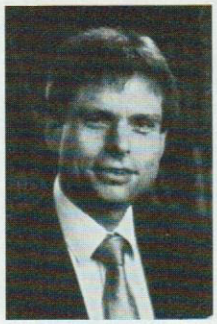
Technology Today

The Cutting Edge
Alan J. Pierce

Welcome to "Technology Today"

With this issue, we welcome a new columnist to Tech Directions. *Dr. Alan J. Pierce is associate professor in the Technology Department, Elizabeth City (NC) State University. He is the former New York State Ambassador of Occupational Education and the author of many published works, including the textbook,* Introduction to Technology *(West Publishing, 1993), co-written with our own Dennis Karwatka, who creates "Technology's Past."*

Dr. Pierce has served as consultant for the U.S. Department of Education and the National Science Foundation and as a member of the Tech Directions *Editorial Advisory Board and the U.S. Congressional Technology Advisory Committee. We are proud to welcome him to our family of distinguished columnists.*



His column, "Technology Today," will cover new and developing technology from around the world. From experimental space craft, like the DC-X *in this month's column, to computer processing chips, Pierce will show you the "cutting edge" of the technological world.*

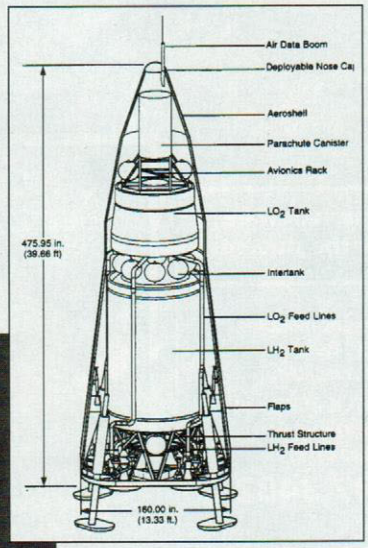
Each column will include a few discussion questions for you to use as launching pads for class activities. We encourage you to photocopy these articles for your students to broaden their exploration of the technology that surrounds them.—PBJ

Birth of a Space Ship

The DC-X, a single-stage, vertical-landing launch vehicle, shows how technology speeds the design and development process.

ON May 16, 1995, the U.S. Army's White Sands (NM) Missile Range was the site for the launch of the sixth test flight of the *DC-X* , a new, single-stage craft that is the first space vehicle to make a vertical earth landing. To appreciate the design and capabilities of the *DC-X*, consider that all our present space vehicles, including our Space Shuttle, were developed during the 1960s and '70s when it took decades to bring a complex project from design to construction.

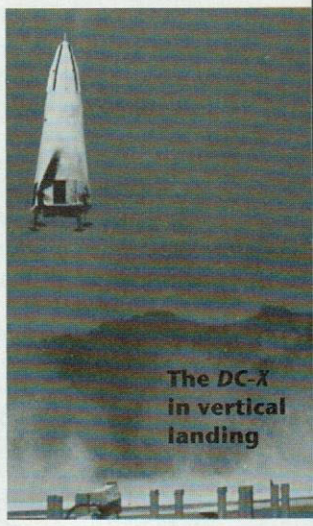
In the last few years, combining our latest knowledge of materials, computers, lasers, fiber optics, and semiconductors with the power of computer-aided design, drafting, and modeling has made it possible to move projects from concept to production in a matter of months. A "Star Wars" team developed the *DC-X* near the end of the Cold War. In a year and a half, it went from computer-aided design to its first test firing.



The *DC-X* launch and a cutaway view of the craft.

The outer shell of the *DC-X* is an epoxy graphite similar to the material used to make tennis rackets. This epoxy graphite fiber has special characteristics for space flight: It is extremely heat resistant but currently falls slightly short of the heat-resistant tiles of the Space Shuttle. It is extremely light, enabling the *DC-X* to reach escape velocity without booster rockets. And it is extremely strong. A shell only as thick as a credit card can provide the strength of the thick aluminum shell of other spacecraft.

When the *DC-X* goes on line, it will carry objects into space at a cost of $500 per pound, as compared to the current $10,000 per pound for the Space Shuttle. It will probably take another five years before the first full-size *DC-X* goes into service. The present craft is a 40', 1/3 scale model that needs only three technicians for launch and flight control.



The *DC-X* in vertical landing

During the flight shown, the DC-X fired vertically, like the Space Shuttle, rose to an altitude of 4,350', stopped in space, turned sideways, shot horizontally for 350', stopped, and turned again, its engine facing the ground, for a vertical landing. Before the *DC-X*, tail-first landings had happened only on the moon and Mars.

For the next phase of development of the fully reusable launch vehicle, which can fly again in just seven days, NASA has awarded a contract to McDonnell Douglas. The new craft, the *DC-XA*, will use different engine configurations and integrate an outer shell with ceramic characteristics that match or exceed the heat-resistance of the Space Shuttle. It will also contain liquid hydrogen tanks and gaseous oxygen tanks, possibly made of carbon fiber.

The *DC-XA* will use technology developed in other nations, including a Russian-built aluminum-lithium alloy cryogenic liquid oxygen tank—perhaps a major step toward space exploration based on cooperation rather than competition.

Recalling the Facts

1. How long ago were plans for our current space vehicles first developed?
2. How long did it take to bring the *DC-X* from its computer drawing board to its first test firing?
3. Describe the *DC-X* test flight recounted in this article.
4. Name the government funding agency that has contracted for construction of the *DC-XA* and the company responsible for its design and construction.
5. What material makes up the current outer shell of the *DC-X*?