solvable problems, however. One is described by the Army as "inadequate directional control during hover and sideward flight." This is due to inefficiency of the tail rotor, and is believed still to be taking up the time of Lockheed engineers. One possible cure, and probably the one Lockheed hopes will work, since it is relatively simple, is simply to reverse the direction that the tail rotor turns, enabling it to work in a different part of the airstream around the helicopter.

"Half-P hop" is another difficulty under study, named for a very low-frequency vibration that occurs at the rate of half a beat per revolution of the main rotor. This occurs only at high speed, and the solution is believed to involve moving it up until it occurs only at a speed beyond the capability of the helicopter. An approach to this may lie in reducing the play in the aircraft control system, which has increased from Lockheed's original rigid-rotor design due to the addition of servomotors and other intermediate components needed to ease handling of the heavy Cheyenne.

A particularly touchy item in the Cure notice is excess weight, which the Army says is due to Lockheed's design changes, and which it blames for "an ensuing degradation in performance, maneuver capability and structural integrity." Lockheed is not expected to accept this lying down, and is likely to argue that as much as one-third of the Cheyenne's 17,000-pound gross weight, and some or all of the excess, comes from Government-furnished equipment, including weapon systems, electronics and other hardware. Similar arguments raged for years over the F-111 (SN: 10/21/67, p. 400).

The nine remaining Cheyenne prototypes were grounded following the crash, and when they will resume flight is unknown. However, the chopper's troubles are financial as well as technical. Costs have skyrocketed since early estimates of the program's expenses, and Rep. Otis Pike (D-N.Y.) of the House Armed Services Committee claims that the Cheyenne's price tag has jumped from $992,000 to $2.2 million each.

As Defense Secretary Melvin Laird guides the Pentagon through a reappraisal of its major contracts, however, another Lockheed contract has turned out to have escalated so far that its cost overrun alone may be twice the size of the entire Cheyenne program. This is the Air Force's giant C-5A jet transport, which Congress charges may cost an extra $2 billion over its original $3.1 billion estimate. The Air Force feels that the excess will be smaller, $882 million plus spare parts.

Other programs getting the stern once-over include: the FB-111, bomber version of the F-111 jet, for which procurement has been cut from 210 to 60 aircraft; the S-3A antisubmarine aircraft, for which the contract is being held up until it can be changed to require the contractor to demonstrate the plane's performance at predetermined milestone points; the SRAM (Short-Range Attack Missile), on which production is being deferred; the Minuteman 3 missile, which is getting a production slowdown; the Navy's shipbuilding program, whose climbing expenses may cost the Navy $600 million in new projects, and possibly the Army's Main Battle Tank.

EXPLOSIVE ISSUE

Nerve gas: too hot to handle

The Army has a tiger by the tail.

It would prefer not to haul 809 railroad cars full of poison gas from four arsenals through several major cities, for loading aboard obsolete Liberty ships and disposal at sea (SN: 5/17, p. 470).

It cannot safely dismantle and detoxify the 2,700 tons of packaged gas, as has been suggested by a group of scientists at Washington University in St. Louis. And its alternative is being attacked as equally risky.

The gas, Army officials disclosed at a hearing last week before a House foreign affairs subcommittee, is not simply old, World War I and II gases contained in cannisters.

The largest portion of the proposed shipment, Acting Assistant Secretary of the Army Charles L. Poor told the subcommittee, is in 1,000-pound bombs which contain a combination of deadly GB nerve gas and high explosive dispersal bomblets. And, says Poor, the surplus weapons are in too great a state of decay and thereby too sensitive to be disassembled on site without a risk of a major disaster.

Some 440 carloads of the gas, at the Rocky Mountain Arsenal in Colorado, are in this category.

Poor told the subcommittee the Army planned to scuttle an assortment of chemical munitions 250 miles at sea due east of Atlantic City, N.J., in 7,200 feet of water. The hearing had been originally scheduled for the previous week, following disclosure of the plans, but the Army had asked for additional time to prepare its information and assemble its experts.

