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COMPUTER PROGRAM FOR VIBRATION PREDICTION OF FIGHTER AIRCRAFT EQUIPMENTS

COMBINED ENVIRONMENTS TEST GROUP
ENVIRONMENTAL CONTROL BRANCH
VEHICLE EQUIPMENT DIVISION

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Final Report for Period 21 March 1976 to 15 April 1977

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This study details in-house efforts that culminate in a computer program for the prediction of vibration inputs to equipments mounted in fighter aircraft.

The computer format is orchestrated about a basic function whose thematic variations are invoked to describe boundary layer excitations and to synthesize a sequence of transfer functions whose operations, in turn, define

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the resultant vibration spectrum; beginning at the aircraft surface and proceeding inward to the designated equipment. Program inputs specify flight conditions, aircraft structural classes, equipment weight, equipment locational coordinates, and mounting categories in order to characterize vibration inputs of fighter aircraft equipments during flight attitudes ranging from straight and level states to a variety of significant flight maneuvers and phases. Program outputs, digital and graphical, are designed to provide the direct spectral information necessary to assemble sequential vibration histories corresponding to fighter aircraft mission profiles.

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FOREWORD

This joint report was prepared by the Vehicle Equipment Division, Air Force Flight Dynamics Laboratory (FEE) and by the ASD Computer Center (ADDS), Wright-Patterson Air Force Base, Ohio. The report contains the results of an in-house research program to develop a computer program for the utilization of a vibration prediction technique applied to equipments mounted in fighter aircraft.

This work was conducted from 21 March 1976 to 15 April 1977 under Task 61460412 with Robert W. Sevy as project engineer and under Problem Number D760078 with Mark N. Haller as mathematician.

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SYMBOLS

θ	angle (rads)
β	slope factor, low frequency rolloff
β'	slope factor, high frequency rolloff
α	form factor for low frequency rolloff segment of flex function
α'	form factor for high frequency rolloff segment of flex function
ω_o	locator frequency, low frequency rolloff (rads/sec)
$\omega_{o'}$	locator frequency, high frequency rolloff (rads/sec)
f_o	locator frequency, low frequency rolloff (Hz)
$f_{o'}$	locator frequency, high frequency rolloff (Hz)
f_x	frequency value at x (given f_o) (Hz)
$f_{x'}$	frequency value at x′ (given $f_{o'}$) (Hz)
f_n	first fuselage bending mode, vertical, symmetric (Hz)
f_{2n}	second fuselage bending mode, vertical, symmetric (Hz)
f_c	center, or resonance frequency of Y(f)
a	acceleration, rms (ft/sec^2)
x	normalizing frequency ratio, low frequency rolloff; also aerodynamic distance downstream from A/C nose (ft)
x_E	aerodynamic distance downstream - from A/C nose to equipment location (ft)
x_{BT}	value of x to A/C mid chord at wing - fuselage junction (ft)
x_L, x_T	value of x to main landing gear strut (ft)
x'	normalizing frequency ratio, high frequency rolloff
I	integral of the flex function

SYMBOLS (CONTINUED)

δ_o	boundary layer thickness, zero altitude (ft)
δ_b	boundary layer thickness at altitude (ft)
H	altitude (ft)
C	speed of sound (ft/sec)
q	dynamic pressure (PSF)
U	free stream velocity (ft/sec)
M	mach number
ρ_o	density of air at zero altitude (slug/ft^3)
ρ	density of air at altitude (slug/ft^3)
P(f)	pressure spectral density (dynes/cm^2)^2/Hz
$\emptyset_n(x)$	normalized mode shape (fuselage)
L(f)	low frequency transfer function of primary structure
$L_m(f)$	maximum value of L(f)
M(f)	medium frequency transfer function of primary structure
$M_m(f)$	maximum value of M(f)
H(f)	high frequency transfer function of primary structure (aircraft skin)
G(f)	primary structure response, (g^2/Hz)
Y(f)	transfer function of equipments mounted on secondary structure
$Y_m(f)$	maximum value of Y(f)
$Y_{I(a)}$	Y(f) for equipment mounting category, I(a)
R(f)	response of secondary structure (g^2/Hz)
ε	load offset distance from maximum response location on secondary structure (in)

SYMBOLS (CONTINUED)

$R_\varepsilon(f)$	adjusted value of R(f) due to ε (g^2/Hz)
$S_{BT}(f)$	special function for the buffet turn flight phase
$P_{BT}(f)$	pressure spectral density spectrum of a fighter aircraft during buffet turn (PSF^2/Hz)
$S_T(f)$	special function for the takeoff phase
$P_T(f)$	equivalent pressure spectral density spectrum of an aircraft during the takeoff phase (PSF^2/Hz)
$S_L(f)$	special function of an aircraft during the landing phase
$P_L(f)$	equivalent pressure spectral density spectrum of an aircraft during the landing phase (PSF^2/Hz)
R_s	distance in from the skin (inches)
W_E	equipment weight (lbs)
W_s	surface density of skin (lbs/ft^2)
$P_m(f)$	maximum value of P(f) (dynes/cm^2)^2/Hz
$H_m(f)$	maximum value of H(f)
P_{mBT}	maximum value of P(f) during buffet turn (dynes/cm^2)^2/Hz
Re_x	$U\ x/\nu$ = Reynolds number at distance x
ν	kinematic viscosity at altitude (ft^2/sec)
m	modal mass (slugs)
E	Young's modulus (lbs/in^2)
I	plate moment of inertia ($bt^3/12$)
t	plate thickness (inches)
L	length of aircraft fuselage (inches)
λ	length of first bending mode, secondary structure (inches)
f_c	center frequency of transfer functions for equipment categories and of special functions

SYMBOLS (CONTINUED)

D_f	nominal fuselage diameter at $x = x_E$ (inches)
$L_M(f)$	maximum value of low frequency transfer function, first bending mode (dB)
$L_2(f)_M$	maximum value of low frequency transfer function, second bending mode (dB)

SECTION I

INTRODUCTION

From the equipment design and the functional test and analysis viewpoint, it is important that the predicted vibration spectra of fighter aircraft equipments emulate the real vibration histories as closely as the forecasting technology will allow. To do this, it is necessary to be able to portray the variform vibration spectra as the aircraft cycles through a variety of flight conditions, attitudes, and phases that, when seen in terms of their sequential assembly, constitutes a vibrational representation of the mission flight profile. Spectral fidelity is important not only from the viewpoint of the reversible*, functional failure -- a failure that underlines the interrelationship between the vibration spectral details and the concomittant equipment malfunction -- its importance is stressed again when vibration test inputs are chosen for the long-time test spectra associated with various reliability test philosophies. Here, premature fatigue failure often results because the vibration test spectrum exceeds the in situ spectrum; or more explicitly, fails to adequately mirror the real vibration environment relative to the spectral details, and to the real time of exposure.

1.0 Approach

The detailed development of the vibration prediction method utilized in this program is found in Reference 1. However, for review purposes, it is useful to briefly survey major elements of the technique.

---

* change the spectrum and the equipment resumes operation

1.1 Fuselage Vibration Behavior

The aircraft fuselage response is subdivided into three regimes: the low frequency region, dominated by the fuselage body bending modes; the medium frequency region, determined by the response of the internal structure; and the high frequency domain, which is established by the aircraft skin contributions. Three transfer functions L(f), M(f), and H(f) are assigned to these regions: low, medium, and high, respectively.

The boundary layer pressure spectral density P(f) is transferred through L(f), M(f), and H(f) to produce a structural response spectrum, G(f), which, in turn, is attenuated and further transformed by other functions as one progresses into the aircraft interior. P(f) and the three transfer functions are variants of the same basic function, the derivation of which is developed fully in Section II. Other special variants of this same function are employed to account for a variety of equipment mounting methods. A further variation is invoked to simulate a number of aircraft phases and maneuvers -- all are discussed in Section III and all are detailed in their applicable Appendices. Section III describes the computer program and its operating procedures, taken from the viewpoint of the user. Section IV demonstrates the applications of the prediction method and the program as it is applied to a number of aircraft equipment mounting methods and flight conditions. Appendix F contains the complete computer program in FORTRAN IV.

SECTION II

FLEX FUNCTION

1.0 Derivation

A rather detailed discussion of the flex function and its derivation is found in reference 1. But since we intend to expand on the earlier work and, moreover, since the function operates as the central mechanism of the computer program, a review of the main elements is essential.

Consider the following function and its mirror image:

$$\theta = \arctan A \tag{1}$$

$$\theta = \pi - \arctan A \tag{2}$$

where: θ = angle (rads)

$A = 2\beta(\omega/\omega_o)/1-(\omega/\omega_o)^2$

ω = angular frequency (rads/Hz)

ω_o, ω_o' = locator frequency (rads/Hz)

β, β' = slope factor

Equations (1) and (2) combine graphically to form a bandpass characteristic (Figure 1a). Equation (1) describes the low frequency roll-off; equation (2) the high frequency roll-off. Note that in this form, frequency translation occurs by control of $\omega_o(\omega_o')$. Slope control is readily obtained by adjustment of $\beta(\beta')$. These flexible

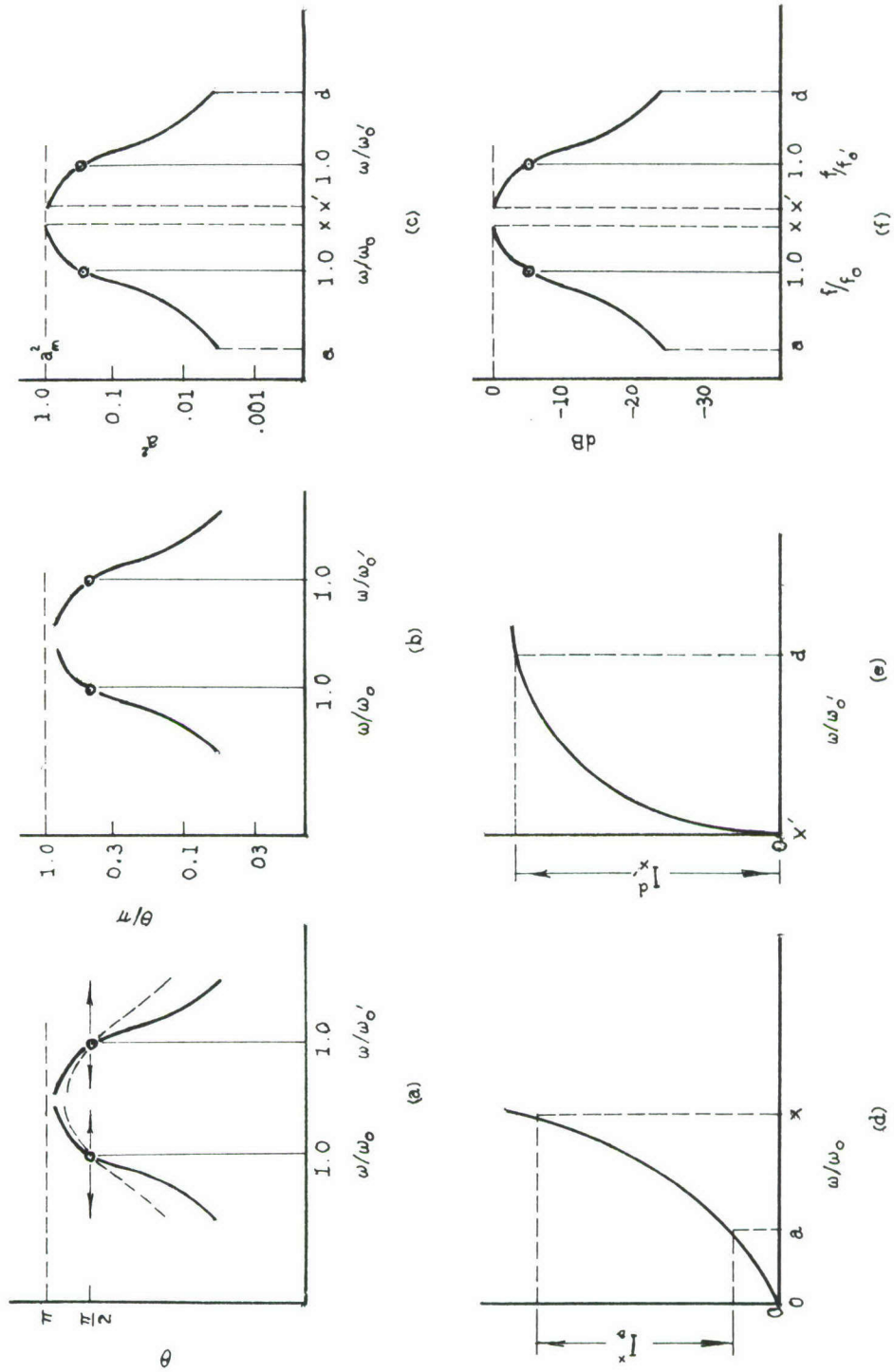


Figure 1. Derivation of the Flex Function and Associated Integral

and useful properties, by which response functions may be described using only four notations, will become more obvious a little later on.

1.1 Further Adjustments

However, there remains an objection to the curve in this form owing to the asymptotic properties of the function. That is, ω/ω_o must approach infinity in order that $\theta \to \pi$. Since π represents the curve maxima, and it is the maxima that we intend to reference when utilizing the functions, we must readjust the curves vertically to obtain a value of $\theta = \pi$ at a real, finite value of ω/ω_o. This we do as follows:

$$\theta/\theta_x = (\arctan A)/\theta_x \tag{3}$$

$$\theta/\theta_{x'} = (\pi - \arctan A)/\theta_{x'} \tag{4}$$

where: $\theta_x = \arctan\left[2\beta x/1-(x)^2\right]$

and: $\theta_{x'} = \pi - \arctan\left[2\beta' x'/1-(x')^2\right]$

The curves are now shown as Figure 1(b) and appear in normalized form, that is, the maximum value is unity at $\theta = \theta_x$ and $\theta = \theta_x'$.

We may let the functions represent a pertinent variable, say acceleration (a), by the following substitutions.

Let: $\theta/\theta_x = K\,a$

and: $a = 1/K(\arctan A)/\theta_x$ (5)

where: $(\arctan A)/\theta_x = g(\omega/\omega_o)$

when: $\omega = x\omega_o$, then $g(x) = 1.0$

and $a = a_{max}$

From inspection of (5), $1/K = a_{max}$. If we substitute this into (5), we have a generalized form for the independent variable, a:

$$a = a_{max}[(\arctan A)/\theta_x] \tag{6}$$

$$o \leq \omega/\omega_o \leq x$$

Operating similarly for the high frequency roll-off portion of the flex function we have:

$$a = a_{max}\ [(\pi-\arctan A)/\theta_{x'}] \tag{7}$$

$$x' \leq \omega/\omega_{o'}$$

A good deal of the time we will be concerned with mean squared values of the acceleration and the acceleration power spectral densities. Thus, (6) and (7) may be squared as follows:

$$a^2 = a^2_{max}\ [(\arctan A)/\theta_x]^2 \tag{8}$$

$$a^2 = a^2_{max}\ [(\pi-\arctan A)/\theta_{x'}]^2 \tag{9}$$

The squared curves are shown in Figure 1(c). When using power spectral densities, we will also be concerned with overall mean squared acceleration, thus the integrals of (8) and (9) appear as follows:

$$I_a^x = a^2_{max} \int_a^x [(\arctan A)/\theta_x]^2 d(\omega/\omega_o) \tag{10}$$

$$I_a^{x'} = a_{max}^2 \int_c^{x'} [(\pi - \arctan A)/\theta_{x'}]^2 \, d(\omega/\omega_{o'}) \tag{11}$$

Figures 1(d) and (e) show the integrals of the low and high frequency curves, respectively. And since most of the time we will use the log of the independent variable a^2 (referred to a_{max}^2) we present (8) and (9) as follows:

$$dB = 10\log_{10}[(\arctan A)/\theta_x]^2 \tag{12}$$

$$dB = 10\log_{10}[(\pi - \arctan A)/\theta_{x'}]^2 \tag{13}$$

Also, since we will be using hertz for the frequency variable, we substitute f in lieu of ω and 180° for π. The final set of curves are shown in Figure 1(f).

2.0 Flex Function Display

Values of x and x′ were chosen for the low and high frequency functions as were values of β and β'. Since x and x′ represent the frequency ratios of the low and high frequency function at which normalization of the ordinate value occurs, they are identified, in truncated computerese, as NORM. FREQ. Both parametrics were selected to cover the range of vibration spectra that one associates with the primary structure of aircraft viewed over a wide range of structural locations and flight conditions. Figures 2 and 3 show a typical low and high frequency curve for x = NORM. FREQ. = 2.00 and x′ = NORM. FREQ. = 0.500, respectively. The $\beta(\beta')$ parameters are shown also on the figures as curve families having β and β' in the following graduations: 0.1, 0.2, 0.4, 0.6, 0.8 and 1.0.

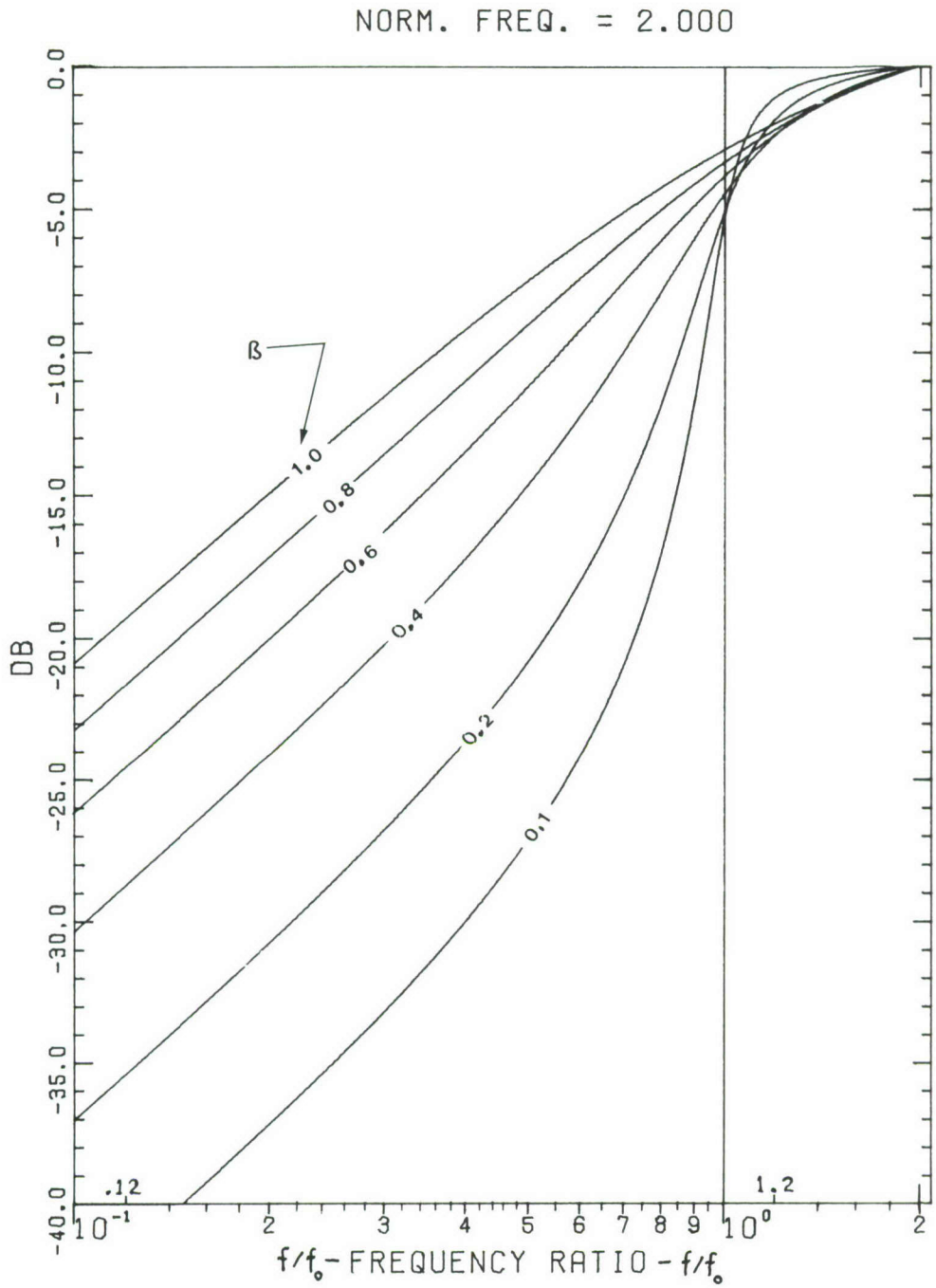


Figure 2. Typical Flex Function for Low Frequency Rolloff

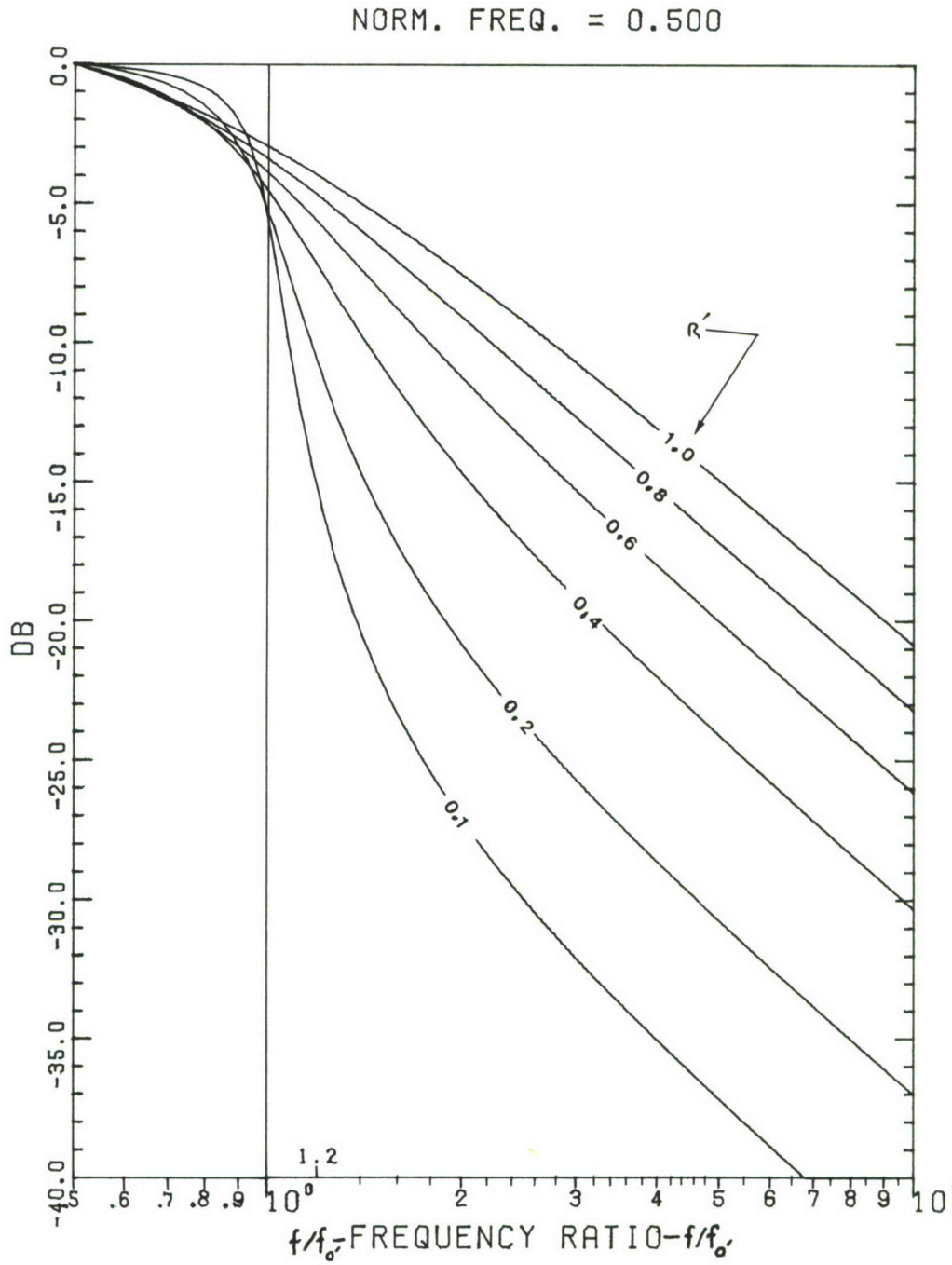


Figure 3. Typical Flex Function for High Frequency Rolloff

2.1 Low Frequency Boost

If we examine the arctan portion of, say, equation (1), we note that the numerator is of the form $2\beta(\omega/\omega_o)^{\alpha}$, where $\alpha = 1$ for the functions represented by Figures 2 and 3. However, by allowing α to go to zero a novel but useful low frequency pre-emphasis results (Figure 4). In short, the curves (in the low frequencies) are raised; given bass boost, as the audiophiles are fond of saying. Such a phenomena corresponds to what happens to the aircraft vibration spectra as the aircraft passes through certain stages of its flight profile -- for example, during taxi, takeoff roll, the dumping of speed brakes, or flaps; and during gunfire or inflight refueling phases. Note that we may make α a function of time and, operating within the limits of $\alpha = 1$ and $\alpha = 0$, we are able, in a gradual, continuous, and reversible way, to effect the smooth transition from one state to the other. This property is of significance when we view the function as a programmable system capable of describing a useful variety of flight vibration phases.

Notice that identical variations can be reflected into the high frequency rolloff curve (equation 13) by assigning an α' within the interval of 1 and 2. Figure 5 shows a set of functions for $\alpha' = 2.00$. From here on out, alpha will follow the same diacritic symbolism as has been assigned to the other high and low frequency rolloff parameters. Thus, α is assigned to the low frequency rolloff equation and α' refers to the exponent for the high frequency rolloff case. Also, note that unless α and α' are specifically stated, their values are <u>always</u> presumed to be unity.

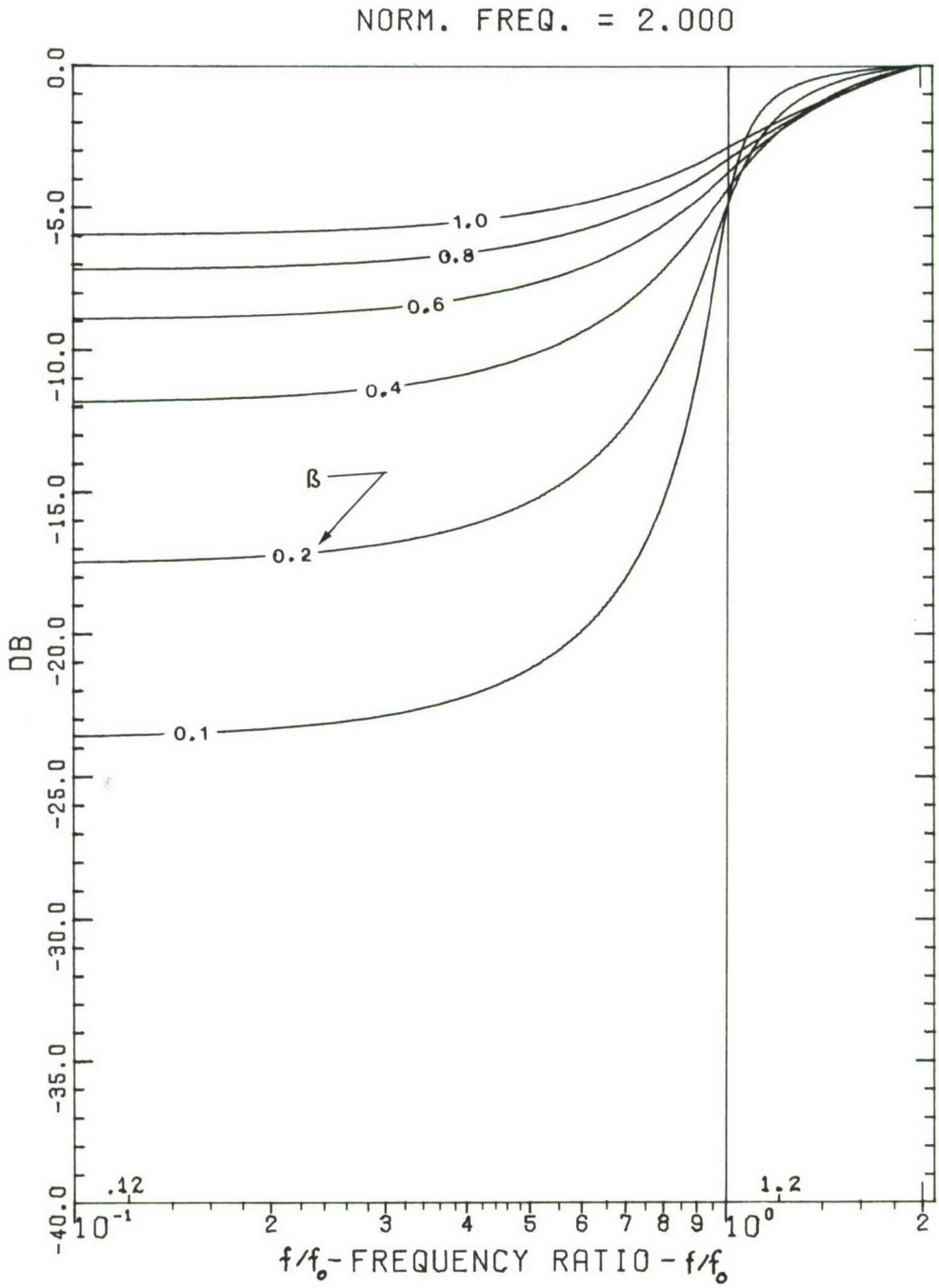


Figure 4. Flex Function with Low Frequency Boost

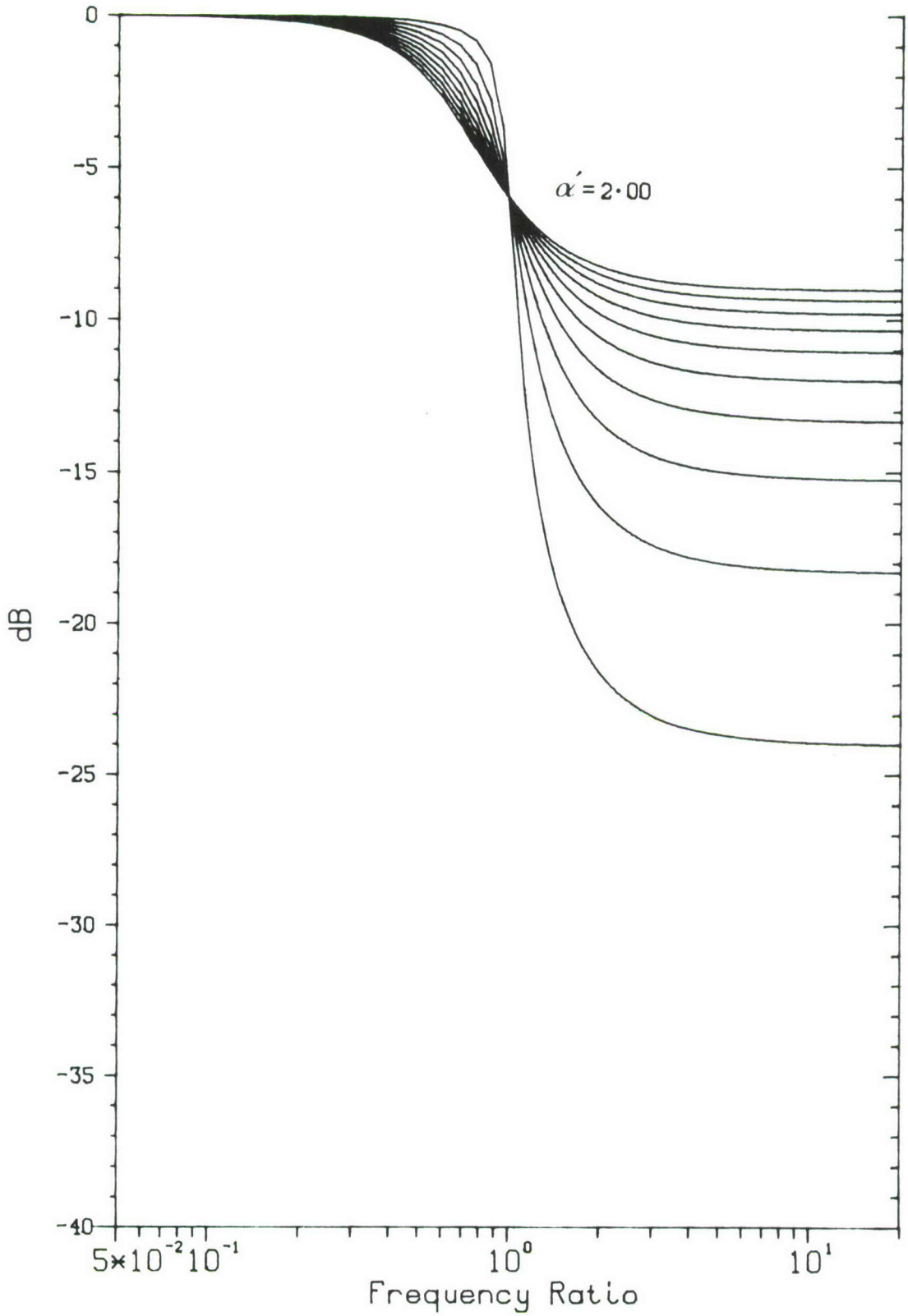


Figure 5. Flex Function with High Frequency Boost

2.2 Boundary Layer Spectra

If we choose $x' = .01$ for the high frequency rolloff function we will obtain a form characterized by a relatively expansive, flat spectrum in the lower frequency part of the curve. Moreover, if we select somewhat different values of β' (0.2, 0.3, 0.4, 0.6, 0.8, 1.0, 1.5) we will have defined a family of curves that will serve to provide a good fit for the pressure spectral density of the boundary layer for a large number of aircraft flight conditions. The boundary layer curves are shown as Figure 6.

3.0 Prediction Equations

The flex function is broken out into the forms and relationships to be used in the computer program. First, the equations are stated in order of progression.

$$P(f)\ [\phi_n(x)L(f),\ M(f),\ H(f)] = G(f) \tag{14}$$

where:

- $P(f)$ = the boundary layer pressure spectral density at some downstream distance (x) on the aircraft surface.
- $\phi_n(x)L(f)$ = the product of the bending mode shape, $\phi_n(x)$, at downstream distance, x, and the low frequency transfer function, L(f), of the aircraft fuselage.
- $M(f)$ = the medium frequency transfer function of the aircraft fuselage internal structure.
- $H(f)$ = the high frequency transfer function of the fuselage skin.
- $G(f)$ = the PSD response of the aircraft primary structure (g^2/Hz).

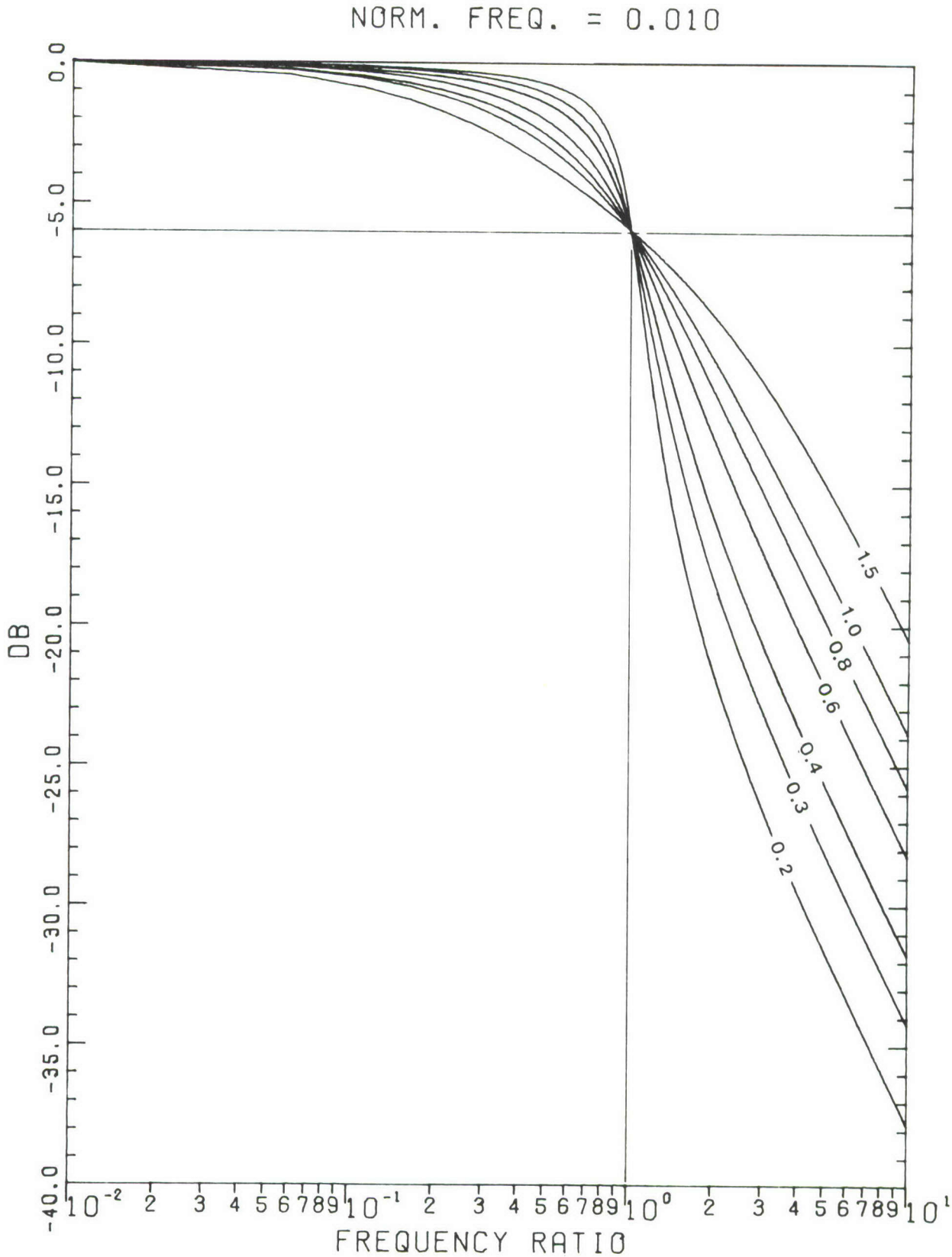


Figure 6. Flex Function Applied to the Aircraft Boundary Layer

The term, primary structure, is defined as that structure of the aircraft which comprises the main load carrying members or elements of the aircraft. Examples of primary structure are skin, frames, rings, bulkheads (periphery), stringers and includes those consoles structurally integrated with the aircraft outer walls.

The working forms for P(f) are described in Appendix A and are listed as equations A-1, A-2, A-3, and A-4.

The mode shape, $\phi_n(x)$, is a function of aircraft type and is included in Appendix B for typical aircraft. The aircraft structural transfer functions L(f), M(f), and H(f) are listed in Appendix C together with appropriate tables.

3.1 Special Functions

Certain flight phases, that deviate from the straight and level condition, are introduced by operating on P(f) with special functions designated, S(f).

$$P(f)S_{BT}(f) = P_{BT}(f) \tag{15}$$

$$P(f)S_{TB}(f) = P_{TB}(f) \tag{16}$$

$$P(f)S_{T}(f) = P_{T}(f) \tag{17}$$

$$P(f)S_{L}(f) = P_{L}(f) \tag{18}$$

where:

$S_{BT}(f)$ = Special function for the buffet turn flight phase.

$P_{BT}(f)$ = Pressure spectral density spectrum of a fighter aircraft during buffet turn (PSF^2/Hz).

$S_T(f)$ = Special function for the takeoff phase.
$P_T(f)$ = Equivalent pressure spectral density spectrum of an aircraft during the takeoff phase (PSF^2/Hz).
$S_L(f)$ = Special function of an aircraft during the landing phase.
$P_L(f)$ = Equivalent pressure spectral density spectrum of an aircraft during the landing phase (PSF^2/Hz).
$S_{TB}(f)$ = Special function for low frequency atmospheric turbulence.

These special functions together with their appropriate tables, curves, and explanations are found in Appendix D.

The second set of basic equations is as follows:

$$G(f)\ Y(f) = R(f) \tag{19}$$

where:

$Y(f)$ = the transfer function for equipments mounted on secondary structure.
$R(f)$ = the PSD response of the secondary structure, or the input to the aircraft equipment, mounted thereon (g^2/Hz).

Secondary structure is defined as that structure to which equipment is attached onto or contained in and whose mounting points terminate at the outer frame, skin, stringers, bulkheads, floors, spars or cast framing of the primary structure. Examples of secondary structure are instrument panels, trays, racks, brackets, shelves, trusses, beams, and consoles.

The final equations apply to those equipment mounting configurations in which isolated equipment are mounted on secondary structure:

$$R(f)\ Y_{I(a)}(f) = a(f) \tag{20}$$

where:

$a(f)$ = The response of the isolated equipments (g^2/Hz).

$Y_{I(a)}(f)$ = Transfer function for equipment mounted on isolators.

$R(f)$ = Response of secondary structure (instrument panels, shelves, or racks) (g^2/Hz).

3.2 Equipment Mounting Categories

How and when $G(f)$, $Y(f)$, and $a(f)$ are used depends upon what, how, and where the equipment is mounted in the aircraft -- and this is established by reference to equipment mounting categories and their associated transfer functions which are classified as follows:

Category I - Equipment(s) attached to primary structure

a. Isolated. Equipment(s) attached to primary structure through vibration isolators.

b. Non-Isolated. Equipment(s) directly attached to primary structure.

Category II - Equipment attached to instrument panels

a. Isolated. Equipment(s) whose instrument panel is attached to primary structure through vibration isolators.

b. Non-Isolated. Equipment(s) whose instrument panel is directly attached to primary structure.

Category III - Equipment(s) mounted on shelves or in racks

a. Isolated. Equipment(s) attached to shelves or in racks - with shelf or rack isolated.

b. Non-Isolated. Equipment(s) attached to shelves or racks - with shelf or rack non-isolated.

Category IV - Equipment(s) that is isolated and mounted on shelves or in racks.

a. Category III(a) with equipment(s) isolated.

b. Category III(b) with equipment(s) isolated.

Category V - Lightweight equipment items directly attached to primary structure via light bracketry.

Category VI - Equipment(s) mounted to or on the bulkhead of the forward looking radar (FLR).

The categories of transfer functions, their tables, curves, and applications are found in Appendix E.

SECTION III

PROGRAMMING

The equations shown in Paragraph 3 of Section II for predicting power spectral density inputs to aircraft equipment are laborious to evaluate - given many selected frequencies over a relatively wide band. And, even though these equations are few in number and are not of themselves complex, a digital computer program was, nonetheless, strongly suggested. Such a program, therefore, was prepared to evaluate the prediction equations at a frequency resolution sufficiently fine to produce quality plots and in the combinations and sequences required by the particular set of input data which describes the aircraft flight profile.

Conceptually, the program is so designed that a minimum of information on flight conditions is required as input for predicting the vibration profiles of the aircraft structure and equipments. The input data consists, chiefly, of numerical values and descriptive information concerning such flight parameters as aircraft type, altitude, Mach number, equipment weight, mounting categories, and flight maneuvers.

For output, the values of the particular transfer and response functions, which were a part of the prediction process, are printed in tabular form and presented as a function of frequency. If desired, plots of these results can be produced on peripheral plotters.

1.0 Program

The program consists of a relatively large main section which, in its operation, "calls" approximately a dozen subroutines. The structure is simple.

2.0 Program Preparation

The program is prepared for execution by first punching numerical and alpha-numeric descriptive information for key aircraft and flight profile parameters on cards, in specified field locations; then inserting these cards in the program deck at its end.

2.1 Execution

On program execution, tabulations of the input, the transfer and the response functions are printed (dB as a function of frequency). The information necessary for producing plots of these tabulated values is transferred in a device-independent, standard form from central memory to a permanent file located in mass storage.

In the final step, plots of all or selected transfer functions are obtained by executing a small post-processor program containing a plot-directive card which is inserted by the user. This program provides for transfer of the plot information from the permanent file to central memory and also provides a "write", on magnetic tape, of information necessary for a plot of each of the functions specified on the plot-directive card. This tape is mounted on a CALCOMP plotter to produce the plots.

Before we proceed to the program deck card order -- the plot, the keyboard instructions, and, finally, the card preparation -- it is useful to note that the basic language and format of the program (Appendix F) is Fortran IV and as such may be readily adapted to other computer facilities. However, certain address characteristics of the card arrays, the plotting, the display instructions reflect the needs of the individual computer facility; and the demands of its terminals. In this report, the ASD Computer Facility and Terminals are invoked -- elsewhere, the reader is invited to consult local computer services.

2.2 Functions* Available for Plotting

	Categories Ia, IIa, IIb, IIIa, IIIb, V, VI
Straight and Level	$P(f)$, $G(f)$, $Y(f)$, $R(f)$
Buffet-Turn	$P_{BT}(f)$, $G_{BT}(f)$, $Y(f)$, $R_{BT}(f)$
Takeoff	$P_T(f)$, $G_T(f)$, $Y(f)$, $R_T(f)$
Landing	$P_L(f)$, $G_L(f)$, $Y(f)$, $R_L(f)$
Turbulence	$P_{TB}(f)$, $G_{TB}(f)$, $Y(f)$, $R_{TB}(f)$

	Categories IVa and IVb
Straight and Level	$P(f)$, $G(f)$, $Y(f)$, $R(f)$, $Y_{1A}(f)$, $A(f)$
Buffet-Turn	$P_{BT}(f)$, $G_{BT}(f)$, $Y(f)$, $R_{BT}(f)$, $Y_{1A}(f)$, $A_{BT}(f)$
Takeoff	$P_T(f)$, $G_T(f)$, $Y(f)$, $R_T(f)$, $Y_{1A}(f)$, $A_T(f)$
Landing	$P_L(f)$, $G_L(f)$, $Y(f)$, $R_L(f)$, $Y_{1A}(f)$, $A_L(f)$
Turbulence	$P_{TB}(f)$, $G_{TB}(f)$, $Y(f)$, $R_{TB}(f)$, $Y_{1A}(f)$, $A_{TB}(f)$

* See Appendices D and E

	Category Ib
Straight and Level	$P(f)$, $G(f)$
Buffet-Turn	$P_{BT}(f)$, $G_{BT}(f)$
Takeoff	$P_T(f)$, $G_T(f)$
Landing	$P_L(f)$, $G_L(f)$
Turbulence	$P_{TB}(f)$, $G_{TB}(f)$

Execution is essentially sequential -- the only important branch is a loop from the program end back to the beginning in order to repeat the process whenever the aircraft flight parameters change. All other branches terminate at nearby statements.

Transfer and response functions can be plotted on a CALCOMP (incremental) plotter. Calls are made to selected subroutines in the DISSPLA* software system for the desired data display.

Salient features of program design are summarized below.

Language:	FORTRAN IV
Digital Computer:	Control Data Corp., 6600 and Cyber 73 computers
Central Memory Requirements:	120,000 (octal) words for compiler; program, and plot subroutines
Word Size:	10 characters
Variable Name Size:	6 characters, maximum
Input Data:	Punched on 80-column cards

* The acronym for "Display Integrated Software System, and Plotting Language," developed and sold by the Integrated Software Systems Corp., San Diego, CA.

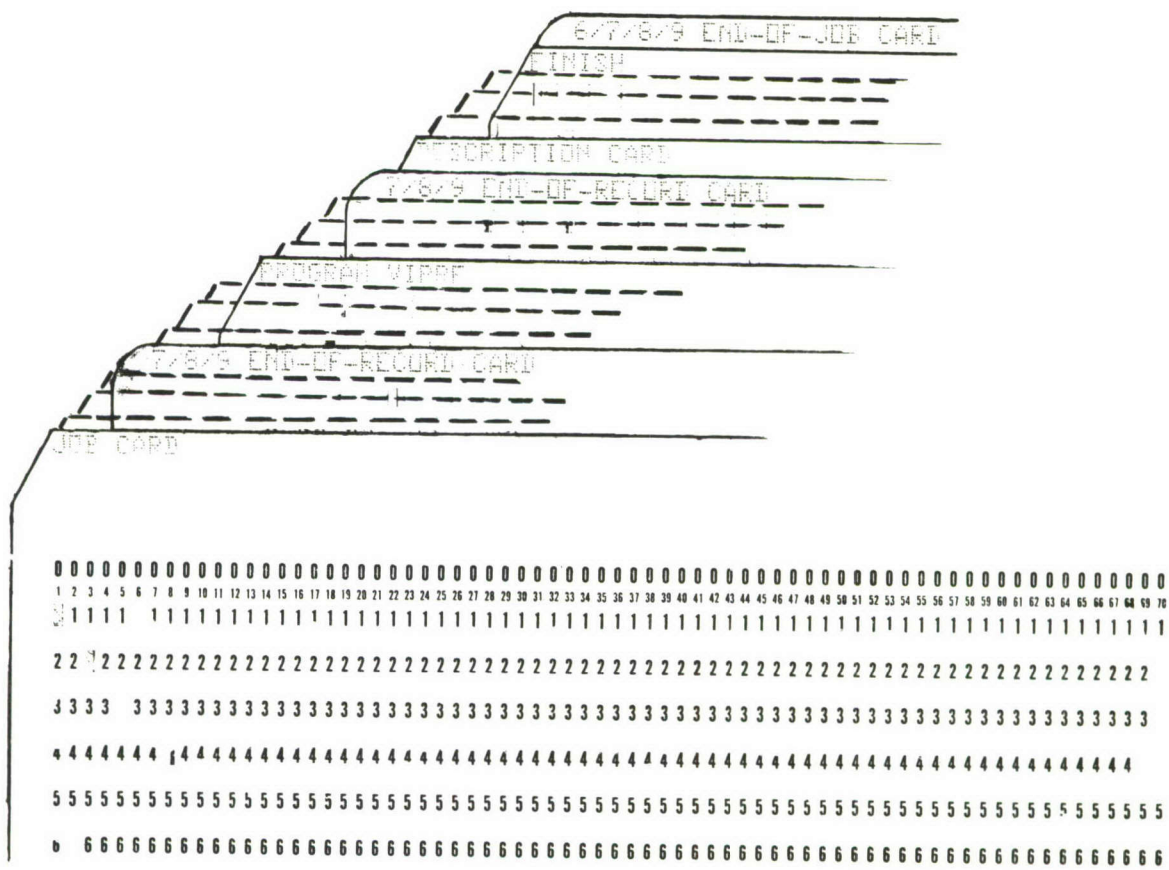
Output:	135-column printed tabulations and off-line plots
Library Mathematical Functions:	Common logarithm and arc-tangent (double argument)

3.0 Program Deck Setup and Card Preparation

3.1 Job Deck Setup

The first step in the procedure to obtain plots of the predicted vibration spectra requires the execution of the program, VIPRF. Upon execution, a printed output is produced; likewise, the plot information is transferred to a permanent file.

The following illustration shows the structure of the card deck setup for program execution.

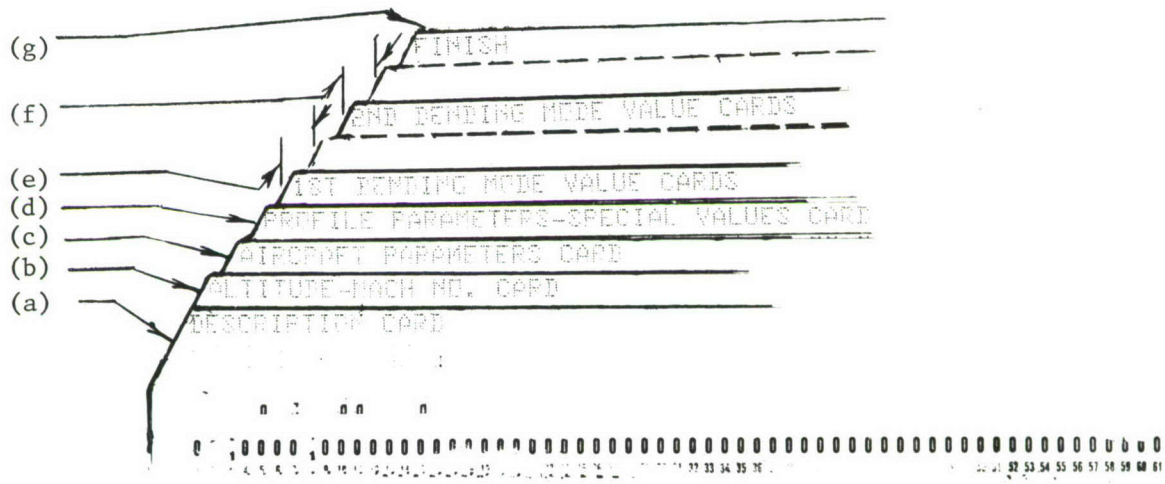


The second and final step in the procedure involves execution of either the ONLINE or the OFFLINE, DISSPLA, post-processor plot program. In this phase, plot information is obtained from the permanent file (previously generated); then, plots are produced either on-line or off-line, in this case, utilizing a CALCOMP plotter.

The structure of the deck setup is shown in the following illustration.

3.1.1 Input Data Deck Setup

Program input data is entered on the cards shown in the next illustration. Note that the cards must be inserted in the deck in the indicated order.



The Description, the Altitude-Mach Number, and the Aircraft Parameter cards must always be prepared and inserted in the deck.

The Profile Parameters and Special Values cards must always be inserted. If the values are already stored in the program (as is, currently, the case for the F-4, F-15, F-16, F-111, and the A-7), then a blank card must be inserted. Any profile parameter or special value can be changed, however, by entering the desired value on the normally blank card. This feature permits the user to "write over" the stored values as the situation requires. If an aircraft different from the stored group is chosen, then a Profile Parameters and Special Values card must be inserted with appropriate entries. Note that in either case, a card must be inserted, blank or not.

The procedural mechanics are more complex when dealing with the first and second bending mode value cards. Here, the combination of orders of proper card usage are such that special guidance must be provided in the form of a summary aid and a table, both of which now follow.

3.1.1.1 Summary of Input Data Card Structure

We return to the last illustration to summarize the rules of order and procedure concerning the card structure of the input data. The summary also makes reference to special guidance in the form of Table I.

Cards	Remarks
a,b,c	These cards must always be prepared and inserted in the deck.
d	A blank card is normally inserted in the deck if aircraft is of the previously stored group (see 3.1.1). Stored values may be written-over by inserting desired values on the blank card. For aircraft not of the stored group, enter appropriate values on the blank card (see Table I).
e,f	Both card sets are normally omitted if the aircraft is of the previously stored group; however, if data changes are required, see Table I.
g	The FINISH card must always be inserted at the end of a set of data cards.

TABLE I

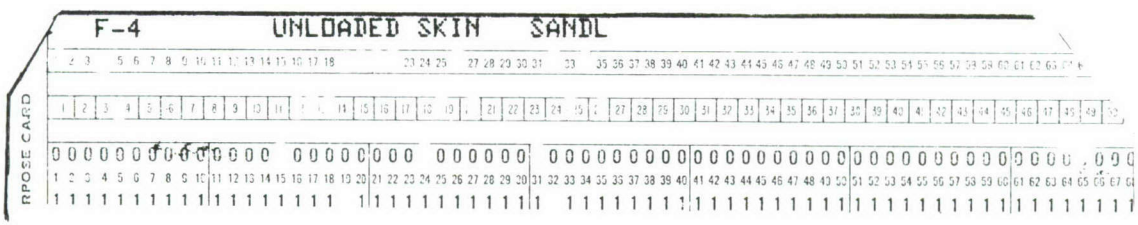
Card Usage Guidance -- Bending Mode Data

1st Mode		2nd Mode				
Stored Data Cards	Read From Input Data Cards	Stored Data Cards	Read From External Input Data Cards	Unavailable	Insert Cards:	Special Entries In Card (d)
X		X			(a) thru (d) followed by (g)	
X				X	(a) thru (d) followed by (g)	enter $f_{2n}=0$
X			X		(a) thru (d) followed by a blank card, followed by a set of 2nd bending mode cards (f); followed by (g)	
	X	X			(a) thru (d) followed by a set of 1st bending mode cards (e); followed by (g)	
	X			X	(a) thru (d) followed by a set of 1st bending mode cards (e); followed by (g)	enter $f_{2n}=0$

3.1.2 Card Preparation for Input Data

Each card example is shown in proper sequence, selected and punched with the input data for the program. Included are column identifications, associated nomenclature, and explanatory references.

3.1.2.1 DESCRIPTION Card



Aircraft Type

COL. 10 Aircraft Type (center aircraft designation in 10-column field to obtain centering plot titles)

Note that the following aircraft types occupy a specific columnar order because certain of their values (Profile Parameters and Special Values; First and Second Bending Mode values) have been previously stored in the program.

COL. 4-6	F-4	Enter on card exactly as specified here.
4-7	F-15	
4-7	F-16	
4-8	F-111	
4-7	A-7D	

This order requirement also holds for any future aircraft, so stored. For example, the A-10 would occupy columns 4 through 7.

Equipment Description

COL. 11-30 Name of equipment item or location (center name in 20-column field to obtain centering in plot titles)

Flight Condition

COL. 31-35 SANDL, straight and level

COL. 31-32 BT, buffet-turn* (see Appendix D)

COL. 31-37 TAKEOFF, takeoff (see Appendix D)

COL. 31-37 LANDING, landing (see Appendix D)

COL. 31-32 TB, turbulence* (see Appendix D)

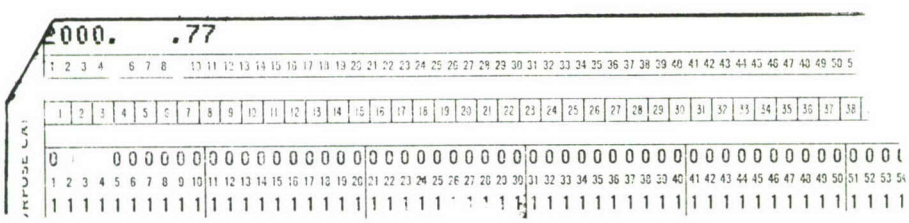
*Requires a straight and level reference flight condition that must be entered in the Altitude-Mach Number card (see 3.1.2.2).

Plot Selection

COL. 41-50 Leave all columns blank if only the plot of the final response function is desired [G(f), R(f), or A(f)].

COL. 41-43 Enter ALL, if plots of all of the special, transfer, and response functions are desired.

3.1.2.2 Altitude-Mach Number Card



COL. 1-8 Altitude, H, feet, of 1st altitude-mach number combination.

COL. 9-13 Mach no., M, of 1st altitude-mach number combination.

COL. 14-21 Altitude, H, feet, of 2nd altitude-mach number combination.

COL. 22-26 Mach no., M, of 2nd altitude-mach number combination.

COL. 27-34 Altitude, H, feet, of 3rd altitude-mach number combination.

COL. 35-39 Mach No., M, of 3rd altitude-mach number combination.

COL. 40-47 Altitude, H, feet, of 4th altitude-mach number combination.

COL. 48-52 Mach no., M, of 4th altitude-mach number combination.

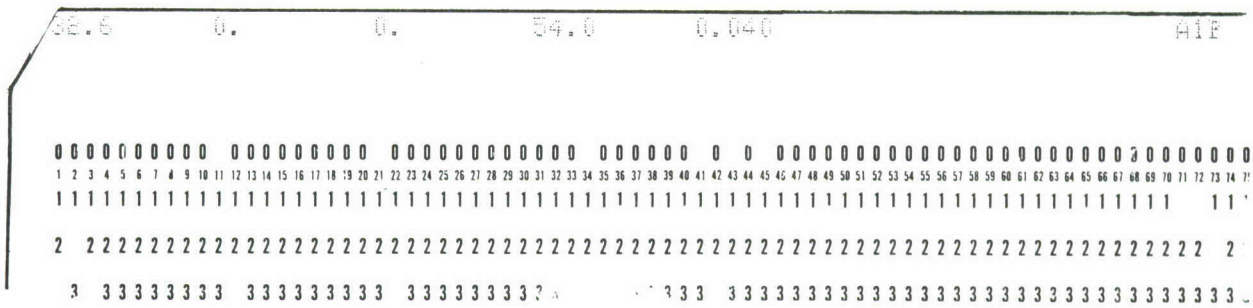
COL. 53-60 Altitude, H, feet, of 5th altitude-mach number combination.

COL. 61-65 Mach no., M, of 5th altitude-mach number combination.

COL. 66-73 Altitude, H, feet of 6th altitude-mach number combination.

COL. 74-78 Mach no., M, of 6th altitude-mach number combination.

3.1.2.3 AIRCRAFT PARAMETERS Card



COL. 1-10 Aerodynamic distance, x_E (feet) (see Appendix B).

COL. 11-20 Distance of equipment from skin, R_s (inches).

COL. 21-30 Equipment weight, W_E (pounds).

COL. 31-40 Nominal fuselage diameter, D_F; at x_E (inches).

COL. 41-50 Aircraft skin thickness, t (inches).

Center Frequency, f_c, of Transfer Function, Y(f)

If Category is not IVa, IVb, or Ib*

COL. 51-60 Center frequency of specified category, f_c, (Hz) (leave blank if unknown).

COL. 61-70 Blank.

*For selection guidance, see Table II. Also, note that Category I(b) has a transfer function (previously built into the program) that is automatically invoked when I(b) is selected (see Figure E-1(b)).

If Category is IVa or IVb*

COL. 51-60 Center frequency for Category Ia, f_{cIA}(Hz) (leave blank if unknown).

COL. 61-70 Center frequency, f_c (Hz) for Category IIIa, if Category IVa is specified; Category IIIb, if Category IVb is specified (leave blank if unknown).

COL. 71 Skin material

A for aluminum
T for titanium
S for steel
M for magnesium

TABLE II

Recommended Center Frequencies of Y(f) When f_c is Either Unknown or Unspecified

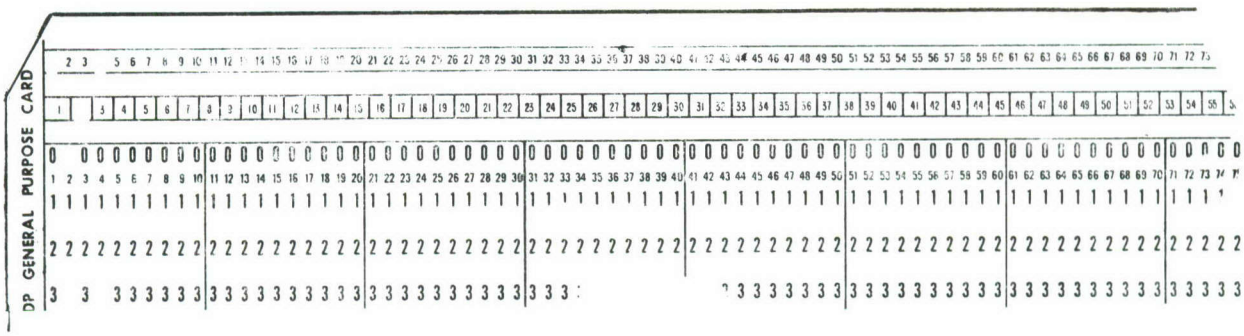
Category	f_c
Ia	25 Hz
IIa	43 Hz
IIb	40 Hz
IIIa	25 Hz
IIIb	35 Hz
V	200 Hz

*For selection guidance, see Table II. Also, note that Category I(b) has a transfer function (previously built into the program) that is automatically invoked when I(b) is selected (see Figure E-1(b)).

Equipment Mounting Category (see Appendix E)

COL. 72-73	1A for Category	Ia
	1B	Ib
	2A	IIa
	2B	IIb
	3A	IIIa
	3B	IIIb
	4A	IVa
	4B	IVb
COL. 72	5	V
	6	VI

3.1.2.4 PROFILE PARAMETERS AND SPECIAL VALUES Card*



COL. 1-10 First fuselage bending mode, vertical, symmetric f_n(Hz) (see Appendix B).

COL. 11-20 Maximum of first bending mode low frequency transfer function, $L_M(f)$(dB) (see Appendix C).

COL. 21-30 Second fuselage bending mode, vertical, symmetric, f_{2n}(Hz) Enter zero if f_{2n} is unavailable (see Table I).

COL. 31-40 Maximum of second bending mode low frequency transfer function, $L_2(f)_M$(dB). (see Appendix C)

COL. 41-50 Maximum of special function, $S_{BT}(f)_M$(dB) (see Appendix D).

COL. 51-60 Distance to aircraft mid-chord at wing, x_{BT} (feet) (see Appendix D).

*Card is normally blank unless specific changes are required or unless aircraft type is other than F-4, F-111, F-15, F-16, and A-7; in which case, the appropriate parameters and special values must be entered (see 3.1.1.1).

COL. 61-70 Distance to main landing gear strut, x_T or x_L (feet) (see Appendix D).

COL. 71-80 Multiplication constant, K. Unless otherwise specified, K=1 (leave blank if straight-and-level flight condition (SANDL) is specified).

3.1.2.5 FIRST BENDING MODE VALUES Cards

Card 1

COL. 1-2 No. of ordinal (dB) values, N

COL. 3-8 Interval, Δx, along abscissa

COL. 9-14 Value 1, db

COL. 15-20 Value 2, db

COL. 75-80 Value 12, db

Card 2

COL. 1-6 Value 13, db

COL. 7-12 Value 14, db

COL. 73-78 Value 25, db

Card 3

COL. 1-6 Value 26, db

COL. 7-12 Value 24, db

COL. 73-78 Value 38, db

Card 4

COL. 1-6 Value 39, db

COL. 7-12 Value 40, db

COL. 73-78 Value 51, db

The above values of dB(x), $db(x_I)$, correspond to values of downstream distance x, which are uniformly spaced, Δx apart:

$$dB(x_I) = db\ [(I-1)\Delta x],\ I = 1, 2, \ldots, N$$

If $N \geq 52$, prepare additional cards, as required, with 12 values per card, following the format of card 2.

3.1.2.6 SECOND BENDING MODE VALUES Cards (Omit these cards if no entry is made for f_{2n}).

Card 1

COL. 1-2 No. of ordinal (db) values, n

COL. 3-8 Interval, Δx, along abscissa

COL. 9-14 Value 1, dB

COL. 15-20 Value 2, dB

COL. 75-80 Value 12, dB

Card 2

COL. 1-6 Value 13, dB

COL. 7-12 Value 14, dB

COL. 73-78 Value 25, dB

Card 3

COL. 1-6 Value 26, dB

COL. 7-12 Value 27, dB

COL. 73-78 Value 38, dB

Card 4

COL. 1-6 Value 39, dB

COL. 7-12 Value 40, dB

COL. 73-78 Value 51, dB

For n $\geq$ 52 and for an explanation of the origin of the decibel values, refer to the remarks made for the first bending mode values.

3.1.2.7 FINISH Card*

COL. 1-6 FINISH

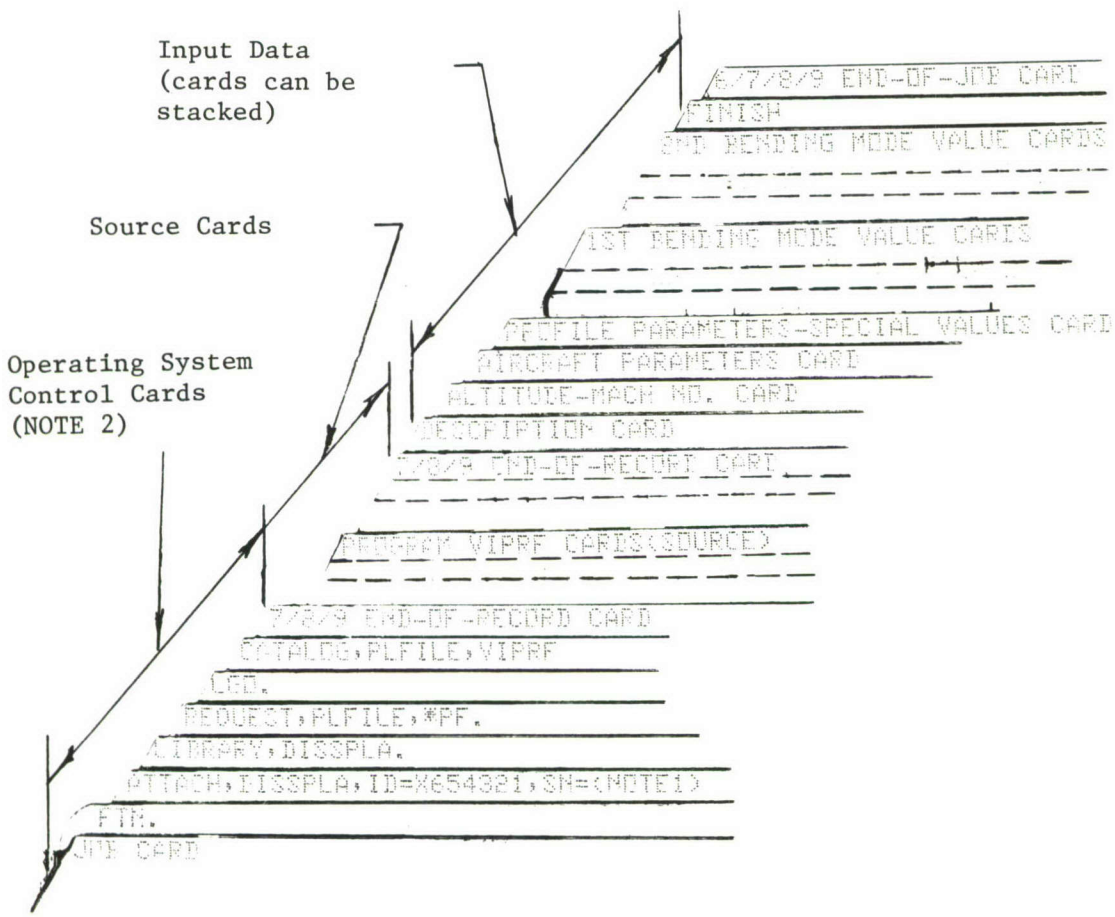
3.1.3 Deck Setup Card Forms ("Source" and "Binary")

In the following illustrations, deck setups are shown for execution of the program in both the source and the binary card form (Control Data Corp. 6600 and Cyber 74 Computer System, using the NOS/BE operating system).

The DISSPLA plot file (PLFILE) is copied to the permanent file, VIPRF.

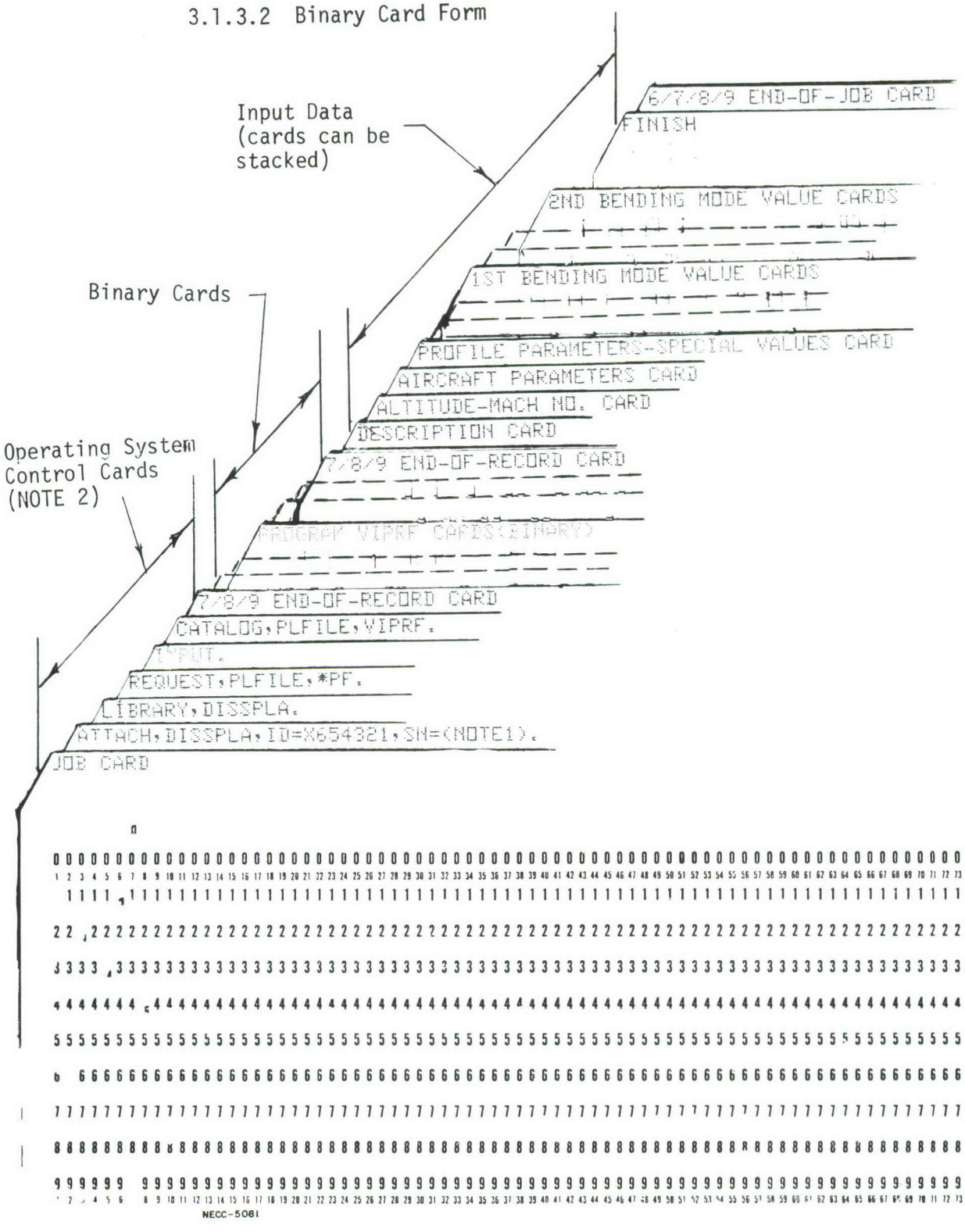
Both illustrations refer to notes that are found at the end of 3.1.4.3.

3.1.3.1 Source Card Form



*Must be last card in every set of input data cards -- cannot be omitted.

3.1.3.2 Binary Card Form



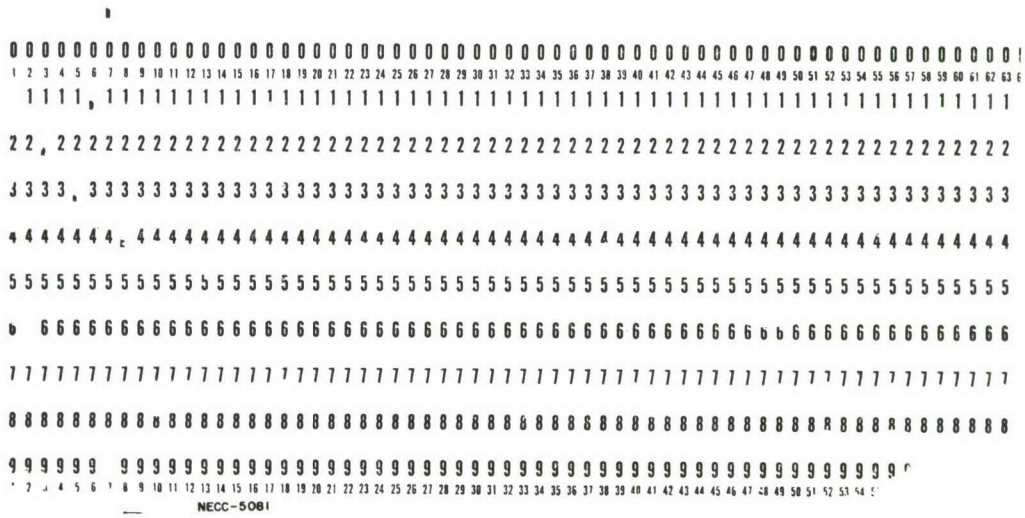
3.1.4 Plot Programs ("On-line" and "Off-line")

In the following illustrations, deck setups are shown for executing the "on-line" and "off-line," DISSPLA, post processor plot programs.

