Flight Data File Materials Handbook

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Operations Division
Flight Activity Branch

Revision B
August 12, 1982

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Lyndon B. Johnson Space Center
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FLIGHT OPERATIONS DIRECTORATE

REVISION B

FLIGHT DATA FILE MATERIALS HANDBOOK

August 12, 1982

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
LYNDON B. JOHNSON SPACE CENTER
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ABBREVIATIONS/ACRONYMS

ALT	Approach and Landing Tests
CO	Carbon Monoxide
C of C	Certificate of Compliance
CT&PD	Crew Training and Procedures Division
DEG	Degrees
DMA	Defense Mapping Agency
FCEPF	Flight Crew Equipment Prepacking Facility
FDF	Flight Data File
FEP	Fluoro-ethylene-propylene
GFE	Government Furnished Equipment
GSA	General Services Administration
JCP	Joint Committee on Printing
JSC	Johnson Space Center
LOEP	List of Effective Pages
MIL	1/1000 inch
MUA	Materials Usage Agreement
N.A.	Not Applicable
N2	Nitrogen
O2	Oxygen
PCN	Page Change Notice
PSIA	Pounds per Square Inch
SR&QA	Safety, Reliability and Quality Assurance
TBS	To Be Supplied at a later date
TO	Total Organics
TPS	Test Preparation Sheet

SECTION 1
INTRODUCTION

1.1 PURPOSE

This document has been prepared to define the control and verification of non-metallic materials used in the Shuttle Flight Data File (FDF) per Paragraph 2.5 of SE-R-006 Rev. B, 'GENERAL SPECIFICATION, NASA JSC REQUIREMENTS FOR MATERIALS AND PROCESSES,' and to catalog those materials approved for use in the Shuttle FDF. Also addressed are the selection and testings of candidate materials and the preparation of the documentation required for approval of those materials.

1.2 SCOPE

This document lists all materials approved for Shuttle FDF as of August 1982. Materials testing has been coordinated under the cognizance of ES5/Materials Technology Branch, Structures and Mechanics Division. Materials Usage Agreements have been secured from LA3/Management Integration where required.

1.3 AUTHORITY

This document is written under the authority vested in the Flight Operations Directorate, Operations Division, for definition, development, validation, and control of all crew procedures and crew activity plans for NASA Manned Missions, as specified by the Space Shuttle Program Manager Directive, SSPM Directive No. 9A, dated September 23, 1974.

1.4 APPLICABILITY

This document applies to orbital flight test, transition and mature operations. The materials used in fabrication of FDF articles will be limited to only those cataloged in this document.

1.5 PUBLICATION AND REVISION

This document is prepared and maintained under the cognizance of the chief of the Flight Activities Branch, Operations Division.

This document will be updated as required to reflect changes to approved materials. Any organization having comments, questions, or suggestions concerning this document should contact CH4 W. M. Maass, Flight Activities Branch,Flight Operations Directorate, Bldg 4, Rm 373, 713-483-5224.

1.6 APPLICABLE DOCUMENTS

A. SE-R-0006 REV. B, General Specification, NASA JSC Requirements for Materials and Processes

B. NHB 8060.1A, Flammability, Odor, and Offgassing Requirements and Test Procedures for Materials in Environments that Support Combustion

C. JSC 02681, Nonmetallic Materials Design Guidelines and Test Data Handbook

D. JSC-PA-D-67-13, Apollo Spacecraft Nonmetallic Materials Requirements. Also Addendum 1, Rev. A, Addendum 2, and Addendum 2A.

E. JSC 09935, Flight Data File Design Specifications

F. JSC 10682, Flight Data File Definition

SECTION 2
NONMETALLIC MATERIALS REQUIREMENTS

The Operations Division is responsible for the overall suitability of materials used in the Shuttle Flight Data File (FDF). In this capacity it must requisition, evaluate, initiate the testing of, and submit worksheets on the nonmetallic materials used in the FDF.

2.1 MATERIAL REQUISITIONING

The materials ordered include 4-ply board, pebble board, cover materials, glues, tapes, overlays, and inks used for handlettering. E-20 and K-10 paper and printing inks are provided by Printing Management Branch. Photo print films and papers are provided by the Photographic Technology Division as well as other photo and map suppliers.

Materials obtained for either evaluation or FDF fabrication are ordered via the JSC Purchase Request (JSC Form 91). A sample Purchase Request for FDF materials is given in Figure 2-1. Such materials must come from the manufacturer or supplier with a Certificate of Compliance (C of C), stating the material was produced according to the manufacture's specifications. Traceability records (lot and batch numbers) are specified to be supplied with the material delivery.

2.2 MATERIALS SELECTION

Initial selections are made by FDF personnel to determine if the material is generally appropriate for the intended use. The characteristics and properties listed are some of those considered in making initial selections. The material is used in sample product construction to evaluate functional acceptability.

A. Physical

Surface finish or texture
Writing or printing characteristics
Color
Tear strength
Shelf life
Useability
Glare
Weight
Flexibility
Burn rate
Flammability

B. Uses

Infrequent
Frequent during a long duration mission
In a lighted cabin
In a darkened cabin
Exposed to a vacuum
Exposed to thermal environment
Other special usage

C. Availability

Sizes available
Quantities available
Supplier able to provide Certificate of Compliance

D. Chemical Composition

Offgassing
Odor
Material degradation when exposed to environment in which used

2.3 MATERIALS TESTING

Nonmetallic materials used in the FDF are considered to be of Group II, Type B as defined in 'FLAMMABILITY, ODOR, AND OFFGASSING REQUIREMENTS AND TEST PROCEDURES FOR MATERIALS IN ENVIRONMENTS THAT SUPPORT COMBUSTION,' NHB 8060. 1A. As such, they must be evaluated for flammability, off-gassing, and odor characteristics in the shuttle atmosphere before they can be approved for use on board the spacecraft. The specific tests are referenced in Table 2-1 of NHB 8060. 1A, under Type B, Group II. The test atmosphere is 3.45 psia O2/11.05 psia N2 or 23.8% O2/76.2% N2 at 14.5 psia. Testing is conducted at the White Sands Testing Facility and is initiated by the submittal of a Materials Test Request (Form 2035B) to ES5/Materials Technology Branch. A sample test request is given in Figure 2-2. Materials submitted for testing should be prepared as indicated in Appendix A of this document. A tabulation of test results on all approved FDF Materials is given in Table 2-1 of this document. Materials which have previously passed Apollo or Skylab Category B testing are considered acceptable for use in the Shuttle FDF.

NOTE

To minimize materials testing, the test records of the Nonmetallic Materials Design Guidelines and Test Data Handbook, JSC 02681, should be consulted to see if candidate materials have been previously tested.

2.4 MATERIALS USAGE AGREEMENTS

As a rule candidate materials which do not pass all six tests of Group II, Type B receive no further consideration for use in the FDF. In some cases, however, a material may possess such generally favorable characteristics that it is considered for use despite its failure to pass one of the tests. In this case a Material Usage Agreement (MUA) must be submitted to ES5/Materials Technology Branch and approved by the manager of crew-related GFE. At present there are five materials approved for the

shuttle FDF via MUA 002E and four materials via MUA G062E. Figure 2-3 gives a sample of the Orbiter GFE Materials Usage Agreement (JSC Form 1466).

2.5 STANDARD MATERIALS WORKSHEET

As part of the certification process, it is required to submit a Standard Materials Worksheet (JSC Form 1392) to ES5/Materials Technology Branch. This worksheet documents the weight and exposed area of each material used in the FDF. These worksheets will be submitted on a programmatic rather than flight-by-flight basis. These will remain in effect until either new materials are introduced into the FDF or the FDF exceeds an established target weight. A sample materials worksheet is given in Figure 2-4.

NOTE

When determining exposed surface area of a given material, consider the worst-case usage situation (i.e., for paper assume every crew member is holding an open book and that cue cards are installed). Do not count items stowed in FDF containers.

2.6 APPROVED MATERIALS

The following pages give a description of the approved materials listed in table 2-1.

2.6.1 Paper

A. Artist Illustration Board (8 Ply)

1. General description

   A white, high surface, 65-mil drawing board. It is composed of 100 percent cotton fiber facing papers bonded to high grade white stock. It has a density of 1.012 grams per square inch. It does not have a shelf life limitation.

2. Uses

   Fabrication of orbit maps.

3. Available sizes

   30 x 40-inch sheets, 10 sheets per package.

4. Evaluation

   Passed all of the Apollo Category B tests and is qualified for use in the FDF.

