Creating a VAPEPS Database –
A VAPEPS Tutorial
VAPEPS Management Center

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ABSTRACT

This report outlines a procedural method for creating a VAPEPS Database. The method of presentation employs flowcharts of sequential VAPEPS Commands used to create a VAPEPS Database. The commands are accompanied by explanatory text to the right of the command in order to minimize the need for repetitive reference to the VAPEPS user's manual. The method is demonstrated by examples of varying complexity. It is assumed that the reader has acquired a basic knowledge of the VAPEPS software program.
1. INTRODUCTION

This report is intended to be a reference for users with some basic knowledge of the VAPEPS software.

The VAPEPS (VibroAcoustic Payload Environment Prediction System) is a computer program that is used to analyze, predict, and manage vibration and acoustic data obtained from Space Shuttle and Expendable Launch Vehicle payload components. Additionally, VAPEPS provides a full range of software routines that can be used to manipulate and perform computational operations on the data.

VAPEPS software commands can be grouped into three functional categories: Computational operations, Database operations, and Prediction operations. This report is devoted exclusively to a discussion of the commands and routines associated with VAPEPS Database operations; specifically, the process of creating a local database. A local database is created by, and serves the needs of, individual organizations. It may contain vibroacoustic data, structural data, Statistical Energy Analysis (SEA) model data, and related information for specific payload components. A general overview of database management, excerpted from Ref.1, is provided in Appendix B.

The local database vibroacoustic and SEA model data for specific payload components may, with the approval of the JPL VAPEPS Management Center, be deposited in the JPL VAPEPS Global Database. The requirements are specified in Appendix E. The VAPEPS Global Database provides a data reference source that may be accessed by the Aerospace community to obtain data for predicting environments for new or similar payload components. A data module naming convention to promote such accessibility, excerpted from Ref.1, is provided in Appendix C.
2. THE DATABASE PROCESSORS

Four VAPEPS processors are utilized to create a database. Each processor consists of a series of commands with options specified by parameters. In sequence of application, they are: the ENTER processor, the PREP processor, the DICTIONARY processor, and the ADMINISTRATION processor.

2.1 THE ENTER PROCESSOR

The ENTER processor is used to read vibroacoustic test event information into a database. The following Event information can be entered into the database: Event Description, Channel Description, Frequency Analysis Information, and Acoustic and/or Vibration Spectral Data. The ENTER processor features include: a channel name change capability, acceptance of data processed in non-standard frequency bands, and data input by sections. This latter feature allows one to supplement incomplete data at a later stage in the process. It also permits the categorization of data to sensor, that is accelerometer data, microphone data, etc. However, the ENTER processor can only read spectral data in a fixed-field FORTRAN format and each line of input must contain a channel identification, a sequence number, and data. The Event information, input thru the ENTER processor, is stored on a DAL file designated by the user. Once stored, the data may be operated on by various VAPEPS commands. The Event data must be processed by the ENTER processor prior to using the PREP processor.

2.2 THE PREP PROCESSOR

The PREP processor is used to define a database Event and standardize the raw data input from the ENTER processor. PREP is divided into sections which are accessed by issuing subcommands within PREP. The following subcommands allow the user to input or modify existing input of the following sections: BOOK - bookkeeping section, CHANNEL - channel description section, CONFIGURATION - configuration tree section, MODUles - data modules section. The CHECK subcommand is used to standardize the raw data input. PREP is that phase of the database entry process where key words and physical parameters associated with the Event are entered into the database. Later, users may interrogate the database, using the SEARCH processor, for those key words and parameters that satisfy certain criteria for Events and/or data modules.
2.3 THE DICTIONARY AND ADMINISTRATION PROCESSORS

The DICTIONARY and ADMINISTRATION processors are used to transmit ENTERed and PREPed data to the local Database Master File. These two processors utilize "write protected" files; consequently, the DICTIONARY and ADMINISTRATION processors can only be accessed by the designated local VAPEPS Database Administrator. The DICTIONARY processor is used to establish and maintain a Data Dictionary of Events on the Database Master File. New entries to the Data Dictionary are preceded by the RUN=PADMIN process of VAPEPS. This process extracts all words to be defined from the specified Event and creates a list for input to the DICTIONARY/PREADMIN command. The DICTIONARY/PREADMIN process authorizes the input list for the Data Dictionary and this process must be invoked if the Event is to be saved on the Database Master File.
3. PROCESSOR COMMAND SEQUENCES

The command sequences for the individual processors are presented in the following sections. A pseudo flowchart format is used wherein the VAPEPS commands and prompts are presented on the left with explanatory remarks on the right. This format should eliminate the need to reference the manual except for those instances when a more detailed explanation of the command and/or prompt is required.
3.1 THE ENTER PROCESSOR

The following pages describe the command sequence and define the commands for the ENTER Processor.
The ENTER Processor is used to store information for an event in a DAL file. Once stored in a DAL file, the data may be operated on by other VAPEPS commands. The event's data must be processed by ENTER before it can be stored in the standardized VAPEPS Database with the PREP Processor. The ENTER Processor processes the following vibroacoustic test event information: Event Description, Frequency Analysis Information, Channel Descriptions, and Acoustic and/or Vibration Spectral Data.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENTER</td>
<td>command call.</td>
</tr>
<tr>
<td>NU</td>
<td>del unit designated for output.</td>
</tr>
<tr>
<td>VENT</td>
<td>4 character name to identify this database. All dal elements created by ENTER will bear this name.</td>
</tr>
<tr>
<td>isec</td>
<td># of data input sections.</td>
</tr>
<tr>
<td></td>
<td>If isec = 0 (default) all data must be entered at this time.</td>
</tr>
<tr>
<td></td>
<td>If isec &gt; 0 multiple data sections are to be entered. The data sections must be identified by sequential values of isec (isec = 1, isec = 2, etc).</td>
</tr>
<tr>
<td>nin</td>
<td>fortran unit &amp; containing Channel Description and/or Spectral input data.</td>
</tr>
<tr>
<td></td>
<td>If nin = 9 (default) input will be read from primary input unit (terminal, etc).</td>
</tr>
<tr>
<td></td>
<td>If nin &gt; 0 all input data is read from fortran unit nin.</td>
</tr>
<tr>
<td></td>
<td>If nin &lt; 0 all input is read from fortran unit 5 except spectral data. Spectral data will be read from fortran unit -nin.</td>
</tr>
<tr>
<td>ipnt</td>
<td>Output print option.</td>
</tr>
<tr>
<td></td>
<td>If ipnt = 0, all specifications and general event description are printed.</td>
</tr>
<tr>
<td></td>
<td>If ipnt = 1 (default), prints as per ipnt = 0 plus channel and frequency summary.</td>
</tr>
<tr>
<td></td>
<td>If ipnt = 2, prints as per ipnt = 1 plus tabular listing of spectral data.</td>
</tr>
<tr>
<td>ifat</td>
<td>Fatal error option flag.</td>
</tr>
<tr>
<td></td>
<td>If ifat = 0, data channels without error will be saved. Data channels with error will have to be corrected and processed as another section.</td>
</tr>
<tr>
<td></td>
<td>If ifat = 1 (default), data with errors will not be saved.</td>
</tr>
<tr>
<td>DESC</td>
<td>Prompt for event description. Up to four lines of descriptive text may be entered to describe event. Each line may be up to 72 characters in length.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCHAN, NFRG</td>
<td># of channels of Spectral data (accelerometers and/or microphones).</td>
</tr>
<tr>
<td>NDVPC, IFORM, IFREQ, ISEQ, IOVER</td>
<td>Type of frequency bands required to analyze data.</td>
</tr>
<tr>
<td>ITYP</td>
<td>Type of frequency band required to analyze data.</td>
</tr>
<tr>
<td></td>
<td>If ITYP = 3, 1/3 octave band.</td>
</tr>
<tr>
<td></td>
<td>If ITYP = 1, whole octave.</td>
</tr>
<tr>
<td></td>
<td>If ITYP = 0, constant bandwidth.</td>
</tr>
<tr>
<td></td>
<td>If ITYP &lt; 0, user specified bands.</td>
</tr>
<tr>
<td>ITCH</td>
<td># description lines/channel in Channel Description Section.</td>
</tr>
<tr>
<td></td>
<td>If ITCH = 0, one line for measurement type and unit. - applies to all sections.</td>
</tr>
<tr>
<td></td>
<td>If ITCH = 1, one line/Channel for measurement type and units and rename channel.</td>
</tr>
<tr>
<td></td>
<td>If ITCH = -1, same as ITCH = 1 but no rename channel.</td>
</tr>
<tr>
<td></td>
<td>If ITCH = 2, two lines/Channel. 1st line as per ITCH = 1; 2nd line is comment.</td>
</tr>
<tr>
<td></td>
<td>If ITCH = -2, same as ITCH = 2 but no rename of channel.</td>
</tr>
</tbody>
</table>
NDVPC = # of data values/line in Spectral Data Section. Data values may include the Spectral data; overall level, and frequencies. Channel ID and sequence #’s are not considered as data values.

IFORM = Order of information on each line in Spectral Data Section.
   If IFORM = 1: DATA, ID, SEQUENCE
   If IFORM = 2: DATA, SEQUENCE, ID
   If IFORM = 3: ID, DATA, SEQUENCE
   If IFORM = 4: ID, SEQUENCE, DATA
   If IFORM = 5: SEQUENCE, DATA, ID
   If IFORM = 6: SEQUENCE, ID, DATA

IFREQ = The pattern of Frequency Vs Spectral Data as it appears in Spectral Data Section
   If IFREQ = 0: No Frequencies embedded in data.
   If IFREQ = 1: Freq. Data alternate (Freq.Data,Freq.Data,.....
   If IFREQ = -1: Data and Freq. alternate (Data.Data.Data,.....)

ISEQ = Starting value of sequence # for each Channel in Spectral Data
   If ISEQ = 0, sequence # begins at 1 and continues sequentially.
   If ISEQ = 0, sequence # begins at 1 and continues sequentially.

IOVER = Indicates where overall level for each channel appears in Spectral Data
   If IOVER < 0: No overall level in data. Level input in Channel Description
   If IOVER = 0: No overall level in data
   If IOVER = 1: Overall level is the first data value in channel data
   If IOVER = 2: Overall level is the last data value in channel data

FORMAT: Prompt for fortran format for input. Enclose format in parenthesis.
         Allowable format types are:
         For data values: E (floating point), F (fixed point)
         For Channel ID: A (alphanumeric), I (integer)
         For Sequence #: I (integer)

START: Prompt for input. Enter center frequency value.
   If ITYPE = 1 or 3, Enter center frequency value.
   If ITYPE = 0, Enter center freq. value, bandwidth.
   If ITYPE < 0, Enter CF(1), CF(NFRG), (CF - Center Freqs.)
   Enter BE(1), BE(NFRG), (BE - Lower Band Edges.)
   Enter TL(1), TL(NFRG), (TL - Upper Band Edges)

ID: Chnl ID used in spectral data. This ID will be used for post-Enter ref to chnl if not renamed. If Chnl ID was integer, it must be renamed to a hollerith name.

NAME: Chnl ID. Max length 4 character hollerith for post Enter ID

TYPE: Measurement Type: MIC - Microphone; SMIC - Surface microphone; NSMC - Non surface microphone; ACC - Accelerometer; VIB - accelerometer. NACC - Normal accelerometer

UNIT: Measurement Units: P2PH = psi**2/Hz; PA2H = Pa**2/Hz; G2PH = g**2/Hz;
   1A2H = (in/sec**2)**2/Hz; FA2H = (ft/sec**2)**2/Hz;
   M2H = (m/sec**2)**2/Hz; D2SP = 10*log(psi**2/B 4144E-18); V2H = 10*log(psi**2/B 4144E-18); DBVL = 10*log(m/sec**2)**2/1.0E-10

RMS: Optional Root Mean Square or overall level. Specified only if IOVER < 0

DESC: Channel Description. Max 72 characters allowed.

The spectral data is entered at this point. Each line in this section must contain (1) an integer sequence #, (2) Channel ID, (3) Numeric Data. The order of entry is specified by IFORM. Numeric data can include Spectral, Freq. and overall values. The last line of this section must be a blank line.
3.2 THE PREP PROCESSOR

The following pages describe the command sequence and define the commands for the PREP Processor.
The PREP Processor is used to define a DataBase event and standardize raw data input from ENTER associated with an event. PREP is divided into sections which are accessed by issuing subcommands within PREP. The sections of PREP allow for input or modification of: BOOK-keeping information, CHANnel description, CONFIGuration trees, and data MODules. PREP is that phase of the DataBase Entry Process where key words and physical parameters are input that will later be searched using a Query Mode.

Required command parameters shown as CAPS: options lower case.

PREP NU, VENT, nsec

PREP - Command Call
NU - Dal unit used for ENTER data or previously PREP'ed event
VENT - Event name defined in ENTER Command
nsec - Status of data read in with ENTER Command
If nsec < 0 (default), event has been previously processed by PREP
If nsec > 0, only 1 data section was input in ENTER
If nsec > 0, 1 thru nsec data sections were input in ENTER

prompt

PREP> selected Subcommand

PREP>BOOK nsec

BOOK - for input of bookkeeping keywords of the data processing agency

PREP>CHAN

CHAN - for modification of ENTER Channel information

PREP>CHECK nsec

CHECK - for conversion of original data input of ENTER to standard format
CONP - to describe vehicle configuration
MODU - to define subsystems of the vehicle configuration
DONE - Exits PREP

PREP> selected subcommand

CHECK - collects and converts data and descriptor Dal elements created in ENTER. Creates a set of DAL elements containing data of a standard format with consistent pressure and acceleration units over fixed frequency bands. CHECK is performed automatically the first time an event is PREP'ed and is normally executed as a subcommand only if a modification or an additional section has been added to the ENTER information for an event that has been PREP'ed. nsec (option) is the # of ENTER sections for the event. If nsec = 0, 1 data section; If nsec > 0, data sections 1 thru nsec

ENTRY data is converted to the following standard units by CHECK:

ACCELERATION: DBEF = B 4144E-18 psi*s
VIBRATION: VLSP (10log(g**2/GREF)) GREF = B 4144E-18 g**2

PREP>CHAN

CHAN - to permit additions and modifications to the event's channel table. This table is created by PREP for each new event and is updated by using the CHECK subcommand of PREP. Descriptive information, in addition to that input during ENTER, may be added in the channel section. Subcommands within CHAN, entered at the CHAN Prompt are:
LIST ALL desc - lists the channel table. If option desc is selected, general
channel description is included.
LIST DESC - lists the channel descriptions
LIST RANGE In thru In desc - lists items In thru In of channel table. desc optional.
LIST TYPE ITEM desc - lists the channel table for all channels of type ITEM
desc optional.
CHANGE ALL - change all values in channel table by accepting input following
the command. Input lines must have the form:
CHAN ITYPE.FLOW.FHIGH.X.Y.Z.SYSTEM
CHANGE TYPE - change the ITYPE field in the channel table. Input form is:
CHAN ITYPE
CHANGE FREQ - change the FLOW.FHIGH fields in the channel table. Input form is:
CHAN FLOW.FHIGH
CHANGE COORD - change the X.Y.Z System fields in the channel table. Input form is:
CHAN X.Y.Z.SYSTEM
Note: The channel name CHAN must match a name already in the table. Input is
accepted until a blank line is encountered.
DMIT - exits CHANNEL without saving changes
DONE - exits CHANNEL (blank line also exits)

BOOK - to enter basic book-keeping information into the database of the event being
PREPd. This info is limited to fields describing key aspects of the event.
Subcommands within BOOK, entered at the BOOK prompt, are:

APROPOS - displays words that have been used in BOOK in previous events
WORDS - displays the list of words
DEFINITION WORD - yields a definition for WORD (use not recommended - slow)
INIT - clears all sections of BOOK
LIST - lists out all sections of BOOK that have been defined
DONE - saves any changes to BOOK and exits BOOK (also by RETURN key)
DMIT - exits BOOK without saving changes
PROC - defines the event as seen by the agency processing the data. Saved in
database master file processed by ADMIN. Not subject to change. Input is:
PROC AGENCY, PROGRAM, PROJECT, ID (agency = agency name, program = program
name, project = project name, id = identifier) first 4 letters of id must
match event name created during ENTER process.
CONT - defines the event as seen by the contracting agency. Input form is:
CONT AGENCY, PROGRAM, PROJECT, ID (similar to agency, id = identifier)
CIGN - defines the event as seen by the cognizant agency. Input form is
CIGN AGENCY, PROGRAM, PROJECT, ID (similar to contracting agency)
DATE - defines the date the event took place. Input form is:
DATE MM/DD/YY (mm = month, dd = day, yy = year. 2 character limit each)
TIME - defines the time the event took place. Input form is:
TIME HH:MM:SS.FRAC (hh = hour (24 hour clock), mm = minute, ss = second,
frac = second fraction)
EVENT - defines the type of event. Uses up to 12 characters/arg. Input form
EVENT CLASS, TYPE, ID1, ID2 (class = word to describe class of test, type =
type of test, id1 = 1st identifier, id2 = 2nd identifier (user choice)
Recommended for CLASS: TYPE
Ground, Reverberant; Ground, Direct; Ground, Progressive;
Ground, Captive; Ground, Dir-Rev; Flight, Liftoff;
Flight, Landing; Flight, Ascent; Flight, Reentry
Recommended for IDI:
Development; Qual; Acceptance; Protoflight; Prototype

LOCA - defines the location of event. Uses up to 12 characters/arg. Input form
LOCA GLOBAL.LOCAL.IDI.ID2 (global = global location, local = local
location, IDI = 1st identifier, ID2 = 2nd identifier)

VEHICLE - defines the vehicle that will fly the test item. 12
VEHICLE CLASS.TYPE,CONF,ID (class = vehicle classification, type =
vehicle type, conf = vehicle configuration, id = other identifier)
Recommended for CLASS: TYPE:
Shuttle, Enterprise, Shuttle, Columbia, Booster, Titan,
Booster, Delta, Booster, Titan, Booster

DESC - Optional subcommand to allow for general information input. 4 lines of
up to 72 characters/line allowed. If DESK is not specified in PREP, these
4 lines are a duplicate of those specified in event description of ENTER.

