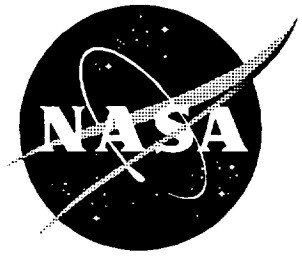


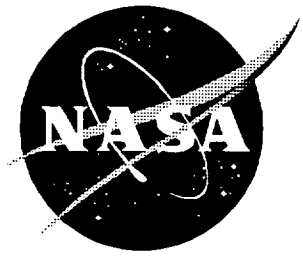
NASA Contractor Report 4747

Database of Mechanical Properties of Textile Composites

Jerry Delbrey

Contract NAS1-19348
Prepared for Langley Research Center

August 1996



NASA Contractor Report 4747

Database of Mechanical Properties of Textile Composites

Jerry Delbrey
Lockheed Martin Aeronautical Systems • Marietta, Georgia

National Aeronautics and Space Administration
Langley Research Center • Hampton, Virginia 23681-0001

Prepared for Langley Research Center
under Contract NAS1-19348

August 1996

Printed copies available from the following:

NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934
(301) 621-0390

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161-2171
(703) 487-4650

ABSTRACT

This report describes the approach followed to develop a database for mechanical properties of textile composites. The data in this database is assembled from NASA Advanced Composite Technology (ACT) programs and from data in the public domain. This database meets the data documentation requirements of MIL-HDBK-17, Section 8.1.2, which describes in detail the type and amount of information needed to completely document composite material properties.

The database focuses on mechanical properties of textile composite. Properties are available for a range of parameters such as direction, fiber architecture, material, environmental condition, and failure mode. The composite materials in the database contain innovative textile architectures such as the braided, woven, and knitted materials evaluated under the NASA ACT programs. In summary, the database contains results for approximately 3500 coupon level tests, for ten different fiber/resin combinations, and seven different textile architectures. It also includes a limited amount of prepreg tape composites data from ACT programs where side-by-side comparisons were made.

Table of Contents

ABSTRACT 1

INTRODUCTION 4

MATERIALS IN THE DATABASE 5

DISCUSSION 6

Database Schema 6

Collection of Data 7

Keypunched Data 7

Electronic Data 8

Data Quality Assurance 8

Data Loading into MVISION 9

Working with the Database 10

CONCLUSIONS 11

ACKNOWLEDGMENT 12

REFERENCES 12

INTRODUCTION

This report describes the approach Lockheed Martin Aeronautical Systems (LMAS), Marietta, GA., followed to develop a database for mechanical properties of textile composites and is available on-line from the Langley Technical Report Server (LTRS) via the World Wide Web (WWW). The URL for LTRS is http://techreports.larc.nasa.gov/ltrs/ltrs.html. The data in this database is assembled from NASA ACT contractors data and from data in the public domain. This database meets the data documentation requirements of MIL-HDBK-17, Section 8.1.2, which describes in detail the type and amount of information needed to completely document composite material properties. The database was delivered to NASA Langley in electronic format, using the MSC/MVISION™ database manager software, Version 1.2a All data in the database is stored as individual coupon test results. This database, which is too lengthy to include in this report, is also available on LTRS. The URL for the database is http://techreports.larc.nasa.gov/ltrs/96/NASA-96-cr4747.refer.html. A separate executive summary with data group averages, which was developed using Microsoft Excel™, is also available at the same address.

This effort focused on preparation of a database that included textile composite strengths and elastic constants as a function of direction, fiber architecture, material, environmental condition, and failure mode. Mechanical property data includes elastic and strength properties in both in-plane and out-of-plane directions. Elastic properties include

Tension Moduli	Compression Moduli
Shear Moduli	Poisson Terms

and strength properties include

Tensile Strength[1]	Compressive Strength[1]
Unnotched Tension	Unnotched Compression
Open Hole Tension	Open Hole Compression
Filled Hole Tension	Filled Hole Compression
Bearing	Through-the-Thickness Tension
Out-of-Plane Loads	Tension and Compression After Impact
Inplane Shear	Fatigue Damage Resistance
Interlaminar Loads	Biaxial Tension and Compression

[1] Lamina level tests.

MATERIALS IN THE DATABASE

This database was developed as a central repository for mechanical properties of textile composite materials. The following types of textile architectures can be found on the database:

2-D triaxial braids	3-D interlock weaves
3-D multiaxial braids	stitched multiaxial warp knits
stitched uniweave fabrics	uniweave fabrics
8 harness fabrics	

In addition, a small amount of unidirectional prepreg tape data is included in the database, as some ACT programs included tape testing as a means of comparison (tape is not considered an architecture within the database, it is stored under Matl_Form=Tape).

All of the data collected under this effort falls under the graphite/epoxy class. The database includes one type of hybrid material, AS4/IM7/3501-6 in stitched knitted preform. A list of material types and product forms follows.

Material Subclass	Available Product Forms
AS4/3501-6	Uniweaves, Knits, Fabric and Tape
AS4/8551-7	Tape Only
AS4/CET-3	8H Satin Fabric Only
AS4/E905-L	3-D Braid and 8H Satin Fabric
AS4/IM7/3501-6	Stitched Knit Only
AS4/PR-500	Braids, Weaves and Fabrics
AS4/PT-500	3-D Weaves Only
AS4/RSL-1895	Braids, Weaves, Uniweaves and Fabrics
AS4/RSS-1952	8H Satin Fabric Only
IM7/8551-7	Tape Only

Each one of the material types listed above is characterized by a different set of textile parameters, i.e., braids are identified by axial and braid tow sizes, weaves are identified by warp/weft/weaver percentages, etc.

DISCUSSION

Database Schema

Since MSC/MVISION was the chosen database manager software for this task, a database schema was necessary. A schema defines the architecture for storing the data attributes and relations in a hierarchical structure. The textile composite database is meant to comply with MIL-HDBK-17 data and documentation requirements, therefore a standardized composite schema developed by a volunteer committee of MIL-HDBK-17 coordination group members was adopted. Because of the unique characteristics of textiles, this schema was further modified to include a "Preform" level that characterizes the special materials to be handled by this database like braids, 3-D woven and knitted materials. It was also necessary to add more attributes to the schema to handle scalar and text descriptors not anticipated by the standardized composite schema. The final schema for the database is shown in Table 1.

The schema hierarchy structure is as follows:

Class (material class, schema level...)
Material (material name, material form...)
Constituent (fiber/matrix class, fiber size...)
Preform (textiles preform architecture, preform descriptions...)
Process (process method, tackifier information...)
Molding (panel layup, NDE method...)
Test (test type, test facility, test fixture...)
Coupon (nominal coupon geometry)
Conditioning (test environment, coupon conditioning...)
Actuals (failure loads/stresses, measured values...)

Class through Conditioning levels are meant to describe in every possible detail the characteristics of a particular coupon so that traceability to its original source is maintained.

All the measured mechanical, hygrothermal and graphical information collected for a particular test is stored under the Actuals level.

Collection of Data

The names and associated reports/technical memorandums listed in the references section were identified by NASA Langley as the sources for textile composites data. Many of those listed were participants in the NASA ACT programs, and included individuals in the aerospace industry, educational facilities and government branches. All sources listed were contacted and asked to provide data in electronic format if possible. Otherwise they were asked to provide the reports/TMs containing the data which would be entered by keypunching at a later time. Even in cases where electronic data was available, written reports were also provided to ensure that data quality was maintained.

Collection of written reports/TMs was accomplished through regular mail directly from the identified source or from NASA Langley. In some cases the reports were obtained from the local LMAS technical library. Collection of electronic data was accomplished via two ways; 1) the data was mailed to the author on 3.5" floppy disk for loading into the LAN, or 2) e-mailed directly to the author. While both of these methods proved to be efficient ways to transfer data, direct e-mail obviously is faster. Since MVISION is a UNIX based software package, it was necessary to use an Apple Macintosh with a data translator program like Stuffit Expander™ or the like, in order to receive data originated on personal computers that were transmitted as encoded files. Once decoded, the data could be manipulated on a PC and transferred to the UNIX workstation as a text file for subsequent loading into MVISION.

The largest collection of data was obtained from Ref. [1], testing performed by the Boeing Defense & Space Group in Philadelphia, PA. Reference [12], testing performed by Lockheed Martin Aeronautical Systems, also proved to be a sizable amount of data. It was this data source that served as the foundation for the textiles composites database since it was already stored in MVISION.

Keypunched Data

Data that was not available in electronic format was typed into electronic spreadsheets from tables provided in the written reports. The data was typed in with one row of attribute identifiers, and the attribute values entered in columnar fashion. An example of keypunched data is shown in Figure 1. A separate spreadsheet was created for each individual test type in order to minimize mistakes and to simplify the loading process into MVISION. Due to the time and expense associated with keypunching data, only tabular data was loaded into the database, i.e., no load-stroke or stress-strain data was loaded into the database for data not provided in electronic format.

Electronic Data

Data in electronic format was usually provided to the author in the form of one or more spreadsheets. In some cases, electronic text files were provided that were easily imported into a spreadsheet for data manipulation. In most cases, the data consisted of measured values of specimen geometry and failure loads/stresses. This data would then be augmented with material characterization and material processing information from the accompanying written report, put into a format similar to that shown in Figure 1, and loaded into MVISION.

Data Quality Assurance

Although mistakes are inevitable as data is loaded into the database, one goal under this task was to end up with a zero defect database. A quality assurance procedure was established that included the following steps to be performed by LMAS:

(1) Conduct initial sanity checks on all incoming data by reviewing the data visually.

(2) Periodically review all new data on the database, in conjunction with periodic releases of database updates.

(3) Maintain copies of old databases, and archive all incoming data. This includes files with the reduced data for loading into MVISION.

Inconsistencies found in step (1) were cleared with the data sender prior to loading into the database. In addition to the QA steps already mentioned, standard input forms (in both paper and electronic format) were developed to maintain consistency and minimize typing in the case of keypunched data. Table 2 shows a sample input form for electronic data. For future NASA programs that have mechanical testing, it is recommended that a similar form be provided to the test laboratory as the preferred method of file storage/transfer. Once the relevant data is stored into such a form, inclusion of the data into a database is greatly simplified.

Quality assurance was further emphasized on the keypunched data by the creation of an automated procedure which searched the data file for a particular parameter and then assigned the common attributes for that specimen. This UNIX script called *ren*, searched the file for the preform ID (e.g., SLL), then assigned values associated with that ID to known attributes like "preform_arch, %_axial_yarn, %_braid_yarn, braid_angle, unit_cell_width and unit_cell_length". This procedure substantially reduced the amount of keypunch, which consequently minimizes mistakes. It also provides for common and consistent attribute values for like specimens, a very important detail for this type of database. The *ren* script also performs a number of other formatting checks like deleting any whitespace at the beginning and end of all entries, it deletes any extra tabs, it makes sure the data file is properly delimited, converts all entries to upper case, etc. All these checks lead to a 'cleaner' data file prior to loading and a database that is easier to use.

One final quality check was performed in conjunction with the preparation of data executive summaries. Since this task consisted of downloading the data from the database, sorting and grouping it, cases where material constituents and/or measured values seemed inconsistent were reviewed against the original data source and corrected if necessary.

Data Loading into MVISION

Three different approaches were used for data loading into MVISION depending on the data origin:

(1) data that was already in MVISION format,
(2) data that was keypunched, and
(3) data received electronically.

For traceability purposes, all information that could possibly be gathered was loaded into the database. In several instances the schema was modified/expanded to accommodate the available information. The data was loaded using customary English units.

Step (1) involved taking data from an existing database and reformatting it. At the time this task started, data from Ref. [12] already had been loaded into MVISION but with a different schema. This data acted as the foundation for the textiles database first version. An MVISION spreadsheet that performed a one-to-one translation from its original schema to the MIL-17 schema was created and the data reloaded in one step. This portion of the data contained load-stroke and stress-strain curves.

Data that was keypunched (step (2)), was reviewed and manipulated using common spreadsheet programs and reformatted into individual files (one data file per specimen). The individual files were then submitted to the QA checks discussed previously, and read individually into an MVISION spreadsheet as shown in Figure 2. The files were categorized by test type in order to simplify the loading process. Since the number of files varied from a few dozen to hundreds depending on test type, MVISION session files were created to automate the loading process. The session file essentially read a data file into an MVISION spreadsheet, loaded the data using the MVISION *put* function, and then moved on to the next file until all specified files were loaded. New versions of the database were created prior to loading of new data to maintain traceability.

Data from step (3) was treated differently since most of the necessary information had already been provided in spreadsheet type format. Any missing information was added directly into the spreadsheet, then the entire block of data was exported as a text file and read into a new MVISION spreadsheet as shown in Figure 3. Then a single *put* statement covering the range of data loaded the information into the database.

Working with the Database

This section is designed to provide some tips on working with the database and using MVISION. Some knowledge about the material constituents is necessary to work with and query the database. Since not all users of the database will be familiar with MVISION

terminology and/or textile composite materials, a copy of the schema is provided in Table 1 to help the user navigate the database.

One of the most useful tools within MVISION is the Query panel. This tool helps the user to limit the information displayed to specific materials or materials with particular properties. Since this database is of moderate size (~17 megabytes) and contains a variety of materials, using the Query panel is the most efficient way to view the data. Figure 4 shows an example of a query specific to this textile database. After the query is executed, the database only displays the AS4/RSL-1895 material for product forms that are stitched. Note that the word *stitched* was enclosed with asterisks on the query command. This tells MVISION to display AS4/RSL-1895 materials for any kind of stitched preform architecture, since the asterisk is used as a wildcard character. The user needs to recognize that MVISION is trying to match the word *stitched* as it searches the database. Any spelling mistakes will return a message saying that no data was found.

At this point the data displayed by MVISION should be of much smaller scale and the user can concentrate of a particular product. He can go back to the Query panel and expand the query to limit the displayed information even more. The Query panel can also be used to display data for two different materials by using operators like *and* or *or*, or by using numerical operators. This is especially useful for side-by-side comparisons of two or more materials.

Another useful database tool is the select command within the MVISION spreadsheet. The select command performs a specified query on the database, and it returns the values of selected attributes. Figure 5 shows an example of the select panel. It is very similar to the Query panel except it contains an 'Attribute to Select' box at the top of the panel where the user specifies the attributes of interest. Once the user fills the select and query boxes and hits the Apply button, MVISION returns the values to the spreadsheet as shown in Figure 6. At this point the data can be sorted or manipulated in any way the user deems necessary. The data can also be written electronically to a file for use in a report, imported to another spreadsheet, plotted with a plotting software package, etc.

