

A casual gas dump

The Army's plan to dispose of nerve gas bombs didn't include consulting the oceanographers

If the U.S. Government considered the oceans to be as inviolable as it does the moon, the Army might never have considered dumping thousands of tons of poison gas off the coast of New Jersey (SN: 5/24, p. 499) without understanding more than it did at the time about the consequences.

But the Army has been using the Atlantic as a munitions disposal ground for decades. In the last 25 years there have been at least 12 editions of Operation CHASE—Cut Holes and Sink 'Em—and charts of the Eastern continental shelf are dotted with areas labeled "Explosives dumping area."

The Army has identified the areas in which explosives have been dumped. But of the dozen CHASE dumps so far, three have been of poison gas. Those locations are at the same site proposed for disposing the current poison gas surplus: 150 miles east of Atlantic City.

Not only did the Army, according to a wide range of oceanographers and chemists close to the situation, give insufficient consideration to the many unknowns involved in the disposal of vast quantities of nerve and mustard gas on the continental shelf; it now appears that the Army did not even solicit scientific opinions on the procedure's safety until after exposure of Operation CHASE 13, by Rep. Richard D. McCarthy (D-N.Y.), early in May.

In the May 13 hearings before a House Foreign Affairs subcommittee, the Army testified that a thorough safety evaluation of ocean burial for mustard and nerve gas had been made well in advance of initiating the project. But according to the scientists consulted, a large part, if not all, of the Army testimony which minimized the potentially hazardous effects upon the ocean was actually based on a scientific review held just four days prior to the Army's appearance before the subcommittee, and after the Army had been summoned to justify its plan.

Dr. Bostwick Ketchum of the National Science Foundation was one of the scientists consulted by the military on May 9. Commenting on the level of Army's knowledge of such technical

questions as pressure effects, speed of descent, diffusion and chemical decay rates and the effect of bottom currents, Dr. Ketchum expresses amazement that so little was known.

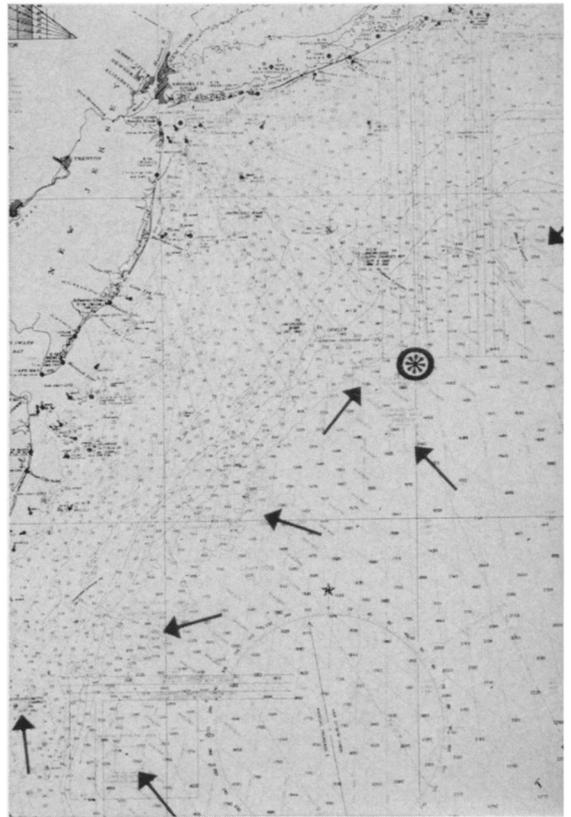
There were gaps "even in the most obvious areas, such as the terminal velocity of those ships when they hit the bottom, let alone what the impact effect would be on the gas containers and explosive charges," he says. Scientists calculate, says Dr. Ketchum, that the U.S. submarine Thresher impacted at about 10 to 20 knots (possibly more than 20 mph) when it went down in 1963.

Although at the hearing the Army came up with a detailed technical description of the events to be expected once the gas was on its way to the bottom, and its reaction thereafter, Dr. Ketchum says that four days earlier, the Army did not have that data. And even though the scientists consulted on May 9 were unable to produce a clear picture of the events that would take place, and even if some confusion was created by conflicting opinions after the interviews, "the Army had more to go on than it started with."

Another scientist whose calculations were cited as part of the Army's initial considerations, but who denies having been contacted by the military until after the time of the Congressional summons, is Dr. Akiro Okubo of Johns Hopkins University. Dr. Okubo assisted in computing the rate at which the different types of gas would decay and move away from the immediate vicinity of its location on the ocean floor.

The question he was grappling with is vital in determining what threat might be posed to areas of the ocean remote from the dump, such as the shallow waters of the coast and continental shelf where contamination would endanger coastal inhabitants, mariners and some of the most important fishing grounds in the world. It was his computations on which the Army based much of its May 13 testimony.

However, while Dr. Okubo believes



Munition (arrows) and gas (*) dumps.

that his calculations are reasonably accurate theoretically, he cautions that his results "can only be expected to apply to the average, not the particular situation." Remarking on the unpredictability of the ocean depths, Dr. Okubo refers to an experiment he conducted with fluorescent dye in the deep bottom currents.

"I could follow the dye, for maybe a couple of days, measuring its progress at about 10 centimeters per day, and then one day, the dye would vanish," he says. He does not know what causes the sudden transport of the dye away from his sensing devices.

Dr. Okubo says that if the computations accepted by the Army are off by as much as 10 percent, it could "result in appreciable surface contamination" either by unhydrolyzed gas, or a sufficient concentration of decay products to harm marine life.

