

# EES Report

ENGINEERING EXPERIMENT STATION • GEORGIA TECH

## EES helping poultry industry in Georgia

Market forces, government regulations and inflation spawned serious problems for Georgia's poultry industry in the early seventies. Businesses sought to improve productivity but often lacked the capital to risk development of promising but untested new technologies. This dilemma was the impetus for a highly successful and continuing partnership between the Georgia Poultry Federation and EES. Largely through the Federation's efforts, the Georgia General Assembly was convinced that the state needed an engineering research program to address the poultry industry's needs. Beginning in 1973, the Legislature has provided the Station with a yearly contract to provide this service. Funding is currently at \$400,000 for the 1982 fiscal year with another \$280,000 in Federal and industrial support coming in the form of matching contracts. EES is conducting diversified research in the areas of energy conservation, alternate energy technologies, noise control, wastewater treatment and computer applications.

"We've assumed much of the risk for the processors and growers in dealing with new technologies," says program director Richard S. Combes of EES' Technology Applications Laboratory. "We've tested new technologies and sorted out the good from the bad. Many growers and processors have streamlined their operations and the industry has become more sophisticated than most people realize."

In working for the poultry industry, EES' typical approach has been to collaborate with poultry producers or processing plants to evaluate, design and construct demonstration projects



**THESE SOLAR** collector panels were installed on the roof of a poultry growout house in Georgia to demonstrate the possible use of the sun's energy as a heat source. This project was part of EES' continuing effort to improve productivity in the Georgia poultry industry. The Station's activities in this program include energy conservation, alternate energy technologies, noise control, wastewater treatment and computer applications.

with state funding. In the field of energy alone, the Station has:

- Demonstrated heating systems fueled with wood furnaces and solar collectors for Georgia broiler houses. The two solar houses are in Cumming and Villa Rica while the wood furnace is used on a Carrollton farm.

- Identified opportunities to conserve energy for poultry farms, broiler processing plants, egg processing plants, hatcheries, feed mills and

rendering plants. Several plants working with EES have reduced their annual energy consumption by 25 to 30 percent.

- Designed and installed heat recovery systems in broiler processing plants, a poultry hatchery and an egg processing plant. In all cases, the capital investment in heat recovery was shown to have a payback period of less than three years.

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# Station doing R&D for poultry firms

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- Designed, constructed and successfully operated a 10,000 gallon anaerobic digester system on a commercial egg farm in Cumming, Georgia. The system converted raw poultry manure into a biogas which can be substituted for natural gas. A solid by-product of this process can be used as a fertilizer or cattle feed supplement.

In the field of environmental research, EES has:

- Worked jointly with the Georgia Department of Agriculture and NASA

to characterize the noise sources in two Georgia processing plants and devise a system of acoustical panels to reduce this noise to acceptable levels.

- Provided technical assistance to poultry and egg processors for pretreatment of wastewater generated by processing plants before it is discharged into municipal sewer systems. Success in this area would allow processors to eliminate surcharges which municipalities frequently assess for handling their wastes.

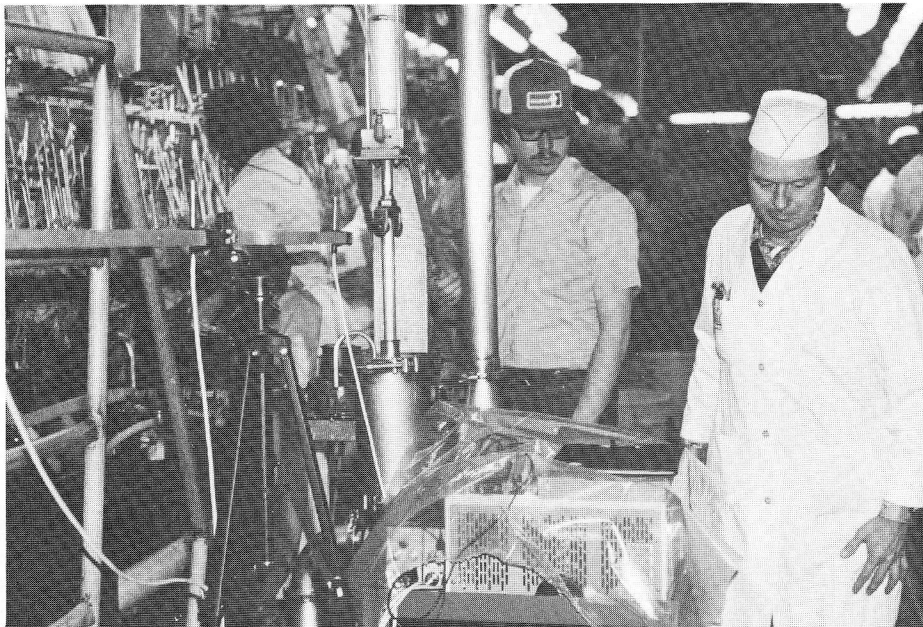
The Station also has given extensive attention to developing electronic

systems which improve productivity on the farm and in the processing plant. Through one project, EES engineers developed a computer-based system so that broiler processing plants can monitor yields during the operations which remove inedible portions of poultry carcasses. This system gives plant supervisors a way to measure the efficiency of manual and automatic operations. It provides potentially significant monetary savings for the processor through more accurate control of poultry carcass weight losses.