CONCLUSIONS

In summary, the effort under this task accomplished the following:

• A mechanical properties database has been created for textile composite materials. It provides a single source where all the data can be found in one place, and facilitates extraction and/or sharing of data within NASA customers.

• The database utilizes a modified standardized composites schema which meets MIL-HDBK-17 data documentation requirements. Use of this schema will help standardize naming scheme conventions throughout the industry.

• The database contains results for approximately 3500 coupon level tests, for ten different fiber/resin combinations, and seven different textile architectures.

ACKNOWLEDGMENT

The author would like to thank Mr. C.C. (Buddy) Poe of the NASA Langley Research Center for his help in gathering some of the necessary data for this task. The author would also like to thank Mr. C.D. Boshers of Lockheed Martin Tactical Aircraft Systems for his work in developing the implementation plan and for his invaluable support during the data loading stages of the database.

REFERENCES

[1] Minguet, P.J., Fedro, M.J. and Gunther, C.K., "Test Methods for Textile Composites", NASA Contractor Report 4609, Jul. 1994.

[2] Swanson, S.R. and Smith, L.V., "Multiaxial Stiffness and Strength Characterization of 2-D Braid Carbon/Epoxy Fiber Composites", NASA Contract NAG-1-1379, 27 Nov. 1994.

[3] Sharma, S.K. and Sankar, B.V., "Effects of Through-the-Thickness Stitching on Impact and Interlaminar Fracture Properties of Textile Graphite/Epoxy Laminates", NASA Contractor Report 195042, Feb. 1995.

[4] Reeder, J., "Comparison of the Compressive Strengths foe Stitched and Toughened Composite Systems", NASA Technical Memorandum 109108, Apr. 1994.

[5] Cox, B., "Failure Models for Textile Composites", NASA Contractor Report 4686, Aug. 1995.

[6] Portanova, M.A., Poe, C.C., Jr., and Whitcomb, J.D., "Open Hole and Post-Impact Compression Fatigue of Stitched and Unstitched Carbon/Epoxy Composites", NASA Technical Memorandum 102676, Jun. 1990.

[7] Portanova, M.A., "Fatigue Resistance of Unnotched and Post-Impact [±30°/0°] 3-D Braided Composites", NASA Contractor Report 191590, Jan. 1994.

[8] Portanova, M.A., "Tension and Compression Fatigue Response of Unnotched 3-D Braided Composites", NASA Contractor Report 189678, Aug. 1992.

[9] Portanova, M.A., "Evaluation of the Impact Response of Textile Composites", NASA Contractor Report 198265, Dec. 1995.

[10] Furrow, K., "ICAPS Composites Allowable Program", Douglas Aircraft Company TAD Z7944591.

[11] Jackson, W.C. and Ifju, P.G., "Through-the-Thickness Tensile Strength of Textile Composites", NASA Technical Memorandum 109115, May 1994.

[12] Kwon, Y.S., "Textile Composite Database Summary", Preliminary Report, NASA Contract NAS1-18888, Oct. 1995.

[13] M/VISION™ Materials System Builder™, User's Guide and Reference, PDA Engineering, Nov. 15, 1993.

TABLE 1. TEXTILES COMPOSITES DATABASE MVISION SCHEMA

```
$       Textile Composite Data Schema Version 4  Version date  3-22-95   agd
$
$       {Revised several descriptions                              4-28-95  agd}
$       {Added Gage1 and Gage2 to attribute list                   5-09-95  agd}
$       {Changed Gage1 and Gage2 to Gage_Strain1 and
$       Gage_Strain2, added Gage_Mod1 and Gage_Mod                 25-11-95  agd}
$       {Added Notch_Depth1, Notch_Depth2, Overlap                 6-12-95  agd}
$       {Added Axial_Stress, Hoop_Stress, Axial_Strain,
$       Hoop_Strain, Braid_Strain                                  7-10-95  agd}
$       {Added Edge_Distance, GIC_Area_Method,
$       GIC_Init_Method, GIIC                                      7-12-95  agd}
$       {Added Strain_Mean                                         7-27-95  agd}
$       {Changed Temperature_Lab, RH_Lab, Temperature_Test and
$       RH_Test from 'Actuals' level to 'Mechanical' level
$       to ensure all coupons have at least
$       one unique common attribute in table data level.           7-31-95  agd}
$       {Added Ftai and ecai.                                      8-24-95  agd}
$       {Added etai.                                               9-05-95  agd}
$
$       The following schema is a draft version of a MIL-17 compliant schema
$       to be used to for the Textile Composite Database prepared for NASA.
$       This schema is based on the draft MIL-17 schema prepared by the M/VISION
$       interest group.
$
$       Chris Boshers
$       Lockheed Martin Aeronautical Systems
$       86 S. Cobb Dr.
$       Marietta, GA. 30063
$
$       (770) 494-9706 voice
$       (770) 494-0799 fax
$       cboshers@advstr6.lasc.lockheed.com
$       34736.00
$       Schema Relations:
$       Class
$       Material
$       Constituent
$       Preform
$       Process
$       Molding
$       Test
$       Coupon
$       Conditioning
$       Actuals
$
$
$
$       Class
$
HIERARCHY ADD Class       Material      Constituent    Preform,
        Process     Molding      Test       Coupon,
        Conditioning   Actuals
TEST SCHEMA
$
ATTRIBUTE ADD  Matl_Class          char     80.00    1.00     -0-      General Material Type
ATTRIBUTE ADD  Schema_Name         char     80.00    1.00     -0-      Schema Name
ATTRIBUTE ADD  Schema_Level        char     80.00    1.00     -0-      Schema Version
ATTRIBUTE ADD  Schema_Software     char     80.00    1.00     -0-      Schema_Software
$
$       Material
$       Process
$
ATTRIBUTE ADD  Matl_Subclass       char     80.00    1.00     -0-      Generic fiber/matrix family
ATTRIBUTE ADD  Matl_Name           char     80.00    1.00     -0-      Common name
ATTRIBUTE ADD  Matl_Form           char     80.00    1.00     -0-      Material reinforcement form
ATTRIBUTE ADD  Matl_Spec char      80.00    1.00     -0-      Material specification number
ATTRIBUTE ADD  Process_Spec        char     80.00    1.00     -0-      Process specification number
ATTRIBUTE ADD  Matl_Max_Temp       real     1.00     1.00     deg F    Material maximum service
temperature
ATTRIBUTE ADD  Matl_MSDS           char     80.00    1.00     -0-      Material safety data sheet number
ATTRIBUTE ADD  Matl_Chem_Family    char     80.00    1.00     -0-      POLYMER MATRIX
ATTRIBUTE ADD  Matl_Designation    char     80.00    1.00     -0-      Supplier internal
designation
ATTRIBUTE ADD  Matl_Min_Temp       real     1.00     1.00     deg F    Material minimum service
temperature
```

TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Matl_Tg_Dry        real    1.00    1.00    deg F     Material nominal dry Tg
ATTRIBUTE ADD  Matl_Tg_Wet        real    1.00    1.00    deg F     Material nominal wet Tg
ATTRIBUTE ADD  CNAME  char        80.00   1.00    -0-     Synonym for Material_Name
$
$       Constituent
$       Reinforcement (an exception)
$       Fiber
$       Tow
$       Matrix
$       Filler
$       Fabric
$       Tracer
$
ATTRIBUTE ADD  Fiber_Name         char    80.00   1.00    -0-       Fiber common name
ATTRIBUTE ADD  Matrix_Name        char    80.00   1.00    -0-       Matrix common name
ATTRIBUTE ADD  Matrix_Subclass    char    80.00   1.00    -0-       Matrix polymer class
ATTRIBUTE ADD  Matrix_Sub_Fam     char    80.00   1.00    -0-       Matrix subfamily
$
ATTRIBUTE ADD  Reinf_Class        char    80.00   1.00    -0-       Reinforcement Class
ATTRIBUTE ADD  Fiber_Desig        char    80.00   1.00    -0-       Fiber mfr internal designation
ATTRIBUTE ADD  Fiber_Chem_Fam     char    80.00   1.00    -0-       Fiber chemical family
ATTRIBUTE ADD  Fiber_Sub_Fam      char    80.00   1.00    -0-       Fiber chemical sub-family
ATTRIBUTE ADD  Fiber_Class        char    80.00   1.00    -0-       Fiber classification
ATTRIBUTE ADD  Fiber_Subclass     char    80.00   1.00    -0-       Fiber subclassification
ATTRIBUTE ADD  Fiber_Mfr char     80.00   1.00    -0-     Fiber manufacturer
ATTRIBUTE ADD  Fiber_Spec_Mfr     char    80.00   1.00    -0-       Fiber mfr specification
number
ATTRIBUTE ADD  Fiber_Spec_User    char    80.00   1.00    -0-       Fiber user specification
number
ATTRIBUTE ADD  Fiber_Lot char     80.00   1.00    -0-     Fiber manufacturer lot number
ATTRIBUTE ADD  Fiber_Density      real    1.00    1.00    Mg/m^3    Average fiber density
ATTRIBUTE ADD  Fiber_Fil_Dia      real    1.00    1.00    micrometre        Fiber filament diameter
ATTRIBUTE ADD  Tow_Count          int     1.00    1.00    count     Fiber tow count per strand/tow
ATTRIBUTE ADD  Tow_Lin_Density    real    1.00    1.00    tex       Fiber tow/strand linear
density
ATTRIBUTE ADD  Tow_Yield          real    1.00    1.00    m/g       Fiber tow/strand yield
ATTRIBUTE ADD  Tow_Twist          real    1.00    1.00    t/m       Fiber tow/strand twist amount
ATTRIBUTE ADD  Tow_Twist_Type     char    1.00    1.00    -0-       Fiber tow twist, Z or S or N
ATTRIBUTE ADD  Fiber_Treat_Name   char    80.00   1.00    -0-       Fiber surface treatment
name
ATTRIBUTE ADD  Fiber_Treat_Dtls   char    80.00   1.00    -0-       Fiber surface treatment
details
ATTRIBUTE ADD  Fiber_Szng_Name    char    80.00   1.00    -0-       Fiber sizing name
ATTRIBUTE ADD  Fiber_Szng_Wt%     real    1.00    1.00    Wt %      Fiber sizing content by
weight %
$
ATTRIBUTE ADD  Matrix_Desig       char    80.00   1.00    -0-       Matrix mfr internal designation
ATTRIBUTE ADD  Matrix_Class       char    80.00   1.00    -0-       Matrix Class
ATTRIBUTE ADD  Matrix_Chem_Fam    char    80.00   1.00    -0-       Matrix chemical family
ATTRIBUTE ADD  Matrix_Mfr         char    80.00   1.00    -0-       Matrix manufacturer name
ATTRIBUTE ADD  Matrix_Spec_Mfr    char    80.00   1.00    -0-       Matrix mfr specification
number
ATTRIBUTE ADD  Matrix_Lot         char    80.00   1.00    -0-       Matrix mfr lot number
ATTRIBUTE ADD  Matrix_Density     real    1.00    1.00    Mg/m^3    Matrix average density
$
ATTRIBUTE ADD  Filler_Name        char    80.00   1.00    -0-       Filler common name
ATTRIBUTE ADD  Filler_Amount      real    1.00    1.00    Wt %      Filler content by weight %
$
ATTRIBUTE ADD  Fabric_Mfr         char    80.00   1.00    -0-       Fabric weaver name
ATTRIBUTE ADD  Fabric_Style       char    80.00   1.00    -0-       Fabric weave style
ATTRIBUTE ADD  Fabric_Spec_Mfr    char    80.00   1.00    -0-       Fabric mfr specification
number
ATTRIBUTE ADD  Fabric_Spec_User   char    80.00   1.00    -0-       Fabric user specification
number
ATTRIBUTE ADD  Fabric_Lot         char    80.00   1.00    -0-       Fabric mfr weave lot
ATTRIBUTE ADD  Fabric_Szng_Name   char    80.00   1.00    -0-       Fabric sizing common name
ATTRIBUTE ADD  Fabric_Szng_Wt%    real    1.00    1.00    Wt %      Fabric sizing content by
weight %
ATTRIBUTE ADD  Fabric_End_Cnt     real    1.00    1.00    count/in  Fabric warp end count per
unit length
ATTRIBUTE ADD  Fabric_Fill_Name   char    80.00   1.00    -0-       Uniweave fabric fill fiber
type
ATTRIBUTE ADD  Fabric_Pick_Cnt    real    1.00    1.00    count/in  Fabric fill pick count
per unit length
ATTRIBUTE ADD  Tracer_Warp_Name char      80.00   1.00    -0-       Fabric warp tracer common
name
ATTRIBUTE ADD  Tracer_Warp_LD     real    1.00    1.00    tex       Fabric warp tracer linear
density
```

TABLE 1. CONTINUED

ATTRIBUTE ADD	Tracer_Warp_Spac	real	1.00	1.00	in	Fabric warp tracer linear spacing
ATTRIBUTE ADD	Tracer_Warp_Szng	char	80.00	1.00	-0-	Fabric warp tracer sizing name
ATTRIBUTE ADD	Tracer_Fill_Name	char	80.00	1.00	-0-	Fabric fill tracer common name
ATTRIBUTE ADD	Tracer_Fill_LD	real	1.00	1.00	tex	Fabric fill tracer linear density
ATTRIBUTE ADD	Tracer_Fill_Spac	real	1.00	1.00	in	Fabric fill tracer linear spacing
ATTRIBUTE ADD	Tracer_Fill_Szng	char	80.00	1.00	-0-	Fabric fill tracer sizing name
$						
$	Preform (added for textiles)					
$						
ATTRIBUTE ADD	Preform_Arch	char	80.00	1.00	-0-	Preform Architecture
ATTRIBUTE ADD	Preform_ID	char	80.00	1.00	-0-	Preform Identifier
ATTRIBUTE ADD	Preform_Mfr	char	80.00	1.00	-0-	Preform Manufacturer
ATTRIBUTE ADD	Fiber_Axial	char	80.00	1.00	-0-	Axial Fiber Type
ATTRIBUTE ADD	Fiber_Braid	char	80.00	1.00	-0-	Braid Fiber Type
ATTRIBUTE ADD	Stitch_Type	char	80.00	1.00	-0-	Stitch Classification
ATTRIBUTE ADD	Stitch_Thread	char	80.00	1.00	-0-	Stitching Thread Material
ATTRIBUTE ADD	Stitch_Pitch	real	1.00	1.00	deg	Stitch Axial Pitch
ATTRIBUTE ADD	Stitch_Spacing	real	1.00	1.00	in	Stitch Row Spacing
ATTRIBUTE ADD	Size_Axial	real	1.00	1.00	K	Number of Fiber Filaments in Axial Yarn
ATTRIBUTE ADD	Size_Braid	real	1.00	1.00	K	Number of Fiber Filaments in Braider Yarn
ATTRIBUTE ADD	Size_Stitch	real	1.00	1.00	denier	Weight in Grams per 9000 meters
ATTRIBUTE ADD	Size_Stitch_Tow	real	1.00	1.00	K	Number of Fiber Filaments in Stitch
ATTRIBUTE ADD	Braid_Angle	real	1.00	1.00	deg	Positive Braid Angle w.r.t. Axial Yarn
ATTRIBUTE ADD	Braid_End_Count	int	1.00	1.00	tow/in	Bias Yarn End Count
ATTRIBUTE ADD	Braid_TTT_Angle	real	1.00	1.00	deg	Bias Yarn Angle Through-the-Thickness
ATTRIBUTE ADD	%_Axial_Yarn	real	1.00	1.00	%	Percentage of Axial Yarn
ATTRIBUTE ADD	%_Braid_Yarn	real	1.00	1.00	%	Percentage of Braider Yarn
ATTRIBUTE ADD	Axial_Spacing	real	1.00	1.00	in	Axial Yarn Spacing in Braids
ATTRIBUTE ADD	Unit_Cell_Width	real	1.00	1.00	in	Unit Cell Width in Braids
ATTRIBUTE ADD	Unit_Cell_Length	real	1.00	1.00	in	Unit Cell Length in Braids
ATTRIBUTE ADD	Interlock_Class	char	80.00	1.00	-0-	Interlock Description for 3-D Woven Matls
ATTRIBUTE ADD	Size_Warp	real	1.00	1.00	K	Number of Fiber Filament in Warp Yarn
ATTRIBUTE ADD	Size_Weftreal	1.00	1.00	K	Number of Fiber Filament in Weft Yarn	
ATTRIBUTE ADD	Size_Angle_Yarn	real	1.00	1.00	K	Number of Fiber Filament in Angle Yarn
ATTRIBUTE ADD	Size_Weaver	real	1.00	1.00	K	Number of Fiber Filament in Weaver Yarn
ATTRIBUTE ADD	%_Warp real	1.00	1.00	%	Percentage of Warp Yarn	
ATTRIBUTE ADD	%_Weft real	1.00	1.00	%	Percentage of Weft Yarn	
ATTRIBUTE ADD	Angle_Yarn_Angle	real	1.00	1.00	deg	Positive Angle of Angle Yarn w.r.t. Axial Yarn
ATTRIBUTE ADD	%_Angle_Yarn	real	1.00	1.00	%	Percentage of Angle Yarn
ATTRIBUTE ADD	%_Weaver	real	1.00	1.00	%	Percentage of Weaver Yarn
ATTRIBUTE ADD	%_TTT real	1.00	1.00	%	Percentage of Through-the-Thickness Yarn	
ATTRIBUTE ADD	Woven_Pitch_Len	real	1.00	1.00	in	Pitch Length in WovenATTRIBUTE ADD
Warp_End_Count	int	1.00	1.00	tow/in	Warp Yarn End Count	
ATTRIBUTE ADD	Weft_End_Count	int	1.00	1.00	tow/in	Weft Yarn End Count
ATTRIBUTE ADD	NLayer int	1.00	1.00	-0-	Number of preform layers	
$						
$	Prepreg					
$	Batch					
$						
ATTRIBUTE ADD	Prepreg_Source	char	80.00	1.00	-0-	Prepreg supplier
ATTRIBUTE ADD	Prepreg_RC	real	1.00	1.00	Wt %	Prepreg nominal matrix weight %
ATTRIBUTE ADD	Prepreg_FAW	real	1.00	1.00	g/m^2	Prepreg nominal FAW
$						
ATTRIBUTE ADD	Prepreg_Mfr	char	80.00	1.00	-0-	Prepreg manufacturer name
ATTRIBUTE ADD	Prepreg_Spec	char	80.00	1.00	-0-	Prepreg mfr internal specification
ATTRIBUTE ADD	Prepreg_VC	real	1.00	1.00	Wt %	Prepreg nominal volatiles weight %
ATTRIBUTE ADD	Prepreg_Width	real	1.00	1.00	in	Prepreg nominal width
ATTRIBUTE ADD	Prepreg_Orient	real	1.00	1.00	deg	Prepreg nominal orientation

TABLE 1. CONTINUED

ATTRIBUTE ADD	Prepreg_Notes	char	700.00	1.00	-0-	Notes about prepreg
$						
ATTRIBUTE ADD	Batch_Number	char	80.00	1.00	-0-	Prepreg mfr batch number
ATTRIBUTE ADD	Batch_Cert	char	80.00	1.00	-0-	Prepreg batch certification
number						
ATTRIBUTE ADD	Batch_Exp_Date	char	10.00	1.00	-0-	Prepreg batch expiration date
ATTRIBUTE ADD	Batch_Roll_Num	char	80.00	1.00	-0-	Prepreg batch mfr
roll/sub-roll number						
$						
ATTRIBUTE ADD	Batch_Resin_Lot	char	80.00	1.00	-0-	Prepreg batch matrix lot
number(s)						
ATTRIBUTE ADD	Batch_Resin_DOM	char	80.00	1.00	-0-	Prepreg batch resin lot date
of mfr						
ATTRIBUTE ADD	Batch_Fiber_Lot	char	80.00	1.00	-0-	Prepreg batch fiber lot
number(s)						
ATTRIBUTE ADD	Batch_Fiber_DOM	char	80.00	1.00	-0-	Prepreg batch fiber lot date
of mfr						
ATTRIBUTE ADD	Batch_Fiber_Cert	char	80.00	1.00	-0-	Prepreg batch fiber cert
number(s)						
ATTRIBUTE ADD	Batch_Fabric_Lot	char	80.00	1.00	-0-	Prepreg batch fabric lot
number(s)						
ATTRIBUTE ADD	Batch_Fabric_DOM	char	80.00	1.00	-0-	Prepreg batch fabric lot
date of mfr						
ATTRIBUTE ADD	Batch_Fab_Cert	char	80.00	1.00	-0-	Prepreg batch fabric cert
number(s)						
ATTRIBUTE ADD	Batch_RC real	1.00	1.00	Wt %	Prepreg batch resin/matrix content	
ATTRIBUTE ADD	Batch_RC_TM	char	80.00	1.00	-0-	Prepreg batch resin content test
method						
ATTRIBUTE ADD	Batch_FAW	real	1.00	1.00	g/m^2	Prepreg batch fiber areal weight
ATTRIBUTE ADD	Batch_FAW_TM	char	80.00	1.00	-0-	Prepreg batch FAW test method
ATTRIBUTE ADD	Batch_VC real	1.00	1.00	Wt %	Prepreg batch volatiles content	
ATTRIBUTE ADD	Batch_VC_TM	char	80.00	1.00	-0-	Prepreg batch VC test method
ATTRIBUTE ADD	Batch_Flow	real	1.00	1.00	Wt %	Prepreg batch resin flow
ATTRIBUTE ADD	Batch_Flow_TM	char	80.00	1.00	-0-	Prepreg batch resin flow test
method						
ATTRIBUTE ADD	Batch_GelTime	real	1.00	1.00	min	Prepreg batch gel time
ATTRIBUTE ADD	Batch_GelTime_TM	char	80.00	1.00	-0-	Prepreg batch gel time test
method						
ATTRIBUTE ADD	Batch_Tack	char	80.00	1.00	-0-	Prepreg batch tack
ATTRIBUTE ADD	Batch_Tack_TM	char	80.00	1.00	-0-	Prepreg batch tack test method
ATTRIBUTE ADD	Batch_Tg_Dry	real	1.00	1.00	deg F	Prepreg batch glass transition
temp						
ATTRIBUTE ADD	Batch_Tg_Dry_TM	char	80.00	1.00	-0-	Prepreg batch glass
transition temp TM						
$						
$	Process					
$	Process					
$	Tackifier					
$	Molded					
$						
ATTRIBUTE ADD	Process_Method	char	80.00	1.00	-0-	Molding consolidation/cure
method						
ATTRIBUTE ADD	Process_Temp	real	1.00	1.00	deg F	Nominal as-molded
cure/consolid. temp						
ATTRIBUTE ADD	Molded_CPT	real	1.00	1.00	in	Nominal as-molded cured ply
thickness						
ATTRIBUTE ADD	Molded_Vf	real	1.00	1.00	Vol %	Nominal as-molded fiber volume
$						
ATTRIBUTE ADD	Tackifier_Name	char	80.00	1.00	-0-	Tackifier common name
ATTRIBUTE ADD	Tackifier_Type	char	80.00	1.00	-0-	Tackifier type
ATTRIBUTE ADD	Tackifier_Mfr	char	80.00	1.00	-0-	Tackifier manufacturer
$						
ATTRIBUTE ADD	Process_Step_1	char	80.00	1.00	-0-	Description of 1st process
step						
ATTRIBUTE ADD	Process_Temp_1	real	1.00	1.00	deg F	Temperature of 1st process
step						
ATTRIBUTE ADD	Process_Press_1	real	1.00	1.00	psig	Pressure during 1st process
step						
ATTRIBUTE ADD	Process_Vac_1	real	1.00	1.00	psig	Vacuum during 1st process step
ATTRIBUTE ADD	Process_Time_1	real	1.00	1.00	min	Elapsed time of 1st process
step						
ATTRIBUTE ADD	Process_Notes_1	char	700.00	1.00	-0-	Notes on 1st process step
$						
ATTRIBUTE ADD	Process_Step_2	char	80.00	1.00	-0-	Description of 2nd process
step						
ATTRIBUTE ADD	Process_Temp_2	real	1.00	1.00	deg F	Temperature of 2nd process
step						

TABLE 1. CONTINUED

ATTRIBUTE ADD	Process_Press_2	real	1.00	1.00	psig	Pressure during 2nd process step
ATTRIBUTE ADD	Process_Vac_2	real	1.00	1.00	psig	Vacuum during 2nd process step
ATTRIBUTE ADD	Process_Time_2	real	1.00	1.00	min	Elapsed time of 2nd process step
ATTRIBUTE ADD	Process_Notes_2	char	700.00	1.00	-0-	Notes on 2nd process step
$						
ATTRIBUTE ADD	Molded_Density	real	1.00	1.00	Mg/m^3	Nominal as-molded density
ATTRIBUTE ADD	Molded_VC	real	1.00	1.00	Vol %	Nominal as-molded void content
ATTRIBUTE ADD	Molded_RC	real	1.00	1.00	Wt %	Nominal as-molded resin content
ATTRIBUTE ADD	Molded_Thickness	real	1.00	1.00	in	Nominal as-molded total thickness
ATTRIBUTE ADD	Molded_Tg_Dry	real	1.00	1.00	deg F	Nominal as-molded dry Tg
ATTRIBUTE ADD	Molded_Tg_Dry_TM	char	80.00	1.00	-0-	Dry Tg test method
ATTRIBUTE ADD	Molded_Tg_Wet	real	1.00	1.00	deg F	Nominal as-molded wet Tg
ATTRIBUTE ADD	Molded_Tg_Wet_TM	char	80.00	1.00	-0-	Wet Tg test method
ATTRIBUTE ADD	Molded_Xtl_Temp	real	1.00	1.00	deg F	Nominal as-molded crystallization temp
ATTRIBUTE ADD	Molded_Melt_Temp	real	1.00	1.00	deg F	Nominal as-molded melt temp
ATTRIBUTE ADD	Molded_Form	char	80.00	1.00	-0-	Form of molding: panel, tube, part, etc
$						
$	Molding					
$	Panel					
$	Process					
$	Tackifier					
$	NDE					
$	Core					
$	Adhesive					
$						
ATTRIBUTE ADD	Panel_Layup_Code	char	80.00	1.00	-0-	Panel layup code
ATTRIBUTE ADD	Panel_ID char	80.00	1.00	-0-	Panel Identification	
ATTRIBUTE ADD	Panel_CPT	real	1.00	1.00	in	Panel average cured ply thickness
ATTRIBUTE ADD	Panel_Vf real	1.00	1.00	Vol %	Panel average fiber volume	
$						
ATTRIBUTE ADD	Panel_Drawing	char	80.00	1.00	-0-	Panel Drawing Number
ATTRIBUTE ADD	Panel_Ply_Count	int	1.00	1.00	-0-	Panel ply count
ATTRIBUTE ADD	Panel_Stack_Sym	char	80.00	1.00	-0-	Panel midplane harness-weave symmetry
ATTRIBUTE ADD	Panel_%0 real	1.00	1.00	%	Panel percent 0 deg plies	
ATTRIBUTE ADD	Panel_%45	real	1.00	1.00	%	Panel percent 45 deg plies
ATTRIBUTE ADD	Panel_%90	real	1.00	1.00	%	Panel percent 90 deg plies
ATTRIBUTE ADD	Panel_Cut_Plan	char	80.00	1.00	-0-	Panel cutting plan
ATTRIBUTE ADD	Panel_Labeling	char	80.00	1.00	-0-	Panel labeling scheme
ATTRIBUTE ADD	Panel_Sampling	char	80.00	1.00	-0-	Panel sampling method
ATTRIBUTE ADD	Panel_Label_Mthd	char	80.00	1.00	-0-	Panel labeling method(s)
$						
ATTRIBUTE ADD	Panel_Mfrchar	80.00	1.00	-0-	Name of panel fabrication org	
ATTRIBUTE ADD	Panel_DOM	char	10.00	1.00	-0-	Panel date of manufacture
ATTRIBUTE ADD	Process_OutTime	real	1.00	1.00	h	Specific panel prepreg cum out-time
ATTRIBUTE ADD	Tackifier_Lot	char	80.00	1.00	-0-	Tackifier mfr lot number
ATTRIBUTE ADD	Tackifier_DOM	char	10.00	1.00	-0-	Tackifier date of manufacture
ATTRIBUTE ADD	Process_Run_1_ID	char	80.00	1.00	-0-	Specific panel cure/consol. run 1 ID
ATTRIBUTE ADD	Process_Run_2_ID	char	80.00	1.00	-0-	Specificpanel cure/consol. run 2 ID
ATTRIBUTE ADD	Process_Run_3_ID	char	80.00	1.00	-0-	Specific panel cure/consol. run 3 ID
ATTRIBUTE ADD	Process_OK	char	80.00	1.00	-0-	Process parameters satisfied?
ATTRIBUTE ADD	Panel_Cut_Method	char	80.00	1.00	-0-	Panel cutting method
ATTRIBUTE ADD	NDE_Criterion	char	80.00	1.00	-0-	NDE criteria
ATTRIBUTE ADD	NDE_Method	char	80.00	1.00	-0-	NDE method
ATTRIBUTE ADD	NDE_Level	char	80.00	1.00	-0-	NDE level
ATTRIBUTE ADD	NDE_Result	char	80.00	1.00	-0-	NDE result
ATTRIBUTE ADD	NDE_Report	char	80.00	1.00	-0-	NDE results report
$						
ATTRIBUTE ADD	Panel_Thickness	real	1.00	1.00	in	Panel average total thickness
ATTRIBUTE ADD	Panel_RC real	1.00	1.00	Wt %	Panel average resin/matrix content	
ATTRIBUTE ADD	Panel_Density	real	1.00	1.00	Mg/m^3	Panel average density
ATTRIBUTE ADD	Panel_Tg_Dry	real	1.00	1.00	deg F	Panel glass transition temperature
ATTRIBUTE ADD	Panel_RC_TM	char	80.00	1.00	-0-	Panel resin content test method
ATTRIBUTE ADD	Panel_Vf_TM	char	80.00	1.00	-0-	Panel fiber volume test method
ATTRIBUTE ADD	Panel_Density_TM	char	80.00	1.00	-0-	Panel density test method

TABLE 1. CONTINUED

ATTRIBUTE ADD	Panel_Tg_Dry_TM	char	80.00	1.00	-0-	Panel glass transition temp test method
$ATTRIBUTE ADD	Core_Name	char	80.00	1.00	-0-	Sandwich core common name
ATTRIBUTE ADD	Core_Type	char	80.00	1.00	-0-	Sandwich core type
ATTRIBUTE ADD	Core_Mfr char	80.00	1.00	-0-	Sandwich core manufacturer	
ATTRIBUTE ADD	Core_Lot char	80.00	1.00	-0-	Sandwich core lot number	
ATTRIBUTE ADD	Core_Cell_Size	real	1.00	1.00	in	Sandwich core cell size
ATTRIBUTE ADD	Core_Cell_Shape	char	80.00	1.00	-0-	Sandwich core cell shape
ATTRIBUTE ADD	Core_Ribbon_Thk	real	1.00	1.00	in	Sandwich core ribbon thickness
$						
ATTRIBUTE ADD	Adhsv_Name	char	80.00	1.00	-0-	Adhesive name
ATTRIBUTE ADD	Adhsv_Chem_Fam	char	80.00	1.00	-0-	Adhesive chemical family
ATTRIBUTE ADD	Adhsv_Mfr	char	80.00	1.00	-0-	Adhesive manufacturer
ATTRIBUTE ADD	Adhsv_Lot	char	80.00	1.00	-0-	Adhesive lot number
ATTRIBUTE ADD	Adhsv_DOM	char	10.00	1.00	-0-	Adhesive lot date of manufacture
ATTRIBUTE ADD	Adhsv_Scrim	char	80.00	1.00	-0-	Adhesive scrim common name
ATTRIBUTE ADD	Adhsv_Scrim_Sty	char	80.00	1.00	-0-	Adhesive scrim fabric style
ATTRIBUTE ADD	Adhsv_Scrim_Szng	char	80.00	1.00	-0-	Adhesive scrim sizing
ATTRIBUTE ADD	Adhsv_Surf_Prep	char	80.00	1.00	-0-	Adhesive surface preparation
$						
$ Test						
$						
ATTRIBUTE ADD	Test_Prop_Class	char	80.00	1.00	-0-	Test property class
ATTRIBUTE ADD	Test_Type char	80.00	1.00	-0-	Test property type	
ATTRIBUTE ADD	Test_Method	char	80.00	1.00	-0-	Test method
ATTRIBUTE ADD	Test_Plan char	80.00	1.00	-0-	Test plan document ID	
ATTRIBUTE ADD	Test_Request_ID	char	80.00	1.00	-0-	Test request ID
ATTRIBUTE ADD	Test_Report_ID	char	80.00	1.00	-0-	Test report ID
ATTRIBUTE ADD	Test_Raw_Data_ID	char	80.00	1.00	-0-	Test raw data ID
ATTRIBUTE ADD	Test_Spec_Geom	char	80.00	1.00	-0-	Test specimen geometry
ATTRIBUTE ADD	Test_Parameter	char	80.00	1.00	-0-	Test parameter
ATTRIBUTE ADD	Test_Facility	char	80.00	1.00	-0-	Test facility
ATTRIBUTE ADD	Test_Eng_Name	char	80.00	1.00	-0-	Test engineer name
ATTRIBUTE ADD	Test_Eng_ID	char	80.00	1.00	-0-	Test engineer ID
ATTRIBUTE ADD	Test_Tech_Name	char	80.00	1.00	-0-	Test technician name
ATTRIBUTE ADD	Test_Tech_ID	char	80.00	1.00	-0-	Test technician ID
ATTRIBUTE ADD	Test_Data_Source	char	80.00	1.00	-0-	Test data source
ATTRIBUTE ADD	Test_Machine_Mfr	char	80.00	1.00	-0-	Test machine manufacturer & model
ATTRIBUTE ADD	Test_Machine_SN	char	80.00	1.00	-0-	Test machine serial number
ATTRIBUTE ADD	Test_Fixture	char	80.00	1.00	-0-	Test fixture type
ATTRIBUTE ADD	Test_Fixture_Mfr	char	80.00	1.00	-0-	Test fixture manufacturer
ATTRIBUTE ADD	Test_Fixture_SN	char	80.00	1.00	-0-	Test fixture serial number
ATTRIBUTE ADD	Test_Grip_Type	char	80.00	1.00	-0-	Test grip type
ATTRIBUTE ADD	Test_Grip_Angle	real	1.00	1.00	deg	Test grip wedge angle
ATTRIBUTE ADD	Test_Grip_Surf	char	80.00	1.00	-0-	Test grip interface
ATTRIBUTE ADD	Test_Load_Type	real	1.00	1.00	in	Test loading type: 1/2, 1/3, 1/4 span
ATTRIBUTE ADD	Test_Load_Radius	real	1.00	1.00	in	Test loading nose radius
ATTRIBUTE ADD	Test_Supp_Span	real	1.00	1.00	in	Test support span
ATTRIBUTE ADD	Test_Supp_Radius	char	80.00	1.00	-0-	Test support radius
ATTRIBUTE ADD	Test_Inst char	80.00	1.00	-0-	Test instrumentation	
ATTRIBUTE ADD	Test_DataAcqSys	char	80.00	1.00	-0-	Test data acquisition system
ATTRIBUTE ADD	Test_Ld_Cell_Mfr	char	80.00	1.00	-0-	Test load cell manufacturer
ATTRIBUTE ADD	Test_Ld_Cell_SN	char	80.00	1.00	-0-	Test load cell serial number
ATTRIBUTE ADD	Test_Run_Number	int	1.00	1.00	-0-	Test run number
$						
$ Coupon						
$ Coupon						
$ Tab						
$ Trans						
$ Test						
$						
ATTRIBUTE ADD	Coupon_Orient	real	1.00	1.00	deg	Coupon nominal orientation
ATTRIBUTE ADD	Test_Modulus_Typ	char	80.00	1.00	-0-	Test modulus type
ATTRIBUTE ADD	Test_OffsetValue	real	1.00	1.00	-0-	Value of offset for offset strength
ATTRIBUTE ADD	Coupon_Hole_Dia	real	1.00	1.00	in	Coupon nominal hole diameter
ATTRIBUTE ADD	Coupon_Bolt_Torq	real	1.00	1.00	in-lbf	Coupon nominal bolt torque
ATTRIBUTE ADD	Coupon_Byp_Ratio	real	1.00	1.00	-0-	Coupon nominal bypass ratio
ATTRIBUTE ADD	Coupon_Grip_Len	real	1.00	1.00	in	Coupon nominal grip length
ATTRIBUTE ADD	Coupon_Thickness	real	1.00	1.00	in	Coupon nominal thickness
ATTRIBUTE ADD	Coupon_Width	real	1.00	1.00	in	Coupon nominal width
ATTRIBUTE ADD	Coupon_Length	real	1.00	1.00	in	Coupon nominal length
ATTRIBUTE ADD	Coupon_Gage_Len	real	1.00	1.00	in	Coupon nominal gage length
ATTRIBUTE ADD	Coupon_Gage_Area	real	1.00	1.00	in^2	Coupon nominal gage area

TABLE 1. CONTINUED

ATTRIBUTE ADD	Coupon_Notch_Rad	real	1.00	1.00	in	Coupon nominal v-notch radius
ATTRIBUTE ADD	Coupon_Notch_Ang	real	1.00	1.00	deg	Coupon nominal v-notch angle
ATTRIBUTE ADD	Coupon_Notch_Wid	real	1.00	1.00	in	Coupon nominal v-notch width
ATTRIBUTE ADD	Coupon_SD_Ratio	real	1.00	1.00	-0-	Coupon nominal span/depth ratio
ATTRIBUTE ADD	Coupon_Crack_Len	real	1.00	1.00	in	Coupon nominal initial crack length
$						
ATTRIBUTE ADD	Tab_Material	char	80.00	1.00	-0-	Coupon tabbing material
ATTRIBUTE ADD	Tab_Adhesive	char	80.00	1.00	-0-	Coupon tabbing adhesive
ATTRIBUTE ADD	Tab_Orientation	real	1.00	1.00	deg	Coupon nominal orientation
ATTRIBUTE ADD	Tab_Thickness	real	1.00	1.00	in	Coupon nominal tab material thk
ATTRIBUTE ADD	Tab_Angle	real	1.00	1.00	deg	Coupon nominal tab bevel angle
ATTRIBUTE ADD	Tab_Length	real	1.00	1.00	in	Coupon nominal tab length
ATTRIBUTE ADD	Tab_Cure_Temp	real	1.00	1.00	deg F	Coupon nominal tab cure temp
ATTRIBUTE ADD	Tab_Cure_Time	real	1.00	1.00	min	Coupon nominal tab cure time
$						
ATTRIBUTE ADD	Coupon_Bolt_Type	char	80.00	1.00	-0-	Coupon bolt/pin spec/description
ATTRIBUTE ADD	Coupon_Bolt_Matl	char	80.00	1.00	-0-	Coupon bolt material
ATTRIBUTE ADD	Coupon_Bolt_Dia	real	1.00	1.00	in	Coupon nominal bolt/pin diameter
ATTRIBUTE ADD	Trans_Type	char	80.00	1.00	-0-	Test transducer type
ATTRIBUTE ADD	Trans_Class	char	80.00	1.00	-0-	Test transducer class
ATTRIBUTE ADD	Trans_Mfr	char	80.00	1.00	-0-	Test transducer manufacturer
ATTRIBUTE ADD	Trans_Model	char	80.00	1.00	-0-	Test transducer model
ATTRIBUTE ADD	Trans_Location	char	80.00	1.00	-0-	Test transducer coupon location
ATTRIBUTE ADD	Trans_Cure_Temp	real	1.00	1.00	deg F	Test transducer cure temp
ATTRIBUTE ADD	Trans_Cure_Time	real	1.00	1.00	min	Test transducer cure time
ATTRIBUTE ADD	Test_DataAcqMthd	char	80.00	1.00	-0-	Description of data acquisition method
ATTRIBUTE ADD	Test_ModulusMthd	char	80.00	1.00	-0-	Test modulus fit method
ATTRIBUTE ADD	Test_Modulus_Pt	char	80.00	1.00	-0-	Test modulus end-point unit
ATTRIBUTE ADD	Test_Modulus_Pt1	real	1.00	1.00	-0-	Test modulus nominal end point 1
ATTRIBUTE ADD	Test_Modulus_Pt2	real	1.00	1.00	-0-	Test modulus nominal end point 2
ATTRIBUTE ADD	Test_Poisson_Typ	char	80.00	1.00	-0-	Test Poisson type
ATTRIBUTE ADD	Test_PoissonMthd	char	80.00	1.00	-0-	Test Poisson fit method
ATTRIBUTE ADD	Test_Poisson_Pt	char	80.00	1.00	-0-	Test Poisson end-point unit
ATTRIBUTE ADD	Test_Poisson_Pt1	real	1.00	1.00	-0-	Test Poisson end point 1
ATTRIBUTE ADD	Test_Poisson_Pt2	real	1.00	1.00	-0-	Test Poisson end point 2
ATTRIBUTE ADD	Test_Offset_Type	char	1.00	1.00	-0-	Strain, stress, displacement
ATTRIBUTE ADD	Test_Offset_Unit	char	1.00	1.00	-0-	Microstrain, ksi, inch
$						
$	Conditioning					
$	Cond					
$	Test					
$						
ATTRIBUTE ADD	Test_Condition	char	80.00	1.00	-0-	Nominal material condition
ATTRIBUTE ADD	Test_Temperature	real	1.00	1.00	deg F	Nominal test temperature
ATTRIBUTE ADD	Test_Environment	char	80.00	1.00	-0-	Test exposure environment
$						
ATTRIBUTE ADD	Cond_Env char	80.00	1.00	-0-	Conditioning environment	
ATTRIBUTE ADD	Cond_TM char	80.00	1.00	-0-	Conditioning test method	
ATTRIBUTE ADD	Cond_Step_1	char	80.00	1.00	-0-	Description of 1st condition step
ATTRIBUTE ADD	Cond_Temp_1	real	1.00	1.00	deg F	Temperature of 1st condition step
ATTRIBUTE ADD	Cond_Medium_1	char	80.00	1.00	-0-	Description of 1st cond. step medium
ATTRIBUTE ADD	Cond_Medium_Val1	real	1.00	1.00	-0-	Measure of Medium 1
ATTRIBUTE ADD	Cond_Time_1	real	1.00	1.00	day	Time of exposure during Step 1
ATTRIBUTE ADD	Cond_Step_2	char	80.00	1.00	-0-	Description of 2nd condition step
ATTRIBUTE ADD	Cond_Temp_2	real	1.00	1.00	deg F	Temperature of 2nd condition step
ATTRIBUTE ADD	Cond_Medium_2	char	80.00	1.00	-0-	Description of 2nd cond. step medium
ATTRIBUTE ADD	Cond_Medium_Val2	real	1.00	1.00	-0-	Measure of Medium 2
ATTRIBUTE ADD	Cond_Time_2	real	1.00	1.00	day	Time of exposure during Step 2
ATTRIBUTE ADD	Cond_Trav_Geom	char	80.00	1.00	-0-	Geometry of conditioning traveler
ATTRIBUTE ADD	Cond_Eq_Crit	char	80.00	1.00	-0-	Criterion for equilibrium
ATTRIBUTE ADD	Cond_Mi_Initial	real	1.00	1.00	Wt %	Initial moisture content

TABLE 1. CONTINUED

ATTRIBUTE ADD	Cond_Mi_Final	real	1.00	1.00	Wt %	Final moisture gain
ATTRIBUTE ADD	Cond_Mi_Total	real	1.00	1.00	Wt %	Total moisture content
$						
ATTRIBUTE ADD	Test_Heatup_Time	real	1.00	1.00	min	Test heat-up time
ATTRIBUTE ADD	Test_Dwell_Time	real	1.00	1.00	min	Test dwell time at temperature
ATTRIBUTE ADD	Test_Dryout	real	1.00	1.00	Wt %	Moisture loss during test
$						
$	Actuals					
$	Mechanical					
$	Hygrothermal					
$						
ATTRIBUTE ADD	ID_of_Coupon	char	80.00	1.00	-0-	Label on Coupon
ATTRIBUTE ADD	Valid_IAW_TM	char	10.00	1.00	-0-	Test valid IAW test method?
ATTRIBUTE ADD	Failure_Mode	char	80.00	1.00	-0-	Failure mode code or description
$						
ATTRIBUTE ADD	Thickness real	1.00	1.00	in	Actual coupon thickness	
ATTRIBUTE ADD	Length real	1.00	1.00	in	Actual coupon length	
ATTRIBUTE ADD	Width real	1.00	1.00	in	Actual coupon width	
ATTRIBUTE ADD	Gage_Length	real	1.00	1.00	in	Actual gage length
ATTRIBUTE ADD	Gage_Width	real	1.00	1.00	in	Actual gage width
ATTRIBUTE ADD	Gage_Area	real	1.00	1.00	in^2	Actual gage cross-section area
ATTRIBUTE ADD	Area_Calc_Method	char	80.00	1.00	-0-	Coupon gage cross-section area method
ATTRIBUTE ADD	Edge_Dist_Ratio	real	1.00	1.00	-0-	Actual edge distance ratio
ATTRIBUTE ADD	Edge_Distance	real	1.00	1.00	in	Actual edge distance
ATTRIBUTE ADD	Hole_Diameter	real	1.00	1.00	in	Actual hole diameter
ATTRIBUTE ADD	Notch_Length	real	1.00	1.00	in	Length between notches
ATTRIBUTE ADD	Notch_Depth1	real	1.00	1.00	in	Notch Depth 1 of CILS coupon
ATTRIBUTE ADD	Notch_Depth2	real	1.00	1.00	in	Notch Depth 2 of CILS coupon
ATTRIBUTE ADD	Overlap real	1.00	1.00	in	Overlap between notches of CILS coupon	
ATTRIBUTE ADD	Sandwich_Thk	real	1.00	1.00	in	Actual sandwich thickness
ATTRIBUTE ADD	Core_Thickness	real	1.00	1.00	in	Actual thickness of sandwich core
ATTRIBUTE ADD	Opposite_FS_Thk	real	1.00	1.00	in	Actual thk of opp. sandwich facesheet
ATTRIBUTE ADD	Impactor_Type	char	80.00	1.00	-0-	Type of Impactor
ATTRIBUTE ADD	Impact_Energy	real	1.00	1.00	in-lbf	Actual impact energy
ATTRIBUTE ADD	Absorb_Energy	real	1.00	1.00	in-lbf	Total energy absorbed during impact
ATTRIBUTE ADD	Impactor_Dia	real	1.00	1.00	in	Actual diameter of impactor
ATTRIBUTE ADD	Impact_Fmax	real	1.00	1.00	lbf	Maximum impact force
ATTRIBUTE ADD	Impact_Mass	real	1.00	1.00	lbf	Weight of impact tup
ATTRIBUTE ADD	Impact_Vel	real	1.00	1.00	ft/s	Impact velocity
ATTRIBUTE ADD	Impact_Number	char	80.00	1.00	-0-	Identification of impact event
ATTRIBUTE ADD	Damaged_Area	real	1.00	1.00	in^2	Size of damaged area due to impact
ATTRIBUTE ADD	Dent_Depth	real	1.00	1.00	in	Dent depth
ATTRIBUTE ADD	Displ_Fmax	real	1.00	1.00	in	Displacement at max. impact force
ATTRIBUTE ADD	Extensometer_Len	real	1.00	1.00	in	Actual extensometer gage length
ATTRIBUTE ADD	Bolt_Diameter	real	1.00	1.00	in	Actual bolt/pin diameter
ATTRIBUTE ADD	Torque real	1.00	1.00	lbf-in	Actual bolt torque	
ATTRIBUTE ADD	Load_Ratio	real	1.00	1.00	-0-	Actual load ratio
ATTRIBUTE ADD	Frequency real	1.00	1.00	Hz	Actual loading frequency	
ATTRIBUTE ADD	Stress_Ratio	real	1.00	1.00	-0-	Actual stress ratio
ATTRIBUTE ADD	Load_Mean	real	1.00	1.00	lbf	Actual mean cyclic load
ATTRIBUTE ADD	Stress_Mean	real	1.00	1.00	ksi	Actual mean cyclic stress
ATTRIBUTE ADD	Strain_Mean	real	1.00	1.00	microstrain	Actual mean cyclic strain
ATTRIBUTE ADD	Start_Date char	10.00	1.00	-0-	Start of testing	
ATTRIBUTE ADD	End_Date char	10.00	1.00	-0-	End of testing	
ATTRIBUTE ADD	Grip_Pressure	real	1.00	1.00	psi	Hydraulic/pneumatic grip pressure
ATTRIBUTE ADD	Preload real	1.00	1.00	lbf	Preload on coupon	
ATTRIBUTE ADD	Control_Method	char	80.00	1.00	-0-	Method of controlling test
ATTRIBUTE ADD	Speed_of_Test	real	1.00	1.00	in/min	Rate of test
ATTRIBUTE ADD	Strain_Rate	real	1.00	1.00	microstrain/s	Nominal initial strain rate
ATTRIBUTE ADD	Data_Acq_Rate	real	1.00	1.00	Hz	Data acquisition sampling rate
ATTRIBUTE ADD	Bending_Checked	char	80.00	1.00	-0-	Was bending strain checked?
ATTRIBUTE ADD	Bending_Stm_Pt1	real	1.00	1.00	microstrain	Mean strain point for Bending 1
ATTRIBUTE ADD	Bending_Stm_Pt2	real	1.00	1.00	microstrain	Mean strain point for Bending 2
ATTRIBUTE ADD	Bending_Pt1	real	1.00	1.00	%	Bending level at point 1

TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Bending_Pt2          real    1.00    1.00    %       Bending level at point 2
$
ATTRIBUTE ADD  Load_Max             real    1.00    1.00    lbf     Actual max load during test
ATTRIBUTE ADD  Load_Audible         real    1.00    1.00    lbf     Load when first audible event
occured
ATTRIBUTE ADD  Disp_Max real        1.00    1.00    in      Actual max displ/defl during test
ATTRIBUTE ADD  Failure_Location     char    80.00   1.00    -0-     Failure location
ATTRIBUTE ADD  Cycles_at_Finish     int     1.00    1.00    -0-     Cycles at test termination
ATTRIBUTE ADD  Test_Term_Crit       char    80.00   1.00    -0-     Test termination criterion
ATTRIBUTE ADD  Max_Stress_Eq_F      char    3.00    1.00    -0-     Did maximum stress =
strength?
ATTRIBUTE ADD  Note_1    char       700.00  1.00    -0-     A first note about this test
ATTRIBUTE ADD  Note_2    char       700.00  1.00    -0-     A second note about this test
ATTRIBUTE ADD  Note_3    char       700.00  1.00    -0-     A third note about this test
$
$       Mechanical Relation Property Table
$       Lamina Tensile Properties (1 - Direction)
$
ATTRIBUTE ADD  F1tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (1-Dir)
ATTRIBUTE ADD  e1tu      real       1.00    1.00    microstrain     Ultimate Tensile Strain (1-Dir)
ATTRIBUTE ADD  E1t       real       1.00    1.00    msi     Tensile Elastic Modulus (1-Dir)
ATTRIBUTE ADD  nu12t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (12-Dir)
ATTRIBUTE ADD  nu13t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (13-Dir)
$
$       Lamina Compressive Properties (1 - Direction)
ATTRIBUTE ADD  F1cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (1-Dir)
ATTRIBUTE ADD  e1cu      real       1.00    1.00    microstrain     Ultimate Compressive Strain
(1-Dir)
ATTRIBUTE ADD  E1c       real       1.00    1.00    msi     Compressive Elastic Modulus (1-Dir)
ATTRIBUTE ADD  nu12c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (12-Dir)
ATTRIBUTE ADD  nu13c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (13-Dir)
$
$       Lamina Tensile Properties (2 - Direction)
ATTRIBUTE ADD  F2tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (2-Dir)
ATTRIBUTE ADD  e2tu      real       1.00    1.00    microstrain     Ultimate Tensile Strain (2-Dir)
ATTRIBUTE ADD  E2t       real       1.00    1.00    msi     Tensile Elastic Modulus (2-Dir)
ATTRIBUTE ADD  nu21t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (21-Dir)
ATTRIBUTE ADD  nu23t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (23-Dir)
$
$       Lamina Compressive Properties (2 - Direction)
ATTRIBUTE ADD  F2cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (2-Dir)
ATTRIBUTE ADD  e2cu      real       1.00    1.00    microstrain     Ultimate Compressive Strain
(2-Dir)
ATTRIBUTE ADD  E2c       real       1.00    1.00    msi     Compressive Elastic Modulus (2-Dir)
ATTRIBUTE ADD  nu21c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (21-Dir)
ATTRIBUTE ADD  nu23c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (23-Dir)
$
$       Lamina Shear Properties (12 - Direction)
ATTRIBUTE ADD  F12su     real       1.00    1.00    ksi     Ultimate Shear Strength (12-Dir)
ATTRIBUTE ADD  F12so     real       1.00    1.00    ksi     Offset Shear Strength (12-Dir)
ATTRIBUTE ADD  e12su     real       1.00    1.00    microstrain     Ultimate Shear Strain (12-Dir)
ATTRIBUTE ADD  e12so     real       1.00    1.00    microstrain     Offset Shear Strain (12-Dir)
ATTRIBUTE ADD  G12       real       1.00    1.00    msi     Shear Elastic Modulus (12-Dir)
$
$       Lamina Tensile Properties (3 - Direction)
ATTRIBUTE ADD  F3tu      real       1.00    1.00    ksi     Ultimate Tensile Strength (3-Dir)
ATTRIBUTE ADD  e3tu      real       1.00    1.00    microstrain     Ultimate Tensile Strain (3-Dir)
ATTRIBUTE ADD  E3t       real       1.00    1.00    msi     Tensile Elastic Modulus (3-Dir)
ATTRIBUTE ADD  nu31t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (31-Dir)
ATTRIBUTE ADD  nu32t     real       1.00    1.00    -0-     Tensile Poisson's Ratio (32-Dir)
$
$       Lamina Compressive Properties (3 - Direction)
ATTRIBUTE ADD  F3cu      real       1.00    1.00    ksi     Ultimate Compressive Strength (3-Dir)
ATTRIBUTE ADD  e3cu      real       1.00    1.00    microstrain     Ultimate Compressive Strain
(3-Dir)
ATTRIBUTE ADD  E3c       real       1.00    1.00    msi     Compressive Elastic Modulus (3-Dir)
ATTRIBUTE ADD  nu31c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (31-Dir)
ATTRIBUTE ADD  nu32c     real       1.00    1.00    -0-     Compressive Poisson's Ratio (32-Dir)
$
$       Lamina Shear Properties (23 - Direction)
ATTRIBUTE ADD  F23su     real       1.00    1.00    ksi     Ultimate Shear Strength (23-Dir)
ATTRIBUTE ADD  F23so     real       1.00    1.00    ksi     Offset Shear Strength (23-Dir)
ATTRIBUTE ADD  e23su     real       1.00    1.00    microstrain     Ultimate Shear Strain (23-Dir)
ATTRIBUTE ADD  e23so     real       1.00    1.00    microstrain     Offset Shear Strain (23-Dir)
AT TRIBUTE ADD G23       real       1.00    1.00    msi     Shear Elastic Modulus (23-Dir)
$
$       Lamina Shear Properties (31 - Direction)
```

