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USAAVLABS TECHNICAL REPORT 70-1B
HELICOPTER ROTOR ROTATIONAL NOISE
PREDICTION AND CORRELATION

VOLUME II

DOCUMENTATION OF NOISE PREDICTION COMPUTER PROGRAM

By

Ronald G. Schlegel

William E. Bausch

November 1970

U. S. ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA

CONTRACT DA 44-177-AMC-448(T)

SIKORSKY AIRCRAFT

DIVISION OF UNITED AIRCRAFT CORPORATION
STRATFORD, CONNECTICUT

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This contract was initiated to acquire NH-3A/S-61F helicopter noise measurements simultaneously with low- and high-frequency aerodynamic rotor loads for the purpose of verifying the accuracy of a rotational noise prediction program. The program itself was modified from the previously assumed rectangular chordal airload distribution to the actual measured chordal airload distribution or to any arbitrary chordal distribution that the program user wished to assume.

Results of this contract demonstrate the importance of high-frequency airloads and the chordal airload distribution in rotational noise predictions. Although inconclusive regarding how many loading harmonics are necessary, findings do show that knowledge of the chordal airload distribution can compensate for a lack of high-frequency airload data.

There are a few available analytical solutions to helicopter rotational noise in addition to that reported herein. These analyses vary in rigor of approach, degree of difficulty of usage, and quantity of input data required, but all appear to be uniformly accurate for the first three or four harmonics of rotational noise under the few normal rotor operating conditions examined.

A program is currently under way to: (1) simultaneously acquire noise and rotor airloads data for "slapping" and "nonslapping" flight conditions of a CH-53A helicopter and (2) correlate these data with noise and airloads prediction methods. The acoustic analyses presented herein will be modified and used in an attempt to predict the occurrence of impulsive rotor noise.

Task 1F162203A14801
Contract DA 44-177-AMC-448(T)
USAAVLABS Technical Report 70-1B
November 1970

HELICOPTER ROTOR ROTATIONAL NOISE PREDICTION AND CORRELATION

Final Report

Volume II

DOCUMENTATION OF NOISE PREDICTION COMPUTER PROGRAM

By

Ronald G. Schlegel

William E. Bausch

Prepared by

Sikorsky Aircraft
Division of United Aircraft Corporation
Stratford Connecticut

For

U. S. ARMY AVIATION MATERIEL LABORATORIES
FORT EUSTIS, VIRGINIA

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ABSTRACT

A computer program for rotational noise prediction is documented in the following sections of this report. The program was developed as a part of a study to develop more accurate methods for predicting rotational noise levels under conditions of nonuniform inflow over the rotor disc.

The computer program will calculate the root-mean-square sound pressure level for up to the 10th harmonic of rotor noise at any field point in the near or far field outside of the rotor disc. Noise levels can be calculated either from a rectangular chordwise distribution of pressure or from the measured chordwise distribution. The equations for noise prediction using the arbitrary (measured) chordwise distribution are derived in Volume I of this report. Although this report concentrated on a helicopter rotor, the analytical results are applicable to propellers in general.

FOREWORD

A computer program for rotational noise prediction was written by Sikorsky Aircraft, Division of United Aircraft Corporation, as part of Contract DA 44-177-AMC-448(T), Task 1F162203A14801. USAAVLABS Project Engineer was Mr. Joseph H. McGarvey.

Acknowledgement is made to Mr. Gediminas Campe for his help in designing the computer program and in bringing it to operational status.

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INTRODUCTION

This report describes a computer program for calculating noise harmonic levels of rotor (or propeller) rotational noise at any point in the acoustic near or far field. In order to simplify the analysis, noise due to blade thickness and aerodynamic shears is not considered, and the rotor disc is assumed to be a flat circular plate perpendicular to the thrust of the rotor system.

The basic physics of the noise prediction analysis are straightforward. Acoustic dipoles (sources and sinks) are the mathematical models used to describe the pressure variations caused by a rotor blade passing over any given point in the rotor disc. By applying an acoustic wave equation, the pressure variations at this point in the disc are transformed to a rotational noise component at a particular field point or observer location. In order to calculate the net rotational noise for a given harmonic and field point, the contributions of many points in the rotor disc are added (vector addition with magnitude and phase) to produce the root-mean-square sound pressure level (SPL) in decibels (dB).

The form of the pressure pulse seen by a point in the rotor disc is important in determining how much noise will be generated. The noise prediction program is designed to use a pulse of arbitrary form, namely the measured chordwise distribution of differential pressure on the section of rotor blade that passes over the point of interest in the rotor disc.

PROGRAMMER/USER INFORMATION

HARDWARE AND SOFTWARE REQUIREMENTS

The noise prediction computer program is written in FORTRAN V for a UNIVAC 1108 digital computing system. In order to manipulate all of the data generated by the program, direct-access storage devices are used. These devices should be UNIVAC FH-332 drums, each with a capacity of at least 90,000 words. Three drum units are called by the program.

PROGRAM DESCRIPTION

The following sections of this report describe the subroutines, structure, and running of the noise prediction computer program.

Subroutines

The name and function of each of the program subroutines are listed below. During normal operation, i.e., all input data on punched cards, the subroutines dealing with magnetic tape will not be called by the main program

E676	Main program, calculates SPL based on the actual chordwise distribution of pressure.
BLODAT	BLOCK DATA subroutine.
RDKU	Reads in one record from the proper input tape, where two records make up one azimuthal pressure cycle.
UNPACK	Unpacks an array containing tape information (two records) into separate arrays representing azimuthal pressure cycles for each pressure transducer channel.
INTERP	Linearly interpolates pressure pulse harmonics up to 20 blade span stations and 288 azimuths.
CUE	Calculates an array which is a function of azimuth and blade station. A double integration of this variable yields the sound pressure components U_m and V_m .
INPUTA	Reads and prints out card input.
MERGES	Combines the absolute pressure of the instrumented top and bottom blade stations, to produce only differential pressures for all blade stations.
OUTSPL	Output subroutine.
DFSRIE	Computes the coefficients of a Fourier series.
AVQUAD	Performs integration by averaged quadratics based on Lagrange interpolation.

E386RN Calculates SPL based on a rectangular chordwise distribution of pressure.

SIMCOR Simpson's Rule integration subroutine.

CURVIT Cubic interpolation subroutine.

PARAM Subroutine used by CURVIT.

CUBIC Subroutine used by CURVIT.

TRIDAG Subroutine used by CURVIT.

START Initializes the clock subroutine CLOCK.

CLOCK Calls the computer clock for the time.

Overlay Structure

In order to pack the data and processing instructions into the memory of the UNIVAC 1108, an overlay technique was used. The overlay map is given below. The small "b" indicates a blank space on the punched card.

bbMAPbE676,,OVER

bbbbbbSEGbE676-(*E386RN,*ALPHA)

ALPHAbbSEGb*RDKU-*UNPACK-*INTERP-*CUE-*INPUTA-*MERGES-*OUTSPL-*DFSRIE

7/8bABSbOVER,AE676

7/8bXQTbCUR

Program Symbols

Both the definition of the alpha-numeric symbols and their proper input units are indicated below. These symbols are used in the programmed equations and in the sample input that are presented later in this report. During normal operation, only those symbols under CARD INPUT need to be included in the input data set.

<u>TAPE</u> <u>INPUT</u>	<u>CARD</u> <u>INPUT</u>	<u>PROGRAM</u> <u>SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
XX	X	BB	in.	Blade thickness; floating point
XX	X	AA	in.	Blade chord; floating point
XX	X	BLADEL	in.	Length of blade (root to tip); floating point

<u>TAPE INPUT</u>	<u>CARD INPUT</u>	<u>PROGRAM SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
XX	X	GAMA	deg/in.	Twist rate of main rotor blade; floating point
XX	X	RO	in.	Radial station with zero twist; floating point
XX	X	CC	in./sec	Speed of sound; floating point
XX	X	OMEG	rpm	Rotor rotational speed; floating point
XX	X	DPSI	deg	Delta azimuth angle= 1.25° or a multiple of 2.5° . All calculations are done at this increment
XX	X	NBLADE		Number of main rotor blades; fixed point
XX	X	MLIMDP		Highest order of harmonic desired to represent all pressure cycles (=1 to 30); fixed point
XX	X	MLIMRN		Highest order of harmonic desired in the rotor noise calculations (=1 to 10); fixed point
XX	X	LSPAN		The number of radial stations as a result of interpolation (=10 or 20). This is an option
XX	X	IREELS		Total number of reels (up to 5)
XX	X	TCOP		=TAPE, data will be read from tape =CARD, data will be read from cards
XX	X	PUNCH		=YES (option to punch out pressure cycle coefficients)
XX	X	INTERM		Intermediate output to be used for checkout; =YES or =NO
XX	X	IDD		Debug printout option; =0, do not print; =1, print
XX	X	E3860P		=YES, call rotor noise subroutine E386RN =NO, do not call E386RN

<u>TAPE INPUT</u>	<u>CARD INPUT</u>	<u>PROGRAM SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
XX	X	OPRONO		Option to calculate SPL from actual chordwise loading =YES, perform rotor noise program =NO, go to subroutine E386RN
XX	X	NFT		Number of field points (up to 20); fixed point
XX	X	ANG	deg	Increment of integration used in E386 subroutine; floating point
XX	X	NHH		Number of Air Load harmonics for E386 program (up to 30); fixed point
XX	X	KEY1		=99, have intermediate output from the E386 program =00, no intermediate output
XX	X	KEY2		
XX	X	KEY3		
XX	X	CAPRF(I)	ft	Spherical coordinates of field point I, used in subroutine E386RN; floating point
XX	X	THETAF(I)	deg	
XX	X	ALFAF(I)	deg	
XX	X	XFP(I)	in.	Coordinates of field point I, origin being at center of rotor disc (I=variable= 1 to 20); floating point
XX	X	YFP(I)	in.	
XX	X	ZFP(I)	in.	
XX	X	IBURST		Burst number being processed, identifies data on telemetry tape
	X	BO	deg	Collective pitch angle; floating point
	X	BIC	deg	Longitudinal cyclic pitch; floating point
	X	BIS	deg	Lateral cyclic pitch; floating point
	X	IN		Spanwise station number, fixed point
	X	JN		Chordwise station number, fixed point
	X	CN(I,JN,IN)	psi	Fourier coefficients of differential pressure where: I = harmonic, JN= chord, IN= span
	X	SN(I,JN,IN)	psi	

<u>TAPE</u> <u>INPUT</u>	<u>CARD</u> <u>INPUT</u>	<u>PROGRAM</u> <u>SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
XX		SLOPE(I,K)	<u>psi</u> full scale	Conversion factors used to get the tape data into engineering units
XX		OFFSET(I,K)	<u>psi</u> full scale	for each tape parameter. I = channel number, K = reel number
XX		KUNIT(I)		Tape drive units on which to mount tape reels
XX		IREEL		Input tape reel number
XX		NC		Channel number
XX		NTBDX(I,J)		Designates top or bottom pressure gage I = IREEL, J = NC
XX		NSTATC(I,J)		Relative chordal position of pressure gage from leading edge (=1,2,3,4,5). I=IREEL, J = NC
XX		NSTATR(I,J)		Relative radial station measured from root of blade (=1,2,3,4,5) I = IREEL, J = NC
XX		NCEND		Input control word. When NCEND is not blank, card specifying reel number follows
XX		ISSET(I)		Set number for reel IREEL
XX		FROC(K)		Filter roll-off correction curve, where K represents the order of the loading harmonic (K= 1 to 30)
		Q1(288,20) Q2(288,20) Q3(288,20)		Functions used in the double integration
		UMF(10,20) VMF(10,20)		Components of sound pressure
		PMRMS(10,20)		Sound pressure
		SPLM(10,20)		Sound pressure level
		LAZI		The number of azimuth stations as a result of interpolation This is calculated knowing DPSI

<u>TAPE INPUT</u>	<u>CARD INPUT</u>	<u>PROGRAM SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
		IRS(I)		Instrumented radial station counter, counting from blade root. If station N.G. then IRS(I) = 0
		ITRACK(I)		Track number for reel number I
		FI(I,J)		Gaussian integration factors for radial station I, chord station J
		NCHAN(I,L)		Blade instrumented station designation for radial station I, chord station J. If = 0, then that station is N.G.
		RR(I)	fraction	Fractional radial station measured from hub center. I = span station = 1 to 5
		XA(I,J)	fraction	Fraction of distance along chord from leading edge. J = span = 1 to 5, I = chord station = 1 to 5
		NCH(I)		Total number of chord stations for radial position I
		XLO(I)	lb/in.	Air Load harmonics used in subroutine E386 where: I = radial station and J = harmonic
		XLM(I,J)	lb/in.	
		XMM(I,J)	lb/in.	
		CHORD(I)	fraction	Chord station array used in the average quadratics integration to get Air Loads (I = chord)
		GPSI(I)	psi	Differential pressure array along a chord, used in average quadratics integration
		FN(I)		Temporary array used to store Air Loads just before harmonic analysis
		PI	rad	PI = 3.14159
		AZMTH2(I)	rad	Azimuth array 0 to 2π rad in $(2.5\pi/180)$ rad increments (I = 1 to 144)
		AZMTH(I)	deg	Azimuth array 0 to 360 deg in 2.5-degree increments (I = 1 to 144)

<u>TAPE</u> <u>INPUT</u>	<u>CARD</u> <u>INPUT</u>	<u>PROGRAM</u> <u>SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
		AZMTH3(288)		Azimuth array every DPRAD radians from 0 to 2π
		DPRAD	rad	$\Delta\psi$ expressed in radians
		BLADES		Number of blades
		SPAN(L)	in.	Radial stations used in the double integration, L = 1 to 20
		S	in.	Distance from element of rotor disc to field point
		B	deg	Blade pitch angle
		GPSI1(I)	psi	Array used in integration of $g_m(\psi, R)$ and $h_m(\psi, R)$
		CHORD2(I)	fraction	Interpolated chord station array used in integration of $g_m(\psi, R)$ and $h_m(\psi, R)$
		AN(I,J,K) BN(I,J,K)		Cosine and sine Fourier coefficients used in filter roll-off correction. I = harmonic, J = channel, K = reel
		TEM1(I) TEM2(I)		Temporary arrays used in Fourier analysis subroutine arguments
		AZRAD	rad	2.5° expressed in radians
		ICHANL(I,J)		Tape channel designation, where J = 1 to NOCH(J) and I = 1 to IREELS
		NO YES		Control words used to check whether or not to execute an option
		NBLANK		Word with all blanks in it
		TEE		Equals "T" in Hollerith used to designate top of blade
		BEE		Equals "B" in Hollerith used to designate bottom of blade
		DEE		Equals "D" in Hollerith used to designate differential pressure

<u>TAPE INPUT</u>	<u>CARD INPUT</u>	<u>PROGRAM SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
		COSINE(I)	deg	Cosine array defined every DPSI degrees
		SINE(I)	deg	Sine array defined every DPSI degrees
		AZ41(I)	rad	Azimuth points I along the chord for a given nominal azimuth
		NCYCLE		Cycles in a burst, counter
		CYCLES		Total number of cycles in a burst
		KU		Current tape unit number
		NDIV(4)		Used to shift integer numbers
		BMASK(6)		Used to mask out parts of a word
		NOCH(I)		Total number of good channels on reel number I
		LIRS		Number of good radial stations
		FTRACK		Current track numbers being read from tape (2nd half of NN(217))
		FBURST		Current burst number being read from tape (2nd half of NN(218))
		FREC		Current record number being read from tape (2nd half of NN(219))
		NN(435)		Tape data cycle array made up of 2 records (Last 3 words are control words)
		ND1(I,J,K) ND2(I,J,K)		Unpacked raw data arrays where: I = azimuthal data point, J = chord station, K = radial station
		DATA2(I,J,K)		Unpacked average raw data cycle where: I = data point, J = chord station, K = radial station
		DATA1(I,J,K) psi		Scaled and corrected average pressure cycles where: I = data point, J = chord, K = radial station

<u>TAPE</u> <u>INPUT</u>	<u>CARD</u> <u>INPUT</u>	<u>PROGRAM</u> <u>SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
		COSRN(I) SINRN(I)		Cosine and sine arrays, the elements being calculated at each instrumented chord station. Used in calculating Fourier coefficients of acoustic Air Loads
		GPSI2(I)	psi	Differential pressure array along a chord, used in average quadratics integration
		GMAR(I,K)		mth cosine coefficient of acoustic pressure pulse where K = radial station, I = azimuthal station
		HMAR(I,K)		mth sine coefficient of acoustic pressure pulse where K = radial station, I = azimuthal station
		DPSI1(I)	psi	Differential pressure array along chord, used in averaged quadratics integration
		GMARI(I,K)		mth cosine coefficient of acoustic pressure pulse after interpolation. I = up to 288, K = 10 or 20
		HMARI(I,K)		mth sine coefficient of acoustic pressure pulse after interpolation. I = up to 288, K = 10 or 20
		TEMP1(I) TEMP2(I) TEMP3(I)		Temporary work arrays used in the interpolation of GMAR and HMAR
		XO(I) YO(I)		Arrays used in interpolation, I = 1 to 20
		W(I)		Temporary work array, I = 1,14
		NOPTS1		Number of radial stations before interpolation (including end points .194 and 1.0)(up to 7)
		ISI		$ISI = (DPSI/2.5) > 1$; if ≤ 0 then $ISI = 1$
		POINT(15)		Gauss integration points (normalized)

<u>TAPE</u> <u>INPUT</u>	<u>CARD</u> <u>INPUT</u>	<u>PROGRAM</u> <u>SYMBOL</u>	<u>UNITS</u>	<u>DESCRIPTION</u>
		WPOINT(15)		Gauss integration weights
		NXY		Number of Gauss points and weights to be used
		PI2	rad	PI2 = 6.28318
		IX		The number of radial intervals to be used in the double integration
		IY		The number of azimuthal intervals to be used in the double integration

Input/Output

The input format is defined symbolically in Figure 1. Note that the blank lines are used to insure legibility. Normal input data would have no blank lines (unpunched cards) unless all of the parameters on a particular card happen to be equal to zero. Figure 2 is a sample numerical input for the first span station with 8 harmonics of pressure for each chord station. The format for the pressure harmonics CN(I,J,K) and SN(I,J,K) for the remaining span stations is completely analogous to that for Span 1. Span stations are specified from root to tip of the blade, and chord stations are specified from leading edge to trailing edge.

Normal output from the noise prediction program contains the following information:

1. Listing of the input parameters except the harmonics of pressure.
2. Values of differential pressure at each span and chord station every DPSI degrees of azimuth from the sum of the input pressure harmonics.
3. Field point coordinates and the corresponding predicted SPL for each noise harmonic.

A typical output is contained in Figure 3.

Operating Instructions

The noise prediction computer program has several options that may be selected. For normal operation, the print options for INTERM and IDD should be refused. If this is not done, several hundred pages of non-essential output will be generated. The following suggestions assume that the input pressure data are on punched cards so that option TCOP is equal to CARD (i.e., no data on magnetic tape).

The azimuthal increment of integration for E676 can be varied from 1.25 degrees to integral multiples of 2.5 degrees, while the value of ANG used in subroutine E386RN can be any value greater than 0.5 degree as long as

(360/ANG) is an even integer. Normally, DPSI and ANG should be equal. If only the first harmonic of noise is being calculated, an increment of 10.0 degrees is acceptable. If 4 harmonics of noise are desired, an increment of 2.5 degrees is recommended. The number of interpolated span stations can be 10 or 20. The larger is recommended for DPSI of 2.5 degrees or less.

Results presented in Volume I of this report demonstrate the importance of high-frequency loading harmonics for prediction of the higher harmonics of noise. At least 15 loading harmonics are recommended for calculation of up to the fourth noise harmonic. However, if only the level of the fundamental is desired, 2 or 3 loading harmonics probably will suffice.

Running time will be a function of the angular increment selected. Calculation of 4 harmonics of rotor noise at 20 field points from both the actual and the hypothetical rectangular chordwise pressure distributions requires approximately 6 minutes of machine time (excluding time for CUR instructions and compilation which can be on the order of 1 minute). Calculations with the actual chordwise distribution take roughly 5 minutes while the corresponding calculations with the rectangular distribution require approximately 1 minute. Running time increases as the azimuthal increment becomes smaller.

The coordinate system for E676 is right-handed Cartesian with Z positive up (in direction of rotor thrust), X positive aft, and Y positive to starboard. The origin of the system is at the center of rotation of the rotor. The coordinate system for E386RN is spherical in which R is the distance between the center of rotation and the field point, θ is the azimuth angle in the plane of the rotor disc, and ϕ is the elevation angle relative to the rotor disc (positive for field points above the disc). Figure 4 contains the coordinate systems for OPRONO and E386OP as used for a conventional helicopter rotor.

If the noise prediction program is used to calculate rotational noise for a propeller rather than a rotor, the following coordinate system definition applies. Z and ϕ are positive for field points on the positive thrust side of the rotor disc. The X-axis and $\theta = 0$ line coincide with the reference point for the azimuthal loading harmonics.

It is advisable to calculate rotational noise via both the OPRONO and E386OP options to determine if the loading details included in OPRONO need to be considered for the configuration being studied. If the rectangular chordwise loading distribution yields acceptable results, use E386 exclusively in order to save computing time.

Detailed instructions regarding control cards and execution commands must be provided by a programmer who is familiar with the particular UNIVAC 1108 installation that is to be used. When the input data and overlay structure are specified correctly, no problems should be encountered in running the program.

Program Logic

Program E676 proceeds as follows for card input (TCOP = CARD):

1. Accept harmonics of differential pressure from cards. Sum these harmonics to produce the differential pressure at each span and chord station every DPSI degrees of azimuth.
2. If output from E386 is desired, calculate the blade section loading (pounds per inch of span) by integrating the differential pressures across the chord at each span station. A trapezoidal integration routine is used.
3. Proceed through E386.
4. If noise levels based on the actual chordwise pressure distribution are required, interpolate to provide 41 points along the blade chord. These points are required to define the Fourier coefficients of the pulse shape (chordwise pressure distribution).
5. Calculate GMAR and HMAR for a particular noise harmonic.
6. Interpolate GMAR and HMAR if 288 azimuthal points and 20 radial points are desired. This interpolation produces GMARI and HMARI.
7. Calculate CUE array for the first field point.
8. Calculate UMF and VMF components of sound pressure for the first field point.
9. Calculate SPLM for the first field point.
10. Repeat steps 7, 8, and 9 for the rest of the field points (field point loop).
11. Repeat steps 5 through 10 for the rest of the noise harmonics (harmonic loop).
12. Repeat steps 1 through 11 for the remaining flight conditions or "data bursts" (burst loop).

Program Equations

Volume I of this report contains the derivation of the noise prediction equations. The critical parameters are GMARI, HMARI, S, Q1, Q2, Q3, UMF, VMF, PMRMS, and SPLM. The relationship between these program symbols and their engineering counterparts is:

$$GMARI = g_m$$

$$HMARI = h_m$$

$$S = s$$

$$Q1 = rq_1$$

$$Q2 = Q1q_2$$

$$Q3 = Q1q_3$$

$$UMF = U_m$$

$$VMF = V_m$$

$$PMRMS = P_m$$

$$SPLM = SPL_m$$

$$UMF \quad u_m = \frac{1}{4\pi} \int_0^{2\pi} \int_0^{r_t} b \, q_1 q_2 \, r \, dr \, d\psi$$

$$VMF \quad v_m = \frac{1}{4\pi} \int_0^{2\pi} \int_0^{r_t} b \, q_1 q_3 \, r \, dr \, d\psi$$

$$Q \quad q_1 \equiv (x - r \cos \psi) \sin \beta \sin \psi - (y - r \sin \psi) \sin \beta \cos \psi + z \cos \beta$$

$$q_2 \equiv g_m \left(-\frac{\cos \phi}{s^3} - \frac{mn\Omega}{cs^2} \sin \phi \right) + h_m \left(\frac{\sin \phi}{s^3} - \frac{mn\Omega}{cs^2} \cos \phi \right)$$

$$q_3 \equiv g_m \left(-\frac{\sin \phi}{s^3} + \frac{mn\Omega}{cs^2} \cos \phi \right) + h_m \left(-\frac{\cos \phi}{s^3} - \frac{mn\Omega}{cs^2} \sin \phi \right)$$

$$\phi = mn\Omega \left(\frac{\psi}{\Omega} + \frac{s}{c} \right)$$

$$GMAR \quad \vec{g}_m(r, \psi) = \frac{n}{\pi b} \int_{-a/2r}^{a/2r} \vec{L}(r, \psi) \cos mn\psi \, d\psi$$

$$HMAR \quad \vec{h}_m(r, \psi) = \frac{n}{\pi b} \int_{-a/2r}^{a/2r} \vec{L}(r, \psi) \sin mn\psi \, d\psi$$

$$s = \left[(x - r \cos \psi)^2 + (y - r \sin \psi)^2 + z^2 \right]^{\frac{1}{2}}$$

Program Listing

The listing for the complete noise prediction deck is contained in Figures 5 through 38. Figure titles correspond to the program or subroutine contained in the figure.

Limitations of the Program

Some aspects of the rotational noise prediction program limit its immediate operation by new users. The direct-access storage drums are called 28, 29, and 30 by the program and the NTRAN routine. It probably will be necessary to change these call numbers to match those used on the UNIVAC 1108 system.

Some additional changes will be required in the programmed equations if the rotor blades being studied differ from those of the NH-3A described in Volume I of this report. In particular, the span stations for which input pressure data are available are assumed to be 40%, 75%, 85%, 95%, and 98% of the radius (BLADEL). The program further assumes that the input chord stations or transducer locations are at 4.2%, 15.8%, 30%, 60%, and 91% chord (AA). In addition, the lifting surface of the blade is assumed to consist of the outer 80.1% of span. Changes in the chord locations will affect the interpolation routine used to calculate GMAR and HMAR, while changes to the span will affect the interpolation used to calculate GMARI and HMARI. These changes are not difficult to make once the programmer is familiar with the deck.

[illegible]

Figure 1. Sample Input, Symbolic.

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Figure 2. Sample Input, Numeric - Continued.

THE

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Figure 2. Sample Input, Numeric - Concluded.