**selected subcommand**

```
PREP>CONF nu, name
```

---

**CONF** - To enter vehicle configuration tree which defines hierarchy of subsystems that
make up the vehicle as it was tested or flown. The configuration tree is composed
of branches. The branches are related to one another by showing which branch is
the parent branch to the current branch. Branches are described by global names
and local names. Global names are used to describe the branch and local names are
used to describe the hierarchy of the branches. Global names are key words that
may be searched by users operating in the database query mode. nu, name (options),
if used, are the DAL unit and event name of an existing database event which are
read in as the configuration tree for this event.

Subcommands within CONF are entered at the CONF prompt. These subcommands, used
to create, delete and list configuration tree branches, are:

- **APPROPOS** - displays the words used in CONF of previous events
- **DEFINITIONS** - displays definitions of words listed by WORDS
- **DEFINITION WORD** - displays definition for specified WORD in WORDS list
- **LIST** - lists the entire configuration tree
- **LIST I1** - lists line I1 of the configuration tree
- **LIST I1, I2** - lists lines I1 thru I2 of the configuration tree
- **DISA I1** - disable command. Marks for deletion branch I1 of the configuration tree
- **DISA I1, I2** - Marks for deletion branches I1 thru I2 of configuration tree
- **ENAB I1** - Enable command. Enables branch I1 of configuration tree that have been
  marked for deletion.
- **ENAB I1, I2** - Enables branches I1 thru I2 that have been marked for deletion.
- **PACK** - packs all disabled configuration tree branches
- **CHECK** - checks configuration tree for errors. Checks database master file for
  global names GENERIC and SPECIFIC and advises user.
- **OMIT** - exits CONF without saving changes
- **DONE** - executes CHECK. PACK commands saves changes and exits CONF
- **READ NU, NAME** - allows user to add an existing configuration tree from another
database event to the tree being built.
  NU, NAME = DAL unit and event name of existing event.
INPUT - allows user to create or add branches to the event's configuration tree.

This subcommand prompts for the inputs:
LAST-THIS, GENERIC, SPECIFIC, mount, enclosure
LAST - local name of parent branch of the current branch (4 chartr max)
       Note: trunk of tree must be designated by $ THIS - local name of current branch (4 chartr max)
GENERIC - global generic name for current branch (12 chartr max) SPECIFIC - global specific name for current branch (12 chartr max)
mount - local branch connected to the current branch (non-tree), (option)
enclosure - local branch which encloses current branch (option).

MODU - The MODULE subcommand of PREP allows the user to further define a branch of an events CONFIGURATION tree by creating data modules for the branch. These data modules can be assembled to represent one or more subsystems within the general system that was tested. Data module inputs are: transducer names, key descriptions and acoustical/structural parameters. Transducer names in the data module are the specific channels used for the instrumentation of the subsystem (a subset of those in the event's CHANNEL table. The physical characteristics of the subsystem are defined by the key descriptions and the acoustical/structural parameters. The acoustical/structural parameters form a SEA model. By including SEA models in the database, predictions can be made on new systems by extrapolation from systems previously saved in the database. This routine uses the SERCH and PRED commands of VAPEPS. The options of the MODU subcommand are:
mxmod - maximum # of modules for this event (default = 20 or 5 plus current #)
mct - maximum # of channels for all modules (default = 2 cine # or cine # + 20)
mxcps - maximum # of channels /SEA element (default = 15)

Subcommands within MODU are entered at the MODU prompt. These subcommands are used to create, delete and list the data modules for the event. The subcommands are:

APPROPOS - displays the words used in MODU of previous events
WORDS - redisplays the list of words
DEFINITIONS - displays definitions of words listed by WORDS
DEFINITION WORD - displays definition for specified WORD in WORDS list
LIST - lists the entire module table.
LIST I1 - lists line I1 of the module table.
LIST I1.I2 - lists lines I1 thru I2 of the module table.
DISA I1 - disable command. Marks for deletion module I1 of the module table.
DISA I1.I2 - Marks for deletion modules I1 thru I2 of the module table.
Disabled branches are deleted upon exit from MODU.
ENAB I1 - Enable command. Enables module I1 of module table that has been
       marked for deletion.
ENAB I1.I2 - Enables modules I1 thru I2 that have been marked for deletion.
PACK - removes all disabled modules in the module table.
CHECK - checks modules in module table for errors. Checks for compatibility
       with configuration and channel sections of event
DUMP - exits MODU without saving changes
DONE - executes CHECK, PACK, SAVE commands. saves changes and exits MODU
SAVE - saves the module table on DAL unit using EVENT name (see DONE)
READ NU.NAME - allows user to add an existing module table from another
       database event to the module table for this event.
       NU.NAME = DAL unit and event name of existing event.
DUMP - produces a long listing of the entire module table.
DUMP I1 - lists line I1 of the module table.
DUMP I1.I2 - lists lines I1 thru I2 of the module table.
REMOVE MODULE,CONF,ZONE - allows user to disable a module in module table
MODULE,CONF,ZONE = 3 argm module name in module table listing
EDIT NUM - allows user to edit existing modules or copy existing modules into
new modules and then edit. This command puts user at DAMO level.
NUM = module number as listed in module table. This form of EDIT does not
change original module name.
EDIT MODULE,CONF,ZONE,new - as per previous command
MODULE,CONF,ZONE = 3 argm module name in module table listing
new - (option) specifies a new local module name where the output of the
edit session will reside. To become part of the module table, the
module NEW must be associated with a configuration tree branch.
CHANGE MODULE,CONF,ZONE,NEWmod,newconf,newzone,newsystem,newx,newy,newz - allows
user to modify name of a data module as it is listed in module
table.
MODULE,CONF,ZONE = 3 argm module name
newmod,newconf,newzone,newsystem,newx,newy,newz - (options). New names and
values of the module. These options may be truncated at any point,
leaving the remaining names and values unchanged.
ATTACH MODULE,CONF,ZONE,SYSTEM,X,Y,Z - creates an entry in the module table.
Modules formed by the DAMO operation must be associated with a
branch of the event's configuration tree. ATTACH defines this
relationship thru the option ZONE. It also allows for associating
a coordinate system and integer coordinates with the module.
MODULE,CONF,ZONE = 3 argm module name in module table. The name defined
by these argmts must be unique. If not other modules with this name
will be disabled and will be lost upon execution of PACK or ZONE.
DAMO nu,name,NEW - used to create a data module in the event's module table.
nu,name - (options) DAL unit and name of DAL element containing a module
previously created by SAVE in DAMO or by DAMO in VAPPEPS. If these options
are specified and NEW is omitted, the local module name will be NAME.
NEW - local data module name.

Subcommands within DAMO are entered at the DAMO prompt. The subcommands are:

DESC NAME1,NAMEx,NAMEx - used to describe the module as a whole. The 3 argms
(up to 12 chrtrs each) are saved in the database master file and can be
searched for by users.
* EXTA name1,name2,name3 - a SEA element acoustic volume that communicates with the
SEA elements SKIN and INTA. The 3 optional argmts (up to 12 chrtrs each)
may be saved in the database master file.
* SKIN name1,name2,name3 - a SEA element structure that communicates with the SEA
elements EXTA,INTA, and MONTR 3 options as described above.
* INTA name1,name2,name3 - a SEA element acoustic volume that communicates with the
SEA elements SKIN,EXTA,MONTR, and INST. 3 options as described above.
* MONTR name1,name2,name3 - a SEA element structure that communicates with the SEA
elements INTA,SKIN, and INST. 3 options as described above.
* INST name1,name2,name3 - a SEA element structure that communicates with the SEA
elements INTA and MONTR. 3 options as described above.
* FRAM name1,name2,name3 - an optional SEA element structure used to define the
physical connection between SEA elements SKIN and MONTR (only useful
if MONTR is a truss). 3 options as described above.
NOTE: When the subcommands designated by * are invoked, the following subcommands may be issued to input, modify, delete, list, and save the contents of the SEA element as well as move to another SEA element or to exit DAMD:

* NAME=VALUE, NAME=VALUE - used to set the values of named physical parameters which describe the SEA element. (Ref PREDICTION section of VAPEPS manual)
  NAME = allowable parameter name
  VALUE = parameter value expressed as a real number.

C* C1.C2.C3...Cn - used to define channel names to be associated with the SEA element. Channel names must exist in channel table of events.
  C1.C2.C3...Cn = channel names

REMOVE C1.C2.C3...Cn - used to deassociate channel names, previously entered by the C* subcommand, from SEA elements.

LIST - list contents of the module/SEA element

LIST para or LIST chan - option form for parameter or channel listing only.

READ NU.VER(.zone) - allows user to read in a data module previously stored in
  DAL element by subcommand SAVE or by DAMD issued from VAPEPS.
  NU.VER = DAL unit and version containing data module.
  zone = (option) SEA element to read in; otherwise all SEA elements will be read in by READ.

SAVE NU.NAME - allows user to save data module in DAL elements not associated with event.
  NU.NAME = DAL unit and version name where data module will be stored.
  The names of these elements will be:
  NU.PARA.NAME - for physical parameters
  NU.DCHN.NAME - for channels associated with the module
  NU.DMDC.NAME - for module descriptions

CHECK - checks the data module for errors, calculates non-dimensional parameters, and lists a summary of the module.

DONE - executes the CHECK subcommand and exits DAMD.
3.3 THE DICTIONARY AND ADMINISTRATION PROCESSORS

The following pages describe the command sequence and define the commands for the DICTIONARY and ADMINISTRATION Processors.
The DICTIONARY and ADMINISTRATION Processors are used to transmit ENTERed and PREPted event data to the DataBase Master File. The Master File and Dictionary File are "write protected files", consequently, the DICTIONARY – ADMINISTRATION processors can only be accessed by the designated Vapeps DataBase Administrator. The DICTIONARY Processor is used to establish and maintain a Data Dictionary of events on the DataBase Master File. New entries to the Data Dictionary are preceded by using the Vapeps RUN=ADMIN process. This process extracts all words to be defined from the specified event and creates a list for input to the DICTIONARY Processor.

RUN=ADMIN NU, VENT

- command call. This command extracts all words to be defined from the specified event and creates a list for input to the DICTIONARY/PREADMIN command.
- NU - dal unit where event is stored
- VENT - event name

DICTIONARY/PREADMIN NU, EVENT

- command call. This command enters the Direct Dictionary Interface processor which allows for the maintenance of the Data Dictionary.
- NU - dal unit where Data Dictionary resides (unit 15).
- EVENT - name of event whose words are to be added to Data Dictionary

DICTIONARY

- Prompt for any DICTIONARY subcommand. Subcommands are:
  - DEFINE WORD - WORD is word to be defined.
  - DELETE WORD - WORD is word to be deleted. Deletes word, word definition and synonym.
  - LIST WORD - Lists definition and synonym for WORD.
  - LIST SECTION - Lists words in section.
  - SPILL WORD - Spills all information for WORD.
  - SPILL section - Spills all information for section
  - SYNONYM WORD SYNONYM - this command associates another word in the Data Dictionary to the word specified. word = word for which SYNONYM is synonym. SYNONYM = word which is synonym of word.
  - DONE - Exits Data Dictionary

ADMINISTRATION MU

- Command call.
- MU - Unit number of master file. MU defaults to unit 13 if not specified.
- MU sets Master File unit number for run duration unless reset by re-entering the ADMIN processor with a different value. Under normal operation MU should always equal default value

ADMIN

- prompt for any ADMIN subcommand. Subcommands are:
  - SPILL - Used to dump an entire event in symbolic form for transmission to other sites. Input form is SPILL NU, VENT, NOUT, NELT, NVER. (nu, vent = dal unit and event name; nout = fortran unit or dal unit to which card images will be written; if nelt and nver are not specified, will write to fortran unit
neit.nver = element name and version on dal unit nout to which card images will be written. Alternate commands: available in Vapeps are: RUN=ESAV and RUN=SPIL.

**FLIP** - Used to transpose files in the Master File. These files may then be interrogated using general Vapeps commands as opposed to the more specific SEARCH command. This command requires experience with Vapeps and is not normally used.

**SAVE** - Used to write portions of an event file to the Master File. A saved event is available for searching, etc. Input form is SAVE NU.VENT (nu.vent = dal unit and event name). NOTE: The SAVE command writes into the Master File. This requires write access to the Master File which is available only to the Vapeps Administrator. The SAVE command will not execute if an authorization list, prepared by the DICTIONARY/PRADMIN command is not present.
4. APPLICATIONS

Examples of application for the individual processors are shown in the following sections. As previously mentioned in Section 3., a pseudo flowchart format is used, wherein the VAPEPS commands and/or the prompts and responses are presented on the left with explanatory remarks on the right.

In creating a local Database, the required data may be input to the processors by using either the Interactive Mode or the Batch Mode of VAPEPS. The drawback to using the Interactive Mode of VAPEPS is that this mode will dump ALL the input data if an error is detected in ANY of the input data. This mode of operation is recommended only where there is a minimum of inputs.

The Batch Mode is strongly recommended for those operations involving a multiplicity of commands and/or data. In this mode of operation, the command and data inputs to the processors are via structured run streams; consequently, if input errors are present, the data dumped by VAPEPS is still retained in the run stream file. Corrections may then be made to the data in error and the run repeated. A convenient method of operation is to use the Batch Mode with both input and output files; the input file being the run stream and the VAPEPS results being directed to the output file. The output file may then be edited for specific report formats, etc., by using the computer system editor. A typical Batch Mode operation of this type, specifically for the MassComp Computer, uses the command: VAPEPS<ENTER12 >ENTER02. A further recommendation is to use CAPS for all commands.

Five examples are shown in the following sections. Examples 1 thru 3 illustrate the use of the ENTER processor only. Examples 4 and 5 progress, in sequence, thru the ENTER, PREP, DICTIONARY, and ADMINISTRATION processors. Example 4 was developed by excerpting information from Ref. 3. This excellent reference, which documents the creation of a local Database for the Tomahawk Missile, was extremely useful in the development of this tutorial. Example 5 is intended to be a somewhat complete example of a typical VAPEPS process which progresses from the modeling stage to the creation of the local Database. The VAPEPS model of the Galileo Spacecraft: Lower sections is excerpted from the VAPEPS Newsletter, Issue 2, Summer 1988. This is presented in Appendix A. The steps required to create a Database for this model are discussed and the response levels measured in the Galileo protoflight acoustic test are used as input to the ENTER processor in Example 5. Additional examples can be found in Volume IV of Ref. 1.

NOTE: Variations in the output format of the processors may be attributed to the currently installed version of VAPEPS.
4.1 THE ENTER PROCESSOR

The following examples demonstrate the various input and output options available within the ENTER processor. Using the ENTER processor command flowchart for reference while reviewing these problems should expedite the learning curve. When the VAPEPS command is issued, the VAPEPS logo appears. The ENTER command and subsequent entries, and the resulting outputs, are shown in the examples. The Interactive Mode was used in Example 1. The run streams used in the other examples precede the VAPEPS output.
EXAMPLE - I

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4
System UNIX
(Released April 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Current Date: 04/22/88
Current Time: 14:54:31
Available Core: 20000
Execution Mode: Interactive

?enter 1.DEM
DESC: In this example, the optional parameters are not specified.
DESC: Enter implements the default values: isec = 0, nin = 5, ipnt = 1
DESC: ifat = 1. Thus, data will be entered in 1 section from the terminal
DESC: and output will be event desc. plus channel & freq summary.
NDVPC, IFORM, IFREG, ISEQ, IDVER> 1.1.0.0.0

FORMAT: (F9.4,14.14)

EVENT NAME = DEMO, CLASS = 0

EVENT DESCRIPTION:

IN THIS EXAMPLE, THE OPTIONAL PARAMETERS ARE NOT SPECIFIED.
ENTER IMPLEMENTS THE DEFAULT VALUES: ISEC = 0, NIN = 5, IPNT = 1
IFAT = 1. Thus, DATA WILL BE ENTERED IN 1 SECTION FROM THE TERMINAL
AND OUTPUT WILL BE EVENT DESC. PLUS CHANNEL & FREQ SUMMARY.

THIS EVENT CONSISTS OF 3 CHANNELS, WITH
3 FREQUENCY POINTS PER CHANNEL.

