1.435E+02)
7	(8.454E-01, 4.407E+01)	(5.036E+00, 1.443E+02)	(7.678E+00, 5.327E+01)
8	(8.454E-01,-4.407E+01)	(5.036E+00,-1.443E+02)	(7.678E+00,-5.327E+01)
9	(5.330E-02,-6.178E+01)	(9.034E-02, 5.581E+01)	(1.502E+00, 6.479E+00)
10	(5.330E-02, 6.178E+01)	(9.034E-02,-5.581E+01)	(1.502E+00,-6.479E+00)
11	(3.648E-02,-1.800E+02)	(1.906E-03, 1.084E-27)	(6.670E-02, 1.084E-27)
12	(3.375E-02,-1.800E+02)	(2.449E-03,-1.800E+02)	(5.722E-02,-1.800E+02)
13	(1.154E+00, 1.800E+02)	(7.696E+00, 0.)	(6.675E+00, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-6.676E-05,-4.102E-05)	(-9.414E-06, 1.457E-05)	(-2.792E-04,-2.729E-04)	(2.654E-05,-1.825E-05)
2	(-6.676E-05, 4.102E-05)	(-9.414E-06,-1.457E-05)	(-2.792E-04, 2.729E-04)	(2.654E-05, 1.825E-05)
3	(-1.478E-05, 1.638E-06)	(1.415E-06, 4.686E-06)	(-1.003E-04, 2.793E-05)	(2.102E-06,-1.882E-06)
4	(-1.478E-05,-1.638E-06)	(1.415E-06,-4.686E-06)	(-1.003E-04,-2.793E-05)	(2.102E-06, 1.882E-06)
5	(3.893E-09, 1.120E-09)	(-7.543E-11,-2.078E-09)	(4.578E-08,-1.237E-09)	(-1.187E-09,-1.335E-09)
6	(3.893E-09,-1.120E-09)	(-7.543E-11, 2.078E-09)	(4.578E-08, 1.237E-09)	(-1.187E-09, 1.335E-09)
7	(-1.878E-03, 2.841E-05)	(-4.567E-06, 1.961E-04)	(-1.145E-03,-2.335E-04)	(6.022E-05, 7.102E-06)
8	(-1.878E-03,-2.841E-05)	(-4.567E-06,-1.961E-04)	(-1.145E-03, 2.335E-04)	(6.022E-05,-7.102E-06)
9	(-6.393E-03, 4.926E-03)	(9.451E-05, 2.144E-04)	(-3.963E-04,-2.630E-05)	(1.145E-04,-4.327E-05)
10	(-6.393E-03,-4.926E-03)	(9.451E-05,-2.144E-04)	(-3.963E-04, 2.630E-05)	(1.145E-04, 4.327E-05)
11	(6.677E-03, 5.295E-28)	(1.065E-05, 8.444E-31)	(-5.562E-07,-4.411E-32)	(1.709E-05, 1.355E-30)
12	(9.032E-03,-6.747E-28)	(-2.090E-05, 1.561E-30)	(-1.517E-06, 1.133E-31)	(-1.258E-05, 9.399E-31)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-7.839E-02, 0.)	(-2.399E-02, 0.)	(2.279E-01, 0.)	(-2.518E-02, 0.)
15	(7.939E-02, 0.)	(2.384E-02, 0.)	(-2.241E-01, 0.)	(2.477E-02, 0.)

	5	6	7
1	(-1.184E-04,-7.193E-05)	(2.117E-03,-2.289E-03)	(-2.543E-05,-2.161E-02)
2	(-1.184E-04, 7.193E-05)	(2.117E-03, 2.289E-03)	(-2.543E-05, 2.161E-02)
3	(-2.430E-04,-1.256E-04)	(2.784E-03,-5.111E-03)	(-1.969E-02,-1.221E-02)
4	(-2.430E-04, 1.256E-04)	(2.784E-03, 5.111E-03)	(-1.969E-02, 1.221E-02)
5	(-1.013E-07,-2.159E-07)	(4.775E-06,-2.186E-06)	(-3.692E-06,-8.544E-06)
6	(-1.013E-07, 2.159E-07)	(4.775E-06, 2.186E-06)	(-3.692E-06, 8.544E-06)
7	(1.370E-04, 1.063E-03)	(-6.375E-03,-3.175E-04)	(-3.136E-04, 9.726E-03)
8	(1.370E-04,-1.063E-03)	(-6.375E-03, 3.175E-04)	(-3.136E-04,-9.726E-03)
9	(1.638E-04, 5.909E-05)	(-2.173E-04, 1.997E-04)	(1.630E-04, 4.902E-03)
10	(1.638E-04,-5.909E-05)	(-2.173E-04,-1.997E-04)	(1.630E-04,-4.902E-03)
11	(1.438E-05, 1.140E-30)	(-7.510E-07,-5.955E-32)	(-2.628E-05,-2.084E-30)
12	(-1.602E-05, 1.197E-30)	(-1.162E-06, 8.681E-32)	(-2.716E-05, 2.029E-30)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-4.533E-02, 0.)	(4.306E-01, 0.)	(3.886E+00, 0.)
15	(4.545E-02, 0.)	(-4.273E-01, 0.)	(-3.794E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.835E-05,-1.484E+02)	(1.735E-05, 1.229E+02)	(3.904E-04,-1.357E+02)	(3.220E-05,-3.451E+01)
2	(7.835E-05, 1.484E+02)	(1.735E-05,-1.229E+02)	(3.904E-04, 1.357E+02)	(3.220E-05, 3.451E+01)
3	(1.487E-05, 1.737E+02)	(4.895E-06, 7.320E+01)	(1.041E-04, 1.644E+02)	(2.821E-06,-4.183E+01)
4	(1.487E-05,-1.737E+02)	(4.895E-06,-7.320E+01)	(1.041E-04,-1.644E+02)	(2.821E-06, 4.183E+01)
5	(4.051E-09, 1.605E+01)	(2.080E-09,-9.208E+01)	(4.580E-08,-1.548E+00)	(1.786E-09,-1.316E+02)
6	(4.051E-09,-1.605E+01)	(2.080E-09, 9.208E+01)	(4.580E-08, 1.548E+00)	(1.786E-09, 1.316E+02)
7	(1.878E-03, 1.791E+02)	(1.961E-04, 9.133E+01)	(1.168E-03,-1.685E+02)	(6.063E-05, 6.727E+00)
8	(1.878E-03,-1.791E+02)	(1.961E-04,-9.133E+01)	(1.168E-03, 1.685E+02)	(6.063E-05,-6.727E+00)
9	(8.071E-03, 1.424E+02)	(2.343E-04, 6.621E+01)	(3.972E-04,-1.762E+02)	(1.224E-04,-2.069E+01)
10	(8.071E-03,-1.424E+02)	(2.343E-04,-6.621E+01)	(3.972E-04, 1.762E+02)	(1.224E-04, 2.069E+01)
11	(6.677E-03, 4.543E-24)	(1.065E-05, 4.543E-24)	(5.562E-07,-1.800E+02)	(1.709E-05, 4.543E-24)
12	(9.032E-03,-4.280E-24)	(2.090E-05, 1.800E+02)	(1.517E-06, 1.800E+02)	(1.258E-05, 1.800E+02)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(7.839E-02, 1.800E+02)	(2.399E-02, 1.800E+02)	(2.279E-01, 0.)	(2.518E-02, 1.800E+02)
15	(7.939E-02, 0.)	(2.384E-02, 0.)	(2.241E-01, 1.800E+02)	(2.477E-02, 0.)

	5	6	7
1	(1.385E-04,-1.487E+02)	(3.118E-03,-4.724E+01)	(2.161E-02,-9.007E+01)
2	(1.385E-04, 1.487E+02)	(3.118E-03, 4.724E+01)	(2.161E-02, 9.007E+01)
3	(2.736E-04,-1.527E+02)	(5.820E-03,-6.142E+01)	(2.317E-02,-1.482E+02)
4	(2.736E-04, 1.527E+02)	(5.820E-03, 6.142E+01)	(2.317E-02, 1.482E+02)
5	(2.385E-07,-1.151E+02)	(5.252E-06,-2.460E+01)	(9.307E-06,-1.134E+02)
6	(2.385E-07, 1.151E+02)	(5.252E-06, 2.460E+01)	(9.307E-06, 1.134E+02)
7	(1.071E-03, 8.265E+01)	(6.383E-03,-1.771E+02)	(9.731E-03, 9.185E+01)
8	(1.071E-03,-8.265E+01)	(6.383E-03, 1.771E+02)	(9.731E-03,-9.185E+01)
9	(1.741E-04, 1.984E+01)	(2.951E-04, 1.374E+02)	(4.905E-03, 8.810E+01)
10	(1.741E-04,-1.984E+01)	(2.951E-04,-1.374E+02)	(4.905E-03,-8.810E+01)
11	(1.438E-05, 4.543E-24)	(7.510E-07,-1.800E+02)	(2.628E-05,-1.800E+02)
12	(1.602E-05, 1.800E+02)	(1.162E-06, 1.800E+02)	(2.716E-05, 1.800E+02)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(4.533E-02, 1.800E+02)	(4.306E-01, 0.)	(3.886E+00, 0.)
15	(4.545E-02, 0.)	(4.273E-01, 1.800E+02)	(3.794E+00, 1.800E+02)

THE AV MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.055E+00	-2.018E+00	-2.250E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-1.774E+02	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.990E+00	3.458E+01
12	1.688E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	[illegible]E+00	0.	0.
7	0.	0.	0.		1.000E+00	0.
8	0.	0.	0.		0.	1.000E+00
9	-1.540E+01	2.088E+01	-1.139E+00	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-2.085E+01	3.457E+00	-1.219E-01	3.784E+00	-1.929E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.020E-01

THE AG MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	1.611E+00	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	3.456E-02	3.636E-02
7	5.298E-01	1.672E+00	1.742E-03	1.103E-01	-1.041E-03	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AU-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-1.774E+02	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-1.139E+00	-2.216E-01	6.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
11	-3.085E+01	3.286E+00	-1.596E-01	3.963E+00	-1.929E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00
11	-2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-6.103E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-1.533E+01	-4.599E+01	-6.597E-02	-3.342E+00	3.012E-02	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-1.774E+02
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.136E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-1.139E+00	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-8.598E+00	1.080E-01	1.017E-01
14	3.621E+01	-3.085E+01	3.286E+00	-1.596E-01	3.963E+00	-1.529E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.649E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-6.103E+01	-9.740E+01	-1.533E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	-6.597E-02	-3.342E+00	3.012E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.50431E+00	2.19936E+01	3.57305E+00	.20063594	2.22010E-01
3	-2.03841E-01	2.20195E+01	3.50468E+00	.00925690	4.90578E+00
5	-6.98715E-01	1.32793E+01	2.11628E+00	.05254431	1.43120E+00
7	-5.64212E-01	5.93400E+00	9.48685E-01	.09465439	1.77238E+00
9	-8.40533E-01	1.04297E+00	2.13190E-01	.62749222	1.18972E+00
11	1.62694E-01	0.	0.	-1.00000000	-6.14649E+00
12	-1.26380E-01	0.	0.	1.00000000	7.91264E+00
13	-6.66667E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-4.555E-03, 7.471E-03)	(-4.555E-03,-7.471E-03)	(-1.460E-04, 6.156E-05)	(-1.460E-04,-6.156E-05)
5	(-6.233E-02,-2.960E-02)	(-6.233E-02, 2.960E-02)	(4.101E-04, 1.495E-03)	(4.101E-04,-1.495E-03)
6	(-1.430E-05,-3.677E-06)	(-1.430E-05, 3.677E-06)	(-4.456E-08,-6.997E-08)	(-4.456E-08, 6.997E-08)
7	(-7.347E-04, 2.984E-03)	(-7.347E-04,-2.984E-03)	(6.773E-05,-1.925E-05)	(6.773E-05, 1.925E-05)
8	(1.844E-03,-3.079E-04)	(1.844E-03, 3.079E-04)	(1.575E-03,-1.582E-03)	(1.575E-03, 1.582E-03)
9	(4.253E-02, 5.805E-03)	(4.253E-02,-5.805E-03)	(6.755E-04, 2.201E-03)	(6.755E-04,-2.201E-03)
10	(-3.567E-03,-7.030E-03)	(-3.567E-03, 7.030E-03)	(2.905E-04,-8.733E-04)	(2.905E-04, 8.733E-04)
11	(-7.347E-06,-2.725E-05)	(-7.347E-06, 2.725E-05)	(-3.649E-02, 2.674E-02)	(-3.649E-02,-2.674E-02)
12	(-1.533E-03, 4.194E-02)	(-1.533E-03,-4.194E-02)	(3.452E-02, 3.499E-02)	(3.452E-02,-3.499E-02)
13	(-4.072E-01, 8.912E-01)	(-4.072E-01,-8.912E-01)	(-4.860E-02, 1.443E-02)	(-4.860E-02,-1.443E-02)
14	(1.707E-01,-4.679E-02)	(1.707E-01, 4.679E-02)	(1.917E-02, 6.575E-03)	(1.917E-02,-6.575E-03)
15	(6.324E-04,-3.884E-05)	(6.324E-04, 3.884E-05)	(-5.814E-01,-8.090E-01)	(-5.814E-01, 8.090E-01)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-3.633E-03,-6.312E-04)	(-3.633E-03, 6.312E-04)	(3.236E-02,-1.593E-02)	(3.236E-02, 1.593E-02)
5	(-7.232E-03,-4.613E-02)	(-7.232E-03, 4.613E-02)	(1.294E-01, 1.684E-01)	(1.294E-01,-1.684E-01)
6	(-1.409E-06,-1.592E-05)	(-1.409E-06, 1.592E-05)	(2.342E-04, 2.715E-04)	(2.342E-04,-2.715E-04)
7	(-3.436E-03, 7.254E-04)	(-3.436E-03,-7.254E-04)	(2.608E-02,-2.428E-02)	(2.608E-02, 2.428E-02)
8	(5.975E-02,-4.457E-02)	(5.975E-02, 4.457E-02)	(5.952E-03, 1.640E-02)	(5.952E-03,-1.640E-02)
9	(3.388E-03,-2.477E-03)	(3.388E-03, 2.477E-03)	(-1.795E-03, 2.489E-04)	(-1.795E-03,-2.489E-04)
10	(-5.272E-03, 2.912E-03)	(-5.272E-03,-2.912E-03)	(7.097E-02,-1.440E-01)	(7.097E-02, 1.440E-01)
11	(3.380E-06,-2.551E-06)	(3.380E-06, 2.551E-06)	(-3.353E-06,-4.561E-07)	(-3.353E-06, 4.561E-07)
12	(5.502E-01, 8.246E-01)	(5.502E-01,-8.246E-01)	(-1.007E-01, 2.607E-02)	(-1.007E-01,-2.607E-02)
13	(3.052E-02, 4.673E-02)	(3.052E-02,-4.673E-02)	(-4.642E-04,-1.079E-02)	(-4.642E-04, 1.079E-02)
14	(-3.498E-02,-7.205E-02)	(-3.498E-02 7.205E-02)	(8.142E-01, 5.024E-01)	(8.142E-01,-5.024E-01)
15	(3.151E-05, 4.666E-05)	(3.151E-05,-4.666E-05)	(4.598E-06,-1.964E-05)	(4.598E-06, 1.964E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-4.367E-01, 2.894E-02)	(-4.367E-01,-2.894E-02)	(2.788E-01, 0.)	(-3.441E-01, 0.)
5	(-1.030E-02,-4.717E-01)	(-1.030E-02, 4.717E-01)	(1.445E-01, 0.)	(-1.076E-01, 0.)
6	(-1.464E-02,-8.346E-03)	(-1.464E-02, 8.346E-03)	(-1.998E-01, 0.)	(1.955E-01, 0.)
7	(-2.694E-01, 2.270E-01)	(-2.694E-01,-2.270E-01)	(8.879E-01, 0.)	(8.513E-01, 0.)
8	(-7.919E-02,-6.585E-03)	(-7.919E-02, 6.585E-03)	(5.229E-02, 0.)	(-6.330E-02, 0.)
9	(3.973E-02,-2.413E-03)	(3.973E-02, 2.413E-03)	(-2.519E-02, 0.)	(3.108E-02, 0.)
10	(3.957E-01, 2.653E-02)	(3.957E-01,-2.653E-02)	(-2.606E-01, 0.)	(3.168E-01, 0.)
11	(4.906E-05,-1.404E-06)	(4.906E-05, 1.401E-06)	(-3.179E-05, 0.)	(3.899E-05, 0.)
12	(7.343E-02,-7.706E-02)	(7.343E-02, 7.706E-02)	(8.508E-03, 0.)	(8.000E-03, 0.)
13	(-3.087E-02, 4.346E-02)	(-3.087E-02,-4.346E-02)	(991E-03, 0.)	(-3.928E-03, 0.)

14	(-3.603E-01, 3.904E-01)	(-3.603E-01,-3.904E-01)	(-4.240E-02, 0.)	(-4.004E-02, 0.)
15	(-3.977E-05, 5.235E-05)	(-3.977E-05,-5.235E-05)	(-5.172E-06, 0.)	(-4.927E-06, 0.)

	13	14	15
1	(2.968E-01, 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(8.373E-01, 0.)
3	(0. , 0.)	(3.466E-01, 0.)	(-1.885E-01, 0.)
4	(-9.308E-02, 0.)	(2.602E-03, 0.)	(-1.243E-03, 0.)
5	(6.311E-01, 0.)	(3.350E-01, 0.)	(-1.839E-01, 0.)
6	(-8.528E-04, 0.)	(-1.190E-04, 0.)	(6.731E-05, 0.)
7	(-9.466E-02, 0.)	(-3.526E-02, 0.)	(1.952E-02, 0.)
8	(8.746E-02, 0.)	(3.783E-02, 0.)	(-2.081E-02, 0.)
9	(1.385E-02, 0.)	(-2.512E-02, 0.)	(1.589E-02, 0.)
10	(-5.522E-02, 0.)	(-7.823E-02, 0.)	(4.334E-02, 0.)
11	(6.831E-06, 0.)	(-3.146E-05, 0.)	(1.719E-05, 0.)
12	(-5.831E-01, 0.)	(-3.594E-01, 0.)	(1.958E-01, 0.)
13	(-9.235E-02, 0.)	(2.767E-01, 0.)	(-1.494E-01, 0.)
14	(3.681E-01, 0.)	(7.432E-01, 0.)	(-4.074E-01, 0.)
15	(-4.554E-05, 0.)	(2.968E-04, 0.)	(-1.618E-04, 0.)

THE CON VECTOR (15 BY 1)

	1
1	(-6.507E-02, 2.179E-02)
2	(-6.507E-02,-2.179E-02)
3	(-9.092E-05,-1.319E-04)
4	(-9.092E-05, 1.319E-04)
5	(-8.201E-01,-1.858E+00)
6	(-8.201E-01, 1.858E+00)
7	(-6.203E-01, 1.314E+00)
8	(-6.203E-01,-1.314E+00)
9	(-2.678E-01,-1.423E+00)
10	(-2.678E-01, 1.423E+00)
11	(-5.411E-01, 3.876E-30)
12	(-2.465E-01,-2.078E-30)
13	(3.349E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(6.862E-02, 1.615E+02)
	6.862E-02 -1.615E+02)
	1.602E-04,-1.248E+02)
	(1.602E-04, 1.248E+02)
	[illegible] ,-1.138E+02)
	(2.031E+00, 1.138E+02)
	(1.453E+00, 1.153E+02)
	(1.453E+00,-1.153E+02)
9	(1.446E+00,-1.007E+02)
10	(1.449E+00, 1.007E+02)
11	(3.411E-01, 1.800E+02)
12	(2.469E-01,-1.800E+02)
13	(3.349E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(5.520E-03, 1.183E-03)
2	(5.520E-03,-1.183E-03)
3	(1.013E-07,-8.532E-06)
4	(1.013E-07, 8.532E-06)
5	(4.532E-04,-3.104E-03)
6	(4.532E-04, 3.104E-03)
7	(-4.629E-03, 3.641E-03)
8	(-4.629E-03,-3.641E-03)
9	(4.351E-06,-5.262E-04)
10	(4.351E-06, 5.262E-04)
11	(-3.047E-05, 4.734E-30)
12	(3.191E-05, 1.571E-30)
13	(0. , 0.)
14	(6.672E-01, 0.)
15	(1.194E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(5.645E-03, 1.210E+01)
2	(5.645E-03,-1.210E+01)
3	(8.533E-06,-8.932E+01)
4	(8.533E-06, 8.932E+01)
5	(3.137E-03,-8.169E+01)
6	(3.137E-03, 8.169E+01)
7	(5.890E-03, 1.418E+02)
8	(5.890E-03,-1.418E+02)
9	(5.262E-04,-8.953E+01)
10	(5.262E-04, 8.953E+01)
11	(3.047E-05, 1.800E+02)
12	(3.191E-05, 2.820E-24)
13	(0. , 0.)
14	(6.672E-01, 0.)
15	(1.194E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-1.357E-02,-3.490E-03)	(-1.357E-02, 3.490E-03)	(-4.228E-05,-6.641E-05)	(-4.228E-05, 6.641E-05)
2	(-7.347E-04, 2.984E-03)	(-7.347E-04,-2.984E-03)	(6.773E-05,-1.925E-05)	(6.773E-05, 1.925E-05)
3	(-6.233E-02,-2.960E-02)	(-6.233E-02, 2.960E-02)	(4.101E-04, 1.495E-03)	(4.101E-04,-1.495E-03)
4	(3.821E-03,-4.486E-03)	(3.821E-03, 4.486E-03)	(2.137E-04,-8.082E-05)	(2.137E-04, 8.082E-05)
5	(-4.153E-02, 5.445E-04)	(-4.153E-02,-5.445E-04)	(3.402E-02,-2.651E-02)	(3.402E-02, 2.651E-02)
6	(1.751E-01,-9.159E-01)	(1.751E-01, 9.159E-01)	(5.767E-01, 7.545E-01)	(5.767E-01,-7.545E-01)
7	(-2.789E+00,-3.699E+00)	(-2.789E+00, 3.699E+00)	(1.673E+00,-1.383E+00)	(1.673E+00, 1.383E+00)

	5	6	7	8
1	(-1.337E-03,-1.510E-02)	(-1.337E-03, 1.510E-02)	(2.223E-01, 2.576E-01)	(2.223E-01,-2.576E-01)
2	(-3.436E-03, 7.254E-04)	(-3.436E-03,-7.254E-04)	(2.608E-02,-2.428E-02)	(2.608E-02, 2.428E-02)
3	(-7.232E-03,-4.613E-02)	(-7.232E-03, 4.613E-02)	(1.294E-01, 1.684E-01)	(1.294E-01,-1.684E-01)
4	(1.976E-04, 1.357E-03)	(1.976E-04,-1.357E-03)	(-6.281E-03,-8.357E-03)	(-6.281E-03, 8.357E-03)
5	(-6.131E-02, 4.487E-02)	(-6.131E-02,-4.487E-02)	(-4.905E-02, 1.030E-01)	(-4.905E-02,-1.030E-01)
6	(-5.530E-01,-8.455E-01)	(-5.530E-01, 8.455E-01)	(-5.837E-01,-3.492E-01)	(-5.837E-01, 3.492E-01)
7	(-4.059E+00, 2.762E+00)	(-4.059E+00,-2.762E+00)	(-1.119E+00, 8.516E-01)	(-1.119E+00,-8.516E-01)

	9	10	11	12
1	(-1.389E+01,-7.920E+00)	(-1.389E+01, 7.920E+00)	(-1.895E+02, 0.)	(1.859E+02, 0.)
2	(-2.694E-01, 2.270E-01)	(-2.694E-01,-2.270E-01)	(8.879E-01, 0.)	(8.513E-01, 0.)
3	(-1.030E-02,-4.717E-01)	(-1.030E-02, 4.717E-01)	(1.445E-01, 0.)	(-1.076E-01, 0.)
4	(1.673E-01, 1.980E-01)	(1.673E-01,-1.980E-01)	(6.091E-01, 0.)	(1.195E+00, 0.)
5	(-6.256E-01, 2.094E-01)	(-6.256E-01,-2.094E-01)	(1.121E+00, 0.)	(5.667E-01, 0.)
6	(3.074E-01,-8.285E-01)	(3.074E-01, 8.285E-01)	(1.824E-01, 0.)	(-7.162E-02, 0.)
7	(-9.271E+00, 9.170E-01)	(-9.271E+00,-9.170E-01)	(2.969E+00, 0.)	(-4.429E+00, 0.)

	13	14	15
1	(-8.093E-01, 0.)	(-1.130E-01, 0.)	(6.388E-02, 0.)
2	(-9.465E-02, 0.)	(-3.526E-02, 0.)	(1.956E-02, 0.)
3	(6.311E-01, 0.)	(2.350E-01, 0.)	(-1.835E-01, 0.)
4	(-1.589E-03, 0.)	(-3.786E-02, 0.)	(2.081E-02, 0.)
5	(-1.408E-01, 0.)	(3.429E-02, 0.)	(-1.866E-02, 0.)
6	(9.385E-01, 0.)	(-3.258E-01, 0.)	(1.774E-01, 0.)
7	(-6.547E+00, 0.)	(3.608E+00, 0.)	(-1.965E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.401E-02,-1.656E+02)	(1.401E-02, 1.656E+02)	(7.873E-05,-1.225E+02)	(7.873E-05, 1.225E+02)
2	(3.074E-03, 1.038E+02)	(3.074E-03,-1.038E+02)	(7.041E-05,-1.587E+01)	(7.041E-05, 1.587E+01)
3	(6.900E-02,-1.546E+02)	(6.900E-02, 1.546E+02)	(1.550E-03, 7.466E+01)	(1.550E-03,-7.466E+01)
4	(5.893E-03,-4.958E+01)	(5.893E-03, 4.958E+01)	(2.285E-04,-2.071E+01)	(2.285E-04, 2.071E+01)
5	(4.154E-02, 1.792E+02)	(4.154E-02,-1.792E+02)	(4.313E-02,-3.792E+01)	(4.313E-02, 3.792E+01)
6	(9.325E-01,-7.918E+01)	(9.325E-01, 7.918E+01)	(9.497E-01, 5.261E+01)	(9.497E-01,-5.261E+01)
7	(4.633E+00,-1.270E+02)	(4.633E+00, 1.270E+02)	(2.170E+00,-3.957E+01)	(2.170E+00, 3.957E+01)

	5	6	7	8
1	(1.516E-02,-9.506E+01)	(1.516E-02, 9.506E+01)	(3.403E-01, 4.921E+01)	(3.403E-01,-4.921E+01)
2	(3.512E-03, 1.681E+02)	(3.512E-03,-1.681E+02)	(3.563E-02,-4.296E+01)	(3.563E-02, 4.296E+01)
3	(4.670E-02,-9.891E+01)	(4.670E-02, 9.891E+01)	(2.124E-01, 5.247E+01)	(2.124E-01,-5.247E+01)
4	(1.371E-03, 3.171E+01)	(1.371E-03,-8.171E+01)	(1.045E-02,-1.269E+02)	(1.045E-02, 1.269E+02)
5	(7.597E-02, 1.438E+02)	(7.597E-02,-1.438E+02)	(1.141E-01, 1.155E+02)	(1.141E-01,-1.155E+02)
6	(1.010E+00,-1.232E+02)	(1.010E+00, 1.232E+02)	(6.802E-01,-1.491E+02)	(6.802E-01, 1.491E+02)
7	(4.910E+00, 1.456E+02)	(4.910E+00,-1.456E+02)	(1.406E+00, 1.427E+02)	(1.406E+00,-1.427E+02)

	9	10	11	12
1	(1.599E+01,-1.503E+02)	(1.599E+01, 1.503E+02)	(1.895E+02, 1.800E+02)	(1.856E+02, 0.)
2	(3.522E-01, 1.399E+02)	(3.522E-01,-1.399E+02)	(8.879E-01, 0.)	(8.513E-01, 0.)
3	(4.718E-01,-9.125E+01)	(4.718E-01, 9.125E+01)	(1.445E-01, 0.)	(1.076E-01, 1.800E+02)
4	(2.592E-01, 4.980E+01)	(2.592E-01,-4.980E+01)	(6.091E-01, 0.)	(1.195E+00, 0.)
5	(6.597E-01, 1.615E+02)	(6.597E-01,-1.615E+02)	(1.121E+00, 0.)	(5.667E-01, 0.)
6	(8.837E-01,-6.964E+01)	(8.827E-01, 6.964E+01)	(1.824E-01, 0.)	(7.162E-02, 1.800E+02)
7	(9.317E+00, 1.744E+02)	(9.317E+00,-1.744E+02)	(2.969E+00, 0.)	(4.429E+00, 1.800E+02)

	13	14	15
1	(8.093E-01, 1.800E+02)	(1.130E-01, 1.800E+02)	(6.388E-02, 0.)
2	(9.466E-02, 1.800E+02)	(3.526E-02, 1.800E+02)	(1.956E-02, 0.)
3	(6.311E-01, 0.)	(3.350E-01, 0.)	(1.809E-01, 1.800E+02)
4	(1.589E-03, 1.800E+02)	(3.788E-02, 1.800E+02)	(2.081E-02, 0.)
5	(1.408E-01, 1.800E+02)	(3.429E-02, 0.)	(1.888E-02, 1.800E+02)
6	(9.385E-01, 0.)	(3.258E-01, 1.800E+02)	(1.774E-01, 0.)
7	(6.547E+00, 1.800E+02)	(3.608E+00, 0.)	(1.969E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(9.592E-04,-6.867E-05)	(-1.722E-05,-2.102E-04)	(4.701E-03, 5.680E-04)	(-1.509E-04, 3.752E-04)
2	(9.592E-04, 6.867E-05)	(-1.722E-05, 2.102E-04)	(4.701E-03,-5.680E-04)	(-1.509E-04,-3.752E-04)
3	(-4.918E-09, 1.162E-08)	(-8.698E-09,-7.186E-09)	(1.600E-07,-1.901E-07)	(-3.010E-08,-2.086E-08)
4	(-4.918E-09,-1.162E-08)	(-8.698E-09, 7.186E-09)	(1.600E-07, 1.901E-07)	(-3.010E-08, 2.086E-08)
5	(-2.696E-02, 1.487E-02)	(4.165E-03, 5.768E-03)	(-7.977E-02, 5.127E-02)	(2.358E-03,-1.480E-03)
6	(-2.696E-02,-1.487E-02)	(4.165E-03,-5.788E-03)	(-7.977E-02,-5.127E-02)	(2.358E-03, 1.480E-03)
7	(-4.765E-01, 1.323E-01)	(1.574E-02, 4.933E-02)	(-3.016E-01, 6.556E-02)	(1.488E-02,-3.070E-03)
8	(-4.765E-01,-1.323E-01)	(1.574E-02,-4.933E-02)	(-3.016E-01,-6.556E-02)	(1.488E-02, 3.070E-03)
9	(-7.552E+00, 2.189E+01)	(3.951E-01, 3.226E-01)	(-6.686E-01, 1.410E-01)	(2.370E-01,-2.912E-01)
10	(-7.552E+00,-2.189E+01)	(3.951E-01,-3.226E-01)	(-6.686E-01,-1.410E-01)	(2.370E-01, 2.912E-01)
11	(6.453E+01,-7.343E-28)	(-3.029E-01, 3.441E-30)	(-4.928E-02, 5.599E-31)	(-2.078E-01, 2.361E-30)
12	(-4.581E+01,-3.856E-28)	(-2.102E-01,-1.769E-30)	(2.656E-02, 2.236E-31)	(-2.951E-01,-2.484E-30)
13	(-2.710E+00, 0.)	(-3.170E-01, 0.)	(2.113E+00, 0.)	(-5.319E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.691E-03,-9.405E-04)	(8.565E-03, 6.342E-02)	(2.621E-01, 1.799E-01)
2	(2.691E-03, 9.405E-04)	(8.565E-03,-6.342E-02)	(2.621E-01,-1.799E-01)
3	(-6.590E-06,-2.079E-06)	(4.712E-05,-1.447E-04)	(-3.346E-04,-3.502E-05)
4	(-6.590E-06, 2.079E-06)	(4.712E-05, 1.447E-04)	(-3.346E-04, 9.502E-05)
5	(1.336E-01, 7.709E-02)	(-1.117E+00, 1.721E+00)	(8.461E+00, 5.275E+00)
6	(1.336E-01,-7.709E-02)	(-1.117E+00,-1.721E+00)	(8.461E+00,-5.275E+00)
7	(-1.050E-01,-1.284E-01)	(8.210E-01,-5.505E-01)	(-4.249E-01,-1.999E+00)
8	(-1.050E-01, 1.284E-01)	(8.210E-01, 5.505E-01)	(-4.249E-01, 1.999E+00)
9	(4.656E-01, 8.343E-01)	(-1.262E+00,-2.157E-01)	(3.788E+00, 1.295E+01)
10	(4.656E-01,-8.343E-01)	(-1.262E+00, 2.157E-01)	(3.788E+00,-1.295E+01)
11	(-3.825E-01, 4.346E-30)	(-6.223E-02, 7.071E-31)	(-1.013E+00, 1.151E-29)
12	(-1.395E-01,-1.178E-30)	(1.768E-02, 1.488E-31)	(1.095E+00, 9.205E-30)
13	(-4.711E-01, 0.)	(3.143E+00, 0.)	(-2.192E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(9.617E-04,-4.095E+00)	(2.109E-04,-9.468E+01)	(4.735E-03, 6.890E+00)	(4.044E-04, 1.119E+02)
2	(9.617E-04, 4.095E+00)	(2.109E-04, 9.468E+01)	(4.735E-03,-6.890E+00)	(4.044E-04,-1.119E+02)
3	(1.261E-08, 1.129E+02)	(1.128E-08,-1.404E+02)	(2.484E-07,-4.991E+01)	(3.662E-08,-1.453E+02)
4	(1.261E-08,-1.129E+02)	(1.128E-08, 1.404E+02)	(2.484E-07, 4.991E+01)	(3.662E-08, 1.453E+02)
5	(3.079E-02, 1.511E+02)	(7.131E-03, 5.426E+01)	(9.482E-02, 1.473E+02)	(2.784E-03,-3.211E+01)
6	(3.079E-02,-1.511E+02)	(7.131E-03,-5.426E+01)	(9.482E-02,-1.473E+02)	(2.784E-03, 3.211E+01)
7	(4.945E-01, 1.645E+02)	(5.178E-02, 7.231E+01)	(3.087E-01, 1.677E+02)	(1.519E-02,-1.166E+01)
8	(4.945E-01,-1.645E+02)	(5.178E-02,-7.231E+01)	(3.087E-01,-1.677E+02)	(1.519E-02, 1.166E+01)
9	(2.316E+01, [illegible]+02)	(5.101E-01, 3.923E+01)	(6.833E-01, 1.681E+02)	(3.754E-01,-5.085E+01)
10	(2.316E+01,-1.090E+02)	(5.101E-01,-3.923E+01)	(6.833E-01,-1.681E+02)	(3.754E-01, 5.085E+01)
11	(6.453E+01,-6.510E-28)	(3.029E-01, 1.800E+02)	(4.928E-02, 1.800E+02)	(2.078E-01, 1.800E+02)
12	(4.581E+01,-1.800E+02)	(2.102E-01,-1.800E+02)	(2.656E-02, 4.823E-28)	(2.951E-01,-1.800E+02)
13	(2.710E+00, 1.800E+02)	(3.170E-01, 1.800E+02)	(2.113E+00, 0.)	(5.319E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.850E-03,-1.927E+01)	(6.399E-02, 8.231E+01)	(3.179E-01, 3.447E+01)
2	(2.850E-03, 1.927E+01)	(6.399E-02,-8.231E+01)	(3.179E-01,-3.447E+01)
3	(6.911E-06,-1.625E+02)	(1.522E-04,-7.196E+01)	(3.478E-04,-1.641E+02)
4	(6.911E-06, 1.625E+02)	(1.522E-04, 7.196E+01)	(3.478E-04, 1.641E+02)
5	(1.543E-01, 2.998E+01)	(2.051E+00, 1.230E+02)	(9.970E+00, 3.194E+01)
6	(1.543E-01,-2.998E+01)	(2.051E+00,-1.230E+02)	(9.970E+00,-3.194E+01)
7	(1.658E-01,-1.293E+02)	(9.885E-01,-3.384E+01)	(2.044E+00,-1.020E+02)
8	(1.658E-01, 1.293E+02)	(9.885E-01, 3.384E+01)	(2.044E+00, 1.020E+02)
9	(9.554E-01, 6.084E+01)	(1.280E+00,-1.703E+02)	(1.349E+01, 7.370E+01)
10	(9.554E-01,-6.084E+01)	(1.280E+00, 1.703E+02)	(1.349E+01,-7.370E+01)
11	(3.825E-01, 1.800E+02)	(6.223E-02, 1.800E+02)	(1.013E+00, 1.800E+02)
12	(1.399E-01,-1.800E+02)	(1.768E-02, 4.823E-28)	(1.093E+00, 4.823E-28)
13	(4.714E-01, 1.800E+02)	(3.143E+00, 0.)	(2.192E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-7.079E-05,-3.532E-05)	(-7.587E-06, [illegible]E-05)	(-3.090E-04,-2.371E-04)	(2.640E-05,-2.024E-05)
2	(-7.079E-05, 3.532E-05)	(-7.587[illegible] ..560E-05)	(-3.090E-04, 2.371E-04)	(2.640E-05, 2.024E-0[illegible]
3	(-5.709E-10, 3.540E-10)	(-1.5[illegible]10,-5.798E-10)	(1.280E-08,-3.348E-09)	(-6.679E-10,-1.832E-0[illegible]
4	(-5.709E-10,-3.540E-10)	(-1.574E-10, 5.79[illegible]-10)	(1.280E-08, 3.348E-09)	(-6.679E-10, 1.832E-09)
5	(-4.750E-05,-2.695E-06)	(6.948E-07, 1.100E-05)	(-1.465E-04, 1.544E-06)	(4.301E-06, 1.466E-09)
6	(-4.750E-05, 2.695E-06)	(6.948E-07,-1.100E-05)	(-1.465E-04,-1.544E-06)	(4.301E-06,-1.466E-09)
7	(-1.967E-03,-3.832E-04)	(-3.229E-05, 2.074E-04)	(-1.212E-03,-3.086E-04)	(5.950E-05, 1.582E-05)
8	(-1.967E-03, 3.832E-04)	(-3.229E-05,-2.074E-04)	(-1.212E-03, 3.086E-04)	(5.950E-05,-1.582E-05)
9	(-4.228E-03, 7.276E-03)	(1.182E-04, 1.427E-04)	(-2.482E-04, 3.365E-06)	(1.049E-04,-8.718E-05)
10	(-4.228E-03,-7.276E-03)	(1.182E-04,-1.427E-04)	(-2.482E-04,-3.365E-06)	(1.049E-04, 8.718E-05)
11	(5.[illegible]73E-03,-8.968E-28)	(-2.706E-05, 4.203E-30)	(-4.402E-06, 6.838E-31)	(-1.858E-05, 2.883E-30)
12	(5.922E-03, 2.914E-28)	(2.717E-05, 1.337E-30)	(-3.434E-06,-1.690E-31)	(3.815E-05, 1.877E-30)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-7.536E-02, 0.)	(-2.352E-02, 0.)	(2.235E-01, 0.)	(-2.526E-02, 0.)
15	(7.629E-02, 0.)	(2.337E-02, 0.)	(-2.195E-01, 0.)	(2.485E-02, 0.)

	5	6	7
1	(-2.299E-04,-4.614E-05)	(2.050E-03,-4.849E-03)	(-1.102E-02,-2.372E-02)
2	(-2.299E-04, 4.614E-05)	(2.050E-03, 4.849E-03)	(-1.102E-02, 2.372E-02)
3	(-2.227E-07,-2.930E-07)	(6.496E-06,-4.844E-06)	(-1.163E-05,-1.441E-05)
4	(-2.227E-07, 2.930E-07)	(6.496E-06, 4.844E-06)	(-1.163E-05, 1.441E-05)
5	(1.115E-04, 2.107E-04)	(-2.875E-03, 1.333E-03)	(6.736E-03, 1.385E-02)
6	(1.115E-04,-2.107E-04)	(-2.875E-03,-1.333E-03)	(6.736E-03,-1.385E-02)
7	(-1.481E-04,-6.555E-04)	(3.973E-03,-5.089E-04)	(2.080E-03,-8.018E-03)
8	(-1.481E-04, 6.555E-04)	(3.973E-03, 5.089E-04)	(2.080E-03, 8.018E-03)
9	(1.075E-04, 3.301E-04)	(-4.346E-04,-1.654E-04)	(4.422E-04, 4.882E-03)
10	(1.075E-04,-3.301E-04)	(-4.346E-04, 1.654E-04)	(4.422E-04,-4.882E-03)
11	(-3.417E-05, 5.308E-30)	(-5.559E-06, 8.636E-31)	(-9.046E-05, 1.405E-29)
12	(1.808E-05, 8.900E-31)	(-2.286E-06,-1.125E-31)	(-1.414E-04,-6.956E-30)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(2.289E-02, 0.)	(-2.173E-01, 0.)	(2.407E+00, 0.)
15	(-2.254E-02, 0.)	(2.119E-01, 0.)	(-2.352E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.911E-05,-1.535E+02)	(1.735E-05, 1.159E+02)	(3.895E-04,-1.425E+02)	(3.327E-05,-3.748E+01)
2	(7.911E-05, 1.535E+02)	(1.735E-05,-1.159E+02)	(3.895E-04, 1.425E+02)	(3.327E-05, 3.748E+01)
3	(6.717E-10, 1.482E+02)	(6.008E-10,-1.052E+02)	(1.323E-08,-1.466E+01)	(1.950E-09,-1.100E+02)
4	(6.717E-10,-1.482E+02)	(6.008E-10, 1.052E+02)	(1.323E-08, 1.466E+01)	(1.950E-09, 1.100E+02)
5	(4.757E-05,-1.768E+02)	(1.102E-05, 8.638E+01)	(1.465E-04, 1.794E+02)	(4.301E-06, 1.953E-02)
6	(4.757E-05, 1.768E+02)	(1.102E-05,-8.638E+01)	(1.465E-04,-1.794E+02)	(4.301E-06,-1.953E-02)
7	(2.004E-03,-1.690E+02)	(2.099E-04, 9.885E+01)	(1.251E-03,-1.657E+02)	(6.157E-05, 1.489E+01)
8	(2.004E-03, 1.690E+02)	(2.099E-04,-9.885E+01)	(1.251E-03, 1.657E+02)	(6.157E-05,-1.489E+01)
9	(8.415E-03, 1.202E+02)	(1.853E-04, 5.036E+01)	(2.483E-04, 1.792E+02)	(1.364E-04,-3.973E+01)
10	(8.415E-03,-1.202E+02)	(1.853E-04,-5.036E+01)	(2.483E-04,-1.792E+02)	(1.364E-04, 3.973E+01)
11	(5.773E-03,-8.901E-24)	(2.706E-05, 1.800E+02)	(4.402E-06, 1.800E+02)	(1.856E-05, 1.800E+02)
12	(5.922E-03, 2.820E-24)	(2.717E-05, 2.820E-24)	(3.434E-06,-1.800E+02)	(3.815E-05, 2.820E-24)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(7.539E-02, 1.800E+02)	(2.352E-02, 1.800E+02)	(2.235E-01, 0.)	(2.526E-02, 1.800E+02)
15	(7.629E-02, 0.)	(2.337E-02, 0.)	(2.198E-01, 1.800E+02)	(2.485E-02, 0.)

	5	6	7
1	(2.345E-04,-1.687E+02)	(5.264E-03,-6.708E+01)	(2.615E-02,-1.149E+02)
2	(2.345E-04, 1.687E+02)	(5.264E-03, 6.708E+01)	(2.615E-02, 1.149E+02)
3	(3.680E-07,-1.272E+02)	(8.103E-06,-3.671E+01)	(1.852E-05,-1.289E+02)
4	(3.680E-07, 1.272E+02)	(8.103E-06, 3.671E+01)	(1.852E-05, 1.289E+02)
5	(2.383E-04, 6.211E+01)	(3.169E-03, 1.551E+02)	(1.540E-02, 6.407E+01)
6	(2.383E-04,-6.211E+01)	(3.169E-03,-1.551E+02)	(1.540E-02,-6.407E+01)
7	(6.721E-04,-1.027E+02)	(4.006E-03,-7.298E+00)	(8.283E-03,-7.545E+01)
8	(6.721E-04, 1.027E+02)	(4.006E-03, 7.298E+00)	(8.283E-03, 7.545E+01)
9	(3.472E-04, 7.197E+01)	(4.650E-04,-1.532E+02)	(4.902E-03, 8.482E+01)
10	(3.472E-04,-7.197E+01)	(4.650E-04, 1.592E+02)	(4.902E-03,-8.482E+01)
11	(3.417E-05, 1.800E+02)	(5.559E-06, 1.800E+02)	(9.046E-05, 1.800E+02)
12	(1.806E-05, 2.820E-24)	(2.286E-06,-1.800E+02)	(1.414E-04,-1.800E+02)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(2.282E-02, 0.)	(2.173E-01, 1.800E+02)	(2.407E+00, 0.)
15	(2.254E-02, 1.800E+02)	(2.119E-01, 0.)	(2.352E+00, 1.800E+02)

CONFIGURATION 5

THE AU MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-1.287E+02	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.390E+00	3.458E+01
12	1.688E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.6[illegible]E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-1.062E+00	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.595E+00	1.161E-01	1.120E-01
11	[illegible]E+02	3.457E+00	-1.219E-01	3.784E+00	-4.677E-01	-2.535E-01
12	[illegible]E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.080E-0[illegible]

THE AC MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.250E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	1.082E+00	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	3.456E-02	3.636E-02
7	1.162E+00	1.672E+00	9.041E-04	1.103E-01	4.965E-04	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -5.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AU-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-1.287E+02	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.33EE-01	1.195E-01	8.468E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	4.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-1.062E+00	-2.216E-01	5.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.595E+00	1.080E-01	1.017E-01
11	-1.439E+02	3.288E+00	-1.596E-01	3.963E+00	-4.677E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.083E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.102E+00
11	-2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-4.100E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-3.363E+01	-4.599E+01	-3.425E-02	-3.342E+00	-1.437E-02	-3.964E-03

THE R-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.383E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.515E+00	3.595E-02	0.	-1.287E+02
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.954E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.372E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-1.062E+00	-2.216E-01	8.998E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-3.592E+00	1.690E-01	.017E-01
14	3.621E+01	-1.439E+02	3.286E+00	-1.596E-01	3.953E+00	-4.877E-01	-2.410E-01
15	-1.065E-01	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	1.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-4.100E+01	-9.740E+01	-3.363E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	-3.425E-02	-3.342E+00	-1.437E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.50739E+00	2.20024E+01	3.57451E+00	.20069099	2.21858E-01
3	-2.03839E-01	2.20195E+01	3.50466E+00	.00925683	4.90582E+00
5	2.12155E-02	1.16211E+01	1.84955E-00	-.00182550	-4.71354E+01
7	-5.90433E-01	1.17271E+01	1.87307E+00	.08415745	1.00986E+00
9	-1.21309E+00	2.21222E+00	4.01547E-01	.48081248	8.24344E-01
11	1.27998E-03	7.53298E-02	1.19908E-02	-.01698856	-7.81275E+02
13	-6.99287E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-4.773E-03,-7.194E-03)	(-4.773E-03, 7.194E-03)	(-4.178E-06,-1.533E-04)	(-4.178E-06, 1.533E-04)
5	(5.245E-02,-4.290E-02)	(5.245E-02, 4.290E-02)	(-1.723E-03,-2.672E-04)	(-1.723E-03, 2.672E-04)
6	(9.266E-06,-1.121E-05)	(9.266E-06, 1.121E-05)	(6.247E-08,-2.309E-08)	(6.247E-08, 2.309E-08)
7	(-2.340E-03,-1.904E-03)	(-2.340E-03, 1.904E-03)	(-1.141E-05, 7.835E-05)	(-1.141E-05,-7.835E-05)
8	(-5.644E-04, 1.415E-03)	(-5.644E-04,-1.415E-03)	(7.469E-04, 1.784E-03)	(7.469E-04,-1.784E-03)
9	(-2.660E-02, 3.406E-02)	(-2.660E-02,-3.406E-02)	(-2.307E-03,-2.759E-04)	(-2.307E-03, 2.759E-04)
10	(9.857E-03,-1.386E-03)	(9.857E-03, 1.386E-03)	(9.005E-04, 8.471E-04)	(9.005E-04,-8.471E-04)
11	(2.768E-05, 4.865E-06)	(2.768E-05,-4.865E-06)	(-9.866E-03,-4.416E-02)	(-9.866E-03, 4.416E-02)
12	(-2.860E-02,-1.880E-02)	(-2.860E-02, 1.830E-02)	(-3.944E-02, 1.608E-02)	(-3.944E-02,-1.608E-02)
13	(-6.295E-01,-7.388E-01)	(-6.295E-01, 7.388E-01)	(6.546E-03,-5.075E-02)	(6.546E-03, 5.075E-02)
14	(-1.393E-02, 2.231E-01)	(-1.393E-02,-2.231E-01)	(-1.884E-02, 1.966E-02)	(-1.884E-02,-1.966E-02)
15	(-2.318E-04, 5.870E-04)	(-2.318E-04,-5.870E-04)	(9.744E-01,-2.082E-01)	(9.744E-01, 2.082E-01)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(4.042E-04, 1.370E-03)	(4.042E-04,-1.370E-03)	(-2.860E-03,-3.830E-03)	(-2.860E-03, 3.830E-03)
5	(-1.216E-02, 1.028E-02)	(-1.216E-02,-1.028E-02)	(3.181E-02,-4.214E-02)	(3.181E-02, 4.214E-02)
6	(-6.180E-06, 3.469E-06)	(-6.180E-06,-3.469E-06)	(1.400E-05,-1.856E-05)	(1.400E-05, 1.856E-05)
7	(8.826E-04, 1.048E-03)	(8.826E-04,-1.048E-03)	(-3.795E-03,-2.392E-03)	(-3.795E-03, 2.392E-03)
8	(-4.252E-02, 4.151E-02)	(-4.252E-02,-4.151E-02)	(5.119E-02, 4.761E-02)	(5.119E-02,-4.761E-02)
9	(-2.148E-03, 2.920E-03)	(-2.148E-03,-2.920E-03)	(2.405E-03, 3.340E-03)	(2.405E-03,-3.340E-03)
10	(-1.843E-02, 5.885E-02)	(-1.843E-02,-5.885E-02)	(-2.722E-02, 3.877E-02)	(-2.722E-02,-3.877E-02)
11	(-1.490E-06, 3.384E-06)	(-1.490E-06,-3.384E-06)	(2.974E-06, 3.645E-06)	(2.974E-06,-3.645E-06)
12	(-4.833E-01,-4.933E-01)	(-4.833E-01, 4.933E-01)	(-5.090E-01, 5.532E-01)	(-5.090E-01,-5.532E-01)
13	(-3.398E-02,-2.490E-02)	(-3.398E-02, 2.490E-02)	(-4.155E-02, 2.490E-02)	(-4.155E-02,-2.490E-02)
14	(-6.843E-01,-2.130E-01)	(-6.843E-01, 2.130E-01)	(-4.277E-01,-3.578E-01)	(-4.277E-01, 3.576E-01)
15	(-3.936E-05,-1.724E-05)	(-3.936E-05, 1.724E-05)	(-4.568E-05, 3.127E-05)	(-4.568E-05,-3.127E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(3.553E-01,-2.567E-02)	(3.553E-01, 2.567E-02)	(8.305E-02,-1.777E-01)	(8.305E-02, 1.777E-01)
5	(-5.678E-02, 8.290E-01)	(-5.678E-02,-8.290E-01)	(-1.741E-02, 6.501E-02)	(-1.741E-02,-6.501E-02)
6	(5.558E-03, 5.831E-03)	(5.558E-03,-5.831E-03)	(-1.726E-01, 3.557E-01)	(-1.726E-01,-3.557E-01)
7	(2.989E-01,-1.382E-01)	(2.989E-01, 1.382E-01)	(8.588E-01, 2.457E-01)	(8.588E-01,-2.457E-01)
8	(6.369E-02, 2.093E-02)	(6.369E-02,-2.093E-02)	(1.413E-02,-2.951E-02)	(1.413E-02, 2.951E-02)
9	(-2.947E-02, 2.821E-03)	(-2.947E-02,-2.821E-03)	(-6.708E-03, 1.439E-02)	(-6.708E-03,-1.439E-02)
10	(-6.794E-02,-9.729E-03)	(-6.794E-02, 8.729E-03)	(-1.585E-02, 3.352E-02)	(-1.585E-02,-3.352E-02)
11	(-3.650E-05, 2.410E-07)	(-3.650E-05,-2.410E-07)	(-8.560E-06, 1.827E-05)	(-8.560E-06,-1.827E-05)
12	(-1.236E-01, 1.155E-01)	(-1.236E-01,-1.155E-01)	(2.241E-03, 1.026E-03)	(2.241E-03,-1.026E-03)
13	(2.951E-02,-6.861E-02)	(2.951E-02, 6.861E-02)	[illegible] 093E-03,-4.889E-04)	(-1.093E-03, 4.889E-04)

ORIGINAL PAGE IS
OF POOR QUALITY

14	(1.017E-01,-1.397E-01)	(1.017E-01, 1.397E-01)	(-2.545E-03,-1.151E-03)	(-2.545E-03, 1.151E-03)
15	(4.374E-05,-8.103E-05)	(4.374E-05, 8.103E-05)	(-1.388E-06,-6.229E-07)	(-1.388E-06, 6.229E-07)

	13	14	15
1	(2.866E-01, 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(8.873E-01, 0.)
3	(0. , 0.)	(4.341E-01, 0.)	(-2.002E-01, 0.)
4	(-9.023E-02, 0.)	(1.664E-03, 0.)	(-5.373E-04, 0.)
5	(6.110E-01, 0.)	(4.390E-01, 0.)	(-2.036E-01, 0.)
6	(-8.261E-04, 0.)	(-1.605E-04, 0.)	(7.696E-05, 0.)
7	(-9.165E-02, 0.)	(-4.611E-02, 0.)	(2.165E-02, 0.)
8	(1.050E-01, 0.)	(5.422E-02, 0.)	(-2.524E-02, 0.)
9	(1.441E-02, 0.)	(-3.568E-02, 0.)	(1.647E-02, 0.)
10	(-1.988E-02, 0.)	(-5.054E-02, 0.)	(2.351E-02, 0.)
11	(7.988E-06, 0.)	(-3.829E-05, 0.)	(1.769E-05, 0.)
12	(-6.997E-01, 0.)	(-5.151E-01, 0.)	(2.373E-01, 0.)
13	(-9.605E-02, 0.)	(3.330E-01, 0.)	(-1.546E-01, 0.)
14	(1.325E-01, 0.)	(4.802E-01, 0.)	(-2.210E-01, 0.)
15	(-5.326E-05, 0.)	(3.637E-04, 0.)	(-1.663E-04, 0.)

