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Germ-Gas Electronic Detectors

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Civil Defense has no warning system against attack by chemical or biological agents. Soviets say they will use these in any full-scale war

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THE COLD FRONT that brought snow to Montana and chills to most of the eastern U. S. last month could have put millions of Americans to bed with influenza or killed them with pneumonia.

Accomplishing this would have been easy.

One or two aircraft could have seeded with pathogenic organisms the warm air that precedes the cold front. This could have been done far up in the Arctic.

Nerve gas that kills in minutes is not as easy to deliver. The source must be closer to the victims. Nevertheless, it too is a threat.

Soviet leaders have stated publicly that in the next war they will use thermonuclear, chemical and biological weapons. Russian writer Raymond Garthoff says in his book *Soviet Strategy in the Nuclear Age:* "Such weapons can be released from subocean containers in the Pacific to 'ride' the prevailing winds covering the U. S."

The National Security Council has recommended that CBR (Chemical-Biological-Radiological Warfare be restricted to use only in retaliation. Some groups want this decision reversed and CBR elevated to [illegible] ship in the [illegible] family of combat weapons.

What Chemical Warfare Means

The U.S. and the Soviets both possess psychochemicals that can convert agressive extroverts into cowering, useless neurotics. Other chemicals might cause defenders of a city to welcome the enemy with ludicrous hospitality or incapacitating fits of giggles.

These chemicals—derivatives of lysergic acid—attack nerve centers.

Both sides have lethal nerve gases—organic phosphorus fluorine compounds—producible in up to 20 combinations. Acting as an anticholinesterase, one nerve gas attacks the nerves around the heart, constricting and stopping it in a matter of four minutes.

Pellets of radioactive material can be released above the clouds to float down to an unsuspecting population below. This approach is unlikely, however, due to cost.

Chemical and biological agents can be delivered in many ways. A low-flying Snark-type missile could dump almost any of the agents over an airfield, town or cornfield ready for harvest.

Saboteurs could do the job with a thermos bottle emptied into a city's water supply, germs dusted into the ventilation system of an office building, or a few trucks armed with gas dispensers surrounding a Strategic Air Command base or a Bomarc air defense site.

Investigations by Army Chemical Corps and by university researchers have established that reproductive rates of microorganisms can be influenced by r-f energy. In the microwave spectrum, this effect can be negative; in the h-f spectrum, it is not only positive but highly frequency-specific. X-band energy, for example, inhibits yeast reproduction, but h-f energy in the 1-to-20-meter band stimulates growth of many microorganisms.

The reaction apparently is not a function of heat, but seems to be due to electrical fields acting on the microorganism.

Researchers have proved that ultrasonic energy also effects reproductive rates of microorganisms. This effect too seems to be frequency specific.

Short-wave r-f and ultrasonic energy also change the reaction times of many enzy[illegible] r-f energy can denaturate prote[illegible]

Electronics Vital for Detection

At present the Chemical Corps has prototypes of warning devices for biological warfare and chemical warfare agents. Civil Defense has no warning devices for either.

The BW warning system consists of three components: an air sampling device developed by the Chemical Corps and the Armour Research Foundation called the aerosolscope; a particichrome analyzer; and an automatic colony counter and microculture counter, developed by

Field tests of chemical, biological and radiological warfare agents require elaborate electronic instrumentation

Needed

DuMont. The entire complex fills a large room. The Corps would like a transportable trailer system.

The aerosoloscope electronically measures and counts airborne particles—including radioactive fallout—ranging in size from one micron to 64 microns at the rate of 100 per second. Here's how it works:

The dust particles seen in a shaft of light are only reflections of the particles themselves. The reflection caused by the light is detected by a multiplier phototube that determines the size of each particle. Electrical impulses are amplified and transmitted to 12 dials. The first dial records the number of particles one to 1.4 microns in diameter. Each succeeding dial records slightly larger particles.

The next step is to identify whether the particles are dust, pollen or germs. The output of the aerosoloscope is fed into the partichrome analyzer. The particles are stained with a blue dye. When viewed under ultraviolet light, BW germs fluoresce blue while dust and pollen fluoresce green. A tv camera using sensitive color filters automatically counts the blue and green particles. A sudden increase in blue particles reveals the presence of a large concentration of germs.

Particles are fed into an automatic colony counter for electronic counting in one second.

The counter uses rectangular plastic strips, each perforated with 994 holes. The strip is photographed and the film examined by a tv scanner which counts the number of holes containing bacteria.

Probe 10-Micron Area

For long-range detection of chemical agents, the Corps is looking for efficient and sensitive infrared detectors that will operate in the 10-micron area. Eastman Kodak is studying use of zinc gold-doped germanium phototransistors.