RAW DATA FORMAT SPECIFICATIONS

NUNIT = 5  NDVPC = 1  IFORM = 1
IFREG = 0  ISEQ = 0  IDVER = 0

THE INPUT FORMAT IS:
(F9.4,14.14)
START> 160.
FREQUENCIES IN THIRD OCTAVE, START = 160.000
ID, NAME, TYPE, UNITS, RMS: 1, A1, ACC, G2PH
DESC: First Accelerometer
ID, NAME, TYPE, UNITS, RMS: 2, A2, ACC, G2PH
DESC: Second Accelerometer
ID, NAME, TYPE, UNITS, RMS: 10, M1, MIC, DBSP
DESC: First Mic

0.0012  1  1
0.5670  1  2
0.3221  1  3
0.0034  2  1
0.4320  2  2
0.1946  2  3
124.2  10  1
129.1  10  2
128.5  10  3

BEGIN DATA PROCESSING
BLANK CARD ENCOUNTERED AFTER 3 GROUPS
EVENT NAME = DEMO.  CLASS = 0

FREQUENCY SUMMARY
BAND CENTER LEADING TRAILING
1 160.000 140.000 180.000
2 200.000 180.000 224.000
3 250.000 224.000 280.000
EVENT NAME = DEMO.  CLASS = 0

CHANNEL SUMMARY
ID NAME TYPE UNITS INPUT RMS COMMENTS
1 A1 ACC G2PH 0.00000000E+00 FIRST ACCELEROMETER
2 A2 ACC G2PH 0.00000000E+00 SECOND ACCELEROMETER
10 M1 MIC DBSP 0.00000000E+00 FIRST MIC

NORMAL TERMINATION -- DATA SAVED ON DAD UNIT 1
CPU: DELTA, EXECUTION, RUN = 2.57 2.57 3.73
***CIAU***
Example 2
Run Stream ENTER12

enter 1:EXMP.0,5,2,1
In this example, the optional parameters are specified. Enter implements
the values: isec = 0, nin = 5, ipnt = 2, ifat = 1.
Thus, data will be entered in 1 section from the terminal and output
will be event desc. plus channel & freq summary and spectral data
3.4.0.-2
2.1.1.0.0
(2E12 4, A4.14)
20.10
M1.MIC.DBSP
CHAMBER MIC
M2.MIC.DBSP
CHAMBER MIC
V1.NNAC.2QPH
X AXIS ACCEL
2.0000E+01 1.1000E+02 M1 1
3.0000E+01 1.1700E+02 M1 2
4.0000E+01 1.2000E+02 M1 3
5.0000E+01 1.2700E+02 M1 4
2.0000E+01 1.0900E+02 M2 1
3.0000E+01 1.2000E+02 M2 2
4.0000E+01 1.2100E+02 M2 3
5.0000E+01 1.2700E+02 M2 4
2.0000E+01 7.5000E-04 V1 1
3.0000E+01 5.2300E-02 V1 2
4.0000E+01 7.2200E-01 V1 3
5.0000E+01 9.2300E-01 V1 4
EXAMPLE - 2

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4
System UNIX
(Released April 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Current Date: 05/05/88
Current Time: 14:05:46
Available Core: 20000
Execution Mode: Batch

?enter 1, EXMP, O, 5, 2, 1
DESC: In this example, the optional parameters are specified. Enter implements
DESC: the values: isec = 0, nin = 5, ipnt = 2, ifat = 1.
DESC: Thus, data will be entered in 1 section from the terminal and output
DESC: will be event desc. plus channel & freq summary and spectral data
NCHAN, NFRQ, ITPY, ITCH> 3, 4, 0, -2
NDVPC, IFORM, IFREG, ISEQ, IOVER> 2, 1, 1, 0, 0

FORMAT: (2E12, 4, A4, 14)
EVENT NAME = EXMP, CLASS = 0

EVENT DESCRIPTION:

IN THIS EXAMPLE: THE OPTIONAL PARAMETERS ARE SPECIFIED. ENTER IMPLEMENTS
THE VALUES: ISEC = 0, NIN = 5, IPNT = 2, IFAT = 1.
THUS, DATA WILL BE ENTERED IN 1 SECTION FROM THE TERMINAL AND OUTPUT
WILL BE EVENT DESC. PLUS CHANNEL & FREQ SUMMARY AND SPECTRAL DATA

THIS EVENT CONSISTS OF 2 CHANNELS, WITH
4 FREQUENCY POINTS PER CHANNEL.

RAW DATA FORMAT SPECIFICATIONS

NUNIT = 5 NDVPC = 2 IFORM = 1
IFREQ = 1 ISEQ = 0 IOVER = 0

THE INPUT FORMAT IS:
(2E12, 4, A4, 14)
START.DF> 20, 10.

Enter command. Del unit. Event name

Description

3 data channels, 4 frequency bands, constant
bandwidth, 2 line chnl descr. no rename
2 data values, line:.Data.ID. Sequence, freq
and data alternate seq starts @ 1. no overall
format for Data.ID.Sequence

Vapeps output

Prompt-Enter start center freq and delta
LINEAR FREQUENCY VECTOR GENERATED

CENTER FREQUENCY RANGE, DELTA = 20.000 50.000 10.0000

ID, TYPE, UNITS, RMS: M1, MIC, DBSP
DESC: First Chamber Mic
ID, TYPE, UNITS, RMS: M2, MIC, DBSP
DESC: Second Chamber Mic
ID, TYPE, UNITS, RMS: V1, NNAC, G2PH
DESC: X Axis Accelerometer

2.000E+01 1.1000E+02 M1 1
3.000E+01 1.1700E+02 M1 2
4.000E+01 1.2000E+02 M1 3
5.000E+01 1.2700E+02 M1 4
2.000E+01 1.9000E+02 M2 1
3.000E+01 1.2000E+02 M2 2
4.000E+01 1.2100E+02 M2 3
5.000E+01 1.2700E+02 M2 4
2.000E+01 7.5000E-04 V1 1
3.000E+01 5.2300E-02 V1 2
4.000E+01 7.2200E-01 V1 3
5.000E+01 9.2300E-01 V1 4

BLANK CARD ENCOUNTERED AFTER 3 GROUPS
EVENT NAME = EXMP, CLASS = 0

FREQUENCY SUMMARY

<table>
<thead>
<tr>
<th>BAND</th>
<th>CENTER</th>
<th>LEADING</th>
<th>TRAILING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20.000</td>
<td>15.000</td>
<td>25.000</td>
</tr>
<tr>
<td>2</td>
<td>30.000</td>
<td>25.000</td>
<td>35.000</td>
</tr>
<tr>
<td>3</td>
<td>40.000</td>
<td>35.000</td>
<td>45.000</td>
</tr>
<tr>
<td>4</td>
<td>50.000</td>
<td>45.000</td>
<td>55.000</td>
</tr>
</tbody>
</table>

EVENT NAME = EXMP, CLASS = 0

CHANNEL SUMMARY

<table>
<thead>
<tr>
<th>NAME</th>
<th>TYPE</th>
<th>UNITS</th>
<th>INPUT RMS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>MIC</td>
<td>DBSP</td>
<td>0.000000E+00</td>
<td>FIRST CHAMBER MIC</td>
</tr>
<tr>
<td>M2</td>
<td>MIC</td>
<td>DBSP</td>
<td>0.000000E+00</td>
<td>SECOND CHAMBER MIC</td>
</tr>
<tr>
<td>V1</td>
<td>NNAC</td>
<td>G2PH</td>
<td>0.000000E+00</td>
<td>X AXIS ACCELEROMETER</td>
</tr>
</tbody>
</table>

EVENT NAME = EXMP, CLASS = 0

C FREQ M1 M2 V1
20.0000 110000E+03 109000E+03 750000E+03
30.0000 117000E+03 120000E+03 523000E+01
40.0000 120000E+03 121000E+03 722000E+00
50.0000 127000E+03 127000E+03 923000E+00

NORMAL TERMINATION -- DATA SAVED ON DAL UNIT 1

CPU: DELTA, EXECUTION, RUN = 2.58 2.58 7.42
***CIAU***
Example 3
Run Stream ENTERI3

Enter 1. EXMN 0.5 2 1
In this example, the optional parameters are specified. Enter implements
the values isec = 0, min = 5, ipnt = 2, ifat = 1.
Thus, data will be entered in 1 section from the terminal and output
will be event desc, plus channel & freq summary and spectral data.

<table>
<thead>
<tr>
<th>2.B.</th>
<th>1. -2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

(A4, 4F10.4, I4)

<table>
<thead>
<tr>
<th>50</th>
<th>80</th>
<th>140</th>
<th>220</th>
<th>400</th>
<th>700</th>
<th>1200</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>65</td>
<td>110</td>
<td>180</td>
<td>310</td>
<td>550</td>
<td>950</td>
<td>1600</td>
</tr>
</tbody>
</table>

A1: ACC 02PH
Y AXIS: Accelerometer
A2: ACC 02PH
X AXIS: Accelerometer

<table>
<thead>
<tr>
<th>A1</th>
<th>0.0012</th>
<th>0.5670</th>
<th>0.3221</th>
<th>0.0034</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.4320</td>
<td>0.1946</td>
<td>0.0012</td>
<td>0.5670</td>
<td>2</td>
</tr>
<tr>
<td>A2</td>
<td>0.4320</td>
<td>0.5670</td>
<td>0.3221</td>
<td>0.0034</td>
<td>1</td>
</tr>
<tr>
<td>A2</td>
<td>0.0012</td>
<td>0.1946</td>
<td>0.3221</td>
<td>0.1946</td>
<td>2</td>
</tr>
</tbody>
</table>
EXAMPLE - 3

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4
System UNIX
(Released April 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY
Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER &
US AIR FORCE/SPACE DIVISION
User support and database management by
JET PROPULSION LABORATORY

Current Date: 05/10/88
Current Time: 10:32:55
Available Core: 20000
Execution Mode: Batch

Enter command. Del unit. Event name

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 data chns. B freq bands. User spec bands</td>
</tr>
<tr>
<td>2 line chnl descrip no rename</td>
</tr>
<tr>
<td>4 data values/line. ID, Data, Seq. no freq data seq starts @ 1. no overall data</td>
</tr>
</tbody>
</table>

Format for ID, DATA, SEG

Vapeps Output

Enter user spec freq bands

Event Description:

In this example, the optional parameters are specified. Enter implements

the values: isec = 0, nin = 5, ipnt = 2, ifat = 1

Thus, data will be entered in 1 section from the terminal and output

will be event desc. plus channel & freq summary and spectral data

This event consists of 2 channels, with

8 frequency points per channel.

Raw Data Format Specifications

nunit = 5  ndvpc = 4  iform = 3
ifreq = 0  iseq = 0  iover = 0

The input format is:
(A4.4F10.4, I4)

CF=50 .80 .140 .220 .400 .700 .1200 .2000
BE=40 .65 .110 .180 .310 .550 .950 .1600
TL=65 .110 .180 .310 .550 .950 .1600 .2850
FREQUENCIES INPUT FROM CARDS

CENTER FREQUENCY RANGE = 50.000  2000.000

ID. TYPE. UNITS. RMS: A1. ACC. G2PH
DESC: Y AXIS ACCELEROMETER
ID. TYPE. UNITS. RMS: A2. ACC. G2PH
DESC: X AXIS ACCELEROMETER
A1 0.0012 0.5670 0.3221 0.0034 1
A1 0.4320 0.1946 0.0012 0.5670 2
A2 0.4320 0.5670 0.3221 0.0034 1
A2 0.0012 0.1946 0.3221 0.1946 2

BEGIN DATA PROCESSING

BLANK CARD ENCOUNTERED AFTER 2 GROUPS
EVENT NAME = EXMN.  CLASS = 0

FREQUENCY SUMMARY

BAND CENTER LEADING TRAILING
1 50.000 40.000 65.000
2 80.000 65.000 110.000
3 140.000 110.000 180.000
4 220.000 180.000 310.000
5 400.000 310.000 550.000
6 700.000 550.000 950.000
7 1200.000 950.000 1600.000
8 2000.000 1600.000 2850.000
EVENT NAME = EXMN.  CLASS = 0

CHANNEL SUMMARY

ID NAME TYPE UNITS INPUT RMS COMMENTS
A1 A1 ACC G2PH 0.000000E+00 Y AXIS ACCELEROMETER
A2 A2 ACC G2PH 0.000000E+00 X AXIS ACCELEROMETER
EVENT NAME = EXMN.  CLASS = 0

C FREQ A1 A2
50 0000. 120000E-020 432000E+00
80 0000. 567000E+000 567000E+00
140 0000. 322100E+000 322100E+00
220 0000. 340000E-020 340000E-02
400 0000. 432000E+000 120000E-02
700 0000. 194600E+000 194600E+00
1200 0000. 120000E-020 322100E+00
2000 0000. 567000E+000 194600E+00

NORMAL TERMINATION -- DATA SAVED ON DAI UNIT 1

CPU. DELTA. EXECUTION. RUN = 2.68  2.68  3.83

***CIAU***
Example 4
Run stream ENTER14

test
The bulkhead is a 0.2 inch circular plate with a circular central cutout reinforced by a ring stiffener flange about 2.6 inches wide.
Non-structural mass 100 lb guidance, 293 lb payload, 50 lb misc.
The nose cone had a half inch hole for wiring access.
3.19.3-2
1.4.0.0.0
(A4, 14, E10 3)
31 5
MAGV.HSMC, DDBP
average of 3 reverberant chamber microphones (mic 1, mic 2, mic 3)
A45X.NACC.242PH
X AXIS STA 18.35 BULKHEAD/GUIDANCE ACCELEROMETER (A21450)
A24X.NACC.242PH
X AXIS STA 18.35 BULKHEAD ACCELEROMETER (A21240)
MAGV 1 1 244E+02
MAGV 2 1 256E+02
MAGV 3 1 271E+02
MAGV 4 1 286E+02
MAGV 5 1 305E+02
MAGV 6 1 326E+02
MAGV 7 1 349E+02
MAGV 8 1 376E+02
MAGV 9 1 411E+02
MAGV 10 1 446E+02
MAGV 11 1 455E+02
MAGV 12 1 465E+02
MAGV 13 1 476E+02
MAGV 14 1 459E+02
MAGV 15 1 441E+02
MAGV 16 1 426E+02
MAGV 17 1 411E+02
MAGV 18 1 398E+02
MAGV 19 1 381E+02
A45X 1 9 500E-05
A45X 2 8 500E-05
A45X 3 1 500E-04
A45X 4 3 000E-04
A45X 5 6 000E-04
A45X 6 1 500E-03
A45X 7 3 000E-03
A45X 8 8 000E-04
A45X 9 1 000E-02
A45X 10 2 500E-02
A45X 11 8 000E-03
A45X 12 1 200E-02
A45X 13 1 700E-02
A45X 14 4 500E-03
A45X 15 2 000E-03
A45X 16 1 400E-03
A45X 17 1 000E-03
A45X 18 8 000E-04
A45X 19 1 200E-04
A24X 1 5 000E-05
A24X 2 4 600E-03
A24X 3 7 000E-03
A24X 4 1 000E-04
A24X 5 1 400E-04
A24X 6 3 400E-04
A24X 7 8 000E-04
A24X 8 2 000E-04
A24X 9 3 000E-03
A24X 10 8 000E-03
A24X 11 8 000E-04
A24X 12 4 000E-03
A24X 13 2 000E-03
A24X 14 1 000E-02
A24X 15 2 000E-03
A24X 16 1 400E-03
A24X 17 3 000E-03
A24X 18 1 600E-03
A24X 19 1 200E-03
EXAMPLE - 4

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4 1
System MASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY
Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION
User support and database management by
JET PROPULSION LABORATORY

Date: Friday, August 12, 1988  Time:  1:14:59 PM.
Execution mode: Batch  Core Size:  20000 words

?enter 1.t23.0.5.2.0
DESC:  The bulkhead is a 0.2 inch circular plate with a circular central cutout
DESC:  reinforced by a ring stiffener flange about 2.6 inches wide.
DESC:  Non-structural mass: 100 lb guidance. 293 lb payload. 50 lb misc.
DESC:  The nose cone had a half inch hole for wiring access.
NCHAN, NFRG, ITYP, ITCH) 3.19.3.-2
NDVPC, IFREG, ISEQ, IOVER 1.4.0.0.0
FORMAT: (A4, I4, E10.3)
EVENT NAME = T23 ,  CLASS =  0

EVENT DESCRIPTION:
THE BULKHEAD IS A 0.2 INCH CIRCULAR PLATE WITH A CIRCULAR CENTRAL CUTOUT
REINFORCED BY A RING STIFFENER FLANGE ABOUT 2.6 INCHES WIDE.
NON-STRUCTURAL MASS: 100 LB GUIDANCE. 293 LB PAYLOAD. 50 LB MISC.
THE NOSE CONE HAD A HALF INCH HOLE FOR WIRING ACCESS.

THIS EVENT CONSISTS OF 3 CHANNELS, WITH
19 FREQUENCY POINTS PER CHANNEL.