5. Source

   Manufactured by Strathmore Paper Company and can be obtained through Texas Art Supply Co., Houston, Texas. The Strathmore Procurement Specification is 240-5. (This material is no longer in production)

B. Artist Drawing Board (4 ply)

1. General description

   A white, high surface poster board. It consists of four plys of 5-mil thick cellulose paper (20 mil), having a density of .358 gram per square inch. It does not have a shelf life limitation.

2. Uses

   Fabrication of orbit maps and cue cards.

3. Available sizes

   30 x 40-inch sheets, 25 sheets per package.

4. Evaluation

Passed all of the Apollo Category B tests and is qualified for use in the FDF.

5. Source

Manufactured by Strathmore Paper Company and can be procured through Texas Art Supply, Houston, Texas. The Strathmore Procurement Specification is 235-374.

C. JCP K-10 Index Paper

1. General description

A cellulose index paper with a smooth surface and is manufactured as a single-ply sheet. It has a density of .119 gram per square inch. The colors used in the FDF are white, pink, yellow, buff, salmon, blue, and green. It does not have a shelf life limitation.

2. Uses

FDF book pages.

3. Available sizes

22-1/2 x 35-inch sheets, 500 sheets per package in thickness of 8.5, 10, and 13 mils. The 8.5-mil thickness is used in the FDF.

4. Evaluation

The colors white, pink and yellow passed all of the Apollo Category B tests except burn rate. They were certified for flight by deviation 070. Approved for shuttle per MUA 002E. All other colors passed all of the Apollo Category B tests.

5. Source

Manufactured according to the specifications of the Joint Council on Printing and obtained through GSA via Printing Management Branch on a print request (JSC Form 31).

D. JCP E-20 Paper

1. General description

A high wet strength lithographic paper made of cellulose fibers. It has a smooth off-white colored surface, an average density of .072 gram per square inch, and a thickness of 5 mils. It does not have a shelf life limitation.

2. Uses

FDF book pages, cue cards, and maps.

3. Available sizes

13 x 44-inch sheets, 500 sheets per package.

4. Evaluation

Passed all of the Apollo Category B tests except burn rate. It was approved for flight by deviation 069. Approved for shuttle per MUA 002E.

5. Sources

Manufactured according to the specifications of the Joint Council on Printing specification and can be obtained through GSA via Printing Management Branch on a print request (JSC Form 31).

E. Correction Paper

1. General Description

A 50% rag pulp paper, with a smooth surface finish. Pressure sensitive, adhesive coating on one side. Has a limited shelf life.

2. Uses

Correcting, changing, adding and deleting material from FDF book pages.

3. Available sizes

16 x 10-1/2 - inch sheets.

4. Evaluation

Passed Apollo Category B tests.

5. Source

Obtained through GSA under Fasson brand name, Index no. PA3015, National Stock Number (NSN) 7510-002900431.

F. Mounting Paperboard

1. General Description

Pebble finish, white on one side, buff on opposite side.

2. Uses

Fabrication of orbit maps, wedges, and flip card backboards.

3. Available sizes

20 x 24 - inch sheets, .046 inches thick.

4. Evaluation

Passed all of Apollo Category B tests.

5. Source

Obtained through GSA, Index no. PA6530, National Stock Number 9310-00058326.

2.6.2 Inks/toners

A. Glen Killian #71 Black Ink

1. General description

A black ink used in printing the FDF.

2. Evaluation

Passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

B. M&M Cougar Black Ink

1. General description

A black ink used in printing the FDF.

2. Evaluation

Passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

C. Paper Mate Pen Inks

1. General description

Aluminum felt tip pens available in several colors. The pens have a shelf life of 12 months. The colors evaluated were red, black, blue, yellow, pink, orange, and green.

2. Uses

Annotating and color coding items of the FDF.

3. Available sizes

Cartons of 12 pens each.

4. Evaluation

Passed Skylab Category B tests for TO, CO, and odor and are acceptable for use in the FDF.

5. Source

The pens are manufactured by Paper Mate.

D. Stafford's Spectra-Matic Inks

1. General description

Drawing ink used for annotating and color coding items of the FDF. The colors evaluated were black, blue, brick red, green, indigo, scarlet, violet, and white.

2. Evaluation

Passed Apollo Category B test for TO, CO, and odor and are acceptable for use in the FDF.

3. Source

Manufactured by Stafford-Reeves, Inc., New York. Can be obtained through GSA supply.

E. Kohl & Madden Black Ink

1. General description

A black ink used in printing the FDF.

2. Evaluation

The ink passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

F. A&M MLS 2100 Black Ink

1. General description

A black ink used in printing the FDF.

2. Evaluation

Passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

G. Defense Mapping Agency Inks

1. General description

Inks used by the Defense Mapping Agency (DMA) for the printing of aeronautical charts by multi-colored offset lithography.

2. Uses

DMA-produced charts and maps are used in the FDF for orbit maps, landing site charts, and other earth graphics.

3. Evaluation

Since DMA ink specifications do not control the chemical composition of the inks procured by DMA, batch testing of all DMA products remains a requirement. Such products must pass Category B tests for TO, CO, and odor to qualify for use in the FDF.

4. Source

All FDF items bearing these inks are obtained from the Defense Mapping Agency Aerospace Center, St. Louis, Missouri.

H. Xerox 3600/7000 Toner

1. General description

The material which forms the 'print' on a copy made with the Xerox 3600 or 7000 copying machines.

2. Uses

The Xerox 3600 and 7000 machines are used in FDF copy preparation.

3. Evaluation

Passed Apollo Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

4. Source

Manufactured by the Xerox Corporation.

I. Xerox 9200 Toner

1. General description

The material which forms the 'print' on a copy made with the Xerox 9200 copying Machine.

2. Uses

The Xerox 9200 Machine is used by Printing Management Branch in FDF copy preparation.

3. Evaluation

Passed Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

4. Source

Manufactured by Xerox Corporation.

J. Xerox 6500 Toners

1. General description

The materials which form the 'print' on a copy made with the Xerox 6500 Color Copier. Three toners are used in the process: magenta, cyan, and yellow.

2. Uses

The Xerox 6500 Machine is used in the preparation of some items used in the FDF.

3. Evaluation

Passed Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

4. Source

Manufactured by Xerox Corporation. Manufacturers stock numbers are 6R192 for cyan, 6R194 for yellow, and 6R196 for magenta.

K. Pentel Pen Inks

1. General description

Plastic fiber tip pens that are available in several colors. The colors evaluated were black, red, blue, green, orange, violet, pink, and yellow.

2. Uses

Annotating and color coding items of the FDF.

3. Available sizes

Cartons of 12 pens each.

4. Evaluation

Passed Category B test for TO, CO, and odor and are acceptable for use in the FDF.

5. Source

The pens are manufactured by Pentel Co. Ltd., Japan, and are available through Texas Art Supply, Houston, Texas.

L. Higgins Drawing Inks

1. General description

Drawing ink used for annotating and color coding items of the FDF. The colors evaluated were yellow, red, violet, blue, green, brown and black.

2. Available sizes

Available in 1-ounce bottles.

3. Evaluation

Passed Category B test for TO, CO, and odor and is acceptable for use in the FDF.

4. Source

Manufactured by A. W. Faber-Castell Corp., Newark N.J. Can be obtained through GSA supply.

M. A-M CS-174-C Black Ink

1. General description

A printing ink used in the FDF.

2. Evaluation

The ink passed Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

N. Uniset Litho Itek B-5749 Black Ink

1. General description

A printing ink used in the FDF.

2. Evaluation

The ink passed Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

O. Colitho 0691-19003 Black Ink

1. General description

A printing ink used in the FDF.

2. Evaluation

The ink passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

P. A-B Dick 3-4020C Black Ink

1. General description

A printing ink used in the FDF.

2. Evaluation

The ink passed Skylab Category B tests for TO, CO, and odor and is acceptable for use in the FDF.

Q. Pilot Fineliner Inks

1. General description

Plastic fiber tip pens that are available in several colors. The colors evaluated were black, red, blue, and green. Manufacturer's designation for fineliner pens is SW-PP.

2. Uses

Annotating items of the FDF.

3. Available sizes

Cartons of 12 pens each.

4. Evaluation

Passed Category B tests for TO, CO, and odor and are acceptable for use in the FDF.

5. Source

The pens are manufactured in Japan, marketed by Pilot Corp. of America, Long Island City, NY 11101, and are available through Texas Art Supply, Houston, Texas.

R. Major Accent Marker Inks

1. General Description

Wick tip marking pens that are available in several colors. The colors evaluated were yellow, turquoise, pink, orange, fluorescent yellow, fluorescent green.' Manufacturer's designation for markers is no. 2500.