THE CON VECTOR (15 BY 1)

	1
1	(5.805E-02, 5.553E-02)
2	(5.805E-02,-5.553E-02)
3	(-7.429E-05, 1.247E-04)
4	(-7.429E-05,-1.247E-04)
5	(1.844E+00, 4.036E-01)
6	(1.844E+00,-4.036E-01)
7	(-2.575E+00,-9.316E-01)
8	(-2.576E+00, 9.316E-01)
9	(3.600E-01, 1.089E+00)
10	(3.600E-01,-1.089E+00)
11	(-1.135E-01, 3.863E-02)
12	(-1.135E-01,-3.863E-02)
13	(3.489E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(8.034E-02, 4.373E+01)
2	(8.034E-02,-4.373E+01)
3	(1.452E-04, 1.208E+02)
4	(1.452E-04,-1.208E+02)
5	(1.888E+00, 1.235E+01)
6	(1.689E+00,-1.235E+01)
7	(2.739E+00,-1.601E+02)
8	(2.739E+00, 1.601E+02)
9	(1.147E+00, 7.170E+01)
10	(1.147E+00,-7.170E+01)
11	(1.199E-01, 1.612E+02)
12	(1.199E-01,-1.612E+02)
13	(3.489E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(-1.248E-03,-5.521E-03)
2	(-1.248E-03, 5.521E-03)
3	(-7.829E-06, 3.280E-06)
4	(-7.829E-06,-3.280E-06)
5	(6.158E-03, 9.611E-04)
6	(6.158E-03,-9.611E-04)
7	(-3.926E-03,-6.826E-03)
8	(-3.926E-03, 6.826E-03)
9	(-3.398E-04, 1.260E-03)
10	(-3.398E-04,-1.260E-03)
11	(-1.109E-05,-1.967E-05)
12	(-1.109E-05, 1.967E-05)
13	(0. , 0.)
14	(5.327E-01, 0.)
15	(1.127E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(5.660E-03,-1.027E+02)
2	(5.660E-03, 1.027E+02)
3	(9.488E-06, 1.573E+02)
4	(8.488E-06,-1.573E+02)
5	(6.233E-03, 8.870E+00)
6	(6.233E-03,-8.870E+00)
7	(7.875E-03,-1.199E+02)
8	(7.375E-03, 1.199E+02)
9	(1.305E-03, 1.051E+02)
10	(1.305E-03,-1.051E+02)
11	(2.258E-05,-1.194E+02)
12	(2.258E-05, 1.194E+02)
13	(0. , 0.)
14	(5.327E-01, 0.)
15	(1.127E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(8.793E-03,-1.064E-02)	(8.793E-03, 1.064E-02)	(5.928E-05,-2.191E-05)	(5.928E-05, 2.191E-05)
2	(-2.340E-03,-1.904E-03)	(-2.340E-03, 1.904E-03)	(-1.141E-05, 7.835E-05)	(-1.141E-05,-7.835E-05)
3	(5.245E-02,-4.290E-02)	(5.245E-02, 4.290E-02)	(-1.723E-03,-2.672E-04)	(-1.723E-03, 2.672E-04)
4	(2.433E-03, 5.289E-03)	(2.433E-03,-5.289E-03)	(-7.230E-06, 2.316E-04)	(-7.230E-06,-2.316E-04)
5	(1.494E-02,-3.600E-02)	(1.494E-02, 3.600E-02)	(1.051E-02, 4.188E-02)	(1.051E-02,-4.188E-02)
6	(7.247E-01, 4.910E-01)	(7.247E-01,-4.910E-01)	(-9.244E-01, 2.230E-01)	(-9.244E-01,-2.230E-01)
7	(4.269E+00,-8.698E-01)	(4.269E+00, 8.698E-01)	(5.957E-01, 2.124E+00)	(5.957E-01,-2.124E+00)

	5	6	7	8
1	(-5.865E-03, 3.292E-03)	(-5.865E-03,-3.292E-03)	(1.328E-02,-1.761E-02)	(1.328E-02, 1.761E-02)
2	(8.826E-04, 1.048E-03)	(8.826E-04,-1.048E-03)	(-3.795E-03,-2.392E-03)	(-3.795E-03, 2.392E-03)
3	(-1.216E-02, 1.028E-02)	(-1.216E-02,-1.028E-02)	(3.181E-02,-4.214E-02)	(3.181E-02, 4.214E-02)
4	(4.784E-04,-3.219E-04)	(4.784E-04, 3.219E-04)	(-9.348E-04, 1.437E-03)	(-9.348E-04,-1.437E-03)
5	(6.399E-02,-1.022E-01)	(6.399E-02, 1.022E-01)	(-3.018E-02,-9.211E-02)	(-3.018E-02, 9.211E-02)
6	(1.190E+00, 7.415E-01)	(1.190E+00,-7.415E-01)	(1.110E+00,-2.626E-01)	(1.110E+00, 2.626E-01)
7	(2.733E+00,-3.864E+00)	(2.733E+00, 3.864E+00)	(-1.323E+00,-3.655E+00)	(-1.323E+00, 3.655E+00)

	9	10	11	12
1	(5.274E+00, 5.534E+00)	(5.274E+00,-5.534E+00)	(-1.638E+02, 3.375E+02)	(-1.638E+02,-3.375E+02)
2	(2.989E-01,-1.382E-01)	(2.989E-01, 1.382E-01)	(8.588E-01, 2.457E-01)	(8.588E-01,-2.457E-01)
3	(-5.678E-02, 8.290E-01)	(-5.678E-02,-8.290E-01)	(-1.741E-02, 6.501E-02)	(-1.741E-02,-6.501E-02)
4	(-5.636E-02,-1.126E-01)	(-5.636E-02, 1.126E-01)	(7.758E-01, 4.234E-01)	(7.758E-01,-4.234E-01)
5	(3.327E-01,-1.533E-01)	(3.327E-01, 1.533E-01)	(8.673E-01, 2.273E-01)	(8.673E-01,-2.273E-01)
6	(-6.451E-02, 9.219E-01)	(-6.451E-02,-9.219E-01)	(-1.601E-02, 6.562E-02)	(-1.601E-02,-6.562E-02)
7	(5.915E+00,-1.929E+00)	(5.915E+00, 1.929E+00)	(-9.212E-01, 1.738E+00)	(-9.212E-01,-1.738E+00)

	13	14	15
1	(-7.839E-01, 0.)	(-1.523E-01, 0.)	(7.304E-02, 0.)
2	(-9.165E-02, 0.)	(-4.611E-02, 0.)	(2.168E-02, 0.)
3	(6.110E-01, 0.)	(4.380E-01, 0.)	(-2.038E-01, 0.)
4	(-1.417E-03, 0.)	(-4.777E-02, 0.)	(2.222E-02, 0.)
5	(-1.911E-01, 0.)	(-1.407E-02, 0.)	(6.534E-03, 0.)
6	(1.274E+00, 0.)	(1.336E-01, 0.)	(-6.518E-02, 0.)
7	(-5.733E+00, 0.)	(5.246E+00, 0.)	(-2.418E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE . PHASE(DEG.))

	1	2	3	4
1	(1.380E-02,-5.043E+01)	(1.380E-02, 5.043E+01)	(6.320E-05,-2.028E+01)	(6.320E-05, 2.028E+01)
2	(3.017E-03,-1.409E+02)	(3.017E-03, 1.409E+02)	(7.918E-05, 9.828E+01)	(7.918E-05,-9.828E+01)
3	(6.776E-02,-3.928E+01)	(6.776E-02, 3.928E+01)	(1.744E-03,-1.712E+02)	(1.744E-03, 1.712E+02)
4	(5.822E-03, 6.529E+01)	(5.822E-03,-6.529E+01)	(2.318E-04, 9.179E+01)	(2.318E-04,-9.179E+01)
5	(3.898E-02,-6.746E+01)	(3.898E-02, 6.746E+01)	(4.318E-02, 7.591E+01)	(4.318E-02,-7.591E+01)
6	(8.754E-01, 3.412E+01)	(8.754E-01,-3.412E+01)	(9.509E-01, 1.864E+02)	(9.509E-01,-1.864E+02)
7	(4.357E+00,-1.152E+01)	(4.357E+00, 1.152E+01)	(2.206E+00, 7.434E+01)	(2.206E+00,-7.434E+01)

	5	6	7	8
1	(6.726E-03, 1.507E+02)	(6.726E-03,-1.507E+02)	(2.206E-02,-5.297E+01)	(2.206E-02, 5.297E+01)
2	(1.370E-03, 4.990E+01)	(1.370E-03,-4.990E+01)	(4.486E-03,-1.478E+02)	(4.486E-03, 1.478E+02)
3	(1.592E-02, 1.398E+02)	(1.592E-02,-1.398E+02)	(5.280E-02,-5.294E+01)	(5.280E-02, 5.294E+01)
4	(5.766E-04,-3.393E+01)	(5.766E-04, 3.393E+01)	(1.715E-03, 1.230E+02)	(1.715E-03,-1.230E+02)
5	(1.209E-01,-5.796E+01)	(1.206E-01, 5.796E+01)	(9.693E-02,-1.081E+02)	(9.693E-02, 1.081E+02)
6	(1.402E+00, 3.194E+01)	(1.402E+00,-3.194E+01)	(1.141E+00,-1.331E+01)	(1.141E+00, 1.331E+01)
7	(4.733E+00,-5.473E+01)	(4.733E+00, 5.473E+01)	(3.887E+00,-1.099E+02)	(3.887E+00, 1.099E+02)

	9	10	11	12
1	(7.644E+00, 4.637E+01)	(7.644E+00,-4.637E+01)	(3.752E+02, 1.159E+02)	(3.752E+02,-1.159E+02)
2	(3.293E-01,-2.482E+01)	(3.293E-01,-2.482E+01)	(8.933E-01, 1.597E+01)	(8.933E-01,-1.597E+01)
3	(8.309E-01, 9.392E+01)	(8.309E-01,-9.392E+01)	(6.730E-02, 1.050E+02)	(6.730E-02,-1.050E+02)
4	(1.259E-01,-1.166E+02)	(1.259E-01, 1.166E+02)	(8.838E-01, 2.862E+01)	(8.838E-01,-2.862E+01)
5	(3.663E-01,-2.474E+01)	(3.663E-01, 2.474E+01)	(8.966E-01, 1.469E+01)	(8.966E-01,-1.469E+01)
6	(9.241E-01, 9.400E+01)	(9.241E-01,-9.400E+01)	(6.755E-02, 1.037E+02)	(6.755E-02,-1.037E+02)
7	(6.222E+00,-1.806E+01)	(6.222E+00, 1.806E+01)	(1.967E+00, 1.179E+02)	(1.967E+00,-1.179E+02)

	13	14	15
1	(7.839E-01, 1.800E+02)	(1.523E-01, 1.800E+02)	(7.304E-02, 0.)
2	(9.165E-02, 1.800E+02)	(4.611E-02, 1.800E+02)	(2.168E-02, 0.)
3	(6.110E-01, 0.)	(4.380E-01, 0.)	(2.038E-01, 1.800E+02)
4	(1.417E-03, 1.800E+02)	(4.777E-02, 1.800E+02)	(2.222E-02, 0.)
5	(1.911E-01, 1.800E+02)	(1.407E-02, 1.800E+02)	(6.934E-03, 0.)
6	(1.274E+00, 0.)	(1.328E-01, 0.)	(6.518E-02, 1.800E+02)
7	(5.733E+00, 1.800E+02)	(5.248E+00, 0.)	(2.418E+00, 1.800E+02)

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.101E-03,-1.293E-04)	(-3.008E-05,-2.405E-04)	(5.427E-03, 4.222E-04)	(-1.525E-04, 4.422E-04)
2	(1.101E-03, 1.293E-04)	(-3.008E-05, 2.405E-04)	(5.427E-03,-4.222E-04)	(-1.525E-04,-4.422E-04)
3	(-1.672E-09, 9.021E-09)	(-8.924E-09,-7.243E-09)	(1.813E-07,-1.950E-07)	(-2.835E-08,-1.811E-08)
4	(-1.672E-09,-9.021E-09)	(-8.924E-09, 7.243E-09)	(1.813E-07, 1.950E-07)	(-2.835E-08, 1.811E-08)
5	(-1.214E-02, 3.703E-03)	(1.204E-03, 2.289E-03)	(-2.658E-02, 1.404E-02)	(1.012E-03,-4.004E-04)
6	(-1.214E-02,-3.703E-03)	(1.204E-03,-2.289E-03)	(-2.658E-02,-1.404E-02)	(1.012E-03, 4.004E-04)
7	(-5.063E-02, 3.300E-02)	(7.548E-03, 9.699E-03)	(-1.212E-01, 7.891E-02)	(3.747E-03,-2.832E-03)
8	(-5.063E-02,-3.300E-02)	(7.548E-03,-9.699E-03)	(-1.212E-01,-7.891E-02)	(3.747E-03, 2.832E-03)
9	(-4.126E+00, 7.735E+00)	(2.582E-01, 2.757E-01)	(-9.231E-01, 2.360E-01)	(1.023E-01,-1.019E-01)
10	(-4.126E+00,-7.735E+00)	(2.582E-01,-2.757E-01)	(-9.231E-01,-2.360E-01)	(1.023E-01, 1.019E-01)
11	(5.556E+00,-4.464E+01)	(-1.070E-01, 5.290E-03)	(-5.354E-04,-8.052E-03)	(-1.044E-01,-1.808E-02)
12	(5.556E+00, 4.464E+01)	(-1.070E-01,-5.290E-03)	(-5.354E-04, 8.052E-03)	(-1.044E-01, 1.808E-02)
13	(-2.738E+00, 0.)	(-3.198E-01, 0.)	(2.132E+00, 0.)	(-4.945E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(2.867E-03,-1.260E-03)	(1.480E-02, 6.875E-02)	(2.961E-01, 1.866E-01)
2	(2.867E-03, 1.260E-03)	(1.480E-02,-6.875E-02)	(2.961E-01,-1.866E-01)
3	(-6.004E-06,-1.800E-06)	(4.086E-05,-1.318E-04)	(-3.092E-04,-8.353E-05)
4	(-6.004E-06, 1.800E-06)	(4.086E-05, 1.318E-04)	(-3.092E-04, 8.353E-05)
5	(1.593E-01,-1.627E-01)	(1.894E+00, 1.847E+00)	(6.600E+00,-6.022E+00)
6	(1.593E-01, 1.627E-01)	(1.894E+00,-1.847E+00)	(6.600E+00, 6.022E+00)
7	(-8.073E-03, 2.654E-01)	(-3.105E+00,-3.576E-01)	(3.419E-03, 1.065E+01)
8	(-8.073E-03,-2.654E-01)	(-3.105E+00, 3.576E-01)	(3.419E-03,-1.065E+01)
9	(2.867E-01, 3.071E-01)	(-1.027E+00, 2.617E-01)	(4.230E+00, 5.746E+00)
10	(2.867E-01,-3.071E-01)	(-1.027E+00,-2.617E-01)	(4.230E+00,-5.746E+00)
11	(-1.072E-01, 7.706E-03)	(-7.177E-04,-8.067E-03)	(3.744E-02,-2.328E-01)
12	(-1.072E-01,-7.706E-03)	(-7.177E-04, 8.067E-03)	(3.744E-02, 2.328E-01)
13	(-6.670E-01, 0.)	(4.446E+00, 0.)	(-2.001E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.109E-03,-6.698E+00)	(2.424E-04,-9.713E+01)	(5.444E-03, 4.448E+00)	(4.677E-04, 1.090E+02)
2	(1.109E-03, 6.698E+00)	(2.424E-04, 9.713E+01)	(5.444E-03,-4.448E+00)	(4.677E-04,-1.090E+02)
3	(9.175E-09, 1.005E+02)	(1.149E-08,-1.409E+02)	(2.531E-07,-5.040E+01)	(3.364E-08,-1.474E+02)
4	(9.175E-09,-1.005E+02)	(1.149E-08, 1.409E+02)	(2.531E-07, 5.040E+01)	(3.364E-08, 1.474E+02)
5	(1.270E-02, 1.630E+02)	(2.587E-03, 6.225E+01)	(3.006E-02, 1.521E+02)	(1.088E-03,-2.159E+01)
6	(1.270E-02,-1.630E+02)	(2.587E-03,-6.225E+01)	(3.006E-02,-1.521E+02)	(1.088E-03, 2.159E+01)
7	(6.043E-02, 1.469E+02)	(1.229E-02, 5.211E+01)	(1.446E-01,-1.469E+02)	(4.697E-03,-3.708E+01)
8	(6.043E-02,-1.469E+02)	(1.229E-02,-5.211E+01)	(1.446E-01, 1.469E+02)	(4.697E-03, 3.708E+01)
9	(8.767E+00, 1.181E+02)	(3.777E-01, 4.688E+01)	(9.529E-01, 1.656E+02)	(1.444E-01,-4.489E+01)
10	(8.767E+00,-1.181E+02)	(3.777E-01,-4.688E+01)	(9.529E-01,-1.656E+02)	(1.444E-01, 4.489E+01)
11	(4.499E+01,-8.291E+01)	(1.071E-01, 1.772E+02)	(8.070E-03,-9.380E+01)	(1.060E-01,-1.702E+02)
12	(4.499E+01, 8.291E+01)	(1.071E-01,-1.772E+02)	(8.070E-03, 9.380E+01)	(1.060E-01, 1.702E+02)
13	(2.736E+00, 1.800E+02)	(3.198E-01, 1.800E+02)	(2.132E+00, 0.)	(4.945E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.131E-03,-2.373E+01)	(7.033E-02, 7.785E+01)	(3.500E-01, 3.221E+01)
2	(3.131E-03, 2.373E+01)	(7.033E-02,-7.785E+01)	(3.500E-01,-3.221E+01)
3	(6.268E-06,-1.633E+02)	(1.380E-04,-7.278E+01)	(3.203E-04,-1.649E+02)
4	(6.268E-06, 1.633E+02)	(1.380E-04, 7.278E+01)	(3.203E-04, 1.649E+02)
5	(2.277E-01,-4.561E+01)	(2.646E+00, 4.428E+01)	(8.934E+00,-4.238E+01)
6	(2.277E-01, 4.561E+01)	(2.646E+00,-4.428E+01)	(8.934E+00, 4.238E+01)
7	(2.655E-01, 9.174E+01)	(3.125E+00,-1.734E+02)	(1.065E+01, 8.958E+01)
8	(2.655E-01,-9.174E+01)	(3.125E+00, 1.734E+02)	(1.065E+01,-8.958E+01)
9	(4.201E-01, 4.697E+01)	(1.060E+00, 1.657E+02)	(7.136E+00,-5.364E+01)
10	(4.201E-01,-4.697E+01)	(1.060E+00,-1.657E+02)	(7.136E+00, 5.364E+01)
11	(1.075E-01, 1.759E+02)	(8.099E-03,-9.508E+01)	(2.358E-01,-8.087E+01)
12	(1.075E-01,-1.759E+02)	(8.099E-03, 9.508E+01)	(2.358E-01, 8.087E+01)
13	(6.670E-01, 1.800E+02)	(4.446E+00, 0.)	(2.001E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-6.972E-05,-3.527E-05)	(-7.594E-06, 1.530E-05)	(-3.023E-04,-2.360E-04)	(2.617E-05,-2.004E-05)
2	(-6.972E-05, 3.527E-05)	(-7.594E-06,-1.530E-05)	(-3.023E-04, 2.360E-04)	(2.617E-05, 2.004E-05)
3	(-3.923E-10, 3.659E-10)	(-1.677E-10,-6.508E-10)	(1.438E-08,-3.559E-09)	(-7.031E-10,-1.837E-09)
4	(-3.923E-10,-3.659E-10)	(-1.677E-10, 6.508E-10)	(1.438E-08, 3.559E-09)	(-7.031E-10, 1.837E-09)
5	(-3.923E-05, 1.463E-05)	(4.428E-06, 7.304E-06)	(-8.478E-05, 5.161E-05)	(3.255E-06,-1.522E-06)
6	(-3.528E-05,-1.463E-05)	(4.428E-06,-7.304E-06)	(-8.478E-05,-5.161E-05)	(3.255E-06, 1.522E-06)
7	(-1.724E-04,-2.154E-05)	(-1.432E-06, 3.530E-05)	(-4.125E-04,-5.176E-05)	(1.348E-05, 7.381E-07)
8	(-1.724E-04, 2.154E-05)	(-1.432E-06,-3.530E-05)	(-4.125E-04, 5.176E-05)	(1.348E-05,-7.381E-07)
9	(-8.764E-03, 4.765E-03)	(7.261E-05, 4.233E-04)	(-1.025E-03,-3.532E-04)	(1.610E-04,-3.276E-05)
10	(-8.764E-03,-4.765E-03)	(7.261E-05,-4.233E-04)	(-1.025E-03, 3.532E-04)	(1.610E-04, 3.276E-05)
11	(8.456E-03,-5.189E-04)	(-4.687E-06,-1.962E-05)	(1.472E-06,-3.782E-07)	(-2.717E-07,-1.996E-05)
12	(8.456E-03, 5.189E-04)	(-4.687E-06, 1.962E-05)	(1.472E-06, 3.782E-07)	(-2.717E-07, 1.996E-05)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-8.113E-02, 0.)	(-2.456E-02, 0.)	(2.333E-01, 0.)	(-2.545E-02, 0.)
15	(8.231E-02, 0.)	(2.443E-02, 0.)	(-2.297E-01, 0.)	(2.504E-02, 0.)

	5	6	7
1	(-2.174E-04,-3.757E-05)	(1.806E-03,-4.614E-03)	(-1.013E-02,-2.248E-02)
2	(-2.174E-04, 3.757E-05)	(1.806E-03, 4.614E-03)	(-1.013E-02, 2.248E-02)
3	(-2.197E-07,-2.934E-07)	(6.505E-06,-4.777E-06)	(-1.163E-05,-1.468E-05)
4	(-2.197E-07, 2.934E-07)	(6.505E-06, 4.777E-06)	(-1.163E-05, 1.468E-05)
5	(4.923E-04,-5.681E-04)	(6.613E-03, 5.709E-03)	(2.055E-02,-2.117E-02)
6	(4.923E-04, 5.681E-04)	(6.613E-03,-5.709E-03)	(2.055E-02, 2.117E-02)
7	(-5.103E-04, 5.676E-04)	(-6.151E-03,-6.547E-03)	(-1.576E-02, 2.338E-02)
8	(-5.103E-04,-5.676E-04)	(-6.151E-03, 6.547E-03)	(-1.976E-02,-2.338E-02)
9	(8.007E-05, 4.713E-04)	(-1.140E-03,-3.945E-04)	(4.207E-04, 8.105E-03)
10	(8.007E-05,-4.713E-04)	(-1.140E-03, 3.945E-04)	(4.207E-04,-8.105E-03)
11	-5.143E-0E -1.958E-05)	(1.469E-06,-4.125E-07)	(4.440E-05,-1.140E-06)
12	(-5.143E-05, 1.958E-05)	(1.469E-06, 4.125E-07)	(4.440E-05, 1.140E-06)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-7.838E-03, 0.)	(7.118E-02, 0.)	(2.794E+00, 0.)
15	(7.814E-03, 0.)	(-7.345E-02, 0.)	(-2.724E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.813E-05,-1.532E+02)	(1.708E-05, 1.164E+02)	(3.835E-04,-1.420E+02)	(3.296E-05,-3.744E+01)
2	(7.813E-05, 1.532E+02)	(1.708E-05,-1.164E+02)	(3.835E-04, 1.420E+02)	(3.296E-05, 3.744E+01)
3	(5.364E-10, 1.370E+02)	(6.720E-10,-1.044E+02)	(1.480E-08,-1.352E+01)	(1.967E-09,-1.109E+02)
4	(5.364E-10,-1.370E+02)	(6.720E-10, 1.044E+02)	(1.480E-08, 1.352E+01)	(1.567E-09, 1.109E+02)
5	(4.192E-05, 1.596E+02)	(8.541E-06, 5.878E+01)	(9.925E-05, 1.487E+02)	(3.594E-06,-2.506E+01)
6	(4.192E-05,-1.596E+02)	(8.541E-06,-5.878E+01)	(9.925E-05,-1.487E+02)	(3.594E-06, 2.506E+01)
7	(1.737E-04,-1.729E+02)	(3.533E-05, 9.232E+01)	(4.158E-04,-1.726E+02)	(1.350E-05, 3.134E+00)
8	(1.737E-04, 1.729E+02)	(3.533E-05,-9.232E+01)	(4.158E-04, 1.726E+02)	(1.350E-05,-3.134E+00)
9	(9.976E-03, 1.515E+02)	(4.298E-04, 8.027E+01)	(1.084E-03,-1.610E+02)	(1.643E-04,-1.150E+01)
10	(9.976E-03,-1.515E+02)	(4.298E-04,-8.027E+01)	(1.084E-03, 1.610E+02)	(1.643E-04, 1.150E+01)
11	(8.472E-03,-3.511E+00)	(2.017E-05,-1.034E+02)	(1.520E-06,-1.441E+01)	(1.998E-05,-9.078E+01)
12	(8.472E-03, 3.511E+00)	(2.017E-05, 1.034E+02)	(1.520E-06, 1.441E+01)	(1.956E-05, 9.078E+01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(8.113E-02, 1.800E+02)	(2.456E-02, 1.800E+02)	(2.333E-01, 0.)	(2.545E-02, 1.800E+02)
15	(8.231E-02, 0.)	(2.443E-02, 0.)	(2.297E-01, 1.800E+02)	(2.504E-02, 0.)

	5	6	7
1	(2.206E-04,-1.702E+02)	(4.955E-03,-6.862E+01)	(2.466E-02,-1.143E+02)
2	(2.206E-04, 1.702E+02)	(4.955E-03, 6.862E+01)	(2.466E-02, 1.143E+02)
3	(3.665E-07,-1.268E+02)	(8.071E-06,-3.629E+01)	(1.873E-05,-1.284E+02)
4	(3.665E-07, 1.268E+02)	(8.071E-06, 3.629E+01)	(1.873E-05, 1.284E+02)
5	(7.517E-04,-4.909E+01)	(8.736E-03, 4.081E+01)	(2.950E-02,-4.586E+01)
6	(7.517E-04, 4.909E+01)	(8.736E-03,-4.081E+01)	(2.950E-02, 4.586E+01)
7	(7.633E-04, 1.320E+02)	(8.983E-03,-1.352E+02)	(3.061E-02, 1.302E+02)
8	(7.633E-04,-1.320E+02)	(8.983E-03, 1.332E+02)	(3.061E-02,-1.302E+02)
9	(4.780E-04, 8.036E+01)	(1.206E-03,-1.609E+02)	(9.120E-03, 8.703E+01)
10	(4.780E-04,-8.036E+01)	(1.206E-03, 1.609E+02)	(8.120E-03,-8.703E+01)
11	(2.025E-05,-1.047E+02)	(1.525E-06,-1.559E+01)	(4.441E-05,-1.471E+00)
12	(2.025E-05, 1.047E+02)	(1.525E-06, 1.559E+01)	(4.441E-05, 1.471E+00)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(7.493E-03, 1.800E+02)	(7.118E-02, 0.)	(2.794E+00, 0.)
15	(7.814E-03, 0.)	(7.345E-02, 1.800E+02)	(2.724E+00, 1.800E+02)

THE AU MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.055E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-4.074E+01	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.031E+02
11	7.577E+02	5.555E+01	-3.900E-03	0.	6.990E+00	3.456E+01
12	1.686E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.436E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-8.726E-01	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-5.593E+01	3.457E+00	-1.219E-01	3.764E+00	-2.785E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.086E-01

THE AC MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	5.322E+00	-1.355E+00	1.423E-02	0.	1.285E-01	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.30[illegible]-02	3.456E-02	3.636E-02
7	6.701E-01	1.672E+00	-1.148E-03	[illegible]	-5.621E-04	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AU-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.366E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-4.074E+01	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-8.726E-01	-2.216E-01	8.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.598E+00	1.080E-01	1.017E-01
11	-5.593E+01	3.286E+00	-1.596E-01	3.583E+00	-2.785E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00
11	-2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-4.869E+00	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-1.939E+01	-4.599E+01	4.350E-02	-3.342E+00	1.627E-02	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	5.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-4.074E+01
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.385E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.307E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-8.726E-01	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.959E-01	-8.596E+00	1.080E-01	1.017E-01
14	3.621E+01	-5.593E+01	3.286E+00	-1.556E-01	3.963E+00	-2.785E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.849E+02	-4.531E-04	2.674E-02	-2.906E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E-02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-4.868E+00	-9.740E+01	-1.939E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	4.350E-02	-3.342E+00	1.627E-02	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.50357E+00	2.19996E+01	3.57396E+00	.20055195	2.22046E-01
3	-2.03840E-01	2.20195E+01	3.50466E+00	.00925587	4.90580E+00
5	-1.42382E+00	7.25867E+00	1.17742E+00	.19313770	6.59876E-01
7	2.09909E-01	6.98189E+00	1.11171E+00	-.03005119	-4.76397E+00
9	-7.98244E-01	9.03440E-01	1.91872E-01	.66213014	1.25275E+00
11	1.69109E-01	0.	0.	-1.00000000	-5.23798E+00
12	-1.46078E-01	0.	0.	1.00000000	6.84566E+00
13	-6.66667E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-8.730E-03, 1.753E-04)	(-8.730E-03,-1.753E-04)	(-8.260E-05, 1.379E-04)	(-8.260E-05,-1.379E-04)
5	(-8.575E-03,-6.820E-02)	(-8.575E-03, 6.820E-02)	(1.252E-03, 1.225E-03)	(1.252E-03,-1.225E-03)
6	(-4.575E-06,-1.399E-05)	(-4.575E-06, 1.399E-05)	(-7.677E-08,-1.329E-08)	(-7.677E-08, 1.329E-08)
7	(-2.899E-03, 9.832E-04)	(-2.899E-03,-9.832E-04)	(5.510E-05,-5.735E-05)	(5.510E-05, 5.735E-05)
8	(7.458E-04, 1.120E-03)	(7.458E-04,-1.120E-03)	(2.765E-04,-1.525E-03)	(2.765E-04, 1.525E-03)
9	(1.453E-02, 4.109E-02)	(1.453E-02,-4.109E-02)	(1.807E-03, 1.534E-03)	(1.807E-03,-1.534E-03)
10	(4.099E-03,-7.197E-03)	(4.099E-03, 7.197E-03)	(-2.332E-04,-9.730E-04)	(-2.332E-04, 9.730E-04)
11	(1.908E-05,-2.086E-05)	(1.908E-05, 2.086E-05)	(-1.621E-02, 4.226E-02)	(-1.621E-02,-4.226E-02)
12	(-2.801E-02, 1.136E-02)	(-2.801E-02,-1.136E-02)	(3.352E-02, 6.399E-03)	(3.352E-02,-6.399E-03)
13	(-9.693E-01, 1.346E-01)	(-9.693E-01,-1.346E-01)	(-3.414E-02, 3.948E-02)	(-3.414E-02,-3.948E-02)
14	(1.359E-01, 1.226E-01)	(1.359E-01,-1.226E-01)	(2.147E-02,-4.936E-03)	(2.147E-02, 4.936E-03)
15	(3.730E-04, 5.136E-04)	(3.730E-04,-5.136E-04)	(-9.273E-01,-3.656E-01)	(-9.273E-01, 3.656E-01)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-1.637E-02, 8.468E-03)	(-1.637E-02,-8.468E-03)	(4.348E-04,-6.365E-03)	(4.348E-04, 6.365E-03)
5	(-7.713E-02,-1.10E-01)	(-7.713E-02, 1.106E-01)	(4.040E-02,-1.002E-02)	(4.040E-02, 1.002E-02)
6	(-1.108E-04,-9.714E-05)	(-1.108E-04, 9.714E-05)	(5.241E-05,-2.720E-06)	(5.241E-05, 2.720E-06)
7	(-1.265E-02, 1.312E-02)	(-1.265E-02,-1.312E-02)	(-1.260E-03,-5.824E-03)	(-1.260E-03, 5.824E-03)
8	(9.639E-02,-2.940E-02)	(9.639E-02, 2.940E-02)	(8.768E-02,-3.956E-02)	(8.768E-02, 3.956E-02)
9	(5.816E-03,-7.505E-04)	(5.816E-03, 7.505E-04)	(4.250E-03,-2.062E-03)	(4.250E-03, 2.062E-03)
10	(3.405E-02, 7.909E-02)	(3.405E-02,-7.909E-02)	(6.878E-02,-7.773E-02)	(6.878E-02, 7.773E-02)
11	(7.064E-06,-1.103E-06)	(7.064E-06, 1.103E-06)	(3.815E-06,-2.734E-06)	(3.815E-06, 2.734E-06)
12	(7.567E-02, 7.417E-01)	(7.567E-02,-7.417E-01)	(2.948E-01, 6.038E-01)	(2.948E-01,-6.038E-01)
13	(-2.862E-03, 4.329E-02)	(-2.862E-03,-4.329E-02)	(1.525E-02, 2.924E-02)	(1.525E-02,-2.924E-02)
14	(-6.228E-01, 1.342E-01)	(-6.228E-01,-1.342E-01)	(5.571E-01, 4.639E-01)	(5.571E-01,-4.639E-01)
15	(-2.090E-06, 5.285E-05)	(-2.090E-06,-5.285E-05)	(1.989E-05, 2.606E-05)	(1.989E-05,-2.606E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-2.556E-01, 4.384E-01)	(-2.556E-01,-4.384E-01)	(2.903E-01, 0.)	(-3.656E-01, 0.)
5	(-4.009E-01,-2.496E-01)	(-4.009E-01, 2.496E-01)	(1.692E-01, 0.)	(-1.258E-01, 0.)
6	(-1.823E-02, 1.059E-02)	(-1.823E-02,-1.059E-02)	(-1.775E-01, 0.)	(1.618E-01, 0.)
7	(6.501E-02, 3.863E-01)	(6.501E-02,-3.863E-01)	(6.946E-01, 0.)	(8.613E-01, 0.)
8	(-2.031E-01, 2.530E-01)	(-2.031E-01,-2.530E-01)	(1.938E-01, 0.)	(-2.383E-01, 0.)
9	(1.630E-02,-3.103E-02)	(1.630E-02, 3.103E-02)	(-1.951E-02, 0.)	(2.482E-02, 0.)
10	(1.165E-01,-1.701E-01)	(1.165E-01, 1.701E-01)	(-1.233E-01, 0.)	(1.526E-01, 0.)
11	(2.262E-05,-3.843E-05)	(2.262E-05, 3.843E-05)	(-2.595E-05, 0.)	(3.251E-05, 0.)
12	(-6.645E-02,-3.854E-01)	(-6.645E-02, 3.854E-01)	(3.662E-02, 0.)	(3.482E-02, 0.)
13	(1.502E-02, 3.950E-02)	(1.502E-02,-3.950E-02)	(690E-03, 0.)	(-3.625E-03, 0.)

14	(6.069E-02, 2.411E-01)	(6.069E-02,-2.411E-01)	(-2.332E-02, 0.)	(-2.230E-02, 0.)
15	(1.666E-05, 5.111E-05)	(1.666E-05,-5.111E-05)	(-4.910E-06, 0.)	(-4.749E-06, 0.)

	13	14	15
1	(1.788E-01, 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(8.157E-01, 0.)
3	(0. , 0.)	(3.191E-01, 0.)	(-1.840E-01, 0.)
4	(-4.688E-02, 0.)	(3.332E-03, 0.)	(-1.782E-03, 0.)
5	(3.085E-01, 0.)	(2.943E-01, 0.)	(-1.707E-01, 0.)
6	(-4.224E-04, 0.)	(-1.017E-04, 0.)	(6.072E-05, 0.)
7	(-4.627E-02, 0.)	(-1.098E-02, 0.)	(1.816E-02, 0.)
8	(1.369E-01, 0.)	(-1.035E-02, 0.)	(-4.123E-02, 0.)
9	(1.046E-02, 0.)	(-2.571E-02, 0.)	(1.483E-02, 0.)
10	(-1.685E-02, 0.)	(-5.721E-02, 0.)	(3.341E-02, 0.)
11	(7.096E-06, 0.)	(-2.706E-05, 0.)	(1.580E-05, 0.)
12	(-9.121E-01, 0.)	(-5.683E-01, 0.)	(3.875E-01, 0.)
13	(-6.973E-02, 0.)	(2.442E-01, 0.)	(-1.394E-01, 0.)
14	(1.124E-01, 0.)	(5.435E-01, 0.)	(-3.140E-01, 0.)
15	(-4.731E-05, 0.)	(2.600E-04, 0.)	(-1.485E-04, 0.)

THE CON VECTOR (15 BY 1)

	1
1	(-1.735E-02, 8.889E-02)
2	(-1.735E-02,-2.839E-02)
3	(-1.227E-05,-1.329E-04)
4	(-1.227E-05, 1.329E-04)
5	(-2.214E-01,-4.199E+00)
6	(-2.214E-01, 4.199E+00)
7	(-2.716E+00,-7.854E-01)
8	(-2.716E+00, 7.854E-01)
9	(4.418E-01,-4.621E-01)
10	(4.418E-01, 4.621E-01)
11	(-1.818E-01,-4.973E-30)
12	(-1.418E-01,-4.091E-30)
13	(5.593E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(9.057E-02, 1.010E+02)
2	(9.057E-02,-1.010E+02)
3	(1.335E-04,-9.527E+01)
4	(1.335E-04, 9.527E+01)
5	(4.205E+00,-9.302E+01)
6	(4.205E+00, 9.302E+01)
7	(2.827E+00,-1.63?E+02)
8	(2.827E+00, 1.535E+02)
9	(5.539E-01,-4.750E+01)
10	(6.539E-01, 4.750E+01)
11	(1.816E-01,-1.800E+02)
12	(1.416E-01,-1.800E+02)
13	(5.593E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(3.946E-03,-3.982E-03)
2	(3.946E-03, 3.982E-03)
3	(4.683E-06,-7.066E-06)
4	(4.683E-06, 7.066E-06)
5	(6.105E-03,-6.940E-03)
6	(6.105E-03, 6.940E-03)
7	(-5.885E-03,-1.404E-03)
8	(-5.885E-03, 1.404E-03)
9	(3.373E-04,-1.583E-04)
10	(3.373E-04, 1.583E-04)
11	(-3.132E-05, 8.774E-31)
12	(3.759E-05, 4.799E-31)
13	(0. , 0.)
14	(7.245E-01, 0.)
15	(1.226E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(5.605E-03,-4.526E+01)
2	(5.605E-03, 4.526E+01)
3	(8.477E-06,-5.647E+01)
4	(8.477E-06, 5.647E+01)
5	(9.243E-03,-4.866E+01)
6	(9.243E-03, 4.866E+01)
7	(6.050E-03,-1.656E+02)
8	(6.050E-03, 1.656E+02)
9	(3.726E-04,-2.515E+01)
10	(3.726E-04, 2.515E+01)
11	(3.132E-05, 1.800E+02)
12	(3.759E-05, 7.314E-25)
13	(0. , 0.)
14	(7.245E-01, 0.)
15	(1.226E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-4.342E-03,-1.328E-02)	(-4.342E-03, 1.328E-02)	(-7.286E-05,-1.261E-05)	(-7.286E-05, 1.261E-05)
2	(-2.899E-03, 9.832E-04)	(-2.899E-03,-9.832E-04)	(5.510E-05,-5.735E-05)	(5.510E-05, 5.735E-05)
3	(-8.575E-03,-6.820E-02)	(-8.575E-03, 6.820E-02)	(1.252E-03, 1.225E-03)	(1.252E-03,-1.225E-03)
4	(5.831E-03, 8.079E-04)	(5.831E-03,-8.079E-04)	(1.377E-04,-1.953E-04)	(1.377E-04, 1.953E-04)
5	(-2.229E-02,-3.401E-02)	(-2.229E-02, 3.401E-02)	(1.442E-02,-4.136E-02)	(1.442E-02, 4.136E-02)
6	(8.485E-01,-3.372E-01)	(8.465E-01, 3.372E-01)	(9.077E-01, 3.259E-01)	(9.077E-01,-3.259E-01)
7	(1.672E+00,-4.217E+00)	(1.672E+00, 4.217E+00)	(6.897E-01,-2.157E+00)	(6.897E-01, 2.197E+00)

	5	6	7	8
1	(-1.052E-01,-9.218E-02)	(-1.052E-01, 9.218E-02)	(4.974E-02,-2.581E-03)	(4.974E-02, 2.581E-03)
2	(-1.265E-02, 1.312E-02)	(-1.265E-02,-1.312E-02)	(-1.260E-03,-5.824E-03)	(-1.260E-03, 5.824E-03)
3	(-7.713E-02,-1.106E-01)	(-7.713E-02, 1.106E-01)	(4.040E-02,-1.002E-02)	(4.040E-02, 1.002E-02)
4	(3.717E-03, 4.649E-03)	(3.717E-03,-4.649E-03)	(-1.695E-03, 5.406E-04)	(-1.695E-03,-5.406E-04)
5	(-1.489E-01,-3.582E-02)	(-1.489E-01, 3.582E-02)	(-1.620E-01, 1.135E-01)	(-1.620E-01,-1.135E-01)
6	(4.728E-01,-1.030E+00)	(4.728E-01, 1.030E+00)	(-8.267E-01,-1.107E+00)	(-8.267E-01, 1.107E+00)
7	(-1.740E+00,-1.196E+00)	(-1.740E+00,-1.196E+00)	(-2.256E+00, 1.791E+00)	(-2.256E+00,-1.791E+00)

	9	10	11	12
1	(-1.730E+01, 1.005E+01)	(-1.730E+01,-1.005E+01)	(-1.685E+02, 0.)	(1.536E+02, 0.)
2	(6.501E-02, 3.863E-01)	(6.501E-02,-3.863E-01)	(8.948E-01, 0.)	(8.613E-01, 0.)
3	(-4.009E-01,-2.496E-01)	(-4.009E-01, 2.496E-01)	(1.692E 01, 0.)	(-1.258E-01, 0.)
4	(3.206E-01,-5.214E-02)	(3.206E-01, 5.214E-02)	(6.045E-01, 0.)	(1.227E+00, 0.)
5	(1.352E-01, 3.345E-01)	(1.352E-01,-3.345E-01)	(8.440E-01, 0.)	(9.222E-01, 0.)
6	(-4.101E-01,-1.448E-01)	(-4.101E-01, 1.448E-01)	(1.598E-01, 0.)	(-1.347E-01, 0.)
7	(-4.982E+00, 9.525E+00)	(-4.982E+00,-9.525E+00)	(3.437E+00, 0.)	(-5.252E+00, 0.)

	13	14	15
1	(-4.008E-01, 0.)	(-9.649E-02, 0.)	(5.763E-02, 0.)
2	(-4.627E-02, 0.)	(-3.098E-02, 0.)	(1.816E-02, 0.)
3	(3.085E-01, 0.)	(2.943E-01, 0.)	(-1.707E-01, 0.)
4	(6.080E-04, 0.)	(-3.421E-02, 0.)	(1.994E-02, 0.)
5	(-1.767E-01, 0.)	(-1.839E-02, 0.)	(1.114E-02, 0.)
6	(1.178E+00, 0.)	(1.747E-01, 0.)	(-1.047E-01, 0.)
7	(-1.620E+00, 0.)	(5.004E+00, 0.)	(-2.893E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.397E-02,-1.081E+02)	(1.397E-02, 1.081E+02)	(7.394E-05,-1.702E+02)	(7.394E-05, 1.702E+02)
2	(3.061E-03, 1.613E+02)	(3.061E-03,-1.613E+02)	(7.953E-05,-4.614E+01)	(7.953E-05, 4.614E+01)
3	(6.874E-02,-9.717E+01)	(6.874E-02, 9.717E+01)	(1.751E-03, 4.439E+01)	(1.751E-03,-4.439E+01)
4	(5.887E-03, 7.888E+00)	(5.887E-03,-7.888E+00)	(2.390E-04,-5.481E+01)	(2.390E-04, 5.481E+01)
5	(4.066E-02,-1.232E+02)	(4.066E-02, 1.232E+02)	(4.380E-02,-7.078E+01)	(4.380E-02, 7.078E+01)
6	(9.131E-01,-2.168E+01)	(9.131E-01, 2.168E+01)	(9.644E-01, 1.975E+01)	(9.644E-01,-1.975E+01)
7	(4.537E+00,-6.837E+01)	(4.537E+00, 6.837E+01)	(2.303E+00,-7.257E+01)	(2.303E+00, 7.257E+01)

	5	6	7	8
1	(1.399E-01,-1.388E+02)	(1.399E-01, 1.388E+02)	(4.980E-02,-2.971E+00)	(4.980E-02, 2.971E+00)
2	(1.823E-02, 1.340E+02)	(1.823E-02,-1.340E+02)	(5.559E-03,-1.022E+02)	(5.959E-03, 1.022E+02)
3	(1.348E-01,-1.249E+02)	(1.348E-01, 1.249E+02)	(4.163E-02,-1.393E+01)	(4.162E-02, 1.393E+01)
4	(5.952E-03, 5.135E+01)	(5.952E-03,-5.135E+01)	(1.779E-03, 1.623E+02)	(1.779E-03,-1.623E+02)
5	(1.532E-01,-1.665E+02)	(1.532E-01, 1.665E+02)	(1.976E-01, 1.450E+02)	(1.970E-01,-1.450E+02)
6	(1.133E+00,-6.534E+01)	(1.133E+00, 6.534E+01)	(1.382E+00,-1.267E+02)	(1.382E+00, 1.267E+02)
7	(2.111E+00,-1.455E+02)	(2.111E+00, 1.455E+02)	(2.680E+00, 1.415E+02)	(2.680E+00,-1.45E+02)

	9	10	11	12
1	(2.001E+01, 1.498E+02)	(2.001E+01,-1.498E+02)	(1.685E+02, 1.800E+02)	(1.536E+02, 0.)
2	(3.917E-01, 8.045E+01)	(3.917E-01,-8.045E+01)	(6.948E-01, 0.)	(8.613E-01, 0.)
3	(4.722E-01,-1.481E+02)	(4.722E-01, 1.481E+02)	(1.692E-01, 0.)	(1.258E-01, 1.800E+02)
4	(3.249E-01,-9.237E+00)	(3.249E-01, 9.237E+00)	(6.045E-01, 0.)	(1.227E+00, 0.)
5	(3.608E-01, 6.799E+01)	(3.609E-01,-6.799E+01)	(8.440E-01, 0.)	(9.222E-01, 0.)
6	(4.350E-01,-1.605E+02)	(4.350E-01, 1.605E+02)	(1.596E-01, 0.)	(1.347E-01, 1.800E+02)
7	(1.075E+01, 1.176E+02)	(1.075E+01,-1.176E+02)	(3.437E+00, 0.)	(5.252E+00, 1.800E+02)

	13	14	15
1	(4.008E-01, 1.800E+02)	(9.649E-02, 1.800E+02)	(5.763E-02, 0.)
2	(4.627E-02, 1.800E+02)	(3.093E-02, 1.800E+02)	(1.816E-02, 0.)
3	(3.085E-01, 0.)	(2.943E-01, 0.)	(1.707E-01, 1.800E+02)
4	(6.030E-04, 0.)	(3.431E-02, 1.800E+02)	(1.994E-02, 0.)
5	(1.767E-01, 1.800E+02)	(1.839E-02, 1.800E+02)	(1.114E-02, 0.)
6	(1.178E+00, 0.)	(1.747E-01, 0.)	(1.047E-01, 1.800E+02)
7	(1.620E+00, 1.800E+02)	(5.004E+00, 0.)	(2.893E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.256E-03,-1.555E-04)	(-3.709E-05,-2.747E-04)	(6.211E-03, 4.212E-04)	(-1.730E-04, 5.043E-04)
2	(1.256E-03, 1.555E-04)	(-3.709E-05, 2.747E-04)	(6.211E-03,-4.212E-04)	(-1.730E-04,-5.043E-04)
3	(-7.824E-10, 9.838E-09)	(-8.298E-09,-6.620E-09)	(1.475E-07,-1.814E-07)	(-2.765E-08,-1.591E-08)
4	(-7.824E-10,-9.838E-09)	(-8.298E-09, 6.620E-09)	(1.475E-07, 1.814E-07)	(-2.765E-08, 1.591E-08)
5	(-3.638E-01, 4.621E-01)	(5.768E-02, 5.024E-02)	(-4.474E-01, 3.484E-01)	(1.870E-02,-1.664E-02)
6	(-3.638E-01,-4.621E-01)	(5.768E-02,-5.024E-02)	(-4.474E-01,-3.484E-01)	(1.870E-02, 1.664E-02)
7	(-1.371E-01,-3.205E-02)	(-1.152E-03, 1.681E-02)	(-1.176E-01,-4.514E-03)	(5.028E-03,-1.372E-04)
8	(-1.371E-01, 3.205E-02)	(-1.152E-03,-1.681E-02)	(-1.176E-01, 4.514E-03)	(5.028E-03, 1.372E-04)
9	(-2.798E+00, 1.278E+01)	(2.149E-01, 1.393E-01)	(-2.974E-01, 8.256E-02)	(1.165E-01,-1.776E-01)
10	(-2.798E+00,-1.278E+01)	(2.149E-01,-1.393E-01)	(-2.974E-01,-8.256E-02)	(1.165E-01, 1.776E-01)
11	(3.055E+01, 8.377E-28)	(-1.625E-01,-4.450E-30)	(-5.073E-02,-8.415E-31)	(-1.098E-01,-3.006E-30)
12	(-2.175E+01,-6.283E-26)	(-1.220E-01,-3.524E-30)	(1.782E-02, 5.147E-31)	(-1.738E-01,-5.019E-30)
13	(-2.242E+00, 0.)	(-2.588E-01, 0.)	(1.725E+00, 0.)	(3.400E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.410E-03,-1.391E-03)	(1.525E-02, 8.127E-02)	(3.459E-01, 2.218E-01)
2	(3.410E-03, 1.391E-03)	(1.525E-02,-8.127E-02)	(3.459E-01,-2.218E-01)
3	(-5.674E-06,-1.409E-06)	(3.218E-05,-1.246E-04)	(-3.005E-04,-6.472E-05)
4	(-5.674E-06, 1.409E-06)	(3.218E-05, 1.246E-04)	(-3.005E-04, 6.472E-05)
5	(-1.175E-01, 6.333E-01)	(-4.429E+00,-1.758E+00)	(-4.638E+00, 7.572E+00)
6	(-1.175E-01,-6.333E-01)	(-4.429E+00, 1.758E+00)	(-4.638E+00,-7.572E+00)
7	(5.291E-01,-1.811E-01)	(1.376E+00, 3.056E+00)	(7.533E+00,-3.094E+00)
8	(5.291E-01, 1.811E-01)	(1.379E+00,-3.656E+00)	(7.533E+00, 3.094E+00)
9	(2.210E-01, 8.259E-02)	(-2.510E-01, 1.337E-01)	(2.381E+00, 6.811E+00)
	2.210E-01,-8.259E-02	(-2.510E-01,-1.337E-01)	(2.381E+00,-6.810E+00)
	-1.333E-01,-4.197E-30)	(-2.298E-02,-7.937E-31)	(-6.241E-01,-1.705E-29)
	-1.330E-01,-3.773E-30)	(1.908E-02, 5.511E-31)	(1.490E-01, 2.143E-29)
	-9.682E-01, 0.)	(6.582E+00, 0.)	(-9.061E+00, 0.)
	0. , 0.)	(0. , 0.)	(0. , 0.)
	0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

ORIGINAL PAGE IS
OF POOR QUALITY

	1	2	3	4
1	1.265E-03, -7.055E+00	2.772E-04, -5.769E+01	6.225E-03, 3.879E+00	5.332E-04, 1.089E+02
2	1.265E-03, 7.055E+00	2.772E-04, 9.769E+01	6.225E-03, -3.879E+00	5.332E-04, -1.089E+02
3	9.669E-09, 9.455E+01	1.062E-08, -1.414E+02	2.336E-07, -5.085E+01	3.190E-08, -1.501E+02
4	9.665E-09, -9.455E+01	1.062E-08, 1.414E+02	2.338E-07, 5.085E+01	3.190E-08, 1.501E+02
5	5.881E-01, 1.282E+02	7.664E-02, 4.096E+01	5.670E-01, 1.421E+02	2.503E-02, -4.167E+01
6	5.881E-01, -1.282E+02	7.664E-02, -4.096E+01	5.670E-01, -1.421E+02	2.503E-02, 4.167E+01
7	1.408E-01, -1.668E+02	1.685E-02, 9.[illegible]E+01	1.177E-01, -1.778E+02	5.030E-03, -1.563E+00
8	1.408E-01, 1.668E+02	1.665E-02, -9.[illegible]E+01	1.177E-01, 1.778E+02	5.030E-03, 1.563E+00
9	1.308E+01, 1.023E+02	2.562E-01, 3.295E+01	3.088E-01, -1.644E+02	2.124E-01, -5.673E+01
10	1.308E+01, -1.023E+02	2.562E-01, -3.295E+01	3.088E-01, 1.644E+02	2.124E-01, 5.673E+01
11	3.055E+01, 1.569E-27	1.625E-01, -1.800E+02	3.073E-02, -1.800E+02	1.098E-01, -1.800E+02
12	2.175E+01, -1.800E+02	1.220E-01, -1.800E+02	1.782E-02, 1.655E-27	1.738E-01, -1.800E+02
13	2.242E+00, 1.800E+02	2.528E-01, 1.800E+02	1.725E+00, 0.	3.400E-03, 0.
14	0.	0.	0.	0.
15	0.	0.	0.	0.

