AVIATION

DEFENSE INFLATION

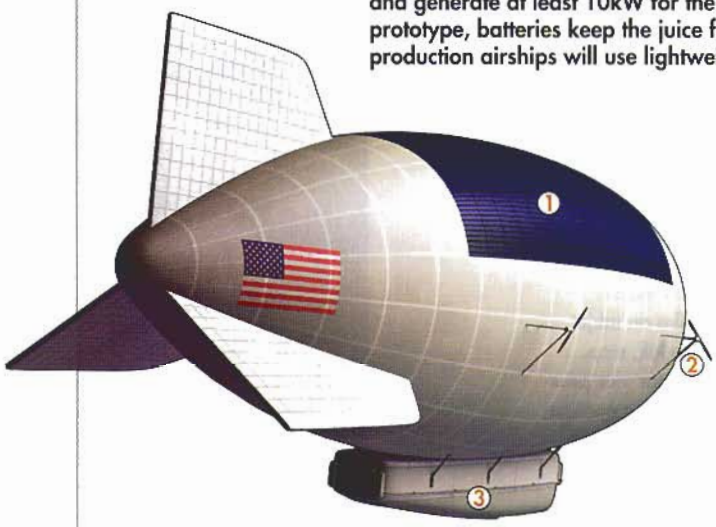
Meet the homeland security blimp, flying high by 2006.

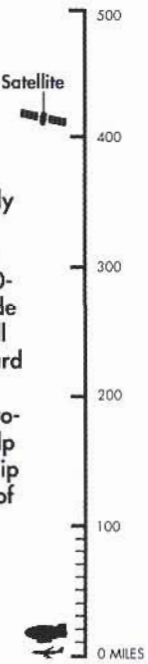
Being oversize has its advantages. Just ask researchers at the U.S. Missile Defense Agency, which recently dished out $40 million to arms maker Lockheed Martin to design what could soon be the world's largest pilotless airship. Measuring 500 feet long, with a volume of 5.2 million cubic feet, the prototype high-altitude airship, or HAA, will be 25 times larger than the Goodyear blimp.

From a military perspective, such an XXL craft may seem like an inviting target, especially since its top speed is only 80 mph. However, parked 12 miles up, it will be immune to most ground-launched missiles, and its onboard sensor systems will "see" at least 350 miles in any direction, allowing it to spy most incoming military threats. A fleet of 10, says the MDA, could provide an early-warning curtain for the continental United States.

Compared to high-altitude unmanned aerial vehicles, such as NASA's ill-fated Helios, the airship should be able to carry a heavy payload; its 4,000-pound capacity makes it ideal for toting heavy surveillance and communications equipment. Another big advantage: HAA's solar panels and fuel cells will allow it to loiter above the jet stream in a geostationary position for up to a year, something no drone or spy plane can do.—MATTHEW STIBBE

1 POWER SUPPLY
The helium airship will generate enough electricity from thin-film photovoltaic solar cells to power the engines and generate at least 10kW for the payload. On the prototype, batteries keep the juice flowing at night, but production airships will use lightweight fuel cells.



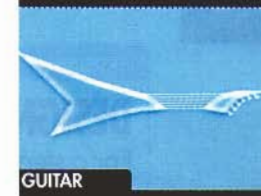


2 ENGINES
Four electrically powered engines, each driving two 30-foot-wide blade propellers, will provide forward thrust. The "steerable" propellers will help keep the airship within a mile of its assigned location.

3 PAYLOAD
The missile-defense airship might carry laser radars for pinpointing ballistic missiles or relay mirrors to extend the range of the 747-derived airborne laser. Other possible payloads: radar systems to detect low-flying cruise missiles, weather sensors, communications relays and cellphone base stations.

SHRINKAGE DEPT.

RESEARCH UPDATES ON THE QUEST TO MAKE REALLY TINY THINGS


GUITAR


DRUM


XYLOPHONE

SHRUNK ROCK

Strumming the strings of the world's smallest guitar requires more than just nimble fingers. Better factor in some deft laser work and a very attuned ear. Cornell University scientists crafted the blood-cell-size Stratocaster in 1997 using e-beam lithography on silicon wafers. But it took them seven years, and a new Gibson Flying V, to actually play a note. To do it, the scientists bounced focused laser light on the guitar's silicon "strings," causing them to vibrate and alter the light they reflect. The resulting "tunes" were screeched out in Es and As, 17 octaves above what a normal guitar produces. A wee xylophone and drum now round out the band. Scientists say these clever little research tools may help improve electronics: Energy-efficient nanorods, similar to the Gibson's "strings," could replace power-hogging quartz oscillators in wireless devices.—MARTHA HARBISON

LEFT: GARRY MARSHALL; COURTESY CCMR/CNF, CORNELL UNIVERSITY

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