Convective Heating Improvement for Emergency Fire Shelters (CHIEFS)

Convective Heating Improvement for Emergency Fire Shelters (CHIEFS) FAQ

What is CHIEFS?

CHIEFS stands for Convective Heating Improvement for Emergency Fire Shelters. CHIEFS is a joint mission between NASA's Langley Research Center and the United States Department of Agriculture U.S. Forest Service to create a safer fire shelter for wildland firefighters.

What is a fire shelter?

A fire shelter is a small, foldable tent that firefighters use as a last-resort safety measure should they get caught in the middle of a fire they can't outrun. This shelter is meant to momentarily protect the firefighters from extreme heat while the fire passes nearby. The current U.S. Forest Service shelter is not designed to be in direct contact with flames.

Why is NASA developing a fire shelter?

NASA's initiatives in aeronautics and space exploration have resulted in technologies with commercial and societal benefits across the economy for quite some time. The CHIEFS project was initiated in response to a 2013 Arizona forest fire accident where 19 firefighters were lost after their fire shelters failed to protect them from a fast moving blaze. NASA engineers approached the U.S. Forest Service with an idea to use flexible thermal protection materials developed for spacecraft to make a lightweight fire shelter that can offer better protection from contact with flames.

How long do the fire shelters last?

Most forest fires burn through a particular area very rapidly, therefore, a shelter may only be exposed to significant flames for 90 seconds or less depending on how fast the flame front is moving and the type of fuel that is burning. Due to the extreme temperatures fire shelters may encounter, CHIEFS' fire shelters are designed for one-time use.

How hot do the fire shelters get?

Depending on the type of forest fire that is burning, flame temperatures can range from about 800°C (1472°F) to 1400°C (2552°F). NASA engineers have experimented more than 270 unique combinations of materials to find a concept to endure those temperatures for specific durations. Since fire shelters may encounter both direct flame contact and radiant heating, CHIEFS is developing materials to withstand both of these heat sources. Though the inside wall of the shelter may exceed 500°C (932°F), the temperature a firefighter would feel is expected to be much lower.

How heavy is the CHIEFS fire shelter?

Wildland firefighters carry lots of heavy gear with them in the field, so it is important for the fire shelters to be as light as possible. The current fire shelter issued by the U.S. Forest Service is about 4.3 pounds, and CHIEFS shelters are about the same weight.

How big is the CHIEFS fire shelter?

The current shelter, when folded and stowed, packs into a 5" by 9" by 4" space. When deployed, the fire shelter is slightly larger than a sleeping bag, but with enough volume to provide a pocket of breathable air for the firefighter inside. CHIEFS shelters can be packed into the same carrying case as the current shelter.

When will the revised fire shelters be in the hands of forest firefighters?

CHIEFS is working with the U.S. Forest Service to implement a revised shelter. With continued development and further successful testing, forest firefighters could have new fire shelters as soon as 2018.

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