	5	6	7
1	3.682E-03, -2.220E+01	8.269E-02, 7.937E+01	4.109E-01, 3.267E+01
2	3.682E-03, 2.220E+01	8.269E-02, -7.937E+01	4.109E-01, -3.257E+01
3	5.846E-06, -1.661E+02	1.287E-04, -7.553E+01	2.074E-04, -1.678E+02
4	5.846E-06, 1.661E+02	1.287E-04, 7.553E+01	3.074E-04, 1.678E+02
5	6.441E-01, 1.005E+02	4.765E+00, -1.584E+02	8.878E+00, 1.215E+02
6	6.441E-01, -1.005E+02	4.765E+00, 1.584E+02	8.878E+00, -1.215E+02
7	5.592E-01, 1.890E+01	3.906E+00, 6.938E+01	8.144E+00, -2.233E+01
8	5.592E-01, -1.890E+01	3.906E+00, -6.938E+01	8.144E+00, 2.[illegible]E+01
9	2.355E-01, 2.049E+01	2.844E-01, 1.520E+02	7.029E+00, -7.011E+01
10	2.355E-01, -2.049E+01	2.844E-01, -1.520E+02	7.029E+00, 7.011E+01
11	1.533E-01, -1.800E+02	2.898E-02, -1.800E+02	6.241E-01, -1.800E+02
12	1.306E-01, 1.800E+02	1.902E-02, 1.655E-27	7.446E-01, 1.655E-27
13	9.882E-01, 1.800E+02	6.568E+00, 0.	9.061E+00, 1.800E+02
14	0.	0.	0.
15	0.	0.	0.

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-7.000E-05,-3.511E-05)	(-7.523E-06, 1.542E-05)	(-3.054E-04,-2.349E-04)	(2.623E-05,-2.003E-05)
2	(-7.000E-05, 3.511E-05)	(-7.523E-06,-1.542E-05)	(-3.054E-04, 2.349E-04)	(2.623E-05, 2.003E-05)
3	(-4.303E-10, 4.558E-10)	(-1.472E-10,-6.580E-10)	(1.452E-08,-3.107E-09)	(-7.351E-10,-1.888E-09)
4	(-4.303E-10,-4.558E-10)	(-1.472E-10, 6.580E-10)	(1.452E-08, 3.107E-09)	(-7.351E-10, 1.886E-09)
5	(-1.282E-03, 1.671E-04)	(1.377E-05, 1.679E-04)	(-1.238E-03,-1.399E-04)	(5.496E-05, 2.582E-06)
6	(-1.282E-03,-1.671E-04)	(1.377E-05,-1.679E-04)	(-1.238E-03, 1.399E-04)	(5.496E-05,-2.582E-06)
7	(-2.963E-04,-5.464E-05)	(-7.615E-07, 3.604E-05)	(-2.518E-04, 2.249E-06)	(1.073E-05,-8.018E-07)
8	(-2.963E-04, 5.464E-05)	(-7.615E-07,-3.604E-05)	(-2.518E-04,-2.249E-06)	(1.073E-05, 8.018E-07)
9	(-4.244E-03, 6.128E-03)	(8.308E-05, 1.200E-04)	(-1.747E-04,-2.072E-05)	(9.990E-05,-6.835E-05)
10	(-4.244E-03,-6.128E-03)	(8.308E-05,-1.200E-04)	(-1.747E-04, 2.072E-05)	(9.990E-05, 6.835E-05)
11	(5.277E-03,-1.141E-28)	(-2.803E-05, 6.061E-31)	(-5.300E-06, 1.146E-31)	(-1.693E-05, 4.094E-31)
12	(5.773E-03, 7.370E-29)	(3.238E-05, 4.133E-31)	(-4.730E-06,-6.033E-32)	(4.612E-05, 5.888E-31)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-6.991E-02, 0.)	(-2.245E-02, 0.)	(2.132E-01, 0.)	(-2.486E-02, 0.)
15	(7.065E-02, 0.)	(2.226E-02, 0.)	(-2.092E-01, 0.)	(2.445E-02, 0.)

	5	6	7
1	(-2.233E-04,-4.542E-05)	(2.005E-03,-4.709E-03)	(-1.019E-02,-2.330E-02)
2	(-2.233E-04, 4.542E-05)	(2.005E-03, 4.709E-03)	(-1.019E-02, 2.330E-02)
3	(-2.247E-07,-2.956E-07)	(6.554E-06,-4.888E-06)	(-1.230E-05,-1.516E-05)
4	(-2.247E-07, 2.956E-07)	(6.554E-06, 4.888E-06)	(-1.230E-05, 1.515E-05)
5	(-1.158E-03, 8.146E-04)	(-4.260E-03,-9.569E-03)	(-1.892E-02, 4.777E-03)
6	(-1.158E-03,-8.146E-04)	(-4.260E-03, 9.569E-03)	(-1.892E-02,-4.777E-03)
7	(1.113E-03,-4.407E-04)	(3.310E-03, 7.675E-03)	(1.579E-02,-7.375E-03)
8	(1.113E-03, 4.407E-04)	(3.310E-03,-7.675E-03)	(1.579E-02, 7.375E-03)
9	(9.857E-05, 9.141E-05)	(-1.613E-04, 1.608E-05)	(-1.723E-04, 4.002E-03)
10	(9.857E-05,-9.141E-05)	(-1.613E-04,-1.608E-05)	(-1.723E-04,-4.002E-03)
11	(-2.644E-05, 5.717E-31)	(-4.399E-06, 1.081E-31)	(-1.077E-04, 2.328E-30)
12	(3.466E-05, 4.425E-31)	(-5.064E-06,-6.464E-32)	(-1.974E-04,-2.520E-30)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-1.332E-02, 0.)	(1.266E-01, 0.)	(3.626E+00, 0.)
15	(1.365E-02, 0.)	(-1.263E-01, 0.)	(-3.547E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.832E-05,-1.534E+02)	(1.716E-05, 1.160E+02)	(3.853E-04,-1.424E+02)	(3.300E-05,-3.737E+01)
2	(7.832E-05, 1.534E+02)	(1.716E-05,-1.160E+02)	(3.853E-04, 1.424E+02)	(3.300E-05, 3.737E+01)
3	(6.268E-10, 1.334E+02)	(6.742E-10,-1.026E+02)	(1.485E-08,-1.208E+01)	(2.026E-09,-1.113E+02)
4	(6.268E-10,-1.334E+02)	(6.742E-10, 1.026E+02)	(1.485E-08, 1.208E+01)	(2.026E-09, 1.113E+02)
5	(1.293E-03, 1.726E+02)	(1.685E-04, 8.531E+01)	(1.246E-03,-1.736E+02)	(5.502E-05, 2.690E+00)
6	(1.293E-03,-1.726E+02)	(1.685E-04,-8.531E+01)	(1.246E-03, 1.736E+02)	(5.502E-05,-2.690E+00)
7	(3.013E-04,-1.696E+02)	(3.605E-05, 9.121E+01)	(2.518E-04, 1.795E+02)	(1.076E-05,-4.273E+00)
8	(3.013E-04, 1.696E+02)	(3.605E-05,-9.121E+01)	(2.518E-04,-1.795E+02)	(1.076E-05, 4.273E+00)
9	(7.454E-03, 1.247E+02)	(1.460E-04, 5.530E+01)	(1.760E-04,-1.732E+02)	(1.210E-04,-3.438E+01)
10	(7.454E-03,-1.247E+02)	(1.460E-04,-5.530E+01)	(1.760E-04, 1.732E+02)	(1.210E-04, 3.438E+01)
11	(5.277E-03,-1.239E-24)	(2.803E-05, 1.800E+02)	(5.300E-06, 1.800E+02)	(1.893E-05, 1.800E+02)
12	(5.773E-03, 7.314E-25)	(3.238E-05, 7.314E-25)	(4.730E-06,-1.800E+02)	(4.612E-05, 7.314E-25)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(6.991E-02, 1.800E+02)	(2.245E-02, 1.800E+02)	(2.132E-01, 0.)	(2.486E-02, 1.800E+02)
15	(7.065E-02, 0.)	(2.226E-02, 0.)	(2.093E-01, 1.800E+02)	(2.445E-02, 0.)

	5	6	7
1	(2.279E-04,-1.685E+02)	(5.118E-03,-6.693E+01)	(2.543E-02,-1.136E+02)
2	(2.279E-04, 1.685E+02)	(5.118E-03, 6.693E+01)	(2.543E-02, 1.136E+02)
3	(3.713E-07,-1.272E+02)	(8.176E-06,-3.672E+01)	(1.952E-05,-1.290E+02)
4	(3.713E-07, 1.272E+02)	(8.176E-06, 3.672E+01)	(1.952E-05, 1.290E+02)
5	(1.416E-03, 1.449E+02)	(1.047E-02,-1.140E+02)	(1.952E-02, 1.658E+02)
6	(1.416E-03,-1.449E+02)	(1.047E-02, 1.140E+02)	(1.952E-02,-1.658E+02)
7	(1.197E-03,-2.161E+01)	(8.359E-03, 6.687E+01)	(1.743E-02,-2.504E+01)
8	(1.197E-03, 2.161E+01)	(8.359E-03,-6.687E+01)	(1.743E-02, 2.504E+01)
9	(1.344E-04, 4.284E+01)	(1.621E-04, 1.743E+02)	(4.005E-03, 9.247E+01)
10	(1.344E-04,-4.284E+01)	(1.621E-04,-1.743E+02)	(4.005E-03,-9.247E+01)
11	(2.644E-05, 1.800E+02)	(4.899E-05, 1.800E+02)	(1.077E-04, 1.800E+02)
12	(3.466E-05, 7.314E-25)	(5.064E-06,-1.800E+02)	(1.974E-04,-1.800E+02)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(1.332E-02, 1.800E+02)	(1.266E-01, 0.)	(3.622E+00, 0.)
15	(1.365E-02, 0.)	(1.283E-01, 1.800E+02)	(3.547E+00, 1.800E+02)

THE AU MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-9.777E+01	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.990E+00	3.458E+01
12	1.688E+00	3.990E-02	0.	0.	1.623E-02	9.700E-02

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-1.005E+00	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-1.030E+02	3.457E+00	-1.219E-01	3.784E+00	-3.913E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.080E-01

THE AG MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	7.473E-01	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	3.456E-02	3.636E-02
7	9.333E-01	1.672E+00	2.922E-04	1.103E-01	6.902E-05	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
6	0.
7	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AV-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-9.777E+01	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.138E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10		12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-02	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-1.005E+00	-2.216E-01	6.996E-01	-1.433E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
11	-1.030E+02	3.286E+00	-1.596E-01	3.963E+00	-3.913E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
	-2.884E-01
	-1.503E+01
	0.
	0.
	0.
	0.
	0.
	0.
9	5.886E+01
10	7.103E+00
11	-2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-2.831E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-2.701E+01	-4.599E+01	-1.107E-02	-3.342E+00	-1.997E-03	-3.964E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-9.777E+01
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-1.005E+00	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
14	3.621E+01	-1.030E+02	3.286E+00	-1.596E-01	3.963E+00	-3.913E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC MATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	1.000E+00
4	0.	0.	0.	-1.000E+00	0.
5	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	1.000E+00
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-2.831E+01	-9.740E+01	-2.701E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.	0.	0.
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	-1.107E-02	-3.342E+00	-1.997E-03	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.50562E+00	2.20005E+01	3.57417E+00	.20063183	2.21945E-01
3	-2.03840E-01	2.20195E+01	3.50466E+00	.00925685	4.90581E+00
5	1.82831E-01	9.92558E+00	1.57997E+00	-.01841702	-5.46954E+00
7	-1.17337E+00	1.01712E+01	1.62954E+00	.11460140	8.52246E-01
9	-1.12898E+00	2.02507E+00	3.69003E-01	.48694112	8.85756E-01
11	3.12706E-03	6.10897E-02	9.73545E-03	-.05112115	-3.19789E+02
13	-6.66667E+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1.00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.06383E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(7.278E-03, 4.738E-03)	(7.278E-03,-4.738E-03)	(1.565E-04,-1.162E-05)	(1.565E-04, 1.162E-05)
5	(-3.120E-02, 6.071E-02)	(-3.120E-02,-6.071E-02)	(2.233E-04,-1.721E-03)	(2.233E-04, 1.721E-03)
6	(-4.073E-06, 1.406E-05)	(-4.073E-06,-1.406E-05)	(2.894E-08, 6.646E-08)	(2.894E-08,-6.646E-08)
7	(2.527E-03, 8.186E-04)	(2.927E-03,-8.18EE-04)	(-7.826E-05,-9.415E-06)	(-7.826E-05, 9.415E-06)
8	(-2.857E-05,-1.469E-03)	(-2.857E-05, 1.469E-03)	(-1.610E-03, 7.567E-04)	(-1.610E-03,-7.567E-04)
9	(1.100E-02,-4.199E-02)	(1.100E-02, 4.199E-02)	(1.823E-04,-2.33EE-03)	(1.823E-04, 2.336E-03)
10	(-7.996E-03, 4.369E-03)	(-7.996E-03,-4.369E-03)	(-7.265E-04, 8.423E-04)	(-7.265E-04,-8.423E-04)
11	(-2.742E-05, 6.515E-06)	(-2.742E-05,-6.515E-06)	(4.373E-02,-1.164E-02)	(4.373E-02, 1.164E-02)
12	(3.244E-02, 5.988E-03)	(3.244E-02,-5.988E-03)	(-1.633E-02,-3.560E-02)	(-1.633E-02, 3.560E-02)
13	(8.743E-01, 4.313E-01)	(8.743E-01,-4.313E-01)	(5.141E-02, 4.490E-03)	(5.141E-02,-4.490E-03)
14	(-6.009E-02,-1.956E-01)	(-6.009E-02, 1.956E-01)	(-1.840E-02,-1.617E-02)	(-1.840E-02, 1.617E-02)
15	(-1.978E-05,-6.327E-04)	(-1.978E-05, 6.327E-04)	(2.473E-01, 9.654E-01)	(2.473E-01,-9.654E-01)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-4.136E-03, 1.320E-03)	(-4.136E-03,-1.320E-03)	(-7.032E-03,-4.063E-03)	(-7.032E-03, 4.063E-03)
5	(-2.517E-02,-3.166E-02)	(-2.517E-02, 3.166E-02)	(2.207E-02,-7.647E-02)	(2.207E-02, 7.647E-02)
6	(-1.150E-05,-2.228E-05)	(-1.150E-05, 2.228E-05)	(9.746E-06,-4.489E-05)	(9.746E-06, 4.489E-05)
7	(-3.235E-03, 2.476E-03)	(-3.235E-03,-2.476E-03)	(-7.666E-03,-1.286E-03)	(-7.666E-03, 1.286E-03)
8	(-4.531E-02,-5.006E-02)	(-4.531E-02, 5.006E-02)	(7.588E-02, 2.515E-02)	(7.588E-02,-2.515E-02)
9	(-2.741E-03,-2.143E-03)	(-2.741E-03, 2.143E-03)	(3.660E-03, 2.284E-03)	(3.660E-03,-2.284E-03)
10	(-7.385E-02, 2.123E-03)	(-7.385E-02,-2.123E-03)	(-2.842E-02, 4.659E-02)	(-2.842E-02,-4.659E-02)
11	(-2.972E-06,-1.395E-06)	(-2.972E-06, 1.395E-06)	(4.323E-06, 2.532E-06)	(4.323E-06,-2.532E-06)
12	(4.886E-01,-4.588E-01)	(4.886E-01, 4.588E-01)	(-3.448E-01, 7.423E-01)	(-3.448E-01,-7.423E-01)
13	(2.077E-02,-2.760E-02)	(2.077E-02, 2.760E-02)	(-2.752E-02, 3.454E-02)	(-2.752E-02,-3.454E-02)
14	(-3.458E-02,-7.326E-01)	(-3.458E-02, 7.326E-01)	(-4.405E-01,-3.438E-01)	(-4.405E-01, 3.438E-01)
15	(1.330E-05,-2.975E-05)	(1.330E-05, 2.975E-05)	(-3.083E-05, 4.100E-05)	(-3.083E-05,-4.100E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(3.558E-01, 1.061E-01)	(3.558E-01,-1.061E-01)	(1.277E-01,-2.291E-01)	(1.277E-01, 2.291E-01)
5	(-3.180E-01, 7.214E-01)	(-3.180E-01,-7.214E-01)	(-1.340E-02, 4.981E-02)	(-1.340E-02,-4.981E-02)
6	(3.675E-03, 8.298E-03)	(3.675E-03,-8.298E-03)	(-2.280E-01, 3.956E-01)	(-2.280E-01,-3.956E-01)
7	(3.385E-01,-3.172E-02)	(3.385E-01, 3.172E-02)	(8.021E-01, 2.605E-01)	(8.021E-01,-2.605E-01)
8	(7.656E-02, 5.702E-02)	(7.656E-02,-5.702E-02)	(3.016E-02,-5.325E-02)	(3.016E-02, 5.325E-02)
9	(-2.924E-02,-7.762E-03)	(-2.924E-02, 7.762E-03)	(-1.016E-02, 1.826E-02)	(-1.016E-02,-1.826E-02)
10	(-8.692E-02,-4.488E-02)	(-8.692E-02, 4.488E-02)	(-3.344E-02, 5.948E-02)	(-3.344E-02,-5.948E-02)
11	(-3.525E-05,-1.258E-05)	(-3.525E-05, 1.258E-05)	(-1.302E-05, 2.328E-05)	(-1.302E-05,-2.328E-05)
12	(-2.019E-01, 9.066E-02)	(-2.019E-01,-9.066E-02)	(3.347E-03, 1.676E-03)	(3.347E-03,-1.676E-03)
13	(4.873E-02,-5.045E-02)	(4.873E-02, 5.045E-02)	(147E-03,-5.636E-04)	(-1.147E-03, 5.636E-04)

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14 ( 1.890E-01,-1.254E-01) ( 1.890E-01, 1.254E-01) (-3.738E-03,-1.857E-03) (-3.738E-03, 1.857E-03)
15 ( 6.528E-05,-5.718E-05) ( 6.528E-05, 5.718E-05) (-1.463E-06,-7.226E-07) (-1.463E-06, 7.226E-07)

                          13                          14                          15
 1 ( 2.584E-01, 0.       ) ( 0.       , 0.       ) ( 0.       , 0.       )
 2 ( 0.       , 0.       ) ( 0.       , 0.       ) ( 8.687E-01, 0.       )
 3 ( 0.       , 0.       ) ( 3.959E-01, 0.       ) (-1.960E-01, 0.       )
 4 (-7.826E-02, 0.       ) ( 2.283E-03, 0.       ) (-9.260E-04, 0.       )
 5 ( 5.271E-01, 0.       ) ( 3.896E-01, 0.       ) (-1.944E-01, 0.       )
 6 (-7.143E-04, 0.       ) (-1.405E-04, 0.       ) ( 7.226E-05, 0.       )
 7 (-7.907E-02, 0.       ) (-4.101E-02, 0.       ) ( 2.069E-02, 0.       )
 8 ( 1.162E-01, 0.       ) ( 5.870E-02, 0.       ) (-2.938E-02, 0.       )
 9 ( 1.339E-02, 0.       ) (-3.242E-02, 0.       ) ( 1.606E-02, 0.       )
10 (-2.162E-02, 0.       ) (-5.535E-02, 0.       ) ( 2.766E-02, 0.       )
11 ( 7.786E-06, 0.       ) (-3.474E-05, 0.       ) ( 1.723E-05, 0.       )
12 (-7.747E-01, 0.       ) (-5.576E-01, 0.       ) ( 2.762E-01, 0.       )
13 (-8.926E-02, 0.       ) ( 3.080E-01, 0.       ) (-1.510E-01, 0.       )
14 ( 1.442E-01, 0.       ) ( 5.258E-01, 0.       ) (-2.602E-01, 0.       )
15 (-5.191E-05, 0.       ) ( 3.300E-04, 0.       ) (-1.620E-04, 0.       )
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THE CON VECTOR (15 BY 1)

	1
1	(-3.302E-02,-7.740E-02)
2	(-3.302E-02, 7.740E-02)
3	(1.193E-04, 7.478E-05)
4	(1.193E-04,-7.478E-05)
5	(9.414E-01,-1.220E+00)
6	(9.414E-01, 1.220E+00)
7	(-2.114E+00,-1.453E+00)
8	(-2.114E+00, 1.453E+00)
9	(6.603E-01, 8.241E-01)
10	(6.603E-01,-8.241E-01)
11	(-1.206E-01, 5.459E-02)
12	(-1.206E-01,-5.459E-02)
13	(3.870E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(8.415E-02,-1.131E+02)
2	(8.415E-02, 1.131E+02)
3	(1.408E-04, 3.208E+01)
4	(1.408E-04,-3.208E+01)
5	(1.541E+00,-5.234E+01)
6	(1.541E+00, 5.234E+01)
7	(2.565E+00,-1.455E+02)
8	(2.565E+00, 1.455E+02)
9	(1.056E+00, 5.130E+01)
10	(1.056E+00,-5.130E+01)
11	(1.324E-01, 1.557E+02)
12	(1.324E-01,-1.557E+02)
13	(3.870E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(-1.033E-03, 5.539E-03)
2	(-1.033E-03,-5.539E-03)
3	(2.973E-06, 7.948E-06)
4	(2.973E-06,-7.948E-06)
5	(1.749E-03,-4.265E-03)
6	(1.749E-03, 4.265E-03)
7	(-7.574E-04,-6.623E-03)
8	(-7.574E-04, 6.623E-03)
9	(1.319E-04, 1.120E-03)
10	(1.319E-04,-1.120E-03)
11	(-1.116E-05,-1.566E-05)
12	(-1.116E-05, 1.566E-05)
13	(0. , 0.)
14	(5.841E-01, 0.)
15	(1.151E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(5.635E-03, 1.006E+02)
2	(5.635E-03,-1.006E+02)
3	(8.486E-06, 6.949E+01)
4	(8.486E-06,-6.949E+01)
5	(4.610E-03,-6.770E+01)
6	(4.610E-03, 6.770E+01)
7	(6.666E-03 -9.652E+01)
8	(6.666E-03, 9.652E+01)
9	(1.128E-03, 8.328E+01)
10	(1.128E-03,-8.328E+01)
11	(1.923E-05,-1.255E+02)
12	(1.923E-05, 1.255E+02)
13	(0. , 0.)
14	(5.841E-01, 0.)
15	(1.151E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-3.865E-03, 1.334E-02)	(-3.865E-03,-1.334E-02)	(2.747E-05, 6.307E-05)	(2.747E-05,-6.307E-05)
2	(2.927E-03, 8.186E-04)	(2.927E-03,-8.186E-04)	(-7.826E-05,-9.415E-06)	(-7.826E-05, 9.415E-06)
3	(-3.120E-02, 6.071E-02)	(-3.120E-02,-6.071E-02)	(2.233E-04,-1.721E-03)	(2.233E-04, 1.721E-03)
4	(-4.351E-03,-3.920E-03)	(-4.351E-03, 3.920E-03)	(-2.348E-04, 2.200E-06)	(-2.348E-04,-2.200E-06)
5	(-2.334E-05, 3.990E-02)	(-2.334E-05,-3.990E-02)	(-4.166E-02, 1.237E-02)	(-4.166E-02,-1.237E-02)
6	(-8.778E-01,-1.803E-01)	(-8.778E-01, 1.803E-01)	(-2.638E-01,-9.198E-01)	(-2.638E-01, 9.198E-01)
7	(-3.664E+00, 2.532E+00)	(-3.664E+00,-2.532E+00)	(-2.135E+00, 7.024E-01)	(-2.135E+00,-7.024E-01)

	5	6	7	8
1	(-1.091E-02,-2.114E-02)	(-1.091E-02, 2.114E-02)	(9.249E-03,-4.260E-02)	(9.249E-03, 4.260E-02)
2	(-3.235E-03, 2.476E-03)	(-3.235E-03,-2.476E-03)	(-7.666E-03,-1.286E-03)	(-7.666E-03, 1.286E-03)
3	(-2.517E-02,-3.166E-02)	(-2.517E-02, 3.166E-02)	(2.207E-02,-7.647E-02)	(2.207E-02, 7.647E-02)
4	(9.016E-04, 1.156E-03)	(9.016E-04,-1.156E-03)	(-6.346E-04, 2.778E-03)	(-6.346E-04,-2.778E-03)
5	(1.187E-01, 5.256E-02)	(1.187E-01,-5.256E-02)	(-5.879E-02,-7.531E-02)	(-5.879E-02, 7.531E-02)
6	(-4.999E-01, 1.187E+00)	(-4.999E-01,-1.187E+00)	(8.350E-01,-5.096E-01)	(8.350E-01, 5.096E-01)
7	(3.465E+00, 1.723E+00)	(3.465E+00,-1.723E+00)	(-1.737E+00,-2.247E+00)	(-1.737E+00, 2.247E+00)

	9	10	11	12
1	(3.488E+00, 7.874E+00)	(3.488E+00,-7.874E+00)	(-2.164E+02, 3.754E+02)	(-2.164E+02,-3.754E+02)
2	(3.385E-01,-3.172E-02)	(3.385E-01, 3.172E-02)	(8.021E-01, 2.605E-01)	(8.021E-01,-2.605E-01)
3	(-3.180E-01, 7.214E-01)	(-3.180E-01,-7.214E-01)	(-1.340E-02, 4.981E-02)	(-1.340E-02,-4.981E-02)
4	(-1.728E-02,-1.378E-01)	(-1.728E-02, 1.378E-01)	(6.744E-01, 4.895E-01)	(6.744E-01,-4.895E-01)
5	(3.782E-01,-3.610E-02)	(3.782E-01, 3.610E-02)	(8.155E-01, 2.360E-01)	(8.155E-01,-2.360E-01)
6	(-3.539E-01, 8.066E-01)	(-3.539E-01,-8.066E-01)	(-1.186E-02, 5.056E-02)	(-1.186E-02,-5.056E-02)
7	(5.679E+00, 6.168E-01)	(6.679E+00,-6.168E-01)	(-8.261E-01, 1.259E+00)	(-8.261E-01,-1.259E+00)

	13	14	15
1	(-6.779E-01, 0.)	(-1.333E-01, 0.)	(6.858E-02, 0.)
2	(-7.907E-02, 0.)	(-4.101E-02, 0.)	(2.069E-02, 0.)
3	5.271E-01, 0.)	(3.896E-01, 0.)	(-1.944E-01, 0.)
4	-8.042E-04, 0.)	(-4.329E-02, 0.)	(2.161E-02, 0.)
5	(-1.870E-01, 0.)	(-1.189E-02, 0.)	(5.311E-03, 0.)
6	1.247E+00, 0.)	(1.130E-01, 0.)	(-5.932E-02, 0.)
7	(-4.576E+00, 0.)	(5.103E+00, 0.)	(-2.527E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.389E-02, 1.062E+02)	(1.389E-02,-1.062E+02)	(6.879E-05, 6.647E+01)	(6.879E-05,-6.647E+01)
2	(3.039E-03, 1.562E+01)	(3.039E-03,-1.562E+01)	(7.882E-05,-1.731E+02)	(7.882E-05, 1.731E+02)
3	(6.826E-02, 1.172E+02)	(6.826E-02,-1.172E+02)	(1.736E-03,-8.261E+01)	(1.736E-03, 8.261E+01)
4	(5.856E-03,-1.380E+02)	(5.856E-03, 1.380E+02)	(2.348E-04, 1.795E+02)	(2.348E-04,-1.795E+02)
5	(3.990E-02, 9.003E+01)	(3.990E-02,-9.003E+01)	(4.346E-02, 1.635E+02)	(4.346E-02,-1.635E+02)
6	(8.961E-01,-1.684E+02)	(8.961E-01, 1.684E+02)	(9.569E-01,-1.060E+02)	(9.569E-01, 1.060E+02)
7	(4.454E+00, 1.454E+02)	(4.454E+00,-1.454E+02)	(2.248E+00, 1.618E+02)	(2.248E+00,-1.618E+02)

	5	6	7	8
1	(2.379E-02,-1.173E+02)	(2.379E-02, 1.173E+02)	(4.359E-02,-7.775E+01)	(4.359E-02, 7.775E+01)
2	(4.074E-03, 1.426E+02)	(4.074E-03,-1.426E+02)	(7.773E-03,-1.705E+02)	(7.773E-03, 1.705E+02)
3	(4.044E-02,-1.285E+02)	(4.044E-02, 1.285E+02)	(7.959E-02,-7.390E+01)	(7.959E-02, 7.390E+01)
4	(1.466E-03, 5.206E+01)	(1.466E-03,-5.206E+01)	(2.849E-03, 1.029E+02)	(2.849E-03,-1.029E+02)
5	(1.298E-01, 2.389E+01)	(1.298E-01,-2.389E+01)	(9.554E-02,-1.280E+02)	(9.554E-02, 1.280E+02)
6	(1.288E+00, 1.128E+02)	(1.288E+00,-1.128E+02)	(9.782E-01,-3.139E+01)	(9.782E-01, 3.139E+01)
7	(3.870E+00, 2.644E+01)	(3.870E+00,-2.644E+01)	(2.840E+00,-1.277E+02)	(2.840E+00, 1.277E+02)

	9	10	11	12
1	(8.612E+00, 6.611E+01)	(8.612E+00,-6.611E+01)	(4.333E+02, 1.200E+02)	(4.333E+02,-1.200E+02)
2	(3.400E-01,-5.353E+00)	(3.400E-01, 5.353E+00)	(8.433E-01, 1.799E+01)	(8.433E-01,-1.799E+01)
3	(7.884E-01, 1.138E+02)	(7.884E-01,-1.138E+02)	(5.159E-02, 1.051E+02)	(5.159E-02,-1.051E+02)
4	(1.389E-01,-9.715E+01)	(1.389E-01, 9.715E+01)	(8.333E-01, 3.598E+01)	(8.333E-01,-3.598E+01)
5	(3.799E-01,-5.452E+00)	(3.799E-01, 5.452E+00)	(8.490E-01, 1.614E+01)	(8.490E-01,-1.614E+01)
6	(8.808E-01, 1.137E+02)	(8.808E-01,-1.137E+02)	(5.193E-02, 1.032E+02)	(5.193E-02,-1.032E+02)
7	(6.708E+00, 5.276E+00)	(6.708E+00,-5.276E+00)	(1.506E+00, 1.233E+02)	(1.506E+00,-1.233E+02)

	13	14	15
1	(6.779E-01, 1.800E+02)	(1.333E-01, 1.800E+02)	(6.858E-02, 0.)
2	(7.907E-02, 1.800E+02)	(4.101E-02, 1.800E+02)	(2.069E-02, 0.)
3	(5.271E-01, 0.)	(3.896E-01, 0.)	(1.944E-01, 1.800E+02)
4	(8.042E-04, 1.800E+02)	(4.329E-02, 1.800E+02)	(2.161E-02, 0.)
5	(1.870E-01, 1.800E+02)	(1.189E-02, 1.800E+02)	(6.311E-03, 0.)
6	(1.247E+00, 0.)	(1.130E-01, 0.)	(5.932E-02, 1.800E+02)
7	(4.576E+00, 1.800E+02)	(5.103E+00, 0.)	(2.527E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.160E-03,-1.413E-04)	(-3.329E-05,-2.536E-04)	(5.729E-03, 4.103E-04)	(-1.597E-04, 4.662E-04)
2	(1.160E-03, 1.413E-04)	(-3.329E-05, 2.536E-04)	(5.729E-03,-4.103E-04)	(-1.597E-04,-4.662E-04)
3	(-1.440E-09, 9.578E-09)	(-8.631E-09,-6.975E-09)	(1.553E-07,-1.886E-07)	(-2.817E-08,-1.730E-08)
4	(-1.440E-09,-9.578E-09)	(-8.631E-09, 6.975E-09)	(1.553E-07, 1.886E-07)	(-2.817E-08, 1.730E-08)
5	(-3.606E-02,-6.591E-03)	(-2.527E-05, 6.276E-03)	(-6.230E-02, 8.967E-04)	(2.259E-03,-1.098E-05)
6	(-3.606E-02, 6.591E-03)	(-2.527E-05,-6.276E-03)	(-6.230E-02,-8.967E-04)	(2.259E-03, 1.098E-05)
7	(-8.146E-02, 7.660E-02)	(1.434E-02, 1.386E-02)	(-1.578E-01, 1.296E-01)	(5.378E-03,-4.949E-03)
8	(-8.146E-02,-7.660E-02)	(1.434E-02,-1.386E-02)	(-1.578E-01,-1.296E-01)	(5.378E-03, 4.949E-03)
9	(-4.186E+00, 8.074E+00)	(2.497E-01, 2.580E-01)	(-8.044E-01, 2.143E-01)	(1.022E-01,-1.052E-01)
10	(-4.186E+00,-8.074E+00)	(2.497E-01,-2.580E-01)	(-8.044E-01,-2.143E-01)	(1.022E-01, 1.052E-01)
11	(5.614E+00,-5.710E+01)	(-1.110E-01, 1.236E-02)	(-1.102E-03,-6.741E-03)	(-1.081E-01,-2.225E-02)
12	(5.614E+00, 5.710E+01)	(-1.110E-01,-1.236E-02)	(-1.102E-03, 6.741E-03)	(-1.081E-01, 2.225E-02)
13	(-2.623E+00, 0.)	(-3.060E-01, 0.)	(2.040E+00, 0.)	(-3.112E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.089E-03,-1.316E-03)	(1.503E-02,-7.390E-02)	(3.170E-01, 2.000E-01)
2	(3.089E-03, 1.316E-03)	(1.503E-02,-7.390E-02)	(3.170E-01,-2.000E-01)
3	(-5.894E-06,-1.640E-06)	(3.731E-05,-1.295E-04)	(-3.072E-04,-7.587E-05)
4	(-5.894E-06, 1.640E-06)	(3.731E-05, 1.295E-04)	(-3.072E-04, 7.587E-05)
5	(1.758E-01,-9.525E-02)	(9.775E-01, 1.728E+00)	(5.364E+00,-2.604E+00)
6	(1.758E-01, 9.525E-02)	(9.775E-01,-1.728E+00)	(5.364E+00, 2.604E+00)
7	(1.482E-02, 2.446E-01)	(-2.506E+00,-1.364E-01)	(4.045E-01, 7.274E+00)
8	(1.482E-02,-2.446E-01)	(-2.506E+00, 1.364E-01)	(4.045E-01,-7.274E+00)
9	(2.795E-01, 2.878E-01)	(-8.984E-01, 2.410E-01)	(3.902E+00, 5.912E+00)
10	(2.795E-01,-2.878E-01)	(-8.984E-01,-2.410E-01)	(3.902E+00,-5.912E+00)
11	(-1.113E-01, 1.605E-02)	(-1.329E-03,-6.747E-03)	(3.092E-02,-1.970E-01)
12	(-1.113E-01,-1.605E-02)	(-1.329E-03, 6.747E-03)	(3.092E-02, 1.970E-01)
13	(-7.238E-01, 0.)	(4.825E+00, 0.)	(-1.771E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.169E-03,-6.945E+00)	(2.558E-04,-9.748E+01)	(5.744E-03, 4.096E+00)	(4.928E-04, 1.089E+02)
2	(1.169E-03, 6.945E+00)	(2.558E-04, 9.748E+01)	(5.744E-03,-4.096E+00)	(4.928E-04,-1.089E+02)
3	(9.685E-09, 9.855E+01)	(1.110E-08,-1.411E+02)	(2.444E-07,-5.053E+01)	(3.306E-08,-1.485E+02)
4	(9.685E-09,-9.855E+01)	(1.110E-08, 1.411E+02)	(2.444E-07, 5.053E+01)	(3.306E-08, 1.485E+02)
5	(3.666E-02,-1.696E+02)	(6.277E-03, 9.023E+01)	(6.231E-02, 1.792E+02)	(2.259E-03,-2.783E-01)
6	(3.666E-02, 1.696E+02)	(6.277E-03,-9.023E+01)	(6.231E-02,-1.792E+02)	(2.259E-03, 2.783E-01)
7	(1.118E-01, 1.368E+02)	(1.994E-02, 4.403E+01)	(2.042E-01, 1.406E+02)	(7.309E-03,-4.262E+01)
8	(1.118E-01,-1.368E+02)	(1.994E-02,-4.403E+01)	(2.042E-01,-1.406E+02)	(7.309E-03, 4.262E+01)
9	(9.095E+00, 1.174E+02)	(3.591E-01, 4.594E+01)	(8.325E-01, 1.651E+02)	(1.467E-01,-4.585E+01)
10	(9.095E+00,-1.174E+02)	(3.591E-01,-4.594E+01)	(8.325E-01,-1.651E+02)	(1.467E-01, 4.585E+01)
11	(5.738E+01,-8.438E+01)	(1.117E-01, 1.736E+02)	(6.831E-03,-9.925E+01)	(1.103E-01,-1.684E+02)
12	(5.738E+01, 8.436E+01)	(1.117E-01,-1.736E+02)	(6.831E-03, 9.925E 01)	(1.103E-01, 1.684E+02)
13	(2.623E+00, 1.800E+02)	(3.060E-01, 1.800E+02)	(2.040E+00, 0.)	(3.112E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.358E-03,-2.307E+01)	(7.541E-02, 7.851E+01)	(3.748E-01, 3.226E+01)
2	(3.358E-03, 2.307E+01)	(7.541E-02,-7.851E+01)	(3.748E-01,-3.226E+01)
3	(6.118E-06,-1.645E+02)	(1.347E-04,-7.392E+01)	(3.165E-04,-1.661E+02)
4	(6.118E-06, 1.645E+02)	(1.347E-04, 7.392E+01)	(3.165E-04, 1.661E+02)
5	(2.000E-01,-2.845E+01)	(1.985E+00, 6.050E+01)	(5.963E+00,-2.590E+01)
6	(2.000E-01, 2.845E+01)	(1.985E+00,-6.050E+01)	(5.963E+00, 2.590E+01)
7	(2.451E-01, 8.653E+01)	(2.509E+00,-1.769E+02)	(7.286E+00, 8.682E+01)
8	(2.451E-01,-8.653E+01)	(2.509E+00, 1.769E+02)	(7.286E+00,-8.682E+01)
9	(4.012E-01, 4.584E+01)	(9.301E-01, 1.650E+02)	(7.083E+00, 5.657E+01)
10	(4.012E-01,-4.584E+01)	(9.301E-01,-1.650E+02)	(7.083E+00,-5.657E+01)
11	(1.124E-01, 1.718E+02)	(6.877E-03,-1.011E+02)	(1.994E-01,-8.108E+01)
12	(1.124E-01,-1.718E+02)	(6.877E-03, 1.011E+02)	(1.994E-01, 8.108E+01)
13	(7.238E-01, 1.800E+02)	(4.825E+00, 0.)	(1.771E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-6.990E-05,-3.520E-05)	(-7.559E-06, 1.537E-05)	(-3.040E-04,-2.355E-04)	(2.621E-05,-2.005E-05)
2	(-6.990E-05, 3.520E-05)	(-7.559E-06,-1.537E-05)	(-3.040E-04, 2.355E-04)	(2.621E-05, 2.005E-05)
3	(-4.196E-10, 4.056E-10)	(-1.578E-10,-6.500E-10)	(1.434E-08,-3.342E-09)	(-7.155E-10,-1.860E-09)
4	(-4.196E-10,-4.058E-10)	(-1.578E-10, 6.500E-10)	(1.434E-08, 3.342E-09)	(-7.155E-10, 1.860E-09)
5	(-1.093E-04, 9.566E-06)	(4.902E-06, 1.813E-05)	(-1.790E-04, 5.197E-05)	(6.510E-06,-1.822E-06)
6	(-1.093E-04,-9.566E-06)	(4.902E-06,-1.813E-05)	(-1.790E-04,-5.197E-05)	(6.510E-06, 1.822E-06)
7	(-2.891E-04,-2.899E-05)	(-2.709E-06, 5.174E-05)	(-5.231E-04,-8.827E-05)	(1.888E-05, 2.099E-06)
8	(-2.891E-04, 2.899E-05)	(-2.709E-06,-5.174E-05)	(-5.231E-04, 8.827E-05)	(1.888E-05,-2.099E-06)
9	(-8.356E-03, 4.944E-03)	(8.018E-05, 3.749E-04)	(-8.498E-04,-2.609E-04)	(1.520E-04,-3.753E-05)
10	(-8.356E-03,-4.944E-03)	(8.018E-05,-3.749E-04)	(-8.498E-04, 2.609E-04)	(1.520E-04, 3.753E-05)
11	(8.294E-03,-8.023E-04)	(-4.875E-06,-1.547E-05)	(9.296E-07,-3.462E-07)	(1.370E-07,-1.602E-05)
12	(8.294E-03, 8.023E-04)	(-4.875E-06, 1.547E-05)	(9.296E-07, 3.462E-07)	(1.370E-07, 1.602E-05)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-7.788E-02, 0.)	(-2.395E-02, 0.)	(2.275E-01, 0.)	(-2.529E-02, 0.)
15	(7.894E-02, 0.)	(2.381E-02, 0.)	(-2.238E-01, 0.)	(2.488E-02, 0.)

	5	6	7
1	(-2.210E-04,-4.136E-05)	(1.906E-03,-4.676E-03)	(-1.024E-02,-2.291E-02)
2	(-2.210E-04, 4.136E-05)	(1.906E-03, 4.676E-03)	(-1.024E-02, 2.291E-02)
3	(-2.221E-07,-2.943E-07)	(6.527E-06,-4.831E-06)	(-1.193E-05,-1.488E-05)
4	(-2.221E-07, 2.943E-07)	(6.527E-06, 4.831E-06)	(-1.193E-05, 1.488E-05)
5	(4.317E-04,-4.142E-04)	(4.190E-03, 4.209E-03)	(1.341E-02,-1.177E-02)
6	(4.317E-04, 4.142E-04)	(4.190E-03,-4.209E-03)	(1.341E-02, 1.177E-02)
7	(-4.542E-04, 4.464E-04)	(-4.007E-03,-5.144E-03)	(-1.357E-02, 1.320E-02)
8	(-4.542E-04,-4.464E-04)	(-4.007E-03, 5.144E-03)	(-1.357E-02,-1.320E-02)
9	(9.031E-05, 4.187E-04)	(-9.499E-04,-2.899E-04)	(1.904E-04, 7.561E-03)
10	(9.031E-05,-4.187E-04)	(-9.499E-04, 2.899E-04)	(1.904E-04,-7.561E-03)
11	(-5.410E-06,-1.540E-05)	(9.241E-07,-3.786E-07)	(2.894E-05,-1.122E-06)
12	(-5.410E-06, 1.540E-05)	(9.241E-07, 3.786E-07)	(2.894E-05, 1.122E-06)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-6.947E-03, 0.)	(6.600E-02, 0.)	(2.981E+00, 0.)
15	(7.265E-03, 0.)	(-6.829E-02, 0.)	(-2.909E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.827E-05,-1.533E+02)	(1.713E-05, 1.162E+02)	(3.846E-04,-1.422E+02)	(3.300E-05,-3.742E+01)
2	(7.827E-05, 1.533E+02)	(1.713E-05,-1.162E+02)	(3.846E-04, 1.422E+02)	(3.300E-05, 3.742E+01)
3	(5.838E-10, 1.360E+02)	(6.689E-10,-1.036E+02)	(1.473E-08,-1.312E+01)	(1.993E-09,-1.110E+02)
4	(5.838E-10,-1.360E+02)	(6.689E-10, 1.036E+02)	(1.473E-08, 1.312E+01)	(1.993E-09, 1.110E+02)
5	(1.097E-04, 1.750E+02)	(1.878E-05, 7.487E+01)	(1.864E-04, 1.638E+02)	(6.760E-06,-1.564E+01)
6	(1.097E-04,-1.750E+02)	(1.878E-05,-7.487E+01)	(1.864E-04,-1.638E+02)	(6.760E-06, 1.564E+01)
7	(2.906E-04,-1.743E+02)	(5.182E-05, 9.300E+01)	(5.305E-04,-1.704E+02)	(1.899E-05, 6.345E+00)
8	(2.906E-04, 1.743E+02)	(5.182E-05,-9.300E+01)	(5.305E-04, 1.704E+02)	(1.899E-05,-6.345E+00)
9	(9.711E-03, 1.494E+02)	(3.834E-04, 7.793E+01)	(8.889E-04,-1.629E+02)	(1.566E-04,-1.387E+01)
10	(9.711E-03,-1.494E+02)	(3.834E-04,-7.793E+01)	(8.889E-04, 1.629E+02)	(1.566E-04, 1.387E+01)
11	(8.333E-03,-5.525E+00)	(1.622E-05,-1.075E+02)	(9.920E-07,-2.043E+01)	(1.602E-05,-8.951E+01)
12	(8.333E-03, 5.525E+00)	(1.622E-05, 1.075E+02)	(9.920E-07, 2.043E+01)	(1.602E-05, 8.951E+01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(7.788E-02, 1.800E+02)	(2.395E-02, 1.800E+02)	(2.275E-01, 0.)	(2.529E-02, 1.800E+02)
15	(7.894E-02, 0.)	(2.381E-02, 0.)	(2.238E-01, 1.800E+02)	(2.488E-02, 0.)

	5	6	7
1	(2.248E-04,-1.694E+02)	(5.049E-03,-6.783E+01)	(2.510E-02,-1.141E+02)
2	(2.248E-04, 1.694E+02)	(5.049E-03, 6.783E+01)	(2.510E-02, 1.141E+02)
3	(3.687E-07,-1.270E+02)	(8.120E-06,-3.651E+01)	(1.907E-05,-1.287E+02)
4	(3.687E-07, 1.270E+02)	(8.120E-06, 3.651E+01)	(1.907E-05, 1.287E+02)
5	(5.983E-04,-4.381E+01)	(5.939E-03, 4.514E+01)	(1.784E-02,-4.126E+01)
6	(5.983E-04, 4.381E+01)	(5.939E-03,-4.514E+01)	(1.784E-02, 4.126E+01)
7	(6.369E-04, 1.355E+02)	(6.521E-03,-1.279E+02)	(1.893E-02, 1.358E+02)
8	(6.369E-04,-1.355E+02)	(6.521E-03, 1.279E+02)	(1.893E-02,-1.358E+02)
9	(4.284E-04, 7.783E+01)	(9.931E-04,-1.630E+02)	(7.563E-03, 8.856E+01)
10	(4.284E-04,-7.783E+01)	(9.931E-04, 1.630E+02)	(7.563E-03,-8.856E+01)
11	(1.633E-05,-1.094E+02)	(9.987E-07,-2.228E+01)	(2.896E-05,-2.219E+00)
12	(1.633E-05, 1.094E+02)	(9.987E-07, 2.228E+01)	(2.895E-05, 2.219E+00)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(6.947E-03, 1.800E+02)	(6.600E-02, 0.)	(2.981E+00, 0.)
15	(7.265E-03, 0.)	(6.829E-02, 1.800E+02)	(2.909E+00, 1.800E+02)

CONFIGURATION 2

THE AV MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.340E-04	0.	-8.940E-03	9.525E-02
2	-7.059E+00	-2.018E+00	-2.290E-03	0.	-1.842E-01	-1.248E-01
3	-2.500E+01	0.	-2.500E-02	-3.220E+01	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	-7.383E+02	-1.333E+02	-1.435E-03	0.	-1.068E+02	-1.568E+01
10	1.300E+03	1.633E+01	0.	0.	1.407E+01	-5.061E+02
11	7.577E+02	5.595E+01	-3.900E-03	0.	6.990E+00	3.458E+01
12	1.688E+00	3.990E-02	0.	0.	1.623E-02	-9.700E-02

	7	8	9	10	11	12
1	4.618E-03	-4.346E-03	-2.130E-04	2.590E-03	1.526E-04	-4.998E-06
2	2.072E-01	-9.171E-02	-7.438E-03	4.972E-02	6.963E-03	-2.004E-03
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.540E+01	2.088E+01	-1.023E+00	-2.770E-01	9.159E-01	-1.977E-01
10	6.593E+00	1.124E+01	2.351E-01	-8.596E+00	1.131E-01	1.120E-01
11	-9.385E+01	3.457E+00	-1.219E-01	3.784E+00	-3.721E-01	-2.535E-01
12	7.112E-03	-4.849E+02	-3.290E-04	2.427E-03	-2.764E-04	-4.080E-01

THE AG MATRIX (2 BY 2)

	1	2
1	-9.400E+00	0.
2	-2.256E-02	-9.500E+00

THE B VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	-2.230E+03
10	-2.152E+02
11	6.136E+02
12	1.079E-01

THE C MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	1.000E+00	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	2.640E-02	3.300E-02
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.423E-02	0.	8.449E-01	3.214E+00

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	3.456E-02	3.636E-02	0.	0.	0.	0.
6	0.	0.	2.640E-02	3.300E-02	3.456E-02	3.636E-02
7	8.823E-01	1.672E+00	4.788E-04	1.103E-01	-3.841E-05	1.441E-04

THE D MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	-7.371E+02
10	0.	1.298E+03
11	0.	7.564E+02
12	0.	1.697E+00

THE E VECTOR (7 BY 1)

	1
1	0.
2	0.
3	0.
4	0.
5	0.
	0.
	2.327E+00

THE F MATRIX (7 BY 2)

	1	2
1	0.	0.
2	0.	0.
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	9.243E+00

THE GG VECTOR (15 BY 1)

	1
1	0.
2	1.000E+00
3	5.621E-03
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

AP = -6.667E+00

THE GP VECTOR (15 BY 1)

	1
1	1.000E+00
2	0.
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	0.
10	0.
11	0.
12	0.
13	0.
14	0.
15	0.

