

*Sen. For. Rel. Subc.*  
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charge from the plant, by using excess heat as its energy source.

Mr. Austin also noted the efforts of Bottlers of Coca-Cola directed toward achieving a better environment. He cited such projects as recycling centers in the United States for the reclamation on one-way glass packages; the collection and recycling of aluminum cans by Bottlers of Coca-Cola in Australia; and the collection for recycling of aluminum bottle caps in South America, where almost all of the Company's products are sold in returnable packages.

Mr. Austin noted also the independent funding, by his Company, of a number of major studies into the total environmental impact of all its packaging designed to seek to determine their true cost, from the mining and extraction of raw materials to the disposal of waste products. That way, he said, "we'll be able to make even more intelligent decisions in the future."

Citing his Company's concern not only for the physical environment, but for the quality of life, Mr. Austin pointed to the Company's efforts toward the development of a protein-rich, nutritional beverage which could aid the undernourished, and to the Company's efforts in a program in its Florida citrus operations to upgrade the standard of living for the migratory-type workers who harvest the citrus.

The protein-beverage work, in progress for more than four years, is not altogether altruistic, Mr. Austin said, "We expect to profit from this venture. But so will those whose diets and lives are improved through our efforts. Those enterprises which succeed to the fullest are the very ones which enrich everyone involved."

The Company's farm labor reform project, Mr. Austin noted, did not contain the profit motive when it was inaugurated; but today, due to the continuing success of the activity, that factor is now a possibility.

With its individual components of better housing, better pay and benefits and improved health and educational facilities, the aim of the farm labor program is to stabilize the once migratory labor force and to raise the standard of living of the workers to a parity with other Company employees.

Even though Mr. Austin called the program "at the beginning of the beginning," he noted that with steady employment and normal incentives, the individual productivity rate is going up. The cost to the Company, he said, for equipment, supervisory personnel, transportation and other support requirements, have diminished surprisingly. "This translates quickly into a more profitable operation and a better return on investment."

**PROHIBITION OF GEOPHYSICAL MODIFICATION ACTIVITY AS A WEAPON OF WAR**

Mr. PELL. Mr. President, as chairman of the Subcommittee on Oceans and International Environment, I have been very much concerned over the unofficial and unconfirmed reports that the United States has attempted to modify weather conditions in Southeast Asia as an instrument of warfare.

During the recent Senate recess, a number of informative articles concerning this subject appeared in the press. Among these were articles written by Bruce De Silva, in the Providence Journal and Evening Bulletin; Seymour M. Hersh and John Noble Wilford, in the New York Times of July 3, 1972; and by Victor Cohn, in the Washington Post of July 2, 1972.

These articles reinforce my belief that we must move quickly to ban the use of

all geophysical warfare. In an effort to achieve this goal, I have scheduled hearings on July 26 and 27, 1972, to receive testimony on Senate Resolution 281 which I introduced earlier this year. This resolution, which was cosponsored by Senators BAYH, CASE, COOPER, CRANSTON, HART, HUGHES, HUMPHREY, JAVITS, KENNEDY, MCGOVERN, MONDALE, NELSON, STEVENSON, TUNNEY, and WILLIAMS expresses the sense of the Senate that the United States should seek the agreement of other governments to a proposed treaty prohibiting the use of any environmental or geophysical modification activity as a weapon of war, or the carrying out of any research or experimentation with respect thereto.

I believe that the articles referred to above will be of great interest to a number of Senators. I therefore ask unanimous consent that they be printed in the RECORD.

There being no objection, the items were ordered to be printed in the RECORD, as follows:

**RAINMAKING IS USED AS WEAPON BY U.S.— CLOUD SEEDING IN INDOCHINA CONFIRMED— CHEMICAL ALSO EMPLOYED TO FOIL RADAR**  
(By Seymour M. Hersh)

WASHINGTON, July 2.—The United States has been secretly seeding clouds over North Vietnam, Laos and South Vietnam to increase and control the rainfall for military purposes.

Government sources, both civilian and military, said during an extensive series of interviews that the Air Force cloudseeding program has been aimed most recently at hindering movement of North Vietnamese troops and equipment and suppressing enemy antiaircraft missile fire.

The disclosure confirmed growing speculation in Congressional and scientific circles about the use of weather modification in Southeast Asia. Despite years of experiments with rainmaking in the United States and elsewhere, scientists are not sure they understand its long-term effect on the ecology of a region.

**SOME OPPOSED PROGRAM**

The weather manipulation in Indochina, which was first tried in South Vietnam in 1963, is the first confirmed use of meteorological warfare. Although it is not prohibited by any international conventions on warfare, artificial rainmaking has been strenuously opposed by some State Department officials.

It could not be determined whether the operations were being conducted in connection with the current North Vietnamese offensive or the renewed American bombing of the North.

**EFFECTIVENESS DOUBTED**

Beginning in 1967, some State Department officials protested that the United States, by deliberately altering the natural rainfall in parts of Indochina, was taking environmental risks of unknown proportions. But many advocates of the operation have found little wrong with using weather modification as a military weapon.

"What's worse," one official asked, "dropping bombs or rain?"

All of the officials interviewed said that the United States did not have the capability to cause heavy flooding during the summer in the northern parts of North Vietnam, where serious flooding occurred last year.

