FIRE RESISTANT AIRCRAFT SEAT MATERIALS

ABSTRACT

This presentation reviews the earlier Phase I program which was oriented toward establishment of a technical data base for individual seat materials in order to facilitate materials selection.

The main focus is on the current follow-on Phase II program. This program examines the thermal response of multi-layer constructions representative of the basic functional layers of a typical future seat. These functional layers include (1) decorative fabric cover, (2) slip sheet (topper), (3) fire blocking layer, (4) cushion reinforcement, and (5) cushioning layer.

The status of the current test program and test results are reported. The implications for material selection for full-scale seats are discussed.
FIRE RESISTANT AIRCRAFT SEAT MATERIALS

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PHASE I MATERIAL TEST PROGRAM

MATERIAL WEIGHT DENSITY DIMENSIONS

FAA BURN TESTS 165°F AGED SPECIMENS AND NON-AGED

FAA NBS SMOKE 165°F AGED SPECIMENS AND NON-AGED

FAA MOD BURN TESTS (MATERIALS THAT MELT)

LOI

TGA

FAILED ELIMINATE

FAILED ELIMINATE

PILL TEST IGNITION AND FLASH PER J1579

TEXTILES

o DYEABILITY AND COLORFASTNESS
  o ABRASION
  o TENSILE
  o ELONGATION
  o CORROSION
  o CLEANABILITY
  o SHRINKAGE

THERMOFORMABLE PLASTICS

o HEAT DEFLECTION
  o FORMABILITY
  o STRESS CRAZING
  o IMPACT GARDINER TESTER
  o TENSILE
  o TENSILE MOD
  o MACHINABILITY
  o COLORFASTNESS

PERFORMANCE TESTS

FOAMS

o STEAM AUTOCLAVE
  o INDENTATION LOAD DEFLECTION (ILD)
  o COMPRESSION SET
  o CORROSION
  o TEAR
  o LOAD VERSUS DEFLECTION

SCREEN NO FURTHER TESTING

TEXTILES

SCREEN NO FURTHER TESTING

ANIMAL TEST TOXICITY

HHR AND FLASH FIRE

DATA BASE

ADVANCED TESTS
MATERIAL TEST CRITERIA FOR PROGRAM INCORPORATION

1. TEST QUANTITIES MUST BE AVAILABLE FOR PHASE I TESTING BEFORE 1 APRIL 1977

2. QUANTITIES MUST BE AVAILABLE FOR FULL-SCALE SEAT FABRICATION 1 OCTOBER 1977

3. MATERIALS MUST BE COMMERCIALY AVAILABLE BY 1980

4. MATERIALS MUST WITHSTAND ENVIRONMENT OF -40°F TO 180°F
FUTURE SEAT COMPONENTS

- Decorative Fabric Cover
- Slip Sheet (Topper)
- Fire Blocking Layer
- Cushion Reinforcement
- Cushioning Layer

Selection Basis
- Judgement Selection
- Abrasion Tests
- Heat Release Rate Testing

Note: Some components may not be included in all designs.
HEAT RELEASE RATE TESTING

PART 1  STANDARD CUSHION LAYER OF GLASS BLOCKING WITH VARIOUS UPPER LAYERS

PART 2  SELECTED UPPER LAYERS FROM PART 1 WITH VARIOUS CUSHION LAYERS
PART 1. HRR AT 3.5 W/cm²

ML SPECIMEN: 8

20787 KERMELO WOOL BLEND (101)
SLIP COVER NOMEX III (214)
ADHESIVE: R2332 N/F
FIRE BLOCK: 400-11 DURETTE BATT (216)
REINFORCEMENT: NOMEX III
ADHESIVE: R2332 N/F
CUSHION: GLASS BLOCK (FG215)

ML SPECIMEN: 5

20787 KERMELO WOOL BLEND (101)
FIRE BLOCK: VONAR 3 (210)
REINFORCEMENT: NOMEX III (214)
ADHESIVE: R2332 N/F
CUSHION: GLASS FIBER BLOCK (FG215)
PART 1  HRR-MULTILAYER SPECIMENS - 3.5 W/CM$^2$
PART 2. HRR AT 3.5 W/cm²

ML SPECIMEN: 12

20787 KERMEL WOOL BLEND (101)
SLIP COVER NOMEX III (214)
ADHESIVE: R2332 N/F
FIRE BLOCK: 400-II DURETT BATT (216)
REINFORCEMENT: NOMEX III
ADHESIVE: R2332 N/F
CUSHION: 9FR618 SILICONE FOAM (309)

1 - 10 BASELINE
EXCEPT 1/2″ t

ML SPECIMEN: 18

20787 KERMEL WOOL BLEND (101)
FIRE BLOCK: VONAR 3
REINFORCEMENT: NOMEX III
ADHESIVE: R2332 N/F
CUSHION: 9FR618 SILICONE FOAM (309)
PART 2  HRR - MULTILAYER SPECIMENS - 3.5 W/CM$^2$
DISCUSSION

1. MATERIAL PROPERTIES USED IN DETERMINING SELECTION CANNOT BE INDEPENDENT OF END USE

2. TWO IMPORTANT ASPECTS OF HEAT RELEASE MUST BE CONSIDERED
   a. EARLY RATE OF RELEASE
   b. TOTAL HEAT RELEASED

3. CONDITIONS OF TEST ASSUMED IN FLIGHT FIRE WITH CONDITIONS OF EXCESS OXYGEN

4. NEW MATERIALS WITH FUTURE SIGNIFICANCE
   POLYPHOSPHAZENE FOAM
   POLYIMIDE FOAM
   HEAT STABILIZED PBI FABRIC