

## PART II - THE TECHNICAL CHARACTERISTICS OF THE MEANS OF SURVEILLANCE

### *Capabilities and Limitations of Surveillance*

Surveillance has always been a key factor in military operations. In ancient times it was limited to what could be seen with the human eye, perhaps from the top of a hill or the mast of a ship. More recently it became possible to enhance optical observation by field glasses or telescopes, and then by photography, and to elevate the observer (or camera) in a balloon. But these improvements could not overcome obscuration by darkness, fog, or rain.

The major technological advances that have improved the capabilities for surveillance during the present century are the ability to raise the observer (or other sensor) to even greater height (at first by aircraft, and later a space vehicle), and the use of radar, which works as well by night as by day, is able to penetrate fog and clouds, and to measure the distance to the objects being detected. Visual surveillance has been extended and improved in many ways, including sensitive camera film, detection in the infrared band, and use of electro-optical techniques (such as low-light-level television) to enhance sensitivity and to transmit images by wire or radio. Acoustic techniques have proven very successful for detecting the underwater noises of submarines, although much less useful with sound transmitted through the air.

While these new techniques have revolutionized the capabilities for surveillance, they each have their limitations, and a brief description of these limitations now follows.

#### **Line of Sight**

Visible light, and other forms of electro-magnetic energy useful for surveillance purposes, can be absorbed and scattered by clouds, rain, dust, or fog. But if the radiation escapes these diversions it is propagated through air or empty space in very nearly straight