Three types of chemical agents are involved. The nerve gas GB, the most toxic of the three, is presently stored in 1,000-pound bomb clusters officially described as "fin-stabilized, air-to-surface" devices, containing "2.6 pounds of agent GB and approximately one-half pound of tetryl burster" (the high explosive), in each of 76 bomblets comprising one bomb. The explosive component deteriorates with age and becomes more unstable and sensitive to heat and pressure.

The other gases are the somewhat less lethal agents, mustard and tear gas, contained in one-ton steel tanks. The mustard is in a liquid state and under no pressure.

Army scientists claim that the mustard will freeze at the water temperatures encountered in the ocean deeps, and that should leakage occur, it would, as would the other gases, be rendered into a harmless breakdown product similar to ordinary industrial waste through the hydrolyzing action of the seawater. Even if all the explosives detonated at once, there would be no danger, if it occurred below 1,000 feet, the Army contends. Also, the area of contamination would allegedly be confined to the immediate site of the dump because of the water's stillness at great depths. The rate at which any leaking gas could be chemically degraded would be faster than the diffusion rate of the gas through the water. None of it could reach the ocean surface, or be carried great distances away in its toxic form.

The picture drawn is one which seems to meet all possible objections, with the exception of long-range consequences or unsuspected effects.

The ocean has been used for disposing of all kinds of military and nonmilitary materials, Poor said. Flanked by Army chemical warfare scientists, and officers, he told the subcommittee the ocean floor has always been regarded as a kind of "Davey Jones Locker," remote and inaccessible where "things could be put and forgotten."

This did not sit well with the Congressmen. Rep. Cornelius E. Gallagher (D-N.J.), chairman of the subcommittee, reminded Poor that the ocean floor may become the food locker of the future. The secretary answered that explorers of the ocean floor should first consult the appropriate charts indicating where dumps have been made.

The Army agreed to delay its shipment until further studies have been made of the plans and other options. For an independent review, the Army has asked the National Academy of Sciences to study the problem and provide "even further assurance that the alter-

native is indeed the best." Once begun, the operation is expected to take about three months. The cost will be close to $4 million.

Attention was initially called to the gas shipment by Rep. Richard D. McCarthy (D-N.Y.) on May 6 when information of the plan which came to him through undisclosed sources led him to write Defense Secretary Melvin Laird and Secretary of Transportation John Volpe. He urged them to hold up the proposed ocean disposal pending a "thorough review of the proposed safety measures, a review of the consequences of dumping large quantities of toxic materials in the ocean, and a consideration of alternative methods of disposing of these highly dangerous materials." McCarthy alluded to "poison gas spillage" in Kansas City, where two have occurred within the past year, and one accident reported from St. Louis. The accidents were attributed to leaky gas tanks which contained phosgene gas that was being trans-shipped by railway.

The Army says that the ocean burial of this particular surplus of chemical agent is the safest and cheapest way to carry out what it calls an urgently needed purging of its stockpiles. Citing an example to illustrate the kind of "unacceptable situation" which makes so large a disposal at one time necessary, Poor said poison gas stockpiling had become hazardous at Rocky Mountain Arsenal near Denver because of population growth and airport expansion around the arsenal. To passengers flying in and out of the adjacent Denver airport the presumably secret stockpiles are clearly visible.

The movement of material will come from four locations: Rocky Mountain, Colorado, Anniston Army Depot, Alabama, Blue Grass Ordnance Depot, Kentucky, and Edgewood Arsenal, Maryland. The collection point is Earle Naval Ammunition Depot, Earle, N.J., located 20 miles across the bay from Manhattan. At Earle, four Liberty ships which have been gutted and converted to floating derelicts will be loaded, towed out to sea and scuttled. The Army designates this general kind of procedure as CHASE, an acronym meaning, Cut Holes And Sink 'Em. Testimony disclosed that there have been some eleven previous CHASE operations involving chemical warfare agents.

The National Academy of Sciences report is expected to be ready somewhat later than the May 16 date when the massive trans-shipment was to begin. Time is running very close for the Army due to serious problems with unpredictable weather conditions if the final ocean phase is not completed before September.