Investigation of Fuselage Penetrations in Burnthrough Protected Area

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Insulation blankets in burnthrough-protected area of fuselage not 100% connected or contiguous.

Discontinuities such as slots, gaps, holes, pass-throughs, and other openings can exist in the burnthrough protected area of the fuselage.

Investigation to focus on what is acceptable level of discontinuities to ensure safety.

Findings of investigation to be implemented into advisory material.
Example of Discontinuity in Burnthrough Protected Area
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- Cabin Interior
- Cheek Area
- Cargo Compartment

- Burnthrough Protected
- Non-Burnthrough Protected
Development of Suitable Mock-up for Evaluating Discontinuity
Development of Suitable Mock-up for Evaluating Discontinuity
Initial Area to be Mocked-up

Cargo Liner

Insulation Blanket

Opening for flames to enter
Initial Area to be Mocked-up

cargo liner

insulation blanket

opening for flame
Formation of Mock-up

cargo liner

insulation blanket

opening for flame
Adjustable Height Concept Mock-up Box

- Pulley
- 4' x 8' Five-Sided Box
  - Kaowool Lined
- Camera
- Weight
- 6'
- Fire Pan
Mock-up Box at 6 Feet Above Fire Pan
Mock-up Box at 3 Feet Above Fire Pan
Begin Test
30 Seconds
Modified Mock-up Box Configuration

- 7.5' x 16' U-Shaped Mock-up
- Steel Cover over Cargo Liner
- Cut-out of Mock-up
- Cargo liner bolted to steel mock-up
- Cargo Liner over Cut-out
- 2" x 20" opening in bottom of mock-up
- Slot in bottom of mock-up

FRONT VIEW

SIDE VIEW
Modified Mock-up Box Configuration
Cargo Liner Mounted Over Opening
Cargo Liner Mounted Over Opening
Modified Mock-up Box Configuration Over Fuel Pan
Modified Mock-up Box Configuration
Insulation Blanket Mounted in Mock-up
Typical Mock-up Box Test With Materials
Post-Test Damage to Cargo Liner
Post-Test Damage to Cargo Liner
Post-Test Damage to Cargo Liner
Post-Test Damage to Cargo Liner
Post-Test Damage to Insulation Blanket
Steel Baffle Test (5/02/07)
4- by 22-Inch Steel Baffle Below Opening
30 Seconds
Cargo Liner
Post Test
Intumescent Coated Steel Baffle (5/16/07)
Intumescent Coated Steel Baffle 30 Seconds
Intumescent Coated Steel Baffle Post Test
Cargo Liner
Post Test
Insulation Blanket Post Test
Oversized Intumescent Coated Aluminum Baffle (6/1/07)
6- by 24-Inch Intumescent Coated Aluminum Baffle
20 seconds
60 seconds
Intumescent-Coated Aluminum Baffle Post Test
Intumescent-Coated Aluminum Baffle Post Test
Insulation Blanket Post Test
Summary of Full-Scale Testing of Penetrations

8 tests conducted with 2- by 20-inch opening in mock-up

Unblocked opening allows flames to enter and climb approximately 3 feet using 4-foot-high box

Unblocked opening allows flames to enter and climb up materials during modified box tests

Non-coated baffle provides marginal decrease in fire penetration

Reduced opening size (1-inch width) provided no decrease in fire penetration

Intumescent-coated baffles limit damage to insulation blanket/cargo liner