TABLE 1. CONTINUED

```
ATTRIBUTE ADD  F31su    real    1.00    1.00    ksi          Ultimate Shear Strength (31-Dir)"
-0-
ATTRIBUTE ADD  F31so    real    1.00    1.00    ksi          Offset Shear Strength (31-Dir)"
-0-
ATTRIBUTE ADD  e31su    real    1.00    1.00    microstrain          Ultimate Shear Strain (31-Dir)
ATTRIBUTE ADD  e31so    real    1.00    1.00    microstrain          Offset Shear Strain (31-Dir)
ATTRIBUTE ADD  G31      real    1.00    1.00    msi          Shear Elastic Modulus (31-Dir)
$
$          Laminate Tensile Properties (x - Direction)
ATTRIBUTE ADD  Fxtu     real    1.00    1.00    ksi          Ultimate Tensile Strength (x-Dir)
ATTRIBUTE ADD  extu     real    1.00    1.00    microstrain          Ultimate Tensile Strain (x-Dir)
ATTRIBUTE ADD  Ext      real    1.00    1.00    msi          Tensile Elastic Modulus (x-Dir)
ATTRIBUTE ADD  nuxyt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (xy-Dir)
ATTRIBUTE ADD  nuxzt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (xz-Dir)
$
$          Laminate Compressive Properties (x - Direction)
ATTRIBUTE ADD  Fxcu     real    1.00    1.00    ksi          Ultimate Compressive Strength (x-Dir)
ATTRIBUTE ADD  excu     real    1.00    1.00    microstrain          Ultimate Compressive Strain
(x-Dir)
ATTRIBUTE ADD  Exc      real    1.00    1.00    msi          Compressive Elastic Modulus (x-Dir)
ATTRIBUTE ADD  nuxyc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (xy-Dir)
ATTRIBUTE ADD  nuxzc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (xz-Dir)
$
$          Laminate Tensile Properties (y - Direction)
ATTRIBUTE ADD  Fytu     real    1.00    1.00    ksi          Ultimate Tensile Strength (y-Dir)
ATTRIBUTE ADD  eytu     real    1.00    1.00    microstrain          Ultimate Tensile Strain (y-Dir)
ATTRIBUTE ADD  Eyt      real    1.00    1.00    msi          Tensile Elastic Modulus (y-Dir)
ATTRIBUTE ADD  nuyxt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (yx-Dir)
ATTRIBUTE ADD  nuyzt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (yz-Dir)
$
$          Laminate Compressive Properties (y - Direction)
ATTRIBUTE ADD  Fycu     real    1.00    1.00    ksi          Ultimate Compressive Strength (y-Dir)
ATTRIBUTE ADD  eycu     real    1.00    1.00    microstrain          Ultimate Compressive Strain
(y-Dir)
ATTRIBUTE ADD  Eyc      real    1.00    1.00    msi          Compressive Elastic Modulus (y-Dir)
ATTRIBUTE ADD  nuyxc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (yx-Dir)
ATTRIBUTE ADD  nuyzc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (yz-Dir)
$
$          Laminate Shear Properties (xy - Direction)
ATTRIBUTE ADD  Fxysu    real    1.00    1.00    ksi          Ultimate Shear Strength (xy-Dir)
ATTRIBUTE ADD  exysu    real    1.00    1.00    microstrain          Ultimate Shear Strain (xy-Dir)
ATTRIBUTE ADD  Gxy      real    1.00    1.00    msi          Shear Elastic Modulus (xy-Dir)
$
$          Laminate Tensile Properties (z - Direction)
ATTRIBUTE ADD  Fztu     real    1.00    1.00    ksi          Ultimate Tensile Strength (z-Dir)
ATTRIBUTE ADD  eztu     real    1.00    1.00    microstrain          Ultimate Tensile Strain (z-Dir)
ATTRIBUTE ADD  Ezt      real    1.00    1.00    msi          Tensile Elastic Modulus (z-Dir)
ATTRIBUTE ADD  nuzxt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (zx-Dir)
ATTRIBUTE ADD  nuzyt    real    1.00    1.00    -0-          Tensile Poisson's Ratio (zy-Dir)
$
$          Laminate Compressive Properties (z - Direction)
ATTRIBUTE ADD  Fzcu     real    1.00    1.00    ksi          Ultimate Compressive Strength (z-Dir)
ATTRIBUTE ADD  ezcu     real    1.00    1.00    microstrain          Ultimate Compressive Strain
(z-Dir)
ATTRIBUTE ADD  Ezc      real    1.00    1.00    msi          Compressive Elastic Modulus (z-Dir)
ATTRIBUTE ADD  nuzxc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (zx-Dir)
ATTRIBUTE ADD  nuzyc    real    1.00    1.00    -0-          Compressive Poisson's Ratio (zy-Dir)
$
$          Laminate Shear Properties (zy - Direction)
ATTRIBUTE ADD  Fzysu    real    1.00    1.00    ksi          Ultimate Shear Strength (zy-Dir)
ATTRIBUTE ADD  ezysu    real    1.00    1.00    microstrain          Ultimate Shear Strain (zy-Dir)
ATTRIBUTE ADD  Gzy      real    1.00    1.00    msi          Shear Elastic Modulus (zy-Dir)
$
$          Laminate Shear Properties (zx - Direction)
ATTRIBUTE ADD  Fzxsu    real    1.00    1.00    ksi          Ultimate Shear Strength (zx-Dir)
ATTRIBUTE ADD  ezxsu    real    1.00    1.00    microstrain          Ultimate Shear Strain (zx-Dir)
ATTRIBUTE ADD  Gzx      real    1.00    1.00    msi          Shear Elastic Modulus (zx-Dir)
$
$          Laminate Structural Properties, SBS, CAI, Open Hole, Filled Hole, Fracture
Toughness and Bearing/Bypass
ATTRIBUTE ADD  Exten_Strain1        real    1.00    1.00    microstrain          Meas. strain from
extensometer 1
ATTRIBUTE ADD  Exten_Strain2        real    1.00    1.00    microstrain          Meas. strain from
extensometer 2
ATTRIBUTE ADD  Gage_Strain1         real    1.00    1.00    microstrain          Meas. strain from gage 1
ATTRIBUTE ADD  Gage_Strain2         real    1.00    1.00    microstrain          Meas. strain from gage 2
ATTRIBUTE ADD  Exten_Mod1           real    1.00    1.00    msi          Meas. modulus from extensometer 1
```