THE AV-SCALED MATRIX (12 BY 12)

	1	2	3	4	5	6
1	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01	-2.886E+00
2	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00	3.782E+00
3	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.	0.
4	0.	1.000E+00	0.	0.	0.	0.
5	0.	0.	0.	0.	0.	0.
6	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	0.	0.	0.
9	1.949E+01	3.519E+00	3.595E-02	0.	-1.068E+02	-1.254E+01
10	-4.290E+01	-5.389E-01	0.	0.	1.759E+01	-5.061E+02
11	-2.619E+01	-1.934E+00	1.279E-01	0.	9.151E+00	3.621E+01
12	-6.136E-02	-1.451E-03	0.	0.	2.235E-02	-1.069E-01

	7	8	9	10	11	12
1	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
2	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	0.	0.	1.000E+00	0.	0.	0.
6	0.	0.	0.	1.000E+00	0.	0.
7	0.	0.	0.	0.	1.000E+00	0.
8	0.	0.	0.	0.	0.	1.000E+00
9	-1.176E+01	1.516E+01	-1.023E+00	-2.216E-01	6.996E-01	-1.435E-01
10	6.295E+00	1.020E+01	2.939E-01	-8.596E+00	1.080E-01	1.017E-01
11	-9.385E+01	3.288E+00	-1.596E-01	3.963E+00	-3.721E-01	-2.410E-01
12	7.482E-03	-4.849E+02	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE B-SCALED VECTOR (12 BY 1)

	1
1	-2.884E-01
2	-1.503E+01
3	0.
4	0.
5	0.
6	0.
7	0.
8	0.
9	5.886E+01
10	7.103E+00
11	-2.120E+01
12	-3.921E-03

THE C-SCALED MATRIX (7 BY 12)

	1	2	3	4	5	6
1	0.	0.	9.490E+02	0.	0.	0.
2	0.	0.	0.	1.000E+00	0.	0.
3	0.	1.000E+00	0.	0.	0.	0.
4	-1.000E+00	0.	0.	1.000E+00	0.	0.
5	0.	0.	0.	1.000E+00	-1.000E+00	-1.000E+00
6	0.	1.000E+00	0.	0.	0.	0.
7	9.322E+00	-1.395E+00	1.350E+01	0.	-3.200E+01	-9.740E+01

	7	8	9	10	11	12
1	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.	0.
5	-1.000E+00	-1.000E+00	0.	0.	0.	0.
6	0.	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-2.553E+01	-4.599E+01	-1.814E-02	-3.342E+00	1.111E-03	-3.954E-03

THE D-SCALED MATRIX (12 BY 2)

	1	2
1	0.	-1.204E+00
2	0.	-7.049E+00
3	0.	0.
4	0.	0.
5	0.	0.
6	0.	0.
7	0.	0.
8	0.	0.
9	0.	1.946E+01
10	0.	-4.283E+01
11	0.	-2.614E+01
12	0.	-6.170E-02

THE AA MATRIX (15 BY 15)

	1	2	3	4	5	6	7	8
1	-6.667E+00	0.	0.	0.	0.	0.	0.	0.
2	0.	-9.400E+00	0.	0.	0.	0.	0.	0.
3	0.	-2.256E-02	-9.500E+00	0.	0.	0.	0.	0.
4	-2.884E-01	0.	-1.204E+00	-1.208E+00	9.440E-01	-6.017E-01	0.	3.386E-01
5	-1.503E+01	0.	-7.049E+00	-7.059E+00	-2.018E+00	-2.173E+00	0.	6.977E+00
6	0.	0.	0.	-2.634E-02	0.	-2.500E-02	-3.393E-02	0.
7	0.	0.	0.	0.	1.000E+00	0.	0.	0.
8	0.	0.	0.	0.	0.	0.	0.	0.
9	0.	0.	0.	0.	0.	0.	0.	0.
10	0.	0.	0.	0.	0.	0.	0.	0.
11	0.	0.	0.	0.	0.	0.	0.	0.
12	5.886E+01	0.	1.946E+01	1.949E+01	3.519E+00	3.595E-02	0.	-1.068E+02
13	7.103E+00	0.	-4.283E+01	-4.290E+01	-5.389E-01	0.	0.	1.759E+01
14	-2.120E+01	0.	-2.614E+01	-2.619E+01	-1.934E+00	1.2[illegible]E-01	0.	9.151E+00
15	-3.921E-03	0.	-6.170E-02	-6.138E-02	-1.451E-03	0.	0.	2.235E-02

	9	10	11	12	13	14	15
1	0.	0.	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.	0.	0.
4	-2.886E+00	-1.336E-01	1.195E-01	8.068E-03	-7.848E-02	-4.416E-03	1.375E-04
5	3.782E+00	-5.995E+00	2.522E+00	2.817E-01	-1.507E+00	-2.015E-01	5.512E-02
6	0.	0.	0.	0.	0.	0.	0.
7	0.	0.	0.	0.	0.	0.	0.
8	0.	0.	0.	1.000E+00	0.	0.	0.
9	0.	0.	0.	0.	1.000E+00	0.	0.
10	0.	0.	0.	0.	0.	1.000E+00	0.
11	0.	0.	0.	0.	0.	0.	1.000E+00
12	-1.254E+01	-1.176E+01	1.516E+01	-1.023E+00	-2.216E-01	6.996E-01	-1.435E-01
13	-5.061E+02	6.295E+00	1.020E+01	2.939E-01	-8.556E+00	1.080E-01	1.017E-01
14	3.621E+01	-9.385E+01	3.286E+00	-1.596E-01	3.963E+00	-3.721E-01	-2.410E-01
15	-1.069E-01	7.482E-03	-4.849E+[illegible]2	-4.531E-04	2.674E-03	-2.908E-04	-4.080E-01

THE CC .ATRIX (7 BY 15)

	1	2	3	4	5
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	1.000E+00
3	0.	0.	0.	-1.000E+00	0.
4	0.	0.	0.	0.	0.
5	0.	0.	0.	0.	1.000E+00
6	0.	0.	0.		
7	2.327E+00	0.	9.243E+00	9.322E+00	-1.395E+00

	6	7	8	9	10
1	9.490E+02	0.	0.	0.	0.
2	0.	1.000E+00	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	1.000E+00	0.	0.	0.
5	0.	1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
6	0.	0.	0.	0.	0.
7	1.350E+01	0.	-3.200E+01	-9.740E+01	-2.553E+01

	11	12	13	14	15
1	0.	0.	0.	0.	0.
2	0.	0.	0.	0.	0.
3	0.	0.	0.	0.	0.
4	0.	0.	0.	0.	0.
5	-1.000E+00	0.	0.		
6	0.	-1.000E+00	-1.000E+00	-1.000E+00	-1.000E+00
7	-4.599E+01	-1.814E-02	-3.342E+00	1.111E-03	-3.964E-03

SPECTRAL DECOMPOSITION OF A-AUG

	REAL PART	IMAGINARY PART	FREQUENCY (HERTZ)	DAMPING RATIO	TIME CONST. (SEC/RAD)
1	-4.50537E+00	2.13997E+01	3.57402E+00	.20062865	2.21957E-01
3	-2.03840E-01	2.20.95E+01	3.50466E+00	.00925686	4.90581E+00
5	-1.13765E+00	1.03012E+01	1.64946E+00	.10977040	8.79009E-01
7	1.49564E-01	9.78322E+00	1.55723E+00	-.01528603	-6.68610E+00
9	-1.13078E+00	2.01535E+00	3.67792E-01	.48932412	8.84343E-01
11	3.222. -03	6.00201E-02	9.56626E-03	-.05361388	-3.10314E+02
13	-6.666[illegible]+00	0.	0.	1.00000000	1.50000E-01
14	-9.50000E+00	0.	0.	1 00000000	1.05263E-01
15	-9.40000E+00	0.	0.	1.00000000	1.063 E-01

THE EE MATRIX (15 BY 15)

	1	2	3	4
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(-8.458E-03,-2.014E-03)	(-8.458E-03, 2.014E-03)	(1.200E-04, 1.017E-04)	(1.200E-04,-1.017E-04)
5	(8.929E-03,-6.778E-02)	(8.929E-03, 6.778E-02)	(1.343E-03,-1.067E-03)	(1.343E-03, 1.067E-03)
6	(-9.009E-07,-1.463E-05)	(-9.009E-07, 1.463E-05)	(-2.783E-08, 6.833E-08)	(-2.783E-08,-6.833E-08)
7	(-3.037E-03, 2.160E-04)	(-3.037E-03,-2.160E-04)	(-4.901E-05,-6.052E-05)	(-4.901E-05, 6.052E-05)
8	(5.536E-04, 1.404E-03)	(5.536E-04,-1.404E-03)	(-1.719E-03,-5.986E-04)	(-1.719E-03, 5.986E-04)
9	(3.778E-03, 4.328E-02)	(3.778E-03,-4.328E-02)	(1.757E-03,-1.545E-03)	(1.757E-03, 1.545E-03)
10	(6.004E-03,-6.623E-03)	(6.004E-03, 6.623E-03)	(-1.081E-03, 9.647E-05)	(-1.081E-03,-9.647E-05)
11	(2.363E-05,-1.537E-05)	(2.363E-05, 1.537E-05)	(3.946E-02, 2.217E-02)	(3.946E-02,-2.217E-02)
12	(-3.339E-02, 5.851E-03)	(-3.339E-02,-5.851E-03)	(1.353E-02,-3.773E-02)	(1.353E-02, 3.773E-02)
13	(-9.692E-01,-1.119E-01)	(-9.692E-01, 1.119E-01)	(3.367E-02, 3.900E-02)	(3.367E-02,-3.900E-02)
14	(1.187E-01, 1.619E-01)	(1.187E-01,-1.619E-01)	(-1.904E-03,-2.381E-02)	(-1.904E-03, 2.381E-02)
15	(2.317E-04, 5.892E-04)	(2.317E-04,-5.892E-04)	(-4.961E-01, 8.643E-01)	(-4.961E-01,-8.643E-01)

	5	6	7	8
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(4.998E-03,-7.456E-03)	(4.998E-03, 7.456E-03)	(5.734E-03,-4.740E-03)	(5.734E-03, 4.740E-03)
5	(8.385E-02, 2.990E-02)	(8.385E-02,-2.990E-02)	(5.936E-02, 3.435E-02)	(5.936E-02,-3.435E-02)
6	(4.812E-05, 1.410E-05)	(4.812E-05,-1.410E-05)	(3.311E-05, 2.853E-05)	(3.311E-05,-2.853E-05)
7	(1.980E-03,-8.359E-03)	(1.980E-03, 8.359E-03)	(3.603E-03,-6.012E-03)	(3.603E-03, 6.012E-03)
8	(-1.257E-02, 8.162E-02)	(-1.257E-02,-8.162E-02)	(4.993E-02, 3.751E-02)	(4.993E-02,-3.751E-02)
9	(-1.520E-03, 3.822E-03)	(-1.520E-03,-3.822E-03)	(2.410E-03, 1.122E-03)	(2.410E-03,-1.122E-03)
10	(-2.668E-02,-4.001E-02)	(-2.668E-02, 4.001E-02)	(5.344E-02,-5.937E-02)	(5.344E-02, 5.937E-02)
11	(-1.799E-06, 4.242E-06)	(-1.799E-06,-4.242E-06)	(2.022E-06, 4.923E-07)	(2.022E-06,-4.923E-07)
12	(-8.265E-01,-2.224E-01)	(-8.265E-01, 2.224E-01)	(-3.595E-01, 4.941E-01)	(-3.595E-01,-4.941E-01)
13	(-3.764E-02,-2.000E-02)	(-3.764E-02, 2.000E-02)	(-1.061E-02, 2.375E-02)	(-1.061E-02,-2.375E-02)
14	(4.425E-01,-2.293E-01)	(4.425E-01, 2.293E-01)	(5.888E-01, 5.140E-01)	(5.888E-01,-5.140E-01)
15	(-4.165E-05,-2.336E-05)	(-4.165E-05, 2.336E-05)	(-4.513E-06, 1.985E-05)	(-4.513E-06,-1.985E-05)

	9	10	11	12
1	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
2	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
3	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
4	(2.807E-01, 2.432E-01)	(2.807E-01,-2.432E-01)	(1.282E-01,-2.346E-01)	(1.282E-01, 2.346E-01)
5	(-5.852E-01, 5.235E-01)	(-5.852E-01,-5.235E-01)	(-1.240E-02, 4.885E-02)	(-1.240E-02,-4.885E-02)
6	(-3.648E-05, 9.102E-03)	(-3.648E-05,-9.102E-03)	(-2.272E-01, 4.020E-01)	(-2.272E-01,-4.020E-01)
7	(3.215E-01, 1.100E-01)	(3.215E-01,-1.100E-01)	(8.004E-01, 2.496E-01)	(8.004E-01,-2.496E-01)
8	(4.338E-02, 7.700E-02)	(4.338E-02,-7.700E-02)	(2.816E-02,-5.075E-02)	(2.816E-02, 5.075E-02)
9	(-2.364E-02,-1.945E-02)	(-2.364E-02, 1.945E-02)	(-1.032E-02, 1.892E-02)	(-1.032E-02,-1.892E-02)
10	(-6.685E-02,-8.534E-02)	(-6.685E-02, 8.534E-02)	(-3.710E-02, 6.734E-02)	(-3.710E-02,-6.734E-02)
11	(-2.718E-05,-2.633E-05)	(-2.718E-05, 2.633E-05)	(-1.320E-05, 2.408E-05)	(-1.320E-05,-2.408E-05)
12	(-2.042E-01, 3.680E-04)	(-2.042E-01,-3.680E-04)	(3.137E-03, 1.527E-03)	(3.137E-03,-1.527E-03)
13	(6.593E-02,-2.564E-02)	(6.593E-02, 2.564E-02)	(169E-03,-5.583E-04)	(-1.169E-03, 5.583E-04)

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14 ( 2.476E-01,-3.823E-02) ( 2.476E-01, 3.823E-02) (-4.161E-03,-2.010E-03) (-4.161E-03, 2.010E-03)
15 ( 8.380E-05,-2.499E-05) ( 8.380E-05, 2.499E-05) (-1.488E-06,-7.145E-07) (-1.488E-06, 7.145E-07)

                          13                          14                          15
 1 ( 2.667E-01, 0.       ) ( 0.       , 0.       ) ( 0.       , 0.       )
 2 ( 0.       , 0.       ) ( 0.       , 0.       ) ( 8.682E-01, 0.       )
 3 ( 0.       , 0.       ) ( 3.949E-01, 0.       ) (-1.959E-01, 0.       )
 4 (-8.145E-02, 0.       ) ( 2.286E-03, 0.       ) (-9.297E-04, 0.       )
 5 ( 5.493E-01, 0.       ) ( 3.888E-01, 0.       ) (-1.944E-01, 0.       )
 6 (-7.440E-04, 0.       ) (-1.402E-04, 0.       ) ( 7.223E-05, 0.       )
 7 (-8.240E-02, 0.       ) (-4.092E-02, 0.       ) ( 2.068E-02, 0.       )
 8 ( 1.128E-01, 0.       ) ( 5.609E-02, 0.       ) (-2.812E-02, 0.       )
 9 ( 1.362E-02, 0.       ) (-3.245E-02, 0.       ) ( 1.610E-02, 0.       )
10 (-2.425E-02, 0.       ) (-5.810E-02, 0.       ) ( 2.912E-02, 0.       )
11 ( 7.768E-06, 0.       ) (-3.480E-05, 0.       ) ( 1.730E-05, 0.       )
12 (-7.521E-01, 0.       ) (-5.328E-01, 0.       ) ( 2.643E-01, 0.       )
13 (-9.083E-02, 0.       ) ( 3.083E-01, 0.       ) (-1.514E-01, 0.       )
14 ( 1.619E-01, 0.       ) ( 5.520E-01, 0.       ) (-2.738E-01, 0.       )
15 (-5.179E-05, 0.       ) ( 3.306E-04, 0.       ) (-1.626E-04, 0.       )
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THE CON VECTOR (15 BY 1)

	1
1	(4.700E-03, 8.243E-02)
2	(4.700E-03,-8.243E-02)
3	(1.396E-04,-2.956E-05)
4	(1.396E-04, 2.956E-05)
5	(-9.947E-01, 2.155E+00)
6	(-9.947E-01,-2.155E+00)
7	(-9.593E-01, 7.571E-02)
8	(-9.593E-01,-7.571E-02)
9	(9.661E-01, 4.999E-01)
10	(9.661E-01,-4.999E-01)
11	(-1.252E-01, 5.561E-02)
12	(-1.252E-01,-5.561E-02)
13	(3.750E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

CONTROLABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
	8.[illegible]E-02 8.674E+01)
	8.[illegible]E-02,-8.674E+01)
	1.42[illegible]E-04,-1.196E+01)
	[illegible] 1.[illegible]8E+01)
	2.373E+00, 1.148E+02)
	2.[illegible]0,-1.148E+02)
	[illegible]-01, [illegible].755E+02)
	9.823E-01,-1.755E+02)
	1.088E+00, 2.736E+01)
	1.088E+00,-2.736E+01)
11	(1.370E-01, 1.561E+02)
12	(1.370E-01,-1.561E+02)
13	(3.750E+00, 0.)
14	(0. , 0.)
15	(0. , 0.)

THE DIST VECTOR (15 BY 1)

	1
1	(2.836E-03,-4.869E-03)
2	(2.836E-03, 4.869E-03)
3	(7.680E-06, 3.621E-06)
4	(7.680E-06,-3.621E-06)
5	(-5.448E-03, 3.220E-04)
6	(-5.448E-03,-3.220E-04)
7	(-2.350E-03, 2.947E-03)
8	(-2.350E-03,-2.947E-03)
9	(5.817E-04, 9.622E-04)
10	(5.817E-04,-9.622E-04)
11	(-1.093E-05,-1.552E-05)
12	(-1.093E-05, 1.552E-05)
13	(0. , 0.)
14	(5.855E-01, 0.)
15	(1.152E+00, 0.)

DISTURBABILITY MATRIX (15 BY 1)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1
1	(5.635E-03,-5.978E+01)
2	(5.635E-03, 5.978E+01)
3	(8.491E-06, 2.525E+01)
4	(8.491E-06,-2.525E+01)
	(5.457E-03, 1.766E+02)
	(5.457E-03,-1.766E+02)
7	(3.769E-03, 1.286E+02)
8	(3.769E-03,-1.286E+02)
9	(1.124E-03, 5.884E+01)
10	(1.124E-03,-5.884E+01)
11	(1.898E-05,-1.251E+02)
12	(1.898E-05, 1.251E+02)
13	(0. , 0.)
14	(5.855E-01, 0.)
15	(1.152E+00, 0.)

THE OBS MATRIX (7 BY 15)

	1	2	3	4
1	(-8.549E-04,-1.388E-02)	(-8.549E-04, 1.388E-02)	(-2.641E-05, 6.484E-05)	(-2.641E-05,-6.484E-05)
2	(-3.037E-03, 2.160E-04)	(-3.037E-03,-2.160E-04)	(-4.901E-05,-6.052E-05)	(-4.901E-05, 6.052E-05)
3	(8.929E-03,-6.778E-02)	(8.929E-03, 6.778E-02)	(1.343E-03,-1.067E-03)	(1.343E-03, 1.067E-03)
4	(5.421E-03, 2.230E-03)	(5.421E-03,-2.230E-03)	(-1.691E-04,-1.622E-04)	(-1.691E-04, 1.622E-04)
5	(-1.340E-02,-3.783E-02)	(-1.340E-02, 3.783E-02)	(-3.846E-02,-2.018E-02)	(-3.846E-02, 2.018E-02)
6	(8.926E-01,-1.243E-01)	(8.926E-01, 1.243E-01)	(4.522E-01,-8.428E-01)	(4.522E-01, 8.428E-01)
7	(2.608E+00,-3.641E+00)	(2.608E+00, 3.641E+00)	(-2.015E+00,-9.828E-01)	(-2.015E+00, 9.828E-01)

	5	6	7	8
1	(4.567E-02, 1.339E-02)	(4.567E-02,-1.339E-02)	(3.142E-02, 2.707E-02)	(3.142E-02,-2.707E-02)
2	(1.980E-03,-8.359E-03)	(1.980E-03, 8.359E-03)	(3.603E-03,-6.012E-03)	(3.603E-03, 6.012E-03)
3	(8.385E-02, 2.990E-02)	(8.385E-02,-2.990E-02)	(5.936E-02, 3.435E-02)	(5.936E-02,-3.435E-02)
4	(-3.019E-03,-9.031E-04)	(-3.019E-03, 9.031E-04)	(-2.131E-03,-1.272E-03)	(-2.131E-03, 1.272E-03)
5	(4.275E-02,-5.380E-02)	(4.275E-02, 5.380E-02)	(-1.022E-01, 1.473E-02)	(-1.022E-01,-1.473E-02)
6	(5.055E-01, 5.016E-01)	(5.055E-01,-5.016E-01)	(-1.594E-01,-9.975E-01)	(-1.594E-01, 9.975E-01)
7	(1.303E+00,-2.004E+00)	(1.303E+00, 2.004E+00)	(-3.183E+00, 2.645E-02)	(-3.183E+00,-2.645E-02)

	9	10	11	12
1	(-3.462E-02, 8.638E+00)	(-3.462E-02,-8.638E+00)	(-2.156E+02, 3.815E+02)	(-2.156E+02,-3.815E+02)
2	(3.215E-01, 1.100E-01)	(3.215E-01,-1.100E-01)	(8.004E-01, 2.496E-01)	(8.004E-01,-2.496E-01)
3	(-5.852E-01, 5.235E-01)	(-5.852E-01,-5.235E-01)	(-1.240E-02, 4.885E-02)	(-1.240E-02,-4.885E-02)
4	(4.076E-02,-1.332E-01)	(4.076E-02, 1.332E-01)	(6.722E-01, 4.842E-01)	(6.722E-01,-4.842E-01)
5	(3.686E-01, 1.378E-01)	(3.686E-01,-1.378E-01)	(8.197E-01, 2.141E-01)	(8.197E-01,-2.141E-01)
6	(-6.946E-01, 5.871E-01)	(-6.946E-01,-5.871E-01)	(-1.021E-02, 4.989E-02)	(-1.021E-02,-4.989E-02)
7	(5.838E+00, 3.355E+00)	(5.838E+00,-3.355E+00)	(-7.993E-01, 1.235E+00)	(-7.993E-01,-1.235E+00)

	13	14	15
1	(-7.061E-01, 0.)	(-1.330E-01, 0.)	(6.855E-02, 0.)
2	(-8.240E-02, 0.)	(-4.092E-02, 0.)	(2.068E-02, 0.)
3	(5.493E-01, 0.)	(3.886E-01, 0.)	(-1.944E-01, 0.)
4	(-9.552E-04, 0.)	(-4.321E-02, 0.)	(2.161E-02, 0.)
5	(-1.846E-01, 0.)	(-6.423E-03, 0.)	(3.552E-03, 0.)
6	(1.230E+00, 0.)	(6.102E-02, 0.)	(-3.339E-02, 0.)
7	(-4.916E+00, 0.)	(4.952E+00, 0.)	(-2.459E+00, 0.)

OBSERVABILITY MATRIX (7 BY 15)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.391E-02,-9.352E+01)	(1.391E-02, 9.352E+01)	(7.002E-05, 1.122E+02)	(7.002E-05,-1.122E+02)
2	(3.044E-03, 1.759E+02)	(3.044E-03,-1.759E+02)	(7.788E-05,-1.290E+02)	(7.788E-05, 1.290E+02)
3	(6.836E-02,-8.249E+01)	(6.836E-02, 8.249E+01)	(1.715E-03,-3.847E+01)	(1.715E-03, 3.847E+01)
4	(5.862E-03, 2.236E+01)	(5.862E-03,-2.236E+01)	(2.343E-04,-1.362E+02)	(2.343E-04, 1.362E+02)
5	(4.013E-02,-1.095E+02)	(4.013E-02, 1.095E+02)	(4.343E-02,-1.523E+02)	(4.343E-02, 1.523E+02)
6	(9.012E-01,-7.925E+00)	(9.012E-01, 7.925E+00)	(9.564E-01,-6.179E+01)	(9.564E-01, 6.179E+01)
7	(4.479E+00,-5.438E+01)	(4.479E+00, 5.438E+01)	(2.241E+00,-1.540E+02)	(2.241E+00, 1.540E+02)

	5	6	7	8
1	(4.759E-02, 1.634E+01)	(4.759E-02,-1.634E+01)	(4.147E-02, 4.075E+01)	(4.147E-02,-4.075E+01)
2	(8.590E-03,-7.668E+01)	(8.590E-03, 7.668E+01)	(7.009E-03,-5.907E+01)	(7.009E-03, 5.907E+01)
3	(8.903E-02, 1.963E+01)	(8.903E-02,-1.963E+01)	(6.858E-02, 3.006E+01)	(6.858E-02,-3.006E+01)
4	(3.151E-03,-1.633E+02)	(3.151E-03, 1.633E+02)	(2.482E-03,-1.492E+02)	(2.482E-03, 1.492E+02)
5	(6.872E-02,-5.153E+01)	(6.872E-02, 5.153E+01)	(1.032E-01, 1.718E+02)	(1.032E-01,-1.718E+02)
6	(7.122E-01, 4.478E+01)	(7.122E-01,-4.478E+01)	(1.010E+00,-9.908E+01)	(1.010E+00, 9.908E+01)
7	(2.390E+00,-5.696E+01)	(2.390E+00, 5.696E+01)	(3.184E+00, 1.795E+02)	(3.184E+00,-1.795E+02)

	9	10	11	12
1	(8.638E+00, 9.023E+01)	(8.638E+00,-9.023E+01)	(4.382E+02, 1.195E+02)	(4.382E+02,-1.195E+02)
2	(3.398E-01, 1.889E+01)	(3.398E-01,-1.889E+01)	(8.385E-01, 1.732E+01)	(8.385E-01,-1.732E+01)
3	(7.852E-01, 1.382E+02)	(7.852E-01,-1.382E+02)	(5.040E-02, 1.042E+02)	(5.040E-02,-1.042E+02)
4	(1.393E-01,-7.299E+01)	(1.393E-01, 7.299E+01)	(8.285E-01, 3.577E+01)	(8.285E-01,-3.577E+01)
5	(3.935E-01, 2.050E+01)	(3.935E-01,-2.050E+01)	(8.472E-01, 1.464E+01)	(8.472E-01,-1.464E+01)
6	(9.094E-01, 1.398E+02)	(9.094E-01,-1.398E+02)	(5.092E-02, 1.016E+02)	(5.092E-02,-1.016E+02)
7	(6.734E+00, 2.989E+01)	(6.734E+00,-2.989E+01)	(1.471E+00, 1.229E+02)	(1.471E+00,-1.229E+02)

	13	14	15
1	(7.061E-01, 1.800E+02)	(1.330E-01, 1.800E+02)	(6.855E-02, 0.)
2	(8.240E-02, 1.800E+02)	(4.092E-02, 1.800E+02)	(2.068E-02, 0.)
3	(5.493E-01, 0.)	(3.889E-01, 0.)	(1.944E-01, 1.800E+02)
4	(9.552E-04, 1.800E+02)	(4.321E-02, 1.800E+02)	(2.161E-02, 0.)
5	(1.846E-01, 1.800E+02)	(6.423E-03, 1.800E+02)	(3.552E-03, 0.)
6	(1.230E+00, 0.)	(6.102E-02, 0.)	(3.339E-02, 1.800E+02)
7	(4.916E+00, 1.800E+02)	(4.958E+00, 0.)	(2.459E+00, 1.800E+02)

****
** RESIDUE MATRICES **
****
*** ROWS CORRESPOND TO MODES ***
*** COLUMNS CORRESPOND TO OUTPUTS ***
****

IMPULSE RESIDUE MATRIX FOR CONTROL - 1

THE C-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(1.140E-03,-1.357E-04)	(-3.208E-05,-2.493E-04)	(5.629E-03, 4.175E-04)	(-1.583E-04, 4.573E-04)
2	(1.140E-03, 1.357E-04)	(-3.208E-05, 2.493E-04)	(5.629E-03,-4.175E-04)	(-1.583E-04,-4.573E-04)
3	(-1.770E-09, 9.831E-09)	(-8.629E-09,-6.999E-09)	(1.559E-07,-1.886E-07)	(-2.839E-08,-1.764E-08)
4	(-1.770E-09,-9.831E-09)	(-8.629E-09, 6.999E-09)	(1.559E-07, 1.886E-07)	(-2.839E-08, 1.764E-08)
5	(-7.427E-02, 8.510E-02)	(1.604E-02, 1.258E-02)	(-1.478E-01, 1.510E-01)	(4.949E-03,-5.607E-03)
6	(-7.427E-02,-8.510E-02)	(1.604E-02,-1.258E-02)	(-1.478E-01,-1.510E-01)	(4.949E-03, 5.607E-03)
7	(-3.219E-02,-2.359E-02)	(-3.001E-03, 6.041E-03)	(-5.955E-02,-2.846E-02)	(2.140E-03, 1.059E-03)
8	(-3.219E-02, 2.359E-02)	(-3.001E-03,-6.041E-03)	(-5.955E-02, 2.846E-02)	(2.140E-03,-1.059E-03)
9	(-4.351E+00, 8.327E+00)	(2.556E-01, 2.670E-01)	(-8.270E-01, 2.132E-01)	(1.060E-01,-1.083E-01)
10	(-4.351E+00,-8.327E+00)	(2.556E-01,-2.670E-01)	(-8.270E-01,-2.132E-01)	(1.060E-01, 1.083E-01)
11	(5.781E+00,-5.976E+01)	(-1.141E-01, 1.326E-02)	(-1.163E-03,-6.806E-03)	(-1.111E-01,-2.325E-02)
12	(5.781E+00, 5.976E+01)	(-1.141E-01,-1.326E-02)	(-1.163E-03, 6.806E-03)	(-1.111E-01, 2.325E-02)
13	(-2.648E+00, 0.)	(-3.090E-01, 0.)	(2.060E+00, 0.)	(-3.582E-03, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.055E-03,-1.282E-03)	(1.444E-02, 7.300E-02)	(3.124E-01, 1.979E-01)
2	(3.055E-03, 1.282E-03)	(1.444E-02,-7.300E-02)	(3.124E-01,-1.979E-01)
3	(-5.965E-06,-1.680E-06)	(3.820E-05,-1.310E-04)	(-3.102E-04,-7.763E-05)
4	(-5.965E-06, 1.680E-06)	(3.820E-05, 1.310E-04)	(-3.102E-04, 7.763E-05)
5	(7.341E-02, 1.456E-01)	(-1.584E+00, 5.905E-01)	(3.022E+00, 4.801E+00)
6	(7.341E-02,-1.456E-01)	(-1.584E+00,-5.905E-01)	(3.022E+00,-4.801E+00)
7	(9.691E-02,-2.186E-02)	(2.284E-01, 9.448E-01)	(3.052E+00,-2.664E-01)
8	(9.691E-02, 2.186E-02)	(2.284E-01,-9.448E-01)	(3.052E+00, 2.664E-01)
9	(2.872E-01, 3.174E-01)	(-9.645E-01, 2.200E-01)	(3.963E+00, 6.160E+00)
10	(2.872E-01,-3.174E-01)	(-9.645E-01,-2.200E-01)	(3.963E+00,-6.160E+00)
11	(-1.146E-01, 1.878E-02)	(-1.496E-03,-6.815E-03)	(3.140E-02,-1.991E-01)
12	(-1.146E-01,-1.878E-02)	(-1.496E-03, 6.815E-03)	(3.140E-02, 1.991E-01)
13	(-6.921E-01, 0.)	(4.614E+00, 0.)	(-1.843E+01, 0.)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

CONTROL RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(1.148E-03,-6.788E+00)	(2.514E-04,-9.733E+01)	(5.644E-03, 4.242E+00)	(4.840E-04, 1.091E+02)
2	(1.148E-03, 6.788E+00)	(2.514E-04, 9.733E+01)	(5.644E-03,-4.242E+00)	(4.840E-04,-1.091E+02)
3	(9.989E-09, 1.002E+02)	(1.111E-08,-1.410E+02)	(2.447E-07,-5.042E+01)	(3.343E-08,-1.481E+02)
4	(9.989E-09,-1.002E+02)	(1.111E-08, 1.410E+02)	(2.447E-07, 5.042E+01)	(3.343E-08, 1.481E+02)
5	(1.130E-01, 1.311E+02)	(2.039E-02, 3.810E+01)	(2.113E-01, 1.344E+02)	(7.478E-03,-4.857E+01)
6	(1.130E-01,-1.311E+02)	(2.039E-02,-3.810E+01)	(2.113E-01,-1.344E+02)	(7.478E-03, 4.857E+01)
7	(3.991E-02,-1.438E+02)	(6.745E-03, 1.164E+02)	(6.600E-02,-1.545E+02)	(2.388E-03, 2.632E+01)
8	(3.991E-02, 1.438E+02)	(6.745E-03,-1.164E+02)	(6.600E-02, 1.545E+02)	(2.388E-03,-2.632E+01)
9	(9.396E+00, 1.176E+02)	(3.696E-01, 4.625E+01)	(8.541E-01, 1.655E+02)	(1.515E-01,-4.563E+01)
10	(9.396E+00,-1.176E+02)	(3.696E-01,-4.625E+01)	(8.541E-01,-1.655E+02)	(1.515E-01, 4.563E+01)
11	(6.003E+01,-8.447E+01)	(1.149E-01, 1.734E+02)	(6.905E-03,-9.970E+01)	(1.135E-01,-1.682E+02)
12	(6.003E+01, 8.447E+01)	(1.149E-01,-1.734E+02)	(6.905E-03, 9.970E+01)	(1.135E-01, 1.682E+02)
13	(2.648E+00, 1.800E+02)	(3.090E-01, 1.800E+02)	(2.060E+00, 0.)	(3.582E-03, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)

	5	6	7
1	(3.314E-03,-2.276E+01)	(7.441E-02, 7.881E+01)	(3.698E-01, 3.236E+01)
2	(3.314E-03, 2.276E+01)	(7.441E-02,-7.881E+01)	(3.698E-01,-3.236E+01)
3	(6.197E-06,-1.643E+02)	(1.365E-04,-7.374E+01)	(3.198E-04,-1.660E+02)
4	(6.197E-06, 1.643E+02)	(1.365E-04, 7.374E+01)	(3.198E-04, 1.660E+02)
5	(1.631E-01, 6.325E+01)	(1.690E+00, 1.596E+02)	(5.673E+00, 5.781E+01)
6	(1.631E-01,-6.325E+01)	(1.690E+00,-1.596E+02)	(5.673E+00,-5.781E+01)
7	(9.934E-02,-1.271E+01)	(9.720E-01, 7.641E+01)	(3.064E+00,-4.989E+00)
8	(9.934E-02, 1.271E+01)	(9.720E-01,-7.641E+01)	(3.064E+00, 4.989E+00)
9	(4.281E-01, 4.786E+01)	(9.892E-01, 1.672E+02)	(7.325E+00, 5.725E+01)
10	(4.281E-01,-4.786E+01)	(9.892E-01,-1.672E+02)	(7.325E+00,-5.725E+01)
11	(1.161E-01, 1.707E+02)	(6.977E-03,-1.024E+02)	(2.016E-01,-8.104E+01)
12	(1.161E-01,-1.707E+02)	(6.977E-03, 1.024E+02)	(2.016E-01, 8.104E+01)
13	(6.921E-01, 1.800E+02)	(4.614E+00, 0.)	(1.843E+01, 1.800E+02)
14	(0. , 0.)	(0. , 0.)	(0. , 0.)
15	(0. , 0.)	(0. , 0.)	(0. , 0.)

THE D-IMP RES MATRIX (15 BY 7)

	1	2	3	4
1	(-7.001E-05,-3.521E-05)	(-7.561E-06, 1.540E-05)	(-3.047E-04,-2.357E-04)	(2.623E-05,-2.007E-05)
2	(-7.001E-05, 3.521E-05)	(-7.561E-06,-1.540E-05)	(-3.047E-04, 2.357E-04)	(2.623E-05, 2.007E-05)
3	(-4.377E-10, 4.023E-10)	(-1.572E-10,-6.423E-10)	(1.417E-08,-3.330E-09)	(-7.108E-10,-1.858E-09)
4	(-4.377E-10,-4.023E-10)	(-1.572E-10, 6.423E-10)	(1.417E-08, 3.330E-09)	(-7.108E-10, 1.858E-09)
5	(-2.531E-04,-5.822E-05)	(-8.094E-06, 4.618E-05)	(-4.665E-04,-1.359E-04)	(1.674E-05, 3.948E-06)
6	(-2.531E-04, 5.822E-05)	(-8.094E-06,-4.618E-05)	(-4.665E-04, 1.359E-04)	(1.674E-05,-3.948E-06)
7	(-1.536E-04, 2.899E-05)	(9.255E-06, 2.475E-05)	(-2.407E-04, 9.425E-05)	(8.757E-06,-3.291E-06)
8	(-1.536E-04,-2.899E-05)	(9.255E-06,-2.475E-05)	(-2.407E-04,-9.425E-05)	(8.757E-06, 3.291E-06)
9	(-8.331E-03, 4.991E-03)	(8.118E-05, 3.733E-04)	(-8.441E-04,-2.585E-04)	(1.519E-04,-3.828E-05)
10	(-8.331E-03,-4.991E-03)	(8.118E-05,-3.733E-04)	(-8.441E-04, 2.585E-04)	(1.519E-04, 3.828E-05)
11	(8.276E-03,-8.227E-04)	(-4.873E-06,-1.515E-05)	(8.936E-07,-3.413E-07)	(1.693E-07,-1.572E-05)
12	(8.276E-03, 8.227E-04)	(-4.873E-06, 1.515E-05)	(8.936E-07, 3.413E-07)	(1.693E-07, 1.572E-05)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-7.789E-02, 0.)	(-2.396E-02, 0.)	(2.276E-01, 0.)	(-2.530E-02, 0.)
15	(7.895E-02, 0.)	(2.382E-02, 0.)	(-2.239E-01, 0.)	(2.489E-02, 0.)

	5	6	7
1	(-2.222E-04,-4.208E-05)	(1.927E-03,-4.698E-03)	(-1.033E-02,-2.303E-02)
2	(-2.222E-04, 4.208E-05)	(1.927E-03, 4.698E-03)	(-1.033E-02, 2.303E-02)
3	(-2.223E-07,-2.942E-07)	(6.524E-06,-4.835E-06)	(-1.191E-05,-1.484E-05)
4	(-2.223E-07, 2.942E-07)	(6.524E-06, 4.835E-06)	(-1.191E-05, 1.484E-05)
5	(-2.156E-04, 3.069E-04)	(-2.916E-03,-2.570E-03)	(-6.454E-03, 1.134E-02)
6	(-2.156E-04,-3.069E-04)	(-2.916E-03, 2.570E-03)	(-6.454E-03,-1.134E-02)
7	(1.967E-04,-3.358E-04)	(3.314E-03, 1.874E-03)	(7.403E-03,-9.445E-03)
8	(1.967E-04, 3.358E-04)	(3.314E-03,-1.874E-03)	(7.403E-03, 9.445E-03)
9	(8.183E-05, 4.348E-04)	(-9.689E-04,-3.268E-04)	(1.676E-04, 7.569E-03)
10	(8.183E-05,-4.348E-04)	(-9.689E-04, 3.268E-04)	(1.676E-04,-7.569E-03)
11	(-5.635E-06,-1.506E-05)	(8.858E-07,-3.867E-07)	(2.790E-05,-1.091E-06)
12	(-5.635E-06, 1.506E-05)	(8.858E-07, 3.867E-07)	(2.790E-05, 1.091E-06)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(-3.761E-03, 0.)	(3.573E-02, 0.)	(2.903E+00, 0.)
15	(4.091E-03, 0.)	(-3.845E-02, 0.)	(-2.832E+00, 0.)

DISTURBANCE RESIDUE MATRIX (15 BY 7)
OUTPUT FORM: (MAGNITUDE , PHASE(DEG.))

	1	2	3	4
1	(7.836E-05,-1.533E+02)	(1.715E-05, 1.162E+02)	(3.852E-04,-1.423E+02)	(3.303E-05,-3.742E+01)
2	(7.836E-05, 1.533E+02)	(1.715E-05,-1.162E+02)	(3.852E-04, 1.423E+02)	(3.303E-05, 3.742E+01)
3	(5.945E-10, 1.374E+02)	(6.612E-10,-1.038E+02)	(1.456E-08,-1.322E+01)	(1.989E-09,-1.109E+02)
4	(5.945E-10,-1.374E+02)	(6.612E-10, 1.038E+02)	(1.456E-08, 1.322E+01)	(1.989E-09, 1.109E+02)
5	(2.597E-04,-1.670E+02)	(4.688E-05, 9.994E+01)	(4.859E-04,-1.638E+02)	(1.719E-05, 1.327E+01)
6	(2.597E-04, 1.670E+02)	(4.688E-05,-9.994E+01)	(4.859E-04, 1.638E+02)	(1.719E-05,-1.327E+01)
7	(1.563E-04, 1.693E+02)	(2.642E-05, 6.950E+01)	(2.585E-04, 1.586E+02)	(9.355E-06,-2.060E+01)
8	(1.563E-04,-1.693E+02)	(2.642E-05,-6.950E+01)	(2.585E-04,-1.586E+02)	(9.355E-06, 2.060E+01)
9	(9.712E-03, 1.491E+02)	(3.820E-04, 7.773E+01)	(8.828E-04,-1.630E+02)	(1.566E-04,-1.414E+01)
10	(9.712E-03,-1.491E+02)	(3.820E-04,-7.773E+01)	(8.828E-04, 1.630E+02)	(1.566E-04, 1.414E+01)
11	(8.317E-03,-5.677E+00)	(1.591E-05,-1.078E+02)	(9.566E-07,-2.090E+01)	(1.572E-05,-8.938E+01)
12	(8.317E-03, 5.677E+00)	(1.591E-05, 1.078E+02)	(9.566E-07, 2.090E+01)	(1.572E-05, 8.938E+01)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(7.789E-02, 1.800E+02)	(2.396E-02, 1.800E+02)	(2.276E-01, 0.)	(2.530E-02, 1.800E+02)
15	(7.895E-02, 0.)	(2.382E-02, 0.)	(2.239E-01, 1.800E+02)	(2.489E-02, 0.)

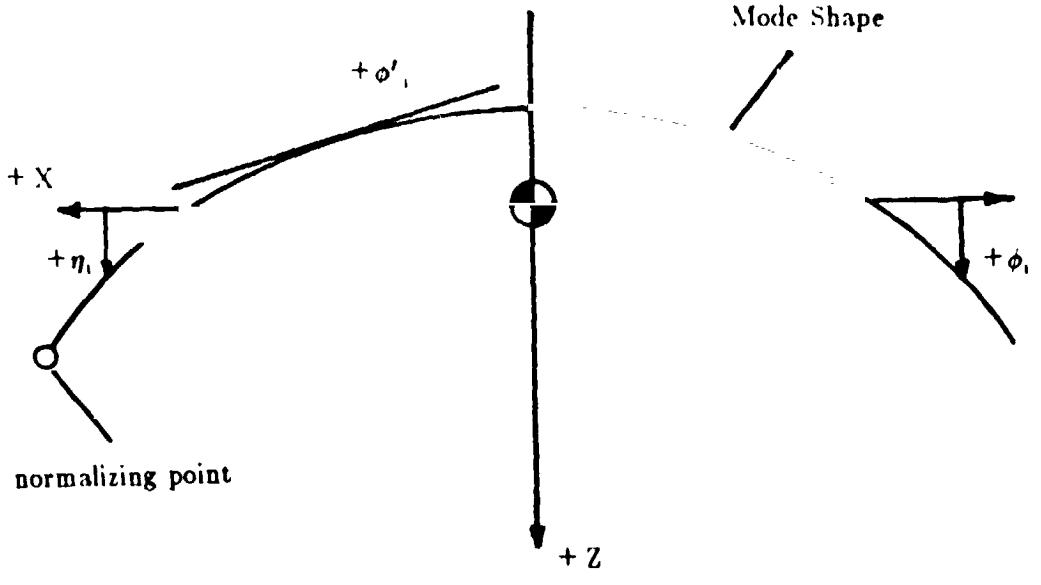
	5	6	7
1	(2.261E-04,-1.693E+02)	(5.078E-03,-6.770E+01)	(2.524E-02,-1.142E+02)
2	(2.261E-04, 1.693E+02)	(5.078E-03, 6.770E+01)	(2.524E-02, 1.142E+02)
3	(3.688E-07,-1.271E+02)	(8.121E-06,-3.654E+01)	(1.903E-05,-1.287E+02)
4	(3.688E-07, 1.271E+02)	(8.121E-06, 3.654E+01)	(1.903E-05, 1.287E+02)
5	(3.750E-04, 1.251E+02)	(3.887E-03,-1.386E+02)	(1.304E-02, 1.197E+02)
6	(3.750E-04,-1.251E+02)	(3.887E-03, 1.386E+02)	(1.304E-02,-1.197E+02)
7	(3.892E-04,-5.964E+01)	(3.808E-03, 2.949E+01)	(1.200E-02,-5.191E+01)
8	(3.892E-04, 5.964E+01)	(3.808E-03,-2.949E+01)	(1.200E-02, 5.191E+01)
9	(4.425E-04, 7.934E+01)	(1.023E-03,-1.614E+02)	(7.571E-03, 8.873E+01)
10	(4.425E-04,-7.934E+01)	(1.023E-03, 1.614E+02)	(7.571E-03,-8.873E+01)
11	(1.608E-05,-1.105E+02)	(9.665E-07,-2.358E+01)	(2.792E-05,-2.240E+00)
12	(1.608E-05, 1.105E+02)	(9.665E-07, 2.358E+01)	(2.792E-05, 2.240E+00)
13	(0. , 0.)	(0. , 0.)	(0. , 0.)
14	(3.761E-03, 1.800E+02)	(3.573E-02, 0.)	(2.903E+00, 0.)
15	(4.091E-03, 0.)	(3.845E-02, 1.800E+02)	(2.832E+00, 1.800E+02)

Appendix A.4
Aeroelastic-Structural Mode Shapes

The mode shapes of the data base configurations are defined to be deflections in feet normalized so that for each mode the deflection at the nose (i.e. F.S. 0) is one foot. The deflections are defined relative to a set of body axes defined in the following way. The x-axis lies along the longitudinal axis of the vehicle and is directed forward. The y-axis lies in the plane of the wings, is orthogonal to the x-axis and points out the right wing. The z-axis is orthogonal to the xy-plane and is directed downward. The origin of the xyz-coordinate system is defined to be the center of gravity of the aircraft.

The deflection definitions and their sign conventions that are used in this study are defined in Figure A.4.1. The mode shapes for the four longitudinal modes used in this study are presented in Figures A.4.2 through A.4.5.

