A photographic slide projected onto an optical memory element is recorded and later read out and imaged on film.

D. S. Oliver

The device is called PROM for Pockels Readout Optical Memory. (Pockels effect is the name of the electro-optic-process by which it is read.) It involves a zinc sulfide crystal as the active element.

To record, a voltage is first put across the crystal. Then light from the image to be recorded is shone on the crystal. The light, by moving electrons in the crystal, changes the voltage pattern so that the pattern represents the light and dark spots of the image. This pattern remains frozen in the crystal for times up to 100 hours, experiment has shown.

To read the information out, a voltage is first placed across the crystal in what crystallographers call the (100) direction. This makes the crystal birefringent: Light polarized in one direction, the fast axis, goes through faster than light polarized in another direction, the slow axis.

Light whose axis of polarization bisects the angle between the fast and slow axes of the crystal is then shone on the crystal. As this light goes through the crystal it is split into two components along the fast and slow axes. What comes out the other side of the crystal is an elliptically polarized beam. A device called a crossed analyzer is used to select the component of the beam that vibrates along the minor axis of the ellipse. This component has had its intensity altered by the pattern recorded in the crystal and will give back the light and dark spots of the original image.

Recording can be done with ultraviolet and read out with visible light. If the readout is quick enough, it can be accomplished without destroying the recording.

The Itek group reports that images have been read out in visible light sufficiently intense for viewing through an eyepiece and have lasted for periods up to one hour. In the experiments also, photographic slides were projected onto the crystal and later read out and imaged on Polaroid film. □

NASA PROGRAM

Subsonic transport for 1980's

Among the many woes of the aviation industry is a growing gap between technological advancements and actual market applications. Until now, the United States, by out-producing its European competitors, has been able to control 80 percent of the world's aviation market, even though it may not always maintain a clear technological superiority. Few believe, however, that this production lead is unsurpassable or that the environmentalists' cries for more quiet, pollution-free aircraft will wane. To survive, the industry will have to respond.

Although aware of the problem, aviation is already faced with current marketing problems with the Boeing 747 and financial indebtedness with the supersonic transport, which was struggling for life in the Senate this week. The risk of producing prototypes for which there may be no market, or which may not work, is great. To help ease the problem, the National Aeronautics and Space Administration proposes to develop an advanced experimental transport (SN: 11/28, p. 413).

If funded, such a subsonic transport would be ready to meet the demands of the 1980's, when the industry would be faced with the shutting down of production lines on the Boeing 747, McDonnell Douglas DC-10 and the Lockheed 1011.

The new plane would incorporate new advances in the critical areas of aerodynamics, flight control, structural design, materials, propulsion and avionics. It would fly just below the speed of sound at around 630 miles per hour, about 120 miles per hour faster than current aircraft.

Advances in structural design are focused on the supercritical concepts developed by Dr. Richard T. Whitcomb of NASA's Langley Research Center in Hampton, Va. (SN: 11/14, p. 389). In propulsion research, the goal is to improve the performance, durability and reliability of engine components that reduce weight, noise and pollution. Research has already demonstrated the feasibility of combustors that operate at high temperatures with lower pressure losses and less smoke formation.

NASA is looking at a new class of structural materials such as filaments of boron or graphite in conjunction with polymeric matrix to reduce structural weight while increasing strength and durability.

A major problem to overcome in avionics is to increase reliability by adding redundant electronic units without increasing weight. The new plane will also use digital control systems with automated communications displays. Another problem is to improve manual control of the larger airplanes in crises situations. Currently, the movable parts, such as flaps and rudders, are almost impossible to control manually; NASA and the industry are working on electronic devices to transmit the signals. □

SCIENCE NEWSBRIEFS

Destroying the stockpile

The Pentagon said last week that it would soon begin destroying the nation's stockpile of germ and biologic weapons. The announcement followed an earlier pledge by President Nixon that the United States would no longer have programs for development of biological warfare for offensive purposes (SN: 2/21, p. 194).

The Pentagon's plans must be approved by the President's Environmental Quality Council, as well as by state and local environmental agencies. But they have already been reviewed by the Department of Health, Education and Welfare, and Army spokesmen said there appeared to be no problems. Full details of disposal techniques were not announced. □

Apollo 14

The National Aeronautics and Space Administration said this week that the flight of Apollo 14, scheduled for liftoff to the moon Jan. 31, would be one day shorter than previous flights. "We want to get them home as fast as we can," says Apollo Mission Director Chester M. Lee. The day will be saved by performing the burn to return the command module Kitty Hawk and the lunar lander Antares home 24 hours earlier, eliminating the day of lunar orbit photography. The change is one of several to avoid a repeat of the near disaster of Apollo 13. □