HOLY CLOUDS

Probably the most successful rainmaking results in the world have come from operations conducted in Israel. In the 1960s cloud seeding was begun on storms moving into Israel from the Mediterranean Ocean. They were seeded with silver iodide from aircraft flying parallel to the coastline upwind of the Sea of Galilea in northern Israel. Increases in precipitation were routinely found to exceed 20% for seeded clouds compared to unseeded clouds over northern Israel and into Lebanon.

Dr. Abe Gagin was the project director for many years in the 1960s, 1970s, and 1980s. He was a professor of meteorology at Hebrew University and a Colonel in the Israeli Air Force. During an extended visit to Colorado State University in the summer of 1972 while I was in graduate school, he told me that the day before the 1967 War broke out five years before he had been flying north and south along the coast of Israel seeding clouds. The next day when hostilities had started with Egypt he was flying in the same area, this time flying a jet fighter firing missiles at tanks. The clouds were similar on both days, but instead of trying to squeeze rain from the clouds, he was using them to hide from enemy aircraft.

It's interesting that the clouds in Israel consistently produce additional rain when seeded. A large percentage of the water in the Sea of Galilee and the snow on Mount Hermon are due to weather modification. The hills north of Jerusalem are greener and farmers can grow more crops due to rainmaking. Even the limited flow of water in the Jordon River has been augmented.

Why are the clouds in Israel so responsive compared to other locations in the world? Is it because they are special in some way? Are they Holy? Dr. Gagin was intrigued by this question and studied the preliminary results from the Climax I project in Colorado. There seemed to be some similarities between Colorado clouds and Israeli clouds when they were partitioned by cloud-top temperature. Although Colorado clouds were far less convective than Israeli clouds and Colorado clouds formed over mountainous terrain, both kinds of clouds seemed to produce the best results when cloud-top temperatures were warm and upper-level

clouds were absent. Warm cloud-top temperatures and missing upper-level clouds seem to occur more frequently in Israel. Possibly this is the reason for the strong response to cloud seeding in Israel.

But, why do Israeli clouds tend to have warm cloud-tops and few clouds above? This is probably due to Israel's unique location at the eastern end of the Mediterranean Ocean. Storms tend to "pile up" against the coastline, which is surrounded by desert in all directions except to the west. The dry air and downward motions over the Mediterranean during the daytime when most aircraft seeding is done may dissipate upper-level clouds over Israel, preventing the natural "seeder process" from working effectively. Under these conditions cloud seeding would be expected to work more effectively.

Of course, this turns out to not be the whole story. When an intense storm moves across Israel it will frequently create high winds which pick up dust. This dust has been found to reduce the effectiveness of cloud seeding. A high-wind storm tends to precipitate more heavily on the dust particles and the precipitation on ice crystals from cloud seeding is not as effective. So, cloud-seeding is now conducted on less intense storms with lighter winds.

Maybe clouds in Israel are more holy than elsewhere. If so, it's probably because they are located over Israel, which is in a unique place on the earth.