S-61F 165KT LOW WING LOADING - 16 HARMONICS (7.7751) 1102787													
BLADE THICKNESS (IN)		=	.2000+01	ZERO TWIST BLADE STA.		(IN)	=	.7400+02					
BLADE CHORD (IN)		=	.1820+02	SPEED OF SOUND		(IN/SEC)	=	.1300+05					
BLADE LENGTH (IN)		=	.3720+03	ROTOR ROT. SPEED		(RPM)	=	.2000+03					
BLADE TWIST RATE (DEG/IN)		=	.1340-01	AZIMUTH INCREMENT		(DEG)	=	.2500+01					
NUMBER OF BLADES				=	5	TAPE / CARD OPTION		= CARD					
NO. OF HARMONICS TO REPRESENT PRESSURE CYCLES				=	16	PRESSURE HARMONIC PUNCH OPTION		= N					
NO. OF ROTOR NOISE HARMONICS				=	4	INTERMEDIATE OUTPUT OPTION		= N					
NO. OF INTERPOLATED SPAN STATIONS				=	20								
TOTAL NO. OF TAPE REELS				=	1								
OPTION TO USE PROGRAM E386 (THEORETICAL CONST. PRESSURE PULSE) = Y													
OPTION TO USE ROTOR NOISE PROGRAM (MEASURED PRESSURE PULSE) = Y													
NO. OF FIELD POINTS = 14													
INCR. OF INTEGRATION USED IN E386 (1/16.) = 2.5000 NO. OF AIR LOAD HARMONICS = 16 KEY1= 0 KEY2= 0 KEY3= 0													
E386 FIELD POINTS													
FP	R (FT)	THETA (DEG)	ALPHA (DEG)	FP	X (IN)	Y (IN)	Z (IN)						
1	.1545+04	.1699+03	-.2320+02	1	-.1680+05	.3000+04	-.7320+04						
2	.1197+04	.1660+03	-.3033+02	2	-.1200+05	.3000+04	-.7296+04						
3	.1114+04	.1645+03	-.3307+02	3	-.1080+05	.3000+04	-.7296+04						
4	.1035+04	.1622+03	-.3597+02	4	-.9600+04	.3000+04	-.7296+04						
5	.9600+03	.1603+03	-.3928+02	5	-.6400+04	.3000+04	-.7296+04						
6	.8900+03	.1573+03	-.4308+02	6	-.7200+04	.3000+04	-.7296+04						
7	.8260+03	.1534+03	-.4740+02	7	-.6000+04	.3000+04	-.7296+04						
8	.7690+03	.1480+03	-.5218+02	8	-.4800+04	.3000+04	-.7296+04						
9	.7230+03	.1402+03	-.5728+02	9	-.3600+04	.3000+04	-.7296+04						
10	.6870+03	.1287+03	-.6223+02	10	-.2400+04	.3000+04	-.7296+04						
11	.6590+03	.1218+03	-.6590+02	11	-.1200+04	.3000+04	-.7224+04						
12	.6200+03	.5130+02	-.6200+02	12	-.2400+04	.3000+04	-.7224+04						
13	.8220+03	.2660+02	-.4710+02	13	-.6000+04	.3000+04	-.7224+04						
14	.1031+04	.1740+02	-.3570+02	14	-.9600+04	.3000+04	-.7224+04						

Figure 3. Sample Output.

DIFFERENTIAL PRESSURE CYCLES AT INSTRUMENTED BLADE STATIONS

SPAN STATION 1		CHORD STATION 1	
6.2306-01	8.0127-01	9.6152-01	1.0958+00
1.4179+00	1.3690+00	1.2937+00	1.1959+00
2.1489-01	5.6847-02	-4.0817-02	-1.9450-01
-2.1961-01	-1.3488-01	-1.9212-02	1.2926-01
1.4724+00	1.6485+00	1.8336+00	2.0324+00
3.2416+00	3.3093+00	3.3040+00	3.4036+00
3.5512+00	3.5228+00	3.4466+00	3.4466+00
2.6236+00	2.3934+00	2.1703+00	1.9759+00
1.3559+00	1.2100+00	1.0466+00	8.6599-01
4.2243-01	3.6126-01	2.9177-01	2.2436-01
8.1915-02	7.3846-02	6.9838-02	7.3022-02
9.1706-02	8.8150-02	9.3198-02	1.0489-01
9.5111-02	1.3807-01	2.0224-01	2.7227-01
4.2341-03	-3.2360-02	-3.1269-02	-3.2555-03
7.0448-02	1.5109-01	2.7680-01	4.4231-01
SPAN STATION 1		CHORD STATION 2	
3.5609-01	4.3257-01	5.0269-01	5.4492-01
7.3176-01	7.0356-01	6.6579-01	6.2255-01
2.1426-01	1.4162-01	7.5924-02	2.2705-02
7.8274-02	1.4107-01	2.1959-01	3.1274-01
1.0045+00	1.0956+00	1.1956+00	1.3056+00
1.4382+00	1.8394+00	1.8304+00	1.8304+00
1.8007+00	1.7859+00	1.7726+00	1.7597+00
1.3186+00	1.2155+00	1.1236+00	1.0467+00
6.3622-01	5.7583-01	5.2375-01	4.8232-01
1.2411-01	7.6612-02	4.5720-02	3.0832-02
-3.3477-02	-4.8280-02	-5.5295-02	-5.4939-02
-5.5624-02	-5.1045-02	-4.2570-02	-3.3226-02
4.4855-02	9.0647-02	1.3902-01	1.8003-01
9.9669-02	1.0271-01	1.1450-01	1.2703-01
9.7150-02	1.4052-01	2.0285-01	2.7731-01
SPAN STATION 1		CHORD STATION 3	
3.8096-03	3.5325-02	6.4503-02	8.8804-02
1.3159-01	1.1823-01	9.8706-02	7.4258-02
-1.3090-01	-1.6169-01	-1.8942-01	-2.1093-01
-8.5498-02	-3.7337-02	1.6301-02	7.4881-02
4.7343-01	5.2847-01	5.9095-01	6.6150-01
1.0183+00	1.0204+00	1.0205+00	1.0213+00
1.0461+00	1.0437+00	1.0410+00	1.0367+00
8.0702-01	7.5710-01	7.1057-01	6.6729-01
3.4234-01	2.9752-01	2.5621-01	2.1743-01
-3.8437-02	-6.1752-02	-7.9263-02	-9.2051-02
-1.3545-01	-1.3693-01	-1.3717-01	-1.3640-01
-1.3124-01	-1.3097-01	-1.3050-01	-1.2919-01
-1.0113-02	2.2700-02	5.3227-02	7.8042-02
5.0526-02	4.4298-02	4.1556-02	3.9734-02
-6.3188-02	-6.2402-02	-4.9349-02	-2.5970-02
SPAN STATION 1		CHORD STATION 4	
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02	3.6706-02	3.6706-02	3.6706-02
1.4317+00	1.4317+00	1.4317+00	1.4317+00
5.3573-01	5.3573-01	5.3573-01	5.3573-01
-2.7936-01	-2.7936-01	-2.7936-01	-2.7936-01
1.2970+00	1.2970+00	1.2970+00	1.2970+00
3.1678+00	3.1678+00	3.1678+00	3.1678+00
3.5676+00	3.5676+00	3.5676+00	3.5676+00
2.8591+00	2.8591+00	2.8591+00	2.8591+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
1.4699+00	1.4699+00	1.4699+00	1.4699+00
5.0267-01	5.0267-01	5.0267-01	5.0267-01
8.9921-02	8.9921-02	8.9921-02	8.9921-02
1.0104-01	1.0104-01	1.0104-01	1.0104-01
7.8873-02	7.8873-02	7.8873-02	7.8873-02
1.6958-01	1.6958-01	1.6958-01	1.6958-01
3.6706-02			

SPAN STATION 1 CHORD STATION 5									
-8.8635-02	-8.6987-02	-8.6039-02	-8.5464-02	-8.4647-02	-8.3209-02	-8.1390-02	-8.0108-02	-8.0666-02	-8.4235-02
-9.1370-02	-1.0177-01	-1.1442-01	-1.2800-01	-1.4146-01	-1.5441-01	-1.6718-01	-1.8059-01	-1.9543-01	-2.1194-01
-8.2968-01	-2.4738-01	-2.6351-01	-2.7668-01	-2.8602-01	-2.9132-01	-2.9278-01	-2.9088-01	-2.8503-01	-2.7346-01
-2.6116-01	-2.8167-01	-2.1774-01	-1.8993-01	-1.6040-01	-1.3145-01	-1.0501-01	-1.2011-02	-6.2182-02	-4.3917-02
-2.5150-02	-3.9917-03	-2.0551-02	-1.8019-02	-7.7242-02	-1.0376-02	-1.5144-01	-1.2691-01	-1.6882-01	-1.8004-01
1.8713-01	1.9107-01	1.9270-01	1.9266-01	1.9143-01	1.8957-01	1.8779-01	1.8691-01	1.8770-01	1.9048-01
1.9499-01	2.0035-01	2.0525-01	2.0893-01	2.0893-01	2.0656-01	2.0163-01	1.9505-01	1.8732-01	1.7880-01
1.6923-01	1.5802-01	1.4441-01	1.2805-01	1.0921-01	8.8792-02	6.8085-02	4.8366-02	3.0577-02	1.4891-02
1.3755-04	1.2047-02	-2.4835-02	-3.7887-02	-5.1197-02	-6.4363-02	-7.6810-02	-8.8073-02	-9.7985-02	-1.0673-01
-1.1471-01	-1.2236-01	-1.1299-01	-1.3757-01	-1.4494-01	-1.5178-01	-1.5782-01	-1.6291-01	-1.6702-01	-1.7038-01
-1.7260-01	-1.7412-01	-1.7472-01	-1.7433-01	-1.7291-01	-1.7048-01	-1.6711-01	-1.6284-01	-1.5771-01	-1.5172-01
-1.4494-01	-1.3754-01	-1.2985-01	-1.2244-01	-1.1558-01	-1.0937-01	-1.0341-01	-9.6896-02	-8.8786-02	-7.8342-02
-6.5545-02	-5.1387-02	-3.7840-02	-2.7286-02	-2.1965-02	-2.2988-02	-2.9911-02	-4.0696-02	-5.2250-02	-6.1378-02
-6.5791-02	-6.4892-02	-5.9907-02	-5.3433-02	-4.8495-02	-4.7485-02	-5.1361-02	-5.9429-02	-6.9669-02	-7.9543-02
-8.7079-02	-9.1128-02	-9.1940-02	-9.0640-02						
SPAN STATION 2 CHORD STATION 1									
-4.0680-02	-4.1627-02	-4.2030-02	-4.1855-02	-4.1058-02	-3.9686-02	-3.7944-02	-3.6190-02	-3.4877-02	-3.4297-02
-3.4513-02	-3.5260-02	-3.6030-02	-3.6374-02	-3.5627-02	-3.4073-02	-3.1967-02	-2.9884-02	-2.8373-02	-2.7710-02
-2.7752-02	-2.7976-02	-2.7659-02	-2.6156-02	-2.3134-02	-1.8878-02	-1.3240-02	-1.4440-03	-1.8621-03	-3.1627-03
7.5598-03	1.1448-02	1.4980-02	1.8944-02	2.0968-02	2.3069-02	2.4327-02	2.4764-02	2.4694-02	2.4673-02
2.5939-02	2.7200-02	3.0450-02	3.4900-02	4.0035-02	4.5180-02	4.9701-02	5.3157-02	5.5357-02	5.6330-02
5.6178-02	5.5078-02	5.3142-02	5.0681-02	4.7250-02	4.3682-02	4.0070-02	3.6690-02	3.3688-02	3.1009-02
2.8396-02	2.5499-02	2.2031-02	1.7931-02	1.3422-02	8.9389-03	4.9383-03	1.6826-03	-1.0328-03	-3.6994-03
-7.1369-03	-1.2101-02	-1.8995-02	-2.7675-02	-3.7450-02	-4.7301-02	-5.6227-02	-6.3579-02	-6.9264-02	-7.3715-02
-7.7657-02	-8.1774-02	-8.6442-02	-9.1405-02	-9.6282-02	-1.0028-01	-1.0304-01	-1.0447-01	-1.0504-01	-1.0553-01
-1.0625-01	-1.0927-01	-1.1342-01	-1.1829-01	-1.2393-01	-1.2970-01	-1.3534-01	-1.4044-01	-1.4730-01	-1.5444-01
-1.6358-01	-1.7343-01	-1.8415-01	-1.9551-01	-2.0330-01	-2.0940-01	-2.1193-01	-2.1055-01	-2.0521-01	-1.9637-01
-1.8477-01	-1.7137-01	-1.5728-01	-1.4358-01	-1.3115-01	-1.2050-01	-1.1159-01	-1.0385-01	-9.6288-02	-8.7878-02
-7.7955-02	-6.6601-02	-5.4803-02	-4.3020-02	-3.7133-02	-3.4979-02	-3.8550-02	-4.7214-02	-5.9029-02	-7.1197-02
-8.0799-02	-8.5592-02	-8.4590-02	-7.8258-02	-6.8274-02	-5.6954-02	-4.6559-02	-3.8715-02	-3.4114-02	-3.2547-02
-3.3201-02	-3.5060-02	-3.7246-02	-3.9201-02						
SPAN STATION 2 CHORD STATION 2									
5.3076+00	5.3657+00	5.3880+00	5.3760+00	5.3351+00	5.2707+00	5.1852+00	5.0775+00	4.9446+00	4.7852+00
4.6015+00	4.3999+00	4.1884+00	3.9727+00	3.7533+00	3.5236+00	3.2812+00	3.0145+00	2.7269+00	2.4288+00
2.1370+00	1.8690+00	1.6352+00	1.4342+00	1.2531+00	1.0735+00	8.8174-01	6.7725-01	4.7675-01	3.0986-01
2.0790-01	1.8987-01	2.5169-01	3.6431-01	4.3269-01	5.6320-01	5.8312-01	5.5400-01	5.2276-01	5.5854-01
7.2924-01	1.0759+00	1.5947+00	2.2338+00	2.9066+00	3.5171+00	3.9894+00	4.2882+00	4.4268+00	4.4548+00
4.4459+00	4.4570+00	4.5193+00	4.6313+00	4.7626+00	4.8719+00	4.9259+00	4.9127+00	4.8451+00	4.7522+00
4.6664+00	4.6094+00	4.5837+00	4.5746+00	4.5574+00	4.5097+00	4.4206+00	4.2983+00	4.1468+00	3.9973+00
3.8603+00	3.7395+00	3.6285+00	3.5158+00	3.3920+00	3.2557+00	3.1147+00	2.9834+00	2.8762+00	2.8017+00
2.7595+00	2.7409+00	2.7335+00	2.7265+00	2.7150+00	2.7002+00	2.6877+00	2.6822+00	2.6844+00	2.6893+00
2.6881+00	2.6723+00	2.6372+00	2.5843+00	2.5199+00	2.4520+00	2.3863+00	2.3235+00	2.2600+00	2.1908+00
2.1137+00	2.0325+00	1.9573+00	1.9017+00	1.8771+00	1.8880+00	1.9294+00	1.9879+00	2.0469+00	2.0924+00
2.1155+00	2.1294+00	2.1368+00	2.1553+00	2.1964+00	2.2643+00	2.3556+00	2.4614+00	2.5726+00	2.6830+00
2.7418+00	2.9023+00	3.0186+00	3.1427+00	3.2722+00	3.4014+00	3.5239+00	3.6363+00	3.7397+00	3.8401+00
3.9446+00	4.0586+00	4.1814+00	4.3070+00	4.4256+00	4.5283+00	4.6118+00	4.6796+00	4.7425+00	4.8120+00
4.8971+00	4.9992+00	5.1109+00	5.2188+00						
SPAN STATION 2 CHORD STATION 2									
3.2571+00	3.3087+00	3.3519+00	3.3902+00	3.4258+00	3.4577+00	3.4822+00	3.4948+00	3.4925+00	3.4764+00
3.4513+00	3.4240+00	3.4004+00	3.3819+00	3.3641+00	3.3486+00	3.2956+00	3.2280+00	3.1350+00	3.0216+00
2.8966+00	2.7682+00	2.6405+00	2.5117+00	2.3759+00	2.2284+00	2.0703+00	1.9118+00	1.7712+00	1.6498+00

Figure 3. Sample Output - Continued.

SPAN STATION 2 CHORD STATION 3									
1.6226+00	1.6335+00	1.6896+00	1.7660+00	1.8334+00	1.8708+00	1.8743+00	1.8620+00	1.8691+00	1.9367+00
2.0966+00	2.3588+00	2.7050+00	3.0922+00	3.4641+00	3.7680+00	3.9685+00	4.0572+00	4.0514+00	3.9858+00
3.8995+00	3.8226+00	3.7693+00	3.7664+00	3.7094+00	3.7615+00	3.6115+00	3.5317+00	3.5337+00	3.5337+00
3.2462+00	3.1739+00	3.1135+00	3.0559+00	2.9907+00	2.9108+00	2.8152+00	2.7082+00	2.5971+00	2.4882+00
2.3846+00	2.2855+00	2.1878+00	2.0891+00	1.9898+00	1.8938+00	1.8070+00	1.7357+00	1.6795+00	1.6395+00
1.6097+00	1.5838+00	1.5574+00	1.5297+00	1.5033+00	1.4831+00	1.4717+00	1.4690+00	1.4704+00	1.4686+00
1.4560+00	1.4281+00	1.3850+00	1.3313+00	1.2742+00	1.2204+00	1.1734+00	1.1391+00	1.0981+00	1.0620+00
1.0242+00	9.8639-01	9.5374-01	9.3277-01	9.2064-01	9.4286-01	9.7255-01	1.0114+00	1.0521+00	1.0891+00
1.1201+00	1.1465+00	1.1722+00	1.2017+00	1.2377+00	1.2809+00	1.3301+00	1.3832+00	1.4391+00	1.4974+00
1.591+00	1.6249+00	1.6944+00	1.7657+00	1.8361+00	1.9030+00	1.9660+00	2.0268+00	2.0891+00	2.1568+00
2.224+00	2.3150+00	2.4008+00	2.4844+00	2.5608+00	2.6283+00	2.6886+00	2.7466+00	2.8086+00	2.8783+00
2.9563+00	3.0390+00	3.1203+00	3.1943+00						
SPAN STATION 2 CHORD STATION 4									
1.7878+00	1.8038+00	1.8105+00	1.8061+00	1.7906+00	1.7658+00	1.7344+00	1.6997+00	1.6639+00	1.6278+00
1.5902+00	1.5488+00	1.5084+00	1.4628+00	1.4133+00	1.3596+00	1.2993+00	1.2319+00	1.1591+00	9.9353-01
9.3078-01	8.7055-01	8.0855-01	7.4426-01	6.6443-01	5.8268-01	5.0154-01	4.3039-01	3.7903-01	3.5471-01
3.5962-01	3.8990-01	4.3663-01	4.8058-01	5.3601-01	5.7412-01	6.0501-01	6.3733-01	6.8360-01	7.5596-01
8.6182-01	1.0008+00	1.1640+00	1.3362+00	1.4993+00	1.6377+00	1.7416+00	1.8099+00	1.8450+00	1.8595+00
1.8629+00	1.8633+00	1.8643+00	1.8654+00	1.8630+00	1.8536+00	1.8351+00	1.8085+00	1.7770+00	1.7449+00
1.7155+00	1.6902+00	1.6674+00	1.6439+00	1.6165+00	1.5817+00	1.5394+00	1.4920+00	1.4413+00	1.3905+00
1.3417+00	1.2955+00	1.2515+00	1.2089+00	1.1677+00	1.1288+00	1.0941+00	1.0659+00	1.0435+00	1.0285+00
1.0300+00	1.0301+00	1.0314+00	1.0317+00	1.0292+00	1.0239+00	1.0161+00	1.0063+00	9.9432-01	9.7924-01
9.5948-01	9.3357-01	9.0081-01	8.6172-01	8.1799-01	7.7200-01	7.2617-01	6.8236-01	6.4166-01	6.0466-01
5.7198-01	5.4483-01	5.2519-01	5.1553-01	5.1801-01	5.3359-01	5.6124-01	5.9780-01	6.3851-01	6.7811-01
7.1226-01	7.3863-01	7.5744-01	7.7124-01	7.8399-01	7.9378-01	8.2160-01	8.5061-01	8.8598-01	9.2536-01
9.6574-01	1.0044+00	1.0396+00	1.0709+00	1.0995+00	1.1273+00	1.1567+00	1.1893+00	1.2285+00	1.2730+00
1.3227+00	1.3760+00	1.4302+00	1.4824+00	1.5299+00	1.5707+00	1.6041+00	1.6309+00	1.6530+00	1.6731+00
1.6937+00	1.7163+00	1.7408+00	1.7656+00						
SPAN STATION 2 CHORD STATION 5									
5.3725-01	5.3835-01	5.3714-01	5.3387-01	5.2888-01	5.2239-01	5.1432-01	5.0431-01	4.9244-01	4.7691-01
4.5919-01	4.3999-01	4.1662-01	3.9232-01	3.6612-01	3.3791-01	3.0766-01	2.7569-01	2.4300-01	2.1040-01
1.7978-01	1.5208-01	1.2745-01	1.0606-01	8.6101-02	6.6465-02	4.7297-02	2.8774-02	1.3173-02	3.3988-03
2.2134-03	1.1281-02	3.0345-02	5.7449-02	8.8058-02	1.1921-01	1.4781-01	1.7311-01	1.9660-01	2.2144-01
2.5117-01	2.8831-01	3.3350-01	3.8410-01	4.3675-01	4.8446-01	5.2905-01	5.6203-01	5.8508-01	5.9970-01
6.0854-01	6.1417-01	6.1833-01	6.2158-01	6.2347-01	6.2312-01	6.1991-01	6.1387-01	6.0578-01	5.9682-01
5.8810-01	5.8014-01	5.7267-01	5.6474-01	5.5511-01	5.4273-01	5.2707-01	5.0833-01	4.8724-01	4.6483-01
4.4212-01	4.1989-01	3.9865-01	3.7873-01	3.6045-01	3.4415-01	3.3024-01	3.1903-01	3.1062-01	3.0483-01
3.0112-01	2.9881-01	2.9716-01	2.9555-01	2.9347-01	2.9055-01	2.8644-01	2.8073-01	2.7399-01	2.6287-01
2.5025-01	2.3536-01	2.1884-01	2.0157-01	1.8454-01	1.6857-01	1.5419-01	1.4161-01	1.3087-01	1.2202-01
1.1525-01	1.1097-01	1.0967-01	1.1165-01	1.1688-01	1.2475-01	1.3423-01	1.4473-01	1.5293-01	1.6030-01
1.6581-01	1.6990-01	1.7334-01	1.7700-01	1.8160-01	1.8760-01	1.9512-01	2.0407-01	2.1426-01	2.2545-01
2.3740-01	2.4979-01	2.6231-01	2.7464-01	2.8662-01	2.9838-01	3.1043-01	3.2356-01	3.3875-01	3.5656-01
3.7708-01	3.9958-01	4.2270-01	4.4668-01	4.6391-01	4.7939-01	4.9097-01	4.9932-01	5.0565-01	5.1124-01
5.1694-01	5.2296-01	5.2889-01	5.3393-01						
SPAN STATION 2 CHORD STATION 6									
-2.9588-01	-3.1349-01	-3.3155-01	-3.5043-01	-3.7005-01	-3.8989-01	-4.0920-01	-4.2739-01	-4.4435-01	-4.6026-01
-4.7692-01	-4.9430-01	-5.1305-01	-5.3277-01	-5.5201-01	-5.6905-01	-5.8230-01	-5.9101-01	-5.9557-01	-5.9746-01
-5.9843-01	-6.0075-01	-6.0460-01	-6.0858-01	-6.1453-01	-6.1726-01	-6.1685-01	-6.1279-01	-6.0619-01	-5.9886-01
-5.9273-01	-5.8884-01	-5.8704-01	-5.8598-01	-5.8375-01	-5.7687-01	-5.6444-01	-5.5297-01	-5.4775-01	-5.3781-01
-5.3089-01	-5.2695-01	-5.2430-01	-5.2019-01	-5.1179-01	-4.9737-01	-4.7698-01	-4.5237-01	-4.2730-01	-4.0444-01
-3.8624-01	-3.7320-01	-3.6399-01	-3.5612-01	-3.4611-01	-3.3461-01	-3.1879-01	-3.0053-01	-2.8176-01	-2.6442-01
-2.4977-01	-2.3792-01	-2.2804-01	-2.1884-01	-2.0919-01	-1.9863-01	-1.8747-01	-1.7653-01	-1.6684-01	-1.5876-01
-1.5219-01	-1.4640-01	-1.4043-01	-1.3354-01	-1.2547-01	-1.1656-01	-1.0733-01	-9.9096-02	-9.1641-02	-8.5183-02

Figure 3. Sample Output - Continued.