The Station is continuing to expand its research in energy, environmental problems and productivity. New work will begin in the current fiscal year aimed at broadening the use of computer technologies in the poultry industry.

"We're hoping to adapt minicomputers to farm business needs," explains Combes. "Small businesses are already moving in this direction and we hope to define the information needs of poultry producers. It should be possible one day to develop a computer system which links up growout houses, processing plants and other informational resources. A communications system with these capabilities would help the industry function more efficiently, as a whole."

Poultry will continue to be one of EES' principal agricultural interests, but the engineering research program is starting to diversify into other areas. The main new thrust is a four-year project aimed at bringing a North Georgia dairy farm near energy self sufficiency. The Station will apply various alternate energy resource forms such as alcohol production from crop residue, methane generation from manure, wood usage and energy conservation. The project is co-sponsored by the U.S. Department of Energy.



**THE STATION'S work for poultry processing companies has resulted in lower energy consumption, noise control devices, more effective pretreatment of wastewater and a computer-based system for monitoring product weight loss during processing.**

## Wiltse co-edits millimeter waves text

An EES researcher has co-edited a new book on millimeter systems. Dr. James C. Wiltse, associate director of the Station, shared chief editorial responsibility with Dr. Kenneth J. Button of the Massachusetts Institute of Technology for Volume 4 of "Infrared and Millimeter Waves." Volume 4, entitled "Millimeter Systems," was recently published by Academic Press. In it, a variety of researchers discuss recent progress toward commercialization of the millimeter wave range of the spectrum.

Wiltse authored the book's introduction and overview of millimeter waves. Two other Georgia Tech radar

specialists wrote the second chapter on "Millimeter Radar." They are Dr. Edward K. Reedy, director of EES' Radar and Instrumentation Laboratory, and Dr. George W. Ewell III, a principal research engineer in the Station's Systems and Techniques Lab.

EES is internationally recognized for its millimeter wave radar programs. The Station is working in the vanguard of this country's efforts to develop this band of the spectrum for military purposes. EES engineers are also finding innovative uses for millimeter waves in weather detection and satellite communications.

### EES REPORT

Mark Hodges — Editor

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**MORE REALISTIC** military field exercises will be possible if the Army develops this launcher built by EES. The device fires man-safe projectiles which simulate on a reduced scale the explosiveness, smoke and noise of artillery shellbursts.

## EES develops war games technology

The Army soon may conduct its war games more realistically, thanks to an EES-developed device called a "cue", which simulates the non-destructive effects of indirect mortar and artillery fire. The invention mimics on a reduced scale the smoke, noise and explosive signature of shells on impact. The Army would use the device primarily to cue soldiers to incoming rounds during military field exercises. It ultimately could allow artillery gunners and forward observers to participate fully in war games in which the use of live ammunition is unacceptable.

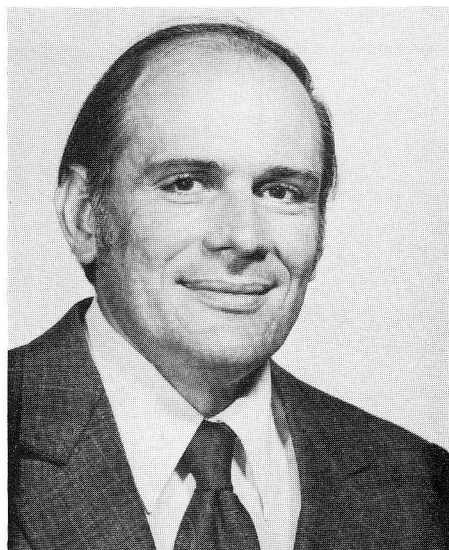
The cues are foot-long projectiles which weigh under three ounces each. They have rounded, rubberized nosecones and styrofoam tail sections. A small pneumatic cannon with a range of up to 230 yards launches the projectiles. In maneuvers, this cannon would sit much closer to the battlefield than actual artillery guns. A computer would link the guns and the cannon so both could operate in coordinated fashion. Artillery gunners would aim at targets several miles away and fire off blank rounds. Then the computer would cause the pneumatic cannon to deliver a harmless cue to the same spot and at the same time the real round would hit.

On impact, the cue carries the force of a served tennis ball. For this reason, it could hit soldiers without hurting them. The cue explodes with a harmless flash/bang effect and releases a small cloud of smoke. The smoke is nothing but chalk dust. A blank shotgun shell and four camera flashcubes produce the flash/bang combination.

With Army sponsorship, EES' Radar

and Instrumentation Laboratory has built and demonstrated the feasibility of a manually-operated version of the cueing device. The lab now is seeking a new contract from the Army to continue this research effort. Station engineers hope to design and build a computer-controlled prototype with a breech-loading launcher. It would have multiple-cue magazines and an extended launcher range.