2. Uses

Highlighting or emphasizing items in the FDF.

3. Available sizes

Boxes of 12 pens each.

4. Evaluation

Odor test not performed, but inks approved by memo from MDTSCO Houston.

5. Source

Manufactured by Sanford Corp., Bellwood, Ill and obtained through Texas Art Supply Houston, Texas.

2.6.3 Photo Film/Photo Paper

A. Cronapaque Print Film

1. General description

A white estar base photographic film.

2. Uses

Maps, star charts, cue cards, and EVA cuff checklists.

3. Available sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20''x 24''
Rolls: 24'', 30'', 40'' widths x 100' or 250' lengths

4. Evaluation

Passed Apollo Category B tests, acceptable for use in the FDF.

5. Source

Manufactured by Du Pont and obtained from the Photographic Technology Division on a Photographic Work Request (JSC Form 246). The material is also supplied as finished products by agencies outside JSC.

B. EK 4588 Projection Print Film

1. General description

A white polyester base photographic film.

2. Uses

Star chart and map graphics.

3. Availables Sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20''x 24''
Rolls: 24'', 30'', 40'' widths x 100' or 250' lengths

4. Evaluation

Passed all Apollo Category B tests except burn rate and was certified for use by deviation 072. Approved for Shuttle per MUA 002E.

5. Source

Manufactured by Eastman Kodak Company, Rochester, N.Y., and is obtained form the Photographic Technology Division on a Photographic Work Request (JSC Form 246).

C. Ektacolor 74 RC Photo Paper

1. General description

A photo paper used in making color prints of moderate resolution.

2. Uses

Used whenever color photographs of moderate resolution are required in the FDF.

3. Available Sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20''x 24''
Rolls: 24'', 30'', 40'' widths x 100' or 250' lengths

4. Evaluation

Passed Category B tests; acceptable for use in the FDF.

5. Source

Manufactured by Eastman Kodak and obtained from Photographic Technology Division.

D. Cibachrome Paper

1. General description

An acetate base photo-film used making high-resolution color prints.

2. Uses

Used wherever high-resolution color photographs are required in the FDF.

3. Available sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20''x 24''
Rolls: 24'', 30'', 40'' widths x 100' or 250' lengths

4. Evaluation

Passed Category B tests; acceptable for use in the FDF

5. Source

Manufactured by Ilford Corp. in Switzerland and obtained from Photographic Technology Division.

E. Kodak LP4 and LP7 Film

1. General description

A flexible, translucent ester base photographic film. LP4 film has a thickness of 4 mils, and LP7 film has a thickness of 7 mils.

2. Uses

Overlays for star charts (4 mil or 7 mil) and orbital maps (4 mil).

3. Available sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20'' x 24''
Rolls: 24'', 30'', 40'', widths x 100' or 250' lengths

4. Evaluation

Passed all Category B Tests; acceptable for use in the FDF.

5. Source

Manufactured by Eastman Kodak and is obtained from the Photographic Technology Division.

F. Cronalar Contact Film
EN-4 and EN-7

1. General description

A clear, flexible mylar base photographic film. EN-4 film has a thickness of 4 mils and EN-7 has a thickness of 7 mils.

2. Uses

Overlays for star charts (4 mil or 7 mil) and orbital maps (4 mil).

3. Available sizes

Sheets: 8''x 10'', 11''x 14'', 16''x 20'', 20''x 24''
Rolls: 24'', 30'', 40'', widths x 100' or 250' lengths

4. Evaluation

Passed category B tests; acceptable for use in the FDF.

5. Source

Manufactured by Du Pont and obtained from Photographic Technology Division.

2.6.4 Adhesives/Tapes/Fasteners

A. UBAGRIP Cement UBS (N-136)

1. General description

A two-part neoprene cement containing one part of activator and 33 parts of cement by weight. Accurate mixing is required. The shelf life is 30 days after mixing. It has a 3- to 4-year shelf life before mixing, if sealed.

2. Uses

To bond Velcro to the data file clips and to mount shims on the cue cards.

3. Available sizes

The cement is purchased in gallon cans and the activator in quart cans.

4. Evaluation

It passed Apollo Category B tests, is acceptable for use in the FDF, but difficult to use.

5. Source

Manufactured by and procured from UBS Chemical Co., Cambridge, Mass.

B. Dry Mount Tissue MT5

1. General decription

A thin (3-mil), beige, waxy tissue used to laminate materials. The tissue is placed between the materials to be bonded, then the assembly is placed in a heating press. The heat from the press causes the wax to bond the materials. The shelf life is 2 years. It has a density of .043 gram per square inch.

2. Uses

Laminating data file book pages, orbital maps, star charts, and cue cards.

3. Available sizes

This tissue can be purchased in 8 1/2''x 11'' sheets, 150 or 500 to a carton, or in rolls of 40 inches x 50 yards.

4. Evaluation

Failed the Apollo combustion rate test but was certified for use by deviation 074. Approved for shuttle per MUA 002E.

5. Source

Manufactured by Seal Incorporated, Derby, Connecticut. It can be obtained from Southwestern Camera Co., Houston, Texas.

C. Scotch No. 5 Electrical Tape

1. General description

A strong, clear, transparent polyester film with an acrylic pressure-sensitive adhesive. It has a maximum service temperature of 120 deg. F and a shelf life of 9 months.

2. Uses

Reinforcing holes and tabs in FDF Books and for general binding in the FDF articles.

3. Available sizes

72-yard rolls in 3/4'', 1'' and 1-1/2'' widths.

4. Evaluation

Passed all of the Apollo Category B tests except combustion rate. It was certified for onboard use by deviation 005R1. Approved for Shuttle per MUA 002E.

5. Source

Manufactured by the 3M Company, St. Paul, Minnesota, and can be purchased from Texas Art Supply Co., Houston, Texas. The manufacturer's procurement specification is Scotch No. 5 electrical tape.

D. Devoseal 12T Tape

1. General description

A thin (2.8-mil), strong, unplasticized polyvinyl chloride film, coated with a natural rubber, high-track, long-aging adhesive.

2. Uses

For reinforcing holes and tabs in FDF books and for general binding of FDF articles.

3. Availables sizes

72-yard roll in 3/4'' (8135-995-0454) and 1'' (8135-995-0454) widths.

4. Evaluation

Passed Apollo Category B tests for TO, CO, and odor is acceptable for use in the FDF.

5. Source

Manufactured by the Devon Tape Corporation, Carlstadt, N.J.

E. Scotch Magic Transparent Tape

1. General description

A translucent cellulose acetate film with a frosted surface and pressure sensitive adhesive. Meets requirements of Federal Specification L-T-90°.

2. Uses

Used in small amounts in FDF fabrication to provide a writing area on items with otherwise smooth finishes (such as a map overlay). Rolls are also carried onboard to use for in-flight updating of the FDF.

3. Available

Rolls 36 yards in length and 3/4 inches in width.

4. Evaluation

Tested in 'out-of-the-box' configuration (roll with plastic spool) and passed Category B tests for TO, CO, and odor. Acceptable for use in the FDF.

5. Source

Manufactured by the 3M Company, St. Paul, Minnesota. Can be obtained through the GSA, Cat. No. 7510-551-9825.

F. Penntube II SMT Shrink Tubing

1. General description

A fluoro-ethylene-propylene (FEP) teflon tubing that shrinks upon application of heat. It does not have a shelf life limitation.

2. Uses

To secure the book binder rings in the closed position.

3. Available sizes

Gauge sizes 1 through 24 in lengths of 100 feet. The gauge sizes used in the FDF are 10, 12, and 14.

4. Evaluation

Passed all of the Apollo Category B tests and is certified for flight.

5. Source

Manufactured and supplied by Pennsylvania Fluorocarbon Co., Inc.,

G. Velcro Hook #65

1. General description

A fastener with small hooks sewn into a fabric backing. The material used for both backing and hooks is nylon. A pressure sensitive adhesive is applied to the back.

2. Uses

Used primarily on cue cards in the FDF. It is applied to the back of the cards which can then be mounted on patches or pile or loop tape material located at various points in the spacecraft.

3. Available sizes

25 yard rolls in widths of 5/8, 3/4, 1, and 2 inches.

4. Evaluation

Passed Category A tests and is acceptable for used onboard shuttle. It was not tested by Operations Division, but the test results from tests by other organizations are shown in Table 2-1.

5. Source

Manufactured by Velcro Corporation, New York, N.Y.

H. Velcro Loop #2000

1. General description

A fastener with small loops sewn into a fabric backing. The material used for both backing and loops is nylon. A pressure-sensitive adhesive is applied to the back.

