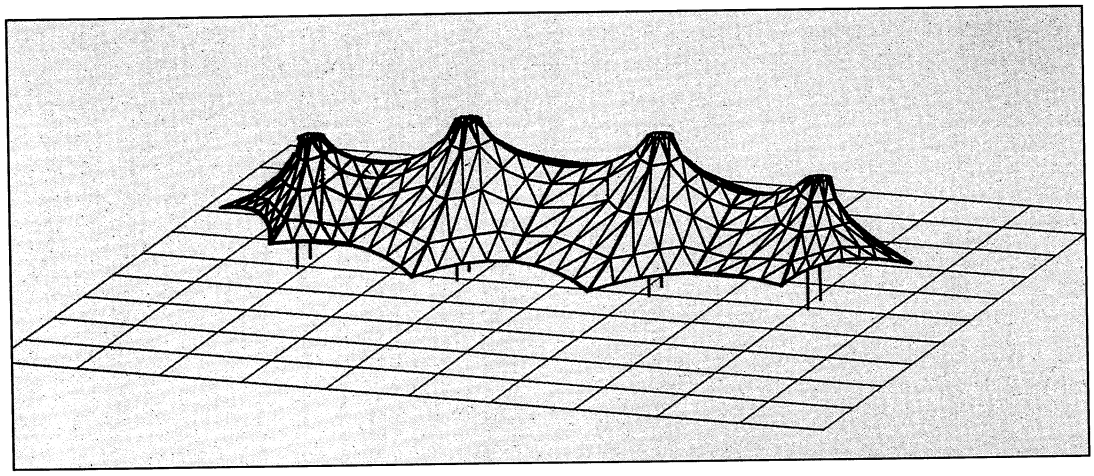
Design Graphics

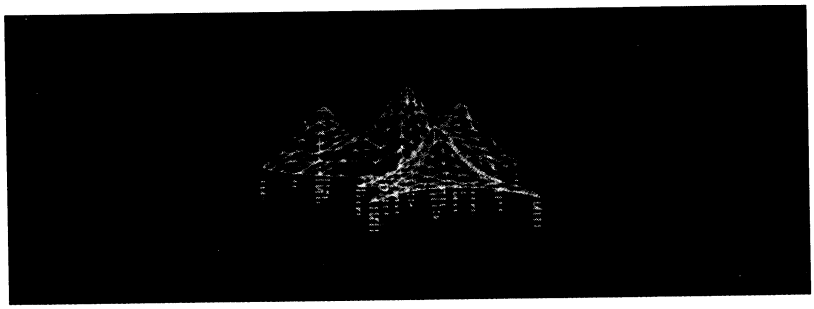


Originally an aerospace innovation, the use of computer-generated graphics as a design tool has long been employed in such other fields of design as architecture, metallurgy and auto development. But until 1982, use of this technique posed a problem.

The problem was that a computer could not "see" a solid object as the human eye sees it; the computer defines the whole object without regard to perspective. For example, if a human looks at a desk, he sees the top surface and one or two sides, depending on his viewing angle. But a computer asked to produce a picture of the desk would show all the desk's surfaces, angles and curves, including all the parts a human viewer could not see. This resulted in a cluttered, confusing graphic representation that complicated the design process.