## Zimmer chairing cybernetics conference



**ROBERT P. ZIMMER**

Robert P. Zimmer, director of EES' Systems Engineering Laboratory (SEL), will be chairman of the IEEE's 1981 International Conference on Cybernetics and Society. The conference is sponsored by the IEEE Systems, Man and Cybernetics Society and will run from October 25 to 28 at the Sheraton-Atlanta Hotel in Atlanta.

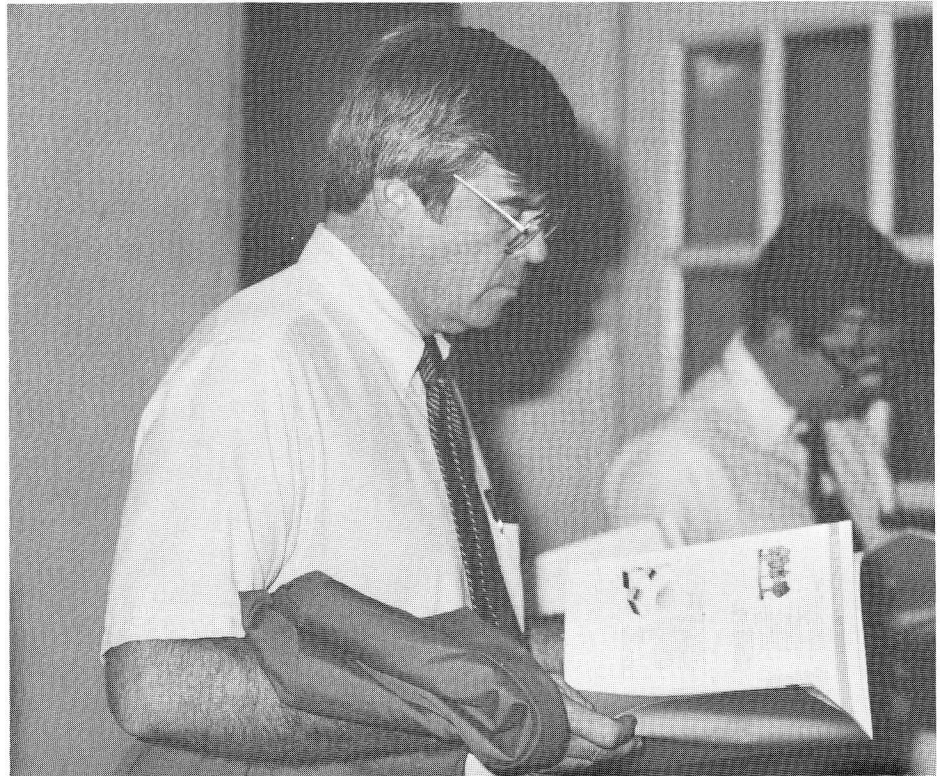
More than 200 professional papers will be presented at the conference, and participants will come from a wide range of disciplines, including engineering, computer science and psychology. Further information on the technical program is available from Dr. Joanne Green, Georgia Tech, EES/SEL, Atlanta, Ga. (Telephone: 404/894-3491).

# Radar application could improve safety in mines

A radar system developed at EES may help to protect American miners from black lung disease. Researchers in the Station's Electromagnetics Laboratory have worked jointly with NASA to build a prototype radar sensor designed to make remote control of some coal mining operations possible. The aim of this research effort is to remove miners from mine shafts where the density of coal dust is heavy and to do it without impairing the efficiency of coal mining operations. In fact, the sensing device would probably enhance productivity, since mining companies must now stop excavating when the level of coal dust in shafts rises too high.

If used commercially, these radar sensing devices would be installed on mechanical shearers which remove sections of coal in mine shafts and transport them out of mines on conveyor belts. At present, human operators must walk alongside these shearers to position the digger for proper cuts. The Tech-NASA radar unit would electronically measure the distance between the cutter and the ceiling of the shaft, making it possible for an operator to control this equipment at a remote location hundreds of yards from the excavation site.

EES has built four prototypes, using radar technology developed by NASA at its Marshall Space Center in Hunts-



**THE CHAIRMAN** of the Georgia House of Representatives' University System Committee, Rep. Thomas B. Buck III, D-Muscogee, studies literature on the Advanced Technology Development Center during a recent tour of EES. Buck accompanied members of the committee's Subcommittee on Marine Research, Oceanography and Experiment Stations during a visit to the Station in September. Buck called the ATDC and other EES research the subcommittee was briefed on "very impressive."

ville, Alabama. Station engineers developed the radar unit's antenna and a special lens which focuses the radar beam on targets several feet from the apparatus. EES packaged the radar, antenna and lens into an explosion-proof box.

No decision has been made yet to release the radar sensing device for commercial development. However, tests undertaken recently at the Marshall Space Center were promising

enough that EES has received a contract to build five new prototypes with modification for improved performance. NASA is the agency in charge of the coal mining radar program and is using funds made available by the Department of Energy. The Station is working as a sub-contractor in the program through Foster-Miller Associates, a Massachusetts engineering firm which is handling mining tests of the radar for NASA.

## **EES Report ENGINEERING EXPERIMENT STATION**

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