Officially, the White House and State Department declined comment on the use of meteorological warfare. "This is one of those things," one official said.

Most officials interviewed agreed that the seeding had accomplished one of its main

objectives—muddying roads and flooding lines of communication. But there were also many military and Government officials who expressed doubt that the project had caused any dramatic results.

The sources, without providing details, also said that a method had been developed for treating clouds with a chemical that eventually produced an acidic rainfall capable of fouling the operation of North Vietnamese radar equipment used for directing surface-to-air missiles.

In addition to hampering SAM missiles and delaying North Vietnamese infiltration, the rainmaking program had the following purposes:

¶Providing rain and cloud cover for infiltration of South Vietnamese commando and intelligence teams into North Vietnam.

¶Serving as a "spoiler" for North Vietnamese attacks and raids in South Vietnam.

¶Altering or tailoring the rain patterns over North Vietnam and Laos to aid United States bombing missions.

¶Diverting North Vietnamese men and material from military operations to keep muddied roads and other lines of communication in operation.

**KEYED TO MONSOON**

The cloud-seeding operations necessarily were keyed to the two main monsoon seasons that affect Laos and Vietnam. "It was just trying to add on to something that you already got," one officer said.

Military sources said that one main goal was to increase the duration of the southwest monsoon, which spawns high-rising cumulus clouds—those most susceptible to cloud seeding—over the panhandle areas of Laos and North Vietnam from May to early October. The longer rainy season thus would give the Air Force more opportunity to trigger rainstorms.

"We were trying to arrange the weather pattern to suit our convenience," said one former Government official who had detailed knowledge of the operation.

According to interviews, the Central Intelligence Agency initiated the use of cloud-seeding over Hue, in the northern part of South Vietnam. "We first used that stuff in about August of 1963," one former C.I.A. agent said, "when the Diem regime was having all that trouble with the Buddhists."

"They would just stand around during demonstrations when the police threw tear gas at them, but we noticed that when the rains came they wouldn't stay on," the former agent said.

"The agency got an Air America Beechcraft and had it rigged up with silver iodide," he said. "There was another demonstration and we seeded the area. It rained."

A similar cloud-seeding was carried out by C.I.A. aircraft in Saigon at least once during the summer of 1964, the former agent said.

**EXPAND TO TRAIL**

The Intelligence Agency expanded its cloud-seeding activities to the Ho Chi Minh supply trail in Laos sometime in the middle nineteen-sixties, a number of Government sources said. By 1967, the Air Force had become involved although, as one former Government official said, "the agency was calling all the shots."

"I always assumed the agency had a mandate from the White House to do it," he added.

A number of former CIA, and high-ranking Johnson Administration officials depicted the operations along the trail as experimental.

The state of the art had not yet advanced to the point where it was possible to predict the results of a seeding operation with any accuracy. "Once, one Government official said, "We used to go out flying around and looking for a certain cloud formation," the official said. "And we made a lot of mis-

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takes. Once we dumped seven inches of rain in two hours on one of our Special Forces camps."

Despite the professed skepticism on the part of some members of the Johnson Administration, military men apparently took the weather modification program much more seriously.

According to a document contained in the Pentagon papers, the Defense Department's secret history of the war, weather modification was one of seven basic options for stepping up the war that were presented on request by the Joint Chiefs of Staff to the White House in late February, 1967.

The document described the weather program over Laos—officially known as Operation Pop-Eye—as an attempt "to reduce trafficability along infiltration routes."

## AUTHORIZATION NEEDED

It said that Presidential authorization was "required to implement operational phase of weather modification process previously successfully tested and evaluated in same area." The brief summary concluded by stating that "risk of compromise is minimal."

A similar option was cited in another 1967 working document published in the Pentagon papers. Neither attracted any immediate public attention.

The Laos cloud-seeding operations did provoke, however, a lengthy and bitter, albeit secret, dispute inside the Johnson Administration in 1967. A team of State Department attorneys and officials protested that the use of cloud-seeding was a dangerous precedent for the United States.

"I felt that the military and agency hadn't analyzed it to determine if it was in our interest," one official who was involved in the dispute said. He also was concerned over the rigid secrecy of the project, he said, "although it might have been all right to keep it secret if you did it once and didn't want the precedent to become known."

The general feeling was summarized by one former State Department official who said he was concerned that the rainmaking "might violate what we considered the general rule of the thumb for an illegal weapon of war—something that would cause unusual suffering or disproportionate damage." There also was concern, he added, because of the unknown ecological risks.

A Nixon Administration official said that he believed the first use of weather modification over North Vietnam took place in late 1968 or early 1969 when rain was increased in an attempt to hamper the ability of antiaircraft missiles to hit American jets in the panhandle region near the Laotian border.

Over the next two years, this official added, "it seemed to get more important—the reports were coming more frequently."

It could not be learned how many specific missions were carried out in any year.

One well-informed source said that Navy scientists were responsible for developing a new kind of chemical agent effective in the warm stratus clouds that often shielded many key antiaircraft sites in northern parts of North Vietnam.

The chemical, he said, "produced a rain that had an acidic quality to it and it would foul up mechanical equipment—like radars, trucks and tanks."

"This wasn't originally in our planning," the official added, "it was a refinement."

