Volume 5, Issue 1 March 10, 2011

The Texas Weather Modification COURIER

Picture taken by Robert Rhodes of West Texas Weather Modification Association. Pictures was taken August 7, 2010, just before 9 p.m. in Irion County.

TWMA Fall Workshop

By Todd Flanagan

On Thursday, October 21, and Friday, October 22, 2010 meteorologists from four of the state weather modification projects gathered for a workshop at the Panhandle Groundwater Conservation District (PGCD) office in White Deer, TX. In addition to the project meteorologists, PGCD Pilot Herb Speckman, Southwest Texas Rain Enhancement Association (SWTREA) and South Texas Weather Modification Association's Pilot Matt Pope, George Bomar from Texas

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Inside this issue:

TX 2010 Main WX Features

By Dr. Arquímedes Ruiz Columbié

Year 2010 began with moderate-strength El Niño conditions in the Tropical Pacific Ocean, which were forecast to persist at least for the first few months of 2010. At this time, sea surface temperatures (SSTs) over the eastern equatorial Pacific ranged from 1.0 to 1.5°C above normal values, with some small areas around 2.5°C. At depth, the presence of a large reservoir of warm water supported the expected condition persistence of conditions.

As a result of El Niño conditions, numerous storms affected the State, including the outburst of severe weather on January 20.

In February, strong El Niño conditions were already in place across the Tropical Pacific Ocean with SSTs between 1 to 3 C° above normal and easterly wind anomalies. Once again, those conditions were forecast to persist into at least the early spring with anticipated significant impact on the weather patterns for the United States.

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Texas Project Updates 2010 Results

Southwest Texas Rain Enhancement Association

By Stephanie Beall

The 2010 seeding season in the Southwest Texas Rain Enhancement (SWTREA) target area was a busy one due to a number of weather features during its' March to November operational season. This included a number of cold fronts, mesoscale convective systems, tropical cyclones and severe weather. In March, South Texas was transitioning from the influence of a weakening El Niño to a strengthening La Niña. A weak to moderate La Niña was in place for most of the summer and into the fall. This pattern typically enhances tropical cyclone activity and makes for drier conditions into the fall and winter months across south Texas. This led to ample rainfall in the summer months with drier conditions starting in October through the rest of the winter. Both ample rainfall and drier conditions impacted operations substantially. During the summer months, a number of tropical systems including Hurricane Alex, Tropical Depression Two, and Tropical Storm Hermine allowed for ample rainfall to fall across the SWTREA target area. This led to an operational suspension from the end of June through most of July for most of Webb County, where historic flooding along the Rio Grande occurred. Seeding did not occur during the first or last month of the operational season. Table one below summarizes weather modification activity during the 2010 season showing an active summer and a below average fall. Hygroscopic seeding continued in 2010 with a number of viable cases collected over the project target area.

In 2010, a total of 77 clouds were seeded. Of the 77 clouds seeded, 34 were classified as small clouds, 12 were classified as large clouds, and 31 were classified as Type B clouds. An estimated total of 553,384 acre-feet of additional water was produced from all cloud types and translates into about a 7 percent increase.

Hail suppression activities continued to show positive effects of decreasing hail size, although only a very small sample size was acquired this season due to a shortened severe weather season.

West Texas Weather Modification

By Robert Rhodes

Seeding operations for the 2010 season started on March 8 and ended on September 12 with 43 operational days. The season was governed largely by high pressure with a long string of 100°F days from July through August. There were 127 clouds seeded with 1,995 flares during 76 flights. The number of seeded clouds is near average since changing radar sources from 74-C to WSR-88D feed. Six reconnaissance flights were flown while making an attempt to find seedable clouds on marginal days. Pilots flew 185.6 flight hours, and six part time pilots including two new pilots made for nearly seamless missions during the season.

2010 was a rather dry year. Annual rainfall (20.13in) at San Angelo was very near yet slightly below normal. Precipitation and percent of normal maps suggest that much of west Texas was well below normal for the majority of the season. San Angelo managed to be mostly above normal with monthly precipitation from January through August, but a change in weather patterns governed by ENSO lead to less precipitation for the last quarter. July marked the wettest month of the season when Hurricane Alex struck the coast of northern Mexico and remnants moved up the Rio Grande.