3.1.4.1 "On-line" Plot Program

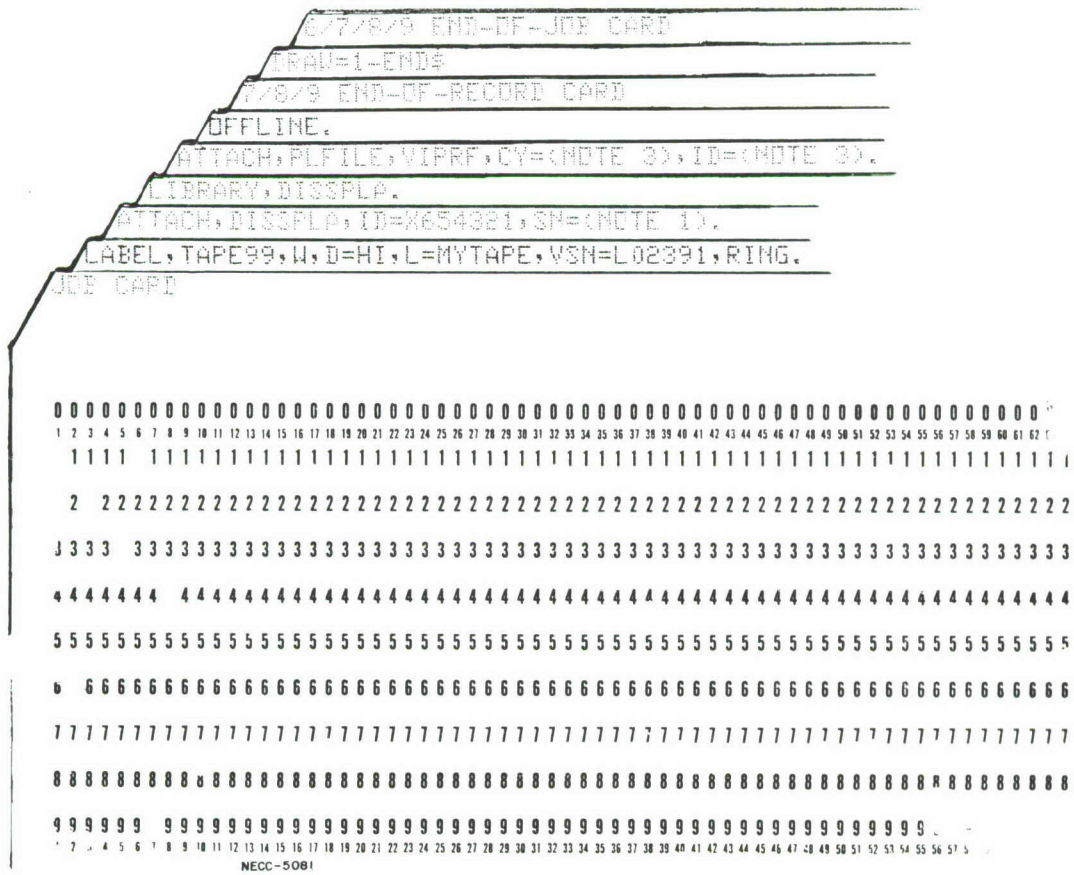
DISSPLA plots are produced on-line, on a CALCOMP plotter.

```
6/7/8/9 END-OF-JOB CARD
DRAW=1-END$
7/8/9 END-OF-RECORD CARD
RETURN,DISSPLA,PLFILE.
ONLINE.
ATTACH,PLFILE,VIPRF,CY=(NOTE 3),ID=(NOTE 3).
LIBRARY,DISSPLA.
ATTACH,DISSPLA,ID=X654321,SN=(NOTE 1).
JOB CARD
```



3.1.4.2 "Off-line" Plot Program

Final plot information is copied to file on magnetic tape (Tape 99). Then, this tape is transferred to an off-line plotter system for graphical recording. However, before any of this can be done, it is necessary to request (Computer Operations) the desired tape to be assigned to Tape 99. In the case illustrated here, the tape number is L02391. Note that if the job deck is submitted at the ASD Computer Center, Operations must be so instructed through submission of card form ASD-59, "Magnetic Tape Transaction Request." On this form the tape number and associated problem number is entered; whereupon the form is submitted together with the job deck. Finally, subsequent to plot program execution, Operations must be directed to mount the tape on the off-line plotter through submission of card form ASD-227, "Data Preparation Request." This card must include the tape and associated problem number as well as identification and plot information obtained from the day file of the computer program listing.



3.1.4.3 Keyboard Visual Display

Keyboard Commands

```
LOG-IN INFORMATION (see ASD Computer Center Inter-
   com Guide)
ATTACH,PLFILE,VIPRF,CY=(NOTE3),ID=(NOTE3)
ATTACH,DISSPLA,ID=X654321,SN=(NOTE1)
XEQ,LIBLOAD=DISSPLA,TEK4010
DRAW=1-END$
LOG-OUT
```

NOTES:

1. SN = ASD for computer system A.
   SN = AFIT for computer system B.
2. Refer to ASD computer center handbook, CDC NOS/BE USER'S GUIDE (latest revision).
3. CY = Permanent file cycle number shown in dayfile of computer listing.
   ID = Problem number under which permanent file was catalogued (shown in dayfile of computer listing).

SECTION IV

APPLICATIONS

1.0 Examples

To illustrate the applications of the prediction program, a number of fighter aircraft are selected for a variety of equipment locations, categories, and flight conditions.

1.1 F-4 (skin)

The inputs (card entries) are:

	SKIN RESPONSE	SANDL
H =	2000.0	ALTITUDE (FT.)
M =	.77	MACH NO.
X_E =	32.60	DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMIC PROFILE (FT.)
R_S =	0.00	DISTANCE FROM SKIN (IN.)
W_E =	0.00	EQUIPMENT WEIGHT (LBS.)
T =	.0400	THICKNESS OF SKIN MATERIAL (IN.)
D_F =	54.0	DIAMETER OF FUSELAGE (IN.)
MATERIAL =	ALUMINUM	TYPE SKIN MATERIAL
CATEGORY =	1B	EQUIPMENT MOUNTING CATEGORY

The input, as it is entered on the input data cards, is shown in Figure 7. (Each of the five examples in this section are accompanied by their respective array of input data cards.) Note that five cards per array are shown -- in agreement with the guidelines provided by Table I and 3.1.1.

As an illustration, this example is rather special. It is interesting because the results describes the response of the unloaded

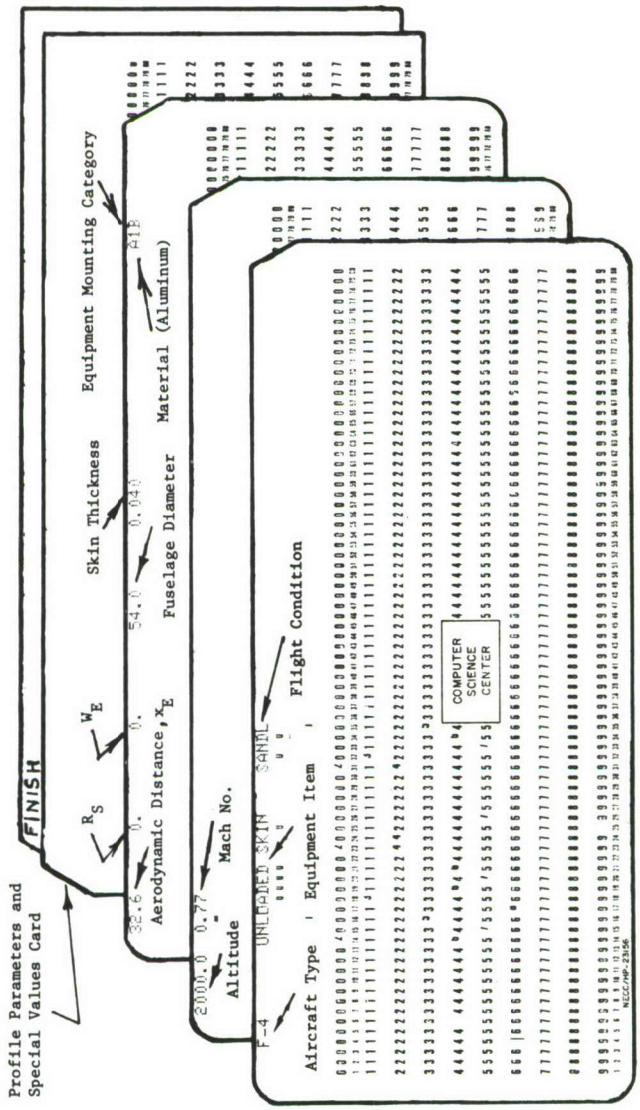


Figure 7. Input Data Cards, RF-4C Skin

skin (R_S and W_E = 0) for straight and level (SANDL) flight. See Figures 8 and 9. The low frequency hump in Figure 9 represents the vibration contributions of the first and second fuselage bending modes.

1.2 F-16 (FCC)

Here, the prediction program describes the vibration input to the Flight Control Computer (FCC) of the F-16 (Figures 11 and 12) during straight and level flight. This example introduces the equipment configuration in which R_S and W_E are greater than zero -- as will be the case from here on out.

F-16	FCC	SANDL
H =	13000.0	ALTITUDE (FT.)
M =	1.55	MACH NO.
X_E =	7.50	DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMIC PROFILE (FT.)
R_S =	3.00	DISTANCE FROM SKIN (IN.)
W_E =	31.20	EQUIPMENT WEIGHT (LBS.)
T =	.0360	THICKNESS OF SKIN MATERIAL (IN.)
D_F =	40.0	DIAMETER OF FUSELAGE (IN.)
MATERIAL =	ALUMINUM	TYPE SKIN MATERIAL
CATEGORY =	1B	EQUIPMENT MOUNTING CATEGORY

1.3 F-4 (Instr. Panel, non-isolated)

This prediction problem describes the vibration spectrum of the radar altimeter indicator (RAI) located on the left side of the instrument panel, aft cockpit (Figures 14 and 15). The instrument panel is hard mounted (non-isolated). Flight conditions are straight and level (SANDL).

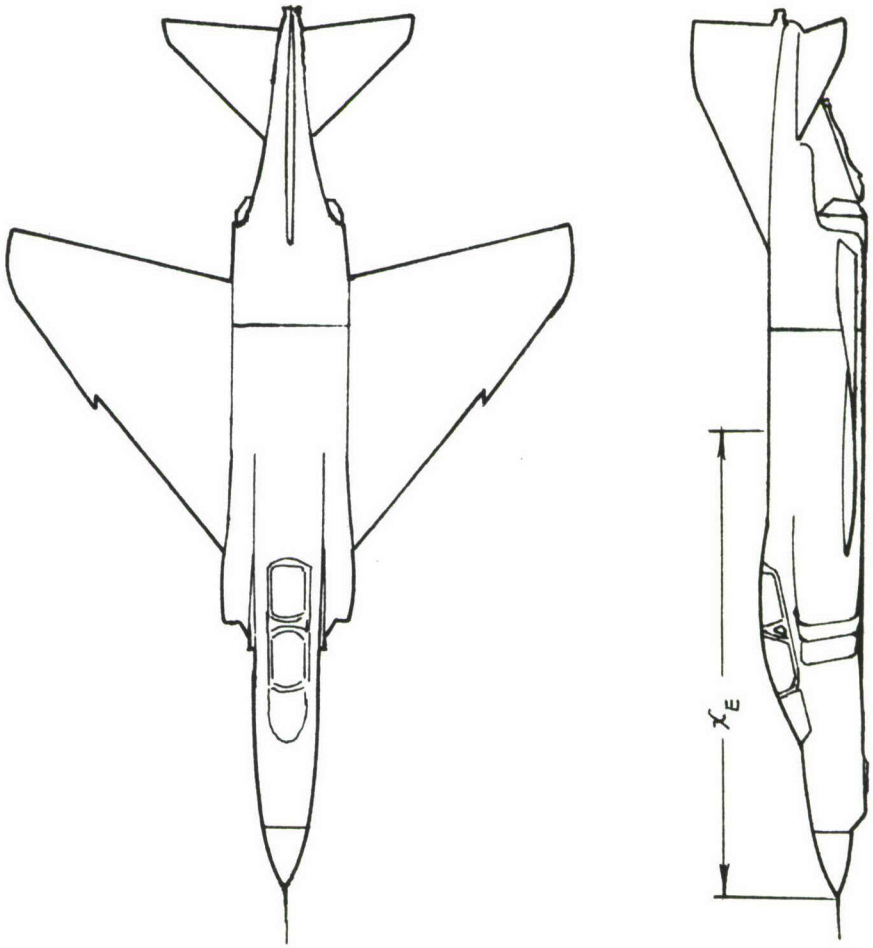


Figure 8. Location of Skin Response, RF-4C

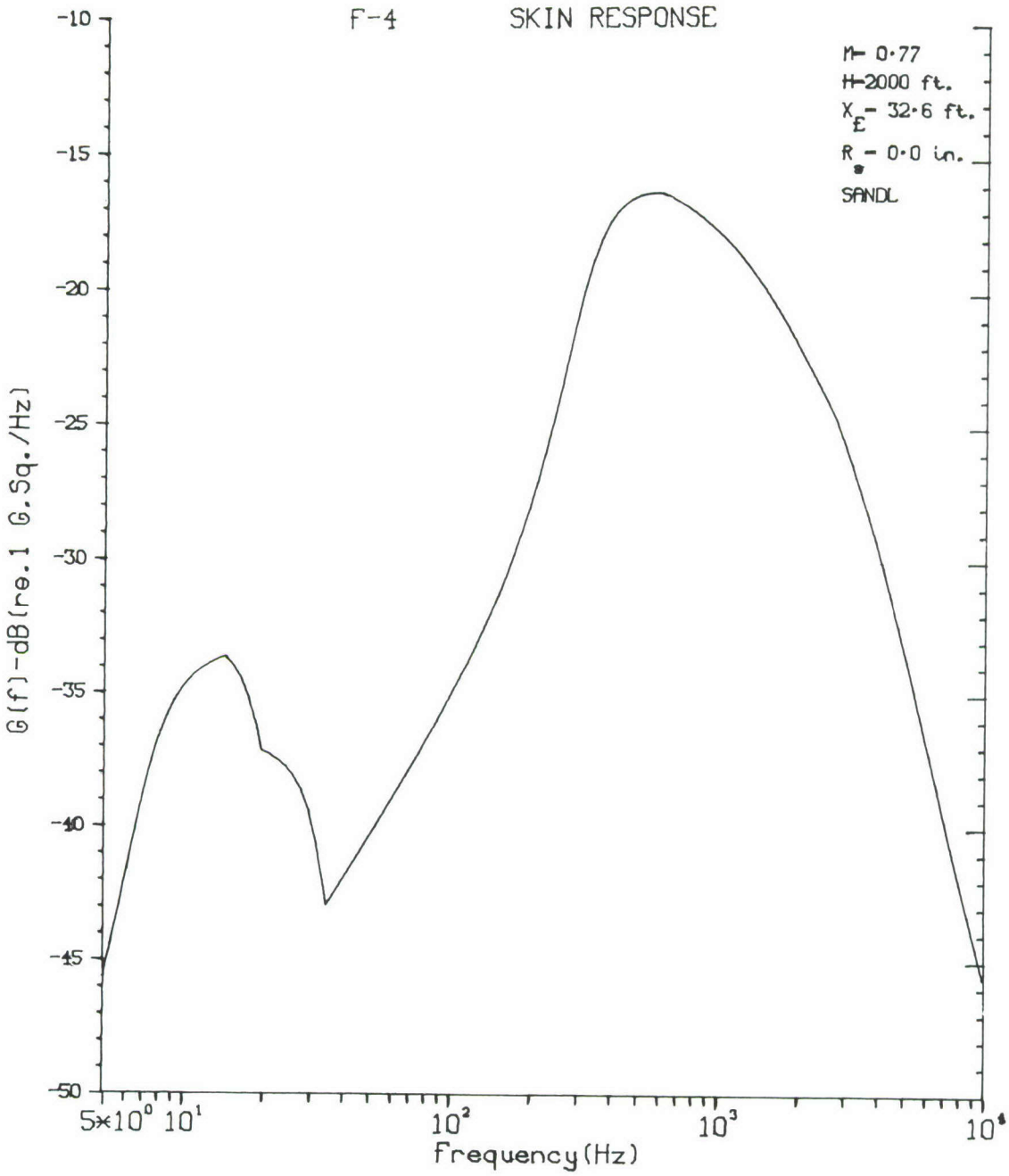


Figure 9. Predicted Response of Skin, RF-4C

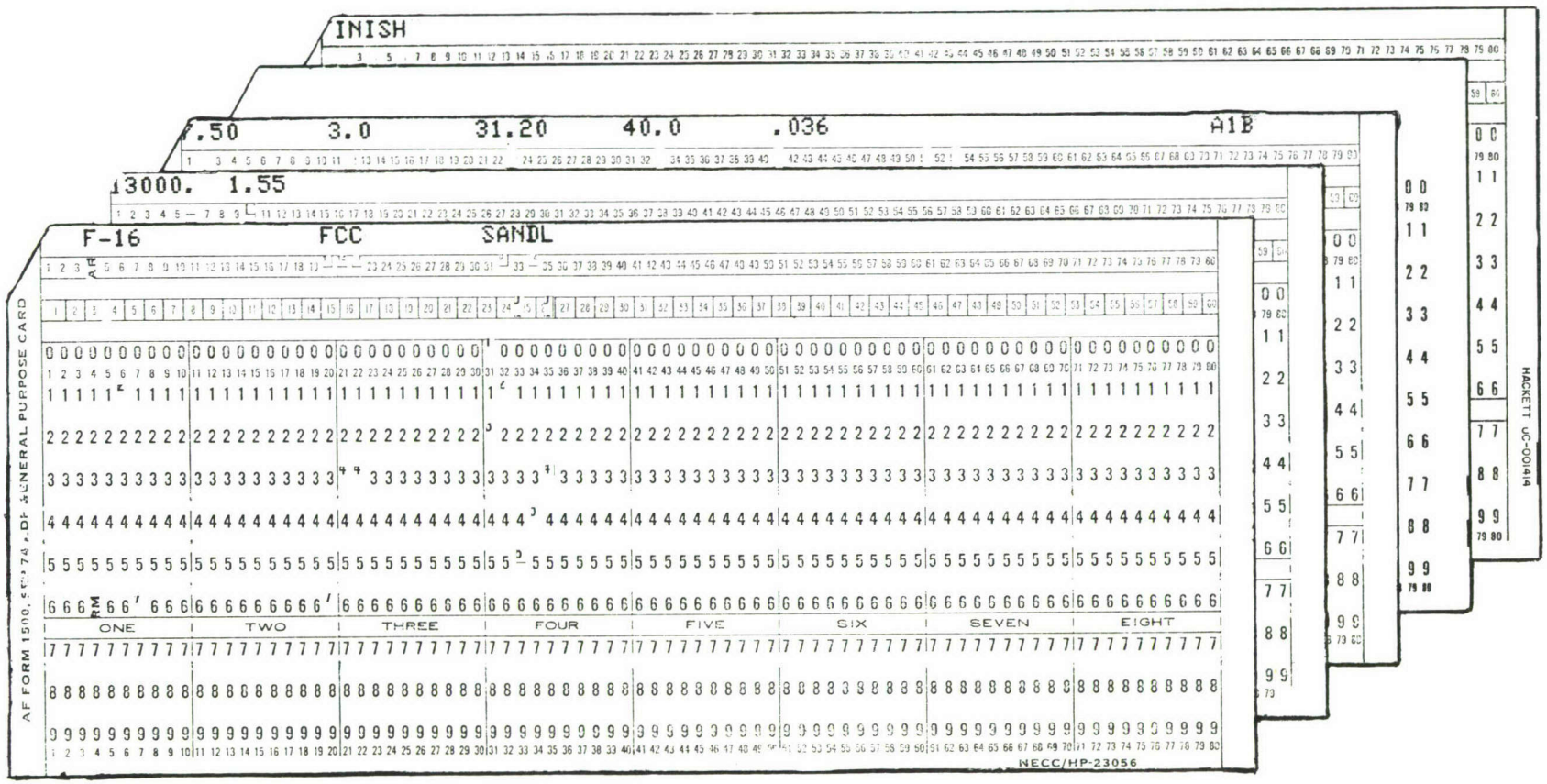


Figure 10. Input Data Cards, FCC, F-16

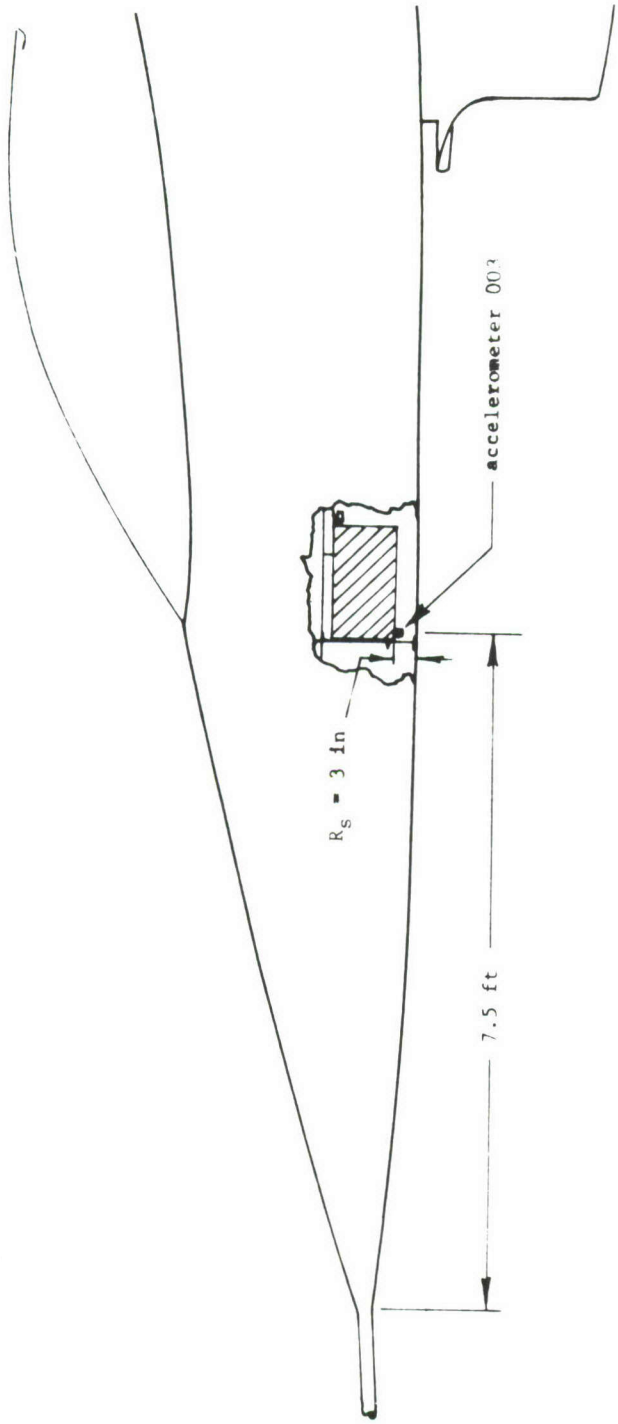


Figure 11. Location of Vibration Input to FCC, F-16

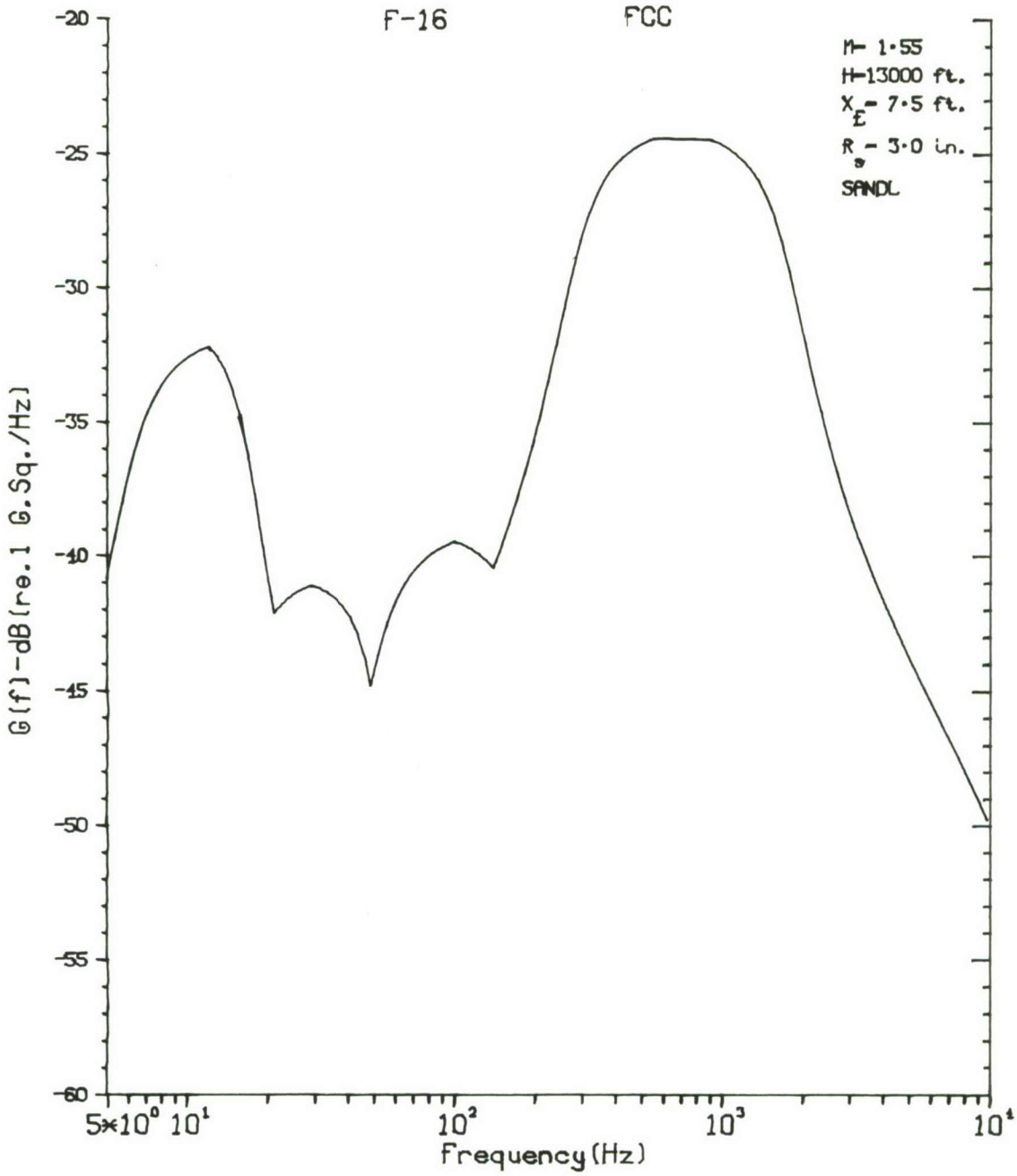


Figure 12. Predicted Vibration Input to FCC, F-16

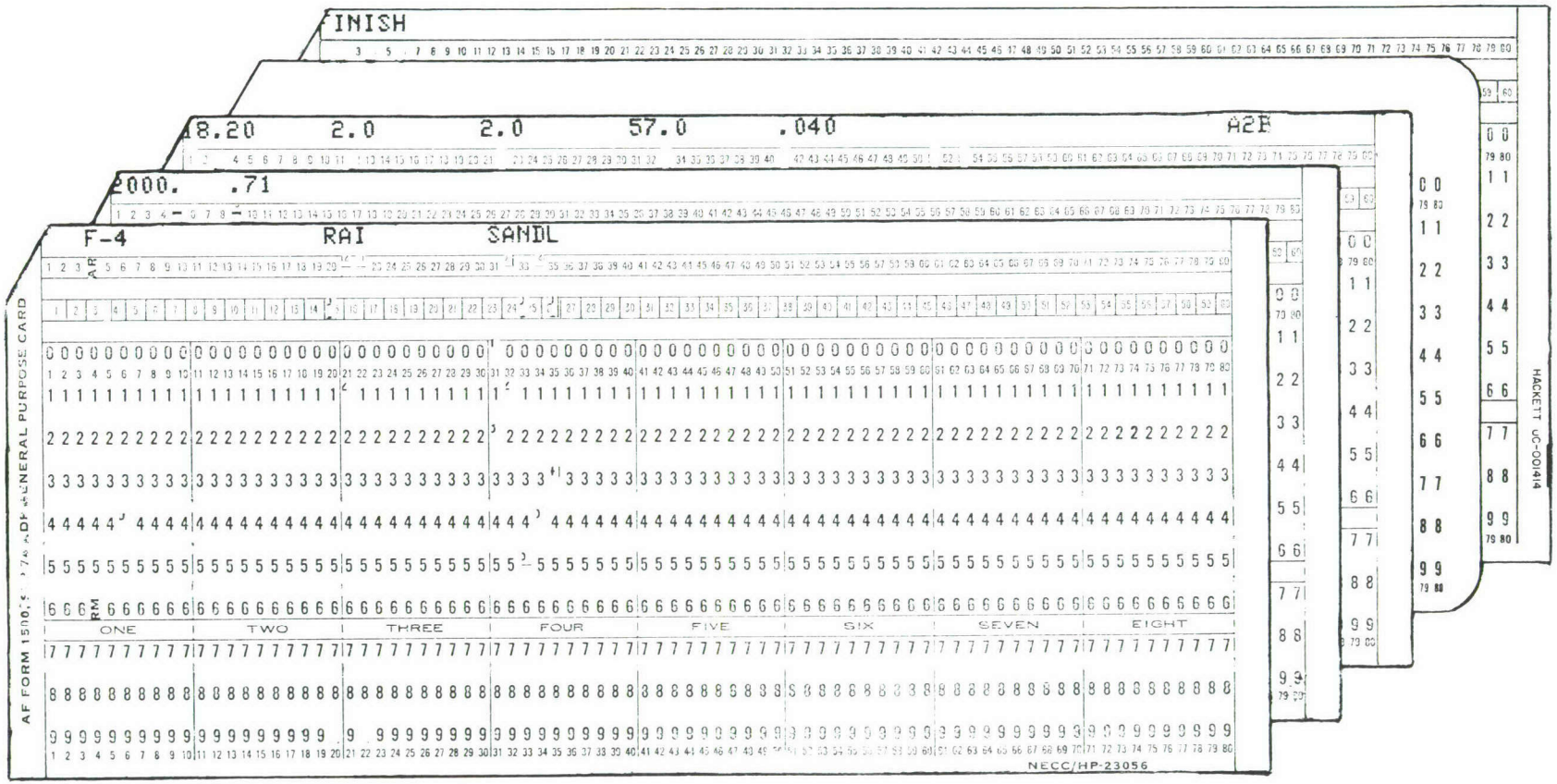


Figure 13. Input Data Cards, RAI, RF-4C

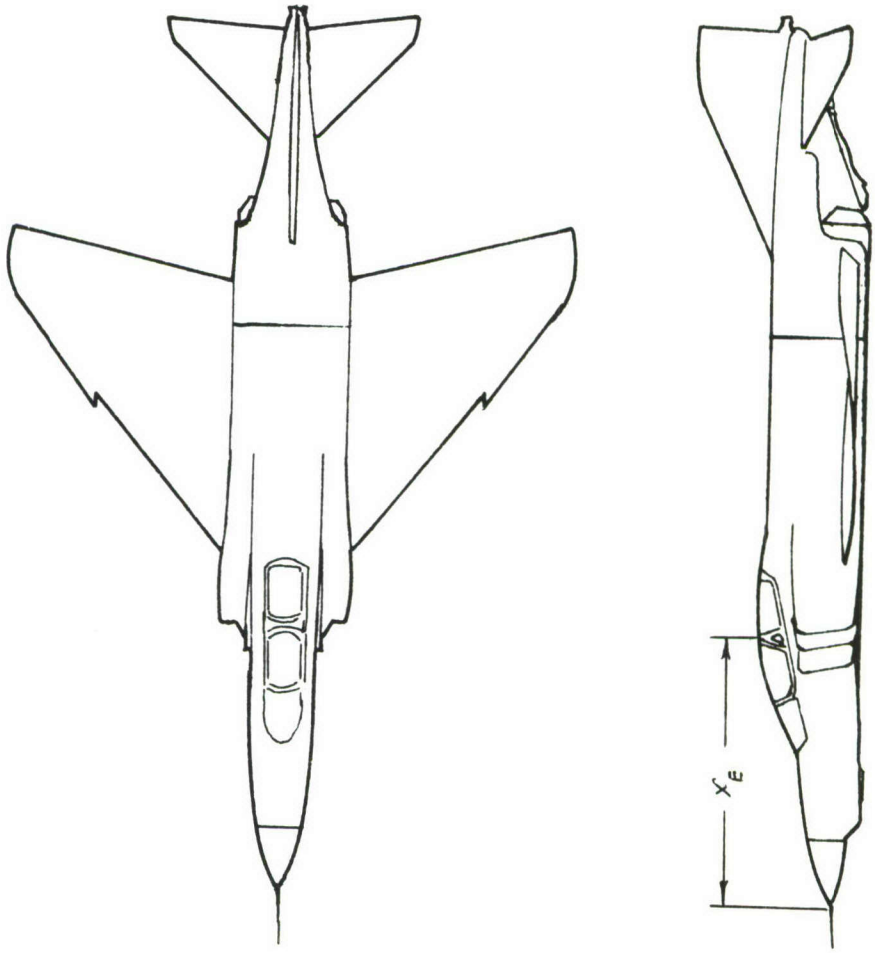


Figure 14. Location of RAI, Aft Instrument Panel, RF-4C

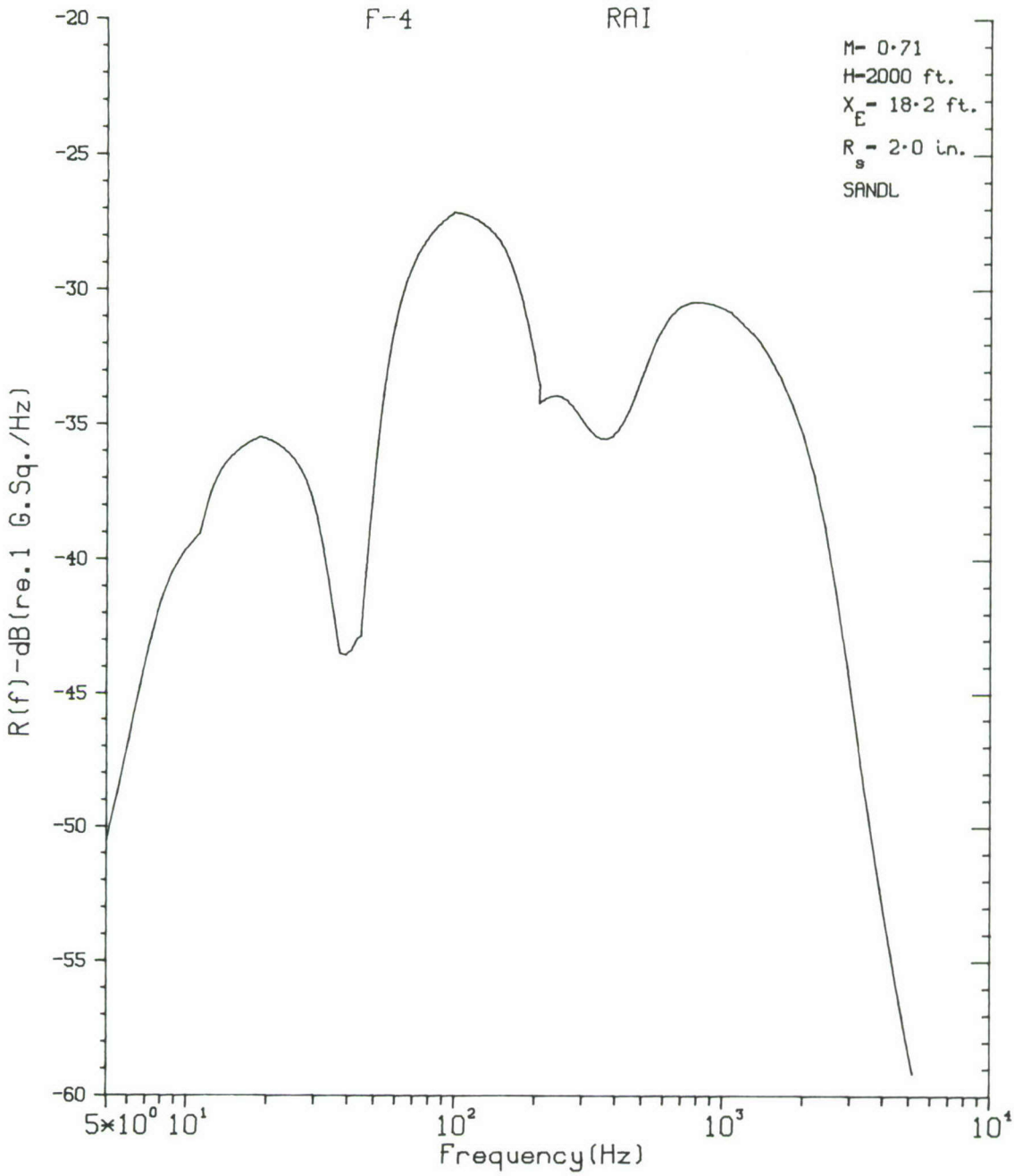


Figure 15. Predicted Vibration Input to RAI, Instrument Panel, Non-Isolated, RF-4C

F-4	RAI	SANDL
H =	2000.0	ALTITUDE (FT.)
M =	.71	MACH NO.
X_E =	18.20	DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMIC PROFILE (FT.)
R_S =	2.00	DISTANCE FROM SKIN (IN.)
W_E =	2.00	EQUIPMENT WEIGHT (LBS.)
T =	.0400	THICKNESS OF SKIN MATERIAL (IN.)
MATERIAL =	ALUMINUM	TYPE SKIN MATERIAL
CATEGORY =	2B	EQUIPMENT MOUNTING CATEGORY
D_F =	57.0	DIAMETER OF FUSELAGE (IN.)

All hard mounted secondary structures, of which non-isolated instrument panels are a member, involve decision criteria concerning the location of the equipment item along the mode shape of the instrument panel (see para 1.2 of Appendix E and Figure E-6). As it turns out $\varepsilon \geq \lambda/4$; so R(f) has been selected, plotted and the results are shown in Figure 15. Note that if the user does not have a suitable estimate for the first bending mode frequency of the panel (f_{cIIb}) then he may refer to the recommended values in Table II, Section III.

1.4 A-7D (Instr. Panel, isolated)

The A-7D features an isolated instrument panel (isolator natural frequency, f_{cIIa}, is 45 Hz). This problem involves a Radio Frequency Indicator (RFI) mounted on the instrument panel (Figures 17 and 18). We wish to predict the indicator response during SANDL flight.

The inputs are:

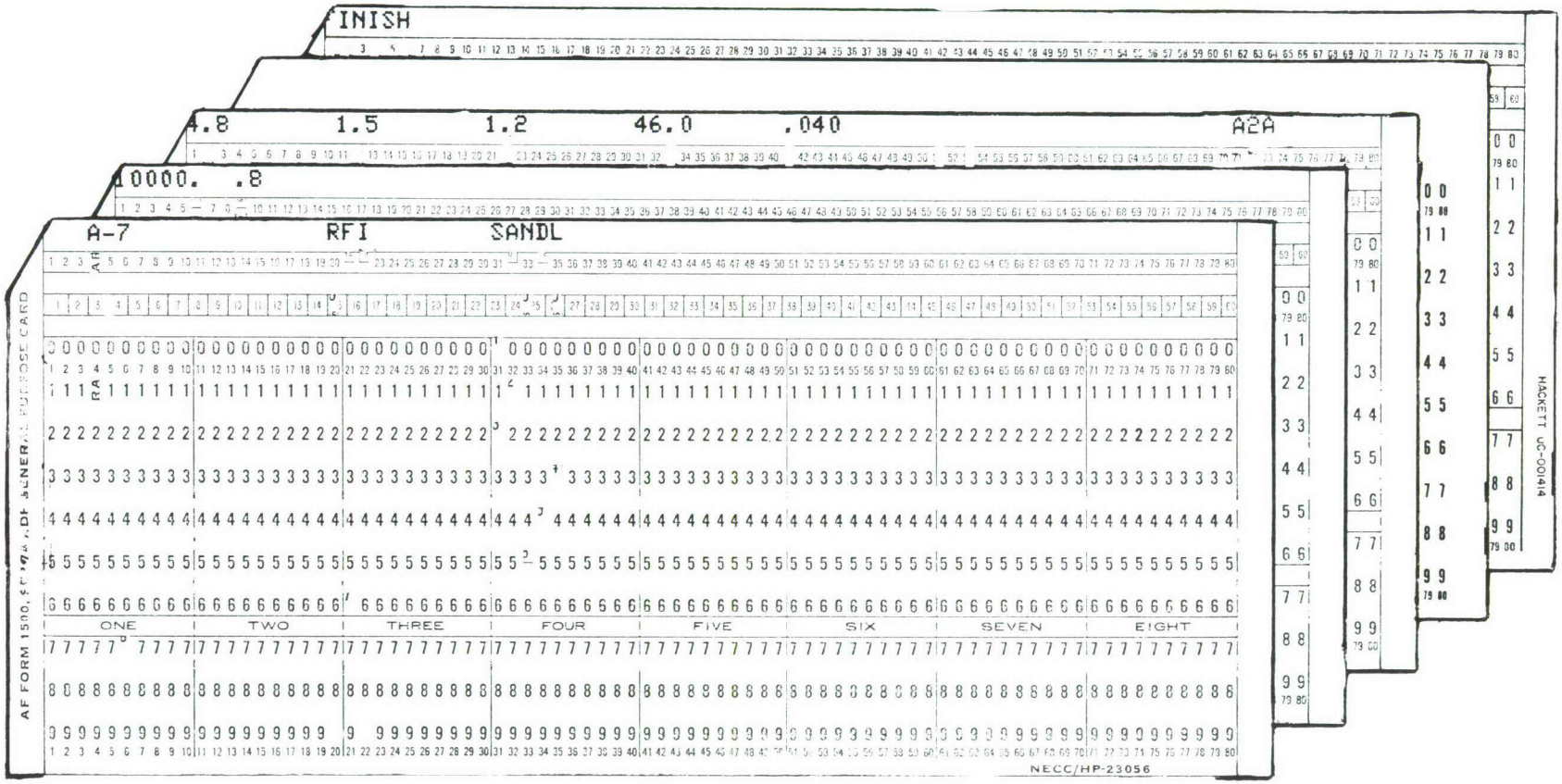


Figure 16. Input Data Cards, RFI, A-7D

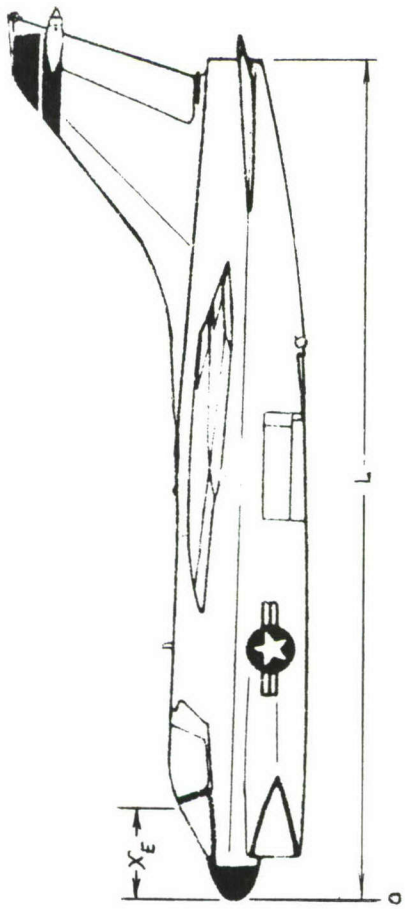


Figure 17. Location of RFI, Instrument Panel, Isolated, A-7D

A-7D	RFI	SANDL
H =	10000.0	ALTITUDE (FT.)
M =	.80	MACH NO.
X_E =	4.80	DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMIC PROFILE (FT.)
R_S =	1.50	DISTANCE FROM SKIN (IN.)
W_E =	1.20	EQUIPMENT WEIGHT (LBS.)
T =	.0400	THICKNESS OF SKIN MATERIAL (IN.)
MATERIAL =	ALUMINUM	TYPE SKIN MATERIAL
CATEGORY =	2A	EQUIPMENT MOUNTING CATEGORY
D_F =	46.0	DIAMETER OF FUSELAGE (IN.)

The predicted response of the instrument panel, or the input to the RFI, is shown in Figure 18.

1.5 F-15 (Black Box Input, Shock Mounted)

A black box assembly, consisting of the TACAN and the APX-76, is located in the nose region of the F-15 (Figure 20). The assembly is shock mounted. The isolator natural frequency is 25 Hz. We wish to predict the vibration input to the shock mounts for the SANDL case as well as for the buffet turn (BT).

The inputs are:

F-15	APX-76	BT
H =	25000.0	ALTITUDE (FT.)
M =	.90	MACH NO.
X_ε =	10.1	DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMIC PROFILE (FT.)
R_S =	5.00	DISTANCE FROM SKIN (IN.)
W_E =	54.00	EQUIPMENT WEIGHT (LBS.)
T =	.0400	THICKNESS OF SKIN MATERIAL (IN.)
MATERIAL =	ALUMINUM	TYPE SKIN MATERIAL
CATEGORY =	1B	EQUIPMENT MOUNTING CATEGORY
D_F =	40.0	DIAMETER OF FUSELAGE (IN.)

The entry condition for buffet turn is M=0.90 and H=25,000 ft. Note that the entry condition, or reference straight and level,

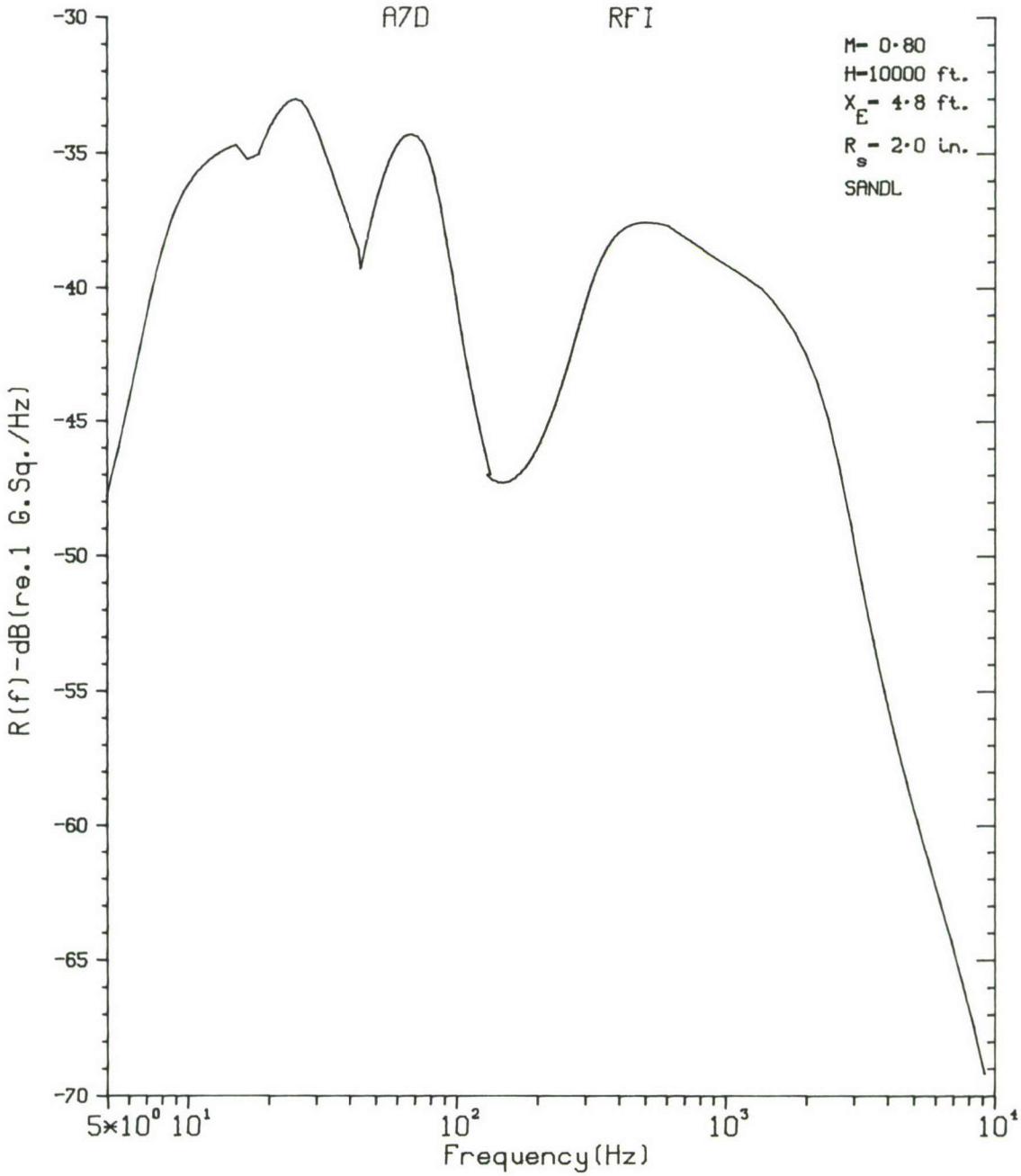


Figure 18. Predicted Vibration Input ot RFI, Instrument Panel, Isolated, A-7D

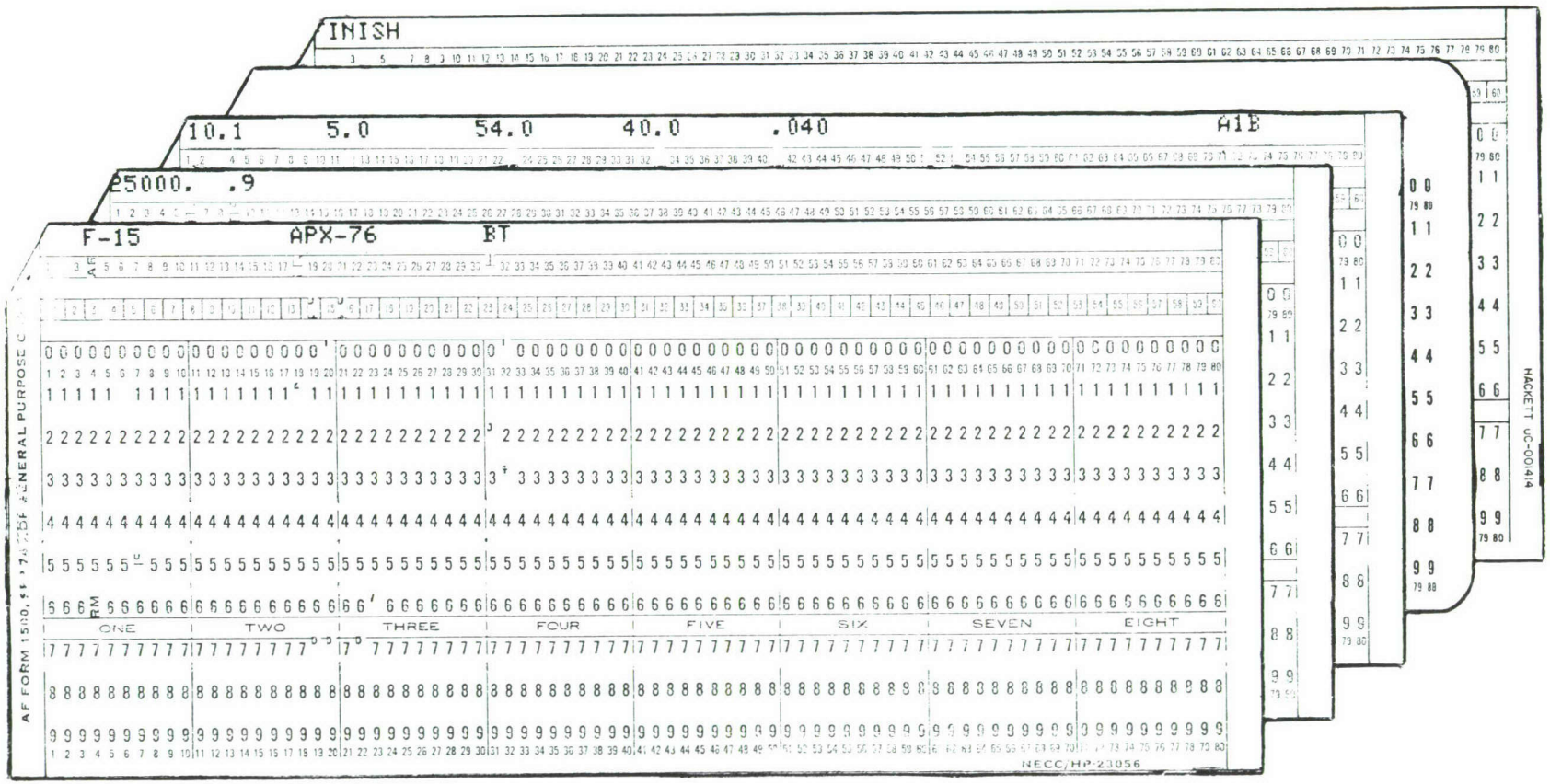


Figure 19. Input Data Cards, APX-76, F-15

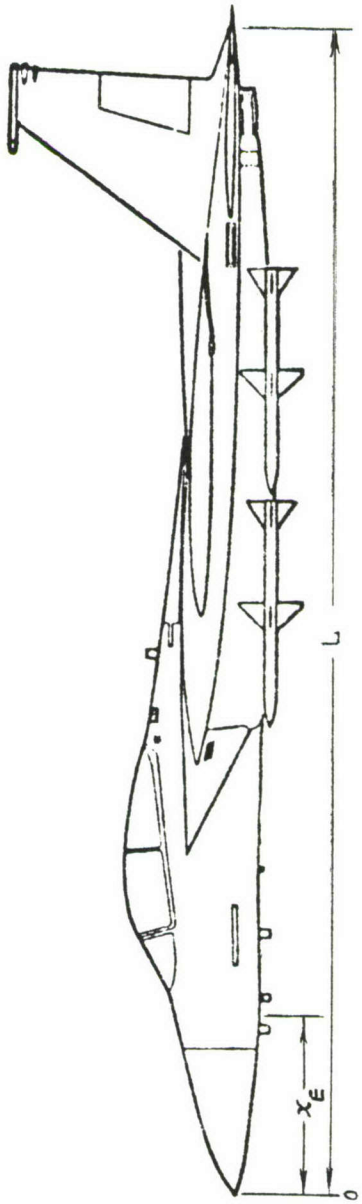


Figure 20. Location of APX-76, Isolated, F-15

is automatically plotted in the program along with the buffet turn curve (see para 3.1.2.1 of Section III). The resultant plots are shown as Figures 21 and 22. The impressive rise of the vibration level in the region of 35 Hz during buffet turn reminds us that severe spectral levels, though brief in duration, can be encountered ... and we add here, that they often go unnoticed by the vibration engineer.

1.6 F-15 (Black Box Response, Shock Mounted)

We repeat para 1.5, except now we wish to predict the response of the assembly mounted on the isolator. If we change category I(b) to I(a) and enter the isolator natural frequency as f_{cIa}=25Hz, we may then add the remaining inputs of para 1.5 to complete the program (Figure 23). The equipment response for entry (reference) SANDL and, finally, for BT is shown as Figures 24 and 25. Here, we see the equipment response -- an excitation magnified significantly by the isolator transfer function.

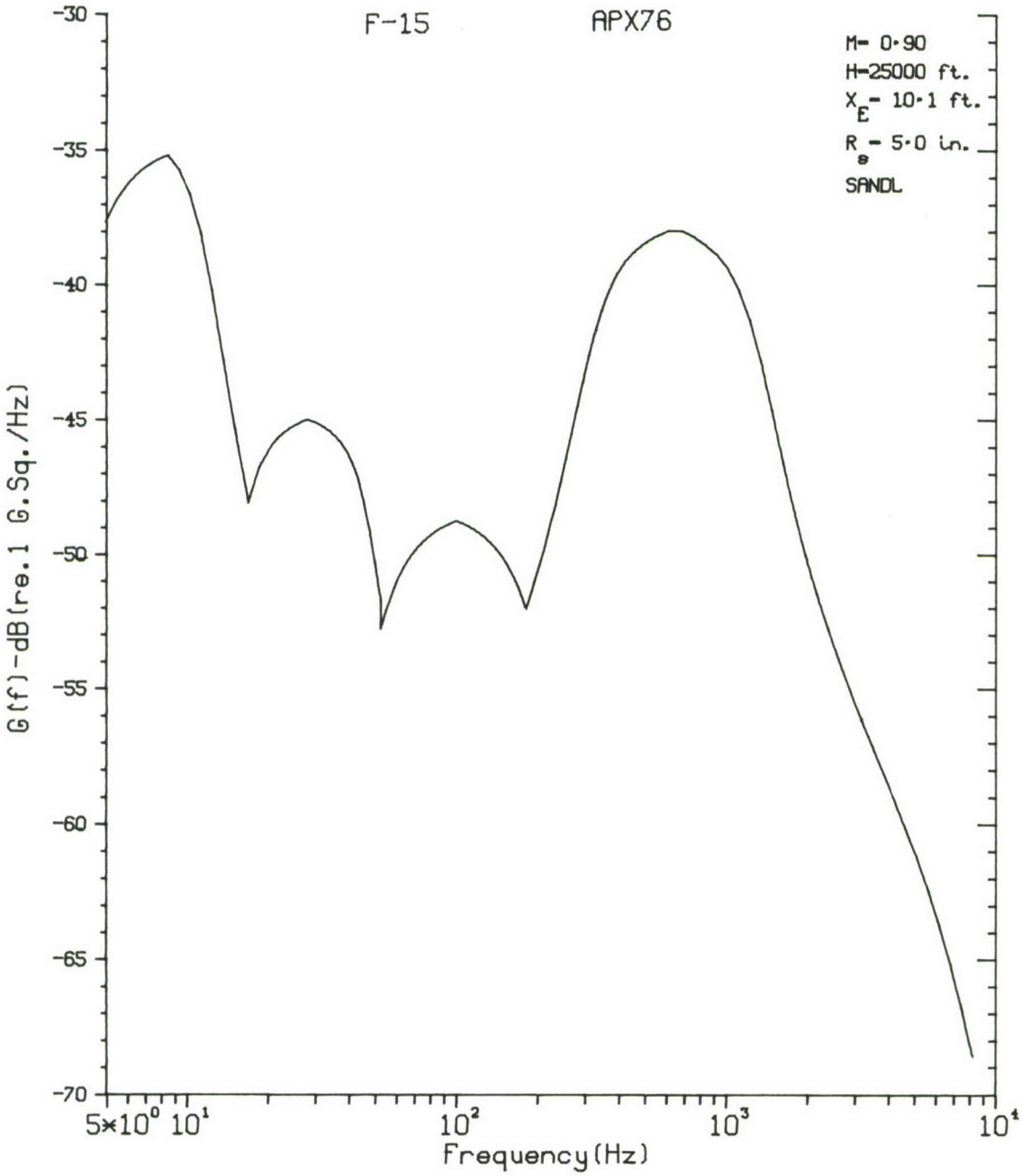


Figure 21. Predicted Input to APX-76, Isolated, F-15, for SANDL Flight

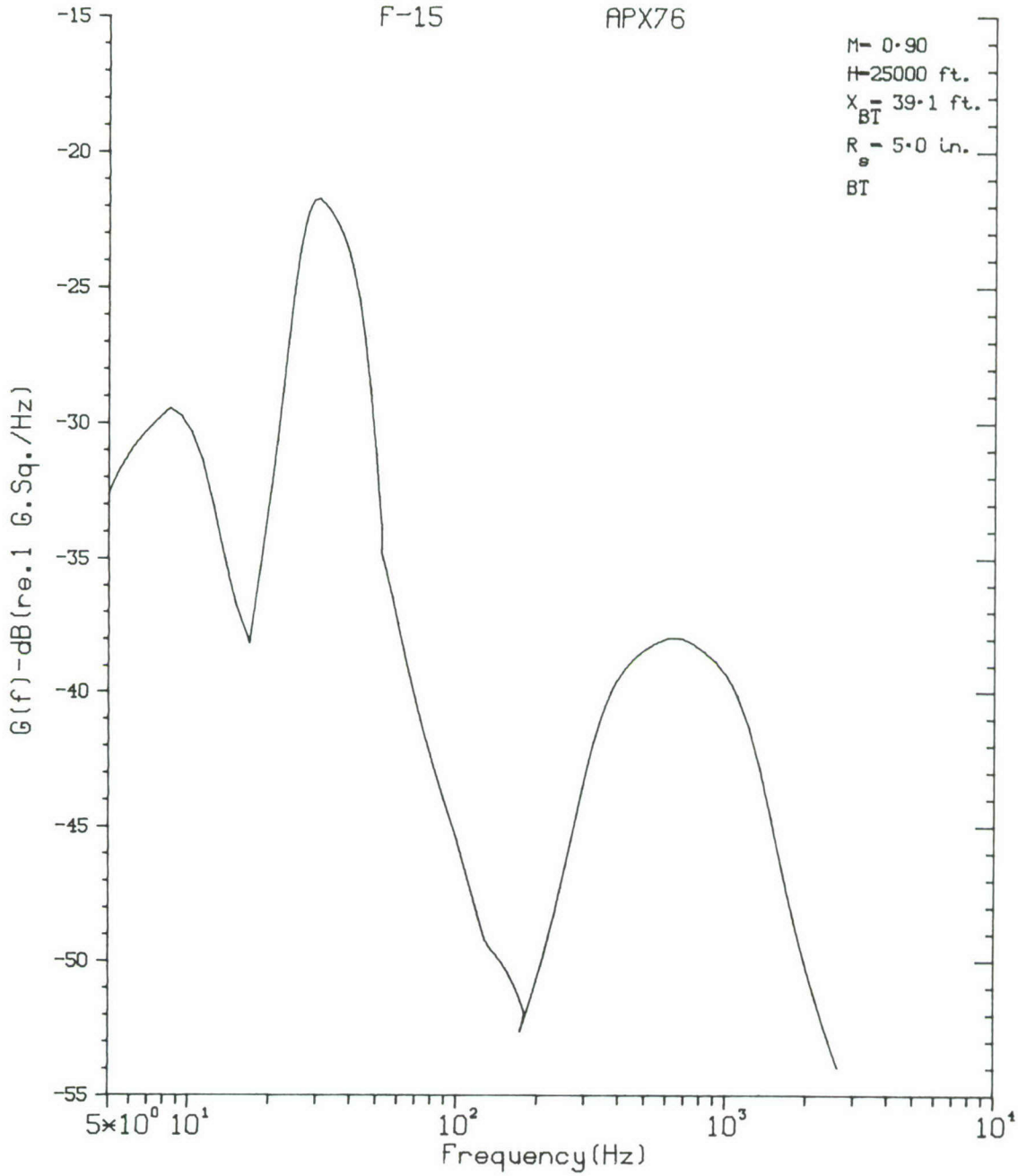


Figure 22. Predicted Input to APX-76, Isolated, F-15, for Buffet Turn

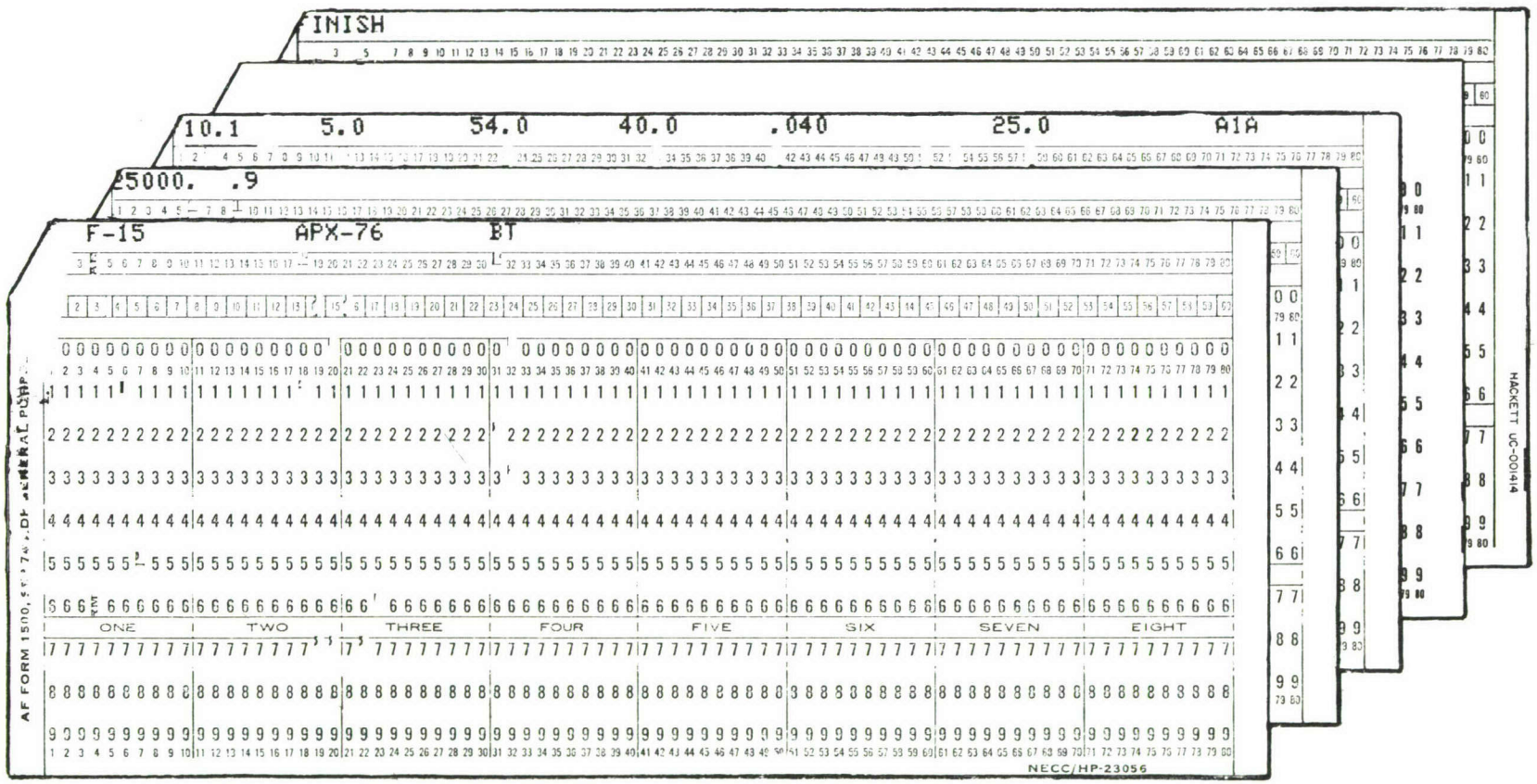


Figure 23. Input Data Cards, APX-76 Response, F-15

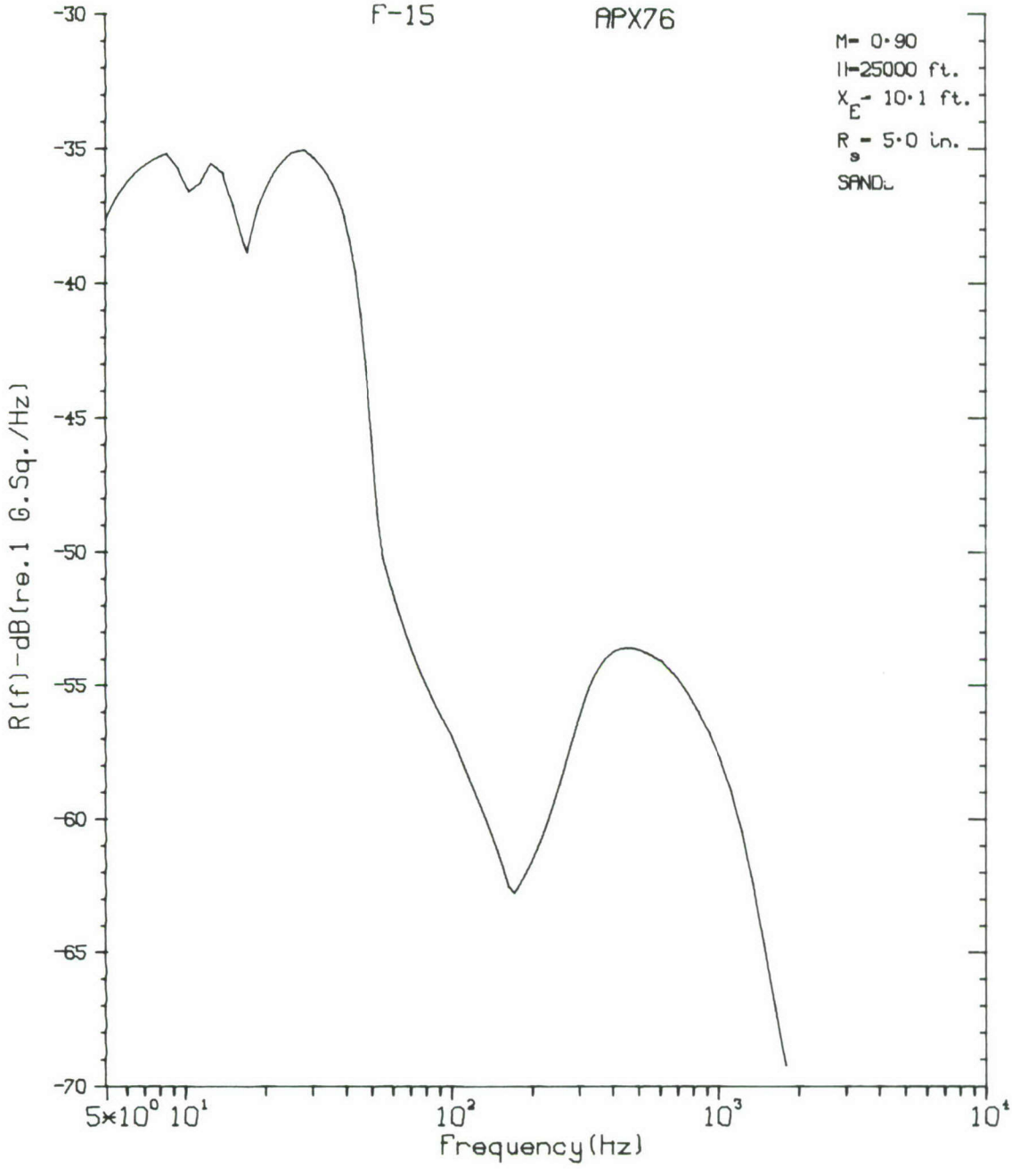


Figure 24. Predicted Response of APX-76, F-15, for SANDL Flight

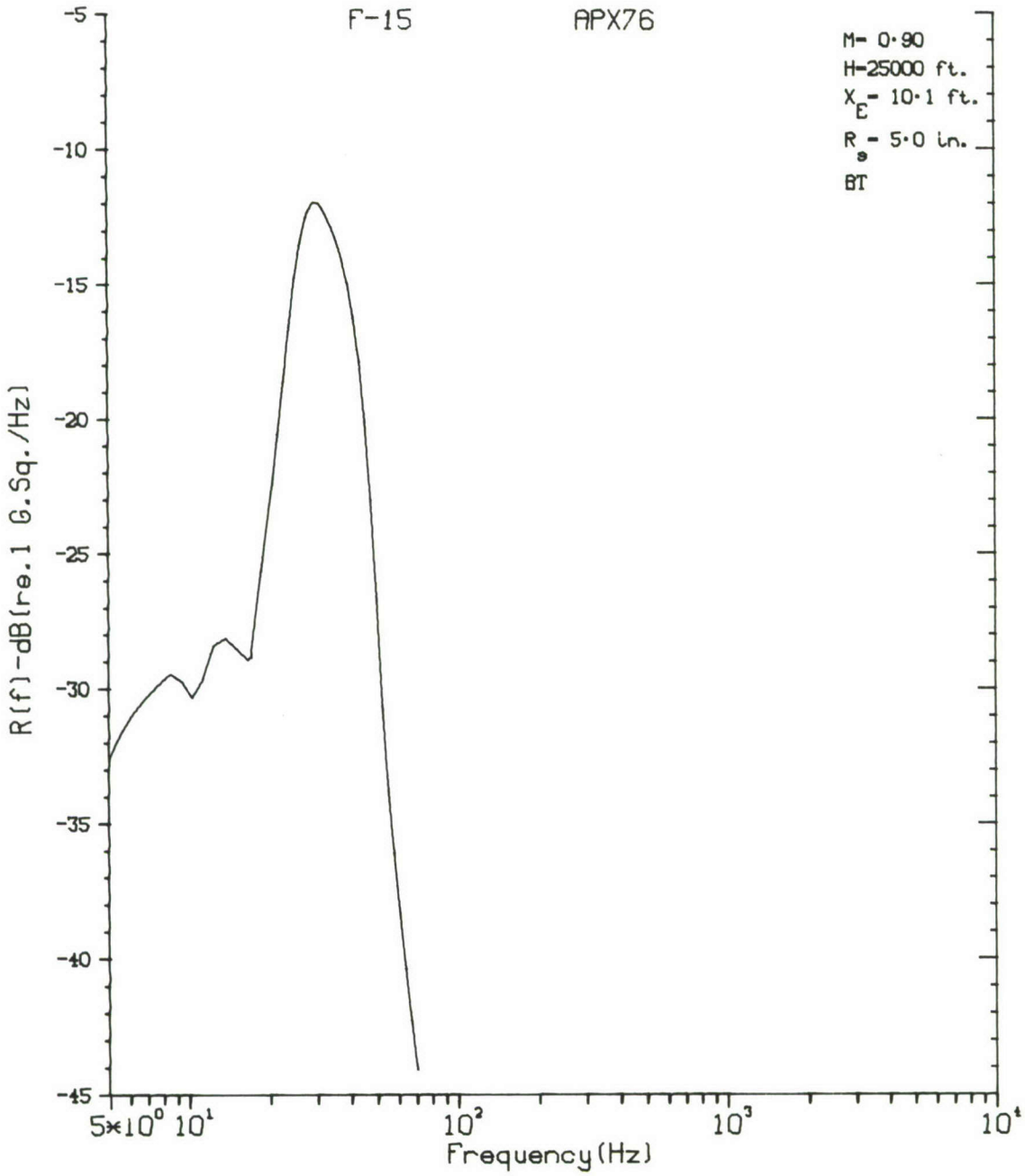


Figure 25. Predicted Response of APX-76, F-15 for Buffet Turn

SECTION V

REVIEW

1.0 Discussion

This work concludes with a discussion that briefly reviews the general philosophy of the prediction method, summarizes results thus far obtained, underlines some remnant problem areas or shortcomings, and finally, terminates with recommendations for future studies. Sections II and III show that, in the main, this prediction method employs the cross product of input and tranfer functions both of which are utilized as variants of a basic equation whose curve is fundamentally sigmoidal in form and plastic in temperament. Indeed, in this approach to vibration prediction, functions of a consummate virtuosity are all but mandatory -- and thus far, the flex function, thought often distended in the application, has yet to be breached in the trial. It will remain for future applications (probably involving other special flight conditions and physical configurations) to determine the ultimate limits of its adaptability; in the meantime, it seems to be working reasonably well.

