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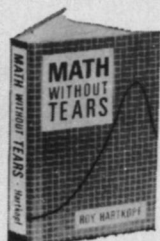
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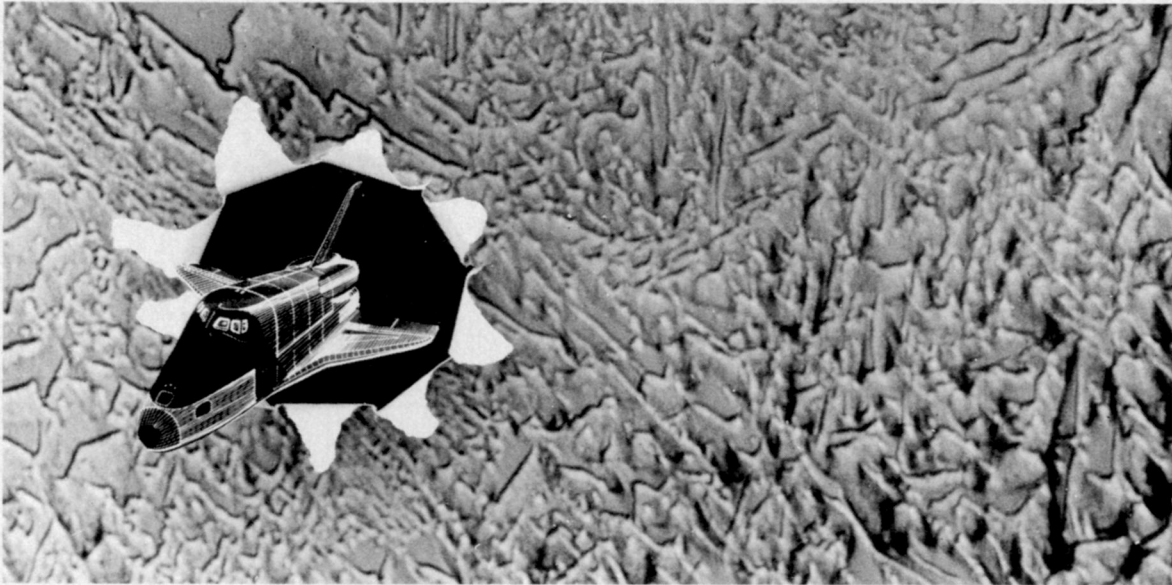
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Conversation Pieces

Planning for Breakthroughs in Materials Technology



What can the Space Shuttle and Spacelab programs really be expected to do for technology and, ultimately, for mankind? Well, let's ignore the gee-whiz stuff. Let's stick to practical probabilities, beginning with medical technology.

Manufacturers of serums, vaccines, antibiotics, and other biomedical products, strive constantly for purity. But, on earth, it's very difficult to separate different kinds of living cells. It only takes a tiny minority of unwanted cells to contaminate an almost perfectly purified culture. Minute differences in the electrical charge on each type of cell could be used to achieve significantly better separation if it weren't for gravity. So, suspend your media in zero-g, apply an electrical field and various cells can be withdrawn with the most delicate precision.

Or, suppose you're a metallurgist, interested in alloys; earth's gravity tends to separate the components of many melts as they cool and harden. In zero-g, mixtures tend to stay uniformly mixed. The same goes for cool mixtures of fluids that differ in density. Immiscible on earth, they're easily kept homogeneous in zero-g.

Crystal-growers face similar problems. The benefits that zero-g processing can bring to makers of semiconductors alone are considerable. As for that curious noncrystal, glass, the prospects for optical technology are exciting, to say the least.

One of the greatest attractions of space manufacturing is containerless processing. On earth, even vessels that

seem perfectly clean can actually contaminate their contents by reacting at the high temperatures that are essential to many processes. In zero-g, you can contain melts in electrostatic, magnetic, or acoustic fields; power requirements are low yet contaminants are quite easy to keep out.

The combination of zero-g and vacuum, that's available in orbital flight, is expected to facilitate developments in materials technology that range from difficult to impossible on earth. But the breakthroughs, whether they're surprising or reasonably predictable, aren't going to come automatically. It's going to take very careful planning.

At TRW, we have a team of systems engineers working the cost, schedule, and technical tradeoffs right now. They're supported by biologists, chemists, and physicists, who cut their teeth on difficult processing problems. We're working closely with NASA and other government agencies and we're teamed on specific projects with Beckman Instruments, Owens-Illinois, and U.S. Steel. By starting so early and proceeding with care, we hope to help develop new materials that will benefit everybody.

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