The statistical reports conducted by Active Influence and Scientific Management (AISM) showed the majority of seeding operation result was excellent or very good; with an average seasonal increase to precipitation at 21 percent. Arrival time to small clouds (91 percent) was excellent. Small clouds showed increases for precipitation mass at 111 percent, cloud mass increases of 52 percent, lifetime increases at 47 percent, increases to cloud area at 36 percent, cloud volume increases of 38 percent, and volume above 6Km of 31 percent. Increases in precipitation mass by county were shown between 14 and 34 percent. Crockett and Schleicher Counties both returned 14 percent. Schleicher County was most favored in number of seeded clouds. In addition to glaciogenic seeding, west Texas also continued a case study using one supplementary hygroscopic flare. Unfortunately, only a small number of cases could be matched with a proper control sample. Further information can be read in the

Month	Seeding Days	Seeding Flights	AgI Used (Glaciogenic) Grams	CaCl Used (Hygroscopic) Grams	Flight Time (hours)
April	5	5	2,640	0	4.8
May	5	6	7,440	2,000	18.8
June	3	3	1,320	1,000	11.7
July	9	12	6,880	3,000	20.9
August	3	4	4,280	1,000	11.6
September	5	8	5,280	2,000	20.9
October	1	1	720	0	2.4
Total	31	39	28,560	9,000	91.1

Table 1 shows the 2010 flight information for the Southwest Texas Rain Enhancement Association project.

Month	Seeding Days	Seeding Flights	AgI Used (Glaciogenic) Grams	CaCl Used (Hygroscopic) Grams	Flight Time (hours)
March	2	2	1,482	0	5.8
April	0	0	0	0	0
May	4	7	5746	0	20.2
June	10	19	19,188	0	55.3
July	12	16	10,634	1,000	30.9
August	10	20	15,158	4,000	54.6
September	5	8	5,356	1,000	19.1
Totals	43	72	57,564	6,000	185.9

Table 2 shows the 2010 flight information for the West Texas Weather Modification project.

AISM evaluation. Total increases in precipitation for the target area were calculated at 1,615,985 acre-feet. 2010 flight information can be found in table two.

West Texas Weather Modification Association is excited to begin the 2011 season. Temperatures are rising quickly during late winter and may allow for an early start to the season. The limited factor to starting the season will be moisture over West Texas; the region has been very dry through the late fall and winter which is in part due to La Niña. La Niña will remain in control through the early spring but lessen toward the summer solstice.

South Texas Weather Modification Association

By Todd Flanagan

The 2010 season for the South Texas Weather Modification Association (STWMA) was one characterized by wide swings in the weather pattern, with some very wet months and also some very dry periods. A recurring issue during 2010 involved the prevalence of warm clouds or tropical air masses over the target area. Clouds are considered warm when the temperature is above freezing throughout the cloud. Tropical air mass intrusions, while generally common in south Texas during the summer months, were more prevalent in June, July and September than what would normally be experienced. This became problematic as some of these air masses were particularly moist and the clouds

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STWMA Continued from Page 3

forming in these environments, although efficient at producing droplets, do not usually respond well to glaciogenic seeding and in several instances good convective days did not yield many seedable clouds.

The season got off to a slow start with the first day of seeding not taking place until May 17 as a cold front pushed south into the area. Air mass convection provided more seeding opportunities on May 24 and 25, which was aided by differential heating resulting from a passing mesoscale convective system to the west.

June was busier than usual for the project, with nine days of seeding operations taking place. Warm, moist flow off the Gulf of Mexico provided an environment favorable for cumulus development, but in several instances these clouds quickly produced precipitation before a formidable supercooled region could form in the cloud. So ideal clouds, although present on these days were limited in number. Hygroscopic seeding was used in some cases where it seemed to be a better approach with glaciogenic seeding being supplementary. A heavy rain event occurred on the night of June 8 into the early morning hours of the June 9 as a warm-core low moved northeast across the target area from Laredo to San Antonio. Rainfall amounts in excess of seven inches were reported from northeast of Pleasanton to the New Braunfels/San Marcos area, where close to a foot of rain fell. At the end of the month, rich tropical moisture associated with Hurricane Alex aided in additional convective development.

