



Restoration Process

In the accompanying photos, a laboratory technician is restoring the once-obiterated serial number of a revolver. The four-photo sequence shows the gradual progression from total invisibility to clear readability. The technician is using a new process developed in an applications engineering project conducted by NASA's Lewis Research Center in conjunction with Chicago State University.



Serial numbers and other markings are frequently eliminated from metal objects to prevent tracing ownership of guns, motor vehicles, bicycles, cameras, appliances and jewelry. To restore obliterated numbers, crime laboratory investigators most often employ a chemical etching technique. It is effective, but it may cause metal corrosion and it requires extensive preparatory grinding and polishing. The NASA-Chicago State process is advantageous because it can be applied without variation to any kind of metal, it needs no preparatory work and number recovery can be accomplished without corrosive chemicals; the liquid used is water.



The basis of the new process is a phenomenon called "cavitation," which occurs when a liquid is subjected to rapid vibration. Cavitation is the formation of tiny vapor bubbles in the liquid—something like boiling effect, except that vibration rather than heat causes the bubbling. Because the vapor bubbles contain high energy, they etch, or pit, the surface of the metal they strike. In vibrating flight vehicles, cavitation is a major headache—it leads to deterioration of tubes and tanks carrying liquids. But long experience in dealing with the problem enabled NASA-Lewis researchers to effect a turnaround whereby the troublesome phenomenon could be applied beneficially.

In the NASA-Chicago State process, the metal object is immersed in water and a probe is positioned immediately above it. Ultrasonic energy is applied, causing the probe to vibrate rapidly and induce cavitation. The resulting vapor bubbles impact the metal surface and pit it. Pitting around the area where the serial number was stamped gradually restores the number.

With support from the Cleveland (Ohio) Police Department and the Na-

tional Auto Theft Bureau, Lewis Research Center conducted successful feasibility demonstrations. NASA then enlisted Chicago State University for the task of improving the technique. Last year NASA and Chicago State produced a handbook detailing the new technique and comparing it with other restoration methods. The handbook generated wide favorable response and won the endorsement of a number of civil and military law enforcement agencies.