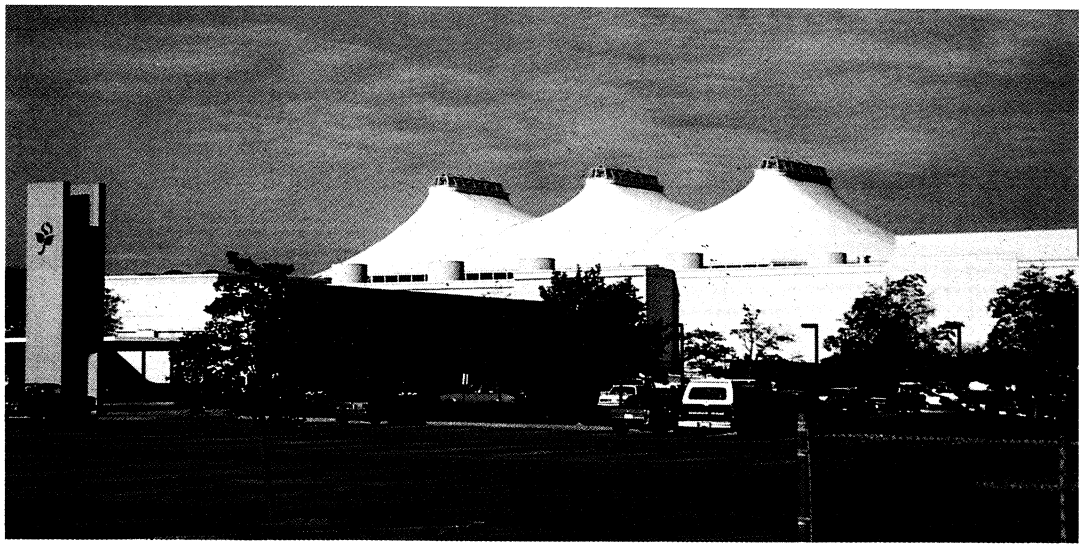
A mathematician at Ames-Dryden Flight Research Facility, David R. Hedgley, Jr., came up with a solution after two years of effort: a computer program that considers whether a line in a graphic model of a three-dimensional object should or should not be visible. Known as the Hidden Line Computer Code, the program automatically removes superfluous lines and displays an object from a specific viewpoint, just as the human eye would see it.

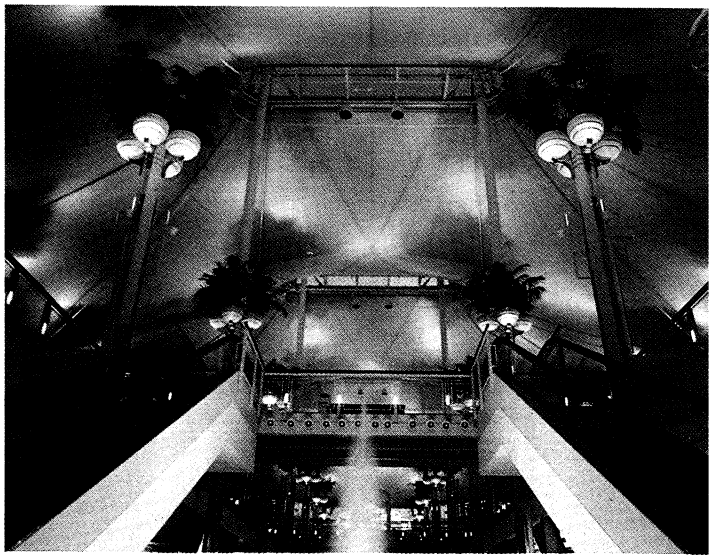
In April 1982, the Hidden Line Computer Code was made available to public users through



NASA's Computer Software Management and Information Center (COSMIC)®, which supplies government-developed programs adaptable to secondary uses for industrial and government customers. It was an immediate best seller and the number of users has grown each year.

An example of how one company uses the program is the experience of Birdair, Buffalo, New York, which specializes in production of fabric skylights and stadium covers. The fabric —called SHEERFILL®—is a Teflon®-coated fiberglass material developed in cooperation with DuPont Company, Wilmington, Delaware. SHEERFILL structures are translucent, lightweight, energy efficient and immune to attack by pollutants and ultraviolet radiation.





SHEERFILL glazed structures are either tension structures, employed in all types of skylighting, or air-supported tension structures, sometimes used as stadium domes. Both are formed by patterned fabric sheets supported by a steel or aluminum frame or a cable network.

Birdair uses the Hidden Line Computer Code, obtained through COSMIC, to illustrate a prospective structure to an architect or owner. The program generates a three-dimensional perspective with the hidden lines (those that would not be visible to the observer) removed.

The fabric structure is plotted as a mesh of triangles (opposite page, top). This finite element model is color coded according to a program modification developed by Claude Frenette, Birdair senior systems analyst/engineering programmer. The fabric proper, the supporting cables and a ground-level planar grid are each plotted in a different color (opposite page, lower photo) to aid in the proper visualization of prospective structures. Examples of completed structures are shown on this page; all are views of the Sherway Gardens Mall, Toronto, Canada.

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