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WEATHER MODIFICATION REPORTING

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HEARING

BEFORE THE

SUBCOMMITTEE ON
COMMUNICATIONS AND POWER
OF THE

COMMITTEE ON
INTERSTATE AND FOREIGN COMMERCE
HOUSE OF REPRESENTATIVES

NINETY-SECOND CONGRESS

FIRST SESSION

ON

H.R. 6893 and H.R. 9547

BILLS TO PROVIDE FOR THE REPORTING OF WEATHER
MODIFICATION ACTIVITIES TO THE
FEDERAL GOVERNMENT

JUNE 30, 1971

Serial No. 92-19

Printed for the use of the Committee on Interstate and Foreign Commerce



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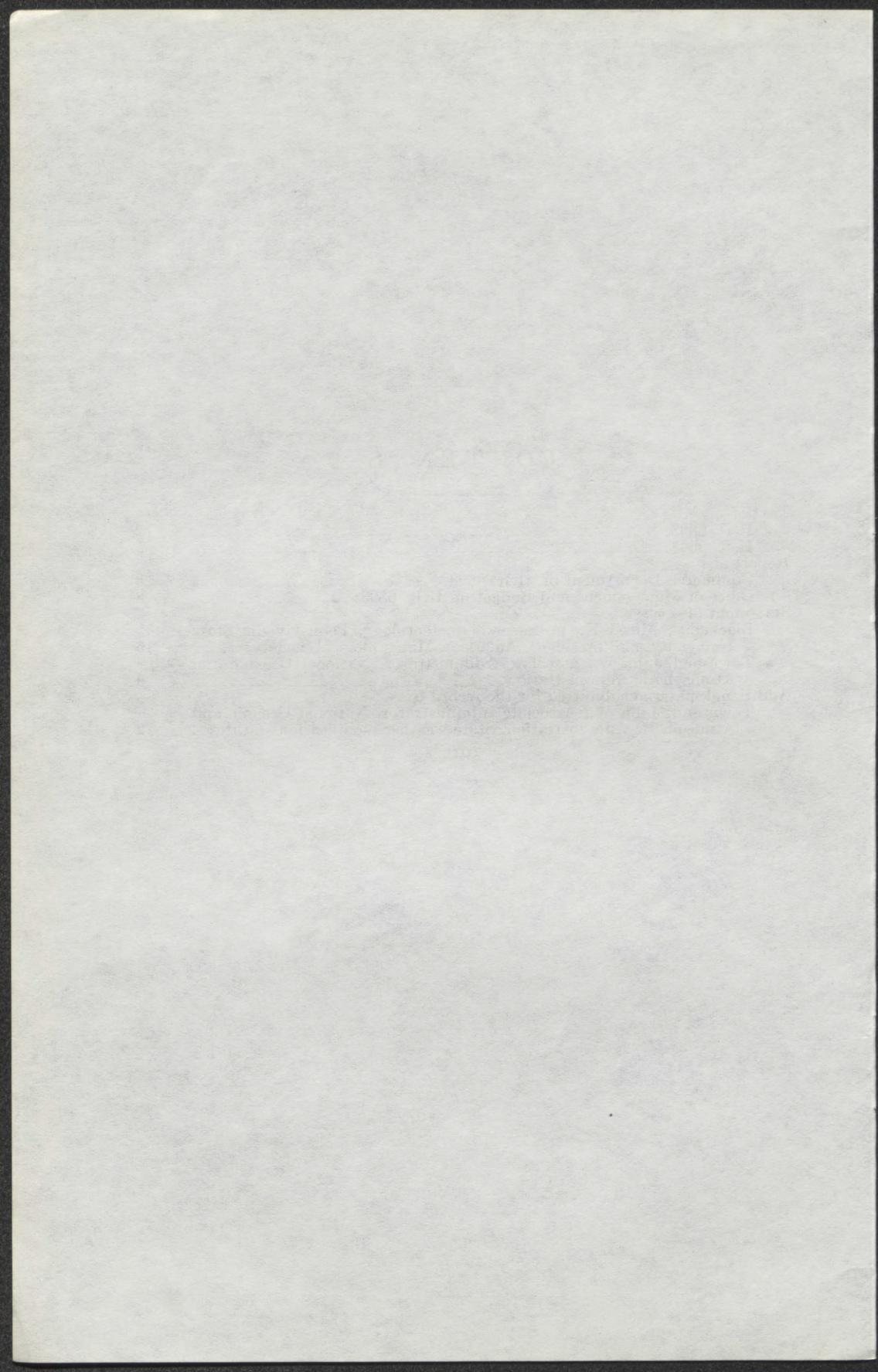
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WEATHER MODIFICATION REPORTING

WEDNESDAY, JUNE 30, 1971

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON COMMUNICATIONS AND POWER,
COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m., in room 2325, Rayburn House Office Building, Hon. Lionel Van Deerlin, presiding (Hon. Torbert H. Macdonald, chairman).

Mr. VAN DEERLIN. The hearing will come to order. The Subcommittee on Communications and Power has before it for hearing this morning H.R. 6893, a bill to provide for the reporting of weather modification activities to the Federal Government.

This legislation was introduced by the chairman and ranking minority member of the full committee at the request of the Secretary of Commerce.

From 1958 until 1968, the National Science Foundation was authorized to promote weather modifications activities and to require reports with respect to such activities from non-Federal entities. This authority was repealed by Public Law 90-407.

H.R. 6893 would vest the Secretary of Commerce with the powers and duties previously exercised by the National Science Foundation in regard to obtaining information with respect to weather modification activities.