Apparently, many Air Force cloud-seeding missions were conducted over North Vietnam and Laos simply to confuse or "attenuate"—a word used by many military men—the radar equipment that controls antiaircraft missiles. The planes used for such operations, C-130's, must fly at relatively slow speeds and at altitudes no greater than 22,000 feet to disperse the chemical effectively.

A number of officials confirmed that cloud seeding had been widely used in South Viet-

nam, particularly in the north along the Laos border. "We tried to use it in connection with air and ground operations," a military officer explained.

One Government official explained more explicitly that "if you were expecting a raid from their side, you would try to control the weather to make it more difficult." This official estimated that more than half of the actual cloud-seeding operations in 1969 and 1970 took place in South Vietnam.

Much of the basic research was provided by Navy scientists, and the seeding operations were flown by the Air Weather Service of the Air Force.

By 1967, or possibly earlier, the Air Force flights were originating from a special operations group at Udorn air base in Thailand. No more than four C-130's, and usually only two, were assigned in the highly restricted section of the base. Each plane was capable of carrying out more than one mission on one flight.

One former high-ranking official said in an interview that by the end of 1971 the program, which had been given at least three different code names since the middle nineteen-sixties, was under the direct control of the White House.

Interviews determined that many usually well-informed members of the Nixon Administration had been kept in the dark.

In the last year, there have been repeated inquiries and publicly posed questions by members of Congress about the weather modification programs in Southeast Asia, but no accurate information has been provided to them by the Department of Defense.

"This kind of thing was a bomb, and Henry restricted information about it to those who had to know," said one well-placed Government official, referring to Henry A. Kissinger, the President's adviser on national security. Nonetheless, the official said, "I understand it to be a spoiling action—that this was descriptive of what was going on north of the DMZ with the roads and the SAM sites."

Another source said that most of the weather modification activities eventually were conducted with the aid and support of the South Vietnamese. "I think we were trying to teach the South Vietnamese how to fly the cloud-seeding missions," the source said.

It was impossible to learn where the staffing and research for the secret weather operation were carried out. Sources at the Air Force Cambridge Research Laboratories at Hanscomb Field in Bedford, Mass., and at the Air Weather Service headquarters, while acknowledging that they had heard of the secret operation, said they had no information about its research center.

One Government source did say that a group was "now evaluating the program to see how much additional rain was caused." He would not elaborate.

## SCIENTISTS ARE CRITICAL OF RAINMAKING IN WAR

(By John Noble Wilford)

After years of rainmaking experimentation, scientists are still not sure they understand the short-term effects of cloud-seeding, much less the possible long-term impact on the ecology of a region or the entire world.

This uncertainty has led to increasing concern among scientists over the use of weather modification as an instrument of warfare.

Dr. Matthew Meselson, professor of biology at Harvard University, was quoted in the June 16 issue of the magazine *Science* as saying:

"It is obvious that weather modification used as a weapon of war has the potential for causing large-scale and quite possibly uncontrollable and unpredictable destruction well have a far greater impact on civilians than on combatants. This would be especially true in areas where subsistence agriculture

is practiced, in food-deficit areas, and in areas subject to flooding."

## ISSUE RAISED RECENTLY

The issue has also been raised in recent months by the National Academy of Sciences, on the floor of the United States Senate and at the international environmental meeting at Stockholm last month.

Recognizing the many potential problems, the national academy issued a statement last year urging the Nixon Administration to sponsor a United Nations resolution "dedicating all weather modification efforts to peaceful purposes and establishing, preferably within the framework of international nongovernmental scientific organizations, an advisory mechanism for consideration of weather-modification problems of potential international concern."

Senator Claiborne Pell, Democrat of Rhode Island, and 13 other Senators recently filed a resolution calling on the United States to join in a treaty outlawing "any use of any environmental or geophysical modification activity as a weapon of war, or the carrying out of any research or experimentation with respect thereto."

But, during the Stockholm conference, the United States delegation was instrumental in inserting a weakening clause in a recommendation calling for all governments to "carefully evaluate the likelihood and magnitude of climactic effects" from weather modification and to disseminate their findings.

## U.S. SPONSORS STUDY

The weakening clause included the words, "to the maximum extent feasible." Officials later acknowledged that possible military use of weather modification was the basis for the amendment.

However, the Department of Defense's Advanced Research Projects Agency is sponsoring research to determine how much and what kind of tinkering with the atmosphere is required to disturb the climate on a global scale—an indication that the Pentagon is not sure of the ecological impact of weather warfare.

The Defense Department acknowledges that it conducted "precipitation augmentation projects" in the Philippines in 1969, in India in 1967, over Okinawa and the Mid Islands in 1971 and in Texas last summer—all at the request of the governments involved.

The results were mixed—success in the Philippines and Texas, but not elsewhere. Other tests over the years have failed to increase rainfall, or else failed to convince meteorologists that the rains would not have fallen without human intervention.

But tests in Florida, in 1968 and 1970, led civilian scientists to conclude that clouds seeded with silver iodide crystals rained more than three times as much as unseeded clouds. The experiment, concluded by the National Oceanic and Atmospheric Administration, produced "explosive" growth of rain clouds.

## CONTROVERSY REMAINS

While conceding that "there's still quite a bit of controversy over whether your seeding caused rain or not," Ferguson Hall of the agency's Office of Environmental Modification said yesterday in a telephone interview from his Rockville, Md., office: "We seem to be on the verge of having convinced ourselves rainmaking will work in certain cases."

