

# environment

## 'Internalizing' the limits to growth

*Limits to Growth*, the now famous MIT study of world trends, implies (although it does not say so explicitly) that the market system may be inadequate to meet the need for a stable economic order. The suggestion is that radical institutional changes are necessary.

Economist Henry C. Wallich of Yale University argues in the October *FORTUNE* that the market system can be adjusted so that the diseconomies of growth can be charged to the products creating these diseconomies—thus stimulating industry and consumers to create and use products with fewer liabilities.

For instance, industry could be stimulated to use less polluting techniques through tax, subsidy and license fee incentives and disincentives. Likewise, the imposition of a "raw materials tax" on resources nearing serious levels of depletion might halt profligate resource use. Wallich warns that the specific diseconomy—whether it be pollution or resource depletion—should be penalized and not the product itself. Thus the choice of what kinds of products are manufactured would be left to market forces; the incentives and disincentives would aim at causing them to be manufactured in less damaging ways.

## NTA in rats

The Environmental Protection Agency and the Surgeon General in effect banned nitrilotriacetate (NTA) as a substitute for phosphates in detergents. Part of the reason was that as a chelating agent (the property that makes it desirable for detergents) NTA was thought to be capable of collecting toxic heavy metal ions and carrying them into the human body in drinking water that had been contaminated with NTA.

Two researchers at the University of North Carolina report in the October 1972 *ARCHIVES OF ENVIRONMENTAL HEALTH* on a study in which they fed rats various levels of NTA in drinking water with and without 200 micrograms of lead per milliliter. Instead of enhancing the pathological effect of lead, NTA resulted in decreased lead in the kidneys of rats not fed lead; in the rats given lead with their NTA there was no significant increase of renal lead over control rats given lead alone.

However, the NTA alone at the level of 1 percent caused pathological reactions in rats. The researchers are Kathryn R. Mahaffey and Robert A. Goyer.

## Effluent use helps wildlife

Pennsylvania State University has been a leader in various proposals for the use of sewage effluents in irrigation. The general purpose is to recycle the nutrients in the effluents into cash crops or into forest areas.

Gene W. Wood, Pennsylvania State wildlife ecologist, now reports that areas treated in the wintertime with chlorinated sewage effluents appear to make a better wildlife habitat than untreated. Wood and his associates have found that rabbits in the irrigated areas are generally in better health than those in nonirrigated areas.

Three factors are involved, says Wood: The effluent improves the nutritive value of forages and grasses, especially for protein, phosphorus, potassium and magnesium. It also creates improved cover through crevices and caves formed beneath mounds of ice formed from the effluent, and the ice causes shrubs and trees to bend to the ground where they are more accessible.

# aerospace

## Testing aircraft from ground controls

NASA's Flight Research Center is working on a new flight technique that will allow a pilot on the ground to fly, maneuver and land a test vehicle. The new method would be used to replace manned flight testing only when there is a high degree of risk to the pilot or craft involved, or where cost prevents full manned testing of aircraft or spacecraft.

The new system, called Remotely Piloted Research Vehicles (RPRV) was tested successfully this month using a modified twin engine Piper Comanche. "The difference between the new technique and autopilot control systems is similar to the difference between driving a car or watching someone else drive it," says Melvin E. Burke of NASA. Autopilot systems are preprogrammed. The RPRV, however, allows the pilot to remain in continuous control all the time, using conventional flight controls and a complete set of flight instruments on the ground. The pilot can perform all precision flight maneuvers, such as wind-up turns, needed to test the craft by using telemetry and television.

The successful landing of the Piper completed the initial stage of development on the system which began a year ago. First planned application of the RPRV test method will be to conduct stall/post-stall tests of the Air Force F-15 fighter next year.

## Colloid thrusters tested

Colloid thrusters operate on the principle of electrostatic propulsion. Small droplets of propellant are electrically charged and then accelerated by a high-voltage electrical field. Two units on a satellite would require only 65 watts of power and weigh only about 90 pounds, but they would carry enough propellant to enable the satellite to stay on station for seven years.

TRW of Redondo Beach, Calif., has just completed a test of one such system for the U.S. Air Force Rocket Propulsion Laboratory at Edwards, Calif. The system operated continuously for more than 1,100 hours. It provided a millionth of a pound of thrust and was the longest firing of such a colloid rocket engine on record. A parallel test of a single thruster module providing one-twelve millipound thrust is still in progress after more than 4,000 hours of operation.

The thrusters are being developed for use on satellites that are required to remain at a particular latitude, such as communications or weather satellites in synchronous orbit. The test completed was equivalent to five months of operation on a 2,000-pound satellite.

## Shuttle manipulator contract

When the space shuttle becomes operational, it will have attached to its cargo bay area a manipulator system that looks like two arms with hands. These will be electrically operated and designed for use by a single operator. The arms will be used to remove space systems, such as weather satellites, from the cargo bay and place them in orbit. The arms can also be used to retrieve satellites from orbit for repair. This capability figures heavily in the shuttle cost-saving scheme.

Martin Marietta Corp., Denver Division, received a \$226,256 contract from NASA for a research and development study of the manipulator system. The study will be concluded in January.