But this prediction approach is not solely preoccupied with the manipulation of an abstruse function. The process is also shaped and otherwise supplemented with large doses of empiricism, chiefly in the form of vibration data which is looped back into the various functions (most notably, the special functions) to provide corrective

information resulting in readjustments of the function parameters. In general, the more relevant, the more detailed, and the more perceptive the data choice; the more accurate the results. We go further: the more details that are known about the aircraft skin, of the equipment mounting method, of the equipment size, shape, function and weight, of the class of the equipment support structure used, of the equipment proximity to special and significant physical configurations (guns, flaps, speed brakes, landing gear, refueling doors, cavities) -- the more that is known of these specifics, the more readily transfer and special functions can be shaped, sized, and integrated into the prediction format to further the advance of a more realistic prediction end.

With these guidelines in mind, it is useful to review some deficient areas of the vibration data process and reflect on its consequences concerning the results of this prediction technique.

1.1 Instrument Panels

Extant vibration data covering instrument panels is relatively scarce, especially data from pickups that measure the input-output properties of the panel or data from response pickups that are located in the central one-third of the panel (central one-third of the half panel, if the panel is tied down at the center). Data indicating the panel weight, the mounting method (isolated or non-isolated) and the isolation frequency, if isolated, is nearly always unspecified and must be ascertained separately -- often at considerable difficulty. From these observations, it is easy to deduce that the

instrument panel transfer functions for the isolated and non-isolated case (Categories IIa and IIb) will, in all probability, be adjusted as additional suitable data becomes available. Finally, it is worth noting that instrument panel vibration, because of the severe levels, should be recorded, wherever possible, during violent flight phases such as buffet turn; especially for those aircraft whose cockpits are located near to, or over the wing areas.

1.2 Skin

Pickups on the skin are, sometimes, not skin mounted -- being mounted on adjacent frames, for example, and if they are placed at the central panel area, they are often of a size (mass) to roll off the high frequencies and so one must apply adjustments to the data in order to derive the transfer function (see Ref. 8). Despite these problems, the skin transfer function derived and used for this prediction process seems to be reasonably accurate for curved aluminum skin surfaces, forty thousandths of an inch thick. Suitable measurements on other type aircraft surfaces (including the wings) should be obtained, however, and much useful transfer function information can be developed for surfaces of greater thicknesses, and for that matter, surfaces of different geometry and composition. Boundary layer microphones remain a problem. They are usually massy; and, if anything, they (rather than accelerometers) are the ones to be moved over near the frame to reduce mass loading. Boundary layer microphone data are rarely accompanied with information indicating whether or not the data has been corrected for the boundary layer thickness and

the microphone effective diameter. The diameter is almost never indicated; but it should be. Sufficient spatial information (fuselage station, for example) should always be included with the microphone data in order that the down stream distance can be determined.

1.3 Buffet Turn

Vibration data covering the buffet turn (BT) maneuver is also rather hard to come by, thus the special function [S(f)] derived for the BT maneuver should be viewed as tentative; subject to future adjustments, if and when new data indicates. The general spectral characteristics occasioned by this maneuver, it is interesting to note, are similar to those generated during pullups; and if we are careful not to push the comparison too far, they are rather similar to such flight phases as lowered speed brakes, flaps, landing gears, and for that matter, open refueling doors and cavities. Processed data and extant vibration records should be sought and examined whenever opportunities arise to obtain valuable parametric information about these flight phases. Because quite apart from their being valuable contributions to the prediction process, the sudden bloom of their spectral peaks (as much as 25 dB!) provides instructive warning to equipment vibration and reliability engineers that straight and level vibration is only a part of the environmental history.

1.4 Forward Looking Radar Zones

The high frequency vibration fields of forward looking radar zones tends to be appreciably higher than the norm. The reasons for this seem to be due to the relatively empty air space

provided by the radome in combination with the low internal damping of the radome cover. Without the mass loading and lossy damping attenuations provided by the usual dense equipment packaging, this area, not surprisingly, will exhibit vibration levels (above 150 Hz) in excess of 6 to 10 dB above that of predicted levels. Because of this, $H_M(f)$ and $M_M(f)$ have been adjusted (in the program) to cover applications for equipment attached to forward looking radar bulkheads. Future additional data may indicate that further adjustments and improvements are desirable.

1.5 Sinusoidals

Sinusoidal-like vibration is present in various regions of the aircraft. It is found in the presence of blowers, pumps, generators, refrigeration units; and, most conspicuously, it is seen as one approaches the engine compartments. Here the vibration content may be fairly described as consisting of predominant sinusoids, superposed on a subordinate, random background. There is no provision in this method for this class of vibration; there should be.

1.6 Determining R_s

Normally, if the equipment is located on primary structure, R_s is chosen as the nearest distance from the aircraft skin to the equipment attachment point. Although this criteria may be modified as the method is applied more and more, the interpretation stated appears to be reasonably workable. However, its application to equipments attached to shelves and beams (secondary structure) is not so certain. At present, the author has chosen the nearest distance from the skin to the place (point) where the member attaches to the primary structure.

This criteria, too, could change in the future if repeated applications suggest.

1.7 Future Work Areas

The prediction method and its associated computer program may be readily extended to cover vehicle locations and in-service operations not covered in this report. The following flight conditions and configurations are considered to be sufficiently important from the vibration viewpoint to warrant future considerations, and are listed for review.

a. Speed brakes, pullups, flaps, landing gears, and open refueling door operations.

b. Gunfire.

c. Vertical fin vibration prediction.

d. Wing locations; including missiles and their launchers.

e. Cavities (ports and open weapons bay).

f. Stores and pylons.

APPENDIX A

AERODYNAMIC PROPERTIES

1.0 Equations

The properties of P(f) are determined from the following equations and procedures:

$$P_m(f) = \frac{(.007)^2 q^2 \delta_b}{(1+.14M^2)^2 U} \tag{A-1}$$

$$f_{o'} = .61\ U/\delta_b \tag{A-2}$$

$$\delta_b = \delta_o\ (\rho/\rho_o) \tag{A-3}$$

$$\delta_o = 0.37 x Re_x^{-1/5} \left[1 + \left(\frac{Re_x}{6.9 \times 10^7} \right)^2 \right]^{1/10} \tag{A-4}$$

where:

$P_m(f)$ = max value of P(f) (PSF^2/Hz)

q = dynamic pressure, $\rho\ U^2/_2$ (PSF)

δ_b = boundary layer thickness (ft)

M = Mach number

U = free stream velocity (ft/sec)

$f_{o'}$ = characteristic, or locator frequency of the flex function at the 6 dB down point (Hz)

δ_o = boundary layer thickness at zero altitude (ft)

ρ = mean density of air at flight altitude ($slug/ft^3$)

ρ_o = mean density of air at zero altitude ($slug/ft^3$)

x = distance downstream from the leading edge of the aerodynamic profile to the equipment location (ft)

$Re_x = U\,x/\nu$ = Reynolds number at distance x

ν = kinematic viscosity (ft^2/sec)

With the mach number and altitude given for straight and level flight (SANDL) the boundary layer parameters $P_m(f)$ and f_o are then determined. A graph (Figure A-1) is used to obtain β'. These three parameters, assigned to the flex function of Figure 6 of the main text, completely defines P(f). To obtain P(f), in dB, refer to the graph shown in Figure A-2. A typical example of a boundary layer pressure spectral density curve (P(f) as a function of frequency) is shown in Figure A-3.

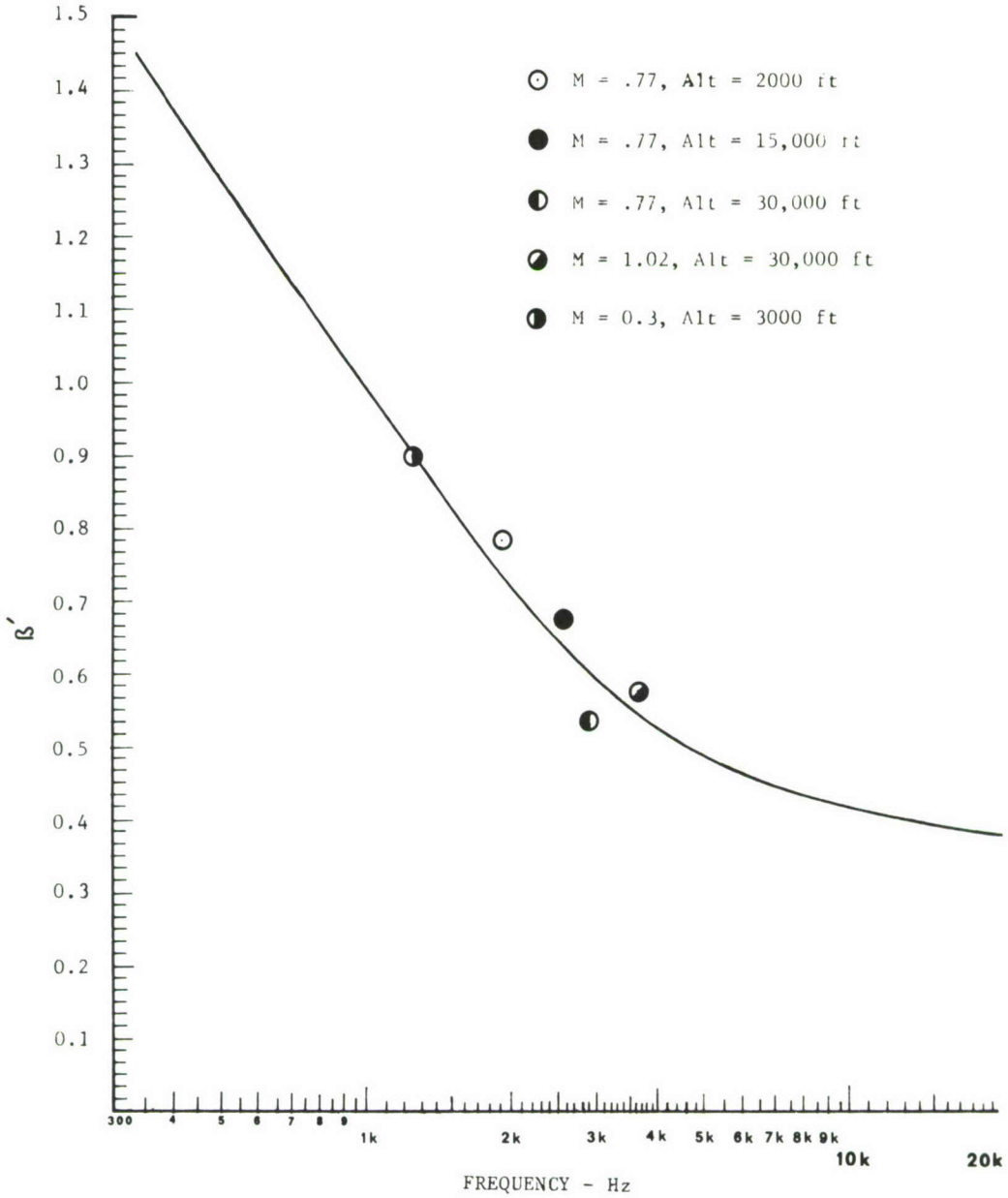


Figure A-1. The slope Factor, β', as a Function of f_o.

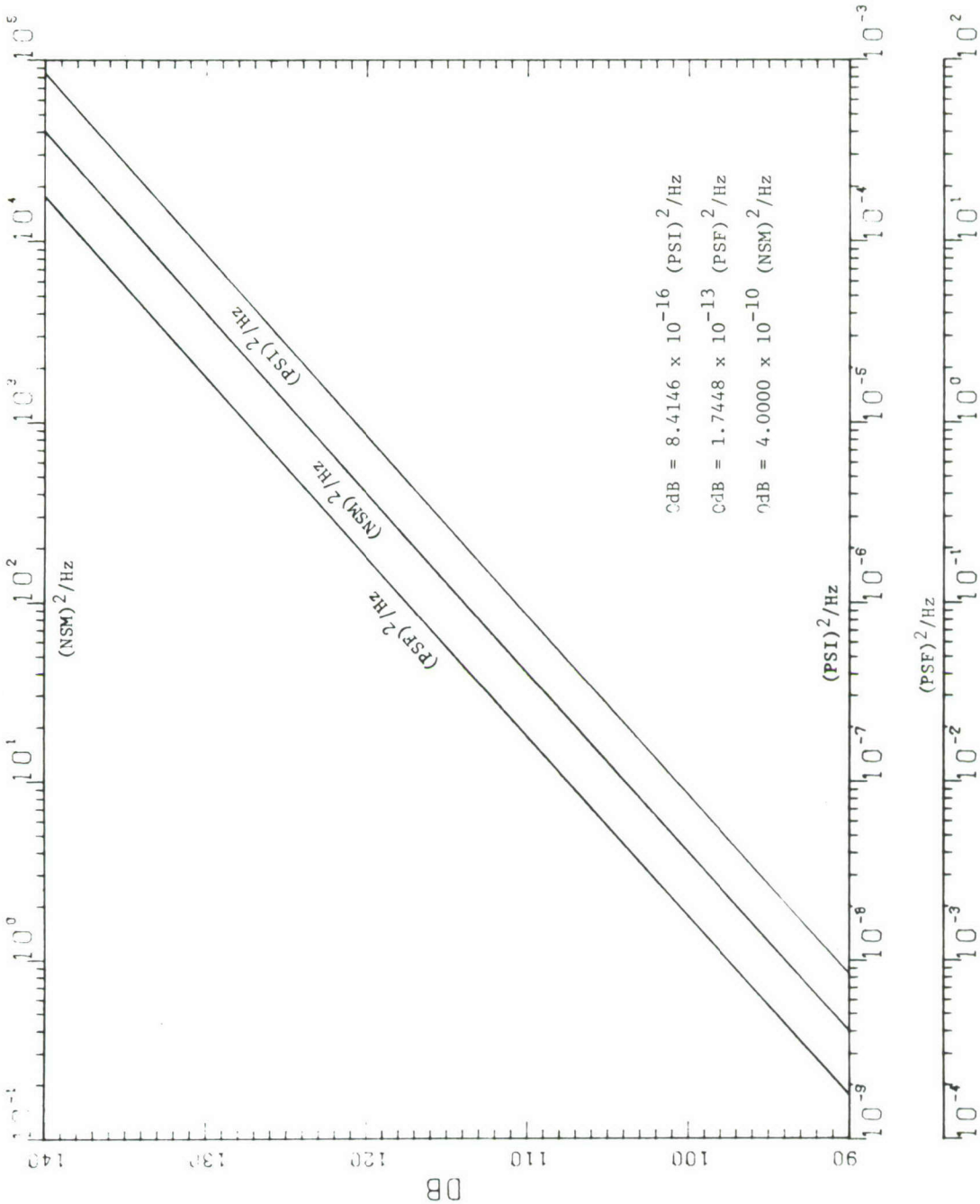


Figure A-2. Conversion Chart (dB as a Function of P(f))

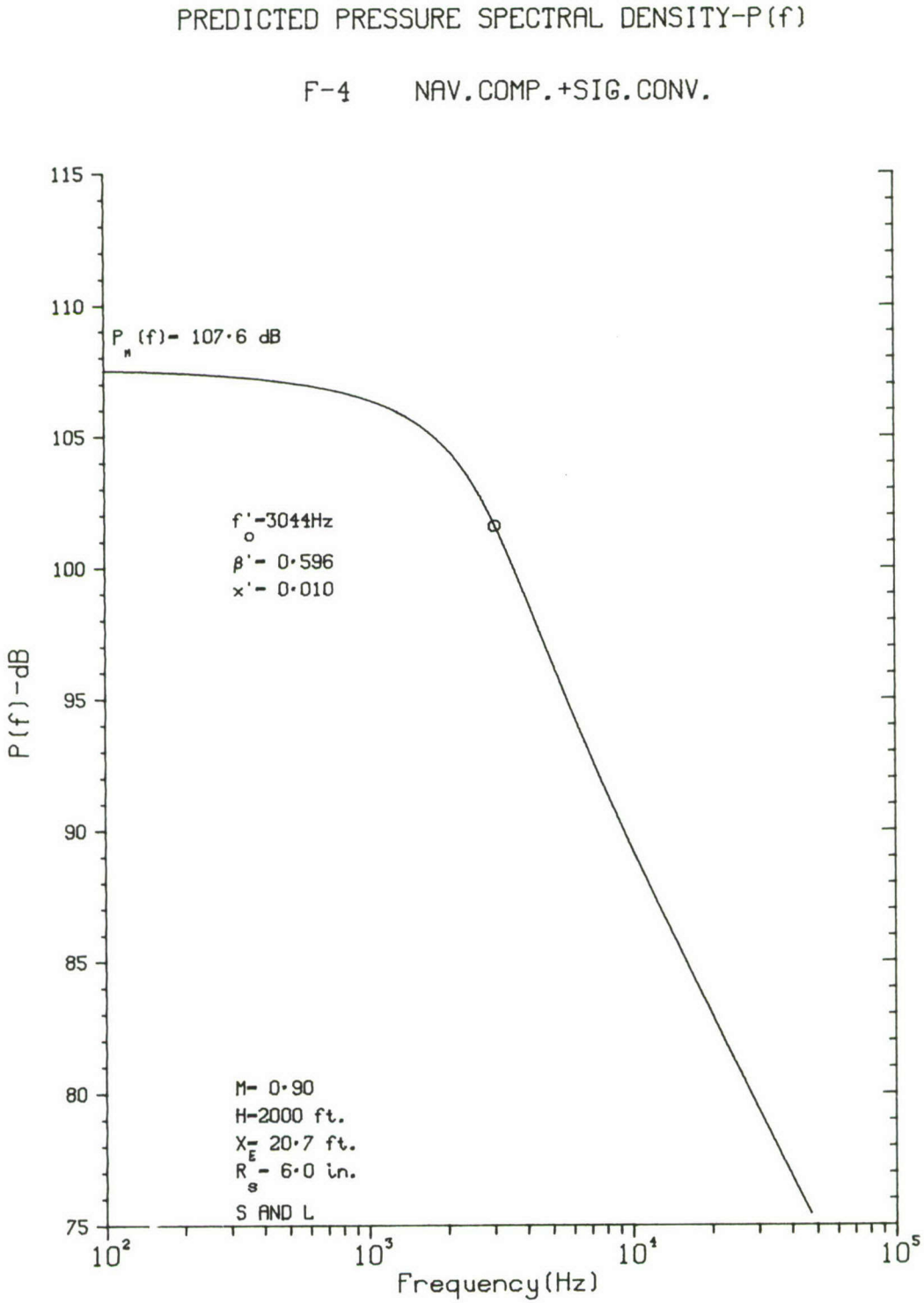


Figure A-3. Example of P(f) as a Function of Frequency

APPENDIX B

AIRCRAFT MODE SHAPES (FUSELAGE)

1.0 Terminology

The fuselage bending mode shapes are identified by the following symbolism: f_n = mode frequency (Hz)

$\emptyset_n(x)$ = normalized mode shape

FBBVS = first body bending, vertical, symmetric

SBBVS = second body bending, vertical, symmetric

x = aerodynamic distance downstream (inches)

L = maximum value of x (inches)

F.S. = aircraft fuselage station (inches)

2.0 Modal Shapes

Each deflection curve has been squared and normalized at the forward fuselage location corresponding to x=0. For some aircraft, x is approximately the same as the fuselage station; for others, it is not. Immediately following the two graphs of the first and second bending modes is a sideview of each aircraft that identifies the x and L parameters. Also included is a notation relating the x=0 coordinate to that of the aircraft fuselage station.

3.0 Derivation of Modal Properties

For fighter aircraft types not included in this Appendix, it will be necessary, as stated in Section III, to obtain the required modal properties and enter them into the program deck before the

prediction scheme can be utilized. The required modal shapes and frequencies are usually obtained from data abstracted from the aircraft ground vibration test report (GVT Report). The determination of $L_M(f)$ requires other strategems. In the absence of vibration data, $L_M(f)$ must be estimated. The procedure for this step is found in Reference 8 and is here repeated.

$$L_M(f) = A + 20 \log (L/B) + 40 \log (f_N/C) \tag{B-1}$$

where:

$L_M(f)$ = property to be determined

$A = L_M(f)$ for a known, similar fighter (dB)

L = length of the new aircraft (inches)

B = length of a known, similar aircraft (inches)

f_n = frequency, FBBVS, of the new aircraft (Hz)

C = frequency, FBBVS, of a known, similar aircraft (Hz)

The maximum value of the low frequency transfer function, $L_2(f)_M$, may be estimated using the following relationship.

$$L_2(f)_M = L_M(f) - 6 \tag{B-2}$$

where adequate vibration data is available more desirable results may be achieved by noting G(f) (during SANDL flight) and, through the use of equation 14 (Section II), solving for $L_M(f)$.

$$P(f)\ [\phi_n(x) L_M(f)] = G(f)$$

and, (B-3)

$$L_M(f) = \frac{G(f)}{P(f)\phi_n(x)}$$

Note that this procedure requires that the first bending mode shape be determined. Also, best results are obtained if one selects G(f) proximate to x=0 where the mode response is large and usually conspicuous. $L_2(f)_M$ may be determined by the response of the second bending mode G(f), relative to the first bending mode value.

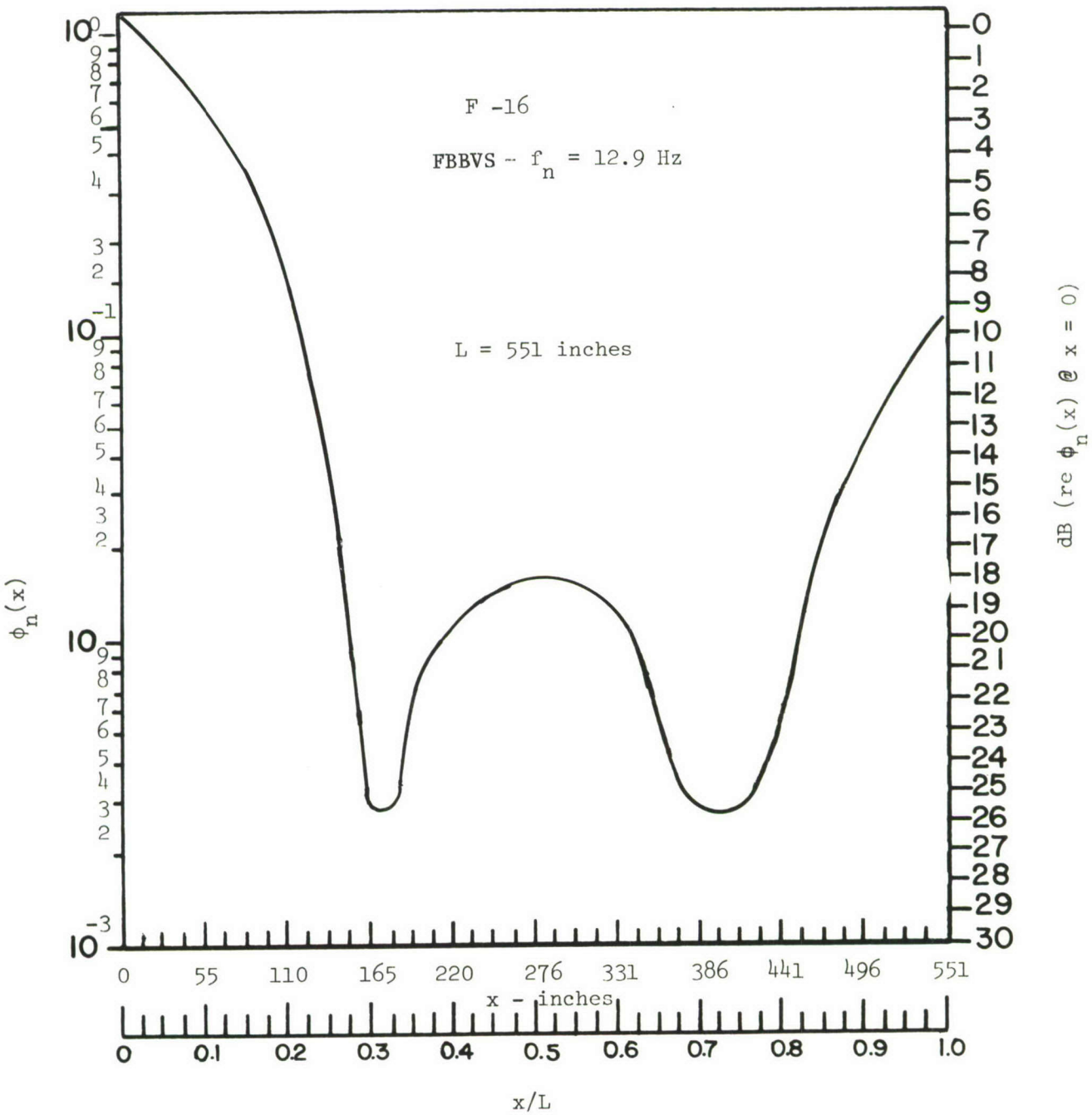


Figure B-1. Mode Shape (FBBVS) of the F-16

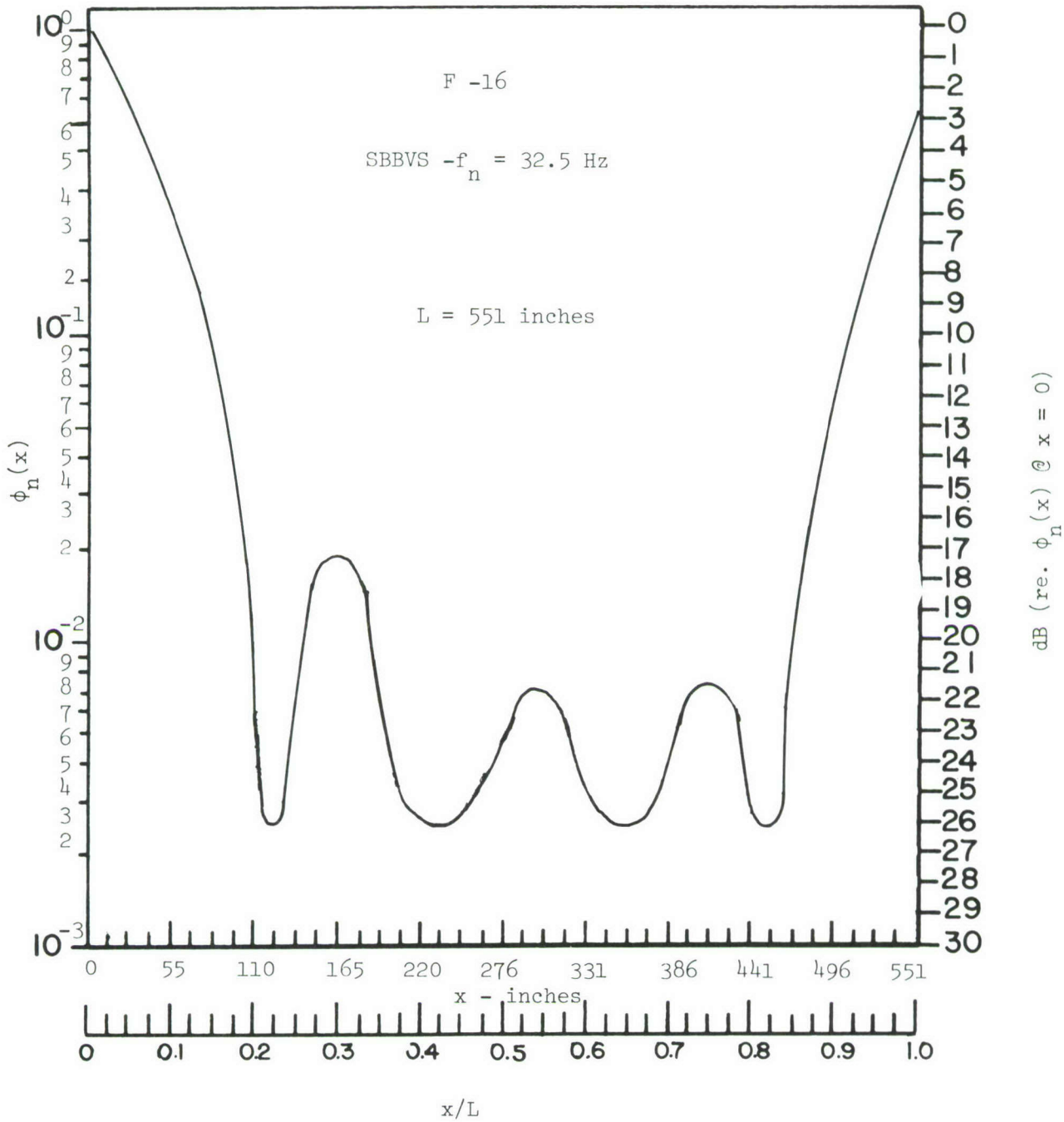
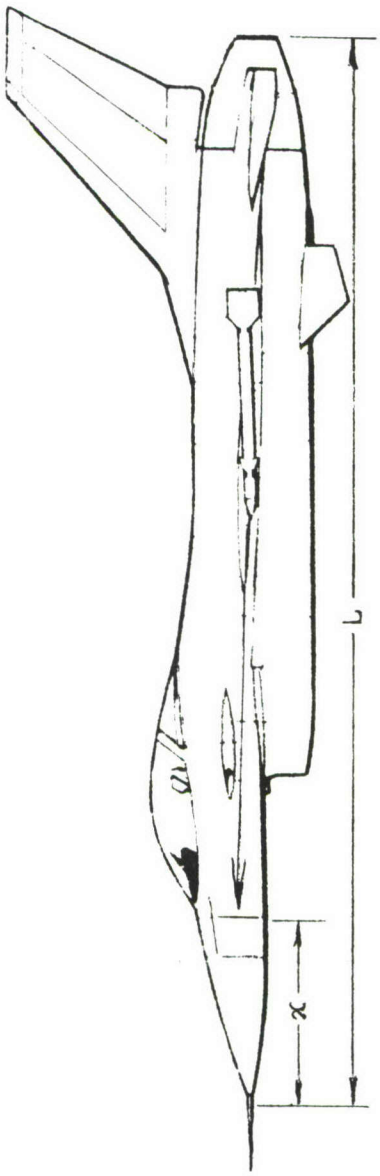


Figure B-2. Mode Shape (SBBVS) of the F-16



Note: x=0 is equivalent to F.S. = 0 inches

Figure B-3. F-16 Aircraft Showing the x and L Parameters

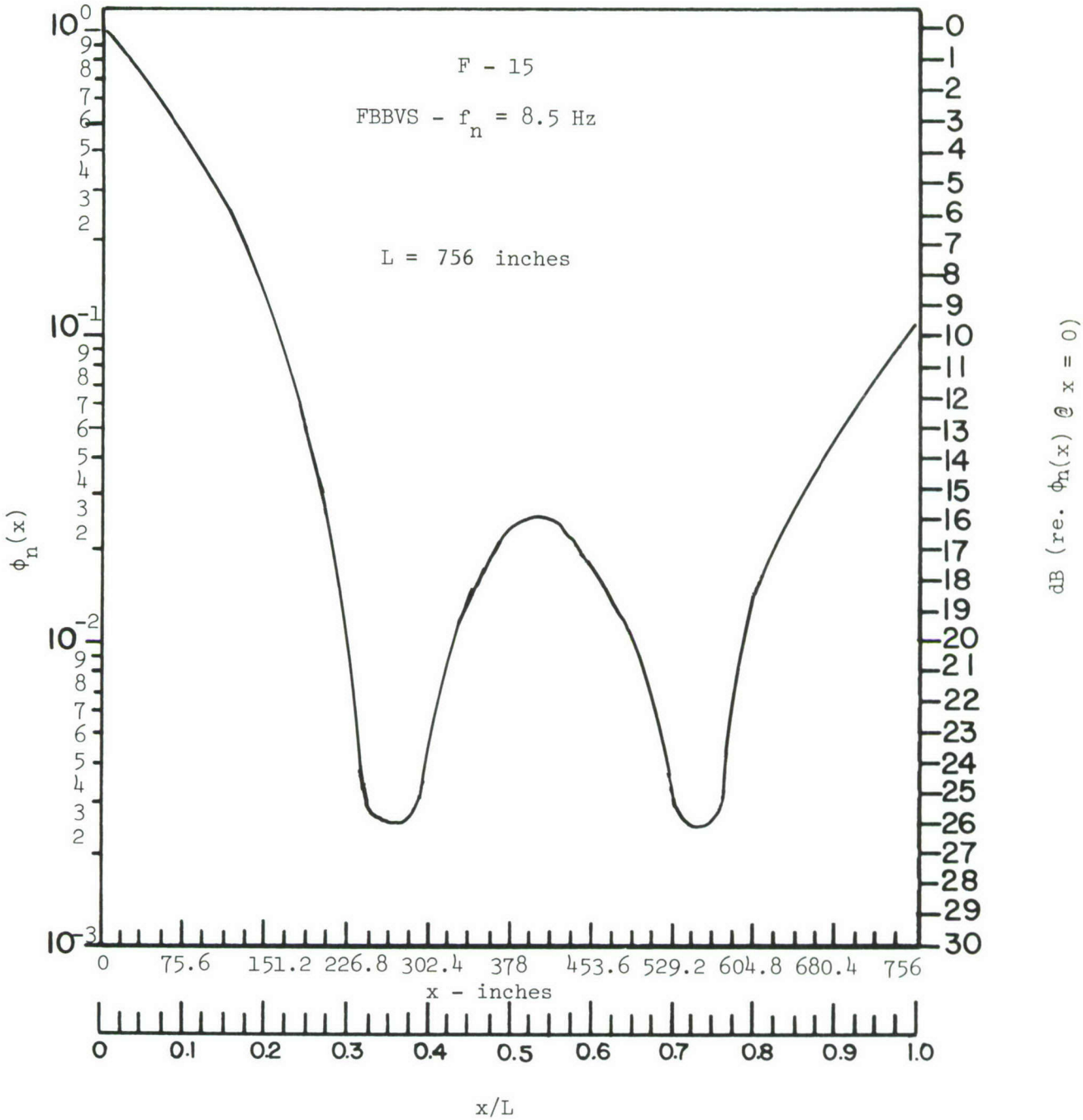


Figure B-4. Mode Shape (FBBVS) of the F-15

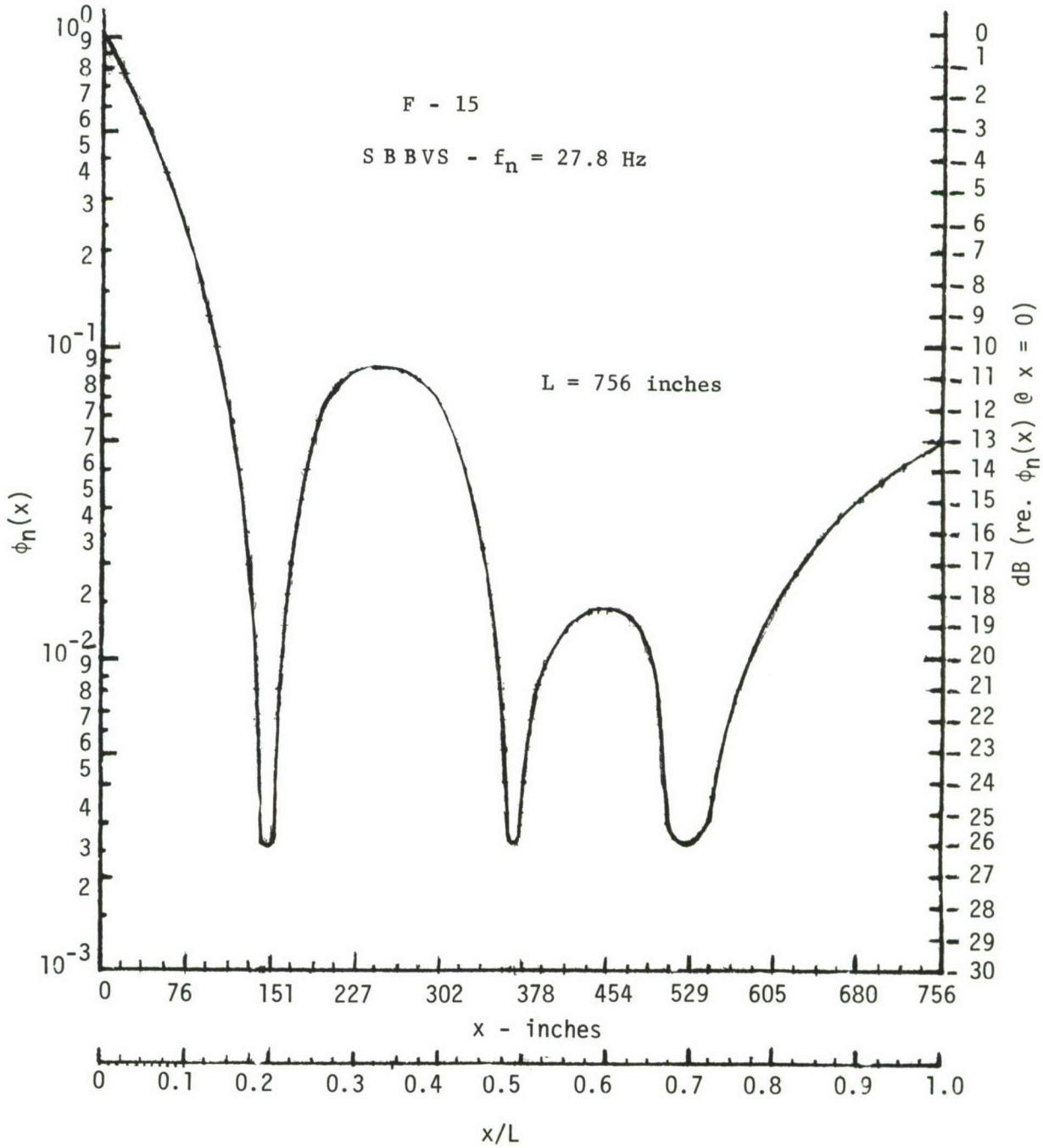
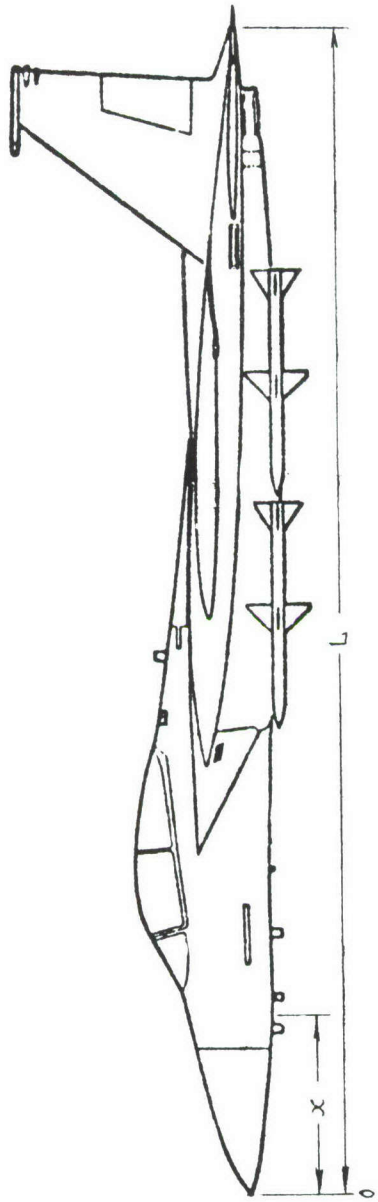


Figure B-5. Mode Shape (SBBVS) of the F-15



Note: x=0 is equivalent to F.S. = 116 inches

Figure B-6. F-15 Aircraft Showing the x and L Parameters

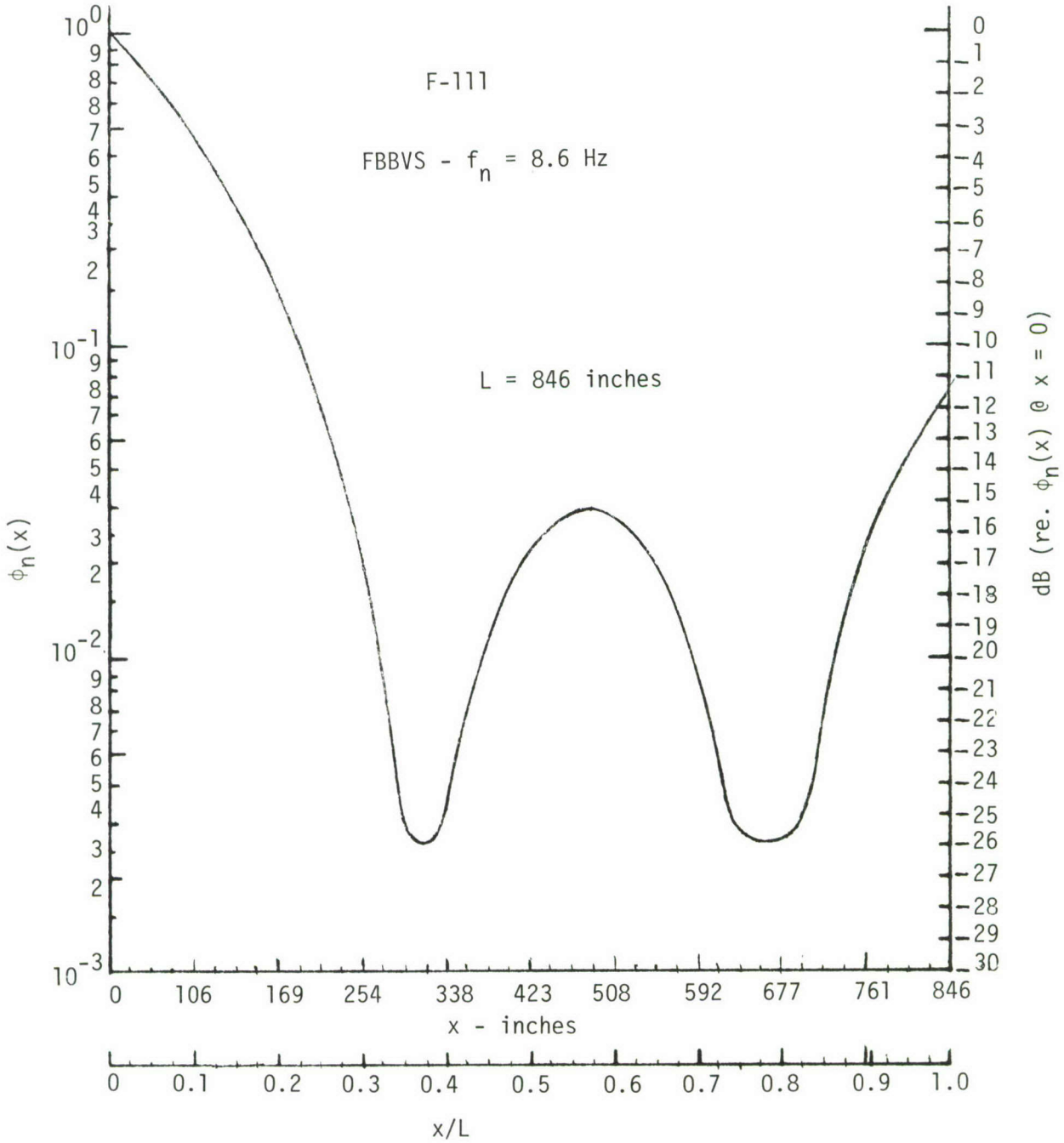
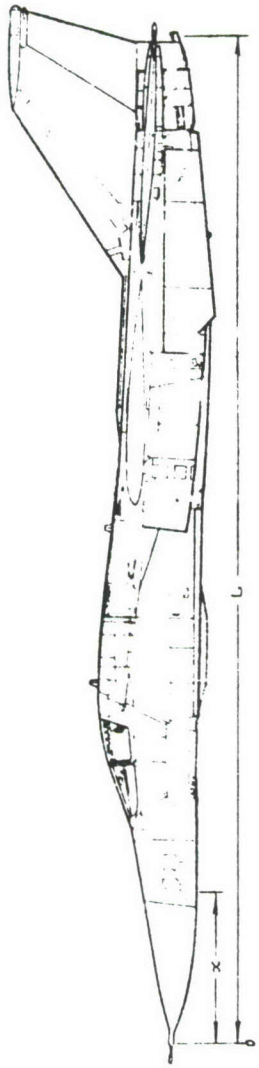


Figure B-7. Mode Shape (FBBVS) of the F-111



Note: x=0 is equivalent to F.S. = 0 inches

Figure B-8. F-111 Aircraft Showing the x and L Parameters

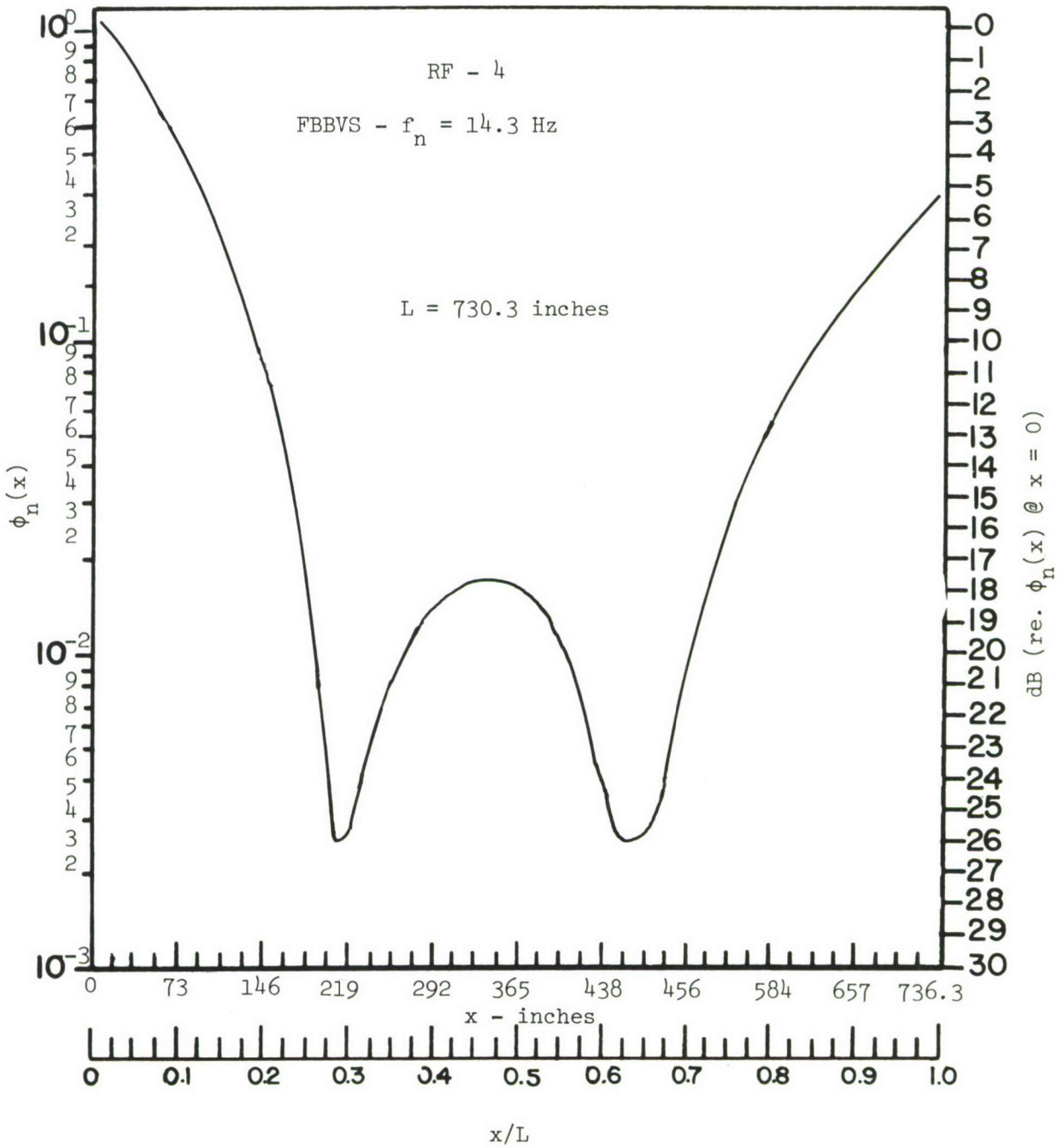


Figure B-9. Mode Shape (FBBVS) of the RF-4C

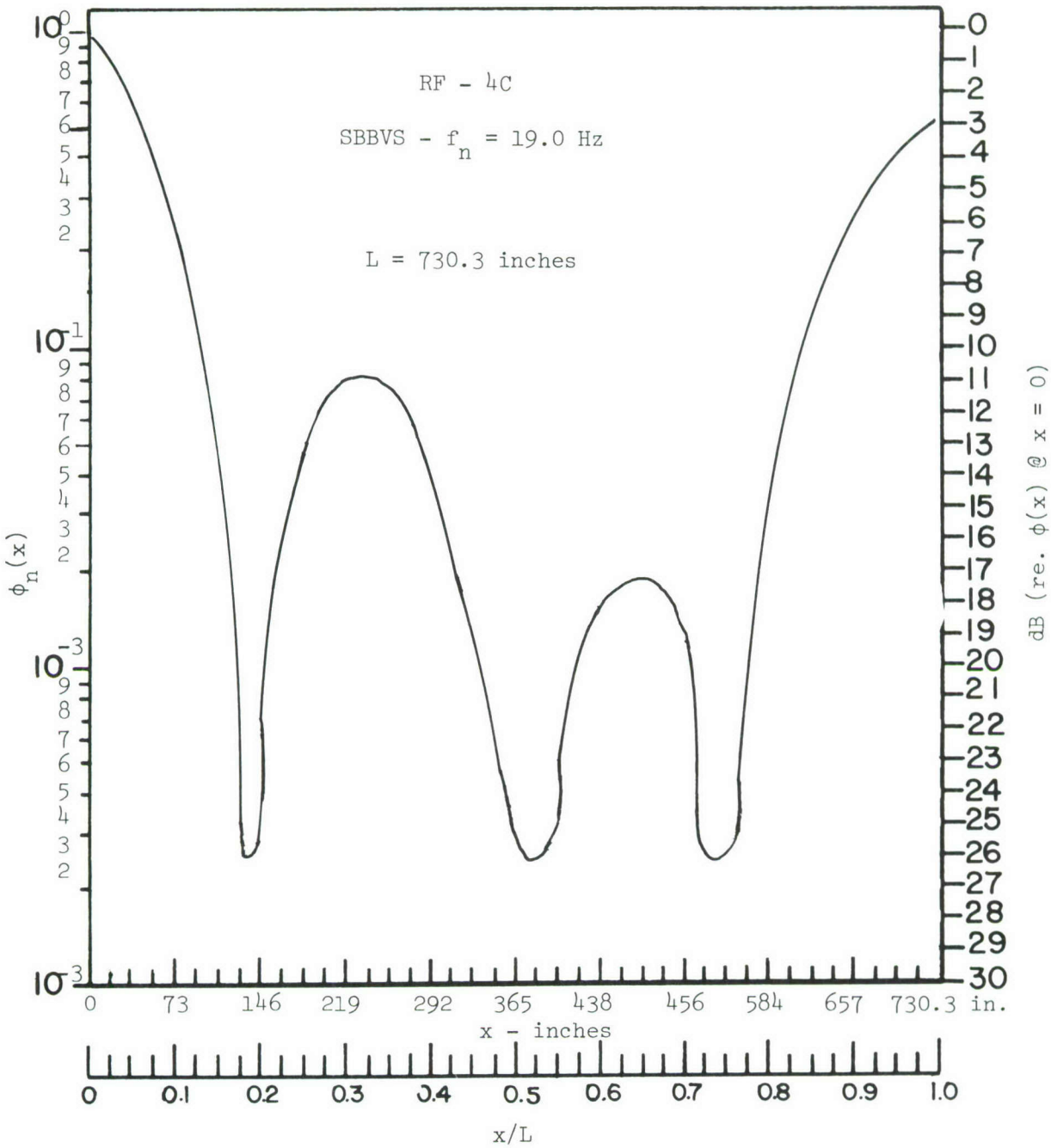
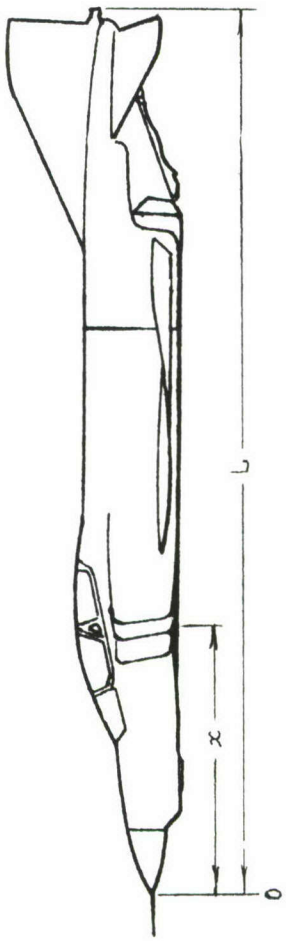


Figure B-10. Mode Shape (SBBVS) of the RF-4C



Note: x=0 is equivalent to F.S. = -59 inches

Figure B-11. RF-4C Aircraft Showing the x and L Parameters

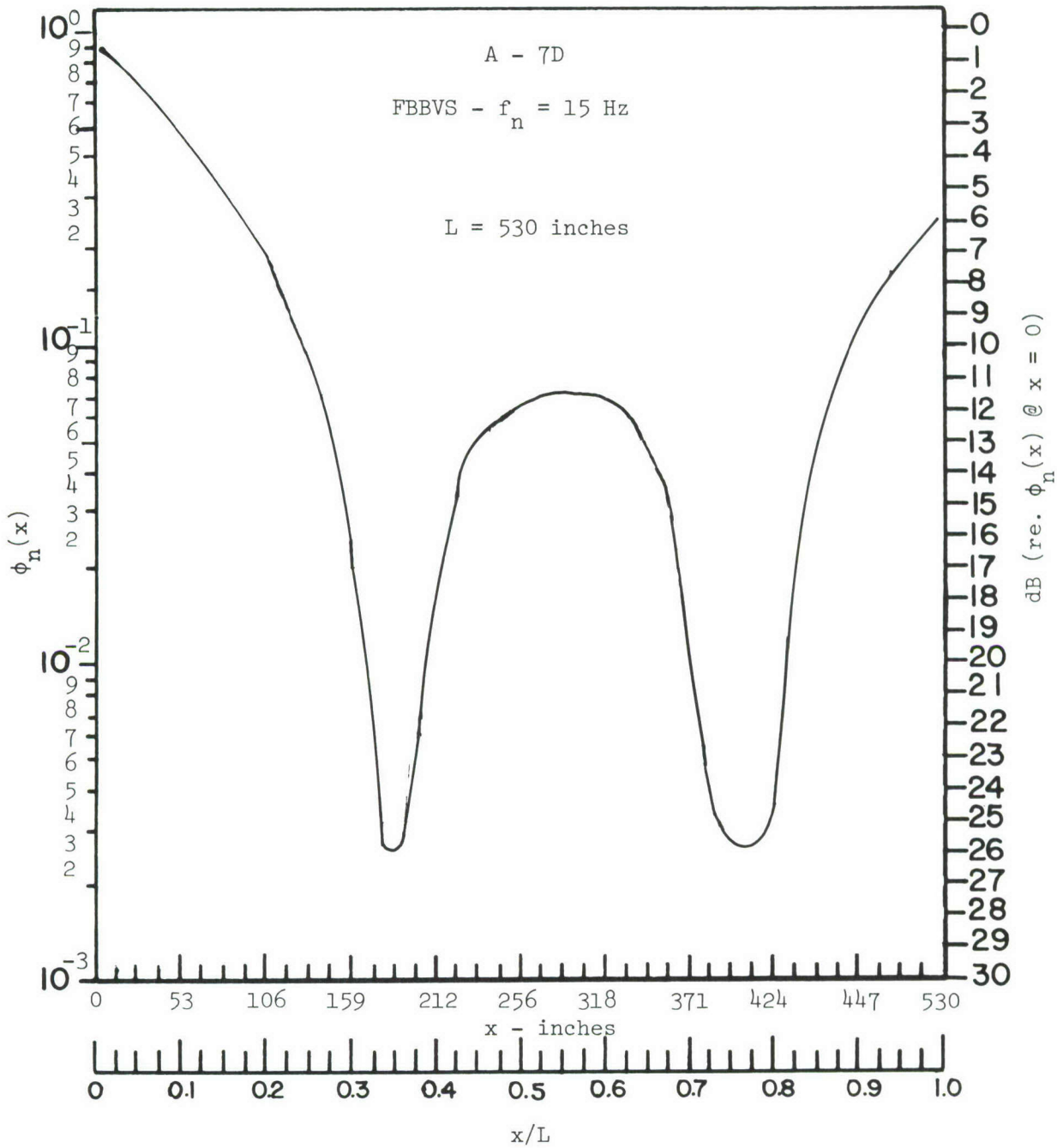


Figure B-12. Mode Shape (FBBVS) of the A-7D

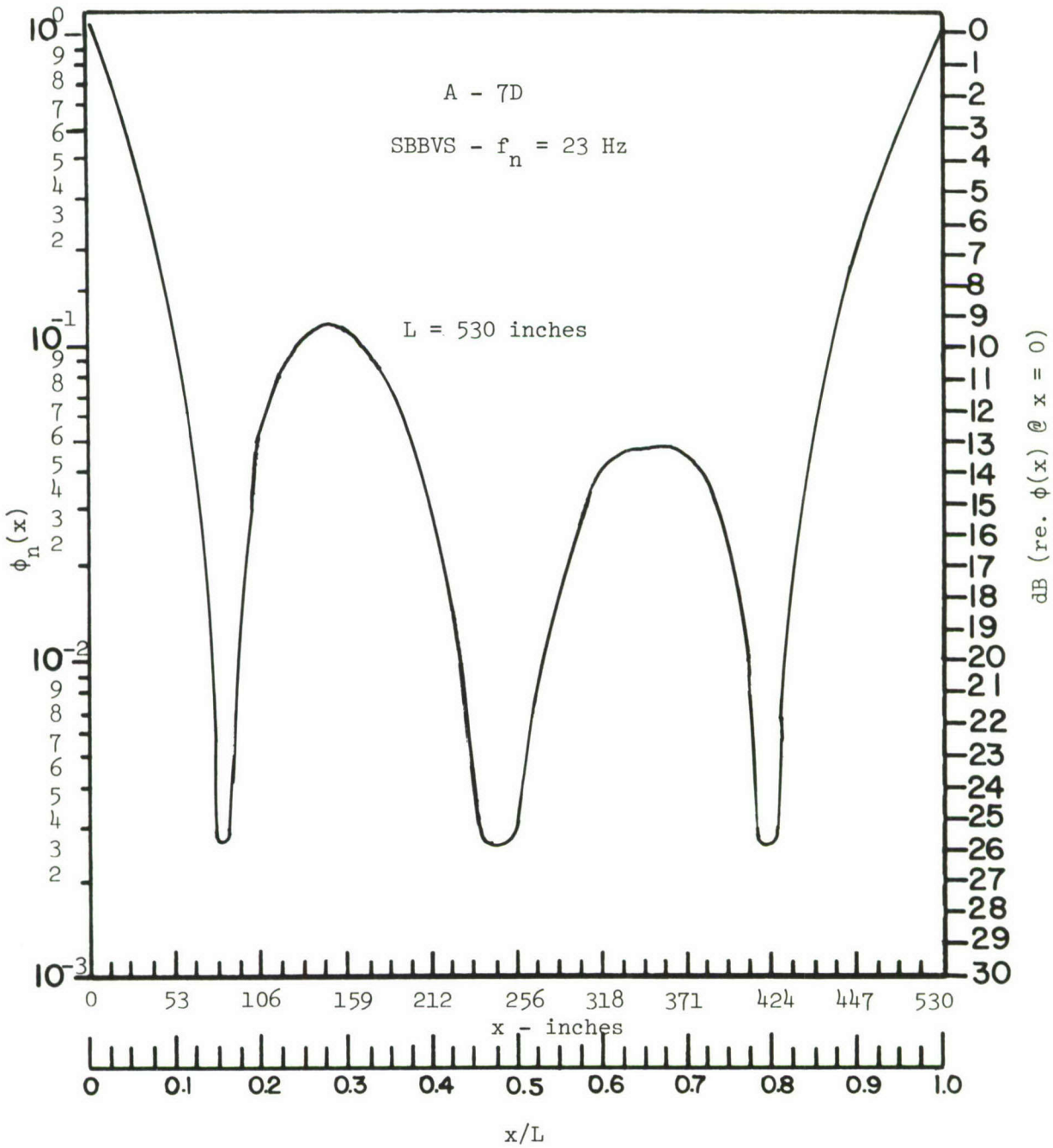
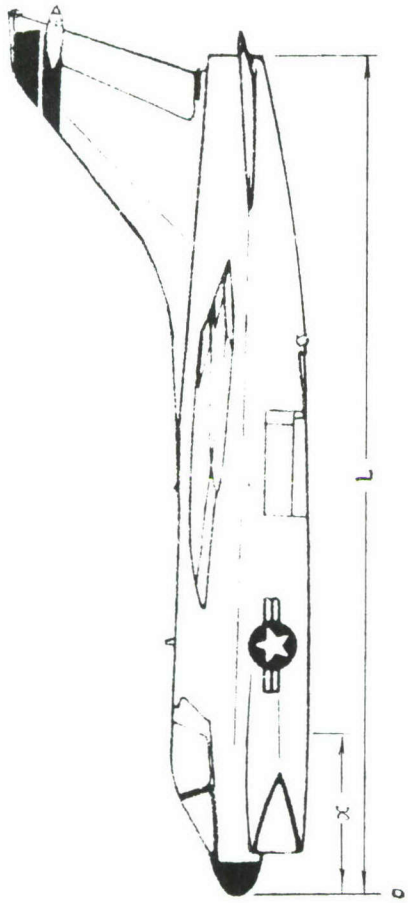


Figure B-13. Mode Shape (SBBVS) of the A-7D



Note: x=0 is equivalent to F.S. = 182 inches

Figure B-14. A-7D Aircraft Showing the x and L Parameters

APPENDIX C

TRANSFER FUNCTIONS -- LOW, MEDIUM, AND HIGH FREQUENCY

The following comments offer supplementary information to that contained in the parameter blocks of the three transfer functions. Most of the topics discussed have to do with operations that are either stored or computationally integrated into the computer program format.

1.0 Low Frequency Transfer Function, L(f)

Note that when the second mode is specified the first bending mode transfer function changes as follows: x' becomes 0.7, β' is changed to 0.23 and f_o assumes $1.54f_n$. The second bending mode transfer function $L_2(f)_M$ assumes the following parameters:

$f_o = f_{2n}/1.8$	$f_{o'} = 1.8\ f_{2n}$
$\beta = 0.2$	$\beta' = 0.2$
$x = 1.8$	$x' = 0.555$
$\alpha = 1.0$	$\alpha' = 1.8$

2.0 Medium Frequency Transfer Function, M(f)

The maximum value of M(f), which is $M_m(f)$, is reduced by $\Delta M_m(f)$ as R_s approaches the skin; that is, as R_s approaches zero. This feature, stored in the program, reflects the fact that as the equipment location moves outwardly toward the region near the skin the medium frequency vibration content begins to drop out.

Some fighter aircraft feature large internal panels, the nose avionics bay of the F-111 for example; and to allow for this spectral downshift, L(f) is translated down frequency by approximately 50 Hz.

3.0 High Frequency Transfer Function, H(f)

Figure C-3(b), among other things, shows that, contrary to the behavior of $M_m(f)$, $H_m(f)$ increases as the aircraft skin is approached.

4.0 Special Parametric Relationships

The first and second bending modes exhibit a peaked characteristic at their mode frequencies. Whenever this happens, that is, whenever the low and high frequency rolloff segment of the flex function peak at the same frequency, say f_n, then f_o and f_o' may be defined in terms of f_n. This statement is best demonstrated by use of the following sylloge.

Always, $xf_o = f_x$ and $x'f_{o'} = f_{x'}$

where: f_x = the frequency at x

and: $f_{x'}$ = the frequency at x'

Thus, $x = f_x/f_o$ and $x' = f_{x'}/f_{o'}$

Now, for the peaking case in which $f_x = f_n = f_{x'}$, it follows that

$$xf_o = f_n = x'f_o,$$

And so, $f_o = f_n/x$ and $f_o' = f_n/x'$

As observed earlier, the peaking form of the flex function appears for bending mode applications; it also appears in the description of the medium frequency transfer function, M(f) -- only to reappear once again as the limiting case for H_m (f) when R_s and W_E are assigned large values.

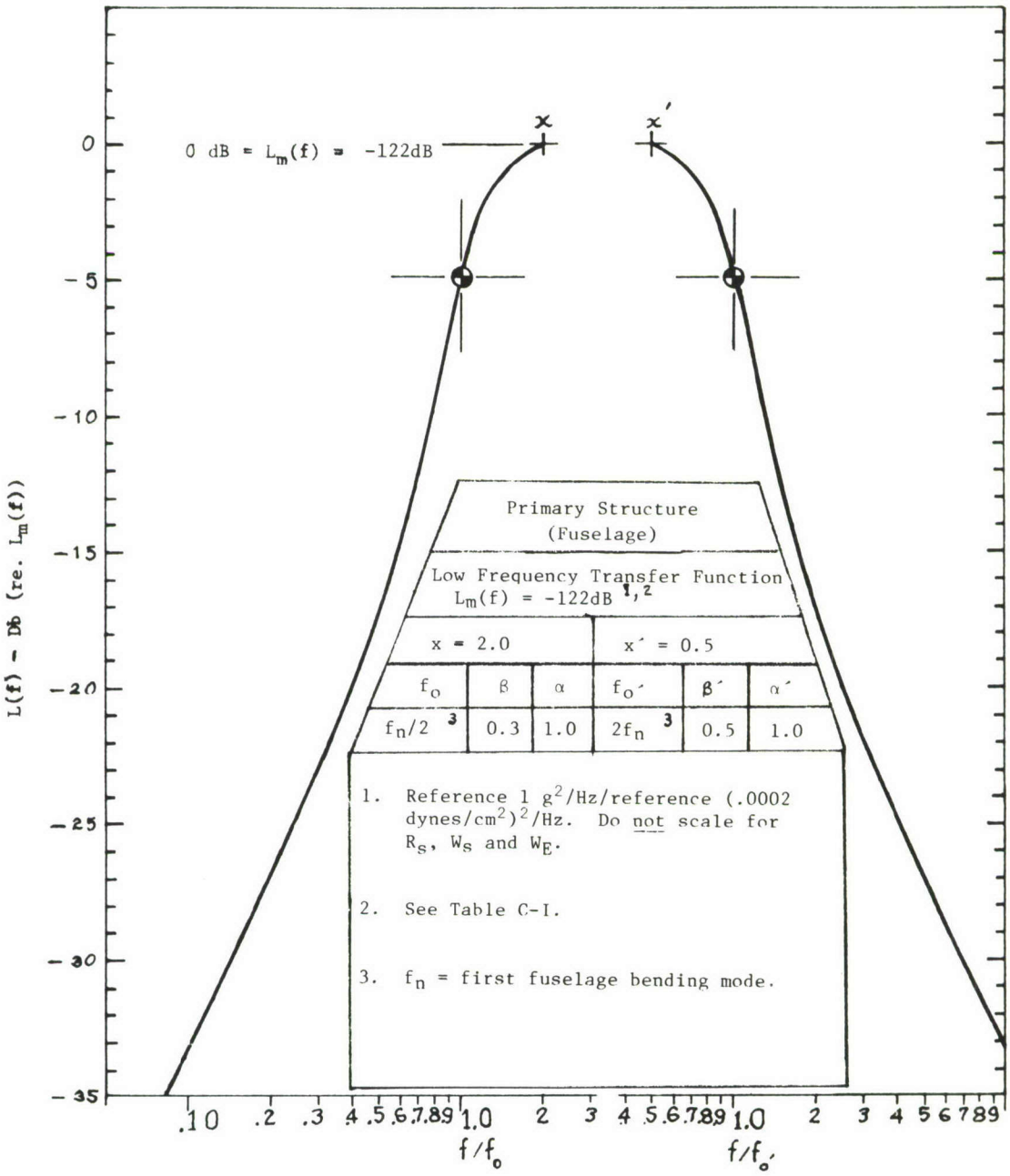


Figure C-1. Low Frequency Transfer Function, L(f), for Fighter Aircraft Fuselage

TABLE C-1

PARAMETRIC VALUES FOR FIRST AND SECOND BENDING MODES*
(AIRCRAFT FUSELAGE)

First Bending Mode

Aircraft Type	$L_m(f)_1$ (dB)	f_n (Hz)
RF-4C	-122	14.3
F-16	-131	12.9
F-111	-134	8.5
A-7D	-129	15.2
F-15	-127	8.5

Second Bending Mode

Aircraft Type	$L_m(f)_2$ (dB)	f_{2n} (Hz)
RF-4C	-129	19.0
F-16	-133	32.5
F-111	----	----
A-7D	-140	23.0
F-15	-131	27.8