RAW DATA FORMAT SPECIFICATIONS
     NUNIT = 5   NDVPC = 1   IFORM = 4
     IFREG = 0   ISEQ = 0   IOVER = 0
THE INPUT FORMAT IS:
(A4, I4, E10.3)
START > 31.5

FREQUENCIES IN THIRD OCTAVE, START = 31.500

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<th>UNITS</th>
<th>RMS</th>
<th>DESC</th>
</tr>
</thead>
<tbody>
<tr>
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<td>AVG</td>
<td>NSMC</td>
<td>DBSP</td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td>STA</td>
<td>18.35</td>
<td>BULKHEAD/GUIDANCE ACCELEROMETER (A2140)</td>
</tr>
<tr>
<td>3</td>
<td>Y</td>
<td>STA</td>
<td>18.35</td>
<td>BULKHEAD ACCELEROMETER (A2140)</td>
</tr>
</tbody>
</table>

BEGIN DATA PROCESSING

BLANK CARD ENCOUNTERED AFTER 3 GROUPS

EVENT NAME = T23, CLASS = 0

FREQUENCY SUMMARY

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<tr>
<th>BAND</th>
<th>CENTER</th>
<th>LEADING</th>
<th>TRAILING</th>
</tr>
</thead>
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<td>35.500</td>
</tr>
<tr>
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<td>560.000</td>
<td>710.000</td>
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<td>800.000</td>
<td>710.000</td>
<td>900.000</td>
</tr>
<tr>
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<td>1000.000</td>
<td>900.000</td>
<td>1120.000</td>
</tr>
<tr>
<td>17</td>
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<td>1120.000</td>
<td>1400.000</td>
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<tr>
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<td>1600.000</td>
<td>1400.000</td>
<td>1800.000</td>
</tr>
<tr>
<td>19</td>
<td>2000.000</td>
<td>1800.000</td>
<td>2240.000</td>
</tr>
</tbody>
</table>

Prompt - enter start center freq.
Prompt - enter desc for 3 channels 2 lines/channel.
Enter data: ID, seq, Data
Blank line after last data entry.
Vapeps output.
**EVENT NAME = T23 , CLASS = 0**

**CHANNEL SUMMARY**

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>TYPE</th>
<th>UNITS</th>
<th>INPUT RMS</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAVG</td>
<td>MAVG</td>
<td>NSMC</td>
<td>DBSP</td>
<td>0.000000E+00</td>
<td>AVERAGE OF 3 REVERBERANT CHAMBER MICROPHONES (MIC 1, MIC 2, MIC 3)</td>
</tr>
<tr>
<td>A45X</td>
<td>A45X</td>
<td>NACC</td>
<td>G2PH</td>
<td>0.000000E+00</td>
<td>X AXIS STA 18.35 BULKHEAD/GUIDANCE ACCELEROMETER (A21450)</td>
</tr>
<tr>
<td>A24X</td>
<td>A24X</td>
<td>NACC</td>
<td>G2PH</td>
<td>0.000000E+00</td>
<td>X AXIS STA 18.35 BULKHEAD ACCELEROMETER (A21240)</td>
</tr>
</tbody>
</table>

**C. FREQ MAVG A45X A24X**

| 31.5000 | 121400E+03 | 950000E-04 | 500000E-04 | 0.000000E-04 |
| 40.0000 | 123600E+03 | 850000E-04 | 460000E-04 | 0.000000E-04 |
| 50.0000 | 127100E+03 | 150000E-03 | 700000E-04 | 0.000000E-03 |
| 63.0000 | 128600E+03 | 300000E-03 | 100000E-03 | 0.000000E-03 |
| 80.0000 | 130500E+03 | 600000E-03 | 140000E-03 | 0.000000E-03 |
| 100.0000 | 132600E+03 | 150000E-02 | 340000E-03 | 0.000000E-03 |
| 125.0000 | 134900E+03 | 300000E-02 | 800000E-03 | 0.000000E-03 |
| 160.0000 | 137600E+03 | 800000E-03 | 200000E-03 | 0.000000E-03 |
| 200.0000 | 141100E+03 | 100000E-01 | 300000E-02 | 0.000000E-02 |
| 250.0000 | 144600E+03 | 250000E-01 | 800000E-02 | 0.000000E-02 |
| 315.0000 | 145350E+03 | 800000E-02 | 800000E-03 | 0.000000E-03 |
| 400.0000 | 146500E+03 | 120000E-01 | 400000E-02 | 0.000000E-02 |
| 500.0000 | 147600E+03 | 170000E-01 | 200000E-02 | 0.000000E-02 |
| 630.0000 | 149900E+03 | 450000E-02 | 110000E-01 | 0.000000E-01 |
| 800.0000 | 144100E+03 | 200000E-02 | 200000E-02 | 0.000000E-02 |
| 1000.0000 | 142600E+03 | 140000E-02 | 140000E-02 | 0.000000E-02 |
| 1250.0000 | 141100E+03 | 100000E-02 | 300000E-02 | 0.000000E-02 |
| 1600.0000 | 139800E+03 | 800000E-03 | 160000E-02 | 0.000000E-02 |
| 2000.0000 | 138100E+03 | 120000E-03 | 120000E-02 | 0.000000E-02 |

NORMAL TERMINATION -- DATA SAVED ON DAL UNIT 1

CPU: DELTA, EXECUTION, RUN = 3.28 3.28 3.95

***CIAU***
Example - 5
Run Stream ENTERIS

ENTER 1. O.L. G. 5.2.0

The Galileo despun section is a magnesium cone with 25 aluminum
stiffeners, 2 magnesium doublers, and 8 aluminum longerons. The cone
is assumed to be a flat plate with a width equal to the height of the
cone and a length equal to the cone circumference at its midpoint.

1.8.3.2
1.1.0.0.0
(E11 4, A2.13)
40 0
A1, ACC.2PH
X. AXIS ACCELEROMETER
A2. ACC.2PH
Y. AXIS ACCELEROMETER
A3. ACC.2PH
Z. AXIS ACCELEROMETER
9 3146E-05 A1 1
9 4714E-05 A1 2
4 9288E-03 A1 3
5 9058E-03 A1 4
5 8734E-02 A1 5
6 2909E-02 A1 6
3 3795E-02 A1 7
4 3050E-02 A1 8
2 5032E-02 A1 9
5 6688E-02 A1 10
3 6252E-02 A1 11
3 3321E-02 A1 12
3 4046E-02 A1 13
5 4812E-03 A1 14
9 2013E-03 A1 15
2 1639E-03 A1 16
4 7687E-04 A1 17
3 1655E-04 A1 18
7 4711E-07 A3 1
1 4473E-06 A3 2
1 2278E-05 A3 3
5 2986E-05 A3 4
4 0889E-04 A3 5
4 7636E-04 A3 6
3 1537E-04 A3 7
3 3182E-04 A3 8
1 2759E-04 A3 9
2 4180E-04 A3 10
2 3219E-04 A3 11
2 2942E-04 A3 12
2 1757E-03 A3 13
3 0299E-03 A3 14
1 3460E-02 A2 11
1 3460E-02 A2 12
5 6581E-03 A2 12
5 9288E-03 A2 13
1 0734E-02 A2 14
1 3460E-02 A2 15
3 6732E-02 A2 16
3 6732E-02 A2 16
6 1814E-07 A2 17
1 6562E-03 A2 18
3 0276E-06 A2 18
EVENT DESCRIPTION:

THE GALILEO DESPUN SECTION IS A MAGNESIUM CONE WITH 25 ALUMINUM STIFFNERS, 2 MAGNESIUM DOUBLERS, AND 6 ALUMINUM LONGERONS. THE CONE IS ASSUMED TO BE A FLAT PLATE WITH A WIDTH EQUAL TO THE HEIGHT OF THE CONE AND A LENGTH EQUAL TO THE CONE CIRCUMFERENCE AT ITS MIDPOINT.

THIS EVENT CONSISTS OF 3 CHANNELS, WITH 19 FREQUENCY POINTS PER CHANNEL.

RAW DATA FORMAT SPECIFICATIONS

NUNIT = 5  NDVPC = 1  IFORM = 1
IFREG = 0  ISEQ = 0  IOVER = 0

---

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MAASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER &
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Friday, September 16, 1988
Time: 8:44:08 AM
Execution mode: Batch
Core Size: 20000 words

?ENTER 1,QLL,0.5,2.0
DESC: The Galileo despun section is a magnesium cone with 25 aluminum stiffeners, 2 magnesium doublers, and 6 aluminum longerons. The cone is assumed to be a flat plate with a width equal to the height of the cone and a length equal to the cone circumference at its midpoint.
NCHAN,NFRQ,ITYP,ITCH> 3,18,3,-2
NDVPC,IFORM,IFREG,ISEQ,IOVER> 1,1,0,0,0
FORMAT: (E11.4,A2,13)

EVENT NAME = QLL, CLASS = 0

ENTER Cnmd.DAL 1,Event QLL, 1 data sect.,
Terminal input, Print all.

Description

3 Chnls, 18 Freqs, 1/3 Octave, 2 lines/Chnl,
1 data value/line, Data ID Seq.
Format for Data ID Seq.

Vapeps Output
THE INPUT FORMAT IS:
(E11 4. A2, I3)
START = 40.0

FREQUENCIES IN THIRD OCTAVE, START = 40.000

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<tr>
<th>ID</th>
<th>TYPE</th>
<th>UNITS</th>
<th>RMS</th>
<th>A1</th>
<th>ACC</th>
<th>G2PH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DESC: X AXIS ACCELEROMETER

ID: TYPE | UNITS | RMS  | A2 | ACC | G2PH |

DESC: Y AXIS ACCELEROMETER

ID: TYPE | UNITS | RMS  | A3 | ACC | G2PH |

DESC: Z AXIS ACCELEROMETER

BEGIN DATA PROCESSING

BLANK CARD ENCOUNTERED AFTER 3 GROUPS
EVENT NAME = GLL, CLASS = 0

FREQUENCY SUMMARY

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<th>BAND</th>
<th>CENTER</th>
<th>LEADING</th>
<th>TRAILING</th>
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<td>900.000</td>
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<tr>
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<tr>
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<td>1800.000</td>
</tr>
<tr>
<td>18</td>
<td>2000.000</td>
<td>1800.000</td>
<td>2240.000</td>
</tr>
</tbody>
</table>

Prompt: Enter start Frequency

Prompt: Enter desc for 3 channels 2 lines/ channel

Enter Data: Data, ID, Seq

Blank line after last data entry

Vapeps Output
EVENT NAME = GLL  CLASS = 0

CHANNEL SUMMARY

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>TYPE</th>
<th>UNITS</th>
<th>INPUT RMS</th>
<th>COMMENTS</th>
</tr>
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<tbody>
<tr>
<td>A1</td>
<td>A1</td>
<td>ACC</td>
<td>G2PH</td>
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<td>X AXIS ACCELEROMETER</td>
</tr>
<tr>
<td>A2</td>
<td>A2</td>
<td>ACC</td>
<td>G2PH</td>
<td>0 000000E+00</td>
<td>Y AXIS ACCELEROMETER</td>
</tr>
<tr>
<td>A3</td>
<td>A3</td>
<td>ACC</td>
<td>G2PH</td>
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<td>Z AXIS ACCELEROMETER</td>
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C FREQ  A1  A2  A3

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<th>A2</th>
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<td>669540E-020</td>
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<td>408890E-03</td>
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<td>165620E-020</td>
<td>302760E-05</td>
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</tbody>
</table>

NORMAL TERMINATION -- DATA SAVED ON DAI UNIT 1
CPU DELTA, EXECUTION, RUN = 3.35 3.35 4.07
***CIAU***
4.2 THE PREP PROCESSOR

Examples 4 and 5 are continued in this section. After the vibroacoustic data is stored in the ENTER processor, the PREP processor is used to define the database event and standardize the raw data input from ENTER. The PREP processor command flow-chart may be referenced for the sequence of commands used. The input run streams for these two examples are designated as PREPI4 and PREPI5, respectively. These run streams precede the VAPEPS output of the PREP processor.
Example 4
Run stream PREP14

PREP 1, T23
BOOK
PROC ODC_TESTLAB, TOMAHAWK, TLAM, T23
CONT ODC, TOMAHAWK, TLAM, T23
CDOU JCMF, TOMAHAWK, TLAM, T23
DATE 09/08/82
LOCA SAN_DIEGO, HARBOR_DRIVE, TEST_CHAMBER, T23
EVENT GROUND, REVERBERANT, ACCEPTANCE, 157_dB_OASPL
VEHICLE CRUISE_MSL, TOMAHAWK, TLAM, T23
DESC
1 RPT 76A7575 T-23 MODIFIED ACoustIC ACCEPTANCE TEST BGM-109A/G 9/27/82
2 QUALIFICATION TEST VEHICLE IN TLAM CONFIGURATION, W-80 SIMULATED WARHEAD
3 TEST LEVEL 157 dB OASPL
4 DONE
LIST
DONE
DONE
CHECK
CMP
INPUT
* FUSE, FUSELAGE, TLAM
FUSE, NOSE, NOSECON, TLAM
END
DONE
DONE
MODULES
DAMO DP4
DESC N12340, DFCOND, NOSE
EXTRA HARBOR_DRIVE, TEST_CHAMBER, CELL
P* TYPE=1, RH0=1.12E-7, AP=2, E=5, V=1, E=6, AAC=0, 02. CO=13200
C* MAVG
SKIN FIBERGLASS, NOSECON, CONE
P* TYPE=3, RH0=2, 07E-4, RH05=2.8E-5, ASMS=0., H=2, Q=2, 0. D=20. 37
P* DL=18 35, ALX=18 35, ALY=64, PATA=64, AP=875, BETA=16.
P* E=5, E=6, DLF=0.05, CL=1.15E+5
INTA t23, NOSE_CAVITY, NCAV
P* TYPE=1, RH0=1.12E-7, AP=2600, V=700, AAC=0, 02. CO=13200
MDT STA_18 35, BULKHEAD, BULK
P* TYPE=3, RH0=2, 617E-4, ASMS=1.15, H=2, ALX=18
P* ALY=18, PATA=105, BULX=64, AP=171, E=10, 5E+6
P* DLF=0.05, CL=2.1E+5
C* A42A, A45X
DONE
ATTACH DP4, NOSE, FUSE
DUMP
LIST
DAMO DP4
DESC N12300, DF0000, FUSE
EXTRA HARBOR_DRIVE, TEST_CHAMBER, CELL
P* TYPE=1, RH0=1.12E-7, AP=2, E=5, V=1, E=6, AAC=0, 02. CO=13200
C* MAVG
SKIN FORWARD, FUSELAGE, CYLIN
P* TYPE=2, RH0=2, 617E-4, RH05=2.09E-5, ASMS=0.0500, H=0.08
P* D=20, 37, BL=34, AL=34, ALX=64, PATA=128, AP=2182.
P* E=10, 5E+6, DLF=0.05, CL=2.10E+5
INTA t23, FUSE_CAVITY, FCAY
P* TYPE=1, RH0=1.12E-7, AP=3250, V=8460, AAC=0, 02. CO=13200
DONE
ATTACH DP4, FUSE, FUSE
DUMP
LIST
SAVE
DONE
DONE
TDC 1
EXAMPLE - 4 (cont)

VAPES
(VibroAcoustic Payload Environment Prediction System)
Version 5.4
System UNIX
(Released April 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Current Date: 06/20/88
Current Time: 13:24:25
Available Core: 20000
Execution Mode: Batch

?PREP 1 . T23, 0
PREP.BOOK
BOOK>PROC GDC.TESTLAB, TOMAHAWK, TLAM, T23
BOOK>CONT GDC, TOMAHAWK, TLAM, T23
BOOK>CDON JCM, TOMAHAWK, TLAM, T23
BOOK>DATE 09/08/82
BOOK>LOCA SAN_DIEGO, HARBOR_DRIVE, TEST_CHAMBER, T23
BOOK>EVENT GROUND, REVERBERANT, ACCEPTANCE, 157 DB_OASPL
BOOK>VEHICLE CRUISE_MSL, TOMAHAWK, TLAM, T
BOOK>DESC
DESC>1 RPT 76A7575 T-23 MODIFIED ACOUSTIC ACCEPTANCE TEST BGM-109A/G 9/27/82
DESC>2 QUALIFICATION TEST VEHICLE IN TLAM CONFIGURATION, W-80 SIMULATED WARHEAD.
DESC>3 TEST LEVEL 157 DB OASPL.
DESC>4
DESC>DONE
BOOK>LIST
PROCESS GDC.TESTLAB TOMAHAWK TLAM T23
CONTRACT GDC TOMAHAWK TLAM T23
CDON JCM TOMAHAWK TLAM T23
DATE 09/08/82
EVENT GROUND REVERBERANT ACCEPTANCE 157 DB_OASPL
LOCATION SAN_DIEGO HARBOR_DRIVE TEST_CHAMBER T23
VEHICLE CRUISE_MSL TOMAHAWK TLAM T23

RPT 76A7575 T-23 MODIFIED ACOUSTIC ACCEPTANCE TEST BGM-109A/G 9/27/82
QUALIFICATION TEST VEHICLE IN TLAM CONFIGURATION, W-80 SIMULATED WARHEAD
TEST LEVEL 157 DB OASPL.