-7.9088-02	-7.2979-02	-6.6475-02	-5.9692-02	-5.3195-02	-4.7787-02	-4.4193-02	-4.2775-02	-4.3415-02	-4.5979-02
-4.8586-02	-5.1847-02	-5.5074-02	-5.8288-02	-6.1688-02	-6.5410-02	-6.9388-02	-7.3251-02	-7.6443-02	-7.9407-02
-7.8794-02	-7.1677-02	-7.5038-02	-7.8442-02	-8.1842-02	-8.5242-02	-8.8642-02	-9.2042-02	-9.5442-02	-9.8842-02
-5.0952-02	-5.1160-02	-5.2878-02	-5.5997-02	-6.0125-02	-6.4489-02	-6.9135-02	-7.3998-02	-7.8534-02	-8.3482-02
-8.2908-02	-8.6537-02	-9.0682-02	-9.5224-02	-9.9855-02	-1.0425-01	-1.0825-01	-1.1190-01	-1.1548-01	-1.1909-01
-1.2307-01	-1.2756-01	-1.3255-01	-1.3811-01	-1.4447-01	-1.5005-01	-1.5619-01	-1.6197-01	-1.6793-01	-1.7399-01
-2.2215-01	-2.4107-01	-2.5989-01	-2.7816-01						
SPAN STATION 3 CHORD STATION 1									
8.2907+00	8.2104+00	8.0435+00	7.8020+00	7.5095+00	7.1950+00	6.8047+00	6.5948+00	6.3290+00	6.0799+00
5.8197+00	5.5481+00	5.2536+00	4.9409+00	4.6231+00	4.3163+00	4.0322+00	3.7725+00	3.5289+00	3.2663+00
3.0303+00	2.7590+00	2.4616+00	2.1675+00	1.8898+00	1.6416+00	1.4270+00	1.2349+00	1.0553+00	0.8880+00
6.6600-01	4.6529-01	2.9154-01	1.7981-01	1.6083-01	2.4884-01	4.3447-01	6.8559-01	9.5437-01	1.2014+00
1.3898+00	1.5141+00	1.5911+00	1.6400+00	1.7397+00	1.8758+00	2.0717+00	2.3173+00	2.5886+00	2.8973+00
3.1011+00	3.3096+00	3.4858+00	3.6394+00	3.7819+00	3.9192+00	4.0487+00	4.1613+00	4.2461+00	4.2958+00
4.3106+00	4.2986+00	4.2725+00	4.2446+00	4.2220+00	4.2046+00	4.1854+00	4.1546+00	4.1039+00	4.0298+00
3.9345+00	3.8253+00	3.7105+00	3.5973+00	3.4890+00	3.3859+00	3.2869+00	3.1918+00	3.1028+00	3.0253+00
2.9657+00	2.9300+00	2.9210+00	2.9377+00	2.9753+00	3.0272+00	3.0864+00	3.1468+00	3.2081+00	3.2550+00
3.2970+00	3.3273+00	3.3433+00	3.3436+00	3.3282+00	3.2990+00	3.2604+00	3.2153+00	3.1687+00	3.1228+00
3.0791+00	3.0393+00	3.0069+00	2.9875+00	2.9886+00	3.0178+00	3.0798+00	3.1740+00	3.2936+00	3.4284+00
3.5579+00	3.6761+00	3.7748+00	3.8557+00	3.9288+00	4.0065+00	4.1039+00	4.2301+00	4.3874+00	4.5787+00
4.7891+00	4.9693+00	5.1601+00	5.3335+00	5.4874+00	5.6246+00	5.7513+00	5.8759+00	6.0051+00	6.1443+00
6.2956+00	6.4583+00	6.6288+00	6.8021+00	6.9734+00	7.1393+00	7.2998+00	7.4572+00	7.6133+00	7.7761+00
7.9370+00	8.0880+00	8.2117+00	8.2864+00						
SPAN STATION 3 CHORD STATION 2									
4.0340+00	4.1610+00	4.3486+00	4.5202+00	4.6715+00	4.7765+00	4.8128+00	4.7682+00	4.6438+00	4.4581+00
4.2229+00	3.9766+00	3.7370+00	3.5156+00	3.3113+00	3.1121+00	2.9015+00	2.6844+00	2.3952+00	2.1001+00
1.7970+00	1.5109+00	1.2662+00	1.0797+00	9.5498-01	8.8188-01	8.3785-01	7.9879-01	7.4309-01	6.8059-01
5.5521-01	4.4406-01	3.5159-01	3.0195-01	3.1133-01	3.8307-01	5.0698-01	6.6319-01	8.2908-01	9.8690-01
1.1293+00	1.2618+00	1.3996+00	1.5617+00	1.7628+00	2.0085+00	2.2833+00	2.6397+00	2.8397+00	3.0693+00
3.2119+00	3.2868+00	3.2912+00	3.2827+00	3.1638+00	3.0752+00	2.9918+00	2.9190+00	2.8544+00	2.7911+00
2.7220+00	2.6433+00	2.5561+00	2.4656+00	2.3782+00	2.2991+00	2.2299+00	2.1678+00	2.1078+00	2.0425+00
1.9686+00	1.8850+00	1.7943+00	1.7018+00	1.6135+00	1.5342+00	1.4665+00	1.4109+00	1.3665+00	1.3321+00
1.3073+00	1.2927+00	1.2828+00	1.2959+00	1.3124+00	1.3349+00	1.3587+00	1.3786+00	1.3902+00	1.3912+00
1.3619+00	1.3642+00	1.3410+00	1.3151+00	1.2880+00	1.2598+00	1.2293+00	1.1958+00	1.1583+00	1.1180+00
1.0782+00	1.0434+00	1.0193+00	1.0113+00	1.0234+00	1.0574+00	1.1119+00	1.1829+00	1.2637+00	1.3467+00
1.4247+00	1.4923+00	1.5475+00	1.5921+00	1.6311+00	1.6717+00	1.7207+00	1.7832+00	1.8605+00	1.9498+00
2.0455+00	2.1406+00	2.2291+00	2.3077+00	2.3770+00	2.4403+00	2.5032+00	2.5707+00	2.6465+00	2.7313+00
2.8236+00	2.9207+00	3.0193+00	3.1171+00	3.2127+00	3.3053+00	3.3937+00	3.4767+00	3.5528+00	3.6216+00
3.6853+00	3.7494+00	3.8228+00	3.9151+00						
SPAN STATION 3 CHORD STATION 3									
2.9525+00	2.9614+00	3.0123+00	3.0399+00	3.0598+00	3.0709+00	3.0762+00	3.0807+00	3.0873+00	3.0934+00
3.0909+00	3.0700+00	3.0263+00	2.9680+00	2.9191+00	2.9153+00	2.9928+00	3.1731+00	3.4496+00	3.7828+00
4.1065+00	4.3479+00	4.4497+00	4.3911+00	4.1966+00	3.9282+00	3.6633+00	3.4669+00	3.3659+00	3.3414+00
3.3383+00	3.2915+00	3.1579+00	2.9413+00	2.6988+00	2.5239+00	2.5125+00	2.7227+00	3.1456+00	3.6983+00
4.2441+00	4.6330+00	4.7507+00	4.5556+00	4.0933+00	3.4824+00	2.8749+00	2.4097+00	2.1714+00	2.1699+00
2.3464+00	2.6007+00	2.8294+00	2.9592+00	2.9654+00	2.8702+00	2.7484+00	2.5838+00	2.4634+00	2.4319+00
2.4107+00	2.3902+00	2.3444+00	2.2631+00	2.1549+00	2.0403+00	1.9409+00	1.8689+00	1.8219+00	1.7858+00
1.7423+00	1.6779+00	1.5906+00	1.4898+00	1.3918+00	1.3118+00	1.2579+00	1.2284+00	1.2137+00	1.2026+00
1.1873+00	1.1674+00	1.1487+00	1.1394+00	1.1449+00	1.1644+00	1.1909+00	1.2297+00	1.2197+00	1.2095+00
1.1843+00	1.1527+00	1.1231+00	1.1048+00	1.0893+00	1.0693+00	1.0462+00	1.0098+00	9.6064-01	9.0560-01
8.5558-01	8.2156-01	8.1046-01	8.2308-01	8.5470-01	8.9789-01	9.4586-01	9.9501-01	1.0450+00	1.0972+00
1.1525+00	1.2030+00	1.2625+00	1.3041+00	1.3431+00	1.3690+00	1.3916+00	1.4195+00	1.4598+00	1.5155+00
1.5638+00	1.6568+00	1.7253+00	1.7825+00	1.8268+00	1.8627+00	1.8988+00	1.9424+00	2.0001+00	2.0717+00

Figure 3. Sample Output - Continued.

2.1529+00	2.2374+00	2.3201+00	2.3984+00	2.4733+00	2.5468+00	2.6201+00	2.6918+00	2.7578+00	2.8134+00
2.8558+00	2.8858+00	2.9079+00	2.9285+00						
SPAN STATION 3 CHORD STATION 4									
1.7042+01	1.5219+01	1.3310+01	1.1253+01	9.0002+02	6.5381+02	3.8924+02	1.1192+02	-1.7189+02	-4.5807+02
-7.4661-02	-1.0421-01	-1.3523-01	-1.6661-01	-2.0501-01	-2.4470-01	-2.8754-01	-3.3302-01	-3.8050-01	-4.2934-01
-4.7901-01	-5.2900-01	-5.7860-01	-6.2875-01	-6.7183-01	-7.1177-01	-7.4754-01	-7.7911-01	-8.0650-01	-8.3240-01
-7.7023-01	-7.5263-01	-7.3607-01	-7.0589-01	-6.8303-01	-6.6338-01	-6.4752-01	-6.3451-01	-6.2221-01	-6.0781-01
-5.6886-01	-5.6199-01	-5.2746-01	-4.8843-01	-4.3778-01	-3.8739-01	-3.3753-01	-2.9105-01	-2.5007-01	-2.1548-01
-1.8709-01	-1.6392-01	-1.4466-01	-1.2814-01	-1.1360-01	-1.0081-01	-8.9869-02	-7.8117-02	-6.5117-02	-6.0449-02
-6.5226-02	-6.2059-02	-5.9148-02	-5.6471-02	-5.4413-02	-5.3631-02	-5.4795-02	-5.8321-02	-6.4199-02	-7.1981-02
-8.0921-02	-9.0204-02	-9.9154-02	-1.0734-01	-1.1453-01	-1.2055-01	-1.2516-01	-1.2791-01	-1.2822-01	-1.2555-01
-1.1961-01	-1.1061-01	-9.9277-02	-8.6796-02	-7.4533-02	-6.3758-02	-5.5385-02	-4.9864-02	-4.7178-02	-4.7016-02
-4.6949-02	-5.2574-02	-5.7589-02	-6.3765-02	-7.0886-02	-7.8485-02	-8.6825-02	-9.4921-02	-1.0254-01	-1.0931-01
-1.1465-01	-1.1793-01	-1.1827-01	-1.1670-01	-1.0638-01	-9.2797-02	-7.4347-02	-5.2344-02	-2.9063-02	-7.3466-03
1.0031-02	2.1699-02	2.5281-02	2.3638-02	1.8635-02	1.3497-02	1.1518-02	1.4191-02	2.2708-02	3.5843-02
5.1414-02	6.6810-02	7.9843-02	8.6387-02	9.5649-02	1.0001-01	1.0454-01	1.1131-01	1.2184-01	1.3671-01
1.5548-01	1.7685-01	1.9900-01	2.1995-01	2.3789-01	2.5137-01	2.5944-01	2.6171-01	2.5833-01	2.4995-01
2.3760-01	2.2247-01	2.0573-01	1.8824-01						
SPAN STATION 3 CHORD STATION 5									
-5.4397-01	-5.6649-01	-5.8849-01	-6.0934-01	-6.2881-01	-6.4716-01	-6.6496-01	-6.8286-01	-7.0132-01	-7.2044-01
-7.3988-01	-7.5902-01	-7.7714-01	-7.9366-01	-8.0824-01	-8.2078-01	-8.3131-01	-8.3986-01	-8.4629-01	-8.5036-01
-8.5182-01	-8.5057-01	-8.4681-01	-8.4107-01	-8.3408-01	-8.2654-01	-8.1890-01	-8.1124-01	-8.0331-01	-7.9475-01
-7.8538-01	-7.7547-01	-7.6575-01	-7.5729-01	-7.5103-01	-7.4735-01	-7.4572-01	-7.4465-01	-7.4199-01	-7.3848-01
-7.2349-01	-7.0554-01	-6.8255-01	-6.5644-01	-6.3057-01	-6.0492-01	-5.8743-01	-5.7252-01	-5.6131-01	-5.5269-01
-5.4242-01	-5.3112-01	-5.1706-01	-5.0052-01	-4.8257-01	-4.6464-01	-4.4808-01	-4.3358-01	-4.2135-01	-4.1085-01
-4.0122-01	-3.9165-01	-3.8162-01	-3.7109-01	-3.6045-01	-3.5032-01	-3.4133-01	-3.3280-01	-3.2480-01	-3.1746-01
-3.1621-01	-3.1246-01	-3.0820-01	-3.0420-01	-3.0345-01	-2.9830-01	-2.9315-01	-2.8830-01	-2.8397-01	-2.8025-01
-2.7710-01	-2.7441-01	-2.7204-01	-2.6995-01	-2.6815-01	-2.6591-01	-2.6423-01	-2.6251-01	-2.6076-01	-2.5899-01
-2.7194-01	-2.7468-01	-2.7748-01	-2.8022-01	-2.8293-01	-2.8576-01	-2.8868-01	-2.9156-01	-2.9440-01	-2.9730-01
-3.0192-01	-3.0318-01	-3.0267-01	-3.0277-01	-2.9628-01	-2.9136-01	-2.8642-01	-2.8244-01	-2.7859-01	-2.7490-01
-2.8302-01	-2.8796-01	-2.9472-01	-3.0240-01	-3.1090-01	-3.1992-01	-3.2615-01	-3.3230-01	-3.3730-01	-3.4137-01
-3.4491-01	-3.4941-01	-3.5233-01	-3.5694-01	-3.6223-01	-3.6798-01	-3.7364-01	-3.7872-01	-3.8284-01	-3.8692-01
-3.8820-01	-3.9024-01	-3.9270-01	-3.9622-01	-4.0121-01	-4.0785-01	-4.1610-01	-4.2588-01	-4.3716-01	-4.5008-01
-4.6488-01	-4.8180-01	-5.0087-01	-5.2181-01						
SPAN STATION 4 CHORD STATION 1									
8.8080+00	8.5549+00	8.3034+00	8.0504+00	7.7850+00	7.4964+00	7.1898+00	6.8407+00	6.4913+00	6.1488+00
5.8239+00	5.5252+00	5.2506+00	4.9939+00	4.7494+00	4.5154+00	4.2940+00	4.0894+00	3.9027+00	3.7278+00
3.5502+00	3.3514+00	3.1150+00	2.8354+00	2.5221+00	2.1996+00	1.9011+00	1.6581+00	1.4697+00	1.2866+00
1.3717+00	1.3763+00	1.3855+00	1.3795+00	1.3537+00	1.3188+00	1.2940+00	1.3016+00	1.3510+00	1.4434+00
1.5633+00	1.6958+00	1.8241+00	1.9409+00	2.0497+00	2.1629+00	2.2959+00	2.4684+00	2.6894+00	2.8856+00
3.1246+00	3.3576+00	3.5681+00	3.7449+00	3.8831+00	3.9834+00	4.0499+00	4.0876+00	4.1020+00	4.0943+00
4.0820+00	4.0586+00	4.0332+00	4.0049+00	3.9854+00	3.9596+00	3.9284+00	3.8747+00	3.8051+00	3.7158+00
3.6111+00	3.4981+00	3.3844+00	3.2772+00	3.1786+00	3.0891+00	3.0077+00	2.9342+00	2.8783+00	2.8197+00
2.7866+00	2.7738+00	2.7813+00	2.8054+00	2.8423+00	2.8890+00	2.9303+00	2.9766+00	3.0241+00	3.0725+00
3.1197+00	3.1612+00	3.1907+00	3.2030+00	3.1965+00	3.1746+00	3.1455+00	3.1194+00	3.1082+00	3.1082+00
3.1289+00	3.1522+00	3.2157+00	3.2831+00	3.3733+00	3.5030+00	3.6753+00	3.8935+00	4.1470+00	4.4173+00
4.6749+00	4.8963+00	5.0681+00	5.1938+00	5.2925+00	5.3944+00	5.5275+00	5.7091+00	5.9487+00	6.2482+00
6.4798+00	6.7361+00	6.9600+00	7.1517+00	7.3250+00	7.5885+00	7.9450+00	8.3887+00	8.9138+00	9.5387+00
8.6021+00	8.7785+00	8.9160+00	9.0252+00	9.1233+00	9.2162+00	9.3060+00	9.4492+00	9.6340+00	9.8799+00
9.5522+00	9.4484+00	9.2760+00	9.0547+00						
SPAN STATION 4 CHORD STATION 2									

Figure 3. Sample Output - Continued.

SPAN STATION 4				CHORD STATION 3			
4.1000+00	4.1721+00	4.2522+00	4.3273+00	4.3819+00	4.4020+00	4.3785+00	4.3094+00
3.9127+00	3.7571+00	3.6070+00	3.4679+00	3.3422+00	3.2310+00	3.1339+00	3.0498+00
2.8208+00	2.7440+00	2.6379+00	2.5101+00	2.3646+00	2.2110+00	2.0624+00	1.9250+00
1.6562+00	1.6589+00	1.6291+00	1.6018+00	1.5769+00	1.5586+00	1.5328+00	1.5091+00
1.6593+00	1.6853+00	1.6976+00	1.6986+00	1.6976+00	1.7084+00	1.7445+00	1.8151+00
2.2067+00	2.3552+00	2.4663+00	2.5877+00	2.6528+00	2.6799+00	2.6714+00	2.6321+00
2.3986+00	2.5085+00	2.5251+00	2.5368+00	2.50967+00	2.517+00	2.50137+00	2.4957+00
1.8107+00	1.7384+00	1.6651+00	1.5966+00	1.5371+00	1.4800+00	1.4408+00	1.3911+00
1.3617+00	1.3607+00	1.3713+00	1.3933+00	1.4243+00	1.4604+00	1.510+00	1.5598+00
1.6014+00	1.6151+00	1.6242+00	1.6282+00	1.6269+00	1.6206+00	1.6115+00	1.6031+00
1.6199+00	1.6475+00	1.6867+00	1.7374+00	1.7999+00	1.8748+00	1.9623+00	2.0429+00
2.3792+00	2.4622+00	2.5234+00	2.5639+00	2.5912+00	2.6173+00	2.6544+00	2.7170+00
3.0006+00	3.1018+00	3.1880+00	3.2560+00	3.3094+00	3.3587+00	3.4132+00	3.4809+00
3.7476+00	3.8290+00	3.8917+00	3.9326+00	3.9540+00	3.9616+00	3.9620+00	3.9634+00
3.9690+00	3.9817+00	4.0050+00	4.0436+00				
SPAN STATION 4				CHORD STATION 4			
1.9663+00	1.9927+00	1.9844+00	1.9079+00	1.7557+00	1.5540+00	1.3563+00	1.2242+00
1.4926+00	1.7072+00	1.8744+00	1.9391+00	1.8827+00	1.7282+00	1.5280+00	1.3099+00
1.1040+00	1.0625+00	9.7002-01	8.0487-01	5.7689-01	3.2187-01	1.5280+00	1.2080+00
-2.1798-01	-2.0918-01	-2.1703-01	-2.4542-01	-2.8271-01	-3.1169-01	-3.2116-01	-1.8790-01
-2.9651-01	-2.9515-01	-2.5342-01	-1.4033-01	7.3299-02	3.7906-01	7.3542-01	-2.9850-01
1.3683+00	1.1835+00	9.3696-01	7.0698-01	5.5656-01	5.1329-01	5.6349-01	1.0743+00
7.7965-01	7.1382-01	6.3633-01	5.8371-01	5.7116-01	6.1421-01	6.7196-01	7.5473+00
6.4592-01	5.8527-01	5.4575-01	5.3997-01	5.6352-01	5.9439-01	6.2277-01	7.3186-01
5.3942-01	5.4549-01	5.8605-01	6.5118-01	7.3052-01	7.7288-01	7.9592-01	5.9746-01
7.7131-01	8.0365-01	8.8916-01	8.9022-01	9.1081-01	9.0455-01	8.7846-01	7.7383-01
8.9660-01	9.5699-01	1.0168+00	1.0627+00	1.0916+00	1.1414+00	1.1925+00	8.3707-01
1.5568+00	1.5244+00	1.5544+00	1.5485+00	1.5237+00	1.5099+00	1.5144+00	1.3648+00
1.7995+00	1.8417+00	1.8516+00	1.8477+00	1.8372+00	1.8545+00	1.9025+00	1.7281+00
2.1381+00	2.1431+00	2.1378+00	2.1418+00	2.1661+00	2.2147+00	2.2645+00	2.0484+00
2.1247+00	2.0306+00	1.9659+00	1.9470+00				2.2783+00
SPAN STATION 4				CHORD STATION 5			
4.3393-01	4.3344-01	4.3305-01	4.3237-01	4.3102-01	4.2889-01	4.2614-01	4.2322-01
4.1803-01	4.1786-01	4.1794-01	4.1758-01	4.1636-01	4.1414-01	4.1116-01	4.0807-01
4.0405-01	4.0530-01	4.0742-01	4.0988-01	4.1219-01	4.1407-01	4.1548-01	4.1752-01
4.1941-01	4.2030-01	4.2102-01	4.2156-01	4.2195-01	4.2231-01	4.2271-01	4.2334-01
4.2213-01	4.2033-01	4.1785-01	4.1512-01	4.1271-01	4.1117-01	4.1084-01	4.1348-01
4.1760-01	4.1910-01	4.2000-01	4.2047-01	4.2074-01	4.2102-01	4.2134-01	4.2167-01
4.2071-01	4.2004-01	4.1975-01	4.2014-01	4.2147-01	4.2344-01	4.2563-01	4.2839-01
4.2722-01	4.2575-01	4.2442-01	4.2367-01	4.2364-01	4.2413-01	4.2470-01	4.2446-01
4.2229-01	4.2142-01	4.2127-01	4.2196-01	4.2324-01	4.2462-01	4.2555-01	4.2667-01
4.2271-01	4.2222-01	4.2261-01	4.2376-01	4.2526-01	4.2653-01	4.2711-01	4.2599-01
4.2455-01	4.2496-01	4.2632-01	4.2833-01	4.3046-01	4.3215-01	4.3303-01	4.3306-01
4.3163-01	4.3193-01	4.3276-01	4.3363-01	4.3472-01	4.3511-01	4.3467-01	4.3253-01
4.3269-01	4.3349-01	4.3498-01	4.3690-01	4.3806-01	4.4057-01	4.4171-01	4.3327-01
4.4072-01	4.4003-01	4.3964-01	4.3968-01	4.4013-01	4.4086-01	4.4159-01	4.4205-01
4.3969-01	4.3794-01	4.3621-01	4.3482-01				4.4190-01
SPAN STATION 4				CHORD STATION 5			
-2.1187-01	-2.1652-01	-2.2478-01	-2.3779-01	-2.5464-01	-2.7255-01	-2.8774-01	-2.9763-01
-2.7778-01	-2.6264-01	-2.4854-01	-2.3774-01	-2.3069-01	-2.2713-01	-2.2408-01	-2.2041-01
-2.1876-01	-2.2243-01	-2.3002-01	-2.4045-01	-2.5121-01	-2.5900-01	-2.6070-01	-2.5444-01
-1.9461-01	-1.6947-01	-1.4648-01	-1.2740-01	-1.1300-01	-1.0329-01	-9.7962-02	-9.9063-02
							-2.9057-01
							-2.1857-01
							-2.1919-01
							-1.0476-01

Figure 3. Sample Output - Continued.

SPAN STATION 5 CHORD STATION 1									
-1.1300-01	-1.2260-01	-1.3203-01	-1.3978-01	-1.4481-01	-1.4687-01	-1.4660-01	-1.4529-01	-1.4436-01	-1.4472-01
-1.4657-01	-1.4918-01	-1.5123-01	-1.5135-01	-1.4860-01	-1.4283-01	-1.3467-01	-1.2527-01	-1.1500-01	-1.0767-01
-1.0056-01	-9.5237-02	-9.1342-02	-8.8735-02	-8.7408-02	-8.7484-02	-8.8970-02	-9.1782-02	-9.5471-02	-9.9401-02
-1.0295-01	-1.0577-01	-1.0793-01	-1.0988-01	-1.1225-01	-1.1549-01	-1.1962-01	-1.2411-01	-1.2804-01	-1.3047-01
-1.3080-01	-1.2906-01	-1.2595-01	-1.2263-01	-1.2031-01	-1.1988-01	-1.2164-01	-1.2533-01	-1.3032-01	-1.3508-01
-1.4149-01	-1.4692-01	-1.5213-01	-1.5709-01	-1.6161-01	-1.6523-01	-1.6739-01	-1.6759-01	-1.6568-01	-1.6193-01
-1.5699-01	-1.5166-01	-1.4657-01	-1.4157-01	-1.3770-01	-1.3339-01	-1.2876-01	-1.2393-01	-1.1953-01	-1.1654-01
-1.1609-01	-1.1881-01	-1.2468-01	-1.3286-01	-1.4189-01	-1.5011-01	-1.5810-01	-1.5910-01	-1.5909-01	-1.5670-01
-1.5293-01	-1.4483-01	-1.3520-01	-1.2451-01	-1.1089-01	-1.4016-01	-1.3996-01	-1.3973-01	-1.3878-01	-1.3642-01
-1.3213-01	-1.2591-01	-1.1844-01	-1.1124-01	-1.0637-01	-1.0598-01	-1.1157-01	-1.2337-01	-1.4011-01	-1.5921-01
-1.7752-01	-1.9235-01	-2.0239-01	-2.0816-01						
SPAN STATION 5 CHORD STATION 2									
7.8284+00	7.4469+00	7.0825+00	6.6284+00	6.1435+00	5.6457+00	5.1486+00	4.6481+00	4.1854+00	3.7305+00
3.3034+00	2.9159+00	2.5806+00	2.3068+00	2.0972+00	1.9456+00	1.8373+00	1.7523+00	1.6493+00	1.5712+00
1.4474+00	1.2960+00	1.1225+00	9.3754-01	7.5368-01	5.8227-01	4.3114-01	3.0343-01	1.9759-01	1.0888-01
3.1129-02	-4.0720-02	-1.0867-01	-1.7050-01	-2.2045-01	-2.5008-01	-2.5173-01	-2.2083-01	-1.5776-01	-6.8169-02
3.8856-02	1.5364-01	2.6931-01	3.8407-01	5.5166-01	6.2942-01	7.7616-01	9.4656-01	1.1407+00	1.3525+00
1.5713+00	1.7846+00	1.9817+00	2.1550+00	2.3015+00	2.4213+00	2.5163+00	2.5884+00	2.6394+00	2.6708+00
2.6853+00	2.6874+00	2.6829+00	2.6777+00	2.6760+00	2.6778+00	2.6782+00	2.6728+00	2.6599+00	2.6081+00
2.5443+00	2.4647+00	2.3786+00	2.2944+00	2.2259+00	2.1706+00	2.1293+00	2.0977+00	2.0713+00	2.0482+00
2.0298+00	2.0210+00	2.0270+00	2.0516+00	2.0945+00	2.1516+00	2.2161+00	2.2807+00	2.3401+00	2.3919+00
2.4358+00	2.4729+00	2.5032+00	2.5258+00	2.5387+00	2.5410+00	2.5343+00	2.5235+00	2.5164+00	2.5210+00
2.5439+00	2.5876+00	2.6523+00	2.7352+00	2.8358+00	2.9585+00	3.1025+00	3.2794+00	3.4885+00	3.7230+00
3.9667+00	4.1969+00	4.5908+00	4.5346+00	4.6297+00	4.6947+00	4.7609+00	4.8185+00	5.0204+00	5.2403+00
5.5011+00	5.7655+00	5.9916+00	6.1437+00	6.2352+00	6.2737+00	6.3151+00	6.4185+00	6.6323+00	6.9767+00
7.4351+00	7.9564+00	8.4693+00	8.9017+00	9.2003+00	9.3431+00	9.3417+00	9.2336+00	9.0638+00	8.8754+00
8.6912+00	8.5131+00	8.3254+00	8.1042+00						
SPAN STATION 5 CHORD STATION 3									
1.7821+00	1.5385+00	1.3153+00	1.1998+00	1.2601+00	1.5173+00	1.9310+00	2.4973+00	2.8253+00	3.0791+00
3.1032+00	2.8997+00	2.5302+00	2.0930+00	1.6867+00	1.3688+00	1.2172+00	1.1518+00	1.1413+00	1.1303+00
1.0809+00	9.8365-01	8.5375-01	7.1816-01	5.9947-01	5.0540-01	4.2789-01	3.5113-01	2.8317-01	1.4467-01
6.9368-02	-3.7753-03	-4.3098-02	-5.4672-02	-6.4730-02	-1.1181-01	-2.3125-01	-4.3863-01	-7.1942-01	-1.0313+00
-1.3151+00	-1.5167+00	-1.6042+00	-1.5781+00	-1.4684+00	-1.3207+00	-1.1774+00	-1.0628+00	-9.7247-01	-8.8671-01
-7.7636-01	-6.2255-01	-4.2662-01	-2.1114-01	-1.1069-02	1.4057-01	2.2610-01	2.4972-01	2.3477-01	2.1321-01
2.1241-01	2.4489-01	3.0544-01	3.7599-01	4.3545-01	4.6974-01	4.7737-01	4.6840-01	4.5810-01	4.5857-01
4.7283-01	4.9397-01	5.0957-01	5.0890-01	4.8912-01	4.5733-01	4.1431-01	4.2856-01	4.9437-01	4.9437-01
5.0502-01	5.4852-01	5.7955-01	5.9635-01	6.0631-01	6.2182-01	6.3559-01	6.4869-01	6.5833-01	6.5833-01
8.7583-01	8.9511-01	8.8881-01	8.6699-01	8.4434-01	8.3344-01	8.3920-01	8.5731-01	8.7728-01	8.8862-01
8.8689-01	8.7681-01	8.7077-01	8.6343-01	9.2506-01	9.9678-01	1.0999+00	1.1894+00	1.2813+00	1.3559+00
1.4128+00	1.4578+00	1.4988+00	1.5407+00	1.5831+00	1.6210+00	1.6496+00	1.6683+00	1.6834+00	1.7061+00
1.7473+00	1.8113+00	1.8913+00	1.9712+00	2.0316+00	2.0591+00	2.0533+00	2.0295+00	2.0124+00	2.0260+00
2.0814+00	2.1701+00	2.2660+00	2.3352+00	2.3511+00	2.3066+00	2.2201+00	2.1255+00	2.0597+00	2.0423+00
2.0648+00	2.0916+00	2.0739+00	1.9728+00						
SPAN STATION 5 CHORD STATION 4									
-5.7085-01	-7.3682-01	-8.5335-01	-9.2409-01	-9.5920-01	-1.0934+00	-1.3040+00	-1.6424+00	-2.0889+00	-2.5612+00
-2.9634+00	-3.1882+00	-3.1683+00	-2.8991+00	-2.4430+00	-1.9116+00	-1.4305+00	-1.0999+00	-9.6853-01	-1.0117+00
-1.1721+00	-1.3621+00	-1.5114+00	-1.5866+00	-1.5986+00	-1.5904+00	-1.6124+00	-1.6987+00	-1.8512+00	-2.0481+00
-2.2179+00	-2.3396+00	-2.3810+00	-2.3610+00	-2.2637+00	-2.1689+00	-2.0927+00	-2.0460+00	-2.0205+00	-1.9971+00
-1.9594+00	-1.9048+00	-1.8484+00	-1.8168+00	-1.8356+00	-1.9158+00	-2.0454+00	-2.1918+00	-2.3115+00	-2.3652+00
-2.3335+00	-2.2191+00	-2.0477+00	-1.8555+00	-1.5291+00	-1.15291+00	-1.4176+00	-1.3304+00	-1.2317+00	-1.1684+00
-1.0776+00	-9.8502-01	-9.0061-01	-8.3218-01	-7.8066-01	-7.3945-01	-6.9908-01	-6.5084-01	-5.9326-01	-5.3259-01
-4.7901-01	-4.4210-01	-4.2527-01	-4.2359-01	-4.2585-01	-4.1963-01	-3.9702-01	-3.5821-01	-3.1100-01	-2.6648-01
-2.3424-01	-2.1581-01	-2.0559-01	-1.9281-01	-1.6728-01	-1.2467-01	-6.9098-02	-1.1508-02	3.5240-02	6.2240-02

Figure 3. Sample Output - Continued.