July saw a continuation of the trend for tropical air masses to dominate the area. Unusually high precipitable water (PWAT) values were measured on July 1, not long after Hurricane Alex made landfall south of Brownsville. The 7 p.m. sounding from Corpus Christi on July 1, which was untainted, meaning it did not sample a precipitating cloud, registered a PWAT value of 2.99 inches. Air mass convection was common during the month, and once PWAT values had declined from early month levels, seedable clouds were once again present across the target area. Eight days of seeding took place during the month the majority of

Month	Seeding Days	Seeding Flights	AgI Used (Glaciogenic) Grams	CaCl Used (Hygroscopic) Grams	Flight Time (hours)
May	3	5	728	0	6
June	9	19	6,006	5,000	27.2
July	8	11	3,848	0	18.7
August	5	11	2,236	0	16.8
September	10	22	6,032	8,000	34.3
October	0	1	0	0	1.5
Totals	35	69	18,850	13,000	104.5

Table 3 shows the 2010 flight information for the South Texas Weather Modification Association project.

Month	Seeding Days	Seeding Flights	AgI Used (Glaciogenic) Grams	CaCl Used (Hygroscopic) Grams	Flight Time (hours)
April	4	4	3,120	0	11
May	3	3	3,680	250	18
June	7	6	5,840	250	25
July	5	14	12,680	500	48
August	5	6	9,960	0	27
September	3	4	10,760	0	15
Totals	27	37	46,040	1,000	144

Table 4 shows the 2010 flight information for Panhandle Groundwater Conservation District project.

which occurred after mid-month.

August saw a reduction in the active tropical weather over south Texas, due in part to a strong upper ridge that parked itself over the southern United States for nearly two weeks during the middle part of the month. This gave the area an opportunity to dry out. On either side of the period where high pressure dominated the weather pattern, there were five days where seedable clouds were present over the target area. The final day of seeding on August 29 was quite active with four flights taking place.

September saw a return to a warm, moist environment over south Texas. The main weather impact of the month came on the September 7 and 8 when Tropical Storm Hermine moved directly over the target area, and this is when the majority of the month's precipitation fell. Outside of this event, the month was quite busy in terms of convective activity with 10 days of seeding operations taking place. The quality of the clouds suitable for glaciogenic seeding in many cases was marginal, and in some instances hygroscopic flares were used in tandem with glaciogenic flares.

The final flight of the season occurred on October 12 when cloud development was investigated, but not seeded.

A radar analysis of 113 seeded clouds in the STWMA target area was performed by Active Influence & Scientific Management once the season ended. Results indicated a radar-derived increase of over 480,000 acre-feet of water in and near the target area, or about 4 percent. Table three shows the flight information for STWMA during the 2010 season.

Panhandle Groundwater Conservation District

By Jennifer Wright Puryear

The conclusion of Panhandle Groundwater Conservation District's (PGCD) 2010 Precipitation Enhancement Program marked the eleventh year of cloud seeding in the Texas Panhandle. This year's season began on April 11 and concluded on September 16. This year we had 37 seeding mission flights and 15 reconnaissance mission flights. Table four shows the number of days flown, seeding flights, amounts of AgI, CaCl and hours flown per month throughout the 2010 season. The District made the most of our opportunities when conditions were favorable. A few missions were cut short due to severe thunderstorm warnings issued by the National Weather Service (NWS), and a few rain events that occurred did not provide favorable seeding conditions.