(The text of H.R. 6893 and H.R. 9547 and departmental reports thereon follow:)

(1)

[H.R. 6893, 92d Congress, 1st sess., introduced by Mr. Staggers (for himself and Mr. Springer) on March 29, 1971]

A BILL

To provide for the reporting of weather modification activities to the Federal Government.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 SECTION 1. In order to provide for the acquisition and
4 compilation of information concerning actual or attempted
5 weather modification activities, each person, before engaging
6 in and upon completion of any form of weather modification
7 activity, including attempts, within the United States, in-
8 cluding any possession or territory thereof and the Com-
9 monwealth of Puerto Rico, shall submit to the Secretary of
10 Commerce a report at such time, in such form and contain-
11 ing such information as the Secretary may prescribe.

1 SEC. 2. As used in this Act—

2 (a) The term “person” includes any individual, cor-
3 poration, company, association, firm, partnership, society,
4 joint stock company, and any other organization, whether
5 commercial or nonprofit, including State and local govern-
6 ments and agencies thereof, who is not performing weather
7 modification activities as an employee, agent, or independent
8 contractor of the Federal Government.

9 (b) The term “weather modification” means any inten-
10 tional, artificially produced changes in the composition, be-
11 havior, or dynamics of the atmosphere.

12 (c) The term “territory” includes the insular possessions
13 of the United States and also any territory of the United
14 States.

15 SEC. 3. The Secretary of Commerce shall maintain a
16 continuous record of weather modification activities, includ-
17 ing attempts, and shall disseminate summaries periodically.

18 SEC. 4. The Secretary of Commerce may obtain from
19 any person by regulation, subpoena, or otherwise such infor-
20 mation in the form of testimony, books, records, or other
21 writings, may require the keeping and furnishing of such re-
22 ports and records, and may make such inspection of the
23 books, records, and other writings and premises or property
24 of any person as may be deemed necessary or appropriate by
25 him to carry out the provisions of this Act, but this authority

1 shall not be exercised if adequate and authoritative data are
2 available from any Federal agency. In case of contumacy by,
3 or refusal to obey a subpoena served upon any person referred
4 to in this section, the district court of the United States for
5 any district in which such person is found or resides or trans-
6 acts business, upon application by the Attorney General, shall
7 have jurisdiction to issue an order requiring such person to
8 appear and give testimony or to appear and produce docu-
9 ments, or both; and any failure to obey such order of the
10 court may be punished by such court as a contempt thereof.

11 SEC. 5. Any person who knowingly and willfully per-
12 forms any act prohibited or knowingly and willfully fails to
13 perform any act required by the provisions of this Act, or any
14 regulation issued thereunder, shall upon conviction be fined
15 not more than \$10,000.

16 SEC. 6. There is hereby authorized to be appropriated
17 such sums as may be necessary to carry out the purposes of
18 this Act.

[H.R. 9547, 92d Congress, 1st sess., introduced by Mr. Collins of Texas on
June 30, 1971]

A BILL

To provide for the reporting of weather modification activities
to the Federal Government.

1 *Be it enacted by the Senate and House of Representa*
2 *tives of the United States of America in Congress assembled,*

3 SECTION 1. In order to provide for the acquisition and
4 compilation of information concerning actual or attempted
5 weather modification activities, each person, before engaging
6 in and upon completion of any form of weather modification
7 activity, including attempts, within the United States, in-
8 cluding any possession or territory thereof and the Com-
9 monwealth of Puerto Rico, shall submit to the Secretary of

I

1 Commerce a report at such time, in such form, and contain-
2 ing such information as the Secretary may prescribe.

3 SEC. 2. As used in this Act—

4 (a) The term “person” includes any individual, cor-
5 poration, company, association, firm, partnership, society,
6 joint stock company, and any other organization, whether
7 commercial or nonprofit, including State and local govern-
8 ments and agencies thereof, who is not performing weather
9 modification activities as an employee, agent, or independent
10 contractor of the Federal Government.

11 (b) The term “weather modification” means any inten-
12 tional, artificially produced changes in the composition, be-
13 havior, or dynamics of the atmosphere.

14 (c) The term “territory” includes the insular possessions
15 of the United States and also any territory of the United
16 States.

17 SEC. 3. The Secretary of Commerce shall maintain a
18 continuous record of weather modification activities, includ-
19 ing attempts, and shall disseminate summaries periodically.

20 SEC. 4. The Secretary of Commerce may obtain from
21 any person by regulation, subpoena, or otherwise such infor-
22 mation in the form of testimony, books, records, or other
23 writings, may require the keeping and furnishing of such
24 reports and records, and may make such inspection of the
25 books, records, and other writings and premises or property

1 of any person as may be deemed necessary or appropriate by
2 him to carry out the provisions of this Act, but this authority
3 shall not be exercised if adequate and authoritative data are
4 available from any Federal agency. In case of contumacy by,
5 or refusal to obey a subpoena served upon any person referred
6 to in this section, the district court of the United States for any
7 district in which such person is found or resides or transacts
8 business, upon application by the Attorney General, shall
9 have jurisdiction to issue an order requiring such person to
10 appear and give testimony or to appear and produce docu-
11 ments, or both; and any failure to obey such order of the
12 court may be punished by such court as a contempt thereof.

13 SEC. 5. Should any person knowingly and willfully per-
14 form any act prohibited or knowingly and willfully fail to
15 perform any act required by the provisions of this Act, or any
16 regulation issued thereunder, the district court of the United
17 States for any district in which such person is found or re-
18 sides or transacts business, upon application by the Attor-
19 ney General, shall have jurisdiction to issue a restraining
20 order prohibiting such person from engaging further in any
21 weather modification activities as described herein for a period
22 not to exceed five years.