6.8571-02	6.1399-02	5.2369-02	5.1859-02	6.4082-02	6.5377-02	1.0651-01	1.1780-01	1.1447-01	9.9557-02
8.2836-02	7.6358-02	8.8735-02	1.2107-01	1.6659-01	2.1404-01	2.5337-01	2.8948-01	2.9888-01	3.1676-01
3.4239-01	3.7791-01	4.1739-01	4.8830-01	4.5829-01	4.8119-01	4.0185-01	3.5946-01	3.2165-01	3.1567-01
3.4188-01	3.8914-01	4.3676-01	4.6252-01	4.5276-01	4.0996-01	3.5040-01	2.9901-01	2.7640-01	2.9166-01
3.3317-01	3.7869-01	4.0173-01	3.4498-01	3.2798-01	2.4699-01	1.6660-01	1.0704-01	7.3142-02	5.0771-02
1.2837-02	6.7409-02	-2.0202-01	-3.8018-01						
SPAN STATION 5 CHORD STATION 4									
-1.4346+00	-1.4987+00	-1.5744+00	-1.6608+00	-1.7511+00	-1.8350+00	-1.9025+00	-1.9476+00	-1.9716+00	-1.9823+00
-1.9115+00	-2.0107+00	-2.0463+00	-2.0976+00	-2.1573+00	-2.2142+00	-2.2578+00	-2.2819+00	-2.2843+00	-2.2751+00
-2.2544+00	-2.2277+00	-2.1935+00	-2.1455+00	-2.0751+00	-1.9752+00	-1.8444+00	-1.6891+00	-1.5228+00	-1.3593+00
-1.2161+00	-1.1020+00	-1.0202+00	-9.5749-01	-9.3769-01	-9.2500-01	-9.2643-01	-9.4226-01	-9.7438-01	-1.0235+00
-1.0866+00	-1.1562+00	-1.2215+00	-1.2714+00	-1.2981+00	-1.2993+00	-1.2787+00	-1.2441+00	-1.2046+00	-1.1669+00
-1.1338+00	-1.1042+00	-1.0748+00	-1.0428+00	-1.0073+00	-9.7057-01	-9.3653-01	-9.0073-01	-8.8839-01	-8.7339-01
-8.5899-01	-8.3980-01	-8.1219-01	-7.7603-01	-7.3487-01	-6.9462-01	-6.6110-01	-6.3771-01	-6.2421-01	-6.1703-01
-6.1100-01	-6.0165-01	-5.8699-01	-5.6811-01	-5.4824-01	-5.3099-01	-5.1842-01	-5.1000-01	-5.0285-01	-4.9307-01
-4.7761-01	-4.5563-01	-4.2888-01	-4.0091-01	-3.7553-01	-3.5531-01	-3.4078-01	-3.3070-01	-3.2313-01	-3.1672-01
-3.1155-01	-3.0907-01	-3.1111-01	-3.1858-01	-3.3052-01	-3.4399-01	-3.5498-01	-3.5996-01	-3.5732-01	-3.4805-01
-3.3529-01	-3.2289-01	-3.1373-01	-3.0849-01	-3.0549-01	-3.0170-01	-2.9445-01	-2.8307-01	-2.6964-01	-2.5851-01
-2.5480-01	-2.6240-01	-2.8246-01	-3.1295-01	-3.4494-01	-3.8655-01	-4.2014-01	-4.4913-01	-4.7091-01	-4.9053-01
-5.0951-01	-5.2972-01	-5.5183-01	-5.7556-01	-6.0024-01	-6.2539-01	-6.5092-01	-6.7681-01	-7.0263-01	-7.2719-01
-7.4890-01	-7.6664-01	-7.8097-01	-7.9480-01	-8.1327-01	-8.4230-01	-8.6655-01	-8.9473-01	-9.2217+00	-1.1032+00
-1.1837+00	-1.2569+00	-1.3207+00	-1.3777+00						
SPAN STATION 5 CHORD STATION 5									
-7.7242-01	-7.7638-01	-7.7852-01	-7.7857-01	-7.7621-01	-7.7129-01	-7.6410-01	-7.5546-01	-7.4659-01	-7.3875-01
-7.3276-01	-7.2857-01	-7.2510-01	-7.2054-01	-7.1233-01	-7.0092-01	-6.8448-01	-6.6310-01	-6.4550-01	-6.2882-01
-6.1758-01	-6.1265-01	-6.1280-01	-6.1484-01	-6.1436-01	-6.0691-01	-5.8926-01	-5.6222-01	-5.2101-01	-4.7895-01
-4.2874-01	-4.2144-01	-4.2360-01	-4.1856-01	-4.1020-01	-3.9028-01	-3.6981-01	-3.2808-01	-2.8163-01	-2.3071-01
-3.9959-01	-4.1736-01	-4.2830-01	-4.3220-01	-4.3033-01	-4.2503-01	-4.1903-01	-4.1402-01	-4.1402-01	-4.1667-01
-4.2203-01	-4.2867-01	-4.3500-01	-4.3987-01	-4.4278-01	-4.4373-01	-4.4300-01	-4.4082-01	-4.3719-01	-4.3196-01
-4.2511-01	-4.1702-01	-4.0863-01	-4.0134-01	-3.9658-01	-3.9534-01	-3.9775-01	-4.0291-01	-4.0918-01	-4.1468-01
-4.1794-01	-4.1836-01	-4.1629-01	-4.1283-01	-4.0921-01	-4.0628-01	-4.0415-01	-4.0220-01	-3.9946-01	-3.9614-01
-3.8909-01	-3.8193-01	-3.7490-01	-3.6934-01	-3.6618-01	-3.6543-01	-3.6650-01	-3.6817-01	-3.6932-01	-3.6932-01
-3.6829-01	-3.6695-01	-3.6620-01	-3.6664-01	-3.6820-01	-3.7016-01	-3.7140-01	-3.7100-01	-3.6865-01	-3.6489-01
-3.6055-01	-3.5830-01	-3.5806-01	-3.6055-01	-3.6525-01	-3.7101-01	-3.7665-01	-3.8147-01	-3.8563-01	-3.9012-01
-3.9634-01	-4.0554-01	-4.1829-01	-4.3419-01	-4.5204-01	-4.7022-01	-4.8730-01	-5.0248-01	-5.1577-01	-5.2784-01
-5.3962-01	-5.5180-01	-5.6455-01	-5.7740-01	-5.8950-01	-5.9990-01	-6.0802-01	-6.1383-01	-6.1707-01	-6.2110-01
-6.2460-01	-6.2932-01	-6.3589-01	-6.4459-01	-6.5537-01	-6.6794-01	-6.8186-01	-6.9655-01	-7.1134-01	-7.2554-01
-7.3853-01	-7.4984-01	-7.5925-01	-7.6673-01						

Figure 3. Sample Output - Continued.

BLADE SECTION LOADING																	
RADIUS		1		2		3		4		5		6		7		8	
1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.37	2.88	1.00	-1.4	-0.65	-1.14	0.00	-0.02	0.13	-0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-4.87	-0.04	0.02	-0.01	0.12	0.05	0.99	-4.07	1.96	1.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.56	0.09	0.18	-0.14	0.07	0.03	0.01	0.08	0.15	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01																
15.84	6.93	3.43	-1.66	-0.09	0.46	-0.30	-0.07	0.30	-0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.77	0.22	0.23	-0.21	-0.04	0.14	0.41	-4.23	2.58	1.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.28	-0.35	0.54	-0.25	-0.02	0.28	-0.04	-0.15	0.22	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.17	0.04																
17.46	6.77	2.89	-0.89	0.32	0.58	0.50	-0.01	-0.71	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.29	0.00	0.47	0.25	-0.18	-0.17	0.63	-3.45	1.80	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.10	-0.87	0.47	0.87	-0.20	-0.52	0.44	0.04	-0.53	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.35	-0.15																
18.99	5.58	1.44	-1.22	0.08	0.14	-0.27	0.42	0.30	-0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.33	0.32	0.10	0.00	-0.04	-0.45	0.66	-4.01	1.31	-0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.10	-0.54	0.00	-0.20	0.17	0.12	-0.13	0.12	0.24	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.72	-0.54																
-0.22	0.16																
1.49	3.25	-0.08	0.92	1.22	-0.29	-0.01	0.51	-0.13	-0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-0.39	-0.28	0.09	0.03	0.18	0.27	-14.05	-4.43	-1.97	-2.28	0.00</							

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12	27.5	.000000	.34982+01	.21336+02	.25999+02	.25431+02	-.182316+02	.000000
13	30.0	.000000	.30821+01	.20427+02	.24576+02	.25398+02	-.196501+02	.000000
14	32.5	.000000	.263719+01	.195970+02	.23069+02	.249729+02	-.201696+02	.000000
15	35.0	.000000	.215289+01	.186460+02	.216450+02	.240915+02	-.197968+02	.000000
16	37.5	.000000	.164613+01	.176278+02	.204019+02	.228397+02	-.187929+02	.000000
17	40.0	.000000	.112094+01	.165313+02	.194950+02	.214411+02	-.175757+02	.000000
18	42.5	.000000	.566111-00	.153574+02	.189312+02	.201481+02	-.165890+02	.000000
19	45.0	.000000	-.316421-01	.141274+02	.188421+02	.191289+02	-.161658+02	.000000
20	47.5	.000000	-.674517-00	.128811+02	.188768+02	.183956+02	-.164109+02	.000000
21	50.0	.000000	-.134398+01	.116848+02	.188412+02	.178010+02	-.171951+02	.000000
22	52.5	.000000	-.199980+01	.105126+02	.184753+02	.171068+02	-.182235+02	.000000
23	55.0	.000000	-.258856+01	.943093+01	.176039+02	.160928+02	-.191579+02	.000000
24	57.5	.000000	-.305827+01	.839319+01	.162045+02	.146583+02	-.197430+02	.000000
25	60.0	.000000	-.337270+01	.736281+01	.144225+02	.128731+02	-.198852+02	.000000
26	62.5	.000000	-.351955+01	.630244+01	.125255+02	.109570+02	-.194595+02	.000000
27	65.0	.000000	-.350887+01	.521250+01	.108070+02	.919480+01	-.192489+02	.000000
28	67.5	.000000	-.336301+01	.416107+01	.947368+01	.783959+01	-.184887+02	.000000
29	70.0	.000000	-.310284+01	.325861+01	.859301+01	.700525+01	-.185793+02	.000000
30	72.5	.000000	-.273734+01	.263789+01	.803050+01	.665534+01	-.184464+02	.000000
31	75.0	.000000	-.225995+01	.240388+01	.756115+01	.662653+01	-.183592+02	.000000
32	77.5	.000000	-.165613+01	.258749+01	.695815+01	.670988+01	-.181951+02	.000000
33	80.0	.000000	-.915862-00	.312148+01	.611872+01	.673824+01	-.178761+02	.000000
34	82.5	.000000	.467672-01	.305275+01	.514844+01	.664336+01	-.174994+02	.000000
35	85.0	.000000	.919450-00	.459139+01	.431222+01	.646117+01	-.169425+02	.000000
36	87.5	.000000	.193109+01	.518153+01	.404222+01	.628891+01	-.166113+02	.000000
37	90.0	.000000	.293087+01	.556790+01	.466840+01	.622039+01	-.165716+02	.000000
38	92.5	.000000	.387266+01	.583082+01	.634729+01	.629407+01	-.164801+02	.000000
39	95.0	.000000	.474142+01	.617224+01	.894086+01	.648001+01	-.174766+02	.000000
40	97.5	.000000	.555299+01	.685332+01	.120266+02	.671079+01	-.182050+02	.000000
41	100.0	.000000	.536082+01	.810280+01	.150722+02	.693791+01	-.188747+02	.000000
42	102.5	.000000	.721342+01	.100283+02	.172898+02	.718151+01	-.193335+02	.000000
43	105.0	.000000	.815639+01	.125636+02	.184721+02	.754384+01	-.195201+02	.000000
44	107.5	.000000	.919976+01	.154717+02	.184695+02	.817416+01	-.194743+02	.000000
45	110.0	.000000	.103129+02	.184062+02	.175372+02	.919770+01	-.193016+02	.000000
46	112.5	.000000	.114304+02	.210091+02	.161809+02	.106405+02	-.191099+02	.000000
47	115.0	.000000	.124697+02	.230108+02	.148779+02	.123870+02	-.184993+02	.000000
48	117.5	.000000	.133548+02	.249399+02	.147592+02	.141951+02	-.187807+02	.000000
49	120.0	.000000	.140375+02	.249382+02	.147690+02	.157674+02	-.184888+02	.000000
50	122.5	.000000	.145083+02	.251190+02	.159146+02	.168528+02	-.179329+02	.000000
51	125.0	.000000	.147955+02	.250881+02	.175691+02	.173373+02	-.170122+02	.000000
52	127.5	.000000	.149522+02	.250573+02	.193085+02	.172840+02	-.157173+02	.000000
53	130.0	.000000	.150384+02	.251420+02	.207422+02	.169072+02	-.141456+02	.000000
54	132.5	.000000	.151027+02	.253430+02	.216314+02	.162620+02	-.124739+02	.000000
55	135.0	.000000	.151784+02	.255727+02	.219384+02	.164869+02	-.109002+02	.000000
56	137.5	.000000	.152513+02	.257120+02	.217979+02	.163442+02	-.957932+01	.000000
57	140.0	.000000	.153269+02	.256696+02	.214321+02	.166875+02	-.857757+01	.000000
58	142.5	.000000	.153814+02	.254222+02	.210509+02	.171237+02	-.786310+01	.000000
59	145.0	.000000	.154022+02	.250188+02	.207764+02	.174859+02	-.733263+01	.000000
60	147.5	.000000	.153867+02	.245338+02	.206177+02	.175016+02	-.686043+01	.000000
61	150.0	.000000	.153415+02	.241229+02	.204971+02	.172565+02	-.634783+01	.000000
62	152.5	.000000	.152758+02	.237814+02	.203082+02	.168012+02	-.575405+01	.000000
63	155.0	.000000	.151929+02	.235244+02	.199762+02	.163040+02	-.509877+01	.000000
64	157.5	.000000	.150831+02	.232942+02	.194922+02	.159308+02	-.444014+01	.000000
65	160.0	.000000	.149226+02	.230809+02	.189111+02	.157715+02	-.384187+01	.000000
66	162.5	.000000	.146775+02	.225998+02	.183183+02	.158046+02	-.334534+01	.000000
67	165.0	.000000	.143134+02	.220382+02	.177846+02	.159135+02	-.295812+01	.000000
68	167.5	.000000	.138053+02	.213438+02	.173320+02	.159446+02	-.266088+01	.000000
69	170.0	.000000	.131517+02	.205712+02	.169258+02	.157787+02	-.242544+01	.000000
70	172.5	.000000	.123693+02	.197838+02	.164949+02	.153432+02	-.223269+01	.000000
71	175.0	.000000	.115003+02	.190284+02	.159486+02	.148214+02	-.208062+01	.000000
72	177.5	.000000	.105994+02	.183122+02	.153117+02	.142183+02	-.197917+01	.000000
73	180.0	.000000	.972221+01	.176504+02	.145424+02	.137017+02	-.193639+01	.000000

Figure 3. Sample Output - Continued.

74	182.5	.000000	.000000	.169929+02	.137249+02	.133453+02	-.194457+01	.000000
75	185.0	.000000	.000000	.163348+02	.129437+02	.131427+02	-.197507+01	.000000
76	187.5	.000000	.000000	.156853+02	.122704+02	.130214+02	-.198508+01	.000000
77	190.0	.000000	.000000	.150771+02	.117404+02	.128670+02	-.193322+01	.000000
78	192.5	.000000	.000000	.645925+01	.113484+02	.126772+02	-.175794+01	.000000
79	195.0	.000000	.000000	.591125+01	.110620+02	.123955+02	-.157526+01	.000000
80	197.5	.000000	.000000	.532768+01	.108456+02	.121121+02	-.129623+01	.000000
81	200.0	.000000	.000000	.470121+01	.106816+02	.119289+02	-.991110+00	.000000
82	202.5	.000000	.000000	.404431+01	.105785+02	.119290+02	-.682671+00	.000000
83	205.0	.000000	.000000	.338385+01	.105622+02	.121383+02	-.372672+00	.000000
84	207.5	.000000	.000000	.275126+01	.106569+02	.125041+02	-.425769+01	.000000
85	210.0	.000000	.000000	.217189+01	.106443+02	.129246+02	.333735+00	.000000
86	212.5	.000000	.000000	.165734+01	.111534+02	.132902+02	.771576+00	.000000
87	215.0	.000000	.000000	.120336+01	.114459+02	.135315+02	.126076+01	.000000
88	217.5	.000000	.000000	.793834+00	.117339+02	.134452+02	.176242+01	.000000
89	220.0	.000000	.000000	.409015+00	.132819+02	.136882+02	.221961+01	.000000
90	222.5	.000000	.000000	.344755+01	.131676+02	.137420+02	.257736+01	.000000
91	225.0	.000000	.000000	.332808+00	.130360+02	.136880+02	.280305+01	.000000
92	227.5	.000000	.000000	.684157+00	.128395+02	.140739+02	.289602+01	.000000
93	230.0	.000000	.000000	.100311+01	.125154+02	.143094+02	.289518+01	.000000
94	232.5	.000000	.000000	.127411+01	.116749+02	.143926+02	.284440+01	.000000
95	235.0	.000000	.000000	.148972+01	.111533+02	.145528+02	.272660+01	.000000
96	237.5	.000000	.000000	.165444+01	.106279+02	.144703+02	.276606+01	.000000
97	240.0	.000000	.000000	.178323+01	.101292+02	.142908+02	.277568+01	.000000
98	242.5	.000000	.000000	.189528+01	.966869+01	.140888+02	.280410+01	.000000
99	245.0	.000000	.000000	.200603+01	.883471+01	.140271+02	.284051+01	.000000
100	247.5	.000000	.000000	.212102+01	.844817+01	.141134+02	.284443+01	.000000
101	250.0	.000000	.000000	.223434+01	.809914+01	.143738+02	.295369+01	.000000
102	252.5	.000000	.000000	.233230+01	.782542+01	.147581+02	.307993+01	.000000
103	255.0	.000000	.000000	.240055+01	.767352+01	.151928+02	.324639+01	.000000
104	257.5	.000000	.000000	.243119+01	.768023+01	.156248+02	.362482+01	.000000
105	260.0	.000000	.000000	.242647+01	.785515+01	.160540+02	.461113+01	.000000
106	262.5	.000000	.000000	.239730+01	.812070+01	.165356+02	.529332+01	.000000
107	265.0	.000000	.000000	.235785+01	.857382+01	.171503+02	.529332+01	.000000
108	267.5	.000000	.000000	.231632+01	.898914+01	.179558+02	.589635+01	.000000
109	270.0	.000000	.000000	.227410+01	.935530+01	.189429+02	.658773+01	.000000
110	272.5	.000000	.000000	.222197+01	.963742+01	.200214+02	.727672+01	.000000
111	275.0	.000000	.000000	.214751+01	.983734+01	.210440+02	.792624+01	.000000
112	277.5	.000000	.000000	.204262+01	.998998+01	.218621+02	.844427+01	.000000
113	280.0	.000000	.000000	.190976+01	.101431+02	.223869+02	.889969+01	.000000
114	282.5	.000000	.000000	.176272+01	.103480+02	.226414+02	.909192+01	.000000
115	285.0	.000000	.000000	.162049+01	.106343+02	.227403+02	.907483+01	.000000
116	287.5	.000000	.000000	.149651+01	.110087+02	.228663+02	.887969+01	.000000
117	290.0	.000000	.000000	.138828+01	.114572+02	.231889+02	.860715+01	.000000
118	292.5	.000000	.000000	.127293+01	.119559+02	.237996+02	.839497+01	.000000
119	295.0	.000000	.000000	.111266+01	.124818+02	.246769+02	.837382+01	.000000
120	297.5	.000000	.000000	.869578+00	.130194+02	.256998+02	.861633+01	.000000
121	300.0	.000000	.000000	.524579+00	.135618+02	.267023+02	.918104+01	.000000
122	302.5	.000000	.000000	.931402+01	.141062+02	.275454+02	.970578+01	.000000
123	305.0	.000000	.000000	.370356+00	.146500+02	.281740+02	.102650+02	.000000
124	307.5	.000000	.000000	.783219+00	.151879+02	.286341+02	.105970+02	.000000
125	310.0	.000000	.000000	.105814+01	.157154+02	.290446+02	.106157+02	.000000
126	312.5	.000000	.000000	.113227+01	.162334+02	.295369+02	.103574+02	.000000
127	315.0	.000000	.000000	.990984+00	.167530+02	.301927+02	.998419+01	.000000
128	317.5	.000000	.000000	.676661+00	.172943+02	.310075+02	.973047+01	.000000
129	320.0	.000000	.000000	.277974+00	.178804+02	.318962+02	.981561+01	.000000
130	322.5	.000000	.000000	.975471+01	.185256+02	.327368+02	.103946+02	.000000
131	325.0	.000000	.000000	.358291+00	.192259+02	.334590+02	.113037+02	.000000
132	327.5	.000000	.000000	.458084+00	.199450+02	.339392+02	.124644+02	.000000
133	330.0	.000000	.000000	.409458+00	.206651+02	.343097+02	.134465+02	.000000
134	332.5	.000000	.000000	.275639+00	.213105+02	.346285+02	.142672+02	.000000
135	335.0	.000000	.000000	.144173+00		.349751+02	.144463+02	.000000

Figure 3. Sample Output - Continued.

136	337.5	.000000	- .923152-01	.218543+02	.292756+02	.353705+02	.140602+02	.000000
137	340.0	.000000	- .156881-00	.222879+02	.300437+02	.357583+02	.132330+02	.000000
138	342.5	.000000	- .319983-00	.226324+02	.307460+02	.360266+02	.121702+02	.000000
139	345.0	.000000	- .515339-00	.229320+02	.313715+02	.360626+02	.110659+02	.000000
140	347.5	.000000	- .652163-00	.232359+02	.319080+02	.358127+02	.100164+02	.000000
141	350.0	.000000	- .647071-00	.235792+02	.324884+02	.353173+02	.089942+01	.000000
142	352.5	.000000	- .451864-00	.239690+02	.329951+02	.347002+02	.078797+01	.000000
143	355.0	.000000	- .673450-01	.243618+02	.329580+02	.341157+02	.051026+01	.000000
144	357.5	.000000	- .460734-00	.247717+02	.331474+02	.336745+02	.040524+01	.000000
145	360.0	.000000	- .106036+01	.250871+02	.335642+02	.333852+02	.279480+01	.000000
FIELD POINT		RADIUS HARMONIC	.154590+04	AZIMUTH SOUND PRESSURE	.169900+03	ELEVATION	-.232000+02	
		1	.307460-04		SPL			
		2	.61724728-05		.80508046+02			
		3	.19928954-05		.66541222+02			
		4	.50246394-05		.56741729+02			
FIELD POINT		RADIUS HARMONIC	.119700+04	AZIMUTH SOUND PRESSURE	.165970+03	ELEVATION	-.303300+02	
		1	.48787879-04		SPL			
		2	.80634497-05		.84504022+02			
		3	.34760025-05		.68882456+02			
		4	.81912515-05		.62519719+02			
FIELD POINT		RADIUS HARMONIC	.111400+04	AZIMUTH SOUND PRESSURE	.164480+03	ELEVATION	-.330700+02	
		1	.55254716-04		SPL			
		2	.82697833-05		.85599425+02			
		3	.50112356-05		.69101921+02			
		4	.91960707-05		.64750934+02			
FIELD POINT		RADIUS HARMONIC	.103500+04	AZIMUTH SOUND PRESSURE	.162250+03	ELEVATION	-.359700+02	
		1	.62364990-04		SPL			
		2	.79715445-05		.86650855+02			
		3	.65207674-05		.68782887+02			
		4	.98726369-05		.67038012+02			
FIELD POINT		RADIUS HARMONIC	.960000+03	AZIMUTH SOUND PRESSURE	.160350+03	ELEVATION	-.392800+02	
		1	.69750150-04		SPL			
		2	.75677435-05		.87622940+02			
		3	.86041009-05		.68331366+02			
		4	.10340351-04		.69446149+02			
FIELD POINT		RADIUS HARMONIC	.890000+03	AZIMUTH SOUND PRESSURE	.157330+03	ELEVATION	-.430800+02	
		1	.77289732-04		SPL			
		2	.64200964-05		.88514473+02			
		3	.11214161-04		.66902869+02			
		4	.97663680-05		.71147373+02			
FIELD POINT		RADIUS HARMONIC	.826000+03	AZIMUTH SOUND PRESSURE	.153430+03	ELEVATION	-.474000+02	
		1	.84002302-04		SPL			
		2	.48359390-05		.89237861+02			
		3	.14103144-04		.64441655+02			
		4	.78029282-05		.73738356+02			
FIELD POINT		RADIUS HARMONIC	.769000+03	AZIMUTH SOUND PRESSURE	.148810+03	ELEVATION	-.521800+02	

Figure 3. Sample Output - Continued.