MODE SHAPE SIGN CONVENTIONS

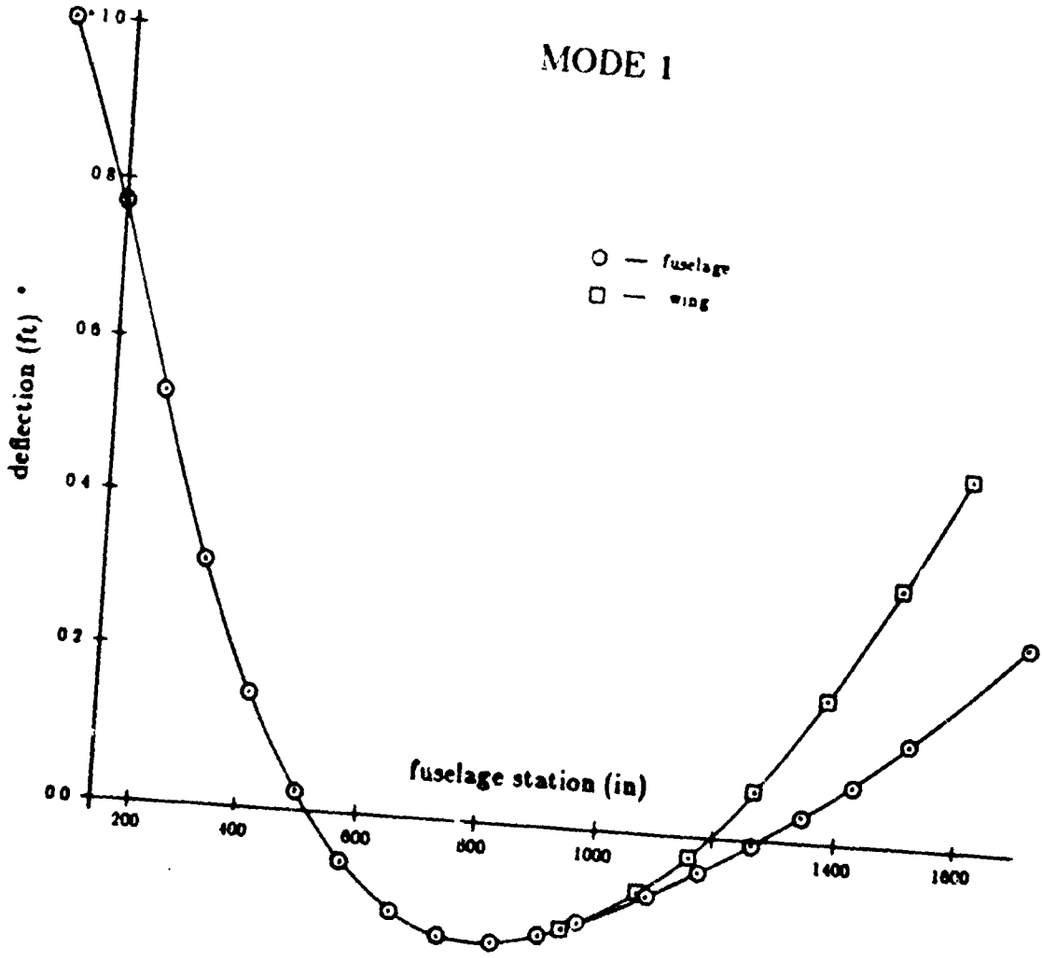


$\phi_i \triangleq$ mode deflection (feet)

$\phi'_i \triangleq$ mode slope (feet/feet)

$\eta_i \triangleq$ generalized deflection (dimensionless)

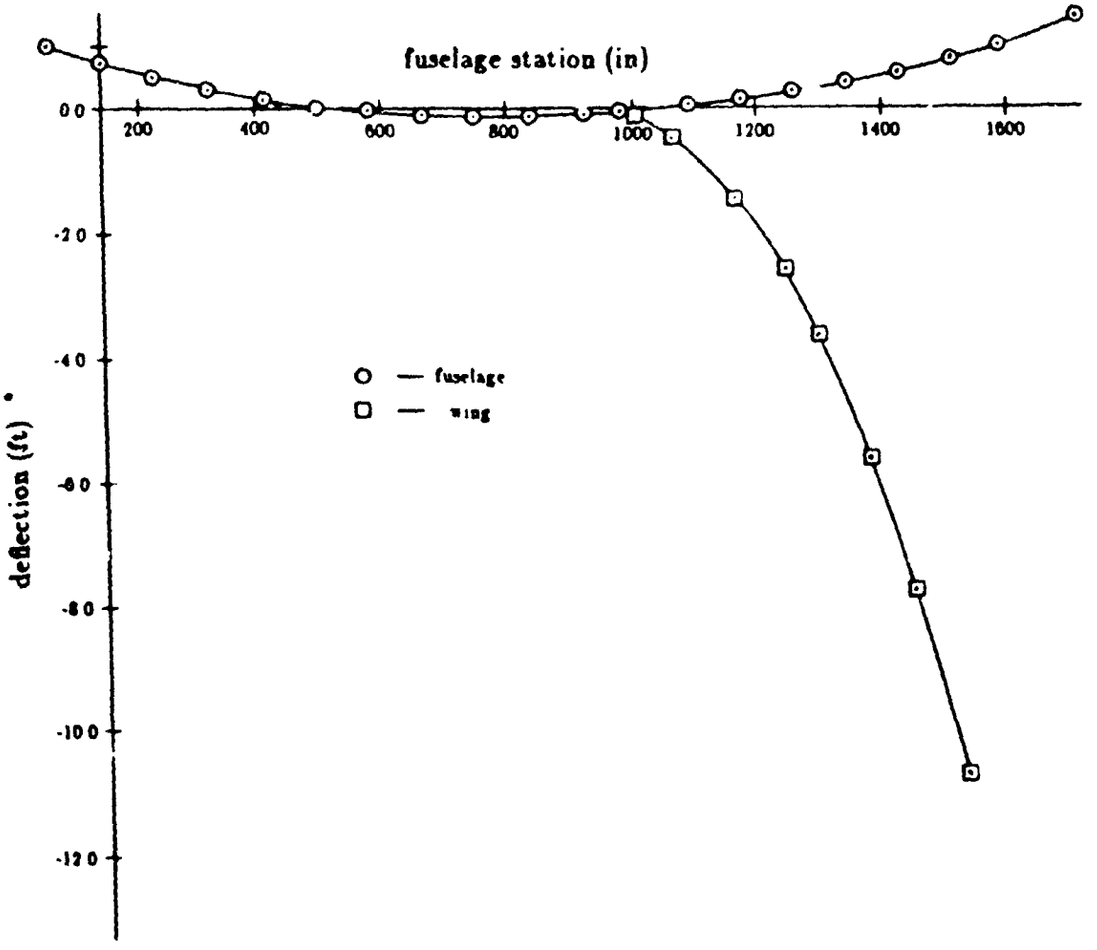
Figure A.4.1
Mode Shape Sign Conventions