2. Uses

Loop type material is normally applied to spacecraft hardware, but if FDF articles need to be fastened to other FDF articles bearing hook-type material, loop material is used.

3. Available sizes

25-yard rolls in widths of 5/8, 3/4, 1, and 2 inches.

4. Evaluation

Passed Category A tests and is acceptable for use onboard shuttle. It was not tested by Operations Divisions, but the test results from tests by other organizations are shown in Table 2-1.

5. Source

Manufactured by Velcro Corporation, New York, N.Y.

I. Elmers Glue-All

1. General Description

A general purpose liquid adhesive for use on most porous and semi-porous materials.

2. Uses

General purpose adhesive.

3. Available sizes

1-1/4 oz., 4 oz., 8 oz., 16 oz., quart and gallon containers.

4. Evaluation

An odor test not performed per memo, adhesive approved.

5. Source

Manufactured by Borden Inc. Columbus, Ohio and obtained through Texas Art Supply Houston, Texas.

J. Plastic Marking Tape

1. General Desciption

A plastic, acetate fiber graphic art type tape, with smooth glossy surface.

2. Uses

Identification of Commander, Pilot and Mission Specialist documents.

3. Sizes

1/16 to 2 inch width rolls, in black, blue, brown, green, red, white and yellow.

4. Evaluation

Passed Apollo Category B tests. Acceptable for use in the FDF.

5. Source

Obtained through Texas Art Supply, Houston, Texas.

K. Plastic Sheet

1. General Description

A clear acetate film with a pressure sensitive adhesive on both sides.

2. Uses

Attachment of material to FDF book pages.

3. Available sizes

17 x 22 - inch sheets, 2 mil thickness, 500 sheets per carton.

4. Evaluation

Approved for shuttle per MUA G062E.

5. Source

Manufactured by Fasson Division of Avery Products (P/N 489). Obtained through GSA, Index no. PL7108, National Stock number 9330-005160647.

2.6.5 Miscellaneous Materials

A. 500 Laminate, Natural Gel, Grade G10, 10 mil.

1. General description

Translucent fiberglass material, composed of fiberglass cloth impregnated with epoxy resin. It has a density of .314 gm per square inch. Does not have a shelf life limitation.

2. Uses

FDF book covers.

3. Available sizes

3 x 4 foot sheets.

4. Evaluation

Passes all Category B tests and is acceptable for use in the FDF.

5. Sources

Manufactured per specification MIL-P-18177, Type GEE by Synthane-Taylor, Laverne, California. Can be obtained through A-1 Plastics, Houston, Texas.

B. Plastic Sheet

1. General Description

A clear vinyl with a pressure sensitive self-adhering back.

2. Uses

Fabrication of C.G. calculator and weather chart.

3. Available sizes

27 x 20 - inch sheets, .0394 inches thick.

4. Evaluation

Approved for shuttle MUA G062E.

5. Sources

Manufactured by Fasson Division of Avery Products. Obtained through GSA, Index no. PL7109, National Stock Number 9330-009824248.

C. Plastic Binders

1. General Description

Plastic binders used with rectangular hole punch.

2. Uses

Prior to STS-3 used for binding flip card pages.

3. Sizes

1/4, 5/16, 3/8, 1/2, 5/8 and 3/4 inside diameters. Available in black, red or white.

4. Evaluation

Approved for shuttle per MUA G062E.

5. Source

NSC International Corporation, Hot Springs, Arkansas.

D. Plastic Bags

1. General Description

A clear polyethelene bag with a special interlocking closure, finger pressure closing.

2. Uses

Bags used to store miscellaneous FDF hardware.

3. Sizes

4x4, 6x6, 8x8, 10x10, 12x12 inch, .004 inches thick, 100 bags to a box.

4. Evaluation

Approved for shuttle per MUA G062E.

5. Source

Obtained through GSA, Index no. BA0105, National Stock Number 8105-008377753.

2.7 WAIVER OF TESTING FOR TONERS

As part of its effort to minimize its expenditures, JM/Management Services Division will in the future procure toners for use in the Xerox 3600, 7000 and 9200 machines on the basis of competitive bidding. Consequently, they will not be able to guarantee the use of previously tested Xerox brand toners in FDF reproduction. To eliminate a potential requirement to batch test each new order of toner, and because of the benign nature of all toners previously tested, ES5/Materials Technology Branch was determined that toners from any manufacturer are acceptable for use in the FDF without testing. This waiver of testing requirements is documented in a two-way memo.

1. DATE: 6-18-81

PURCHASE REQUEST

See instructions on reverse side

PAGE 1 OF 1

2. ACCOUNTING CODE: 971-70-MD-11-CG5741-CG51 (MA 93)

3. ORIG ORGN REQUEST NO: CG-495

4. PURCHASE REQUEST CONTROL NO.:

5. EQUIPMENT CATEGORY
- [ ] FLIGHT RELATED
- [ ] EXPERIMENTS, PAYLOADS
- [ ] TEST ARTICLE ONLY
- [x] SUPPORT EQUIPMENT
- [ ] NON FLIGHT RELATED

6. GOVERNMENT-FURNISHED PROPERTY REQUIRED?
- [ ] YES (If yes, identify property in Block 13)
- [x] NO

7. QUALITY REQUIREMENT
- [ ] CATEGORY (A)
- [ ] CATEGORY (B)
- [ ] CATEGORY (C)
- [ ] CATEGORY (D)
- [x] NOT APPLICABLE

RELIABILITY REQUIREMENT
- [ ] CATEGORY (A)
- [ ] CATEGORY (B)
- [x] NOT APPLICABLE

SYSTEM SAFETY REQUIREMENTS
- [ ] CATEGORY (A)
- [x] NOT APPLICABLE

8. FOLLOW-ON PROCUREMENT REQUIRED? [ ] YES [x] NO
DATA REQUIRED? [ ] YES [x] NO

9. CONTRACTOR WILL REQUIRE ACCESS TO CLASSIFIED INFO [ ] YES [x] NO
CONTRACTOR WILL GENERATE CLASSIFIED INFO [ ] YES [x] NO

10. ITEM NO.	11. OBJECT CLASS CODE	12. NATIONAL STOCK NO AND/OR MFG PART NUMBER	13. *include statement on government facility changes see JSC 1.5101.6D)* DESCRIPTION	14. QTY	15. UNIT OF ISSUE	16. UNIT COST	17. TOTAL COST
1.			Challenge paper drill machine Model JO	1	EA.	590.00	590.00
2.			Challenge hollow drills				
			a. hole size 3/8"	3	EA.	11.50	34.50
			b. " " 1/8"	2	EA.	11.50	23.00
			c. " " 7/32"	2	EA.	11.50	23.00
3.			Challenge hand drill sharpener Cat. No. A-4950	1	EA.	50.00	50.00

MA 93

SAMPLE

18. USE: To build flight and back-up items for shuttle ~~SSSS~~ NASA /DOD Missions

19. TOTAL: 720.50

20. TYPE OF REQUEST
- A. [ ] NEW PROCUREMENT
- B. [ ] FUNDING ACTION ONLY (CONTR # _____)
- C. [ ] ADD ON/NEW WORK (CONTR # _____)
- D. [ ] UNSOLICITED PROPOSAL
- E. [ ] OTHER

21. SOURCES *Attach additional sheet, if necessary*

The Challenge Machinery Company
c/o Addressograph-Multigraph Corp.,
Beaumont, Texas 77706
Grand Haven, Michigan 49417

Daniel A. Bland Jr.

