

TESTIMONY BY DR. THOMAS P. DEFELICE BEFORE JOINT HEARING BY SEN. SUBCOMMITTEE ON SCIENCE & SPACE AND SUBCOMMITTEE ON DISASTER PREDICTION & PREVENTION, NOVEMBER 10, 2005:

I am honored to appear before you today in regards to Senate Bill S-517, the Weather Modification Research and Technology Transfer Authorization Act of 2005. My name is Dr. Thomas P. DeFelice. My background in weather modification began when I was 15 by reading books on the subject; I had many sessions with WMA forefathers Schaefer & Vonnegutt as an undergrad; my academic and subsequent professional career concentrated on learning the fundamentals of weather modification relevant sciences and its technologies; president of WMA (2000-2002), Chair WMA Public Information Committee (since 2004). I now work as the contractor program manager for 2 NOAA programs. I am here on my own behalf, expressing my own beliefs. I began this process, engaged John Leedom, who engaged Senator Hutchison & her staff, and here we are today.

Weather modification technologies are key to dealing with many present and potential future scientific, environmental, and socioeconomic issues like steadily increasing human suffering and property damage caused by hazardous weather (e.g., severe weather-Katrina, supercooled fog, freezing rain), fire, and other environmental problems related to “acid rain”, biological or chemical warfare, for instance. Their application generally increases rainfall amount. Rain contributes 1% of the total global water budget. Global water consumption presently makes up 8% of the total global water budget. Models estimate about 40% of the world’s population will live in water – stressed areas by the decade of the 2020’s and consumption will increase. Further, air pollution (global warming) is (are) reported to reduce the amount of rainfall. Hence, a need to develop new technologies, while applying proven techniques. Water rationing and water management techniques are useful, they Do Not replenish the reduced rainwater amount. (They simply put a small band-aid on a wound that requires multiple stitches.) Therefore they fail to resolve the issues’ root cause. Alternatively, weather modification technologies increase the rainfall amount (compared to normal) under certain conditions. (They simply put multiple stitches on a wound that requires multiple stitches.) Therefore weather modification technologies can resolve the issues’ root cause, which *will be ensured through the research and development program set up by passing S-517 and its companion bill (HR 2995).*

Yet some retain an issue concerning whether operational cloud seeding activities, especially associated with convective clouds, achieved the intended results claimed. *Additional evaluations should pacify this issue, especially with the recent technological advances.* This would also help us answer, are weather modification technologies ready to increase water resources and alleviate, or possibly prevent, drought. *Yes they are ready to increase water resources under certain cases, based on the available 60 yr literature archive, and first hand information. S-517 provides a research and development infrastructure for a program that addresses and ultimately resolves these issues, while nurturing and developing these technologies to provide better returns on our investment.*

The *scientific and operational communities generally agree* that the recent advances in the relevant, general physical processes and technologies need to be capitalized upon in the form of a concerted and sustained national program to carry out basic and applied research in weather modification (e.g. Garstang report, Orville report, NRC). However, the *perceptions* between the science and operational communities *differ*, namely, 1) Interpretation of scientific proof, 2) Current status of cloud models as applied to weather modification, 3) Evidence of glaciogenic seeding in convective clouds, 4) Cold season orographic seeding, 5) Evidence for hail suppression, and 6) Support for specific purposes. The cold season orographic seeding perceptual difference (4) is not a significant difference in perspective, since the science community (post Garstang report) sees orographic cloud seeding as a particularly promising candidate for an intensive field program.

Perceptual difference (6) reflects the differences between the individual cultures (i.e., scientific versus operational) than anything else. *Nonetheless, no implementation plans have been proposed.*

I summarize an implementation plan for S-517 for consideration by its Weather Modification Board, which addresses all issues. This implementation plan is born from sound scientific basis derived from 60 years of lessons learned exercises, recent technological advances, and science community recommendations (Garstang report, Orville report, NRC). Societal need provides an impetus for developing systems and technologies that monitor and manage atmospheric events, the creation of a new weather modification research program and implementation plan according to standard engineering practices. *This plan helps mitigate the perceptual differences by setting up an integrated team approach to its activities, and by insisting that its research and development component be geared toward improving the effectiveness of operations.*

It calls for administering the resources and the activities for all research and development efforts directed toward optimizing the technologies used to manage atmospheric processes and their resultants (e.g., collision-coalescence, hurricanes, orographic and convective precipitation, frozen rain). Its mission would be to develop the technologies used for operational activities that help provide sustainable water supplies and reduce airborne hazards. This includes improving the understanding of the relevant processes and their simulations, as well as the evaluation methods (physical; chemical; statistical-random, non-random) for operational activities through cooperative multidisciplinary research and development arrangements and a well-designed outreach effort. Further development is needed for successful application of weather modification technologies to mitigate hurricane and tornado damage, minimize the negative affects of anthropogenic air pollution on precipitation efficiency, or to neutralize negative effects from pollutant deposition. Such requires a modeling approach, then verification, and transition to operational use.

The modern weather modification technologies applied to disperse supercooled fog, augment the ice crystal process in cloud systems, especially orographic clouds, are very effective. Statistical reanalysis using 50+ years of Sierra data show strong signals that the seeding did produce seasonal snowpack increases of 5-10%; as measured by stream runoff data (a conservative surrogate for snowpack increases). Thus, orographic systems, especially winter orographic systems, would help maximize S-517 derived program success. Garstang's report apparently was unclear on this fact.

The implementation plan does not include less developed technologies (e.g. extraterrestrial mirrors; ionization, chaos theory-related approaches; sonic initiation of precipitation, making hurricane disappear from conventional radar), or technologies that are already known to be too costly for the benefits they provide if any (e.g., using vertical pointing jet engines, or mono-layer films to suppress moisture flow into hurricanes), based on insufficient scientific and engineering test results, which pose a significant risk to programmatic success. The plan does not support funding for Federal Operational cloud seeding, except for small tests/experiments of new technologies.

In closing, failure to send S-517 to appropriate committee hearings with the companion Udall Bill (HR 2995), translates into desertification, more destructive weather, and even jeopardizes our standing as the premier scientists, engineers and practitioners in this area. We have an implementation plan for the program under this bill. We have the best technology, the brightest personnel to successfully carry out the implementation plan. The 60 years scientific and engineering basis helps assure success. Passing S-517 now, helps avert adverse effects of desertification, Katrina-like hurricane destruction, and air pollution effect on the rain process, for example. Thus, this tax payer fully supports passage of Senate Bill S-517 with a sufficient budget and duration.

Respectfully Submitted by Tom DeFelice, PhD.