



National Wildfire Coordinating Group
Equipment Technology Committee



ETC-19-01

Date: 27 March 2019
To: Garth Fisher, Chair, NWCG Executive Board
From: Dave Haston, Chair, Equipment Technology Committee
Subject: Outcome of Fire Shelter Review Project

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Purpose: This memorandum presents the results and recommendation from the five-year Fire Shelter Review Project conducted by the USDA National Technology and Development Program (NTDP) in coordination with the NWCG Fire Shelter Subcommittee (FSSC).

Issue/Action: This study concluded that the current fire shelter (M2002, Forest Service specification 5100-606) continues to provide the most practical amount of protection given trade-offs of weight, volume (bulk), durability and material toxicity. The purpose of the review, initiated in 2014, was to identify possible improvements to the fire shelter system carried by wildland firefighters.

NTDP executed an exhaustive search of materials and designs working with 23 different entities including the National Aeronautical Space Administration (NASA) Langley Research Center, which produced hundreds of different materials, and combinations of materials.

Recommendation: Retain use of the current (M-2002) fire shelter.

Findings: Based on the NTDP project findings, the FSSC has recommended that the current shelter be retained. The committee weighed many facets of the fire shelter but emphasized the increased physiological stress of the additional weight, limited storage space left on firefighters' backs, the limited incremental increase in protection, the firefighter survey that showed a desire for a lighter weight/less bulky shelter, and the trend towards decreased number of annual fire shelter deployments. The results of the 2014 nation-wide firefighter survey was held in high regard. The results of the desire of a new shelter was as follows:

2014 Firefighter Survey:

Potential Option	Total Interagency Responses 3,803 total	Total Interagency Responses Percentage
Lighter Weight/Less Bulk with Similar Protection	1,939	51%
Similar Weight and Bulk with Improved Performance	1,349	35%
No Change; Continue to Use Current Shelter	217	6%
All Protective/Heavier Weight and Increased Bulk	185	5%

The project was unable to find an alternative that offered less weight/less bulk with similar protection or similar weight and bulk with more protection. Furthermore, past shelter deployments show that the vast majority of firefighters are able to deploy their shelter in a location that is predominantly exposed to only radiant heat. The current shelter performs very well in radiant heat exposure.

Through NTDP, the FSSC will continue to monitor developments in fire shelter technology to improve future fire shelter designs.

Background: Promising materials were full-scale tested in direct flame impingement laboratory tests to compare designs. Test parameters included air temperature, heat flux, oxygen levels, carbon monoxide levels and toxicity hazards. After hundreds of full-scale tests, four prototype designs were selected for wear testing by firefighters during the 2018 fire season. A total of 60 prototype shelters were produced for wear testing of the shelter finalists during the 2018 fire season. With a very small chance of being used in an actual deployment situation the wear test was used to expose any unforeseen issues with production, packaging wearing, and durability.

One of the prototypes that was lighter, smaller and performed better than the current shelter, did not satisfactorily endure production rigors and was eliminated from consideration. One prototype (green shelter carry case, below) style was tested by line-going firefighters, while two (yellow shelter carry case, below) were so large that they were intended for equipment operators only.



The prototype designed for line-going firefighters showed a 37 second direct-flame test performance improvement, however it is nearly one pound heavier and 1.7 times more volume than the current shelter. The prototype shelter envisioned for equipment operators is more than four times the volume and nearly 1½ pounds heavier. **Regardless of size or weight, the research indicates that none of the prototypes would ensure firefighter survival in extreme fire conditions.**

Coordination: This document was coordinated with the USDA National Technology and Development Program (NTDP) and the NWCG Fire Shelter Subcommittee (FSSC).

Contact: Please direct questions to you agency representative on the Fire Shelter Subcommittee (<https://www.nwcg.gov/committees/fire-shelter-subcommittee/roster>).

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