23 SEC. 6. There is hereby authorized to be appropriated
24 \$100,000 for 1972 and \$150,000 for 1973 to carry out the
25 purposes of this Act.

DEPARTMENT OF COMMERCE,
OFFICE OF THE GENERAL COUNSEL,
Washington, D.C., April 14, 1971.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce,
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: This is in reply to your request for the views of this Department concerning H.R. 6893, a bill to provide for the reporting of weather modification activities to the Federal Government. H.R. 6893 is identical to draft legislation which this Department submitted to the Congress for introduction on March 4, 1971.

For the reasons set forth in the enclosed statement of purpose and need, which accompanied our draft bill, we recommend enactment of H.R. 6893.

We have been advised by the Office of Management and Budget that there would be no objection to the submission of this letter from the standpoint of the Administration's program.

Sincerely,

WILLIAM H. LETSON,
Acting General Counsel.

Enclosure.

STATEMENT OF PURPOSE AND NEED

The purpose of this bill is to require that non-Federally sponsored weather modification activities within the U.S. be reported to the Secretary of Commerce both before and after taking place and to give the Secretary the authority and responsibility for compiling and maintaining records of weather modification activities.

Prior to September 1, 1968, the National Science Foundation had authority to compel reporting of non-Federal weather modification activities (42 U.S.C. 1872a(f)) in addition to authority to promote weather modification activities (42 U.S.C. 1862(a)(9), 1872a). A Congressional reassessment of the functions of N.S.F. resulted in enactment of P.L. 90-407 which repealed the Foundation's special authority in weather modification, including the reporting of weather modification activities. Although this authority was not reassigned to another agency, the Senate Committee on Labor and Public Welfare in its reform on the bill (Senate Report No. 1137) emphasized "the necessity for legislation to continue elsewhere in the executive branch the development and reporting activities which N.S.F. will not have authority to support after September 1, 1968." This bill will reestablish that part of the repealed N.S.F. authority which provided for the reporting of weather modification activities to the Federal Government.

This legislation is needed in order that the Federal Government may: (1) maintain a record of all weather modification activities in the United States that might affect the public welfare or might affect on-going weather modification research projects; (2) be kept aware of all releases of pollutants in the atmosphere in connection with weather modification activities; and (3) keep the public informed regarding weather modification activities.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF MANAGEMENT AND BUDGET,
Washington, D.C., April 9, 1971.

Hon. HARLEY O. STAGGERS,
Chairman, Committee on Interstate and Foreign Commerce, House of Representatives,
Rayburn House Office Building, Washington, D.C.

DEAR MR. CHAIRMAN: This is in response to your request of April 1, 1971 for the views of the Office of Management and Budget on H.R. 6893, a bill, "To provide for the reporting of weather modification activities to the Federal Government."

H.R. 6893 is identical to draft legislation transmitted to the Congress on March 4, 1971 by the Department of Commerce. We would have no objection to its enactment.

Sincerely,

WILFRED H. ROMMEL,
Assistant Director for Legislative Reference.

Mr. VAN DEERLIN. Our first witness this morning for the Department of Commerce is John W. Townsend, Jr., Associate Administrator.

STATEMENT OF JOHN W. TOWNSEND, JR., ASSOCIATE ADMINISTRATOR, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Mr. TOWNSEND. Mr. Chairman and members of the subcommittee, it is indeed a pleasure for me, as a representative of the Department of Commerce, to appear before your subcommittee today and present our views on the weather modification bill under consideration, H.R. 6893.

This bill recognizes the growing importance of weather modification throughout the Nation and the increasing need to establish and maintain an up-to-date monitoring program. Section 1 of the bill establishes the authority for requiring the reporting of weather modification activities within the United States to the Secretary of Commerce. Section 2 contains necessary definitions. Section 3 will require the Secretary of Commerce to maintain a record of weather-modification activities reported to him, and to disseminate summaries of such information periodically. Sections 4 and 5 lay the basis for enforcement of the bill, and section 6 provides for funding for carrying out the provisions of the bill.

The purpose of this bill is to require that nonfederally sponsored weather-modification activities within the United States be reported both before and after taking place, and to give the Secretary of Commerce the authority and responsibility for compiling and maintaining records of such activities.

Prior to September 1, 1968, the National Science Foundation had authority to compel these reporting activities in addition to its general authority to promote weather-modification research and development. As the result of a congressional reassessment of NSF functions, this authority was repealed. However, the Senate Committee on Labor and Public Welfare at that time emphasized the need for reporting to continue elsewhere in the executive branch. This bill will provide a renewal of the Federal Government's authority in this field.

The legislation is needed to permit the Federal Government to maintain a record of all weather-modification activities in the United States. An important effect of the bill will be to alert sponsors of Federal experiments and activities of possible contamination by other activities in adjacent areas. Such interference could lead to the complete loss of the value of expensive experiments, and could even result in the misinterpretation of the results. Reporting data would have been highly useful in the planning of the recent cloud-seeding activities in Texas which were designed to help alleviate the serious drought conditions in that State, since plans might have been varied in accordance with existing seeding projects, if known.

A knowledge of all private operations would also be necessary in the event that another national evaluation of the effects of such operations were undertaken, as was done for east coast projects by the Committee on Atmospheric Sciences of the National Academy of Sciences in 1965. For such purposes it is necessary to be certain of having all records of activity in the area of interest in order that the survey be valid.