22. APPROVAL SIGNATURES

	DATE
R & QA/SAFETY	
BRANCH CHIEF	6/23/81
DIVISION CHIEF	
PROGRAM MGR OR DIR	
CENTER DIRECTOR	
BUDGET	6-22-81
SUPPLY BRANCH	
OTHER	

23. REQUESTED BY (NAME, OFFICE CODE & EXT): Daniel A. Bland, Jr. x2201

24. EXCESS PROPERTY LISTS REVIEWED NOT AVAILABLE FROM EXCESS PROPERTY OFFICER

25. REQUIRED DELIVERY DATE: ASAP

26. ACCEPTANCE
- [ ] AT SOURCE
- [x] AT DESTINATION
- [ ] BY ENGINEER
- [ ] BY RECEIVING

27. FUNDS ARE
- [ ] COMMITTED
- — NOT AVAILABLE. PLANNING PURCHASE REQUEST
- — FOR PRELIMINARY PROCUREMENT PROCESS ONLY

SIGNATURE

28. SHIPPING INSTRUCTIONS
(A) DELIVER TO TRANSPORTATION OFFICER DISC & DS INC HOUSTON TX
(B) MARK FOR INDIVIDUAL OFFICE CODE Carmen Cruz
BLDG # 4 RM # 1043 EXT # 4694

29. PROCUREMENT BRANCH

30. CLASSIFICATION CODE

31. DATE

JSC FORM 91 (REV MAR 78) *Previous editions are obsolete*

CONTRACT FILE COPY

FIGURE 2-1

NASA JSC MATERIALS TEST REQUEST

(See instructions on reverse side)

77-9011

TEST REQUEST (To be completed by Test Requester)

NAME: JOHN RIVERS	ORGANIZATION: NASA/CG
ADDRESS: NASA/JSC/CG HOUSTON, TEXAS 77058	
DATE: 3/21/77	PHONE: (713) 483-5871

COORDINATOR: JLH

JSC S.N.: 8615

TEST FACILITY: W S T F

CODE (Leave blank): AP XX XX

1. MANUFACTURER'S IDENTIFICATION: HIGGINS VIOLET NO. 4115/JCP K-10

2. MANUFACTURER'S NAME: A..W. FABER

3. SPECIFICATION:

4. CHEMICAL CLASS: UNKNOWN

5. GENERIC USE: COATING, INK

6. CHECK CATEGORY: A [ ] B [ ] C [ ] D [ ] E [ ] F [ ] G [ ] H [ ] J [ ]

7. TESTS REQUIRED: 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [ ] 6 [X] 7 [X] 8 [ ] 9 [ ] 10 [ ] 11 [ ] 12 [ ] 13 [ ] 14 [ ] 15 [ ] VOM [ ] SPECIAL [ ]

8. VEHICLE: SPACE SHUTTLE

9. TEST DOCUMENT: NHB 8060.1A

10. REQUESTER CONTRACT NUMBER:

11. USE TEMPERATURE:

12. USE ATMOSPHERE FLUID: SHUTTLE ATMOS.

13. IGNITER TYPE:

14. USE PRESSURE:

15. USE THICKNESS:

16. INTENDED APPLICATION:

17. QUANTITY IN HABITABLE AREA/HAZARDOUS FLUID/VACUUM: _____ LBS _____ SQ. INCHES EXPOSED (If Known)

18. CURE TIME:

19. CURE TEMPERATURE:

20. CURE PRESSURE:

21. SPECIAL INSTRUCTIONS AND GENERAL DESCRIPTION OF SAMPLE

SAMPLE

NOTE TO TEST FACILITY: A COPY OF THIS REQUEST SHOULD BE RETURNED WITH THE TEST REPORT

JSC FORM 2035B (REV. MAY 74) SUPERSEDES MSC FORM 2035B (REV. DEC. 70) NASA-JSC

FIGURE 2-2

ORBITER GFE MATERIALS USAGE AGREEMENT(MUA)

GFE MUA NO. 002E

TITLE: Flight Data File

DISPOSITION

APPROVED ☐
DISAPPROVED ☐

OTHER ☐ DATE: _____

REMARKS:

1. Type of Deviation: ☐ Material ☒ Equipment, No. Per Vehicle 1
2. Requirement Deviated: ☐ Flammability ☐ VCM
   ☐ Offgassing ☐ Other _____ Specify
3. Description of Material and/or Equipment: See attached list
4. Part Number TBD
5. Vehicle Effectivity: OV-101 and [illegible]t
6. Location and Amount of Material U[illegible] (Nonmetallics only)

   Weight _____ lbs Area _____ in^2
7. Reason for Deviation: Failure to pass flammability requirements of SE-R-0006.
8. Rationale for Acceptance: (Use second page if required)
   These materials have been used on previous missions with deviations as indicated and are still the best available for currently anticipated Flight Data File use. Environment aboard OV-101 and subsequent spacecraft is less hazardous from a flammability standpoint than for previous programs; therefore, deviations are considered acceptable.

APPROVALS:

SUPPLYING ORGANIZATION/DATE
ORIGINATOR: ROBERT L. JOHNSTON

SHEET 1 OF 2

JSC MATERIALS TECHNOLOGY BRANCH/DATE
R. L. JOHNSTON, EB5

OTHER PROJECT MANAGER/DATE

IN RELATED GFE MANAGER/DATE

JSC Form 1407 (Jan 75)(2)

SAMPLE

FIGURE 2-3

FLIGHT DATA FILE MATERIALS REQUIRING DEVIATION APPROVAL

MATERIAL	APOLLO DEVIATION NO.
EK4588 Projection Print Film	072
Kodagraph Contact Film 2581	073
Croner Engineering Film Negative Cen 7 (7-Mil) and Cen 4 (4-Mil)	072
Dry Mount Tissue MT5	074
Scotch No. 5 Electrical Tape	005R1
JCP K10 Index Paper	070
JCP E20 Paper	069

SAMPLE

SHEET 2 OF 2

FIGURE 2-3

STANDARD MATERIALS WORKSHEET

PAGE ___ OF ___

DOCUMENT/PART NO.	R/L	FRAC	ASSOC CONTR	NEXT ASSEMBLY	DASH	EFF	DASH	EFF	DASH	EFF
SKD32100278	NA	0	0101	SL-ALT-001						

PREPARED BY JOHN RIVERS DATE 3/8/77

REVISED BY DATE

LINE NO.	MATERIAL CODE	OVERALL EVALUATION: FLAM	TOX	TVS	AGE	FSC	SCC	CORR	MATERIAL WEIGHT	MATERIAL SURFACE AREA	MATERIAL THICKNESS	FLAMMABILITY: EXP CAT	COMB RATE	FLASH	FIRE	CONFIG	TOX: ODOR	CO	TC	TVS: WT LOSS	VCM	CONFIG	AGE: CONFIG	RATING	FLUID SYSTEMS COMPATIBILITY (FSC): FLUID TYPE	SYS PRES	SYS TEMP	IGN	SERVICE	PNEU	MECH	CONFIG	SCC CONFIG	CORR CONFIG
01									0.985	400.00																								
02									4.700	400.00																								
03									1.250	NEGL.																								
04									0.310	NEGL.																								
05									0.050	21.00																								
06									0.020	1.20																								
07									0.030	47.50																								
08									0.550	400.00																								

SAMPLE

LN NO	T/W	TEST/WAIVER DOCUMENT	SUPPORT DOCUMENT	MANUFACTURER'S DESIGNATION	MATERIAL SPECIFICATION
01			JSC 10639/JSC 09935	JCP E-20 PAPER	
02				JCP K-10 PAPER	
03				4-PLY ILLUSTRATION BOARD	
04				MT-5 DRY MOUNT TISSUE	
05				SCOTCH 5 TAPE	
06				PENUTUBE SHT SHRINK TUBING	
07				VELCRO HOOK NO. 65	
08				EPOXY-GLASS LAMINATE-10 MIL	

LN NO

REMARKS

00 CREW CABIN

ALT FLIGHT DATA FILE ASSEMBLY

APPROVALS	INIT	DATE
ORIGINAL		
METALS		
NONMETALS		
REVISION	INIT	DATE
METALS		
NONMETALS		

NASA JSC

FIGURE 2-4

TABLE 2-1.- MATERIALS TEST RESULTS

EXPLANATION AND LEGEND

MATERIAL	Material being tested	
CONFIG	Configuration of the test sample	
	MAP	- E-20 paper laminated to 8-ply board using MT5 drymount tissue.
	E-20	- Test material applied to E-20 paper
	K-10	- Test material applied to K-10 paper
	4-ply	- Test material applied to 4-ply board
	CRON	- Test material applied to cronapaque
	12T	- Test sample include Devoseal 12T tape
	DMA	- Finished graphic from Defense Mapping Agency
	USGS	- Finished graphic from U.S. Geological Survey
	ROLL	- Roll of tape
MISSION	Mission for which the test was run	
	(GEN - general, A - Apollo, SL - Skylab)	
ATMOS	Atmosphere in which the test was run	
	Apollo	- 100% oxygen at 6.2 psia
	Skylab	- 70% oxygen/30% nitrogen at 5 psia
	16.502	- 100% oxygen at 16.5 psia
	16.5 Mix	- 60% oxygen/40% nitrogen at 16.5 psia
	Shuttle	- 23.8% oxygen/76.2% nitrogen at 14.5 psia

	Annotation denotes special test conditions
	W - Pretest 24-hour thermal-vacuum bakeout at 155 deg F
	X - Soaked for 72 hours at 90 deg F prior to odor, TO, and CO tests
TEST REPORT NO.	Test number assigned by White Sands Test Facility
DOWNWARD BURN RATE	Downward propagation rate measured during Test No. 2 (SE - self extinguishing)
FLASH POINT	Flash point measured during Test No. 3
FIRE POINT	Fire point measured during Test No. 3
ODOR SCORE	Odor score measured with no dilution during Test No. 6
CO	Carbon monoxide concentration measured during Test No. 7
TO	Total organics concentration measured during Test No. 7
REMARKS	Evaluation or disposition of the material tested
	ACCEPT - Meets Category B requirements of NHB8060. 1A or JSC-PA-D-67-13
	DEVXXX - Do not meet all Apollo or Skylab Category B requirements, but was approved via Deviation XXX
	MUAXXX - Approved for shuttle usage via Materials Usage Ageement XXX
REQUIREMENTS	Acceptable values specified in NHB8060. 1A for the various tests. (Downward burn rate is not applicable for shuttle materials testing, but the value noted was used as a standard of acceptability for Category B Materials tested for Apollo and Skylab, per JSC-PA-D-67-13.)