FIELD POINT	RADIUS HARMONIC	1 2 3 4	.8671394-04 .35515691-05 .16948111-04 .45795711-05	.723000+03 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.140200+03 SPL	ELEVATION	-.572800+02	.89711875+02 .61760443+02 .75334465+02 .63968535+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05	.687000+03 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.126670+03 SPL	ELEVATION	-.622300+02	.89795267+02 .63979433+02 .76709068+02 .59924305+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05	.659000+03 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.121800+03 SPL	ELEVATION	-.659000+02	.89400079+02 .66163623+02 .77664767+02 .62804330+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05	.682000+03 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.513000+02 SPL	ELEVATION	-.620000+02	.88941169+02 .69900331+02 .77868108+02 .62971456+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05	.822000+03 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.266000+02 SPL	ELEVATION	-.471000+02	.84922672+02 .73903460+02 .75559707+02 .61226138+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05	.103100+04 AZIMUTH SOUND PRESSURE	.89569774-04 .45853212-05 .19854157-04 .28748377-05	.174000+02 SPL	ELEVATION	-.357000+02	.82949216+02 .64660622+02 .71412520+02 .51924859+02
FIELD POINT	RADIUS HARMONIC	1 2 3 4	.6871394-04 .35515691-05 .16948111-04 .45795711-05						.79055090+02 .60965327+02 .67866286+02 .56684418+02

Figure 3. Sample Output - Continued.

ROTATIONAL NOISE PROGRAM E676						
HARMONIC = 1						
FIELD POINT	FIELD POINT COORDINATES (IN)			SOUND PRESSURE LEVEL		
	X	Y	Z	DECIBELS		
1	-1.6000+04	3.0000+03	-7.3200+03	8.0674+01		
2	-1.2000+04	3.0000+03	-7.2960+03	8.4816+01		
3	-1.0800+04	3.0000+03	-7.2960+03	8.5917+01		
4	-9.6000+03	3.0000+03	-7.2960+03	8.7012+01		
5	-8.4000+03	3.0000+03	-7.2960+03	8.6075+01		
6	-7.2000+03	3.0000+03	-7.2960+03	8.9058+01		
7	-6.0000+03	3.0000+03	-7.2960+03	8.9897+01		
8	-4.8000+03	3.0000+03	-7.2960+03	9.0497+01		
9	-3.6000+03	3.0000+03	-7.2960+03	9.0735+01		
10	-2.4000+03	3.0000+03	-7.2960+03	9.0462+01		
11	-1.2000+03	3.0000+03	-7.2240+03	8.9636+01		
12	2.4000+03	3.0000+03	-7.2240+03	8.3730+01		
13	6.0000+03	3.0000+03	-7.2240+03	7.9509+01		
14	9.6000+03	3.0000+03	-7.2240+03	7.5340+01		

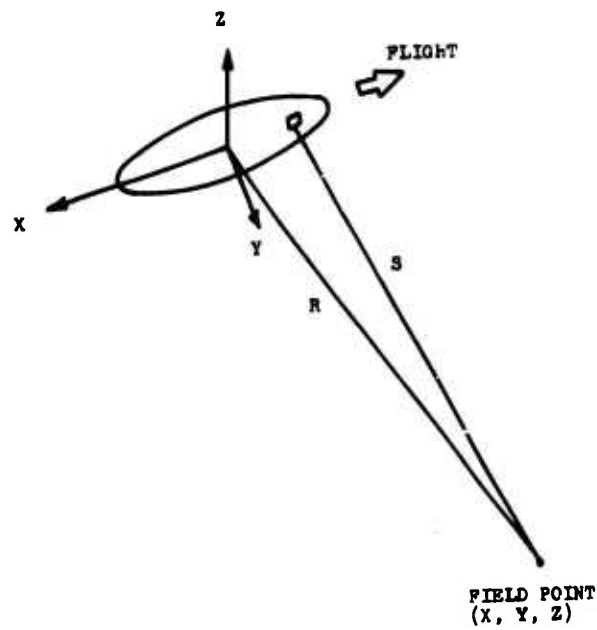
HARMONIC = 2						
FIELD POINT	FIELD POINT COORDINATES (IN)			SOUND PRESSURE LEVEL		
	X	Y	Z	DECIBELS		
1	-1.6000+04	3.0000+03	-7.3200+03	6.7485+01		
2	-1.2000+04	3.0000+03	-7.2960+03	6.8965+01		
3	-1.0800+04	3.0000+03	-7.2960+03	6.8820+01		
4	-9.6000+03	3.0000+03	-7.2960+03	6.8491+01		
5	-8.4000+03	3.0000+03	-7.2960+03	6.8567+01		
6	-7.2000+03	3.0000+03	-7.2960+03	7.0262+01		
7	-6.0000+03	3.0000+03	-7.2960+03	7.3457+01		
8	-4.8000+03	3.0000+03	-7.2960+03	7.6751+01		
9	-3.6000+03	3.0000+03	-7.2960+03	7.9431+01		
10	-2.4000+03	3.0000+03	-7.2240+03	8.1343+01		
11	-1.2000+03	3.0000+03	-7.2240+03	8.2463+01		
12	2.4000+03	3.0000+03	-7.2240+03	7.7527+01		
13	6.0000+03	3.0000+03	-7.2240+03	6.1343+01		
14	9.6000+03	3.0000+03	-7.2240+03	6.7779+01		

Figure 3. Sample Output - Continued.

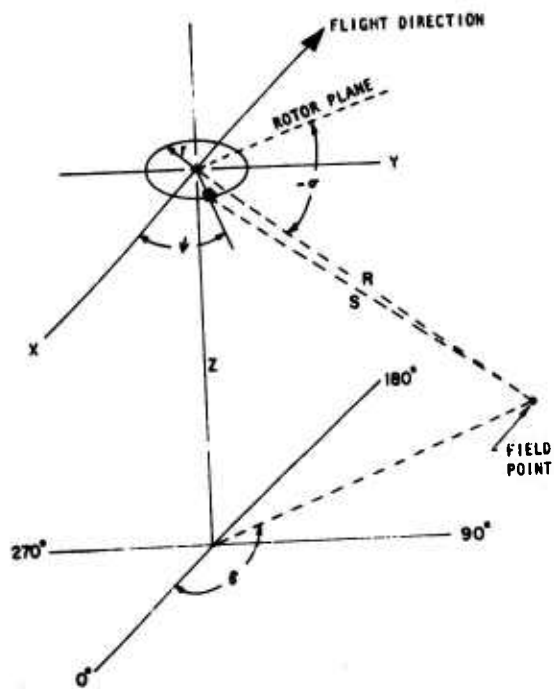
ROTATIONAL NOISE PROGRAM E676				
HARMONIC = 3				
FIELD POINT	FIELD POINT COORDINATES (IN)			SOUND PRESSURE LEVEL DECIBELS
	X	Y	Z	
1	-1.6800+04	3.0000+03	-7.3200+03	7.0054+01
2	-1.2000+04	3.0000+03	-7.2960+03	7.4959+01
3	-1.0800+04	3.0000+03	-7.2960+03	7.6184+01
4	-9.6000+03	3.0000+03	-7.2960+03	7.7293+01
5	-8.4000+03	3.0000+03	-7.2960+03	7.8147+01
6	-7.2000+03	3.0000+03	-7.2960+03	7.8525+01
7	-6.0000+03	3.0000+03	-7.2960+03	7.8139+01
8	-4.8000+03	3.0000+03	-7.2960+03	7.7259+01
9	-3.6000+03	3.0000+03	-7.2960+03	7.6763+01
10	-2.4000+03	3.0000+03	-7.2960+03	8.2059+01
11	-1.2000+03	3.0000+03	-7.2240+03	8.3364+01
12	2.4000+03	3.0000+03	-7.2240+03	7.9220+01
13	6.0000+03	3.0000+03	-7.2240+03	7.4849+01
14	9.6000+03	3.0000+03	-7.2240+03	6.6092+01

HARMONIC = 4				
FIELD POINT	FIELD POINT COORDINATES (IN)			SOUND PRESSURE LEVEL DECIBELS
	X	Y	Z	
1	-1.6800+04	3.0000+03	-7.3200+03	6.2514+01
2	-1.2000+04	3.0000+03	-7.2960+03	6.8894+01
3	-1.0800+04	3.0000+03	-7.2960+03	7.1068+01
4	-9.6000+03	3.0000+03	-7.2960+03	7.3444+01
5	-8.4000+03	3.0000+03	-7.2960+03	7.5415+01
6	-7.2000+03	3.0000+03	-7.2960+03	7.7899+01
7	-6.0000+03	3.0000+03	-7.2960+03	7.9145+01
8	-4.8000+03	3.0000+03	-7.2960+03	7.8402+01
9	-3.6000+03	3.0000+03	-7.2960+03	7.1984+01
10	-2.4000+03	3.0000+03	-7.2960+03	7.0577+01
11	-1.2000+03	3.0000+03	-7.2240+03	7.8219+01
12	2.4000+03	3.0000+03	-7.2240+03	7.3212+01
13	6.0000+03	3.0000+03	-7.2240+03	7.0343+01
14	9.6000+03	3.0000+03	-7.2240+03	5.1346+01

Figure 3. Sample Output - Concluded.



a. OPRONO Coordinates.



b. E3860P Coordinates.

Figure 4. Coordinate Systems for Noise Prediction.

1	2	3	4	5	6	7	8	CD	COUNT
1	0	0	0	0	0	0	0	0	
C MOTOR NOISE PROGRAM FOR W. BAUSCH BY G. CAMPE.									
	COMMON /BK1/	ID0,88,AA,XA(5,5),DPS1,RR(5),OMEG,CC,NBLADE,MLIMRN,							001
	* MLIMOP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADL,B0,B1C,BIS,PUNCH,								002
	* LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,								003
	* IRS(5),ITRACK(5),PI(5,5),NCHAN(5,5),E366OP,NFT,ANG,KEY1,KEY2,								004
	* KEY3,NHH,CAPRF(20),THETAF(20),ALFAF(20),OPRUND,NCH(5),INTERM,								005
	* IRELL,NC,NTBOX(5,10),NSTAIC(5,10),NSTAIR(5,10),ISET(5),IREELS,								006
	* NOCHI(5),LAZI								007
	COMMON /BK2/	NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(4,35),LIRS,							008
	* KTRACK,KBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),								009
	* XMH(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),								010
	* UPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),								011
	* HMARI(288,20),X0(20)								012
	COMMON /BK3/	SPLM(10,20),AZMTH3(288),							013
	* SPAN(20),								014
	* ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE								015
	COMMON /TEMPUS/	TIME,COUNT							016
	DIMENSION DATA1(144,10,5),DATA2(144,10,5),FN(144),CHORD(7),								017
	* GPS1(7),GPS11(7),TEML(30),TEN2(30),CHORD2(41),GPS12(41),GPS13(41),								018
	* COSNN(41),SINRN(41)								019
	EQUIVALENCE (ND1,DATA1),(ND2,DATA2),(NN,FN),(TEMP1,CHORD),								020
	* (TEMP2,GPS1),(TEMP3,GPS11)								021
	DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),								022
	* GMAR(144,5),HMAR(144,5)								023
	* ,91(288,20),92(288,20)								024
	EQUIVALENCE	(ND2(5671),HMAR),(GMARI,AN),							025
	* (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN),(ND2,92)								026
	EQUIVALENCE (ND1(5761),GMAR),(ND1,91)								027
	DIMENSION AZ41(41)								028
	DIMENSION DBI(289)								029
	EQUIVALENCE (DBI,SINE)								030
	MSTART=1								031
	CALL INPUTA								032
	IF(TCOP,EG,CARD) GO TO 199								033
	REWIND 8								034
	REWIND 9								035
	REWIND 10								036
	REWIND 11								037
	REWIND 12								038
	REWIND 13								039
	LIRS = 0								040
199	PI = 3.14159265								041
	DO I = 1,5								042
	IF(IRS(I).NE.0) LIRS = LIRS+1								043
1	CONTINUE								044
	UPRAU = DPS1*6.28318531/360.								045
	AZRAD = (2.5*PI)/180.								046
	AZMTH(1) = 0.								047
	AZMTH2(1) = 0.								048
	DO I = 2,144								049
	AZMTH2(I) = AZMTH2(I-1)+AZRAD								050
2	AZMTH(1) = AZMTH(1-1)+2.5								051
	PI2 = 6.283185								052
	AZMTH3(1)=0.								053
									054

Figure 5. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
.....0.....	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0.....
COSINE(1)=1.								055
SINE(1)=0.								056
Y1=(PI2/DPDAD)+.001								057
J=1								058
IF(J.LE.288) GO TO 211								059
WRITE(6,212)								060
212 FORMAT(1H1, 63THE DIMENSION OF AZMTH3 HAS BEEN EXCEEDED AT								061
*ENT NO. 211)								062
WRITE(6,35) (AZMTH3(L),L=1,288)								063
WRITE(6,35) P12								064
STOP								065
211 DO 4 LAZI=2,J								066
AZMTH3(LAZI) = AZMTH3(LAZI-1)+DPDAD								067
COSINE(LAZI) = COS(AZMTH3(LAZI))								068
4 SINE(LAZI) = SIN(AZMTH3(LAZI))								069
IF(IDU.NE.1) GO TO 210								070
WRITE(6,213)								071
213 FORMAT(1H1,11HAZMTH3(288))								072
WRITE(6,35) (AZMTH3(L),L=1,288)								073
210 BLADES = NBLADE								074
T1 = 1./41.								075
CHORD2(1) = 0.								076
CHORD2(41) = 1.								077
DO 6 L=2,40								078
6 CHORD2(L) = CHORD2(L-1)+T1								079
C								080
C *** A LONG LOOP ON BURSTS IS NEXT.								081
7 IF(IDU.NE.1) GO TO 9300								082
CALL START								083
9300 IF(TCOP.EQ.CARD) GO TO 10								084
READ(5,18) IBURST								085
C GET START OF BURST TIME								086
8 FORMAT(11X,13)								087
C								088
C *** A CHOOSE I MADE NEXT (OPTION) TO EITHER ACCEPT TAPE OR CARD INPUT.								089
DO 9 I=1,144								090
DO 9 J=1,10								091
DO 9 K=1,5								092
9 MD2(I,J,K) = 0								093
C								094
C *** LOOP ON TAPE REELS FOLLOWS.								095
DO 11 IREEL=1,IREELS								096
KU = KUNIT(IREEL)								097
IF(IDU.EQ.1)								098
XWRITE(6,231) IREEL,KU								099
12 CALL RDKU(1)								100
IF(1BURST.NE.KBURST) GO TO 12								101
IF(IDU.EQ.1)								102
XWRITE(6,231) IREEL,KU,KREC,KBURST,KTRACK								103
60 TO (13,13,13,13,13,13,13,13,14,15,16,17),KU								104
13 BACKSPACE 8								105
60 TO 18								106
14 BACKSPACE 9								107
60 TO 18								108

Figure6 . Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	0
15	BACKSPACE 10							109
	60 TO 18							110
16	BACKSPACE 11							111
	60 TO 18							112
17	BACKSPACE 12							113
	BACKSPACE 13							114
18	NCYCLE = 0							115
C ***	THE FIRST CYCLE IN BURST IBURST IS READ.							116
	CALL RDKU(1)							117
	CALL RDKU(2)							118
	KB = KBURST							119
	GO TO 19							120
C ***	THE REMAINING CYCLES IN BURST IBURST ARE READ AND AVERAGED.							121
20	CALL RDKU(1)							122
	IF(KBURST.NE.KB) GO TO 21							123
	CALL RDKU(2)							124
	IF(KBURST.NE.KB) GO TO 21							125
C ***	SUBR. UNPACK UNPACKS NN(435) TO FORM ND1(I,J,K) WHERE I=DATA POINT,							126
C ***	J=CHANNEL, K=REEL NO.							127
19	CALL UNPACK							128
	NCYCLE = NCYCLE+1							129
C ***	CHANNEL LOOP							130
	K = NOCH(IREEL)							131
	DO 22 J=1,K							132
	NC = ICHANL(J,IREEL)							133
	IF(IDO-1) 234,236,234							134
236	IF(IREEL-1) 234,235,234							135
235	IF(IDO.EQ.1)							136
	X L)							137
	WRITE(6,231) NCYCLE,K,NC,ND1(I,NC,IREEL							138
234	CONTINUE							139
231	FORMAT(4I13)							140
	DO 22 I=1,144							141
	ND2(I,NC,IREEL) = ND2(I,NC,IREEL) + ND1(I,NC,IREEL)							142
22	CONTINUE							143
	GO TO 20							144
C ***	AT THIS POINT THE END OF BURST HAS BEEN REACHED.							145
21	GO TO (23,23,23,23,23,23,23,23,24,25,26,27),KU							146
23	BACKSPACE 8							147
	60 TO 28							148
24	BACKSPACE 9							149
	60 TO 28							150
25	BACKSPACE 10							151
	60 TO 28							152
26	BACKSPACE 11							153
	60 TO 28							154
27	BACKSPACE 12							155
	BACKSPACE 13							156
28	CYCLES = NCYCLE							157
C ***	THE AVERAGE CYCLES ARE FOUND NEXT.							158
	K = NOCH(IREEL)							159
DO 29	J=1,K							160
	NC = ICHANL(J,IREEL)							161
DO 29	I=1,144							162

Figure 7. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	163
								164
								165
								166
								167
								168
								169
								170
								171
								172
								173
								174
								175
							9999	176
								177
								178
								179
								180
								181
								182
								183
								184
								185
								186
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```

T1 = N02(I,NC,I REEL)
29 DATA2(I,NC,I REEL) = T1/CYCLES
11 CONTINUE
C *** FILTER ROLL OFF CORRECTION AND TAPE DATA SCALING FOLLOWS.
UO 30 I REEL=1,I REELS
K = N0CH(I REEL)
UO 30 J=1,K
NC = ICHAM(J,I REEL)
UO 31 I=1,144
J1 FN(I) = DATA2(I,NC,I REEL)
CALL DFSRIE (I44,MLINDP,FN,TEM1,TEM2)
AN(I,NC,I REEL) = TEM1(I)
UO 32 I=1,MLINDP
AN(I+1,NC,I REEL) = TEM1(I+1)
J2 BN(I,NC,I REEL) = TEM2(I+1)
IF(100,NC,1) GO TO 30
WRITE(6,33) I REEL,NC,(FN(I),L=1,144)
33 FORMAT(1H0,5H REEL=13,7X,8H CHANNEL=,13,7X,3SHAVE. CYCLE AND
115 HARMONICS FOLLOW // (2X,1PE10.3,12E10.3) )
I=MLINDP+1
WRITE(6,34) (AN(L,NC,I REEL),L=1,I)
WRITE(6,35) (BN(L,NC,I REEL),L=1,MLINDP)
34 FORMAT(1H0,1X,1PE10.3 / (2X,13E10.3))
35 FORMAT( / (2X,1PE10.3,12E10.3) )
30 CONTINUE
UO 36 I REEL=1,I REELS
IF(100,EG,1) WRITE(6,40) I REEL
40 FORMAT(1H0,10H REEL NO. =,13,10X,77H HAVE. PRESSURE CYCLE HARMONICS
X(CORRECTED FOR FILTER ROLL-OFF AND ENGR. UNITS) )
K=N0CH(I REEL)
UO 36 J=1,K
NC = ICHAM(J,I REEL)
AN(I,NC,I REEL) = AN(1,NC,I REEL)*SLOPE(NC,I REEL)+OFFSET(NC,I REEL)
UO 37 I=1,MLINDP
T1 = FROC(I)*SLOPE(NC,I REEL)
AN(I+1,NC,I REEL) = AN(I+1,NC,I REEL)*T1
37 BN(I,NC,I REEL) = BN(1,NC,I REEL)*T1
IF(100,NE,1) GO TO 36
WRITE(6,38) NC,AN(1,NC,I REEL),(AN(I+1,NC,I REEL),I=1,MLINDP)
38 FORMAT(1X,8H CHANNEL=,13,5X,11(1PE10.3 / (27X,10E10.3 / ) )
WRITE(6,39) (BN(I,NC,I REEL),I=1,MLINDP)
39 FORMAT( 27X,10(1PE10.3) / (27X,10E10.3) )
36 CONTINUE
C *** THE FOLLOWING SUBR. COMBINES THE TOP AND BOTTOM ABSOLUTE PRESSURE COEFF.
C TO PRODUCE DIFFERENTIAL PRESS. COEFF. CN(31,5,5), SN(30,5,5) WHERE THE
C FIRST SUBS. = HARMONIC, SECOND SUBS. = CHORD, THIRD SUBS. = SPAN.
C BLADE PITCH HARMONICS, 80,B1C,B1S ARE ALSO CALCULATED.
CALL MERGES
IF(100,NE,1) GO TO 240
UO 239 I=1,5
UO 239 J=1,5
WRITE(6,47) CN(I,J,I)
WRITE(6,47) (CN(K+1,J,I),K=1,MLINDP)
239 WRITE(6,47) (SN(K,J,I),K=1,MLINDP)

```

Figure 8. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	217
C ***	NOW THE DIFFERENTIAL PRESSURE FOURIER COEFFICIENTS OF THE AVERAGE CYCLES							218
C	IF (PUNCH.NE.YES) GO TO 41							219
	240 WRITE(7,42) IBURST							220
	42 FORMAT(11MBURST NO. =,I3,I1X, 34H*** ROTOR NOISE PUNCHED OUTPUT *							221
	X**)							222
	WRITE(7,43) B0,B1C,B1S							223
	43 FORMAT(21HBLADE PITCH HARMONICS / 3(1PE10.4),2X, 46H(COLLECTIVE,							224
	XLONGITUDINAL,LATERAL, RESPECTIVELY) / 75HDIFFERENTIAL PRESSURE HAR							225
	XMONICS FOR 5 CHORD STATIONS AT EACH OF THE 5 SPANS / 66H(MEASURING							226
	X FROM THE LEADING EDGE AND THE BLADE ROOT RESPECTIVELY).)							227
C ***	SPAN LOOP							228
	DO 44 I=1,5							229
C ***	CHORD LOOP							230
	DO 44 J=1,5							231
	WRITE(7,49) I,J,CN(1,J,I)							232
	49 FORMAT(4HSPAN,12,2X, 5HCHORD,12,7X, 8HSTEADY= , 1PE10.4)							233
	WRITE(7,45)							234
	45 FORMAT(19HCOSINE COEFFICIENTS)							235
	47 FORMAT(8(1PE10.4))							236
	WRITE(7,47) (CN(K+1,J,I),K=1,MLIMDP)							237
	WRITE(7,48)							238
	48 FORMAT(17HSINE COEFFICIENTS)							239
	44 WRITE(7,47) (SN(K,J,I),K=1,MLIMDP)							240
	GO TO 41							241
C ***	CARD INPUT (INSTEAD OF TAPE INPUT) IS ACCEPTED NEXT.							242
	10 READ(5,42) IBURST							243
C ***	SPAN LOOP							244
	HEAD(5,43) B0,B1C,B1S							245
C ***	CHORD LOOP							246
	DO 50 I=1,5							247
	DO 50 J=1,5							248
	HEAD(5,49) IN,JN,CN(1,JN,IN)							249
	HEAD(5,45)							250
	HEAD(5,47) (CN(K+1,J,I),K=1,MLIMDP)							251
	HEAD(5,48)							252
	50 HEAD(5,47) (SN(K,J,I),K=1,MLIMDP)							253
C ***	AVERAGE DIFFERENTIAL PRESSURE CYCLES FOR SPAN I CHORD J AZIMUTH K ARE							254
C	FOUND BY SUMMING THE CORRECTED HARMONICS.							255
C ***	SPAN LOOP							256
C	AT THIS POINT THE PRESSURE INPUT HAS BEEN ACCEPTED (TAPE OR CARD INPUT)							257
	41 IF(100.NE.1) GO TO 9301							258
	CALL CLOCK							259
	9301 DO 51 I=1,5							260
C ***	CHORD LOOP							261
	DO 51 J=1,5							262
	T1 = -AZRAD							263
C ***	AZIMUTH (POINT) LOOP							264
	DO 51 K=1,144							265
	DATA1(K,J,I) = CN(1,J,I)							266
	T1 = T1+AZRAD							267
	T3 = 0.							268
C ***	HARMONIC LOOP							269
	DO 51 L=1,MLIMDP							270

Figure 9. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	271
	I3 = I3+1							272
	I2 = I2+1							273
	51 DATA(K,J,I) = DATA1(K,J,I)+CN(L+1,J,I)*COS(T2)+SN(L,J,I)*SIN(T2)							274
	WRITE(6,54)							275
	54 FORMAT(1H1,59HDIFFERENTIAL PRESSURE CYCLES AT INSTRUMENTED BLADE S							276
	XTATIONS //)							277
	DO 53 I=1,5							278
	DO 53 J=1,5							279
	WRITE(6,55) I,J							280
	55 FORMAT(1H0, 12HSPAN STATION,13,5X,13HCHORD STATION, 13//)							281
	53 WRITE(6,56) (DATA1(K,J,I),K=1,144)							282
	56 FORMAT(2X,10(1PE13.4))							283
	C *** THE FOLLOWING INPUT OPTION DESIDES WHETHER OR NOT TO CALL THE ACOUSTICS							284
	C PROGRAM E386 WHICH IS A SIMPLIFIED VERSION OF THIS PROGRAM.							285
	52 IF(E386OP.NE.YES) GO TO 57							286
	KK = 1							287
	XLO(1) = 0.							288
	DO 9501 J=1,NHH							289
	XLM(1,KK) = 0.							290
	9501 XMM(1,KK) = 0.							291
	C *** RADIAL STATION LOOP							292
	DO 58 I=1,5							293
	KK = KK+1							294
	IF(INS(I).EQ.0) GO TO 58							295
	IF(INCH(I).EQ.5) GO TO 59							296
	NI1 = NCH(I)+2							297
	K=1							298
	CHORD(1) = 0.							299
	DO 60 L=1,5							300
	IF(INCHAN(I,L).EQ.0) GO TO 60							301
	K=K+1							302
	CHORD(K)=XA(L,I)							303
	60 CONTINUE							304
	CHORD(K+1)=1.							305
	GPSI(1)=0.							306
	DO 61 J=1,144							307
	K=1							308
	DO 62 L=1,5							309
	IF(INCHAN(I,L).EQ.0) GO TO 62							310
	K=K+1							311
	GPSI(K) = DATA1(J,L,I)							312
	62 CONTINUE							313
	GPSI(K+1) = 0.							314
	CALL AVQUAD(NT1,CHORD,GPSI,AREA)							315
	61 FN(J) = AREA*AA							316
	GO TO 63							317
	59 DO 64 J=1,144							318
	FN(J) = 0.							319
	DO 65 L=1,5							320
	65 FN(J) = FN(J)+DATA1(J,L,I)*FI(I,L)							321
	64 FN(J) = FN(J)*AA							322
	63 CALL DFKIE(144,NHH,FN,TEM1,TEM2)							323
	XLO(KK) = TEM1(1)							324
	DO 66 J=1,NHH							

Figure 10. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	
	XLM(KK,J) = TEM1(J+1)							325
	66 XMM(KK,J) = TEM2(J+1)							326
	58 CONTINUE							327
	KK = KK+1							328
	XLO(KK) = 0.							329
	DO 9500 J=1,NMH							330
	XLM(KK,J) = 0.							331
	9500 XMM(KK,J) = 0.							332
	WRITE(6,201)							333
	201 FORMAT(1H1, 11HXLO XLM XMM ,//)							334
	DO 202 KK=1,7							335
	WRITE(6,203) XLO(KK), (XLM(KK,J),J=1,NMH), (XMM(KK,J),J=1,NMH)							336
	203 FORMAT(//11PE13.5)							337
	205 FORMAT(F8.2/(10F8.2))							338
	200 CONTINUE							339
	200 CALL E3BGRN							340
	57 IF(OPHONO.NE.YES) GO TO 7							341
	C BEGINNING OF ROTOR NOISE ANALYSIS							342
	IF(1DD.NE.1) GO TO 9302							343
	CALL START							344
	9302 11 = LSPAN-1							345
	11 = 298./T1							346
	DELSN = T1/2.							347
	SPAN(1) = 74.							348
	DO 67 L=2,LSPAN							349
	67 SPAN(L) = SPAN(L-1)+T1							350
	L=START-1							351
	FMEL							352
	T4 = BLADES/(PI*BB)							353
	DIMENSION RSQ(18)							354
	NEWIND 28							355
	IF(1DD.NE.1) GO TO 9103							356
	GC2=SPAN(1)+DELSN							357
	J=LSN-2							358
	DO 10005 I=1,J							359
	GC1=GC2+T1							360
	RSQ(I) = PI*(GC1**2-GC2**2)/(288.*SPAN(I+1))							361
	10005 GC2=GC1							362
	WRITE(6,8826) (RSQ(I),I=1,18)							363
	GO TO 9103							364
	9100 WRITE(6,9104) LSD2							365
	9104 FORMAT(1H0,11MTRAN ERROR , 5I13)							366
	STOP							367
	9103 WRITE(28) (ND1(I),I=1,7200)							368
	WRITE(28) (SINE(I),I=1,288),BLADES							369
	END FILE 28							370
	LSD2= 1							371
	C *** HARMONIC LOOP							372
	DO 83 B=START,MLIMRN							373
	NEWIND 28							374
	HEAD (28) (ND1(I),I=1,7200)							375
	FM = FM+1.							376
	C *** RADIAL STATION LOOP							377
	CALL NTRAN(29,10)							378

Figure 11. Program Listing - Main, Noise Analysis Begins.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	379
2	0	0	0	0	0	0	0	380
3	0	0	0	0	0	0	0	381
4	0	0	0	0	0	0	0	382
5	0	0	0	0	0	0	0	383
6	0	0	0	0	0	0	0	384
7	0	0	0	0	0	0	0	385
8	0	0	0	0	0	0	0	386
9	0	0	0	0	0	0	0	387
10	0	0	0	0	0	0	0	388
11	0	0	0	0	0	0	0	389
12	0	0	0	0	0	0	0	390
13	0	0	0	0	0	0	0	391
14	0	0	0	0	0	0	0	392
15	0	0	0	0	0	0	0	393
16	0	0	0	0	0	0	0	394
17	0	0	0	0	0	0	0	395
18	0	0	0	0	0	0	0	396
19	0	0	0	0	0	0	0	397
20	0	0	0	0	0	0	0	398
21	0	0	0	0	0	0	0	399
22	0	0	0	0	0	0	0	400
23	0	0	0	0	0	0	0	401
24	0	0	0	0	0	0	0	402
25	0	0	0	0	0	0	0	403
26	0	0	0	0	0	0	0	404
27	0	0	0	0	0	0	0	405
28	0	0	0	0	0	0	0	406
29	0	0	0	0	0	0	0	407
30	0	0	0	0	0	0	0	408
31	0	0	0	0	0	0	0	409
32	0	0	0	0	0	0	0	410
33	0	0	0	0	0	0	0	411
34	0	0	0	0	0	0	0	412
35	0	0	0	0	0	0	0	413
36	0	0	0	0	0	0	0	414
37	0	0	0	0	0	0	0	415
38	0	0	0	0	0	0	0	416
39	0	0	0	0	0	0	0	417
40	0	0	0	0	0	0	0	418
41	0	0	0	0	0	0	0	419
42	0	0	0	0	0	0	0	420
43	0	0	0	0	0	0	0	421
44	0	0	0	0	0	0	0	422
45	0	0	0	0	0	0	0	423
46	0	0	0	0	0	0	0	424
47	0	0	0	0	0	0	0	425
48	0	0	0	0	0	0	0	426
49	0	0	0	0	0	0	0	427
50	0	0	0	0	0	0	0	428
51	0	0	0	0	0	0	0	429
52	0	0	0	0	0	0	0	430
53	0	0	0	0	0	0	0	431
54	0	0	0	0	0	0	0	432