Rainmaking research primarily involves experiments in seeding clouds with silver iodide, dry ice, common salt and other chemicals that can act as condensation nuclei. The Federal Government is spending about \$20 million annually on weather-modification research.

There are two types of clouds, warm and cold, and processes by which seeding is believed to trigger rainfall.

In 1946, the first American experiments in cloud seeding, by Vincent J. Schaefer of

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the General Electric Research Laboratory in Schenectady, were aimed at supercooled clouds. From an airplane, Mr. Schaefer dropped three pounds of dry ice (frozen carbon dioxide) into clouds to create billions of glistening ice crystals.

## MOISTURE TO ICE

Dry ice—or silver iodide, which is more commonly used today—turns moisture in the clouds to ice crystals that grow larger and larger until they are heavy enough to fall as either rain or snow.

Silver iodide is ordinarily used as the seeding agent because its crystals are similar to those of ice and it is more effective in causing supercooled water drops to freeze.

In warm clouds, salt or silver iodide particles can cause moisture to coalesce into water droplets large enough to fall as rain. This would be the type of experiments that could be effective in tropical or semitropical areas, such as Southeast Asia.

The type of seeding agent that could cause a highly acidic rainfall, as reported in Southeast Asia, has not been disclosed. Civilian scientists are loathe to discuss the possibility, except to note that the method has a name—hygroscopic seeding.

Most cloud-seeding operations are conducted by airplane—the C-130 in Vietnam. But small rockets can also be used to deliver the seeding agent.

WEATHER WAR: A GATHERING STORM  
(By Victor Cohn)

Technological America, that accomplished laser-radar-electronic warrior, has been learning to use still another remote-control weapon: control of the weather for military purposes.

Indochina—by the evidence of a long-ignored passage in the Pentagon Papers—has been a test battleground, the site of purposeful rain-making along the Ho Chi Minh trails. Some accusers, going further, hold American rain-makers responsible for the flood disasters that struck North Vietnam last year.

How much there is past a hard kernel of truth behind an array of increasingly serious accusations is unclear. Yet the very possibility that there has been serious weather war—as well as the emerging fact that the Pentagon has been systematically developing a rain-making capability—is enough to chill many scientists.

These scientists include fearful prophets who warn of future "geophysical warfare"—wars waged by adjusting, changing, modifying and ultimately despoiling the air, water and earth.

They also include a growing number of weather-modifiers, scientists interested in the peaceful users of seeding clouds, modifying hurricanes or preventing hail to help farmers and everyone else.

## OPERATION POP EYE

The term "seeding" simply means making the proper clouds yield rain, or destructive force, by bombarding them with silver iodide particles. The particles act as condensation nuclei around which moisture can form. The would-be cloud engineers want to develop such programs through international cooperation, because both weather and weather modification ignore borders.

Weather modification, these men believe, is on the verge of huge advances, and needs only a period of concentrated research, in a framework of interstate and international rules.

But "if it turns out that the U.S. has militaristic uses for weather modification," one weather scientist maintains, "international weather programs would drop dead."

A prominent White House scientist, Dr. Gordon J. F. MacDonald, a member of the President's three-man Council on Environmental Quality, is among those who

believe it is important for nations to agree not to wage weather war—"before," as he put it, "it becomes a reality."

Sen. Claiborne Pell (D-R.I.) is prominent among members of Congress who believe it has become a reality. "There is very little doubt in my mind," he says. Rep. Gilbert Gude (R-Md.) states: "There's no doubt in my mind that it's going on in Vietnam."

"I think there's no doubt rain-making was used in Laos on the trail," says a Senate committee aide well versed in defense affairs. "And I think there's little doubt that it has been used fairly recently; that is, in 1971."

Such use, in 1971 or otherwise, may have been only sporadic, several sources believe. "Otherwise," said one, "a lot more people would have known about it long ago."

It is a "successful" pre-1967 use, sometime in the years of Vietnam escalation, possibly in 1966, that is documented in the "Senator Gravel" edition of the Pentagon Papers. In late February, 1967, this document discloses the Joint Chiefs of Staff prepared a list of "alternative strategies" for President Johnson.

One, titled "Laos Operations," read: "Continue as at present plus Operation Pop Eye to reduce trafficability along infiltration routes . . . Authorization required to implement operational phase of weather modification process previously successfully tested and evaluated in same area." (Italics added.)

In 1967—according to columnist Jack Anderson, who published the first allegation of Indochina rain-making—U.S. forces started secret Project Intermediary Compartment "to hamper enemy logistics . . . (with) claimed success in creating man-made cloudbursts . . . (and) flooding conditions" along the Ho Chi Minh trails, "making them impassable."

## "CLASSIFIED" WORK

Sen. Pell, most persistently, and Rep. Gude and Sen. Alan Cranston (D-Calif.), on behalf of Members of Congress for Peace Through Law, have showered the Pentagon with inquiries since Anderson published his charges in March, 1971. Defense Secretary Melvin Laird and Director of Defense Research and Engineering John Foster have repeatedly replied (to quote Laird): "Some aspects of our work in this area have a definite relationship to national security and are classified accordingly."