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
1.0 PAPER										
A. Artist Illustration Board	GEN	APOLLO	PLN-0460	0.07	---	---	---	---	---	ACCEPT
3-PLY	GEN	16.5 O2	PLN-0460	0.12	---	---	---	---	---	ACCEPT
(MAP)	A-14	APOLLO	70-2095	0.1	---	---	---	19	0.7	ACCEPT
(MAP)	A-16	APOLLO	71-3183	0.09	>600	>600	2.1	4.8	3.9	ACCEPT
	A-17	APOLLO	72-3986	0.07	503	>1000	1.8	14	2.9	ACCEPT
B. Artist Drawing Board	GEN	APOLLO	PLN-3285	0.12	---	---	---	---	---	ACCEPT
4-ply	GEN	APOLLO	69-1524	0.10	550	>600	1.5	2.9	1.4	ACCEPT
	GEN	16.5 O2	69-1524	0.13	543	543	---	---	---	ACCEPT
	GEN	16.5 MIX	69-1524	0.08	---	---	---	---	---	ACCEPT
	A-17	APOLLO	72-3985	0.10	574	>1000	1.9	1.4	5.5	ACCEPT
	SL-1	SKYLAB	73-4161	0.07	>1000	>1000	2.0	3.9	4.1	ACCEPT
	SL-4	SKYLAB	73-4444	0.07	567	>1000	1.2	2.5	0.8	ACCEPT
C. JCP K-10 Index Paper										
White	GEN	APOLLO	68-1023	0.34	515	515	1.4	0	.46	DEV 070
	A-16	APOLLO	71-3182	0.34	---	---	---	---	---	DEV 070
	A-17	APOLLO	72-3982	0.33	530	>1000	1.5	3.3	3.9	DEV 070
	SL-1	SKYLAB	73-4164	0.25	>1000	>1000	1.8	2.2	3.1	ACCEPT
	SL-2	SKYLAB	73-4309	0.27	>1000	>1000	2.0	1.4	1.8	ACCEPT
	SL-3	SKYLAB	73-4440	[illegible]24	532	>1000	2.0	1.6	[illegible].4	ACCEP[illegible]

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
JCP E-10 Index Paper										
Pink	A-14	APOLLO	71-2246	0.33	585	598	1.6	3.7	3.1	DEV 070
Yellow	A-14	APOLLO	71-2245	0.32	554	575	1.9	3.3	2.2	DEV 070
Green	A-17	SKYLAB	72-3881	0.22	>1000	>1000	1.8	2.5	3.2	ACCEPT
Salmon	GEN	SHUTTLE	81-14256	0.08	NONE	NONE	0.8	.4	.2	ACCEPT
Blue	GEN	SHUTTLE	81-14257	0.08	NONE	NONE	0.8	.4	.2	ACCEPT
Buff	GEN	SHUTTLE	81-14255	0.08	NONE	NONE	1.6	.6	.2	ACCEPT
D. JCP E-20 Paper	GEN	APOLLO	69-1523	0.50	543	>600	1.4	3.1	3.3	DEV 069
	GEN	16.5 O2	69-1523	0.50	550	553	---	---	---	DEV 069
	GEN	16.5 MIX	69-1523	0.40	---	---	---	---	---	DEV 069
	GEN	APOLLO	72-3614	0.59	>600	>600	1.3	2.7	5.5	DEV 069
	A-17	APOLLO	72-3983	0.62	585	>1000	1.5	2.4	7.1	DEV 069
	SL-1	SKYLAB	73-4158	0.50	>1000	>1000	1.6	4.3	6.0	DEV 069
	SL-3	SKYLAB	73-4310	0.48	>1000	>1000	1.4	2.3	7.4	DEV 069
	SL-4	SKYLAB	73-4441	0.48	570	>1000	1.6	2.2	6.9	DEV 069
E. Correction Paper	GEN	SHUTTLE	80-13609	-	858	NONE	1.2	.8	.4	ACCEPT
F. Mounting Paperboard	GEN	SHUTTLE	81-14372	SE	---	---	---	1.4	.4	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
2.0 INKS/TONERS										
A. Glen Killian #71										
Black Ink (4-Ply)	A-14	APOLLO	70-2089	0.10	---	---	2.2	5.8	3.4	ACCEPT
(4-Ply)	A-15	APOLLO	71-2807	0.09	---	---	2.0	4.9	4.3	ACCEPT
(E-20)	GEN	---	68-1021	---	---	---	1.4	---	---	ACCEPT
(E-20)	A-16	APOLLO	71-3236	0.57	NONE	NONE	2.3	5.7	40	ACCEPT
(E-20)	SL-1	SKYLAB WX	73-4128	---	---	---	0.4	0.2	0.4	ACCEPT
(E-20)	SL-1	SKYLAB X	73-4128	---	---	---	1.0	1.6	1.1	ACCEPT
B. M&M Cougar Black										
Ink	GEN	APOLLO	69-1284	0.63	455	455	1.5	6.2	5	ACCEPT
(E-20)	A-14	APOLLO	71-2247	0.55	>1000	>1000	---	4.0	8.3	ACCEPT
(E-20)	A-15	APOLLO	71-2805	0.65	>1000	>1000	---	9.5	9.3	ACCEPT
(E-20)	A-16	APOLLO	72-3458	0.61	>1000	>1000	1.8	3.5	6.0	ACCEPT
(E-20)	SL-1	SKYLAB WX	73-4132	---	---	---	0.2	0.4	0.3	ACCEPT
(E-20)	SL-1	SKYLAB X	73-4132	---	---	---	1.0	2.0	1.7	ACCEPT
(K-10)	A-14	APOLLO	71-2248	0.30	560	580	---	3.5	3.6	ACCEPT
(K-10)	A-15	APOLLO	71-2803	0.33	>1000	>1000	---	2.7	2.3	ACCEPT
(K-10)	A-16	APOLLO	71-3457	0.31	550	>1000	2.5	6.9	9.7	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
C. Paper Mate Pen Inks										
Red (E-20)	GEN	SKYLAB	72-3882	0.42	>1000	>1000	2.0	3.6	6.2	ACCEPT
Black (E-20)	GEN	SKYLAB	72-3883	0.43	>1000	>1000	1.7	3.2	4.6	ACCEPT
Red (E-20)	SL-3	SKYLAB	73-4303	0.46	>1000	>1000	2.2	3.9	5.8	ACCEPT
Black (E-20)	SL-3	SKYLAB	73-4301	0.45	>1000	>1000	1.8	4.0	5.1	ACCEPT
Blue (E-20)	SL-3	SKYLAB	73-4305	0.46	>1000	>1000	1.8	4.9	5.7	ACCEPT
Yellow (E-20)	SL-3	SKYLAB	73-4300	0.45	>1000	>1000	2.4	5.4	5.5	ACCEPT
Pink (E-20)	SL-3	SKYLAB	73-4299	0.45	>1000	>1000	3.0	4.6	6.9	ACCEPT
Orange (E-20)	SL-3	SKYLAB	73-4302	0.44	>1000	>1000	2.0	6.1	6.7	ACCEPT
Green (E-20)	SL-3	SKYLAB	73-4304	0.45	>1000	>1000	1.2	2.3	5.9	ACCEPT
D. Stafford's Spectra-Matic										
Inks										
Black (E-20)	GEN	APOLLO	69-1317	0.63	500	500	1.0	2.9	1.9	ACCEPT
Blue (E-20)	GEN	APOLLO	69-1319	0.61	450	450	1.5	2.3	2.3	ACCEPT
Brick Red (E-20)	GEN	APOLLO	69-1323	0.59	415	415	1.3	2.3	2.0	ACCEPT
Green (E-20)	GEN	APOLLO	69-1322	0.59	420	420	1.4	2.7	1.9	ACCEPT
Indigo (E-20)	GEN	APOLLO	69-1318	0.64	440	440	1.2	4.0	2.1	ACCEPT
Scarlet (E-20)	GEN	APOLLO	69-1324	0.61	430	430	1.9	2.1	1.7	ACCEPT
Violet (E-20)	GEN	APOLLO	69-1326	0.60	445	445	1.7	1.9	1.6	ACCEPT
White (E-20)	GEN	APOLLO	69-1325	0.57	410	410	1.6	2.3	1.6	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
E. Kohl & Madden Black Ink										
(E-20)	GEN	APOLLO	72-3610	0.64	NONE	NONE	2.8	15	27	ACCEPT
(K-10)	SL-1	SKYLAB WX	73-4126	---	---	---	0.4	0.2	0.6	ACCEPT
(K-10)	SL-1	SKYLAB X	73-4126	---	---	---	0.6	1.6	1.4	ACCEPT
(E-20)	SL-3	SKYLAB	73-4306	0.43	>1000	>1000	2.4	3.9	11.0	ACCEPT
(K-10)	SL-4	SKYLAB	73-4443	0.24	536	NONE	2.0	2.1	2.0	ACCEPT
F. A&M MLS 2100 Black Ink										
(E-20)	A-17	APOLLO	72-4003	---	---	---	1.8	25	42	ACCEPT
(E-20)	SL-1	SKYLAB WX	73-4130	---	---	---	1.6	0.4	0.7	ACCEPT
(E-20)	SL-1	SKYLAB X	73-4130	---	---	---	1.4	3.3	1.4	ACCEPT
(E-20)	SL-4	SKYLAB	73-4442	0.46	567	>1000	2.4	5.6	6.5	ACCEPT
G. Defense Mapping Agency										
Inks (E-20)	A-14	16.5 O2	71-2344	0.70	---	---	---	19	8.4	---
(E-20)	A-15	APOLLO	71-2804	0.62	---	---	1.8	1.5	2.6	ACCEPT
(E-20)	A-16	APOLLO	72-3461	0.63	>1000	>1000	2.2	6.1	7.7	ACCEPT
(E-20)	A-17	APOLLO	72-3979	0.61	>1000	>1000	2.0	5.2	13.0	ACCEPT
(E-20)	SL-1	SKYLAB	73-4154	0.48	>1000	>1000	2.4	4.8	7.9	ACCEPT