BOOK>DONE
BOOK DATA SAVED
PREP> CHECK
PREP> CONF
CONF> INPUT
LIGSM> FUSE, FUSELAGE, TLAM
LIGSM> FUSE, NOSE, NOSECON, TLAM
LIGSM> END
CONF> LIST
  1: FUSE FUSELAGE TLAM
  2: FUSE NOSE NOSECON TLAM
CONF> DONE
WARNING: THE FOLLOWING GENERIC NAMES ARE NOT IN THE MASTER DIRECTORY
FUSELAGE
NOSECON
WARNING: THE FOLLOWING SPECIFIC NAMES ARE NOT IN THE MASTER DIRECTORY
TLAM
NO ERRORS
PREP> MODULES
MODS> DAMD DPA4
DAMD> DESC NI2340. DFOONO. NOSE
DAMD> EXTRA HARBOR_DRIVE, TEST_CHAMBER, CELL
EXTA> P* TYPE=1, RHQ=1.12E-7, AP=2, E=3, V=1, E=6, AAC=0.02, CO=13200.
EXTA> C= MAVG
EXTA> SKIN FIBERGLASS, NOSECON, CONE
SKIN> P* TYPE=3, RHQ=2.07E-4, RHG=0.28E-5, ASMS=0.4, D=20.37
SKIN> BL=18.35, ALX=18.35, ALY=64.5, PATA=64.5, AP=875, BETA=16.
SKIN> E=2.5E-6, DLF=0.05, CL=1.15E+3
SKIN> INTA T23, NOSE_CAVITY, NCAV
INTA> P* TYPE=1, RHQ=1.12E-7, AP=2600, V=700, AAC=0.02, CO=13200.
INTA> MONT STA18.35, BULKHEAD BULK
MONT> P* TYPE=3, RHQ=2.617E-4, ASMS=1.15, H=0.2, ALX=18.
MONT> A1Y=18, PATA=105.8, BL=64.5, AP=171.2, E=10.5E+6
MONT> DLF=0.05, CL=2, E=6+5
MONT> C= A24X, A43X
MONT> DONE
MODS> ATTACH DPA4, NOSE, FUSE
MODS> DUMP
  1 DPA4 NOSE FUSE 0 0 0 NI2340 DFOONO NOSE

Collects and converts Enter data
Prep SubCmd- to enter configuration tree
Config SubCmd- to input tree data
tree data
end data
List Configuration tree
Væpeps response
Exit CONF
Warning issued because names are yet to be
defined by DICTIONARY(See Dict-Admin ProcDr)

Prep SubCmd- to enter SEA Model data
input at MODULES prompt
DAMD prompt-SubCmd DESC for descrpnt
DAMD prompt-SubCmd EXTRA for data

Enter SEA Model parameters

MODS SubCmd-attach mod to config tree
Long list- event's MODULES table
Væpeps response

A shorter listing of event's module table
MODS> DAMO DP84
DAMO>DESC N12300, DF000, FUSE
DAMO>EXTA HARBOR_DRIVE, TEST_CHAMBER, CELL
EXTA> TYPE=1, RHO=1.12E-7, AP=2. E=5, V=1. E=6, AAC=0.02. CO=13200.
EXTA>C MAVG
EXTA>SKIN FORWARD. FUSELAGE, CYLIN
SKIN> TYPE=2, RHO=2, 6.17E-4. RHOS=2.09E-5. ASMS=0.050. H=0.08
SKIN> D=20.37, BL=34.1, ALX=34.1, ALY=64, PATA=128, AP=2182
SKIN> E=10-6, DLF=0.03, CL=2. 10E+5
SKIN> INTA 23, FUSE_CAVITY, PCAV
INTA> TYPE=1, RHO=1, 1.2E-7. AP=3250, V=8460, AAC=0.02, CO=13200.
INTA>DONE
MODS>ATTACH DP84, FUSE, FUSE
MODS>DUMP

1 DP 4 noe fuse 0 0 0 N12340 DF000 NOSE

EXTA 0 1 0 0 0 0 0 0 0 HARBOR_DRIVE TEST CHAMBER CELL
SKIN 0 0 0 0 0 0 0 0 0 FIBERGLASS NOSE CONE CONE
INTA 0 0 0 0 0 0 0 0 0 T23 NOSE CAVITY NCAV
MONT 0 0 0 0 0 0 0 0 0 STA_10.35 BULKHEAD BULK
INST 0 0 0 0 0 0 0 0 0
FRAM 0 0 0 0 0 0 0 0 0

2 DP 4 FUSE FUSE 0 0 0 N12300 DF0000 FUSE

EXTA 0 1 0 0 0 0 0 0 0 HARBOR_DRIVE TEST CHAMBER CELL
SKIN 0 0 0 0 0 0 0 0 0 FIBERGLASS NOSE CONE CONE
INTA 0 0 0 0 0 0 0 0 0 T23 NOSE CAVITY NCAV
MONT 0 0 0 0 0 0 0 0 0 STA_10.35 BULKHEAD BULK
INST 0 0 0 0 0 0 0 0 0
FRAM 0 0 0 0 0 0 0 0 0

MODS>LIST

DAMO CNTG ZONE GLBL IX IY IZ DESCRIPTIONS

1 DP 4 FUSE FUSE 0 0 0 N12340 DF000 NOSE
2 DP 4 FUSE FUSE 0 0 0 N12300 DF0000 FUSE

MODU subcmd DAMO to create Dts data module in Event module table
MODU subcmd DESC, EXTA for data inputs

SEA Model Inputs

Exit INTA Vapeps prompts with MODS
Long list data module
Vapeps response

Short list data module
Vapeps response
MODS>SAVE
WARNING. THE FOLLOWING TERMS ARE NOT IN THE MASTER GLOSSARY.
NOSECON. CONE. T23. NOSE_CAVITY. NCAV
STA.18.35. BULKHEAD. BULK. DF0000. FUSE
FORWARD. FUSELAGE. CYLIND. FUSE_CAVITY. FCAV
0 ERRORS IN 2 MODULES. 4 CHANNELS. DESC LENGTH = 23
SAVE COMPLETE
MODS>DONE
PREP>DONE
UPDATING PREP STATUS
?TOC 1

TABLE OF CONTENTS FOR DAL UNIT 1. DAL001

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CPU: DELTA. EXECUTION. RUN = 7.18 7.18 8.28

***CIAU***
Example - 5
Run stream PREP15

PREP 1. GLL 0
BOOK
PROC JPL,GALILEO,DESUN_SEC, GLL
CONT JPL,GALILEO,DESUN_SEC, GLL
CDGN JPL,GALILEO,DESUN_SEC, GLL
DATE 09/24/84
LOCA PASADENA, JPL, ACOUSTIC, CHAMBER
EVENT GROUND, REVERBERANT, PROTOFLIGHT, SYSTEM_LEVEL
VEHICLE SHUTTLE, ATLANTIS, GALILEO, STS-34
DESC
1 REPORT JPL D-1936, FEBRUARY, 1985 GALILEO (GLL) PROTOFLIGHT
2 SPACECRAFT ACOUSTIC TEST REPORT
3 FINAL SYSTEM LEVEL TEST, COMPLETE SPACECRAFT
4 142 dB DASPL
DONE
LIST
DONE
CHECK
CONF
INPUT
* . DESP, DESPUN, GLL_DESP_SEC
END
DONE
MODULES
DAMG DPA4
DESC NI2300, DFN000, GLL_DESP_SEC
EXTA JPL, ACQ, CHA, NITROGEN, REVERBERANT
P * TYPE=1. RHO=1. 14BE-7. AP=4. 130E+5. V=1. 773E+7. AAC=1. 5E-2. CD=1. 376E+4
SKIN GLL_DSP_CONE, MAGNESIUM, STIFFENERS
P * TYPE=5. RHO=1. 246E-4. RHOS=1. 172E-5. ABMS= 919, H= 1477
P * D=55. BL=12. AL=160. ALv=12. PARA=320. AP=1874
P * E=4. 890E+6. DL=0. 05. C1=1. 980E+5
C* A1, A2, A3
INTA DSP_CONE_INT, NITROGEN, REVERBERANT
DONE
ATTACH DPA4, DESP, DESP
DUMP
LIST
SAVE
DONE
DONE
EXAMPLE - 5 (cont)

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Thursday, October 27, 1988
Time: 3:06:30 PM.
Execution mode: Batch
Core Size: 20000 words

?PREP 1, GLL, 0
PREP> BOOK
BOOK>PROC JPL, GALILEO, DESPUN_SEC, GLL
BOOK>CONT JPL, GALILEO, DESPUN_SEC, GLL
BOOK>COGN JPL, GALILEO, DESPUN_SEC, GLL
BOOK>DATE 09/24/84
BOOK>LOCA PASADENA, JPL, ACOUSTIC, CHAMBER
BOOK>EVENT GROUND, REVERBERANT, PROTOFLIGHT, SYSTEM_LEVEL
BOOK>VEHICLE SHUTTLE, ATLANTIS, GALILEO, STS-34
BOOK>DESC
DESC>1 REPORT JPL, D-1936, FEBRUARY, 1985 GALILEO (GLL) PROTOFLIGHT
DESC>2 SPACECRAFT ACOUSTIC TEST REPORT
DESC>3 FINAL SYSTEM LEVEL TEST, COMPLETE SPACECRAFT
DESC>4 142 dB GASPL
DESC>DONE

BOOK>LIST
PROCESSI JPL GALILEO PROTOFLIGHT GLL
CONTRACT JPL GALILEO DESPUN_SEC GLL
COGNIZNT JPL GALILEO DESPUN_SEC GLL
DATE 09/24/84
EVENT GROUND REVERBERANT PROTOFLIGHT SYSTEM_LEVEL
LOCATION PASADENA JPL ACOUSTIC CHAMBER
VEHICLE SHUTTLE ATLANTIS GALILEO STS-34

REPORT JPL, D-1936, FEBRUARY, 1985 GALILEO (GLL) PROTOFLIGHT
SPACECRAFT ACOUSTIC TEST REPORT
FINAL SYSTEM LEVEL TEST, COMPLETE SPACECRAFT
142 dB GASPL
BOOK>DONE
BOOK DATA SAVED

Prep Cmd: DA1 I.event GLL, I data sect-Enter
Prep SubCmd to enter keywords

Book SubCmds

Exit Desc
Short listing of Book contents

Vapeps response

Exit Book
PREP> CHECK
PREP> CONF
CONF> INPUT
LTGSEM>*, DESP, DESPUN, GLL_DESP_SEC
LTGSEM> END
CONF> DONE
WARNING: THE FOLLOWING GENERIC NAMES ARE NOT IN THE MASTER DIRECTORY
DESPUN
WARNING: THE FOLLOWING SPECIFIC NAMES ARE NOT IN THE MASTER DIRECTORY
GLL_DESP_SEC
NO ERRORS
PREP> MODULES
MODULE> DPA4
DAMO> DESC N12300, DFNO00, GLL_DESP_SEC
DAMO> EXTA JPL_ACO_CHM, NITROGEN, REVERBERANT
EXTA> TYPE=1, RHQ=1.148E-7, AP=4, 130E=5, V=1, 773E=7, AAC=1.5E-2, CD=1.376E+4
EXTA> SKIN GLL_DSP_CONE, MAGNEXMUM, STIFFENERS
SKIN> TYPE=5, RHQ=1.24E-4, RHQS=1.172E-5, ASMS=919, M=1477
SKIN> D=55, BL=12, ALX=160, ALY=120, PATA=320, AP=1974.5
SKIN> E=4.890E+6, DLF=.03, C1=1.980E+5
SKIN> C= A1, A2, A3
SKIN> INTA DSP_CONE_INT, NITROGEN, REVERBERANT
INTA> TYPE=1, RHQ=1.148E-7, AP=2, 2802E+4, V=4, 02132E+5, AAC=0.015, CD=1.376E+4
INTA> DONE
MODULE> ATTACH DPA4, DESP, DESP
MODULE> DUMP

1 DPA1 DESP IUS 0 0 0 DESP IUS GLL

EXTA 0 0 0 0 0 0 JPL_TEST_CHAMBER_CELL
SKIN 0 0 0 0 0 0 DESPUN_UPAD IUS
INTA 0 0 0 0 0 0 GLL_CAVITY_DESP
MONT 0 0 0 0 0 0
INST 0 0 0 0 0 0
FRAM 0 0 0 0 0 0

2 DPA4 DESP DESP 0 0 0 N12300 DFNO00 GLL_DESP_SEC

EXTA 0 0 0 0 0 0 JPL_ACO_CHM NITROGEN REVERBERANT
SKIN 0 0 0 0 0 0 GLL_DSP_CONE_MAGNEXMUM STIFFENERS
INTA 0 0 0 0 0 0 DSP_CONE_INT NITROGEN REVERBERANT
MONT 0 0 0 0 0 0
INST 0 0 0 0 0 0
FRAM 0 0 0 0 0 0

Collect & convert Enter data SubCmd to enter Config tree
SubCmd to input data Enter config data
Exit Config Warning: terms not yet defined see DICT-ADMIN

SubCmd to enter SEA model data

SEA Model data

Exit Inta Attach data module to Config tree
Long list data module

Vapeps response
MODS>LIST

DAMO CNFG ZONE GLBL IX IY IZ DESCRIPTIONS
1 DPA1 DESP IUS 0 0 0 DESP IUS GLL
2 DPA4 DESP DESP 0 0 0 N12300 DFN000 GLL_DESP_SEC

MODS>SAVE
WARNING. THE FOLLOWING TERMS ARE NOT IN THE MASTER GLOSSARY:
DESP IUS GLL JPL TEST_CHAMBER
CELL DESPUN UPAD GLL_DESP_SEC JPL_ACO_CHM
REVERBERANT GLL_DSP_CONE STIFFENERS DSP_CONE_INT
0 ERRORS IN 2 MODULES. 6 CHANNELS. DESC LENGTH = 19
SAVE COMPLETE
MODS>DONE
PREP>DONE
UPDATING PREP STATUS
CPU: DELTA, EXECUTION: RUN = 5.38 5.38 6.03
***CIAU***

Short Listing of data module

Save module table

Terms yet to be defined.
(see DICT- ADMIN Processor)

Exit Mods
Exit Prep
4.3 THE DICTIONARY AND ADMINISTRATION PROCESSORS

Examples 4 and 5 are continued in this section. After the event is PREPared, these processors are used to transmit the event to the local Database Master File. The command flow for these two processors may be referenced for the sequence of commands. The input run streams for these two examples are designated as ADMINI4 and ADMINI5, respectively. These run streams use the command inputs: fnname 13, 'DBT' and fnname 15, 'DICTIONARY.DAL' to establish pseudo local Database Master Files and Dictionaries for these events. These pseudo files may be accessed without permission of the Database Administrator. The commands :run=event t23 all unit=1, and run=event GLL all unit=1, respectively, were used to print the events for these two examples.

On the initial callup of the Dictionary and Administration Processors, VAPEPS will require definitions of the terms in the data module. The event cannot be saved until these terms are defined for the data dictionary. To illustrate this phase of the process of creating a database, two examples of using the dictionary are provided in Appendix D. These two examples, which relate to Examples 4 and 5 of the text, demonstrate the method of defining terms for the data dictionary. These examples should be reviewed prior to continuing with the text Examples 4 and 5 wherein all terms for the data module have been defined.
EXAMPLE - 4 (cont)

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKEED MISSILES & SPACE COMPANY
Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Friday, August 19, 1988 Time: 1:16:51 PM
Execution mode: Batch Core Size: 20000 words

?fname 13, 'DBT'
?fname 15, 'DICTIONARY.DAL'
?run=admin 1,t23
?dictionary/preadmin 1,t23

Welcome to Data Dictionary version 1.0

Dictionary > list
Word not found.

Dictionary > done

ACCEPTANCE CRUISE_MSL QDC QDC_TESTLAB GROUND
HARBOUR_DRIVE JCMC REVERBERANT SAN_DIEGO TEST_CHAMBER

leaving Data Dictionary.

?admin
ADMIN>save 1,t23
SAVE THE WORLD
THAT WAS EVENT NUMBER 1
ADMIN>done

?toc 1

TABLE OF CONTENTS FOR DAL UNIT 1 DAL001

SEQ RR DATE TIME E WORDS NR NC T ELM VER C1 C2
1 -16 BB0705 135001 0 57 19 3 1 SPDT T23 0 0
2 -20 BB0705 135001 0 69 23 3 4 CHAN T23 0 0
3 -24 BB0705 135001 0 80 80 1 4 EVNT T23 0 0
4 -28 BB0705 135001 0 57 19 3 1 FREG T23 0 0
5 32 BB0705 135040 0 100 100 1 0 PREP T23 0 0
6 36 BB0705 135040 0 108 108 1 4 BOOK T23 0 0
7 40 BB0705 135040 0 72 72 1 4 AMRK T23 0 0
8 44 BB0705 135042 0 93 31 3 1 DBDT T23 0 0
9 48 BB0705 135042 0 56 18 3 4 CDSE T23 0 0
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11 56 BB0705 135043 0 8 2 4 4 CFFD T23 0 0
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Vapeps Logo

create temp data base file DBT
create temp DICTIONARY.DAL file
Vapeps command-precedes DICT ADMIN
Command to enter Dictionary interface
Vapeps response
Vapeps Dictionary prompt Define words, then list.
Exit Dictionary

Vapeps prompt: call ADMIN
Vapeps prompt: save event

Exit ADMIN processor
Vapeps prompt: list DAL UNIT 1
Vapeps response
*run event t23 all unit=1

Summary of event T23

Description

RPT 76A7575 T-23 MODIFIED ACOUSTIC ACCEPTANCE TEST BGM-109A/G 9/27/82
QUALIFICATION TEST VEHICLE IN TLAM CONFIGURATION. M-80 SIMULATED WARHEAD
TEST LEVEL 157 DB OASPL

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Channel descriptions:

MAVG - AVERAGE OF 3 REVERBERANT CHAMBER MICROPHONES (MIC 1, MIC 2, MIC 3)
A45x - X AXIS STA 18.35 BULKHEAD/GUIDANCE ACCELEROMETER (A21450)
A24x - X AXIS STA 18.35 BULKHEAD ACCELEROMETER (A21240)

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Example - 5
Run stream ADMINIS

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frame 15: 'DICTIONARY DAL'
run = padmin 1.GL
dictionary/preadmin 1.GL
list
done
admin
save 1.GL
done
TCC 1
run = event GLL all unit=1
end
EXAMPLE - 5  (cont)

VAPEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/Goddard Space Flight Center

US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Friday, October 28, 1988  Time: 2:17:02 PM
Execution mode: Batch  Core Size: 20000 words

?frame 13, 'DOT'
?frame 15, 'DICTIONARY DAL'
?run=preadmin 1.QLL
?directory/preadmin 1.QLL
Welcome to Data Dictionary version 1.0
Dictionary > list
Word $$$$ not found
Dictionary > done
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DYNAMIC_LAB  GALILEO  GDC  GDC_TESTLAB  GROUND
HARBOR_DRIVE  JUMP  JPL  JPL_LAB  PASADENA
PROTOFLIGHT  REVERBERANT  SAN_DIEGO  SHUTTLE  SPACECRAFT
TEST  TEST_CHAMBER  TEST_LAB  TLAM  TOMAHAWK

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Summary of event GLL.