*See Appendix B

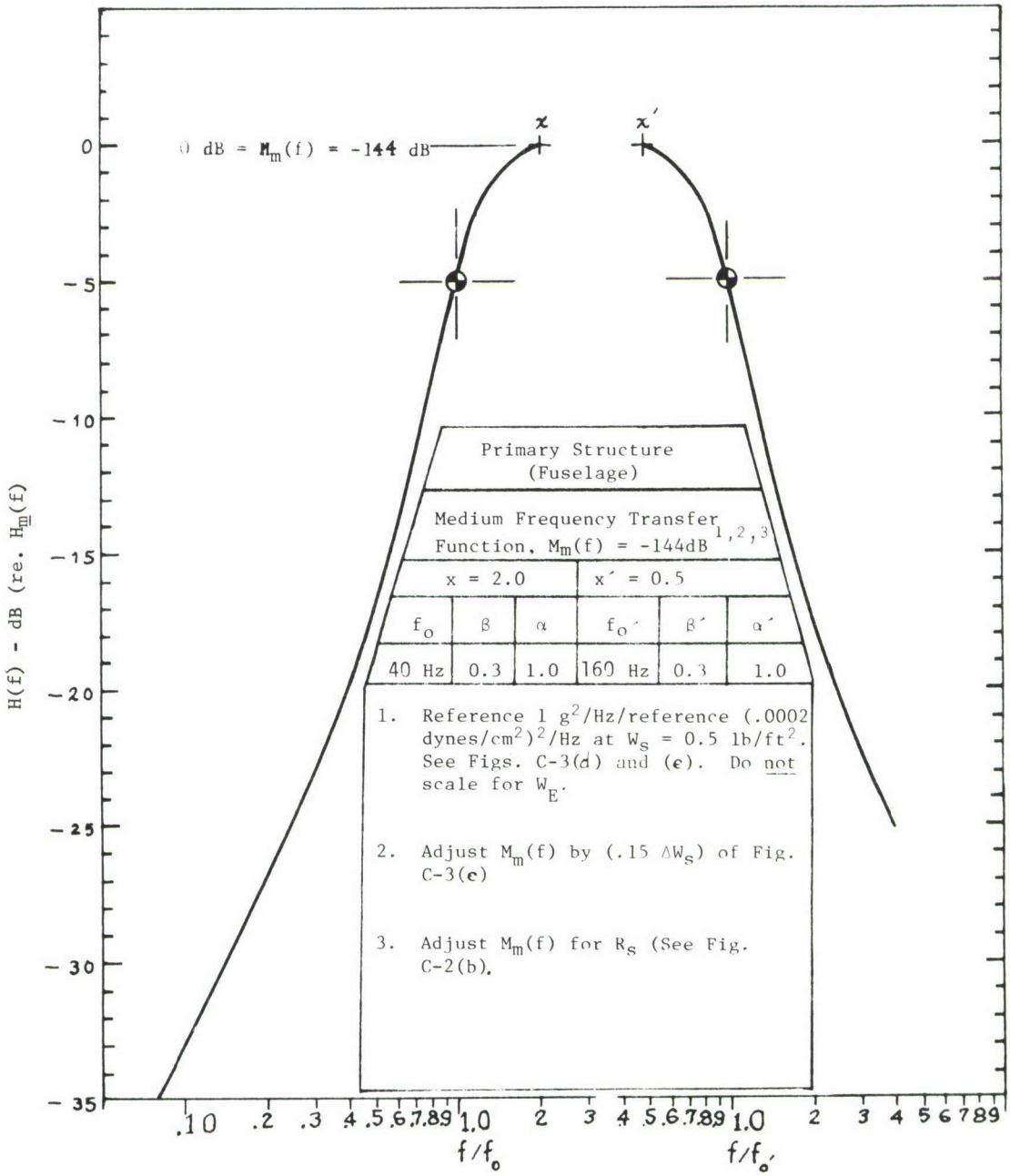


Figure C-2a. Medium Frequency Transfer Function, M(f), for Fighter Aircraft

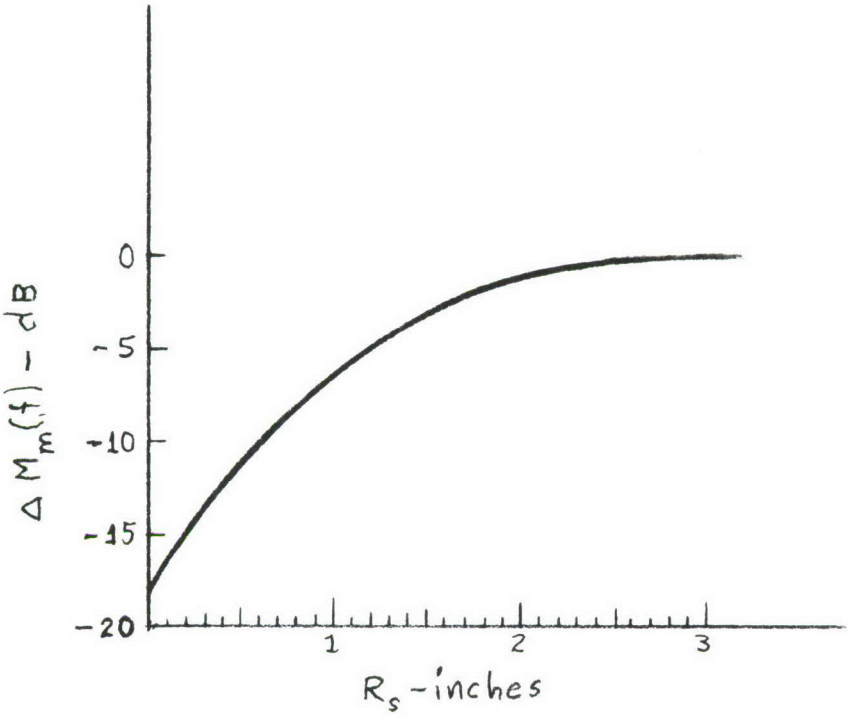


Figure C-2b. Attenuation of M_m (f) as a Function of R_s

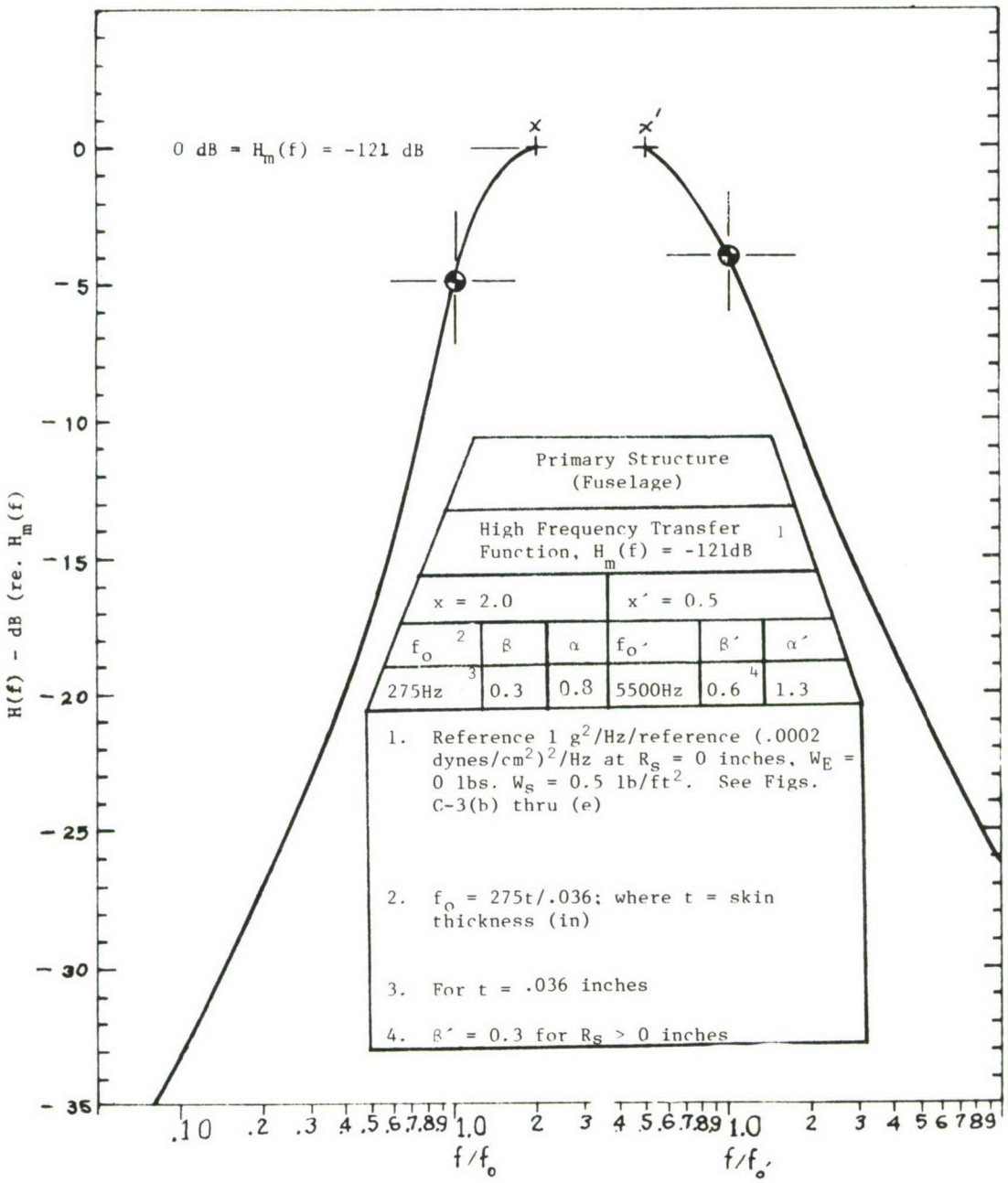


Figure C-3a. High Frequency Transfer Function, H(f), for Fighter Aircraft

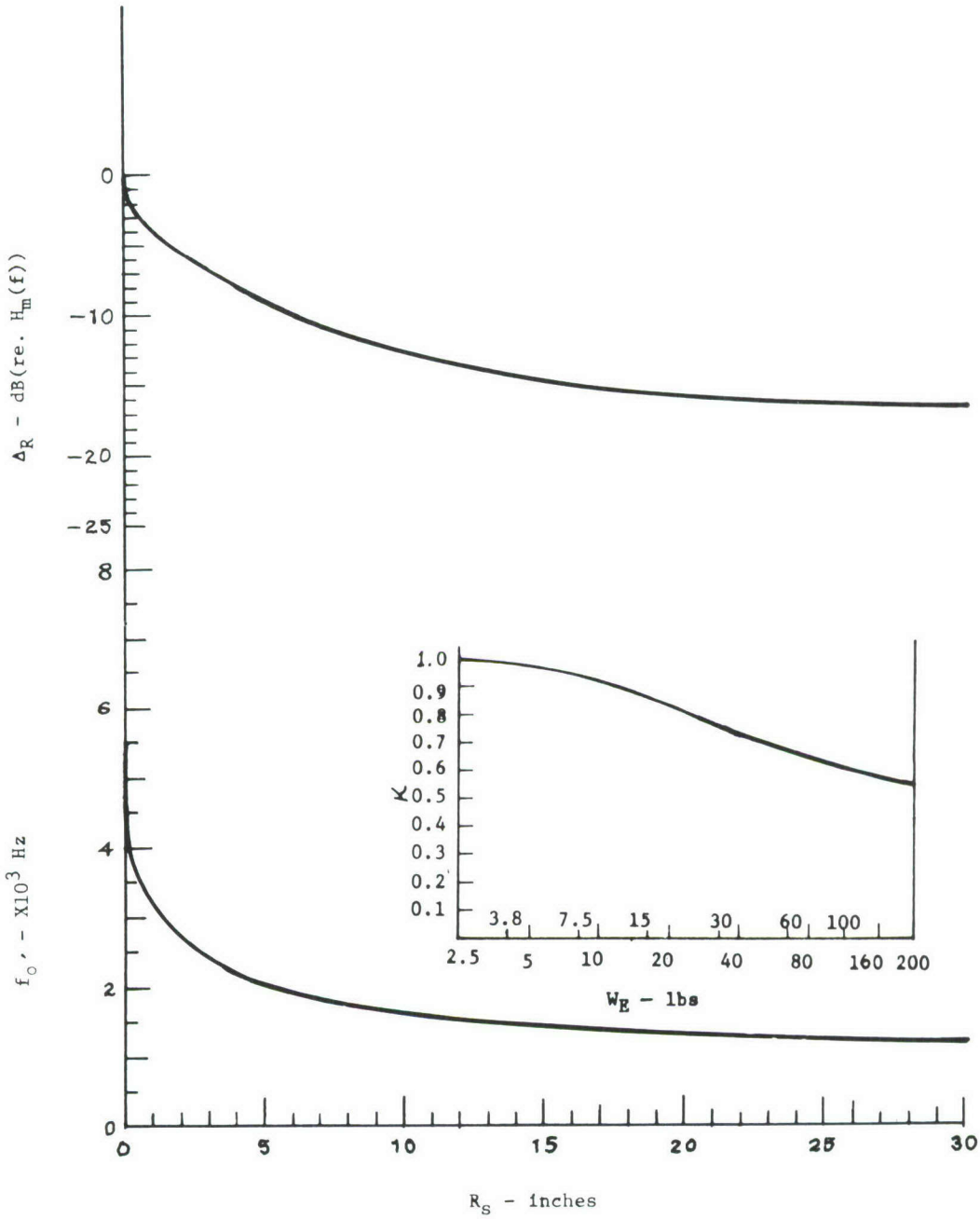


Figure C-3b. Frequency and Amplitude Attenuation of H_m (f) as a Function of R_s

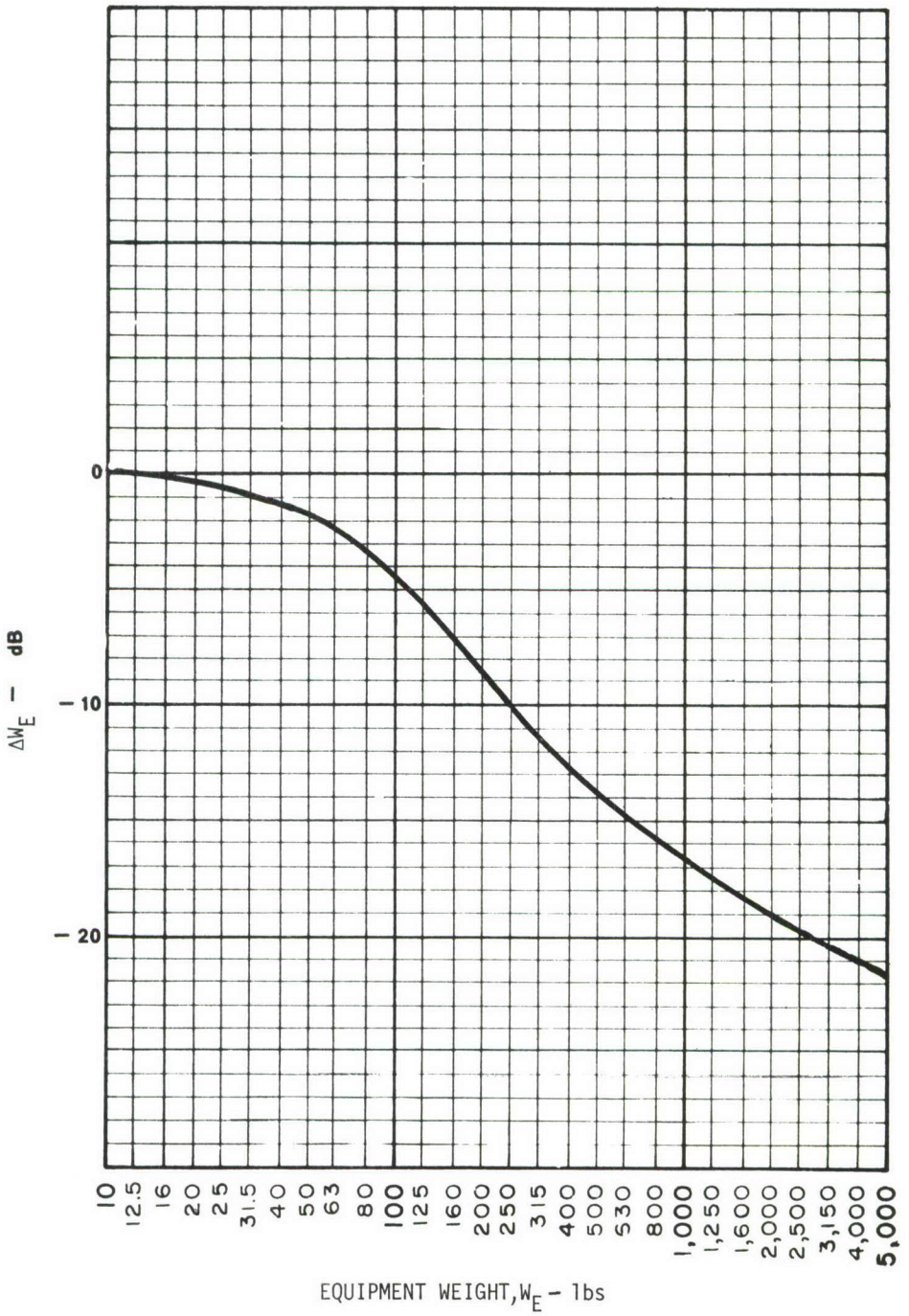


Figure C-3c. Attenuation of $H_m(f)$ as a Function of Equipment Weight

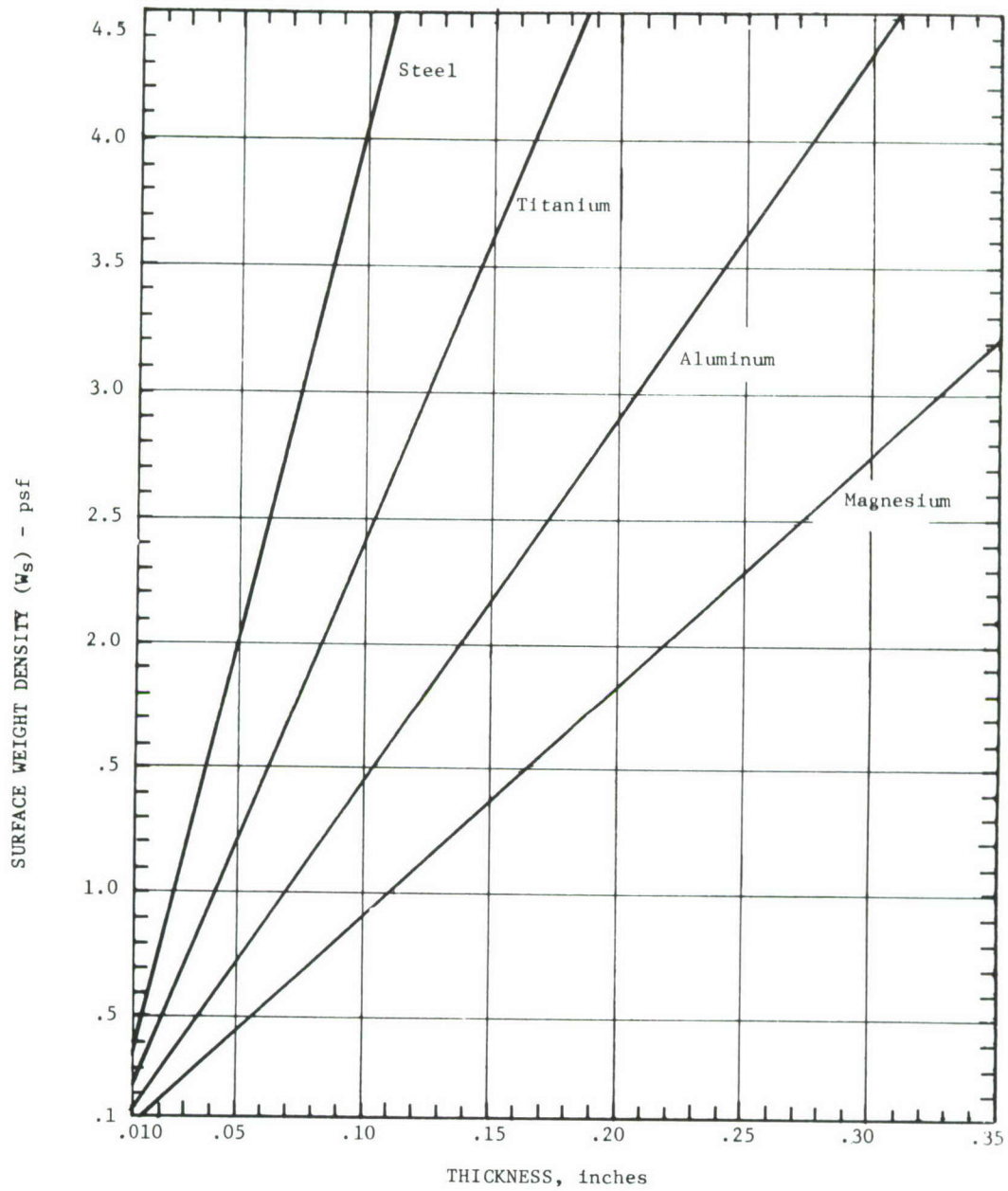


Figure C-3d. Surface Weight Density for Aircraft Materials and Their Thicknesses

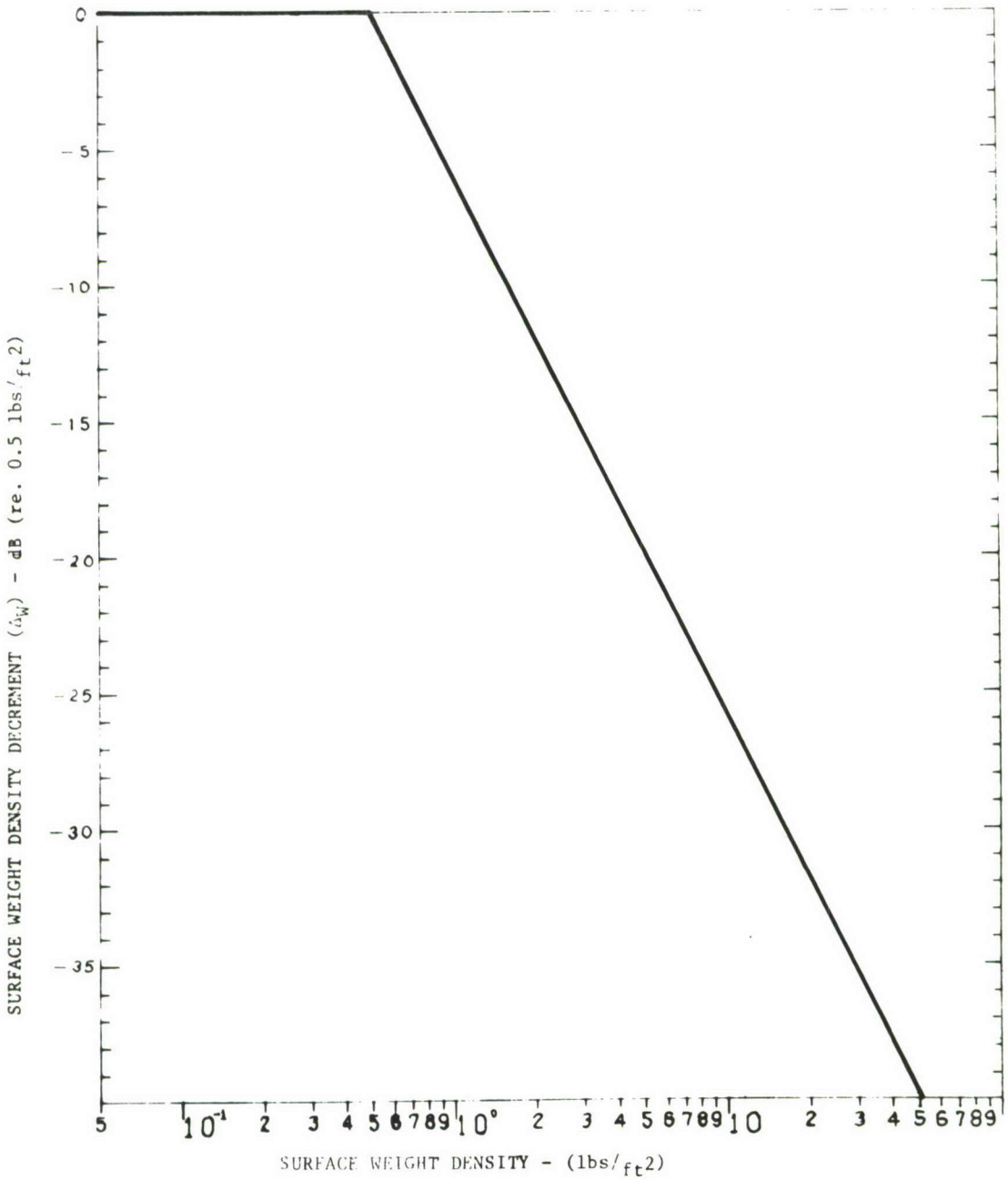


Figure C-3e. Attenuation of $H_m(f)$ as a Function Surface Weight Density

APPENDIX D

SPECIAL FUNCTIONS

The purpose of the special functions is to provide an appropriate function which, after having operated on P(f), results in a specific input to the transfer function elements that, in turn, predict the vibration input spectra of aircraft equipments during flight conditions that deviate from the smooth, straight and level norm. Such flight phases as buffet turn, pullups, takeoff, landing, rough air turbulence, proximity to open speed brakes (flaps), refueling doors, chin effects, including open weapons bay cavitations -- all of these conditions invoke special functions, a limited number of which are described in Figures D-2 through D-4.

1.0 Available Functions

Four functions presently incorporated into this Appendix describe the following flight phases: buffet turn (BT), takeoff (T), landing (L), low frequency atmospheric turbulence (TB). Several of the special functions involve a series of distance parameters listed in Table D-1 and illustrated in Figure D-1.

1.1 Buffet Turn

This excitation results from tight, high g turns that appear only infrequently in the fighter mission profile. The resultant levels, however, are sufficiently severe (see Figure D-2) to warrant inclusion. Note that excitations arising from pullups, speed brakes, flaps, landing gears, and open refueling doors belong

TABLE D-I

Downstream Distance (x)* for Special Functions $S_{BT}(f)$, $S_T(f)$ and $S_L(f)$

Aircraft	x_{BT}	x_T	x_L
F-4	32.3	35.3	35.3
F-111	38.1	47.7	47.7
F-16	27.1	29.5	29.5
F-5	27.7	28.3	28.3
A-7D	20.5	25.4	25.4
F-15	39.1	40.2	40.2

*in feet

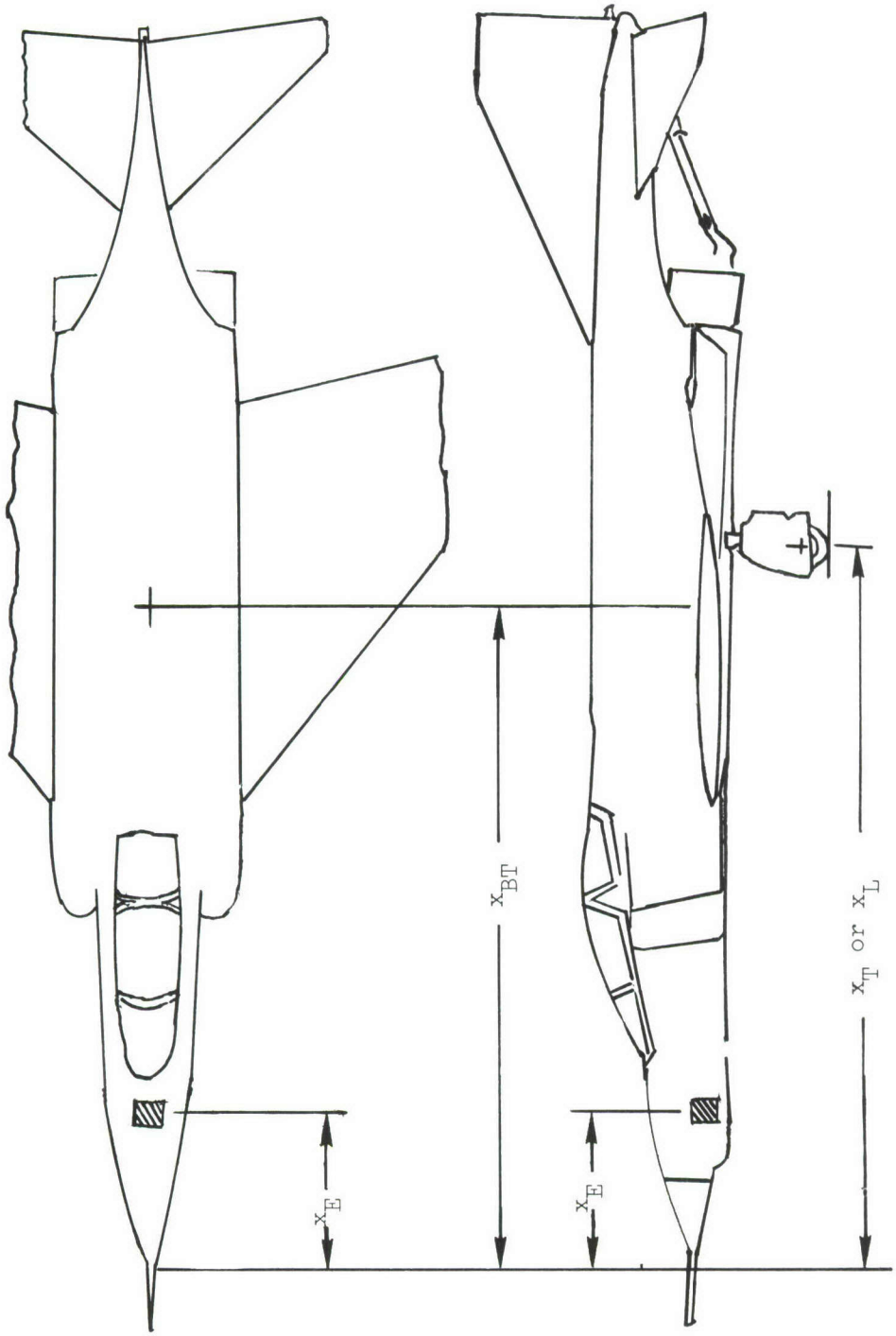


Figure D-1. Location on Aircraft of x_{BT}, x_T, x_L

in this family of special functions. They have not, as yet, been synthesized for the current computer program. The pullup phase (PU), be it noted, is, in its main characteristics, sufficiently close to that of the BT phase to allow temporary substitution.

1.2 Takeoff

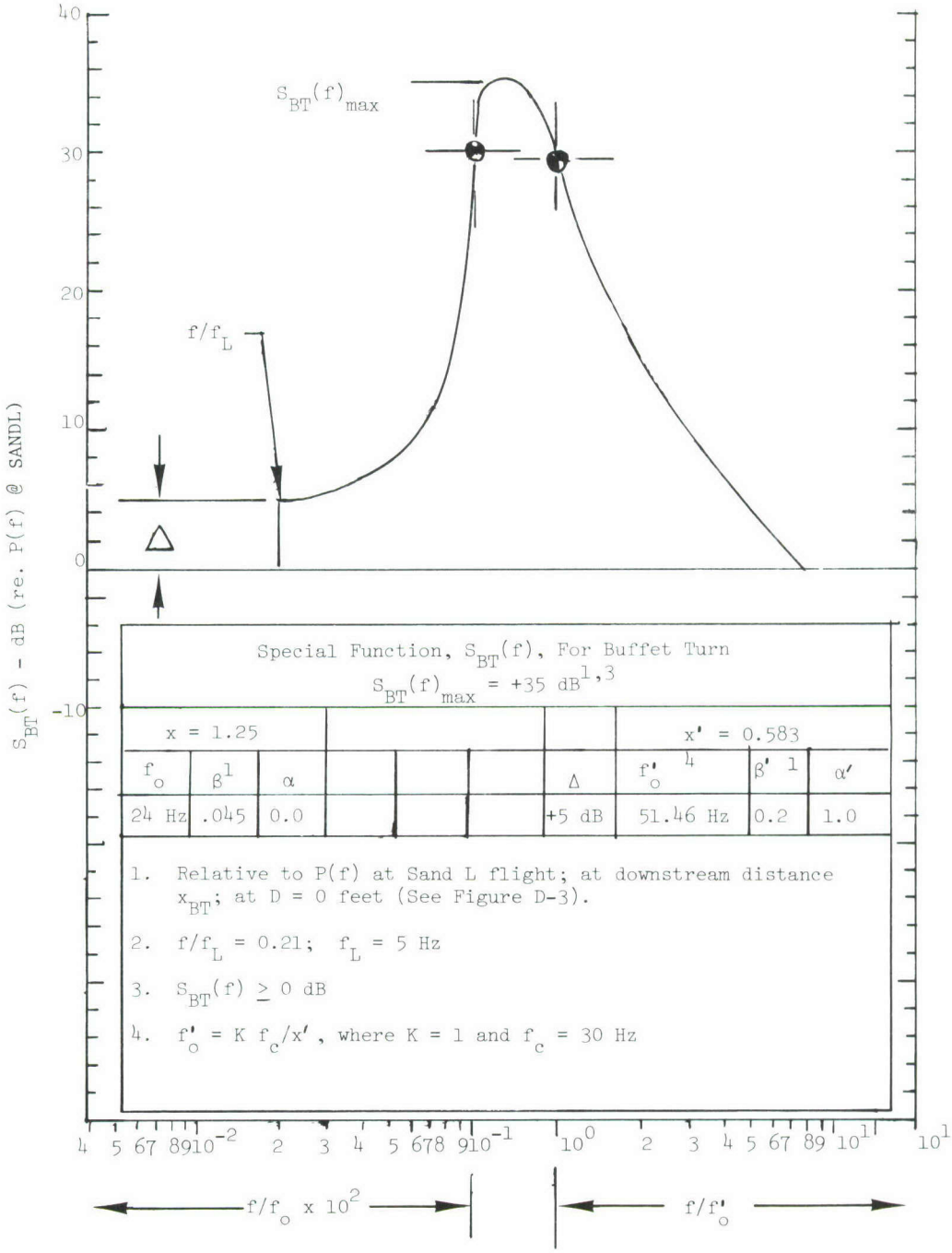
$S_T(f)$ is derived from F-4 data and is referenced to that aircraft at the straight and level flight conditions noted in Figure D-4. Although this approach may be suitable as an approximation for most predicted results, it is prudent to add $10 \log_{10} T_{max}/5x10^4$ to the high frequency portion (see H(f)) of the final predicted spectrum when the aircraft features engines with a maximum thrust, T_{max}, appreciably greater than 50,000 lbs. Note that this last provision has not yet been entered into the computer program.

1.3 Landing

$S_L(f)$ emphasizes the excitation of the fuselage second bending mode (vertical); otherwise there is no great distinction to this flight phase.

1.4 Low Frequency Atmospheric Turbulence

This function is, in effect, added to the SANDL flight phase of the aircraft to provide emphasis in the low frequency regime. Simulation of rough air characteristics is the objective of this special function and may be used in conjunction with P(f) at any altitude and mach combination so long as the flight conditions are straight and level.



Special Function, $S_{BT}(f)$, For Buffet Turn

$S_{BT}(f)_{max}$ = +35 dB[1,3]

x = 1.25							x' = 0.583		
f_o	β[1]	α				Δ	f'_o [4]	β' [1]	α'
24 Hz	.045	0.0				+5 dB	51.46 Hz	0.2	1.0

1. Relative to P(f) at Sand L flight; at downstream distance x_{BT}; at D = 0 feet (See Figure D-3).
2. $f/f_L = 0.21$; $f_L = 5$ Hz
3. $S_{BT}(f) \geq 0$ dB
4. $f'_o = K\, f_c/x'$, where K = 1 and f_c = 30 Hz

Figure D-2. Special Function, $S_{BT}(f)$, for Buffet Turn

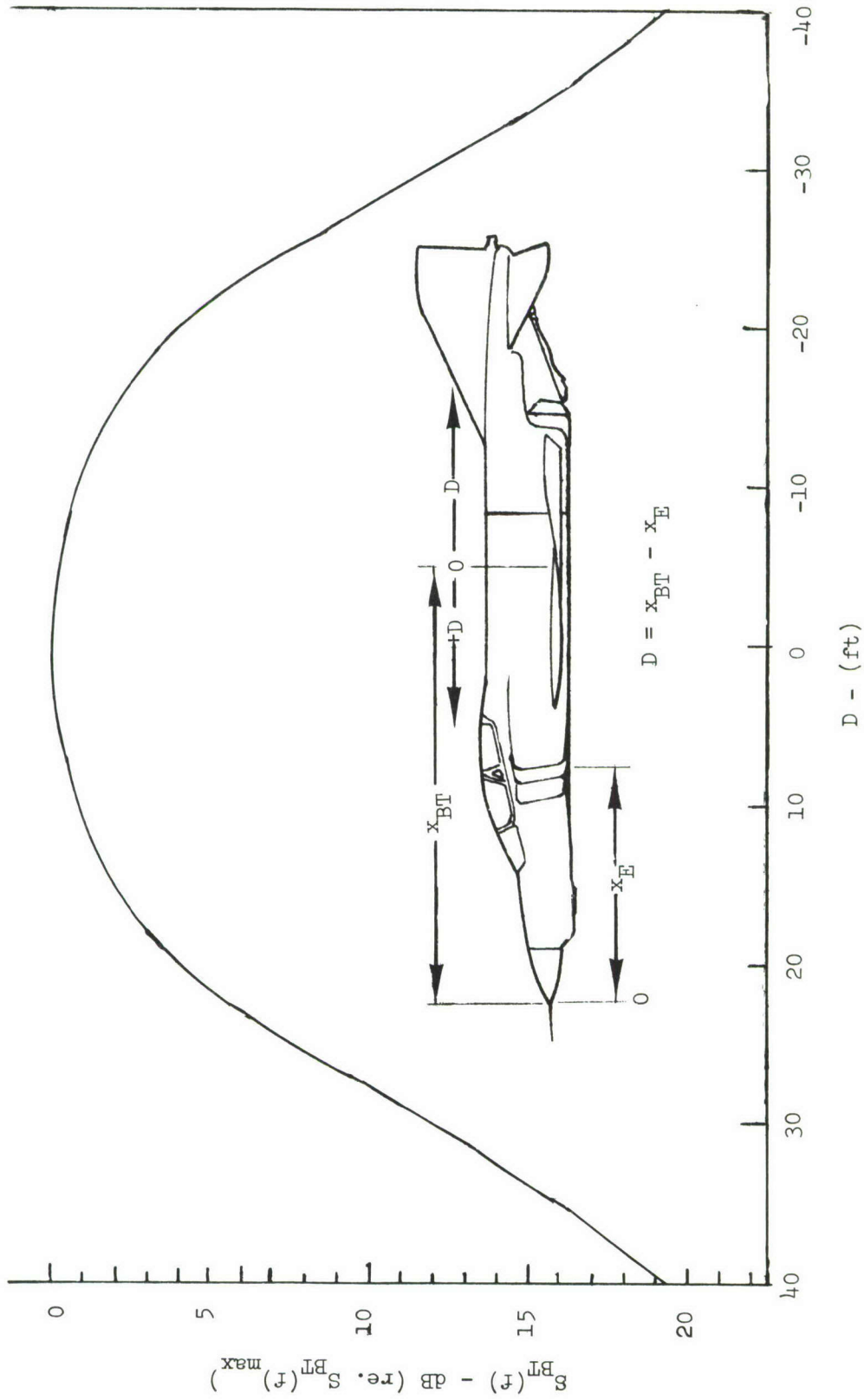
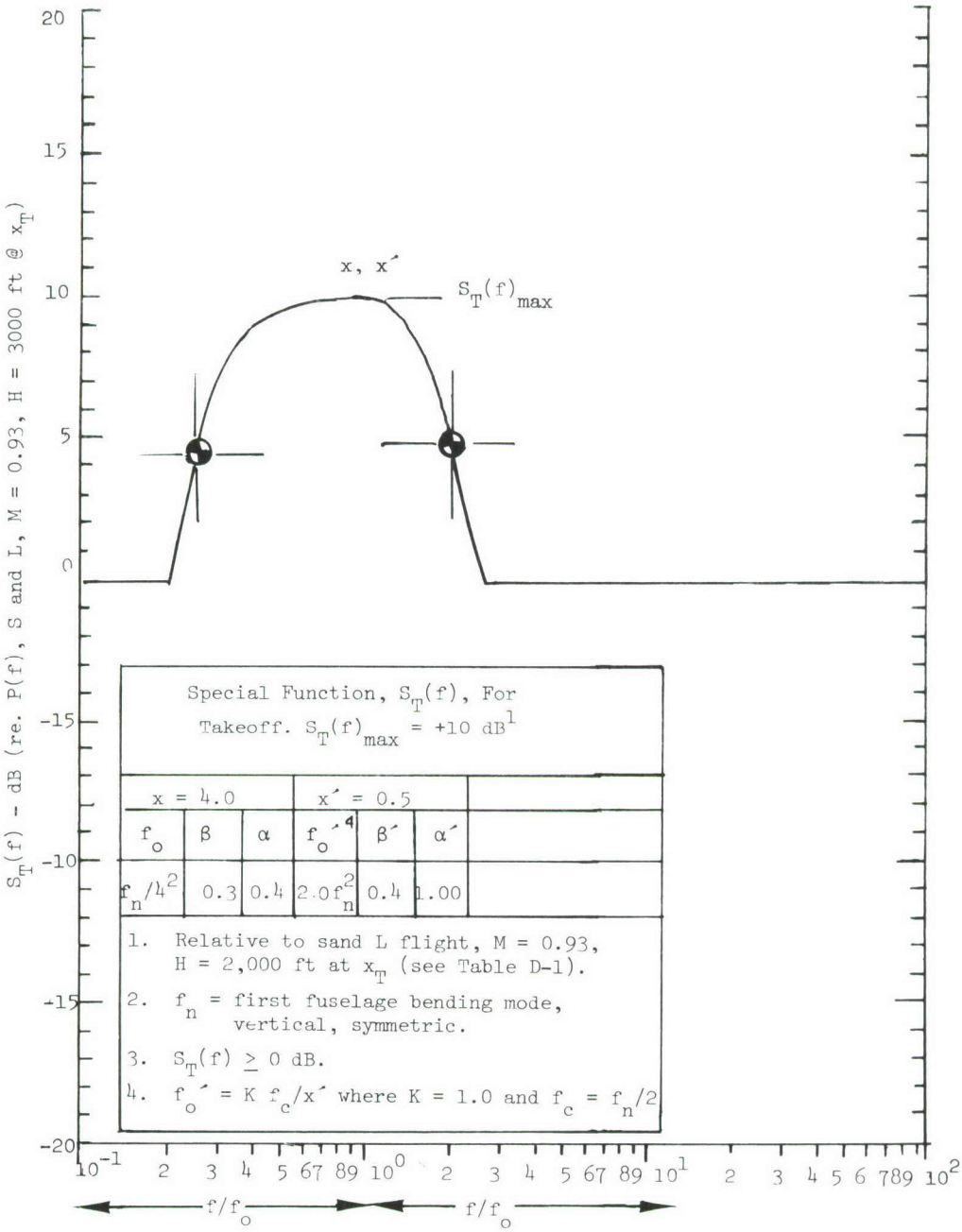


Figure D-3. Location on Aircraft of D Parameter

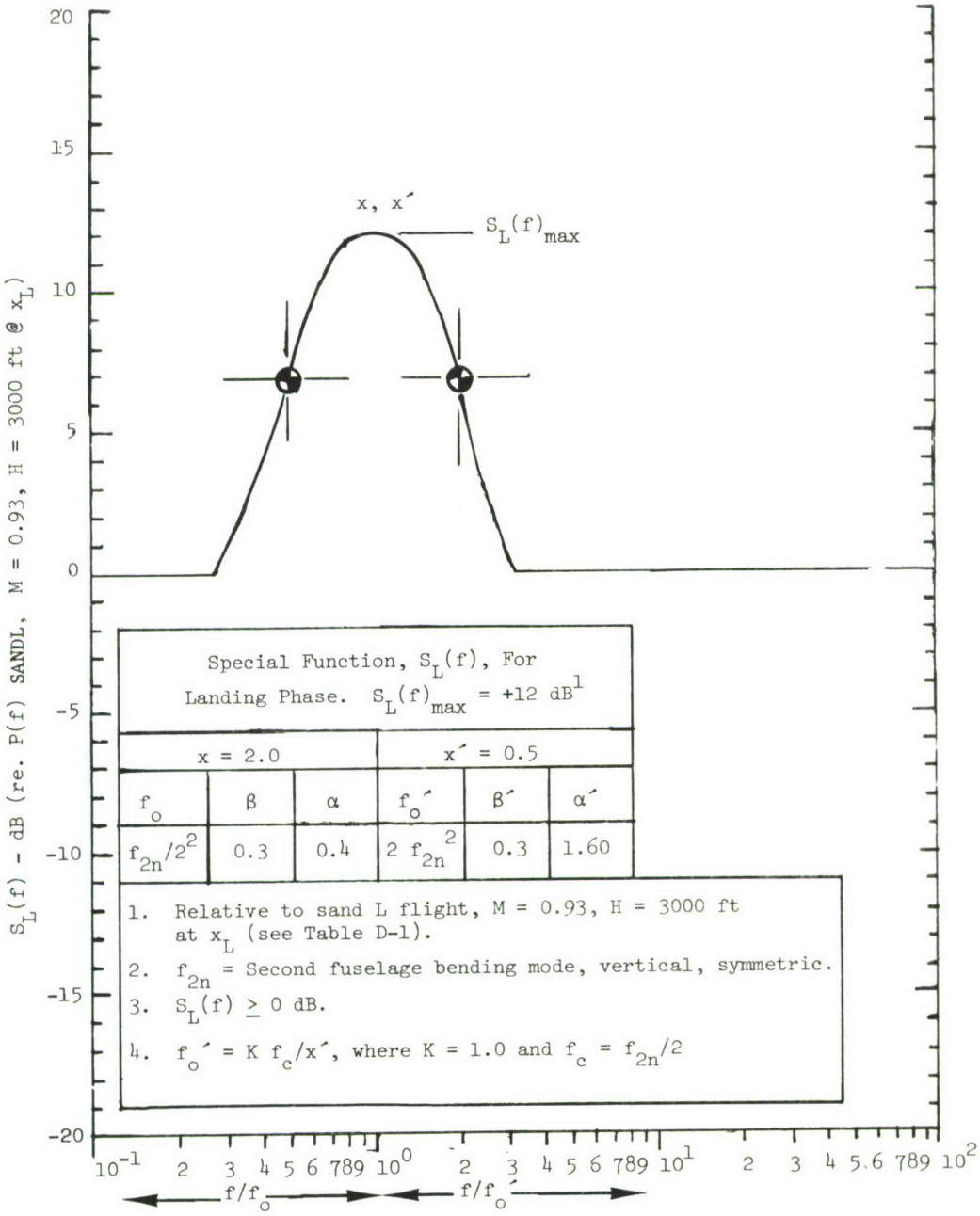


Special Function, $S_T(f)$, For Takeoff. $S_T(f)_{max}$ = +10 dB[1]

x = 4.0			x´ = 0.5		
f_o	β	α	f_o´[4]	β´	α´
$f_n/4^2$	0.3	0.4	$2.0 f_n^2$	0.4	1.00

1. Relative to sand L flight, M = 0.93, H = 2,000 ft at x_T (see Table D-1).
2. f_n = first fuselage bending mode, vertical, symmetric.
3. $S_T(f) \geq 0$ dB.
4. $f_o' = K f_c/x'$ where K = 1.0 and $f_c = f_n/2$

Figure D-4. Special Function, $S_T(f)$, for Takeoff

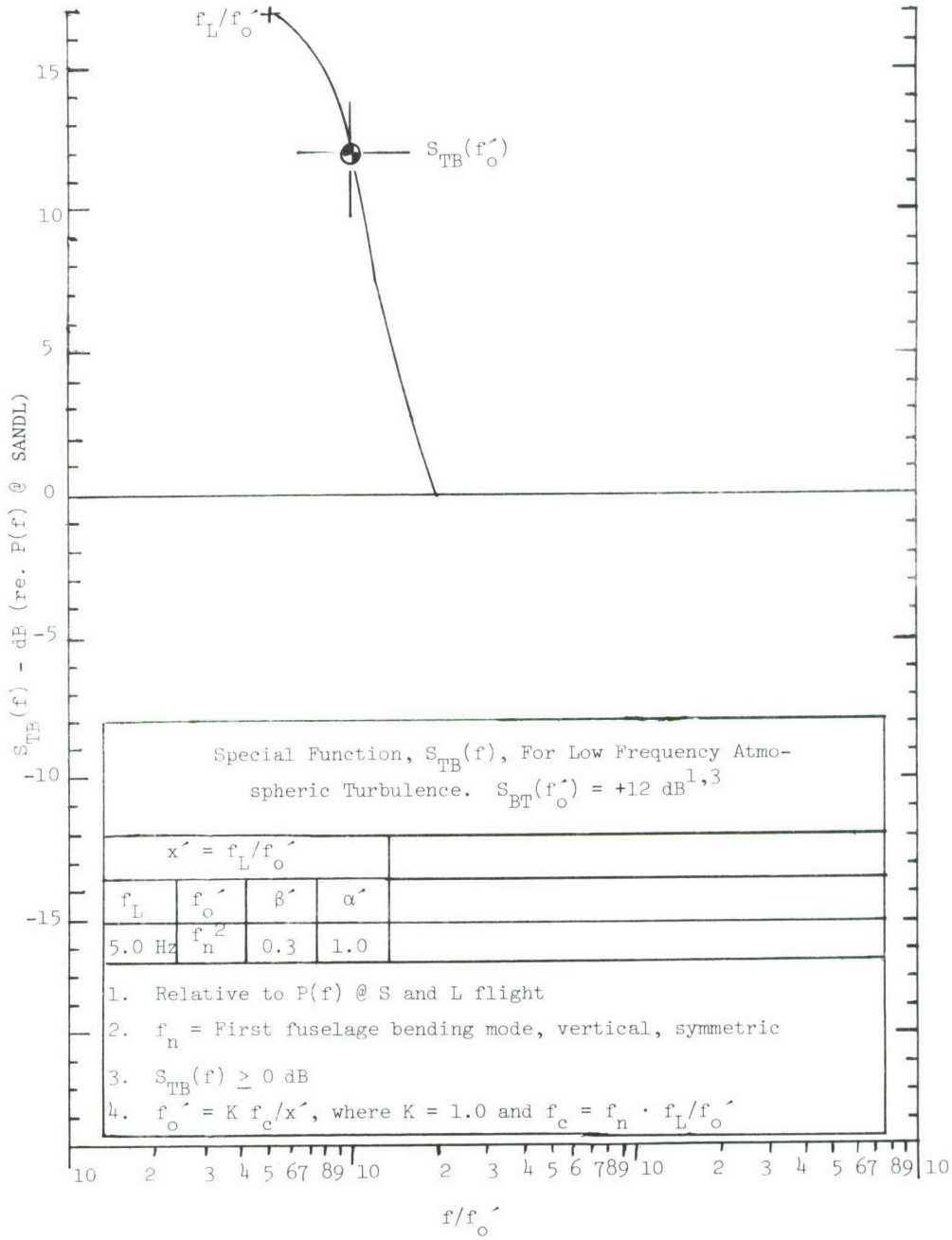


Special Function, $S_L(f)$, For Landing Phase. $S_L(f)_{max}$ = +12 dB[1]

x = 2.0			x´ = 0.5		
f_o	β	α	f_o'	β´	α´
$f_{2n}/2^2$	0.3	0.4	$2\ f_{2n}^{\ 2}$	0.3	1.60

1. Relative to sand L flight, M = 0.93, H = 3000 ft at x_L (see Table D-1).
2. f_{2n} = Second fuselage bending mode, vertical, symmetric.
3. $S_L(f) \geq 0$ dB.
4. $f_o' = K\ f_c/x'$, where K = 1.0 and $f_c = f_{2n}/2$

Figure D-5. Special Function, $S_L(f)$, for Landing



Special Function, $S_{TB}(f)$, For Low Frequency Atmospheric Turbulence. $S_{BT}(f_o') = +12$ dB[1,3]

$x' = f_L/f_o'$			
f_L	f_o'	β'	α'
5.0 Hz	f_n[2]	0.3	1.0

1. Relative to P(f) @ S and L flight
2. f_n = First fuselage bending mode, vertical, symmetric
3. $S_{TB}(f) \geq 0$ dB
4. $f_o' = K\, f_c/x'$, where K = 1.0 and $f_c = f_n \cdot f_L/f_o'$

Figure D-6. Special Function, $S_{TB}(f)$, for Low Frequency Atmospheric Turbulence

APPENDIX E

EQUIPMENT MOUNTING CATEGORIES

1.0 Category Selection

Table E-1 provides a number of equipment mounting configurations that, with the possible exceptions of categories III and IV(a), represent equipment mounting methods commonly encountered in fighter aircraft. By referring to the simplified drawings of the table, the user may choose which of the configurations most closely agrees with the user's particular equipment mounting situation. Having selected a category, the user has immediate reference to the adjacent remarks column which identifies and locates the transfer function corresponding to the selected category. All such transfer functions are, of course, stored in the program card file and are automatically selected when the user identifies the category during the input steps detailed in Section III.

1.1 I(b), A Special Case

Note that Category I(b) is simply the high frequency transfer function, H(f), and represents the only case when $H_m(f)$ is corrected for the equipment mass loading, W_E (see Appendix C). Mass loading corrections for the other categories are integrated into their respective transfer functions, Y(f); this can be seen by referring to the associated graphs of the transfer function curves (Figures E-1 through E-5).

1.2 Spatial Adjustment for R(f)

Predicted response magnitudes of the secondary structure are based upon structural transfer functions, whose maximum values, $Y_m(f)$, are taken to be at the first bending antinodal point of the shelves, racks, or instrument panels (Figures E-5 and E-6). Thus R(f) represents the maximum expected response of the structure and this is usually at the midspace point. For many fighter aircraft configurations, the equipment mounting points are located rather close to the end constraints of the secondary structure. From the equipment response viewpoint, this situation represents the case where R(f) tends to approach G(f) and thereby induces the following decision criteria (not yet entered into the computer program); a criteria which allows the user a choice of responses, R(f) or G(f).

If $\varepsilon \leq L/4$
let $R(f) = G(f)$ (see Figure E-5)

If the above condition is obtained, then the user may reject the computer output of R(f) and select G(f).

TABLE E-I

Transfer Function Categories For Equipments

Mounted In Fighter Aircraft

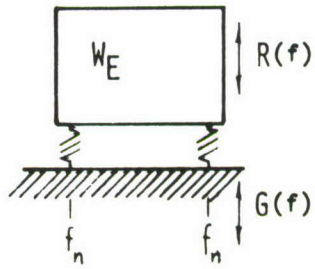
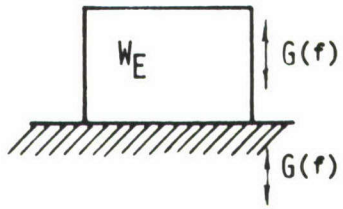
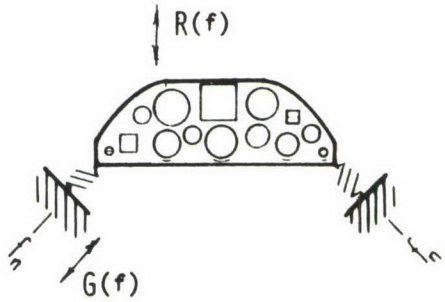
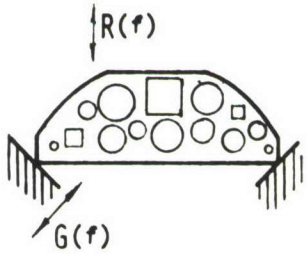
CATEGORY		REMARKS
I(a)		See Fig. E-1(a)
I(b)		See Fig. E-1(b) and Fig. C-7
II(a)		See Fig. E-2(a) and Table E-II
II(b)		See Fig. E-2(b) and Table E-II

TABLE E-I (Cont.)

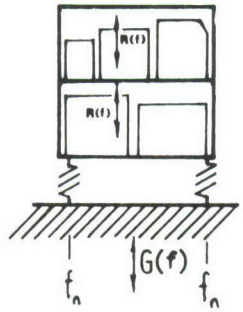
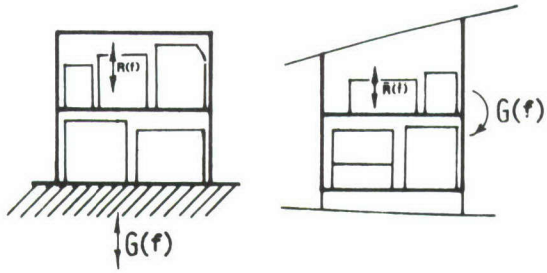
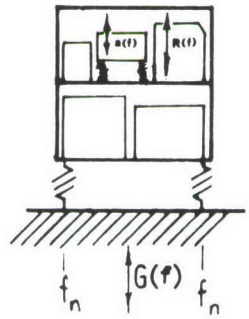
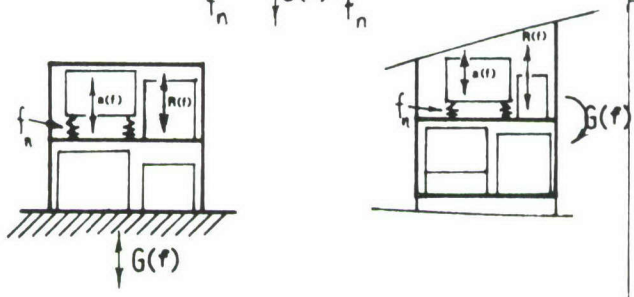
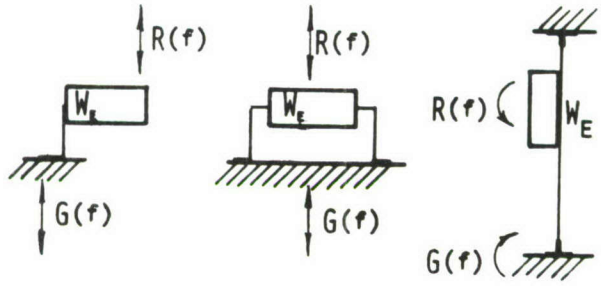
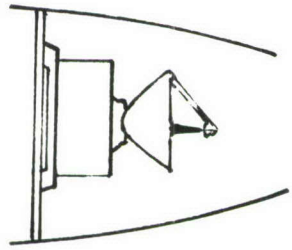
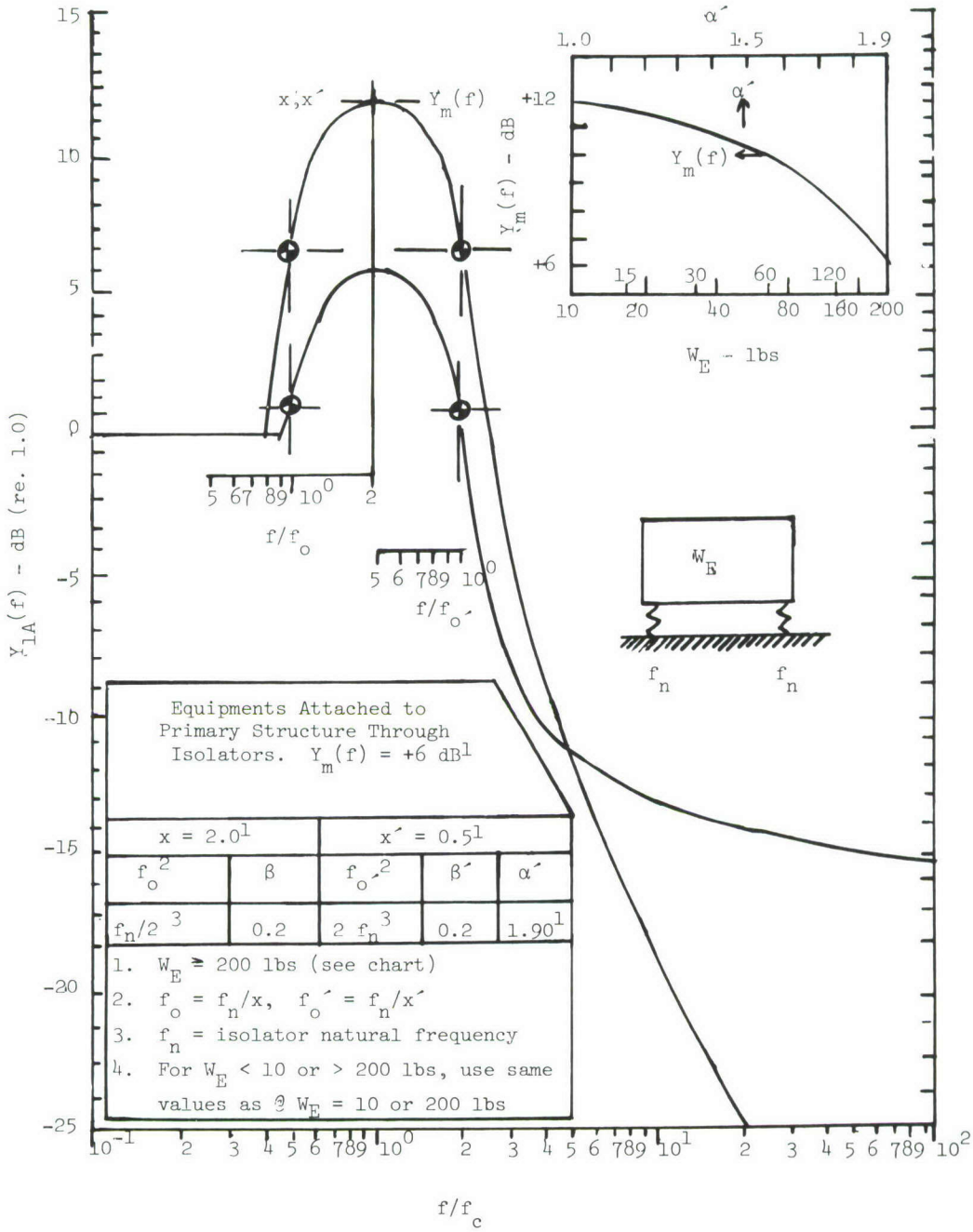
CATEGORY		REMARKS
III(a)		See Fig. E-3(a)
III(b)		See Fig. E-3(b)
IV(a)		dB wise, add Fig. E-I(a) to Fig. E-3(a)
IV(b)		dB wise, add Fig. E-1(a) to Fig. E-3(b)

TABLE E-I (Cont.)

CATEGORY		REMARKS
V		See Fig. E-5
VI		See Fig. E-7



Equipments Attached to Primary Structure Through Isolators. $Y_m(f) = +6$ dB[1]

x = 2.0[1]		x´ = 0.5[1]		
f_o[2]	β	f_o´[2]	β´	α´
$f_n/2$[3]	0.2	2 f_n[3]	0.2	1.90[1]

1. $W_E \geq 200$ lbs (see chart)
2. $f_o = f_n/x$, $f_o' = f_n/x'$
3. f_n = isolator natural frequency
4. For $W_E < 10$ or > 200 lbs, use same values as @ $W_E = 10$ or 200 lbs

Figure E-1a. Transfer Function for Category I(a)

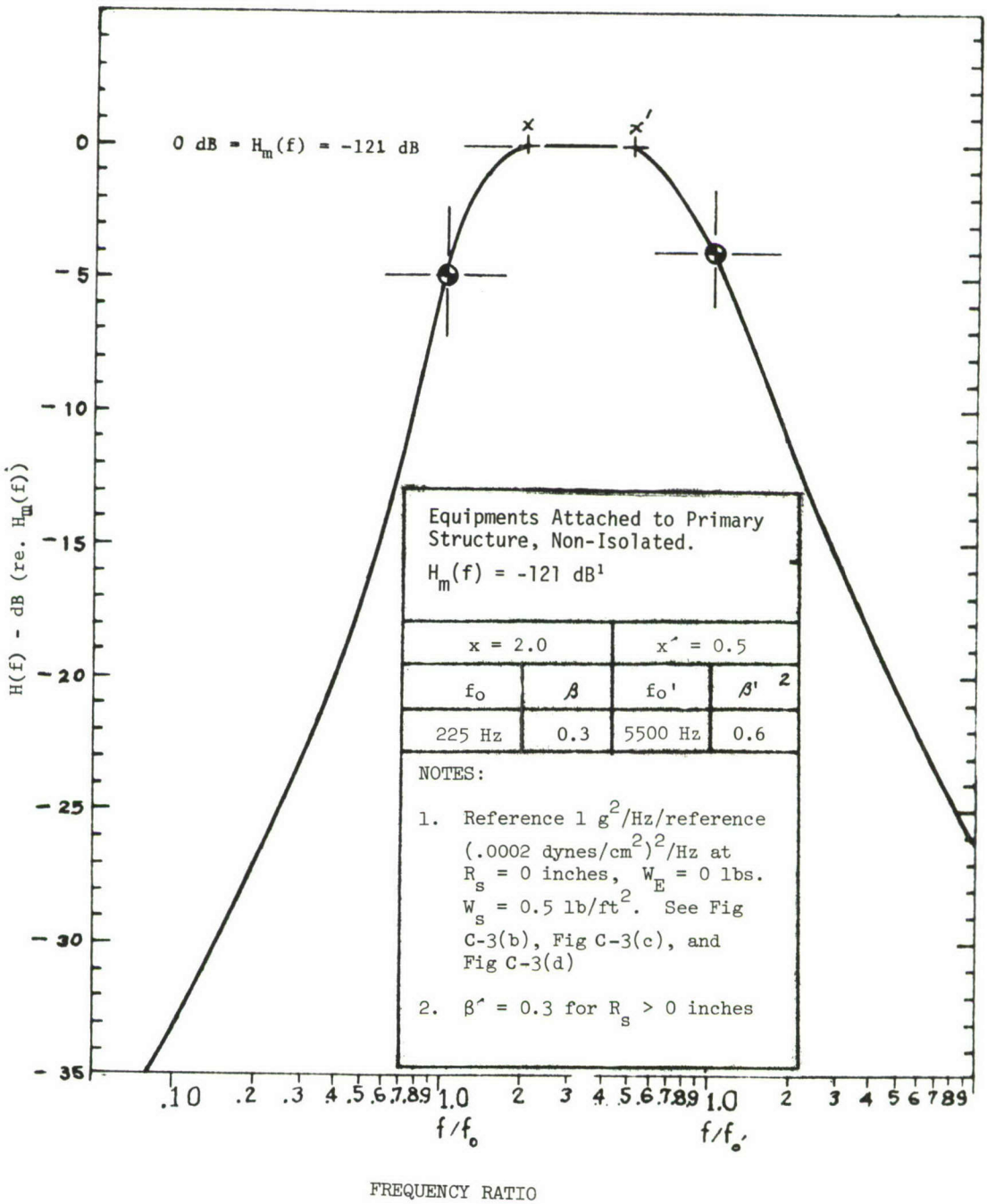


Figure E-1b. Transfer Function for Category I(b)

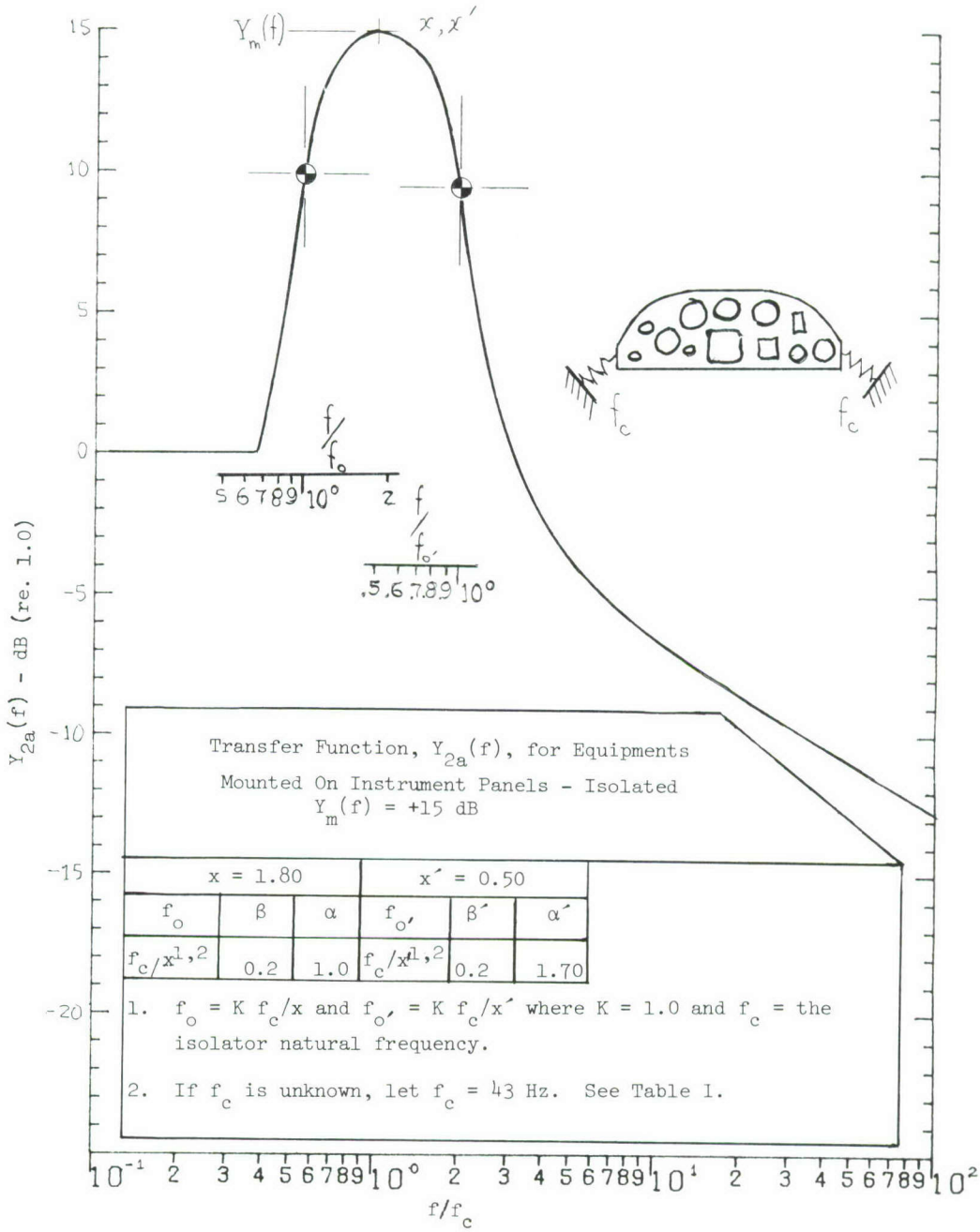
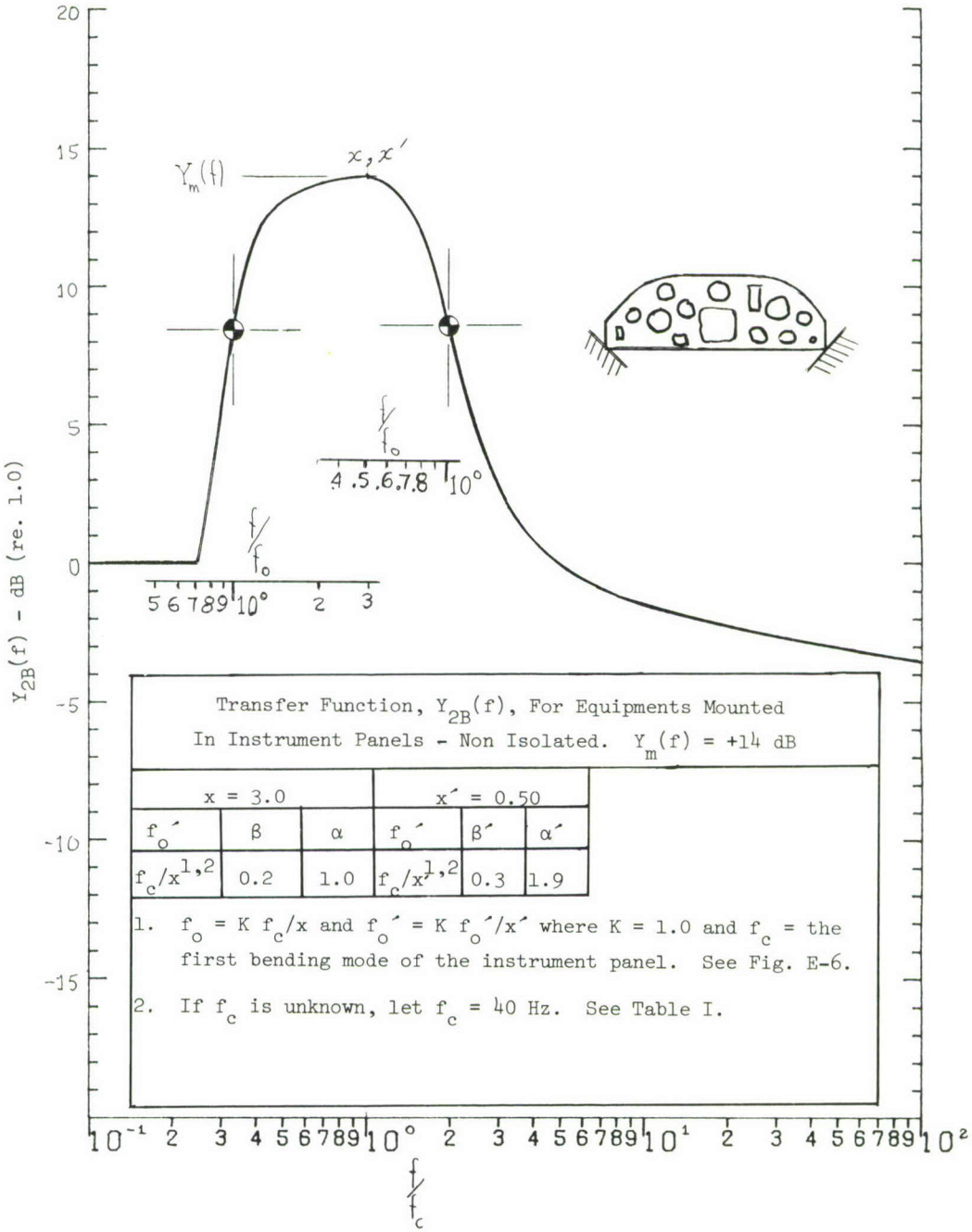


Figure E-2a. Transfer Function for Category II(a)



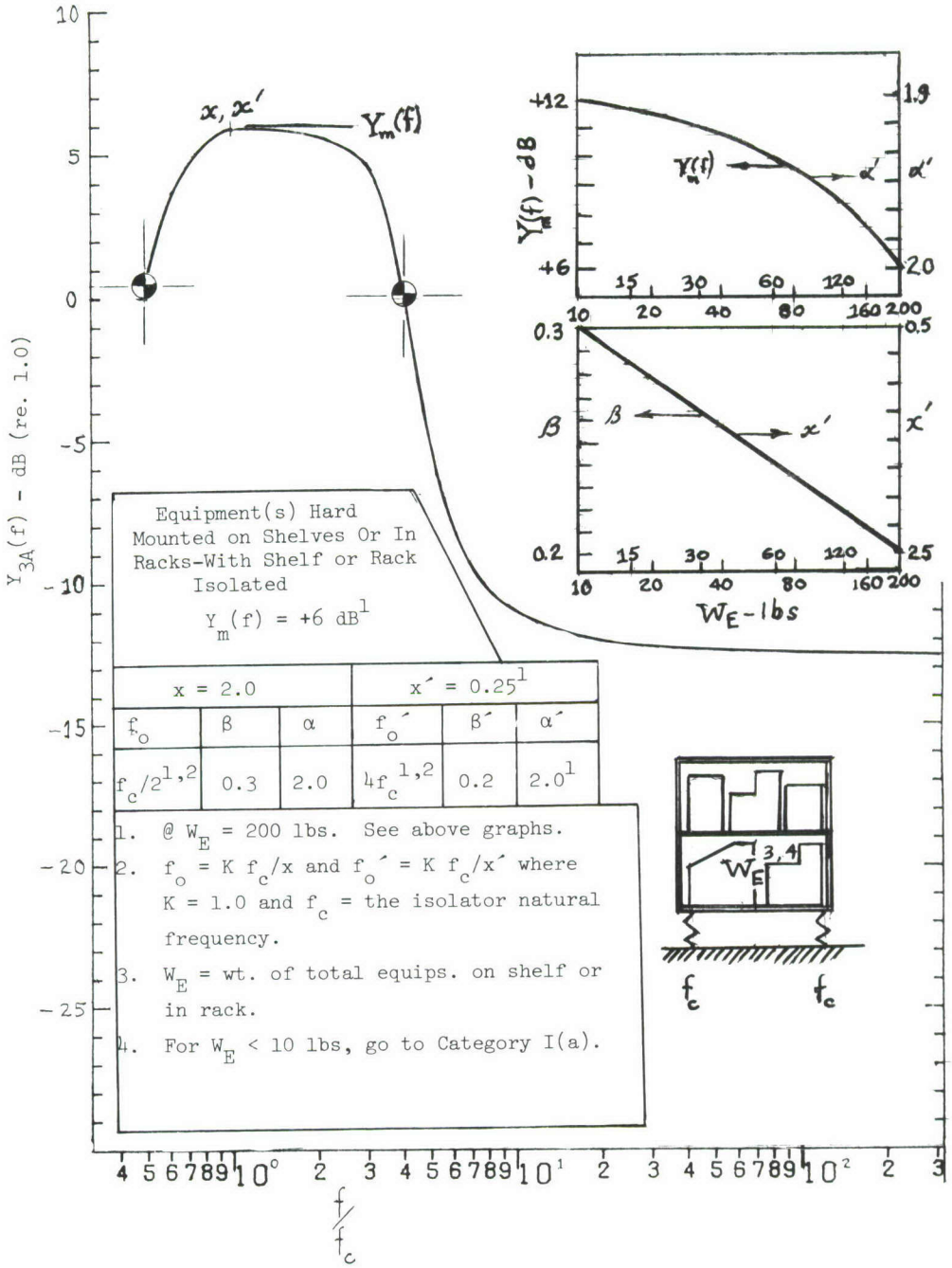
Transfer Function, $Y_{2B}(f)$, For Equipments Mounted In Instrument Panels - Non Isolated. $Y_m(f) = +14$ dB

x = 3.0			x′ = 0.50		
f_o'	β	α	f_o'	β′	α′
$f_c/x^{1,2}$	0.2	1.0	$f_c/x^{1,2}$	0.3	1.9

1. $f_o = K f_c/x$ and $f_o' = K f_o'/x'$ where K = 1.0 and f_c = the first bending mode of the instrument panel. See Fig. E-6.

2. If f_c is unknown, let f_c = 40 Hz. See Table I.

Figure E-2b. Transfer Function for Category II(b)



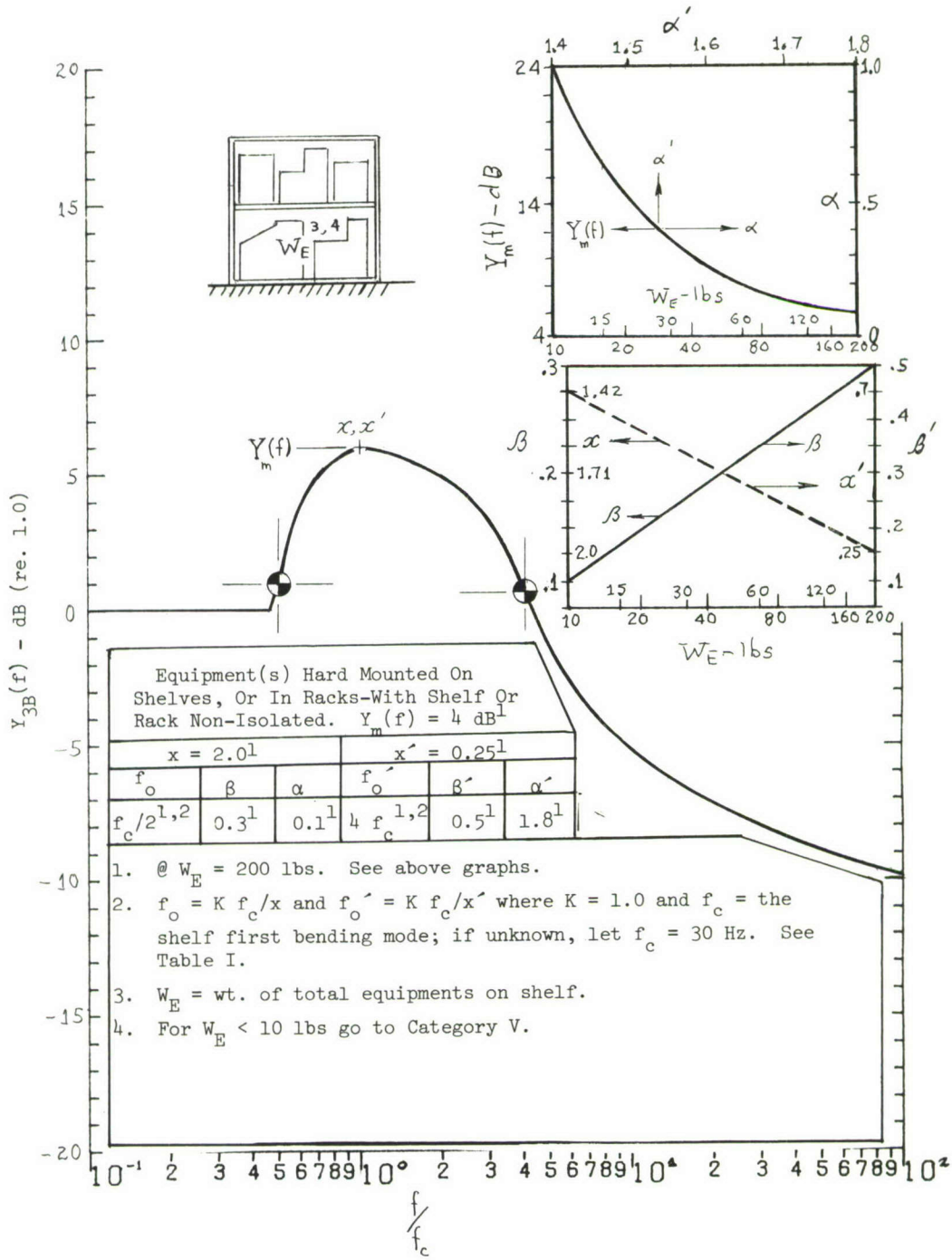
Equipment(s) Hard Mounted on Shelves Or In Racks-With Shelf or Rack Isolated

$Y_m(f) = +6$ dB[1]

x = 2.0			x′ = 0.25[1]		
f_o	β	α	f_o'	β'	α'
$f_c/2^{1,2}$	0.3	2.0	$4f_c^{1,2}$	0.2	2.0[1]

1. @ W_E = 200 lbs. See above graphs.
2. $f_o = K f_c/x$ and $f_o' = K f_c/x'$ where $K = 1.0$ and f_c = the isolator natural frequency.
3. W_E = wt. of total equips. on shelf or in rack.
4. For W_E < 10 lbs, go to Category I(a).

