ground crew can extend the border line back to the
sending point by conventional surveying techniques.

After NASA developed the laser pole, a joint
NASA-Department of Agriculture contract was award-
ed RCA Corp., Burlington, Mass., to produce an
operational version. The Forest Service now has
several in use. So does the Department of the
Interior's Bureau of Land Management for surveying
large areas such as those in Alaska.

**Educational Packages**

An environmental spinoff for educational purposes
broadens the availability of remote sensing imagery.

Through manned space missions, Landsat, and in
aerial remote sensing programs, NASA is acquiring

Educational packages developed by NASA's industrial
application center at the University of New Mexico provide
instruction on remote sensing and its value in environmental
disciplines. Now commercially available, the packages
combine aerospace imagery with instructional narration.
Sample subject: how satellite imagery can aid in crop
management.

thousands of photographs of Earth which, properly
packaged, can be useful in a variety of ways. In 1974,
the NASA Industrial Applications Center at the Uni-
versity of New Mexico in Albuquerque, undertook
the production of educational packages, which com-
bine these photos with instructional narration. A
sample: *Food Watch by Satellite*, a tape-slide presen-
tation on the potential of satellite systems for crop
management, includes 51 slides, a cassette recording
of the narration, a printed copy of the text, and a
bibliography of agricultural remote sensing litera-
ture. Produced in conjunction with the Audio-Visual
Institute, also of Albuquerque, the package now sells
for $90.

'Threadboard' Facility

Environmental control of automobile emissions is
enhanced by new electronic systems devised during
the Apollo program by a NASA contractor. Many
interesting technology transfers involve not merely a
specific product, but rather a whole facility, its equip-
ment, and the experience of the people who operate
it. Chrysler Corp.'s Huntsville Ala. facility provides a
good example. Once a key test and development
center for the space program, the Electronics division
there is now engaged in similar but non-NASA work
for the parent company.
In the sixties, Chrysler was NASA's prime contractor for the Saturn I and IB test launch vehicles. The company installed and operated at Huntsville what was known as the Saturn I/IB Development Breadboard Facility. "Breadboard," means an array of electrical and electronic equipment for performing a variety of development and test functions. This work gave Chrysler a broad capability in computerized testing to assure quality control in development of solid-state electronic systems.

Today that division is manufacturing many products not destined for NASA, most of them being associated with the company's automotive line. A major project is production and quality-control testing of the "lean-burn" engine, one that has a built-in computer to control emission timing, and allow the engine to run on a leaner mixture of fuel and air.

Other environment-related products include vehicle emission analyzers. The newest of the line is an accurate, portable solid state instrument for testing auto exhaust gases. The exhaust analyzers, now being produced for company dealers and for service
stations, are expected to find broad application in state and municipal auto inspection programs.

Similar technology is employed in production of other exhaust analyzers, including systems to check out new engines in laboratory tests and units for testing new car emissions to assure that they meet Environmental Protection Agency standards. The Automated System for Emission Testing (ASET) can coordinate as many as seven vehicle exhaust analyzers at one time. The Automotive Pre-Check Corp. of Los Angeles uses ASET to test about 3,000 new cars each year, to comply with California air pollution laws which require that a two-percent sample of all new cars sold in the state be exhaust-analyzed.

This Jacksonville, Florida, apartment complex has a wastewater treatment system which clears the water, removes harmful microorganisms and reduces solid residue to ash. It is a spinoff from spacecraft waste management and environmental control technology.

Packaged Waste Treatment

As NASA contractor on the biosatellite program several years ago, General Electric Co. acquired experience in waste management and associated spacecraft environmental technology. The company has spun off this experience into packaged waste treatment systems for both sea and land applications.

GE’s initial effort was a “shipboard waste treatment system,” which used physical and chemical processes to clear wastewater, settle the solid matter, and remove harmful microorganisms. The solid residue is reduced to a small amount of ash by the system. GE built and installed these sludge incinerator systems on an Army dredge, a Navy destroyer escort and three Great Lakes steel ore carriers.

Shortly thereafter, passage of the 1972 Clean Water Act prohibited ships from dumping treated or untreated wastewater. Thus, demand turned from shipboard treatment systems to shipboard holding tanks and shore-based treatment systems.

Using the same technology, GE then built and tested a trial land-based system. This experiment evolved into an advanced 50,000-gallon-a-day “packaged waste treatment system,” installed in Jacksonville, Fla. by Demetree Builders of that city. The system now serves about 600 units in the Villa del Rio and Ortega Arms apartment complexes.