In April, Senate Foreign Relations Committee Chairman J. William Fulbright (D-Ark.), pressed further, asking Laird: "Why do you decline to discuss weather control activities in North Vietnam, yet you freely discuss B-52 flights over Vietnam?" Laird replied blandly, "We have never engaged in that type of activity over North Vietnam."

Fulbright failed to go on to ask Laird about Laos or Cambodia or the Gulf of Tonkin, where some Vietnam weather originates. "He just didn't follow up on that question," one of his staff explains. "He was trying to cover a whole range of things."

The Defense Department freely reports that it has "field capabilities" for making rain. It used them in the Philippines in 1969, in a six-month "precipitation augmentation project" at the Philippines request; in India in 1967, a similar invitation; over Okinawa and Midway islands, and in June, July and August, 1971, over drought-stricken Texas, at the urgent request of Gov. Preston Smith.

Pierre Saint-Amand, head of earth and planetary sciences for the Naval Ordnance Laboratory at China Lake, Calif., led the Philippine Project, which that government considered highly successful. The India and Midway tries failed for lack of suitable clouds. But the Texas effort was "successful," in Saint-Amand's view.

Navy rain-makers are currently involved in

two long-range California programs—one over the Pacific off Santa Barbara, an attempt to increase rainfall over a national forest; the other over the Central Sierras to try to increase the snow-pack for electric utilities that depend on water power.

Air Force weather modifying is done by Air Weather Service, working out of Scott Field, East St. Louis, Ill., with participation by the Environmental Technology Applications Center at Suitland, Md. Operations over Indochina are flown out of Udorn Air Force Base, Thailand, says a Senate source.

"None of the weather research work in the entire DOD is classified," Saint-Amand adds—the word *research* should be noted here. "Our labs are open to anyone who wants to come and see what we're doing." Chief Scientist John N. Howard of the Air Force's Cambridge Research Laboratories at Bedford, Mass., made a similar statement. The Defense Department's Advanced Research Projects Agency (ARPA) likewise reports conducting only classified research.

An ARPA study called Nile Blue has been cited by some of the military's accusers as prime evidence of nefarious DOD rainmaking. Actually, Nile Blue is a study by computer of how purposeful or accidental man-made changes might affect the globe's year-to-year climate rather than the day-to-day conditions called weather.

Nile Blue has been funded this year at \$2.5 million but will rise to \$3.1 million in fiscal year 1973, with use of a new super-computer, Illiac IV, designed at the University of Illinois and now being installed at Ames Research Center, Moffett Field, Calif.

Defending the project, ARPA Director Stephen J. Lukasik told the Senate Appropriations Committee in March: "Since it now appears highly probable that major world powers have the ability to create modifications of climate that might be seriously detrimental to the security of this country, Nile Blue . . . was established in FY 70 to achieve a U.S. capability to (1) evaluate all consequences of a variety of possible actions . . . (2) detect trends in the global circulation which foretell changes . . . and (3) determine if possible, means to counter potentially deleterious climatic changes . . ."

"What this means," Lukasik explains, "is learning how much you have to tinkle the atmosphere to perturb the earth's climate. I guess we'd call it a threat assessment."

## A VISION OF ECOCIDE

How might such changes be made by one country desiring to harm another?

The highly respected Dr. MacDonald, who will leave the White House soon to teach at Dartmouth, wrote a 1968 warning against geophysical warfare, titled "How to Wreck the Environment." On weather war in Indochina, he now says only, "I wouldn't know about that." But melting the Arctic cap by some means, he conjectured in 1968, might be one future way in which a land-locked equatorial country could flood the world's coastal cities while insuring itself a temperate climate with abundant rainfall.

"As economic competition among many advanced nations heightens," he warned, "it may be to a country's advantage to ensure a peaceful natural environment for itself and a disturbed environment for its competitors. Operations . . . might be carried out covertly . . . The years of drought and storm would be attributed to unkindly nature and only after a nation were thoroughly drained would an armed takeover be attempted."

Far-fetched? Short-term rain-making— which MacDonald in 1968 called only a "future" military possibility—already seems an easier, if capricious, weapon.

"When the proper meteorological conditions (producing natural rain exist)," Laird told Sen. Pell in a November letter, "it is a relatively simple matter to increase the amount

of rain which will fall. The amount of increase is frequently of the order of 30 to 50 per cent."

Laird carefully added: "Massive downpours have not been produced, and theoretical knowledge at hand indicates that this will probably always be the case." This, if oblique, seemed to quarrel with the allegations that the 1971 North Vietnam floods have been produced by the Pentagon. Pell, however, maintains that U.S. cloud-seeding produced the floods, which he says killed thousands.

#### "IT IS ENTIRELY POSSIBLE"

Robert M. White, the nation's chief weather man as director of the Commerce Department's National Oceanographic and Atmospheric Administration (NOAA), declined to discuss military matters in an interview. But to the question, "Could cloud seeding cause flooding?" he—unlike Laird—said, "Yes, it is entirely possible to get heavy rains out of certain clouds."

"In the past decade," White added, "there has been a considerable change of view in the scientific community on weather modification. I think most knowledgeable people would agree that we have primitive capabilities for modifying certain weather patterns. And it is reasonable now to look to possible development of more sophisticated ones."

