13 Positioning Technology (GPS)

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The global positioning system (GPS) was designed primarily as a military navigation system intended to provide 24-h, all weather, real-time positioning to within tens of meters worldwide. With the launch of the first test satellites in the late 1970s, engineers began to develop alternative means of using the satellite signals to allow a wide variety of positioning techniques. This chapter will describe the basic properties of the system and explain the principle ways in which it is used, particularly in the context of agriculture.

GLOBAL POSITIONING SYSTEM

Satellites

The current GPS constellation consists of 17 satellites (5 block I and 12 block II) in five orbital planes at an altitude of 20,000 km with 12-h orbits. The five block I satellites are the remains of the experimental constellation established in the early 1980s to test the concepts of the system and new hardware configurations. The block II satellites are the production models which will continue to be launched for the next few years. Block III satellites are in the design and construction phase and will eventually replace the Block II satellites.

The full constellation of 24 satellites, with 20 operational and three spares is planned to be fully operational in 1993. This constellation will provide 24-h coverage of 5 to 10 visible satellites worldwide.

The former USSR has implemented a navigation system call GLONASS which is very similar to the GPS. GLONASS consists of 24 satellites (21 operational and three spares) in three orbital planes at an altitude of 19,100 km with an 11.25-h orbit. At least one manufacturer is currently developing a receiver which will use both GPS and GLONASS signals (Danaher and Gerlach, 1991).