

POLLUTION EFFECTS DEBATED

Weather control nears reality

SAN FRANCISCO (AP) — On a recent flight into San Francisco, an airline captain, once shrouded in fog, announced the flight was being diverted to Los Angeles because the weatherman had made a mistake.

Aboard the flight was a delegate to the annual meeting of the American Meteorological Society convening in San Francisco. He took out a business card, scribbled "It wasn't me" on the back and sent it up to the crew.

Although meteorologists probably always will encounter difficulties predicting each quirk of the weather, sudden airplane-diverting fogs soon may be a thing of the past.

Scientists have learned how to briefly dispel certain types of ground fog by seeding

For instance weather scientists are split over what the results of weather modification experiments mean. Ecologists warn that even the most innocent-looking weather modification project could wreak havoc with the environment.

"It is clear that we as scientists have developed a primitive but probably real capability for manipulating certain kinds of atmospheric processes and as a result we are entering a new era, an era of weather management," Dr. Robert White, acting director of the National Oceanic and Atmospheric Administration, told the American Meteorological Society.

The new era had its beginnings in the late 1940s when scientists discovered that silver iodide, or dry ice, caused growth of ice crys-

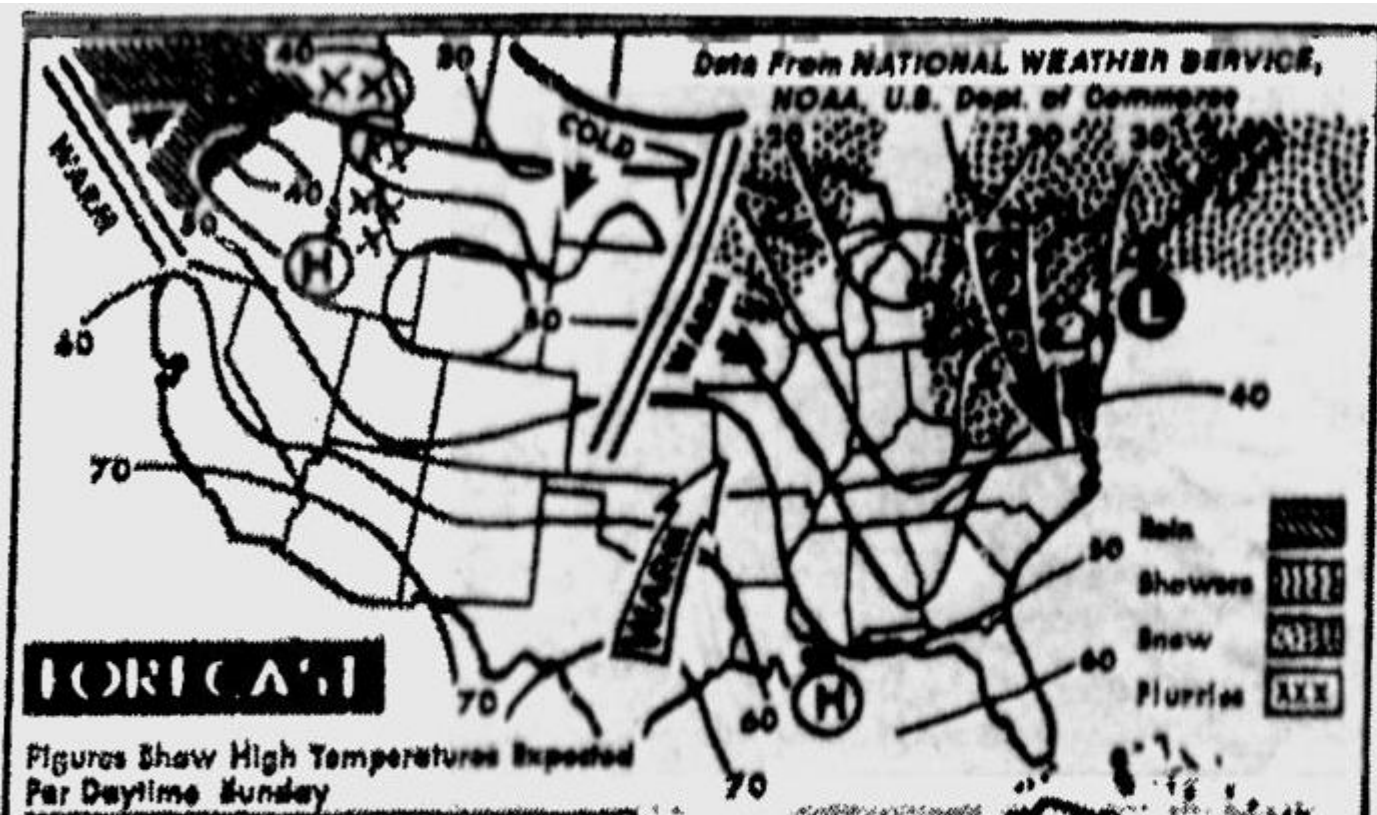
encouraging results. By seeding a brewing thunderstorm, scientists force it to give up rain early, preventing formation of hail.