Figure E-3a. Transfer Function for Category III(a)

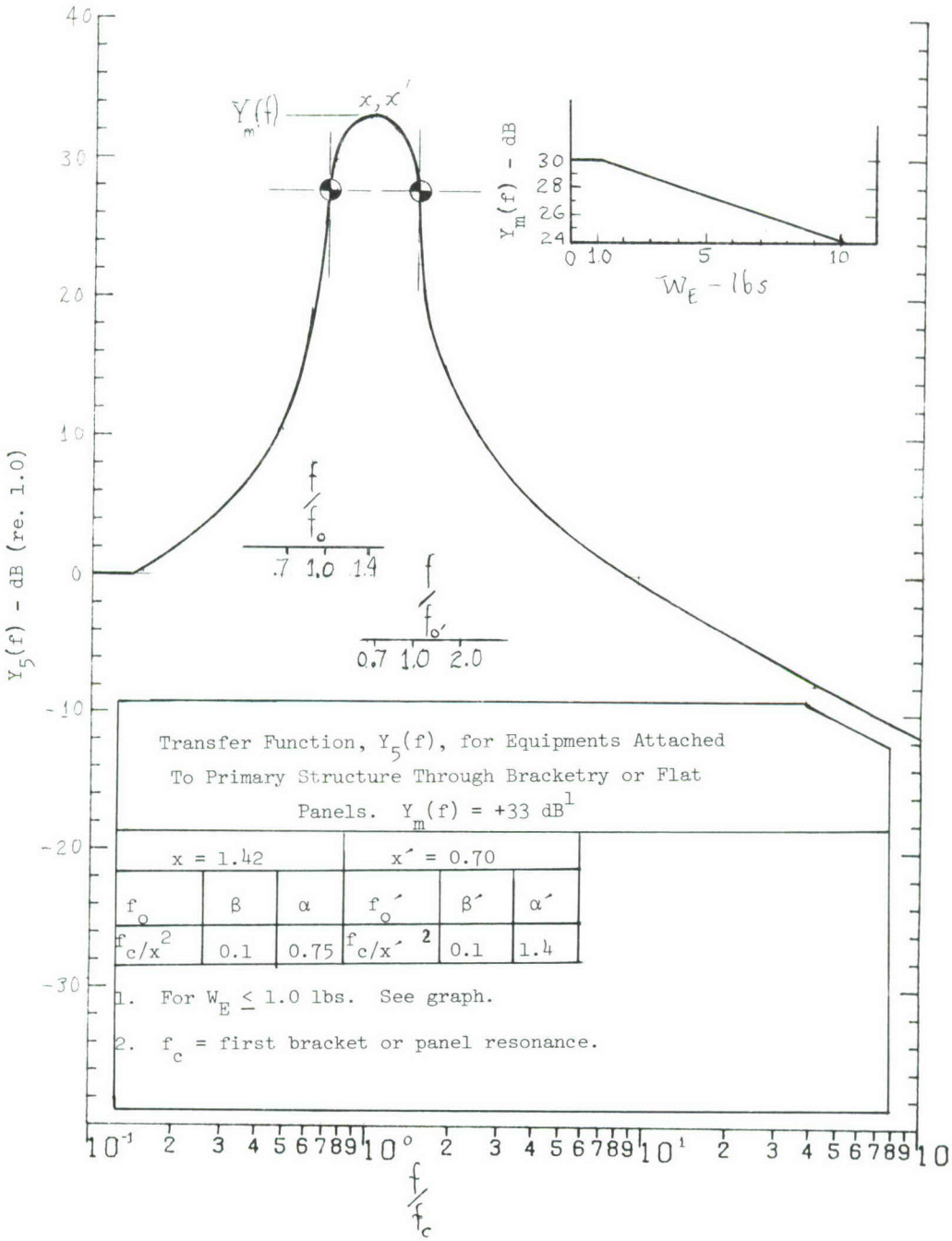


Equipment(s) Hard Mounted On Shelves, Or In Racks-With Shelf Or Rack Non-Isolated. $Y_m(f) = 4$ dB[1]

$x = 2.0$[1]			$x' = 0.25$[1]		
f_o	β	α	f_o'	β'	α'
$f_c/2$[1,2]	0.3[1]	0.1[1]	$4\ f_c$[1,2]	0.5[1]	1.8[1]

1. @ W_E = 200 lbs. See above graphs.
2. $f_o = K\ f_c/x$ and $f_o' = K\ f_c/x'$ where K = 1.0 and f_c = the shelf first bending mode; if unknown, let f_c = 30 Hz. See Table I.
3. W_E = wt. of total equipments on shelf.
4. For W_E < 10 lbs go to Category V.

Figure E-3b. Transfer Function for Category III(b)

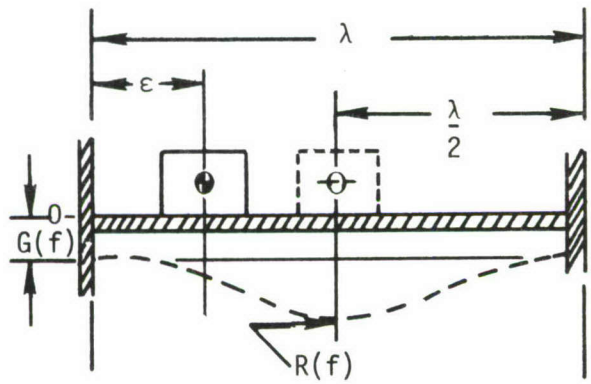


Transfer Function, $Y_5(f)$, for Equipments Attached To Primary Structure Through Bracketry or Flat Panels. $Y_m(f) = +33$ dB[1]

x = 1.42			x' = 0.70		
f_o	β	α	f_o'	β'	α'
f_c/x^2	0.1	0.75	f_c/x'^2	0.1	1.4

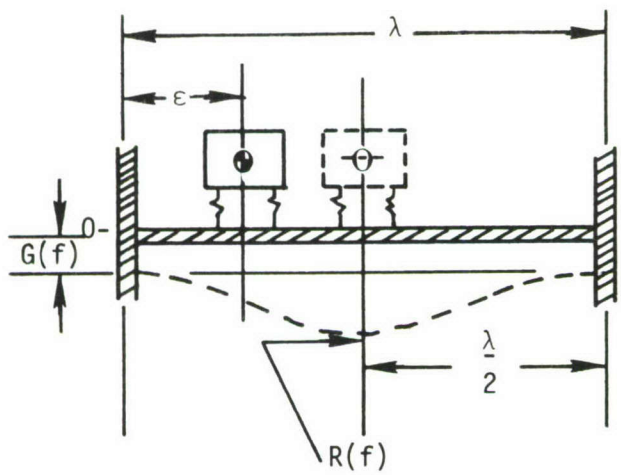
1. For $W_E \leq 1.0$ lbs. See graph.
2. f_c = first bracket or panel resonance.

Figure E-4. Transfer Function for Category V



Category III(b)

$$0 \le \varepsilon \le \frac{\lambda}{2}$$



Category IV(b)

Figure E-5. Midspan Location of R(f)

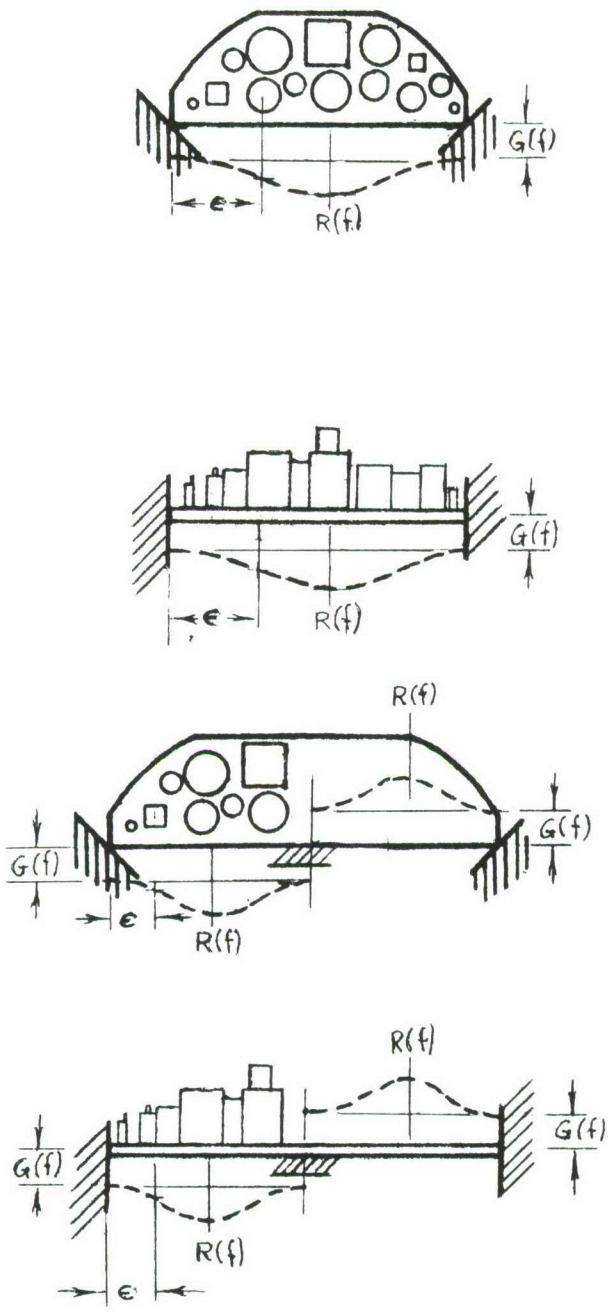
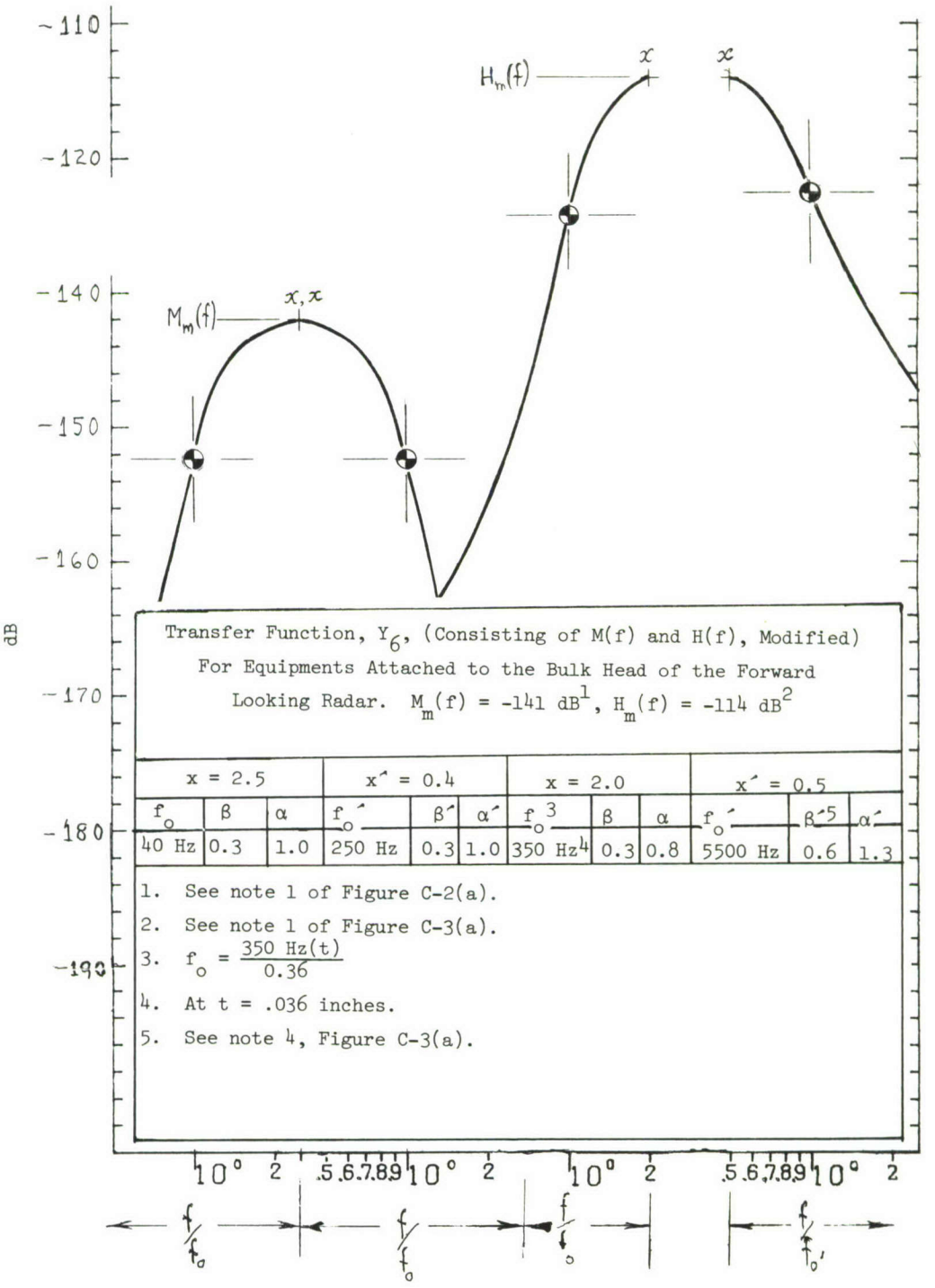


Figure E-6. Midspan Locations of R(f) for Instrument Panels



Transfer Function, Y_6, (Consisting of M(f) and H(f), Modified) For Equipments Attached to the Bulk Head of the Forward Looking Radar. $M_m(f) = -141$ dB[1], $H_m(f) = -114$ dB[2]

x = 2.5			x′ = 0.4			x = 2.0			x′ = 0.5		
f_o	β	α	f_o'	β′	α′	f_o[3]	β	α	f_o'	β′[5]	α′
40 Hz	0.3	1.0	250 Hz	0.3	1.0	350 Hz[4]	0.3	0.8	5500 Hz	0.6	1.3

1. See note 1 of Figure C-2(a).
2. See note 1 of Figure C-3(a).
3. $f_o = \frac{350 \text{ Hz}(t)}{0.36}$
4. At t = .036 inches.
5. See note 4, Figure C-3(a).

Figure E-7. Transfer Function for Category VI

APPENDIX F

COMPUTER PROGRAM

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                74/74    OPT=1                    FTN 4.5+414          08/16/77  13.11.28

      PROGRAM VIPRF(INPUT,OUTPUT,TAPE5=INPUT,PLFILE)                          VIPRF      2
C     AHFHI   FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR H(F)                         VIPRF      3
C     AHFLO   FORM FACTOR, LOW-FREQ.ROLL-OFF,FOR H(F)                         VIPRF      4
C     AHFMAX  MAXIMUM VALUE OF H(F)                                           VIPRF      5
C     AHI     FORM FACTOR,HIGH-FREQ.ROLL-OFF=FORM FACTOR OF Y(F) FOR          VIPRF      6
C             SPECIFIED CATEGORY                                              VIPRF      7
C     AK      WORKING VAR.USED WHEN CALCULATING FZHFHI                        VIPRF      8
C     ALFHI   FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR L(F)                         VIPRF      9
C     ALFLO   FORM FACTOR, LOW-FREQ.ROLL-OFF,FOR L(F)                         VIPRF     10
C     ALNAHI  FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE           VIPRF     11
C     ALNALO  FORM FACTOR, LOW-FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE           VIPRF     12
C     ALNPHI  SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE          VIPRF     13
C     ALNPLO  SLOPE FACTOR, LOW-FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE          VIPRF     14
C     ALNMAX  MAXIMUM VALUE OF S(F)-LANDING PHASE                             VIPRF     15
C     ALNXHI  NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE       VIPRF     16
C     ALNXLO  NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR S(F)-LANDING PHASE       VIPRF     17
C     ALO     FORM FACTOR,LOW FREQ.ROLL-OFF=FORM FACTOR OF Y(F) FOR           VIPRF     18
C             SPECIFIED CATEGORY                                              VIPRF     19
C     ALPHA   ARRAY USED FOR STORING FORM FACTORS OF TRANSFER FUNCTIONS       VIPRF     20
C             WHEN CALCULATING L(F)-M(F)-H(F)                                 VIPRF     21
C     ALT     ARRAY USED FOR STORING INPUT ALTITUDE VALUES                    VIPRF     22
C     ALTTUT  ARRAY USED FOR STORING ALTITUDE TABULAR VALUES                  VIPRF     23
C     AL2FHI  FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR L (F)                        VIPRF     24
C                                                 2                           VIPRF     25
C     AL2FLO  FORM FACTOR, LOW-FREQ.ROLL-OFF,FOR L (F)                        VIPRF     26
C                                                 2                           VIPRF     27
C     AMACHNO MACH NO.                                                        VIPRF     28
C     AMFHI   FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR M(F)                         VIPRF     29
C     AMFLO   FORM FACTOR, LOW-FREQ.ROLL-OFF,FOR M(F)                         VIPRF     30
C     AMFMAX  MAXIMUM VALUE OF M(F)                                           VIPRF     31
C     APFHI   FORM FACTOR,HIGH-FREQ.ROLL-OFF,FOR P(F)                         VIPRF     32
C     AVDENS  ARRAY USED FOR STORING AVERAGE DENSITY TABULAR VALUES           VIPRF     33
C     AVP     ARRAY USED FOR STORING AVERAGE PRESSURE TABULAR VALUES          VIPRF     34
C     BPLFHI  SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR L(F)-INITIAL VALUE          VIPRF     35
C     BPLFLO  SLOPE FACTOR, LOW-FREQ.ROLL-OFF,FOR L(F)-INITIAL VALUE          VIPRF     36
C     BFZPF   ARRAY FOR TABULAR BETA VALUES USED WHEN CALCULATING FZPF        VIPRF     37
C     BHFHI   SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR H(F)                        VIPRF     38
C     BHFLO   SLOPE FACTOR, LOW-FREQ.ROLL-OFF,FOR H(F)                        VIPRF     39
C     BHI     SLOPE FACTOR,HIGH-FREQ.ROLL-OFF=SLOPE FACTOR OF Y(F) FOR        VIPRF     40
C             SPECIFIED CATEGORY                                              VIPRF     41
C     BLFHI   SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR L(F)                        VIPRF     42
C     BLFLO   SLOPE FACTOR, LOW-FREQ.ROLL-OFF,FOR L(F)                        VIPRF     43
C     BLO     SLOPE FACTOR, LOW-FREQ.ROLL-OFF=SLOPE FACTOR OF Y(F) FOR        VIPRF     44
C             SPECIFIED CATEGORY                                              VIPRF     45
C     BL2FHI  SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR L (F)                       VIPRF     46
C                                                 2                           VIPRF     47
C     BL2FLO  SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR L (F)                       VIPRF     48
C                                                 2                           VIPRF     49
C     BMFHI   SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR M(F)                        VIPRF     50
C     BMFLO   SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR M(F)                        VIPRF     51
C     BPF     SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR P(F)                        VIPRF     52
C     BUFAHI  FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR S(F)-BUFFET TURN PHASE       VIPRF     53
C     BUFALO  FORM FACTOR, LOW FREQ.ROLL-OFF,FOR S(F)-BUFFET TURN PHASE       VIPRF     54
C     BUFPHI  SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR S(F)-BUFFET TURN PHASE      VIPRF     55
C     BUFDEL  DELTA VALUE FOR S(F)-BUFFET TURN PHASE                          VIPRF     56
C     BUFFZH  LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR S(F)-BUFFET TURN PHASE     VIPRF     57
C     BUFFZL  LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR S(F)-BUFFET TURN PHASE     VIPRF     58
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                74/74   OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      C     BUFMAX MAXIMUM VALUE OF S(F) FOR BUFFET-TURN FLIGHT PHASE          VIPRF     59
      C     BUFXHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR BUFFET TURN PHASE    VIPRF     60
      C     BUFXLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR BUFFET TURN PHASE    VIPRF     61
      C     C      SPEED OF SOUND,CURRENT VALUE                                VIPRF     62
      C     CATGRY EQUIP.MOUNTING CATEGORY,CURRENT VALUE                       VIPRF     63
      C     CONST  FRACTION OF FREQ.VALUE BY WHICH THE FREQ.IS INCREASED       VIPRF     64
      C     CORLEM VALUE OF CORRECTION TO MAXIMUM VALUE OF L(F)                VIPRF     65
      C     CORL2F VALUE OF CORRECTION TO MAXIMUM VALUE OF L (F)               VIPRF     66
      C                                                   2                    VIPRF     67
      C     C1A    C1A=2H1A(CATEGORY 1A)                                       VIPRF     68
      C     C1AAHI FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR CATEGORY 1A              VIPRF     69
      C     C1AALO FORM FACTOR, LOW FREQ.ROLL-OFF,FOR CATEGORY 1A              VIPRF     70
      C     C1AAWE ARRAY FOR STORING TABULAR FORM FACTOR VALUES(HIGH FREQ.     VIPRF     71
      C            ROLL-OFF FOR CATEGORY 1A)                                   VIPRF     72
      C     C1ABHI SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A        VIPRF     73
      C     C1ABLO SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A        VIPRF     74
      C     C1AFN  FIRST FUSELAGE BENDING MODE FREQ.,FOR Y(F)-CATEGORY 1A      VIPRF     75
      C     C1AFZH LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A       VIPRF     76
      C     C1AFZL LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A       VIPRF     77
      C     C1AMAX MAXIMUM VALUE OF Y(F)-CATEGORY 1A                           VIPRF     78
      C     C1AMWE ARRAY FOR STORING TABULAR DB VALUES USED WHEN CALCULATING   VIPRF     79
      C            CORRECTION TO C1AMAX FOR WE VALUE                           VIPRF     80
      C     C1AMXC CORRECTED MAXIMUM VALULE OF Y(F)-CATEGORY 1A                VIPRF     81
      C     C1AXHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A     VIPRF     82
      C     C1AXLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 1A     VIPRF     83
      C     C1B    C1B=2H1B(CATEGORY 1B)                                       VIPRF     84
      C     C2A    C2A=2H2A(CATEGORY 2A)                                       VIPRF     85
      C     C2AAHI FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A         VIPRF     86
      C     C2AALO FORM FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A         VIPRF     87
      C     C2ABHI SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A        VIPRF     88
      C     C2ABLO SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A        VIPRF     89
      C     C2AFN  FIRST FUSELAGE BENDING MODE FREQ. FOR Y(F)-CATEGORY 2A      VIPRF     90
      C     C2AMAX MAXIMUM VALUE OF Y(F)-CATEGORY 2A                           VIPRF     91
      C     C2AXHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A     VIPRF     92
      C     C2AXLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2A     VIPRF     93
      C     C2B    C2B=2H2B(CATEGORY 2B)                                       VIPRF     94
      C     C2BAHI FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B         VIPRF     95
      C     C2BALO FORM FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B         VIPRF     96
      C     C2BBHI SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B        VIPRF     97
      C     C2BBLO SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B        VIPRF     98
      C     C2BFN  FIRST FUSELAGE BENDING MODE FREQ.FOR Y(F)-CATEGORY 2B       VIPRF     99
      C     C2BMAX MAXIMUM VALUE OF Y(F)-CATEGORY 2B                           VIPRF    100
      C     C2BXHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B     VIPRF    101
      C     C2BXLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 2B     VIPRF    102
      C     C3A    C3A=2H3A(CATEGORY 3A)                                       VIPRF    103
      C     C3AALO FORM FACTOR,LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 3A          VIPRF    104
      C     C3AAP  ARRAY FOR STORING TABULAR ALPHA' VALUES,USED WHEN CALCULATI VIPRF    105
      C            ALPHA' FOR Y(F)-CATEGORY 3A FROM WE(EQUIP.WEIGHT)           VIPRF    106
      C     C3AB   ARRAY FOR STORING TABULAR BETA VALUES,USED WHEN CALCULATING VIPRF    107
      C            BETA FOR Y(F)-CATEGORY 3A FROM WE(EQUIP.WEIGHT)             VIPRF    108
      C     C3ABHI SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 3A        VIPRF    109
      C     C3AFN  FIRST FUSELAGE BENDING MODE FREQ.,FOR Y(F)-CATEGORY 3A      VIPRF    110
      C     C3AXLO NORM.FREQ.RATIO,LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 3A      VIPRF    111
      C     C3AXP  ARRAY FOR STORING TABULAR X' VALUES USED WHEN CALCULATING   VIPRF    112
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C     C3BA    ARRAY FOR STORING TABULAR ALPHA VALUES,USED WHEN CALCULATIN VIPRF
C             ALPHA FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT)         VIPRF
C     C3BAP   ARRAY FOR STORING TABULAR ALPHA' VALUES USED WHEN        VIPRF
C             CALCULATING ALPHA'FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT VIPRF
C     C3BB    ARRAY FOR STORING TABULAR BETA VALUES USED WHEN CALCULATING VIPRF
C             BETA FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT)          VIPRF
C     C3BBP   ARRAY FOR STORING TABULAR BETA' VALUES USED WHEN CALCULATIN VIPRF
C             BETA' FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT)         VIPRF
C     C3BFN   FIRST FUSELAGE BENDING MODE FREQ.FOR Y(F)-CATEGORY 3B    VIPRF
C     C3BX    ARRAY FOR STORING TABULAR X VALUES USED WHEN CALCULATING VIPRF
C             X FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT)             VIPRF
C     C3BXP   ARRAY FOR STORING TABULAR X' VALUES USED WHEN CALCULATING VIPRF
C             X' FOR Y(F)-CATEGORY 3B FROM WE(EQUIP.WEIGHT)            VIPRF
C     C3BYMX  ARRAY FOR STORING TABULAR Y(F),MAX.,VALUES USED WHEN     VIPRF
C     C3WE    ARRAY FOR STORING VALUES OF "WE" USED WHEN INTERPOLATING VIPRF
C             FOR PARAMETERS OF Y(F) FOR CATEGORIES 3A AND 3B          VIPRF
C             CALCULATING Y(F),MAX.,(CATEGORY 3B) FROM WE(EQUIP.WEIGHT) VIPRF
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C     C4B     C4B=2H4B(CATEGORY 4B)                                    VIPRF
C     C5      C5=1H5 (CATEGORY 5)                                      VIPRF
C     C5AHI   FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5       VIPRF
C     C5ALO   FORM FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5       VIPRF
C     C5BHI   SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5      VIPRF
C     C5BLO   SLOPE FACTOR, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5      VIPRF
C     C5FN    FIRST FUSELAGE BENDING MODE FREQ.FOR Y(F)-CATEGORY 5     VIPRF
C     C5MAX   MAXIMUM VALUE OF Y(F)-CATEGORY 5                         VIPRF
C     C5XHI   NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5   VIPRF
C     C5XLO   NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR Y(F)-CATEGORY 5   VIPRF
C     C6      C6=1H6(CATEGORY 6)                                       VIPRF
C     D       DIFFERENCE BET.BUFFET-TURN AND E DISTANCES               VIPRF
C     DB      ARRAY FOR STORING DECIBEL VALUES OF L(F),M(F) AND H(F)   VIPRF
C             USED WHEN CALCULATING L(F)-M(F)-H(F) FUNCTION            VIPRF
C     DBEL    ARRAY FOR STORING DECIBEL VALUES WHEN MAKING CALCULATIONS VIPRF
C             TO DETERMINE THE COORDINATES OF POINTS OF FUNCTIONS P(F),G( VIPRF
C             Y(F),R(F) AND A(F)                                       VIPRF
C     DBMFRS  ARRAY FOR STORING TABULAR DECIBEL VALUES USED FOR        VIPRF
C             CORRECTING "XMFMAX" FOR THE VALUE OF "RS"                VIPRF
C     DBMIN   MIN. Y AXIS(DECIBEL)VALUE,AN ARGUMENT OF "XLOG" PLOT SUBRCU VIPRF
C     DBMOD1  ARRAY FOR STORING 1ST BENDING MODE (DB) VALS. FOR CURRENT VIPRF
C             TYPE AIRCRAFT                                            VIPRF
C     DBMOD2  ARRAY FOR STORING 2ND BENDING MODE (DB) VALS. FOR CURRENT VIPRF
C             TYPE AIRCRAFT                                            VIPRF
C     DBRS    ARRAY FOR STORING DECIBEL VALUES USED WHEN CALCULATING   VIPRF
C             CORRECTION TO H(F) FOR R                                 VIPRF
C                                M        S                            VIPRF
C     DBSPL   ARRAY FOR STORING DECIBEL VALUES WHEN MAKING CALCULATIONS VIPRF
C             TO DETERMINE THE COORDINATES OF POINTS OF FUNCTIONS P(F),S( VIPRF
C     DB1A10  ARRAY FOR STORING 1ST BENDING MODE (DB) VALUES FOR A10   VIPRF
C     DB1A7D  ARRAY FOR STORING 1ST BENDING MODE VALUES FOR A-7D       VIPRF
C     DB1F15  ARRAY FOR STORING 1ST BENDING MODE VALUES FOR F-15       VIPRF
C     DB1F16  ARRAY FOR STORING 1ST BENDING MODE VALUES FOR F-16       VIPRF
C     DB1F4   ARRAY FOR STORING 1ST BENDING MODE VALUES FOR F-4        VIPRF
C     DB1111  ARRAY FOR STORING 1ST BENDING MODE VALUES FOR F-111      VIPRF
C     DB2A10  ARRAY FOR STORING 2ND BENDING MODE (DB) VALUES FOR A10   VIPRF
C     DB2A7D  ARRAY FOR STORING 2ND BENDING MODE VALUES FOR A-7D       VIPRF
C     DB2F15  ARRAY FOR STORING 2ND BENDING MODE VALUES FOR F-15       VIPRF
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      C     DB2F4  ARRAY FOR STORING 2ND BENDING MODE VALUES FOR F-4           VIPRF     174
      C     DB2111 ARRAY FOR STORING 2ND BENDING MODE (DB) VALUES FOR F-111    VIPRF     175
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      C            S (F)' TO DETERMINE S (F),GIVEN D=X -X                       VIPRF     177
      C             BT M                BT M          BT F                      VIPRF     178
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      C            L(F)-M(F)-H(F),G(F),R(F),A(F)                               VIPRF     181
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      C            WHICH A DB VALUE IS STORED IN ARRAY "DDBVAL"                VIPRF     183
      C     DELRS  CORRECTION TO M(F) AND H(F) FOR R (DISTANCE FROM SKIN)      VIPRF     184
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      C     DELTAF BOUNDARY LAYER THICKNESS AT THE GIVEN ALTITUDE              VIPRF     186
      C     DELTAZ BOUNDARY LAYER THICKNESS AT ZERO ALTITUDE                   VIPRF     187
      C     DLLWE  CORRECTION TO H(F) FOR W (EQUIPMENT WEIGHT)                 VIPRF     188
      C                                     E                                  VIPRF     189
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      C     DWE100 DISTANCE BETWEEN UNIFORMLY SPACED WE VALUES(100 LBS. MAX.), VIPRF     194
      C            FOR EACH OF WHICH A DB VALUE IS STORED IN ARRAY WE100       VIPRF     195
      C     DWE1K  DISTANCE BETWEEN UNIFORMLY SPACED WE VALUES(1000 LBS. MAX.) VIPRF     196
      C            FOR EACH OF WHICH A DB VALUE IS STORED IN ARRAY WE1000      VIPRF     197
      C     DWE5K  DISTANCE BETWEEN UNIFORMLY SPACED WE VALUES(5000 LBS. MAX.) VIPRF     198
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      C            STORED IN ARRAY DBMOD1 FOR CURRENT TYPE AIRCRAFT            VIPRF     203
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      C            STORED IN ARRAY DBMOD2 FOR CURRENT TYPE AIRCRAFT            VIPRF     205
      C     DX1A10 INTERVAL,DELTA XE,BETWEEN TABULAR 1ST BENDING MODE VALS.,A- VIPRF     206
      C     DX1A70 INTERVAL,DELTA XE,BETWEEN TABULAR 1ST BENDING MODE VALS.,A- VIPRF     207
      C     DX1F15 INTERVAL,DELTA XE,BETWEEN TABULAR 1ST BENDING MODE VALS.,F- VIPRF     208
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      C     DX1F4  INTERVAL,DELTA XE,BETWEEN TABULAR 1ST BENDING MODE VALS.,F- VIPRF     210
      C     DX1111 INTERVAL,DELTA XE,BETWEEN TABULAR 1ST BENDING MODE VALS.,F- VIPRF     211
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      C     DX2A70 INTERVAL,DELTA XE,BETWEEN TABULAR 2ND BENDING MODE VALS.,A- VIPRF     213
      C     DX2F15 INTERVAL,DELTA XE,BETWEEN TABULAR 2ND BENDING MODE VALS.,F- VIPRF     214
      C     DX2F16 INTERVAL,DELTA XE,BETWEEN TABULAR 2ND BENDING MODE VALS.,F- VIPRF     215
      C     DX2F4  INTERVAL,DELTA XE,BETWEEN TABULAR 2ND BENDING MODE VALS.,F- VIPRF     216
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      C                                                 2                    VIPRF     233
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235   C   FMAX   MAXIMUM FREQ.VALUE USED WHEN CALC.VALUES OF TRANSFER FUNCTI VIPRF     236
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      C   FMAXPF MAXIMUM FREQ.FOR PLOT OF P(F)                               VIPRF     239
      C   FMFHI  LOCATOR FREQ.,HIGH-FREQ.ROLL-OFF,FOR M(F)                   VIPRF     240
240   C   FMFLO  LOCATOR FREQ., LOW-FREQ.ROLL-OFF,FOR M(F)                   VIPRF     241
      C   FMINGF MINIMUM FREQ.FOR PLOT OF G(F)                               VIPRF     242
      C   FMINHF MINIMUM FREQ.FOR PLOT OF H(F)                               VIPRF     243
      C   FMINPF MINIMUM FREQ.FOR PLOT OF P(F)                               VIPRF     244
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245   C   FPRIHF ARRAY FOR STORING VALUES OF FREQ.USED WHEN CALCULATING F' F VIPRF     246
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      C   FRED   ARRAY FOR STORING FREQ.VALUES SELECTED WHEN CALCULATING     VIPRF     248
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      C   FZ     ARRAY FOR STORING VALUES OF F  AND F' USED WHEN CALC.L(F)-M VIPRF     253
      C                                        0       0                     VIPRF     254
      C   FZHFHI LOCATOR FREQ.,HIGH-FREQ.ROLL-OFF,FOR H(F)                   VIPRF     255
255   C   FZHFLO LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR H(F)                   VIPRF     256
      C   FZHI   LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR SPECIFIED Y(F) CATEGOR VIPRF     257
      C   FZLFHI LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR L(F)                   VIPRF     258
      C   FZLFLO LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR L(F)                   VIPRF     259
      C   FZLO   LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR SPECIFIED Y(F) CATEGOR VIPRF     260
260   C   FZMFHI LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR M(F)                   VIPRF     261
      C   FZMFLO LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR M(F)                   VIPRF     262
      C   FZPF   LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR P(F)                   VIPRF     263
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265   C   HILO   ARRAY FOR STORING VALUES=0 OR =1,DENOTING LOW-PASS,HIGH-PAS VIPRF     266
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      C   IA10   =2H   A-10 FOR COMPARE WITH IPLANE(1)                       VIPRF     272
      C   IA7D   =2H   A-7D FOR COMPARE WITH IPLANE(1)                       VIPRF     273
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275   C   ICK    VARIABLE EQUAL TO 1 OR 0 USED FOR DETERMINING CURRENT       VIPRF     276
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      C          BRANCHING DIRECTION AFTER RETURN FROM CALL TO "READCDS"     VIPRF     279
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      C   IFN    =1HN OR 2H2N FOR SUBSCRIPT IN PRINT OF F  OR F              VIPRF     282
      C                                                   N     2N            VIPRF     283
      C   IFNISH =6HFINISH USED FOR COMPARE WITH CONTENTS OF COL.1-6         VIPRF     284
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285   C   IF111  =8H   F-111 FOR COMPARE WITH IPLANE(1)                      VIPRF     286
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      C     IHOLD   ARRAY FOR STORING CONTENTS OF APPARENT "DESCRIPTION"       VIPRF     290
290   C             INPUT,DATA CARD AFTER RETURN FROM SUBROUTINE "READCDS"     VIPRF     291
      C     II      WORKING INTEGER VARIABLE                                   VIPRF     292
      C     ILAND   =7HLANDING FOR LANDING FLIGHT PHASE                        VIPRF     293
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295   C     IMAG    =1HM FOR MAGNESIUM                                         VIPRF     296
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      C             TRANSFER AND RESPONSE FUNCTIONS ARE PRODUCED               VIPRF     298
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      C     IPLANE  ARRAY FOR STORING INPUT VALUES FOR INPUT DATA IDENTIFICATIO VIPRF     300
300   C     IPLOT   INTEGER VARIABLE FOR COUNT OF PLOTS                        VIPRF     301
      C     ISANDL  =6HSANDL,DENOTING S AND L FLIGHT PHASE                     VIPRF     302
      C     ISTEEL  =1HS,DENOTING STEEL PLATE MATERIAL                         VIPRF     303
      C     ITAKOF  =7HTAKEOFF,DENOTING TAKEOFF FLIGHT PHASE                   VIPRF     304
      C     ITITAN  =1HT,DENOTING TITANIUM PLATE MATERIAL                      VIPRF     305
305   C     ITITL1  ARRAY FOR STORING PLOT TITLE LINE CHARACTERS               VIPRF     306
      C     ITURB   =2HTB,FOR LOW FREQ. ATMOS. TURBULENCE                      VIPRF     307
      C     IX      INTEGER VARIABLE FOR SUBSCRIPT IN PRINT OF X  ,X ,X OR X   VIPRF     308
      C                                                          RT  T  L    E VIPRF     309
      C     J       INTEGER WORKING VARIABLE                                   VIPRF     310
310   C     JFLITE  INPUT VALUE FOR FLIGHT PHASE                               VIPRF     311
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      C     LXNAME  ARRAY FOR STORING CHARACTERS FOR NAME OF X-AXIS ON PLOT    VIPRF     314
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      C     NC3     NUMBER OF TABULAR VALUES FOR CATEGORY 3,Y(F) PARAMETERS    VIPRF     319
      C     NDDB    NUMBER OF DECIBEL VALUES STORED IN ARRAY "DDBVAL"          VIPRF     320
320   C     NMERS   NUMBER OF DECIBEL VALUES IN ARRAY "DBMERS"                 VIPRF     321
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      C     NPTS    NUMBER OF POINTS CALCULATED FOR FUNCTION L(F)-M(F)-H(F)    VIPRF     324
      C     NRSVAL  NUMBER OF TABULAR VALUES OF R  USED WHEN CALC. F' FOR H(F) VIPRF     325
325   C                                           S                     0      VIPRF     326
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      C                                                 S                      VIPRF     328
      C     NWE100  NUMBER OF DB VALUES IN ARRAY WE100                         VIPRF     329
      C     NWE1K   NUMBER OF DB VALUES IN ARRAY WE1000                        VIPRF     330
330   C     NWE5K   NUMBER OF DB VALUES IN ARRAY WE5000                        VIPRF     331
      C     N1A10   NUMBER OF DECIBEL VALUES IN ARRAY "DB1A10"                 VIPRF     332
      C     N1A70   NUMBER OF DECIBEL VALUES IN ARRAY "DB1A70"                 VIPRF     333
      C     N1F15   NUMBER OF DECIBEL VALUES IN ARRAY "DB1F15"                 VIPRF     334
      C     N1F16   NUMBER OF DECIBEL VALUES IN ARRAY "DB1F16"                 VIPRF     335
335   C     N1F4    NUMBER OF DECIBEL VALUES IN ARRAY "DB1F4"                  VIPRF     336
      C     N1F111  NUMBER OF DECIBEL VALUES IN ARRAY "DB1111"                 VIPRF     337
      C     N2A10   NUMBER OF DECIBEL VALUES IN ARRAY "DB2A10"                 VIPRF     338
      C     N2A70   NUMBER OF DECIBEL VALUES IN ARRAY "DB2A70"                 VIPRF     339
      C     N2F15   NUMBER OF DECIBEL VALUES IN ARRAY "DB2F15"                 VIPRF     340
340   C     N2F16   NUMBER OF DECIBEL VALUES IN ARRAY "DB2F16"                 VIPRF     341
      C     N2F4    NUMBER OF DECIBEL VALUES IN ARRAY "DB2F4"                  VIPRF     342
      C     N2F111  NUMBER OF DECIBEL VALUES IN ARRAY DB2111                   VIPRF     343
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C                                 2                                           VIPRF    345
C     PEM     MAXIMUM OF P(F),PSF./HZ.                                        VIPRF    346
C     PEMDB   MAXIMUM OF P(F),DB.                                             VIPRF    347
C     PI      CONSTANT=3.14159265                                             VIPRF    348
C     RNORM   RATIO:AV.PRESSURE AT ALTITUDE/AV.PRESSURE AT SEA LEVEL ALTI     VIPRF    349
C     QSQ     SQUARE OF Q,DYNAMIC PRESSURE                                    VIPRF    350
C     R       AVERAGE DENSITY                                                 VIPRF    351
C     REX     RE ,REYNOLDS NUMBER AT DISTANCE X                               VIPRF    352
C               X                                                             VIPRF    353
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C     RS      INPUT VALUE FOR DISTANCE FROM SKIN,R                            VIPRF    355
C                                                   S                         VIPRF    356
C     RSMAX   MAX.VALUE OF R  COVERED BY ARRAY OF TABULAR,DECIBEL VALUES,     VIPRF    357
C                           S                                                 VIPRF    358
C     RSVALS  ARRAY FOR STORING TABULAR DECIBEL VALUES USED WHEN CALCULAT     VIPRF    359
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C              0                                                 S            VIPRF    361
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C     SBHI    SET EQUAL TO SLOPE FACTOR,HF ROLL-OFF FOR S(F) OF SPEC.FLIG     VIPRF    364
C     SBLO    SET EQUAL TO SLOPE FACTOR,LF ROLL-OFF FOR S(F) OF SPEC.FLIG     VIPRF    365
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C                   BT M  BT M                BT M                            VIPRF    367
C             VALUE FOR PUEMAX                                                VIPRF    368
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C                         BT                                                  VIPRF    370
C     SEZHI   SET EQUAL TO LOCATOR FREQ.,HIGH FREQ.ROLL-OFF,FOR S(F)          VIPRF    371
C             OF SPEC.FLIGHT PHASE                                            VIPRF    372
C     SEZLO   SET EQUAL TO LOCATOR FREQ., LOW FREQ.ROLL-OFF,FOR S(F)          VIPRF    373
C             OF SPEC.FLIGHT PHASE                                            VIPRF    374
C     SIGN    ARRAY FOR STORING VALUE 0 OR VALUE 1,DENOTING LOW-FREQ.AND      VIPRF    375
C             HIGH-FREQ.ROLL-OFF,RESP.,WHEN CALC. L(F)-M(F)-H(F)              VIPRF    376
C     SOUND   ARRAY FOR STORING TABULAR VALUES FOR VELOCITY OF SOUND          VIPRF    377
C     SPEAK   SET EQUAL TO MAXIMUM VALUE OF S(F) FOR SPEC.FLIGHT PHASE        VIPRF    378
C     SXHI    SET EQUAL TO NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF FOR S(F)        VIPRF    379
C             OF SPEC.FLIGHT PHASE                                            VIPRF    380
C     SXLO    SET EQUAL TO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF FOR S(F)        VIPRF    381
C             OF SPEC.FLIGHT PHASE                                            VIPRF    382
C     T       INPUT VALUE FOR AIRCRAFT PLATE THICKNESS                        VIPRF    383
C     TAKAHI  FORM FACTOR,HIGH FREQ.ROLL-OFF,FOR S(F) OF TAKE-OFF FLIGHT      VIPRF    384
C     TAKALO  FORM FACTOR, LOW FREQ.ROLL-OFF,FOR S(F) OF TAKE-OFF FLIGHT      VIPRF    385
C     TAKBHI  SLOPE FACTOR,HIGH-FREQ.ROLL-OFF,FOR S(F) OF TAKE-OFF FLIGHT     VIPRF    386
C     TAKBLO  SLOPE FACTOR, LOW-FREQ.ROLL-OFF,FOR S(F) OF TAKE-OFF FLIGHT     VIPRF    387
C     TAKMAX  MAXIMUM VALUE OF SPECIAL FUNCTION S(F) FOR TAKE-OFF FLIGHT      VIPRF    388
C     TAKXHI  NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR S(F),TAKE-OFF FLIGHT     VIPRF    389
C     TAKXLO  NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR S(F),TAKE-OFF FLIGHT     VIPRF    390
C     TBAHI   FORM FACTOR,HIGH FREQ. ROLL-OFF,FOR S(F) OF LOW FREQ.           VIPRF    391
C             ATMOS.TURBULENCE PHASE                                          VIPRF    392
C     TBBHI   SLOPE FACTOR,HIGH FREQ.ROLL-OFF,FOR S(F) FOR LOW FREQ.          VIPRF    393
C             ATMOS. TURBULENCE                                               VIPRF    394
C     TBFC    CENTER FREQ.OF HIGH FREQ. ROLL-OFF SECTION OF S(F) FOR          VIPRF    395
C             LOW FREQ. ATMOS.TURBULENCE PHASE                                VIPRF    396
C     TBREF   VALUE(REFERENCE) OF S(F) AT FREQ=F' USED WHEN CALC. MAXIMUM     VIPRF    397
C                                                 0                           VIPRF    398
C             VALUE OF S(F) AT FREQ.=TBFC                                     VIPRF    399
C     TICLEN  LENGTH OF TICK MARK ON RIGHT HAND Y AXIS OF PLOT                VIPRF    400
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C     TWOR    ARRAY FOR STORING VALUES OF BETA AND BETA' FOR L(F),M(F) AN VIPRF   401
C             H(F),USED WHEN CALCULATING L(F)-M(F)-H(F) TRANSFER FUNCTION VIPRF   402
C     TWORPF  TWICE BETA' FOR R(F)                                        VIPRF   403
C     U       FREE-STREAM VELOCITY                                        VIPRF   404
C     V       AVERAGE KINEMATIC VISCOSITY                                 VIPRF   405
C     VALK    ARRAY FOR STORING VALUES OF K USED WHEN CALCULATING F' FOR  VIPRF   406
C                                                                 C       VIPRF   407
C     VISCOS  ARRAY FOR STORING TABULAR VALUES OF AVERAGE KINEMATIC VISCO VIPRF   408
C     VNORM   RATIO:AV.KINEMATIC VISCOSITY AT ALTITUDE/AV.KINEMATIC VISCO VIPRF   409
C             AT SEALEVEL ALTITUDE                                        VIPRF   410
C     WE      INPUT VALUE FOR EQUIPMENT WEIGHT                            VIPRF   411
C     WEK     ARRAY FOR STORING TABULAR VALUES OF EQUIPMENT WEIGHT USED W VIPRF   412
C             CALCULATING F' FOR H(F)                                     VIPRF   413
C                                                                         VIPRF   414
C     WEMAX   MAXIMUM VALUE OF EQUIPMENT WEIGHT,WE,FOR TABULAR DECIBEL    VIPRF   415
C             VALUES STORED IN ARRAY"WE5000"                              VIPRF   416
C     WE100   ARRAY FOR STORING DECIBEL VALUES CORRESPONDING TO EQUIP.WEI VIPRF   417
C             UP TO 100LBS.,USED WHEN CALC.CORRECTION TO MAXIMUM OF H(F)  VIPRF   418
C     WE1000  ARRAY FOR STORING DECIBEL VALUES CORRESPONDING TO EQUIP.WEI VIPRF   419
C             UP TO 1000LBS.,USED WHEN CALC.CORRECTION TO MAXIMUM OF H(F) VIPRF   420
C     WE5000  ARRAY FOR STORING DECIBEL VALUES CORRESPONDING TO EQUIP.WEI VIPRF   421
C             UP TO 5000LBS.,USED WHEN CALC.CORRECTION TO MAXIMUM OF H(F) VIPRF   422
C     WS      DENSITY OF AIRCRAFT PLATE MATERIAL                          VIPRF   423
C     X       DISTANCE X ,X  OR X                                         VIPRF   424
C                        F  PT    TL                                      VIPRF   425
C     XAXIS   LENGTH OF X AXIS OF PLOTS                                   VIPRF   426
C     XBT     PT DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAM VIPRF   427
C             PROFILE TO THE WING CHORD CENTER                            VIPRF   428
C     XCYCLE  LENGTH OF LOGARITHMIC CYCLE FOR XAXIS OF PLOT               VIPRF   429
C     XF      F DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE AERODYNAMI VIPRF   430
C             PROFILE TO THE WING CHORD CENTER                            VIPRF   431
C     XFFRMX  ARRAY FOR STORING THE MAXIMUM VALUES OF L(F),L (F),M(F) AND VIPRF   432
C                                                          2              VIPRF   433
C             TRANSFER FUNCTIONS USED WHEN CALCULATING L(F)-M(F)-H(F)     VIPRF   434
C     XHFCOR  MAXIMUM VALUE OF H(F) CORRECTED FOR W ,W  AND R             VIPRF   435
C                                                  F  S       S            VIPRF   436
C     XHFHI   NORM.FREQ.RATIO,HIGH-FREQ.ROLL-OFF,H(F) OF CURRENT FLIGHT P VIPRF   437
C     XHFLO   NORM.FREQ.RATIO, LOW-FREQ.ROLL-OFF,H(F) OF CURRENT FLIGHT P VIPRF   438
C     XHFMAX  MAXIMUM VALUE OF H(F) BEFORE CORRECTION                     VIPRF   439
C     XHI     SET EQUAL TO NORM.FREQ.RATIO,HIGH-FREQ.ROLL-OFF,FOR SPEC.Y( VIPRF   440
C     XLFCOR  MAXIMUM VALUE OF L(F) CORRECTED FOR X                       VIPRF   441
C                                                  F                      VIPRF   442
C     XLFHI   NORM.FREQ.RATIO,HIGH-FREQ.ROLL-OFF,FOR L(F)                 VIPRF   443
C     XLFLO   NORM.FREQ.RATIO, LOW-FREQ.ROLL-OFF,FOR L(F)                 VIPRF   444
C     XLFMAX  MAXIMUM VALUE OF L(F) BEFORE CORRECTION                     VIPRF   445
C     XLO     SET EQUAL TO NORM.FREQ.RATIO,LOW-FREQ.ROLL-OFF,FOR SPEC.Y(F VIPRF   446
C     XL2FCR  MAXIMUM VALUE OF L (F) AFTER CORRECTION FOR X               VIPRF   447
C                              2                                 F        VIPRF   448
C     XL2FHI  NORM.FREQ.RATIO,HIGH-FREQ.ROLL-OFF,FOR L (F)                VIPRF   449
C                                                     2                   VIPRF   450
C     XL2FLO  NORM.FREQ.RATIO, LOW-FREQ.ROLL-OFF,FOR L (F)                VIPRF   451
C                                                     2                   VIPRF   452
C     XL2FMX  MAXIMUM VALUE OF L (F)                                      VIPRF   453
C                              2                                          VIPRF   454
C     XMACHNO MACH NO. OF CURRENT AIRCRAFT PROFILE ANALYSIS               VIPRF   455
C     XMFCOR  MAXIMUM VALUE OF M(F),CORRECTED FOR "WS"AND"RS"             VIPRF   456
C     XMFHI   NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR M(F)                 VIPRF   457
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                74/74   OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      C     XMFLO  NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR M(F)                      VIPRF     458
      C     XMFMAX MAXIMUM VALUE OF M(F)                                            VIPRF     459
      C     XRF    NORM.FREQ.RATIO,HIGH-FREQ.ROLL-OFF,FOR R(F)                      VIPRF     460
      C     XTL    "T" OR "L" DISTANCE FROM THE LEADING EDGE OF THE FUSELAGE        VIPRF     461
      C            AERODYNAMIC PROFILE TO THE LANDING GEAR                          VIPRF     462
      C     XVAL   X COORDINATE OF LOWER LEFT-HAND CORNER OF INFO.LINE PLT ON       VIPRF     463
      C            PLOT BY DISSPLA SUB-ROUTINE "RLMESS"                             VIPRF     464
      C     XX     WORKING,REAL VARIABLE                                            VIPRF     465
      C     XXHFHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR H(F)--CONSTANT VALUE      VIPRF     466
      C     XXHFLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR H(F)--CONSTANT VALUE      VIPRF     467
      C     XXLFHI NORM.FREQ.RATIO,HIGH FREQ.ROLL-OFF,FOR L(F)--CONSTANT VALUE      VIPRF     468
      C     XXLFLO NORM.FREQ.RATIO, LOW FREQ.ROLL-OFF,FOR L(F)--CONSTANT VALUE      VIPRF     469
      C     X1     WORKING VARIABLE                                                 VIPRF     470
      C     X2     WORKING VARIABLE                                                 VIPRF     471
      C     X3     WORKING VARIABLE                                                 VIPRF     472
      C     X4     WORKING VARIABLE                                                 VIPRF     473
      C     YAXIS  LENGTH OF Y AXIS ON PLOTS                                        VIPRF     474
      C     YSTEP  STEP SIZE ,Y DATA UNITS/INCH FOR PLOT Y AXIS                     VIPRF     475
      C     YVAL   Y COORDINATE OF LOWER LEFT-HAND CORNER OF INFO.LINE PLT ON       VIPRF     476
      C            PLOT BY DISSPLA SUB-ROUTINE "RLMESS"                             VIPRF     477
                                                                                    VIPRF     478
                                                                                    VIPRF     479
                                                                                    VIPRF     480
            DIMENSION FREQ(150),DECBEL(150),DBFL(150),DBSPL(150),FSPL(150)          VIPRF     481
            DIMENSION ALT(6),AMAKNO(5),ALPHA(4),DDBVAL(41),IHOLD(5)                 VIPRF     482
            DIMENSION DB1F4(41),DB2F4(41),DB1F15(41),DB2F15(41)                     VIPRF     483
            DIMENSION DB1F16(55),DB2F16(41),DB1111(41),DB2111(41)                   VIPRF     484
            DIMENSION DB1A70(41),DB2A70(41),DB1A10(41),DB2A10(41)                   VIPRF     485
            DIMENSION WSK(14),VALK(14),C1AAWE(11),C1AMWE(11)                        VIPRF     486
            DIMENSION BETBF(29),FDRIHF(43),DBRS(43),RSVALS(43),WE1CO(7)             VIPRF     487
            DIMENSION WE1000(7),WE5000(9),DBMFRS(29)                                VIPRF     488
            DIMENSION CB(4),XFERMX(4),TWOB(4),FLX(4),FZ(4),HILC(4),SIGN(4)          VIPRF     489
            DIMENSION ALTITUD(61),AVP(61),AVDENS(61),SOUND(61),VISCOS(61)           VIPRF     490
            DIMENSION C3WE(10),C3AYMX(10),C3AAP(10),C3AXP(10),C3BE(10),             VIPRF     491
           1C3BX(10),C3BRP(10),C3BXP(10),C3BYMX(10),C3BAP(10),C3BA(10),             VIPRF     492
           2C3AP(10)                                                                VIPRF     493
                                                                                    VIPRF     494
                                                                                    VIPRF     495
            COMMON/PRLCTT/H,XMAKNO,X,RS,WE,WS,IFLITL,CATGRY,ILINE1(7),              VIPRF     496
           1ITITL1(7),IPLANE(3),LYNAME(4),LYNAME(4),XCYCLE,YSTEP,YAXIS,             VIPRF     497
           2XAXIS,HITF,HITF1,TICLEN,X1,X2,X3,X4,XX,IPHASE,INOPLT,IBLANK             VIPRF     498
                                                                                    VIPRF     499
            COMMON/KARCS/FN,XLFMAX,F2N,XL2FMX,RUFMAX,XFT,XTL,FCMOVF,                VIPRF     500
           1NMODF1,DXMOD1,DBMOD1(100),NMODF2,DXMOD2,DBMOD2(100),                    VIPRF     501
           2ILINE2(8),ISANDL,IBUFET,ITAKOF,ILAND,ITURB,IFNISH                       VIPRF     502
                                                                                    VIPRF     503
                                                                                    VIPRF     504
            DATA BETBF/29*/BETBF/1.745,1.150,0.900,0.746,0.651,0.592,0.551,         VIPRF     505
           10.530,0.509,0.492,0.480,0.470,0.457,0.454,0.446,0.440,0.435,            VIPRF     506
           20.424,0.421,0.4154,0.4118,0.4072,0.4026,0.3980,0.3934,0.3888,           VIPRF     507
           30.3842,0.3796,0.375/                                                    VIPRF     508
                                                                                    VIPRF     509
            DATA RSVALS/0.,0.25,0.50,0.75,1.0,1.25,1.50,1.75,2.0,2.25,2.50,         VIPRF     510
           12.75,3.0,3.5,4.0,4.5,5.0,5.5,6.0,7.0,8.0,9.0,10.0,11.0,12.0,13.0,       VIPRF     511
           214.0,15.0,16.0,17.0,18.0,19.0,20.0,21.0,22.0,23.0,24.0,25.0,26.0,       VIPRF     512
           327.0,28.0,29.0,30.0/                                                    VIPRF     513
                                                                                    VIPRF     514
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      DATA CPRS/0.,-2.00,-2.60,-3.30,-3.90,-4.40,-4.80,-5.20,-5.50,
     1-5.90,-6.15,-6.40,-6.80,-7.30,-8.00,-8.50,-9.0,-9.5,-10.0,-10.8,
     2-11.5,-12.0,-12.75,-13.20,-13.70,-14.00,-14.40,-14.60,-14.90,
     3-15.20,-15.35,-15.70,-15.85,-15.95,-16.0,-16.10,-16.20,-16.30,
     4-16.40,-16.50,-16.60,-16.65,-16.70/

      DATA FPRIHF/5500.,3800.,3550.,3350.,3200.,3100.,2950.,2800.,
     12730.,2650.,2560.,2470.,2400.,2320.,2200.,2100.,2000.,1950.,
     21900.,1850.,1754.,1690.,1600.,1580.,1550.,1510.,1480.,1450.,
     31420.,1380.,1360.,1340.,1320.,1305.,1285.,1268.,1256.,1250.,
     41244.,1238.,1232.,1226.,1220./

      DATA KFK/2.5,3.8,5.0,7.5,10.0,15.0,20.0,30.0,40.0,60.0,80.0,100.0,
     1160.0,200.0/
      DATA VALK/1.0,0.99,0.98,0.95,0.92,0.87,0.84,0.76,0.73,0.675,
     10.650,0.608,0.575,0.550/

      DATA NMFRS/29/,DXMFRS/0.10/
      DATA DFMFRS/-17.0,-16.5,-15.0,-13.7,-12.4,-11.2,-10.2,-9.2,-8.1,
     1-7.3,-6.6,-5.8,-5.0,-4.5,-3.9,-3.2,-2.8,-2.2,-2.0,-1.7,-1.2,
     2-1.1,-0.90,-0.70,-0.40,-0.30,-0.20,-0.10,0./

      DATA NC1A/11/,DXC1A/20.0/,XINC1A/10.0/
      DATA C1AAWE/1.0,1.34,1.48,1.57,1.62,1.70,1.75,1.77,1.82,1.86,1.92/
      DATA C1AMWE/0.,-1.0,-1.8,-2.7,-2.8,-3.3,-4.0,-4.5,-5.2,-5.5,-6.5/

      DATA NWE100/7/,DWE100/15.0/
      DATA WE100/0.,-0.5,-1.25,-2.0,-2.5,-3.75,-4.5/
      DATA NWE1K/7/,DWE1K/150.0/
      DATA WE1000/-4.5,-10.0,-12.6,-14.4,-15.2,-16.1,-16.6/
      DATA NWE5K/9/,DWE5K/500.0/
      DATA WE5000/-16.6,-17.65,-18.9,-19.7,-20.15,-20.6,-21.0,-21.25,
     1-21.50/

      DATA NDDB/41/,DELDDB/1.0/
      DATA DDBVEL/0.,-0.02,-0.05,-0.10,-0.20,-0.22,-0.30,
     1-0.44,-0.50,-0.60,-0.80,-1.00,-1.20,-1.40,-1.60,-1.90,-2.20,
     2-2.50,-3.00,-3.50,-4.00,-4.50,-5.10,-5.80,-6.60,-7.50,-8.30,
     3-9.20,-10.10,-11.50,-11.80,-12.70,-13.50,-14.30,-15.00,
     4-15.70,-16.50,-17.20,-17.90,-18.50,-19.10/

      DATA C3WE/10.0,15.0,20.0,30.0,40.0,60.0,80.0,120.0,160.0,200.0/
      DATA C3AYMX/12.0,11.6,11.5,11.0,10.7,10.0,9.6,9.3,7.5,6.0/
      DATA C3AB/0.300,0.285,0.278,0.264,0.257,0.240,0.235,0.220,
     10.212,0.200/
      DATA C3AXE/0.500,0.460,0.445,0.406,0.385,0.350,0.332,0.295,
     10.280,0.250/
      DATA C3AAE/1.900,1.907,1.909,1.918,1.920,1.936,1.940,1.960,
     11.970,2.000/
      DATA C3BYMX/24.0,16.7,14.6,11.2,10.2,8.0,7.4,6.3,6.1,6.0/
      DATA C3BB/0.100,0.130,0.140,0.175,0.190,0.225,0.235,0.265,
     10.283,0.300/
      DATA C3BBE/0.100,0.167,0.190,0.260,0.280,0.350,0.375,0.435,
     10.463,0.500/
      DATA C3BX/1.42,1.52,1.55,1.65,1.69,1.78,1.81,1.89,1.95,2.00/
      DATA C3BXE/0.700,0.625,0.599,0.524,0.494,0.419,0.400,0.333,
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     10.288,0.250/                                                      VIPRF    572
      DATA C3BA/1.00,0.64,0.54,0.36,0.30,0.20,0.175,0.120,0.110,0.10/   VIPRF    573
      DATA C3BAF/1.40,1.46,1.50,1.56,1.58,1.64,1.68,1.73,1.75,1.80/     VIPRF    574
                                                                        VIPRF    575
      DATA ALTTUD/ 0.,500.,1000.,1500.,2000.,2500.,3000.,3500.,4000.,   VIPRF    576
     * 4500., 5000., 5500., 6000., 6500., 7000., 7500., 8000., 8500.,   VIPRF    577
     * 9000., 9500.,10000.,11000.,12000.,13000.,14000.,15000.,16000.,   VIPRF    578
     *17000.,18000.,19000.,20000.,21000.,22000.,23000.,24000.,25000.,   VIPRF    579
     *26000.,27000.,28000.,29000.,30000.,31000.,32000.,33000.,34000.,   VIPRF    580
     *35000.,36000.,37000.,38000.,39000.,40000.,41000.,42000.,43000.,   VIPRF    581
     *44000.,45000.,46000.,47000.,48000.,49000.,50000./                 VIPRF    582
                                                                        VIPRF    583
      DATA AVP/2116.2,2078.3,2040.9,2004.0,1967.7,1931.9,1896.6,1861.9, VIPRF    584
     *1827.7,1794.0,1760.8,1728.1,1695.9,1664.2,1632.9,1602.2,1571.9,   VIPRF    585
     *1542.1,1512.7,1483.8,1455.3,1399.7,1345.9,1293.7,1243.2,1194.3,   VIPRF    586
     *1146.9,1101.1,1056.8,1013.9, 972.5, 932.4, 893.7, 856.3, 820.2,   VIPRF    587
     *785.3,751.6,719.1,687.8,657.6,628.4,600.3,573.3,547.2,522.1,498.0, VIPRF    588
     *474.7,452.4,431.2,411.0,391.7,373.3,355.8,339.1,323.2,308.0,293.6, VIPRF    589
     *279.8,266.7,254.1,242.2/                                          VIPRF    590
                                                                        VIPRF    591
      DATA AMDENS/.2513E-02,.2467E-02,.2422E-02,.2377E-02,.2334E-02,    VIPRF    592
     *.2291E-02,.2249E-02,.2211E-02,.2173E-02,.2137E-02,.2102E-02,      VIPRF    593
     *.2067E-02,.2033E-02,.1999E-02,.1965E-02,.1932E-02,.1900E-02,      VIPRF    594
     *.1868E-02,.1836E-02,.1805E-02,.1774E-02,.1718E-02,.1663E-02,      VIPRF    595
     *.1611E-02,.1559E-02,.1508E-02,.1458E-02,.1411E-02,.1364E-02,      VIPRF    596
     *.1318E-02,.1273E-02,.1230E-02,.1188E-02,.1147E-02,.1107E-02,      VIPRF    597
     *.1068E-02,.1030E-02,.9933E-03,.9577E-03,.9228E-03,.8890E-03,      VIPRF    598
     *.8536E-03,.8189E-03,.7853E-03,.7529E-03,.7215E-03,.6912E-03,      VIPRF    599
     *.6621E-03,.6341E-03,.6074E-03,.5818E-03,.5573E-03,.5338E-03,      VIPRF    600
     *.5113E-03,.4898E-03,.4692E-03,.4495E-03,.4306E-03,.4125E-03,      VIPRF    601
     *.3952E-03,.3786E-03/                                              VIPRF    602
                                                                        VIPRF    603
      DATA SOUND/1090.6,1090.4,1090.3,1090.1,1090.,1089.8,1089.7,1089.0, VIPRF    604
     *1087.8,1086.7,1085.5,1084.3,1083.1,1081.9,1080.7,1079.5,1078.4,   VIPRF    605
     *1077.1,1075.9,1074.7,1073.4,1069.6,1065.9,1062.1,1058.4,1054.5,   VIPRF    606
     *1050.7,1046.9,1043.1,1039.2,1035.4,1031.5,1027.5,1023.6,1019.7,   VIPRF    607
     *1015.8,1011.8,1007.8,1003.8, 999.7, 995.7, 991.1, 990.7, 988.2,   VIPRF    608
     *985.7,983.3,980.8,978.3,975.8,973.3,970.9,968.5,966.0,963.6,961.1, VIPRF    609
     *958.8,956.3,954.0,951.6,949.2,946.9/                              VIPRF    610
                                                                        VIPRF    611
      DATA VTSCOS/.1467E-03,.1492E-03,.1517E-03,.1543E-03,.1570E-03,    VIPRF    612
     *.1597E-03,.1625E-03,.1651E-03,.1675E-03,.1699E-03,.1724E-03,      VIPRF    613
     *.1749E-03,.1775E-03,.1802E-03,.1826E-03,.1856E-03,.1883E-03,      VIPRF    614
     *.1911E-03,.1940E-03,.1969E-03,.1998E-03,.2051E-03,.2106E-03,      VIPRF    615
     *.2163E-03,.2222E-03,.2283E-03,.2346E-03,.2411E-03,.2478E-03,      VIPRF    616
     *.2551E-03,.2621E-03,.2696E-03,.2774E-03,.2854E-03,.2938E-03,      VIPRF    617
     *.3025E-03,.3115E-03,.3208E-03,.3306E-03,.3407E-03,.3512E-03,      VIPRF    618
     *.3639E-03,.3775E-03,.3917E-03,.4066E-03,.4223E-03,.4387E-03,      VIPRF    619
     *.4559E-03,.4738E-03,.4925E-03,.5118E-03,.5320E-03,.5530E-03,      VIPRF    620
     *.5749E-03,.5976E-03,.6213E-03,.6460E-03,.6717E-03,.6984E-03,      VIPRF    621
     *.7263E-03,.7554E-03/                                              VIPRF    622
                                                                        VIPRF    623
      DATA ISTEEL,ITITAN,IALUM,IMAG/1HS,1HT,1HA,1HM/                    VIPRF    624
                                                                        VIPRF    625
      DATA C1A/2H1A/,C2A/2H2A/,C2B/2H2B/,C3A/2H3A/,C3B/2H3B/,C5/1H5/    VIPRF    626
      DATA C1B/2H1B/,C4A/2H4A/,C4B/2H4B/,C6/1H6/,IBLANK/1H /            VIPRF    627
                                                                        VIPRF    628
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      DATA IF4/6H    F-4/,IF15/7H    F-15/,IF16/7H    F-16/                                  VIPRF     629
      DATA IF111/8H    F-111/,IA70/7H    A-70/,IA10/7H    A-10/                              VIPRF     630
                                                                                              VIPRF     631
      DATA ISANDL,IRUEST,ILAND,ITAKOF/5HSANDL,2HRT,7HLANDING,7HTAKEOFF/                       VIPRF     632
      DATA ITURF/2HTR/                                                                        VIPRF     633
                                                                                              VIPRF     634
      DATA PI/3.14159265/,IFNISH/6HFINISH/                                                    VIPRF     635
                                                                                              VIPRF     636
                                                                                              VIPRF     637
      DATA N1F4/41/,DX1F4/1.52/                                                               VIPRF     638
      DATA DB1F4 / 0.0,  -.80, -1.60, -2.80, -4.10, -5.40, -7.30, -9.80,                      VIPRF     639
     1-12.00,-15.00,-20.00,-26.00,-24.40,-22.10,-20.20,-19.10,-18.40,                         VIPRF     640
     2-19.00,-17.90,-17.90,-18.20,-18.90,-20.40,-22.90,-25.30,-26.00,                         VIPRF     641
     3-25.20,-22.60,-19.60,-17.70,-15.60,-14.00,-12.70,-11.30,-10.10,                         VIPRF     642
     4 -9.10, -8.30, -7.50, -6.80, -6.00, -5.30/                                              VIPRF     643
                                                                                              VIPRF     644
      DATA N2F4/41/,DX2F4/1.52/                                                               VIPRF     645
      DATA DB2F4 / 0.0,  -.90, -2.00, -4.00, -6.50, -9.70,-15.00,-26.00,                      VIPRF     646
     1-22.00,-16.70,-13.70,-11.00,-11.00,-11.30,-11.30,-12.60,-14.20,                         VIPRF     647
     2-16.50,-18.80,-22.40,-30.00,-25.90,-22.00,-19.10,-17.90,-17.30,                         VIPRF     648
     3-17.40,-17.90,-19.80,-25.90,-25.60,-19.00,-14.80,-11.00, -8.75,                         VIPRF     649
     4 -7.00, -5.75, -4.60, -3.80, -3.00,  2.40/                                              VIPRF     650
                                                                                              VIPRF     651
      DATA N1F15/41/,DX1F15/1.375/                                                            VIPRF     652
      DATA DB1F15/ 0.0,  -.90, -1.75, -2.80, -3.90, -5.00, -6.00, -7.80,                      VIPRF     653
     1 -9.25,-11.10,-13.75,-16.90,-21.20,-25.40,-26.00,-25.60,-23.60,                         VIPRF     654
     2-20.10,-18.30,-16.90,-16.25,-16.10,-16.15,-16.90,-17.60,-18.70,                         VIPRF     655
     3-20.00,-21.75,-25.00,-25.80,-25.70,-21.40,-19.00,-16.80,-15.40,                         VIPRF     656
     4-14.30,-13.00,-12.20,-11.10,-10.30, -9.50/                                              VIPRF     657
                                                                                              VIPRF     658
      DATA N2F15/41/,DX2F15/1.375/                                                            VIPRF     659
      DATA DB2F15/ 0.0, -1.10, -2.40, -4.25, -6.30, -8.80,-12.40,-18.00,                      VIPRF     660
     1-26.00,-17.00,-13.00,-11.35,-10.90,-10.75,-10.83,-11.10,-11.90,                         VIPRF     661
     2-14.00,-16.50,-23.00,-24.00,-20.30,-19.10,-18.50,-18.40,-18.80,                         VIPRF     662
     3-19.30,-25.30,-26.00,-21.40,-21.40,-19.80,-18.20,-17.20,-16.20,                         VIPRF     663
     4-15.70,-15.00,-14.40,-13.90,-13.40,-13.00/                                              VIPRF     664
                                                                                              VIPRF     665
      DATA N1F16/55/,DX1F16/0.85/                                                             VIPRF     666
      DATA DB1F16/ 0.0,  -.40, -1.00, -1.40, -2.20, -2.60, -3.40, -4.20,                      VIPRF     667
     1 -5.00, -6.00, -7.40, -8.60,-10.60,-12.30,-14.80,-18.80,-22.60,                         VIPRF     668
     2-26.20,-25.90,-23.10,-21.60,-20.90,-20.15,-19.80,-19.30,-19.00,                         VIPRF     669
     3-18.90,-18.80,-18.60,-18.50,-18.60,-18.75,-19.00,-19.60,-20.20,                         VIPRF     670
     4-21.40,-22.80,-24.40,-25.50,-26.00,-26.20,-26.00,-25.80,-25.30,                         VIPRF     671
     5-23.90,-21.20,-19.30,-17.80,  -.00,-15.10,-14.10,-13.20,-12.30,                         VIPRF     672
     6-11.60,-11.00/                                                                          VIPRF     673
                                                                                              VIPRF     674
      DATA N2F16/41/,DX2F16/1.1475/                                                           VIPRF     675
      DATA DB2F16/ 0.0, -1.20, -2.50, -4.30, -6.00, -8.20,-10.90,-15.00,                      VIPRF     676
     1-22.10,-26.00,-20.75,-17.60,-17.15,-17.40,-21.60,-25.10,-25.90,                         VIPRF     677
     2-26.00,-25.90,-25.00,-23.30,-21.90,-21.60,-22.75,-24.50,-25.80,                         VIPRF     678
     3-26.00,-25.80,-24.10,-21.80,-21.60,-21.80,-25.10,-26.00,-21.00,                         VIPRF     679
     4-16.25,-12.75, -9.70, -7.30, -5.40, -3.80/                                              VIPRF     680
                                                                                              VIPRF     681
      DATA N1F111/41/,DX1111/1.7621/                                                          VIPRF     682
      DATA DB1111/ 1.0,   .20,  -.75, -1.70, -2.60, -3.75, -4.90, -6.00,                      VIPRF     683
     1 -7.80, -9.60,-11.25,-13.60,-16.25,-20.00,-25.80,-26.00,-24.00,                         VIPRF     684
     2-20.50,-18.30,-16.80,-15.60,-14.90,-14.40,-14.35,-14.70,-15.20,                         VIPRF     685
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      PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                3-16.00,-17.60,-19.90,-22.00,-25.85,-26.20,-26.10,-25.20,-20.70,     VIPRF     686
                4-17.75,-15.80,-14.00,-12.70,-11.50,-10.50/                          VIPRF     687
                 DATA N2F111/41/,DX2111/1.7621/                                      VIPRF     688
                 DATA DF2111/41*0./                                                  VIPRF     689
                                                                                     VIPRF     690
                 DATA N1A70/41/,DX1A70/1.104/                                        VIPRF     691
                 DATA DF1A70/ 0.0,  -.90, -1.60, -2.20, -3.00, -3.90, -4.90, -5.80, VIPRF     692
                1 -7.00, -8.60,-10.60,-12.90,-16.60,-25.20,-25.80,-20.20,-16.40,     VIPRF     693
                2-14.10,-13.00,-12.40,-12.00,-11.80,-11.60,-11.65,-11.90,-12.50,     VIPRF     694
                3-13.75,-15.80,-19.80,-23.20,-26.00,-25.80,-23.00,-16.80,-13.40,     VIPRF     695
                4-11.00, -9.50, -8.35, -7.70, -6.90, -6.00/                          VIPRF     696
                                                                                     VIPRF     697
                 DATA N2A70/41/,DX2A70/1.104/                                        VIPRF     698
                 DATA DF2A70/ 0.0, -1.60, -3.70, -6.40, -9.50,-13.00,-21.70,-21.70, VIPRF     699
                1-16.00,-11.15,-10.00, -9.50, -9.72,-10.20,-11.20,-12.50,-14.60,     VIPRF     700
                2-17.70,-22.00,-25.90,-25.70,-22.00,-18.10,-16.00,-14.30,-13.75,     VIPRF     701
                3-13.40,-13.60,-13.98,-14.25,-15.60,-19.70,-26.00,-20.00,-13.00,     VIPRF     702
                4-10.30, -7.80, -5.00, -3.30, -1.80,  -.66/                          VIPRF     703
                                                                                     VIPRF     704
                 DATA N1A10/41/,DX1A10/1.315/                                        VIPRF     705
                 DATA DF1A10/ 0.0, -1.09, -2.38, -4.01, -5.68, -7.54,-10.12,-13.40, VIPRF     706
                1-18.06,-25.50,-25.50,-19.17,-15.29,-13.15,-11.70,-10.63, -9.68,     VIPRF     707
                2 -9.09, -8.71, -8.40, -8.27, -8.04, -8.11, -8.34, -8.68, -9.32,     VIPRF     708
                3-10.63,-11.57,-14.00,-18.27,-25.80,-20.90,-13.68, -9.24, -6.02,     VIPRF     709
                4 -3.68, -1.87,  -.32,   .98,  2.26,  3.15/                          VIPRF     710
                 DATA N2A10/41/,DX2A10/1.315/                                        VIPRF     711
                 DATA DF2A10/41*0./                                                  VIPRF     712
                                                                                     VIPRF     713
                                                                                     VIPRF     714
                 NRSVAL=43                                                           VIPRF     715
                 FMINRF=100.0 $FMAXRF=100000.0                                       VIPRF     716
                 FMINHF=10. $FMAXHF=10000.                                           VIPRF     717
                 FMINGF=5.0 $FMAXGF=10000.                                           VIPRF     718
                 HMAX=50000.0 $RSMAX=30.0 $WFMAX=5000.0                              VIPRF     719
                 XDF=0.010 $IPLOT=0                                                  VIPRF     720
                 DBLFLO=0.3 $DBLFHI=0.5 $XXLFLO=2.0 $XXLFHI=0.5                      VIPRF     721
                 FMFLO=40.0 $FMFHI=250.0 $BMFLO=0.3 $BMFHI=0.3                       VIPRF     722
                 XMFLO=2.5 $XMFHI=0.4                                                VIPRF     723
                 BHFLO=0.3 $BHFHI=0.3 $XXHFLO=2.0 $XXHFHI=0.5                        VIPRF     724
                 AHFLO=0.8 $AHFHI=1.30  $ADFHI=1.0 $ALFLO=1.0 $ALFHI=1.0             VIPRF     725
                 AMFLO=1.0 $AMFHI=1.0                                                VIPRF     726
                 FL2FLO=0.3 $FL2FHI=0.2 $XL2FLO=1.80 $XL2FHI=0.555                   VIPRF     727
                 AL2FLO=1.0 $AL2FHI=2.0                                              VIPRF     728
                 AMFMAX=-144.0 $AHFMAX=-121.0                                        VIPRF     729
                 C1AXLO=2.0 $C1AXHI=0.5 $C1ABLO=0.2 $C1ABHI=0.2 $C1AALO=1.0          VIPRF     730
                 C1AAHI=1.0 $C1AFM=25.0 $C1AMAX=12.0                                 VIPRF     731
                 C2AXLO=1.5 $C2AXHI=0.5 $C2ABLO=0.2 $C2ABHI=0.2 $C2AALO=1.0          VIPRF     732
                 C2AAHI=1.7 $C2AFM=43.0 $C2AMAX=13.0                                 VIPRF     733
                 C2BXLO=2.0 $C2BXHI=0.50 $C2BBLO=0.200 $C2BBHI=0.300 $C2BALO=1.0     VIPRF     734
                 C2BAHI=1.90 $C2BFM=40.0 $C2BMAX=14.0                                VIPRF     735
                 C5BLO=0.1 $C5BHI=0.1 $C5XLO=1.42 $C5XHI=1.71.42 $C5ALO=0.50         VIPRF     736
                 C5AHI=1.4 $C5FM=200.0 $C5MAX=33.0                                   VIPRF     737
                 DUFXLO=1.25 $DUFXHI=0.583 $DUFBHI=0.200 $DUFFZL=24.0 $DUFFZH=60.0   VIPRF     738
                 DUFALO=0. $DUFAHI=1.0 $DUFDEL=5.0                                   VIPRF     739
                                                                                     VIPRF     740
                 TAKBLO=0.3 $TAKBHI=0.4 $TAKXLO=4.0 $TAKXHI=0.50 $TAKALO=0.4         VIPRF     741
                 TAKAHI=1.0 $TAKMAX=10.0                                             VIPRF     742
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```
PROGRAM VIPRF      74/74   OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      ALNBLO=0.3 $ALNBHI=0.3 $ALNXLO=2.0 $ALNXHI=0.5 $ALNALO=0.4
      ALNAHI=1.60 $ALNMAX=12.0
      TBBHI=0.3 $TBAHI=1.0 $TBFC=5.0 $TBREF=12.0