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TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
H. Xerox 3600/7000 Toner										
(E-20)	A-15	APOLLO	71-2388	0.59	579	605	1.8	8.4	9.5	ACCEPT
I. Xerox 9200 Toner										
(E-20)	GEN	SHUTTLE	76-8074	0.13	NONE	NONE	1.5	1.0	3.0	ACCEPT
(K-10)	GEN	SHUTTLE	76-8075	0.07	NONE	NONE	1.2	0.7	1.7	ACCEPT
J. Xerox 6500 Toners										
Magenta (E-20)	GEN	SHUTTLE	76-8629	---	---	---	1.4	1.4	1.2	ACCEPT
Cyan (E-20)	GEN	SHUTTLE	76-8630	---	---	---	0.8	1.5	1.3	ACCEPT
Yellow (E-20)	GEN	SHUTTLE	76-8632	---	---	---	0.6	1.0	2.0	ACCEPT
Combination (E-20)	GEN	SHUTTLE	76-8631	---	---	---	1.4	1.0	1.0	ACCEPT
K. Pentel Pen Inks										
Black S360-101 (K-10)	GEN	SHUTTLE	77-9016	---	---	---	1.0	0.5	0.3	ACCEPT
Red S360-102 (K-10)	GEN	SHUTTLE	77-9017	---	---	---	1.0	0.5	0.3	ACCEPT
Blue S360-103 (K-10)	GEN	SHUTTLE	77-9018	---	---	---	1.2	0.5	0.3	ACCEPT
Green S360-104 (K-10)	GEN	SHUTTLE	77-9019	---	---	---	1.2	0.5	0.4	ACCEPT
Orange S360-107 (K-10)	GEN	SHUTTLE	77-9020	---	---	---	0.6	1.0	0.6	ACCEPT
Violet S360-108 (K-10)	GEN	SHUTTLE	77-9021	---	---	---	1.6	0.5	0.7	ACCEPT
Pink S360-109 (K-10)	GEN	SHUTTLE	77-9022	---	---	---	1.2	0.5	0.7	ACCEPT
Yellow S360-122 (K-10)	GEN	SHUTTLE	77-9023	---	---	---	1.4	0.5	0.7	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
L. Higgins Drawing Inks										
Yellow-4025 (K-10)	GEN	SHUTTLE	77-9009	---	---	---	0.8	0.5	0.3	ACCEPT
Red-4085 (K-10)	GEN	SHUTTLE	77-9010	---	---	---	0.8	0.5	0.5	ACCEPT
Violet-4115 (K-10)	GEN	SHUTTLE	77-9011	---	---	---	1.2	0.5	0.5	ACCEPT
Blue-4145 (K-10)	GEN	SHUTTLE	77-9012	---	---	---	0.6	0.5	0.9	ACCEPT
Green-4205 (K-10)	GEN	SHUTTLE	77-9013	---	---	---	1.2	0.5	0.4	ACCEPT
Brown-4295 (K-10)	GEN	SHUTTLE	77-9014	---	---	---	0.8	0.5	0.5	ACCEPT
Black-4415 (K-10)	GEN	SHUTTLE	77-9015	---	---	---	0.8	0.5	0.8	ACCEPT
M. A-M CS-174-C										
Black Ink (K-10)	GEN	SHUTTLE	77-9042	---	---	---	1.2	0.5	0.6	ACCEPT
N. Uniset Litho Itek										
B-5749 Black Ink (K-10)	GEN	SHUTTLE	77-9041	---	---	---	1.8	0.5	0.3	ACCEPT
O. Colitho 0691-19003										
Black Ink (E-0)	GEN	SKYLAB	74-4785	---	---	---	2.2	5.0	10	ACCEPT
P. A. B. Dick 3-4020C										
Black Ink (E-20)	GEN	SKYLAB	74-4787	---	---	---	2.0	6.0	11	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
Q. Pilot Fineliner Inks										
Red (K-10)	GEN	SHUTTLE	78-9847	---	---	---	1.2	0.4	0.3	ACCEPT
Green (K-10)	GEN	SHUTTLE	78-9848	---	---	---	1.5	0.3	0.3	ACCEPT
Blue (K-10)	GEN	SHUTTLE	78-9849	---	---	---	1.5	0.4	0.3	ACCEPT
Black (K-10)	GEN	SHUTTLE	78-9850	---	---	---	1.7	0.2	0.1	ACCEPT
R. Major Accent Inks										
Turquoise (K-10)	GEN	SHUTTLE	81-14367	---	---	---	---	1.4	0.4	ACCEPT
Fluorescent Green (K-10)	GEN	SHUTTLE	81-14368	---	---	---	---	1.4	0.4	ACCEPT
Fluorescent Yellow (K-10)	GEN	SHUTTLE	81-14369	---	---	---	---	1.4	0.4	ACCEPT
Orange (K-10)	GEN	SHUTTLE	81-14370	---	---	---	---	1.4	0.4	ACCEPT
Pink (K-10)	GEN	SHUTTLE	81-14371	---	---	---	---	1.4	0.4	ACCEPT

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TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
3.0 PHOTO FILM/PHOTO PAPER										
A. Cronapaque Print Film	GEN	APOLLO	68-0988	0.27	>600	>600	1.4	0.2	0.8	ACCEPT
	GEN	APOLLO	68-1222	0.24	---	---	1.9	0.2	0.8	ACCEPT
	A-15	APOLLO	71-2806	0.23	---	---	---	0.3	0.4	ACCEPT
	A-16	APOLLO	72-3459	0.24	>1000	>1000	1.5	0.7	1.9	ACCEPT
	A-17	APOLLO	72-3981	0.33	>1000	>1000	0.9	0.4	1.1	ACCEPT
	SL-1	SKYLAB	73-4156	0.16	>1000	>1000	1.8	0.4	0.9	ACCEPT
(DMA)	A-14	16.5 02	71-2342	0.33	---	---	---	0.5	0.9	---
(DMA)	A-14	16.5 02	71-2341	0.33	---	---	---	0.6	1.4	---
(12T) (DMA)	A-15	APOLLO	71-2754	0.23	>1000	>1000	---	---	---	ACCEPT
(12T) (DMA)	A-15	APOLLO	71-2755	0.23	>600	>600	0.7	0.3	44	ACCEPT
(DMA)	A-16	APOLLO	72-3460	0.25	>1000	>1000	2.2	0.4	0.8	ACCEPT
(DMA)	A-17	APOLLO	72-3987	0.24	>1000	>1000	2.2	0.2	0.8	ACCEPT
(DMA)	A-17	APOLLO	72-3988	0.28	>1000	>1000	1.2	0.2	0.7	ACCEPT
(USGS)	SL-1	SKYLAB	73-4157	0.15	>1000	>1000	1.8	0.3	0.7	ACCEPT
B. EK 4583 Projection										
Print Film	GEN	APOLLO	PLN-0462	0.33	---	---	---	---	---	DEV 072
	GEN	---	68-1025	---	>600	>600	1.8	0.5	0.5	DEV 072
	A-14	16.5 02	71-2343	0.39	---	---	---	0.6	0.8	---

