

THE ATMOSPHERIC RESERVOIR

Examining the Atmosphere and Atmospheric Resource Management

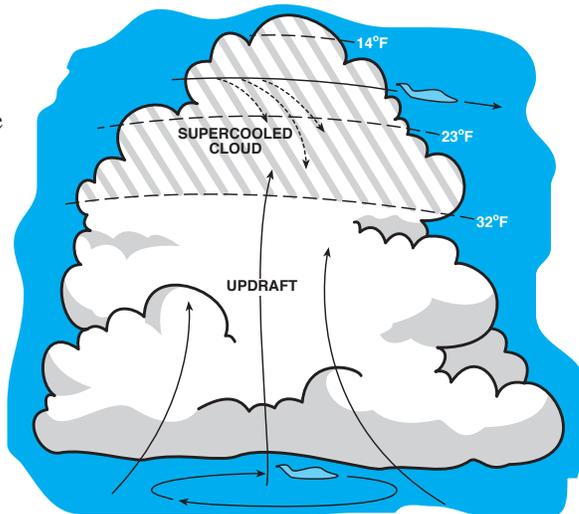
Cloud Seeding 201: Operations Targeting

By Aaron Gilstad

In my previous article on cloud seeding, I described the processes by which thunderstorms and precipitation develop. Now that you have some understanding of how natural thunderstorms work, I can begin to explain how cloud seeding is actually done.

Operations on the North Dakota Cloud Seeding Project (NDCMP) are conducted 24 hours a day, seven days a week, during the prime growing season months, June through August. The NDCMP is split into two operations districts; District I in southwestern ND and District II in northwestern ND. The NDCMP employs four meteorologists, two in Stanley and one in Bowman to conduct radar operations, and a forecaster in Bismarck. In addition, each radar is staffed with a meteorology student intern. The NDCMP employs eight seeding aircraft; two for District I, both in Bowman, and six dispersed throughout District II; two in Watford City and one each in Williston, Stanley, Kenmare, and Minot. Each aircraft crew is comprised of a Pilot in Command and an Intern Co-Pilot. Meteorologists tell the pilots when they need to fly, and where they may find their best chance for seeding targets. Meteorologist then track storm movement during the seeding mission, to maintain project safety and effectively cover as much area as possible. Without close coordination of the NDCMP team, the success of the program would suffer.

There are two main chemicals



used on the NDCMP; dry ice and silver iodide. Dry ice is used because, at a temperature of approximately -109°F, it will force the formation of trillions of super-cooled water droplets and cause them to flash freeze, rapidly increasing the number of ice crystals in the cloud. Silver iodide is delivered into the cloud by three different means, 20 gram ejectable (EJT) flares, 75 gram burn-in-place (BIP) flares, and a liquid silver iodide solution delivered through a wingtip generator. In all three of the delivery methods the silver iodide is burned to form a microscopic ash. This ash takes on a structure similar to that of an ice crystal. These nuclei are also slightly salty, which helps to draw water to them more quickly. Silver iodide is used in small amounts and has no adverse effects on the environment.

Clouds are seeded through two modes on the NDCMP; at cloud-top and cloud base. Top-seeding aircraft fly through or very near the top of the seeded feeder cloud between the temperature levels of 23°F to 14°F (-5°C to -10°C), looking for super-

cooled liquid water, which will collect on the windshield, and updrafts. When looking for their targets, the pilot will try to find towering cumulus clouds that are just reaching their altitude and have a crisp, cauliflower-like appearance. When the right conditions are met, the pilot releases dry ice and/or 20 gram EJT flares directly into the top of the cloud, which begins to take effect almost immediately.

Cloud base aircraft fly along the base, or bottom of the cloud, and use the natural updraft that supports the growth of the storm to bring the seeding agent from their wingtip generators and BIP flares into the cloud. Base seeding takes longer to have the desired effect (15-20 minutes) because it relies on the natural processes of the storm to transport the nuclei to the 23°F temperature level where it becomes active. When targeting the base of the cloud, the pilots look for dark, smooth, rain-free bases usually in front of or toward the south end of the thunderstorm complex, where new feeder cloud development most likely occurs.

This is a brief overview of what takes place during flight operations and how thunderstorms are targeted and seeded for both rain increase and hail suppression. In upcoming issues I will discuss the theory of how cloud seeding works, and the economic benefits to those areas with cloud seeding projects.

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