TABLE 1. CONTINUED

```
ATTRIBUTE ADD  Exten_Mod2          real   1.00   1.00   msi          Meas. modulus from extensometer 2
ATTRIBUTE ADD  Gage_Mod1           real   1.00   1.00   msi          Meas. modulus from gage 1
ATTRIBUTE ADD  Gage_Mod2           real   1.00   1.00   msi          Meas. modulus from gage 2
ATTRIBUTE ADD  Trans_Strain        real   1.00   1.00   microstrain   Meas. transverse strain
ATTRIBUTE ADD  Fsbs        real    1.00   1.00   ksi          Short beam strength
ATTRIBUTE ADD  Fils        real    1.00   1.00   ksi          Compression Coupon ILS
ATTRIBUTE ADD  Filt        real    1.00   1.00   ksi          Interlaminar Tension Strength
ATTRIBUTE ADD  Fcai        real    1.00   1.00   ksi          Compression-after-impact strength
ATTRIBUTE ADD  ecai        real    1.00   1.00   microstrain  Compressive-after-impact strain
ATTRIBUTE ADD  Ftai        real    1.00   1.00   ksi          Tension-after-impact strength
ATTRIBUTE ADD  etai        real    1.00   1.00   microstrain  Tension-after-impact strain
ATTRIBUTE ADD  Fohc        real    1.00   1.00   ksi          Open hole compressive strength
ATTRIBUTE ADD  eohc        real    1.00   1.00   microstrain  Open hole compressive strain
ATTRIBUTE ADD  Foht        real    1.00   1.00   ksi          Openhole tensile strength
ATTRIBUTE ADD  eoht        real    1.00   1.00   microstrain  Open hole tensile strain
ATTRIBUTE ADD  Ffhc        real    1.00   1.00   ksi          Filled hole compressive strength
ATTRIBUTE ADD  Ffht        real    1.00   1.00   ksi          Filled hole tension strength
ATTRIBUTE ADD  Axial_Stress        real   1.00   1.00   ksi          Biaxial test axial stress
ATTRIBUTE ADD  Hoop_Stress         real   1.00   1.00   ksi          Biaxial test hoop stress
ATTRIBUTE ADD  Axial_Strain        real   1.00   1.00   microstrain  Biaxial test axial
strain
ATTRIBUTE ADD  Hoop_Strain         real   1.00   1.00   microstrain  Biaxial test hoop strain
ATTRIBUTE ADD  Braid_Strain        real   1.00   1.00   microstrain  Biaxial test braid
strain
ATTRIBUTE ADD  GIC_Area_Method     real   1.00   1.00   in-lbs/in^2 Fracture toughness
mode I with area method
ATTRIBUTE ADD  GIC_Init_Method     real   1.00   1.00   in-lbs/in^2 Fracture toughness
mode I with initiation method
ATTRIBUTE ADD  GIIC        real    1.00   1.00   in-lbs/in^2 Fracture toughness mode II
ATTRIBUTE ADD  Fbr         real    1.00   1.00   ksi          Bearing ultimate strength
ATTRIBUTE ADD  Fbro        real    1.00   1.00   ksi          Bearing offset strength
ATTRIBUTE ADD  ebr         real    1.00   1.00   microstrain  Bearing ultimate strain
ATTRIBUTE ADD  Fbyp        real    1.00   1.00   ksi          Bypass ultimate strength

ATTRIBUTE ADD  Fbypo       real    1.00   1.00   ksi          Bypass offset strength
ATTRIBUTE ADD  ebyp        real    1.00   1.00   microstrain  Bypass ultimate strain
ATTRIBUTE ADD  Pbru        real    1.00   1.00   lbf          Bearing ultimate load
ATTRIBUTE ADD  Pbro        real    1.00   1.00   lbf          Bearing offset load
ATTRIBUTE ADD  Pbypu       real    1.00   1.00   lbf          Bypass ultimate load
ATTRIBUTE ADD  Pbypo       real    1.00   1.00   lbf          Bypass offset load
ATTRIBUTE ADD  Temperature_Lab     real   1.00   1.00   deg F        Actual laboratory temperature
ATTRIBUTE ADD  RH_Lab      real    1.00   1.00   %RH          Actual laboratory relative humidity
ATTRIBUTE ADD  Temperature_Test    real   1.00   1.00   deg F        Actual test temperature
ATTRIBUTE ADD  RH_Test     real    1.00   1.00   %RH          Actual test relative humidity
$
$          Graphical Test Data (Mechanical Lamina)
ATTRIBUTE ADD  F1_tVSe1_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
(1-Dir) ; Tensile Stress (1-Dir)
ATTRIBUTE ADD  F1_cVSe1_c          real   3.00   0.00   microstrain ; ksi   Compressive Strain
(1-Dir) ; Compressive Stress (1-Dir)
ATTRIBUTE ADD  F2_tVSe2_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
(2-Dir) ; Tensile Stress (2-Dir)
ATTRIBUTE ADD  F2_cVSe2_c          real   3.00   0.00   microstrain ; ksi   Compressive Strain
(2-Dir) ; Compressive Stress (2-Dir)
ATTRIBUTE ADD  F12_sVSe12_s        real   3.00   0.00   microstrain ; ksi   Shear Strain
(12-Dir) ; Shear Stress (12-Dir)
ATTRIBUTE ADD  F3_tVSe3_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
(3-Dir) ; Tensile Stress (3-Dir)
ATTRIBUTE ADD  F3_cVSe3_c          real   3.00   0.00   microstrain ; ksi   Compressive Strain
(3-Dir) ; Compressive Stress (3-Dir)
ATTRIBUTE ADD  F23_sVSe23_s        real   3.00   0.00   microstrain ; ksi   Shear Strain
(23-Dir) ; Shear Stress (23-Dir)
ATTRIBUTE ADD  F31_sVSe31_s        real   3.00   0.00   microstrain ; ksi   Shear Strain
(13-Dir) ; Shear Stress (13-Dir)
$
$          Graphical Test Data (Mechanical Laminate)
ATTRIBUTE ADD  Fx_tVSex_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
(x-Dir) ; Tensile Stress (x-Dir)
ATTRIBUTE ADD  Fx_cVSex_c          real   3.00   0.00   microstrain ; ksi   Compressive Strain
(x-Dir) ; Compressive Stress (x-Dir)
ATTRIBUTE ADD  Fy_tVSey_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
(y-Dir) ; Tensile Stress (y-Dir)
ATTRIBUTE ADD  Fy_cVSey_c          real   3.00   0.00   microstrain ; ksi   Compressive Strain
(y-Dir) ; Compressive Stress (y-Dir)
ATTRIBUTE ADD  Fxy_sVSexy_s        real   3.00   0.00   microstrain ; ksi   Shear Strain
(xy-Dir) ; Shear Stress (xy-Dir)
ATTRIBUTE ADD  Fz_tVSez_t          real   3.00   0.00   microstrain ; ksi   Tensile Strain
```