Prototype of a ½-mi to 5-mi-range infrared device has been developed by the Corps and Farrand Optical Co. for use by troops in the field. Called LOPAIR (for long-path infrared), the equipment [illegible] on the 10 [illegible] wire a tiny amount of contaminant in the air crosses an i-r beam, a warning light flashes and a horn sounds. Contaminants are detected even if they are colorless and invisible to the naked eye, as nerve gas is.

The system can detect and measure almost any substance by its i-r spectrum. Once the alarm has been set to detect one specific substance, however, it will normally not be set off by other materials present.

The equipment will not sound the alarm if a person, animal or vehicle breaks the i-r beam.

The present system uses mirrors to set up a beam pattern.

The Army would like to circumvent using the mirrors. The setup requires precision and, in a tactical area, might be dangerous. With a more sensitive i-r detector, radiation could be reflected by natural objects, such as large rocks. An even more sensitive detector could receive natural i-r radiation emitted by the rock itself.

Developing Dosimeter

The Corps is [illegible] small-load cell warfare [illegible] and develop [illegible] a radiac gamma neutron dosimeter for use in field operations.

Research center for both CW and RW is the Chemical Warfare Laboratories, Army Chemical Center, near Edgewood, Md.

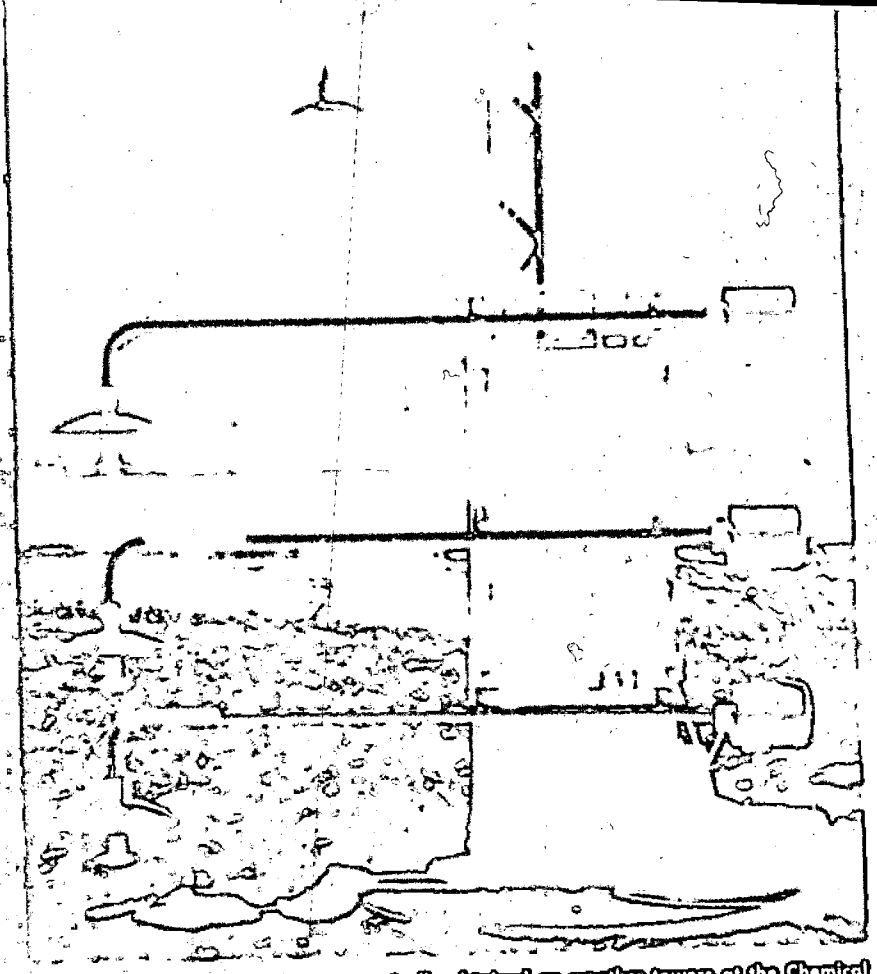
Main test work for BW, CW and RW is carried out at the U.S. Army Chemical Corps Proving Ground, Dugway, Utah. The proving ground includes meteorological towers, CW and BW samplers arranged in a grid pattern, telemetry network and central control center.

The weather towers continuously record temperature, barometric pressure, humidity and wind data. This information is telemetered to the control center every hour.

Samplers are glass bottles with small battery-run motors for taking in air and sealing the bottle; they are controlled remotely by radio.

The control center directs all sites by a master radio transmitter. Telemetered data from the weather towers and test sites are automatically translated to punched cards and fed into a computer.

A radioactive test facility is under [illegible] at Dugway which will use a radio-controlled rail system for sending instruments into contaminated areas.



Precise meteorological data is automatically obtained on weather towers at the Chemical Corps Proving Ground and telemetered back to the master control center for analysis