      NC3=10
      C3APHI=0.2 $C3AXLO=2.0 $C3AALO=2.0 $C3AFN=25.0 $C3BFN=35.0

      CALL COMPRS $CALL YAXANG(0.) $CALL YINTAX
      CALL BASALF("L/CSTD") $CALL MIXALF("STANDARD") $CALL MARKER(1)
      HITE=0.140 $HITE1=5.*HITE/7.
      XCYCLF=2.0 $YAXIS=8.0 $TICLFN=0.026

C     ************************
C     *                      *
C     *    READ INPUT DATA   *
C     *                      *
C     ************************

    1 READ(5,15) (IPLANE(I),I=1,3),JFLITE,INOPLT
      IF(EOF(5).NE.0) GO TO 890
   15 FORMAT(8A10)

   31 I=10H*********0 $PRINT 25,I,I,I,I,I,I,I
   25 FORMAT(1H1,19X,*INPUT DATA CARDS*//63X,*COLUMN NUMBER*/
     138X,*1*,9X,*2*,9X,*3*,9X,*4*,9X,*5*,9X,*6*,9X,*7*,9X,*8*/
     229X,10H1*********0,7A10/)
      PRINT 33,(IPLANE(I),I=1,3),JFLITE,INOPLT
   33 FORMAT(1H0,28X,*DESCRIPTION CARD*/29X,8A10)

      READ 15,ILINE2
      PRINT 36,ILINE2
   36 FORMAT(1H0,28X,*ALTITUDE-MACH NO. CARD*/29X,8A10)
      DECODE(80,37,ILINE2) (ALT(I),AMAKNO(I),I=1,6)
   37 FORMAT(6(F8.2,F5.2))

      READ 15,ILINE2
      PRINT 38,ILINE2
   38 FORMAT(1H0,28X,*AIRCRAFT PARAMETERS CARD*/29X,8A10)
      DECODE(80,39,ILINE2) XE,PS,WE,DF,T,FCCAT1,FCCAT2,MATERL,CATGRY
   39 FORMAT(7F10.3,A1,A2)

      I=IPLANE(1)
      IF(I.EQ.IF4) GO TO 20
      IF(I.EQ.IF15) GO TO 26
      IF(I.EQ.IF16) GO TO 40
      IF(I.EQ.IF111) GO TO 43
      IF(I.EQ.IA20) GO TO 45
      IF(I.EQ.IA10) GO TO 48

      CALL READCDS(0.,0.,0.,0.,0.,0.,0.,0.,0,0.,0.,0,0.,0.,0,I,IERROR)
      GO TO 47

   20 CALL READCDS(14.3,-122.0,18.94,-129.0,35.0,32.3,35.3,1.0,
     1N1F4,DX1F4,DB1F4,N2F4,DX2F4,DB2F4,1,IF4,IERROR)
      GO TO 47
```

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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      23 CALL READCDS(8.5,-127.0,27.8,-131.0,35.0,39.1,40.2,1.0,
        2N1F15,DX1F15,DB1F15,N2F15,DX2F15,DB2F15,1,IF15,IERROR)
         GO TO 47
      40 CALL READCDS(12.9,-131.0,32.5,-133.0,35.0,27.1,29.5,1.0,
        2N1F16,DX1F16,DB1F16,N2F16,DX2F16,DB2F16,1,IF16,IERROR)
         GO TO 47
      43 CALL READCDS(8.5,-134.0,0.00, 0.0,35.0,38.1,47.1,1.0,
        1N1F111,DX1111,DB1111,N2F111,DX2111,DB2111,1,IF111,IERROR)
         GO TO 47
      46 CALL READCDS(15.2,-129.0,23.0,-140.0,35.0,20.5,25.4,1.0,
        2N1A7D,DX1A7D,DB1A7D,N2A7D,DX2A7D,DB2A7D,1,IA7D,IERROR)
         GO TO 47
      48 CALL READCDS(9.04,-131.0, 0.0, 0.0,35.0,0.00, 4.0,1.0,
        1N1A10,DX1A10,DB1A10,N2A10,DX2A10,DB2A10,1,IA10,IERROR)

      47 IF(IERROR.EQ.0) GO TO 27
         IF(IERROR.EQ.1) GO TO 1
         IF(IERROR.EQ.2) GO TO 4
         IF(IERROR.EQ.3.OR.IERROR.EQ.4) GO TO 41

       4 IPLANE(1)=ILINE2(1) $IPLANE(2)=ILINE2(2)
         IPLANE(3)=ILINE2(3) $JFLITE=ILINE2(4)
         INOPLT=ILINE2(5)
         GO TO 31

      41 DO 42 I=1,5
      42 IHOLD(I)=ILINE2(I)

C     *                                          *
C     * CHECK VALIDITY OF INPUT DATA VALUES      *
C     *                                          *
C     ******************************************

      27 M=0
         IF(JFLITE.EQ.ISANDL.OR.JFLITE.EQ.IBUFET.OR.JFLITE.EQ.ITAKOF
        1.OR.JFLITE.EQ.ILAND.OR.JFLITE.EQ.ITURB) GO TO 9
         M=1 $PRINT 29,JFLITE,ISANDL,IBUFET,ITAKOF,ILAND,ITURB
      29 FORMAT(1H-, A10,* WAS READ FOR THE FLIGHT CONDITION,NOT*,A10,*OR*,
        1A10,*OR*,A10,*OR*,A10,*OR*,A10/* FOR "STRAIGHT-AND-LEVEL","BUFFET-
        2TURN","TAKE-OFF","LANDING" AND "LOW-FREQ. ATMOSPHERIC TURBULENCE",
        3RESPECTIVELY.*)

       9 IF(XE.GT.0.) GO TO 10
         M=1 $II=10HDOWN-STREA  $J=10HM AERO.DST $PRINT 5,II,J,XE
         II=3H>0. $PRINT 8,II,IBLANK

      10 IF(RS.GE.0.) GO TO 14
         M=1 $II=10H DISTANCE  $J=9HFROM SKIN $PRINT 5,II,J,RS
         II=10H>0. OR =0. $PRINT 8,II,IBLANK

      14 IF(WE.GE.0.) GO TO 11
         M=1 $II=10H  EQUIPMEN $J=8HT WEIGHT $PRINT 5,II,J,WE
         II=10H>0. OR =0. $PRINT 8,II,IBLANK

      11 IF(DF.GT.0.) GO TO 18
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      M=1 $II=10H FUSELAGE  $J=8HDIAMETER $PRINT 5,II,J,DF
      II=3H>0. $PRINT 8,II,IBLANK
      GO TO 19

   18 X1=DF/2. $IF(RS.LE.X1) GO TO 19
      M=1 $PRINT 16,RS,X1
   16 FORMAT(1H-,*THE SPECIFIED DISTANCE FROM THE SKIN *,F7.2,* EXCEEDS
     1ONE-HALF THE FUSELAGE DIAMETER *,F7.2)
      II=10HFUSELAGE D $J=6HIA./2. $PRINT 8,II,J

   19 IF(T.GT.0.) GO TO 23
      M=1 $II=10H   SKIN TH $J=7HICKNESS $PRINT 5,II,J,T
      II=3H>0. $PRINT 8,II,IBLANK

   23 IF(CATGRY.EQ.C1B) GO TO 76
      IF(FCCAT1.GE.0.) GO TO 74
      M=1 $II=10HCATEGORY C $J=10HENTER FRQ. $PRINT 5,II,J,FCCAT1
      II=10H>0. OR =0. $PRINT 8,II,IBLANK

   74 IF(FCCAT2.GE.0.) GO TO 76
      M=1 $II=10HCATEGORY 3 $J=10HA OR 3B FC $PRINT 5,II,J,FCCAT2
      II=10H>0. OR =0. $PRINT 8,II,IBLANK

   76 IF(MATERL.EQ.ISTEEL.OR.MATERL.EQ.ITITAN.OR.MATERL.EQ.IALUM
     1.OR.MATERL.EQ.IMAG) GO TO 50
      M=1 $PRINT 24,MATERL
   24 FORMAT(1H-,*THE LETTER SPECIFIED FOR THE AIRCRAFT MATERIAL WAS *,
     1A1/* IT MUST BE S,T,A OR M FOR STEEL,TITANIUM,ALUMINUM AND MAGNESI
     2UM,RESPECTIVELY.*)

   50 IF(CATGRY.EQ.C1A.OR.CATGRY.EQ.C1B.OR.CATGRY.EQ.C2A.OR.CATGRY.EQ.
     1C2B.OR.CATGRY.EQ.C3A.OR.CATGRY.EQ.C3B.OR.CATGRY.EQ.C4A.OR.
     2CATGRY.EQ.C4B.OR.CATGRY.EQ.C5.OR.CATGRY.EQ.C6) GO TO 54
      M=1 $PRINT 52,CATGRY,C1A,C1B,C2A,C2B,C3A,C3B,C4A,C4B,C5,C6
   52 FORMAT(1H-,A3,* WAS SPECIFIED FOR THE EQUIPMENT-MOUNTING CATEGORY.
     1*/* THE PROGRAM EXPECTS SPECIFICATIONS FOR CATEGORIES ONLY AS FOLL
     2OWS:*10(1X,A3)/* THE PROGRAM PROCEEDS TO THE NEXT PROBLEM FOR ANAL
     3YSIS.*)
   54 IF(FN.GT.0.) GO TO 60
      M=1 $II=10H1ST MODE F $J=8HREQUENCY $PRINT 5,II,J,FN
      II=3H>0. $PRINT 8,II,IBLANK

   60 IF(XLFMAX.LT.0.) GO TO 56
      M=1 $II=10H MAX.VALUE $J=8H OF L(F) $PRINT 5,II,J,XLFMAX
      II=3H<0. $PRINT 8,II,IBLANK

   56 IF(F2N.GE.0.) GO TO 64
      M=1 $II=10H2ND MODE F $J=8HREQUENCY $PRINT 5,II,J,F2N
      II=10H>0. OR =0. $PRINT 8,II,IBLANK

   64 IF(XL2FMX.LE.0.) GO TO 58
      M=1 $II=10H MAX.VALUE $J=9H OF L2(F) $PRINT 5,II,J,XL2FMX
      II=10H<0. OR =0. $PRINT 8,II,IBLANK

   58 IF(BUFMAX.GE.0.) GO TO 62
      M=1 $II=10HMAX.OF BUF $J=10H.TURN S(F) $PRINT 5,II,J,BUFMAX
      II=10H>0. OR =0. $PRINT 8,II,IBLANK
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                                                                                VIPRF
      62 IF(XBT.GE.0.) GO TO 66                                                 VIPRF
         M=1 $II=10HBUFFET-TUR $J=10HN DISTANCE $PRINT 5,II,J,XBT               VIPRF
         II=10H>0. OR =0. $PRINT 8,II,IBLANK                                    VIPRF
                                                                                VIPRF
      66 IF(XTL.GE.0.) GO TO 68                                                 VIPRF
         M=1 $II=10HTAKEOFF-LA $J=10HNDING DIST $PRINT 5,II,J,XTL               VIPRF
         II=10H>0. OR =0. $PRINT 8,II,IBLANK                                    VIPRF
                                                                                VIPRF
      68 IF(FCMOVE.GE.0.) GO TO 70                                              VIPRF
         M=1 $II=10HMULT.CONST $J=5HANT K $PRINT 5,II,J,FCMOVE                  VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
                                                                                VIPRF
      70 IF(NMODE1.GT.0.) GO TO 21                                              VIPRF
         M=1 $II=10HNO.DB VAL. $J=10H1ST B.MODE $X1=NMODE1 $PRINT 5,II,J,X1     VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
                                                                                VIPRF
      21 IF(DXMOD1.GT.0.) GO TO 30                                              VIPRF
         M=1 $II=10HXE DIST.BE $J=9HT.DB VALS $PRINT 5,II,J,DXMOD1              VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
                                                                                VIPRF
      30 IF(F2N.EQ.0.) GO TO 35                                                 VIPRF
         IF(NMODE2.GT.0) GO TO 32                                               VIPRF
         M=1 $II=10HNO.DB VAL. $J=10H2ND B.MODE $X1=NMODE2 $PRINT 5,II,J,X1     VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
                                                                                VIPRF
      32 IF(DXMOD2.GT.0.) GO TO 35                                              VIPRF
         M=1 $II=10HXE DIST.BE $J=10HT.DB VALS. $PRINT 5,II,J,DXMOD2            VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
                                                                                VIPRF
                                                                                VIPRF
      35 DO 1000 I=1,6                                                          VIPRF
         IF(AMAKNO(I).EQ.0.) GO TO 1000                                         VIPRF
                                                                                VIPRF
                                                                                VIPRF
         H=ALT(I) $IF(H.GE.0..AND.H.LE.HMAX) GO TO 28                           VIPRF
         M=1 $II=10H       ALTI $J=4HTUDE $PRINT 5,II,J,H                       VIPRF
         II=9H    > OR = $J=9H    < OR = $X1=0. $PRINT 6,II,X,J,HMAX             VIPRF
       6 FORMAT(* THE PROGRAM ASSUMES THAT IT WILL BE *,A10,G12.5,* AND *,      VIPRF
        1A10,F11.2)                                                             VIPRF
         GO TO 7                                                                VIPRF
                                                                                VIPRF
      28 XMAKNO=AMAKNO(I)                                                       VIPRF
         IF(JFLITE.NE.ITAKOF.AND.JFLITE.NE.ILAND) GO TO 7                       VIPRF
         IF(XMAKNO.EQ.0.93.AND.H.EQ.2000.0) GO TO 78                            VIPRF
         PRINT 2,H,XMAKNO                                                       VIPRF
       2 FORMAT(//////////1H1/*THE FOLLOWING VALUES,READ FOR ALTITUDE(H) AND    VIPRF
        1 MACH NUMBER(M),WERE INCORRECTLY SPECIFIED ON THE ALTITUDE-MACH NO     VIPRF
        2. CARD:*/35X,*H=*,F10.1/35X,*M*,F10.3//* THEY WERE SET EQUAL TO TH     VIPRF
        3E CORRECT VALUES,H=2000.0 AND M=0.93, WHICH ALWAYS MUST BE SPECIFI     VIPRF
        4ED*/* WHEN THE FLIGHT PHASE IS TAKE-OFF AND LANDING.*)                 VIPRF
         XMAKNO=0.93 $H=2000.0 $GO TO 78                                        VIPRF
                                                                                VIPRF
       7 IF(XMAKNO.GT.0.) GO TO 78                                              VIPRF
         M=1 $II=10H       MACH $J=4H NO. $PRINT 5,II,J,XMAKNO                  VIPRF
       5 FORMAT(1H-,*THE VALUE SPECIFIED FOR *,2A10,* IS *,G12.5)               VIPRF
         II=3H>0. $PRINT 8,II,IBLANK                                            VIPRF
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      PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

            8 FORMAT(* THE PROGRAM ASSUMES THAT IT WILL BE *,2A10)                    VIPRF
                                                                                      VIPRF
                                                                                      VIPRF
                                                                                      VIPRF
           78 IF(M.EQ.1) GO TO 1000                                                   VIPRF
                                                                                      VIPRF
              IF(FCMOVE.EQ.0.) FCMOVE=1.0                                             VIPRF
                                                                                      VIPRF
              ICK=0 $IFLITE=ISANDL                                                    VIPRF
                                                                                      VIPRF
            3 DO 17 II=1,7                                                            VIPRF
              ILINE1(II)=1H $ILINE2(II)=1H                                            VIPRF
           17 ITITL1(II)=1H                                                           VIPRF
                                                                                      VIPRF
              ILINE1(1)=10H TO EQUIPM $ILINE1(2)=10HENT LOCATI $ILINE1(3)=2HON        VIPRF
              X=XE $IX=1HE $IPHASE=5H (E)$ $IF(IFLITE.EQ.ISANDL) GO TO 34             VIPRF
              IF(IFLITE.NE.IBUFET) GO TO 12                                           VIPRF
              ILINE1(1)=10H TO THE CH $ILINE1(2)=10HORD CENTER                        VIPRF
              ILINE1(3)=10H OF THE WI $ILINE1(4)=2HNG                                 VIPRF
              X=XBT $IX=2HBT $IPHASE=6H (BT)$ $GO TO 34                               VIPRF
           12 IF(IFLITE.NE.ITAKOF) GO TO 13                                           VIPRF
              ILINE1(1)=10H TO THE LA $ILINE1(2)=10HNDING GEAR                        VIPRF
              X=XTL $IX=1HT $IPHASE=5H (T)$ $IFN=1HN $GO TO 34                        VIPRF
                                                                                      VIPRF
           13 IF(IFLITE.NE.ILAND) GO TO 22                                            VIPRF
              X=XTL $IX=1HL $IPHASE=5H (L)$ $IFN=2H2N $GO TO 34                       VIPRF
                                                                                      VIPRF
           22 X=XE  $IX=2HTB $IPHASE=6H (TB)$ $IFN=1HN                                VIPRF
                                                                                      VIPRF
           34 II=H/500.+1 $X1=500.                                                    VIPRF
              IF(H.LE.10000.) GO TO 44                                                VIPRF
              II=H/1000.+11 $X1=1000.                                                 VIPRF
           44 V=VISCOS(II) $C=SOUND(II) $R=AVDENS(II)                                 VIPRF
              X2=AMOD(H,X1) $IF(X2.EQ.0.) GO TO 45                                    VIPRF
              II=II+1 $X3=X2/X1                                                       VIPRF
              R=R+(AVDENS(II)-R)*X3                                                   VIPRF
              C=C+(SOUND(II)-C)*X3                                                    VIPRF
              V=V+(VISCOS(II)-V)*X3                                                   VIPRF
                                                                                      VIPRF
           45 RNORM=R/AVDENS(1) $VNORM=V/VISCOS(1) $U=XMAKNO*C $QSQ=R*U*U/2.          VIPRF
              QSQ=QSQ*QSQ $REX=U*XE/VISCOS(1)                                         VIPRF
              DELTAZ=6.9E7/REX $DELTAZ=1.0E-2*XE*(1.0+DELTAZ*DELTAZ)**0.10            VIPRF
              DELTAB=DELTAZ*(RNORM**0.7)                                              VIPRF
                                                                                      VIPRF
              FZPF=0.70*L/DELTAB                                                      VIPRF
                                                                                      VIPRF
              BPF=1.745 $IF(FZPF.LE.300.0) GO TO 90                                   VIPRF
              BPF=0.375 $IF(FZPF.GE.19900.0) GO TO 90                                 VIPRF
              CALL TERPLIN(FZPF,700.0,300.0,X1,0,BPF,BFZPF,NBFZPF)                    VIPRF
                                                                                      VIPRF
                                                                                      VIPRF
           90 X1=.007/(1.0+0.14*XMAKNO*XMAKNO) $PFM=X1*X1*QSQ*DELTAB/U                VIPRF
              PFMDB=0.41771E-6 $PFMDB=10.0*ALOG10(PFM/(PFMDB*PFMDB))                  VIPRF
                                                                                      VIPRF
                                                                                      VIPRF
              IF(MATERL.NE.IALUM) GO TO 92                                            VIPRF
              WS=14.5*T $J=10H  ALUMINUM                                              VIPRF
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PROGRAM VIPRF      74/74   OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      GO TO 100                                                                VIPRF
   93 IF(MATERL.NE.ITITAN) GO TO 94                                            VIPRF
      WS=24.0*T $J=10H  TITANIUM                                               VIPRF
      GO TO 100                                                                VIPRF
   94 IF(MATERL.NE.ISTEEL) GO TO 96                                            VIPRF
      WS=41.0*T $J=10H     STEEL                                               VIPRF
      GO TO 100                                                                VIPRF
   96 WS=9.17*T $J=10H MAGNESIUM                                               VIPRF
                                                                               VIPRF
                                                                               VIPRF
  100 PRINT 246                                                                VIPRF
      PRINT 353,IPLANE,IFLITE                                                  VIPRF
      PRINT 205,H,XMAKNO,X,IX,IX,(ILINE1(II),II=1,5)                           VIPRF
      II=1H $IF(CATGRY.EQ.C1A) II=1H*                                          VIPRF
      PRINT 210,RS,WE,T,J,WS,CATGRY,DF                                         VIPRF
      PRINT 220                                                                VIPRF
      PRINT 225,R,AVDENS(1),PNORM,V,VISCOS(1),VNORM,C                          VIPRF
      PRINT 230                                                                VIPRF
      PRINT 235,U,QSQ,REX,DELTAZ,DELTAB                                        VIPRF
  205 FORMAT(1H-,19X,*H=*,F12.1,6X,*ALTITUDE(FT.)*/                            VIPRF
     *20X,*M=*,F12.2,6X,*MACH NO.*/                                            VIPRF
     219X,*X =*,F12.2,6X,A2,* DISTANCE FROM THE LEADING EDGE OF THE */         VIPRF
     320X,A2,18X,*FUSELAGE AERODYNAMIC PROFILE(FT.) *,5A10)                    VIPRF
  210 FORMAT(19X,*R =*,F12.2,6X,*DISTANCE FROM SKIN(IN.)*/20X,*S*/             VIPRF
     119X,*W =*,F12.2,6X,*EQUIPMENT WEIGHT(LBS.)*/20X,*E*/                     VIPRF
     220X,*T=*,F12.4,6X,*THICKNESS OF SKIN MATERIAL(IN.)*/                     VIPRF
     313X,*MATERIAL=*,3X,A10,5X,*TYPE SKIN MATERIAL*/                          VIPRF
     472X,*2*/19X,*W =*,F12.3,6X,*DENSITY OF SKIN MATERIAL,LBS./FT.(CALC       VIPRF
     5ULATED)*/20X,*S*/                                                        VIPRF
     613X,*CATEGORY=*,9X,A2,7X,*EQUIPMENT MOUNTING CATEGORY*/                  VIPRF
     719X,*D =*,F12.1,6X,*DIAMETER OF FUSELAGE(IN.)*/20X,*F*//)                VIPRF
  220 FORMAT(* VALUES SELECTED FROM ATMOSPHERIC TABLE*)                        VIPRF
  225 FORMAT(                                                                  VIPRF
     *19X,*P =*,F12.6,6X,*MEAN AIR DENSITY AT ALTITUDE H(SLUG/CU.FT.)*/        VIPRF
     *19X,*P =*,F12.6,6X,*MEAN AIR DENSITY AT ZERO ALTITUDE(SLUG/CU.FT.)       VIPRF
     **/20X,*0*/                                                               VIPRF
     *17X,*P/R =*,F12.5,6X,*NORMALIZED MEAN AIR DENSITY*/20X,*0*//             VIPRF
     *19X,*V =*,F12.7,6X,*KINEMATIC VISCOSITY AT ALTITUDE H(FT.SQ./SEC.)       VIPRF
     **/                                                                       VIPRF
     *19X,*V =*,F12.7,6X,*KINEMATIC VISCOSITY AT ZERO ALTITUDE(FT.SQ./SE       VIPRF
     *C.)*/20X,*0*/                                                            VIPRF
     *17X,*V/V =*,F12.3,6X,*NORMALIZED KINEMATIC VISCOSITY*/20X,*0*//          VIPRF
     *20X,*C=*,F12.2,6X,*SPEED OF SOUND AT ALTITUDE H(FT./SEC.)*///)           VIPRF
  230 FORMAT(* VALUES CALCULATED FOR AERODYNAMIC PARAMETERS*)                  VIPRF
  235 FORMAT(                                                                  VIPRF
     119X,*U =*,F12.2,6X,*FREE STREAM VELOCITY(FT.SEC.)*/                      VIPRF
     220X,*2*,39X,*2*/19X,*Q =*,E12.5,6X,*DYNAMIC PRESSURE(PSF )*/             VIPRF
     *18X,*RE =*,F12.5,6X,*REYNOLDS NUMBER AT DISTANCE X*/20X,*X*/             VIPRF
     *15X,*DELTA =*,F12.4,6X,*BOUNDARY LAYER THICKNESS AT ZERO ALTITUDE(       VIPRF
     *FT.)*/20X,*0*/                                                           VIPRF
     *15X,*DELTA =*,F12.4,6X,*BOUNDARY LAYER THICKNESS AT ALTITUDE H(FT.       VIPRF
     7)*/20X,*B*)                                                              VIPRF
                                                                               VIPRF
                                                                               VIPRF
                                                                               VIPRF
      PRINT 246 $PRINT 353,IPLANE,IFLITE                                       VIPRF
      PRINT 240                                                                VIPRF
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                 240 FORMAT(1H-,*PARAMETERS OF THE BOUNDARY LAYER FUNCTION FOR P(F)*)   VIBRE   1085
1085                 PRINT 245,PEM,PEMDB,PPE,YPE,FZPE,APEHI                             VIBRE   1086
                 245 FORMAT(54X,*Z*/16X,*P (F)=*,F12.4,6X,*MAXIMUM VALUE OF PSD,PSF /HZ VIBRE   1087
                    1.*/17X,*M*/                                                        VIBRE   1088
                    279X,*-6 2*,4X,*Z*/16X,*P (F)=*,F12.2,6X,*MAXIMUM VALUE OF PSD,DB.  VIBRE   1089
                    3RE.(0.41771X10  )  PSF/HZ.*/17X,*M*/                               VIBRE   1090
1090                41QX,*B'=*,F12.3,6X,*SLOPE FACTOR,HIGH FREQ.ROLL-OFF*/              VIBRE   1091
                    51QX,*X'=*,F12.3,6X,*NORMALIZING FREQ.RATIO,HIGH-FREQ.ROLL-OFF*/    VIBRE   1092
                    61QX,*F'=*,F12.1,6X,*LOCATOR FREQUENCY,HIGH FREQ.ROLL-OFF(HZ.)*/    VIBRE   1093
                    720X,*C*/                                                           VIBRE   1094
                    81QX,*ALPHA'=*,F12.3,6X,*FORM FACTOR,HIGH FREQ.ROLL-OFF*)           VIBRE   1095
1095                                                                                    VIBRE   1096
                     TITTL1(1)=10H(S AND L F  $TITITL1(2)=7HLIGHT)*                     VIBRE   1097
                     XMEMAX=AMEMAX $XHEMAX=AHEMAX                                       VIBRE   1098
                                                                                        VIBRE   1099
                                                                                        VIBRE   1100
1100                                                                                    VIBRE   1101
                     IF(IFLITE.EQ.ISANDL) GO TO 280                                     VIBRE   1102
                     IF(IFLITE.NE.IBUFET) GO TO 250                                     VIBRE   1103
                                                                                        VIBRE   1104
               C   ************************                                             VIBRE   1105
1105           C   *                      *                                             VIBRE   1106
               C   * BUFFET-TURN PHASE    *                                             VIBRE   1107
               C   *                      *                                             VIBRE   1108
               C   ************************                                             VIBRE   1109
                     ILINE1(1)=10HCENTER FRE $ILINE1(2)=10HQUENCY OF                    VIBRE   1110
1110                 ILINE1(3)=10HSPECIAL TR $ILINE1(4)=10HANSFER FUN                   VIBRE   1111
                     ILINE1(5)=5HCTION                                                  VIBRE   1112
                     ITITL1(1)=10H(BUFFET TU $ITITL1(2)=10HRN PHASE)$                   VIBRE   1113
                                                                                        VIBRE   1114
                     SXLO=BUFXLO $SXHI=BUFXHI $SAHI=BUFAHI $M=3HORT                     VIBRE   1115
1115                 SALO=BUFALO $SAHI=BUFAHI $SDELTA=BUFDEL $SFZLO=BUFFZL              VIBRE   1116
                                                                                        VIBRE   1117
                     D=ABS(X-XE)                                                        VIBRE   1118
                     SBTFD=DDBVAL(NDDB) $IF(D.GT.(NDDB-1)) GO TO 239                    VIBRE   1119
                                                                                        VIBRE   1120
1120                 CALL TERPLIN(D,DELDDB,0.,X1,0,SBTFD,DDBVAL,NDDB)                   VIBRE   1121
                                                                                        VIBRE   1122
                 239 SBTFD=BUFMAX+SBTFD $IF(SBTFD.EQ.SDELTA) SBTFD=1.01*SDELTA          VIBRE   1123
                     IF(SBTFD.GT.SDELTA) GO TO 247                                      VIBRE   1124
                                                                                        VIBRE   1125
1125                 HILO(1)=PI $SIGN(1)=-1.0 $SXHI=0.167 $SAHI=2.0 $SFZHI=30.0         VIBRE   1126
                     SPEAK=SDELTA                                                       VIBRE   1127
                     FCS=FCMOVE*SXHI*SFZHI $SFZHI=FCS/SXHI $FRQ=SXLO*SFZLO              VIBRE   1128
                     CALL DELTA(SDHI,SDELTA,SBTFD,SXHI,SAHI,FRQ,SFZHI,SIGN(1),HILO(1))  VIBRE   1129
                     GO TO 253                                                          VIBRE   1130
1130                                                                                    VIBRE   1131
                 247 HILO(1)=0. $SIGN(1)=1.0 $FCS=SXLO*SFZLO $SPEAK=SBTFD               VIBRE   1132
                     SFZHI=FCMOVE*FCS/SXHI $FRQ=FMINGE                                  VIBRE   1133
                     CALL DELTA(SDLO,SBTFD,SDELTA,SXLO,SALO,FRQ,SFZLO,SIGN(1),HILO(1))  VIBRE   1134
                     GO TO 253                                                          VIBRE   1135
1135                                                                                    VIBRE   1136
                                                                                        VIBRE   1137
               C   ************************                                             VIBRE   1138
               C   *                      *                                             VIBRE   1139
               C   * TAKE-OFF PHASE       *                                             VIBRE   1140
1140           C   *                      *                                             VIBRE   1141
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      C   ************************                                                VIPRF    1142
        250 IF(IFLITE.NE.ITAKOF) GO TO 252                                        VIPRF    1143
            ILINE1(1)=10HFIRST FUSE $ILINE1(2)=10HLAGE BENDI                      VIPRF    1144
            ILINE1(3)=10HNG MODE,VE $ILINE1(4)=10HRTICAL(HZ)                      VIPRF    1145
            ITITL1(1)=10H(TAKEOFF P $ITITL1(2)=6HHASE)$                           VIPRF    1146
                                                                                  VIPRF    1147
            XMFMAX=-148.0 $XHFMAX=-129.0                                          VIPRF    1148
            SXLO=TAKXLO $SXHI=TAKXHI $SBLO=TAKBLO $SBHI=TAKBHI                    VIPRF    1149
            SALO=TAKALO $SAHI=TAKAHI $SPEAK=TAKMAX $M=2HCT                        VIPRF    1150
                                                                                  VIPRF    1151
            SFZLO=FN/SXLO                                                         VIPRF    1152
            SFZHI=FCMOVE*FN/SXHI $FCS=FN                                          VIPRF    1153
                                                                                  VIPRF    1154
            GO TO 253                                                             VIPRF    1155
                                                                                  VIPRF    1156
      C   ************************                                                VIPRF    1157
      C   *                      *                                                VIPRF    1158
      C   * LANDING PHASE        *                                                VIPRF    1159
      C   *                      *                                                VIPRF    1160
      C   ************************                                                VIPRF    1161
        252 IF(IFLITE.NE.ILAND) GO TO 256                                         VIPRF    1162
            ILINE1(1)=10HSECOND FUS $ILINE1(2)=10HELAGE BEND                      VIPRF    1163
            ILINE1(3)=10HING MODE,V $ILINE1(4)=10HRTICAL(HZ)                      VIPRF    1164
                                                                                  VIPRF    1165
            ITITL1(1)=10H(LANDING P $ITITL1(2)=6HHASE)$                           VIPRF    1166
                                                                                  VIPRF    1167
            XMFMAX=-152.0 $XHFMAX=-135.0                                          VIPRF    1168
                                                                                  VIPRF    1169
            SXLO=ALNXLO $SXHI=ALNXHI $SBLO=ALNBLO $SBHI=ALNBHI                    VIPRF    1170
            SALO=ALNALO $SAHI=ALNAHI $SPEAK=ALNMAX $M=2HCL                        VIPRF    1171
            SFZLO=F2N/SXLO $FCS=F2N                                               VIPRF    1172
            SFZHI=FCMOVE*F2N/SXHI                                                 VIPRF    1173
            GO TO 253                                                             VIPRF    1174
                                                                                  VIPRF    1175
                                                                                  VIPRF    1176
      C   ************************                                                VIPRF    1177
      C   *                      *                                                VIPRF    1178
      C   * TURBULENCE PHASE     *                                                VIPRF    1179
      C   *                      *                                                VIPRF    1180
      C   ************************                                                VIPRF    1181
        256 ILINE1(1)=10HCENTER FRE $ILINE1(2)=10HQ. OF S(F)                      VIPRF    1182
            ILINE1(3)=10HFOR LF ATM $ILINE1(4)=10HOS.TURBULE                      VIPRF    1183
            ILINE1(5)=10HNCE(HF POL $ILINE1(6)=10HL-OFF ONLY $ILINE1(7)=1H)       VIPRF    1184
            ITITL1(1)=10H(LOW FREQ. $ITITL1(2)=10HATMOS.TURB                      VIPRF    1185
            ITITL1(3)=10HULENCE PHA $ITITL1(4)=4HSE)$                             VIPRF    1186
                                                                                  VIPRF    1187
            SBHI=TBBHI $SAHI=TBAHI $SFZHI=FN $M=3HCTB                             VIPRF    1188
            FCS=FCMOVE*TBFC $SXHI=FCS/SFZHI                                       VIPRF    1189
                                                                                  VIPRF    1190
            FRQ=SFZHI $X1=FRQ/SFZHI                                               VIPRF    1191
            X2=PI-ATAN2(2.0*SBHI*(X1**SAHI),1.0-X1*X1)                            VIPRF    1192
            X3=PI-ATAN2(2.0*SBHI*(SXHI**SAHI),1.0-SXHI*SXHI)                      VIPRF    1193
            SPEAK=TBREF-20.0*ALOG10(X2/X3)                                        VIPRF    1194
                                                                                  VIPRF    1195
                                                                                  VIPRF    1196
        253 PRINT 251,IX                                                          VIPRF    1197
        251 FORMAT(1H-,*PARAMETERS OF THE SPECIAL FUNCTION FOR S (F)*/41X,A2)     VIPRF    1198
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      II=5HS (F) $J=1HM $PRINT 352,II,SPEAK,II,IPLANE(1),IX,J,IX          VIPRF    1199
  352 FORMAT(17X,A5,*=*,F12.2,6X,*MAXIMUM VALUE OF *,A5,*-DB.,FOR*,       VIPRF    1200
     1A10,*TYPE AIRCRAFT*/18X,A2,1X,A1,37X,A2)                            VIPRF    1201
                                                                          VIPRF    1202
      IF(IFLITE.EQ.IBUFFT.AND.SRTFD.LT.SDELTA) GO TO 257                  VIPRF    1203
                                                                          VIPRF    1204
      PRINT 380,SFLO,SBHI,SXLO,SXHI,SFZLO,SFZHI                           VIPRF    1205
      PRINT 441,FOS,(ILINE1(J),J=1,7),M                                   VIPRF    1206
      PRINT 425,SALO,SAHI                                                 VIPRF    1207
      IF(IFLITE.EQ.IBUFFT) PRINT 254,SDELTA,FMINGF,BUFMAX,D,XF            VIPRF    1208
  254 FORMAT(1H-,15X,*DELTA =*,F12.2,6X,*VALUE OF S (F) AT*,              VIPRF    1209
     1F6.1,* HZ.*/21X,*D*,29X,*RT*/                                       VIPRF    1210
     287X,*2*,12X,*-4*,9X,*2 2*/16X,*S (F)'=*,F12.1,6X,*MAXIMUM VALUE OF  VIPRF    1211
     3 S (F) (WHEN D=0.)-DB.RE 1.0 G /HZ./RE.(2X10  DYNES-CM.) /HZ.*/     VIPRF    1212
     417X,*RT M*,38X,*RT M*//                                             VIPRF    1213
     521X,*D=*,F12.2,6X,*DIFFEREMCE,X -X*/53X,*RT E*/                     VIPRF    1214
     620X,*X =*,F12.2,6X,*F DISTANCE FROM THE LEADING EDGE OF THE FUSELA  VIPRF    1215
     7GE*/21X,*E*,19X,*AERODYNAMIC PROFILE(FT.) TO THE CENTER OF THE WIN  VIPRF    1216
     8G CHORD*)                                                           VIPRF    1217
      GO TO 280                                                           VIPRF    1218
                                                                          VIPRF    1219
  257 PRINT 255,SFHI,SXHT,SFZHI,SAHI,FOS                                  VIPRF    1220
  255 FORMAT(20X,*B'=*,F12.3,6X,*SLOPE FACTOR,HIGH-FREQ.ROLL-OFF*/        VIPRF    1221
     120X,*X'=*,F12.3,6X,*NORMALIZING FREQ.RATIO,HIGH-FREQ.ROLL-OFF*/     VIPRF    1222
     220X,*F'=*,F12.2,6X,*LOCATOR FREQ.,HIGH-FREQ.ROLL-OFF*/21X,*0*/      VIPRF    1223
     316X,*ALPHA'=*,F12.3,6X,*FORM FACTOR,HIGH-FREQ.ROLL-OFF*/            VIPRF    1224
     420X,*F =*,F12.2,6X,*CENTER FREQ. OF TRANSFER FUNCTION(HZ.)*/        VIPRF    1225
     521X,*0*)                                                            VIPRF    1226
      PRINT 254,SDELTA,FMINGF,SDELTA,BUFMAX,D,XF                          VIPRF    1227
      PRINT 260,SRTFD,D,SDELTA,SRTFD,FRO                                  VIPRF    1228
  260 FORMAT(1H-,                                                         VIPRF    1229
     120X,*NOTE:SINCE S (F)=*,G12.5,* CORRESPONDING TO D=*,G12.5/         VIPRF    1230
     232X        /25X,*IS LESS THAN DELTA=*,G12.5* ONLY THE HIGH-FREQ.ROL VIPRF    1231
     3L-OFF PORTION */25X,*OF THE S(F) TRANSFER FUNCTION IS USED IN CALC  VIPRF    1232
     4ULATING D (F).*/79X,*RT*/25X,*(S(F)=*,G12.5,* AT F=X*,4H*F =,G12.5  VIPRF    1233
     5* HZ.)*/52X,*0*)                                                    VIPRF    1234
                                                                          VIPRF    1235
                                                                          VIPRF    1236
C     ************************                                            VIPRF    1237
C     *                      *                                            VIPRF    1238
C     *     H(F)             *                                            VIPRF    1239
C     *                      *                                            VIPRF    1240
C     ************************                                            VIPRF    1241
  281 XX=RS $IF(RS.GT.RSMAX) XX=RSMAX                                     VIPRF    1242
      CALL TERPLIN(XX,X1,RSVALS(1),RSVALS,1,DELRS,DBRS,NPSVAL)            VIPRF    1243
      CALL TERPLIN(XX,Y1,RSVALS(1),RSVALS,1,FZHFHI,FPRIHF,NRSVAL)         VIPRF    1244
      FRO=FZHFHI                                                          VIPRF    1245
                                                                          VIPRF    1246
                                                                          VIPRF    1247
      AK=1.0 $IF(WE.LE.2.5) GO TO 320                                     VIPRF    1248
      AK=0.55 $IF(WE.GE.200.0) GO TO 320                                  VIPRF    1249
                                                                          VIPRF    1250
      DO 310 J=1,14                                                       VIPRF    1251
      II=J $X1=WEK(J)                                                     VIPRF    1252
      IF(WE.LE.X1) GO TO 315                                              VIPRF    1253
  310 CONTINUE                                                            VIPRF    1254
  315 AK=VALK(II)+(WE-X1)*(VALK(II-1)-VALK(II))/(WEK(II-1)-X1)            VIPRF    1255
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PROGRAM VIPRF      74/74   OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      320 FZHFHI=AK*FZHFHI                                                    VIPRF
          FZHFLO=275.0*T/0.036 $IF(CATGRY.EQ.C6) FZHFLO=350.0*T/0.036         VIPRF
                                                                              VIPRF
                                                                              VIPRF
          XHFLO=XXHFLO $XHFHI=XXHFHI                                          VIPRF
          X1=XHFLO*FZHFLO $X2=XHFHI*FZHFHI $IF(X2.GE.X1) GO TO 325            VIPRF
          CONST=0.025                                                         VIPRF
                                                                              VIPRF
      323 XHFLO=XHFLO-CONST*XHFLO $XHFHI=XHFHI+CONST*XHFHI                    VIPRF
          IF(XHFLO.GT.1.0) GO TO 321                                          VIPRF
          XHFLO=1.0 $XHFHI=FZHFLO/FZHFHI $GO TO 325                           VIPRF
                                                                              VIPRF
      321 IF(XHFHI.LT.1.0) GO TO 322                                          VIPRF
          XHFHI=1.0 $XHFLO=FZHFHI/FZHFLO $GO TO 325                           VIPRF
                                                                              VIPRF
      322 X1=XHFLO*FZHFLO $X2=XHFHI*FZHFHI $IF(X2.LT.X1) GO TO 323            VIPRF
          XHFLO=X2/FZHFLO                                                     VIPRF
                                                                              VIPRF
                                                                              VIPRF
      325 DELWE=0. $IF(WE.LE.10.0) GO TO 340                                  VIPRF
          IF(CATGRY.NE.C1B.AND.CATGRY.NE.C6) GO TO 340                        VIPRF
          IF(WE.GE.100.) GO TO 330                                            VIPRF
          CALL TERPLIN(WE,DWE100,10.,X1,0,DELWE,WE100,NWE100)                 VIPRF
          GO TO 340                                                           VIPRF
      330 IF(WE.GE.1000.) GO TO 335                                           VIPRF
          CALL TERPLIN(WE,DWE1K,100.,X1,0,DELWE,WE1000,NWE1K)                 VIPRF
          GO TO 340                                                           VIPRF
      335 DELWE=WE5000(9) $IF(WE.GE.WEMAX) GO TO 340                          VIPRF
          CALL TERPLIN(WE,DWE5K,1000.0,X1,0,DELWE,WE5000,NWE5K)               VIPRF
                                                                              VIPRF
                                                                              VIPRF
      340 DELWS=0. $IF(WS.LE.0.5) GO TO 350                                   VIPRF
          DELWS=20.*ALOG10(0.5/WS)                                            VIPRF
                                                                              VIPRF
                                                                              VIPRF
      350 IF(CATGRY.EQ.C6) XHFMAX=XHFMAX+7.0                                  VIPRF
          XHFCOR=XHFMAX+DELWE+DELWS+DELRS                                     VIPRF
          IF(IFLITE.EQ.ISANDL) GO TO 351                                      VIPRF
          PRINT 246 $PRINT 353,IPLANE,IFLITE                                  VIPRF
      246 FORMAT(1H1)                                                         VIPRF
      353 FORMAT(1H-,7H*******,3A10,1H,,A10,7H*******)                        VIPRF
      351 II=4HH(F) $PRINT 383,II,IBLANK                                      VIPRF
      383 FORMAT(1H-,*PARAMETERS OF THE TRANSFER FUNCTION FOR: *,A10/43X,A2) VIPRF
          PRINT 355,XHFMAX,DELRS,DELWE,DELWS,XHFCOR                           VIPRF
      355 FORMAT(                                                             VIPRF
         175X,*2*,13X,*-4*,8X,*2  2*/17X,*H (F)=*,F12.2,6X,*MAXIMUM VALUE OF VIPRF
         2 H(F)-DB.RE. 1.0 G /HZ.,RE.(2X10  DYNES-CM. ) /HZ.*/18X,*M*/        VIPRF
         216X,*DEL R =*,F12.2,6X,*CORRECTION FACTOR TO H (F) FOR R (DB.)*/    VIPRF
         321X,*S*,41X,*M*,9X,*S*/                                             VIPRF
         416X,*DEL W =*,F12.2,6X,*CORRECTION FACTOR TO H (F) FOR W (DB.)*/    VIPRF
         521X,*E*,41X,*M*,9X,*E*/                                             VIPRF
         616X,*DEL W =*,F12.2,6X,*CORRECTION FACTOR TO H (F) FOR W (DB.)*/    VIPRF
         821X,*S*,41X,*M*,9X,*S*/                                             VIPRF
         917X,*H (F)=*,F12.2,6X,*CORRECTED VALUE OF H (F)*/18X,*M*,2X,        VIPRF
         **C*,39X,*M*)                                                        VIPRF
                                                                              VIPRF
          IF(WE.LE.10.0) GO TO 375                                            VIPRF
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                IF(CATGRY.EQ.C13.OR.CATGRY.EQ.C6) GO TO 375                          VIPRF    1313
                PRINT 354                                                            VIPRF    1314
            354 FORMAT(1H0,*NOTE:THE CORRECTION FACTOR FOR W  IS SET EQUAL TO ZERO VIPRF    1315
               1 EVEN THOUGH W >10 POUNDS.*/33X,*E*,35X,*F*/)                        VIPRF    1316
                                                                                     VIPRF    1317
                                                                                     VIPRF    1318
            375 BHFHI=0.6 $IF(RS.GT.0.) BHFHI=0.3                                    VIPRF    1319
                PRINT 380,BHFLO,BHFHI,XHFLO,XHFHI,FZHFLO,FZHFHI                      VIPRF    1320
            380 FORMAT(                                                              VIPRF    1321
               120X,*B =*,F12.3,6X,*SLOPE FACTOR,LOW-FREQ.ROLL-OFF*/                 VIPRF    1322
               220X,*B'=*,F12.3,6X,*SLOPE FACTOR,HIGH FREQ.ROLL-OFF*/                VIPRF    1323
               320X,*X =*,F12.3,6X,*NORMALIZING FREQ.RATIO,LOW-FREQ.ROLL-OFF*/       VIPRF    1324
               420X,*X'=*,F12.3,6X,*NORMALIZING FREQ.RATIO,HIGH-FREQ.ROLL-OFF*/      VIPRF    1325
               520X,*F =*,F12.2,6X,*LOCATOR FREQ., LOW FREQ.ROLL-OFF*/21X,*0*/       VIPRF    1326
               620X,*F'=*,F12.2,6X,*LOCATOR FREQ.,HIGH FREQ.ROLL-OFF*/21X,*0*)       VIPRF    1327
                PRINT 382,AK,FRQ                                                     VIPRF    1328
            382 FORMAT(21X,*K=*,F12.4,6X,*CORRECTION FACTOR TO F' FOR W (F'=K X *, VIPRF    1329
               1F8.1,*)*/63X,*0*,6X,*F*,2X,*0*)                                      VIPRF    1330
                PRINT 425,AHFLO,AHFHI                                                VIPRF    1331
                                                                                     VIPRF    1332
                                                                                     VIPRF    1333
          C   ************************                                               VIPRF    1334
          C   *                      *                                               VIPRF    1335
          C   *    M(F)              *                                               VIPRF    1336
          C   *                      *                                               VIPRF    1337
          C   ************************                                               VIPRF    1338
                IF(IFLITE.NE.ISANDL) GO TO 356                                       VIPRF    1339
                PRINT 246 $PRINT 353,IPLANE,IFLITE                                   VIPRF    1340
            356 II=4HM(F) $PRINT 383,II,IBLANK                                       VIPRF    1341
                FZMFLO=FMFLO $FZMFHI=FMFHI                                           VIPRF    1342
                                                                                     VIPRF    1343
                DELRS=0. $IF(RS.GE.2.8) GO TO 370                                    VIPRF    1344
                CALL CLAP(XX,DXMFRS,0.,DELRS,DBMFRS,NMFRS)                           VIPRF    1345
                                                                                     VIPRF    1346
            370 DELWS=0.15*DELWS                                                     VIPRF    1347
                                                                                     VIPRF    1348
                IF(CATGRY.EQ.C6) XMFMAX=XMFMAX+2.0                                   VIPRF    1349
                XMFCOR=XMFMAX+DELWS+DELRS                                            VIPRF    1350
                                                                                     VIPRF    1351
                PRINT 385,XMFMAX,DELWS,DELRS,XMFCOR                                  VIPRF    1352
                PRINT 380,BMFLO,BMFHI,XMFLO,XMFHI,FZMFLO,FZMFHI                      VIPRF    1353
            385 FORMAT(                                                              VIPRF    1354
               175X,*2*,13X,*-4*,8X,*2  2*/17X,*M (F)=*,F12.2,6X,*MAXIMUM VALUE OF VIPRF    1355
               2 M(F)-DB.RE. 1.0 G /HZ./RE.(2X10  DYNES-CM. ) /HZ.*/18X,*M*/         VIPRF    1356
               316X,*DEL W =*,F12.2,6X,*CORRECTION FACTOR TO M (F) FOR W (DB.)*/     VIPRF    1357
               421X,*S*,41X,*M*,9X,*S*/                                              VIPRF    1358
               516X,*DEL R =*,F12.2,6X,*CORRECTION FACTOR TO M (F) FOR R (DB.)*/     VIPRF    1359
               621X,*S*,41X,*M*,9X,*S*/                                              VIPRF    1360
               717X,*M (F)=*,F12.2,6X,*CORRECTED VALUE OF M (F)*/18X,*M*,2X,*C*,     VIPRF    1361
               839X,*M*)                                                             VIPRF    1362
                PRINT 425,AMFLO,AMFHI                                                VIPRF    1363
                                                                                     VIPRF    1364
                                                                                     VIPRF    1365
          C   ************************                                               VIPRF    1366
          C   *                      *                                               VIPRF    1367
          C   *    L(F)              *                                               VIPRF    1368
          C   *                      *                                               VIPRF    1369
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

          ************************                                                VIPRF    1370
            M=1HF                                                                 VIPRF    1371
            CALL QUAD(XE,DXMOD1,0.,CORLFM,DBMOD1,NMODE1)                          VIPRF    1372
            IF(CORLFM.LT.-21.0) CORLFM=-21.0                                      VIPRF    1373
            XLFCOR=XLFMAX+CORLFM                                                  VIPRF    1374
                                                                                  VIPRF    1375
            IF(IFLITE.EQ.ISANDL) GO TO 387                                        VIPRF    1376
            PRINT 246 $PRINT 353,IPLANE,IFLITE                                    VIPRF    1377
        387 II=4HL(F) $PRINT 383,II,IBLANK                                        VIPRF    1378
            J=1HM $K=1H $L=1HC                                                    VIPRF    1379
            PRINT 390,XLFMAX,J,K,K,CORLFM,XE,IPLANE(1),M,J,M,XLFCOR,J,L,J         VIPRF    1380
        390 FORMAT(                                                               VIPRF    1381
           176X,*2*,12X,*-4*,8X,*2  2*/17X,*L (F)=*,F12.2,6X,*MAXIMUM VALUE OF VIPRF    1382
           2 L (F)-DB.RE. 1.0 G /HZ.,RE.(2X10  DYNES-CM. ) /HZ.*/18X,A1,2X,A2, VIPRF    1383
           336X,A1/                                                               VIPRF    1384
           416X,*DEL X =*,F12.2,6X,*CORRECTION FACTOR TO L (F) FOR DISTANCE X  VIPRF    1385
           5=*,F6.2,* ON*,A10,* TYPE AIRCRAFT*/21X,A2,40X,A1,18X,A2/              VIPRF    1386
           617X,*L (F)=*,F12.2,6X,*CORRECTED VALUE OF L (F)*/18X,A1,2X,A2,        VIPRF    1387
           738X,A1)                                                               VIPRF    1388
                                                                                  VIPRF    1389
            FZLFLO=FN/2.0 $FZLFHI=2.0*FN                                          VIPRF    1390
            BLFLO=$BLFLO $BLFHI=BBLFHI $XLFLO=XXLFLO $XLFHI=XXLFHI                VIPRF    1391
                                                                                  VIPRF    1392
            IF(F2N.EQ.0.) GO TO 395                                               VIPRF    1393
            BLFHI=0.23 $XLFHI=0.70 $FZLFHI=1.42*FN                                VIPRF    1394
                                                                                  VIPRF    1395
        395 PRINT 380,BLFLO,BLFHI,XLFLO,XLFHI,FZLFLO,FZLFHI                       VIPRF    1396
            ILINE1(1)=10HFIRST BODY $ILINE1(2)=10H BENDING M                      VIPRF    1397
            ILINE1(3)=10HODE FREQUE $ILINE1(4)=8HNCY(HZ.) $ILINE1(5)=1H           VIPRF    1398
            IFN=1HN $PRINT 441,FN,(ILINE1(II),II=1,7),IFN                         VIPRF    1399
            PRINT 425,ALFLO,ALFHI                                                 VIPRF    1400
                                                                                  VIPRF    1401
                                                                                  VIPRF    1402
      C   ************************                                                VIPRF    1403
      C   *                      *                                                VIPRF    1404
      C   *    L (F)             *                                                VIPRF    1405
      C   *     2                *                                                VIPRF    1406
      C   *                      *                                                VIPRF    1407
      C   ************************                                                VIPRF    1408
            IF(F2N.EQ.0.) GO TO 389                                               VIPRF    1409
                                                                                  VIPRF    1410
            CALL QUAD(XE,DXMOD2,0.,CORL2F,DBMOD2,NMODE2)                          VIPRF    1411
            IF(CORL2F.LT.-21.0) CORL2F=-21.0                                      VIPRF    1412
            XL2FCR=XL2FMX+CORL2F                                                  VIPRF    1413
                                                                                  VIPRF    1414
            IF(IFLITE.NE.ISANDL) GO TO 393                                        VIPRF    1415
            PRINT 246 $PRINT 353,IPLANE,IFLITE                                    VIPRF    1416
        393 II=5HL (F) $J=1HM $K=1H2 $L=2HMC $PRINT 383,II,K                      VIPRF    1417
            PRINT 390,XL2FMX,K,J,K,CORL2F,XE,IPLANE(1),M,K,M,XL2FCR,K,L,K         VIPRF    1418
                                                                                  VIPRF    1419
            FL2FLO=F2N/XL2FLO $FL2FHI=F2N/XL2FHI                                  VIPRF    1420
            PRINT 380,FL2FLO,FL2FHI,XL2FLO,XL2FHI,FL2FLO,FL2FHI                   VIPRF    1421
                                                                                  VIPRF    1422
            ILINE1(1)=10HSECOND BOD $ILINE1(2)=10HY BENDING                       VIPRF    1423
            ILINE1(3)=10HMODE FREQU $ILINE1(4)=9HENCY(HZ.) $ILINE1(5)=1H          VIPRF    1424
            IFN=2H2N $PRINT 441,F2N,(ILINE1(II),II=1,7),IFN                       VIPRF    1425
            PRINT 425,AL2FLO,AL2FHI                                               VIPRF    1426
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                                                                                VIPRF    1427
                                                                                VIPRF    1428
          383 IFN=1HC $IF(CATGRY.EQ.C4A) IFN=3HC3A $IF(CATGRY.EQ.C4B) IFN=3HC3B  VIPRF    1429
              ILINE1(1)=10HISOLATOR N $ILINE1(2)=10HATURAL FRE                  VIPRF    1430
              ILINE1(3)=10HQUENCY(HZ. $ILINE1(4)=1H)                            VIPRF    1431
                                                                                VIPRF    1432
                                                                                VIPRF    1433
              IF(CATGRY.EQ.C1A) GO TO 398                                       VIPRF    1434
              IF(CATGRY.EQ.C1B) GO TO 600                                       VIPRF    1435
              IF(CATGRY.EQ.C2A) GO TO 431                                       VIPRF    1436
              IF(CATGRY.EQ.C2B) GO TO 433                                       VIPRF    1437
              IF(CATGRY.EQ.C3A) GO TO 442                                       VIPRF    1438
              IF(CATGRY.EQ.C3B) GO TO 435                                       VIPRF    1439
              IF(CATGRY.EQ.C4A) GO TO 398                                       VIPRF    1440
              IF(CATGRY.EQ.C4B) GO TO 398                                       VIPRF    1441
              IF(CATGRY.EQ.C5) GO TO 427                                        VIPRF    1442
              IF(CATGRY.EQ.C6) GO TO 437                                        VIPRF    1443
                                                                                VIPRF    1444
        C   ************************                                            VIPRF    1445
        C   *                      *                                            VIPRF    1446
        C   *    CATEGORY 1A       *                                            VIPRF    1447
        C   *                      *                                            VIPRF    1448
        C   ************************                                            VIPRF    1449
          398 DELWE=0. $IF(WE.LE.10.0) GO TO 410                                VIPRF    1450
              IF(WE.LT.210.0) GO TO 405                                         VIPRF    1451
              C1AAHI=1.92 $DELWE=-6.5                                           VIPRF    1452
              GO TO 410                                                         VIPRF    1453
          405 CALL QUAD(WE,DXC1A,XINC1A,C1AAHI,C1AAWE,NC1A)                     VIPRF    1454
              CALL QUAD(WE,DXC1A,XINC1A,DELWE,C1AMWE,NC1A)                      VIPRF    1455
          410 C1AMXC=C1AMAX+DELWE                                               VIPRF    1456
                                                                                VIPRF    1457
              IF(FCCAT1.EQ.0.) FCCAT1=C1AFN                                     VIPRF    1458
              C1AFZL=FCCAT1/C1AXLO $C1AFZH=FCCAT1/C1AXHI $FC=FCCAT1             VIPRF    1459
                                                                                VIPRF    1460
                                                                                VIPRF    1461
              ILINE2(1)=10H(EQUIPMENT $ILINE2(2)=10H MOUNTED O                  VIPRF    1462
              ILINE2(3)=10HN PRIMARY  $ILINE2(4)=10HSTRUCTURE                   VIPRF    1463
              ILINE2(5)=10HTHROUGH IS $ILINE2(6)=9HOLATORS)$                    VIPRF    1464
                                                                                VIPRF    1465
              IF(CATGRY.NE.C1A) GO TO 415                                       VIPRF    1466
                                                                                VIPRF    1467
              PEAK=C1AMXC $XLO=C1AXLO $XHI=C1AXHI $BLO=C1ABLO $BHI=C1ABHI       VIPRF    1468
              ALO=C1AALO $AHI=C1AAHI $FZLO=C1AFZL $FZHI=C1AFZH                  VIPRF    1469
              GO TO 440                                                         VIPRF    1470
                                                                                VIPRF    1471
          415 PRINT 246 $PRINT 353,IPLANE,IFLITE                                VIPRF    1472
              II=FHY (F) $L=2H1A $PRINT 383,II,L $PRINT 438,CATGRY              VIPRF    1473
              PRINT 420,C1AMAX,IPLANE(1),DELWE,WE,C1AMXC                        VIPRF    1474
              PRINT 380,C1ABLO,C1ABHI,C1AXLO,C1AXHI,C1AFZL,C1AFZH               VIPRF    1475
              L=3HC1A $PRINT 441,FCCAT1,(ILINE1(K),K=1,7),L                     VIPRF    1476
              PRINT 425,C1AALO,C1AAHI                                           VIPRF    1477
                                                                                VIPRF    1478
              IF(CATGRY.EQ.C4A) GO TO 442                                       VIPRF    1479
              GO TO 435                                                         VIPRF    1480
                                                                                VIPRF    1481
                                                                                VIPRF    1482
        C   ************************                                            VIPRF    1483
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PROGRAM VIPRF 74/74 OPT=1 FTN 4.5+414 08/16/77 13.11.28

```
C   *                        *
C   *    CATEGORY 2A         *
C   *                        *
C   ************************
  431 PEAK=C2AMAX $XLO=C2AXLO $XHI=C2AXHI $BLO=C2ABLO $BHI=C2ABHI
      ALO=C2AALO $AHI=C2AAHI

      IF(FCCAT1.EQ.0.) FCCAT1=C2AFN
      FZLO=FCCAT1/XLO $FZHI=FCCAT1/XHI $FC=FCCAT1

      ILINE2(1)=10H(SECONDARY  $ILINE2(2)=10H STRUCTURE
      ILINE2(3)=10H EQUIP.MOU $ILINE2(4)=10HNTED ON IN
      ILINE2(5)=10HSTRUMENT P $ILINE2(6)=10HANEL,ISOL. $ILINE2(7)=2H)$
      GO TO 440

C   ************************
C   *                        *
C   *    CATEGORY 2B         *
C   *                        *
C   ************************
  433 PEAK=C2BMAX $XLO=C2BXLO $XHI=C2BXHI $BLO=C2BBLO $BHI=C2BBHI
      ALO=C2BALO $AHI=C2BAHI

      IF(FCCAT1.EQ.0.) FCCAT1=C2BFN
      FZLO=FCCAT1/XLO $FZHI=FCCAT1/XHI $FC=FCCAT1

      ILINE1(1)=10HFIRST INST $ILINE1(2)=10HRUMENT PAN
      ILINE1(3)=10HEL RESONAN $ILINE1(4)=7HCE(HZ.)