During a normal seeding season the weather events are concentrated in a certain part of the Panhandle, and this year most of the weather events during the precipitation enhancement season occurred in the central portion of the PGCD target area. The most seeding days occurred in Armstrong and Gray counties with 14 days, followed by Donley County with 12 days and Carson County with 11 days. The least amount of seeding days occurred in Wheeler County with four. The weather this season was compiled of lots of disturbances including cold fronts, warm fronts, trough passages, dry lines and mesoscale convective systems; however, the majority of the summer was characterized by strong southerly flow that ushered in plenty of moisture from the Gulf of Mexico. This moisture combined with weak steering current mid-summer brought heavy rainfall to portions of the Panhandle, and caused some flash flooding. A rainfall event of significance occurred on July 7, when a storm system brought very heavy rains to the central Panhandle flooding several buildings and roadways. The NWS, which is just east of Rick Husband International Airport, reported 10.5 inches of rainfall. The rainfall amounts in 2010 from April-October for all counties in the District were above the 2009 rainfall amounts. This increase in rainfall is a continued trend from 2009, when most counties were also above the average rainfall from 2008.

Harrison Hoffman flying the Piper Comanche for the PGCD Precipitation Enhancement Program. The GPS helps Hoffman to navigate his track within the District, and also shows real time radar data which helps in communicating with the meteorologist.

This year's seeding season was very successful, providing on average a 15 percent rainfall increase per county according to Active Influence and Scientific Management. This increase was calculated using real-time rain gauge measurements collected throughout the District. This increase calculated out to an average of 2.96 inches of additional rainfall per county within the PGCD target area. Active Influence and Scientific Management analyzed a total of 45 seeded clouds in 32 operational days. The results were evaluated as excellent with timing of seeding at 93 percent and no seeding opportunities missed. The economic impact of the

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Meet Stephanie Beall from SWTREA

By Stephanie Beall

Stephanie Beall is the current meteorologist for Southwest Texas Rain Enhancement. Stephanie was born in Seattle, Washington, in September of 1980. Soon after, Stephanie and her family relocated to Houston, Texas, as her father who had served in Air Force moved to Houston to start a long career with the National Aeronautic and Space Administration (NASA). Her father's involvement with NASA, as a pilot, helped to encourage her love for science and more importantly, the weather. At age four, Stephanie relocated to Midwest City, Oklahoma, with her mother and brother. Over the years, moving became common place for Stephanie living in Midwest City, Oklahoma City and Wichita, Kansas. All of these locations being in the heart of tornado alley only fueled her love for the weather. By her sophomore year of high school, she was totally obsessed with the weather and decided that meteorology would be her life. Seeing how close the University of Oklahoma was to where she had lived most of her life, she moved to Norman, Oklahoma, after her senior year to pursue a degree in meteorology. In May of 2004, she received her Bachelor of Science in meteorology with an area of concentration in business. After graduation and a number of job interviews, Stephanie finally decided that working in weather modification would be something interesting, seeing that she knew little about it at the time. She was hired in August of 2004. Over the past six seeding seasons in south Texas, Stephanie has an even deeper love of the weather and its ever precious resource, water. Stephanie enjoys the outdoors, hiking, reading, traveling, and is interested in water policy and management.

Meet Matthew Pope from SWTREA

By Stephanie Beall

Assistant Chief Pilot/Chief Flight Instructor Matt Pope is entering his fourth season with the Southwest Texas Rain Enhancement Association (SWTREA).

Matt flies the association's incomparable Piper Pa-24 Comanche, assists in routine maintenance, and provides recurrent training for other weather modification pilots. Matt embarked on his aviation odyssey in 2006, by attaining private pilot license through flight instructor ratings at ATP Dallas in a matter of months. In 2007, Matt began full time flight instruction for Austin Academy of Aviation in Austin, Texas. However, the quiet skies of flight training could not satiate his desire to reach for the stars that shone in weather modification. In February of 2008, Matt began his first season with SWTREA, and has been gleefully cloud seeding ever since. Matt now resides in Pleasanton, Texas, but may be found regularly on the Texas Gulf Coast.

