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## **Weather Control -- It's Still Sci Fi, But...**

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That oft-vaunted idea of controlling the weather -- it's one science fiction topic that (unlike so many others) remain firmly beyond our control. We, and our technologies, remain "puny" compared to the energies of global circulation, sunlight, oceans, and the other forces that drive the chaotic global environment.

Indeed, when MIT PhD student Ross Hoffman attempted to seriously study weather control for his thesis, his advisor called the project "too outlandish," and unlikely to generate the funding that the study would require.

So Hoffman did what any good innovator does -- he listened to the experts' advice, and then happily proceeded to garner a half-million dollars from NASA spin-off NIAC ([NASA Institute for Advanced Concepts](#)). NIAC specifically focuses on 40-odd year "outlandish" ideas that just might change our world.

According to the May 7 [Wired News](#), Hoffman's research has indicated that by heating a small area of the atmosphere a few degrees, it may be possible to alter the path of hurricanes, perhaps tornados, and other previously unassailable weather phenomena. And the payoff from that could be huge, saving the loss of life and billions of dollars of destruction that typically accompany such nasty "heat engines."

But an "electric heater" is a wee bit too small to make a difference at the scale of weather. So Hoffman envisioned a ring of solar-powered satellites that would convert energy into 183 gigahertz microwaves, and then beam them to just the right small area where his software predicts that a little heat will go a long way towards altering a storm's course.

Specifically, from the description of his [Phase II NIAC](#) study:

*"The key factor enabling control of the weather is that the atmosphere is sensitive to small perturbations. That is, it is the very instability of the atmosphere's dynamics that makes global weather control a possibility. Certainly realistic numerical weather prediction models are very sensitive to initial conditions.*

*Extreme sensitivity to initial conditions suggests that small perturbations to the atmosphere may effectively control the evolution of the atmosphere, if the atmosphere is observed and modeled sufficiently well. The architecture of a system to control the global atmosphere and the components of such a system are described. A feedback control system similar to many used in industrial settings is envisioned. Although the weather controller is extremely complex, the realization of the required technology is plausible in the time range of several decades.*

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*A critical concern is the feasibility of the required perturbations. The [Phase 1 research](#) demonstrated a proof of concept approach for calculating the perturbations required to move a hurricane. Altering the track of a hurricane is a clear goal of global weather control.*

*The Phase 2 research will refine this approach, making the results more realistic, and translate the required perturbations into requirements for a fleet of solar reflectors in orbits close to the plane of the terminator, as the physical controller. These requirements, in turn, will be used to estimate the area and hence the mass which must be stationed in orbit.*

*In addition to being directly relevant to the call for revolutionary concepts which expand our vision of the future, many of the technologies involved in our proposed system are areas of interest to NASA that will be developed for other reasons. These include atmospheric science, remote sensing, aviation systems, fleets of low-cost satellites, solar power satellites, advanced computational systems, mega-systems engineering, and more."*

Additional insights into Hoffman's work are available in a PowerPoint slide show at [http://www.niac.usra.edu/files/library/fellows\\_mtg/jun02\\_mtg/pdf/715Hoffman.pdf](http://www.niac.usra.edu/files/library/fellows_mtg/jun02_mtg/pdf/715Hoffman.pdf) .

Of course this is still unproven technology, and it will likely remain so for decades. Yet it IS a foot in the door for future research towards a laudable goal.

### **The Thing Is...**

The thing is, though, that while such capabilities would surely have its benefits, some obvious challenges lay ahead. For example, might this additional heat upset other elements of our global environment (the "if a butterfly in the Amazon flaps its wings" syndrome)?

To me, the most interesting (and potentially the most explosive) fallout of such a technology might be less about the global environment, and more about the political environment. Imagine if a country with these capabilities alters the path of a storm threatening their coast, and it eventually ravages another country? Even if there was no tangible proof that the path-alteration affected the outcome, there would certainly be suspicions -- and that could make for some all-too-interesting political "discussions..." Similarly, what might happen if an attempt to keep a storm away from, say, Houston, failed to do so? What, and where, might liability issues come to rest?

And of course, the specter of abuse is always, uh, hanging over our heads, as depicted in this lead-in from a fanciful January 1, 2100 New York Times article in Hoffman's paper:

*"A new system of weather modification satellites, designed and launched at immense cost and still not in full operation, has been repeatedly diverted for personal uses by*



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*politicians and senior officials In the Weather Administration, an investigation by The New York Times has learned..."*

### **Not To Worry!**

Happily (or not, depending on how you choose to look at it), this isn't something we'll have to worry about for quite some time. Nevertheless, this offers an easy-to-contemplate template through which we can consider other, shorter-term technological, social, and ethical effects that will be raised by our increasingly powerful technologies (such as nanotechnology, biotechnology, and genetically engineered foods, flowers, and potentially people!)

We don't have answers, yet. But *NOW* is the time for thoughtful discussion and contemplation. *NOT* after these various cats get out of their bags.

Don't Blink!

*This essay is original and was specifically prepared for publication at Future Brief. A brief biography of Jeff Harrow can be found at our main [Commentary](#) page. Other essays written by Jeff Harrow can be found at his [web site](#). Jeff receives e-mail at [jeff@thearrowgroup.com](mailto:jeff@thearrowgroup.com).*