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REPORT JPL D-1936, FEBRUARY 1983 GALILEO (GLL) PROTOFLIGHT
SPACECRAFT ACOUSTIC TEST REPORT
FINAL SYSTEM LEVEL TEST, COMPLETE SPACECRAFT
142 D8 DASPL

| Processing | JPL | GALILEO | PROTOFLIGHT | GLL |
| Contracting | JPL | GALILEO | DESPUN_SEC | GLL |
| Cognizant | JPL | GALILEO | DESPUN_SEC | GLL |
| Date | 09/24/84 |
| Time | 00:00:00 |
| Event | GROUND | REVERBERANT | PROTOFLIGHT | SYSTEM_LEVEL |
| Location | PASADENA | JPL | ACOUSTIC | CHAMBER |
| Vehicle | SHUTTLE | ATLANTIS | GALILEO | STS-34 |

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AI  A2  A3
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CPU DELTA EXECUTION RUN = 63 62 64 64 45

***ciau***
5. CONCLUSIONS

A procedural method for creating a VAPEPS Database has been presented. Flowcharts of sequential commands were developed for reference and their use demonstrated by examples.
6. REFERENCES


APPENDIX A

CREATING A VAPEPS MODEL OF GALILEO
The VAPEPS Database SEA models consist of up to five elements: EXTA (external acoustic space), INTA (internal acoustic space), SKIN (structure), MONT (mount structure), and INST (internal structure). A model must conform to two or more of these elements in order to be entered into the Database. This limitation, however, does not apply when making predictions using the SEMOD Processor.

As shown in the following excerpt from the Summer 1988 VAPEPS Newsletter, the Galileo Spacecraft lower sections were modeled in SEMOD by using six distinct elements: despun section, upper, lower, and IUD adapters, and external and internal acoustic spaces. The Database model, on the other hand, was developed using three elements: EXTA (external acoustic space), SKIN (pseudo despun section), and INTA (internal acoustic space). The MONT and INST elements were not used in this model. The despun section was chosen as the Database model because it contained the only accelerometer from which data was obtained during the acoustic tests of the lower spacecraft section.
Creating a VAPEPS Model of Galileo: the Lower Sections

Melissa Slay; JPL

JPL's Galileo spacecraft is scheduled to fly a mission to Jupiter to observe the planet and its Galilean satellites, measure its intense magnetic environment, and directly sample the planet's atmosphere. The spacecraft will be carried into Earth orbit by the space shuttle Discovery in October/November 1989, and then boosted into its interplanetary trajectory by a two-stage Inertial Upper Stage (IUS). This trajectory will provide gravity assists from one Venus flyby (February 1990) and two Earth flybys (December 1990 and December 1992) during the spacecraft's six year journey to Jupiter.

This was not Galileo's originally planned flight. The spacecraft was to be launched aboard a space shuttle in May 1986, and then boosted into a direct trajectory to Jupiter by a Centaur rocket. This was changed to the present mission after the Challenger accident and the cancellation of the Centaur/shuttle program. At the time, Galileo had already undergone all of its assembly level and system level testing, and was at Kennedy Space Center awaiting launch. The new mission design required the addition of new hardware as well as rework of existing hardware to withstand harsher thermal environments and to function over a longer period of time. Galileo was brought back to JPL and disassembled so that it could be rebuilt to withstand its new mission requirements.

The response of the lower sections of Galileo to the expected acoustic load is of interest since they are thin structures with large surface areas. Several instrument assemblies are attached to these sections through trusses, as seen in Figure 1. The VAPEPS model consists of the despun section, upper adapter, lower adapter, and IUS adapter. The IUS adapter is new hardware required for the mission change. The super-zip (cylindrical ring between the despun section and upper adapter) was not modeled, since its configuration and size make it difficult for an accurate SEA element to be developed. The despun section, upper adapter, and lower adapter were modeled as conical sections with identical apex angles. The IUS adapter was modeled as a cylinder.
Creating Your Own RUN = Commands

Loading and Executing a Runstream

Once a runstream has been created using the system editor, it must be loaded into VAPEPS so that it can be executed. On a VAX or a UNIX machine the editor file may be loaded using the CSYM command. For our example the file name should be RUNCMPD.DRS. Now load it into DAL unit 27 (DAL unit 30 may be used if the runstream is to be available system wide). The command to load it is as follows:

CSYM DRS RUN CPMD 27

On all systems a FORTRAN file may be loaded with the SYMIN command. Let us assume that the file is contained in FORTRAN unit 1. On a VAX the file name would be FOR001.DAT. Consult your system FORTRAN documentation for naming conventions on other systems. The command would be as follows:

SYMIN 27 RUN CPMD 1

To execute it use the following command:

RUN27 + CPMD ...

Example Runstream

Now putting it all together we have the following runstream.

*RUN = CPMD Command

*Purpose

*Calculates the frequencies of
* modes on a simply supported
* curved plate

*Command

* RUN = CPMD E, RHOS, RAL,
  * THETA, M, N, GAMMA
  * Where
  * E - Young's modulus.
  * H - Thickness of plate.
  * RHOS - Surface mass density of plate.
  * AL - Length of plate.
  * THETA - Angle subtended by plate.
  * M - Longitudinal mode number.
  * N - Circumferential mode number.
  * GAMMA - Poisson's ratio.

RECOVER, RHOS, RAL, THETA, M, N, GAMMA,
DEFAULT E = 1.E-6, H = 0.1, RHOS = 2.54E-6,
THETA = 20.

* First check input.

CALC
  NAME = "E"
  # &E2 &E1, ERX1
  NAME = "H"
  # &H2 &H1, ERX1
  NAME = "RHOS"
  # &RHOS, ERX1
  NAME = "AL"
  # &AL, ERX1
  NAME = "THETA"
  # &THETA &THETA, ERX1
  NAME = "GAMMA"
  # &GAMMA &GAMMA, ERX1
  NAME = "AM"
  # &AM, ERX2
  NAME = "N"
  # &N2 &N1, ERX2
  DONE

* Everything is ok so calculate mode.

CALC
  GAM1 = GAMMA**2
  GAM1 = 1.0GAM1
  T1 = H**3/12/RHOS/GAM1
  AMPL = M*PI/L**2
  ANRT = N*PI/R/TY = THETA**2
  T2 = AMPL + ANRT**2
  T3 = E*N/1/RHOS
  T4 = AMPL*AAMPL/T2
  WARN1 = 111172
  WARN2 = 13+1
  WARN = WARN1 + WARN2 ** .5
  DONE

* Display output.
  write 8 I, M, N, SVM
  (# Frequency of mode 12, 12, 12, "F0.2")
  SET ERR = 0
  # # JUMP EXIT
  * Error analysis.
  > ERX1
  DONE.

WRITE 8 &NAME
  (# Variable "A4" is less than or equal to zero.)
  SET ERR = 1
  # # JUMP EXIT
  > ERX2
  DONE

WRITE 8 &NAME
  (# Mode number "A1" is less than zero.)
  SET ERR = 1
  # # JUMP EXIT
  > ERX1
  DONE

WRITE 8 &NAME

SET ERR = 1
  # # JUMP EXIT
  > ERX2
  DONE

** End (FILE: /FOR003.FOR, "A")
Creating a VAPEPS Model of Galileo: the Lower Sections

Step 1. Obtain Structural Parameters

**Overall Geometry**

![Diagram of structural parameters]

1. Obtained Structural Parameters

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**Using RUN = EOPL**

Despun Section (DESP):

- The despun section is a magnesium cone with 25 aluminum stiffeners, two magnesium doublers, and eight magnesium anglegus. To use RUN = EOPL, the cone is assumed to be a flat plate whose width is equal to the height of the cone and whose length is equal to the circumference at the middle of the cone. The distance to each layer's centroid is referenced from the bottom of the bare skin layer.

- Bare skin layer 1: magnesium cone
- Widthwise beam layer 1: stiffeners (20 @ 2.125 in. wide)
- Widthwise beam layer 2: doublers (2 @ 3.15 in. wide)
- Widthwise beam layer 3: longeons (8 @ 3.15 in. wide)

**UPAD (Upper adapter):**

- The upper adapter is a cone made up of graphite epoxy face sheets and an aluminum honeycomb core. To use RUN = EOPL, the core is assumed to be a flat plate whose width is equal to the height of the cone and whose length is equal to the circumference at the middle of the cone. The distance to each layer's centroid is referenced from the center of the honeycomb core.

- Bare skin layer 1: graphite epoxy face sheet
- Bare skin layer 2: aluminum honeycomb core
- Bare skin layer 3: graphite epoxy face sheet

**LOAD (Lower adapter):**

- General parameters: r = 1.90, h = 4.08, a = 1.085, b = 0.95, t = 0.95, w = 1.95
- Beam parameters: h = 0.95, p = 0.95, t = 0.95, w = 1.95
- Beam parameters: h = 0.95, p = 0.95, t = 0.95, w = 1.95
Creating a VAPEPS Model of Galileo: the Lower Sections

RUN = EQPL, IUS
General parameters: \( r_a = 1.5, \beta = 1.5, \alpha = 1.5, \gamma = 3.3. \)
General parameters: \( r_e = 10.56, \beta = 2.564, \gamma = 1.566 \)
General parameters: \( \phi = 0 \)

OK
 Bare skin layer 1 of 3, \( h = 0.021, \) lam = 1385
 Bare skin layer 2 of 3, \( h = 0.025, \) lam = 3.844
 Bare skin layer 3 of 3, \( h = 0.025, \) lam = 1385
 Bare skin layer 3 of 3, \( h = 0.025, \) lam = 1.000

* Result: 1, EQPL/UPAD Size: \( 5 \times 1 \)
* Result: 1, EQPL/UPAD Size: \( 5 \times 1 \)

Input Specifications

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<tr>
<th>Layer</th>
<th>H</th>
<th>CEN</th>
<th>E</th>
<th>RHO</th>
<th>W</th>
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<td>1.335E-01</td>
<td>1.430E+07</td>
<td>1.830E-04 N/A</td>
</tr>
</tbody>
</table>

Equations Parameters

\( H = 1.675E + 00, E = 2.823E + 04, \) or \( H = 4.781E + 06, \) or \( H = 8.000E + 06 \)

Stress prediction parameters

\( H = 2.101E + 01, E = 1.430E + 07, \) or \( H = 3.811E + 06, \)

Centered distance = 0.000E + 00

Lower Adapter (LOAD):

RUN = EQPL was not used for the lower adapter since it is a homogeneous aluminum structure with no beam layers.

Inertial Upper Stage (IUS):

* The US adapter is a magnesium cylinder with one longitudinal aluminum ring.
* A and B are longitudinal aluminum flanges. To use RUN = EQPL, the cylinder is assumed to be a flat plate whose length is equal to the height of the cylinder and whose length is equal to its circumference. The distance to each layer's centroid is referenced from the bottom of the bare skin layer.
* Bare skin layer 1: magnesium cylinder
* Lengthwise beam layer 1: aluminum ring \( (2 \text{ in. wide}) \)
* Widthwise beam layer 1: aluminum flange \( (8 @ 20 \text{ in. wide}) \)

The surface area of a cone is:

\[ AP = \pi r (r + \sqrt{r^2 + h^2}) \]

The surface area of a cylinder is:

\[ AP = 2 \pi r t \]

The sum of all surface areas yields the surface area of the internal acoustic space, INTA.
Creating a VAPEPS Model of Galileo: the Lower Sections

INTA's VOLUME and AP were obtained earlier while determining structural parameters. The acoustic absorption coefficient, AAC, is estimated based on past experience. Again, EXTA's AAC is not used since EXTA is the excitation element. INTA's AAC is based on recommendations from LMSC for acoustic spaces surrounded by "smooth" surfaces. For surfaces with thermal blankets, equipment, or cabling, AAC should be increased.

Step 3. Determine Connection Paths

The acoustic spaces are connected to the structural elements using both resonant and nonresonant connection paths. The structural elements are connected to each other by using type 43, which is actually a butt connection between two plates. VAPEPS will accept cones or cylinders instead of plates, but will treat them as plates. Obviously, this is not an entirely accurate representation of a conical section, but is the best method available, and in this case works reasonably well. BJL, the butt joint length, is the circumference at the interface of the elements.

Step 4. Obtain the Excitation Levels

The levels in this model are the levels measured in the Galileo protoflight acoustic test.

Step 5. Execute VAPEPS

```
* This model consists of the deepson section, upper adapter, lower adapter,
  and LV adapter from the Galileo spacecraft.
  * A 4 for echo
  * A 5 for echo

Creating new model: SLL
SEMOD > sllname
Maximum number of elements  =  50
Maximum variable storage  =  800
Maximum string storage words  = 1000
Input element name > slla,1
EXTA > mo = 1.144e-7,co = 1.3764, volume = 1.7726, ap = 4.1305, AAC = 1.5e-2
INTA > mo = 1.144e-7,co = 1.3764, volume = 403132, ap = 29892, AAC = 1.5e-2
INTA > done
OK
Input element name > deep,5
DESP > mo = 1.24645, ap = 1.5865, h = 1.4742, ap = 1674, d1 = 12, d2 = 180, d3 = 12.
DESP > d = 55, d1 = 05, d2 = 690, pass = 320, mo = 1.1725, sacm = 919
DESP > co = 1.3764, projm = 250, beta = 20.
DESP > done
OK
Input element name > upad,5
UPAD > mo = 4.78145, d1 = 7.684, h = 1.6735, ap = 7028, d1 = 25, d2 = 207, d3 = 23.
UPAD > d = 78, d1 = 05, d2 = 8.2234, pass = 418, mo = 5.0685, sacm = 1166
UPAD > co = 1.3764, projm = 250, beta = 20.
UPAD > done
OK
Input element name > load,6
LOAD > mo = 2.591e-4, d1 = 2.01 e-5, h = 8.62 e-2, ap = 19813, d1 = 32. d2 = 292, d3 = 32.
LOAD > d = 106, d1 = 05, d2 = 10.005, pass = 584, mo = 2.591e-4, sacm = 4721
LOAD > co = 1.3764, projm = 250, beta = 20.
LOAD > done
OK
Input element name > ius,4
IUS > mo = 5.1116e-5, d1 = 1.8865, mo = 323, ap = 3393, d1 = 10, d2 = 328, d3 = 10.
IUS > d = 106, d1 = 05, d2 = 7.400e6, pass = 508, mo = 1.8865, sacm = 0.
IUS > co = 1.3764, projm = 250.
IUS > done
OK
Input element name > done
OK
SEMOD > pathname
Approximate maximum number of connections  =  80
Approximate maximum variable storage  =  300
Input connection > exta,deep,inta,5
Creating new path.
EXTA,DESP,INTA > done
OK
Input connection > exta,upad,inta,6
Creating new path.
EXTRA,UPAD,INTA > done
OK
Input connection > exta,load,inta,6
Creating new path.
EXTRA,LOAD,INTA > done
OK
Input connection > exta,load,inta,6
Creating new path.
EXTRA,LOAD,INTA > done
OK
Input connection > exta,us,inta,5
Creating new path.
EXTRA,US,INTA > done
OK
Input connection > exta,deep,3
```
Creating a VAPEPS Model of Galileo: 
the Lower Sections

Volumes

The volume of a cone is:

\[ V = \frac{1}{3} \pi r^2 l \]

\[ V_{\text{DESP}} = 23,389 \text{ in}^3 \]
\[ V_{\text{UPAD}} = 101,485 \text{ in}^3 \]
\[ V_{\text{LOAD}} = 246,722 \text{ in}^3 \]

The volume of a cylinder is:

\[ V = \pi r^2 l \]

\[ V_{\text{IUS}} = 30,536 \text{ in}^3 \]

The volume of the internal acoustic space, INTA, is the sum of all volumes.