Among other scientists, opinions range from firm reservations about CHASE 13 to a very strong, explicit opposition.

Dr. Leslie Glasgow, Assistant Secretary for Fish and Wildlife, Parks and Marine Resources of the Department of Interior, says that while there may not be much current on the ocean bottom, there is no way to estimate the likelihood of such underwater phenomena as turbulence and chemical reactions, under the extreme conditions of the ocean bottom, moving contaminants into areas that would threaten im-

portant physical and biological systems. U.S. Navy Capt. T. K. Treadwell, commanding officer of the Naval Oceanographic Office, says of Operation CHASE, "The results could be truly catastrophic." He says the effects could be felt in almost any area along the Eastern coast.

One misconception that must be corrected about the capacity of the northwest Atlantic to continue to absorb the waste of the Eastern U.S., he points out, is the idea that the entire northern part of the ocean is just one big continuous mixing system. Treadwell describes the northwestern Atlantic as a semi-closed circulation system which rotates clockwise between the U.S. land mass and an area approximately in mid-ocean. He says this cyclonic movement of water may be more significant than has been supposed, extending down to the deeper currents, and causing a concentration of contaminants rather than an ocean-wide dispersal.

The Navy has oceanographic data from recent studies of deep currents in the vicinity of the proposed disposal which indicate the presence of underwater turbidity sufficient to transport materials across the ocean floor and even upward at a much faster rate than suggested in the Army testimony.

Following the May hearing, the Army agreed to suspend the gas dump pending the evaluation and recommendations of a special group of scientists appointed by the National Academy of Sciences.

But the Army is impatient with the delay. Beyond the month of September, it says, Operation CHASE would no longer be feasible due to the beginning of the winter storm season in the North Atlantic. And, it will require three summer months for some 20 trains to be loaded at four different chemical munitions stockpiles and brought to Earl, N.J., where the ocean phase of the operation begins. If the academy report is not completed by the end of June, ocean burial would probably be ruled out for this year.

It is going to be close. Having been assembled for only a short while, the NAS scientists have much work remaining, although the chairman of the group, Dr. George B. Kistiakowsky, says that his ambition is to have a final report by the end of June. The scientists are finding no easy task in compiling a comprehensive collection of information covering the many ramifications of the Army's gas dump plans.

One of the most difficult areas to evaluate is the effect of a large volume of various toxic chemical munitions upon the physical and biological systems of the ocean.

As one oceanographer put it, "I don't envy them their job." ◇

GAS AND GERMS

Policy reevaluation ordered

President Nixon is ordering a Government-wide reevaluation of the U.S. chemical and biological warfare program.

The President's action was relayed to Rep. Richard D. McCarthy (D-N.Y.) last week in a letter to him written by Gerard Smith, director of the U.S. Arms Control and Disarmament Agency. Smith wrote:

"Within the U.S. Government, the control of chemical and biological weapons is a subject of major concern. The President has directed the Executive Branch to undertake a detailed review of chemical and biological warfare, including U.S. position on arms control and the question of ratification of the 1925 Geneva Protocol."

Although the U.S. is publically committed to the substance of the protocol banning first use of chemical and biological weapons, it has never formally ratified it. McCarthy has been joined by 25 other House members in urging Senate ratification of the protocol.

McCarthy also said last week he learned of Defense Department tests with biological warfare agents on Eniwetok Island in the South Pacific. McCarthy says that while the island has no native human population, biological agents could be spread to other islands by migrating birds. He has called for a moratorium on all open-air testing of biological agents by U.S. biological-warfare agencies.

VENUS

Still a mystery

Once again instruments sent to Venus by the Soviet Union have descended through the planet's thick and hot atmosphere. And once again, a trail of confusion and minor scientific mystery has followed.

This time, however, the puzzlement is not over whether the instruments continued transmitting until they reached the surface. When Venera 4 dropped into Venus' atmosphere in October 1967, Soviet scientists steadfastly claimed they had achieved a landing. It took many months of detective work by U.S. scientists (SN: 8/24, p. 179) to show that Venera 4 must have transmitted from about 50 kilometers above the surface down to 25 rather than from 25 down to the surface. The fault probably was with its radio altimeter.

When Venera 5 and 6 entered the atmosphere on the nightside of the planet three days apart last month, there were no similar claims of transmission down to the surface.

In the official Soviet report of the preliminary findings, which was reaching U.S. scientists last week, it is made quite clear that no intact landing was achieved by either capsule. In fact, it is obvious none was expected. Although certain modifications had made the packages more resistant to Cytherian conditions, their collapse limit was about 27 earth atmospheres, far below the pressures expected at the surface.

Most of the data returned by the two new probes tend to confirm or refine measurements obtained by Venera 4, Mariner 5 and ground-based observations.



Novosti Press Agency

Venera model: The altimeter again.

But some perplexity is being caused by a disparity in altitude readings. When both capsules were reporting a pressure of 27 atmospheres, indicating they were at about the same level, Venera 5 registered an altitude of 24 to 26 kilometers; Venera 6 read 10 to 12 kilometers. The descents were over different sections of the planet's surface, leading the Soviet scientists tentatively to attribute the difference to "accidents of the Venusian terrain."

U.S. scientists are highly skeptical. High mountains have been discovered on Mars, but no variations of surface features greater than about 2 kilometers have thus far been measured on Venus by radar.

"This is a much bigger variation in altitude than is considered acceptable,"