```

DO 69 K=1,5
  IF(IRS(K).EQ.0) GO TO 69
  T=AA/(2.*RR(K)*BLADEL)
C *** AZIMUTHAL LOOP
  DO 99 I=1,144
    T1=T5
    T2=T5
    T3 = (T2-T1)/40.
    T6=T1*BLADES*FM
    COSRN(I) = COS(T6)
    SINRN(I) = SIN(T6)
    T6=T2*BLADES*FM
    COSRN(I+1) = COS(T6)
    SINRN(I+1) = SIN(T6)
    AZ41(I)=T1
    AZ41(I+1)=T2
    L=0
  DO 71 J=2,40
    T1=T1+T3
    T6=T1*BLADES*FM
    AZ41(J)=T1
    COSRN(J) = COS(T6)
    SINRN(J) = SIN(T6)
  71 CONTINUE
    NT1 = NCH(K)+2
    KKK = 1
    CHORD(I)=0.
    GPSI(I)=0.
  DO 72 L=1,5
    IF(NCHAN(K,L).EQ.0) GO TO 72
    KKK = KKK + 1
    CHORD(KKK) = X(L,K)
    GPSI(KKK) = DATA(I,L,K)
  72 CONTINUE
    CHORD(KKK+1) = 1.
    GPSI(KKK+1) = 0.
C *** THE MEASURED PRESSURE POINTS ALONG THE CHORD ARE INTERPOLATED TO 41 POINTS
    CHORD2(1)=0.
    CHORD2(41) = 1.
    AREA = 1./41.
  DO 9307 L=2,40
    CHORD2(L) = CHORD2(L-1) + AREA
    CALL CURVIT(NT1,CHORD,GPSI,KKK+1,CHORD2,GPSI2)
    DO 73 L=1,41
      GPSI3(L) = GPSI2(L)*COSRN(L)
      CALL AVQUAD(41,AZ41 ,GPSI3,AREA)
      AREA = AREA*T4
    9105 IF(LSD2+1) 9100,9105,9106
    9106 CALL NTRAN(29,1,1,AREA,LSO2)
    IF(IUD.NE.1) GO TO 2741
    IF(I.GT.10) GO TO 2741
    IF(K.GT.2) GO TO 2741
    WRITE(6,2742) I,K,M,NT1
  2742 FORMAT(1H0,2H1=,15,5X,2HK=,15,5X,2HMC=,15,10X,

```

Figure 12. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0.....	0.....	0.....	0.....	0.....	0.....	0.....	433
	X 33 MACUUSIC PRESSURE PULSE COS TERM							434
	WRITE(6,2747) COSRN							435
	WRITE(6,2747) CHORD							436
	WRITE(6,2747) GPSI							437
	WRITE(6,2747) CHORD2							438
	WRITE(6,2747) GPSI2							439
	WRITE(6,2747) T1,T2,T3,T4,T5,GMAR(I,K),AREA,FM							440
	2747 FORMAT(2X,IP10E13.5)							441
	2741 DO 74 L=1,41							442
	74 GPSI3(L) = GPSI2(L)*SINRN(L)							443
	CALL AVQUAD(41,AZ41 ,GPSI3,AREA)							444
	AREA = AREA*T4							445
	9107 IF(1LSU2+1)9100,9107,9108							446
	9108 CALL NTRAN(29,1,1,AREA,1LSU2)							447
	99 CONTINUE							448
	9200 IF(1LSU2+1) 9100,9200,9201							449
	9201 CALL NTRAN(29,10)							450
	DO 9109 K=1,5							451
	DO 9109 I=1,144							452
	9110 IF(1LSU2+1) 9100,9110,9111							453
	9111 CALL NTRAN(29,2,1,AREA,1LSU2)							454
	9112 IF(1LSU2+1) 9100,9112,9113							455
	9113 GMAR(1,K)=AREA							456
	CALL NTRAN(29,2,1,AREA,1LSU2)							457
	9114 IF(1LSU2+1) 9100,9114,9115							458
	9115 HMAR(1,K) = AREA							459
	9109 CONTINUE							460
	IF(100,NE.1) GO TO 75							461
	WRITE(6,76) M							462
	76 FORMAT(1H0,123HCO S AND SIN COEFFICIENTS OF ACOUSTIC PRESSURE PULSE							463
	X AT EACH OF 144 AZIMUTH STATIONS AT EACH BLADE STATION FOR HARMO							464
	XN1C M,13)							465
	DO 77 I=1,5							466
	WRITE(6,78) I							467
	78 FORMAT(1H0,14HBLADE STATION=,12)							468
	WRITE(6,56) (GMAR(K,I),K=1,144)							469
	77 WRITE(6,56) (HMAR(K,I),K=1,144)							470
	C *** THE FOLLOWING SUBR. INTERPOLATES ACOUSTIC PRESSURE PULSE HARMONICS UP TO							471
	C 288 AZIMUTH AND 20 BLADE STATIONS							472
	75 IF(100,NE.1) GO TO 9303							473
	CALL CLOCK							474
	9303 CALL INTERP							475
	IF(100,NE.1) GO TO 79							476
	CALL CLOCK							477
	WRITE(6,80) LAZI,LSAN							478
	80 FORMAT(1H1, 51HINTERPOLATED ACOUSTIC PRESSURE PULSE COEFFICIENTS (							479
	X ,13,1X,17HAZIMUTH STATIONS, ,13,1X,17HBLADE STATIONS) ///							480
	DO 81 I=1,LSAN							481
	WRITE(6,82) SPAN(I)							482
	82 FORMAT(1H0,11HBLADE SPAN=,F8.2,10X,21HGMAR(I,J),HMAR(I,J,1))							483
	81 WRITE(6,56) (GMAR(I,J),J=1,LAZI)							484
	81 WRITE(6,56) (HMAR(I,J),J=1,LAZI)							485
	C *** DOUBLE INTEGRATION FOLLOWS							486

Figure 13. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	487
79	LSI = (DPSI/2.5)+.01							488
C ***	FIELD POINT LOOP							489
	DO 83 NFIELD=1,NFT							490
	NFIELD = NFIELD							491
	IF (INTERM.EQ.NO) GO TO 84							492
	WRITE(6,85) NFIELD,XEP(NFIELD),YFP(NFIELD),ZEP(NFIELD),M							493
85	FORMAT(1H, 12NFIELD POINT=,13,5X, 4HXP=,1PE10.4,5X,4HYFP=,1PE10.							494
X 4,5X,	4HXP=,1PE10.4,15X, 11HARMONIC ME=,13)							495
C ***	SUBR. CUE WILL CALCULATE Q1 AND Q2=Q1*Q2							496
84	HEAD(28) (SINE(1),I=1,288),BLADES							497
	BACKSPACE 28							498
	CALL CUE(2,FM,NFIELD)							499
	IF (INTERM.EQ.NO) GO TO 86							500
	WRITE(6,87) LAZI,LSPAN							501
87	FORMAT(1H0, 3H01(,13,1H,,12,1H))							502
	DO 88 I=1,LSPAN							503
	WRITE(6,89) I,XO(I)							504
89	FORMAT(1H0, 13HSPAN STATION=,13, 1H, F6.3,1H) 1							505
88	WRITE(6,90) (Q1(J,I),J=1,LAZI)							506
90	FORMAT(2X,13,1PE10.3))							507
C ***	THE FOLLOWING LOOP EFFECTS A DOUBLE INTEGRATION WHICH YIELDS THE SOUND							508
C	PRESSURE COMPONENTS UMF(M,NFIELD) AND VMF(M,NFIELD).							509
86	DO 91 K=1,2							510
	IF (INTERM.EQ.NO) GO TO 92							511
	I=K+1							512
	WRITE(6,93) I,LAZI,LSPAN							513
93	FORMAT(1H0, 1H0,11,1H(,13,1H,,12,1H))							514
	DO 94 I=1,LSPAN							515
	WRITE(6,89) I,XO(I)							516
94	WRITE(6,90) (Q2(J,I),J=1,LAZI)							517
C ***	A DOUBLE INTEGRATION IS DONE NEXT.							518
92	IF (IDU.NE.1) GO TO 9304							519
	CALL CLOCK							520
C KING	ITEGNATION							521
	LAUDRE=LSPAN-2							522
	AREA=0.							523
	DO 10006 J=1,LAUDRE							524
	QAVR = 0.							525
	DO 10007 I=1,LAZI							526
10007	QAVR=QAVR+Q2(I,J+1)							527
	QAVR=QAVR*RSQ(J)							528
10008	FORMAT(5H RING,13,20X,E13.5)							529
10006	AREA=AREA+QAVR							530
	IF (K.EQ.2) GO TO 10009							531
	UKING=AREA*T1							532
	GO TO 10010							533
10009	VKING=AREA*T1							534
10010	CONTINUE							535
9304	LAUDRE = LSPAN-1							536
	DO 8820 I=1,LAZI							537
	UBI(I)=0.							538
	DO 8821 J=2,LAUDRE							539
								540

Figure 14. Program Listing - Main.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	541
8821	DBI(1)=DBI(1)+Q2(I,J)							542
8820	DBI(1)=(DBI(1)+2*Q2(I,1)+Q2(I,LSPAN))*DELSPN							543
	DBI(LAZI+1)=DBI(1)							544
	IF(IDD.NE.1) GO TO 8825							545
8826	WRITE(6,8826) (DBI(I),I=1,145),DELSPN							546
	FORMAT(1H0,1X,10E13.5)							547
	CALL SINCOR(LAZI+1,DPRAD,DBI,GAVR,1)							548
	TEMP1(K)=GAVR							549
8825	GAVR = 0.							550
	DO 9701 I=1,LAZI							551
9701	GAVR=GAVR+DBI(I)							552
	GAVR=GAVR+DPRAD*T1							553
	IF(K.EG.2) GO TO 9703							554
	UTRAP=GAVR							555
	GO TO 9702							556
9703	VTRAP=GAVR							557
C=IMPSON 5								558
9702	IF(IDD.NE.1) GO TO 9305							559
	GAVR=2*DELSPN							560
	DO 10000 I=1,LAZI							561
	DO 10001 J=1,IAUDRE							562
10001	AZ41(J)=Q2(I,J+1)							563
10000	CALL SINCOR(IAUDRE,GAVR,AZ41,AREA,J)							564
	DBI(LAZI+1)=DBI(1)							565
	WRITE(6,8826) (DBI(I),I=1,145),GAVR							566
	CALL SINCOR(LAZI+1,DPRAD,DBI,GAVR,1)							567
	IF(K.EG.2) GO TO 10002							568
	USIMP=GAVR*T1							569
	GO TO 10003							570
10002	VSIMP=GAVR*T1							571
10003	WRITE(6,2222) TEMP1(K),R0,BLADEL,T1,B3							572
2222	FORMAT(1H0,5E20.6)							573
	CALL CLOCK							574
	GAVR=0.							575
	DO 901 IROMA=1,20							576
	DO 901 IAUDRE=1, 34							577
901	GAVR=GAVR+Q2(IAUDRE,IROMA)							578
	GAVR=GAVR/2880.							579
	WRITE(6,902) GAVR							580
902	FORMAT(1H0,11H0 AVERAGE= ,1PE20.5)							581
9305	IF(K.EG.2) GO TO 91							582
C ***	SUBR. CUE WILL CALCULATE Q2=Q1*Q2							583
	HEAD(28) (SINE(I),I=1,288),BLADES							584
	BACKSPACE 28							585
	CALL CUE(3,FM,MFIELD)							586
91	CONTINUE							587
	READ(28) (SINE(I),I=1,288),BLADES							588
	BACKSPACE 28							589
	TEMP1(1) = TEMP1(1)*T1							590
	TEMP1(2) = TEMP1(2)*T1							591
	IF(IDD.NE.1) GO TO 95							592
	WRITE(6,9704)							593
9704	FORMAT(1H0,85 H)THE FOLLOWING ANSWERS ARE OBTAINED BY USING TRAPAZO							594

Figure 15. Program Listing - Main.