Among patterns that can "predictably" be modified, he said, are: cold fog (which can be cleared from airfields); cumulus clouds (most common in the tropics—"In Florida," White said, "we have been able almost at will to make them grow explosively"); orographic clouds (moist air moving up over mountains—"At the right temperature you can begin thinking of milking them for water") and hailstorms (which can often be suppressed, according to recent claims by the Russians, who fire silver iodide into them from rockets and artillery).

Beyond these, there are storms like hurricanes—as Hurricane Agnes, for example—which cannot yet be reliably suppressed, "but for which we have some encouraging results," in White's view.

All in all, he sums up, "We're beginning to move from a situation where everything that happens in the atmosphere is an act of God to where some things are an act of man."

#### THE MORAL ISSUE

What perturbs many scientists is the morality of using such "acts of man" for military purposes.

The Navy's Saint-Amant emphatically does not see turning weather into a weapon as something inherently evil. "If you estimate the amount of damage done by impeding someone's transportation versus blowing or burning them up, I don't think it is so immoral," he told Science magazine.

Most scientists, left-wing and establishment, seem to disagree.

The Science for Vietnam, Chicago Collective—a radical anti-war group of scientists and students who first spotted the passage in the Pentagon Papers—charges: "The U.S. government has embarked on a totally new and insidious form of warfare . . . (that) could disrupt the economy and social structure of a small country; it could create famine . . ."

University of Connecticut Graduate Dean Thomas Malone, chairman of the National Academy of Sciences' Weather Modification Panel, likewise says: "I'm opposed to it." He urges a treaty that would not merely ban weather war but go on to encourage international weather modifications "in a positive way." A 1971 Academy study urged the United States to sponsor a United Nations resolution dedicating all weather modifying to peace.

Unless nations do this, Malone told Science, "we will face horrendous political problems, putting the genie back in the bottle."

Pell argues that present military activities "could very well lead to another interna-

tional arms race." "The use of rain-making as a weapon of war can only lead to the development of vastly more dangerous environmental techniques," he says. "We must move quickly to place weather, climate and geophysical modification off limits."

Joined by 13 colleagues (McGovern, Humphrey, Case, Cooper, Cranston, Hart, Hughes, Javits, Kennedy, Mondale, Nelson, Tunney and Williams), he has proposed a Senate resolution urging that the United States seek a treaty to bar both weather war and research into it. As chairman of the Senate Foreign Relations Committee's international environment subcommittee, Pell will try to smoke Laird out further at upcoming hearings, perhaps this month.

#### LACK OF RESPONSE

The administration, too, may be considering the subject. But how seriously it is doing so is unsure.

The Pentagon's Foster told Gude that the National Security Council Under Secretaries' Committee "at the request of Dr. Kissinger is currently meeting to formulate a definitive national policy. Presumably this policy, when completed, will be announced to the nation in some appropriate fashion."

The NSC unit involved is headed by Herman Pollock, the State Department's director of international scientific affairs. He reports that it has considered only peaceful weather-making, not military.

Pell is undiscouraged by lack of administration response so far to the pleas that it support his proposed treaty, or that the President declare that the United States will never be first to wage weather war.

"I remember what happened five years ago when I first introduced a draft treaty to ban nuclear weapons from the seabed," he says. "I got rather unreal executive branch comment, just as we're getting now. But I knew very well that a strip of missiles along the Atlantic ridge and 'creepy crawlers'—tank-like underwater missile carriers—were on the drawing board at the Pentagon."

"I see the same process now. I think that given a few years, we'll get some sort of treaty here, too."

Of all fields of science, Dean Malone has said, none has produced more world cooperation than meteorology. "What a tragic reversal it would be if we started using our knowledge to beat one another over the head."

#### PELL FEELS U.S. WAGES WEATHER WARFARE

(By Bruce DeSilva)

WASHINGTON.—The Pentagon has the power to change the weather and already may have used that power to kill and destroy in Southeast Asia.

"I strongly believe clouds have been seeded in Southeast Asia for military reasons. There is very little doubt in my mind," Sen. Clairborne Pell said during an interview in his Washington office last week.

David Kearney, a member of the professional staff of the Senate foreign relations committee, is less cautious. "I have no doubt at all," he said.

Senator Pell said he believes the military has been seeding clouds, perhaps beginning as early as 1966, to clear them away from bombing targets in North Vietnam. He said he also believes seeding with other chemicals has produced torrential rains. The rains have washed-out portions of the Ho Chi Minh Trail impeding the infiltration of supplies and men from North to South Vietnam and caused floods which killed thousands, he said.

Defense Department spokesmen had admitted that they have the capability to drastically increase rainfall, but in a sharp exchange in a Senate foreign relations committee hearing with Sen. J. William Fulbright of Arkansas, they have refused to con-

firm, but carefully avoided denying, that such activities are under way in Southeast Asia. Beginning in June of last year and lasting well into the normally dry season in the fall, North Vietnam was devastated by heavy rains, typhoons and floods.

According to reports by Pierre Darcourt, a French journalist, the heavy rains triggered mud slides, washed away or weakened roads and breached dikes.

The Associated Press reported that flooding destroyed 10 per cent of the country's rice crop and killed thousands.