      ILINE2(1)=10H(SECONDARY $ILINE2(2)=10H STRUCTURE
      ILINE2(3)=10H EQUIP.MOU $ILINE2(4)=10HNTED ON IN
      ILINE2(5)=10HSTRU.PANEL $ILINE2(6)=10H,NON-ISOL. $ILINE2(7)=2H)$
      GO TO 440

C   ************************
C   *                        *
C   *    CATEGORY 3A         *
C   *                        *
C   ************************
  442 XX=2H3A
      BHI=C3ABHI $XLO=C3AXLO $ALO=C3AALO

      IF(WE.GT.10.0) GO TO 443
      PEAK=C1AMAX $BLO=C1ABLO $XHI=C1AXHI $AHI=C1AAHI
      GO TO 448

  443 IF(WE.LT.200.0) GO TO 444
      PEAK=C3AYMX(NC3) $BLO=C3AB(NC3) $XHI=C3AXP(NC3) $AHI=C3AAP(NC3)
      GO TO 448

  444 CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,PEAK,C3AYMX,NC3)
      CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,BLO,C3AB,NC3)
      CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,XHI,C3AXP,NC3)
      CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,AHI,C3AAP,NC3)
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                                                                                VIPRF    1541
      448 FC=FCCAT1 $IF(CATGRY.EQ.C4A) FC=FCCAT2 $IF(FC.EQ.0.) FC=C3AFN         VIPRF    1542
          FZLO=FC/XLO $FZHI=FC/XHI                                              VIPRF    1543
                                                                                VIPRF    1544
          ILINE2(1)=10H(EQUIPMENT $ILINE2(2)=10H HARD MOUN                      VIPRF    1545
          ILINE2(3)=10HTED ON ISO $ILINE2(4)=10HLATED SHEL                      VIPRF    1546
          ILINE2(5)=10HE OR BACK  $ILINE2(6)=2H)$                               VIPRF    1547
          GO TO 440                                                             VIPRF    1548
                                                                                VIPRF    1549
                                                                                VIPRF    1550
C     ************************                                                  VIPRF    1551
C     *                      *                                                  VIPRF    1552
C     *    CATEGORY 3B       *                                                  VIPRF    1553
C     *                      *                                                  VIPRF    1554
C     ************************                                                  VIPRF    1555
      433 XX=2H3B                                                               VIPRF    1556
                                                                                VIPRF    1557
          ILINE1(1)=10HLOWEST SHE $ILINE1(2)=10HLF FIRST B                      VIPRF    1558
          ILINE1(3)=10HENDING MOD $ILINE1(4)=6HE(HZ.)                           VIPRF    1559
                                                                                VIPRF    1560
          IF(WE.GT.10.0) GO TO 446                                              VIPRF    1561
          BLO=C5BLO $BHI=C5BHI $XLO=C5XLO $XHI=C5XHI $ALO=C5ALO $AHI=C5AHI      VIPRF    1562
          PEAK=-6.0-2.0*(WE-10.0)/3.                                            VIPRF    1563
          GO TO 449                                                             VIPRF    1564
      446 IF(WE.LT.200.0) GO TO 447                                             VIPRF    1565
          BLO=C3BB(NC3) $BHI=C3BBP(NC3) $XLO=C3BX(NC3) $XHI=C3BXP(NC3)          VIPRF    1566
          ALO=C3BA(NC3) $AHI=C3BAP(NC3) $PEAK=C3BYMX(NC3)                       VIPRF    1567
          GO TO 449                                                             VIPRF    1568
      447 CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,PEAK,C3BYMX,NC3)                    VIPRF    1569
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,BLO,C3BB,NC3)                       VIPRF    1570
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,BHI,C3BBP,NC3)                      VIPRF    1571
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,XLO,C3BX,NC3)                       VIPRF    1572
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,XHI,C3BXP,NC3)                      VIPRF    1573
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,ALO,C3BA,NC3)                       VIPRF    1574
          CALL TERPLIN(WE,X1,C3WE(1),C3WE,1,AHI,C3BAP,NC3)                      VIPRF    1575
                                                                                VIPRF    1576
                                                                                VIPRF    1577
      449 FC=FCCAT1 $IF(CATGRY.EQ.C4B) FC=FCCAT2 $IF(FC.EQ.0.) FC=C3BFN         VIPRF    1578
          FZLO=FC/XLO $FZHI=FC/XHI                                              VIPRF    1579
                                                                                VIPRF    1580
          ILINE2(1)=10H(EQUIPMENT $ILINE2(2)=10H HARD MOUN                      VIPRF    1581
          ILINE2(3)=10HTED ON NON $ILINE2(4)=10H-ISOLATED                       VIPRF    1582
          ILINE2(5)=10HSHELF OR R $ILINE2(6)=5HACK)$                            VIPRF    1583
          GO TO 440                                                             VIPRF    1584
                                                                                VIPRF    1585
                                                                                VIPRF    1586
C     ************************                                                  VIPRF    1587
C     *                      *                                                  VIPRF    1588
C     *    CATEGORY 5        *                                                  VIPRF    1589
C     *                      *                                                  VIPRF    1590
C     ************************                                                  VIPRF    1591
      427 DELWE=0. $IF(WE.LE.1.0) GO TO 436                                     VIPRF    1592
          DELWE=-6.0 $IF(WE.GE.10.0) GO TO 436                                  VIPRF    1593
          DELWE=-6.0-2.0*(WE-10.0)/3.                                           VIPRF    1594
      430 PEAK=C5MAX+DELWE                                                      VIPRF    1595
          BLO=C5BLO $BHI=C5BHI $XLO=C5XLO $XHI=C5XHI $ALO=C5ALO $AHI=C5AHI      VIPRF    1596
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      IF(FCCAT1.EQ.0.) FCCAT1=CSEN                                      VIPRF    1598
      FZLO=FCCAT1/XLO $FZHI=FCCAT1/XHI $FC=FCCAT1                       VIPRF    1599
                                                                        VIPRF    1600
                                                                        VIPRF    1601
      ILINE2(1)=10H(LIGHT WEI $ILINE2(2)=10HGHT EQUIP.                  VIPRF    1602
      ILINE2(3)=10HMOUNTED ON $ILINE2(4)=10H PRIMARY S                  VIPRF    1603
      ILINE2(5)=10HTRUCTURE B  $ILINE2(6)=10HY BRACKETS                 VIPRF    1604
      ILINE2(7)=2H)$                                                    VIPRF    1605
                                                                        VIPRF    1606
      ILINE1(1)=10HLOWEST NAT $ILINE1(2)=10HURAL FREQU                  VIPRF    1607
      ILINE1(3)=10HENCY OF BR $ILINE1(4)=10HACKET AND                   VIPRF    1608
      ILINE1(5)=10HEQUIPMENT  $ILINE1(6)=10HCOMBINATIO                  VIPRF    1609
      ILINE1(7)=6HN(H7.)                                                VIPRF    1610
      GO TO 440                                                         VIPRF    1611
                                                                        VIPRF    1612
                                                                        VIPRF    1613
C     ************************                                          VIPRF    1614
C     *                      *                                          VIPRF    1615
C     *    CATEGORY 6        *                                          VIPRF    1616
C     *                      *                                          VIPRF    1617
C     ************************                                          VIPRF    1618
                                                                        VIPRF    1619
  437 IF(IFLITE.NE.ISANDL) PRINT 246                                    VIPRF    1620
      PRINT 439                                                         VIPRF    1621
  439 FORMAT(1H-,*TRANSFER FUNCTION FOR CATEGORY 6:  EQUIP.MOUNTED ON,OR VIPRF    1622
     1 ATTACHED TO FORWARD LOOKING RADAR BULK-HEADS*///                 VIPRF    1623
     2* FOR THIS CATEGORY Y(F)=1 AT ALL FREQUENCIES SO THAT R(F)=Y(F)G(F VIPRF    1624
     3)=G(F).*/                                                         VIPRF    1625
     4* CHANGES ARE MADE AS FOLLOWS WHEN THIS CATEGORY IS SPECIFIED:*//  VIPRF    1626
     52X,*H(F):7.0 DB IS ADDED TO H(F)*/45X,*M*/                        VIPRF    1627
     622X,*E : E =350.0T/0.035(T DENOTES PLATE THICKNESS)*/23X,*0*4X*0*/ VIPRF    1628
     720X,*M(F):2.0 DB IS ADDED TO M(F)*/45X,*M*)                       VIPRF    1629
      GO TO 600                                                         VIPRF    1630
                                                                        VIPRF    1631
                                                                        VIPRF    1632
  440 IF(IFLITE.NE.ISANDL) PRINT 246                                    VIPRF    1633
      II=5HY (F) $J=1HM $M=1H                                           VIPRF    1634
      PRINT 393,TT,XX                                                   VIPRF    1635
      IF(CATGRY.EQ.C4A.OR.CATGRY.EQ.C4B) PRINT 438,CATGRY               VIPRF    1636
      IF(CATGRY.EQ.C5) PRINT 420,C5MAX,IPLANE(1),DELWE,WE,PEAK          VIPRF    1637
      IF(CATGRY.NE.C5) PRINT 352,II,PEAK,II,IPLANE(1),J,M,M             VIPRF    1638
      PRINT 780,SLO,SHI,XLO,XHI,FZLO,FZHI                               VIPRF    1639
                                                                        VIPRF    1640
      PRINT 441,FC,(ILINE1(II),II=1,7),IFN                              VIPRF    1641
      PRINT 425,ALO,AHI                                                 VIPRF    1642
  420 FORMAT(                                                           VIPRF    1643
     217X,*Y (F)=*,F12.2,6X,*MAXIMUM VALUE OF Y(F)-DB.,FOR*,A10,        VIPRF    1644
     3*TYPE AIRCRAFT*/18X,*M*/                                          VIPRF    1645
     416X,*DEL W =*F12.2,6X,*CORRECTION FACTOR TO Y (F) FOR EQUIPMENT WE VIPRF    1646
     5IGHT W =*,F6.1 * LBS.*/21X,*E*,41X,*M*,26X,*E*/                   VIPRF    1647
     617X,*Y (F)=*,F12.2,6X,*CORRECTED VALUE OF Y (F)*/18X,*M*,2X,*C*,  VIPRF    1648
     739X,*M*)                                                          VIPRF    1649
  425 FORMAT(                                                           VIPRF    1650
     116X,*ALPHA =*,F12.3,6X,*FORM FACTOR,LOW-FREQ.ROLL-OFF*/           VIPRF    1651
     216X,*ALPHAH=*,F12.3,6X,*FORM FACTOR,HIGH-FREQ.ROLL-OFF*)          VIPRF    1652
  438 FORMAT(42X,*(REQUIRED WHEN CATEGORY *,A2,* EQUIPMENT MOUNTING IS S VIPRF    1653
     1PECIFIED)*//)                                                     VIPRF    1654
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

      441 FORMAT(20X,*F =*,F12.2,6X,7A10/21X,A3)                                VIPRF   1655
                                                                                VIPRF   1656
                                                                                VIPRF   1657
                                                                                VIPRF   1658
C     ************************                                                  VIPRF   1659
C     *                      *                                                  VIPRF   1660
C     *    L(F)-M(F)-H(F)    *                                                  VIPRF   1661
C     *                      *                                                  VIPRF   1662
C     ************************                                                  VIPRF   1663
      600 TWOB(1)=2.*BLFLO $TWOB(2)=2.*BMFLO $TWOB(3)=2.*BHFLO                  VIPRF   1664
          FZ(1)=FZLFLO $FZ(2)=FZMFLO $FZ(3)=FZHFLO                              VIPRF   1665
          XFERMX(1)=XLFCOR $XFERMX(2)=XMFCOR $XFERMX(3)=XHFCOR                  VIPRF   1666
                                                                                VIPRF   1667
          FLX(1)=ATAN2(TWOB(1)*(XLFLO**ALFLO),1.-XLFLO*XLFLO)                   VIPRF   1668
          FLX(2)=ATAN2(TWOB(2)*(XMFLO**AMFLO),1.-XMFLO*XMFLO)                   VIPRF   1669
          FLX(3)=ATAN2(TWOB(3)*(XHFLO**AHFLO),1.-XHFLO*XHFLO)                   VIPRF   1670
                                                                                VIPRF   1671
          ALPHA(1)=ALFLO $ALPHA(2)=AMFLO $ALPHA(3)=AHFLO                        VIPRF   1672
          HILO(1)=0. $HILO(2)=0. $HILO(3)=0.                                    VIPRF   1673
          SIGN(1)=1.0 $SIGN(2)=1.0 $SIGN(3)=1.0 $K=3 $DB(4)=-1000.0             VIPRF   1674
                                                                                VIPRF   1675
                                                                                VIPRF   1676
          J=0 $CONST=0.10 $II=1 $L=0                                            VIPRF   1677
          FRQ=FMINGE $FMAX=XLFLO*FZLFLO                                         VIPRF   1678
                                                                                VIPRF   1679
          IF(F2N.EQ.0.) GO TO 620                                               VIPRF   1680
          X1=XL2FLO*FL2FLO $IF(X1.GE.FMAX) GO TO 610                            VIPRF   1681
          PRINT 605,X1,FMAX                                                     VIPRF   1682
      605 FORMAT(1H-,*THE FREQUENCY AT WHICH THE MAXIMUM VALUE OF L2(F) OCCU VIPRF   1683
         1RS,*,G12.5,* HZ.*/* IS LESS THAN THE CORRESPONDING FREQUENCY FOR L VIPRF   1684
         2(F),*,G12.5/* THE PROGRAM ASSUMES THAT THE FREQUENCY OF THE MAXIMU VIPRF   1685
         3M VALUE OF L2(F) WILL FE*/* GREATER THAN OR EQUAL TO THE CORRESPON VIPRF   1686
         4DING FREQUENCY OF L(F).*)                                             VIPRF   1687
          GO TO 1000                                                            VIPRF   1688
                                                                                VIPRF   1689
      610 TWOB(4)=2.0*BL2FLO $FZ(4)=FL2FLO $ALPHA(4)=AL2FLO                     VIPRF   1690
          XFERMX(4)=XL2FCR                                                      VIPRF   1691
          FLX(4)=ATAN2(TWOB(4)*(XL2FLO**AL2FLO),1.-XL2FLO*XL2FLO)               VIPRF   1692
          K=4 $HILO(4)=0. $SIGN(4)=1.0                                          VIPRF   1693
                                                                                VIPRF   1694
                                                                                VIPRF   1695
      620 IF(FMAX.LE.FMINGE) GO TO 625                                          VIPRF   1696
          CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,        VIPRF   1697
         1HILO,SIGN,ALPHA,II,J,K,L)                                             VIPRF   1698
          FRQ=FMAX                                                              VIPRF   1699
                                                                                VIPRF   1700
      625 FMAX=XMFLO*FZMFLO                                                     VIPRF   1701
          TWOB(1)=2.*BLFHI $FZ(1)=FZLFHI $ALPHA(1)=ALFHI                        VIPRF   1702
          FLX(1)=PI-ATAN2(TWOB(1)*(XLFHI**ALFHI),1.-XLFHI*XLFHI)                VIPRF   1703
          HILO(1)=PI $SIGN(1)=-1.0                                              VIPRF   1704
                                                                                VIPRF   1705
          IF(F2N.EQ.0.) GO TO 640                                               VIPRF   1706
          IF(X1.LE.FRQ) GO TO 630                                               VIPRF   1707
                                                                                VIPRF   1708
                                                                                VIPRF   1709
          FMAX=X1 $II=1                                                         VIPRF   1710
          CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,        VIPRF   1711
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                 1HILO,SIGN,ALPHA,II,J,K,L)
                  FRQ=FMAX $FMAX=XMFLO*FZMFLO

            630 TWOB(4)=2.0*BL2FHI $FZ(4)=FL2FHI $ALPHA(4)=AL2FHI
                  FLX(4)=PI-ATAN2(TWOB(4)*(XL2FHI**AL2FHI),1.-XL2FHI*XL2FHI)
                  HILO(4)=PI $SIGN(4)=-1.0

            640 II=1
                  CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,
                 1HILO,SIGN,ALPHA,II,J,K,L)

                  FRQ=FMAX $FMAX=XMFHI*FZMFHI
                  IF(FMAX.EQ.FRQ) GO TO 580
                  DB(2)=XMFCOR $II=1 $L=2
                  CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,
                 1HILO,SIGN,ALPHA,II,J,K,L)

            580 FRQ=FMAX $FMAX=XHFLO*FZHFLO
                  TWOB(2)=2.0*BMFHI $FZ(2)=FZMFHI $ALPHA(2)=AMFHI
                  FLX(2)=PI-ATAN2(TWOB(2)*(XMFHI**AMFHI),1.-XMFHI*XMFHI)
                  HILO(2)=PI $SIGN(2)=-1. $II=1 $L=0
                  CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,
                 1HILO,SIGN,ALPHA,II,J,K,L)

                  FRQ=FMAX $FMAX=XHFHI*FZHFHI
                  IF(FMAX.EQ.FRQ) GO TO 590
                  DB(3)=XHFCOR $II=1 $L=3
                  CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,
                 1HILO,SIGN,ALPHA,II,J,K,L)

            590 FRQ=FMAX $FMAX=FMAXGF
                  TWOB(3)=2.0*BHFHI $FZ(3)=FZHFHI $ALPHA(3)=AHFHI
                  FLX(3)=PI-ATAN2(TWOB(3)*(XHFHI**AHFHI),1.-XHFHI*XHFHI)
                  HILO(3)=PI $SIGN(3)=-1. $II=1 $L=0
                  CALL GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,FZ,
                 1HILO,SIGN,ALPHA,II,J,K,L)
                  NPTS=J

          C    ************************
          C    *                      *
          C    *     P(F)             *
          C    *                      *
          C    ************************

                  LXNAME(1)=10H(F)REQUENC $LXNAME(2)=10HY((H)Z())$
                  X=XE $YSTEP=5.0

                  IF(INCPLT.EQ.IBLANK) GO TO 459
                  IPLOT=IPLOT+1

                  LYNAME(1)=10H(P()F())-D $LYNAME(2)=4H(B)$
                  ILINE1(1)=10H(BOUNDARY  $ILINE1(2)=10HLAYER PSD) $ILINE1(3)=1H$
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

          J=10H(F()F())=$ $N=9H P(F) DB.                                                  VIPRF   1769
                                                                                          VIPRF   1770
                                                                                          VIPRF   1771
      459 TWOBPF=2.*BPF $FLXPF=PI-ATAN2(TWOBPF*(XPF**APFHI),1.-XPF*XPF)                   VIPRF   1772
          DO 460 II=1,NPTS                                                                VIPRF   1773
          K=II $X1=FREQ(II) $IF(X1.GE.FMINPF) GO TO 463                                   VIPRF   1774
          X1=X1/FZPF                                                                      VIPRF   1775
          X1=PFMDB+20.*ALOG10((PI-ATAN2(TWOBPF*(X1**APFHI),1.-X1*X1))/FLXPF)              VIPRF   1776
      460 DBFL(II)=X1                                                                     VIPRF   1777
                                                                                          VIPRF   1778
      463 L=0                                                                             VIPRF   1779
          DO 465 II=K,NPTS                                                                VIPRF   1780
          L=L+1 $X1=FREQ(II) $FSFL(L)=X1 $X1=X1/FZPF                                      VIPRF   1781
          X1=PFMDB+20.*ALOG10((PI-ATAN2(TWOBPF*(X1**APFHI),1.-X1*X1))/FLXPF)              VIPRF   1782
      465 DBFL(II)=X1                                                                     VIPRF   1783
                                                                                          VIPRF   1784
                                                                                          VIPRF   1785
          IF(IFLITE.NE.ISANDL) GO TO 465                                                  VIPRF   1786
                                                                                          VIPRF   1787
                                                                                          VIPRF   1788
          FRQ=FMAXPF                                                                      VIPRF   1789
      467 FRQ=FRQ+CONST*FRQ $IF(FRQ.GT.FMAXPF) GO TO 472                                  VIPRF   1790
          L=L+1 $FSFL(L)=FRQ                                                              VIPRF   1791
          GO TO 467                                                                       VIPRF   1792
                                                                                          VIPRF   1793
                                                                                          VIPRF   1794
      472 CALL CNFFUN(FSFL,DBSPL,L,PFMDB,0.,BPF,0.,XPF,0.,FZPF,0.,APFHI,                  VIPRF   1795
         1FMINPF,FMAXPF,DBMIN,0,IFIRST,J,M,1H ,2HHI)                                      VIPRF   1796
                                                                                          VIPRF   1797
                                                                                          VIPRF   1798
          IF(INOPLT.EQ.IBLANK) GO TO 475                                                  VIPRF   1799
          CALL ENDPL(IPLOT) $GO TO 473                                                    VIPRF   1800
                                                                                          VIPRF   1801
                                                                                          VIPRF   1802
C     ************************                                                            VIPRF   1803
C     *                      *                                                            VIPRF   1804
C     *     S(F)             *                                                            VIPRF   1805
C     *                      *                                                            VIPRF   1806
C     ************************                                                            VIPRF   1807
      460 IPHASE=0 $IF(INOPLT.EQ.IBLANK) GO TO 457                                        VIPRF   1808
          IPHASE=1 $II=5H S(F)                                                            VIPRF   1809
          IF(IFLITE.EQ.IDUFET.AND.SBTFD.LT.SDELTA) GO TO 450                              VIPRF   1810
          IF(IFLITE.EQ.ITURB) GO TO 450                                                   VIPRF   1811
          PRINT 458,II,IX,SPLC,BPF,SBHI,SXLO,XPF,SXHI,SFZLO,FZPF,SFZHI,SALC,              VIPRF   1812
         1APFHI,SAHI,PFMDB,SPEAK                                                          VIPRF   1813
      458 FORMAT(1H1,*PARAMETERS*,3X,*P(F)*,8X,A10/28X,A2/                                VIPRF   1814
         18X,*B =*,11X,G12.3/8X,*B'=*,G11.3,G12.3/                                        VIPRF   1815
         28X,*X =*,11X,G12.3/8X,*X'=*,G11.3,G12.3/8X,*F =*,11X,G12.5/9X,*0*/              VIPRF   1816
         38X,*F'=*,G11.5,G12.5/9X,*0*/4X,*ALPHA =*,11X,G12.3/4X,*ALPHA'=*,                VIPRF   1817
         4G11.3,G12.3/2X,*MAX.VAL.=*,G11.4,G12.4)                                         VIPRF   1818
          M=4HBOTH $GO TO 452                                                             VIPRF   1819
                                                                                          VIPRF   1820
      450 PRINT 451,II,IX,BPF,SBHI,XPF,SXHI,FZPF,SFZHI,APFHI,SAHI,PFMDB,                  VIPRF   1821
         1SPEAK                                                                           VIPRF   1822
      451 FORMAT(1H1,*PARAMETERS*,3X,*P(F)*,8X,A10/27X,A2/                                VIPRF   1823
         18X,*B"=*,G11.3,G12.3/8X,*X'=*,G11.3,G12.3/                                      VIPRF   1824
         28X,*F"=*,G11.4,G12.4/4X,*ALPHA'=*,G11.3,G12.3/                                  VIPRF   1825
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      32X,*MAX.VAL.=*,G11.4,G12.4)                                      VIPRF    1826
       M=2HHT                                                           VIPRF    1827
                                                                        VIPRF    1828
                                                                        VIPRF    1829
  452 K=7H   P(F) $L=5H P(F)                                            VIPRF    1830
      PRINT 790,II,K,IBLANK                                             VIPRF    1831
      PRINT 461,II,K,L,IPLANK                                           VIPRF    1832
  461 FORMAT(1H-,3X,*FREQUENCY(H7.)*,9X,A5,10X,A10,11X,A5,12X,A10)      VIPRF    1833
      PRINT 455,IX,IBLANK,IX                                            VIPRF    1834
  455 FORMAT(29X,A2,15X,A2,17X,A2)                                      VIPRF    1835
                                                                        VIPRF    1836
  457 CALL XFEFUN(FREQ,DBSPL,NPTS,SPEAK,SXLO,SXHI,SBLO,SBHI,            VIPRF    1837
     1SFZLO,SFZHI,SALO,SAHI,M)                                          VIPRF    1838
                                                                        VIPRF    1839
      DO 453 K=1,NPTS                                                   VIPRF    1840
      IF(DBSPL(K).LT.0.) DBSPL(K)=0.                                    VIPRF    1841
  453 CONTINUE                                                          VIPRF    1842
                                                                        VIPRF    1843
                                                                        VIPRF    1844
      CALL TWOFUN(FREQ,DBSPL,DBFL,NPTS,FMINGF,FMAXGF,DBMIN,DYVAL)       VIPRF    1845
                                                                        VIPRF    1846
      IF(INCPLT.EQ.IPLANK) GO TO 475                                    VIPRF    1847
                                                                        VIPRF    1848
                                                                        VIPRF    1849
      K=2HHT                                                            VIPRF    1850
      IF(IFLITS.EQ.IBUFFT.AND.SBTFD.LT.SDELTA) GO TO 456                VIPRF    1851
      IF(IFLITF.EQ.ITURB) GO TO 456                                     VIPRF    1852
      K=4HBOTH                                                          VIPRF    1853
      IF(SFZLO.LT.FMINGF) GO TO 456                                     VIPRF    1854
      FLX1=ATAN2(2.*SBLO*(SXLO**SALO),1.-SXLO*SXLO)                     VIPRF    1855
      IF(FLX1.LT.0.) FLX1=FLX1+2.0*PI                                   VIPRF    1856
      X1=SPEAK+20.*ALOG10(PI/(2.*FLX1)) $X2=SFZLO/FZPF                  VIPRF    1857
      X2=PEMDB+20.*ALOG10((PI-ATAN2(TWOBPF*(X2**APFHI),1.-X2*X2))/FLXPF) VIPRF    1858
      YVAL=X1+X2 $CALL CURVS(SFZLO,YVAL,1,1)                            VIPRF    1859
                                                                        VIPRF    1860
  456 FLX1=PI-ATAN2(2.*SBHI*(SXHI**SAHI),1.-SXHI*SXHI)                  VIPRF    1861
      X1=SPEAK+20.*ALOG10(PI/(2.*FLX1)) $X2=SFZHI/FZPF                  VIPRF    1862
      X2=PEMDB+20.*ALOG10((PI-ATAN2(TWOBPF*(X2**APFHI),1.-X2*X2))/FLXPF) VIPRF    1863
      YVAL=X1+X2 $CALL CURVS(SFZHI,YVAL,1,1)                            VIPRF    1864
                                                                        VIPRF    1865
      CALL HEIGHT(HITE1)                                                VIPRF    1866
      CALL LOGFXA(SBLO,SBHI,SXLO,SXHI,SFZLO,SFZHI,SALO,SAHI,FMINGF,     VIPRF    1867
     1FMAXGF,YVAL,DYVAL,K)                                              VIPRF    1868
                                                                        VIPRF    1869
      CALL ENDPL(IPLOT)                                                 VIPRF    1870
                                                                        VIPRF    1871
                                                                        VIPRF    1872
C     ************************                                          VIPRF    1873
C     *                      *                                          VIPRF    1874
C     *     H(F)             *                                          VIPRF    1875
C     *                      *                                          VIPRF    1876
C     ************************                                          VIPRF    1877
                                                                        VIPRF    1878
                                                                        VIPRF    1879
  477 IPLOT=IPLOT+1                                                     VIPRF    1880
      LYNAME(1)=10H(H)(()F()) $LYNAME(2)=6H-C(B)$                       VIPRF    1881
      ILINE1(1)=10H(HIGH FREQ $ILINE1(2)=10HUENCY TRAN                  VIPRF    1882
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PROGRAM VIPRF      74/74   OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                ILINE1(3)=10HSFER FUNCT $ILINE1(4)=5HION)$
                ITITL1(1)=10H(PRIMARY S $ITITL1(2)=10HTRUCTURE-F
                ITITL1(3)=9HUSELAGE)$
                II=10H(H()F())=$ $J=9H H(F) DB.

            475 K=0 $CONST=0.07 $FRQ=FMINHF $FMAX=XHFLO*FZHFLO $L=0
            480 K=K+1 $FSPL(K)=FRQ
                FRQ=FRQ+CONST*FRQ $IF(FRQ.LT.FMAX) GO TO 480
                IF(L.EQ.1) GO TO 505
                L=1 $FRQ=FMAX $FMAX=FMAXHF
                X1=XHFHI*FZHFHI $IF(FRQ.EQ.X1) GO TO 480
                K=K+1 $FSPL(K)=FRQ $FRQ=X1 $GO TO 480

            505 CALL ONEFUN(FSPL,DBSPL,K,XHFCOR,BHFLO,BHFHI,XHFLO,XHFHI,FZHFLO,
               1FZHFHI,AHFLO,AHFHI,FMINHF,FMAXHF,DBMIN,0,IFIRST,II,J,1H ,4HBOTH)

                IPHASE=1 $IF(INOPLT.NE.IBLANK) GO TO 508
                IF(CATGRY.EQ.C1B) GO TO 507
                IPHASE=0 $GO TO 520

            508 XVAL=1.10*FMINHF $CALL HEIGHT(HITE1)
                DYVAL=1.5*HITE*YSTEP $YVAL=DBMIN+YSTEP+1.5*DYVAL
                CALL RLMESS("(W) =$",+100,XVAL,YVAL)
                CALL RLREAL(WS,+2,"ABUT","ABUT")
                CALL RLMESS(" PSF.$",+100,"ABUT","ABUT")
                CALL RLMESS(" S $",+100,XVAL,YVAL-0.5*DYVAL)

                CALL RLMESS("(R) =$",+100,XVAL,YVAL-1.5*DYVAL)
                CALL RLREAL(RS,+1,"ABUT","ABUT")
                CALL RLMESS(" IN.$",+100,"ABUT","ABUT")
                CALL RLMESS(" S $",+100,XVAL,YVAL-2.0*DYVAL)
                CALL RLMESS("(W) =$",+100,XVAL,YVAL-3.0*DYVAL)
                CALL RLREAL(WE,+1,"ABUT","ABUT")
                CALL RLMESS(" LBS.$",+100,"ABUT","ABUT")
                CALL HEIGHT(0.7*HITE1)
                CALL RLMESS(" (E)$",+100,XVAL,YVAL-3.5*DYVAL)
                CALL HEIGHT(HITE1)
                CALL RESET("BASALF") $CALL RLMESS(IFLITE,10,XVAL,YVAL-4.5*DYVAL)
                CALL BASALF("L/CSTD")
                CALL HEIGHT(HITE)
                CALL ENDPL(IPLOT)

          C   ************************
          C   *                      *
          C   *    C(F)              *
          C   *                      *
          C   ************************

            507 IPLOT=IPLOT+1

                LYNAME(1)=10H(G()F())-D $LYNAME(2)=10H(B)(()RE.1
                LYNAME(3)=10H (G.S)O./( $LYNAME(4)=7HH)Z())$
```

PROGRAM VIPRF 74/74 OPT=1 FTN 4.5+414 08/16/77 13.11.28

```
      ILINE1(1)=10H(RESPONSE  $ILINE1(2)=10HOF PRIMARY
      ILINE1(3)=10H STRUCTURE $ILINE1(4)=2H)$
      ITITL1(1)=2H $ $YSTEP=5.0

      PRINT 246 $PRINT 353,IPLANE,IFLITE

      IF(F2N.NE.0.) GO TO 514
      PRINT 509
  509 FORMAT(1H-,4X,*PARAMETERS*,3X,*P(F)*,5X,*L(F)*,5X,*M(F)*,5X*H(F)*)
      II=1HB $K=2HB'
      PRINT 511,II,BLFLO,BMFLO,BHFLO
  511 FORMAT(9X,A4,F18.3,3F9.3)
      PRINT 512,K,BPF,BLFHI,BMFHI,BHFHI
  512 FORMAT(9X,A4,5F9.3)
      II=1HX $K=2HX'
      PRINT 511,II,XLFLO,XMFLO,XHFLO
      PRINT 512,K,XPF,XLFHI,XMFHI,XHFHI
      II=1HF $K=2HF' $L=1HC
      PRINT 511,II,FZLFLO,FZMFLO,FZHFLO
      PRINT 513,L
  513 FORMAT(10X,A1)
      PRINT 512,K,FZPF,FZLFHI,FZMFHI,FZHFHI
      PRINT 513,L
      II=1HA $K=2HA'
      PRINT 511,II,ALFLO,AMFLO,AHFLO
      PRINT 512,K,APFHI,ALFHI,AMFHI,AHFHI
      II=4HMAX.
      PRINT 512,II,PFMDB,XLFCOR,XMFCOR,XHFCOR
      GO TO 518

  514 PRINT 521
  521 FORMAT(1H-,4X,*PARAMETERS*,3X,*P(F)*,5X,*L(F)*,5X,*L (F)*,5X,
     1*M(F)*,5X,*H(F)*/37X,*2*)
      II=1HB $K=2HB'
      PRINT 511,II,BLFLO,BL2FLO,BMFLO,BHFLO
      PRINT 512,K,BPF,BLFHI,BL2FHI,BMFHI,BHFHI
      II=1HX $K=2HX'
      PRINT 511,II,XLFLO,XL2FLO,XMFLO,XHFLO
      PRINT 512,K,XPF,XLFHI,XL2FHI,XMFHI,XHFHI
      II=1HF $K=2HF' $L=1HC
      PRINT 511,II,FZLFLO,FL2FLO,FZMFLO,FZHFLO
      PRINT 513,L
      PRINT 512,K,FZPF,FZLFHI,FL2FHI,FZMFHI,FZHFHI
      PRINT 513,L
      II=1HA $K=2HA'
      PRINT 511,II,ALFLO,AL2FLO,AMFLO,AHFLO
      PRINT 512,K,APFHI,ALFHI,AL2FHI,AMFHI,AHFHI
      II=4HMAX.
      PRINT 512,II,PFMDB,XLFCOR,XL2FCR,XMFCOR,XHFCOR

  518 II=5H P(F) $K=9H L-M-H(F) $L=5H G(F) $M=10H G SQ./HZ.
      PRINT 790,II,K,L $PRINT 461,II,K,L,M $PRINT 455,IX,IBLANK,IBLANK

  520 CALL TWOFUN(FREQ,DBEL,DECBEL,NPTS,FMINGF,FMAXGF,DBMIN,DYVAL)
```

```
      IF(CATGRY.NE.C1B) GO TO 774                                       VIPRF   1997
      CALL ENDPL(IPLOT) $GO TO 860                                      VIPRF   1998
                                                                        VIPRF   1999
  774 IPHASE=0 $IF(INOPLT.EQ.IPLANK) GO TO 775                          VIPRF   2000
      IPHASE=1 $CALL ENDPL(IPLOT)                                       VIPRF   2001
                                                                        VIPRF   2002
                                                                        VIPRF   2003
C     ************************                                          VIPRF   2004
C     *                      *                                          VIPRF   2005
C     *    Y(F)              *                                          VIPRF   2006
C     *                      *                                          VIPRF   2007
C     ************************                                          VIPRF   2008
      IPLOT=IPLOT+1                                                     VIPRF   2009
      LYNAME(1)=10H(Y()F())-0 $LYNAME(2)=10H(B()RE.1.0 $LYNAME(3)=4H()) $ VIPRF   2010
      ILINE1(1)=10H(TRANSFER  $ILINE1(2)=10HFUNCTION F $ILINE1(3)=4HOR) $ VIPRF   2011
                                                                        VIPRF   2012
      DO 776 II=1,7                                                     VIPRF   2013
  776 ITITL1(II)=ILINE2(II)                                             VIPRF   2014
                                                                        VIPRF   2015
      II=10H(Y()F())=$ $K=10H Y (F) DB. $YSTEP=5.0                      VIPRF   2016
      X1=CATGRY $IF(CATGRY.EQ.C4A) X1=2H3A                              VIPRF   2017
      IF(CATGRY.EQ.C4B) X1=2H33                                         VIPRF   2018
                                                                        VIPRF   2019
                                                                        VIPRF   2020
  775 IF(CATGRY.NE.C6) GO TO 785                                        VIPRF   2021
                                                                        VIPRF   2022
      DO 780 II=1,NPTS                                                  VIPRF   2023
  780 DBFL(II)=0.                                                       VIPRF   2024
      GO TO 787                                                         VIPRF   2025
                                                                        VIPRF   2026
                                                                        VIPRF   2027
  785 CALL CNFFUN(FREQ,DBFL,NPTS,PEAK,BLO,BHI,XLO,XHI,FZLO,FZHI,ALO,AHI, VIPRF   2028
     1FMINGF,FMAXGF,DBMIN,1,IFIRST,II,K,X1,4HBOTH)                      VIPRF   2029
                                                                        VIPRF   2030
  787 IPHASE=1 $IF(INOPLT.NE.IPLANK) GO TO 788                          VIPRF   2031
      IF(CATGRY.NE.C4A.AND.CATGRY.NE.C4B) GO TO 789                     VIPRF   2032
      IPHASE=0 $GO TO 800                                               VIPRF   2033
                                                                        VIPRF   2034
  788 CALL ENDPL(IPLOT)                                                 VIPRF   2035
                                                                        VIPRF   2036
                                                                        VIPRF   2037
C     ************************                                          VIPRF   2038
C     *                      *                                          VIPRF   2039
C     *    R(F)              *                                          VIPRF   2040
C     *                      *                                          VIPRF   2041
C     ************************                                          VIPRF   2042
  789 IPLOT=IPLOT+1                                                     VIPRF   2043
      PRINT 246 $PRINT 3E3,IPLANE,IFLITE                                VIPRF   2044
      II=6H Y (F) $K=7H   G(F) $L=5H R(F) $M=10H G SQ./HZ.              VIPRF   2045
      PRINT 790,II,K,L                                                  VIPRF   2046
  790 FORMAT(1H-,*VALUES CALCULATED FOR FUNCTIONS: *,7A10)              VIPRF   2047
      PRINT 461,II,K,L,M                                                VIPRF   2048
                                                                        VIPRF   2049
      II=2H3A $IF(CATGRY.EQ.C4A) GO TO 793                              VIPRF   2050
      II=2H33 $IF(CATGRY.EQ.C4B) GO TO 793                              VIPRF   2051
      PRINT 455,CATGRY,IPLANK,IPLANK                                    VIPRF   2052
      GO TO 795                                                         VIPRF   2053
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                                                                                VIPRF    2054
          793 PRINT 455,II,IPLANK,IBLANK                                        VIPRF    2055
                                                                                VIPRF    2056
                                                                                VIPRF    2057
          795 LYNAME(1)=10H(R()F())-D $LYNAME(2)=10H(B)(()RF.1                  VIPRF    2058
              LYNAME(3)=10H (G.S)Q./( $LYNAME(4)=7HH)Z())$                      VIPRF    2059
              ILINE1(1)=10H(RESPONSE  $ILINE1(2)=10HOF THE AIR                  VIPRF    2060
              ILINE1(3)=10HCRAFT EQUI $ILINE1(4)=7HPMENT)$                      VIPRF    2061
              ITITL1(1)=2H $                                                    VIPRF    2062
                                                                                VIPRF    2063
                                                                                VIPRF    2064
          800 CALL TWOFUN(FREQ,DBEL,DECBEL,NPTS,FMINGF,FMAXGF,DBMIN,DYVAL)      VIPRF    2065
                                                                                VIPRF    2066
              IF(CATGRY.EQ.C4A.OR.CATGRY.EQ.C4B) GO TO 805                      VIPRF    2067
              CALL ENDPL(IPLOT) $GO TO 860                                      VIPRF    2068
          805 LYNAME(2)=10H(B)(()RF.1                                           VIPRF    2069
              LYNAME(3)=10H (G.S)Q./( $LYNAME(4)=7HH)Z())$                      VIPRF    2070
              IF(INCPLT.EQ.IBLANK) GO TO 810                                    VIPRF    2071
              CALL ENDPL(IPLOT)                                                 VIPRF    2072
                                                                                VIPRF    2073
                                                                                VIPRF    2074
                                                                                VIPRF    2075
        C    ************************                                           VIPRF    2076
        C    *                      *                                           VIPRF    2077
        C    *    Y(F)              *                                           VIPRF    2078
        C    *     1A               *                                           VIPRF    2079
        C    *                      *                                           VIPRF    2080
        C    ************************                                           VIPRF    2081
                                                                                VIPRF    2082
                                                                                VIPRF    2083
              IPLOT=IPLOT+1                                                     VIPRF    2084
                                                                                VIPRF    2085
              LYNAME(1)=10H(Y()F())-D                                           VIPRF    2086
              ILINE1(1)=10H(TRANSFER  $ILINE1(2)=10HFUNCTION F $ILINE1(3)=4HOR)$ VIPRF    2087
                                                                                VIPRF    2088
              ITITL1(1)=10H(EQUIPMENT $ITITL1(2)=10H MOUNTED O                  VIPRF    2089
              ITITL1(3)=10HN PRIMARY  $ITITL1(4)=10HSTRUCTURE                   VIPRF    2090
              ITITL1(5)=10HTHROUGH IS $ITITL1(6)=9HOLATORS)$                    VIPRF    2091
              II=10H(Y()F())=$ $K=10H Y (F) DB. $YSTEP=5.0 $L=2H1A              VIPRF    2092
                                                                                VIPRF    2093
          810 CALL ONEFUN(FREQ,DBEL,NPTS,C1AMXC,C1ABLO,C1ABHI,C1AXLO,C1AXHI,    VIPRF    2094
             1C1AFZL,C1AFZH,C1AALO,C1AAHI,FMINGF,FMAXGF,DBMIN,1,IFIRST,II,K,L,  VIPRF    2095
             24HBOTH)                                                           VIPRF    2096
                                                                                VIPRF    2097
              IF(INCPLT.NE.IBLANK) CALL ENDPL(IPLOT)                            VIPRF    2098
                                                                                VIPRF    2099
                                                                                VIPRF    2100
        C    ************************                                           VIPRF    2101
        C    *                      *                                           VIPRF    2102
        C    *    A(F)              *                                           VIPRF    2103
        C    *                      *                                           VIPRF    2104
        C    ************************                                           VIPRF    2105
              IPLOT=IPLOT+1                                                     VIPRF    2106
              IPHASE=1                                                          VIPRF    2107
              PRINT 246 $PRINT 353,IPLANE,IFLITE                                VIPRF    2108
              II=6H Y (F) $J=8H   R (F) $K=6H A (F) $M=10H G SQ./HZ.            VIPRF    2109
              L=2H3A $IF(CATGRY.EQ.C4B) L=2H3B                                  VIPRF    2110
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PROGRAM VIPRF      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                PRINT 790,II,J,K $PRINT 461,II,J,K,M                                  VIPRF   2111
                M=2H1A $PRINT 455,M,L,CATGRY                                          VIPRF   2112
                                                                                      VIPRF   2113
                LYNAME(1)=10H(A()E())-D                                               VIPRF   2114
                ILINE1(1)=10H(INPUT TO  $ILINE1(2)=10HTHE AIRCRA                      VIPRF   2115
                ILINE1(3)=10HFT EQUIPME $ILINE1(4)=4HNT)$                             VIPRF   2116
                                                                                      VIPRF   2117
                ITITL1(1)=10H(EQUIPMENT $ITITL1(2)=10H MOUNTED T                      VIPRF   2118
                ITITL1(3)=10HHROUGH ISO $ITITL1(4)=10HLATORS ON                       VIPRF   2119
                                                                                      VIPRF   2120
                IF(CATGRY.EQ.C43) GO TO 820                                           VIPRF   2121
                                                                                      VIPRF   2122
                ITITL1(5)=10HISOLATED S $ITITL1(6)=10HHELF OR RA                      VIPRF   2123
                ITITL1(7)=4HCK)$                                                      VIPRF   2124
                GO TO 840                                                             VIPRF   2125
                                                                                      VIPRF   2126
            820 ITITL1(5)=10HNON-ISOL.S $ITITL1(6)=10HHELF OR RA                      VIPRF   2127
                ITITL1(7)=4HCK)$                                                      VIPRF   2128
                                                                                      VIPRF   2129
                                                                                      VIPRF   2130
            840 CALL TROFUN(FREQ,DBEL,DECBEL,NPTS,FMINGF,FMAXGF,DBMIN,DYVAL)          VIPRF   2131
                                                                                      VIPRF   2132
                                                                                      VIPRF   2133
                CALL ENDPL(IPLOT)                                                     VIPRF   2134
                                                                                      VIPRF   2135
                                                                                      VIPRF   2136
            860 IF(JFLITE.EQ.ISANDL.OR.ICK.EQ.1) GO TO 1000                           VIPRF   2137
                IFLITE=JFLITE $ICK=1 $GO TO 3                                         VIPRF   2138
                                                                                      VIPRF   2139
           1000 CONTINUE                                                              VIPRF   2140
                IF(IERROR.EQ.4) GO TO 890                                             VIPRF   2141
                IF(IERROR.NE.3) GO TO 1                                               VIPRF   2142
                IPLANE(1)=IHOLD(1) $IPLANE(2)=IHOLD(2)                                VIPRF   2143
                IPLANE(3)=IHOLD(3) $JFLITE=IHOLD(4)                                   VIPRF   2144
                INCPLT=IHOLD(5)                                                       VIPRF   2145
                GO TO 31                                                              VIPRF   2146
                                                                                      VIPRF   2147
                                                                                      VIPRF   2148
            890 CALL DONEPL                                                           VIPRF   2149
                                                                                      VIPRF   2150
                                                                                      VIPRF   2151
                PRINT 900                                                             VIPRF   2152
            900 FORMAT(1H1,45X,*AVERAGE*,23X,*AVERAGE*,8X,*SPEED*,9X,*AVERAGE*,       VIPRF   2153
               16X,*AV.KINEMATIC*/31X,*AVERAGE*,7X,*PRESSURE*,7X,*AVERAGE*,           VIPRF   2154
               29X,*DENSITY*,10X,*OF*,9X,*KINEMATIC*,7X,*VISCOSITY*/                  VIPRF   2155
               315X,*ALTITUDE*,7X,*PRESSURE*,6X,*NORMALIZED*,6X,*DENSITY*,            VIPRF   2156
               48X,*NORMALIZED*,6X,*SOUND*,8X,*VISCOSITY*,7X,*NORMALIZED*)            VIPRF   2157
                DO 910 I=1,61                                                         VIPRF   2158
                PNORM=AVP(I)/AVP(1) $DNORM=AVDENS(I)/AVDENS(1)                        VIPRF   2159
                VNORM=VISCOS(I)/VISCOS(1)                                             VIPRF   2160
            910 PRINT 920,ALTTUD(I),AVP(I),PNORM,AVDENS(I),DNORM,SOUND(I),            VIPRF   2161
               1VISCOS(I),VNORM                                                       VIPRF   2162
            920 FORMAT(F22.0,F15.1,F15.4,F15.7,F15.4,F15.1,F15.7,F15.4)               VIPRF   2163
                STOP                                                                  VIPRF   2164
                END                                                                   VIPRF   2165
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PROGRAM VIPRF      74/74   OPT=1                    FTN 4.5+414        08/16/77  13.11.28

      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
 6152  VIPRF

VARIABLES      SN  TYPE            RELOCATION
20627  AHFHI      REAL                          20626  AHFLO      REAL
20644  AHFMAX     REAL                          21067  AHI        REAL
21024  AK         REAL                          20632  ALFHI      REAL
20631  ALFLO      REAL                          20731  ALNAHI     REAL
20730  ALNALO     REAL                          20725  ALNBHI     REAL
20724  ALNBLO     REAL                          20732  ALNMAX     REAL
20727  ALNXHI     REAL                          20726  ALNXLO     REAL
21066  ALO        REAL                          22500  ALPHA      REAL       ARRAY
22464  ALT        REAL        ARRAY             24214  ALTTUD     REAL       ARRAY
20642  AL2FHI     REAL                          20641  AL2FLO     REAL
22472  AMAKNO     REAL        ARRAY             20634  AMFHI      REAL
20633  AMFLO      REAL                          20643  AMFMAX     REAL
20630  AFFHI      REAL                          24406  AVDENS     REAL       ARRAY
24311  AVP        REAL        ARRAY             20611  BBLFHI     REAL
20610  BBLFLO     REAL                          23636  BFZPF      REAL       ARRAY
20623  BHFHI      REAL                          20622  BHFLO      REAL
21065  BHI        REAL                          21046  BLFHI      REAL
21045  BLFLO      REAL                          21064  BLO        REAL
20636  BL2FHI     REAL                          20635  BL2FLO     REAL
20617  BMFHI      REAL                          20616  BMFLO      REAL
20777  BPF        REAL                          20713  BUFAHI     REAL
20712  BUFALO     REAL                          20707  BUFBHI     REAL
20714  BUFDEL     REAL                          20711  BUFFZH     REAL
20710  BUFFZL     REAL                              4  BUFMAX     REAL                  KARDS
20706  BUFXHI     REAL                          20705  BUFXLO     REAL
20765  C          REAL                              7  CATGRY     REAL                  PPLOTT
21030  CONST      REAL                          21037  CORLFM     REAL
21051  CORL2F     REAL                          13734  C1A        REAL
20652  C1AAHI     REAL                          20651  C1AALO     REAL
23610  C1AAWE     REAL        ARRAY             20650  C1ABHI     REAL
20647  C1ABLO     REAL                          20653  C1AFN      REAL
21057  C1AFZH     REAL                          21056  C1AFZL     REAL
20654  C1AMAX     REAL                          23623  C1AMWE     REAL       ARRAY
21055  C1AMXO     REAL                          20646  C1AXHI     REAL
20645  C1AXLO     REAL                          13742  C1B        REAL
13735  C2A        REAL                          20662  C2AAHI     REAL
20661  C2AALO     REAL                          20660  C2ABHI     REAL
20657  C2ABLO     REAL                          20663  C2AFN      REAL
20664  C2AMAX     REAL                          20656  C2AXHI     REAL
20655  C2AXLO     REAL                          13736  C2B        REAL
20672  C2BAHI     REAL                          20671  C2BALO     REAL
20670  C2BBHI     REAL                          20667  C2BBLO     REAL
20673  C2BFN      REAL                          20674  C2BMAX     REAL
20666  C2BXHI     REAL                          20665  C2BXLO     REAL
13737  C3A        REAL                          20742  C3AALO     REAL
24721  C3AAP      REAL        ARRAY             25053  C3AB       REAL       ARRAY
20740  C3ABHI     REAL                          20743  C3AFN      REAL
20741  C3AXLO     REAL                          24733  C3AXP      REAL       ARRAY
24707  C3AYMX     REAL        ARRAY             13740  C3B        REAL
25041  C3BA       REAL        ARRAY             25027  C3BAP      REAL       ARRAY
24745  C3BB       REAL        ARRAY             24771  C3BBP      REAL       ARRAY
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        PROGRAM VIPRF       74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

VARIABLES      SN  TYPE              RELOCATION
20744  C3BEN      REAL                                24757  C3BX       REAL       ARRAY
25003  C3BXP      REAL       ARRAY                    25015  C3BYMX     REAL       ARRAY
24675  C3WE       REAL       ARRAY                    13743  C4A        REAL
13744  C4P        REAL                                13741  C5         REAL
20702  C5AHI      REAL                                20701  C5ALO      REAL
20676  C5BHI      REAL                                20675  C5BLO      REAL
20703  C5EN       REAL                                20704  C5MAX      REAL
20700  C5XHI      REAL                                20677  C5XLO      REAL
13745  C6         REAL                                21013  D          REAL
24160  DF         REAL       ARRAY                    21562  DBEL       REAL       ARRAY
24123  DBMERS     REAL       ARRAY                    21076  DBMIN      REAL
   12  DBMOD1     REAL       ARRAY     KARDS            160  DBMOD2     REAL       ARRAY     KARDS
23746  DBRS       REAL       ARRAY                    22010  DBSPL      REAL       ARRAY
23432  DB1A10     REAL       ARRAY                    23310  DB1A7D     REAL       ARRAY
22704  DB1F15     REAL       ARRAY                    23026  DB1F16     REAL       ARRAY
22562  DB1F4      REAL       ARRAY                    23166  DB1111     REAL       ARRAY
23503  DB2A10     REAL       ARRAY                    23361  DB2A7D     REAL       ARRAY
22755  DB2F15     REAL       ARRAY                    23115  DB2F16     REAL       ARRAY
22633  DB2F4      REAL       ARRAY                    23237  DB2111     REAL       ARRAY
22504  DBPVAL     REAL       ARRAY                    21334  DECBEL     REAL       ARRAY
13727  DELDDB     REAL                                21022  DELRS      REAL
20775  DELTAB     REAL                                20774  DELTAZ     REAL
21031  DELWE      REAL                                21032  DELWS      REAL
20750  DF         REAL                                21105  DNCRM      REAL
13723  DWE1K      REAL                                13721  DWE100     REAL
13725  DWCEK      REAL                                13716  DXC1A      REAL
13714  DXMERS     REAL                                   11  DXMOD1     REAL                KARDS
  157  DXMOD2     REAL                  KARDS         14002  DX1A10     REAL
13776  DX1A7D     REAL                                13762  DX1F15     REAL
13766  DX1F16     REAL                                13756  DX1F4      REAL
13772  DX1111     REAL                                14004  DX2A10     REAL
14000  DX2A7D     REAL                                13764  DX2F15     REAL
13770  DX2F16     REAL                                13760  DX2F4      REAL
13774  DX2111     REAL                                21100  DYVAL      REAL
21060  EC         REAL                                20752  ECCAT1     REAL
20753  ECCAT2     REAL                                    7  ECMOVE     REAL                KARDS
21017  ECS        REAL                                24174  ELX        REAL       ARRAY
21075  ELXPE      REAL                                21101  ELX1       REAL
21054  EL2FHI     REAL                                21053  EL2FLO     REAL
21072  EMAX       REAL                                20602  EMAXGE     REAL
20600  EMAXHE     REAL                                20576  EMAXPE     REAL
20615  EMFHI      REAL                                20614  EMFLO      REAL
20601  EMINGE     REAL                                20577  EMINHE     REAL
20575  EMINPE     REAL                                    0  EN         REAL                KARDS
23673  ESPIHE     REAL       ARRAY                    21106  ERFO       REAL       ARRAY
21020  ERO        REAL                                22236  ESPL       REAL       ARRAY
24200  EZ         REAL       ARRAY                    21023  EZHFHI     REAL
21025  EZHFLO     REAL                                21071  EZHI       REAL
21044  EZLFHI     REAL                                21043  EZLFLO     REAL
21070  EZLO       REAL                                21035  EZMFHI     REAL
21034  EZMFLO     REAL                                20776  EZPE       REAL
    2  F2N        REAL                  KARDS             0  H          REAL                PPLOTT
24204  HILO       REAL       ARRAY                       45  HITE       REAL                PPLOTT
   46  HITE1      REAL                  PPLOTT        20603  HMAX       REAL
20745  I          INTEGER                             13732  IALUM      INTEGER
13753  IA10       INTEGER                             13752  IA7D       INTEGER
   57  IBLANK     INTEGER               PPLOTT          375  IBUFET     INTEGER             KARDS
```

```
          PROGRAM VIPRE        74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

VARIABLES       SN  TYPE              RELOCATION
20761  ICK          INTEGER                          20755  IERRCR     INTEGER
21077  IFIRST       INTEGER                              6  IFLITE     INTEGER                PPLOTT
20763  IFN          INTEGER                            341  IFNISH     INTEGER                KARDS
13751  IF111        INTEGER                          13747  IF15       INTEGER
13750  IF16         INTEGER                          13746  IF4        INTEGER
22555  IHOLD        INTEGER     ARRAY                20757  II         INTEGER
  337  ILAND        INTEGER                 KARDS       10  ILINE1     INTEGER     ARRAY      PPLOTT
  324  ILINE2       INTEGER     ARRAY       KARDS    13733  IMAG       INTEGER
   56  INOPLT       INTEGER                 PPLOTT       55  IPHASE     INTEGER                PPLOTT
   26  IPLANE       INTEGER     ARRAY       PPLOTT   20607  IPLOT      INTEGER
  334  ISANDL       INTEGER                 KARDS    13730  ISTEEL     INTEGER
  336  ITAKOF       INTEGER                 KARDS    13731  ITITAN     INTEGER
   17  ITITL1       INTEGER     ARRAY       PPLOTT      340  ITURB      INTEGER                KARDS
20762  IX           INTEGER                          20760  J          INTEGER
20746  JFLITE       INTEGER                          21041  K          INTEGER
21042  L            INTEGER                             31  LXNAME     INTEGER     ARRAY      PPLOTT
   35  LYNAME       INTEGER     ARRAY       PPLOTT   20756  M          INTEGER
20754  MATERL       INTEGER                          13712  NEFZPF     INTEGER
13715  NC1A         INTEGER                          20737  NC3        INTEGER
13726  NFDB         INTEGER                          13713  NMFRS      INTEGER
   10  NMODE1       INTEGER                 KARDS      156  NMODE2     INTEGER                KARDS
21073  NFTS         INTEGER                          20574  NRSVAL     INTEGER
13722  NWE1K        INTEGER                          13720  NWE100     INTEGER
13724  NWE5K        INTEGER                          14001  N1A10      INTEGER
13775  N1A7D        INTEGER                          13771  N1F111     INTEGER
13761  N1F15        INTEGER                          13765  N1F16      INTEGER
13755  N1F4         INTEGER                          14003  N2A10      INTEGER
13777  N2A7D        INTEGER                          13773  N2F111     INTEGER
13763  N2F15        INTEGER                          13767  N2F16      INTEGER
13757  N2F4         INTEGER                          21061  PEAK       REAL
21000  PEM          REAL                             21001  PEMDB      REAL
13754  PI           REAL                             21104  PNORM      REAL
20772  PSO          REAL                             20766  R          REAL
20773  PEX          REAL                             20767  RNORM      REAL
    3  RS           REAL                    PPLOTT   20604  RSMAX      REAL
24021  RSVALS       REAL        ARRAY                21010  SAHI       REAL
21007  SALO         REAL                             21006  SPHI       REAL
21021  SFLO         REAL                             21014  SBTFD      REAL
21011  SFELTA       REAL                             21015  SFZHI      REAL
21012  SFZLO        REAL                             24210  SIGN       REAL        ARRAY
24503  SOUND        REAL        ARRAY                21016  SPEAK      REAL
21005  SXHI         REAL                             21004  SXLO       REAL
20751  T            REAL                             20722  TAKAHI     REAL
20721  TAKALO       REAL                             20716  TAKPHI     REAL
20715  TAKPLO       REAL                             20723  TAKMAX     REAL
20720  TAKXHI       REAL                             20717  TAKXLO     REAL
20734  TFAHI        REAL                             20733  TBPHI      REAL
20735  TFFC         REAL                             20736  TBREF      REAL
   47  TICLEN       REAL                    PPLOTT   24170  TWOB       REAL        ARRAY
21074  TWOBPF       REAL                             20771  U          REAL
20764  V            REAL                             23572  VALK       REAL        ARRAY
24600  VISCOS       REAL        ARRAY                20770  VNORM      REAL
    4  WE           REAL                    PPLOTT   23554  WEK        REAL        ARRAY
20605  WEMAX        REAL                             24074  WE100      REAL        ARRAY
24103  WE1000       REAL        ARRAY                24112  WE5000     REAL        ARRAY
    5  WS           REAL                    PPLOTT       2  X          REAL                   PPLOTT
   44  XAXIS        REAL                    PPLOTT       5  XBT        REAL                   KARDS
```

```
          PROGRAM VIBRE       74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

VARIABLES       SN  TYPE              RELOCATION
   41  XCYCLE      REAL                  PPLOTT        20747  XL          REAL
24164  XFERMX      REAL        ARRAY                   21033  XHFCOR      REAL
21027  XHFHI       REAL                                21026  XHFLO       REAL
21003  XHFMAX      REAL                                21063  XHI         REAL
13717  XINC1A      REAL                                21040  XLFCOR      REAL
21050  XLFHI       REAL                                21047  XLFLO       REAL
    1  XLFMAX      REAL                  KARDS         21062  XLO         REAL
21052  XL2FCR      REAL                                20640  XL2FHI      REAL
20637  XL2FLO      REAL                                    3  XL2FMX      REAL                KARDS
    1  XMAKNG      REAL                  PPLOTT        21036  XMFCOR      REAL
20621  XMFHI       REAL                                20620  XMFLO       REAL
21002  XMFMAX      REAL                                20606  XPF         REAL
    6  XTL         REAL                  KARDS         21103  XVAL        REAL
   54  XX          REAL                  PPLOTT        20625  XXHFHI      REAL
20624  XXHFLO      REAL                                20613  XXLFHI      REAL
20612  XXLFLO      REAL                                   50  X1          REAL                PPLOTT
   51  X2          REAL                  PPLOTT           52  X3          REAL                PPLOTT
   53  X4          REAL                  PPLOTT           43  YAXIS       REAL                PPLOTT
   42  YSTEP       REAL                  PPLOTT        21102  YVAL        REAL

FILE NAMES          MODE
    0  INPUT       FMT            2041  OUTPUT     FMT            4102  FLFILE                    0  TAPE5      FMT

EXTERNALS           TYPE    ARGS
       ALOG10       REAL       1 LIBRARY                    ATAN2       REAL       2 LIBRARY
       BASALE                  1                            BETA                   9
       COMPRS                  0                            CURVE                  4
       DCNEPL                  0                            ENDPL                  1
       ECF          REAL       1                            GPCINTS               17
       HEIGHT                  1                            LOCFEXA               13
       MARKER                  1                            MIXALF                 1
       ONEFUN                 21                            QUAD                   6
       READCDS                17                            RESET                  1
       RLMESS                  4                            RLREAL                 4
       TEEPLIN                 8                            TWOFUN                 8
       XFERFUN                13                            YAXANG                 1
       YINTAX                  0

INLINE FUNCTIONS    TYPE    ARGS
       ABS          REAL       1  INTRIN                    AMOD        REAL       2  INTRIN

STATEMENT LABELS
 6337  1                                  14703  2       FMT                          7141  3
 6445  4                                  14753  5       FMT                         14665  6       FMT
 7120  7                                  14767  8       FMT                          6501  9
 6513  10                                  6577  11                                   7177  12
 7212  13                                  6525  14                                  14014  15      FMT
14273  16       FMT                           0  17                                   6552  18
 6564  19                                  6414  20                                   7017  21
 7222  22                                  6576  23                                  14360  24      FMT
14030  25       FMT                       6417  26                                   6464  27
 7100  28                                 14163  29      FMT                          7031  30
 6344  31                                  7045  32                                  14054  33      FMT
 7227  34                                  7057  35                                  14072  36      FMT
14110  37       FMT                      14124  38      FMT                         14147  39      FMT
 6422  40                                  6455  41                                      0  42
 6425  43                                  7241  44                                   7264  45
```

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        PROGRAM VIPRF       74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

STATEMENT LABELS
 6430  46                                  6435  47                                  6433  48
 6637  50                                 14416  52       FMT                        6664  54
 6710  56                                  6734  58                                  6676  60
 6746  62                                  6722  64                                  6760  66
 6772  68                                  7004  70                                  6612  74
 6624  76                                  7132  78                                  7320  90
 7340  92                                  7346  94                                  7354  96
 7357  100                                15060  205      FMT                       15104  210      FMT
15156  220      FMT                       15164  225      FMT                       15246  230      FMT
15255  235      FMT                        7463  239                                 15333  240      FMT
15353  245      FMT                       15735  246      FMT                        7510  247
 7524  250                                15433  251      FMT                        7563  252
 7676  253                                15523  254      FMT                       15607  255      FMT
 7622  256                                 7723  257                                 15670  260      FMT
 7731  280                                    0  310                                  7760  315
 7766  320                                10015  321                                 10022  322
10005  323                                10027  325                                 10043  330
10050  335                                10055  340                                 10063  350
10101  351                                15454  352      FMT                       15737  353      FMT
16054  354      FMT                       15770  355      FMT                       10136  356
10150  370                                10116  375                                 16101  380      FMT
16154  382      FMT                       15751  383      FMT                       16231  385      FMT
10205  387                                10321  389                                 16344  390      FMT
10267  393                                10233  395                                 10357  398
10367  405                                10373  410                                 10432  415
16734  420      FMT                       16771  425      FMT                       10747  427
10460  431                                10514  433                                 10642  435
10757  436                                11027  437                                 17006  438      FMT
16577  439      FMT                       11036  440                                 17017  441      FMT
10556  442                                10574  443                                 10605  444
10667  446                                10704  447                                 10615  448
10722  449                                11506  450                                 17162  451      FMT
11512  452                                    0  453                                 17234  455      FMT
11606  456                                11522  457                                 17111  458      FMT
11365  459                                    0  460                                 17220  461      FMT
11421  463                                    0  465                                 11467  466
11451  467                                11460  472                                 11647  473
11671  475                                11677  480                                 11716  505
12044  507                                11726  508                                 17252  509      FMT
17271  511      FMT                       17304  512      FMT                       17341  513      FMT
12135  514                                12200  518                                 12213  520
17411  521      FMT                       11265  580                                 11320  590
11074  600                                17030  605      FMT                       11162  610
11200  620                                11206  625                                 11235  630
11251  640                                    0  770                                 12222  774
12265  775                                    0  780                                 12276  785
12300  787                                12311  788                                 12313  789
17611  790      FMT                       12342  793                                 12344  795
12361  800                                12372  805                                 12427  810
12507  820                                12513  840                                 12517  860
12544  890                                17700  900      FMT                            0  910
17751  920      FMT                       12526  1000

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
 6360          * I          775  775       108                EXT REFS
 6460  42        I          825  826        38      INSTACK
 7060  1000    * I          944  2139    34510                EXT REFS  NOT INNER
```

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          PROGRAM VIPRE       74/74    OPT=1                                  FTN 4.5+414        08/16/77  13.11.28

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
 7144  17        II          980  982       4B      INSTACK
 7752  710     * J          1250 1233      6B      INSTACK     EXITS
11376  460     * II         1772 1776     23B                 EXT REFS     EXITS
11423  465     * II         1779 1792     23B                 EXT REFS
11527  453       K          1839 1841      3B      INSTACK
12245  770       II         2012 2013      3B      INSTACK
12272  780       II         2022 2023      2B      INSTACK
12550  910     * I          2157 2160     23B                 EXT REFS

COMMON BLOCKS    LENGTH
       PELOTT        4B
       KARDS       226

STATISTICS
  PROGRAM LENGTH                 17017B    7695
  BUFFER LENGTH                   6144B    3172
  CM LABELED COMMON LENGTH         422B     274
```

```
      SUBROUTINE READCDS(ZFN,ZLFMAX,ZF2N,ZL2FMX,ZBUFMX,ZXBT,ZXTL,        VIPRF   2166
     1ZFCMOV,NCMOD1,DXM1,DBM1,NOMOD2,DXM2,DBM2,ITYPCK,ICRAFT,IERROR)     VIPRF   2167
                                                                         VIPRF   2168
      COMMON/KARDS/FN,XLFMAX,F2N,XL2FMX,BUFMAX,XBT,XTL,FCMOVE,           VIPRF   2169
     1NMODE1,DXMOD1,DBMOD1(100),NMODE2,DXMOD2,DBMOD2(100),               VIPRF   2170
     2ILINE2(8),ISANFL,IRUFET,ITAKOF,ILAND,ITURB,IFNISH                  VIPRF   2171
                                                                         VIPRF   2172
      DIMENSION DBM1(1),DBM2(1),IDATA(8)                                 VIPRF   2173
                                                                         VIPRF   2174
      DATA IBLANK/1H /                                                   VIPRF   2175
                                                                         VIPRF   2176
      IERROR=0                                                           VIPRF   2177
                                                                         VIPRF   2178
C    ************************                                            VIPRF   2179
C    *                      *                                            VIPRF   2180
C     READ INPUT DATA CARD 4                                             VIPRF   2181
C    *                      *                                            VIPRF   2182
C    ************************                                            VIPRF   2183
      READ(5,20) ILINE2                                                  VIPRF   2184
   20 FORMAT(8A10)                                                       VIPRF   2185
                                                                         VIPRF   2186
                                                                         VIPRF   2187
C     CHECK WHETHER "END-OF-JOB" CARD WAS READ                           VIPRF   2188
                                                                         VIPRF   2189
      IF(EOF(5).EQ.0) GO TO 110                                          VIPRF   2190
                                                                         VIPRF   2191
      PRINT 40                                                           VIPRF   2192
   40 FORMAT(1H-,28X,*THE END-OF-JOB CARD WAS ENCOUNTERED INSTEAD OF THE VIPRF   2193
     1 EXPECTED*)                                                        VIPRF   2194
      PRINT 43                                                           VIPRF   2195
   43 FORMAT(28X,*PROFILE PARAMETERS-SPECIAL VALUES CARD.*)              VIPRF   2196
                                                                         VIPRF   2197
      IF(ITYPCK.EQ.1) GO TO 50                                           VIPRF   2198
                                                                         VIPRF   2199
      PRINT 45                                                           VIPRF   2200
   45 FORMAT(28X,*PROGRAM EXECUTION STOPS BECAUSE*)                      VIPRF   2201
      PRINT 47                                                           VIPRF   2202
   47 FORMAT(28X,*INPUT DATA VALUES ARE NOT STORED IN THE PROGRAM FOR TH VIPRF   2203
     1E SPECIFIED TYPE OF AIRCRAFT*/29X,*VALUES ARE STORED ONLY FOR THE  VIPRF   2204
     2TYPES F-4,F-15,F-16,F-111,A-10 AND A-7D AIRCRAFT.*)                VIPRF   2205
      CALL CONREL                                                        VIPRF   2206
      STOP                                                               VIPRF   2207
                                                                         VIPRF   2208
   50 IERROR=4 $PRINT 60                                                 VIPRF   2209
   60 FORMAT(                                                            VIPRF   2210
     11H-,28X,    *PROGRAM EXECUTION PROCEEDS ASSUMING THAT A BLANK "PROF VIPRF   2211
     1ILE PARAMETERS-SPECIAL VALUES" CARD*/29X,*THEN A "FINISH" CARD SHO VIPRF   2212
     2ULD HAVE FOLLOWED THE "AIRCRAFT PARAMETERS" CARD.*)                VIPRF   2213
                                                                         VIPRF   2214
   65 FN=ZFN $XLFMAX=ZLFMAX $F2N=ZF2N $XL2FMX=ZL2FMX $BUFMAX=ZBUFMX      VIPRF   2215
      XBT=ZXBT $XTL=ZXTL $FCMOVE=ZFCMOV                                  VIPRF   2216
      PRINT 67,FN,XLFMAX,F2N,XL2FMX,BUFMAX,XBT,XTL,FCMOVE                VIPRF   2217
   67 FORMAT(1H-,28X,*PROFILE PARAMETERS-SPECIAL VALUES,INPUT DATA VALUE VIPRF   2218
     1S STORED IN PROGRAM*/29X,8F10.1)                                   VIPRF   2219
                                                                         VIPRF   2220
   70 NMODE1=NCMOD1 $DXMOD1=DXM1                                         VIPRF   2221
      DO 80 I=1,NMODE1                                                   VIPRF   2222
```

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SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      80 DBMOD1(I)=DBM1(I)
         J=6HFIRST  $PRINT 85,J,NMODE1,DXMOD1,(DBMOD1(I),I=1,NMODE1)
      85 FORMAT(1H0,28X,A6,* BENDING MODE VALUES,INPUT DATA VALUES STORED I
        1N PROGRAM*/29X,I2,13F6.2/(29X,13F6.2))

      90 IF(F2N.NE.0.) GO TO 100

         PRINT 92
      92 FORMAT(1H-,28X,*SECOND BENDING MODE VALUES WILL NOT BE USED IN PRO
        1GRAM CALCULATIONS*/29X,*BECAUSE F  =0.*/38X,*2N*)
         RETURN

     100 NMODE2=NOMOD2 $DXMOD2=DXM2
         DO 105 I=1,NMODE2
     105 DBMOD2(I)=DBM2(I)

         J=6HSECOND $PRINT 85,J,NMODE2,DXMOD2,(DBMOD2(I),I=1,NMODE2)

         RETURN

C        CHECK WHETHER "FINISH" CARD WAS READ

     110 IF(ILINE2(1).NE.IFNISH) GO TO 160

         PRINT 120
     120 FORMAT(1H-,28X,*THE "FINISH" CARD WAS ENCOUNTERED INSTEAD OF THE E
        1XPECTED*)
         PRINT 43

         IF(ITYPCK.EQ.1) GO TO 140

         IERROR=1 $PRINT 130
     130 FORMAT(29X,*THE PROGRAM PROCEEDS TO THE NEXT SET,IF ANY,OF INPUT D
        1ATA CARDS BECAUSE*)
         PRINT 47 $RETURN

     140 PRINT 60 $GO TO 65

C        CHECK WHETHER "DESCRIPTION" CARD WAS READ

     160 I=ILINE2(4) $IF(I.NE.ISANDL.AND.I.NE.IBUFET.AND.I.NE.ITAKOF.AND.
        1I.NE.ILAND.AND.I.NE.ITURB) GO TO 203

         PRINT 180
     180 FORMAT(1H-,28X,*THE CARD SHOWN BELOW APPARENTLY IS A "DESCRIPTION"
        1 CARD*/29X,*WHICH WAS ENCOUNTERED INSTEAD OF THE EXPECTED*)
         PRINT 43
         PRINT 185,ILINE2
     185 FORMAT(1H0,28X,8A10)

         IF(ITYPCK.EQ.1) GO TO 210

         IERROR=2
         PRINT 190
```

```
SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      190 FORMAT(1H-,28X,*IT IS ASSUMED THAT THIS APPARENT "DESCRIPTION" CAR VIPRF    2280
         1D*/29X,*BELONGS TO THE NEXT SET,IF ANY,OF INPUT DATA CARDS.*/      VIPRF    2281
         229X,*AND THE PROGRAM PROCEEDS TO THIS SET.*)                       VIPRF    2282
          RETURN                                                             VIPRF    2283
                                                                             VIPRF    2284
      210 IERROR=3 $PRINT 60 $PRINT 200                                      VIPRF    2285
      200 FORMAT(29X,*IT ALSO IS ASSUMED THAT THIS APPARENT "DESCRIPTION" CA VIPRF    2286
         1RD*/29X,*BELONGS TO THE NEXT SET,IF ANY, OF INPUT DATA CARDS.*)    VIPRF    2287
          GO TO 65                                                           VIPRF    2288
                                                                             VIPRF    2289
                                                                             VIPRF    2290
C         CHECK VALUE IN CARD COLUMNS 75-80                                  VIPRF    2291
                                                                             VIPRF    2292
      203 ENCODE(10,205,I) ILINE2(8)                                         VIPRF    2293
      205 FORMAT(R6)                                                         VIPRF    2294
          DECODE(10,207,I) YFCMOV                                            VIPRF    2295
      207 FORMAT(F6.2)                                                       VIPRF    2296
          IF(YFCMOV.GE.0.) GO TO 220                                         VIPRF    2297
                                                                             VIPRF    2298
                                                                             VIPRF    2299
C         CARD IS ASSUMED TO BE CARD 1 OF THE SET OF 1ST BENDING MODE VAL. C VIPRF    2300
                                                                             VIPRF    2301
          PRINT 217                                                          VIPRF    2302
      217 FORMAT(1H-,28X,*THE CARD SHOWN BELOW APPARENTLY IS CARD 1 OF THE S VIPRF    2303
         1ET OF*/29X,*1ST BENDING MODE VALUE CARDS INSTEAD OF THE EXPECTED*) VIPRF    2304
          PRINT 43 $PRINT 185,ILINE2                                         VIPRF    2305
                                                                             VIPRF    2306
          IF(ITYPCK.EQ.1) GO TO 213                                          VIPRF    2307
                                                                             VIPRF    2308
          PRINT 45 $PRINT 47                                                 VIPRF    2309
          CALL CONEPL $STOP                                                  VIPRF    2310
                                                                             VIPRF    2311
      213 PRINT 215                                                          VIPRF    2312
      215 FORMAT(1H-,28X,*PROGRAM EXECUTION PROCEEDS ASSUMING THAT A BLANK " VIPRF    2313
         1PROFILE PARAMETERS-SPECIAL VALUES" CARD*/29X,*SHOULD HAVE PRECEDE VIPRF    2314
         2D THIS CARD.*)                                                     VIPRF    2315
                                                                             VIPRF    2316
          FN=ZFN $XLFMAX=ZLFMAX $F2N=ZF2N $XL2FMX=ZL2FMX $BUFMAX=ZBUFMX      VIPRF    2317
          XBT=ZXBT $XTL=ZXTL $FCMOVE=ZFCMOV                                  VIPRF    2318
                                                                             VIPRF    2319
          PRINT 260,FN,XLFMAX,F2N,XL2FMX,BUFMAX,XBT,XTL,FCMOVE               VIPRF    2320
                                                                             VIPRF    2321
          NCARDS=1 $NMODE=5HFIPST $IMODCK=1                                  VIPRF    2322
          GO TO 570                                                          VIPRF    2323
                                                                             VIPRF    2324
                                                                             VIPRF    2325
C         CARD IS ASSUMED TO BE THE "PROFILE PARAMETERS-SPECIAL VALUES" CARD VIPRF    2326
                                                                             VIPRF    2327
      220 IF(ITYPCK.EQ.1) GO TO 230                                          VIPRF    2328
                                                                             VIPRF    2329
          DECODE(80,225,ILINE2) FN,XLFMAX,F2N,XL2FMX,BUFMAX,XBT,XTL,FCMOVE   VIPRF    2330
      225 FORMAT(8F11.3)                                                     VIPRF    2331
          PRINT 227,ILINE2                                                   VIPRF    2332
      227 FORMAT(1H-,28X,*PROFILE PARAMETERS-SPECIAL VALUES CARD*/29X,8A10)  VIPRF    2333
          GO TO 290                                                          VIPRF    2334
                                                                             VIPRF    2335
      230 FN=ZFN $XLFMAX=ZLFMAX $F2N=ZF2N $XL2FMX=ZL2FMX $BUFMAX=ZBUFMX      VIPRF    2336
```

```
      XRT=ZXRT $XTL=ZXTL $FCMOVE=ZFCMOV                                 VIPRF   2337
                                                                        VIPRF   2338
      J=1H                                                              VIPRF   2339
                                                                        VIPRF   2340
      DO 240 I=1,8                                                      VIPRF   2341
      IF(ILINE2(I).NE.J) GO TO 270                                      VIPRF   2342
  240 CONTINUE                                                          VIPRF   2343
                                                                        VIPRF   2344
                                                                        VIPRF   2345
      PRINT 260,FN,XLFMAX,F2N,XL2FMX,BUFMAX,XRT,XTL,FCMOVE              VIPRF   2346
  260 FORMAT(1H0,28X,*PROFILE PARAMETERS-SPECIAL VALUES CARD,INPUT DATA VIPRF   2347
     1VALUES STORED IN PROGRAM(A BLANK CARD WAS READ)*/                 VIPRF   2348
     229X,8F10.1)                                                       VIPRF   2349
      GO TO 298                                                         VIPRF   2350
                                                                        VIPRF   2351
                                                                        VIPRF   2352
  27  DECODE(80,225,ILINE2) YFN,YLFMAX,YF2N,YL2FMX,YBUFMX,YXRT,YXTL,    VIPRF   2353
     1YFCMOV                                                            VIPRF   2354
                                                                        VIPRF   2355
      J=8H        *                                                     VIPRF   2356
      DO 277 I=1,8                                                      VIPRF   2357
  277 IDATA(I)=1H                                                       VIPRF   2358
                                                                        VIPRF   2359
      IF(YFN.EQ.0.) GO TO 280                                           VIPRF   2360
      FN=YFN $IDATA(1)=J                                                VIPRF   2361
  280 IF(YLFMAX.EQ.0.) GO TO 282                                        VIPRF   2362
      XLFMAX=YLFMAX $IDATA(2)=J                                         VIPRF   2363
  282 IF(YF2N.EQ.0.) GO TO 284                                          VIPRF   2364
      F2N=YF2N $IDATA(3)=J                                              VIPRF   2365
  284 IF(YL2FMX.EQ.0.) GO TO 286                                        VIPRF   2366
      XL2FMX=YL2FMX $IDATA(4)=J                                         VIPRF   2367
  286 IF(YBUFMX.EQ.0.) GO TO 288                                        VIPRF   2368
      BUFMAX=YBUFMX $IDATA(5)=J                                         VIPRF   2369
  288 IF(YXRT.EQ.0.) GO TO 290                                          VIPRF   2370
      XRT=YXRT $IDATA(6)=J                                              VIPRF   2371
  290 IF(YXTL.EQ.0.) GO TO 292                                          VIPRF   2372
      XTL=YXTL $IDATA(7)=J                                              VIPRF   2373
  292 IF(YFCMOV.EQ.0.) GO TO 294                                        VIPRF   2374
      FCMOVE=YFCMOV $IDATA(8)=J                                         VIPRF   2375
                                                                        VIPRF   2376
  294 PRINT 296,FN,XLFMAX,F2N,XL2FMX,BUFMAX,XRT,XTL,FCMOVE,IDATA        VIPRF   2377
  296 FORMAT(1H-,28X,*PROFILE PARAMETERS-SPECIAL VALUES CARD,INPUT DATA VIPRF   2378
     1VALUES READ FROM CARD OR STORED IN PROGRAM*/ 29X,8F10.1/29X,8A10/ VIPRF   2379
     229X,32H* INDICATES VALUE READ FROM CARD )                         VIPRF   2380
                                                                        VIPRF   2381
                                                                        VIPRF   2382
  298 NCARDS=1 $NMODE=FHFIRST $IMODCK=1                                 VIPRF   2383
                                                                        VIPRF   2384
                                                                        VIPRF   2385
C     ************************                                          VIPRF   2386
C     *                      *                                          VIPRF   2387
C      READ FIRST CARD IN SET                                           VIPRF   2388
C      OF PENDING MODE VALUE CARDS                                      VIPRF   2389
C     *                      *                                          VIPRF   2390
C     ************************                                          VIPRF   2391
                                                                        VIPRF   2392
  300 READ(5,20) ILINE2                                                 VIPRF   2393
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SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                                                                                    VIPRF   2394
                                                                                    VIPRF   2395
      C     CHECK WHETHER "END-OF-JOB" CARD WAS READ                                VIPRF   2396
                                                                                    VIPRF   2397
            IF(EOF(5).EQ.0) GO TO 430                                               VIPRF   2398
                                                                                    VIPRF   2399
            IERROR=4 $PRINT 40                                                      VIPRF   2400
            IF(IMODCK.EQ.2) GO TO 350                                               VIPRF   2401
                                                                                    VIPRF   2402
            PRINT 310,NCARDS,NMODE                                                  VIPRF   2403
        310 FORMAT(29X,*CARD *,I1,* OF THE SET OF "*,A6,* BENDING MODE VALUE"C      VIPRF   2404
           1ARDS *,2A10)                                                            VIPRF   2405
                                                                                    VIPRF   2406
            IF(ITYPCK.EQ.1) GO TO 320                                               VIPRF   2407
                                                                                    VIPRF   2408
            PRINT 45 $PRINT 47                                                      VIPRF   2409
            CALL DONEPL $STOP                                                       VIPRF   2410
                                                                                    VIPRF   2411
        320 I=10HOR THE FIN $J=8HISH CARD $PRINT 330,I,J                            VIPRF   2412
        330 FORMAT(29X,8A10)                                                        VIPRF   2413
            PRINT 340 $PRINT 43                                                     VIPRF   2414
        340 FORMAT(1H0,28X,*PROGRAM EXECUTION PROCEEDS ASSUMING THAT THE "FINI      VIPRF   2415
           1SH" CARD FOLLOWED THE*/29X,8A10)                                        VIPRF   2416
            GO TO 70                                                                VIPRF   2417
                                                                                    VIPRF   2418
                                                                                    VIPRF   2419
        350 IF(F2N.NE.0.) GO TO 380                                                 VIPRF   2420
                                                                                    VIPRF   2421
            I=10HFINISH CAR $J=1HD $PRINT 330,I,J                                   VIPRF   2422
            PRINT 360                                                               VIPRF   2423
        360 FORMAT(29X,*PROGRAM EXECUTION PROCEEDS ASSUMING THAT THE "FINISH"       VIPRF   2424
           1CARD SHOULD HAVE FOLLOWED*)                                             VIPRF   2425
            PRINT 370                                                               VIPRF   2426
        370 FORMAT(29X,*THE PRECEEDING SET OF BENDING MODE VALUE CARDS.*)           VIPRF   2427
            PRINT 92                                                                VIPRF   2428
            RETURN                                                                  VIPRF   2429
                                                                                    VIPRF   2430
        380 IF(ITYPCK.EQ.1) GO TO 390                                               VIPRF   2431
                                                                                    VIPRF   2432
            PRINT 45 $PRINT 47                                                      VIPRF   2433
            CALL DONEPL $STOP                                                       VIPRF   2434
                                                                                    VIPRF   2435
        390 I=10HOR THE FIN $J=8HISH CARD $PRINT 310,NCARDS,NMODE,I,J               VIPRF   2436
            PRINT 360 $PRINT 370                                                    VIPRF   2437
            GO TO 90                                                                VIPRF   2438
                                                                                    VIPRF   2439
                                                                                    VIPRF   2440
            CHECK WHETHER "FINISH" CARD WAS READ                                    VIPRF   2441
                                                                                    VIPRF   2442
        430 IF(ILINE2(1).NE.IFNISH) GO TO 450                                       VIPRF   2443
                                                                                    VIPRF   2444
            IF(IMODCK.EQ.2) GO TO 440                                               VIPRF   2445
                                                                                    VIPRF   2446
            IF(ITYPCK.EQ.1) GO TO 70                                                VIPRF   2447
                                                                                    VIPRF   2448
            IERROR=1                                                                VIPRF   2449
            PRINT 120 $PRINT 310,NCARDS,NMODE                                       VIPRF   2450
```

