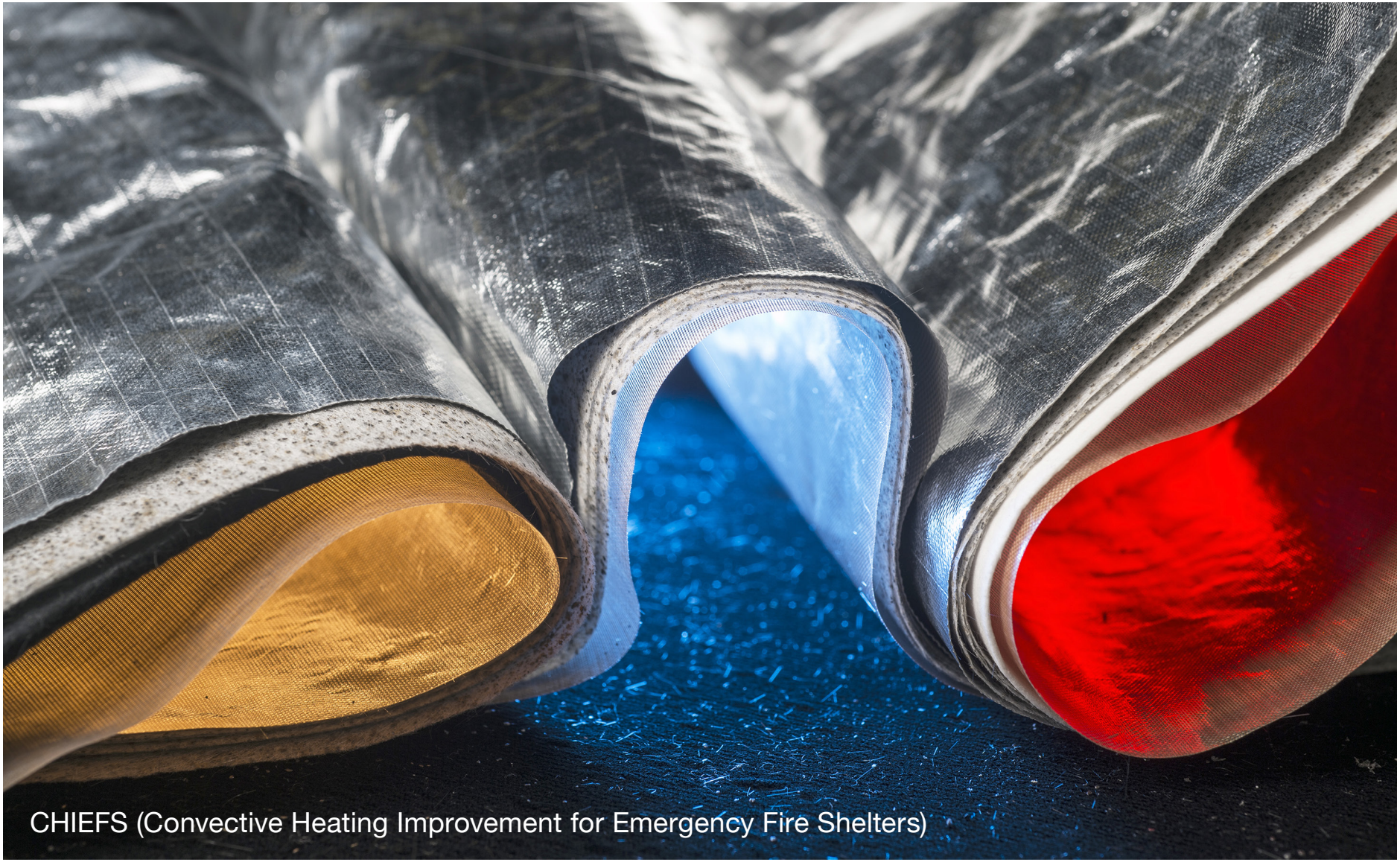
National Aeronautics and Space Administration



CHIEFS (Convective Heating Improvement for Emergency Fire Shelters)

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CHIEFS (Convective Heating Improvement for Emergency Fire Shelters) FAQ

What is CHIEFS?
The acronym CHIEFS stands for Convective Heating Improvement for Emergency Fire Shelters. CHIEFS is a joint mission between NASA Langley Research Center and the U.S.D.A. Forest Service to create a safer fire shelter for forest firefighters.

What is a fire shelter?
A fire shelter is a last resort safety device that protects forest firefighters in emergency situations. The shelter, resembling a small foldable tent, is primarily designed to protect the user from hot gas inhalation, but also radiant and convective heating.

If NASA makes space technology, why make a fire shelter?
This effort is directly aligned with NASA's strategic goal to develop technologies that also improve the quality of life on Earth. NASA's initiatives in aeronautics and space exploration often result in commercial products that have social and economic benefits.

What materials are used to make the CHIEFS fire shelter?
The outer layer of the shelter consists of a woven quartz fabric bonded to an aluminum film; however, NASA is also looking at more efficient high and low temperature insulators that will inhibit hot combustion gases from reaching the firefighter.

How is the CHIEFS fire shelter different than the existing fire shelters?
The CHIEFS fire shelters use materials drawn from a new flexible heat shield NASA is developing for future planetary exploration missions. By modifying this material and experimenting with different shelter structures, the CHIEFS team strives to make the shelter lighter than existing fire shelters.

How long can the fire shelters last?
Most forest fires burn through an area very rapidly; the shelter may be exposed to flames for only 1½ to 3 minutes depending on weather conditions, the landscape, and the type of burning trees or brush. Due to the extreme temperatures fire shelters may encounter, fire shelters can be used only once.

How do fire shelters work?
The shelter protects against both thermal radiation and hot gas conduction. The exterior aluminum coating effectively reflects over 90 percent of radiant heat from a forest fire. The convective heat from hot winds or direct contact with the fire is handled with interior insulation.

How hot do the fire shelters get?
Depending on conditions, the exterior temperature of a shelter can range from about 800° C (1472° F) to 1200° C (2400° F). The air temperature inside the shelter needs to stay below 300°F to make it survivable for the firefighter.

How heavy is the CHIEFS fire shelter?
NASA is developing a light design and a heavy design. Currently, the light design weighs about the same as the current fire shelter (4.3 pounds), but is more protective. The heavier 6.9-pound design offers much more protection, but due to its size would need to be transported on a vehicle.

How big is the CHIEFS fire shelter?
Though the exact shape of the shelter is still in development, NASA is looking at using the 86 inches long, 15 inches tall and 31inches wide U.S.D.A. Forest Service design as well as its own design called a "T-Pod," or thermal pod, which uses 20 percent less surface area than the U.S.D.A. Forest Service design.

When will the CHIEFS fire shelters be in the hands of forest firefighters?
With continued development and further successful testing, forest firefighters could have new fire shelters as soon as 2017.

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