* deflections are normalized to a one foot displacement at the nose

Figure A.4.2
Aeroelastic-Structural Mode Shape - Mode 1

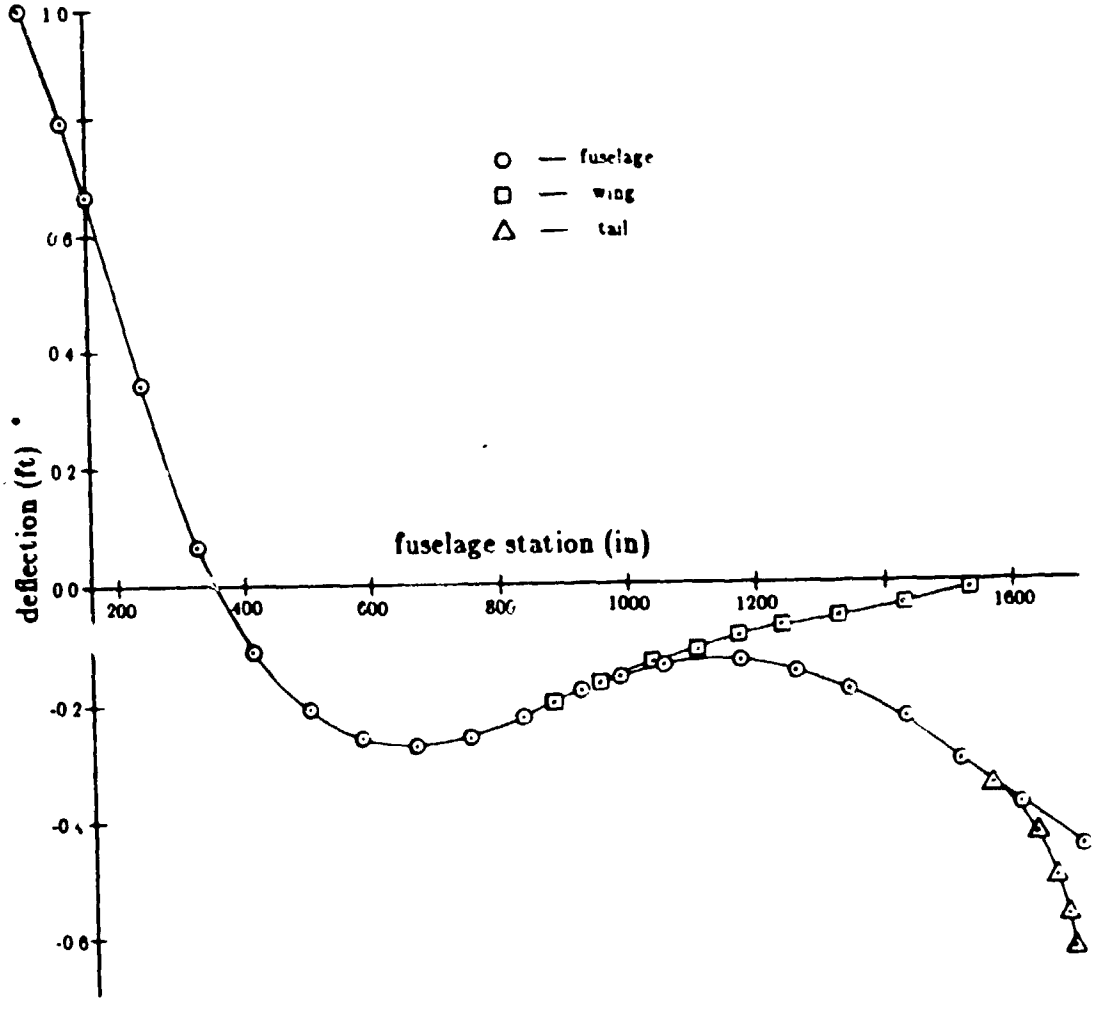
MODE 2



* deflections are normalized to a one foot displacement at the nose

Figure A.4.3
Aeroelastic-Structural Mode Shape - Mode 2

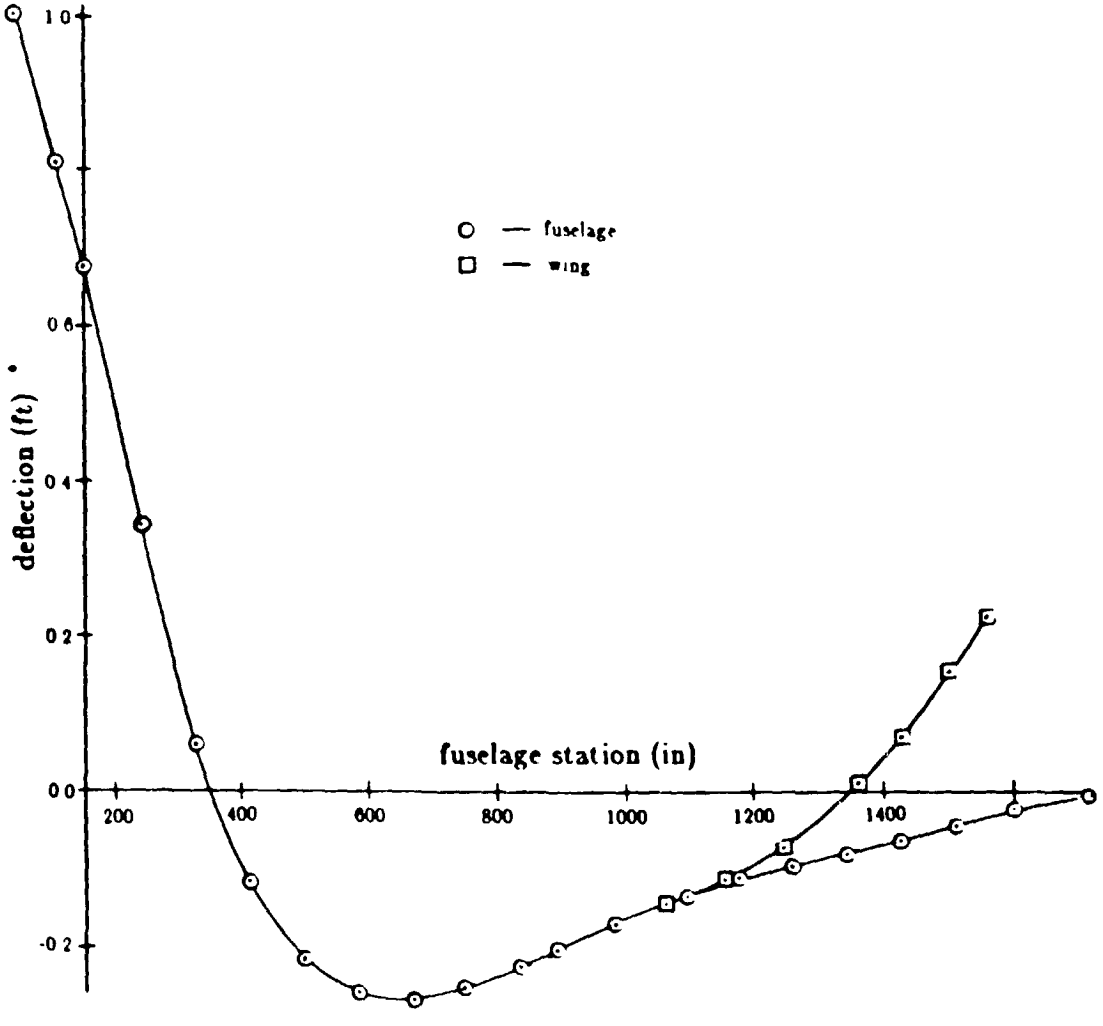
MODE 3



* deflections are normalized to a one foot displacement at the nose

Figure A.4.4
Aeroelastic-Structural Mode Shape - Mode 3

MODE 4



* deflections are normalized to a one foot displacement at the nose

Figure A.4.5
Aeroelastic-Structural Mode Shape - Mode 4

Appendix A.5
OCM Frequency Responses

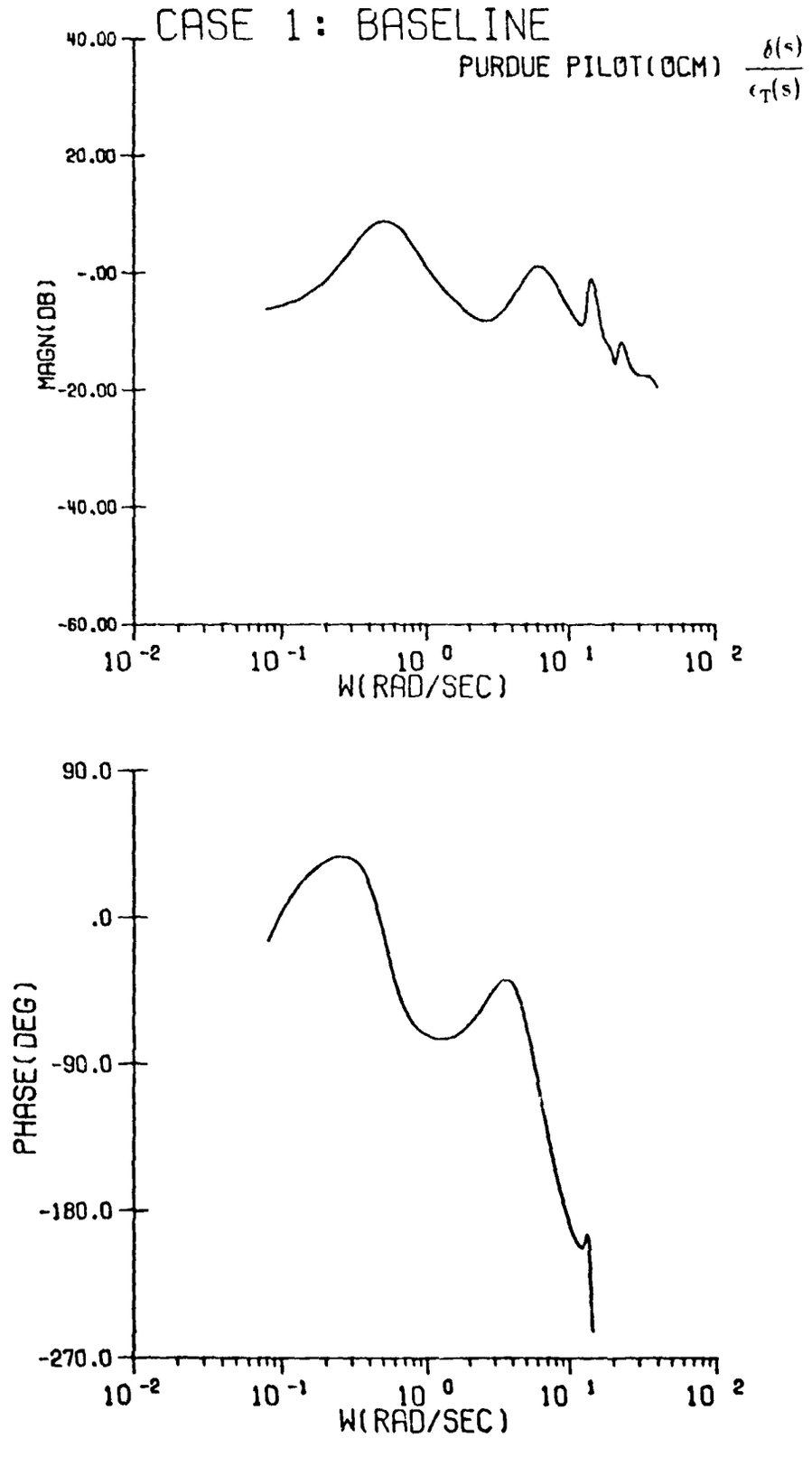


Figure A.5.1
OCM Frequency Responses - Config. 1

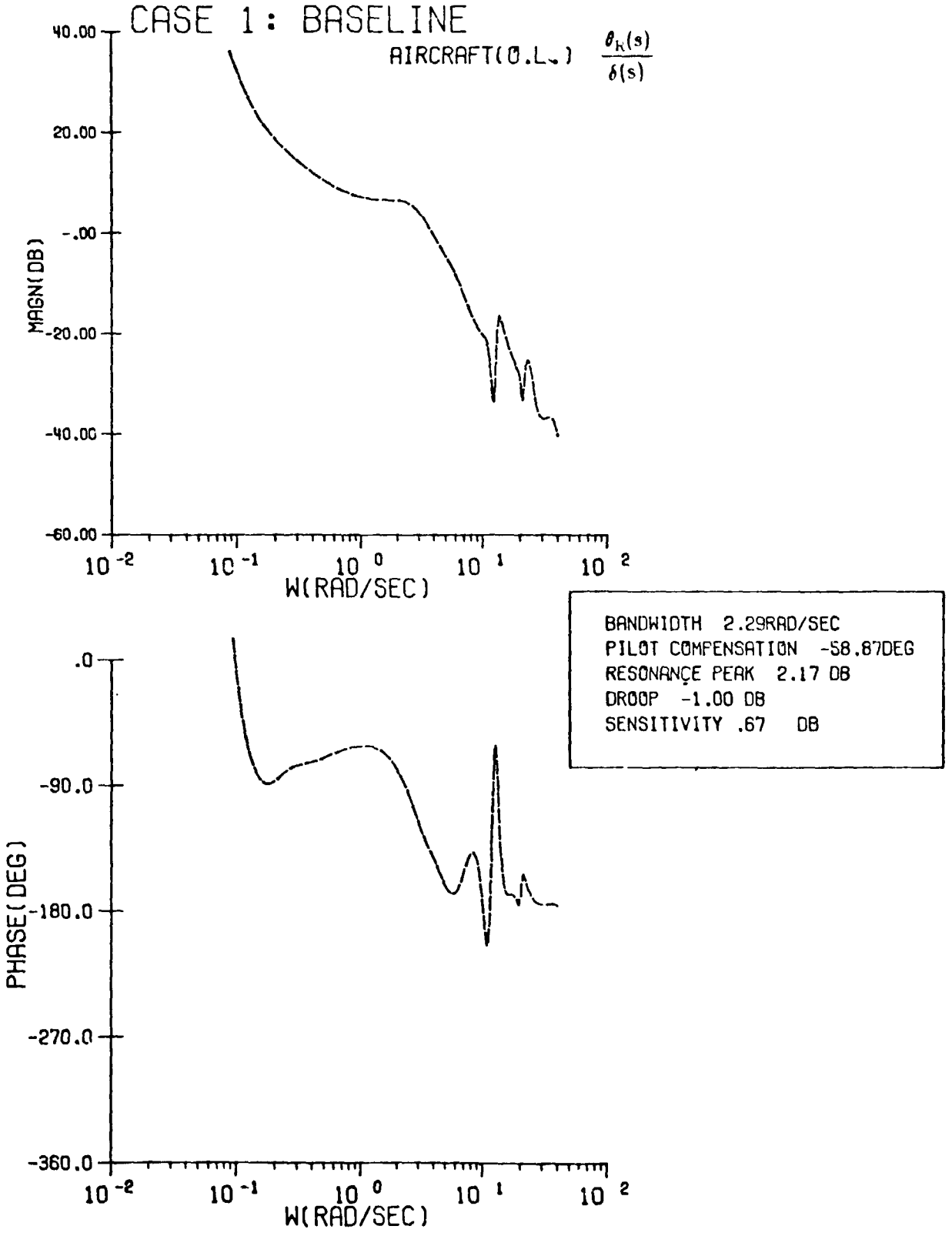


Figure A.5.1 (con't)
OCM Frequency Responses - Config. 1

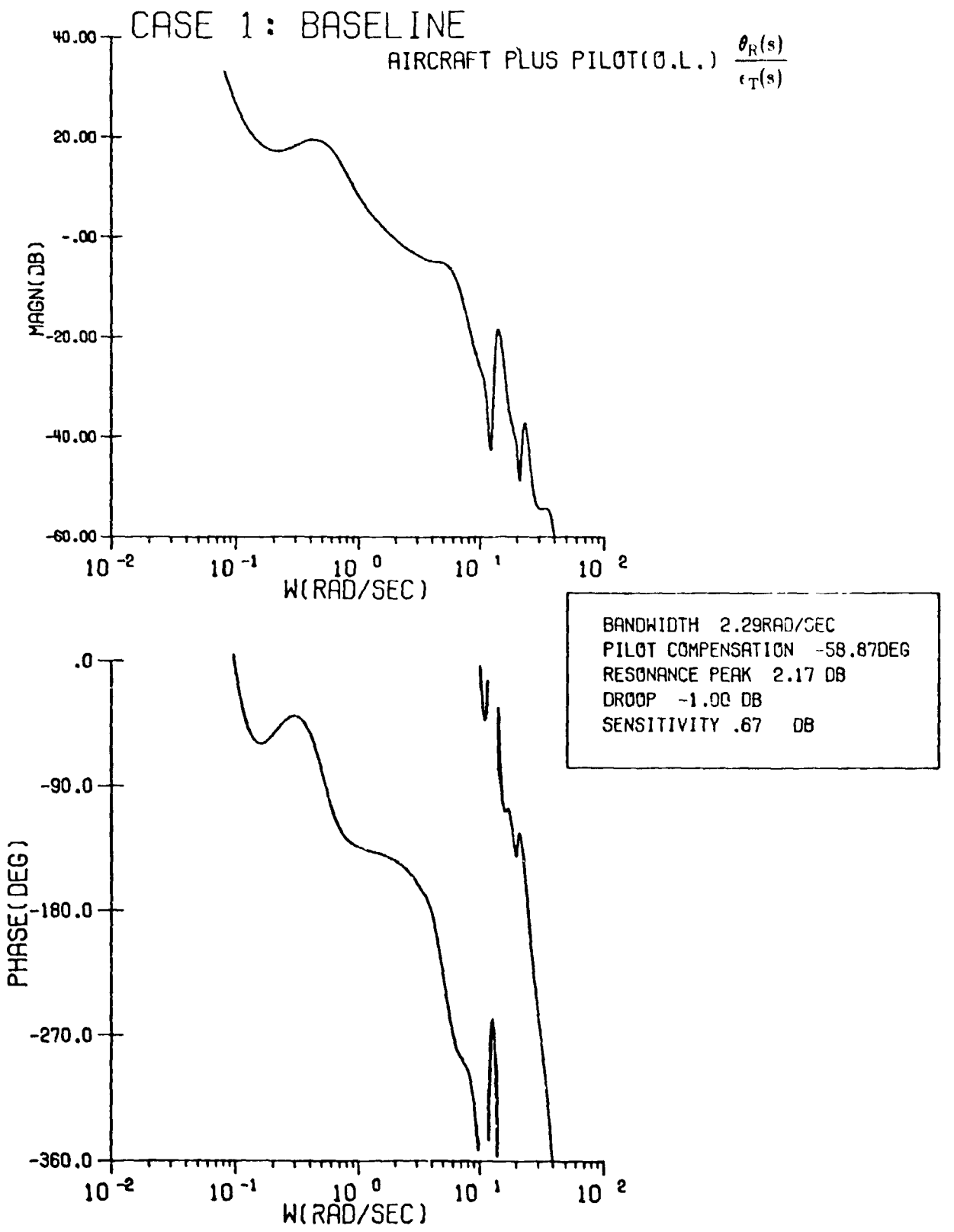


Figure A.5.1 (con't)
OCM Frequency Responses - Config. 1

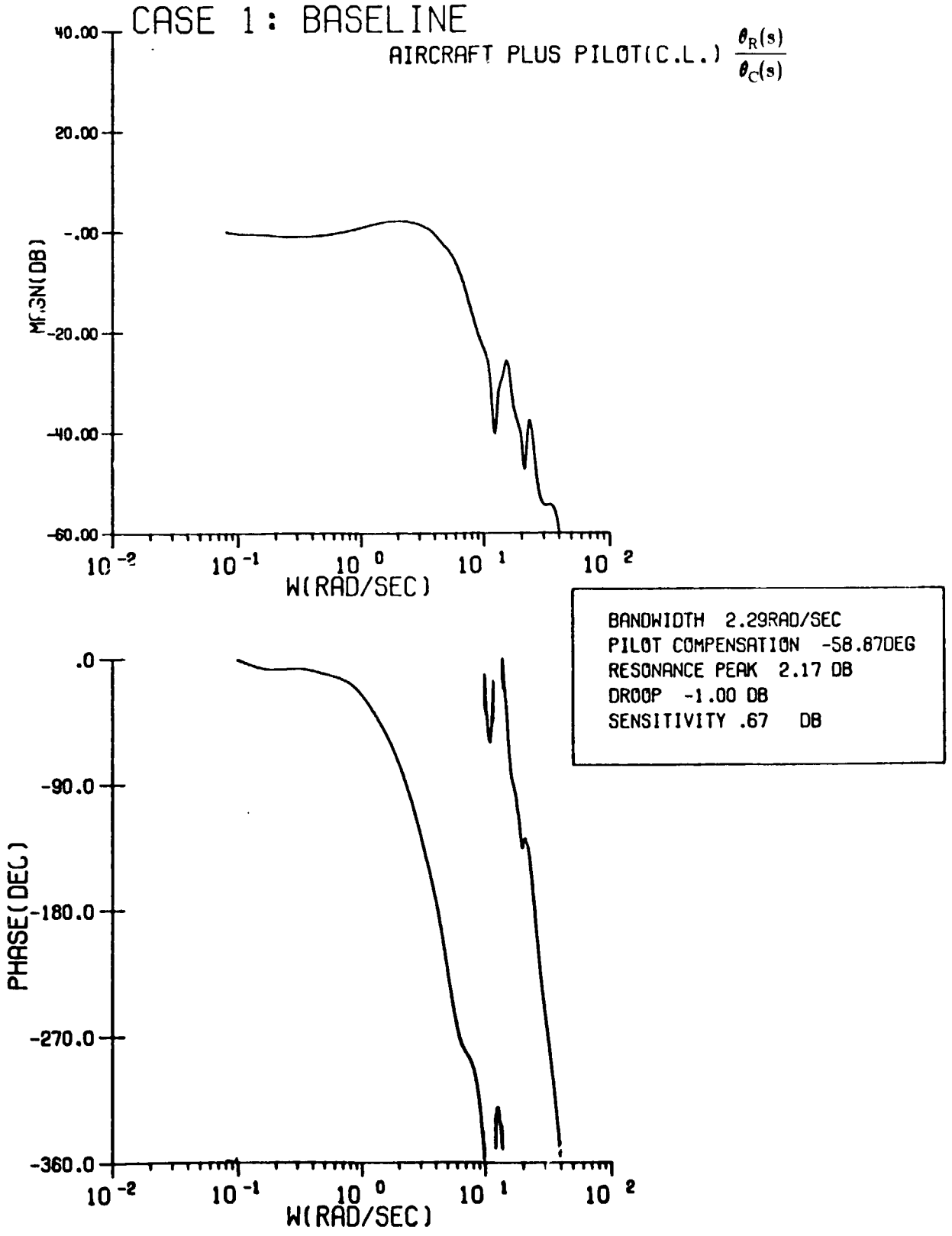


Figure A.5.1 (con't)
OCM Frequency Responses - Config. 1

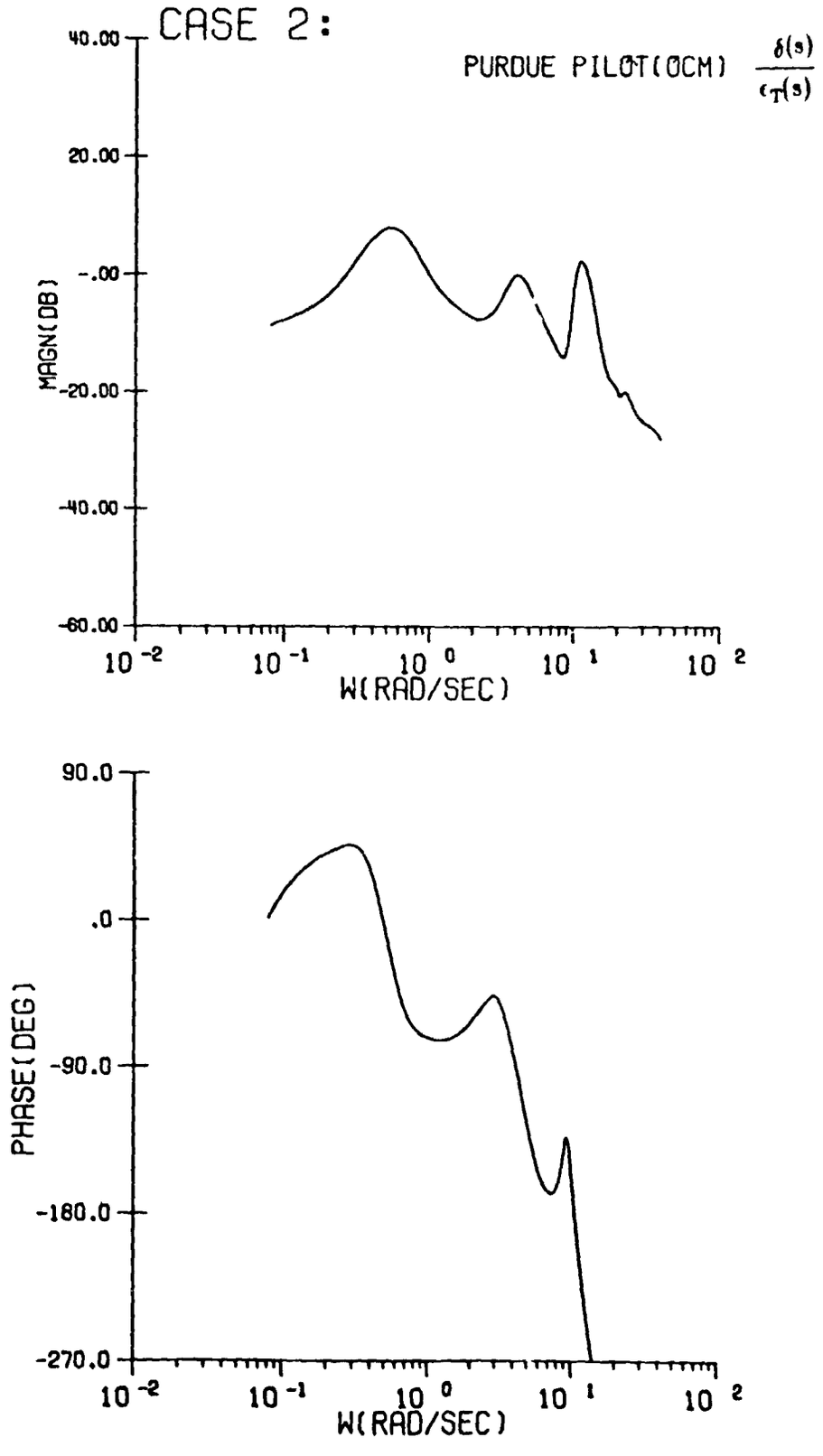


Figure A.5.2
OCM Frequency Responses - Config. 2

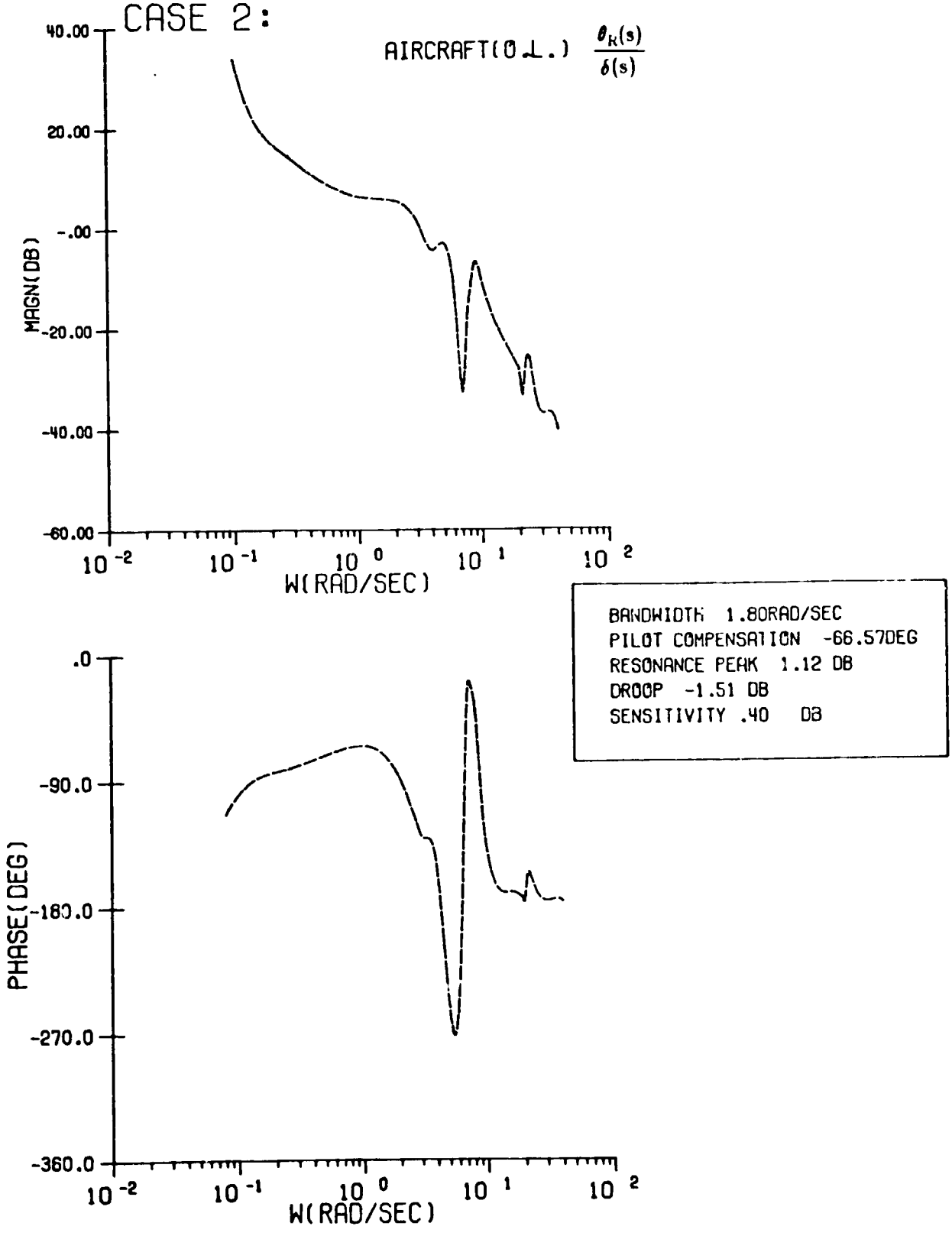


Figure A.5.2 (con't)
OCM Frequency Responses - Config. 2

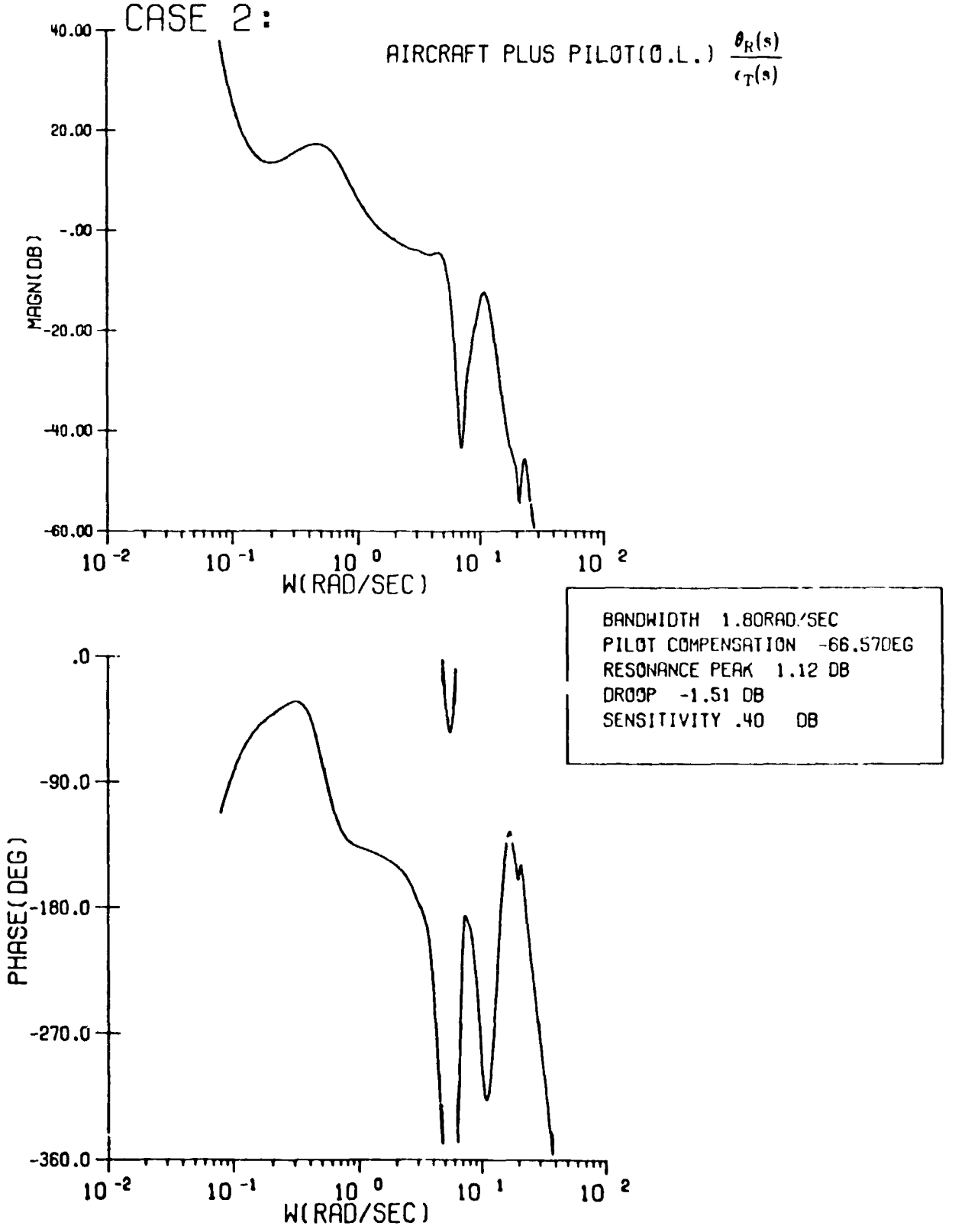


Figure A.5.2 (con't)
OCM Frequency Responses - Config. 2

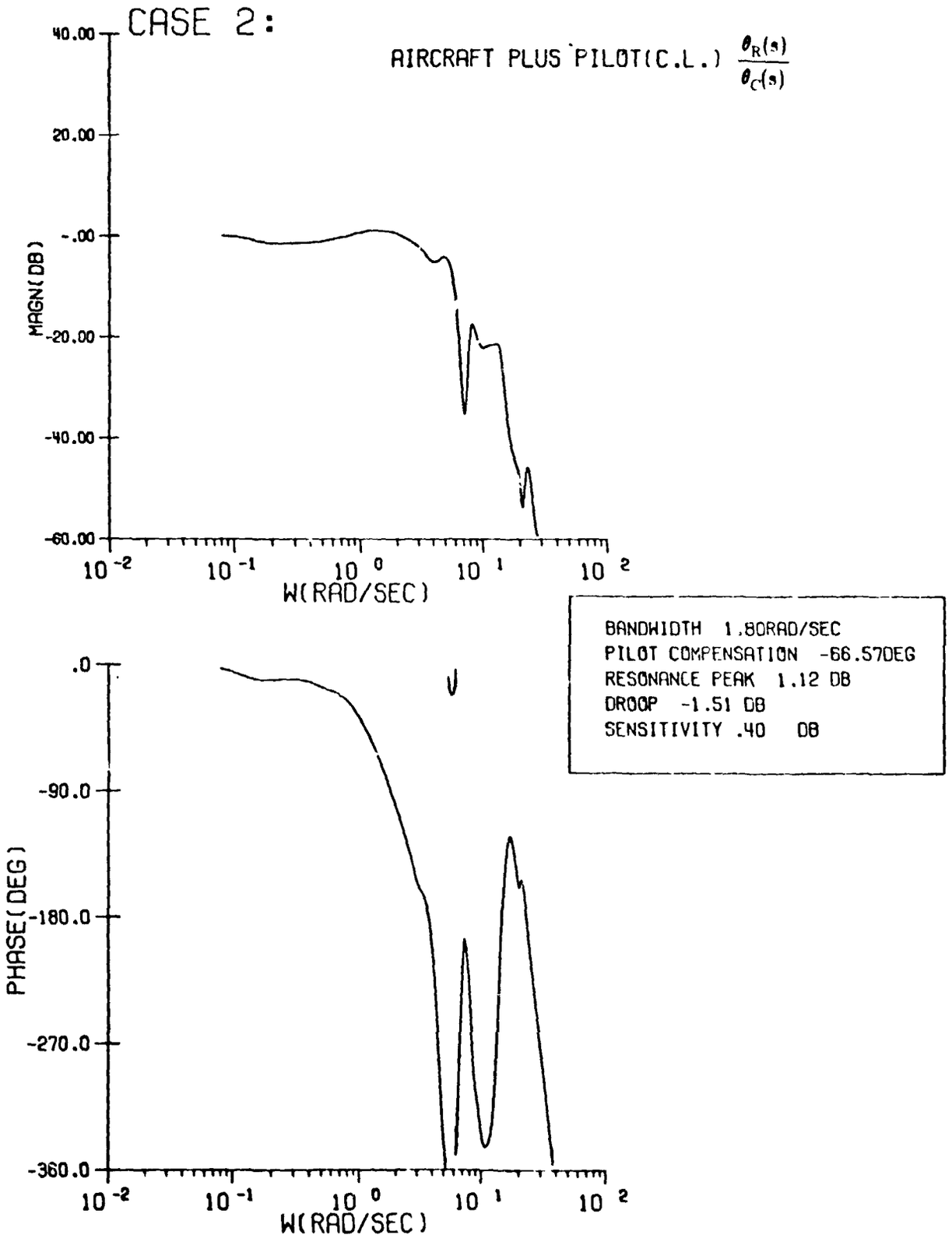


Figure A.5.2 (con't)
OCM Frequency Responses - Config. 2

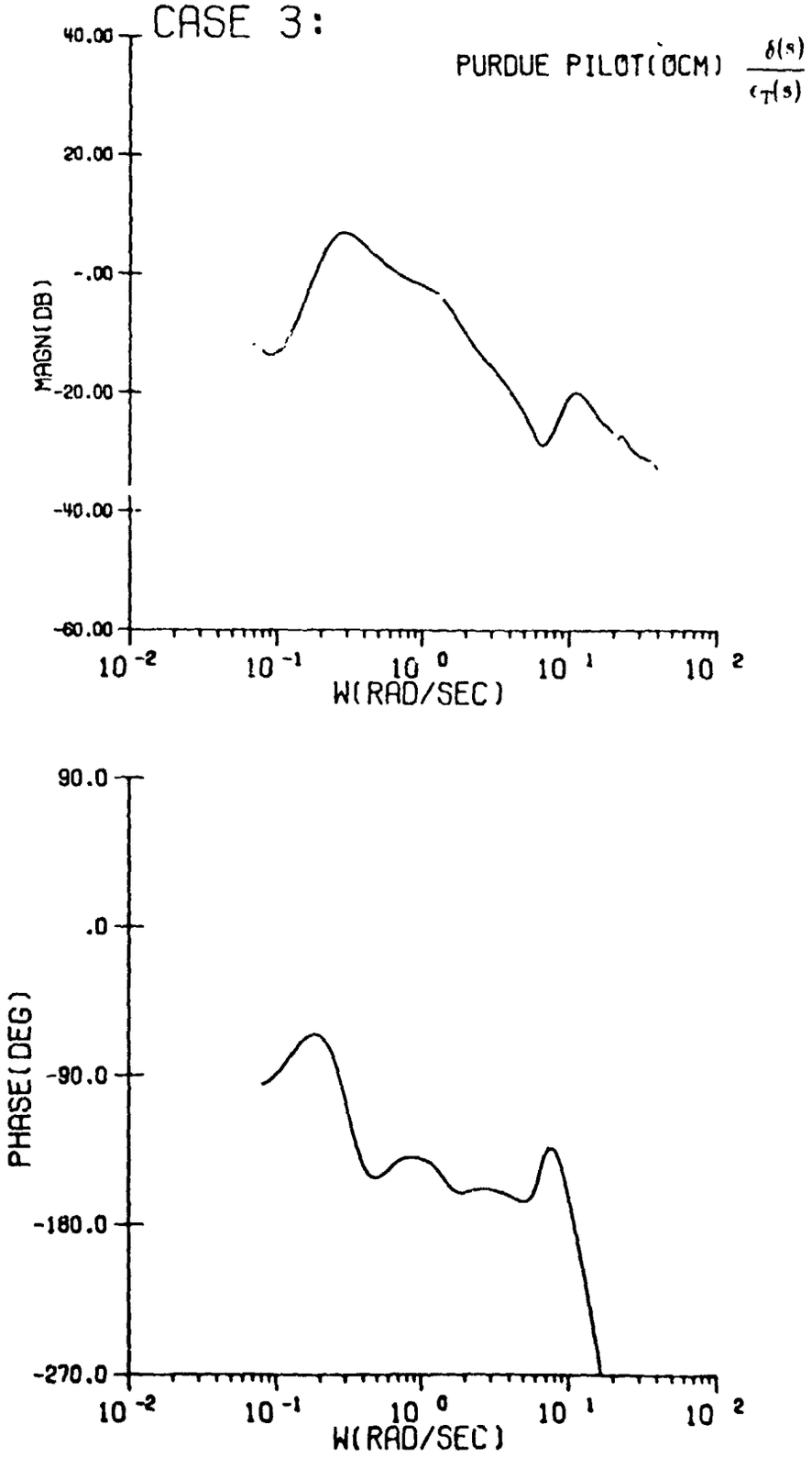


Figure A.5.3
OCM Frequency Responses - Config. 3

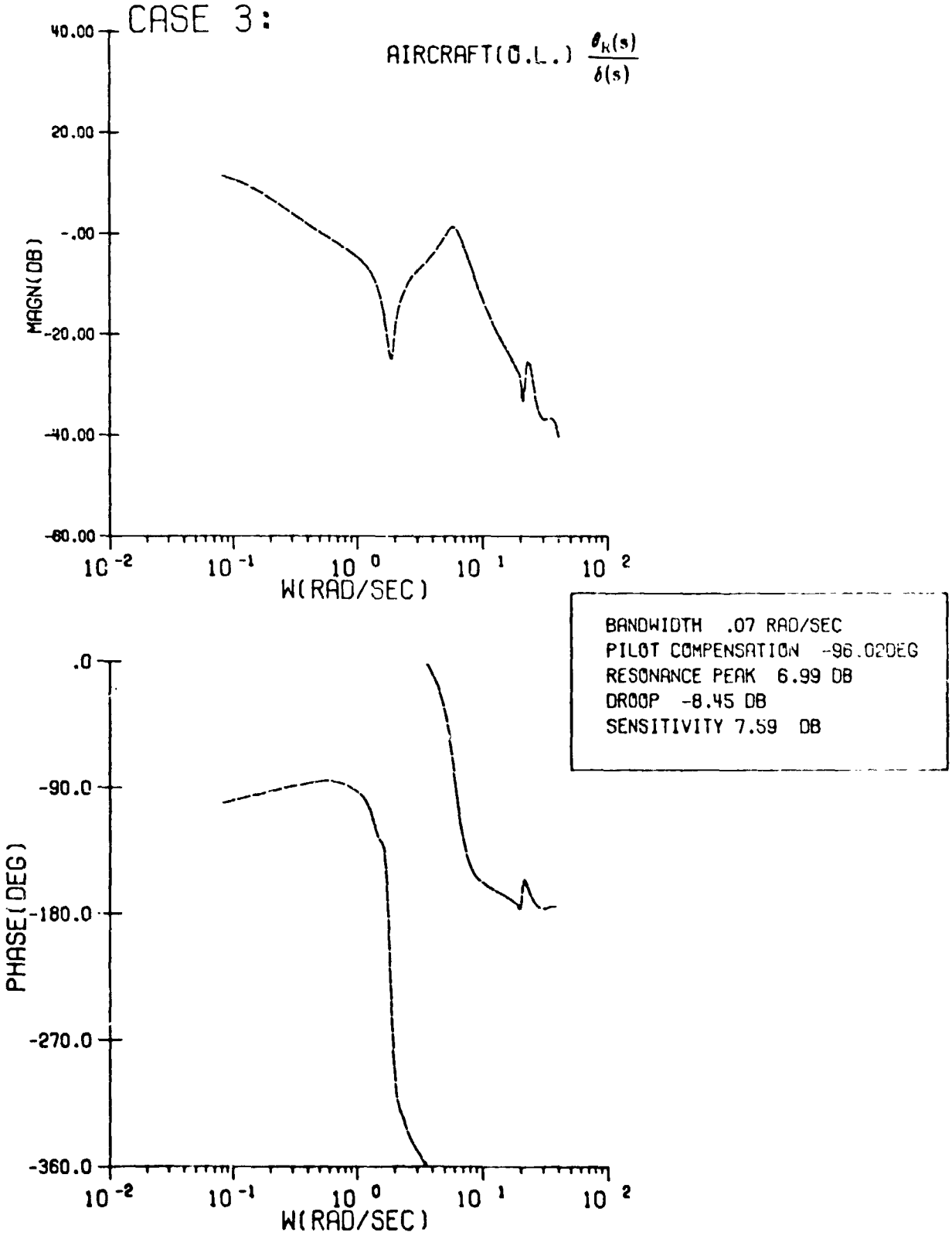


Figure A.5.3 (con't)
OCM Frequency Responses - Config. 3

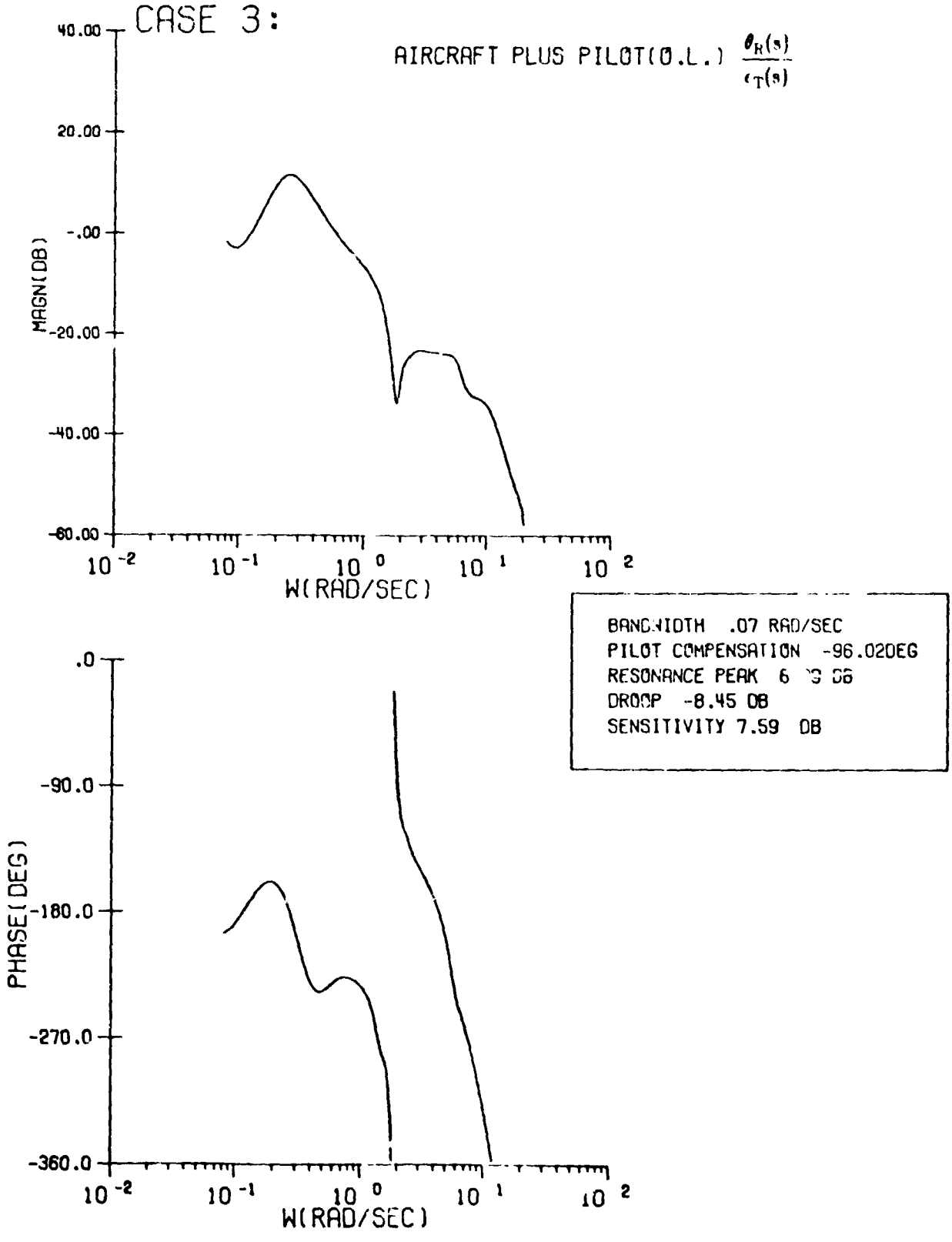


Figure A.5.3 (con't)
OCM Frequency Responses - Config 3

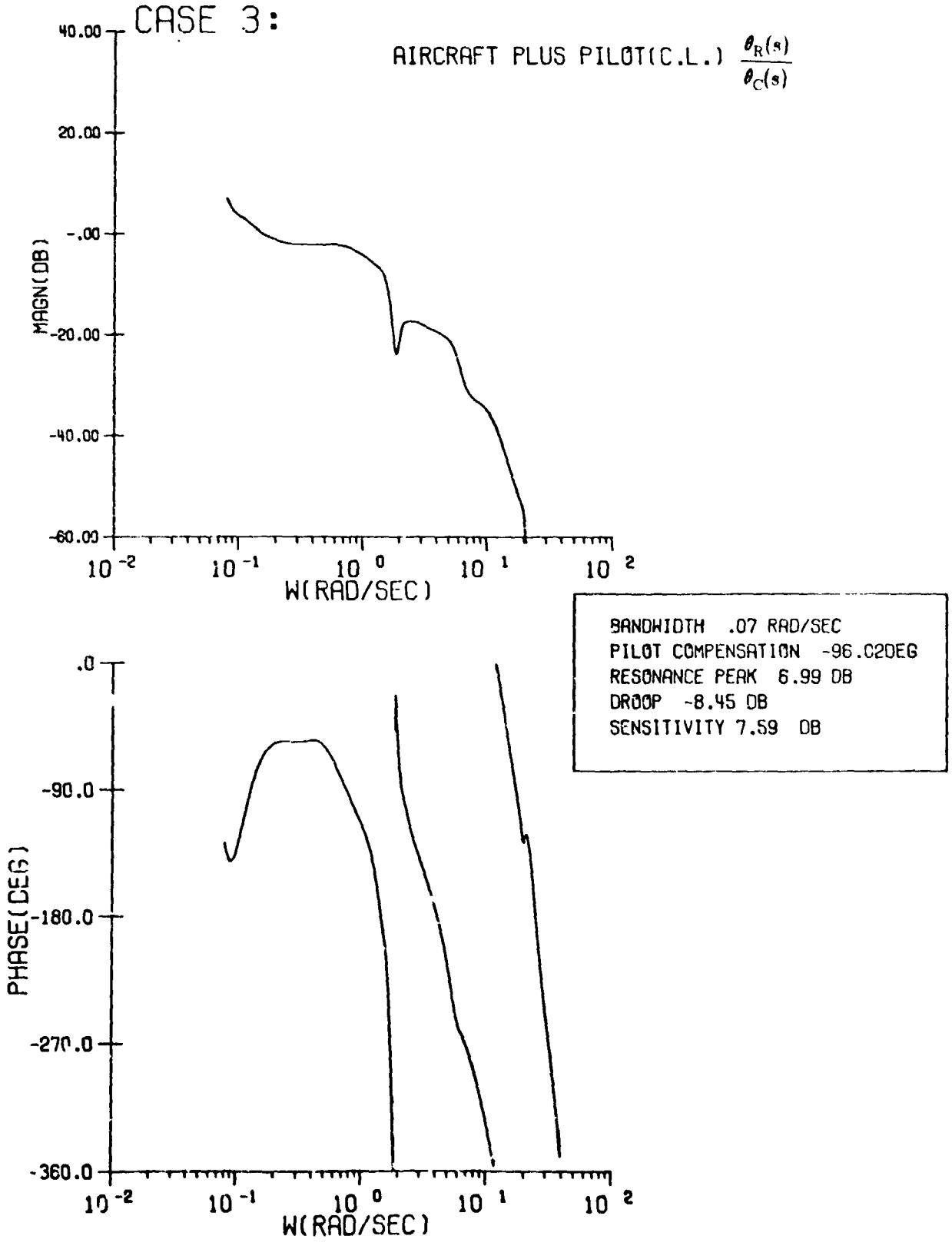


Figure A.3-2 (con't)
OCM Frequency Responses - Config. 3

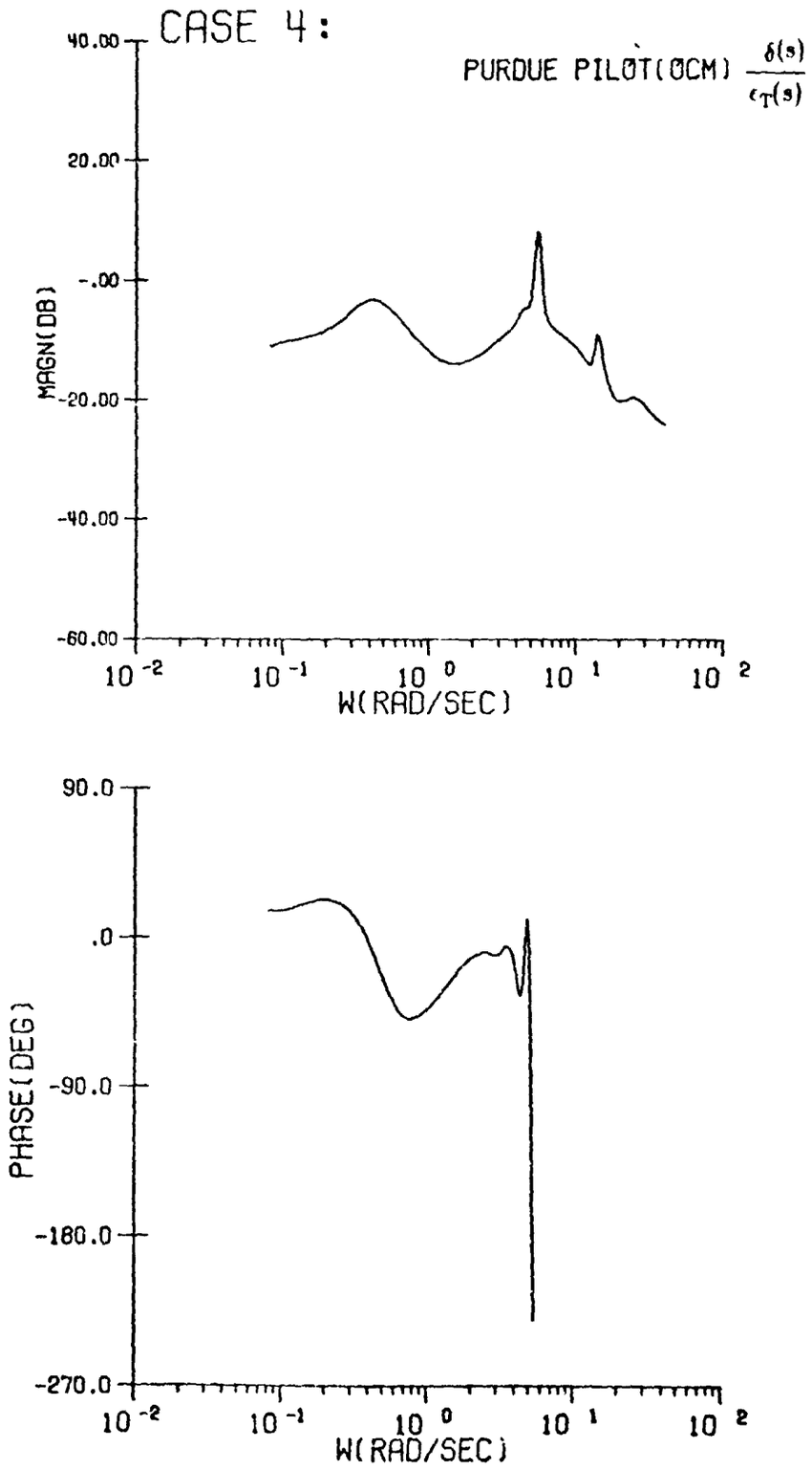


Figure A.5.4
OCM Frequency Responses - Config. 4

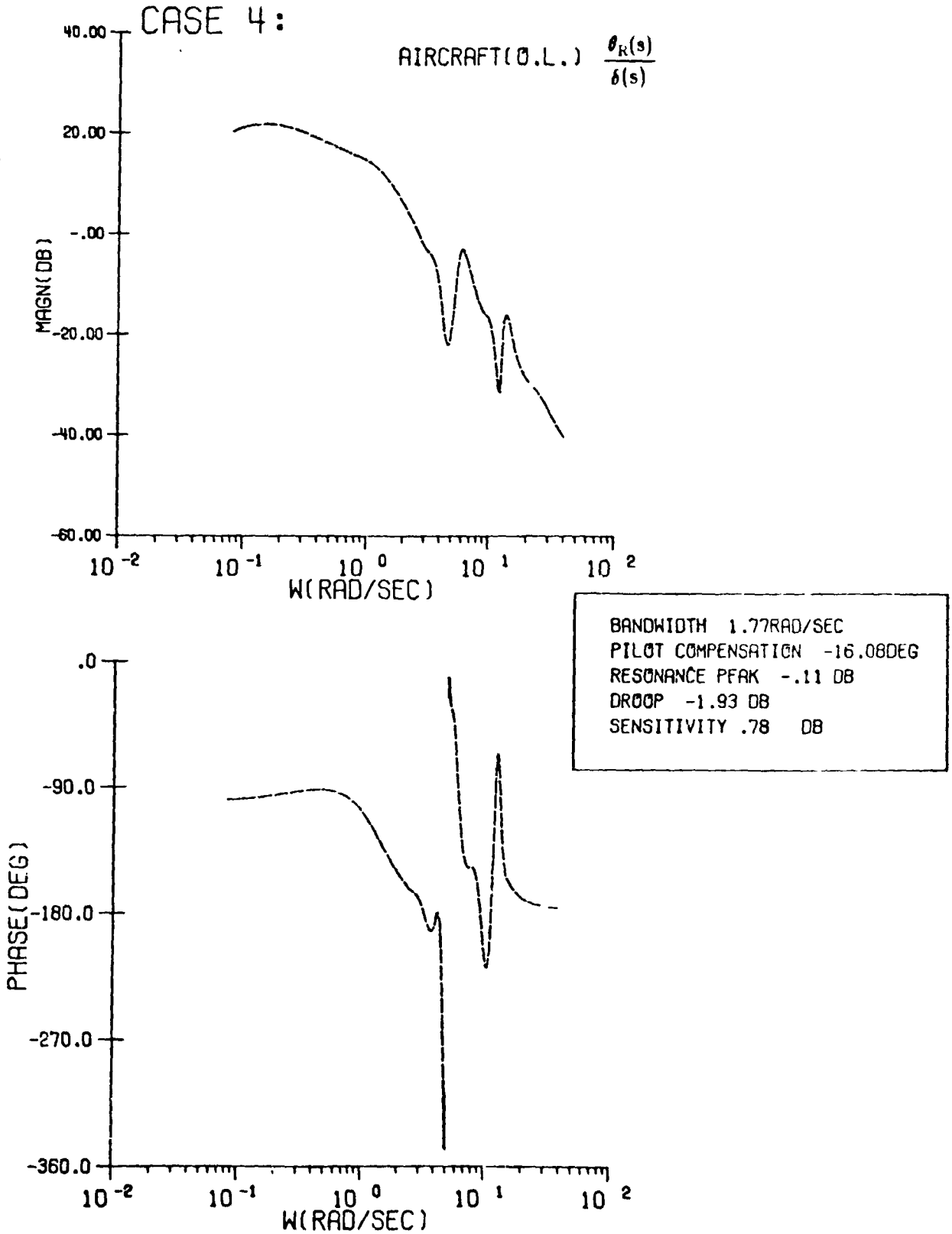


Figure A.5.4 (con't)
OCM Frequency Responses - Config. 4

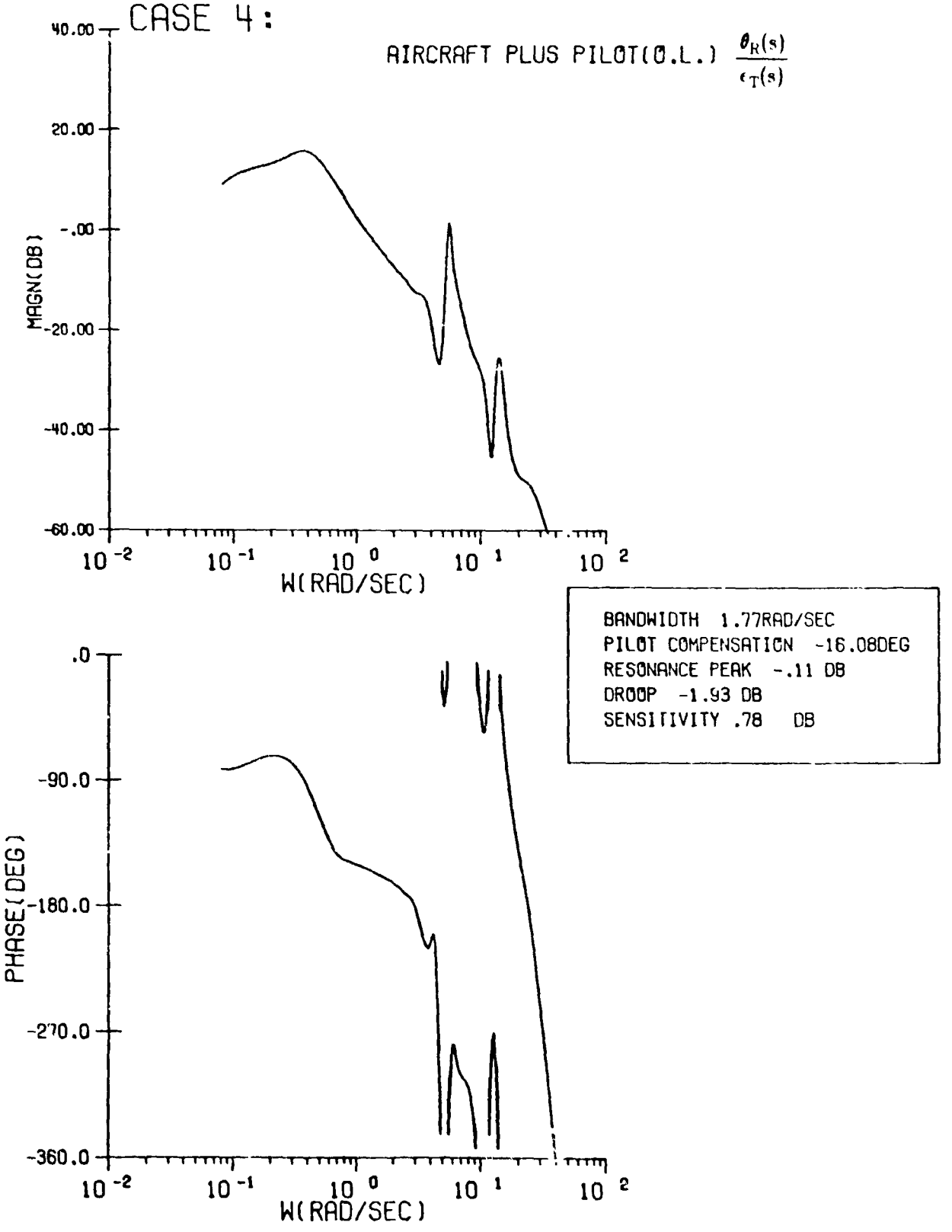


Figure A.5.4 (con't)
OCM Frequency Responses - Config. 4

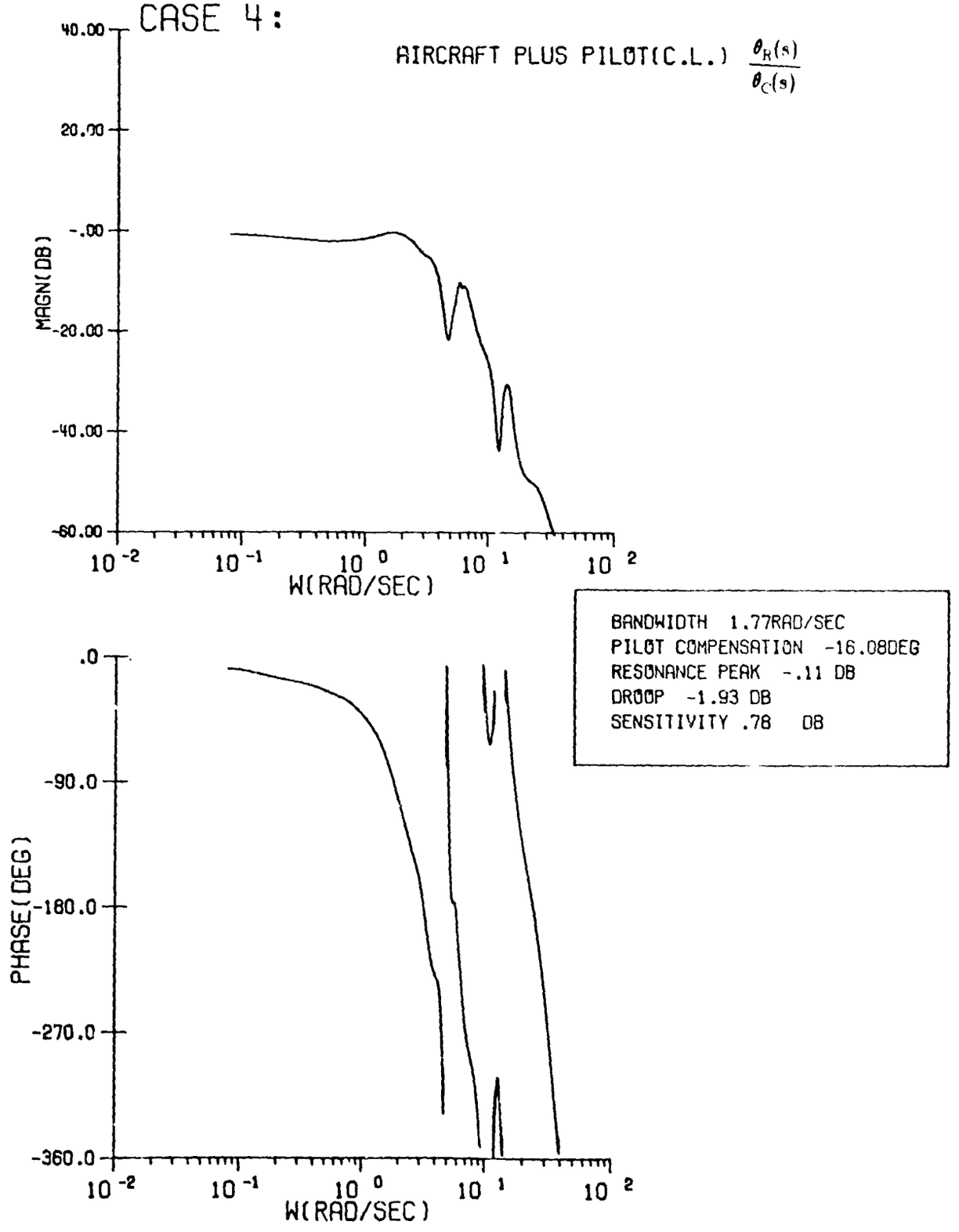


Figure A.5.4 (con't)
OCM Frequency Responses - Config. 4

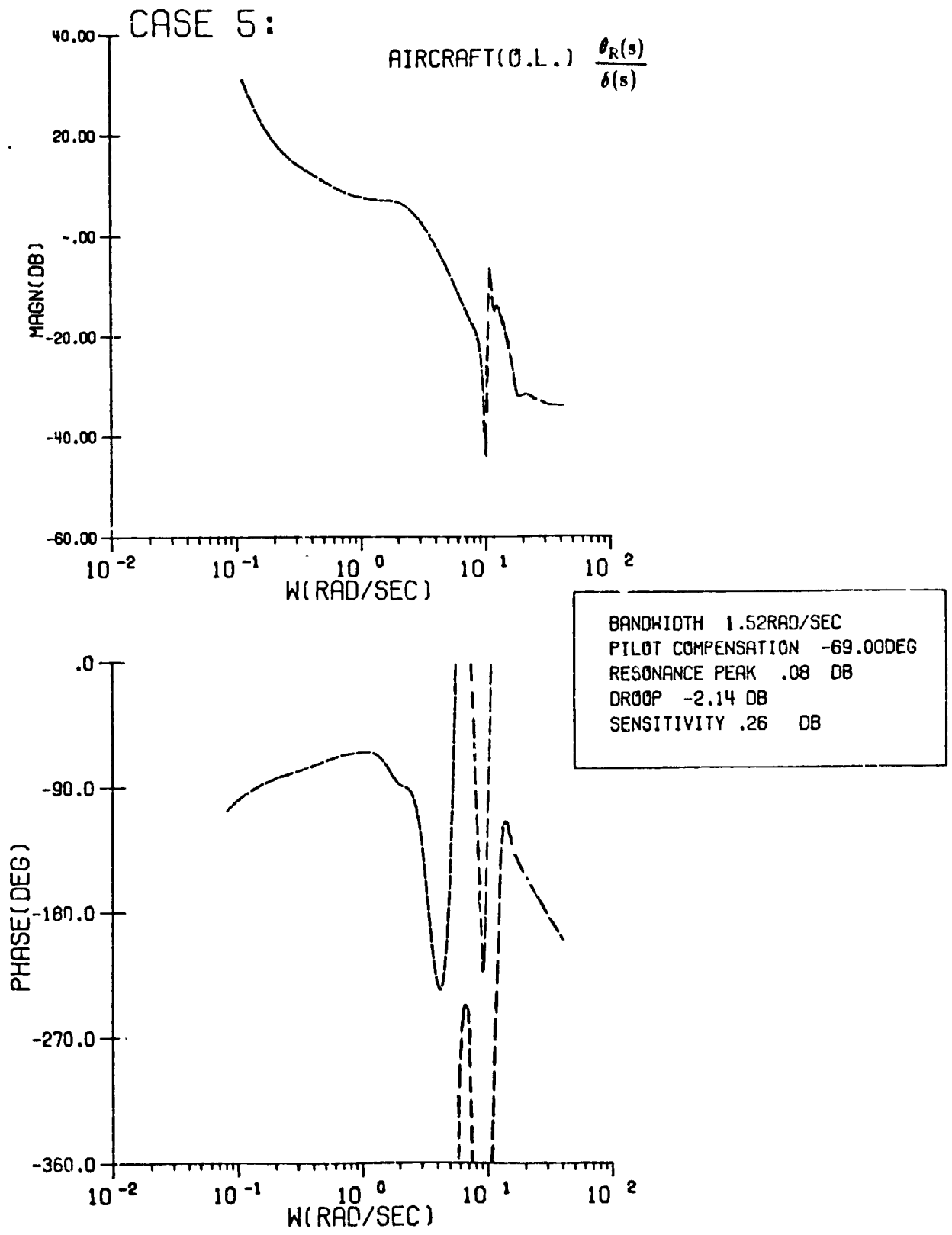


Figure A.5.5 (con't)
OCM Frequency Responses - Config. 5

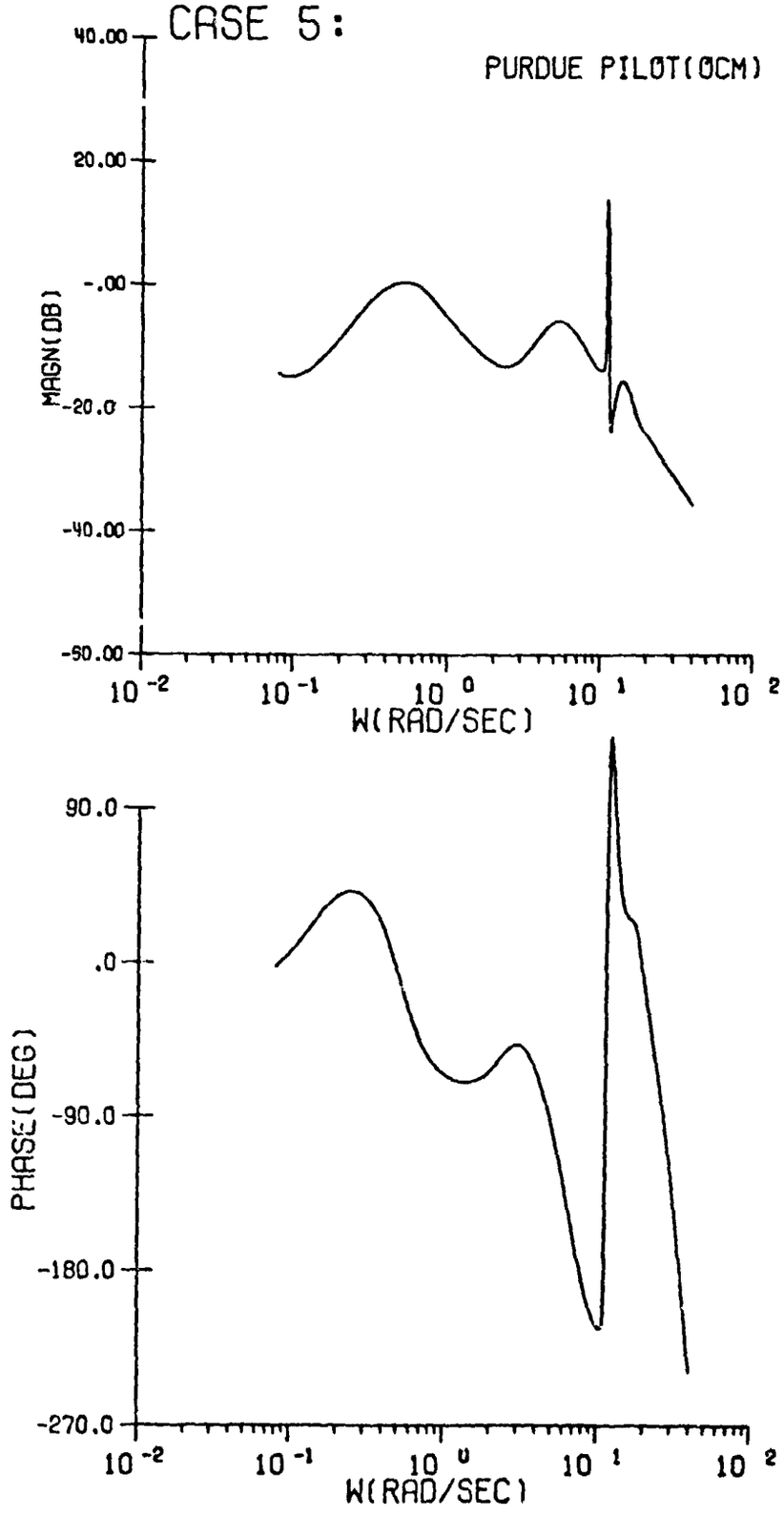


Figure A.5.5
OCM Frequency Responses - Config. 5

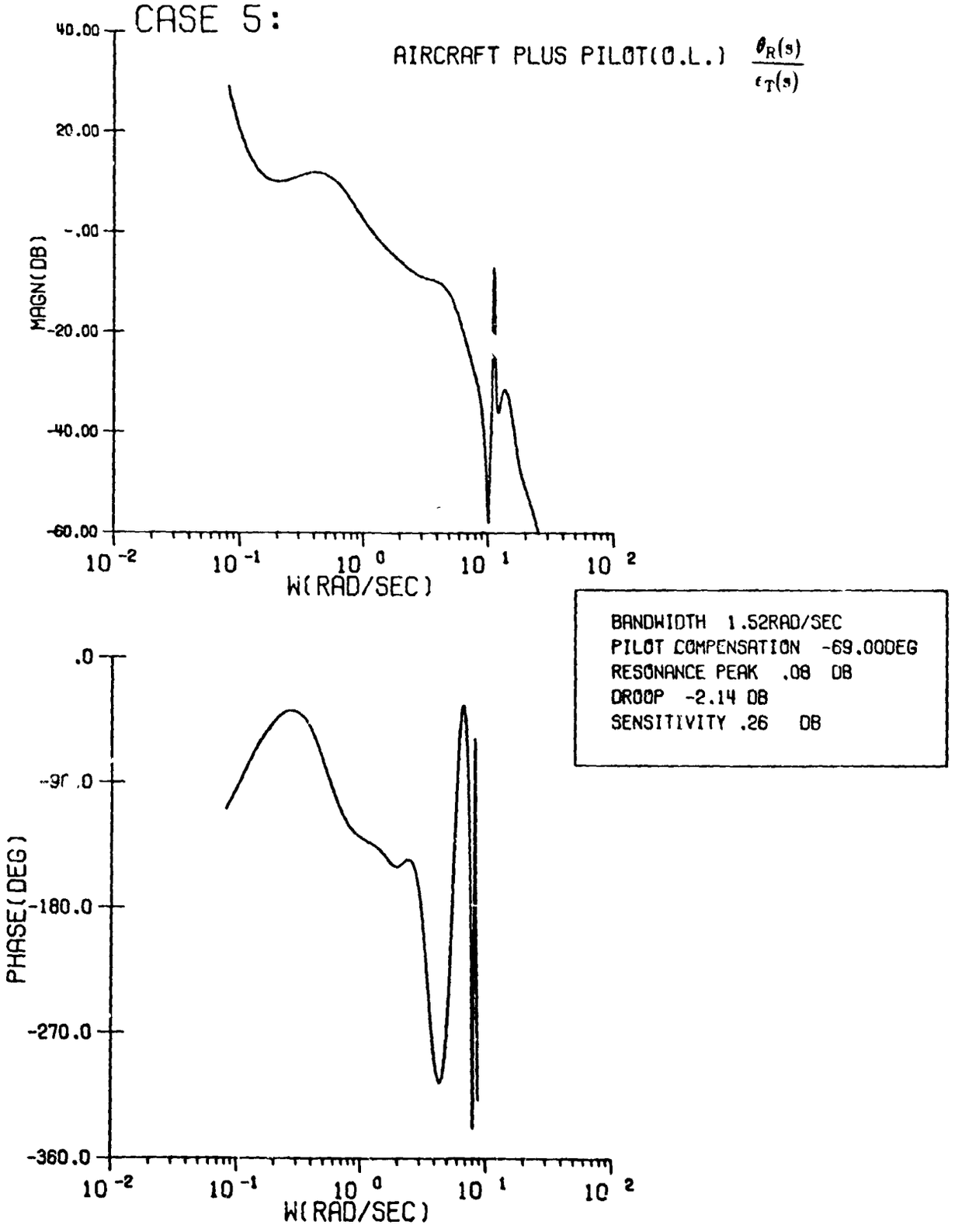


Figure A.5.5 (con't)
OCM Frequency Responses - Config. 5

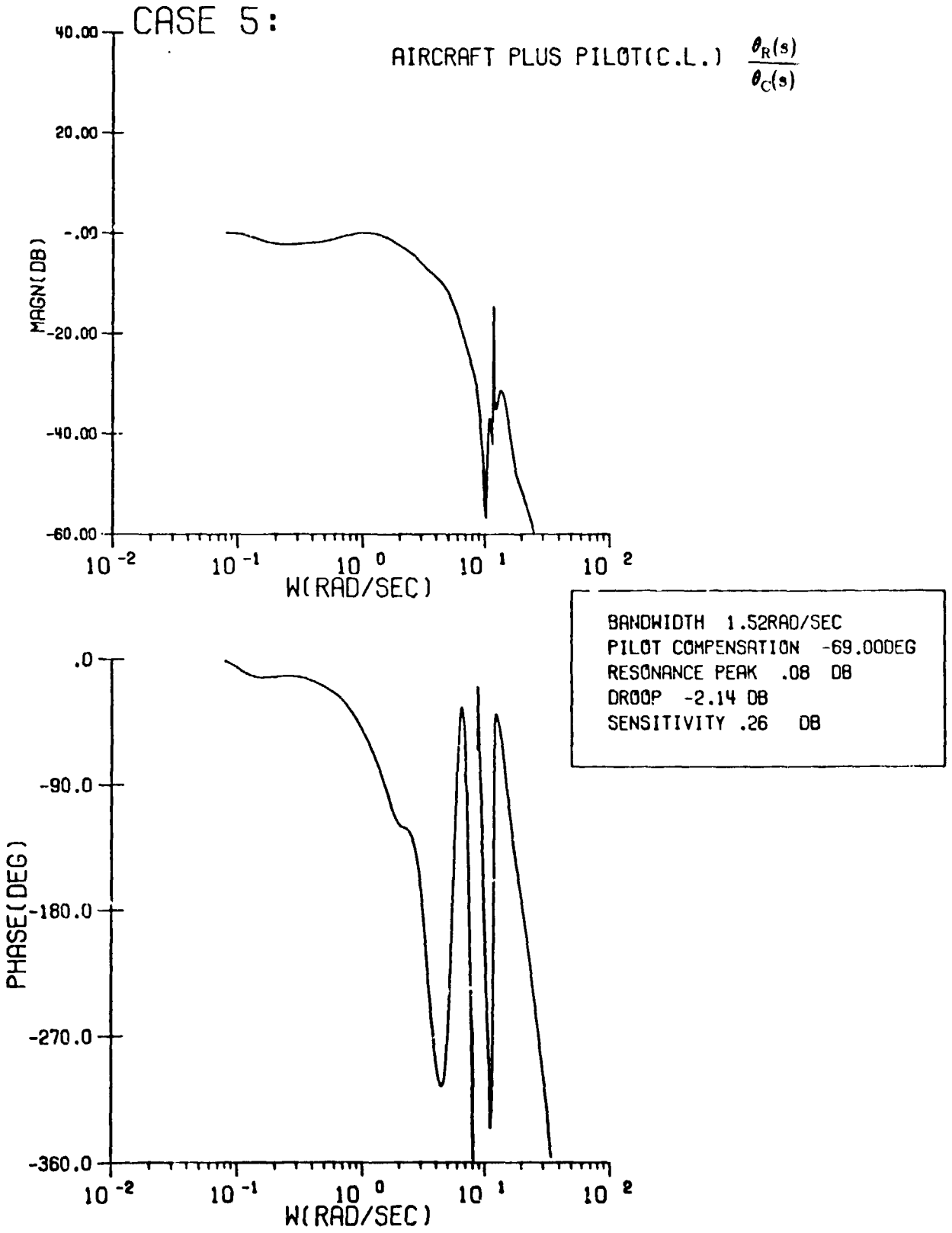


Figure A.5.5 (con't)
OCM Frequency Responses - Config. 5

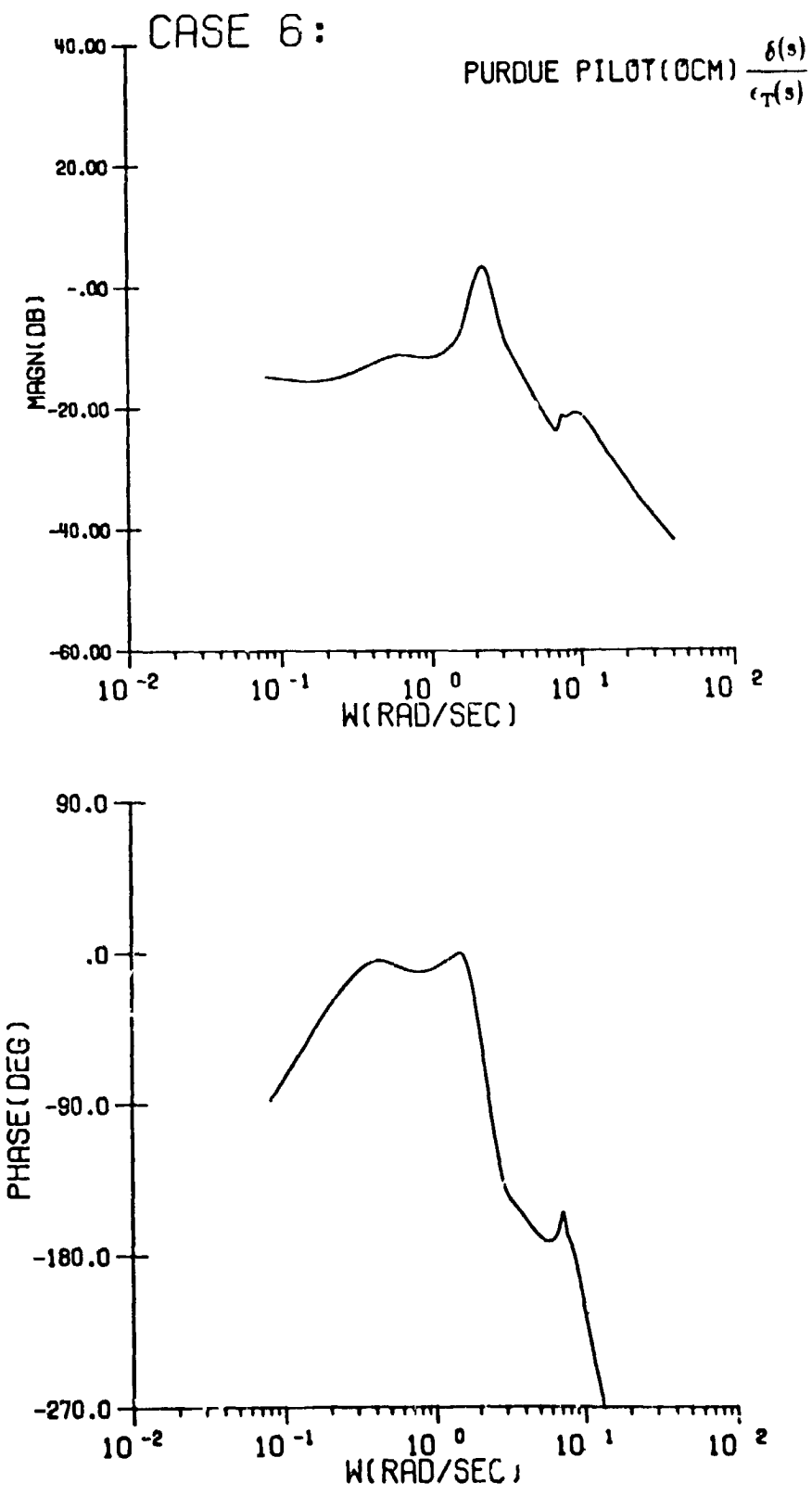


Figure A.5.6
OCM Frequency Responses - Config. 6

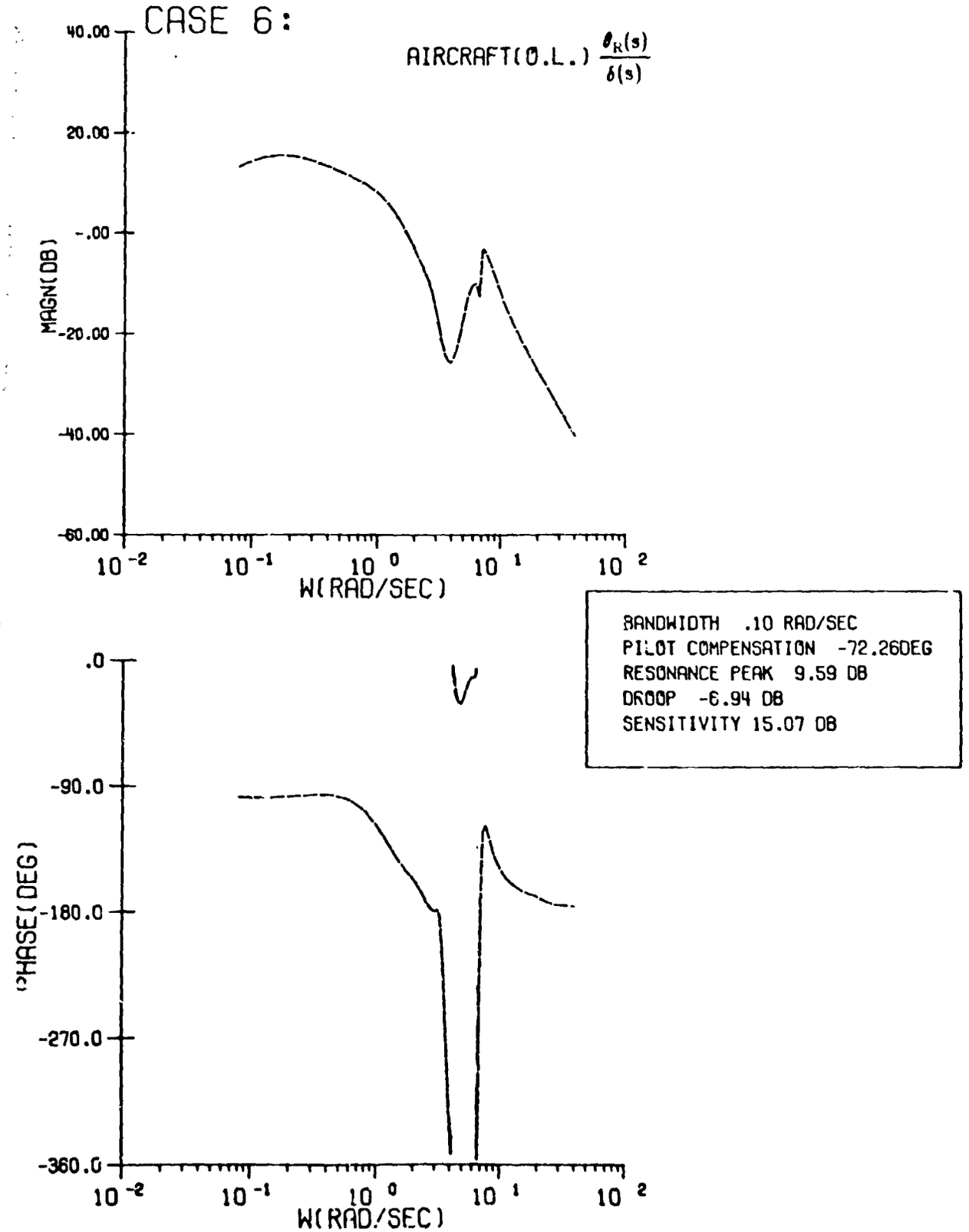


Figure A.5 6 (con't)
OCM Frequency Responses - Config. 6

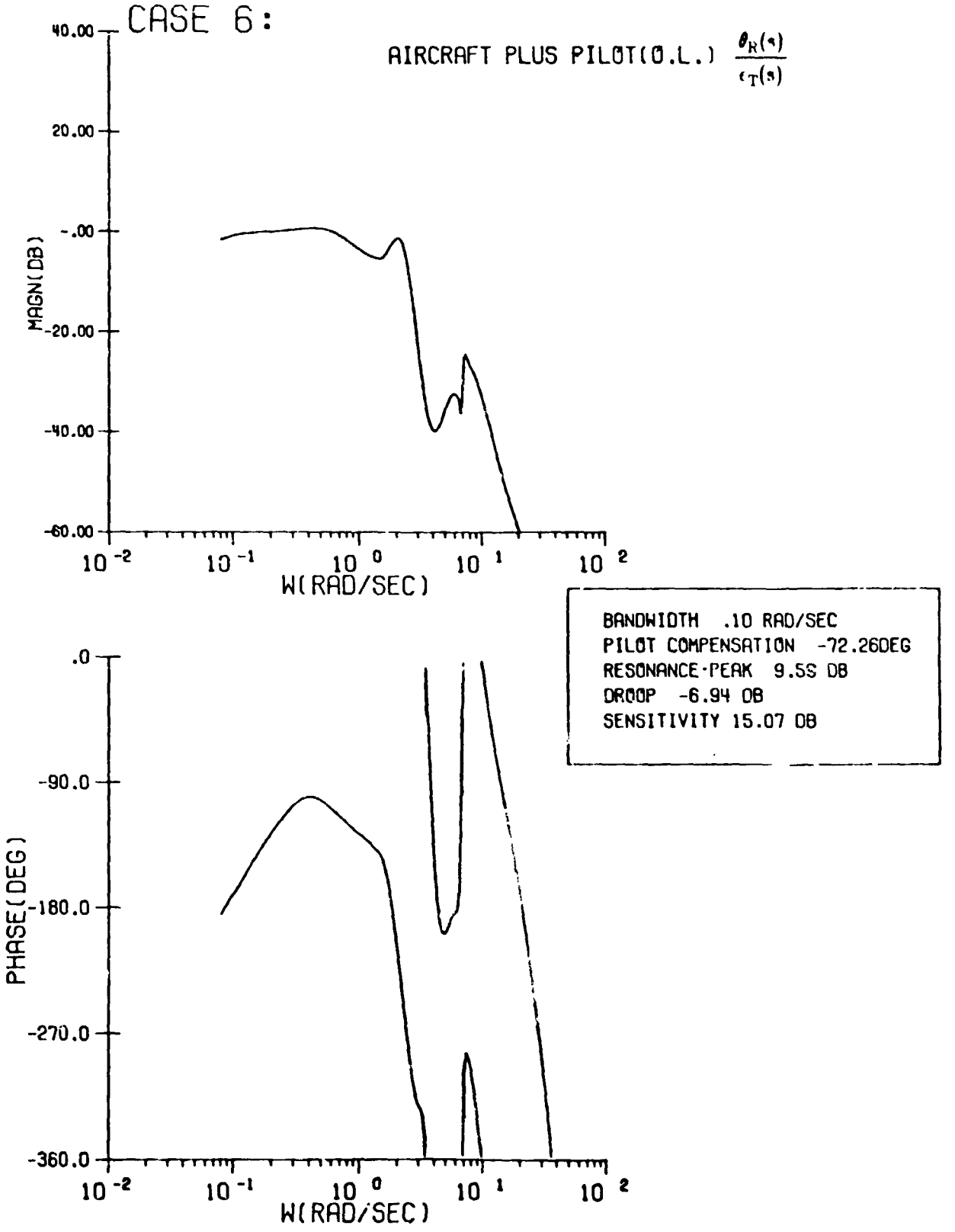


Figure A.5.6 (con't)
OCM Frequency Responses - Config. 6

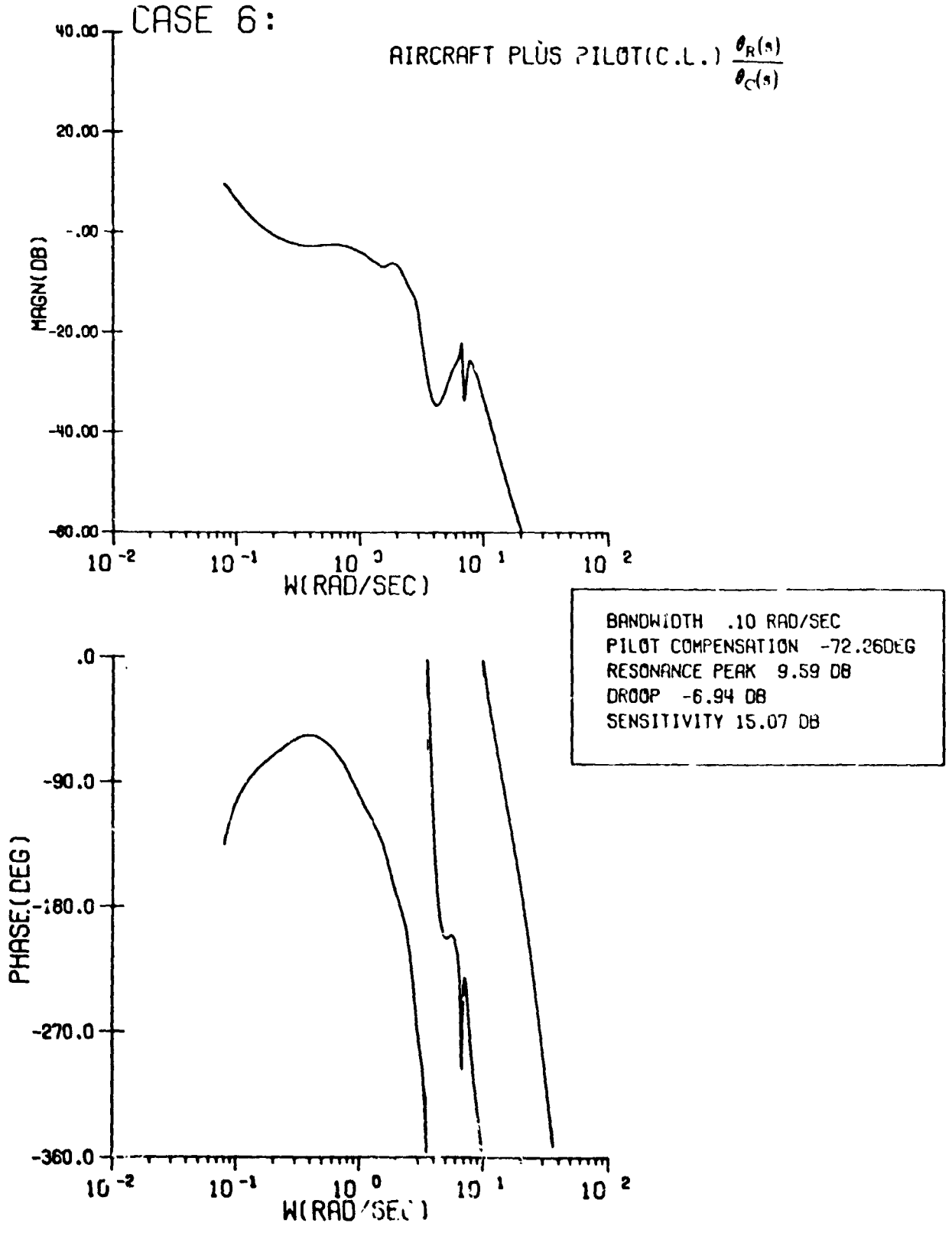


Figure A.5.6 (cont)
OCM Frequency Responses - Config. 6

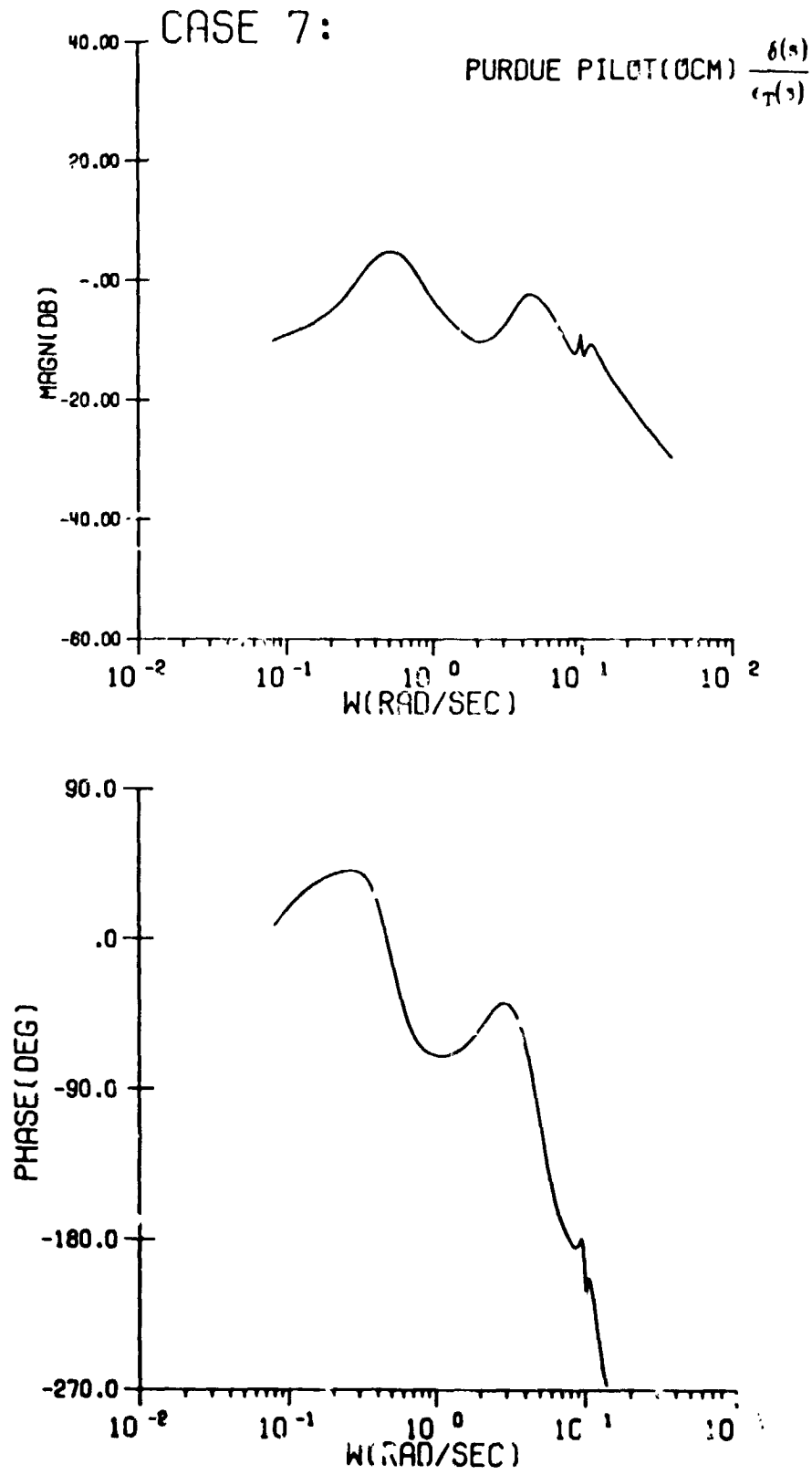


Figure A.5.7
OCM Frequency Responses - Config. 7

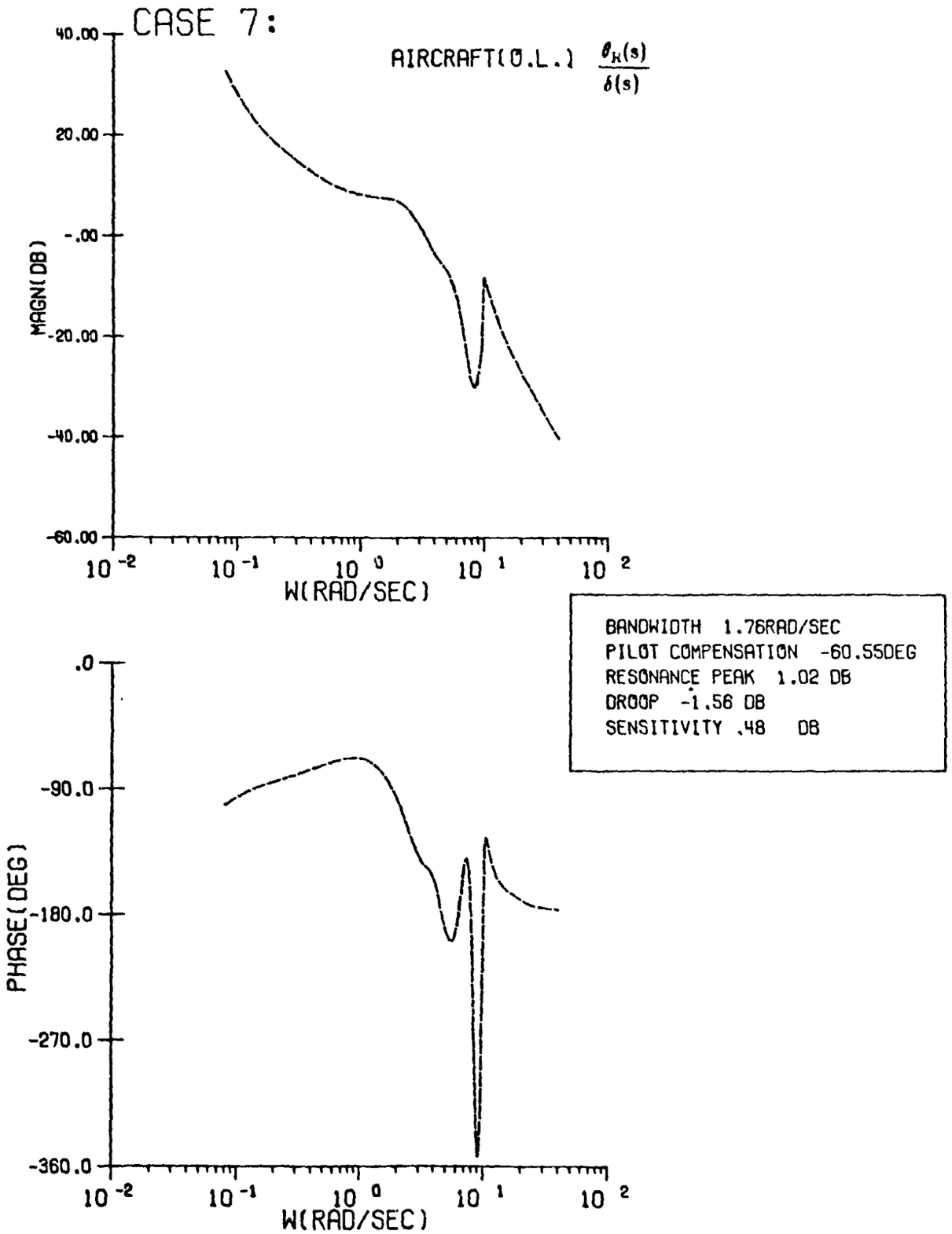


Figure A.5.7 (con't)
OCM Frequency Responses - Config. 7

C-3

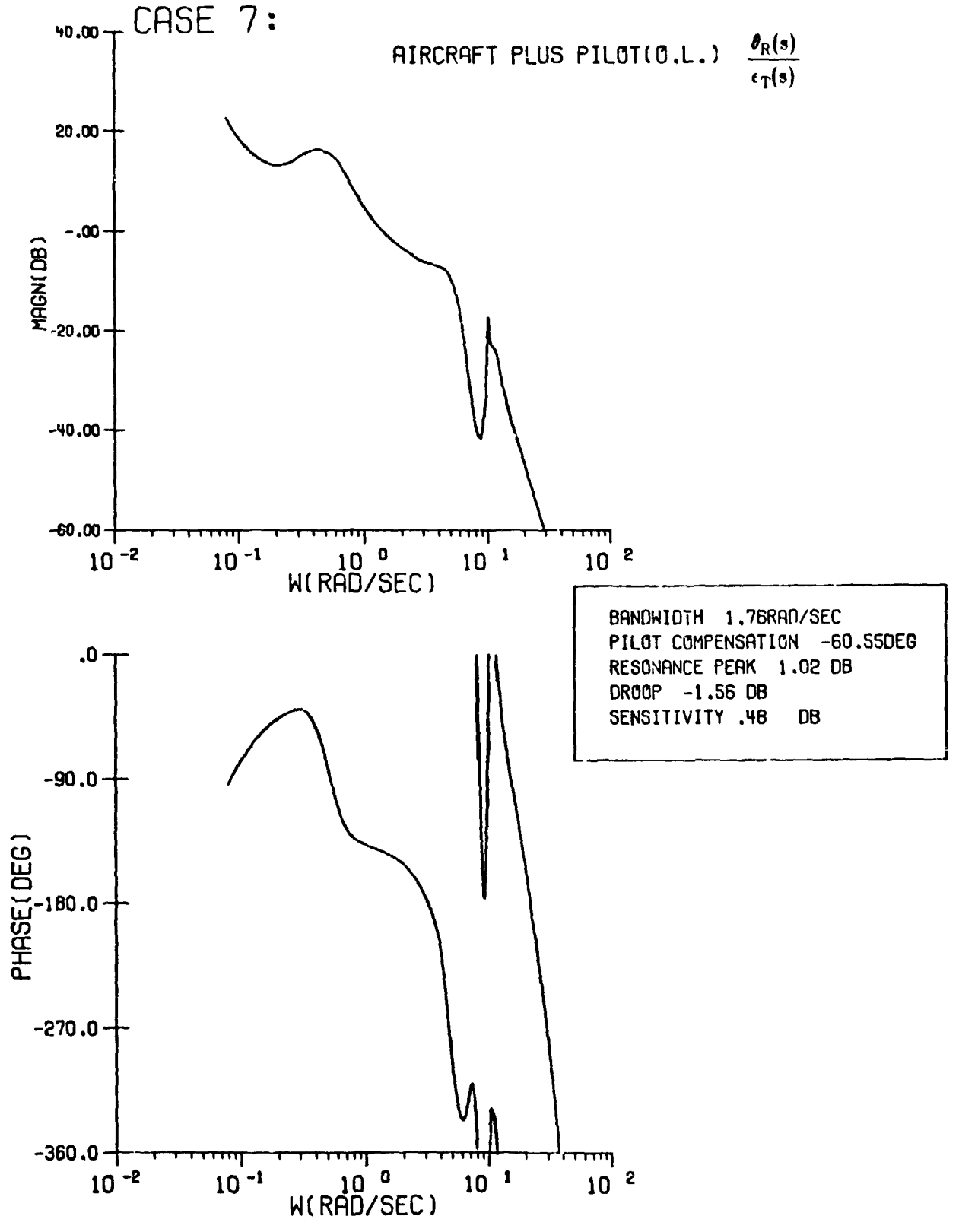


Figure A.5.7 (con't)
OCM Frequency Responses - Config. 7

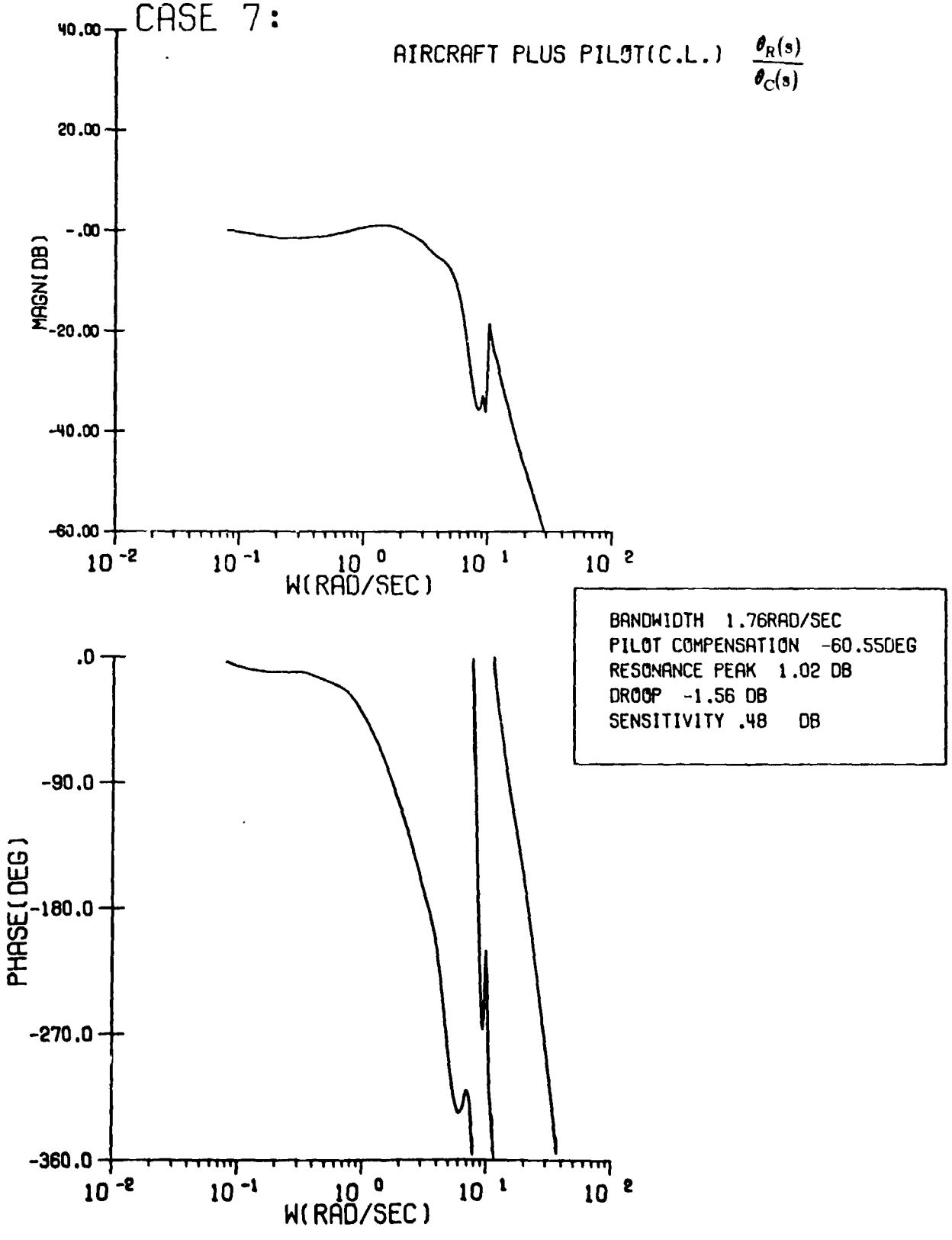


Figure A.5.7 (con't)
CCM Frequency Responses - Config. 7

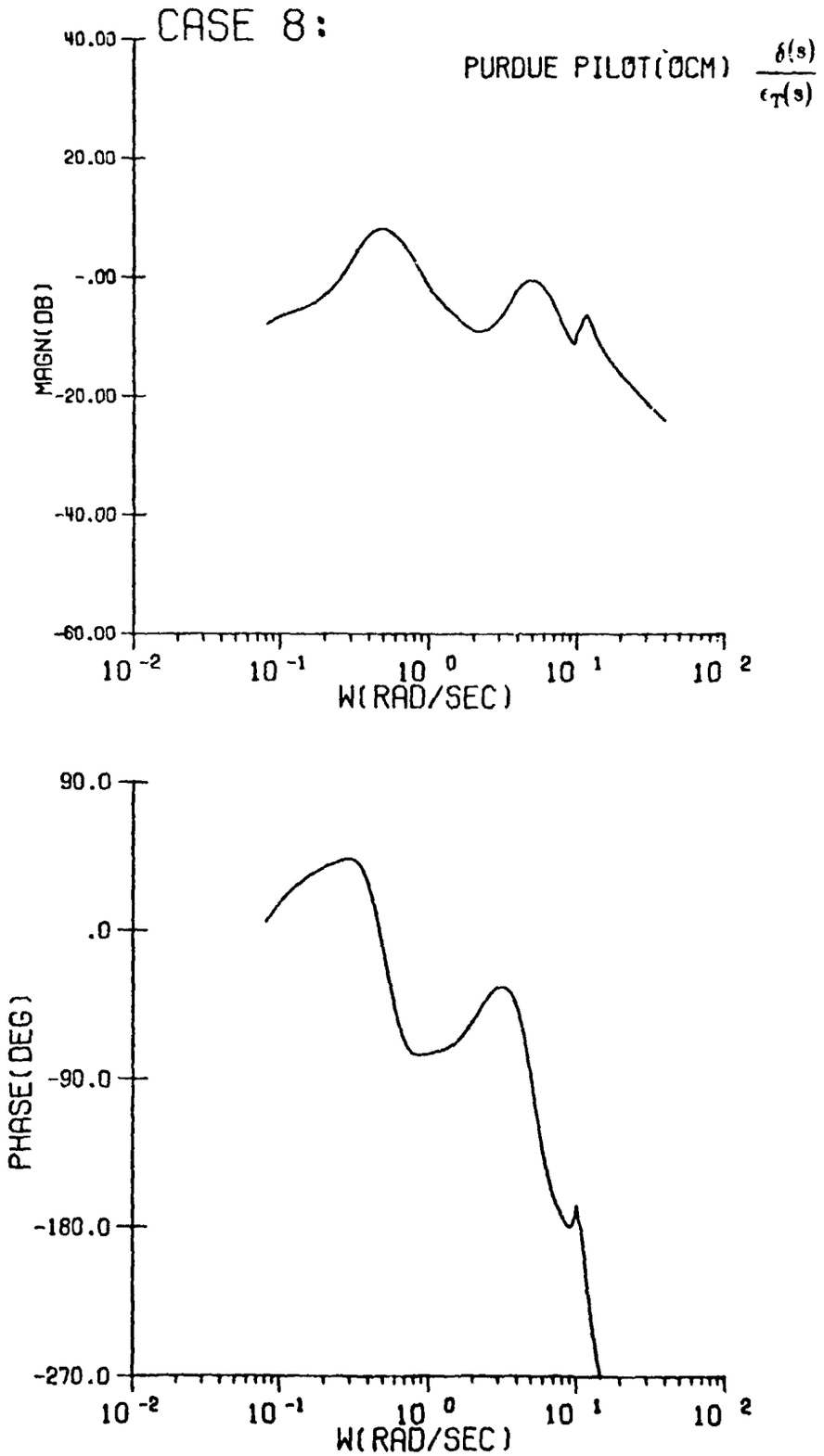


Figure A.5.8
OCM Frequency Responses - Config. 8

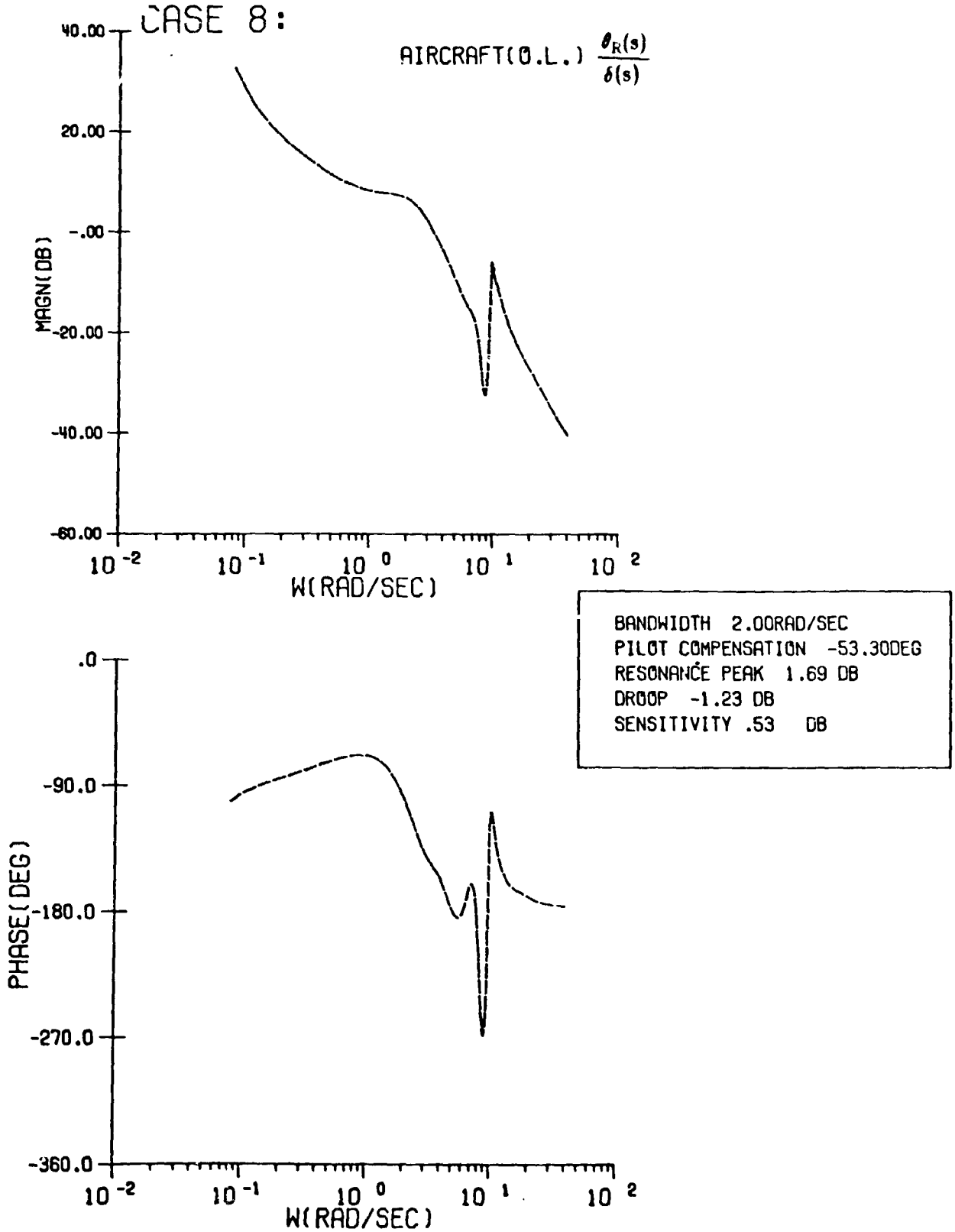


Figure A.5.8 (con't)
OCM Frequency Responses - Config. 8

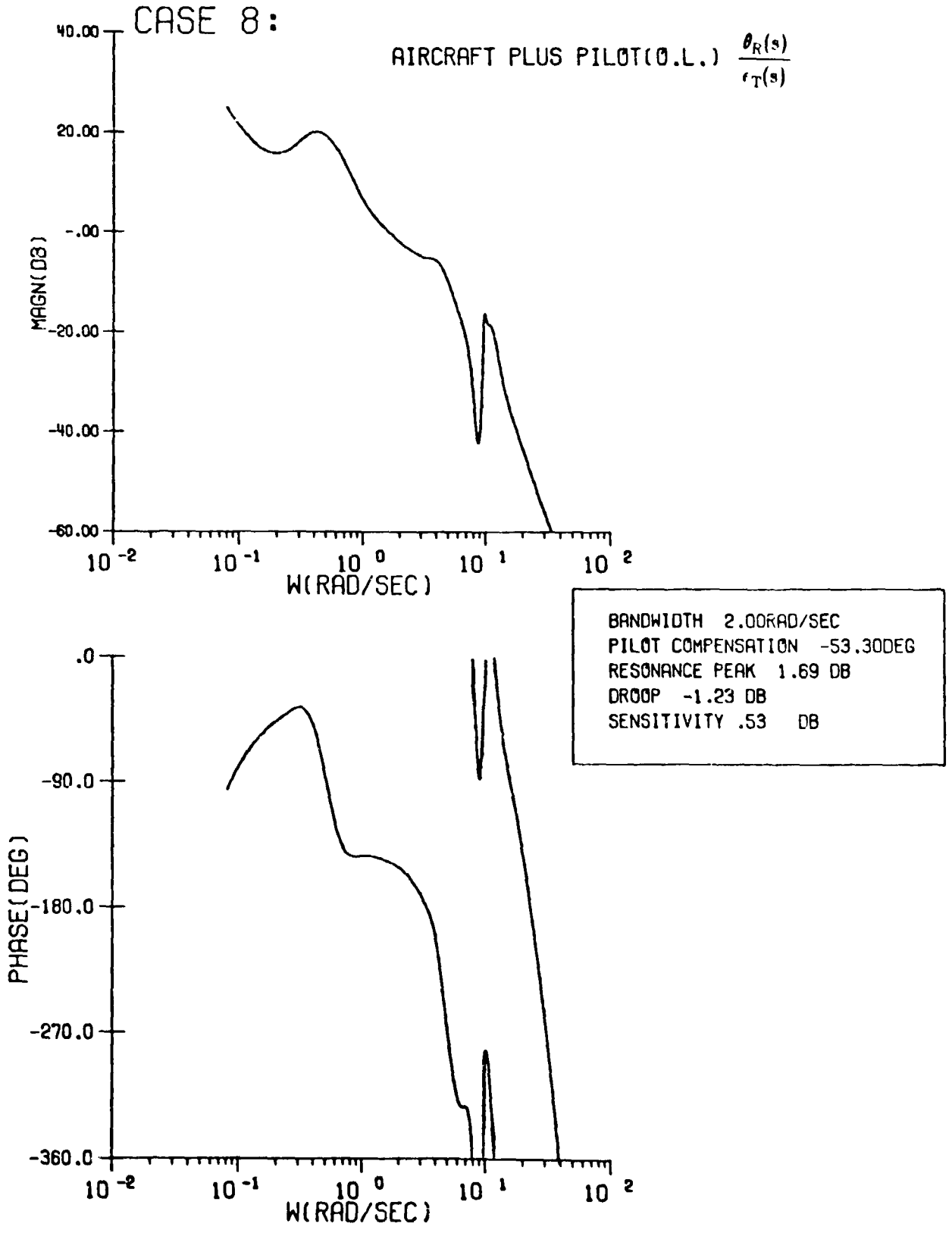


Figure A.5.8 (con't)
OCM Frequency Responses - Config. 8

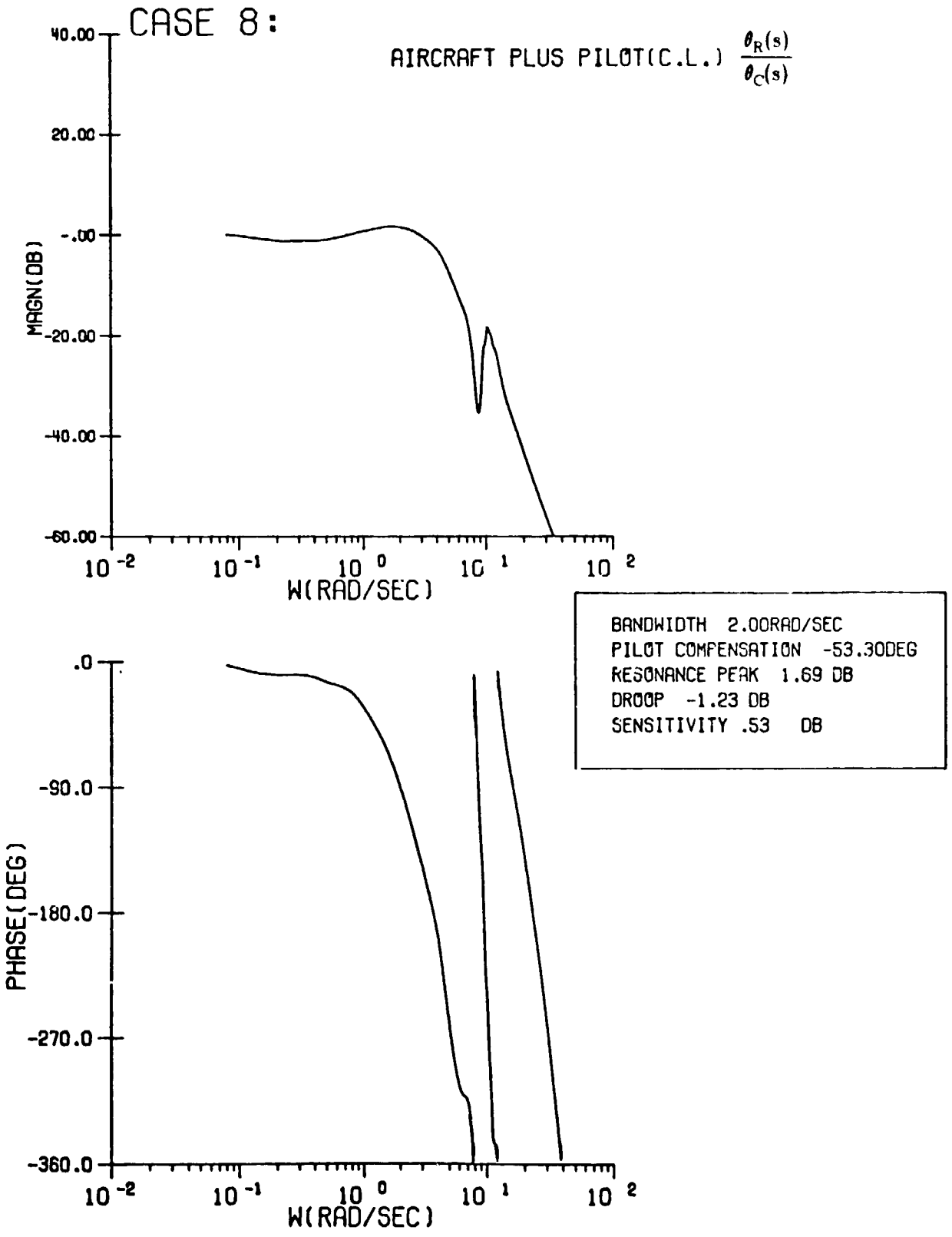


Figure A.5.8 (con't)
OCM Frequency Responses - Config. 8

Appendix A.6
Listing of Modal Analysis Program

The modal analysis computer program which was used for the open-loop analysis method is presented here. This program is written in FORTRAN and makes use of a modular structure to simplify its use and to allow the reader to more easily follow the procedure. Documentation is integrated with the code and a variable name listing and description is included to further aide the reader.

Even though the program was written to be flexible, it is based on a linear system analysis package of subroutines that is unique to the Purdue computer system. The package was developed at Purdue and is entitled LSLIB.

LIST OF VARIABLES USED IN MODAL ANALYSIS PROGRAM

VARIABLE NAME	VARIABLE TYPE	DESCRIPTION
A	REAL	UTILITY VARIABLE USED IN SUBROUTINE PHAG
AA	REAL ARRAY	AUGMENTED SYSTEM MATRIX
AG	REAL ARRAY	GUST EQUATION SYSTEM MATRIX
AMASE	REAL ARRAY	ARRAY USED IN FORMING MAG/PHASE FORM OF COMPLEX MATRICES
AP	REAL ARRAY	PILOT EQUATION SYSTEM MATRIX
ARRAY	REAL ARRAY	UTILITY ARRAY USED IN SUBROUTINE PHAG
AS	REAL ARRAY	UTILITY ARRAY USED IN SCALING MATRIX AU
AU	REAL ARRAY	VEHICLE EQUATION SYSTEM MATRIX
B	REAL ARRAY	VEHICLE EQUATION CONTROL MATRIX
B	REAL	UTILITY VARIABLE USED IN SUBROUTINE PHAG
BB	REAL ARRAY	AUGMENTED CONTROL MATRIX - USED ONLY IF THE PILOT CHARACTERISTICS ARE NOT BEING MODELED IN THE ANALYSIS
BS	REAL ARRAY	UTILITY ARRAY USED IN SCALING MATRIX B
C	REAL ARRAY	OUTPUT MATRIX ASSOCIATED WITH THE VEHICLE STATES
CASE	REAL ARRAY	ALPHA-NUMERIC USED TO TITLE OUTPUT
CC	REAL ARRAY	AUGMENTED OUTPUT MATRIX FORMED BY COMBINING C, E, AND F
CNM	REAL ARRAY	UTILITY VECTOR USED TO DETERMINE ELEMENTS OF C ASSOCIATED WITH PLUNGE ACCELERATION (NZ)
CON	COMPLEX ARRAY	CONTROLABILITY MATRIX FORMED FROM THE MODAL MATRIX (EE) AND THE SYSTEM CONTROL MATRIX (BB OR CP)
CS	REAL ARRAY	UTILITY ARRAY USED IN SCALING MATRIX C
D	REAL ARRAY	VEHICLE EQUATION DISTURBANCE MATRIX
DIST	COMPLEX ARRAY	DISTURBABILITY MATRIX FORMED FROM THE MODAL MATRIX (EE) AND THE SYSTEM DISTURBANCE MATRIX (GG)

DS	REAL ARRAY	UTILITY ARRAY USED IN SCALING MATRIX D
E	REAL ARRAY	OUTPUT MATRIX ASSOCIATED WITH THE CONTROLS
EE	COMPLEX ARRAY	MATRIX OF EIGENVECTORS OF MATRIX AA (ALSO CALLED THE MODAL MATRIX)
EI	COMPLEX ARRAY	INVERSE OF MATRIX EE (INVERSE MODAL MATRIX)
EIG	COMPLEX ARRAY	VECTOR OF EIGENVALUES OF MATRIX AA
EIGMAT	COMPLEX ARRAY	DIAGONAL MATRIX OF EIGENVALUES EIG
EINV	COMPLEX ARRAY	INVERSE OF MATRIX EIGMAT
ENM	REAL ARRAY	UTILITY VECTOR USED TO DETERMINE ELEMENTS OF E ASSOCIATED WITH PLUNGE ACCELERATION (NZ)
F	REAL ARRAY	OUTPUT MATRIX ASSOCIATED WITH THE DISTURBANCES
FIELD	REAL	USED IN PRINTING REAL MATRICES (ONLY USED IN MPRINT, A LSLIB ROUTINE)
FIELDC	REAL	USED IN PRINTING COMPLEX MATRICES (ONLY USED IN CMPRNT, A LSLIB ROUTINE)
FNM	REAL ARRAY	UTILITY VECTOR USED TO DETERMINE ELEMENTS OF F ASSOCIATED WITH PLUNGE ACCELERATION (NZ)
FORMAA	SUBROUTINE	FORMS AUGMENTED SYSTEM MATRIX AA
FORMBB	SUBROUTINE	FORMS AUGMENTED CONTROL MATRIX BB WHEN NP=0
FORMCC	SUBROUTINE	FORMS AUGMENTED OUTPUT MATRIX CC
FORMGA	SUBROUTINE	FORMS AUGMENTED CONTROL MATRIX GPA AND AUGMENTED DISTURBANCE MATRIX GGA
FORMNZ	SUBROUTINE	FORMS PLUNGE ACCELERATION ELEMENTS OF THE OUTPUT MATRICES C, E AND F
GG	REAL ARRAY	DISTURBANCE EQUATION WHITE NOISE MATRIX
GGA	REAL ARRAY	AUGMENTED SYSTEM WHITE NOISE DISTURBANCE MATRIX
GP	REAL ARRAY	PILOT EQUATION WHITE NOISE MATRIX
GPA	REAL ARRAY	AUGMENTED SYSTEM WHITE NOISE CONTROL MATRIX
GRAV	REAL	GRAVITATIONAL ACCELERATION
HBLANK	REAL	USED IN PRINTING MATRICES (ONLY USED IN MPRINT AND CMPRNT, LSLIB ROUTINES)
I	INTEGER	DO LOOP COUNTING VARIABLE
IMPMAT	COMPLEX ARRAY	UTILITY ARRAY FOR OUTPUTTING RESIDUES (IMPMAT = IMPULSE RESIDUE MATRIX)

IP	INTEGER	DO LOOP COUNTING VARIABLE
ITITLE	INTEGER	ALPHA-NUMERIC USED TO TITLE MATRICES
J	INTEGER	DO LOOP COUNTING VARIABLE
JP	INTEGER	DO LOOP COUNTING VARIABLE
JTITLE	INTEGER	ALPHA-NUMERIC USED TO TITLE MATRICES
K	INTEGER	DO LOOP COUNTING VARIABLE
KP	INTEGER	DO LOOP COUNTING VARIABLE
L	INTEGER	DO LOOP COUNTING VARIABLE
LINE	INTEGER	VARIABLE USED IN HEADER, A LSLIB ROUTINE USED TO TITLE OUTPUT
LX	REAL	DISTANCE FROM NOSE TO C.G. OF AIRCRAFT (FT)
M	INTEGER	# OF COLUMNS IN MATRIX ARRAY IN SUBROUTINE PHAG
MATOUT	COMPLEX ARRAY	UTILITY MATRIX FOR OUTPUTTING COMPLEX MATRICES IN MAG/PHASE FORM
MODAL	SUBROUTINE	DETERMINES MODAL MATRIX, INVERSE MODAL MATRIX AND EIGENVALUES OF A MATRIX
N	INTEGER	# OF COLUMNS IN MATRIX MATOUT IN SUBROUTINE PHAG
NAGC	INTEGER	# OF AG COLUMNS
NAGR	INTEGER	# OF AG ROWS
NAMEAG	INTEGER	ALPHA-NUMERIC NAMING THE AG MATRIX
NAMEAP	INTEGER	ALPHA-NUMERIC NAMING THE AP MATRIX
NAMEAV	INTEGER	ALPHA-NUMERIC NAMING THE AV MATRIX
NAMEB	INTEGER	ALPHA-NUMERIC NAMING THE B MATRIX
NAMEC	INTEGER	ALPHA-NUMERIC NAMING THE C MATRIX
NAMED	INTEGER	ALPHA-NUMERIC NAMING THE D MATRIX
NAMEE	INTEGER	ALPHA-NUMERIC NAMING THE E MATRIX
NAMEF	INTEGER	ALPHA-NUMERIC NAMING THE F MATRIX
NAMEGG	INTEGER	ALPHA-NUMERIC NAMING THE GG MATRIX
NAMEGP	INTEGER	ALPHA-NUMERIC NAMING THE GP MATRIX
NAPC	INTEGER	# OF AP COLUMNS
NAPR	INTEGER	# OF AP ROWS

NAVC	INTEGER	# OF AV COLUMNS
NAVR	INTEGER	# OF AV ROWS
NBC	INTEGER	# OF B COLUMNS
NBR	INTEGER	# OF B ROWS
NC	INTEGER	# OF CONTROLS IN VEHICLE EQUATION
NCC	INTEGER	# OF C COLUMNS
NCDV	INTEGER	NC + ND + NV
NCP	INTEGER	USED IN PRINTING MATRICES (ONLY USED IN MPRINT AND CMPRNT, LSLIB ROUTINES)
NCPC	INTEGER	USED IN PRINTING MATRICES (ONLY USED IN MPRINT AND CMPRNT, LSLIB ROUTINES)
NCR	INTEGER	# OF C ROWS
ND	INTEGER	# OF DISTURBANCES IN VEHICLE EQUATION
NDC	INTEGER	# OF D COLUMNS
NDR	INTEGER	# OF D ROWS
NDV	INTEGER	ND + NV
NEC	INTEGER	# OF E COLUMNS
NER	INTEGER	# OF E ROWS
NFC	INTEGER	# OF F COLUMNS
NFR	INTEGER	# OF F ROWS
NGGC	INTEGER	# OF GG COLUMNS
NGGR	INTEGER	# OF GG ROWS
NGPC	INTEGER	# OF GP COLUMNS
NGPR	INTEGER	# OF GP ROWS
NM	INTEGER	# OF OUTPUTS IN OUTPUT EQUATION
NP	INTEGER	FLAG FOR USING PILOT EQUATION IN THE ANALYSIS (NP=0; NO PILOT - NP=NC; PILOT)
NPDV	INTEGER	NP + ND + NV
NRA	INTEGER	ROW DIMENSION OF MATRIX MATOUT IN SUBROUTINE PHAG
NRB	INTEGER	# OF RIGID BODY STATES IN VEHICLE EQUATION
NROW	INTEGER	ROW DIMENSION OF MATRIX ARRAY IN

		SUBROUTINE PHAG
NS.*	INTEGER	# OF STRUCTURAL MODE STATES MODELED IN THE VEHICLE EQUATION
NU	INTEGER	# OF STATES IN THE VEHICLE EQUATION
NW	INTEGER	ROW DIMENSION OF VEHICLE SYSTEM MATRICES (THIS IS THE LARGEST POSSIBLE MODEL WHICH AN BE ANALYZED WITHOUT ALTERING THE PROGRAM)
NWX	INTEGER	NW + NX
NWXY	INTEGER	NW + NX + NY
NWY	INTEGER	NW + NY
NX	INTEGER	ROW DIMENSION OF PILOT SYSTEM MATRICES (THIS IS THE LARGEST PILOT MODEL WHICH THE PROGRAM CAN HANDLE WITHOUT ALTERATION)
NY	INTEGER	ROW DIMENSION OF DISTURBANCE SYSTEM MATRICES (THIS IS THE LARGEST GUST MODEL WHICH THE PROGRAM CAN HANDLE WITHOUT ALTERATION)