PATA

PATA, the total length of discontinuities, is used in VAPEPS to account for the edge effects (from stiffeners, beams, etc.) on the radiation efficiency below the critical frequency. However, if the structure is not any larger than the bending wavelength at its critical frequency, then the edges do not affect the radiation efficiency and therefore should not be included in PATA. The bending wavelength is defined as the bending wave speed, \( C_b \), divided by the frequency, \( f \), where

\[ C_b = \left[ \frac{2 \pi f K C_1}{C_1} \right]^{1/2} \]

\( K \) = radius of gyration
\( C_1 \) = longitudinal wave speed

\[ \text{PATA}_{\text{DESP}} = \text{upper circumference} \times \text{lower circumference} = 320 \text{ in} \]
\[ \text{PATA}_{\text{UPAD}} = \text{upper circumference} \times \text{lower circumference} = 418 \text{ in} \]
\[ \text{PATA}_{\text{LOAD}} = \text{upper circumference} \times \text{lower circumference} = 594 \text{ in} \]
\[ \text{PATA}_{\text{IUS}} = \text{upper circumference} \times \text{one half lower circumference} = 506 \text{ in} \]

ALX and ALY

ALX and ALY, the subpanel dimensions, are also used to account for edge effects (from stiffeners, beams, etc.) at and below the critical frequency. Dividing this model into subpanels had little effect on the results so subpanels were not used. Further investigation is being done to better define the use of ALX and ALY.

DESP:
\[ \text{ALX} = \text{circumference at the middle of the cone} = 160 \text{ in} \]
\[ \text{ALY} = \text{height of cone} = 12 \text{ in} \]

UPAD:
\[ \text{ALX} = \text{circumference at the middle of the cone} = 207 \text{ in} \]
\[ \text{ALY} = \text{height of cone} = 25 \text{ in} \]

LOAD:
\[ \text{ALX} = \text{circumference at the middle of the cone} = 292 \text{ in} \]
\[ \text{ALY} = \text{height of cone} = 32 \text{ in} \]

IUS:
\[ \text{ALX} = \text{circumference of cylinder} = 339 \text{ in} \]
\[ \text{ALY} = \text{height of cylinder} = 10 \text{ in} \]

ASMS

ASMS, the added nonstructural mass, was taken from a Galileo weight list.

\[ \text{ASMS}_{\text{DESP}} = 355 \text{ lb} = 0.919 \text{ lb s}^2/\text{in} \]
\[ \text{ASMS}_{\text{UPAD}} = 303 \text{ lb} = 0.7856 \text{ lb s}^2/\text{in} \]
\[ \text{ASMS}_{\text{LOAD}} = 185 \text{ lb} = 0.4791 \text{ lb s}^2/\text{in} \]
\[ \text{ASMS}_{\text{IUS}} = 0 \text{ lb} = 0 \text{ lb s}^2/\text{in} \]

DLF and PIVOTFRQ

DLF, the damping loss factor, and PIVOTFRQ, the frequency to pivot damping as a function of 1/frequency, are estimates based on past experience.

\[ \text{DLF} = 0.05 \]
\[ \text{PIVOTFRQ} = 250 \text{ Hz} \]

It is recommended that a value of 0.04 or 0.05 be used as the DLF for aluminum or magnesium. For structures made of composites (such as graphite/epoxy), it is recommended that a value between 0.05 and 0.1 be used.

Step 2. Obtain Acoustical Parameters

The mass density and speed of sound for EXTA and INTA are the values for nitrogen, which is what JPL uses in its acoustic chamber. The volume of the chamber and the total surface area of its walls are used for EXTA's VOLUME and AP, respectively, although they are not used by VAPEPS since EXTA is the excitation element.
Creating a VAPEPS Model of Galileo: the Lower Sections

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**OK**

Input connection > load,us,43

Creating new path.

**IUS**

LOAD > bj = 538

LOAD > done

OK

Input connection > done

OK

**SEMOD**

> select aids

**SEMOD**

> frequency 40.0,2000.0

**FREQ**

> freq gll 0 0, size = 18 6, nu = 1

**SEMOD**

> excitation

**EXTA**


**SEMOD**

> make

**DEN**

> dens gll 0 0, size = 18 6, nu = 1

**SEMOD**

> elastic

# of damping loss factors = 6

# of coupling loss factors = 30

**ATA**

> ata gll 0 0, size = 18 36, nu = 1

**SEMOD**

> excit

**CO**

> co gll 0 0, size = 18 18, nu = 1

**TRNF**

> trnf gll 0 0, size = 18 5, nu = 1

**SEMOD**

> efac 7,1,4

**CONV**

> conv gll 0 0, size = 18 6, nu = 1

**SEMOD**

> load

**RESP**

> resp gll 0 0, size = 18 6, nu = 1

**SEMOD**

> power

**POWER**

> power gll 0 0, size = 18 36, nu = 1

**SEMOD**

> set resp

Excitations and responses for model gll

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<th>INTA</th>
<th>DEEP</th>
<th>UPAD</th>
<th>LOAD</th>
<th>IUS</th>
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<td>dB</td>
<td>dB</td>
<td>G^*2Hz</td>
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<td>117.5</td>
<td>103.1</td>
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<td>8.812E-04</td>
<td>1.7305E-03</td>
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<td>1.0585E-03</td>
<td>7.861E-03</td>
<td>1.8443E-02</td>
</tr>
</tbody>
</table>

Original page is of poor quality
Creating a VAPEPS Model of Galileo: the Lower Sections

Note: The VAPEPS outfile was edited due to its length.

Step 6. Examine Results

The response of the despun section is shown plotted against data from an accelerometer located on the super-zip, at the despun section interface. Unfortunately, there were no other measurements made on the lower sections of the spacecraft during the acoustic test, so it cannot be determined absolutely if the model is valid. The VAPEPS prediction does closely follow the data, and the 95th percentile does envelop that local response which is what we would expect of our model. (See Figure 2.)

To estimate the frequency range over which the prediction is valid, the number of modes per one-third octave band (calculated from the modal densities listed in the output) was plotted (Figure 3). There are approximately two modes in the one-third octave band centered at 200 Hz. Predictions at frequencies below this do not contain enough modes to be considered valid. Between 200 Hz and 400 Hz, where there are between two and six modes per one-third octave band, the prediction is considered questionable. Above 400 Hz, the prediction is considered valid.
APPENDIX B
DATABASE MANAGEMENT
In this section the features of the database management mode of operation are described. This operation deals specifically with the creation and maintenance of a vibroacoustic database. The database management commands provide for the entry, editing, and retrieval of data sets. Each data set, obtained at a specific time in flight from a given payload configuration or from a specific test configuration during a given ground test run, is referred to as an event.

The database management functions may be grouped into four major operational phases: spectral data input, event definition and data standardization, administration, and data retrieval. The spectral data input phase is performed using a processor named ENTER; the remaining three phases are performed using processor named PREP, ADMIN, and SERCH, respectively. The use and function of each of these processors is discussed in detail in the VAPEPS USER'S MANUAL. This section discusses the salient features of each processor and rationale behind the design of the processor.

**DATA ENTRY**

Using the processor command ENTER, spectral data can be placed on any DAL file desired, except for the four files that have been reserved for special use, using any bandwidth in the frequency range from 10 to 10,000 Hz and for a variety of measurement units. By providing the appropriate system control statements before VAPEPS is executed, all original data provided by the user can be saved by permanently cataloging this file in the systems master directory. For a given event, all acoustic data may be placed on file followed by vibration data; or, a mixture of acoustic and vibration data may be placed on file at one time, followed by another such entry at a later time. Once these spectral data have been processed by ENTER, the general computational routines can be called to perform such operations as manipulating these data into various subsets, finding maximums and minimums, and performing statistical analyses, etc.

*Excerpted from VAPEPS User's Manual, Lockheed Missiles and Space Company (see Ref. 2 in this publication)
ENTER is basically a batch-oriented processor which requires the following input: (1) Four 80 character lines providing a general description of the event, using a free-field format (2) frequency range and frequency bandwidth format (a number of entry steps can be eliminated when the American National Standards International [ANSI] one-third octave format has been used for data processing) (3) type of data (acoustic or vibration) and the names or measurement numbers of the data channels (renaming is provided for) (4) measurement units (5) and spectral data in the form of acceleration/pressure spectral density, or sound-pressure/vibration level in dB (narrow-band, amplitude-time data cannot be accommodated). Spectral data is read as a group of FORTRAN-formatted card images which may be arranged to be read from the local system files. ENTER output consists of matrices stored as elements on a user-owned DAL file. Depending on input options, ENTER may also produce a listing of the input data.

The ability to rename measurement channels is necessary because subsequent VAPEPS processing requires that all channel names be up to four characters long, with the first character being an alphabetic character. The renaming feature also permits a user to cope with the situation (most likely to happen in ground test) in which the data processing facility processed all the acoustic data first using a given measurement numbering scheme, and then processed all the vibration data using this same scheme. In the VAPEPS database, each data channel must have a unique name. VAPEPS allows data obtained for a given event to be input in separate batches to accommodate large quantities of data, and permit a user operate on whatever data is available at a given time, rather than wait for all the data to be processed. When the entire data set (acoustic and vibration) becomes available, VAPEPS will collect all data entries and assemble them under the correct event name. This is accomplished with the PREP processor.
The previously described ENTER processor was basically used to define the attributes of a set (acoustic and vibration) of spectral data for a given event. It is the PREP processor that is used to develop the database for defining the attributes of the event itself. This processor has five subprocessors named CHECK, BOOK, CHAN, CONF, and MODULES. Each of these processors has a multitude of subcommands followed by arguments which will be assigned values to define event attributes. The success of subsequent VAPEPS operations depends on how thoroughly and conscientiously the user assigns values to these arguments. These values can be the free creations of the local user or can be under the control of a global database administrator. A set of worksheets are included with the VAPEPS USER'S MANUAL to assist with the preparation of these values. The database administrator will code and place the values of key arguments into the VAPEPS master file; particular attention should be given to these arguments. The arguments containing key values are those noted on the worksheets as being SEARCHABLE. A special processor named DATA DICTIONARY has been designed that will control and define all values of free creations.

A brief explanation of the basic function, including some general commentary of the PREP subprocessors is given below.

CHECK: Collects spectral data from all EVENT sections and forms one standardized spectral data matrix. The need for standardization and the format standard is discussed in the VAPEPS USER'S MANUAL. The one-third octave bandwidth standard was chosen to support the prediction schemes that are presently in VAPEPS.

BOOK: Controls bookkeeping entries for the event. This includes the data processing agency, time, date, type of flight vehicle, and type of event, etc. This is accomplished through the arguments of the various BOOK subcommands. It is the value assigned to the four arguments of the BOOK subcommand named PROC that uniquely
identifies an event. The event is automatically coded and the coding is stored in the VAPEPS master file by the database administrator.

CHAN: This subprocessor affects the channel descriptive data previously placed in a DAL file with the processor ENTER. Integer value coordinates, and the type of coordinate system used, for each measurement can be specified using the subcommands of this processor. Perhaps of more importance, the user is requested to identify the frequency range of valid data. This will ensure that a conscious decision is made in this regard, because the frequency range over which valid data was obtained may have been overlooked or unknown when the spectral data was first placed on file. It is accomplished using the CHANGE subcommand.

CONF: A configuration tree such as the one shown in Figure B-1 is constructed, modified, or examined using this subprocessor. Each user is free to form the payload or test specimen configuration tree considered most representative for an event. However, it is essential to develop configuration trees using a consistent format if a successful search of the VAPEPS database can be achieved at a later date. This processor has a number of subcommands that can be used to create a new configuration tree by modifying one that already exists. This avoids the effort of reconstructing an entire tree for events that have similar or even identical payload test specimen configurations.

MODULES: This subprocessor is used to collect the structural parameters and channel names of the acoustic and vibration measurements that are pertinent to a particular branch of a configuration tree and attach the complete data set (called a data module or simply the module) to this tree branch. A tree must exist before this attachment can be made and more than one module can be attached to the same branch. This is accomplished with the MODULE subcommand ATTACH and three arguments named MODULE, CONF, and ZONE of this.
command uniquely identify a module. The argument ZONE and the remaining arguments SYSTEM, X, Y and Z of ATTACH permit the user to create zoning systems for the shuttle vehicles or the EIVs. Each module is automatically given a module number which is placed in the VAPEPS master file by the database administrator. To expedite creating new modules for an event, subcommands are provided to edit and use modules already in existence. Structural parameters and channel names are collected into the module in such a manner that they can be searched for and extracted from the database, and are used to support prediction schemes. Because of this, a module is also referred to as a "prediction model". The module concept is intended to support the prediction schemes presently in VAPEPS or any future modification of these schemes. More than one module can be constructed and attached to the same branch of a configuration tree. It may be useful to construct one module for a given frequency range and another for a different frequency range. Modules can be constructed with or without channel names; this is also the case for structural parameters. This feature permits the user to collect acoustic and vibration data obtained from a particular flight or ground test, and to assign the module containing the channel names to a particular branch of the configuration tree. This then permits the user to search out and operate on this data at a later date. It is the processor named DAMO that is used to build a data module.

The DAMO processor can be activated as a subcommand from MODULES, or it can be activated as a VAPEPS processor command. A DAMO subcommand from MODULES is used to construct a data module and attach it to a particular branch of a configuration tree. When VAPEPS is used to predict the vibroacoustic environment for a payload, the structural parameters for this payload must appear in a data module. In this case DAMO is activated from VAPEPS as a processor command and only structural parameters need be placed in this module; the various arguments of DAMO do not need to be specified. The specific format of the DAMO processor used in MODULES is shown in figure
Figure B-2. DAMO Processor Format
B-2. The commands named EXTA, SKIN, INTA, MONT, INST, and FRAM correspond to the names of the prediction model elements described in Section 4. The characters P* and C* following each of these commands represent the structural parameters and channel names, respectively, that are to be associated with each element. The three-word arguments of these commands are provided to allow for descriptive codes to characterize each of these elements. The value of each argument is a free creation of the user; but, in order for a community of users to search from the database an element with prescribed characteristics, a common coding format is necessary. This would be a function for the global database administrator. Appendix C is a discussion of the coding system presently used for the global database.

Figure B-3 serves to illustrate the operation of the PREP processor. Shown is a configuration tree, data module and prediction model that one might construct with this processor for a typical shuttle payload.

ADMINISTRATION
After the tasks for providing spectral data input, and event definition and data standardization have been completed, the data associated with these tasks will exist on preassigned DAL files; it now remains to code and save certain key elements of this data set in the master file of VAPEPS. This is the task of the individual(s) assigned the responsibility of being the database administrator(s). The administrator is charged with the responsibility of maintaining the integrity of the database and processing the transfer of data sets to and from other user sites.

The master file should be write-protected to ensure that multiple users do not attempt to write simultaneously to the file. The recommended approach is to grant write-access only to the VAPEPS administrator or to a small group of administrators who will share the responsibility of saving all events. In maintaining the integrity of the database, the administrator will check all data sets for possible errors and inconsistencies. Having affirmed that the data set contains no errors, the database administrator will write key elements of these data to the VAPEPS master file using the
Figure B-3. Concept of PREP Procedures
SAVE subcommand of the AEMIN processor. It is when the SAVE command is issued that the previously mentioned coding of event(s) and module(s) occurs and the results are stored in the VAPEPS master file. These data then become available to the SERCH processor, which the community of VAPEPS users can use to examine these data for prescribed attributes.

The process of transferring a data set to another site involves completely recreating card images of the data provided to the ENTER and PREP processors. This can be performed automatically by using the subcommand of AEMIN named SPILL. The process of reading these data at another site involves the use of general computational commands given in the VAPEPS USER'S MANUAL. A flow diagram of the process of transferring data to and from another site is presented in Figure B-4. Referring to Figure B-4(a), when only a few VAPEPS database events are to be transmitted, the administrator creates the necessary card images using the SPILL subcommand. These card images are read to and written from tape using the general computational command as described in the VAPEPS USER'S MANUAL. The transmitted events are placed on a DAL file via VAPEPS, checked by the administrator and, if appropriate, saved in the receiving site's database using the SAVE subcommand of the AEMIN processor.

If the entire VAPEPS database at one site is to be transmitted, the run streams SPILL and SAVE can be used. Documentation for these two run streams can be found in the VAPEPS HELP file. Transferring the original spectral data and measurement channel data, referring to Figure B-4(b), is accomplished using the run stream ESAV which recreates an ENTER deck for a given event. This is written and read from tape as previously described and placed on the user's DAL file via VAPEPS.

VAPEPS installation instructions for the administrator are provided in the VAPEPS USER'S MANUAL.
Figure B-4. Data Transfer Flow Diagram
DATABASE QUERY

The SEARCH processor enables a user to search the master file for data placed on this file by the database administrator. Command SEARCH initiates an interrogation of the master file regarding the data obtained during BOOK, CONF, or MODULE operations that have been performed within the PREP processor. The user specifies those data attributes of interest and the search operation produces a list of coded event names that have these attributes associated with them. Most search requests have three basic forms: (1) all events that have all the attributes requested (2) all events that have at least one of the attributes requested or (3) all events that have none of the attributes requested. Each query may cover all events in the VAPEPS database, or may be limited to those events contained in a previously generated list.

Following is a discussion of the various BOOK, CONF, or MODULE attributes where searches can be made; refer to the VAPEPS USER'S MANUAL for information on the data used to define these attributes.

BOOK: Queries can be made involving the following attributes: processing agency, cognizant agency, contracting agency, date (specific or range), time (specific or range), event name, event type, location, and vehicle.

CONF: Requests are made for events which have configuration tree branches with specified generic names, specific names, or generic and specific name pairs. Requests may be made for events with branches anywhere in the tree or branches with a specific relationship to one another.