North Vietnamese Premier Pham Van Dong, the Christian Science Monitor reported, said water levels in the entire Red River and Thai Binh River system rose to "unprecedented levels." He called the flooding the "worst disaster since the beginning of the war."

An act of God? Perhaps.

But Senator Pell said he believes the disaster was merely the most successful of Pentagon rainmaking efforts in the region.

The best evidence that the Pentagon is altering the weather is provided in brief remarks in the Pentagon Papers. The significance of the remarks apparently went largely unnoticed during the furor of other sensational disclosures in the documents.

According to the Gravel edition of the papers, Volume 4, Page 421, the Joint Chiefs of Staff presented President Lyndon B. Johnson with a memo in 1967 suggesting that modifying the weather in the region might be one way of widening the war without creating dissent at home.

The memo stated in part:

"Laos Operations—Continue as at present plus Operation Pop Eye to reduce trafficability along infiltration routes. Authority/Policy Changes—Authorization required to implement operational phase of weather modification process previously successful tested and evaluated in some areas."

Later that year, the President was presented with a list of escalation proposals, the Papers indicate. The list included the following item:

"Cause interdicting rains in or near Laos." Other evidence concerning the rainmaking efforts are circumstantial.

In March of last year, Jack Anderson, a nationally syndicated columnist, claimed in his column that the Air Force has been seeding clouds over Laos and Cambodia since 1967. He said the project went by the code name of "Intermediary-Compatriot."

Unlike other Anderson columns, such as the one on the ITT memo or the disclosure of a secret U.S. posture during the India-Pakistan war, this column went largely unnoticed nationally.

Last Sept. 23, Senator Pell sent a letter to Rody Johnson, assistant secretary of defense for legislative affairs, inquiring about "the Air Force weather modification activities against the North Vietnamese."

The letter, and all subsequent communication, was made public by the senator and was inserted in the Jan. 26 Congressional Record.

The letter asked the following questions:

"1. What are the objectives of the project known by the code name 'Intermediary-Compatriot'?"

"2. How long has this project been in existence? Would you provide a rather detailed description of this project?"

"3. In what specific countries is this project conducted?"

"4. What amounts have been spent on this project over the last three years?"

"5. Is the Department conducting any similar offense-oriented weather modification programs? If so, what are the names of these projects and where are they being conducted?"

OTHER LETTER

The following day, Mr. Johnson replied, saying the questions had been referred to

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the director of defense research and engineering.

After waiting for a response for two weeks, Senator Pell sent another letter to Mr. Johnson, again asking for a reply to his earlier questions.

On Nov. 23, Mr. Johnson sent the senator a lengthy reply.

The reply stated in part that "the possibilities inherent in weather modification techniques to support military operations have been the subject of discussion for more than 20 years. For a number of these years, the Department of Defense has been conducting several modest research and development programs relating to various forms of weather modification."

In the letter, Mr. Johnson stated that research has been undertaken for "the suppression of hail and lightning (to reduce damage to military property and equipment and to increase safety of operations) and the dissipation of fog at airports and within harbors (to enhance operations of safety of aircraft and ships)."

**"RELATIVELY SIMPLE"**

The letter added that "One example of fruitful field research has been the investigation of precipitation augmentation. . . . When the proper meteorological conditions prevail (that is, when clouds capable of producing natural rain exist) it is a relatively simple matter to increase the amount of rain which will fall. The amount of increase is frequently of the order of 30 to 50 per cent."

Mr. Kearney said some scientists have told him the increase could actually be ten or 20 times that. However, he noted, a 50 per cent increase in the monsoon rains of Southeast Asia can have a tremendous impact.

Mr. Johnson's letter noted that in 1969, the Department of Defense, at the request of the Philippines, conducted a six-month rainmaking project on the Philippine Islands to relieve a drought. "The Philippine government considered the undertaking so successful that they have subsequently taken steps to acquire an independent capability," the letter added.

"I trust," the letter closed, "that the foregoing information will be helpful to you and regret the delay in responding to your inquiry."

**QUESTIONS UNANSWERED**

But the letter did not answer a single one of Senator Pell's questions.

Senator Pell sent a letter to Defense Secretary Melvin Laird on Dec. 3 stating his dissatisfaction with Mr. Johnson's letter and requesting "a written response to the specific questions."

Mr. Laird referred the letter to John S. Foster Jr., director of defense research and engineering, who sent a written reply to Senator Pell on Dec. 16.

"Certain aspects of our work in this area are classified," Mr. Foster's letter said. "Recognizing that the Congress is concerned with the question of the military application of weather modification technology, I have, at the direction of Secretary Laird, seen to it that the chairmen of the committees of Congress with primary responsibility for this department's operations have been completely informed regarding the details of all classified weather modification undertakings by the department."

**"RESPECTFULLY DECLINE"**

"However, since the information to which I refer has a definite relationship to national security and is classified as a result, I find it necessary to respectfully decline to make any further disclosures of the details of these activities at this time."

Senator Pell said he understood the letter to mean that only Sen. John Stennis, D-Miss., and Rep. F. Edward Hebert, D-La., the chairmen of the Senate and House armed services committees, had been briefed on the matter. The briefings were confidential and make

it impossible for those two legislators to discuss the matter even if they want to.

Senator Pell said he has been offered a classified briefing but has declined to accept it because it would limit his ability to ask Defense Department officials probing questions about the project at future Senate hearings and limit his freedom to speak out on the subject.