```

1 .....0.....2.....3.....4.....5.....6.....7.....8.....CD COUNT
XIALAL INTERGRATION ALONG THE BLADE, /
X 44HAND SIMPSON S INTEGRATION ALONG THE AZIMUTH.
WRITE(6,96) M,NFIELD,TEMP1(1) ,M,NFIELD,TEMP1(2)
96 FORMAT(1H0, 4HUMF(,12,1H,,12,3H) =,1PE10.4,13X,
X 4HVMF(,12,1H,,12,3H) =,1PE10.4 )
C *** SOUND PRESSURE AND SOUND PRESSURE LEVEL ARE CALCULATED NEXT
95 PMRMS(M,NFIELD) = (1./1.41421356)*SQRT(UTRAP**2+VTRAP**2)
SPLM(M,NFIELD) = 20.*ALOG10(PMRMS(M,NFIELD)/2.9E-09)
IF(INTERM.EQ.NO) GO TO 31000
WRITE(6,97) M,NFIELD,PMRMS(M,NFIELD),M,NFIELD,SPLM(M,NFIELD)
97 FORMAT(1H0, 6HPMRMS(,12,1H,,12,3H) =,1PE10.4,10X,
X 6H SPLM(,12,1H,,12,3H) =,1PE10.4 )
31000 IF(100.NE.1) GO TO 83
WRITE(6,9705)
9705 FORMAT(1H0,95 HTHE FOLLOWING ANSWERS ARE OBTAINED BY USING TRAPAZO
XIALAL INTERGRATION ALONG THE BLADE AND AZIMUTH
WRITE(6,96) M,NFIELD,UTRAP,M,NFIELD,VTRAP
UTRAP=(1./1.41421356)*SQRT(UTRAP**2+VTRAP**2)
VTRAP=20.*ALOG10(UTRAP/2.9E-09)
WRITE(6,97) M,NFIELD,UTRAP,M,NFIELD,VTRAP
WRITE(6,10004)
10004 FORMAT(1H0, 17H SIMPSON, SIMPSON )
WRITE(6,96) M,NFIELD,USIMP,M,NFIELD,VSIMP
USIMP= (1./1.41421356)*SQRT(USIMP**2+VSIMP**2)
VSIMP=20.*ALOG10(USIMP/2.9E-09)
WRITE(6,97) M,NFIELD,USIMP,M,NFIELD,VSIMP
WRITE(6,10011)
10011 FORMAT(1H0, 6H RINGS )
WRITE(6,96) M,NFIELD,URING,M,NFIELD,VRING
URING=(1./1.41421356)*SQRT(URING**2+VRING**2)
VRING=20.*ALOG10(URING/2.9E-09)
WRITE(6,97) M,NFIELD,URING,M,NFIELD,VRING
83 CONTINUE
C *** THE FOLLOWING SUBR. PRINTS OUT SOUND PRESSURE LEVELS FOR ALL CALCULATED
C HARMONICS.
CALL OUTSPL
IF(100.NE.1) GO TO 7
CALL CLOCK
GO TO 7
STOP
END
91XG FOR CURVIT,CURVIT
SUBROUTINE CURVIT (MM, X9, Y9, W, N, X0, Y0)
C
C
C SIGNED IN THE CALLING PROGRAM.
C PRESENTLY * IS NOT USED IN THIS ROUTINE, HOWEVER, IT SHOULD BE DIMEN-
C
C * W WILL BE USED LATER FOR A WORK VECTOR. -- COEF'S DIMENSION WILL
C ***** BE CHANGED ALSO. -- SO, FOR NOW ASSUME THE INPUT IS SORTED *****
C
C DIMENSION X(14),Y(7), W(1), X0(1), Y0(1), CUBE(3), ROOT(3),
C * ROOT1(3), X9(1), Y9(1)
C * COMMON /COTAN/ TIN( 7,2), COEF(4, 7,2)

```

Figure 16. Program Listing - Main, CURVIT.

1	2	3	4	5	6	7	8	CD	COUNT
1	0.....	0.....	0.....	0.....	0.....	0.....	0.....		
	DO 1 I=1,MM								649
	X(I) = X9(I)								650
	X(I+7) = Y9(I)								651
1	Y(I) = Y9(I)								652
	IF (MM .GE. 2) GO TO 10								653
	IF (MM .EQ. 0) Y = 0.								654
	DO 3 I=1,N								655
5	Y0(I) = Y								656
	WRITE (6,100) (X0(I), Y0(I), I=1,N)								657
100	FORMAT (9H0 PROBLEM WITH CURVE FITS (CURVIT) - LESS THAN TWO POI								658
	NTS ON THIS CURVE. - INPUT X OUTPUT Y, / (72X, 2E11.4, /))								659
	RETURN								660
10	CALL PARAM (MM, X, 2)								661
	DO 90 J=1,N								662
	TUM1=1								663
	DO 20 I=1,MM								664
	K=I-1								665
20	IF (X0(J) .LT. X(I)) GO TO 30								666
	IF (X0(J) .EQ. X(I)) GO TO 48								667
	TUM1=-1								668
	I=MM								669
25	TUM1=-TUM1								670
	SLOPE = Y(I,2)/Y(I,1)* TUM1								671
	CONST = Y(I) - SLOPE*X(I)								672
	Y0(J) = SLOPE*X0(J) + CONST								673
	GO TO 90								674
30	IF (I .EQ. 1) GO TO 25								675
35	IF (X0(J) .EQ. X9(K)) GO TO 64								676
	K REFER TO THE SECTION FROM WHICH WE NEED THE COEFFICIENTS.								677
	DE COEF(4,K,1)								678
	DO 40 I=1,3								679
40	CUBE(I) = COEF(I,K,1)/D								680
	CUBE(I) = CUBE(I) - X0(J)/D								681
	CALL CUBIC (CUBE(3), CUBE(2), CUBE(1), CUBE(0), ROOT, ROOTI)								682
	DO 50 I=1,3								683
	IF (ABS(ROOT(I)) .LE. .0001) ROOT(I) = 0.								684
	IF (ABS(ROOT(I)-1.) .GT. .0001) GO TO 49								685
48	ROOT(I) = 1.								686
	Y0(J) = Y9(K+1)								687
	GO TO 90								688
49	IF (ROOT(I) .NE. 0.) GO TO 50								689
	IF (ROOT(I) .LT. 0.) GO TO 50								690
	IF (ROOT(I) .GT. 1.) GO TO 50								691
	GO TO 60								692
50	CONTINUE								693
	** THERE IS NO SOLN. **								694
	WRITE(6,101) (COEF(I,K,1), I=1,4), K, X0(J), (ROOT(I), ROOTI(I), I=1								695
	,3)								696
101	FORMAT (39H0 A ROOT FOR THE CUBIC EQUATION X =, E11.4, 3H + ,								697
	* E11.4, 7H * T + , E11.4, 9H * T*T + , E11.4, 7H * T**3, 13H IN S								698
	SECTION, 13, // 6X, 42H DOES NOT EXIST BETWEEN 0. AND 1. WHEN X = ,								699
	*E13.5, 47H AND THE ROOTS ARE - REAL								700
	*E15.7, 2X, E15.7)								701
	T = .5								702

Figure 17. Program Listing - CURVIT.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	703
64	T = 0.							704
60	T = ROOT(1)							705
61	YU(J) = COEF(1,K,2) + COEF(2,K,2)*T + COEF(3,K,2)*T**2 +							706
	COEF(4,K,2)*T**3							707
90	CONTINUE							708
	END							709
910	FOR RDKU, RDKU							710
911	SUBROUTINE RDKU(N)							711
C ***	THIS SUBR. READS THE PROPER TAPE (UNIT 8,9,10,11, OR 12)							712
	COMMON /BK1/ IDO, BB, AA, XA(5,5), DP(5), RR(5), OMEG, CC, NBLADE, MLINRN,							713
	MLINUP, XEP(20), YEP(20), ZEP(20), GAMA, R0, BLADEL, B0, BIC, BIS, PUNCH,							714
	LSPAN, FROC(30), TCOP, SLOPE(10,5), OFFSET(10,5), KUNIT(5), IBURST,							715
	IS(5), ITRACK(5), FI(5,5), NCHAN(5,5), E386OP, NFI, ANG, KEY1, KEY2,							716
	KEY3, NMH, CAPRF(20), THETA(20), ALFA(20), OPRONO, NCH(5), INTERM,							717
	IREEL, NC, NIBOX(5,10), NSTATC(5,10), NSTATR(5,10), ISET(5), IREELS,							718
	NOCH(5), LAZI							719
	COMMON /BK2/ NCYCLE, CYCLES, KU, NDIV(4), BMASK(6), NN(435), LIRS,							720
	KTRACK, KBURST, KREC, ND1(144,10,5), ND2(144,10,5), XL0(7), XL0(7,40),							721
	XMM(7,40), TEMP1(7), TEMP2(7), TEMP3(7), PI, AZMTH2(144), AZMTH(144),							722
	UPRAD, AZRAD, NO, YES, NBLANK, TEE, BEE, DEE, GMARI(288,20),							723
	HMARI(288,20), X0(20)							724
	DIMENSION CN(31,5,5), SN(30,5,5), AN(31,10,5), BN(30,10,5),							725
	GMAR(144,5), HMAR(144,5)							726
	DIMENSION NNPS(219)							727
	EQUIVALENCE							728
	(GMARI(1551), BN), (HMARI, CN), (HMARI(776), SN)							729
	EQUIVALENCE (FTRACK, KTRACK), (FBURST, KBURST), (FREC, KREC)							730
	EQUIVALENCE (ND1(5761), GMAR)							731
	GO TO (1,2), N							732
1	LIM1 = 1							733
	LIM2 = 219							734
2	GO TO 3							735
2	LIM1 = 217							736
	LIM2 = 435							737
3	I=KU-7							738
	GO TO (4,5,6,7,8), I							739
4	HEAD(8) (NN(I), I=LIM1, LIM2)							740
GO TO 9								741
5	HEAD(9) (NN(I), I=LIM1, LIM2)							742
GO TO 9								743
6	HEAD(10) (NN(I), I=LIM1, LIM2)							744
GO TO 9								745
7	HEAD(11) (NN(I), I=LIM1, LIM2)							746
GO TO 9								747
8	HEAD(12) (NN(I), I=LIM1, LIM2)							748
HEAD (13) (NNPS(I), I=1,219)								749
I=-1								750
DO 20 J=LIM1, LIM2, 3								751
I=I+3								752
20 NN(J)=NNPS(I)								753
9 FTRACK = AND(NN(LIM2-2), BMASK(6))								754
FBURST = AND(NN(LIM2-1), BMASK(6))								755
								756

Figure 18. Program Listing - CURVIT, RDKU.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	0
	PREC = AND(NN(LIM2) , BMASK(6))							757
	IF(100.EQ.1)							758
	XWRITE(6,10) (NN(1),I=LIM1,LIM2)							759
	10 FORMAT(1H0, 19H(NN(1),I=LIM1,LIM2) / (2X,10013))							760
	RETURN							761
	END							762
	DIAG FOR INTERP. INTERP							763
	SUBROUTINE INTERP							764
	C *** THIS SUBR. INTERPOLATES PRESSURE PULSE HARMONICS FOR UP TO 20 SPAN							765
	C STATIONS AND 288 AZIMUTHS.							766
	* COMMON /BK1/ IDO,BB,AA,XA(5,5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,							767
	* MLIMUP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,							768
	* LSPAN,FROGL(30),TCOP,SLOPE(10,5),OEFSEI(10,5),KUNIT(5),IBURSI,							769
	* IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,							770
	* KEY3,NHH,CAPRF(20),THETA(20),ALFAF(20),OPRONO,NCH(5),INTERM,							771
	* IREEL,NC,NTBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,							772
	* NOCHI(5),LAZI							773
	* COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,							774
	* KTRACK,KBURSI,KREC,ND1(144,10,5),ND2(144,10,5),XLQ(17),XLM(7,40),							775
	* XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),							776
	* HMM(288,20),XO(20)							777
	* DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),							778
	* GMAR(144,5),HMM(144,5)							779
	* EQUIVALENCE							780
	* (GMAR(155),BN), (HMM(1,CN), (HMM(1,776),SN)							781
	* EQUIVALENCE (NO1(576),GMAR)							782
	DIMENSION YO(20)							783
	T1=.199							784
	T2=.801							785
	C *** WE FIRST DEFINE THE RADIAL STATION GRID XO(20)							786
	XO(1) = T1							787
	KELSPAN=1							788
	DEL=K							789
	DO 1 J=2,K							790
	1 XO(J)=XO(J-1)+DEL							791
	KKK = 1							792
	TEMP1(1) = 0.							793
	TEMP3(1) = 0.							794
	TEMP2(1) = T1							795
	C *** RADIAL STATION LOOP (ZERO AZIMUTH BEGIN)							796
	DO 2 K=1,5							797
	IF (IRS(K).EQ.0) GO TO 2							798
	KKK = KKK+1							799
	TEMP1(KKK) = GMAR(1,K)							800
	TEMP3(KKK) = HMM(1,K)							801
	TEMP2(KKK) = RR(K)							802
	2 CONTINUE							803
	NOPTS1 = KKK+1							804
	TEMP1(NOPTS1) = 0.							805
	TEMP3(NOPTS1) = 0.							806
	TEMP2(NOPTS1) = 1.							807
								808
								809
								810

Figure 19. Program Listing - RDKU, INTERP.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	0
2	CALL CURVIT (NOPTS1,TEMP2,TEMP1,W,LSPAN,XO,YO)							811
3	DO 3 K=1,LSPAN							812
4	GMARI(1,K) = YO(K)							813
5	CALL CURVIT(NOPTS1,TEMP2,TEMP3,W,LSPAN,XO,YO)							814
6	DO 4 K=1,LSPAN							815
7	* HMARI(1,K) = YO(K)							816
8	U = (UPSI/2.5) + .00001							817
9	ISI = 0							818
10	JJ = ISI							819
11	JAZZ = 1							820
12	J = 3							821
13	ISI2=ISI							822
14	IF (ISI.EQ.0) ISI2=1							823
15	LOW = ISI2+1							824
16	*** AZIMUTH LOOP							825
17	DO 5 JAZ=LOW,14*,ISI2							826
18	JAZZ = JAZZ+1							827
19	KKK=1							828
20	DO 6 K=1,5							829
21	IF (INS(K).EQ.0) GO TO 6							830
22	KKK = KKK+1							831
23	TEMP1(KKK) = GMAR(JAZ,K)							832
24	TEMP3(KKK) = HMAR(JAZ,K)							833
25	6 CONTINUE							834
26	CALL CURVIT(NOPTS1,TEMP2,TEMP1,W,LSPAN,XO,YO)							835
27	IF (ISI.GE.1) J=JAZZ							836
28	DO 7 K=1,LSPAN							837
29	GMARI(J,K) = YO(K)							838
30	CALL CURVIT(NOPTS1,TEMP2,TEMP3,W,LSPAN,XO,YO)							839
31	DO 8 K=1,LSPAN							840
32	HMARI(J,K) = YO(K)							841
33	IF (JJ.NE.0) GO TO 5							842
34	DO 9 K=1,LSPAN							843
35	GMARI(J-1,K) = (GMARI(J,K)+GMARI(J-2,K))/2.							844
36	HMARI(J-1,K) = (HMARI(J,K)+HMARI(J-2,K))/2.							845
37	J=J+2							846
38	5 CONTINUE							847
39	IF (JJ.NE.0) RETURN							848
40	J=J-2							849
41	DO 10 K=1,LSPAN							850
42	GMARI(J+1,K) = (GMARI(1,K) + GMARI(J ,K))/2.							851
43	HMARI(J+1,K) = (HMARI(1,K) + HMARI(J ,K))/2.							852
44	10 RETURN							853
45	END							854
46	FOR MERGES, MERGES							855
47	SUBROUTINE MERGES							856
48	*** THIS SUBR. PRODUCES DIFFERENTIAL PRESSURES FROM ABSOLUTE TOP AND BOTTOM							857
49	CD							858
50	HEADINGS.							859
51	COMMON /BK1/ IDO,BB,AA,XA(5,5),DPS1,RR(5),OMEG,CC,NBLADE,MLIMRN,							860
52	* MLIMOP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,							861
53	* LSPAN,PHOC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,							862
54	* IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,							863
55	* KEY3,NHM,CAPRF(20),THETAF(20),ALFAP(20),OPRONO,NCH(5),INTERM,							864
56	* IREEL,NC,NTBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,							

Figure 20. Program Listing - INTERP, MERGES.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	865
	* NUCH(5),LAZI							866
	COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,							867
	* KTRACK,KBUKST,KREC,ND1(144,10,5),ND2(144,10,5),XLM(7,40),							868
	* XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),							869
	* UPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),							870
	* HMARI(288,20),XO(20)							871
	DIJENSION CH(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),							872
	* GMAR(144,5),HMAR(144,5)							873
	EQUIVALENCE							874
	* (GMARI(1551),BN),(HMARI,CN),(HMARI(776),SN)							875
	EQUIVALENCE (ND1(5761),GMAR)							876
	INTEGER DEE,BEE							877
	DO 1 I=1,5							878
	DO 1 J=1,5							879
	CN(1,I,J) = 0.0							880
	DO 1 K=1,30							881
	CN(K+1,I,J) = 0.0							882
	1 SN(K,I,J) = 0.0							883
	C *** SPAN LOOP							884
	1 SWITCH=0							885
	DO 2 I=1,5							886
	C *** CHORD LOOP							887
	DO 2 J=1,5							888
	ISW = 0							889
	IREEL = 0							890
	3 IREEL = IREEL+1							891
	NC = 0							892
	4 NC = NC+1							893
	IF(100.NE.1) GO TO 25							894
	WRITE(6,20) I,J,NC,IREEL,NSTATR(IREEL,NC),NSTATC(IREEL,NC),							895
	X NIBDX(IREEL,NC)							896
	20 FORMAT(6I13,5X,A6)							897
	25 IF(NC.GT.10) GO TO 3							898
	IF(1SWCH.EQ.1) GO TO 15							899
	IF(NSTATR(IREEL,NC).EQ.0) GO TO 5							900
	15 IF(NSTATC(IREEL,NC).NE.1) GO TO 4							901
	IF(NSTATC(IREEL,NC).NE.J) GO TO 4							902
	IF(NIBDX(IREEL,NC).EQ.DEE) GO TO 6							903
	IF(NIBDX(IREEL,NC).EQ.BEE) GO TO 7							904
	IRTOP = IREEL							905
	NCTOP = NC							906
	1SW = 1SW+1							907
	GO TO 8							908
	7 IRBOT = IREEL							909
	NCRBOT = NC							910
	1SW = 1SW+1							911
	8 IF(1SW.NE.2) GO TO 4							912
	CN(1,J,I) = AN(1,NCBOT,IRBOT) - AN(1,NCTOP,IRTOP)							913
	DO 10 K=1,30							914
	CN(K+1,J,I) = AN(K+1,NCBOT,IRBOT)-AN(K+1,NCTOP,IRTOP)							915
	10 SN(K,J,I) = BN(K,NCBOT,IRBOT)-BN(K,NCTOP,IRTOP)							916
	GO TO 2							917
	C *** COLLECTIVE, LONGITUDINAL CYCLIC, AND LATERAL CYCLIC PITCH ANGLES FOUND							918
	C NEXT.							

Figure 21. Program Listing - MERGES.

	1	2	3	4	5	6	7	8	CD	COUNT
	1	0	0	0	0	0	0	0		
	5	B0 = AN(1,NC,IREEL)								919
		B1C = AN(2,NC,IREEL)								920
		B1S = BN(1,NC,IREEL)								921
		1SWTCH=1								922
		IF(IDU.E9.1) WRITE(6,20) B0,B1C,B1S,IREEL,I,J								923
		GO TO 4								924
	6	CN(1,J,I) = AN(1,NC,IREEL)								925
		DO 11 K=1,30								926
		CN(K+1,J,I) = AN(K+1,NC,IREEL)								927
	11	SN(K,J,I) = BN(K,NC,IREEL)								928
	2	CONTINUE								929
		RETURN								930
		END								931
Q1X6		FOR DFSRIE,DFSRIE								932
		SUBROUTINE DFSRIE(NP,NH,Y,A,B)								933
		DIMENSION Y(NP),A(1),B(1)								934
C		-----								935
C		NUMBER OF HARMONICS MUST NOT EXCEED HALF								936
C		THE NUMBER OF DATA POINTS INPUTED.								937
C		-----								938
		NN=MINO(NH,NP/2)								939
C		-----								940
C		INITIALIZATION AND CONSTANTS.								941
C		-----								942
		SP=0.								943
		CP=1.								944
		NN=2./NP								945
		B(1)=0.								946
		A(1)=0.								947
		ARG=NN*3.14159265								948
		C=COS(ARG)								949
		S=SIN(ARG)								950
C		-----								951
C		COMPUTE A FOR THE ZEROTH HARMONIC								952
C		-----								953
		DO 10 I=1,NP								954
10		A(1)=A(1)+Y(I)								955
		A(1)=RN*A(1)/2.								956
C		-----								957
C		MAIN LOOP.								958
C		-----								959
		DO 100 K=1,NNH								960
		X=C*CP-S*SP								961
		SP=C*SP+S*CP								962
		CP=X								963
		U=0.								964
		V=0.								965
C		COMPUTE RECURSIVE U,S								966
		U02011=2,NP								967
		J=NP-11+2								968
		W=Y(J)+2.*CP*V-U								969
		U=V								970
		V=W								971
20		A(K+1)=RN*(Y(1)+CP*V-U)								972

Figure 22. Program Listing - MERGES, DFSRIE.

1	2	3	4	5	6	7	8	CD COUNT
100	B(K+1)=R*SP*V							973
	RETURN							974
	END							975
	WIXG FOR CUE,CUE							976
	SUBROUTINE CUE(N,FM,MFIELD)							977
	COMMON /BK1/ IOO,BB,AA,XA(5,5),GPSI,RR(5),OMEG,CC,NBLADE,MLINRN,							978
	MLINOP,XFP(20),YFP(20),ZFP(20),GAMA,R0,BLADEL,B0,B1C,B1S,PUNCH,							979
	LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,							980
	IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,							981
	KEY3,NMH,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,							982
	IREL,NC,NBBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,							983
	NOCH(5),LAZI							984
	COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BNASK(6),NN(4,35),LIRS,							985
	KTRACK,NBURST,KREC,ND1(144,10,5),ND2(144,10,5),XL0(7),XLM(7,40),							986
	XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),							987
	UPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GHARI(288,20),							988
	GHARI(288,20),XO(20)							989
	COMMON /BK3/ SPLM(10,20),AZMTH3(288),							990
	SPAN(20),							991
	ICHANL(10,5),COSINE(288),SINE(288),BLADES,CARD,TAPE							992
	EQUIVALENCE							993
	(GHARI(1551),BN),(GHARI,CN),(ND2(5671),HMAR),(GHARI,AN),							994
	UIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),							995
	GHAR(144,5),HMAR(144,5)							996
	Q1(288,20),Q2(288,20)							997
	EQUIVALENCE (ND1(5761),GHAR),(ND1,Q1)							998
	T1=PI/30.							999
	T5=PI/180.							000
	C *** SPAN LOOP							001
	IF(100.NE.1) GO TO 7							002
	WRITE(6,3) XFP							003
	WRITE(6,3) YFP							004
	WRITE(6,3) ZFP							005
	WRITE(6,3) SPAN							006
	WRITE(6,3) COSINE							007
	WRITE(6,3) SINE							008
	WRITE(6,3) AZMTH3							009
	WRITE(6,3) OMEG,CC,GAMA,R0,B0,B1C,B1S,FM,BLADES,T1,T5							010
	3 FORMAT(1H0/12X,1P10E13.5)							011
	7 DO 1 I=1,LSPAN							012
	C *** AZIMUTH LOOP							013
	DO 1 J=1,LAZI							014
	S = SQRT((XFP(MFIELD)-SPAN(I)*COSINE(J))**2 + (YFP(MFIELD)-SPAN(I)*							015
	X*SINE(J))**2 + ZFP(MFIELD)**2)							016
	B = (B0 - GAMA*(SPAN(I)-R0) + B1C*COSINE(J) + B1S*SINE(J))*T5							017
	SINB = SIN(B)							018
	COSB = COS(B)							019
	T4 = FM*BLADES*(AZMTH3(J)+(S*OMEG*T1)/CC)							020
	T2 = COS(T4)							021
	T3 = SIN(T4)							022
	T4 = (FM*BLADES*OMEG/(CC*S**2))*T1							023
	IF(N.EQ.3) GO TO 2							024
	W1(J,I) = SPAN(I)*((XFP(MFIELD)-SPAN(I)*COSINE(J))*SINB*SINE(J)-							025
	X*(YFP(MFIELD)-SPAN(I)*SINE(J))*SINB*COSINE(J)+ZFP(MFIELD)*COSB)							026

Figure 23. Program Listing - DFSRIE, CUE.

57

1	2	3	4	5	6	7	8	CD COUNT
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	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	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	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0
41	0	0	0	0	0	0	0	0
42	0	0	0	0	0	0	0	0
43	0	0	0	0	0	0	0	0
44	0	0	0	0	0	0	0	0
45	0	0	0	0	0	0	0	0
46	0	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0
49	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0
51	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0
53	0	0	0	0	0	0	0	0
54	0	0	0	0	0	0	0	0
55	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0
57	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0
59	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0
61	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0
63	0	0	0	0	0	0	0	0
64	0	0	0	0	0	0	0	0
65	0	0	0	0	0	0	0	0
66	0	0	0	0	0	0	0	0
67	0	0	0	0	0	0	0	0
68	0	0	0	0	0	0	0	0
69	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0
71	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0
73	0	0	0	0	0	0	0	0
74	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0
79	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0
82	0	0	0	0	0	0	0	0
83	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0
86	0	0	0	0	0	0	0	0
87	0	0	0	0	0	0	0	0
88	0	0	0	0	0	0	0	0
89	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0
91	0	0	0	0	0	0	0	0
92	0	0	0	0	0	0	0	0
93	0	0	0	0	0	0	0	0
94	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0
96	0	0	0	0	0	0	0	0
97	0	0	0	0	0	0	0	0
98	0	0	0	0	0	0	0	0
99	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0

```

NOCHI(IREEL)=0
6 HEAD(5,5) NC,NTBOX(IREEL,NC),NSTATC(IREEL,NC),NSTATR(IREEL,NC),
  *SLOPE(10,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100),
5 FORMAT(2X,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100)
NOCHI(IREEL)=NOCHI(IREEL)+1
K=NOCHI(IREEL)
ICHANL(K,J)=NC
IF(NCND.EQ.0) GO TO 6
16 CONTINUE
HEAD(5,7) (FROC(J),J=1,30)
7 FORMAT(6E13.1,2X)
45 HEAD(5,8) E386OP,OPRONO,NFT
8 FORMAT(1X,2(1X,A1),2X,12)
IF(E386OP.NE.YES) GO TO 9
HEAD(5,10) ANG,NM,KEY1,KEY2,KEY3
10 FORMAT( E7.0,4(2X,12) )
9 DO 11 I=1,NFT
IF(E386OP.NE.YES) GO TO 12
HEAD(5,13) CAPRE(I),THETA(I),ALFA(I),XFP(I),YFP(I),ZFP(I)
13 FORMAT( 3E10.1,20X,3E10.1 )
GO TO 11
12 HEAD(5,14) XFP(I),YFP(I),ZFP(I)
14 FORMAT( 50X,3E10.1 )
11 CONTINUE
C *** NOW THE INPUT IS PRINTED OUT ***
WRITE(6,20) BB,R0,AA,CC,BLADEL,OMEG,DPSI,GAMA
20 FORMAT(1H0,1X, 28HBLADE THICKNESS (IN) = , E10.4, 8X,
1 35HZERO TWIST BLADE STA. (IN) = , E10.4 // 2X,
2 28HBLADE CHORD (IN) = , E10.4, 8X,35HSPEED OF SOUND
3 (IN/SEC) = , E10.4 // 2X,28HBLADE LENGTH (IN) =
4 35HROTOR ROT. SPEED (RPM) = , E10.4 // 48X,35HAZIMUTH
5INCMENT (DEG) = , E10.4 / 2X, 28HBLADE TWIST RATE (DEG/
6IN) = , E10.4 )
WRITE(6,21) NBLADE,TCOP,MLIMOP,PUNCH,MLIMRN,INTERM,LSPAN,IREELS
21 FORMAT(1H0,17H NUMBER OF BLADES, 32X,2H , 12, 14X, 18HTAPE / CARD
1 OPTION, 15X, 2H , A4 // 2X, 49HNO. OF HARMONICS TO REPRESENT PRE
2SSURE CYCLES = , 13, 14X, 35HPRESSURE HARMONIC PUNCH OPTION =
3 , A1 // 2X, 28HNO. OF ROTOR NOISE HARMONICS, 20X,2H , 12, 14X,
4 26HINTERMEDIATE OUTPUT OPTION, 7X, 2H , A1 // 2X, 33HNO. OF INTE
5MPULATED SPAN STATIONS, 15X, 2H , 12 // 2X, 23HTOTAL NO. OF TAPE
6REELS, 25X,2H , 12 / )
IF(TCOP.EQ.CARD) GO TO 46
DO 22 IREEL=1,IREELS
WRITE(6,23) IREEL,ITRACK(IREEL),ISET(IREEL),KUNIT(IREEL)
23 FORMAT(1H0,1X, 11HREEL NO. = , 11, 4X,12HTRACK NO. = , 12, 4X,
1 10HSET NO. = , 12, 4X, 24HLOGICAL TAPE UNIT NO. = , 12 // 8X,
2 7HCHANNEL, 24X, 5HSLOPE, 14X, 6HOFFSET )
K=NOCHI(IREEL)
DO 22 I=1,K
NC = ICHANL(I,IREEL)
WRITE(6,24) NC,NTBOX(IREEL,NC),NSTATC(IREEL,NC),NSTATR(IREEL,NC),
1 SLOPE(10,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100),
24 FORMAT( 10X,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100)

```

Figure 26. Program Listing - INPUTA.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	0
SLOPE(NG,IREFL) = SLOPE(NG,IREFL)/256.								
22	CONTINUE							189
	WRITE(6,25)							190
25	FORMAT(//// 3X, 8HARMONIC, 5X, 18HFREQ, CORR. FACTOR, 19X, 8HARMON							191
	11C) 5X, 18HFREQ, CORR. FACTOR //)							192
	DO 26 J=1,15							193
	JJ = JJ+15							194
	WRITE(6,63) J,FROC(J),JJ,FROC(JJ)							195
63	FORMAT(10X,12,13X,1PE11.4,25X,12,13X,1PE11.4)							196
26	CONTINUE							197
46	WRITE(6,27) E386OP,OPRONO,NFI							198
27	FORMAT(2H0 , 62HOPTION TO USE PROGRAM E386 (THEORETICAL CONST. PR							199
	LESSURE PULSE) .8X,2HE , A1 // 2X, 59HOPTION TO USE ROTOR NOISE OR							200
	2ORAM (MEASURED PRESSURE PULSE) .11X, 2HE , A1 // 2X, 19HNO. OF F							201
	FIELD POINTS, 51X, 1HE , 12 //)							202
	IF(E386OP.NE.YES) 60 TO 28							203
	WRITE(6,29) ANG,NHM,KEY1,KEY2,KEY3							204
29	FORMAT(2X, 43HINCR. OF INTEGRATION USED IN E386 (DEG.) = , F7.4,							205
	1 5X, 28HNO. OF AIR LOAD HARMONICS = ,12.4X, 6HKEY1= ,12.2X,6HKEY2=							206
	2 ,12.2X,6HKEY3= ,12.7//)							207
C **	FIELD POINTS PRINTED OUT NEXT.							208
28	IF(E386OP.NE.YES,AND.OPRONO.NE.YES) 60 TO 60							209
	WRITE(6,36)							210
36	FORMAT(25X,17HE386 FIELD POINTS, 32X,24HROTOR NOISE FIELD POINT							211
	15 // 6X,2HEP,7X, 6HR (FT),7X, 28HTHETA (DEG) ALPHA (DEG), 9X,							212
	2 2HFP, 7X, 6HX (IN), 7X,6HZ (IN) /)							213
	60 TO 31							214
60	IF(E386OP.NE.YES) 60 TO 30							215
	WRITE(6,37)							216
37	FORMAT(25X,17HE386 FIELD POINTS // 6X,2HFP, 7X, 6HR (FT), 7X,							217
	1 28HTHETA (DEG) ALPHA (DEG) /)							218
	60 TO 31							219
30	WRITE(6,38)							220
38	FORMAT(74X, 24HROTOR NOISE FIELD POINTS // 61X, 2HFP, 7X, 6HX (IN							221
	11, 7X,6HZ (IN),7X,6HZ (IN) /)							222
31	DO 32 I=1,NFI							223
	IF(E386OP.NE.YES,AND.OPRONO.NE.YES) 60 TO 33							224
	WRITE(6,39) I,CAPRF(I),THETAF(I),ALFAF(I),I,XFP(I),YFP(I),ZFP(I)							225
39	FORMAT(6X,12.4X, 313X,E10.4),10X,12.2X, 313X,E10.4)							226
	60 TO 32							227
33	IF(E386OP.NE.YES) 60 TO 34							228
	WRITE(6,39) I,CAPRF(I),THETAF(I),ALFAF(I)							229
	60 TO 32							230
34	WRITE(6,40) I,XFP(I),YFP(I),ZFP(I)							231
40	FORMAT(61X,12.2X, 313X,E10.4)							232
32	CONTINUE							233
	RETURN							234
	END							235
RIX6	FOR UNPACK,UNPACK							236
	SUBROUTINE UNPACK							237
C **	THIS SUBR. UNPACKS A CYCLE NNI(435) TO FORM THE ARRAY NDI(144,10,IREFL)							238
C	WHERE THE FIRST SUBSCRIPT REPRESENTS AZIMUTH, AND THE SECOND ARRAY							239
C	REPRESENTS CHANNEL NO.							240
	COMMON /BK1/ IDD,BB,AA,XA(5,5),DPSI,RR(5),ONE6,CC,NBLADE,MLIMRN,							241
								242

Figure 27. Program Listing - INPUTA, UNPACK.

1	2	3	4	5	6	7	8	CD COUNT
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	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
5	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
6	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
7	0.....	0.....	0.....	0.....	0.....	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	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
13	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
14	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
15	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
16	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
17	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
18	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
19	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
20	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
21	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
22	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
23	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
24	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
25	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
26	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
27	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
28	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
29	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
30	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
31	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
32	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
33	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
34	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
35	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
36	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
37	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
38	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
39	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
40	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
41	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
42	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
43	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
44	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
45	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
46	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
47	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
48	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
49	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
50	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
51	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
52	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
53	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
54	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
55	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
56	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
57	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
58	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
59	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
60	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
61	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
62	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
63	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
64	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
65	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
66	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
67	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
68	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
69	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
70	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
71	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
72	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
73	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
74	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
75	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
76	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
77	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
78	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
79	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
80	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
81	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
82	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
83	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
84	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
85	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
86	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
87	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
88	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
89	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
90	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
91	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
92	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
93	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
94	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
95	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
96	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
97	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
98	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
99	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0
100	0.....	0.....	0.....	0.....	0.....	0.....	0.....	0