MODULES: Queries can be made for events with prediction models or elements of the prediction model which have specified descriptions or nondimensional parameters within a specified range. Queries can be limited to only those models with spectral data channels or to model elements which lie within a specified range of coordinates.
In addition to those described above, the SERCH processor provides the user with commands which manipulate the output lists of events to: (1) perform logical comparisons of two or more lists, (2) list the contents of one or more event lists, (3) list the names of all lists created during a search session, (4) store the list in a user-owned DAL file for future use, and (5) bring a saved list back into the SERCH processor. A status command is also provided which gives the names of the current input and output lists.

To obtain a good understanding of the codes and tabular output obtained in response to various SERCH commands, the user may refer to both the VAPEPS USER'S MANUAL and the Data Dictionary.
APPENDIX C

DATA MODULE NAMING CONVENTION
APPENDIX C

DATA MODULE NAMING CONVENTION*

A VAPEPS data module is created by using the DAMO-processor which is initiated with a command named DAMO. The arguments of this command defines the name of a data module, which is a free creation of the user. There are various subcommands within the DAMO-processor (see page 8-16, 8-17, and 8-18 of VAPEPS USER'S MANUAL). The subcommands DESC, EXTA, SKIN, INTA, MONT, INST, and FRAM are designed to further describe the data modules. Their arguments are also free creations of the user. In this Appendix, the naming convention used by the global data base is illustrated. Other users may define their own convention without effecting the function of VAPEPS. However, for a global database to be shared by the aerospace community, a unified system needs to be established. Presently the data module naming convention is totally oriented toward supporting VAPEPS prediction schemes. However, the naming convention could be expanded to include, for example, reliability/failure related data schemes.

*Excerpted from VAPEPS User's Manual, Lockheed Missiles and Space Company (see Ref. 2 in this publication)
DAMO -- The argument opposite DAMO is a four character word which indicates the content of the data module and the system of units associated with the structural parameters. These are the values given to this word:

A. The first two characters indicate the presence of channel names and structural parameters in the module.
   - DO -- only channel names present in the module
   - PO -- parameters present only
   - DP -- channel names and parameters present.

B. The third character is alphabetic and used to make the various modules of a given event unique.
   - A-
   - B-
   - O
   - O
   - O
   - Z-

C. The last character is an integer used to indicate the units used for the structural parameters
   - 0 no parameters
   - 1 units of meter, kg., sec.
   - 2 units of cm., gram, sec.
   - 3 units of ft., slug, sec.
   - 4 units of in., snail, sec.

The values for the DAMO arguments for a typical group of modules would then be as follows: (1) DPA4; channel names and parameters present, units are in., snail, sec. (2) DPB4; channel names and parameters present, units are in., snail, sec. (3) DOAO; only channel names are present in the module. (4) DOBO; only channel names present.
DESC — The three word argument opposite DESC describes the general layout of the prediction model contained by the module and characterizes the acoustic and vibration measurements within the module. Each word can consist of up to twelve characters. The following is a discussion of the values given to these words. In this discussion only six characters out of the twelve permitted are used. The remaining six characters can be employed as desired by the user.

A. The first word is a six character code that indicates which of the individual prediction model elements were used for the physical situation being modeled, and whether a conventional or non-conventional prediction model was used. The first character indicates the model convention and the next five characters form a code for the prediction model elements EXTA, SKIN, INTA, MONT and INST, respectively. The following tabulation defines the coding used:

1. First character.
   N - Non-conventional prediction model
2. Next five characters.
   1 - External acoustics, parameters present.
   2 - Skin structure, parameters present.
   3 - Internal acoustics, parameters present.
   4 - Mounting structure, parameters present.
   5 - Payload component installation, parameters present.
   0 - Element not present, or parameters not present.

The value for a typical first word of the DESC argument would be as follows:
(1) N12345; a conventional prediction model with parameters present for EXTA, SKIN, INTA, MONT and INST, (2) R32140; a non-conventional prediction model, the INST element is not present, external space acoustic parameters are assigned to INTA, and internal space acoustic parameters are assigned to EXTA.
B. The second word is a six character code used to describe the general characteristics of the acoustic field and orientation of the vibration measurements. The first character of this code, D, is simply a place holder. Characters two through six again form a code for the prediction model elements EXTA, SKIN, INTA, MONT and INST, respectively. The coding associated with these five elements is:

- F - free acoustic field
- D - direct acoustic field
- P - progressive wave acoustic field
- S - surface pressure
- N - normal (perpendicular to a plane)
- L - lateral (parallel to a plane)
- U - orientation unspecified
- 0 - measurements not present

A code with the format DSUF00 would then be interpreted to mean: The EXTA element is a surface pressure acoustic field, the orientation of the SKIN vibration measurements are not specified, INTA is free acoustic field, and measurements are not available for the MONT and INST prediction model elements.

C. The third word is a free word that the user can code as desired. The frequency range over which the prediction model is considered valid could be identified here.
EXTA — The three words of the argument opposite EXTA; and, the corresponding words of the arguments of SKIN, INTA, MONT, INST, and FRAM are used to describe the geometry, material and physical details of the prediction model elements. A convention for this description has been initiated by IMSC, but it is considered preliminary and incomplete. As will be discussed, the establishment of a perceptive convention is important to the success of the VAPEPS prediction schemes. This convention is expected to develop and/or change as the future experience of VAPEPS users so indicates so appropriate. This is the convention being used:

A. The first word is used to provide a description of the geometry of the acoustic space or structure being modeled. Typical values for this word are: Rectangle, triangle, curve, cylinder, annulus, etc.

B. The second word is used to provide a description of the general properties of the acoustic space or structural materials. Typical values for this word would be: Air, helium, nitrogen, aluminum, graphite-epoxy, etc.

C. The third word is used to provide a description of the general physical characteristics of each of the individual structural elements or acoustic spaces. It is intended for boundary conditions to be identified with this word although a scheme for doing so remains to be developed. Typical values for this word are: Reverberant, hydrodynamic, honeycomb, corrugation, skin/stringer, etc.

When using VAPEPS to predict the vibroacoustic environment of a new payload component, the best results can be expected when this component is similar to the VAPEPS model on which the prediction is based. The above described arguments will serve to indicate when this similarity exists.
APPENDIX D

DICTIONARY EXAMPLES
fnme 13, 'DBT'
fnme 15, 'DICTIONARY.DAL'
run=padmin 1, t23
dictionary/padmin 1, t23
define $root of configuration tree
define 157_db_oaspl
157 dB overall sound pressure level
list
done
admin
save 1, t23
done
run=event t23 all unit=1
VAEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MASSCOMP/UNIX
(Released June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Friday, October 28, 1988
Time: 10:32:56 AM.
Execution mode: Batch
Core Size: 20000 words

?fname 13, 'DBT'
?fname 15, 'DICTIONARY.DAL'
?run=padmin 1,t23
?dictionary/preadmin 1,t23

The following words have not been defined.
$ 157_db_oaspl acceptance bulk bulkhead cell cone cruise_msl
cylin df0000 df0ono dpa4 dpb4 fcav fiberglass forward fuse
fuselage fuse_cavity gdc gdc_testlab ground harbor_drive jcmp
n12300 n12340 nca nca nca nca reverberant
san_diego sta_18.35 t23 test_chamber tlam tomahawk

Welcome to Data Dictionary version 1.0
Dictionary > define $
$  > root of configuration tree
$  >

*root of configuration tree

Dictionary > define 157_db_oaspl
157_db_oaspl > 157 dB overall sound pressure level
157_db_oaspl >

157_db_oaspl
157 dB overall sound pressure level

Dictionary > list
Word $$$$ not found.
Dictionary > done

Word ACCEPTANCE not defined.
Word BULK not defined.
Word BULKHEAD not defined.
Word CELL not defined.
Word CONE not defined.
Word CRUISE_MSL not defined.
Word CYLIN not defined.
Word DF0000 not defined.
Word DF00NO not defined.
Word DPA4 not defined.
Word DPB4 not defined.
Word FCAV not defined.
Word FIBERGLASS not defined.
Word FORWARD not defined.
Word FUSE not defined.
Word FUSELAGE not defined.
Word FUSE_CAVITY not defined.
Word GDC not defined.
Word GDC_TESTLAB not defined.
Word GROUND not defined.
Word HARBOR_DRIVE not defined.
Word JCMP not defined.
Word N12300 not defined.
Word N12340 not defined.
Word NCAV not defined.
Word NOSE not defined.
Word NOSE_CONE not defined.
Word NOSE_CAVITY not defined.
Word REVERBERANT not defined.
Word SAN_DIEGO not defined.
Word STA_18.35 not defined.
Word T23 not defined.
Word TEST_CHAMBER not defined.
Word TLAM not defined.
Word TOMAHAWK not defined.
Leaving Data Dictionary.

?admin
ADMIN>save 1,t23
One or more words have not been defined.
Data Dictionary must be updated before event can be saved.
Event not saved.
ADMIN>done
?run=event t23 all unit=1
fname 13, 'DBT'
fname 15, 'DICTIONARY.DAL'
run=padmin 1,QLL
dictionary/preadmin 1,QLL
define &
root of configuration tree
define acoustic
acoustic

list
done
admin
save 1,QLL
done
run=event QLL all unit=1
VAEPS
(VibroAcoustic Payload Environment Prediction System)
Version 5.4.1
System MASSCOMP/UNIX
(Relased June 1988)

Developed by
LOCKHEED MISSILES & SPACE COMPANY

Sponsored by
NASA/GODDARD SPACE FLIGHT CENTER
&
US AIR FORCE/SPACE DIVISION

User support and database management by
JET PROPULSION LABORATORY

Date: Friday, October 28, 1988    Time: 10:37:05 AM.
Execution mode: Batch    Core Size: 20000 words

fname 13, 'DBT'
fname 15, 'DICTIONARY.DAL'
run=padmin 1, GLL
dictionary/preadmin 1, GLL

The following words have not been defined.
* acoustic atlantis chamber desp despun despun_sec dfn000 dpa4
dsp_cone_int galileo gll gll_dsp_cone ground jpl
jpl_aoo_chm magnesium n12300 nitrogen pasadena protoflight
reverberant shuttle stiffeners sts-34 system_level

Welcome to Data Dictionary version 1.0
Dictionary > define *
* > root of configuration tree
*

* root of configuration tree
Dictionary > define acoustic
acoustic > acoustic
acoustic >

acoustic
Dictionary > list
Word $$$ not found.
Dictionary > done
Word ATLANTIS not defined.
Word CHAMBER not defined.
Word DESP not defined.
Word DESPUN not defined.
Word DESPUN_SEC not defined.
Word DFN000 not defined.
Word DPA4 not defined.
Word DSP_CONE_INT not defined.
Word GALILEO not defined.
Word GLL not defined.
Word GLL_DESP_SEC not defined.
APPENDIX E

VAPEPS GLOBAL DATABASE REQUIREMENTS

This appendix contains (1) a VAPEPS Database Checklist and Request for Supplemental Information, and (2) a VAPEPS Database Questionnaire.
VAPEPS Database Checklist
and
Request for Supplemental Information

Section I of the following questionnaire is a checklist of information for data being prepared for the VAPEPS database, but should also be considered when preparing for the acoustic flight or ground test. Also included in the list are items to consider when reviewing and analyzing the resulting data. These questions pertain both to data stored at your local site and to data to be submitted for inclusion in the VAPEPS global database stored at the VAPEPS Management Center (VMC). The second part of this form specifically addresses data sets that are to be included in the global VAPEPS database and requests for supplemental information about each event.

Vibroacoustic data that is submitted to the VMC must be processed into Acceleration Spectral Density form (either narrow band or 1/nth octave band). The VMC cannot accept time history data or data recorded on analog tape due to facility processing and manpower limitations. Data submitted to the VMC should be written on standard 1/2 inch magnetic tape, 1600 bpi, ASCII format in fixed block sizes and record lengths. Please specify the company name, data set name, block sizes and record lengths on the tape.

The data should also be in VAPEPS ENTER processor format. The VAPEPS User's Reference Manual has a complete description of the ENTER processor and the VAPEPS Workshop User's Guide has an illustrative example to follow. You should also review the section in the User's Manual on the PREP processor to determine what additional information will be required by the VMC to process the data set. Specifically, look at the descriptive information required by the BOOK, CHANNEL, CONFIGURATION, and MODULES subprocessors within PREP. Statistical Energy Analysis (SEA) models should be included with the data, although they are not actually required to store the data. VMC personnel have experience in SEA modeling and can assist in you in this area.

One of the VMC's main objectives as the VAPEPS database administrator is to acquire, validate and maintain the global VAPEPS database. To assist in this function, a VAPEPS Technical Review Committee will review each new data set for accuracy, consistency of data formats and completeness. The supplemental information requested by this form will assist the committee in understanding and reviewing the data and will help to ensure that only valid information is entered into the global database. In this manner, VAPEPS users in the payload community can be assured that the integrity of the shared database will be maintained.
I. GENERAL CONSIDERATIONS - ACOUSTIC GROUND/FLIGHT TEST

1. Was the acoustic field diffuse? VAPEPS Statistical Energy Analysis (SEA) models assume that the acoustic elements are reverberant spaces. Was a turbulent boundary layer present? The VAPEPS software can model turbulent boundary layers as progressive waves.

2. Were there sufficient microphones to adequately describe the acoustic field and/or to control the test? Since VAPEPS uses statistical methods, a large number of microphones are advantageous and will improve the statistical quantities.

3. Were the microphones properly placed?

4. Was there much spatial variation in the measured acoustic levels?

5. Were there sufficient numbers of accelerometers to adequately measure the response of the test article? Again, since VAPEPS predictions are based on statistical methods and averaging, the more measurements on a particular structural element, the better.

6. Were the accelerometers installed or bonded properly?

7. Were gains, offsets, attenuations, etc., properly set and checked?

8. Was noise, distortion, or clipping a problem or consideration?

9. Were all the transducers properly and recently calibrated?

10. Was an end to end system calibration or check-out performed prior to the test?

11. Is the data stationary?

12. Was the data recorded for a sufficient period of time?

13. If digital analysis was used to produce spectra:
   a. Was the sampling rate sufficient to avoid aliasing?
   b. Were proper filtering/windowing techniques used?
   c. VAPEPS converts all spectral data to 1/3 octave bands. Were the test analysis bandwidths appropriate for this?

14. Were there any anomalies or unusual occurrences that may have influenced the data?

15. Does test data compare well with VAPEPS SEA predictions (if a prediction was made)?
II. REQUIRED INFORMATION

The objective of the VAPEPS database is to provide vibroacoustic data which can be extrapolated to new configurations using the VAPEPS Extrap I, Extrap II, or some other semi-empirical technique. All of these techniques require some knowledge of the baseline data structure and acoustic levels. As a minimum, the following must be included with data submitted for inclusion in the VAPEPS database:

1. Is there a written report on the flight or test that can be released to VMC personnel?

Please provide the following information if it is not included in the report:

2. Sketches or photographs of the facility or vehicle configuration showing transducer locations and coordinate systems.

3. Sketches or photographs of the test article or payload showing transducer locations and coordinate systems.

4. Drawings, sketches, or written description of the test article's structural configuration. Is the structure a plate, cylinder, cone, beam, truss, sphere, etc.?

   Is it a simple uniform plate structure, or is the construction honeycomb, composite, skin stringer, etc.?

   What is the material?

5. What is the mass per unit area for each element for which vibroacoustic data is provided?

6. What is the thickness of each element for which vibroacoustic data is provided? In the case of honeycomb, provide thickness of each layer.

7. What is the equipment mass loading (mass per unit area)?

   Where is the equipment located?

8. What are the dimensions (width, breadth, radius, etc.) of the structural elements?

9. What are the edge conditions (baffled or unbaffled, free or supported)?

10. What are the acoustic spectrum levels?

11. Is the excitation one-sided or two-sided?

12. Descriptions or block diagrams of the measurement system including transducers, recorders, analyzers, control systems, etc. (Manufacturers and model numbers are desirable, but not required).

13. A list of pertinent instrumentation characteristics such as frequency responses, filter characteristics, sampling rates, etc.
14. A brief description of how the test was controlled.

15. A brief description of the calibration procedures.

16. If digital analysis was used to produce the spectra, what were the number of averages used?

17. What were the analyzer bandwidths used?

18. If spectral data were plotted in 1/3 octave bands, were the data analyzed in:
   a. 1/3 octave bandwidths?
   b. Other bandwidths and then converted to 1/3 octave bands?

19. If converted to 1/3 octave bands, what were the original bands?

20. What was the method of conversion?

21. Were "noise floor" spectra analyzed?

22. Were "noise floor" spectra plotted for comparison with data spectra?

23. Were the data signals examined for distortion and/or clipping?

24. Were the data considered stationary or steady state during the analysis periods?

25. Were the test data compared with VAPEPS predictions?
   If yes:
   a. In general, how did the two compare?
   b. If a comparison report was written, can your organization release a copy of it to the VAPEPS Management Center?

26. If a finite element model of the test or flight article was developed, can your organization release the results if necessary?

27. Additional comments or information:
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VAEPS Management Center
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16. Abstract
    This report outlines a procedural method for creating a VAPEPS Database. The
    method of presentation employs flowcharts of sequential VAPEPS Commands used to
    create a VAPEPS Database. The commands are accompanied by explanatory text to the
    right of the command in order to minimize the need for repetitive reference to the
    VAPEPS user’s manual. The method is demonstrated by examples of varying complexity. It is
    assumed that the reader has acquired a basic knowledge of the VAPEPS software program.

17. Key Words (Selected by Author(s))
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