Air Force
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Materials and Manufacturing Directorate

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Inflatable Shelter Technology

Researchers here are developing a new type of temporary shelter that is significantly lighter, faster to transport, and easier to construct than existing shelters.

Scientists at the Air Force Research Laboratory Materials and Manufacturing Directorate, in conjunction with the Army, are testing inflatable textile air beam technology to provide deployed forces with a quick, lightweight, and easily constructed alternative to current temporary aircraft shelters.

Constructing large shelters for use as aircraft hangars, maintenance facilities, and storage warehouses is a major concern for forces deploying to bare-base locations around the world.

Air beam technology emerged from nearly six years of cooperative research and development between the directorate's Deployed Base Systems Branch and the Army's Soldier and Biological Chemical Command. Researchershopetoreplacetheheavieraluminumstructural frame of current shelters with the lightweight air beam.

Reza Salavani, AFRL program manager, said he expected the technology to reduce deployment time by 75 percent, labor hours by 85 percent, and the number of people required to put up the shelter by nearly half. He also anticipates the shelters will be 60 percent lighter and require a single shipping container in lieu of three, which will allow twice as many shelters to be shipped per aircraft.

"Many of the current shelters being used are based on old-fashioned pole tent technology," said Salavani. "They take several airmen anywhere from several hours to days to construct. With air beam technology, we can significantly reduce deployment logistics, including the amount of time, people, and aircraft required to set up bare-base operations." The directorate is currently evaluating two small-sized shelters that have air beams made with a lightweight, high-strength fiber (polyethylenenapthelate and Vectran®) outer material and a plastic inner tube. The beam's outer material is high strength, durable, moldable, and can be charged to a high air pressure to provide the rigid frame. After inflation, the beams are covered with a tan or camouflage polyvinylcloride-coated polyester.

"The high-performance beams for these shelters feature high strength under applied loads, high stiffness, low weight, and will deflect weight from an overload without damage," said Salavani. "When deployed forces face high-winds, snow, or other environmental effects, these shelters will be strong and sturdy enough to keep Air Force troops and assets safe."

The directorate is testing the shelters, made by two separate manufacturers and differing in several ways, to evaluate their advantages and differing characteristics. The tests will provide useful data on how well the shelters perform over extended periods of time, in adverse weather, and after being constructed and taken down several times.

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Salavani said the Air Force will choose a manufacturer to design, build, demonstrate, and evaluate a large aircraft shelter in the near future. Researchers expect the shelters to be 72 feet wide, 135 feet long, and 24 feet high.

"This will be more than enough space to store an F-15, F-16, or F-22, and all of its support and maintenance equipment," Salavani said. "We'd eventually like to develop a shelter large enough to house larger aircraft; the idea is conceivable with this technology at our disposal."

Follow-on efforts will incorporate protection against toxic chemical effects, integrate next generation power utilities, and accelerate the transition of all other bare-base shelter support equipment. In addition, both the Air Force and air beam technology manufacturers anticipate technology spin-offs that will be useful to other military services.

The Army plans to use the technology for shelters, but they are also exploring the possibility of using it for break water systems, which would provide wave protection behind inflated textiles for ships. "Both the Navy and Marine Corps suggested that, with slight modifications to the polymer used in manufacturing, the technology might be useful as fuel bladders," Salavani said.

"What started as technology for deployable