



USDA Forest Service Fire and Aviation Management Briefing Paper



Date: April 7, 2004

Topic: Potential Tearing of New Generation Fire Shelter

Issue: In mid-March, a Safenet was submitted describing rips occurring in two new generation fire shelters during deployment training. According to the Safenet, the tears were in the floor material near the shake handles used to quickly deploy the shelters.

Background: Since the late 1960's, the original fire shelter has saved over 300 lives. It protects firefighters by reflecting radiant heat but is easily damaged by direct flame contact. During experiments in the summer of 1999, MTDC discovered the potential for the glue in the laminate to expel gases when exposed to flames that emphasized the need for a new shelter. The gases can ignite inside the fire shelter. Firefighters were provided guidance and training to avoid flame contact with the older shelters until a new design could be developed and tested. In June 2002 the new generation shelter design was selected by WFLC, with the first of the new shelters arrived in the field during the summer of 2003. A 3-5 year transition period to the new shelter was planned.

Key Points:

- MTDC instructed GSA to have the shelter manufacturers halt production until a remedy to the tearing could be found, and instructed GSA to put a hold on distribution of the shelters currently in stock.
- During the development of the shelter, shake tests did not reveal a weakness in the design. MTDC personnel believe the problem is related to the stitch pattern used to attach the shake handles to the seam that joins the shelter floor and shelter shell.
- It typically requires 3-4 shakes to unfold a shelter during deployment. MTDC personnel tested 28 shelters from 15 manufacturing lots and found that after four shakes four shelters had tears ranging from 1"-4". An additional 8 shelters tore after 8-12 total shakes. These tears ranged in size from 1.5" – 5.5".
- All tears are on the floor material. The tears run along the seam that holds the shelter shell to the floor. NO TEARS have occurred in the shell material.
- Approximately 18,800 New Generation Fire Shelters are in the field. Approximately 49,800 shelters are in stock in GSA warehouses.
- The cost of a retrofit of existing shelters is approximately \$20 per shelter including shipping and handling.
- Forest Service equipment specialists believe that the added risk associated with the potential tearing of the shelter is very small. The main protective layers of the shelter are in the shell, not the floor. Flames and heat tend to rise and would be unlikely to impact the shelter at the floor level.

There is a small risk that a larger tear could occur if the initial tear were snagged by a boot, on brush, etc. A larger tear could expose an occupant to greater risk.

- MTDC consulted with Mark Ackerman, University of Alberta Mechanical Engineer. Ackerman reported that since energy transfer via thermal radiation is “line of sight”, the presence of a tear or hole on the underside, or floor, would have no bearing on the shelter’s performance. Ackerman added that since the location of the tear is under the shelter and next to the ground, it is unlikely that it will allow significantly more gases to enter the shelter than might find their way in through the intentional floor opening. Ackerman added, “The new USDA Forest Service shelter, even with a small tear, is vastly superior to the model it replaced.”
- Tearing was observed in older style fire shelters during past entrapments. In a few instances, firefighters were in life threatening situations but still survived despite the tears because they were able to manipulate the shelter to limit exposure.

Response:

Interagency fire management leadership, and the specialists at MTDC are addressing issue as quickly as possible to provide a quality product for firefighter safety, and retain confidence in the new shelter. Actions taken include:

- MTDC and the newer shelter manufacturer developed a solution to the weakness in newly manufactured shelters by reinforcing the floor material adjacent to the shake handles.
- MTDC and the new shelter manufacturer developed a simple retrofit solution to ‘fix’ the existing new generation shelters.

In addition, the plan of action regarding new and older fire shelters for distribution is:

- GSA and the fire management agencies will recall the existing 68,600 new generation fire Shelters for retrofit under a new GSA contract to prevent the problem. The recall procedures will be identified in a National Cache memo to be issued the week of 4/12/04.
- GSA and contractors will work to immediately begin producing the new generation fire Shelter design with the reinforced floor section.
- Firefighters with the older style shelters will carry those shelters until replaced by the new reinforced shelter or the retrofitted shelters. Only 11,399 older style shelters are left in the caches. Retrofitting should proceed at the rate of approximately 3,000-5,000 per week.
- State firefighters will return the new generation shelter for retrofitting to the nearest federal cache. The federal agencies will pay for shipping and retrofit of the newer shelters.
- Fire caches will not issue the new generation shelter until it has been retrofitted or replaced with units made using the new reinforced design.
- Increased monitoring of quality control will be established.
- A testing review process will be established for 30 days to ensure no other problems currently exist with the new generation fire shelter.

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