TABLE 1. CONTINUED

```
(z-Dir) ; Tensile Stress (z-Dir)
ATTRIBUTE ADD  Fz_cVSez_c          real    3.00    0.00    microstrain ; ksi     Compressive Strain
(z-Dir) ; Compressive Stress (z-Dir)
ATTRIBUTE ADD  Fzy_sVSezy_s        real    3.00    0.00    microstrain ; ksi     Shear Strain
(zy-Dir) ; Shear Stress (zy-Dir)
ATTRIBUTE ADD  Fzx_sVSezx_s        real    3.00    0.00    microstrain ; ksi     Shear Strain
(zx-Dir) ; Shear Stress (zx-Dir)
ATTRIBUTE ADD  F_ohcVSe_ohc        real    3.00    0.00    microstrain ; ksi     Open Hole
Compressive Strain ; Open Hole Compressive Stress
ATTRIBUTE ADD  F_ohtVSe_oht        real    3.00    0.00    microstrain ; ksi     Open Hole Tensile
Strain ; Open Hole Tensile Stress
ATTRIBUTE ADD  F_brVSe_br          real    3.00    0.00    microstrain ; ksi     Bearing Strain ;
Bearing Stress
ATTRIBUTE ADD  F_brVSDisp_br       real    3.00    0.00    in ; ksi      Bearing Displacement ;
Bearing Stress
ATTRIBUTE ADD  F_briniVSDisp_br    real    3.00    0.00    in ; ksi      Bearing Displacement ;
Initial Bearing Stress
ATTRIBUTE ADD  F_broffVSDisp_br    real    3.00    0.00    in ; ksi      Bearing Displacement ;
Offset Bearing Stress
ATTRIBUTE ADD  P_brVSDisp_br       real    3.00    0.00    in ; lbf      Bearing Displacement ;
Bearing Load
ATTRIBUTE ADD  LoadVSStroke        real    3.00    0.00    in ; lbf      Displacement ; Load
ATTRIBUTE ADD  StressVSStrain_1    real    3.00    0.00    microstrain ; ksi     Strain 1 ;
Stress 1
ATTRIBUTE ADD  StressVSStrain_2    real    3.00    0.00    microstrain ; ksi     Strain 2 ;
Stress 2
ATTRIBUTE ADD  StressVSStrain_3    real    3.00    0.00    microstrain ; ksi     Strain 3 ;
Stress 3
ATTRIBUTE ADD  StressVSStrain_4    real    3.00    0.00    microstrain ; ksi     Strain 4 ;
Stress 4
ATTRIBUTE ADD  FxVSey  real        3.00    0.00    microstrain ; ksi     Transverse Strain ;
Longitudinal Stress
ATTRIBUTE ADD  EnergyVSTime        real    3.00    0.00    ms ; in-lb    Time ; Absorbed Energy
ATTRIBUTE ADD  ImpForceVSDispl     real    3.00    0.00    in ; lb       Impactor Displacement ;
Impact Force
ATTRIBUTE ADD  ImpForceVSTime      real    3.00    0.00    ms ; lb       Time ; Impact Force
$
$          Hygrothermal Relation Property Table
ATTRIBUTE ADD  Cp      real        1.00    1.00    J/(g K)       Specific Heat
ATTRIBUTE ADD  Mm      real        1.00    1.00    Wt %          Equilibrium Moisture Content
$
$          Hygrothermal Lamina
ATTRIBUTE ADD  TD1     real        1.00    1.00    m^2/s         Lamina Thermal Diffusivity (1-Dir)
ATTRIBUTE ADD  TD2     real        1.00    1.00    m^2/s         Lamina Thermal Diffusivity (2-Dir)
ATTRIBUTE ADD  TD3     real        1.00    1.00    m^2/s         Lamina Thermal Diffusivity (3-Dir)
ATTRIBUTE ADD  D1      real        1.00    1.00    mm^2/s        Lamina Moisture Diffusivity (1-Dir)
ATTRIBUTE ADD  D2      real        1.00    1.00    mm^2/s        Lamina Moisture Diffusivity (2-Dir)
ATTRIBUTE ADD  D3      real        1.00    1.00    mm^2/s        Lamina Moisture Diffusivity (3-Dir)
ATTRIBUTE ADD  CME1    real        1.00    1.00    microstrain/Wt %      Lamina Coefficient of
Moisture Expansion (1-Dir)
ATTRIBUTE ADD  CME2    real        1.00    1.00    microstrain/Wt %      Lamina Coefficient of
Moisture Expansion (2-Dir)
ATTRIBUTE ADD  CME3    real        1.00    1.00    microstrain/Wt %      Lamina Coefficient of
Moisture Expansion (3-Dir)
ATTRIBUTE ADD  CTE1    real        1.00    1.00    microstrain/K         Lamina Coefficient of Thermal
Expansion (1-Dir)
ATTRIBUTE ADD  CTE2    real        1.00    1.00    microstrain/K         Lamina Coefficient of Thermal
Expansion (2-Dir)
ATTRIBUTE ADD  CTE3    real        1.00    1.00    microstrain/K         Lamina Coefficient of Thermal
Expansion (3-Dir)
ATTRIBUTE ADD  CTC1    real        1.00    1.00    W/(m K)/K     Lamina Coefficient of Thermal
Conductivity (1-Dir)
ATTRIBUTE ADD  CTC2    real        1.00    1.00    W/(m K)/K     Lamina Coefficient of Thermal
Conductivity (2-Dir)
ATTRIBUTE ADD  CTC3    real        1.00    1.00    W/(m K)/K     Lamina Coefficient of Thermal
Conductivity (3-Dir)
$
$          Hygrothermal Laminate
ATTRIBUTE ADD  TDx     real        1.00    1.00    m^2/s         Laminate Thermal Diffusivity (x-Dir)
ATTRIBUTE ADD  TDy     real        1.00    1.00    m^2/s         Laminate Thermal Diffusivity (y-Dir)
ATTRIBUTE ADD  TDz     real        1.00    1.00    m^2/s         Laminate Thermal Diffusivity (z-Dir)
ATTRIBUTE ADD  Dx      real        1.00    1.00    mm^2/s        Laminate Moisture Diffusivity (x-Dir)
ATTRIBUTE ADD  Dy      real        1.00    1.00    mm^2/s        Laminate Moisture Diffusivity (y-Dir)
ATTRIBUTE ADD  Dz      real        1.00    1.00    mm^2/s        Laminate Moisture Diffusivity (z-Dir)
ATTRIBUTE ADD  CMEx    real        1.00    1.00    microstrain/Wt %      Laminate Coefficient of
Moisture Expansion (x-Dir)
ATTRIBUTE ADD  CMEy    real        1.00    1.00    microstrain/Wt %      Laminate Coefficient of
```