NZ	INTEGER	ROW DIMENSION OF THE OUTPUT MATRICES (THIS IS THE LARGEST POSSIBLE NUMBER OF OUTPUTS WHICH THE PROGRAM CAN HANDLE WITHOUT ALTERATION)
OBS	COMPLEX ARRAY	OBSERVABILITY MATRIX FORMED FROM THE MODAL MATRIX (EE) AND THE OUTPUT MATRIX (CC)
PHAG	SUBROUTINE	OUTPUTS A COMPLEX MATRIX IN PHASE AND MAGNITUDE FORM (PHASE IN DEGREES)
PHI	REAL ARRAY	MODE SHAPES FOR EACH OF THE STRUCTURAL MODES
PHIP	REAL ARRAY	MODES SLOPES FOR EACH OF THE STRUCTURAL MODES
RESID	SUBROUTINE	DETERMINES THE IMPULSE RESIDUE MATRIX OF A SYSTEM GIVEN THE CONTROLABILITY OR DISTURBABILITY AND OBSERVABILITY MATRICES
SCALE	SUBROUTINE	SCALES THE MATRICES OF A SYSTEM (IE. DYNAMIC, CONTROL, DISTURBANCE AND OUTPUT MATRICES) WITH A DIAGONAL SCALING MATRIX
STEP	SUBROUTINE	FORMS STEP RESIDUE MATRIX GIVEN IMPULSE RESIDUE MATRIX AND VECTOR OF EIGENVALUES
STP	COMPLEX ARRAY	UTILITY ARRAY FOR FORMING RESIDUE MATRICES (USED IN SUBROUTINE STEP)
STPMAT	COMPLEX ARRAY	UTILITY ARRAY FOR OUTPUTTING RESIDUES (STPMAT = STEP RESIDUE MATRIX)
SUBT	REAL ARRAY	VARIABLE USED IN PRINTING THE HEADING ON THE OUTPUT

T	REAL ARRAY	SCALING MATRIX FOR SCALING THE VEHICLE STATES
TERM1	REAL	INTERMEDIATE VARIABLE IN SUBROUTINE PHAG
TERM2	REAL	INTERMEDIATE VARIABLE IN SUBROUTINE PHAG
TINV	REAL ARRAY	INVERSE OF MATRIX T
TITLE	REAL ARRAY	VARIABLE USED FOR PRINTING THE HEADING ON THE OUTPUT
UZERO	REAL	CRUISE VELOCITY OF AIRCRAFT
WORK	SUBROUTINE	DETERMINES THE CONTROLABILITY, DISTURBABILITY AND OBSERVABILITY MATRICES OF A SYSTEM GIVEN THE SYSTEM MATRICES AND THE MODAL MATRIX
WK	REAL ARRAY	UTILITY VECTOR USED IN SEVERAL SUBROUTINES
X	REAL ARRAY	TRANSFORMATION VECTOR USED IN DETERMINING ELEMENTS OF THE C MATRIX ASSOCIATED WITH THE PLUNGE ACCELERATION (NZ)

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C-----------------------------------------------------------------------
C///////////////////////////////////////////////////////////////////////
C-----------------------------------------------------------------------
C                                                                      ↑
C      ANALYSIS OF FLEXIBLE AIRCRAFT DYNAMICS USING MODAL ANALYSIS METHODS ↑
C     ================================================================ ↑
C                                                                      ↑
C      THIS PROGRAM USES A MODAL ANALYSIS TECHNIQUE TO DETERMINE THE   ↑
C      IMPULSE RESIDUES OF A STATE VARIABLE MATH MODEL OF A FLEXIBLE   ↑
C      AIRCRAFT.  IT DOES THIS ANALYSIS BY FORMING AN AUGMENTED SYSTEM ↑
C      FROM THE MATRIX EQUATIONS DESCRIBING THE VEHICLE DYNAMICS AND   ↑
C      THE FREQUENCY CHARACTERISTICS OF A HUMAN PILOT AND ATMOSPHERIC  ↑
C      DISTURBANCES.                                                   ↑
C                                                                      ↑
C-----------------------------------------------------------------------↑
C                                                                      ↑
C          VEHICLE MATRIX EQUATION -                                   ↑
C                                                                      ↑
C               X-DOT = [AV]*X + [B]*U + [D]*W                         ↑
C                                                                      ↑
C               Y = [C]*X + [E]*U + [F]*W                              ↑
C                                                                      ↑
C                                                                      ↑
C          PILOT MATRIX EQUATION -                                     ↑
C                                                                      ↑
C               U-DOT = [AP]*U + [GP]*ETA                              ↑
C                                                                      ↑
C                                                                      ↑
C          DISTURBANCE MATRIX EQUATION -                               ↑
C                                                                      ↑
C               W-DOT = [AG]*W + [GG]*ETA                              ↑
C                                                                      ↑
C                                                                      ↑
C-----------------------------------------------------------------------
C///////////////////////////////////////////////////////////////////////
C-----------------------------------------------------------------------
C
      PROGRAM ANAFLEX(INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,
     *   TAPE1,TAPE2,TAPE3)
C
C---------------------------------
C:::::  DIMENSION STATEMENTS  :::::
C---------------------------------
C
      DIMENSION  AV(20,20),     B(20,5),      D(20,5)
      DIMENSION  C(15,20),      E(15,5),      F(15,5)
C
      DIMENSION  AP(5,5),       GP(5,5)
C
      DIMENSION  AG(5,5),       GG(5,5)
C
      DIMENSION  AA(30,30),     BB(25,5),     CC(15,30)
      DIMENSION  GPA(30,5),     GGA(30,5)
C
      COMPLEX    EIG(30),       EE(30,30),    EI(30,30)
      COMPLEX    CON(30,5),     OBS(15,30),   DIST(30,5)
C
      COMPLEX    IMPMAT(30,15), STPMAT(30,15)
C
      DIMENSION  T(20,20),      TINV(20,20)
```

```
C
      DIMENSION  TITLE(7),      CASE(4),      SUBT(2)
      DIMENSION  PHI(4),        PHIP(4)
      DIMENSION  X(1,20),       CNM(1,20),    ENM(1,5), FNM(1,5)
C
      DIMENSION  AS(20,20),     BS(20,5),     CS(15,20),DS(20,5)
C
      DIMENSION  AMASE(30,2),   ITITLE(2),    JTITLE(2)
      DIMENSION  ICNAME(2),     IDNAME(2),    IONAME(2)
C
      COMPLEX    MATOUT(30,30)
      COMPLEX    EIGMAT(30,30),  EINV(30,30)
C
      DIMENSION  AR(20,20),    ART(20,20),  ATR(20,20),  AT(20,20)
      DIMENSION  BR(20,5),     BT(20,5),    DR(20,5),    DT(20,5)
      DIMENSION  CR(15,20),    CT(15,20)
C
      LOGICAL    TEST(20)
C
      DIMENSION  A3(20,20),    B3(20,5),    D3(20,5)
      DIMENSION  C3(15,20),    E3(15,5),    F3(15,5)
C
      DIMENSION  ATI(20,20)
C
      DIMENSION    (20,20),    BM(20,5),    DM(20,5)*
      DIMENSION  C  15,20),    EM(15,5),    FM(15,5)
C
      REAL       LX
C
      EXTERNAL   PHAG
C
C-------------------------------
C:::::    COMMON BLOCKS     :::::
C-------------------------------
C***   THESE VARIABLES ARE USED IN PRINTING THE HEADINGS ON THE OUTPUT
C
      COMMON/MPRINT/ NCP,FIELD,NCPC,FIELDC,HBLANK
      COMMON/HEAD/ TITLE,CASE,LINE
C
C***   THESE VARIABLES ARE THE ACTUAL WORKING MATRIX DIMENSIONS
C***   USED IN MOST OF THE SUBROUTINES
C
      COMMON/DIM/  NV, NC, ND, NM, NP
C
C-------------------------------
C:::::  SET ROW DIMENSIONS  :::::
C-------------------------------
C***   THESE VARIABLES ARE THE ROW DIMENSIONS OF THE SYSTEM MATRICES
C
C          ROW DIMENSION = SIZE OF MATRIX SET IN DIMENSION STATEMENTS
C
C***   THESE ROW DIMENSIONS MUST BE AT LEAST AS LARGE
C***   AS THE WORKING DIMENSIONS
C
C       AV(NW,NW),       B(NW,NX),       D(NW,NY)
C       AP(NX,NX),       GP(NX,NX)
C       AG(NY,NY),       GG(NY,NY)
C       C(NZ,NX),        E(NZ,NX),       F(NZ,NY)
C       AA(NWXY,NWXY),   BB(NWX,NX),     CC(NZ,NWXY)
C       GPA(NWXY,NX),    GGA(NWXY,NY)
```

```
C
      NW = 20
      NX = 5
      NY = 5
      NZ = 15
      NWY = NW + NY
      NWXY = NW + NX + NY
C
C=============================================================
C                                                            ↑
C       PHYSICAL PARAMETERS PARTICULAR TO THIS PROBLEM       ↑
C////////////////////////////////////////////////////////////↑
C=============================================================
C       NUMBER OF STRUCTURAL MODES MODELED
      NSM = 4
C=============================================================
C       STRUCTURAL MODE  :::  SHAPES (FT)   :::  SLOPES      ↑
C-------------------------------------------------------------
                          PHI(1) = .349  $   PHIP(1) = -.02640
                          PHI(2) = .400  $   PHIP(2) = -.03300
                          PHI(3) = .180  $   PHIP(3) = -.03456
                          PHI(4) = .140  $   PHIP(4) = -.03636
C=============================================================
C       CRUISE VELOCITY (FT/SEC)                             ↑
      UZERO = 949.0
C=============================================================
C       COCKPIT LOCATION (FT)                                ↑
      LX = 63.4
C=============================================================
C       GRAVITATIONAL ACCELERATION (FT/SEC/SEC)              ↑
      GRAV = 32.17
C
C////////////////////////////////////////////////////////////
C------------------------------------------------------------
C
C-------------------------
C:::::  READ TITLES  :::::
C-------------------------
C***   TITLE / CASE / SUBTITLE
C
      READ(5,501) TITLE
      WRITE(3,501) TITLE
501   FORMAT(7A10)
      READ(5,502) CASE
      WRITE(3,502) CASE
502   FORMAT(4A10)
      READ(5,503) SUBT
      WRITE(3,503) SUBT
503   FORMAT(2A10)
C
C***   THIS SUBROUTINE PRINTS THE HEADER ON THE OUTPUT
C
      CALL HEADER(SUBT)
C
C-------------------------
C:::::  READ MATRICES  :::::
C-------------------------
C***   NAME / DIMENSION (ROW,COLUMN) / ELEMENTS
C
      READ(5,504) NAMEAV
```

```
      WRITE(3,504) NAMEAV
      READ(5,*) NAVR,NAVC
      WRITE(3,*) NAVR,NAVC
      DO 1 I=1,NAVR
      READ(5,*) (AV(I,J),J=1,NAVC)
    1 WRITE(3,*) (AV(I,J),J=1,NAVC)
      READ(5,504) NAMEAG
      READ(5,*) NAGR,NAGC
      DO 2 I=1,NAGR
    2 READ(5,*) (AG(I,J),J=1,NAGC)
      READ(5,504) NAMEB
      WRITE(3,504) NAMEB
      READ(5,*) NBR,NBC
      WRITE(3,*) NBR,NBC
      DO 3 I=1,NBR
      READ(5,*) (B(I,J),J=1,NBC)
    3 WRITE(3,*) (B(I,J),J=1,NBC)
      READ(5,504) NAMEC
      WRITE(3,504) NAMEC
      READ(5,*) NCR,NCC
      WRITE(3,*) NCR,NCC
      DO 4 I=1,NCR
      READ(5,*) (C(I,J),J=1,NCC)
    4 WRITE(3,*) (C(I,J),J=1,NCC)
      READ(5,504) NAMED
      WRITE(3,504) NAMED
      READ(5,*) NDR,NDC
      WRITE(3,*) NDR,NDC
      DO 5 I=1,NDR
      READ(5,*) (D(I,J),J=1,NDC)
    5 WRITE(3,*) (D(I,J),J=1,NDC)
      READ(5,504) NAMEE
      WRITE(3,504) NAMEE
      READ(5,*) NER,NEC
      WRITE(3,*) NER,NEC
      DO 6 I=1,NER
      READ(5,*) (E(I,J),J=1,NEC)
    6 WRITE(3,*) (E(I,J),J=1,NEC)
      READ(5,504) NAMEF
      WRITE(3,504) NAMEF
      READ(5,*) NFR,NFC
      WRITE(3,*) NFR,NFC
      DO 7 I=1,NFR
      READ(5,*) (F(I,J),J=1,NFC)
    7 WRITE(3,*) (F(I,J),J=1,NFC)
      READ(5,504) NAMEGG
504   FORMAT(A4)
      READ(5,*) NGGR,NGGC
      DO 8 I=1,NGGR
    8 READ(5,*) (GG(I,J),J=1,NGGC)
C
      READ(5,504) NAMEAP
      READ(5,*) NAPR,NAPC
      IF(NAPR.EQ.0) GO TO 10
C
      DO 11 I=1,NAPR
   11 READ(5,*) (AP(I,J),J=1,NAPC)
      READ(5,504) NAMEGP
      READ(5,*) NGPR,NGPC
        DO 12 I=1,NGPR
```