But many weather scientists say results of experiments have been overrated.

"No analysis has ever satisfactorily shown whether cloud seeding has actually caused a net increase in precipitation or only a redistribution," Dr. Helmut Landsberg of the University of Maryland wrote in a recent issue of *Science* magazine.

Inability to predict the outcome of their efforts is weather scientists' biggest handicap. Attempts to increase rainfall in a small valley may unknowingly be changing the weather hundreds or even thousands of miles away.

One of the most dramatic examples of the effect of air pollution on the weather was



them with chemicals. And airlines are finding it cheaper to pay for seeding to get a flight landed than to bear the expense of diverting it and accommodating inconvenienced passengers.

Dissipation of fog is just one of the tech-

nals in supercooled clouds — clouds in which moisture remained unfrozen although the temperature was below freezing. The ice crystals would attract nearby droplets of moisture and turn into snow.

The research that followed is beginning

effect of air pollution on the weather was discovered at La Porte, Ind.

Meteorologists with the Illinois State Water Survey found evidence that air pollution at Gary, Ind., 30 miles upwind, has been substantially increasing La Porte's rain, hail and thunder for 40 years.

During each of the six steel production peaks at Gary between 1923 and 1968, rainfall at La Porte increased correspondingly. Between 1946 and 1967, La Porte received 47 per cent more precipitation than areas upwind of Gary.

The popular theory is that air pollutants — dust, smoke, soot, chemicals — act just like cloud seeding agents. Lead from automobile exhaust, for example, may be combining with iodine already in the atmosphere to form lead iodide, which acts similarly to silver iodide, a favorite cloud seeding chemical.

Such chemicals may be increasing cloud cover throughout the world.

Scientists also know that urban areas are vast "heat islands" caused by expanses of heat-absorbing asphalt and concrete, restriction to air flow by tall buildings and heat from man's activities. Clouds ascend over the heat island, giving up their moisture

niques weather scientists are mastering as they stand on the threshold of an era of weather management. They hope it will be possible to take the lightning and hail from thunderstorms, dampen the fury of hurricane winds and increase snowfall in mountains and rainfall from tropical clouds.

But the new optimism that man soon will manage the weather, even if only on local or regional scales, is tempered by mounting evidence that air pollution already is changing the weather. It may even be altering world climate.

The spectre of weather modification, planned or accidental, has raised a host of ecological, social, economic, legal and political questions that have sparked a spirited debate among scientists.

to pay off.

A recent project showed that seeding hurricanes can reduce their death-dealing winds. Hurricane Debbie's winds in 1969 were cut from 15 to 30 per cent — substantial reductions in a storm in which winds exceeded 100 miles per hour.

Scientists have learned how to spot winter clouds in which seeding is likely to increase snowfall. The U.S. Bureau of Reclamation has begun a five-year, \$5 million project in the San Juan Mountains of Colorado to increase the snowpack and the subsequent spring runoff in the Colorado River, which serves parched areas of Arizona, Southern California and Mexico.

Experiments to suppress hail and reduce lightning in thunderstorms also have shown

as rain or releasing heat that could trigger a thunderstorm.

Air pollution also is cutting sunlight over most cities by at least 15 per cent, more in many heavily polluted areas. And research has shown that although some levels of pollutants increase precipitation, heavier concentrations cause too many ice crystals to form, decreasing precipitation.

But theories advanced so far about the effect of air pollution on world climate are speculative. Predictions that increasing levels of carbon dioxide will heat the earth, melt the polar ice caps and raise the oceans several hundred feet are countered by prophecies that increasing dust, smoke and clouds will cut sunlight, cool the earth and bring the onset of another ice age.

• **Michigan Daily - Feb'71.** Cloud seeding (loading them "with chemicals") , increase snowfall, hurricane seeding, weather modification, suppress hail, reduce lightening, seeding a brewing storm, The US Bureau of Reclamation \$5M project to increase snowpack in the San Jaun Mountains of Colorado
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