TABLE 1. CONCLUDED

```
Moisture Expansion (y-Dir)
ATTRIBUTE ADD  CMEz      real    1.00    1.00    microstrain/Wt %        Laminate Coefficient of
Moisture Expansion (z-Dir)
ATTRIBUTE ADD  CTEx      real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (x-Dir)
ATTRIBUTE ADD  CTEy      real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (y-Dir)
ATTRIBUTE ADD  CTEz      real    1.00    1.00    microstrain/K           Laminate Coefficient of
Thermal Expansion (z-Dir)
ATTRIBUTE ADD  CTCx      real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (x-Dir)
ATTRIBUTE ADD  CTCy      real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (y-Dir)
ATTRIBUTE ADD  CTCz      real    1.00    1.00    W/(m K)/K               Laminate Coefficient of Thermal
Conductivity (z-Dir)
$
$          Graphical Data (General Hygrothermal)
ATTRIBUTE ADD  CpVSTemp          real    3.00    0.00    deg C ; J/(g K)         Temperature ; Specific
Heat
ATTRIBUTE ADD  MiVSsqrtTime      real    3.00    0.00    s^1/2 ; Wt %            sqrt(time) ; Moisture
Content
ATTRIBUTE ADD  MmVSRH real       3.00    0.00    %RH ; Wt %              Relative Humidity ; Equilibrium
Moisture Content
$
$          Graphical Data (Lamina Hygrothermal)
ATTRIBUTE ADD  CTE1vsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (1-Dir)
ATTRIBUTE ADD  CTE2vsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (2-Dir)
ATTRIBUTE ADD  CTE3vsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ; Lamina
Coefficient of Thermal Expansion (3-Dir)
ATTRIBUTE ADD  CTC1vsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (1-Dir)
ATTRIBUTE ADD  CTC2vsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (2-Dir)
ATTRIBUTE ADD  CTC3vsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Lamina
Coefficient of Thermal Conductivity (3-Dir)
$
$          Graphical Data (Laminate Hygrothermal)
ATTRIBUTE ADD  CTExvsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (x-Dir)

ATTRIBUTE ADD  CTEyvsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (y-Dir)
ATTRIBUTE ADD  CTEzvsTemp        real    3.00    0.00    C ; microstrain/K       Temperature ;
Laminate Coefficient of Thermal Expansion (z-Dir)
ATTRIBUTE ADD  CTCxvsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (x-Dir)
ATTRIBUTE ADD  CTCyvsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (y-Dir)
ATTRIBUTE ADD  CTCzvsTemp        real    3.00    0.00    C ; W/(m K)/K           Temperature ; Laminate
Coefficient of Thermal Conductivity (z-Dir)
$====================
```

NOTE: Relation definitions omitted for brevity.

TABLE 2. SAMPLE STANDARD INPUT FORMAT

TEST FACILITY:	INTEGRATED TECHNOLOGIES INC. (BOTHELL, WA)
MATERIAL CLASS:	COMPOSITE MATERIAL
MATERIAL SUBCLASS:	AS4/RSL-1895
MATL FORM:	FABRIC
FIBER NAME:	AS4
MATRIX NAME:	RSL-1895
MATRIX SUBCLASS:	EPOXY
MATRIX MFR:	SHELL
REIN. CLASS:	CONTINUOUS FIBER
FIBER MFR:	HERCULES
FABRIC MFR:	
FABRIC STYLE:	
FABRIC FILL NAME:	
FABRIC PICK COUNT:	
PREFORM ARCH:	2-D TRIAXIAL BRAID
PREFORM MFR:	
PREFORM ID:	SLL
SIZE AXIAL (K):	30
SIZE BRAID (K):	6
PERCENT AXIAL YARN:	46
BRAID ANGLE (DEG):	70
UNIT CELL WIDTH (IN):	0.458
UNIT CELL LENGTH (IN):	0.083
STITCH THREAD MATL.:	
STITCH SPACING (IN):	
STITCH TOW SIZE (K):	
INTERLOCK CLASS:	
PERCENT WARP:	
PERCENT WEFT:	
PERCENT WEAVER:	
SIZE WARP (K):	
SIZE WEFT (K):	
SIZE WEAVER (K):	
PROCESS METHOD:	RESIN TRANSFER MOLDING
PANEL MFR:	BOEING DEFENSE & SPACE GROUP, SEATTLE, WA.
TEST TYPE:	DOUBLE SHEAR BEARING
TEST REPORT ID:	NASA CONTRACTOR REPORT 4609
TEST CONDITION:	ROOM TEMPERATURE
PERCENT 0:	
PERCENT 45:	
PERCENT 90:	
LAYUP CODE:	
SPECIMEN WIDTH (IN):	
NOMINAL THICK (IN):	
MEASURED THICK (IN):	
FASTENER CALLOUT:	
FASTENER MATERIAL:	
FAILURE LOAD (LBS):	4207.95
FAILURE MODE:	BEARING
FAILURE LOCATION:	AT HOLE
NOTE 1:	
NOTE 2:	CRITICAL BEARING LOAD: 3369.95
NOTE 3:	

SCAN	LOAD(LB)	DISP(IN)	COD GAGE(IN)	TIME(SEC
1	0.12	0.0012	0.0001	0.36
2	1.21	0.0350	0.0095	0.98
3	3.36			
		....DATA OMITTED FOR BREVITY...		
494	4206.87	1.5095	0.9834	129.87
495	4207.95	1.5098	0.9837	129.99

	Tension Test Program			
specimen id	plate id	preform id	configuration	gage length(in)
BH2-01-3A-1	T7-SLL-B-3B	2-D SLL	baseline tension 1/8"	7.00
BH2-01-3A-2	T7-SLL-B-3B	2-D SLL	baseline tension 1/8"	7.00
BH2-01-3A-3	T7-SLL-B-3B	2-D SLL	baseline tension 1/8"	7.00
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.

Figure 1 Example of Keypunched Data

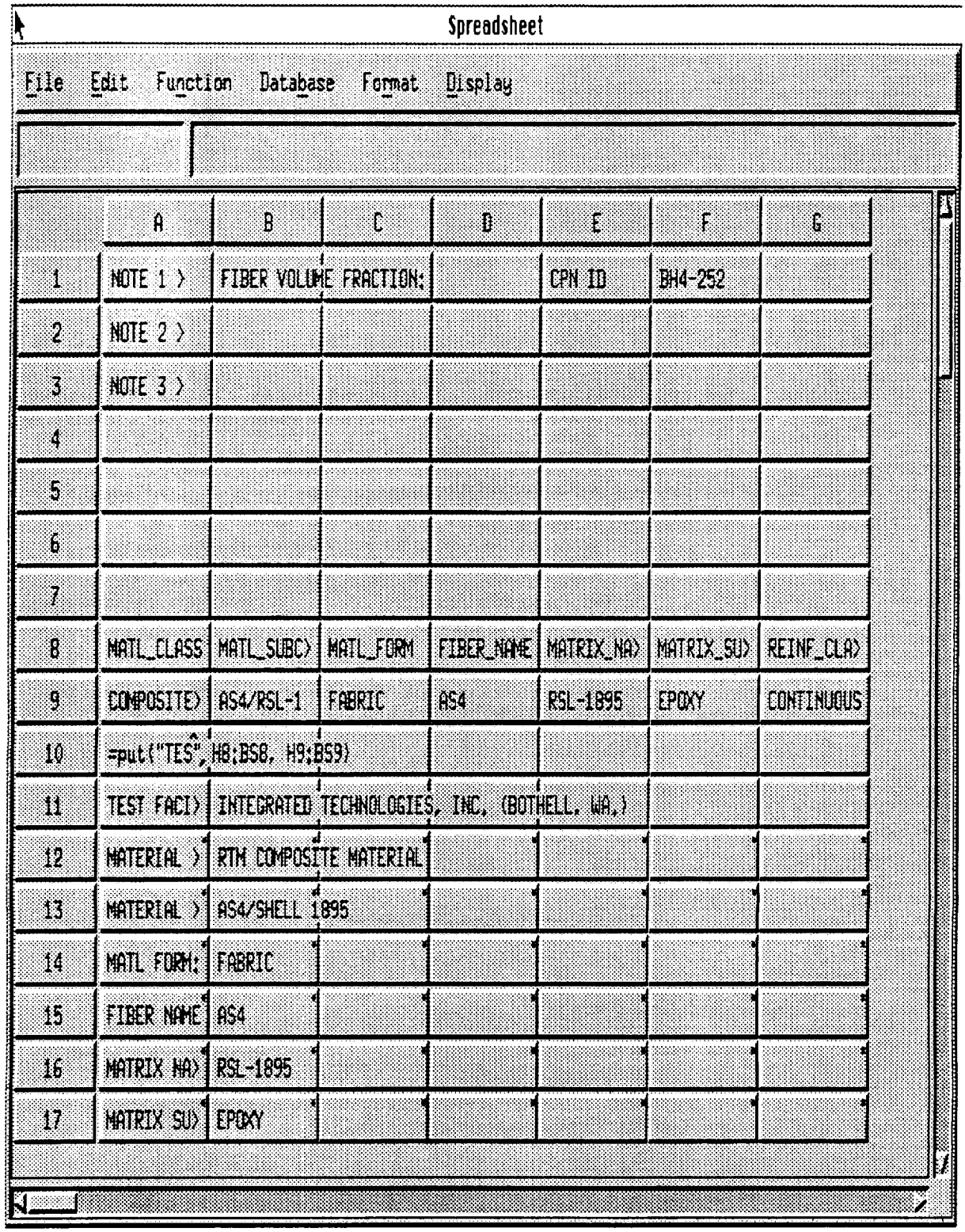
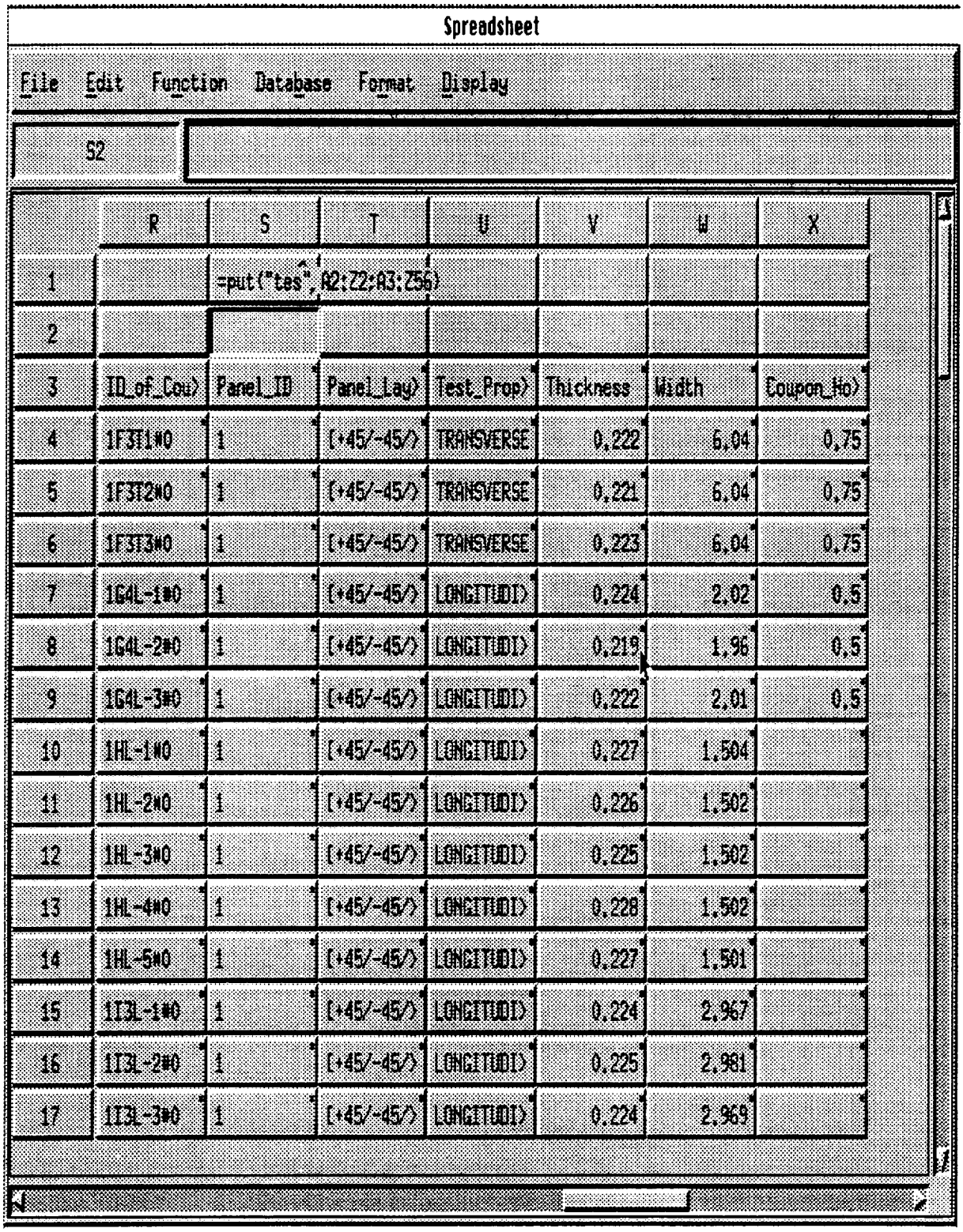


