

Pumped-Up Performance

INFLATABLES FOR A GO-ANYWHERE WING AND A PLANE BY SARAH TODD DAVIDSON



INFLATION SCENARIO: Six-foot-long wings emerge once filled with air. Deflating them enables the airplane to be carried and stored (*inset*).

The deep thud of a 155-millimeter howitzer echoes off the mountains as what looks like an artillery shell speeds from the gun barrel. Within less than a second, however, the shell inflates into a full-fledged airplane with a six-foot wingspan. It soars through a smoke-filled sky toward a forest fire too hot and unpredictable for conventional airplanes to fly low and track.

It is just a matter of a few tweaks over the next year before inflatable vehicles should be able to fulfill such a role, say engineers at ILC Dover, an engineering company based in Delaware. Their goal is to have an unmanned aircraft that can be crumpled down and carried or stored in small spaces. Besides being able to fire them from howitzers, users could haul them around in backpacks or drop them from the air. Inflatable wings on otherwise normal airplanes would also allow engineers to double the craft's wingspan in flight. Such planes could fly to their destinations with the speed of their short wings, then extend their inflatables to burn less fuel while they loitered or slowed down for landing.

Inflatable wings passed a milestone in 2001, when inventors at the NASA Dryden Flight Research Center in Edwards, Calif., dropped a rigid aircraft from nearly 1,000 feet and two inflatable wings successfully deployed. But those wings lacked flight controls. So ILC began working to design actuators, which would be small, flexible and steerable, into the wings. Engineers are now building photovoltaic cells that can be scrunched when the wing is folded. When it unfolds, the cells provide power to onboard machinery.

"We have a number of different programs we are working on with this plane," says David Cadogan, the R&D manager at ILC. The potential for the plane to perform a variety

of tasks lies, to some extent, in the fact that it can be scaled; it can range in size from 150 pounds down to 10, Cadogan says. A 100-pound version could carry various kinds of detection equipment, such as optical and infrared cameras, and ideally be operated by a single person.

For Bobby Jones, who helped to develop the wing while a student at the University of Kentucky and who now works on space suits at ILC, the groundbreaking aspect of the flying machine makes the project especially memorable. "I would talk about inflatable wings to people, and it would just be over their heads," he says.

In the long term, engineers at ILC and their collaborators at the University of Kentucky hope the wings will someday cut through the atmosphere of Mars. Engineers on the project say the technology is perfect for such a mission, where storage space on the flight to the planet is a scarce commodity.

ILC, which also designed the air bags that enabled the Mars rovers to land safely, is not the only firm interested in developing the technology. Vertigo, the Lake Elsinore, Calif., company that designed NASA's 2001 wings, continues to work on its version, which also includes a set of inflatables attached to a munition that can be fired from a howitzer. With several groups showing interest in the technology—including NASA, the Defense Advanced Research Projects Agency and companies that produce unmanned aerial vehicles—Cadogan might be aiming too low when he says the sky is the limit for these wings.

CRASH POSITION

Inflatable aircraft not only save space but also are tough enough so that runways are not necessary.

When the remote-controlled plane's time in the sky is over, the operator brings it home simply by crash-landing it. The impact does little to harm the robust wings, which are typically made of Vectran, a synthetic fiber stronger and more flexible than Kevlar. The operator can then just deflate the plane, roll it up and put it away.