

# agricultural automation

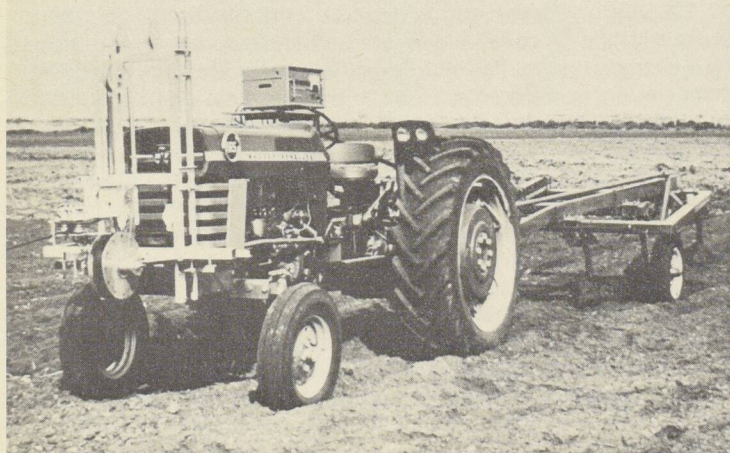
In another aspect of automatic tractor guidance, a system is being developed whereby the tractor automatically follows a guidance furrow made on the previous pass. This system serves as a form of "auto-pilot" eliminating the need for the operator to make continual steering corrections.

The combine is a versatile harvesting machine that can cut a standing crop or pick up a swathed crop and then thresh and clean the grain as it moves over a field. The rate at which the crop feeds through the combine is one of the most significant factors affecting grain losses. Losses increase exponentially with feed rate and often may exceed 20 percent. As crop conditions vary in a given field, the combine's forward speed requires continuous adjustment to minimize these losses. The Division of Control Engineering has used sensors on the combine pick-up to detect the amount of swath entering the combine. These sensors give anticipatory signals which permit alteration of the forward ground speed of the combine sooner than with other methods.

During harvesting operations, grain is cut with a combine or by a windrower prior to combining. Whichever method is used, the grain is cut by a cutter-bar, the height of which is controlled by the operator. It is important for the operator to adjust the cutter-bar for the proper height-of-cut, since crop height may vary considerably throughout each field and an improper cut increases grain losses. The University of Saskatchewan engineers have developed a system which automatically adjusts the cutter-bar height in accordance with the crop height. Sensors are used to determine the length of the cut material. The system soon will be ready for commercial development.

Tillage involves loosening and stirring the soil and is done at some stage in the production of almost every agricultural crop. Machines for tilling and seeding must be operated at the correct depth. Tilling too deeply results in unnecessary use of power and loss of soil moisture. Tilling not deeply enough permits less effective control of weeds. Improper seeding can result in uneven germination and growth: seeds planted at too shallow a depth may not receive enough moisture to germinate; seeds planted too deeply may germinate but may not have sufficient

Slave tractor showing instrument control box and mounting assembly and drum for the variable-length cable. • Tracteur asservi, avec sa boîte de télécommande, le système d'attelage et le tambour permettant de régler la longueur du câble de liaison.



strength to reach the soil surface or may rot in cold moist soil before germination can occur.

A feasibility study, including field testing, on a fluidic system for controlling tillage depth has been completed at the University of Saskatchewan. This simple yet automatic system ensures that seeding and tilling equipment operates at a uniform depth regardless of soil conditions.

The development of various measuring instruments is also an important part of the University's agricultural program. A device for measuring the draft (pull) of a tractor on an attached implement, to determine horsepower requirements, has been developed as well as a meter to indicate continuously the amount of slip of tractor tires. A grain moisture meter within the price range of the average farmer also has been proposed.

Studies also are concerned with operator comfort and safety. The objective of this part of the program is to reduce fatigue caused by noise, vibration, dust, and temperature variations, and to remove hazards caused by inadequate design. In this area, one project is concerned with reducing tractor seat vibration, a frequent cause of back ailments.

Front view of slave tractor with cable extending forward. • Vue de face du tracteur asservi montrant le câble de liaison en extension.

