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# Electronic Cameras" with Instantaneous G Now Make Real-time, Precision Tactical Targeting Operationally-Feasible

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SUCH MINUTE DETAILS of enemy activity and troop dispositions can now be photographed by airborne or spaceborne high-resolution "electronic cameras" from long stand-off distances and relayed *instantaneously* to small ground read-out stations that a NATO commander could literally tell—and *show*—the White House when the front road wheels of a tank leading a Russian attack into Western Europe have crossed the East-West German border.

The first such photo ever made public is shown here.

It was taken three years ago by a system similar to the new Itek miniature electro-optical imaging system shown on the right, which weighs only 26 lbs. (and which could be reduced in the near future using the latest manufacturing technology). Itek produces such electronic cameras in versions weighing up to 1,600 lbs.

The film strip on this page was taken from a 12-mile slant range over the center of Los Angeles and covers an area about three miles wide by 22 miles. There is a power station toward the lower right; in the original film from which this half-tone was printed, the number of wires or power lines emanating from it are clearly visible without further magnification, as are the condensers on those lines. (Some of that detail inevitably is lost in even the most precise commercial printing process available, which *AFJ* uses.) Toward the upper left is a football stadium and sports field on which one can count the number of people playing soccer, again with the naked eye or a small magnifying glass. Elsewhere throughout the photo, one can distinguish between Volkswagen sedans and Ford coupes, whether parked in a driveway or moving along a freeway at 55 miles per hour.

The photo printed here appeared at a ground read-out station about 100 miles away from the sensor platform within thousandths of a second after being taken.

angles—thus, almost 12 hours a day in average climes, compared with the four hours a day (roughly 10 a.m. until 2 p.m.) in which conventional cameras provide their high-resolution imagery.

Photos like this can now be relayed instantaneously to mobile ground processing and control stations with no degradation in resolution (or quality of the imagery). In fact, mobile ground processing stations small enough to fit in a medium size van can instantaneously "enhance" the digital imagery using many different algorithms to provide even *greater* detail than what is apparent here—making the photos brighter, lighter, or darker; sharpening the contrast so that edges show up better; and filtering out smoke, haze, or smog.

An operator in the same station can zoom the camera in for a closer look at any particular area; focus the camera more precisely; and cause it to roam over other target areas. He can "freeze" portions of the image and project individual frames on separate displays for closer scrutiny; enlarge them from two to 15 times (with no degradation in resolution up to about 10 times magnification); and obtain an immediate hard-copy, film print-out of equal clarity. Using even a commercial telephone line, he can instantaneously transmit the imagery to distant, mobile read-out stations (or more sophisticated processing centers), again without compromise to the image's resolution. (One version of a mobile, ground processing station is shown on page 72.)

experiments in Europe to find efficient ways to incorporate such information in its targeting process. In one such field experiment, the BDM Corporation is using off-the-shelf equipment to bring the chip revolution into division and corps operation centers without waiting 15 years.

The imagery is transmitted and processed in digital form, and stored on magnetic tape for post-flight analysis and comparison with earlier or subsequent imagery, or for correlation with data from other sensors.

The imagery shown here is comparable to that produced by a prototype of Itek's model 2KL "mini-EOIS"—miniaturized electro-optical imaging system. The 2KL was designed for extended border surveillance and real time tactical battle management, and can be mounted in a small aircraft such as the OV-10 Bronco used by USAF forward air controllers in Europe.

Quality of the tactical imagery varies, of course, but does not degrade significantly, as a function of distance or slant range, viewing angle, or light and visibility conditions.

The unique two-dimensional arrangement device