```
12    READ(5,*) (GP(I,J),J=1,NGPC)
C
C-----------------------------------
C:::::  SET WORKING DIMENSIONS  :::::
C-----------------------------------
C***   THESE VARIABLES ARE THE ACTUAL DIMENSION OF THE SYSTEM MATRICES
C
C       AV(NV,NV),       B(NV,NC),       D(NV,ND)
C       C(NM,NV),        E(NM,NC),       F(NM,ND)
C       AP(NC,NC),       GP(NC,NC)
C       AG(ND,ND),       GG(ND,1)
C       AA(NCDV,NCDV),   BB(NDV,NC),     CC(NM,NCDV)
C
10    NV = NAVC
      NC = NBC
      ND = NDC
      NM = NCR
      NDV = NV + ND
      NCDV = NV + ND + NC
C
C-------------------------------------------------------------
C***   INCLUDE PILOT MODEL IN ANALYSIS     -  NP = NC        ↑
C***   IGNORE PILOT IN ANALYSIS            -  NP = 0         ↑
C-------------------------------------------------------------
C
      NP = NC
      NPDV = NV + ND + NP
C
C=============================================================
C                                                           ↑
C     THIS SECTION OF THE PROGRAM IS PROBLEM DEPENDENT      ↑
C/////////////////////////////////////////////////////////////↑
C             IT IS DUE TO THE CHOICE OF USING PLUNGE       ↑
C             ACCELERATION AS A SYSTEM OUTPUT VARIABLE      ↑
C-------------------------------------------------------------
C
C-----------------------------------------
C:::::  FORM VECTOR-X FOR NZ EQUATION  :::::
C-----------------------------------------
C
        DO 13 I=1,NV
13    X(1,I) = 0.0
C
      X(1,1) = -UZERO/GRAV
      X(1,2) = LX/GRAV
      X(1,4) = UZERO/GRAV
      X(1,9) = -PHI(1)/GRAV
      X(1,10) = -PHI(2)/GRAV
      X(1,11) = -PHI(3)/GRAV
      X(1,12) = -PHI(4)/GRAV
C
C-------------------------------------------------
C:::::  COMPLETE C MATRIX WITH NZ EQUATION  :::::
C-------------------------------------------------
C
      CALL FORMNZ(AV,B,C,D,E,F,NW,NX,NY,NZ,X,CNM,ENM,FNM)
C
C/////////////////////////////////////////////////////////////
C-------------------------------------------------------------
C
```

```
C
C-----------------------------------
C:::::  OUTPUT SYSTEM MATRICES  :::::
C-----------------------------------
C
      CALL MPRINT(NW,AV,NV,NV,6,6,NAMEAV,1)
      CALL MPRINT(NY,AG,ND,ND,ND,6,NAMEAG,1)
      CALL MPRINT(NW,B,NV,NC,NC,6,NAMEB,1)
      CALL MPRINT(NZ,C,NM,NV,6,6,NAMEC,1`
      CALL MPRINT(NW,D,NV,ND,ND,6,NAMED,1)
      CALL MPRINT(NZ,E,NM,NC,NC,6,NAMEE,1)
      CALL MPRINT(NZ,F,NM,ND,ND,6,NAMEF,1)
        IF (NP.EQ.0) GO TO 14
      CALL MPRINT(NX,AP,NC,NC,NC,6,NAMEAP,1)
14    CONTINUE
C
C---------------------------------
C:::::  FORM SCALING MATRIX  :::::
C---------------------------------
C
C-------------------------------------------------------------
C           THE T MATRIX IS PROBLEM DEPENDENT
C/////////////////////////////////////////////////////////////
C-------------------------------------------------------------
C***   THE ACTUAL SCALING MATRIX, T, IS PROBLEM DEPENDENT
C***   BUT THE SCALING PROCESS IS ALWAYS RECOMMENDED
C
C***   NUMBER OF RIGID BODY STATES
C
      NRB = NV - 2.0 * NSM
C
C-------------------------------------------------------------------------
C***  IN THIS CASE, THE SCALING MATRIX, T, IS BASED ON MODE SLOPES
C
C             [1.0                                                      ]
C             [     1.0                                                 ]
C             [         1/U                                             ]
C             [             1.0                                         ]
C             [                 Y/X(1)                                  ]
C             [                     Y/X(2)                              ]
C     T = DIAG[                         Y/X(3)                          ]
C             [                             Y/X(4)                      ]
C             [                                 Y/X(1)                  ]
C             [                                     Y/X(2)              ]
C             [                                         Y/X(3)          ]
C             [                                             Y/X(4)      ]
C
C               - WHERE Y/X(I) IS THE MODE SLOPE ASSOCIATED WITH
C                 THE ITH MODE OF THE STRUCTURE
C
C                           -AND-
C
C               - WHERE U IS SOME CHARACTERISTIC VELOCITY
C                 ( IN THIS CASE U = UZERO )
C
C-------------------------------------------------------------------------
C
        DO 15 I=1,NV
        DO 16 J=1,NV
16    T(I,J) = 0.0
```

```
15    T(I,I) = 1.0
C
      T(3,3) = 1.0 / UZERO
C
        DO 17 I=1,NSM
      T(I+NRB,I+NRB) = PHIP(I)
17    T(I+NRB+NSM,I+NRB+NSM) = PHIP(I)
C
C////////////////////////////////////////////////////////////////
C----------------------------------------------------------------
C----------------------------------------
C::::: SCALE VEHICLE SYSTEM STATES  :::::
C------------------ ---------------------
C
      CALL SCALE(AV,B,C,D,NW,NX,NY,NZ,T,TINV,AS,BS,CS,DS)
C
C-----------------------------------
C:::::  OUTPUT SCALED MATRICES  :::::
C-----------------------------------
C
      CALL MPRINT(NW,T,NV,NV,6,6,'SCALING',1)
C
      CALL MPRINT(NW,AV,NV,NV,6,6,'AV-SCALED',1)
      CALL MPRINT(NW,B,NV,NC,NC,6,'B-SCALED',1)
      CALL MPRINT(NZ,C,NM,NV,6,6,'C-SCALED',1)
      CALL MPRINT(NW,D,NV,ND,6,6,'D-SCALED',1)
C
C-------------------------------
C:::::  SET UP TEST ARRAY  :::::
C-------------------------------
C
C***  NR = THE NUMBER OF RETAINED STATES
C***  NT = THE NUMBER OF TRUNCATED STATES
C
      NR = 12
      NT = NV - NR
C
C***  INITIALIZE THE TEST ARRAY TO .TRUE.
C
      DO 29 I=1,NV
   29 TEST(I)= .TRUE.
C
      IF (NT.EQ.0) GO TO 42
C
C***  IF TEST(I) = .FALSE. THE ITH STATE IS
C***               TRUNCATED IN THE RESIDUALIZATION
C
      TEST(6)= .FALSE.
      TEST(7)= .FALSE.
      TEST(8)= .FALSE.
      TEST(10)= .FALSE.
      TEST(11)= .FALSE.
      TEST(12)= .FALSE.
C
C-----------------------------------------------
C:::::  APPLY STATE MODEL RESIDUALIZATION  :::::
C-----------------------------------------------
C
      CALL SORT(AV,B,C,D,AR,ART,ATR,AT,BR,BT,DR,DT,CR,CT,TEST,
     *          NW,NX,NY,NZ,NR,NT)
```

```
C
C/////////  OUTPUT PARTITIONED MATRICES  ----------
      CALL MPRINT(NW,AR,NR,NR,NR,6,≠AR≠,+1)
      CALL MPRINT(NW,ART,NR,NT,NT,6,≠ART≠,+1)
      CALL MPRINT(NW,ATR,NT,NR,NR,6,≠ATR≠,+1)
      CALL MPRINT(NW,AT,NT,NT,NT,6,≠AT≠,+1)
      CALL MPRINT(NW,BR,NR,NC,NC,6,≠BR≠,+1)
      CALL MPRINT(NW,BT,NT,NC,NC,6,≠BT≠,+1)
      CALL MPRINT(NW,DR,NR,ND,ND,6,≠DR≠,+1)
      CALL MPRINT(NW,DT,NT,ND,ND,6,≠DT≠,+1)
      CALL MPRINT(NZ,CR,NM,NR,NR,6,≠CR≠,+1)
      CALL MPRINT(NZ,CT,NM,NT,NT,6,≠CT≠,+1)
C
      CALL MRR(AR,ART,ATR,AT,BR,BT,DR,DT,CR,CT,E,F,AM,BM,CM,DM,EM,FM,
     *         NW,NX,NY,NZ,NR,NT,A3,B3,C3,D3,E3,F3,ATI)
C
      GO TO 41
C
C***  IF NO TRUNCATION SET THE VEHICLE MATRICES TO THE MODIFIED MATRICES
C
42    CALL MEQ(AV,AM,NV,NV,NW,NW)
      CALL MEQ(B,BM,NV,NC,NW,NW)
      CALL MEQ(C,CM,NM,NV,NZ,NZ)
      CALL MEQ(D,DM,NV,ND,NW,NW)
      CALL MEQ(E,EM,NM,NC,NZ,NZ)
      CALL MEQ(F,FM,NM,ND,NZ,NZ)
C
41    CONTINUE
C
C***  RESET NV SO THAT THE VEHICLE MODEL IS
C***  REPRESENTED BY THE SMALLER, RESIDUALIZED MODEL
C
      NV = NR
      NDV = ND + NV
      NPDV = NP + ND + NV
C
C-------------------------------------------------
C:::::  FORM AUGMENTED WHITE NOISE MATRICES  :::::
C-------------------------------------------------
C              [ 0  ]            [ GP ]
C       GGA = [ GG ]     GPA =  [ 0  ]
C              [ 0  ]            [ 0  ]
C
C     IF NP = 0 ;
C
C
C       GGA = [ GG ]     GPA = [ 0 ]
C             [ 0  ]
C-------------------------------------------------
C
      CALL FORMGA(GG,GP,NWXY,NX,NY,GGA,GPA)
C
C-----------------------------------
C:::::  OUTPUT NOISE MATRICES  :::::
C-----------------------------------
C
      CALL MPRINT(NWY,GGA,NPDV,1,1,6,NAMEGG,1)
        IF (NP.EQ.0) GO TO 39
      CALL MPRINT(NWXY,GPA,NPDV,NC,NC,6,NAMEGP,1)
39    CONTINUE
```

```
C
C
C-----------------------------------------
C:::::  FORM AUGMENTED SYSTEM MATRIX  :::::
C-----------------------------------------
C
C              [ AP ↑ 0  ↑ 0  ]
C         AA = [ 0  ↑ AG ↑ 0  ]
C              [ B  ↑ D  ↑ AV ]
C
C    IF NP = 0 ;
C
C         AA = [ AG ↑ 0  ]
C              [ D  ↑ AV ]
C
C-----------------------------------------
C
      CALL FORMAA(AM,AG,AP,BM,DM,AA,NW,NX,NY,NWXY)
C
C/////////// OUTPUT MATRIX AA ~~~~~~~~~~~~~~
      CALL MPRINT(NWXY,AA,NPDU,NPDU,8,6,'AA',1)
C
      IF (NP.NE.0) GO TO 18
C
C-------------------------------------
C:::::  FORM AUGMENTED B MATRIX  :::::
C-------------------------------------
C    ONLY IF NP = 0 ;
C
C      BB = [ 0 ]
C           [ B ]
C
C-------------------------------------
C
      CALL FORMBB(BM,BB,NW,NX,NWY)
C
C/////////// OUTPUT MATRIX BB ~~~~~~~~~~
      CALL MPRINT(NWX,BB,NDU,NC,6,6,'BB',1)
C
C-------------------------------------
C:::::  FORM AUGMENTED C MATRIX  :::::
C-------------------------------------
C
C      CC = [ E ↑ F ↑ C ]
C
C    IF NP = 0 ;
C
C      CC = [ F ↑ C ]
C
C-------------------------------------
C
18    CALL FORMCC(CM,EM,FM,CC,NW,NX,NY,NZ,NWXY)
C
C/////////// OUTPUT MATRIX CC ~~~~~~~~~~~~
      CALL MPRINT(NZ,CC,NM,NPDU,5,6,'CC',1)
C
C-----------------------------------------------------
C:::::  DETERMINE E-VALUES AND E-VECTORS OF MATRIX AA  :::::
C-----------------------------------------------------
C***  THIS SUBROUTINE USES GEIGEN WHICH OUTPUTS THE E-VALUES
```

```
C
      CALL MODAL(AA,EIG,EE,EI,NWXY)
C
C/////////// OUTPUT E-VECTOR MATRIX ¬¬¬¬¬¬¬¬¬¬¬¬
      CALL CMPRNT(NWXY,EE,NPDU,NPDU,6,6,≠EE≠,1)
C
C-------------------------------------------------------
C:::::  DETERMINE CONTROLABILITY, DISTURBABILITY AND  :::::
C:::::            OBSERVABILITY MATRICES              :::::
C-------------------------------------------------------
C
C          CON = MINV * B
C          DIST = MINV * D
C          OBS = C * M
C                         -WHERE  M = MODAL MATRIX
C
C-------------------------------------------------------
C
      IF (NP.EQ.0) GO TO 21
C
      CALL WORK(GPA,CC,GGA,EE,EI,NX,NY,NZ,NWXY,CON,OBS,DIST)
      GO TO 22
C
21    CALL WORK(BB,CC,GGA,EE,EI,NX,NY,NZ,NWXY,CON,OBS,DIST)
C
22    CONTINUE
C
C////////////// OUTPUT CON, DIST, OBS MATRICES ¬¬¬¬¬¬¬¬¬¬¬¬¬
C
      DATA ICNAME/≠   CONTROL≠,≠ABILITY   ≠/
      DATA IDNAME/≠   DISTURB≠,≠ABILITY   ≠/
      DATA IONAME/≠   OBSERVA≠,≠BILITY    ≠/
      CALL CMPRNT(NWXY,CON,NPDU,NC,6,6,≠CON≠,1)
      CALL PHAG(CON,NWXY,NPDU,NC,ICNAME,AMASE,MATOUT,NWXY)
      CALL CMPRNT(NWXY,DIST,NPDU,1,6,6,≠DIST≠,1)
      CALL PHAG(DIST,NWXY,NPDU,1,IDNAME,AMASE,MATOUT,NWXY)
      CALL CMPRNT(NZ,OBS,NM,NPDU,6,6,≠OBS≠,1)
      CALL PHAG(OBS,NZ,NM,NPDU,IONAME,AMASE,MATOUT,NZ)
C
C-------------------------------------------------------------
C:::::  DETERMINE MODAL IMPULSE AND STEP RESIDUE MATRICES  :::::
C-------------------------------------------------------------
C
C      RESMAT = OBS ) ( CON  (OR DIST)
C
C-------------------------------------------------------------
C
      WRITE(6,601)
601   FORMAT(///,10X,≠*****************************************≠,/,
     ^           10X,≠***          RESIDUE MATRICES           ***≠,/,
     ^           10X,≠*****************************************≠,/,
     ^           10X,≠***   ROWS CORRESPOND TO MODES      ***≠,/,
     ^           10X,≠*** COLUMNS CORRESPOND TO OUTPUTS  ***≠,/,
     ^           10X,≠*****************************************≠)
C
C***   I = # OF WHITE NOISE CONTROL INPUTS
C
       DO 19 I=1,NC
C
      CALL RESID(CON,OBS,NZ,NX,NWXY,IMPMAT,I)
```

```
C
C///// OUTPUT IMPULSE RESIDUE MATRIX ------
C
      WRITE(6,602) I
602   FORMAT(/,5X,'----------------------------------------------',/,
     ^          5X,'  IMPULSE RESIDUE MATRIX FOR CONTROL - ',I3,/,
     ^          5X,'----------------------------------------------')
C
      CALL CMPRNT(NWXY,IMPMAT,NPDU,NM,6,6,'C-IMP RES ',1)
C
      DATA ITITLE/'   CONTROL',' RESIDUE  '/
      CALL PHAG(IMPMAT,NWXY,NPDU,NM,ITITLE,AMASE,MATOUT,NWXY)
C
      CALL STEP(IMPMAT,EIG,NWXY,NZ,STPMAT,EIGMAT,EINV)
C
C///// OUTPUT STEP RESIDUE MATRIX ------
C
      WRITE(6,604) I
604   FORMAT(///,5X,'----------------------------------------------',/,
     ^          5X,'  STEP RESIDUE MATRIX FOR CONTROL - ',I3,/,
     ^          5X,'----------------------------------------------',/)
C
      CALL CMPRNT(NWXY,STPMAT,NPDU,NM,6,6,'C-STP RES ',1)
C
      CALL PHAG(STPMAT,NWXY,NPDU,NM,ITITLE,AMASE,MATOUT,NWXY)
C
19    CONTINUE
C
C***   I = # OF WHITE NOISE DISTURBANCES
C
      I = 1
C
      CALL RESID(DIST,OBS,NZ,NY,NWXY,IMPMAT,I)
C
C///// OUTPUT IMPULSE RESIDUE MATRIX ------
C
      WRITE(6,603) I
603   FORMAT(///,5X,'----------------------------------------------',
     ^       /,5X,'  IMPULSE RESIDUE MATRIX FOR DISTURBANCE - ',I3,/,
     ^       5X,'----------------------------------------------',/)
C
      CALL CMPRNT(NWXY,IMPMAT,NPDU,NM,6,6,'D-IMP RES ',1)
C
      DATA JTITLE/'DISTURBANC','E RESIDUE '/
      CALL PHAG(IMPMAT,NWXY,NPDU,NM,JTITLE,AMASE,MATOUT,NWXY)
C
      CALL STEP(IMPMAT,EIG,NWXY,NZ,STPMAT,EIGMAT,EINV)
C
C///// OUTPUT STEP RESIDUE MATRIX ------
C
      WRITE(6,605) I
605   FORMAT(///,5X,'----------------------------------------------',/,
     ^          5X,'  STEP RESIDUE MATRIX FOR DISTURBANCE - ',I3,/,
     ^          5X,'----------------------------------------------',/)
C
      CALL CMPRNT(NWXY,STPMAT,NPDU,NM,6,6,'D-STP RES ',1)
C
      CALL PHAG(STPMAT,NWXY,NPDU,NM,JTITLE,AMASE,MATOUT,NWXY)
C
      REWIND 1
```

```
C
      STOP
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                SUBROUTINE FORMAA
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE FORMS THE AUGMENTED MATRIX -
C
C                  [ AP ↑  0 ↑  0]
C            AA =  [  0 ↑ AG ↑  C]
C                  [  B ↑  D ↑ AV]
C
C            - FROM THE MATRICES AP, AG, AV, B AND D
C              IF NP = NC
C
C       AND   E AUGMENTED MATRIX -
C
C            AA = [ AG ↑  0]
C                 [  D ↑ AV]
C
C            - FROM THE MATRICES AG, AV AND D IF NP = 0
C
C-------------------------------------------------------- ---
C
C       CALL STATEMENT ARGUMENTS -
C
C                AV : NV X NV MATRIX OF ROW DIMENSION NW
C                AG : ND X ND MATRIX OF ROW DIMENSION NY
C                AP : NC X NC MATRIX OF ROW DIMENSION NX
C                B  : NV X NC MATRIX OF ROW DIMENSION NW
C                D  : NV X ND MATRIX OF ROW DIMENSION NW
C                AA : NCDV X NCDV MATRIX OF ROW DIMENSION NWXY
C
C-----------------------------------------------------------
C
      SUBROUTINE FORMAA(AV,AG,AP,B,D,AA,NW,NX,NY,NWXY)
      DIMENSION  AV(NW,NW),  AG(NY,NY),   AP(NX,NX)
      DIMENSION  B(NW,NX),    D(NW,NY),   AA(NWXY,NWXY)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
      NPDV = NV + ND + NP
C
C       INITIALIZE MATRIX AA TO ZERO
C
        DO 10 I=1,NPDV
        DO 20 J=1,NPDV
20    AA(I,J) = 0.0
10    CONTINUE
C
      IF (NP.EQ.0) GO TO 35
C
C       FORM UPPER LEFT PARTITION OF MATRIX AA IF NP = NC
C
        DO 30 I=1,NP
        DO 40 J=1,NP
40    AA(I,J) = AP(I,J)
30    CONTINUE
C
C       FORM LOWER LEFT PARTITION OF MATRIX AA IF NP = NC
C
        DO 50 I=1,NV
```

```
        DO 60 J=1,NC
60    AA(I+NP+ND,J) = B(I,J)
50    CONTINUE
C
C       FORM CENTER PARTITIION OF MATRIX AA IF NP = NC,
C       OR THE UPPER RIGHT PARTITION OF MATRIX AA IF NP = 0
C
35      DO 70 I=1,ND
        DO 80 J=1,ND
80    AA(I+NP,J+NP) = AG(I,J)
70    CONTINUE
C
C       FORM LOWER RIGHT PARTITION OF MATRIX AA
C
        DO 90 I=1,NV
        DO 100 J=1,NV
100   AA(I+NP+ND,J+NP+ND) = AV(I,J)
90    CONTINUE
C
C       FORM LOWER CENTER PARTITION OF MATRIX AA IF NP = NC
C       OR THE LOWER LEFT PARTITION OF MATRIX AA IF NP = 0
C
        DO 110 I=1,NV
        DO 120 J=1,ND
120   AA(I+NP+ND,J+NP) = D(I,J)
110   CONTINUE
C
      RETURN
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                    SUBROUTINE FORMBB
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE FORMS THE AUGMENTED MATRIX -
C
C                BB = [ 0 ]
C                     [ B ]
C
C                - FROM THE MATRIX B AND THE ZERO PARTITION
C                  HAS ND ROWS
C
C-----------------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C                B  : NV X NC MATRIX OF ROW DIMENSION NW
C                BB : NDV X NC MATRIX OF ROW DIMENSION NWY
C                NX : COLUMN DIMENSION OF MATRICES B AND BB
C
C-----------------------------------------------------
C
      SUBROUTINE FORMBB(B,BB,NW,NX,NWY)
      DIMENSION  B(NW,NX),  BB(NWY,NX)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
        NDV = NV + ND
C
C       INITIALIZE MATRIX BB TO ZERO
C
        DO 10 I=1,NDV
        DO 20 J=1,NC
 20   BB(I,J) = 0.0
 10   CONTINUE
C
C       FORM LOWER PARTITION OF MATRIX BB
C
        DO 30 I=1,NV
        DO 40 J=1,NC
 40   BB(I+ND,J) = B(I,J)
 30   CONTINUE
C
      RETURN
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::
C              SUBROUTINE FORMCC
C:::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE FORMS THE MATRIX -
C
C               CC = [ E ↑ F ↑ C ]
C
C               - FROM THE MATRICES C, E AND F
C
C---------------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               C  : NM X NV MATRIX OF ROW DIMENSION NZ
C               E  : NM X NC MATRIX OF ROW DIMENSION NZ
C               F  : NM X ND MATRIX OF ROW DIMENSION NZ
C               CC : NM X NCDV MATRIX OF ROW DIMENSION NWXY
C               NW : COLUMN DIMENSION OF MATRIX C
C               NX : COLUMN DIMENSION OF MATRIX E
C               NY : COLUMN DIMENSION OF MATRIX F
C
C---------------------------------------------------
C
      SUBROUTINE FORMCC(C,E,F,CC,NW,NX,NY,NZ,NWXY)
      DIMENSION  C(NZ,NW),  E(NZ,NX),  F(NZ,NY),  CC(NZ,NWXY)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
      NPDV = NV + ND + NP
C
C       INITIALIZE MATRIX CC TO ZERO
C
        DO 10 I=1,NM
        DO 20 J=1,NPDV
20    CC(I,J) = 0.0
10    CONTINUE
C
      IF (NP.EQ.0) GO TO 25
C
C       FORM LEFT PARTITION OF MATRIX CC IF NP = NC
C
        DO 30 I=1,NM
        DO 40 J=1,NC
40    CC(I,J) = E(I,J)
30    CONTINUE
C
C       FORM CENTER PARTITION OF MATRIX CC IF NP = NC
C       OR FORM LEFT PARTITION OF MATRIX CC IF NP = 0
C
25      DO 50 I=1,NM
        DO 60 J=1,ND
60    CC(I,J+NP) = F(I,J)
50    CONTINUE
C
C       FORM RIGHT PARTITION OF MATRIX CC
C
        DO 70 I=1,NM
        DO 80 J=1,NV
80    CC(I,J+NP+ND) = C(I,J)
```

```
70      CONTINUE
C
        RETURN
        END
```

```
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                SUBROUTINE FORMGA
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE FORMS THE MATRICES -
C
C                          [  0 ]              [ GP ]
C                  GGA = [ GG ] ;      GPA = [  0 ]
C                          [  0 ]              [  0 ]
C
C                  - FROM THE MATRICES GG AND GP
C                    IF NP = 0, WHERE THE LOWER
C                    ZERO PARTITIONS HAVE NV ROWS
C                    AND THE OTHER ZERO PARTITIONS
C                    ARE COMPATABLE WITH THE
C                    CORRESPONDING POPULATED PARTITIONS
C
C        AND, THE MATRIX -
C
C                  GGA = [ GG ]
C                        [  0 ]
C
C                  - IF NP = NC, WHERE THE LOWER
C                    ZERO PARTITION HAS NV ROWS
C
C-----------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C              GG  : ND X 1 MATRIX OF ROW DIMENSION NY
C              GP  : NC X NC MATRIX OF ROW DIMENSION NX
C              GGA : NPDV X 1 MATRIX OF ROW DIMENSION NWXY
C                    (IF NP = 0; NPDV = ND + NV
C                     IF NP = NC; NPDV = NP +  ND + NV)
C              GPA : NPDV X NV MATRIX OF ROW DIMENSION NWXY
C
C-----------------------------------------------
C
      SUBROUTINE FORMGA(GG,GP,NWXY,NX,NY,GGA,GPA)
      DIMENSION  GG(NY,1),  GP(NX,NX),  GGA(NWXY,1),  GPA(NWXY,NX)
C
      COMMON/DIM/  NV, NC, ND, NM, NP
C
      NPDV = NP + ND + NV
C
C       INITIALIZE MATRICES GGA AND GPA TO ZERO
C
        DO 1 I=1,NPDV
      GGA(I,1) = 0.0
        DO 2 J=1,NC
2     GPA(I,J) = 0.0
1     CONTINUE
C
C       FORM UPPER PARTITION OF MATRIX GGA IF NP = 0
C       OF FORM CENTER PARTITION OF MATRIX GGA IF NP = NC
C
        DO 3 K=1,ND
3     GGA(K+NP) = GG(K)
C
      IF (NP.EQ.0) RETURN
```

```
C
C       FORM UPPER PARTITION OF MATRIX GPA
C
        DO 4 L=1,NC
        DO 5 M=1,NC
5     GPA(L,M) = GP(L,M)
4     CONTINUE
C
      RETURN
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                  SUBROUTINE FORMNZ
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE DETERMINES THE ROW OF ELEMENTS
C       OF THE MATRICES C, E AND F WHICH CORRESPOND
C       TO TERMS OF AN OUTPUT EQUATION WHICH DESCRIBES
C       AN OUTPUT VARIABLE WHICH IS PROPORTIONAL TO
C       THE FIRST DERIVATIVE OF THE STATES, WHERE-
C
C               Y = CX + EU + FW.
C
C       THE ROW WHICH CORRESPONDS TO THE THIS RESPONSE
C       IS ASSUMED TO BE THE LAST ROW OF THE MATRICES.
C
C       THE OPERATION OF DETERMINING THE X-DOT
C       PROPORTIONAL ELEMENTS CONSISTS
C       OF EXTRACTING CERTAIN ELEMENTS OF THE MATRICES A,
C       B AND D WHICH APPEAR IN THE OUTPUT EQUATION.
C
C       IN THE SPECIFIC PROBLEM DONE IN THIS STUDY,
C       THE X-DOT PROPORTIONAL OUTPUT IS PLUNGE ACCELERATION.
C       THE ACTUAL NZ EQUATION CAN BE FOUND IN THE TEXT
C       DESCRIBING THIS SUBROUTINE.
C
C------ ---------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               A  : NV X NV MATRIX OF ROW DIMENSION NW
C               B  : NV X NC MATRIX OF ROW DIMENSION NW
C               C  : NM X NV MATRIX OF ROW DIMENSION NZ
C               D  : NV X ND MATRIX OF ROW DIMENSION NW
C               E  : NM X NC MATRIX OF ROW DIMENSION NZ
C               F  : NM X ND MATRIX OF ROW DIMENSION NZ
C               NX : COLUMN DIMENSION OF MATRICES B AND E
C               NY : COLUMN DIMENSION OF MATRICES D AND F
C               X  : 1 X NV TRANSFORMATION ROW VECTOR OF
C                    COLUMN DIMENSION NW
C               CNM: 1 X NM UTILITY ROW VECTOR OF NZ ELEMENTS
C                    FOR THE MATRIX C OF COLUMN DIMENSION NW
C               ENM: 1 X NC UTILITY ROW VECTOR OF NZ ELEMENTS
C                    FOR THE MATRIX E OF COLUMN DIMENSION NX
C               FNM: 1 X ND UTILITY ROW VECTOR OF NZ ELEMENTS
C                    FOR THE MATRIX F OF COLUMN DIMENSION NY
C
C---------------------------------------- ----------
C
      SUBROUTINE FORMNZ(A,B,C,D,E,F,NW,NX,NY,NZ,X,CNM,ENM,FNM)
      DIMENSION  A(NW,NW),  B(NW,NX),  C(NZ,NW)
      DIMENSION  D(NW,NY),  E(NZ,NX),  F(NZ,NY)
      DIMENSION  X(1,NW),   CNM(1,NW), ENM(1,NX), FNM(1,NY)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
C-------------------------------------------------
C       SUBROUTINE MULT ( A, B, AB, L, M, N, NA, NB, NAB )
C
C       COMPUTES THE MATRIX PRODUCT: AB = A * B
C               A : L X M MATRIX WITH ROW DIMENSION NA
```

```
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                  SUBROUTINE MODAL
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE DETERMINES THE EIGENVECTORS,
C       MODAL MATRIX AND INVERSE MODAL MATRIX OF A
C       GENERAL MATRIX.
C
C-------------------------------------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               AA   : NPDV X NPDV MATRIX OR ROW DIMENSION NWXY
C               EIG  : NPDV VECTOR OF EIGENVALUES OF MATRIX AA OF
C                      DIMENSION NWXY
C               EE   : NPDV X NPDV MATRIX OF EIGENVECTORS OF AA
C                      OF ROW DIMENSION NWXY
C               EI   : NPDV X NPDV MATRIX INVERSE OF EE OF ROW
C                      DIMENSION NWXY
C
C-------------------------------------------------------------------------
C
      SUBROUTINE MODAL(AA,EIG,EE,EI,NWXY)
      DIMENSION  AA(NWXY,NWXY),   WK(1000)
      COMPLEX    EIG(NWXY),       EE(NWXY,NWXY),  EI(NWXY,NWXY)
C
      COMMON /DIM/  NV, NC, ND, NM, NP
C
      NPDV = NV + NP + ND
C
C
C-------------------------------------------------------------------------
C
C       SUBROUTINE GEIGEN ( NA, AA, N, JOB, WK, KPR, FROM,
C                           EIG, NE, EE, EI, NAME )
C
C       COMPUTES EIGENVALUES AND, OPTIONALLY, MODAL MATRIX OR
C       NORMALIZED MODAL MATRIX AND INVERSE MODAL MATRIX OF A
C       REAL GENERAL MATRIX
C
C               INPUT ARGUMENTS-
C                       AA(N,N): REAL GENERAL MATRIX WITH ROW
C                                DIMENSION NA
C                             N : ORDER OF AA
C                           JOB : OPTION CONTROL
C                                 = 0 : EIGENVALUES ONLY
C                                 = 1 : EIGENVALUES AND MODAL MATRIX
C                                 = 2 : EIGENVALUES, MODAL MATRIX AND
C                                       INVERSE MODAL MATRIX
C                                 = 3 : SAME AS 1 WITH NORMALIZED
C                                       MODAL MATRIX
C                                 = 4 : SAME AS 2 WITH NORMALIZED
C                                       MODAL MATRIX
C                            WK : REAL WORK VECTOR OF LENGTH GREATER
C                                 THAN 2*N*N + 3*N
C                           KPR : PRINT CONTROL
C                                 = 0 : PRINT NOTHING
C                                 = 1 : PRINT EIGENVALUES
C                                 = 2 : PRINT EVERYTHING
C                          FROM : 10-CHARACTER NAME OF CALLING PROGRAM
```

```
C                       NA,NE : ROW DIMENSIONS
C                        NAME : 10-CHARACTER NAME FOR MATRIX AA
C
C
C               OUTPUT ARGUMENTS-
C                       EIG(N)  : COMPLEX VECTOR OF EIGENVALUES OF AA
C                       EE(N,N) : MODAL MATRIX WITH ROW DIMENSION NE
C                       EI(N,N) : EE INVERSE WITH ROW DIMENSION NE
C
C-----------------------------------------------------------------------
C
      CALL GEIGEN(NWXY,AA,NPDV,4,WK,1,≠MODAL≠,EIG,NWXY,EE,EI,≠A-AUG≠)
C
        RETURN
        END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                  SUBROUTINE PHAG
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS ROUTINE CALCULATES AND PRINTS COMPLEX MATRICES
C       IN MAGNITUDE AND  PHASE FORM.
C
C-------------------------------------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               ARRAY   : N X M COMPLEX MATRIX OF ROW DIMENSION NROW
C               ITITLE  : TWO WORD LENGTH LITERAL ARRAY CONTAINING THE
C                         NAME OF ARRAY IN THE MAIN PROGRAM
C               AMASE   : NRA X 2 ARRAY CONTAINING THE MAGNITUDE AND
C                         PHASE FORM OF THE ELEMENTS OF THE COLUMNS OF ARRAY
C               MATOUT  : N X M COMPLEX MATRIX OF ROW DIMENSION NRA
C                         CONTAINS ARRAY TRANSFORMED INTO MAGNITUDE AND PHASE
C                         FORM
C
C-------------------------------------------------------------------------
C
      SUBROUTINE PHAG (ARRAY,NROW,N,M,ITITLE,AMASE,MATOUT,NRA)
C
      COMPLEX  ARRAY(NROW,M), MATOUT(NRA,M)
      DIMENSION AMASE(NRA,2), ITITLE(2)
C
C       NROW : ROW DIMENSION OF THE INCOMING MATRIX
C       NRA  : ROW DIMENSION OF THE OUTPUT MATRIX
C
C       PRINT HEADER FOR OUTPUT MATRIX
C     BOTH WORDS OF ITITLE CAN BE SET IN A DATA STATEMENT OR
C     INDIVIDUALLY USING DIRECT ASSIGNMENT.
C
C       I.E. ITITLE(1)=10HCONTROLLAB
C            ITITLE(2)=10HILITY=====
C
C     NO ERRORS WILL BE FLAGGED IF ITITLE IS PASSED AS A SINGLE VARIABLE;
C     HOWEVER, THE REMAINING WORD WILL BE PRINTED AS JUNK CHARACTERS IN
C     THE HEADER.
C
      WRITE(6,100)
      WRITE(6,110) ITITLE,N,M
      WRITE(6,120)
C
C     PHAG LOOPS THROUGH ARRAY COLUMN BY COLUMN CONVERTING
C     EACH ELEMENT INTO MAGNITUDE AND PHASE FORM.
C
      DO 10 JP=1,M
C
C       REINITIALIZE AMASE
C
      DO  1 KP=1,N
      AMASE(KP,1)=0.0
      AMASE(KP,2)=0.0
    1 CONTINUE
      DO  5 IP=1,N
C
C     SEPARATE REAL AND IMAGINARY PARTS OF COMPLEX NUMBERS
C       REAL AND AIMAG ARE ANSI STANDARD FORTRAN FUNCTIONS
```

```
C
      TERM1=REAL(ARRAY(IP,JP))
      TERM2=AIMAG(ARRAY(IP,JP))
      AMASE(IP,1)=SQRT(TERM1**2+TERM2**2)
      IF(ABS(TERM1).LT.1.0E-15) TERM1=1.0E-15
C
C       ATAN2 RETURNS ARGUMENT IN RADIANS ( -PI < THETA < PI )
C
      AMASE(IP,2)=ATAN2(TERM2,TERM1)
C
C       CONVERSION TO DEGREES
C
      AMASE(IP,2)=57.29578*AMASE(IP,2)
C
C       LOAD INTO OUTPUT MATRIX
C
C       CMPLX IS ANSI STANDARD REAL TO COMPLEX CONVERSION
C
      MATOUT(IP,JP)=CMPLX(AMASE(IP,1), AMASE(IP,2))
C
    5 CONTINUE
   10 CONTINUE
C
C     USE COMPLEX MATRIX OUTPUT ROUTINE TO PRINT MATOUT
C       HEADER PRINTING SUPRESSED (LPRINT= -1)
C
      CALL CMPRNT (NRA,MATOUT,N,M,6,6,*OUTPUT*,-1)
C
  100 FORMAT(//////,10X,50(*-*))
  110 FORMAT(10X,2A10,* MATRIX (*,I2,* BY *,I2,*) *,/,
     +       15X,*OUTPUT FORM: ( MAGNITUDE , PHASE(DEG.) )*)
  120 FORMAT(10X,50(*-*))
      RETURN
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C              SUBROUTINE RESID
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE DETERMINES THE OUTTER PRODUCT
C       OF THE MATRIX OBS AND A COLUMN OF THE MATRIX CON.
C       THIS MATRIX RESMAT . EPRESENTS AN IMPULSE RESIDUE
C       MATRIX.
C
C       THE ELEMENTS OF THE RESMAT MATRIX ARE WRITTEN TO A TAPE
C       SO THAT POST EXECUTION ANALYSIS CAN BE PERFORMED.  SOME
C       EXAMPLES OF THIS MIGHT BE NORMALIZATION OR REORDERING
C       OF THE RESIDUES ASSOCIATED WITH PARTICULAR MODES.
C
C-------------------------- ----------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               CON    : NPDV X NC MATRIX OF ROW DIMENSION NWXY
C               OBS    : NM X NPDV MATRIX OF ROW DIMENSION NZ
C               NX     : COLUMN DIMENSION OF MATRIX CON
C               RESMAT : MATRIX FORMED FROM OUTER PRODUCT OF
C                        OBS AND A COLUMN OF CON
C               I      : COLUMN OF CON USED IN DETERMINING RESMAT
C
C-------------------------------------------------------------------
C
      SUBROUTINE RESID(CON,OBS,NZ,NX,NWXY,RESMAT,I)
      COMPLEX   CON(NWXY,NX),  OBS(NZ,NWXY),  RESMAT(NWXY,NZ)
C
      COMMON /DIM/  NV, NC, ND, NM, NP
C
      NPDV = NP + ND + NV
C
        DO 10 J=1,NM
        DO 20 K=1,NPDV
      RESMAT(K,J) = OBS(J,K) * CON(K,I)
20    WRITE(1,100) RESMAT(K,J)
100   FORMAT(2F10.5)
10    CONTINUE
      RETURN
      END
```

```
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                SUBROUTINE SCALE
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE SCALES THE MATRICES A, B, C AND D WITH
C       A DIAGONAL MATRIX T.  THIS PROCEDURE IS ANALOGOUS TO
C       A CHANGE OF VARIABLE TRANSFORMATION.
C
C                X-DOT = AX + BU + DW
C                Y = CX + EU + FW
C
C       APPLY TRANSFORMATION      X = TZ
C
C                Z-DOT = (TINV*A*T)Z + (TINV*B)U + (TINV*D)W
C                Y = (C*T)X + EU + FW
C
C-----------------------------------------------------------------------
C
      SUBROUTINE SCALE (A,B,C,D,NW,NX,NY,NZ,T,TINV,AS,BS,CS,DS)
      DIMENSION   A(NW,NW),   B(NW,NX),     C(NZ,NW),   D(NW,NY)
      DIMENSION   AS(NW,NW),  BS(NW,NX),    CS(NZ,NW),  DS(NW,NY)
      DIMENSION   T(NW,NW),   TINV(NW,NW),  WRK(500)
C
      COMMON /DIM/  NU, NC, ND, NM, NP
C
C-----------------------------------------------------------------------
C
C       SUBROUTINE RINV ( TT, TI, WK, NR, N )
C
C       COMPUTES THE INVERSE OF A REAL MATRIX
C
C                INPUT ARGUMENTS-
C                        TT(N,N) : REAL MATRIX WITH ROW DIMENSION NR
C                             WK : REAL WORK VECTOR WITH LENGTH
C                                  GREATER THAN N*N+2*N
C                             NR : ROW DIMENSION
C
C                OUTPUT ARGUMENTS-
C                        TI(N,N) : INVERSE OF TT WITH ROW DIMENSION NR
C
C-----------------------------------------------------------------------
C
C
C       FORM INVERSE OF SCALING MATRIX T
C
      CALL RINV(T,TINV,WRK,NW,NU)
C
C-----------------------------------------------------------------------
C
C       SUBROUTINE MP3 ( NA, AR, A, NB, BR, B, NC, CR, CC, C, NP, P )
C
C       COMPUTE THE MATRIX PRODUCT: P = A*B*C
C
C                A : AR X BR REAL MATRIX WITH ROW DIMENSION NA
C                B : BR X CR REAL MATRIX WITH ROW DIMENSION NB
C                C : CR X CC REAL MATRIX WITH ROW DIMENSION NC
C                P : AR X CC REAL MATRIX WITH ROW DIMENSION NP
C
C-----------------------------------------------------------------------
C
```

```
C
C       FORM SCALED DYNAMIC MATRIX AS
C
      CALL MP3(NW,NV,T,NW,NV,A,NW,NV,NV,TINV,NW,AS)
C
C-----------------------------------------------------------------------
C
C       SUBROUTINE MEQ ( AIN, AOUT, NR, NC, NRI, NRO )
C
C       STORE MATRIX AIN(NR,NC) IN THE MATRIX AOUT(NR,NC)
C       WHERE AIN AND AOUT HAVE ROW DIMENSIONS NRI AND NRO
C
C-----------------------------------------------------------------------
C
C
C       EQUATE SCALED DYNAMIC MATRIX AS TO DYNAMIC
C       MATRIX A FOR RETURN TO MAIN PROGRAM
C
      CALL MEQ(AS,A,NV,NV,NW,NW)
C
C-----------------------------------------------------------------------
C
C       SUBROUTINE MULT ( A, B, AB, L, M, N, NA, NB, NAB )
C
C       COMPUTE MATRIX PRODUCT: AB = A*B
C
C               A  : L X M MATRIX WITH ROW DIMENSION NA
C               B  : M X N MATRIX WITH ROW DIMENSION NB
C               AB : L X N MATRIX WITH ROW DIMENSION NAB
C               A, B, AB REAL MATRICES
C
C-----------------------------------------------------------------------
C
C
C       FORM SCALED CONTROL MATRIX BS AND EQUATE IT TO THE
C       CONTROL MATRIX B FOR RETURN TO MAIN PROGRAM
C
      CALL MULT(T,B,BS,NV,NV,NC,NW,NW,NW)
      CALL MEQ(BS,B,NV,NC,NW,NW)
C
C       FORM SCALED DISTURBANCE MATRIX DS AND EQUATE IT TO
C       THE DISTRUBANCE MATRIX D FOR RETURN TO MAIN PROGRAM
C
      CALL MULT(T,D,DS,NV,NV,ND,NW,NW,NW)
      CALL MEQ(DS,D,NV,ND,NW,NW)
C
C       FORM SCALED OUTPUT MATRIX CS AND EQUATE IT TO THE
C       OUTPUT MATRIX C FOR RETURN TO MAIN PROGRAM
C
      CALL MULT(C,TINV,CS,NM,NV,NV,NZ,NW,NZ)
      CALL MEQ(CS,C,NM,NV,NZ,NZ)
C
      RETURN
      END
```

```
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C              SUBROUTINE STEP
C:::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE DETERMINES THE MATRIX OF
C       STEP RESIDUES FOR A GIVEN IMPULSE RESIDUE
C       MATRIX AND A SPECIFIED SET OF EIGEN-
C       VALUES.
C
C       THIS IS DONE BY FORMING A DIAGONAL MATRIX
C       OF THE EIGENVALUES AND POST-MULTIPLYING ITS
C       INVERSE BY THE IMPULSE RESIDUE MATRIX.
C
C-----------------------------------------------------
C
C       CALL STATEMENT ARGUEMENTS -
C
C               IMP     : NPDV X NM MATRIX OF ROW
C                         DIMENSION NWXY (IMPULSE RESIDUES)
C               EIG     : NPDV VECTOR OF DIMENSION NWXY
C                         (VECTOR OF E-VALUES)
C               STP     : NPDV X NM MATRIX OF ROW
C                         DIMENSION NWXY (STEP RESIDUES)
C               EIGMAT : NPDV X NPDV DIAGONAL MATRIX
C                         OF ROW DIMENSION NWXY
C                         (E-VALUES ON DIAGONAL)
C               EINV    : NPDV X NPDV DIAGONAL MATRIX
C                         OF ROW DIMENSION NWXY
C                         (INVERSE OF EIGMAT)
C
C-----------------------------------------------------
C
      SUBROUTINE STEP (IMP,EIG,NWXY,NZ,STP,EIGMAT,EINV)
C
      COMPLEX IMP(NWXY,NZ), EIG(NWXY), STP(NWXY,NZ)
      COMPLEX EIGMAT(NWXY,NWXY), EINV(NWXY,NWXY)
      REAL WK(1000)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
      NPDV = NP + ND + NV
C
C       INITIALIZE MATRIX EIGMAT TO ZERO
C
        DO 5 J=1,NPDV
        DO 6 K=1,NPDV
6     EIGMAT(J,K) = 0.0
5     CONTINUE
C
C       FORM DIAGONAL MATRIX OF E-VALUES
C
        DO 10 I=1,NPDV
10    EIGMAT(I,I) = EIG(I)
C
C-----------------------------------------------------------------
C       SUBROUTINE CINV ( TT, TI, WK, NR, N )
C
C       COMPUTE THE INVERSE OF A COMPLEX MATRIX
C
C               INPUT ARGUMENTS-
```

```
C                       TT(N,N) : COMPLEX MATRIX WITH ROW DIMENSION NR
C                            WK : REAL WORK VECTOR WITH LENGTH
C                                 GREATER THAN N*N*2 + 3*N
C                            NR : ROW DIMENSION
C                             N : ORDER OF TT AND TI
C
C                 OUTPUT ARGUMENTS-
C                         TI(N,N) : COMPLEX INVERSE OF TT WITH
C                                   ROW DIMENSION NR
C
C-----------------------------------------------------------------
C
C       INVERT DIAGONAL MATRIX OF E-VALUES
C
      CALL CINV(EIGMAT,EINV,WK,NWXY,NPDV)
C
C-----------------------------------------------------------------
C
C       SUBROUTINE MULTCC ( A, B, AB, L, M, N, NA, NB, NAB )
C
C       COMPUTE MATRIX PRODUCT: AB = A*B
C
C               A  : L X M COMPLEX MATRIX WITH ROW DIMENSION NA
C               B  : M X N COMPLEX MATRIX WITH ROW DIMENSION NB
C               AB : L X N COMPLEX MATRIX WITH ROW DIMENSION NAB
C
C-----------------------------------------------------------------
C
C       FORM STEP RESIDUE MATRIX
C
      CALL MULTCC(EINV,IMP,STP,NPDV,NPDV,NM,NWXY,NWXY,NWXY)
C
C       OUTPUT STEP RESIDUES TO A TAPE
C
        DO 30 I=1,NM
        DO 20 J=1,NPDV
20    WRITE(2,200) STP(J,I)
30    CONTINUE
C
200   FORMAT(2F10.5)
C
      RETURN
      END
```

```
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C                SUBROUTINE WORK
C::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
C
C       THIS SUBROUTINE FORMS THE COMPLEX MATRICES
C       CON, OBS AND DIST BY MULTIPLYING THE MATICES
C       B, C AND D BY A COMPLEX MATRIX M.
C
C       THIS COMPLEX MATRIX MULTIPLICATION REPRESENTS A
C       TRANSFORMATION THROUGH THE COMPLEX MATRIX M, WHEN
C       THE MATRICES B, C AND D ARE RELATED THROUGH THE
C       STATE VARIABLE EQUATIONS -
C
C               X-DOT = AX + BU + DW
C               Y = CX
C
C       SO THAT -
C
C               CON = MINV * B
C               OBS = C * M
C               DIST = MINV * D
C
C---------------------------------------------------------------
C
C       CALL STATEMENT ARGUMENTS -
C
C               B    : NPDV X NC MATRIX OF ROW DIMENSION NWXY
C               C    : NM X NPDV MATRIX OF ROW DIMENSION NZ
C               D    : NPDV X ND MATRIX OF ROW DIMENSION NWXY
C               M    : NPDV X NPDV MARTIX OF ROW DIMENSION NWXY
C               MINV : INVERSE OF MATRIX M
C               NX   : COLUMN DIMENSION OF MATRIX B
C               NY   : COLUMN DIMENSION OF MATRIX D
C               CON  : NPDV X NC MATRIX OF ROW DIMENSION NWXY
C               OBS  : NM X NPDV MATRIX OF ROW DIMENSION NWXY
C               DIST : NPDV X ND MATRIX OF ROW DIMENSION NWXY
C
C---------------------------------------------------------------
C
      SUBROUTINE WORK(B,C,D,M,MINV,NX,NY,NZ,NWXY,CON,OBS,DIST)
      DIMENSION  B(NWXY,NX),     C(NZ,NWXY),      D(NWXY,1)
      COMPLEX    M(NWXY,NWXY),   MINV(NWXY,NWXY)
      COMPLEX    CON(NWXY,NX),   OBS(NZ,NWXY),    DIST(NWXY,1)
C
      COMMON /DIM/ NV, NC, ND, NM, NP
C
      NPDV = NV + NP + ND
C
C---------------------------------------------------------------
C
C       SUBROTUINE MULTCR ( A, B, AB, L, M, N, NA, NB, NAB )
C
C       COMPUTE MATRIX PRODUCT: AB = A*B
C
C               A  : L X M COMPLEX MATRIX WITH ROW DIMENSION NA
C               B  : M X N REAL MATRIX WITH ROW DIMENSION NB
C               AB : L X N COMPLEX MATRIX WITH ROW DIMENSION NAB
C
C---------------------------------------------------------------
C
```

```
C       FORM MATRIX CON
C
      CALL MULTCR(MINV,B,CON,NPDV,NPDV,NC,NWXY,NWXY,NWXY)
C
C-----------------------------------------------------------
C
C       SUBROUTINE MULTRC ( A, B, AB, L, M, N, NA, NB, NAB )
C
C       COMPUTE MATRIX PRODUCT: AB = A*B
C
C               A  : L X M REAL MATRIX WITH ROW DIMENSION NA
C               B  : M X N COMPLEX MATRIX WITH ROW DIMENSION NB
C               AB : L X N COMPLEX MATRIX WITH ROW DIMENSION NAB
C
C-----------------------------------------------------------
C
C       FORM MATRIX OBS
C
      CALL MULTRC(C,M,OBS,NM,NPDV,NPDV,NZ,NWXY,NZ)
C
C       FORM MATIX DIST
C
      CALL MULTCR(MINV,D,DIST,NPDV,NPDV,1,NWXY,NWXY,NWXY)
C
      RETURN
      END
```

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15. Supplementary Notes

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16. Abstract

As aircraft become larger and lighter due to design requirements for increased payload and improved fuel efficiency, they will also become more flexible. For highly flexible vehicles, the handling qualities may not be accurately predicted by conventional methods. This study applies two analysis methods to a family of flexible aircraft in order to investigate how and when structural (especially dynamic aeroelastic) effects affect the dynamic characteristics of aircraft. The first type of analysis is an open-loop modal analysis technique. This method considers the effect of modal residue magnitudes on determining vehicle handling qualities. The second method is a pilot-in-the-loop analysis procedure that considers several closed-loop system characteristics. Both analyses indicated that dynamic aeroelastic effects caused a degradation in vehicle tracking performance, based on the evaluation of some simulation results.

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