The possibility that man's contamination of the atmosphere with pollutants may have an effect on weather and climate that could be disastrous, is receiving concerted attention. Such contamination is generally considered to be the byproduct of industry and similar activities, but the possibility exists that seeding materials released in a deliberate but largely uncontrolled manner also could be responsible for untoward alternations in weather processes. The reports obtained under the present bill would permit an overall view of the release of seeding chemicals throughout the Nation, and permit an early assessment of significant effects, if any. Although it is not at present known that such contamination will have effects on the occurrence of severe storms, this possibility must be kept in mind and included in future evaluations of the effects of large-scale seeding on weather.

As the potentialities of weather modification become clarified and operational and application becomes widespread, it will be necessary for the National Oceanic and Atmospheric Administration to take modification operations into account in preparing and issuing its weather forecasts. This may impose a requirement for daily or even hourly reporting of modification activities, a step which goes beyond the requirements of the present bill. We do not feel that a current need for such frequent reporting can be justified; however, the activities reported under the present bill will permit a watch to be maintained to see if forecasts are being adversely affected.

The reporting provided by the bill is further required in the case of projects carried out near the Canadian and Mexican borders or in such locations as to have a possible effect on the weather and climate of Canada and Mexico. Increasing attention is being given to the possibility of international complications arising from weather modification activities of various types, and it will be important to insure that non-Federal activities will not be the source of misunderstanding or friction.

From time to time, we in the Department of Commerce are asked about the presence of seeding activities by groups who are concerned that such activities are actually producing harm in surrounding areas, such as reducing the natural rainfall. We have received frequent complaints of this nature from the Tri-State Natural Weather Association, with members from Pennsylvania, West Virginia, and Maryland, which believes that the drought which persisted in each State for several years was the result of clandestine cloud seeding, either by the Federal Government or by private interests. We in NOAA carried out limited investigations in the area involved and could find no evidence of private activities. However, a firmer reply could have been given had the present bill been in effect.

Finally, I believe that passage of the bill will provide a needed basis for determining if some form of Federal regulation of weather modification will eventually be needed. It will furnish a mechanism for determining the size of the problem as it develops. It will reveal the extent to which conflicts may develop between the beneficiaries of a given project and those who may be injured. It will provide an indication of the degree to which modification activities have an interstate scope which could suggest that regulation should be a Federal responsibility.

In closing let me say that we in the Department of Commerce believe that we must press forward in seeking the advantages of weather modification. However, we must at the same time exercise a responsibility for the consequences of modification activities. As a first step in this direction, we believe that it is necessary to give visibility to the extent to which modification efforts are being carried out in the United States, and we, therefore, recommend enactment of H.R. 6893.

Mr. VAN DEERLIN. Thank you, Mr. Townsend. I take it from your testimony that you don't really believe in rainmakers?

Mr. TOWNSEND. No; that is not correct. I personally feel, and I know that my Department feels, that the weather can be modified under certain circumstances. There is no question in my mind.

Mr. VAN DEERLIN. Would it consist mainly of precipitating that which is already there, and perhaps denying it in its natural form to adjacent areas?

Mr. TOWNSEND. No, sir; that is not clear. We do feel that we can modify the weather when conditions are right. For example, it is clear that one can disperse cold fog. Under certain conditions there has been successes with warm fog. In our own Department we have an extensive program in Florida and adjacent areas of the gulf on modifying tropical cumulus clouds and we have had success. We have modeled clouds mathematically. We have predicted the results and we have validated them by experiment. However, the conditions under which this can be done are rather special.

Now, we also believe that under certain conditions one can reduce precipitation. Again the exact conditions depend upon the microphysics within the clouds and within the system. So it is possible to reduce rainfall.

Now as far as stealing the water from an adjacent area goes, I don't believe we have enough data to show one can remove a significant amount of water in a system so that downwind areas would be essentially devoid of moisture. Weather modification is still a fairly local phenomenon.

Mr. VAN DEERLIN. Have there been any sizable legal problems growing out of damage actions filed as a result of cloud seeding?

Mr. TOWNSEND. There have been a number of court actions. To the best of my knowledge, however, there has never been a major case that went against a modifier. However, I would like to point out that the way the courts are interpreting the laws in this land nowadays gives some of us a bit of concern as to what could happen in the future. Up to now has been that the burden of proof is on the man who thinks that he has been injured by such activity and he is seldom able to get expert testimony that says beyond a shadow of a doubt somebody did something and that had that effect on him.

Mr. VAN DEERLIN. There was an incident in my home county, San Diego, where the case went against the modifier because the city council refused to pay him for fear that they would be in receipt of so many suits by farmers. It had rained to beat the band. This was back in 1916.

You touched lightly on the international aspects, Mr. Townsend. Would that again turn on the assumption that there had been a possibly disastrous change in weather patterns for which a foreign country might blame us?

Mr. TOWNSEND. We are concerned that such instances could arise, that is, there could be a feeling that activities had altered their weather. That is one of the reasons we are asking for the reporting so that we can clearly say yes, the United States was engaged in activities in adjacent areas or was not, as the case might be.

From a scientific standpoint, I don't think at the present time we are capable of modifying the weather over a very large area. That statement may not hold true in the future as we obtain a technology or capability for modifying the larger systems. Then one would obviously have to show concern for the effect on neighboring countries.

Mr. VAN DEERLIN. You mentioned the absence of adequate co-operative reporting procedures in the current drought situation in Texas and the Southwest. Have there been a number of independent rainmaking efforts down there?

Mr. TOWNSEND. Well, we knew that there were people operating in that area. We were unable in a short period of time, to determine precisely who was operating, where, and in what fashion. The Texas problem this spring resulted in a rather swift action by the Federal Government to try to alleviate conditions there. We had to plan within a few days for the project and one of the immediate concerns was who is operating down there. We found by calling people that we were able to get some of the information but I do not believe we got all of it.

Mr. VAN DEERLIN. Under present law, I presume anybody can go out and set up his paraphernalia and start firing away?

Mr. TOWNSEND. It depends on the State. My understanding is that about half of the States have laws governing weather modification activities to some extent. They vary all the way from outright prohibition to essentially surveillance. About half of the States do not have any form of control, so it would depend upon the particular State the activity was in.

Mr. VAN DEERLIN. It might be helpful in compiling a complete record here—and I always hate to ask somebody to undertake an extra project—could you give us a listing of the States that do have legislation in the field and very simply what it covers? The overriding fact would seem to be that this is an area for national supervision, and not State by State. Every morning on television news we see a picture shot from outer space of the weather patterns in the United States and obviously they are not subject to State—

Mr. TOWNSEND. Any boundaries?

Mr. VAN DEERLIN. No.

Mr. TOWNSEND. Yes; we will be glad to furnish a list.

Mr. VAN DEERLIN. I would appreciate that.

(The following information was received for the record:)

STATE WEATHER MODIFICATION STATUTES¹

Arizona : Ariz. Rev. Stat. Ann. Secs. 45-2401 to -2407 (1956).

California : Cal. Water Code Secs. 400-415 (West 1956), *as amended*, (Supp. 1969) ; Cal. Water Code—App. Sec. 48-9(13) (West 1968) [authorizes weather-modification activity by Riverside County Flood Control and Water Conservation District] ; Cal. Gov't. Code Sec. 53063 (West 1966) [authorizes weather modification by political subdivisions].

Colorado : Colo. Rev. Stat. Ann. Secs. 151-1-1to -12 (1963).

Connecticut : Conn. Gen. Stat. Ann. Sec. 24-5 to -8 (1960), *as amended*, (Supp. 1969).

¹ Excerpted from "Controlling the Weather, A Study of Law and Regulatory Processes." Edited by Haward J. Taubenfeld, Dunellen Publishing Co., Inc., New York, N.Y. (1970).

Florida: Fla. Stat. Ann. Secs. 373.261-391 (1960), *as amended*, (Supp. 1969).
 Hawaii: Hawaii Rev. Stat. Sec. 174-5(8) (1968) [only authorizes investigation of weather-modification feasibility].
 Idaho: Idaho Code Ann. Secs. 22-3201 to -3202 (1968).
 Kansas: Kan. Stat. Ann. Sec. 82a-927(4) (Supp. 1968) [merely mentions atmospheric water].
 Louisiana: La. Rev. Stat. Ann. Secs. 37:2201-2208 (1964).
 Maryland: Md. Ann. Code art. 66C, Sec. 110A (Supp. 1969) [this statute expires by its terms September 1, 1971].
 Massachusetts: Mass. Ann. Laws ch. 6, Secs. 17, 72 (1966), *as amended*, (Supp. 1969).
 Minnesota: Min. Laws 1969, ch. 771.
 Montana: Mont. Rev. Codes Ann. Secs. 89-310 to -331 (Supp. 1969).
 Nebraska: Neb. Rev. Stat. Secs. 2-2401 to -2499 (1962), *as amended*, (Supp. 1967).
 Nevada: Nev. Rev. Stat. Secs. 244.190, 544.010-240 (1967).
 New Hampshire: N.H. Rev. Stat. Ann. Sec. 432.1 (1968).
 New Mexico: N.M. Stat. Ann. Secs. 75-37-1 to -15 (1968).
 New York: N.Y. Gen. Munic. Law Sec. 119-p (McKinney Supp. 1969).
 North Dakota: N.D. Cent. Code Secs. 2-07-01 to -13 (Supp. 1969); N.D. Cent. Code Sec. 58-03-07(19) (1960), *as added*, (Supp. 1969) [township expenditure].
 Oklahoma: Okla. Stat. Ann. tit. 82, Sec. 1078, n. Secs. 2(I), 2(V) (Supp. 1969) [notes atmospheric water as a natural resource].
 Oregon: Ore. Rev. Stat. Secs. 558.010-.990 (1967).
 Pennsylvania: Pa. Stat. Ann. tit. 3, Secs. 1101-18 (Supp. 1969).
 South Dakota: S.D. Comp. Laws Secs. 38-9-1 to -24 (1967); S.D. Comp. Laws Sec. 10-12-18 (Supp. 1969 [county tax levy]).
 Texas: Tex. Rev. Civ. Stat. Ann. art. 8280-12, Secs. 1-19 (Supp. 1969).
 Utah: Utah Code Ann. Secs. 73-15-1 to -2 (1968).
 Washington: Wash. Rev. Code Ann. Secs. 43.37.010-.200 (1965), *as amended*, Secs. 43.27A.080(6), .180(1) (Supp. 1969).
 West Virginia: W. Va. Code Secs. 29-2B-1 to -15 (Supp. 1969).
 Wisconsin: Wis. Stat. Ann. Sec. 195.40 (1957), *as amended*, (Supp. 1969).
 Wyoming: Wyo. Stat. Ann. Secs. 9-267 to -276 (1957) *as amended*, (Supp. 1969).

Mr. VAN DEERLIN. Is there any way of estimating, on page 3 of the bill, under section 6, what the cost might run in carrying out the terms of this bill?

Mr. TOWNSEND. Yes; we believe that initially we could start with a professional and a secretary. As activity increases we feel that a sum approximating \$300,000 a year might be required in this area.

Mr. VAN DEERLIN. Would it be your idea that eventually this structure might have some authority in the field other than merely compiling reports and keeping track of who is doing what?

Mr. TOWNSEND. Yes, sir; the executive branch now has under consideration legislation that goes beyond this bill. We are not in a position to detail this now but we have going on within the Interdepartmental Committee on Atmospheric Science a review of needed legislation and the drafting for review by the various agencies and OMB of proposed legislation.

Mr. VAN DEERLIN. Is enough yet known to proceed? Are we talking about the next year or two that such proposals are coming up, or are you wanting to take a longer look?

Mr. TOWNSEND. I think it is a bit premature to guess how this is going to come out. We have an active group in the area right now. The committee has met. I have been there on this subject, I think, three times now. I don't think there is yet unanimous agreement as to what form legislation should take, but we are all concerned that we have a problem here.

The reporting aspect of it, though, is absolutely vital. We found that those reports were very useful. When they ceased to become available, right away we ran into problems. I ran into them personally with the tristate group in Maryland, Pennsylvania, and West Virginia. I couldn't absolutely swear that somebody wasn't operating in that area. We were very certain that they weren't, but we had no basis to make a complete and positive statement. We sent some people from the Weather Service in a small plane up into those areas examining aircraft at local airports to make sure there weren't people seeding there. We did everything we could, and it cost us a fair bit more than a reporting process would have cost, but those farmers were very upset in the tristate area.

Mr. VAN DEERLIN. There could still be clandestine operations even under reporting procedures?

Mr. TOWNSEND. I guess it is always possible to break the law. However, this kind of seeding is usually done by aircraft. The aircraft has to have seeding gear on it, an acetone burner or some means of dispensing the seeding agent.

Mr. VAN DEERLIN. Something like dry ice that they put on?

Mr. TOWNSEND. That would take a dispenser. Although seeders use dry ice, most weather modification nowadays is done with silver iodide, either generated on the ground by burners, under certain conditions, such as upwind of a mountain, or dispensed by aircraft, either by acetone burners or by the dropping of flares that contain silver iodide.

Mr. VAN DEERLIN. Mr. Rooney.

Mr. ROONEY. I regret very much I was unable to be here for your testimony. However, I have no questions.

Mr. VAN DEERLIN. The question has been raised, Mr. Townsend, about the reporting by other Federal agencies. It has to be assumed, does it not, that governmental agencies would be expected to report any activities they are undertaking in this regard?

Mr. TOWNSEND. Sir, it is not explicit in this draft legislation. Our feeling is that the Federal agencies now active in this area are reporting through the mechanism of the environmental impact statements that are being currently filed for almost every project that has the potential for altering the environment. However, I do not believe there would be any objection to including the Federal Government. The bill requires reporting on weather-modification activities within the United States, and on that basis I don't believe there would be a problem.

Mr. VAN DEERLIN. It seems to me that you have a great blank area in the procedures if it did not cover other Federal agencies and departments.

Mr. COLLINS, from drought-stricken Texas.

Mr. COLLINS. I was sorry I didn't get to hear the discussion on that. Could you give me a little background on what happens when we get into seeding to solve drought?

Mr. TOWNSEND. As you probably know, we made an effort late this spring to help out certain parts of Texas which are very badly damaged by drought. It is an extremely severe drought. The Federal agencies did get together under the Office of Emergency Preparedness to see what could be done. We worked against the clock day and

night for about a week, and a determination was made that the Bureau of Reclamation—which is already operating in that area—would increase its operations and try to help.

I made the comment earlier that, during our planning in NOAA, we immediately realized we didn't know what, if any, commercial seeding activities were taking place down in Texas, and this caused us some problems. We resorted to the telephone to call some of the better known firms and tried to find out via the grapevine what was going on down there, without regard to Federal activity.

The Federal agencies have worked very closely together on weather modification, primarily through the mechanism of the Interdepartmental Committee on Atmospheric Science, and in general we are well aware of what other agencies are doing in weather modification, but we are not aware of private activities taking place.

Mr. COLLINS. Do you consider these private seeding projects? Do you have any way of measuring whether or not they are successful?

Mr. TOWNSEND. Some of them are very well handled and are done on a scientific basis. I suspect there are some that are not so well done. It would depend upon the quality of the individual or the firm involved. It would depend to a certain extent on how much money they had. I would say an honest answer to that question would be that it varies.

Mr. COLLINS. You judge them by their past record of performance?

Mr. TOWNSEND. It is not very easy to judge on past record because most of the private operations take place necessarily in a somewhat uncontrolled fashion. That is, they do not have networks of rain gages on the ground or calibrated radars or other means of determining exactly how much water was precipitated due to the seeding vis-a-vis that that occurred naturally. By and large, they don't possess the capability for running what we call a controlled experiment. They are not in that business. They are in the business to try to make rain.

Mr. COLLINS. Are you for H.R. 6893 completely, as the bill is now written?

Mr. TOWNSEND. Yes, sir.

Mr. COLLINS. Unequivocally?

Mr. TOWNSEND. Yes. This is an administration bill. It has been staffed, and it is my understanding that there is no objection to it on the part of any of the other Federal agencies.

Mr. COLLINS. I think there is a little pride of authorship here.

Mr. TOWNSEND. No, sir; not on my personal part. It is very similar to legislation that has been introduced before.

Mr. COLLINS. What happened to it before?

Mr. VAN DEERLIN. Better a member of the committee shouldn't ask that question.

Mr. TOWNSEND. Weather-modification bills have a habit of dying on the vine for one reason or another.

Mr. VAN DEERLIN. We will try to do better this time.

Mr. TOWNSEND. I would appreciate that, sir.

Mr. VAN DEERLIN. Thank you very much for your testimony.

Mr. TOWNSEND. Thank you.

Mr. VAN DEERLIN. The next witness is Dr. Alfred K. Blackadar, president of the American Meteorological Society, chairman of the Department of Meteorology at Pennsylvania State University, in the great Commonwealth of Pennsylvania.

STATEMENT OF ALFRED K. BLACKADAR, PROFESSOR OF METEOROLOGY, PENNSYLVANIA STATE UNIVERSITY, AND PRESIDENT AMERICAN METEOROLOGICAL SOCIETY

Mr. BLACKADAR. Mr. Chairman and members of the subcommittee, weather modification research and operations in the United States are now being conducted on such a scale and under such freedom from control and regulation that it is a matter of great importance to our Nation that systematic information on these activities be compiled and published. In order that such information can be complete it is necessary that Federal legislation requiring the reporting of such activities be enacted.

All of the present weather modification activities must be regarded as experimental in nature. Some activities are undertaken entirely for research purposes while others are being engaged in commercially. The development of more effective techniques and the evaluation of the effectiveness of present techniques require the documentation of all activities that might have consequences for significantly changing the state of the atmosphere.

At the present time it is not known to what extent weather modification activities are being conducted within the United States. In many States anybody who desires to do so, for any reason, can seed clouds with no legal restrictions whatsoever. The materials used are relatively inexpensive and simple to release. We know that such activities are being conducted in a scientifically responsible manner by various agencies of the Federal Government and also by a number of privately owned and conducted enterprises. There is, however, at present no systematic mechanism for reporting or compiling information on the specific nature of the activities they are conducting. There are also reports that some weather modification operations are being conducted by unknown parties. We know nothing concerning the extent of such operations, the nature of the methods being attempted, or the specific time and place of the operations.

The testing and evaluation of cloud seeding methods are done by conducting a series of applications on a random basis within a prescribed target area. Before a corrective evaluation of such experiments is possible it must be known which areas and/or which days are seeded as well as those that are not seeded. The presence of unknown cloud seeding in the target area or in neighboring regions could lead to incorrect conclusions and resulting waste of public and private funds.

Much of the success meteorologists hope to achieve in the future development of weather modification methods depends on our ability to gather scientific measurements on the natural physical characteristics of clouds. As more scientific measurements of cloud characteristics and processes are undertaken, it becomes essential that we be able to separate the situations that represent natural conditions from those that have been created by artificial influences. It is impossible to do this effectively without a system for reporting of all weather modification activities.

It is true that certain industrial activities are suspected of producing direct or indirect effects that modify the distributions of fogs, clouds, or precipitation. Because these effects are not intentional, and because the effects cannot generally be documented, they would not be reported

under this act. Such activities are generally fixed in their location and follow a known time pattern. It is therefore feasible to monitor their effects. On the other hand, intentional modification attempts tend to be sporadic in space and time, and information about such activities cannot generally be collected from anyone other than the person conducting the operation. For this reason I feel that the proposed legislation is necessary.

In my opinion the wording is unnecessarily all-inclusive in its definition of the term "weather modification." Such commonly practiced measures as the erection of snowfences along highways, planting of trees to form windrows, the building of covered ballparks, all represent intentional and effective artificial modifications of the dynamics of the atmosphere. Inclusion of such activities is unnecessary for purposes of this legislation and might lead to litigations of a nuisance nature.

The wording of the resolution is such that the Federal Government, its agencies, and its contractors would be excluded from the requirements of the act. It should be clear, from what I have said, that the important purposes to be served by this legislation will not be realized unless all weather modification activities are required to be reported without regard to who performs them. The proposed act needs to be rewritten in such a way as to make it clear that no one is excluded.

Mr. VAN DEERLIN. Your last paragraph, Mr. Blackadar, refers to the suggestion that Government agencies of all types—the Defense Department and everyone—be included specifically in the coverage; is that right?

Mr. BLACKADAR. I feel this is important; yes, sir.

Mr. VAN DEERLIN. Don't you think you are being unnecessarily nervous about bringing in the Houston Astrodome and farmers who put up snowfences?

Mr. BLACKADAR. Well, these are certainly extreme——

Mr. VAN DEERLIN. What you are referring to is paragraph (b) under section 2 on page 2 which says the term "weather modification" means any intentional artificially produced changes in the composition, behavior, or dynamics of the atmosphere.

Mr. BLACKADAR. Yes, sir; there are extreme and perhaps absurd illustrations but between these extreme cases and the obvious ones it seems to me there lies a domain of less clear situations.

For example, people have intentionally covered certain lakes with monomolecular layers of certain materials to reduce evaporation. This is the type of environmental modification which does have effects on the atmosphere and it is intentional.

Mr. VAN DEERLIN. Do you think it would be helpful to put in the word "ambient," meaning covers an area or region, moving around; doesn't it? What does ambient mean? We use it in the Clean Air Act.

Mr. ROONEY. All inclusive.

Mr. VAN DEERLIN. It means, doesn't it, covering, effecting more than one place?

Mr. BLACKADAR. Well——

Mr. VAN DEERLIN. Could you suggest that should be inserted in this paragraph?

Mr. BLACKADAR. I was afraid you would ask me that. Well, this might be done by a little amplification of types of activities that could

be excluded or scale of activities that might be excluded.

Mr. VAN DEERLIN. Counsel points out that we provide criminal penalties here for anyone failing to comply with the legislation, and so we do have to be rather specific in whom we are covering.

Mr. BLACKADAR. I recognize that it is probably unwise to be overly specific because we cannot anticipate all of the types of activity that may from time to time be attempted.

