

## What Weather Modification Needs: An Insurance Perspective

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### ABSTRACT

Individuals and businesses use insurance as one important means of dealing with uncertainty. While the insurance industry does not require the elimination of risk, for insurance to be affordable and available it must take into account all the elements affecting risk. Underwriters must perceive the satisfaction of certain minimum needs if insurance is to function in circumstances of or affected by weather modification.

### 1. Introduction

The crop insurance industry is concerned with effects of weather on crop production; it will therefore be affected by hail suppression and by precipitation enhancement kinds of weather modification. The property insurance segment will also to some similar degree be affected by such weather modification activities as hurricane abatement, flood control or temperature alteration.

Insurance is an economic mechanism conceived to moderate the effects of the fortuitous and the extremes of variability, by spreading to many over time the shocks incurred by a few. The delivery device is the organized insurance industry, which functions to assume collective risk by individual contract, for a consideration calculated prospectively to be sufficient for the aggregate indemnification. Companies build reserves and surplus, minimums of which are the responsibility of regulatory bodies against the catastrophes which may occur, the error of anticipation which may be committed, and the introduction of new/novel elements affecting risk. But there are outer limits of the financial capability of the system to absorb and survive the extreme catastrophic events.

The insurance industry will therefore be keenly interested in the possibilities of effective weather modification, not as a threat to its role in our economic society but in two major respects affecting risk bearing: first, the actuary and the underwriter are always concerned that they have taken into account all the elements affecting risk, as they determine the acceptability and the cost of risk offering, and they abhor unknowns; second, the same professionals are delighted with the prospect that preventive or moderative action may be part of the consideration for risk bearing.

But while anything that promises to confine the extremes of nature is a positive good, the concern

about unknowns poses a considerable problem to the mechanism of insurance. This can perhaps be best understood if one perceives such problems as confronting a capitalistic enterprise system without the service of insurance, the development and advance of which necessitated the invention of insurance as a means to some degree of hedging or delimiting economic risk. Insurance is but the handmaiden of capitalism.

With this understanding it will be seen that an insurer needs from weather modification, first and foremost, an advanced degree of certainty and predictability. This is not the same as public acceptance: much is publicly accepted that fails all tests of certainty or predictability.

The propositional, research, experimental, operational and evaluative history of weather modification, even the present status of those spheres of activity, provide little comfort to the laymen, stakeholders and risk bearers who stand greatly in this general need. Here we seek to state more explicitly this and major derivative specifics as answer from an insurance viewpoint to the question, "What does weather modification need?"

### 2. Weather modification needs

a. First and foremost, there is need of a definitive and coherent declaration of the extent to which (technologically) weather can be modified. This should spell out the weather events which can be influenced under what conditions, with a range of results which can reasonably be expected. In the absence of evidence of an empirical nature there should obtain at least a qualified consensus of the scientific community.

b. The second most critical need is for evaluation of experimental and commercial projects. We need something more than is yet realized from statistical

analysis, in three respects:

(i) A prediction capability with which the commercial operator (and his clientele) or the experimenter might anticipate, for example, the natural hail regime for the period of suppression application. Then, results of suppression applications could be measured against predicted and historical weather, in addition to the analyses pertinent to the usual randomization.

(ii) In the use of historical data (e.g., crop-hail insurance statistics) a caution for normal variation. I submit that claims for hail suppression effectiveness should be in terms of departure from long-time mean annual loss cost greater than one standard deviation (if not two). It is not sufficient to compare a recent period with the suppression regime.

(iii) As a condition of license or permit it should be required of every commercial modification project that a standard evaluation of results be performed; which means that also there should be a standard evaluation procedure.

There follows a need for improved understanding of what insurance statistics are and the limitations on application to evaluation analyses. As a contribution toward resolving this matter, the Crop-Hail Insurance Actuarial Association is about to publish a treatise on available crop-hail insurance statistics with interpretations and general information which may suggest guidelines for using such data.

c. The third most critical need is organized assessment before commitment of funds to experimental and operational projects. The TASH<sup>1</sup> study was at least 10 years late. It seems elementary that we should consider whether a technology is worth doing and whether there may be preferred alternatives.

d. We should rarely use the term "weather modification" without the qualifying language, "an event introduced into a localized weather system which can be withdrawn and its effects (if any) thereby terminated." There is too much apprehension about the potential of unintended effects, misplaced because the uninformed lump together "weather modification" and the "climatic alterations" which are envisioned from such projects as the Bering Straits dam, reversed Siberian rivers, etc. Indeed, some of the "pop" weather

stuff is bad press for weather modification. There may not be a solid measure for it but I suspect that much of the "don't fool with mother nature" public attitude stems from over-sized expectations which have been implied or suggested.

e. Such qualification would also serve the need for an improved "psychology of scale or/and degree" for the promise of weather modification. It is not widely understood that hail suppression efforts will be justifiable for only the high intensity/frequency areas, and that therefore cost-benefit calculations should embrace only such areas (as opposed to the United States as a whole); it is not generally understood that to enhance precipitation we must have a moisture bearing system. Lack of precision in these respects is costly in public attitude and confidence. Common sense or ordinary logic prompts doubt about grand design.

f. Finally, there is great need for a central entity to monitor research, experimental and operational efforts of weather modification. It needs the authority to obtain information as well as a directive to maintain and distribute such information to all thus engaged and interested.

### 3. Conclusions

In conclusion, a footnote to the introductory orientation. The crop insurance segment of the insurance industry has an interest in weather modification which is perhaps readily but also possibly incorrectly presumed; it is far from vested. It does not know, precisely, but it doubts that an effective hail suppression capability, for example, would affect the industry substantially or beyond acceptable recourse, either way, over the long period. It perceives that a precipitation enhancement capability *might* enable the provision of all risk crop insurance, by in some instances moderating the extremes of rainfall distribution, etc.; or, it might obviate the need of such insurance coverage for some farmers.

Whatever the effects, as a public service institution the industry's direct concern is about *uncertainties, misadventures*, etc., which could affect its endeavors, rather than so much the potential benefits or disbenefits to the industry. One may observe that ultimately this concern will be shared by others who, in time, will be faced with decision-making obligations, at local and national levels, if, as seems likely, the interest in weather modification continues.

<sup>1</sup> Technology Assessment of Hail Suppression. Refer to *Hail Suppression: Impacts and Issues*, Report prepared with support from the RANN program of the National Science Foundation under Grant ERP75-09980. Available from NTIS.