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
C. Ektacolor 74RC Paper	GEN	SHUTTLE	79-11700	0.04	944	NONE	1.2	0.7	1.0	ACCEPT
D. Cibachrome Film	GEN	SHUTTLE	79-11696	SE	633	NONE	1.2	0.6	60	ACCEPT
E. Kodak LP4 Film	GEN	SHUTTLE	79-11699	0.07	807	NONE	0.2	0.8	0.4	ACCEPT
LP7 Film	GEN	SHUTTLE	79-11698	SE	810	NONE	0.6	0.6	0.8	ACCEPT
F. DuPont Cronalar EN-4	GEN	SHUTTLE	79-11701	0.10	766	NONE	0.8	0.6	6.0	ACCEPT
EN-7	GEN	SHUTTLE	79-11697	0.08	763	NONE	1.0	0.5	1.0	ACCEPT

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
4.0 ADHESIVES/TAPES/										
FASTENERS										
A. Ubagrip Cement										
UBS(N-136)	GEN	APOLLO	69-1461	0.00	600	600	1.3	5.9	25.8	ACCEPT
B. Dry Mount Tissue MT5	GEN	APOLLO	68-0993	0.41	550	550	1.8	10	2.0	DEV 074
(MAP)	A-14	APOLLO	70-2095	0.10	---	---	---	19	0.7	DEV 074
(MAP)	A-16	APOLLO	71-3183	0.09	>1000	>1000	2.1	4.8	3.9	DEV 074
	A-17	APOLLO	72-3980	1.13	501	>1000	2.3	22	24	DEV 074
	SL-1	SKYLAB	73-4159	0.74	>1000	>1000	2.0	19	82	DEV 074
C. Scotch No. 5 Electrical										
Tape	GEN	APOLLO	68-1035	1.06	>600	>600	2.0	0.5	6.1	DEV 005R1
	GEN	APOLLO	PLN-1757	1.06	---	---	---	---	---	DEV 005R1
(E-20)	GEN	APOLLO	PLN-1758	0.83	---	---	---	---	---	DEV 005R1
(E-20)	SL-1	SKYLAB	73-4163	0.19	>1000	>1000	2.6	1.0	7.0	DEV 005R1
(E-20)	SL-3	SKYLAB	73-4308	0.19	>1000	>1000	2.4	0.8	12.0	ACCEPT
(E-20)	SL-3	SKYLAB	73-4307	0.18	>1000	>1000	2.8	1.7	11.0	DEV 005R1

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
D. Devoseal 12T Tape										
(CRO)	A-15	APOLLO	71-2548	0.28	>600	>600	1.5	0.5	31.0	ACCEPT
(E-20)	A-15	APOLLO	71-2549	0.52	490	529	2.1	4.5	27.0	ACCEPT
(E-20)	A-16	APOLLO	71-3236	0.57	>600	>600	2.3	5.7	40.0	ACCEPT
(E-20)	A-17	APOLLO	72-3984	0.68	487	>1000	2.1	2.2	43.0	ACCEPT
(E-20)	SL-1	SKYLAB	73-4165	0.36	>1000	>1000	---	2.0	43.0	ACCEPT
E. Scotch Magic Transparent Tape (ROLL)	GEN	SHUTTLE	76-7916	---	---	---	1.5	1.0	16.0	ACCEPT
F. Penntube II SMT Shrink Tubing	GEN	16.5 02	67-0441	0.02	>400	>450	0.9	0.1	0.1	ACCEPT
G. Velcro Hook #65	GEN	SHUTTLE	76-8156	SE*	---	---	---	---	---	ACCEPT
H. Velcro Loop #2000	GEN	SHUTTLE	76-8155	SE*	---	---	---	---	---	ACCEPT
I. Elmers Glue	GEN	SHUTTLE	81-14254	--	---	---	---	.7	1.0	ACCEPT

*Upward Burn Rate

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
J. Plastic Marking Tape										
Red	GEN	SHUTTLE	81-14258	.08	797	NONE	2.0	.7	.2	ACCEPT
Yellow	GEN	SHUTTLE	81-14259	.08	NONE	NONE	1.2	.5	.2	ACCEPT
K. Plastic Sheet	GEN	SHUTTLE	81-13138	SE	823	NONE	.6	.2	2.1	MUA G062E

TABLE 2-1 FDF MATERIALS TEST RESULTS

MATERIAL (CONFIG)	MISSION	ATMOS	TEST REPORT NO.	DOWNWARD BURN RATE (IN/SEC)	FLASH POINT (°F)	FIRE POINT (°F)	ODOR SCORE	CO (μGM/GM)	TO (μGM/GM)	REMARKS
	REQUIREMENTS →			≤ 0.3	> 400	> 450	≤ 2.5	≤ 25	≤ 100	
5.0 MISCELLANEOUS										
A. 500 Laminate, Natural Gel, Grade G-10, 10 mil	GEN	SHUTTLE	76-7850	SE	633	NONE	1.6	1.4	0.6	ACCEPT
B. Plastic Sheet	GEN	SHUTTLE	80-13137	SE	812	NONE	1.4	.6	1.6	MUA G062E
C. Plastic Comb Binder										
Black	GEN	SHUTTLE	79-12088	SE	818	NONE	2.0	.9	.1	MUA G062E
White	GEN	SHUTTLE	79-12089	SE	838	NONE	2.4	.5	.1	MUA G062E
D. Ziplock Polyethelene Bags	GEN	SHUTTLE	80-13610	.42	907	NONE	.8	.2	.1	MUA G062E

APPENDIX A
MATERIALS TEXT SAMPLE PREPARATION

In order for tests on FDF materials to produce consistent data, the samples submitted must be prepared in a standardized manner. All test samples should be prepared as described below and only those tests specified for each type of material should be indicated under ''Tests Required'' on the Materials Test Request (Test 2 - downward propogation, Test 3 - flash & fire, Test 6 - Odor, Test 7 - offgassing and carbon monoxide). All test samples should be 8 inches x 10 1/2 inches.

1. PAPER

   A. Configuration - Samples should be free of other materials, such as inks or tapes. Six samples will be required.

   B. Tests - 2, 3, 6 and 7

2. INKS/TONERS

   A. Configuration - Ink or toner should be applied to an existing flight qualified material (usually E-20 or K-10 paper). Four samples will be required.

      1. For inks and toners intended for general printing purposes a page of text should be printed on the test sheets. The text should consist of 54 lines of 12 pitch type, single-spaced, with 72 characters per line. Text should be printed on both sides of each test sheet.

      2. For inks intended for making hand annotations in the FDF (pen & ink updates, color marking) a line pattern should be drawn on the test sheets. The pattern should be made of parallel lines drawn 1/2 inch apart on both sides of each sheet.

      3. For inks or toners intended for color coding large areas (such as on title sheets) a stripe pattern should be applied to the test sheets. The stripes should be parallel, 1-1/2 inches wide, and 1-1/2 inches apart. The stripes should be applied to only one side of each test sheet.

   B. Tests - 6 and 7 only (it is assumed that flammability characteristics of the base material will not be affected by the ink or toner).

3. PHOTO FILM/PHOTO PAPER

   A. Configuration - Samples should be tested after they have been exposed and developed. Six samples will be required.

   B. Tests - 2, 3, 6 and 7

4. ADHESIVES/TAPES/FASTENERS

   A. Configuration - All materials in this category should be tested in end-item configuration, applied to flight qualified as it would appear in flight (tapes applied to paper, glues between sheets of 4-ply board, fasteners installed on 4-ply or 8-ply board). Six samples will be required.

   B. Tests - 2, 3, 6, and 7

5. EPOXY-GLASS LAMINATES

   A. Configuration - Samples should be free of other materials. Six samples will be required.

   B. Tests - 2, 3, 6 and 7

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