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SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      PRINT 47 $PRINT 435                                                          VIPRF     2451
  430 FORMAT(29X,*THE PROGRAM PROCEEDS TO THE NEXT SET,IF ANY,OF DATA CA VIPRF     2452
     1RDS.*)                                                                       VIPRF     2453
      RETURN                                                                       VIPRF     2454
200                                                                                VIPRF     2455
                                                                                   VIPRF     2456
  440 IF(ITYPCK.EQ.1) GO TO 90                                                     VIPRF     2457
                                                                                   VIPRF     2458
      IF(E2N.EQ.0.) RETURN                                                         VIPRF     2459
205                                                                                VIPRF     2460
      IERROR=1                                                                     VIPRF     2461
      PRINT 120 $PRINT 310,NCARDS,NMODE                                            VIPRF     2462
      PRINT 47 $PRINT 435                                                          VIPRF     2463
      RETURN                                                                       VIPRF     2464
300                                                                                VIPRF     2465
                                                                                   VIPRF     2466
      CHECK WHETHER "DESCRIPTION" CARD WAS READ                                    VIPRF     2467
                                                                                   VIPRF     2468
  450 I=ILINE2(4) $IF(I.NE.ISANDL.AND.I.NE.IPUFET.AND.I.NE.ITAKOF.AND.             VIPRF     2469
305  1I.NE.ILAND.AND.I.NE.ITURB) GO TO 540                                         VIPRF     2470
                                                                                   VIPRF     2471
      PRINT 190                                                                    VIPRF     2472
                                                                                   VIPRF     2473
      IF(IMODCK.EQ.2) GO TO 470                                                    VIPRF     2474
310                                                                                VIPRF     2475
      IF(ITYPCK.EQ.1) GO TO 460                                                    VIPRF     2476
                                                                                   VIPRF     2477
      IERROR=2 $PRINT 310,NCARDS,NMODE                                             VIPRF     2478
      PRINT 185,ILINE2 $PRINT 47 $PRINT 190                                        VIPRF     2479
315   RETURN                                                                       VIPRF     2480
                                                                                   VIPRF     2481
  460 IERROR=3                                                                     VIPRF     2482
      I=10HOR THE FIN $J=8HISH CARD $PRINT 310,NCARDS,NMODE,I,J                    VIPRF     2483
      PRINT 185,ILINE2 $PRINT 340 $PRINT 43 $PRINT 200                             VIPRF     2484
320   GO TO 70                                                                     VIPRF     2485
                                                                                   VIPRF     2486
                                                                                   VIPRF     2487
  470 IERROR=3 $IF(ITYPCK.EQ.1) GO TO 500                                          VIPRF     2488
                                                                                   VIPRF     2489
325   IF(E2N.NE.0.) GO TO 490                                                      VIPRF     2490
                                                                                   VIPRF     2491
      I=10HFINISH CAR $J=1HD $PRINT 330,I,J                                        VIPRF     2492
      PRINT 360 $PRINT 370                                                         VIPRF     2493
      PRINT 92 $PRINT 200                                                          VIPRF     2494
330   RETURN                                                                       VIPRF     2495
                                                                                   VIPRF     2496
  490 IERROR=2                                                                     VIPRF     2497
      PRINT 310,NCARDS,NMODE                                                       VIPRF     2498
      PRINT 185,ILINE2 $PRINT 47 $PRINT 495                                        VIPRF     2499
335 495 FORMAT(29X,*PROGRAM EXECUTION PROCEEDS ASSUMING THAT THIS APPARENT VIPRF     2500
     1 "DESCRIPTION" CARD*/29X,*BELONGS TO THE NEXT SET,IF ANY,OF INPUT  VIPRF     2501
     2 DATA CARDS.*)                                                               VIPRF     2502
      RETURN                                                                       VIPRF     2503
                                                                                   VIPRF     2504
340 500 I=10HOR THE FIN $J=8HISH CARD $PRINT 310,NCARDS,NMODE,I,J                  VIPRF     2505
      PRINT 185,ILINE2 $PRINT 360 $PRINT 370 $PRINT 200                            VIPRF     2506
      GO TO 90                                                                     VIPRF     2507
```

```
                                                                        VIPRF   2508
                                                                        VIPRF   2509
      542 DO 543 I=1,8                                                  VIPRF   2510
          IF(ILINE2(I).NE.IPLANK) GO TO 570                             VIPRF   2511
      543 CONTINUE                                                      VIPRF   2512
                                                                        VIPRF   2513
                                                                        VIPRF   2514
C         A BLANK CARD WAS READ                                         VIPRF   2515
                                                                        VIPRF   2516
          IF(ITYPCK.EQ.1) GO TO 553                                     VIPRF   2517
                                                                        VIPRF   2518
          IF(IMCDCK.EQ.2) GO TO 547                                     VIPRF   2519
                                                                        VIPRF   2520
          PRINT 545                                                     VIPRF   2521
      545 FORMAT(1H-,28X,*A BLANK CARD WAS READ INSTEAD OF THE EXPECTED*) VIPRF   2522
          PRINT 310,NCARDS,NMODE $PRINT 45 $PRINT 47                    VIPRF   2523
          CALL CONSEL $STOP                                             VIPRF   2524
                                                                        VIPRF   2525
      547 IF(F2N.NE.0.) GO TO 550                                       VIPRF   2526
                                                                        VIPRF   2527
          PRINT 92                                                      VIPRF   2528
          RETURN                                                        VIPRF   2529
                                                                        VIPRF   2530
      550 PRINT 545                                                     VIPRF   2531
          I=10HOF THE FIN $J=8HISH CARD $PRINT 310,NCARDS,NMODE,I,J     VIPRF   2532
          PRINT 45 $PRINT 47                                            VIPRF   2533
          CALL CONSEL $STOP                                             VIPRF   2534
                                                                        VIPRF   2535
                                                                        VIPRF   2536
      553 IF(IMCDCK.EQ.2) GO TO 557                                     VIPRF   2537
                                                                        VIPRF   2538
          NMODE1=NCMOD1 $DXMOD1=DXM1                                    VIPRF   2539
          DO 555 I=1,NMODE1                                             VIPRF   2540
      555 DBMOD1(I)=DBM1(I)                                             VIPRF   2541
                                                                        VIPRF   2542
          J=6HFIRST $PRINT 85,J,NMODE1,DXMOD1,(DBMOD1(I),I=1,NMODE1)    VIPRF   2543
          GO TO 510                                                     VIPRF   2544
                                                                        VIPRF   2545
      557 IF(F2N.NE.0.) GO TO 563                                       VIPRF   2546
                                                                        VIPRF   2547
          PRINT 92                                                      VIPRF   2548
          RETURN                                                        VIPRF   2549
                                                                        VIPRF   2550
      563 NMODE2=NCMOD2 $DXMOD2=DXM2                                    VIPRF   2551
          DO 565 I=1,NMODE2                                             VIPRF   2552
      565 DBMOD2(I)=DBM2(I)                                             VIPRF   2553
                                                                        VIPRF   2554
          J=6HSECOND $PRINT 85,J,NMODE2,DXMOD2,(DBMOD2(I),I=1,NMODE2)   VIPRF   2555
          GO TO 820                                                     VIPRF   2556
                                                                        VIPRF   2557
                                                                        VIPRF   2558
C         CARD IS ASSUMED TO BE CARD 1 OF THE SET OF 1ST BENDING MODE VALUE VIPRF   2559
                                                                        VIPRF   2560
      570 IF(IMCDCK.EQ.2) GO TO 575                                     VIPRF   2561
                                                                        VIPRF   2562
          DECODE(80,580,ILINE2) NMODE1,DXMOD1,(DBMOD1(I),I=1,12)        VIPRF   2563
          NVALS=NMODE1 $GO TO 542                                       VIPRF   2564
```

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SUBROUTINE READODS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                                                                                      VIPRF    2565
          575 DECODE(80,580,ILINE2) NMODE2,DXMOD2,(DBMOD2(I),I=1,12)                  VIPRF    2566
          580 FORMAT(I2,13F6.2)                                                       VIPRF    2567
              NVALS=NMODE2                                                            VIPRF    2568
                                                                                      VIPRF    2569
          590 PRINT 600,NMODE,ILINE2                                                  VIPRF    2570
          600 FORMAT(1H0,28X,A6,* BENDING MODE VALUE CARDS*/29X,8A10)                 VIPRF    2571
              IF(NVALS.LE.12) GO TO 800                                               VIPRF    2572
                                                                                      VIPRF    2573
              J=13 $K=25 $L=0 $IF(K.LT.NVALS) GO TO 620                               VIPRF    2574
              K=NVALS $L=1                                                            VIPRF    2575
                                                                                      VIPRF    2576
                                                                                      VIPRF    2577
        C    ************************                                                 VIPRF    2578
        C    *                      *                                                 VIPRF    2579
        C     READ 2ND AND SUCCEEDING                                                 VIPRF    2580
        C     BENDING MODE VALUE CARDS                                                VIPRF    2581
        C    *                      *                                                 VIPRF    2582
        C    ************************                                                 VIPRF    2583
                                                                                      VIPRF    2584
          620 NCARDS=NCARDS+1                                                         VIPRF    2585
              READ(5,20) ILINE2                                                       VIPRF    2586
                                                                                      VIPRF    2587
                                                                                      VIPRF    2588
        C      CHECK WHETHER "END-OF-JOB" CARD WAS READ                               VIPRF    2589
                                                                                      VIPRF    2590
              IF(EOF(5).EQ.0) GO TO 650                                               VIPRF    2591
                                                                                      VIPRF    2592
              PRINT 40 $PRINT 310,NCARDS,NMODE                                        VIPRF    2593
              PRINT 45 $PRINT 630,NVALS,NMODE                                         VIPRF    2594
          630 FORMAT(29X,*ALL OF THE *,I3,* *,A6,* BENDING MODE VALUES COULD NOT      VIPRF    2595
             1 BE READ FROM INPUT DATA CARDS.*)                                       VIPRF    2596
              CALL DONEPL $STOP                                                       VIPRF    2597
                                                                                      VIPRF    2598
                                                                                      VIPRF    2599
        C      CHECK WHETHER "FINISH" CARD WAS READ                                   VIPRF    2600
                                                                                      VIPRF    2601
          650 IF(ILINE2(1).NE.IFNISH) GO TO 670                                       VIPRF    2602
                                                                                      VIPRF    2603
              IERROR=1                                                                VIPRF    2604
              PRINT 120 $PRINT 310,NCARDS,NMODE                                       VIPRF    2605
              PRINT 130 $PRINT 630,NVALS,NMODE                                        VIPRF    2606
              RETURN                                                                  VIPRF    2607
                                                                                      VIPRF    2608
                                                                                      VIPRF    2609
        C      CHECK WHETHER "DESCRIPTION" CARD WAS READ                              VIPRF    2610
                                                                                      VIPRF    2611
          670 I=ILINE2(4) $IF(I.NE.ISANDL.AND.I.NE.IBUFET.AND.I.NE.ITAKOF.AND.        VIPRF    2612
             1I.NE.ILAND.AND.I.NE.ITURB) GO TO 690                                    VIPRF    2613
                                                                                      VIPRF    2614
              IERROR=2                                                                VIPRF    2615
              PRINT 180 $PRINT 310,NCARDS,NMODE                                       VIPRF    2616
              PRINT 185,ILINE2 $PRINT 190                                             VIPRF    2617
              RETURN                                                                  VIPRF    2618
                                                                                      VIPRF    2619
          690 DO 700 I=1,8                                                            VIPRF    2620
              IF(ILINE2(I).NE.IBLANK) GO TO 740                                       VIPRF    2621
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SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      700 CONTINUE                                                                VIPRF    2622
                                                                                  VIPRF    2623
                                                                                  VIPRF    2624
C         A BLANK CARD WAS READ                                                   VIPRF    2625
                                                                                  VIPRF    2626
          PRINT 710                                                               VIPRF    2627
      710 FORMAT(1H-,28X,*A BLANK CARD WAS ENCOUNTERED INSTEAD OF THE EXPECT VIPRF    2628
         1ED*)                                                                    VIPRF    2629
          PRINT 310,NCARDS,NMODE                                                  VIPRF    2630
          PRINT 45 $PRINT 630,NVALS,NMODE                                         VIPRF    2631
          CALL DCNEPL $STOP                                                       VIPRF    2632
                                                                                  VIPRF    2633
                                                                                  VIPRF    2634
C         CARD IS ASSUMED TO BE A MODE VALUE CARD                                 VIPRF    2635
                                                                                  VIPRF    2636
      740 IF(IMODCK.EQ.1) DECODE(80,760,ILINE2) (DBMOD1(I),I=J,K)                 VIPRF    2637
          IF(IMODCK.EQ.2) DECODE(80,760,ILINE2) (DBMOD2(I),I=J,K)                 VIPRF    2638
      760 FORMAT(13F6.2)                                                          VIPRF    2639
                                                                                  VIPRF    2640
          PRINT 780,ILINE2                                                        VIPRF    2641
      780 FORMAT(29X,8A10)                                                        VIPRF    2642
                                                                                  VIPRF    2643
          IF(L.EQ.1) GO TO 800                                                    VIPRF    2644
                                                                                  VIPRF    2645
          J=J+13 $K=K+13 $IF(K.LT.NVALS) GO TO 620                                VIPRF    2646
          K=NVALS $L=1                                                            VIPRF    2647
          GO TO 620                                                               VIPRF    2648
                                                                                  VIPRF    2649
                                                                                  VIPRF    2650
      800 IF(IMODCK.EQ.2) GO TO 820                                               VIPRF    2651
      810 IMODCK=2 $NCARDS=1 $NMODE=6HSECOND                                      VIPRF    2652
          GO TO 300                                                               VIPRF    2653
                                                                                  VIPRF    2654
                                                                                  VIPRF    2655
C     ************************                                                    VIPRF    2656
C     *                      *                                                    VIPRF    2657
C      READ LAST CARD                                                             VIPRF    2658
C      IN SET OF DATA CARDS                                                       VIPRF    2659
C     *                      *                                                    VIPRF    2660
C     ************************                                                    VIPRF    2661
                                                                                  VIPRF    2662
      820 READ(5,20) ILINE2                                                       VIPRF    2663
                                                                                  VIPRF    2664
                                                                                  VIPRF    2665
C         CHECK WHETHER "END-OF-JOB" CARD WAS READ                                VIPRF    2666
                                                                                  VIPRF    2667
          IF(ECF(5).EQ.0) GO TO 860                                               VIPRF    2668
                                                                                  VIPRF    2669
          IERROR=4                                                                VIPRF    2670
          PRINT 40 $I=10HFINISH CAR $J=1HD $PRINT 330,I,J $PRINT 840              VIPRF    2671
      840 FORMAT(29X,*PROGRAM EXECUTION STOPS AFTER THE CURRENT SET OF INPUT VIPRF    2672
         1 DATA CARDS.*)                                                          VIPRF    2673
          RETURN                                                                  VIPRF    2674
                                                                                  VIPRF    2675
                                                                                  VIPRF    2676
C         CHECK WHETHER "FINISH" CARD WAS READ                                    VIPRF    2677
                                                                                  VIPRF    2678
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      SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                  860 IF(ILINE2(1).NE.IFNISH) GO TO 870                                      VIPRF    2679
  515                                                                                        VIPRF    2680
                      PRINT 185,ILINE2                                                       VIPRF    2681
                      RETURN                                                                 VIPRF    2682
                                                                                             VIPRF    2683
                                                                                             VIPRF    2684
  520           C     CHECK WHETHER "DESCRIPTION" CARD WAS READ                              VIPRF    2685
                                                                                             VIPRF    2686
                  870 I=ILINE2(4) $IF(I.NE.ISANDL.AND.I.NE.IBUFET.AND.I.NE.ITAKOF.AND.       VIPRF    2687
                     1I.NE.ILAND.AND.I.NE.ITURB) GO TO 880                                   VIPRF    2688
                                                                                             VIPRF    2689
  525                 IERROR=3                                                               VIPRF    2690
                      PRINT 180 $I=10HFINISH CAR $J=1HD $PRINT 330,I,J                       VIPRF    2691
                      PRINT 185,ILINE2 $PRINT 495                                            VIPRF    2692
                      RETURN                                                                 VIPRF    2693
                                                                                             VIPRF    2694
  530                                                                                        VIPRF    2695
                C     A CARD WITH UNKNOWN CONTENTS WAS READ                                  VIPRF    2696
                                                                                             VIPRF    2697
                  880 IERROR=4                                                               VIPRF    2698
                      PRINT 900,ILINE2                                                       VIPRF    2699
  535             900 FORMAT(1H-,28X,*INSTEAD OF THE EXPECTED "FINISH" CARD,THE CARD SHO     VIPRF    2700
                     1WN BELOW WAS EXCOUNTERED AFTER THE */29X,*LAST CARD IN THE SET OF      VIPRF    2701
                     2"SECOND BENDING MODE VALUE" CARDS.*/29X,*PROGRAM EXECUTION STOPS A     VIPRF    2702
                     3FTER OUTPUT AND PLOTS ARE PRODUCED FOR THE CURRENT SET OF INPUT DA     VIPRF    2703
                     4TA CARDS.*//29X,8A10)                                                  VIPRF    2704
  540                 RETURN                                                                 VIPRF    2705
                      END                                                                    VIPRF    2706


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  READCDS

VARIABLES      SN  TYPE              RELOCATION
    4  BLEMAX     REAL                  KARDS          12  DPMOD1     REAL        ARRAY     KARDS
  160  DPMOD2     REAL        ARRAY     KARDS           0  DPM1       REAL        ARRAY      F.P.
    0  DPM2       REAL        ARRAY      F.P.          11  DXMOD1     REAL                  KARDS
  157  DXMOD2     REAL                  KARDS           0  DXM1       REAL                   F.P.
    0  DXM2       REAL                   F.P.           7  FCMOVE     REAL                  KARDS
    0  FN         REAL                  KARDS           2  F2N        REAL                  KARDS
 3045  I          INTEGER                            1200  IBLANK     INTEGER
  335  IBUFET     INTEGER               KARDS           0  ICRAFT     INTEGER    *UNUSED     F.P.
 3065  IDATA      INTEGER     ARRAY                     0  IERROR     INTEGER                F.P.
  341  IFNISH     INTEGER               KARDS         337  ILAND      INTEGER               KARDS
  324  ILINE2     INTEGER     ARRAY     KARDS        3052  IMODOK     INTEGER
  334  ISANDL     INTEGER               KARDS         336  ITAKOF     INTEGER               KARDS
  340  ITURB      INTEGER               KARDS           0  ITYPOK     INTEGER                F.P.
 3046  J          INTEGER                            3063  K          INTEGER
 3064  L          INTEGER                            3050  NCARDS     INTEGER
 3051  NMODE      INTEGER                              10  NMODE1     INTEGER               KARDS
  156  NMOD02     INTEGER               KARDS           0  NOMOD1     INTEGER                F.P.
    0  NOMOD2     INTEGER                F.P.        3062  NVALS      INTEGER
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      SUBROUTINE READCDS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

VARIABLES       SN  TYPE              RELOCATION
    5  XBT          REAL                 KARDS            1  XLFMAX     REAL                 KARDS
    3  XL2FMX       REAL                 KARDS            6  XTL        REAL                 KARDS
 3057  YEUFMX       REAL                                3047  YFCMOV     REAL
 3053  YFN          REAL                                3055  YF2N       REAL
 3054  YLFMAX       REAL                                3056  YL2FMX     REAL
 3060  YXBT         REAL                                3061  YXTL       REAL
    0  ZFUFMX       REAL                 F.P.            0  ZFCMOV     REAL                 F.P.
    0  ZFN          REAL                 F.P.            0  ZF2N       REAL                 F.P.
    0  ZLFMAX       REAL                 F.P.            0  ZL2FMX     REAL                 F.P.
    0  ZXBT         REAL                 F.P.            0  ZXTL       REAL                 F.P.

FILE NAMES          MODE
      OUTPUT        FMT                  TAPE5      FMT

EXTERNALS           TYPE    ARGS
      DCNEPL                  0                          EOF        REAL        1

STATEMENT LABELS
 1206  20       FMT                 1213  40       FMT                 1227  43       FMT
 1240  45       FMT                 1250  47       FMT                   26  50
 1276  60       FMT                   31  65                           1335  67       FMT
   50  70                              0  80                           1357  85       FMT
   70  90                           1375  92       FMT                   74  100
    0  105                           115  110                          1424  120      FMT
 1442  130      FMT                  133  140                           136  160
 1464  180      FMT                 1510  185      FMT                 1516  190      FMT
 1546  200      FMT                  172  203                          1571  205      FMT
 1600  207      FMT                  164  210                           215  213
 1643  215      FMT                 1605  217      FMT                  242  220
 1712  225      FMT                 1720  227      FMT                  251  230
    0  240                          1742  260      FMT                  277  270
    0  277                           314  280                           317  282
  322  284                           325  286                           330  288
  333  290                           336  292                           341  294
 2007  296      FMT                  343  298                           346  300
 2046  310      FMT                  372  320                          2072  330      FMT
 2102  340      FMT                  403  350                          2125  360      FMT
 2142  370      FMT                  417  380                           427  390
  440  430                          2215  435      FMT                  460  440
  475  450                           527  460                           546  470
  570  490                          2351  495      FMT                  602  500
  617  540                             0  543                          2420  545      FMT
  642  547                           646  550                           662  553
    0  555                           705  557                           711  563
    0  565                           732  570                           740  575
 2524  580      FMT                  744  590                          2534  600      FMT
  756  620                          2567  630      FMT                  775  650
 1011  670                          1036  690                             0  700
 2644  710      FMT                 1055  740                          2703  760      FMT
 2711  780      FMT                 1111  800                          1113  810
 1117  820                          2733  840      FMT                 1136  860
 1143  870                          1172  880                          2773  900      FMT

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   57  80        I           57 58        2B        INSTACK
  103  105       I           72 73        2B        INSTACK
  270  240     * I          176 178       5B        INSTACK     EXITS
```

```
      SUBROUTINE READCDS     74/74    OPT=1                                  FTN 4.5+414          08/16/77  13.11.28

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
  305  277       I          192 193        3B       INSTACK
  620  543     * I          345 347        5B       INSTACK     EXITS
  673  555       I          375 376        2B       INSTACK
  720  565       I          387 388        2B       INSTACK
 1037  700     * I          455 457        5B       INSTACK     EXITS

COMMON BLOCKS    LENGTH
       KARDS        226

STATISTICS
  PROGRAM LENGTH                  3075B     1597
  CM LABELED COMMON LENGTH         342B      226
```

```
SUBROUTINE ONEFUN      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      SUBROUTINE ONEFUN(FREQ,DB,N,PEAK,BLO,BHI,XLO,XHI,FZROLO,FZROHI,     VIPRF    2707
     1ALO,AHI,FMIN,FMAX,DBMIN,ISETZ,IFIRST,LPEAK,IFUN,ISCRPT,ILOHI)       VIPRF    2708
      DIMENSION FREQ(1),DB(1)                                             VIPRF    2709
                                                                          VIPRF    2710
      COMMON/PFLOTT/H,XMAKNO,X,RS,WE,WS,IFLITE,CATGRY,ILINE1(7),          VIPRF    2711
     1ITITL1(7),IPLANE(3),LXNAME(4),LYNAME(4),XCYCLE,YSTEP,YAXIS,         VIPRF    2712
     2XAXIS,HITE,HITE1,TICLEN,X1,X2,X3,X4,XX,IPHASE,INOPLT,IBLANK         VIPRF    2713
                                                                          VIPRF    2714
      DATA IHI/2HHI/,IX/5H (E)*/                                          VIPRF    2715
                                                                          VIPRF    2716
                                                                          VIPRF    2717
      IF(INOPLT.EQ.IBLANK) GO TO 15                                       VIPRF    2718
                                                                          VIPRF    2719
      IF(ILOHI.EQ.IHI) GO TO 5                                            VIPRF    2720
                                                                          VIPRF    2721
      PRINT 1,IPLANE,IFLITE,IFUN,ISCRPT,BLO,BHI,XLO,XHI,FZROLO,FZROHI,    VIPRF    2722
     1ALO,AHI,PEAK                                                        VIPRF    2723
    1 FORMAT(1H1,8H********,3A10,1H,,A10,8H********///* PARAMETERS OF *   VIPRF    2724
     1A5/17X,A2//8X,*B =*,G11.3/8X,*B'=*,G11.3/                           VIPRF    2725
     28X,*X =*,G11.3/8X,*X'=*,G11.3/8X,*F =*,G11.5/9X,*C*/                VIPRF    2726
     38X,*F'=*,G11.5/9X,*C*/4X,*ALPHA =*,G11.3/4X,*ALPHA'=*,G11.3/        VIPRF    2727
     42X,*MAX.VAL.=*,G11.4)                                               VIPRF    2728
      GO TO 15                                                            VIPRF    2729
                                                                          VIPRF    2730
    5 PRINT 10,IPLANE,IFLITE,IFUN,ISCRPT,BHI,XHI,FZROHI,AHI,PEAK          VIPRF    2731
   10 FORMAT(1H1,8H********,3A10,1H,,A10,8H********///* PARAMETERS OF *   VIPRF    2732
     1A5/17X,A2//8X,*B'=*,G11.3/8X,*X'=*,F7.3/                            VIPRF    2733
     28X,*F'=*,G11.5/9X,*C*/4X,*ALPHA'=*,G11.4/2X,*MAX.VAL.=*,G11.4)      VIPRF    2734
                                                                          VIPRF    2735
                                                                          VIPRF    2736
   15 CALL XFSRFUN(FREQ,DB,N,PEAK,XLO,XHI,BLO,BHI,FZROLO,FZROHI,ALO,AHI,  VIPRF    2737
     1ILOHI)                                                              VIPRF    2738
                                                                          VIPRF    2739
                                                                          VIPRF    2740
      IF(ISETZ.EQ.0) GO TO 40                                             VIPRF    2741
      DO 20 I=1,N                                                         VIPRF    2742
      IF(DB(I).GE.0.) GO TO 40                                            VIPRF    2743
   20 DB(I)=0.                                                            VIPRF    2744
                                                                          VIPRF    2745
                                                                          VIPRF    2746
   40 IF(INOPLT.EQ.IBLANK) RETURN                                         VIPRF    2747
      XAXIS=ALOG10(FMAX/FMIN)*XCYCLE                                      VIPRF    2748
      CALL TITLE(1H ,1,LXNAME,+100,LYNAME,+100,XAXIS,YAXIS)               VIPRF    2749
                                                                          VIPRF    2750
      CALL HEIGHT(HITE)                                                   VIPRF    2751
      CALL HEADIN(ILINE1,+100,2,3)                                        VIPRF    2752
      CALL HEADIN(ITITL1,+100,2,3)                                        VIPRF    2753
      CALL RESET("BASALF")                                                VIPRF    2754
      CALL HEADIN(IPLANE,+30,2,3)                                         VIPRF    2755
      CALL BASALF("L/CSTO")                                               VIPRF    2756
      CALL XTICKS(5)                                                      VIPRF    2757
                                                                          VIPRF    2758
      XX=PEAK $CALL DBELMAX(XX,YSTEP,DBMAX) $DBMIN=DBMAX-40.0             VIPRF    2759
      CALL XLOG(FMIN,XCYCLE,DBMIN,YSTEP)                                  VIPRF    2760
      CALL TICKMK(TICLEN,FMAX,YSTEP,YAXIS,DBMIN)                          VIPRF    2761
                                                                          VIPRF    2762
      IFIRST=0                                                            VIPRF    2763
```

```
SUBROUTINE ONEFUN      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                  DO 60 I=1,N                                                          VIPRF    2764
                  IFIRST=IFIRST+1 $IF(DB(IFIRST).GE.DBMIN) GO TO 80                    VIPRF    2765
   60          60 CONTINUE                                                             VIPRF    2766
                                                                                       VIPRF    2767
               80 K=0                                                                  VIPRF    2768
                  DO 100 I=IFIRST,N                                                    VIPRF    2769
                  IF(DB(I).LT.DBMIN) GO TO 120                                         VIPRF    2770
   65         100 K=K+1                                                                VIPRF    2771
                                                                                       VIPRF    2772
              120 CALL TABLE(FREQ(IFIRST),DB(IFIRST),K,IFUN,ISCRPT)                    VIPRF    2773
                  CALL CURVE(FREQ(IFIRST),DB(IFIRST),K,0)                              VIPRF    2774
                                                                                       VIPRF    2775
   70             CALL HEIGHT(HITE1)                                                   VIPRF    2776
                  X1=1.10*FMIN $X2=PEAK+0.5                                            VIPRF    2777
                  CALL RLMESS(LPEAK,+100,X1,X2)                                        VIPRF    2778
                  CALL RLPEAL(PEAK,+1,"ABUT","ABUT")                                   VIPRF    2779
                  CALL RLMESS(" D(B)$",+100,"ABUT","ABUT")                             VIPRF    2780
   75             CALL HEIGHT(0.5*HITE1)                                               VIPRF    2781
                  CALL RLMESS("  (M)$",+100,X1,X2-0.5)                                 VIPRF    2782
                                                                                       VIPRF    2783
                                                                                       VIPRF    2784
                  DYVAL=1.5*HITE*YSTEP $CALL HEIGHT(HITE1)                             VIPRF    2785
   80                                                                                  VIPRF    2786
                  X1=3.14159265-ATAN2(2.0*BHI*(XHI**AHI),1.0-XHI*XHI)                  VIPRF    2787
                  YVAL=PEAK+20.0*ALOG10(3.14159265/(2.0*X1))                           VIPRF    2788
                  CALL CURVE(FZROHI,YVAL,1,1)                                          VIPRF    2789
                                                                                       VIPRF    2790
   85             IF(ILCHI.EQ.IHI.OR.FZROLO.LT.FMIN) GO TO 140                         VIPRF    2791
                                                                                       VIPRF    2792
                  X1=ATAN2(2.0*BLO*(XLO**ALO),1.-XLO*XLO)                              VIPRF    2793
                  YVAL=PEAK+20.0*ALOG10(3.14159265/(2.0*X1))                           VIPRF    2794
                  CALL CURVE(FZROLO,YVAL,1,1)                                          VIPRF    2795
   90                                                                                  VIPRF    2796
              14  CALL LOCFBXA(BLO,BHI,XLO,XHI,FZROLO,FZROHI,ALO,AHI,FMIN,FMAX,        VIPRF    2797
                 1YVAL,DYVAL,ILCHI)                                                    VIPRF    2798
                                                                                       VIPRF    2799
                  XX=ALOG10(FMAX)-1.10/XCYCLE $XX=10.0**XX                             VIPRF    2800
   95             X1=DBMAX-0.25*YSTEP                                                  VIPRF    2801
                  CALL PARAMS(XX,X1,DYVAL,XMAKNO,H,X,IX,RS,IFLITE,HITE,HITE1)          VIPRF    2802
                                                                                       VIPRF    2803
                  RETURN                                                               VIPRF    2804
                  END                                                                  VIPRF    2805


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  ONEFUN

VARIABLES      SN  TYPE            RELOCATION
    0  AHI         REAL                F.P.          0  ALO        REAL                F.P.
    0  BHI         REAL                F.P.          0  BLO        REAL                F.P.
    7  CATGRY      REAL               PPLOTT         0  DB         REAL       ARRAY    F.P.
  675  DBMAX       REAL                              0  DBMIN      REAL                F.P.
```

```
      SUBROUTINE ONEFUN      74/74    OPT=1                                  FTN 4.5+414          08/16/77  13.11.28

VARIABLES       SN  TYPE              RELOCATION
  677  DYVAL        REAL                                  0  FMAX      REAL                  F.P.
    0  FMIN         REAL                   F.P.           0  FREQ      REAL        ARRAY     F.P.
    0  FZROHI       REAL                   F.P.           0  FZROLO    REAL                  F.P.
    0  H            REAL                  PPLOTT         45  HITE      REAL                 PPLOTT
   46  HITE1        REAL                  PPLOTT        674  I         INTEGER
   57  IBLANK       INTEGER               PPLOTT          0  IFIRST    INTEGER               F.P.
    6  IFLITE       INTEGER               PPLOTT          0  IFUN      INTEGER               F.P.
  545  IHI          INTEGER                              10  ILINE1    INTEGER     ARRAY    PPLOTT
    0  ILOHI        INTEGER                F.P.          56  INCPLT    INTEGER              PPLOTT
   55  IPHASE       INTEGER               PPLOTT         26  IPLANE    INTEGER     ARRAY    PPLOTT
    0  ISCRPT       INTEGER                F.P.           0  ISETZ     INTEGER               F.P.
   17  ITITL1       INTEGER     ARRAY     PPLOTT        546  IX        INTEGER
  676  K            INTEGER                                0  LPEAK     INTEGER               F.P.
   31  LXNAME       INTEGER     ARRAY     PPLOTT         35  LYNAME    INTEGER     ARRAY    PPLOTT
    0  N            INTEGER                F.P.           0  PEAK      REAL                  F.P.
    3  RS           REAL                  PPLOTT         47  TICLEN    REAL                 PPLOTT
    4  WE           REAL                  PPLOTT          5  WS        REAL                 PPLOTT
    2  X            REAL                  PPLOTT         44  XAXIS     REAL                 PPLOTT
   41  XCYCLE       REAL                  PPLOTT          0  XHI       REAL                  F.P.
    0  XLO          REAL                   F.P.           1  XMAKNO    REAL                 PPLOTT
   54  XX           REAL                  PPLOTT         50  X1        REAL                 PPLOTT
   51  X2           REAL                  PPLOTT         52  X3        REAL                 PPLOTT
   53  X4           REAL                  PPLOTT         43  YAXIS     REAL                 PPLOTT
   42  YSTEP        REAL                  PPLOTT        700  YVAL      REAL

FILE NAMES          MODE
      OUTPUT        FMT

EXTERNALS             TYPE    ARGS
      ALOG10        REAL        1 LIBRARY                  ATAN2     REAL        2 LIBRARY
      BASALE                    1                          CURVE                   4
      DBELMAX                   3                          HEADIN                  4
      HEIGHT                    1                          LOCFBXA                13
      PARAMS                   11                          RESET                   1
      RLMESS                    4                          RLREAL                  4
      TABLE                     5                          TICKMK                  5
      TITLE                     8                          XFERFUN                13
      XLOG                      4                          YTICKS                  1

STATEMENT LABELS
  567  1        FMT                          24  5                                  634  10       FMT
   26  15                                     0  20                                  64  40
    0  60                                   147  80                                   0  100
  161  120                                  302  140

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   56  20      * I           36 38        6B       INSTACK     EXITS
  140  60      * I           58 60        7B       INSTACK     EXITS
  152  100     * I           63 65        7B       INSTACK     EXITS

COMMON BLOCKS    LENGTH
      PPLOTT        48

STATISTICS
  PROGRAM LENGTH                 1003B      515
  CM LABELED COMMON LENGTH         60B       48
```

```
SUBROUTINE TWOFUN      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      SUBROUTINE TWOFUN(FREQ,DB1,DB2,N,FMIN,FMAX,DBMIN,DYVAL)                    VIPRF    2806
      DIMENSION FREQ(1),DB1(1),DB2(1)                                            VIPRF    2807
                                                                                 VIPRF    2808
      COMMON/PPLOTT/H,XMAKNO,X,RS,WE,WS,IFLITE,CATGRY,ILINE1(7),                 VIPRF    2809
     1ITITL1(7),IPLANE(3),LXNAME(4),LYNAME(4),XCYCLE,YSTEP,YAXIS,                VIPRF    2810
     2XAXIS,HITE,HITE1,TICLEN,X1,X2,X3,X4,XX,IPHASE,INOPLT,IBLANK                VIPRF    2811
                                                                                 VIPRF    2812
      DATA IX/5H (E)$/                                                           VIPRF    2813
                                                                                 VIPRF    2814
                                                                                 VIPRF    2815
      DBMAX=-1.0E3                                                               VIPRF    2816
      DO 10 I=1,N                                                                VIPRF    2817
      X1=DB1(I) $X2=DB2(I) $X3=X1+X2 $DB2(I)=X3                                  VIPRF    2818
      IF(X3.GT.DBMAX) DBMAX=X3 $X3=10.0**(X3/10.)                                VIPRF    2819
      IF(IPHASE.EQ.1) PRINT 20,FREQ(I),X1,X2,DB2(I),X3                           VIPRF    2820
   10 CONTINUE                                                                   VIPRF    2821
   20 FORMAT(6G18.5)                                                             VIPRF    2822
                                                                                 VIPRF    2823
      IF(IPHASE.EQ.0) RETURN                                                     VIPRF    2824
                                                                                 VIPRF    2825
      DYVAL=1.5*HITE*YSTEP                                                       VIPRF    2826
      X1=DBMAX $CALL DBELMAX(X1,YSTEP,DBMAX)                                     VIPRF    2827
      DBMIN=DBMAX-40.0 $IF(ABS(X1-DB2(1)).LE.35.0) GO TO 30                      VIPRF    2828
      YSTEP=10.0 $DBMIN=DBMAX-80.0 $DYVAL=2.0*DYVAL                              VIPRF    2829
                                                                                 VIPRF    2830
   30 XAXIS=ALOG10(FMAX/FMIN)*XCYCLE                                             VIPRF    2831
      CALL TITLE(1H ,1,LXNAME,+100,LYNAME,+100,XAXIS,YAXIS)                      VIPRF    2832
                                                                                 VIPRF    2833
      CALL HEIGHT(HITE)                                                          VIPRF    2834
      CALL HEADIN(ILINE1,+100,2,3)                                               VIPRF    2835
      CALL HEADIN(ITITL1,+100,2,3)                                               VIPRF    2836
      CALL RESET("BASALF")                                                       VIPRF    2837
      CALL HEADIN(IPLANE,+30,2,3)                                                VIPRF    2838
      CALL BASALF("L/CSTD")                                                      VIPRF    2839
      CALL YTICKS(5)                                                             VIPRF    2840
      CALL XLOG(FMIN,XCYCLE,DBMIN,YSTEP)                                         VIPRF    2841
      CALL TICKMK(TICLEN,FMAX,YSTEP,YAXIS,DBMIN)                                 VIPRF    2842
                                                                                 VIPRF    2843
      DO 40 I=1,N                                                                VIPRF    2844
      IF(DB2(I).LT.DBMIN) DB2(I)=DBMIN                                           VIPRF    2845
   40 CONTINUE                                                                   VIPRF    2846
                                                                                 VIPRF    2847
      CALL CURVE(FREQ,DB2,N,0)                                                   VIPRF    2848
                                                                                 VIPRF    2849
      X1=ALOG10(FMAX)-1.1/XCYCLE $X1=10.0**X1                                    VIPRF    2850
      X2=DBMAX-0.25*YSTEP                                                        VIPRF    2851
      CALL PARAMS(X1,X2,DYVAL,XMAKNO,H,X,IX,RS,IFLITE,HITE,HITE1)                VIPRF    2852
      RETURN                                                                     VIPRF    2853
      END                                                                        VIPRF    2854


SYMBOLIC REFERENCE MAP (R=1)
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```
      SUBROUTINE TWOFUN      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

ENTRY POINTS
    3  TWOFUN

VARIABLES      SN  TYPE              RELOCATION
    7  CATGRY     REAL                  PPLOTT          321  DBMAX     REAL
    0  DBMIN      REAL                   F.P.             0  DB1       REAL       ARRAY     F.P.
    0  DB2        REAL        ARRAY      F.P.             0  DYVAL     REAL                 F.P.
    0  FMAX       REAL                   F.P.             0  FMIN      REAL                 F.P.
    0  FREQ       REAL        ARRAY      F.P.             0  H         REAL                PPLOTT
   45  HITE       REAL                  PPLOTT           46  HITE1     REAL                PPLOTT
  322  I          INTEGER                                57  IBLANK    INTEGER             PPLOTT
    6  IFLITE     INTEGER               PPLOTT           10  ILINE1    INTEGER    ARRAY    PPLOTT
   56  INOPLT     INTEGER               PPLOTT           55  IPHASE    INTEGER             PPLOTT
   26  IPLANE     INTEGER     ARRAY     PPLOTT           17  ITITL1    INTEGER    ARRAY    PPLOTT
  266  IX         INTEGER                                31  LXNAME    INTEGER    ARRAY    PPLOTT
   35  LYNAME     INTEGER     ARRAY     PPLOTT            0  N         INTEGER              F.P.
    3  RS         REAL                  PPLOTT           47  TICLEN    REAL                PPLOTT
    4  WE         REAL                  PPLOTT            5  WS        REAL                PPLOTT
    2  X          REAL                  PPLOTT           44  XAXIS     REAL                PPLOTT
   41  XCYCLE     REAL                  PPLOTT            1  XMAKNO    REAL                PPLOTT
   54  XX         REAL                  PPLOTT           50  X1        REAL                PPLOTT
   51  X2         REAL                  PPLOTT           52  X3        REAL                PPLOTT
   53  X4         REAL                  PPLOTT           43  YAXIS     REAL                PPLOTT
   42  YSTEP      REAL                  PPLOTT

FILE NAMES        MODE
      OUTPUT      FMT

EXTERNALS          TYPE    ARGS
      ALOG10       REAL      1 LIBRARY                    BASALF              1
      CURVE                  4                            DBFLMAX             3
      HEADIN                 4                            HEIGHT              1
      PARAMS                11                            RESET               1
      TICKMK                 5                            TITLE               8
      XLOG                   4                            YTICKS              1

INLINE FUNCTIONS   TYPE    ARGS
      ABS         REAL      1  INTRIN

STATEMENT LABELS
    0  10                                  277  20      FMT                          67  30
    0  40

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   20  10      * I           12 16        25B                EXT REFS
  135  40        I           39 41        3B      INSTACK

COMMON BLOCKS    LENGTH
      PPLOTT        48

STATISTICS
  PROGRAM LENGTH                  352B      234
  CM LABELED COMMON LENGTH         60B       48
```

```
SUBROUTINE LOGFBXA     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      SUBROUTINE LOGFBXA(BLO,BHI,XLO,XHI,FZRCLO,FZROHI,ALO,AHI,FMIN,
     1FMAX,YVAL,DYVAL,ILOHI)

      COMMON/PELOTT/H,XMAKNO,X,RS,WE,WS,IFLITE,CATGRY,ILINE1(7),
     1ITITL1(7),IPLANE(3),LXNAME(4),LYNAME(4),XCYCLE,YSTEP,YAXIS,
     2XAXIS,HITE,HITE1,TICLEN,X1,X2,X3,X4,XX,IPHASE

      DATA IHI/2HHI/

      WIDTH=1.25
      FZLO=FZRCLO $IF(FZRCLO.LT.FMIN) FZLO=FMIN
      FZHI=FZROHI $IF(FZROHI.GT.FMAX) FZHI=FMAX
      IF(ILOHI.NE.IHI) GO TO 100
      X3=FZHI $X4=FMAX
      DHIMAX=ALOG10(FMAX/FZHI)*XCYCLE $IF(DHIMAX.GE.WIDTH) GO TO 220
      X3=FMIN $X4=FZHI
      GO TO 220

  100 DLOHI=ALOG10(FZHI/FZLO)*XCYCLE $DHIMAX=ALOG10(FMAX/FZHI)*XCYCLE
      XX=ALOG10(FZLO/FMIN)*XCYCLE $IF(XX.LT.WIDTH) GO TO 140
      IF(DHIMAX.LT.WIDTH) GO TO 120
      X1=FMIN $X2=FZLO $X3=FZHI $X4=FMAX
      GO TO 200

  120 X1=FMIN $X4=FZLO $IF(DLOHI.LT.WIDTH) GO TO 180
      X1=FMIN $X2=FZLO $X3=FZLO $X4=FZHI
      GO TO 200

  140 IF(DLOHI.LT.WIDTH) GO TO 160
      X1=FZLO $X4=FZHI
      IF(DHIMAX.LT.WIDTH) GO TO 180
      X1=FZLO $X2=FZHI $X3=FZHI $X4=FZHI
      GO TO 200

  160 IF(DHIMAX.LT.WIDTH) RETURN
      X1=FZHI $X4=FMAX

  180 XX=ALOG10(X4/X1)*XCYCLE $XX=(XX-2.0*WIDTH)/3.0
      X2=ALOG10(X1) $X3=X2+(XX+WIDTH)/XCYCLE $X3=10.0**X3
      X2=X2+(2.0*XX+WIDTH)/XCYCLE $X2=10.0**X2

  200 CALL FBOXBA(FZLO,BLO,XLO,ALO,X1,X2,YVAL,DYVAL,XCYCLE,3,0)
  220 CALL FBOXBA(FZHI,BHI,XHI,AHI,X3,X4,YVAL,DYVAL,XCYCLE,3,1)

      RETURN
      END
```

```
SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3  LOGFBXA
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```
      SUBROUTINE LOCEBXA     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

VARIABLES       SN  TYPE              RELOCATION
    0  AHI          REAL                  F.P.          0  ALO        REAL                  F.P.
    0  BHI          REAL                  F.P.          0  BLO        REAL                  F.P.
    7  CATGRY       REAL                 PPLOTT       222  DHIMAX     REAL
  223  DLOHI        REAL                                0  DYVAL      REAL                  F.P.
    0  FMAX         REAL                  F.P.          0  FMIN       REAL                  F.P.
  221  FZHI         REAL                               220  FZLO       REAL
    0  FZROHI       REAL                  F.P.          0  FZROLO     REAL                  F.P.
    0  H            REAL                 PPLOTT        45  HITE       REAL                 PPLOTT
   46  HITE1        REAL                 PPLOTT         6  IFLITE     INTEGER              PPLOTT
  206  IHI          INTEGER                            10  ILINE1     INTEGER    ARRAY     PPLOTT
    0  ILOHI        INTEGER                F.P.         55  IPHASE     INTEGER              PPLOTT
   26  IPLANE       INTEGER    ARRAY     PPLOTT        17  ITITL1     INTEGER    ARRAY     PPLOTT
   31  LXNAME       INTEGER    ARRAY     PPLOTT        35  LYNAME     INTEGER    ARRAY     PPLOTT
    3  RS           REAL                 PPLOTT        47  TICLEN     REAL                 PPLOTT
    4  WE           REAL                 PPLOTT       217  WIDTH      REAL
    5  WS           REAL                 PPLOTT         2  X          REAL                 PPLOTT
   44  XAXIS        REAL                 PPLOTT        41  XCYCLE     REAL                 PPLOTT
    0  XHI          REAL                  F.P.          0  XLO        REAL                  F.P.
    1  XMAKNO       REAL                 PPLOTT        54  XX         REAL                 PPLOTT
   50  X1           REAL                 PPLOTT        51  X2         REAL                 PPLOTT
   52  X3           REAL                 PPLOTT        53  X4         REAL                 PPLOTT
   43  YAXIS        REAL                 PPLOTT        42  YSTEP      REAL                 PPLOTT
    0  YVAL         REAL                  F.P.

EXTERNALS            TYPE    ARGS
      ALOG10         REAL      1 LIBRARY                    FROXBA                11

STATEMENT LABELS
   34  100                                  61  120                                  71  140
  102  160                                 107  180                                 133  200
  144  220

COMMON BLOCKS    LENGTH
      PPLOTT        46

STATISTICS
  PROGRAM LENGTH                  224B      148
  CM LABELED COMMON LENGTH         56B       46
```

```
SUBROUTINE DBELMAX     74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                 SUBROUTINE DBELMAX(PEAK,YSTEP,DBMAX)                                  VIPRF    2901
                 I=PEAK/YSTEP $J=0 $SIGN=-1.0 $IF(PEAK.LT.0.) GO TO 10                 VIPRF    2902
                 J=1 $SIGN=1.0                                                         VIPRF    2903
              10 DBMAX=YSTEP*(I+J)                                                     VIPRF    2904
                 IF(AMOD(PEAK,YSTEP).GT.SIGN*YSTEP/2.) DBMAX=DBMAX+5.                  VIPRF    2905
                 RETURN                                                                VIPRF    2906
                 END                                                                   VIPRF    2907


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  DBELMAX

VARIABLES      SN  TYPE              RELOCATION
    0  DBMAX       REAL                   F.P.          35  I          INTEGER
   36  J           INTEGER                               0  PEAK       REAL                F.P.
   37  SIGN        REAL                                  0  YSTEP      REAL                F.P.

INLINE FUNCTIONS    TYPE    ARGS
       AMOD        REAL        2  INTRIN

STATEMENT LABELS
   15  10

STATISTICS
  PROGRAM LENGTH                  40B       32
```

```
SUBROUTINE GPOINTS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                SUBROUTINE GPOINTS(FREQ,DECBEL,FRQ,FMAX,CONST,DB,XFERMX,TWOB,FLX,  VIPRF    2908
               1FZ,HILO,SIGN,ALPHA,II,J,K,L)                                       VIPRF    2909
                DIMENSION XFERMX(4),TWOB(4),FZ(4),ALPHA(4),FLX(4)                  VIPRF    2910
                DIMENSION FREQ(1),DECBEL(1),DB(4),DBPRV(4),HILO(4),SIGN(4)         VIPRF    2911
                                                                                   VIPRF    2912
             10 DO 20 I=1,K                                                        VIPRF    2913
                IF(L.EQ.I) GO TO 20                                                VIPRF    2914
                X1=FRQ/FZ(I) $DBPRV(I)=DB(I)                                       VIPRF    2915
                DB(I)=XFERMX(I)+20.*ALOG10((HILO(I)+SIGN(I)*ATAN2(                 VIPRF    2916
               1TWOB(I)*(X1**ALPHA(I)),1.-X1*X1))/FLX(I))                          VIPRF    2917
             20 CONTINUE                                                           VIPRF    2918
                                                                                   VIPRF    2919
                X1=DB(1) $X2=DB(2) $X3=DB(3) $X4=DB(4) $ITYPEP=ITYPE               VIPRF    2920
                IF(X1.LE.X2) GO TO 30                                              VIPRF    2921
                IF(X1.LE.X3) GO TO 40                                              VIPRF    2922
                IF(X1.LE.X4) GO TO 50                                              VIPRF    2923
                ITYPE=1 $GO TO 60                                                  VIPRF    2924
                                                                                   VIPRF    2925
             30 IF(X2.LE.X3) GO TO 40                                              VIPRF    2926
                IF(X2.LE.X4) GO TO 50                                              VIPRF    2927
                ITYPE=2 $GO TO 60                                                  VIPRF    2928
                                                                                   VIPRF    2929
             40 IF(X3.LE.X4) GO TO 50                                              VIPRF    2930
                ITYPE=3 $GO TO 60                                                  VIPRF    2931
                                                                                   VIPRF    2932
             50 ITYPE=4                                                            VIPRF    2933
                                                                                   VIPRF    2934
                                                                                   VIPRF    2935
             60 IF(ITYPE.NE.ITYPEP.AND.II.EQ.0) GO TO 70                           VIPRF    2936
                J=J+1 $FREQ(J)=FRQ $DECBEL(J)=DB(ITYPE) $GO TO 80                  VIPRF    2937
                                                                                   VIPRF    2938
             70 X1=DBPRV(ITYPE)-DBPRV(ITYPEP)                                      VIPRF    2939
                FRQ=FPRV+CONST*FPRV*X1/(X1+DB(ITYPEP)-DB(ITYPE))                   VIPRF    2940
                J=J+1 $FREQ(J)=FRQ $X1=FRQ/FZ(ITYPE)                               VIPRF    2941
                X1=XFERMX(ITYPE)+20.*ALOG10((HILO(ITYPE)+SIGN(ITYPE)*              VIPRF    2942
               1ATAN2(TWOB(ITYPE)*(X1**ALPHA(ITYPE)),1.-X1*X1))/FLX(ITYPE))        VIPRF    2943
                DECBEL(J)=X1                                                       VIPRF    2944
                                                                                   VIPRF    2945
             80 IF(FRQ.GE.20.0.AND.FRQ.LE.500.0) X1=CONST/2.0                      VIPRF    2946
                IF(FRQ.LT.20.0.OR.FRQ.GT.500.0) X1=CONST                           VIPRF    2947
                FPRV=FRQ                                                           VIPRF    2948
                FRQ=FRQ+X1*FRQ $IF(FRQ.GT.FMAX) RETURN                             VIPRF    2949
                II=0 $GO TO 10                                                     VIPRF    2950
                END                                                                VIPRF    2951


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  GPOINTS

VARIABLES      SN  TYPE            RELOCATION
    0  ALPHA      REAL       ARRAY      F.P.          0  CONST      REAL                F.P.
    0  DB         REAL       ARRAY      F.P.        206  DBPRV      REAL       ARRAY
```

```
      SUBROUTINE GPOINTS     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

VARIABLES      SN  TYPE            RELOCATION
    0  DECBLL      REAL        ARRAY      F.P.          0  FLX        REAL        ARRAY      F.P.
    0  FMAX        REAL                   F.P.        205  FPRV       REAL
    0  FREQ        REAL        ARRAY      F.P.          0  FRQ        REAL                   F.P.
    0  FZ          REAL        ARRAY      F.P.          0  HILO       REAL        ARRAY      F.P.
  176  I           INTEGER                               0  II         INTEGER                F.P.
  204  ITYPE       INTEGER                             203  ITYPEP     INTEGER
    0  J           INTEGER                F.P.          0  K          INTEGER                F.P.
    0  L           INTEGER                F.P.          0  SIGN       REAL        ARRAY      F.P.
    0  TWOP        REAL        ARRAY      F.P.          0  XFERMX     REAL        ARRAY      F.P.
  177  X1          REAL                                200  X2         REAL
  201  X3          REAL                                202  X4         REAL

EXTERNALS            TYPE    ARGS
      ALOG10      REAL        1 LIBRARY                     ATAN2      REAL        2 LIBRARY

STATEMENT LABELS
   15  10                                  40  20                                  56  30
   63  40                                  67  50                                  70  60
  104  70                                 146  80

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   16  20      * I            6  11        258                EXT REFS

STATISTICS
  PROGRAM LENGTH                  2558      173
```

```
SUBROUTINE XFERFUN     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                 SUBROUTINE XFERFUN(FREQ,DECBEL,N,PEAK,XLO,XHI,BLO,BHI,FZEROL,      VIPRF    2952
                1FZEROH,ALO,AHI,ILOHI)                                              VIPRF    2953
                 DIMENSION FREQ(1),DECBEL(1)                                        VIPRF    2954
                 DATA PI/3.14159265/,IHI/2HHI/                                      VIPRF    2955
                 J=1 $IF(ILOHI.EQ.IHI) GO TO 40                                     VIPRF    2956
                                                                                    VIPRF    2957
                 FMAX=XLO*FZEROL $TWOB=2.*BLO                                       VIPRF    2958
                 FLX=ATAN2(TWOB*(XLO**ALO),1.-XLO*XLO)                              VIPRF    2959
                                                                                    VIPRF    2960
                 DO 10 I=1,N                                                        VIPRF    2961
                 J=I $FRQ=FREQ(I) $IF(FRQ.GT.FMAX) GO TO 20                         VIPRF    2962
                 X1=FRQ/FZEROL                                                      VIPRF    2963
              10 DECBEL(I)=PEAK+20.*ALOG10(ATAN2(TWOB*(X1**ALO),1.-X1*X1)/FLX)      VIPRF    2964
                                                                                    VIPRF    2965
              20 X1=FMAX $FMAX=XHI*FZEROH $IF(X1.EQ.FMAX) GO TO 40                  VIPRF    2966
              30 FRQ=FREQ(J) $IF(FRQ.GT.FMAX) GO TO 40                              VIPRF    2967
                 DECBEL(J)=PEAK $J=J+1                                              VIPRF    2968
                 GO TO 20                                                           VIPRF    2969
                                                                                    VIPRF    2970
              40 TWOB=2.*BHI $FLX=PI-ATAN2(TWOB*(XHI**AHI),1.-XHI*XHI)              VIPRF    2971
                                                                                    VIPRF    2972
                 DO 50 I=J,N                                                        VIPRF    2973
                 FRQ=FREQ(I) $X1=FRQ/FZEROH                                         VIPRF    2974
              50 DECBEL(I)=PEAK+20.*ALOG10((PI-ATAN2(TWOB*(X1**AHI),1.-X1*X1))/FLX) VIPRF    2975
                                                                                    VIPRF    2976
                 RETURN                                                             VIPRF    2977
                 END                                                                VIPRF    2978


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  XFERFUN

VARIABLES      SN  TYPE              RELOCATION
    0  AHI         REAL                  F.P.          0  ALO       REAL                  F.P.
    0  BHI         REAL                  F.P.          0  BLO       REAL                  F.P.
    0  DECBEL      REAL        ARRAY     F.P.        135  FLX       REAL
  133  FMAX        REAL                              0  FREQ      REAL        ARRAY     F.P.
  137  FRQ         REAL                              0  FZEROH    REAL                  F.P.
    0  FZEROL      REAL                  F.P.        136  I         INTEGER
  126  IHI         INTEGER                           0  ILOHI     INTEGER               F.P.
  132  J           INTEGER                           0  N         INTEGER               F.P.
    0  PEAK        REAL                  F.P.        125  PI        REAL
  134  TWOB        REAL                              0  XHI       REAL                  F.P.
    0  XLO         REAL                  F.P.        140  X1        REAL

EXTERNALS          TYPE    ARGS
      ALOG10       REAL       1 LIBRARY                  ATAN2     REAL        2 LIBRARY

STATEMENT LABELS
    0  10                                  54  20                                  0  30          INACTIVE
   70  40                                   0  50
```

```
      SUBROUTINE XFERFUN     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   33  10      * I            10 13        21B                EXT REFS     EXITS
  103  50      * I            22 24        20B                EXT REFS

STATISTICS
  PROGRAM LENGTH                  177B      127
```

```
SUBROUTINE PARAMS      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                 SUBROUTINE PARAMS(XVAL,YVAL,DYVAL,XMAKNO,H,DISTFT,JX,RS,IFLITE,    VIPRF    2979
                1HITE,HITE1)                                                        VIPRF    2980
                 CALL HEIGHT(HITE1)                                                 VIPRF    2981
                 CALL RLMESS("(M)=$",+100,XVAL,YVAL)                                VIPRF    2982
                 CALL RLREAL(XMAKNO,+2,"ABUT","ABUT")                               VIPRF    2983
                 CALL RLMESS("(H)=$",+100,XVAL,YVAL-DYVAL)                          VIPRF    2984
                 II=H $CALL INTNO(II,"ABUT","ABUT")                                 VIPRF    2985
                 CALL RLMESS(" FT.$",+100,"ABUT","ABUT")                            VIPRF    2986
                 CALL RLMESS("(X) =$",+100,XVAL,YVAL-2.0*DYVAL)                     VIPRF    2987
                 CALL RLREAL(DISTFT,1,"ABUT","ABUT")                                VIPRF    2988
                 CALL RLMESS(" FT.$",+100,"ABUT","ABUT")                            VIPRF    2989
                 CALL RLMESS(JX,+100,XVAL,YVAL-2.5*DYVAL)                           VIPRF    2990
                 CALL RLMESS("(R) =$",+100,XVAL,YVAL-3.5*DYVAL)                     VIPRF    2991
                 CALL RLREAL(RS,+1,"ABUT","ABUT")                                   VIPRF    2992
                 CALL RLMESS(" IN.$",+100,"ABUT","ABUT")                            VIPRF    2993
                 CALL RLMESS(" S $",+100,XVAL,YVAL-4.0*DYVAL)                       VIPRF    2994
                 CALL RESET("BASALF")                                               VIPRF    2995
                 CALL RLMESS(IFLITE,10,XVAL,YVAL -5.0*DYVAL)                        VIPRF    2996
                 CALL BASALF("L/CSTD")                                              VIPRF    2997
                 CALL HEIGHT(HITE)                                                  VIPRF    2998
                 RETURN                                                             VIPRF    2999
                 END                                                                VIPRF    3000


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  PARAMS

VARIABLES      SN  TYPE            RELOCATION
    0  DISTFT      REAL                F.P.          0  DYVAL      REAL                F.P.
    0  H           REAL                F.P.          0  HITE       REAL                F.P.
    0  HITE1       REAL                F.P.          0  IFLITE     INTEGER             F.P.
  260  II          INTEGER                           0  JX         INTEGER             F.P.
    0  RS          REAL                F.P.          0  XMAKNO     REAL                F.P.
    0  XVAL        REAL                F.P.          0  YVAL       REAL                F.P.

EXTERNALS          TYPE    ARGS
       BASALF                1                          HEIGHT                1
       INTNO                 3                          RESET                 1
       RLMESS                4                          RLREAL                4

STATISTICS
  PROGRAM LENGTH                  3419      225
```

```
SUBROUTINE TABLE      74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                 SUBROUTINE TABLE(FREQ,DB,N,IFUN,ISCRPT)                                  VIPRF    3001
                 DIMENSION FREQ(1),DB(1)                                                  VIPRF    3002
                 PRINT 10,IFUN,IFUN,IFUN,IFUN,ISCRPT,ISCRPT,ISCRPT,ISCRPT                 VIPRF    3003
              10 FORMAT(1H-,* FREQ.(HZ.)*,2X,A10,3(14X,*FREQ.(HZ.)*,2X,A10)/              VIPRF    3004
                116X,A2,3(34X,A2))                                                        VIPRF    3005
                 NLINES=N/4 $LINPRT=MOD(N,4)                                              VIPRF    3006
                                                                                          VIPRF    3007
                 DO 20 I=1,NLINES                                                         VIPRF    3008
                 I1=I+NLINES $I2=I1+NLINES $I3=I2+NLINES                                  VIPRF    3009
              20 PRINT 30,FREQ(I),DB(I),FREQ(I1),DB(I1),FREQ(I2),DB(I2),FREQ(I3),         VIPRF    3010
                1DB(I3)                                                                   VIPRF    3011
              30 FORMAT(F10.1,F12.2,3(F24.1,F12.2))                                       VIPRF    3012
                                                                                          VIPRF    3013
                 IF(LINPRT.EQ.0) RETURN                                                   VIPRF    3014
                                                                                          VIPRF    3015
                 NLINES=N-LINPRT+1                                                        VIPRF    3016
                                                                                          VIPRF    3017
                 DO 40 I=NLINES,N                                                         VIPRF    3018
              40 PRINT 50,FREQ(I),DB(I)                                                   VIPRF    3019
              50 FORMAT(106X,F12.1,F12.2)                                                 VIPRF    3020
                                                                                          VIPRF    3021
                 RETURN                                                                   VIPRF    3022
                 END                                                                      VIPRF    3023


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  TABLE

VARIABLES      SN  TYPE              RELOCATION
    0  DB          REAL        ARRAY      F.P.          0  FREQ       REAL        ARRAY      F.P.
  143  I           INTEGER                              0  IFUN       INTEGER                F.P.
    0  ISCRPT      INTEGER                F.P.        144  I1         INTEGER
  145  I2          INTEGER                            146  I3         INTEGER
  142  LINPRT      INTEGER                              0  N          INTEGER                F.P.
  141  NLINES      INTEGER

FILE NAMES         MODE
      OUTPUT       FMT

INLINE FUNCTIONS    TYPE    ARGS
      MOD          INTEGER    2  INTRIN

STATEMENT LABELS
  102  10       FMT                          0  20                                  125  30       FMT
    0  40                                  136  50       FMT

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   24  20      * I            8  10        25B                EXT REFS
   55  40      * I           18  19        11B                EXT REFS

STATISTICS
  PROGRAM LENGTH                  171B      121
```

```
SUBROUTINE TICKMK      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                 SUBROUTINE TICKMK(TICLEN,FMAX,YSTEP,YAXIS,DBMIN)                    VIPRF    3024
                 DIMENSION FREQ(2),DECBEL(2)                                         VIPRF    3025
                                                                                     VIPRF    3026
                 X1=ALOG10(FMAX) $X2=X1-2.5*TICLEN $X1=X1-TICLEN                     VIPRF    3027
                 X1=10.**X1 $X2=10.**X2                                              VIPRF    3028
                   DBMAX=DBMIN+YSTEP*YAXIS $DB=DBMIN $DELDB=YSTEP/5.                 VIPRF    3029
                 FREQ(1)=FMAX $FREQ(2)=FMAX $DECBEL(1)=DBMIN $DECBEL(2)=DBMAX        VIPRF    3030
                 CALL CURVE(FREQ,DECBEL,2,0)                                         VIPRF    3031
                                                                                     VIPRF    3032
              10 DB=DB+DELDB                                                         VIPRF    3033
                 IF(DB.GT.DBMAX) RETURN                                              VIPRF    3034
                 FREQ(1)=X1 $IF(AMOD(DB,YSTEP).EQ.0.) FREQ(1)=X2                     VIPRF    3035
                 DECBEL(1)=DB $DECBEL(2)=DB                                          VIPRF    3036
                 CALL CURVE(FREQ,DECBEL,2,0)                                         VIPRF    3037
                 GO TO 10                                                            VIPRF    3038
                                                                                     VIPRF    3039
                 RETURN                                                              VIPRF    3040
                 END                                                                 VIPRF    3041


CARD NR. SEVERITY  DETAILS    DIAGNOSIS OF PROBLEM

     17     I                THERE IS NO PATH TO THIS STATEMENT.


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  TICKMK

VARIABLES      SN  TYPE            RELOCATION
   66  DB          REAL                                  65  DBMAX      REAL
    0  DBMIN       REAL                  F.P.            72  DECBEL     REAL        ARRAY
   67  DELDB       REAL                                   0  FMAX       REAL                  F.P.
   70  FREQ        REAL        ARRAY                      0  TICLEN     REAL                  F.P.
   63  X1          REAL                                  64  X2         REAL
    0  YAXIS       REAL                  F.P.             0  YSTEP      REAL                  F.P.

EXTERNALS           TYPE    ARGS
      ALOG10        REAL      1 LIBRARY                      CURVE                  4

INLINE FUNCTIONS    TYPE    ARGS
      AMOD          REAL      2  INTRIN

STATEMENT LABELS
   31  10

STATISTICS
  PROGRAM LENGTH                  74B       60
```

```
SUBROUTINE FROXBA      74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

      SUBROUTINE FROXBA(FZERO,BETA,X,ALPHA,F1,F2,Y,DY,XCYCLE,NXPLAC,      VIPRF    3042
     1IPRIME)                                                             VIPRF    3043
      DATA WIDTH/1.25/                                                    VIPRF    3044
                                                                          VIPRF    3045
      XX=ALOG10(F2/F1)*XCYCLE $XX=(XX-WIDTH)/2.0                          VIPRF    3046
      XX=ALOG10(F1)+XX/XCYCLE $XX=10.0**XX                                VIPRF    3047
      IF=3HF = $IX=3HX = $IB=3HB = $IA=3HA =                              VIPRF    3048
      IF(IPRIME.EQ.0) GO TO 10                                            VIPRF    3049
      IF=3HF'= $IX=3HX'= $IB=3HB'= $IA=3HA'=                              VIPRF    3050
                                                                          VIPRF    3051
   10 CALL RLMESS(IF,3,XX,Y)                                              VIPRF    3052
      CALL RLREAL(FZERO,1,"ABUT","ABUT")                                  VIPRF    3053
      CALL RLMESS(" (H)Z$",+100,"ABUT","ABUT")                            VIPRF    3054
      CALL RLMESS(" O$",+100,XX,Y-0.5*DY)                                 VIPRF    3055
      CALL RLMESS(IX,3,XX,Y-1.5*DY)                                       VIPRF    3056
      CALL RLREAL(X,NXPLAC,"ABUT","ABUT")                                 VIPRF    3057
      CALL PASALE("L/CGPEEK")                                             VIPRF    3058
      CALL RLMESS(IB,3,XX,Y-2.5*DY)                                       VIPRF    3059
      CALL RLREAL(BETA,3,"ABUT","ABUT")                                   VIPRF    3060
      CALL RLMESS(IA,3,XX,Y-3.5*DY)                                       VIPRF    3061
      CALL RLREAL(ALPHA,2,"ABUT","ABUT")                                  VIPRF    3062
      CALL PASALE("L/CSTD")                                               VIPRF    3063
                                                                          VIPRF    3064
      RETURN                                                              VIPRF    3065
      END                                                                 VIPRF    3066


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  FROXBA

VARIABLES      SN  TYPE            RELOCATION
    0  ALPHA      REAL                  F.P.          0  BETA      REAL                F.P.
    0  DY         REAL                  F.P.          0  FZERO     REAL                F.P.
    0  F1         REAL                  F.P.          0  F2        REAL                F.P.
  231  IA         INTEGER                           230  IB        INTEGER
  226  IF         INTEGER                             0  IPRIME    INTEGER             F.P.
  227  IX         INTEGER                             0  NXPLAC    INTEGER             F.P.
  203  WIDTH      REAL                                0  X         REAL                F.P.
    0  XCYCLE     REAL                  F.P.        225  XX        REAL
    0  Y          REAL                  F.P.

EXTERNALS          TYPE    ARGS
      ALOG10     REAL       1 LIBRARY                  PASALE              1
      RLMESS                4                          RLREAL              4

STATEMENT LABELS
   36  10

STATISTICS
  PROGRAM LENGTH                 266B      182
```

```
SUBROUTINE BETA        74/74    OPT=1                          FTN 4.5+414        08/16/77  13.11.28

                 SUBROUTINE BETA(B,PEAK,SPLVAL,X,ALPHA,FREQ,FZERO,SGN,HILO)          VIPRF    3067
                                                                                     VIPRF    3068
                 FBETA(XX,PEAK,SPLVAL,X,ALPHA,FREQ,FZERO,SGN,HILO)=                  VIPRF    3069
                1(10.0**((SPLVAL-PEAK)/20.0))*                                       VIPRF    3070
                2(HILO+SGN*ATAN2(2.0*XX*X**ALPHA,1.0-X*X))-                          VIPRF    3071
                3(HILO+SGN*ATAN2(2.0*XX*(FREQ/FZERO)**ALPHA,                         VIPRF    3072
                41.0-(FREQ/FZERO)*(FREQ/FZERO)))                                     VIPRF    3073
                                                                                     VIPRF    3074
                 BPRV=1.0 $DELB=0.05                                                 VIPRF    3075
                 FPRV=FBETA(BPRV,PEAK,SPLVAL,X,ALPHA,FREQ,FZERO,SGN,HILO)            VIPRF    3076
                 B=BPRV+DELB                                                         VIPRF    3077
                 F=FBETA(B,PEAK,SPLVAL,X,ALPHA,FREQ,FZERO,SGN,HILO)                  VIPRF    3078
                 IF(FPRV*F.LE.0.) GO TO 30                                           VIPRF    3079
                 IF(ABS(FPRV).GT.ABS(F)) GO TO 10                                    VIPRF    3080
                 DELB=-DELB $B=BPRV $F=FPRV                                          VIPRF    3081
                                                                                     VIPRF    3082
              10 BPRV=B $FPRV=F $B=B+DELB                                            VIPRF    3083
                 F=FBETA(B,PEAK,SPLVAL,X,ALPHA,FREQ,FZERO,SGN,HILO)                  VIPRF    3084
                 IF(FPRV*F.GT.0.) GO TO 10                                           VIPRF    3085
                                                                                     VIPRF    3086
              30 B=(BPRV*F-B*FPRV)/(F-FPRV)                                          VIPRF    3087
                 RETURN                                                              VIPRF    3088
                 END                                                                 VIPRF    3089


      SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  BETA

VARIABLES      SN  TYPE            RELOCATION
    0  ALPHA       REAL                 F.P.          0  B          REAL                F.P.
  157  BPRV        REAL                             160  DELB       REAL
  162  F           REAL                             161  FPRV       REAL
    0  FREQ        REAL                 F.P.          0  FZERO      REAL                F.P.
    0  HILO        REAL                 F.P.          0  PEAK       REAL                F.P.
    0  SGN         REAL                 F.P.          0  SPLVAL     REAL                F.P.
    0  X           REAL                 F.P.

EXTERNALS            TYPE    ARGS
       ATAN2       REAL       2 LIBRARY

INLINE FUNCTIONS     TYPE    ARGS
       ABS         REAL       1  INTRIN                    FBETA      REAL       9    SF

STATEMENT LABELS
  103  10                                  143  30

STATISTICS
  PROGRAM LENGTH                 163B      115
```

```
SUBROUTINE TERPLIN     74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                SUBROUTINE TERPLIN(X,DELX,XINIT,XARRAY,IXARAY,Y,YARRAY,N)          VIPRF    3090
                                                                                   VIPRF    3091
                DIMENSION XARRAY(1),YARRAY(1)                                      VIPRF    3092
                                                                                   VIPRF    3093
                IF(IXARAY.EQ.1) GO TO 100                                          VIPRF    3094
                                                                                   VIPRF    3095
                I=(X-XINIT)/DELX $XI=I                                             VIPRF    3096
                Y=YARRAY(I+1)+(X-XINIT-XI*DELX)*(YARRAY(I+2)-YARRAY(I+1))/DELX     VIPRF    3097
                RETURN                                                             VIPRF    3098
                                                                                   VIPRF    3099
                                                                                   VIPRF    3100
            100 DO 110 I=1,N                                                       VIPRF    3101
                J=I $IF(XARRAY(I).GE.X) GO TO 120                                  VIPRF    3102
            110 CONTINUE                                                           VIPRF    3103
                                                                                   VIPRF    3104
            120 IF(XARRAY(J).NE.X) GO TO 130                                       VIPRF    3105
                Y=YARRAY(J) $RETURN                                                VIPRF    3106
                                                                                   VIPRF    3107
            130 Y=YARRAY(J-1)+                                                     VIPRF    3108
               1(X-XARRAY(J-1))*(YARRAY(J)-YARRAY(J-1))/(XARRAY(J)-XARRAY(J-1))    VIPRF    3109
                                                                                   VIPRF    3110
                RETURN                                                             VIPRF    3111
                END                                                                VIPRF    3112


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
    3  TERPLIN

VARIABLES      SN  TYPE              RELOCATION
    0  DELX        REAL                  F.P.          61  I          INTEGER
    0  IXARAY      INTEGER               F.P.          63  J          INTEGER
    0  N           INTEGER               F.P.           0  X          REAL                F.P.
    0  XARRAY      REAL        ARRAY     F.P.          62  XI         REAL
    0  XINIT       REAL                  F.P.           0  Y          REAL                F.P.
    0  YARRAY      REAL        ARRAY     F.P.

STATEMENT LABELS
   31  100                                    0  110                                  40  120
   47  130

LOOPS  LABEL     INDEX      FROM-TO     LENGTH     PROPERTIES
   32  110     * I            12 14        68       INSTACK     EXITS

STATISTICS
  PROGRAM LENGTH                  1043       68
```

```
SUBROUTINE QUAD        74/74    OPT=1                          FTN 4.5+414          08/16/77  13.11.28

                 SUBROUTINE QUAD(X,DELX,XINITL,Y,YVALS,N)                                  VIPRF    3113
                 DIMENSION YVALS(1)                                                        VIPRF    3114
                                                                                           VIPRF    3115
                 XI=(X-XINITL)/DELX $I=XI $XI=I                                            VIPRF    3116
                 X1=XINITL+XI*DELX $XX1=X-X1                                               VIPRF    3117
                                                                                           VIPRF    3118
                 I=I+1 $IF(XX1.NE.0.) GO TO 10                                             VIPRF    3119
                 Y=YVALS(I) $RETURN                                                        VIPRF    3120
                                                                                           VIPRF    3121
              10 X3=X1+DELX $K=I+1 $IF(I.NE.1) GO TO 20                                    VIPRF    3122
                 X2=X3+DELX $J=K+1 $GO TO 30                                               VIPRF    3123
                                                                                           VIPRF    3124
              20 X2=X1-DELX $J=I-1                                                         VIPRF    3125
                                                                                           VIPRF    3126
              30 XX2=X-X2 $XX3=X-X3                                                        VIPRF    3127
                 X1X2=X1-X2 $X1X3=X1-X3 $X2X3=X2-X3                                        VIPRF    3128
                 Y=XX2*XX3*YVALS(I)/(X1X2*X1X3)-XX1*XX3*YVALS(J)/(X1X2*X2X3)+              VIPRF    3129
                1XX1*XX2*YVALS(K)/(X1X3*X2X3)                                              VIPRF    3130
                 RETURN                                                                    VIPRF    3131
                 END                                                                       VIPRF    3132


SYMBOLIC REFERENCE MAP (R=1)

ENTRY POINTS
   3  QUAD

VARIABLES      SN  TYPE              RELOCATION
   0  DELX        REAL                  F.P.          62  I          INTEGER
  70  J           INTEGER                             66  K          INTEGER
   0  N           INTEGER   *UNUSED     F.P.           0  X          REAL                F.P.
  61  XI          REAL                                0  XINITL     REAL                F.P.
  64  XX1         REAL                               71  XX2        REAL
  72  XX3         REAL                               63  X1         REAL
  73  X1X2        REAL                               74  X1X3       REAL
  67  X2          REAL                               75  X2X3       REAL
  65  X3          REAL                                0  Y          REAL                F.P.
   0  YVALS       REAL        ARRAY     F.P.

STATEMENT LABELS
  21  10                                  31  20                                  36  30

STATISTICS
  PROGRAM LENGTH                  76D       62
```

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