```

* MLIMP, XFP(20), YFP(20), ZFP(20), GAMAR0, BLADEL, B0, B1C, B1S, PUNCH,
* LSPAN, FROC(30), TCOF, SLOPE(10,5), OFFSET(10,5), KUNIT(5), IBURST,
* IRS(5), ITRACK(5), FI(5,5), NCHAN(5,5), E386OP, NPT, ANG, KEY1, KEY2,
* KEYS, NMH, CAPRF(20), THETA(20), ALFA(20), OPRNO, NCH(5), INTERM,
* IREEL, NC, NTBOX(5,10), NSTATC(5,10), NSTATR(5,10), ISET(5), IREELS,
* NOCH(5), LAZI
COMMON /BK2/ NCYCLE, CYCLES, KU, NDIV(4), BMASK(6), NN(435), LIRS,
* KTRACK, KBURST, KREC, NDI(14,10,5), ND2(14,10,5), XLO(7), XLM(7,40),
* XMM(7,40), TEMP1(7), TEMP2(7), TEMP3(7), PI, AZMTH2(14), AZMTH(14),
* DPRAD, AZRAD, NO, YES, NBLANK, TEE, BEE, DEE, GMARI(288,20),
* HMARI(288,20), XO(20)
EQUIVALENCE
* (GMARI(1551), BN), (HMARI, CN), (HMARI(776), SN)
DIMENSION CN(31,5,5), SN(30,5,5), AN(31,10,5), BN(30,10,5),
* GMARI(14,5), HMARI(14,5)
EQUIVALENCE (NDI(5761), GMAR)
DATA SIN/O 400 000 000 000/
EQUIVALENCE (V2, IV2)
WRITE(6,6) NN
6 FORMAT(2X,100I3)
NW = 0
C *** AZIMUTH POINT LOOP
DO 1 I=1,144
NCT = 0
C *** WORDS IN A FRAME LOOP
DO 1 J=1,3
NW = NW+1
NIO = 5
C *** DATA WORDS TO UNPACK LOOP
DO 1 K=1,4
NIO = NIO-1
IF(J.EQ.3.AND.K.GT.2) GO TO 1
NCT = NCT+1
N1 = NN(NW)
IF(K.EQ.1) GO TO 2
N1 = N1*NDIV(NIO)
2 N1 = N1/NDIV(1)
IV2=N1
V2=AND(V2,SIN)
IV2=IV2/2
IF(IV2.NE.0) N1=N1-1
NDI(1,NCT,IREEL) = N1
1 CONTINUE
IF(IOD.NE.1.AND.NCYCLE.GT.0) RETURN
WRITE(6,5) IREEL, (NDI(1,K,IREEL), K=1,10)
5 FORMAT(1H0, 6HIREEL=,13,10X,
X 18HNDI(144,10,IREEL) /2X,10I13)
RETURN
END
QIXG FOR PARAM, FARAM
SUBROUTINE PARAM (N, P, IJ)
DIMENSION G( 7), P( 7,2), DEL( 7,2), DIST( 7), A( 7, 8), G( 7,2)
COMMON /COTAN/ T( 7,2), COE (4, 7,2)
N1 = N-1

```

Figure 28. Program Listing - UNPACK, PARAM.

1	2	3	4	5	6	7	8	CD COUNT
1	0.....	0.....	0.....	0.....	0.....	0.....	0.....	297
	N2 = N-2							298
	N3 = N-3							299
	NU=N2							300
	IG0 = 2							301
	DO 15 I=1,N1							302
	DO 10 J=1,2							303
10	DEL(I,J) = P(I+1,J) - P(I,J)							304
15	DIST(I) = SQRT(DEL(I,1)**2 + DEL(I,2)**2)							305
	DO 20 I=1,N							306
	DO 20 J=1,N							307
20	A(I,J) = 0.							308
	A(I,3) = DIST(I)							309
	A(N2,N2) = DIST(N1)							310
	DO 30 I=2,N3							311
	A(I,1) = DIST(I+1)							312
	A(I,1+1) = 2.*(DIST(I)+DIST(I+1))							313
	A(I,1+2) = DIST(I)							314
30	DO 30 J=1,2							315
	9(I,J) = 3.*(DIST(I)/DIST(I+1)*DEL(I+1,J)+DIST(I+1)/DIST(I)*DEL(I,J))							316
	* I,J)							317
12	A(I,2) = 2.* DIST(I) + DIST(2)*1.5							318
12	A(I,2) = 2.*(DIST(I) + DIST(2))							319
DO 33 J=1,2								320
33	9(I,J) = 3.*(DIST(I)/DIST(2)*DEL(2,J)+DIST(2)/DIST(I)*DEL(I,J)) -							321
	* DIST(2)* T(I,J)							322
22	A(N2, N1) = 2.*(DIST(N2) + DIST(N1))							323
22	A(N2, N1) = 1.5* DIST(N2) + DIST(N1)*2.							324
DO 27 J=1,2								325
27	9(N2, J) = 1.5*(DIST(N2)/DIST(N1)*DEL(N1, J) +DIST(N1)/DIST							326
27	9(N2, J) = 3.*(DIST(N2)/DIST(N1)*DEL(N1, J) +DIST(N1)/DIST							327
	*(N2)*DEL(N2, J)) - DIST(N2)* T(N,J)							328
17	DO 45 J=1,2							329
	DO 36 I=1,N0							330
	9(I)=9(I,J)							331
	CALL TRIDAG(A(1,2),G,N0,T(2,J))							332
	T(1,J) = 1.5/DIST*DEL(I,J) - .5*T(2,J)							333
	T(N,J) = 1.5/DIST(N1)*DEL(N1,J) - .5*T(N1,J)							334
DO 45 I=1,N1								335
44	COE(4,I,J)=-2.*DEL(I,J) + DIST(I)*(T(I+1,J)+T(I,J))							336
	COE(3,I,J)= 3.*DEL(I,J) - DIST(I)*(T(I+1,J)+2.*T(I,J))							337
	COE(2,I,J)= DIST(I)*T(I,J)							338
45	COE(1,I,J)= P(I,J)							339
	RETURN							340
	END							341
FIX6	FOR TRIDAG,TRIDAG							342
	SUBROUTINE TRIDAG(A,G,K1,Z)							343
	DIMENSION A(7,8),G(7),Z(7)							344
1	FORMAT (10X,50HT=0. .OR. 5=0. IN TRIDAG. CANNOT DIVIDE BY 5 OR T)							345
C	PURPOSE							346
C	TO SOLVE THE TRIANGULAR MATHX EQUATION							347
C								348
C								349
								350

Figure 29. Program Listing -PARAM, TRIDAG.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	
C	*****	***	***					351
C	* * *	- * *	* *					352
C	* S R *	- * *	* *					353
C	* * *	- * *	* *					354
C	*****	- * *	* *					355
C	* * *	- * *	* *					356
C	* T S R *	- * *	* *					357
C	* * *	- * *	* *					358
C	*****	***	***					359
C	- * *	- * *	* *					360
C	- * T S R *	- * *	* *					361
C	- * *	- * *	* *					362
C	*****	***	***					363
C	- * *	- * *	* *					364
C	- * T S *	- * *	* *					365
C	- * *	- * *	* *					366
C	*****	***	***					367
C	FOR THE SOLUTIONS Z, WHERE GAUSS IS NOT USED AND THE SUB-MATRICES							368
C	ALL CONSIST OF A SINGLE ELEMENT.							369
C								370
C	DESCRIPTION OF PARAMETERS							371
C	A -- MATRIX WHOSE THREE DIAGONALS CENTERED ON THE PRINCIPAL							372
C	DIAGONAL BECOME THE TRI-DIAGONAL MATRIX.							373
C	G -- RIGHT HAND SIDE OF EQUATION. VECTOR OF LENGTH K1.							374
C	K1-- NUMBER OF ROWS IN THE MATRIX A.							375
C	Z -- SOLUTIONS, VECTOR (COLUMN) OF LENGTH K1 .							376
C								377
C								378
C								379
C								380
C	FIND THE LAST SOLUTION, Z(K1)							381
C	S= A(1,1)							382
C	R= A(1,2)							383
C	IF (S.EQ. 0.) GO TO 25							384
C	C= G(1)/S							385
C	DE= -R/S							386
C	K2= K1-1							387
C	DO 10 I=2,K2							388
C	T= A(I,I-1)							389
C	S= A(I,I)							390
C	R= A(I,I+1)							391
C	DENOM= T*D+S							392
C	C= (G(I)-C*T)/DENOM							393
C	U= -R/DENOM							394
C	10 CONTINUE							395
C	S= A(K1,K1)							396
C	T= A(K1,K1-1)							397
C	Z(K1)=(G(K1)-T*C)/(T*D+S)							398
C	CALCULATE OTHER SOLUTIONS, PROCEEDING BACKWARDS							399
C								400
C	IF(T.EQ. 0.) GO TO 25							401
C	Z(K1-1)= (G(K1)-Z(K1)*S)/T							402
C	15 K3=K2-1							403
C								404

Figure 30. Program Listing - TRIDAG.

	1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	0	405
	DO 20 I=2,K3								406
	J = K1-I								407
	S = A(J+1,J+1)								408
	R = A(J+1,J+2)								409
	T = A(J+1,J)								410
	IF(T.EQ.0.) GO TO 25								411
	Z(J) = (G(J+1)-S*Z(J+1)-R*Z(J+2))/T								412
	20 CONTINUE								413
	Z(1) = (G(1)-A(1,2)*Z(2))/A(1,1)								414
	RETURN								415
	25 WRITE(6,1)								416
	RETURN								417
	END								418
	916 FOR CUBIC,CUBIC								419
	SUBROUTINE CUBIC (P,Q,R , ROOT, ROOT1)								420
	C CUBIC FINDS THE REAL + COMPLEX ROOTS OF								421
	DIMENSION								422
	90 DO 220 I=1,3								423
	ROOT(I)= 0.								424
	220 ROOT(I)=0.								425
	P3 = P/3.								426
	SMALLA = Q - P*P3								427
	SMALLB = 2. *P3**3 - P3* Q +R								428
	AU3 = SMALLA/3.								429
	SB2 = SMALLB/2.								430
	B4 = SB2**2								431
	A27 = AU3 **3								432
	SMALLC = B4 + A27								433
	IF (SMALLC)14 , 1 , 5								434
	1 XA=SQRT (-AU3)								435
	IF (SMALLB) 3,4,4								436
	3 XA=-XA								437
	4 ROOT(1) =XA-P3								438
	ROOT(2) = ROOT(1)								439
	ROOT(3) = -XA-XA-P3								440
	GO TO 22								441
	5 POWER = 1./ 3.								442
	B2 = - SMALLB / 2.								443
	SBA= SQRT (SMALLC)								444
	B1GA = B2 + SBA								445
	B1GB = B2 -SBA								446
	IF (B1GA) 6 , 7 , 8								447
	6 B1GA1 =((-B1GA)**POWER)								448
	GO TO 9								449
	7 B1GA1 =0.								450
	GO TO 9								451
	8 B1GA1 = (B1GA)**POWER								452
	9 IF (B1GB)10 , 11, 12								453
	10 B1GB1 =((-B1GB)**POWER)								454
	GO TO 13								455
	11 B1GB1 = 0.								456
	GO TO 13								457
	12 B1G B1 = (B1GB) ** POWER								458
	13 AB = B1GA1+B1GB1								

Figure 31. Program Listing - TRIDAG, CUBIC.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	513
2	0	0	0	0	0	0	0	514
3	0	0	0	0	0	0	0	515
4	0	0	0	0	0	0	0	516
5	0	0	0	0	0	0	0	517
6	0	0	0	0	0	0	0	518
7	0	0	0	0	0	0	0	519
8	0	0	0	0	0	0	0	520
9	0	0	0	0	0	0	0	521
10	0	0	0	0	0	0	0	522
11	0	0	0	0	0	0	0	523
12	0	0	0	0	0	0	0	524
13	0	0	0	0	0	0	0	525
14	0	0	0	0	0	0	0	526
15	0	0	0	0	0	0	0	527
16	0	0	0	0	0	0	0	528
17	0	0	0	0	0	0	0	529
18	0	0	0	0	0	0	0	530
19	0	0	0	0	0	0	0	531
20	0	0	0	0	0	0	0	532
21	0	0	0	0	0	0	0	533
22	0	0	0	0	0	0	0	534
23	0	0	0	0	0	0	0	535
24	0	0	0	0	0	0	0	536
25	0	0	0	0	0	0	0	537
26	0	0	0	0	0	0	0	538
27	0	0	0	0	0	0	0	539
28	0	0	0	0	0	0	0	540
29	0	0	0	0	0	0	0	541
30	0	0	0	0	0	0	0	542
31	0	0	0	0	0	0	0	543
32	0	0	0	0	0	0	0	544
33	0	0	0	0	0	0	0	545
34	0	0	0	0	0	0	0	546
35	0	0	0	0	0	0	0	547
36	0	0	0	0	0	0	0	548
37	0	0	0	0	0	0	0	549
38	0	0	0	0	0	0	0	550
39	0	0	0	0	0	0	0	551
40	0	0	0	0	0	0	0	552
41	0	0	0	0	0	0	0	553
42	0	0	0	0	0	0	0	554
43	0	0	0	0	0	0	0	555
44	0	0	0	0	0	0	0	556
45	0	0	0	0	0	0	0	557
46	0	0	0	0	0	0	0	558
47	0	0	0	0	0	0	0	559
48	0	0	0	0	0	0	0	560
49	0	0	0	0	0	0	0	561
50	0	0	0	0	0	0	0	562
51	0	0	0	0	0	0	0	563
52	0	0	0	0	0	0	0	564
53	0	0	0	0	0	0	0	565
54	0	0	0	0	0	0	0	566

```

EQUIVALENCE (ND1(5761),GMAR),(ND1,01)
C *** HARMONIC LOOP
  DO 1 I=1,MLIMN,2
    WRITE(6,2) I
  2 FORMAT(1H1, 28X, 29HROTATIONAL NOISE PROGRAM E676 / 8X,
    X 10HARMONIC =, I3 )
    WRITE(6,3)
  3 FORMAT(1H0, 8X, 5HFIELD, 11X, 28HFIELD POINT COORDINATES (IN),
    X 16X, 20H SOUND PRESSURE LEVEL / 8X, 5HPOINT, 10X, 14X, 1HY,
    X 14X, 1H2, 20X, 8HDECIBELS / )
C *** FIELD POINT LOOP
  DO 4 J=1,NFT
    WRITE(6,5) J,XFP(J),YFP(J),ZFP(J),SPLM(I,J)
  5 FORMAT( 9X,12,2X, 3(5X,1PE10.4),15X, 1PE10.4 )
    IF(1.GE.MLIMN) GO TO 7
    K=I+1
    WRITE(6,6) K
  6 FORMAT(1H2 / 8X,10HARMONIC =,I3 )
    WRITE(6,3)
C *** FIELD POINT LOOP
  DO 8 J=1,NFT
    WRITE(6,5) J,XFP(J),YFP(J),ZFP(J),SPLM(K,J)
  8 FORMAT( 9X,12,2X, 3(5X,1PE10.4),15X, 1PE10.4 )
  1 CONTINUE
  7 RETURN
  8 END

C *** FOR AVQUAD,AVQUAD
SUBROUTINE AVQUAD (N,X,Y,AREA)
  INTEGRATION BY AVERAGED QUADRATICS BASED ON LAGRANGE INTERPOLATION
  DIMENSION X(12),Y(12)
  AREA=0.
  T1=Y(1)/((X(1)-X(2))*X(1)-X(3)))
  T2=Y(2)/((X(2)-X(1))*X(2)-X(3)))
  T3=Y(3)/((X(3)-X(1))*X(3)-X(2)))
  A2=T1+T2+T3
  B2=-(T1*(X(2)+X(3))+T2*(X(1)+X(3))+T3*(X(1)+X(2)))
  C2=T1*(X(2)+X(3))+T2*(X(1)+X(3))+T3*(X(1)+X(2))
  AREA=AREA+(A2/3.)*((X(2)+X(3))-X(1))*2)+((X(2)+X(3))-X(1))*2)
  12)+C2*(X(2)-X(1))
  N2=N-2
  DO 101 K=2,N2
    A1=A2
    B1=B2
    C1=C2
    T1=Y(K)/((X(K)-X(K+1))*X(K)-X(K+2)))
    T2=Y(K+1)/((X(K+1)-X(K))*X(K+1)-X(K+2)))
    T3=Y(K+2)/((X(K+2)-X(K))*X(K+2)-X(K+1)))
    A2=T1+T2+T3
    B2=-(T1*(X(K+1)+X(K+2))+T2*(X(K)+X(K+2))+T3*(X(K)+X(K+1)))
    C2=T1*(X(K+1)+X(K+2))+T2*(X(K)+X(K+2))+T3*(X(K)+X(K+1))
    A=(A1+A2)/2.
    B=(B1+B2)/2.
    C=(C1+C2)/2.
  101 AREA=AREA+(A/3.)*((X(K+1)+X(K+2))-X(K))*2)+((X(K+1)+X(K+2))-X(K))*2)
    12)+C*(X(K+1)-X(K))

```

Figure 33. Program Listing -OUTSPL, AVQUAD.

1	2	3	4	5	6	7	8	CD COUNT
1	0	0	0	0	0	0	0	567
2	0	0	0	0	0	0	0	568
3	0	0	0	0	0	0	0	569
4	0	0	0	0	0	0	0	570
5	0	0	0	0	0	0	0	571
6	0	0	0	0	0	0	0	572
7	0	0	0	0	0	0	0	573
8	0	0	0	0	0	0	0	574
9	0	0	0	0	0	0	0	575
10	0	0	0	0	0	0	0	576
11	0	0	0	0	0	0	0	577
12	0	0	0	0	0	0	0	578
13	0	0	0	0	0	0	0	579
14	0	0	0	0	0	0	0	580
15	0	0	0	0	0	0	0	581
16	0	0	0	0	0	0	0	582
17	0	0	0	0	0	0	0	583
18	0	0	0	0	0	0	0	584
19	0	0	0	0	0	0	0	585
20	0	0	0	0	0	0	0	586
21	0	0	0	0	0	0	0	587
22	0	0	0	0	0	0	0	588
23	0	0	0	0	0	0	0	589
24	0	0	0	0	0	0	0	590
25	0	0	0	0	0	0	0	591
26	0	0	0	0	0	0	0	592
27	0	0	0	0	0	0	0	593
28	0	0	0	0	0	0	0	594
29	0	0	0	0	0	0	0	595
30	0	0	0	0	0	0	0	596
31	0	0	0	0	0	0	0	597
32	0	0	0	0	0	0	0	598
33	0	0	0	0	0	0	0	599
34	0	0	0	0	0	0	0	600
35	0	0	0	0	0	0	0	601
36	0	0	0	0	0	0	0	602
37	0	0	0	0	0	0	0	603
38	0	0	0	0	0	0	0	604
39	0	0	0	0	0	0	0	605
40	0	0	0	0	0	0	0	606
41	0	0	0	0	0	0	0	607
42	0	0	0	0	0	0	0	608
43	0	0	0	0	0	0	0	609
44	0	0	0	0	0	0	0	610
45	0	0	0	0	0	0	0	611
46	0	0	0	0	0	0	0	612
47	0	0	0	0	0	0	0	613
48	0	0	0	0	0	0	0	614
49	0	0	0	0	0	0	0	615
50	0	0	0	0	0	0	0	616
51	0	0	0	0	0	0	0	617
52	0	0	0	0	0	0	0	618
53	0	0	0	0	0	0	0	619
54	0	0	0	0	0	0	0	620

```

      AREA=AREA*(A2/3.)*((X(N)**3)-(X(N-1)**3)+(B2/2.)*(X(N)**2)-(X(N-
      1)**2))+C2*(X(N)-X(N-1))
      RETURN
      END
      FOR E386RN,E386RN
      SUBROUTINE E386RN
      C ACUSTIC PRESSURE V.BEREZ FOR R.KING DECK E386
      COMMON /BK1/ IDO,BB,AA,AA(5),DPSI,RR(5),OMEG,CC,NBLADE,MLIMRN,
      * MLIMP,XFP(20),YFP(20),ZFP(20),GAMA,RO,BLADEL,BO,B1C,B1S,PUNCH,
      * LSPAN,FROC(30),TCOP,SLOPE(10,5),OFFSET(10,5),KUNIT(5),IBURST,
      * IRS(5),ITRACK(5),FI(5,5),NCHAN(5,5),E386OP,NFT,ANG,KEY1,KEY2,
      * KEYS,NHM,CAPRF(20),THETAF(20),ALFAF(20),OPRONO,NCH(5),INTERM,
      * IREEL,NC,NTBOX(5,10),NSTATC(5,10),NSTATR(5,10),ISET(5),IREELS,
      * NOCH(5),LAZI
      COMMON /BK2/ NCYCLE,CYCLES,KU,NDIV(4),BMASK(6),NN(435),LIRS,
      * KTRACK,KBURST,KREC,NOI(144,10,5),ND2(144,10,5),XLO(7),XLM(7,40),
      * XMM(7,40),TEMP1(7),TEMP2(7),TEMP3(7),PI,AZMTH2(144),AZMTH(144),
      * DPRAD,AZRAD,NO,YES,NBLANK,TEE,BEE,DEE,GMARI(288,20),
      * HMARI(288,20),XD(20)
      DIMENSION CN(31,5,5),SN(30,5,5),AN(31,10,5),BN(30,10,5),
      * GMAR(144,5),HMAR(144,5)
      EQUIVALENCE
      * (GMARI(1551),BN),(HMAR,CN),(HMAR(776),SN)
      EQUIVALENCE (NOI(5761),GMAR)
      DIMENSION V25(721),V251(721),PSI(721),PRAD(721)
      1 V25(721),V251(721),PSI(721),PRAD(721)

      HEAD FLT. COND. PARAMETERS AND BLADE SECTION LOADING, PRINT SAME.
      C
      C
      C
      KBNENBLADE
      EQUIVALENCE
      X (CH,AA),(SOS,CC),(BO1,BO),(B1,B1C),(B11,B1S),(G,GAMA),
      X (NHAN,MLIMRN),
      * (NFT,NFP),(OMG,OMEG)
      NHAD = LIRS+2
      GATC1=B0
      GATC2=B1C
      GATC3=B1S
      GATC4=GAMA
      GATC5=OMEG
      SOS = SOS/12.0
      J=1
      K(1)=0.
      DO 730 I=1,5
      JEJ+1
      IF(IIRS(1).EQ.0) GO TO 730
      K(J)=RR(1)*BLADEL
      730 CONTINUE
      JEJ+1
      K(J)=BLADEL
      MADE 1./57.2957795
      NP=(360./ANG)+1.001
      NT=NP-1
      PSI(1)= 0.
      PRAD(1)=0.

```

Figure 34. Program Listing - AVQUAD, E386RN.

1	2	3	4	5	6	7	8	CD COUNT
DO 4 I=2,NP								621
PSI(I)=PSI(I-1)+ANG								622
4 PRAD(I)=PSI(I)*RAD								623
DO 77 I=1,NRAD								624
DO 77 J=1,NP								625
W(J,I)=XL0(I)								626
DO 77 K=1,NH								627
X=K								628
77 W(J,I)=Q(J,I)+XLM(I,K)*COS(X*PRAD(J))+XMM(I,K)*SIN(X*PRAD(J))								629
IF(KEY1.NE.99) GO TO 88								630
DO 86 I=1,NRAD								631
86 WRITE (6,87) XL0(I),((XLM(I,J),XMM(I,J)),J=1,NHAR)								632
87 FORMAT (E25.8//,2E25.8//)								633
88 WRITE (6,8) R01,B1,B11,CH,OMG,RBN,R0,(R(I),I=1,NRAD)								634
8 FORMAT (4H0801,E15.6,4H B1,E15.6,5H B11,E15.6,7H CHORD,E15.6,								635
1 7H OMEGA,E15.6,8H BLADES,F7.0//,25H RADIUS AT START OF TWIST,								636
2 E15.6//,30X,21HBLADE SECTION LOADING,/,7H RADIUS,10X,1H1,14X,								637
3 1H2,14X,1H3,14X,1H4,14X,1H5,14X,1H6,14X,1H7,14X,1H8,78H AZIMUTH,								638
4 2X,E15.6,/,1								639
DO 9 I=1,NP								640
9 WRITE (6,10) I,PSI(I),Q(I,K),K=1,NRAD								641
10 FORMAT (14,F7.1,8E15.6)								642
OMG=3.14159265*OMG/30.								643
SOS=12.*SOS								644
R01=R01*RAD								645
B1=B1*RAD								646
B11=B11*RAD								647
G=G*RAD								648
								649
								650
								651
C BEGIN MAJOR LOOP ON FIELD POINTS								652
DO 999 I=1,NP								653
CAPR=CAPR(I)								654
THETA=THETA(I)								655
ALFA=ALFA(I)								656
11 FORMAT (3F12.4)								657
12 WRITE (6,12) CAPR,THETA,ALFA								658
12 FORMAT (12H0FIELD POINT,10X,6H RADIUS,E15.6,5X,7H AZIMUTH,E15.6,5X,								659
1 9HELEVATION,E15.6//,20X,8H HARMONIC,10X,14H SOUND PRESSURE,15X,								660
2 3HSPL)								661
CAPR=12.*CAPR								662
ALFA= RAD*ALFA								663
THETA= RAD*THETA								664
DO 999 K=1,NHAR								665
DO 99 KK=1,NRAD								666
DO 99 JJ=1,NT								667
CAPS= SORT(CAPR*CAPR+R(KK)*R(KK)-2.*CAPR*R(KK)*COS(ALFA)*								668
1 COS(PRAD(JJ)-THETA))								669
BETA=B01-G*(R(KK)-R0)+B1*COS(PRAD(JJ))+B11*SIN(PRAD(JJ))								670
SRTA=SIN(BETA)								671
CRTA=COS(BETA)								672
V= M								673
V= V*(RBN*OMG*CAPS/SOS+.5*CH*BN/R(KK)+RBN* PRAD(JJ))								674
IF (KEY3.EQ.99) WRITE (6,9874) CAPS, BETA, V								

Figure 35. Program Listing - E386RN.

1	2	3	4	5	6	7	8	CD	COUNT
1	0	0	0	0	0	0	0		
C	IF (N-1) IS NOT DIVISIBLE BY 2 THIS IMPLIES THAT N								729
C	IS EVEN AND THIS SUBROUTINE CAN NOT BE USED.								730
C	CALLING SEQUENCE								731
C	CALL SIMCOR (N,H,Y,XINT,IERR)								732
C	DESCRIPTION OF PARAMETERS								733
C	N -NUMBER OF POINTS THAT ARE TAKEN OVER THE CURVE								734
C	H -CONSTANT INTERVAL BETWEEN THE POINTS								735
C	Y -SUPPLIED FUNCTION								736
C	XINT-TOTAL AREA UNDER THE CURVE BETWEEN A AND B								737
C	IERR-ERROR CODE								738
C	IERR = 0 (N-1) NOT DIVISIBLE BY 2 THEREFORE N IS EVEN								739
C	IERR = 1 (N-1) IS DIVISIBLE BY 2								740
C	IERR = 2 (N-1) IS DIVISIBLE BY BOTH 2 AND 4								741
C	DIMENSION Y(1)								742
C	IERR = 0								743
C	K = MOD ((N-1),4) + 1								744
C	IF (K .EQ. 2 .OR. K .EQ. 4) RETURN								745
C	XINT = Y(1) + 4.* Y(N-1) + Y(N)								746
C	N3 = N - 3								747
C	DO 10 I = 2,N3,2								748
C	10 XINT = XINT + 4.* Y(I) + 2.* Y(I+1)								749
C	XINT = H/3.0 * XINT								750
C	IERR = 1								751
C	IF (K .EQ. 3 .OR. N .LT. 9) RETURN								752
C	XINT1 = Y(1) + 4.* Y(N-2) + Y(N)								753
C	N6 = N - 6								754
C	DO 20 I = 3,N6,4								755
C	20 XINT1 = XINT1 + 4.* Y(I) + 2.* Y(I+2)								756
C	XINT1 = 2.* H/3. * XINT1								757
C	XINT = XINT + (XINT - XINT1)/15.								758
C	IERR = 2								759
C	RETURN								760
C	END								761
C	91X6 FOR START,START								762
C	SUBROUTINE START								763
C	COMMON /TEMPUS/ TIME,COUNT								764
C	INTEGER COUNT								765
C	DATA COUNT /0/								766
C	CALL RTIMING (TIME)								767
C	COUNT = COUNT + 1								768
C	CALL CLOCK								769
C	RETURN								770
C	END								771
C	91X6 FOR CLOCK,CLOCK								772
C									773
C									774
C									775
C									776
C									777
C									778
C									779
C									780
C									781
C									782

Figure 37. Program Listing - SIMCOR, START, CLOCK.

1	2	3	4	5	6	7	8	CD	COUNT
1	0	0	0	0	0	0	0		
	SUBROUTINE CLOCK								783
	COMMON /TEMPUS/ TIME,COUNT								784
	INTEGER COUNT								785
	CALL RTMINS (BALLS)								786
	T = BALLS - TIME								787
	WRITE (6,100) COUNT, T								788
	100 FORMAT (1H25X,18(1H*))/56X,8H* (12,8H) * /56X,18H* ELAPSE								789
	XD TIME = */56X,1H*16X,1H*/56X,2H* F8.4,8H MIN */56X,1H*16X,1H*/5								790
	X6X,18(1H*))								791
	RETURN								792
	END								793
	MAP E676,,OVER								794
	SEG E676-(*E386RN,ALPHA)								795
	ALPHA SEG *RDKU--*UNPACK--*INTERP--*CUE--*INPUTA--*MERGES--*OUTSPL--*DFSRIE								796
	ABS OVER,AE676								797
	XBT CUR								798
	OUT Z,2								799
	TEF Z								800
	OUT Z,1,3,4								801
	TEF Z								802
	TRW Z								803
	ENS								804
	IN Z								805
	TOC								806
	ERS								807
	IN Z								808
	TOC								809
	TRI Z								810
									811
									812
									813
									814

Figure 38. Program Listing -CLOCK, End.

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13. ABSTRACT A computer program for rotational noise prediction is documented. The program was developed as a part of a study to develop more accurate methods for predicting rotational noise levels under conditions of nonuniform inflow over the rotor disc. The computer program will calculate the root-mean-square sound pressure level for up to the 10th harmonic of rotor noise at any field point in the near or far field outside of the rotor disc. Noise levels can be calculated either from a rectangular chordwise distribution of pressure or from the measured chordwise distribution. The equations for noise prediction using the arbitrary (measured) chordwise distribution are derived in Volume I of this report. Although this report concentrated on a helicopter rotor, the analytical results are applicable to propellers in general.		

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