**LARGELY UNNOTICED**

When Mr. Laird appeared before the foreign relations committee in April to testify concerning renewed bombing of the North, Senator Pell and Senator Fulbright questioned him briefly on weather modification. The exchange went largely unnoticed in the press.

Senator Pell asked Mr. Laird if the United States had engaged in rainmaking activities "for military reasons in Southeast Asia."

Mr. Laird replied, "I don't discuss the operating authority that we go forward with as far as Southeast Asia specifically, but I would be glad to discuss with you the techniques that have been used outside the battle zone."

Senator Fulbright asked, "Why do you decline to discuss weather control activities in North Vietnam, yet you freely discuss B-52 flights over North Vietnam?"

After a brief exchange between Mr. Laird and Senator Fulbright, Mr. Laird said:

"We have never engaged in that type of activity over North Vietnam."

Senator Pell said last week that Mr. Laird carefully limited his response to "activity over North Vietnam." It would be expected that clouds would be seeded over Laos or Cambodia or over the Tonkin Gulf, depending on the time of year, rather than over North Vietnam, Senator Pell added.

The senator said the Defense Department has been "extremely sensitive" to questioning about weather modification and that information about it has been difficult to get.

Such an operation is easy to keep secret, because three men in a small plane are all that is needed to carry it out. Large numbers of men need not be involved, the senator said.

Senator Pell said one indication that the Pentagon is involved in weather modification over Vietnam is the United States' decision to torpedo a resolution on weather modification at the United Nations Environmental Conference in Stockholm earlier this month.

A resolution on the question required that before taking any action that might have an effect on the climate, a government should evaluate the change that could occur and disseminate its findings.

**"IT GIVES THEM AN OUT"**

The United States succeeded in amending the agreement to say that information will be disseminated "to the maximum extent feasible."

"It gives them an out. They can say that dissemination is not feasible for security reasons," Senator Pell said.

Fearful that the Pentagon's tinkering with natural phenomenon may not be limited to making rain, Senator Pell has prepared a draft of a treaty that would ban all weather and climate modification activities as weapons of war.

On March 17, he introduced a resolution in the Senate stating that it is "the sense of the Senate" that such a treaty be negotiated. Among its 14 sponsors are Senators Edward M. Kennedy of Massachusetts, George McGovern of South Dakota and Hubert H. Humphrey, Minnesota.

"When I proposed the seabed treaty (banning nuclear arms from the ocean floors), a string of ABM's along the Atlantic Ridge and creepy crawlers (tank-like weapons that would crawl along the ocean floor) were on the drawing board at the Pentagon," Senator Pell said.

**"CAN LEAD TO DISASTER"**

Weather modification is also "a weapon that can lead to disaster," he said.

If the Pentagon can make rain, is it also trying to develop ways to divert typhoons to the shores of other nations or cause earthquakes? the senator wondered.

Without a treaty banning such activities, an inland nation could melt the antarctic ice (which can be easily done by sprinkling soot on it according to scientists) and raise the level of the sea by 300 feet, he said.

Senator Pell referred to an article by Gordon J. F. McDonald, a member of the Council for Environmental Quality in the Nixon administration, which was printed in 1963 in a book titled "Unless Peace Comes."

In the article, Mr. McDonald said weather and climate modification "might be carried out covertly since nature's great irregularity permits storms, flooding, earthquakes, and tidal waves to be viewed as unusual but not unexpected."

**"OR EVEN KOREA"**

"Such a secret war will never be declared or ever known by the affected population. It could go on for years with only the security forces involved, being aware of it," the article stated.

"These are the kinds of weapons I don't want to see developed," Senator Pell said, adding that the Soviet Union is doing research on weather and climate modifications.

Senator Pell said he plans hearings on his resolution and treaty late next month or in August.

He said he expects to have "some exciting witnesses" for the hearings and hopes the hearings will "flush out" the truth concerning Pentagon weather modification activities.

**POLITICAL SPYING**

Mr. GOLDWATER. Mr. President, the whole subject of political spying is one that has intrigued me for some time. As a matter of fact, the whole pursuit has struck me as an exercise in futility from the first time it was ever brought to my attention.

In recent weeks, we have heard a great amount of inflated rhetoric about an alleged attempt to bug the telephones for an eavesdropping operation aimed at the Democratic National Committee headquarters in Washington, D.C. Quite naturally the suspected culprits in this fascinating caper were—you guessed it—the Republicans. Consequently, the Democratic Committee has brought a \$1 million suit against officials of the GOP because of some alleged connection between the caperees and the campaign to reelect President Nixon.

Mr. President, needless to say it brought back interesting memories to a man who was once his party's presidential candidate and had the experience of having his campaign train boarded by a pretty 23-year-old Democratic spy who posed as a reporter but who actually worked for the Democratic National Committee.

I might have forgotten this interesting bit of cloak-and-dagger work in my own campaign had it not been for an amusing and informative and well written editorial in the Arizona Republic of June 24, entitled "Spymasters at Work." The Republic notes that when the Democrats were caught at the game of spying, the press reacted with light feature stories which compared the Democratic ploy with the exploits of James Bond. It

comment:  
But now that the Democratic campaign sanctuary has supposedly been breached by GOP functionaries—one of them a former