Figure 2 MVISION Data Loading Spreadsheet for Keypunched Data



	R	S	T	U	V	W	X
1							
2							
3	ID_of_Cou>	Panel_ID	Panel_Lay>	Test_Prop>	Thickness	Width	Coupon_Ho>
4	1F3T1#0	1	[+45/-45/>	TRANSVERSE	0,222	6,04	0,75
5	1F3T2#0	1	[+45/-45/>	TRANSVERSE	0,221	6,04	0,75
6	1F3T3#0	1	[+45/-45/>	TRANSVERSE	0,223	6,04	0,75
7	1G4L-1#0	1	[+45/-45/>	LONGITUDI>	0,224	2,02	0,5
8	1G4L-2#0	1	[+45/-45/>	LONGITUDI>	0,219	1,96	0,5
9	1G4L-3#0	1	[+45/-45/>	LONGITUDI>	0,222	2,01	0,5
10	1HL-1#0	1	[+45/-45/>	LONGITUDI>	0,227	1,504	
11	1HL-2#0	1	[+45/-45/>	LONGITUDI>	0,226	1,502	
12	1HL-3#0	1	[+45/-45/>	LONGITUDI>	0,225	1,502	
13	1HL-4#0	1	[+45/-45/>	LONGITUDI>	0,228	1,502	
14	1HL-5#0	1	[+45/-45/>	LONGITUDI>	0,227	1,501	
15	1I3L-1#0	1	[+45/-45/>	LONGITUDI>	0,224	2,967	
16	1I3L-2#0	1	[+45/-45/>	LONGITUDI>	0,225	2,981	
17	1I3L-3#0	1	[+45/-45/>	LONGITUDI>	0,224	2,969	

Figure 3 MVISION Data Loading Spreadsheet for Electronic Data

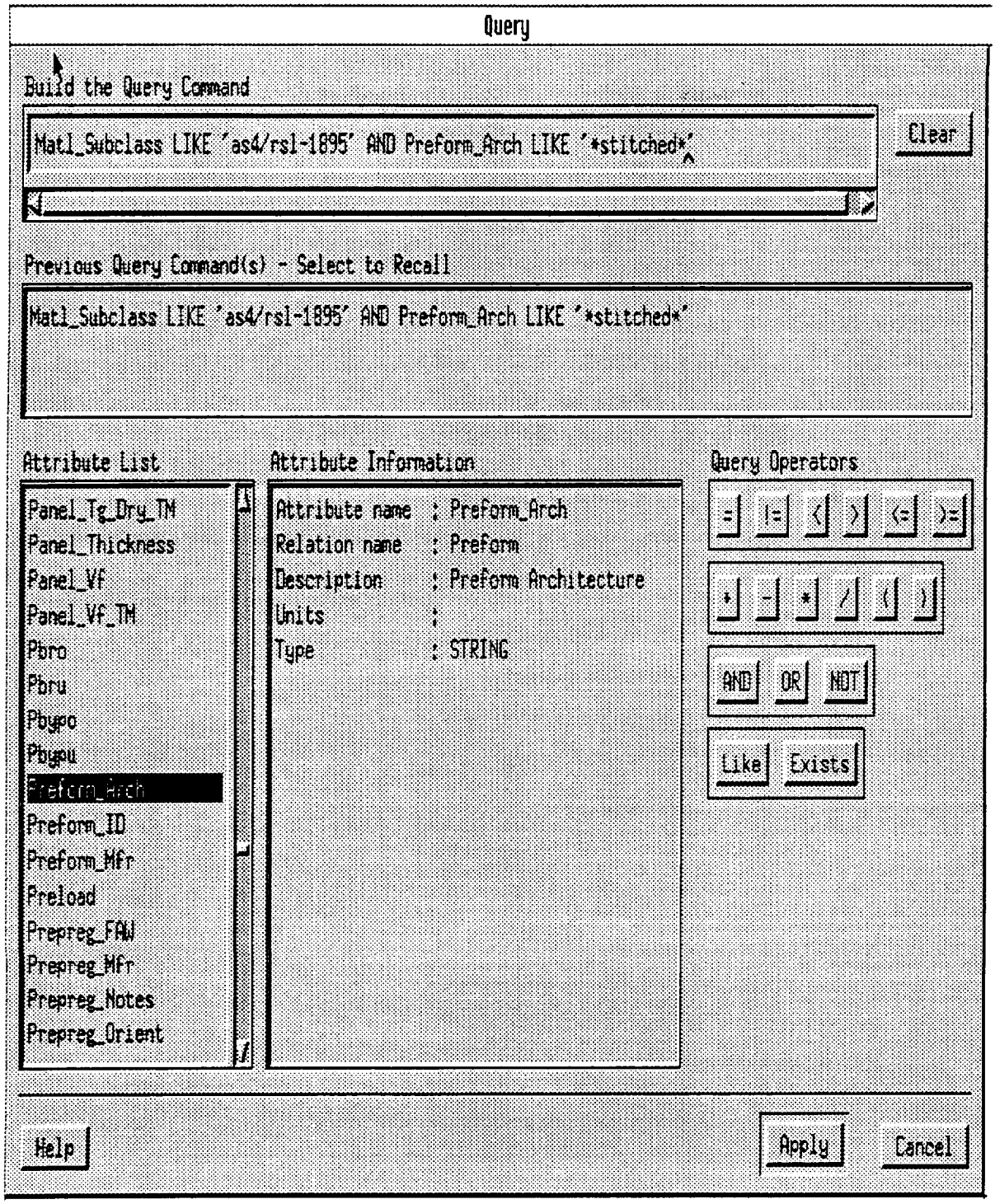


Figure 4 MVISION Query Panel

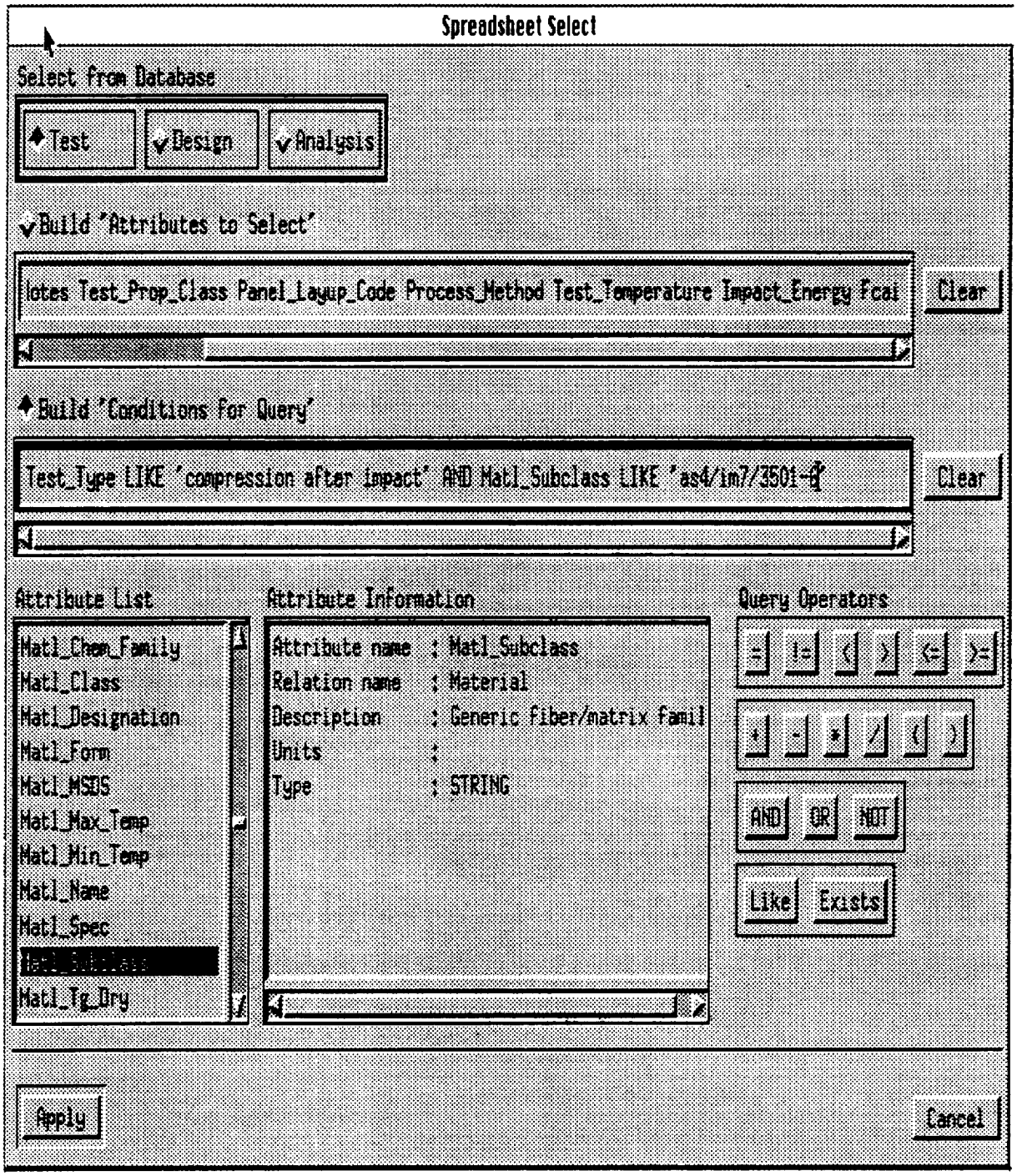


Figure 5 MVISION Select Panel

Spreadsheet

File Edit Function Database Format Display

	A	B	C	D	E	F	G
1	Test_Type LIKE 'compression after impact' AND Matl_Subclass LIKE 'as4/im7/3501-6'						
2	Preform_A>	Test_Prop>	Panel_Lay>	Process_M>	Test_Temp>	Impact_En>	Fcai
3	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	120	52.7
4	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	240	47.3
5	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	240	49.9
6	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	480	40.7
7	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	480	43.2
8	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	840	35.2
9	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	840	39.7
10	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	840	40.7
11	STITCHED >	LONGITUDI>	[+45/-45/>	RESIN FIL>	70	840	41.1
12	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	120	28.5
13	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	240	25.6
14	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	480	17.3
15	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	480	19.5
16	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	840	16.3
17	STITCHED >	TRANSVERSE	[+45/-45/>	RESIN FIL>	70	840	18.4

Figure 6 MVISION Spreadsheet Select Output

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (*Leave blank*)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	August 1996	Contractor Report

4. TITLE AND SUBTITLE
Database of Mechanical Properties for Textile Composites

5. FUNDING NUMBERS
C NAS1-19348
WU 505-63-10-10

6. AUTHOR(S)
Jerry Delbrey

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Lockheed Martin Aeronautical Systems
86 South Cobb Drive
Marietta, GA 30063

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
National Aeronautics and Space Administration
Langley Research Center
Hampton, VA 23681-0001

10. SPONSORING / MONITORING AGENCY REPORT NUMBER
NASA CR-4747

11. SUPPLEMENTARY NOTES
Langley Technical Monitor: Clarence C. Poe, Jr.
Final Report

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Unclassified - Unlimited

Subject Category 24

12b. DISTRIBUTION CODE

13. ABSTRACT (*Maximum 200 words*)

This report describes the approach followed to develop a database for mechanical properties of textile composites. The data in this database is assembled from NASA Advanced Composites Technology (ACT) programs and from data in the public domain. This database meets the data documentation requirements of MIL-HDBK-17, Section 8.1.2, which describes in detail the type and amount of information needed to completely document composite material properties.

The database focuses on mechanical properties of textile composite. Properties are available for a range of parameters such as direction, fiber architecture, materials, environmental condition, and failure mode. The composite materials in the database contain innovative textile architectures such as the braided, woven, and knitted materials evaluated under the NASA ACT programs. In summary, the database contains results for approximately 3500 coupon level tests, for ten different fiber/resin combinations, and seven different textile architectures. It also includes a limited amount of prepreg tape composites data from ACT programs where side-by-side comparisons were made.

14. SUBJECT TERMS	15. NUMBER OF PAGES
Database; Mechanical properties; Textile composites	34
	16. PRICE CODE: A03

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified		