

HAIL SUPPRESSION - BACKGROUND MEMORANDUM

INTRODUCTION

House Concurrent Resolution No. 3043 directs the Legislative Council to study the feasibility and desirability of implementing hail suppression programs for the reduction of property damage in urban and rural areas and funding the programs through property and casualty line insurance premium taxes. A copy of House Concurrent Resolution No. 3043 is attached as Appendix "A".

NEIGHBORING STATES AND PROVINCE

In Alberta, Canada, insurance companies and brokers established the Alberta Severe Weather Management Society to administer a cloud seeding program. This program is for rural and urban areas. The society is private and not for profit. A copy of the society's brochure is attached as Appendix "B".

South Dakota Codified Laws Chapter 46-3A creates the South Dakota Water Management Board, which may perform hail suppression operations.

Montana Statutes Chapter 85-3 authorizes the Montana Department of Natural Resources and Conservation to perform hail suppression operations.

Although the Montana and South Dakota weather modification law was patterned on North Dakota weather modification law, neither state is active in weather modification. The Alberta project is the only known project addressing urban and rural hail suppression.

HAIL SUPPRESSION Background

The North Dakota Cloud Modification Project Operations Manual, published by the State Water Commission's Atmospheric Resource Board, describes operational cloud seeding in North Dakota as beginning in the 1950s when ground-based seeding began in the western portion of the state. In 1975 the North Dakota Weather Modification Board was created as a division of the Aeronautics Commission. State cost-sharing was made available in 1976. The six counties currently participating in the project are Ward, Mountrail, McKenzie, Hettinger, Slope, and Bowman. The two purposes of the program are to suppress hail and to enhance rainfall.

The article "An Exploratory Analysis of Crop Hail Insurance Data for Evidence of Cloud Seeding Effects in North Dakota" in the May 1997 issue of the *Journal of Applied Meteorology* refers to studies of the

climatology of hail damage to crops which show North Dakota experiences the highest insurance dollar loss of any state in the United States and southwestern North Dakota has the highest ratio of damage claims paid to insured crop liability. The reduction in hail crop insurance loss ratios in the six program counties is estimated to be 45 percent. Specific statistics are not available for hail damage to property other than crops because most insurance companies do not classify property and casualty claims for hail-only damage.

North Dakota

North Dakota Atmospheric Resource Board

North Dakota Century Code (NDCC) Chapter 61-04.1 relates to weather modification. Section 61-04.1-08 creates the North Dakota Atmospheric Resource Board as a division of the State Water Commission. Hail suppression falls within the definition of weather modification. The board may contract with any person, the federal government, or any county or group of counties to provide weather modification operations. Additionally, Section 58-03-07 authorizes township electors to use township funds for weather modification activities. Although the board has discretion in what it charges counties for providing weather modification services, the mill levy tax funds appropriated to the state weather modification fund by a county may not exceed seven mills upon the taxable valuation of property in the county. This mill levy may be levied in excess of the mill levy limit fixed by law for taxes for general county purposes.

Insurance Premium Taxes

North Dakota Century Code Section 26.1-03-17 provides a premium tax of two percent must be paid for life insurance, 1.75 percent for accident and health insurance, and 1.75 percent for all other lines of insurance. This money is deposited in the insurance tax distribution fund in an amount not to exceed one-half of the biennial amount appropriated for distribution by the Commissioner of Insurance.

North Dakota Century Code Chapter 18-04 provides for the distribution of a portion of the insurance premium tax to fire departments and fire districts. The amount appropriated to the insurance tax distribution fund for insurance tax payments to fire departments for the 1997-98 biennium is \$5.2 million, the same amount as was appropriated

for the 1995-96 biennium. The tax premium for fire departments has been a topic of discussion over the years. Section 8 of House Bill No. 1010 (1997) requires the Commissioner of Insurance to analyze fire district payments distributed during 1996, 1997, and 1998 and report to the Budget Section in December 1998. This report is funded with a \$25,000 appropriation and requires the commissioner to also report the actions taken to stabilize the distribution of funds to each fire district.

STUDY APPROACH

This study can be broken down into two main issues. The first issue is whether a hail suppression program to reduce property damages is desired and, if so, if it is desired statewide. Implementation of a hail suppression program could be statewide, the western portion of the state, or through pilot projects. The logistics of cloud seeding is technical in nature, and there are a variety of resources to rely on to

gather this information. Information regarding the amount of damage caused by hail in urban areas may be difficult to gather. Legislative action may be required to create this pool of data within the state insurance industry.

The second issue is if cloud seeding is determined by the committee to be a desired program, whether an appropriate funding source can be established. If an insurance premium tax is established, factors to consider include the cost of administering the program, how to deal with fluctuations in the amount of insurance premium tax moneys, and the impact an additional premium tax will have on the insurance industry within the state. Although the study resolution addresses funding the program through property and casualty line insurance premium taxes, the committee may want to consider whether other funding sources are available.

ATTACH:2

Fifty-fifth Legislative Assembly, State of North Dakota, begun in the Capitol in the City of Bismarck, on Monday, the sixth day of January, one thousand nine hundred and ninety-seven

HOUSE CONCURRENT RESOLUTION NO. 3043
(Representatives Wald, Carlson, Gerntholz, Keiser, Tollefson)

A concurrent resolution directing the Legislative Council to study the feasibility and desirability of implementing hail suppression programs for the reduction of property damage in urban and rural areas and funding the programs through property and casualty line insurance premium taxes.

WHEREAS, county-sponsored summertime cloud seeding operations to mitigate hail damage have been conducted in North Dakota since the 1960s; and

WHEREAS, evaluations show strong evidence of the benefits within cloud seeding target areas, including 45 percent reductions in crop hail damage and six percent increases in wheat production; and

WHEREAS, the technology developed through combined research and operational efforts in this state has been and continues to be successfully applied and developed by a native North Dakota company in numerous other projects elsewhere in other states, provinces, and countries; and

WHEREAS, the domestic property and casualty insurance industry of Alberta, Canada, has joined with a native North Dakota company in funding and implementing a five-year pilot program for the suppression of property and casualty hail damage within major metropolitan target areas, including the cities of Calgary and Red Deer; and

WHEREAS, the domestic property and casualty insurance industry of this state has suffered considerable hail losses in recent years attributable to urban hailstorms in Bismarck, Grand Forks, and Minot, and as a result some insurance companies are withdrawing from the North Dakota market; and

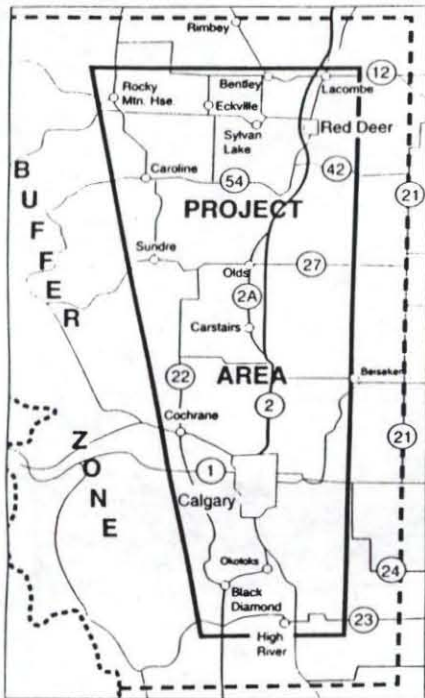
WHEREAS, if hail continues to strike larger urban areas, it is likely additional insurance companies will withdraw from the North Dakota market and premiums and deductibles will continue to increase;

NOW, THEREFORE, BE IT RESOLVED BY THE HOUSE OF REPRESENTATIVES OF NORTH DAKOTA, THE SENATE CONCURRING THEREIN:

That the Legislative Council study the feasibility desirability of implementing hail suppression programs for the reduction of property damage in urban and rural areas and funding the programs through property and casualty line insurance premium taxes; and

BE IT FURTHER RESOLVED, that the Legislative Council report its findings and recommendations, together with any legislation required to implement the recommendations, to the Fifty-sixth Legislative Assembly.

Filed March 28, 1997



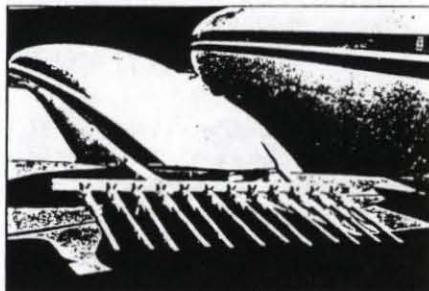
Project Area

Canada's Costliest Weather Disasters
(in millions of dollars)

Hail, Calgary	1991	\$342.7
Tornado + Hail, Edmonton	1987	\$148.3
Hail, Calgary	1981	\$125.0
Tornado + Hail, Medicine Hat	1988	\$ 50.0
Hail, Calgary	1988	\$ 37.1
Wind, Southern Ontario	1992	\$ 36.2
Red Deer	1991	\$28.2
Tornado + Hail, Sarnia	1991	\$ 25.4
Hail, Calgary	1992	\$ 22.0
Storm, Ontario, Que., N.S.	1993	\$ 18.4
Hail, Calgary	1980	\$ 16.3

Environmental impacts?

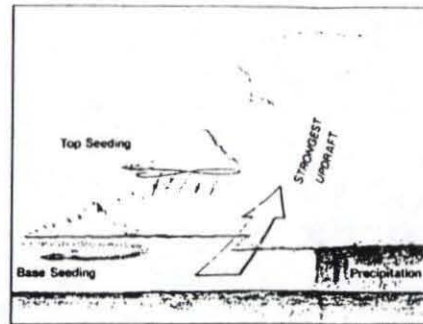
Seeding hailstorms does not present any environmental or health hazards. Silver iodide salt is not a toxic or hazardous material. Silver occurs naturally in Canadian soils and many foods. It is also found in our water supplies in very low concentrations. The amount of silver iodide used when seeding clouds is very small relative to the large quantities of water in the storm. Average seeding rates are about 10 grams per minute. This is equivalent to putting a spoonful of material over Niagara Falls per minute. Rain samples collected from seeded storms were found



Wing Flares

to contain levels of silver similar to most surface and tap water supplies, and much less silver than in a cup of water that has been stirred with a silver teaspoon!

Cloud seeding has no known adverse effects. All precipitation in Alberta results from ice crystals and snowflakes which grow in the upper parts of clouds and melt on their way down. Seeding with silver-iodide causes ice to form lower in



Cloud Seeding Logistics

the cloud where hail starts, rather than in the upper part of the cloud. While these changes have little effect on the overall energetics of the storm, they may help to reduce the high precipitation intensities by causing some spreading of the intense storm core. Some projects have found a small overall increase in rain from hail suppression seeding.

Who benefits?

Controlling insurance company losses will help to stabilize insurance rates throughout the province. The insurance industry believes that a hail suppression program makes good economic sense in Alberta.

For further information, contact:

Alberta Severe Weather Management Society
600, 708 - 11 Avenue, S.W.
Calgary, Alberta T2R 0E4

or call:

Jim Renick, Project Director
Ph. 403-347-1545
Fax 403-340-1340

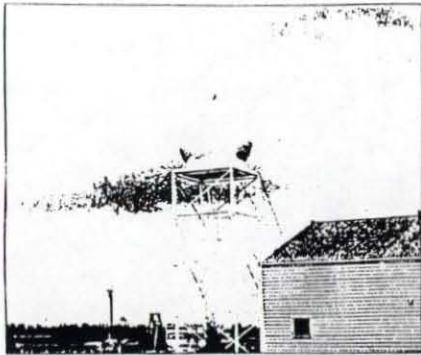
Alberta Severe Weather Management Society

Suppressing
Hailstorm
Damage

Is there a need?

Yes! Canada's most costly natural disaster occurred in Calgary on September 1991. A severe hailstorm struck the city causing \$342 million in damage to home owners, businesses and automobiles. Another 40 major hailstorms rumble through the province every summer. Over the past decade, these hailstorms have caused \$1 billion damage in Alberta!

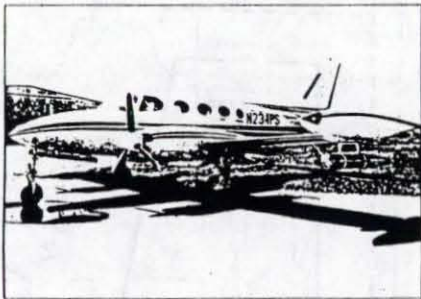
After years of innovative work in the insurance industry, the Alberta Severe Weather Management Society will reduce hailstorms with silver iodide to reduce property damage from hail.



Project Radar

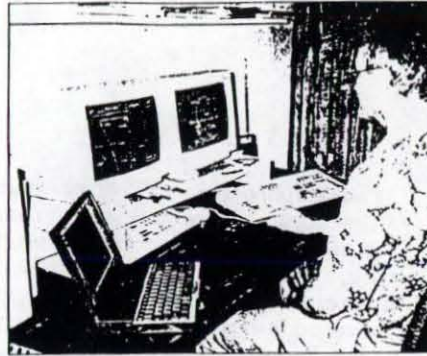
Action?

Following the disastrous Calgary storm, the insurance industry began taking a serious look at reducing losses due to hail damage. An investigative committee was established to look into the possibility of suppressing hail to mitigate property damage. The committee found that hail suppression programs have operated successfully and continue in numerous countries around the world. They pro-



Cloud Seeding Aircraft

posed a hail suppression program to reduce property damage in the primary hail corridors of the province. The program is fully funded by the automobile and property insurers and brokers in Alberta.



Operations Control Centre

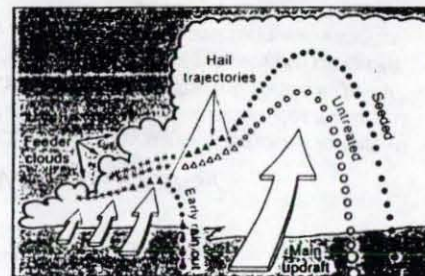
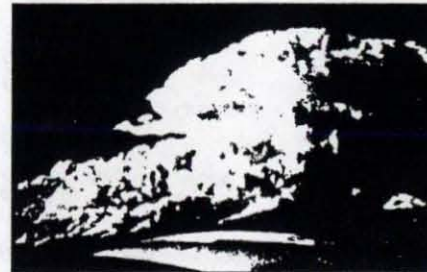
Who are we?

The Alberta Severe Weather Management Society is a private, non-profit society established by the insurance companies and brokers to administer the cloud seeding program. The director is the former manager of the Alberta Research Council's hail program. The cloud seeding operations are performed under contract by Weather Modification Canada Ltd.

How does it work?

Hail suppression works by seeding thunderstorms with billions of silver iodide smoke particles. These special particles act as artificial ice crystals to freeze up the

supercooled (colder than 0°C) water drops in the storm's updraft. In hailstorms, rapid formation of cloud water occurs in the lower part of the cloud exceeding the rate of natural ice crystal growth, resulting in an environment ripe for hail growth. The billions of ice crystals, formed from seeding, freeze this supercooled water causing the storm to produce smaller hailstones, rather than the "bruisers" that smash windows, dent cars, and wreck roofs and siding.



Hail Suppression Model

Is hail eliminated?

No, cloud seeding does not eliminate hail. But, it does reduce the size of the larger hailstones which results in less damage.

What area is protected?

Hailstorms are seeded as they develop along the foothills from west of High River to Rocky Mountain House. The seeding aircraft follow the stronger storms as they move off the foothills and threaten communities. Priority is assigned to storms depending upon their severity and the size of the community.

What are seeding aircraft?

Cloud seeding aircraft are twin-engine performance aircraft equipped to disperse cloud seeding materials. Three seeding aircraft are engaged in the project; two stationed in Calgary and one in Red Deer. They are ready for immediate launch to seed storms at any time from June 15 to September 15. They are difficult to see during the day as they fly at 15,000 to 20,000 feet above the cloud towers to seed their tops. They may occasionally be seen flying back and forth in the storm updraft when they are seeding at cloud base.

Hailstorms and cloud seeding aircraft are tracked continuously by radar and satellite from the project operations centre at the Olds-Didsbury airport.

Five-year test program!

The hail suppression project begins in () and operates from June 15 to September 15 each summer for the next 5 years. The success of the project will be determined by the change in insurance payouts for hail damage