Mr. VAN DEERLIN. I would hate to think an orchardist, who put up a row of eucalyptus trees, to protect against wind damage, would conceivably come under this kind of legislation.

Mr. Rooney, do you have any questions?

Mr. ROONEY. Dr. Blackadar, what has the American Meteorological Society done? Do they conduct experiments in this field?

Mr. BLACKADAR. No, sir; we are a society of scientists. Our aims are to promote the science of meteorology and we provide services to our members and to the profession. But we do not engage in scientific research activities ourselves.

Mr. ROONEY. Does the Pennsylvania State University have any such program?

Mr. BLACKADAR. We have a modest program in cloud physics. We are not at the moment doing any field work. We have in previous years conducted experiments in the neighborhood of Lake Erie in cooperation with what was then the Environmental Science Services Administration.

Mr. ROONEY. You haven't been very successful in Lake Erie?

Mr. BLACKADAR. The problem was that the kind of weather situations that we thought we could do something about didn't occur in the years we were trying to work there. So, scientifically, it was an unproductive operation.

We have also done some experiments in Arizona and in the Virgin Islands. But as you are aware, I think, we are not allowed to do this in our home State.

Mr. ROONEY. Because of the State laws?

Mr. BLACKADAR. Because of the State laws.

Mr. ROONEY. Does Pennsylvania receive any money from the Federal Government?

Mr. BLACKADAR. We are supported by a grant from the National Science Foundation for studies of cloud physics.

Mr. ROONEY. On page 2 of your statement you mention that there are also reports that some weather modification operations are being conducted by unknown parties. Who are the unknown parties?

Mr. BLACKADAR. Well, if we knew who they were they wouldn't be unknown.

Mr. ROONEY. How do you assume that they are unknown parties undertaking such experiments?

Mr. BLACKADAR. I have heard reports of the sort that, and this might just be hearsay, that some quack—that is a name one often gives to someone you don't know—has a contract with some city to modify precipitation and this could very well be. But there is very little way one can substantiate such reports because there is no requirement for reporting.

Mr. ROONEY. Thank you very much.

Mr. VAN DEERLIN. Mr. Collins?

Mr. COLLINS. Doctor, on this bill our chairman here raised a question about your suggestions here, about the terminology being rather broad. Specifically what did you have in mind as to how it could be clarified? I am not a lawyer myself and I don't know how to get into these things, but making out reports, I agree with you we ought to make it as simple as we can to avoid any confusion, but we can't hardly just write a law like don't snow fence along the highways, you don't know how to take care of all of the little odd exceptions.

Mr. BLACKADAR. Perhaps one way of doing this is to make a specific exclusion of those activities which can be demonstrated to have purely very local effect. This would, I think, take care of a great many of these borderline situations.

Mr. COLLINS. You mean if you get up in the air—is our real objective here to take weather testing of different types above the ground, say, 100 feet or more above the ground? Is that your understanding? The only weather testing on the ground in some way to check the rain?

Mr. BLACKADAR. I did not participate in writing the legislation and I am not sure myself what all of the purposes of the legislation are. From the scientific point of view I think it is important that we know specifically what agents are being put into the atmosphere that might interact with clouds, interact with experiments that are being conducted in various areas. But one cannot exclude the ground from this because many of the attempts that are being undertaken to modify the weather are done with ground-based generators.

Mr. COLLINS. They use the term atmosphere and I am no authority on terminology, "The term 'weather modification' means any intentional, artificially produced changes in the composition, behavior, or dynamics of the atmosphere."

If I could ask counsel, is that word "atmosphere" defined here?

Mr. GUTHRIE. No, sir; it is not.

Mr. COLLINS. How do you understand atmosphere?

Mr. BLACKADAR. The atmosphere is one of three major domains of the earth and is the gaseous part of our earth in which we all live. In my view it includes the air in this room but perhaps this is not the way it is most commonly used.

Mr. COLLINS. Anything that is not solid almost is atmosphere.

Mr. BLACKADAR. Solid or liquid.

Mr. COLLINS. Solid liquid atmosphere.

Mr. BLACKADAR. Solid earth, the oceans and the atmosphere, in my way of looking at it.

Mr. COLLINS. That is pretty broad.

Thank you, Mr. Chairman.

Mr. VAN DEERLIN. I just think maybe if we can find out somebody who knows what ambient means we can throw that in.

Mr. TOWNSEND. Natural state.

Mr. VAN DEERLIN. Well, maybe it won't be much help then.

Mr. BYRON.

Mr. BYRON. Are any of the States regulating weather modification to your knowledge?

Mr. BLACKADAR. Dr. Townsend commented on this in his testimony and I think he probably has much better information on this than I have. I know that the State of Pennsylvania has laws which effectively prohibit any weather modification in Pennsylvania, and I understand that West Virginia has passed similar legislation.

Dr. Townsend said that according to the information he had about half of the States have some kind of regulation of weather modification.

Mr. BYRON. Thank you.

Mr. VAN DEERLIN. Well, thank you very much, Mr. Blackadar, for contributing to our knowledge on this subject in preparation of the legislation at hand, and I do hope we will manage to get a bill out this year and get it enacted.

If there is no further evidence to be offered by anyone in support of or in opposition to this proposed legislation—

Mr. ROONEY. In closing I would like to say that the Commonwealth of Pennsylvania has added greatly to this meeting of the Subcommittee on Communications and Power by your presence here today.

Mr. VAN DEERLIN. By Mr. Blackadar's presence. The hearing is adjourned.

(Whereupon, at 10:50 a.m., the hearing was adjourned.)