New House Bill Could Effect WX Modification

By George Bomar

While the matter of global warming continues to be hotly contested, there is no doubt about the reality of climate change, even within the realm of weather modification. Just four years ago, the Texas Legislature came within an eyelash of enacting legislation that would have established an atmospheric modification research program here in Texas. The bill would have created a competitive grant program for researchers at Texas universities to advance the science of cloud seeding. The Senate passed the bill, sponsored by Jeff Wentworth (R-San Antonio), but the House ran out of time before the bill could clear the floor.

Four years, and two legislative sessions later, the political winds now blow from a radically different direction. With the state confronting a monumental budget shortfall estimated to be as much as $27 billion

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A Summary of the 2010 Texas Weather Modification Evaluation

By Dr. Arquímedes Ruiz Columbié
Active Influence & Scientific Management

2010 cloud seeding operations took place in Texas between the months of March and October. A total of 399 clouds were seeded and identified by TITAN in 166 target area. Projects in this report include Panhandle, Trans-Pecos, San Angelo, Pleasanton and Carrizo. The first operational day was March 8, 2010 in the West Texas Weather Modification Association target area, and the last operational day was October 12, 2010 in the Southwest Texas Rain Enhancement Association target area. Most active period was May to September with 157 days, and the less active months included March with two days, April with six days, and October with one day.

Table 5 below shows some results associated with small clouds (precipitation mass less than 10,000 ktons), Table 6 below shows some results associated with large clouds (precipitation mass greater than or equal to 10,000 ktons), and Table 7 shows some results associated with type B clouds (older than one hour when operation began).

Final comments include:

1. Results were evaluated as excellent.
2. The micro-regionalization analysis showed increases per county; the average increase in precipitation, referred to an average seasonal value, is about 11.2 percent.
3. Radar estimations of precipitation should be considered as measurements of trend. Nevertheless, seeding operations appeared to improve the dynamics of seeded clouds.
4. In 2010. relative increases due to cloud seeding in South Texas competed with rainfall values associated with active tropical activity and therefore they may look pale when compared with seasonal values. However, the total increase in the region, estimated in more than one million acre-feet (South Texas Weather Modification Association and Southwest Texas Rainfall Enhancement Association (SWTREA) combined), should be considered a great help to fresh water natural resources.
5. Anti-hail seeding operations over the SWTREA seemed to partially mitigate the hail formation in the corresponding seeded storms.

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime (min.)	65.0	40.0	1.63	63
Area (km²)	66.0	44.1	1.50	50
Volume (km³)	221.9	141.1	1.57	57
Volume Above 6 km (km³)	54.7	33.3	1.64	64
Prec. Flux (m³/s)	473.1	288.6	1.64	64
Prec. Mass (kton)	2142.9	839.1	2.55	155

Table 5 shows seeded sample versus control sample in small clouds. (193 couples, averages) Increase from the 193 small seeded clouds was 1,444,472 ac-ft.

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime (min.)	240	200	1.20	20
Area (km²)	1,384	1,133	1.22	22
Volume (km³)	5,731	4,675	1.23	23
Volume Above 6 km (km³)	2,029	1,725	1.18	18
Prec. Flux (m³/s)	11,348	9,361	1.21	21
Prec. Mass (kton)	121,115	81,968	1.48	48

Table 6 shows seeded sample versus virtual control sample in large clouds. (79 couples, averages) Increase from the 79 large seeded clouds was 2,520,772 ac-ft.

Variable	Seeded Sample	Control Sample	Simple Ratio	Increases (%)
Lifetime (min.)	240	200	1.20	20
Area (km²)	1,384	1,133	1.22	22
Volume (km³)	5,731	4,675	1.23	23
Volume Above 6 km (km³)	2,029	1,725	1.18	18
Prec. Flux (m³/s)	11,348	9,361	1.21	21
Prec. Mass (kton)	121,115	81,968	1.48	48

Table 7 shows seeded sample versus virtual control sample in type B clouds. (127 couples, averages) Increase from the 127 type B seeded clouds was 2,583,598 ac-ft.

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Department of Licensing and Regulations and Archie Ruiz from Active Influence & Scientific Management were in attendance.

The first presentation on Thursday morning was given via Skype by Duncan Axisa, scientist at NCAR and former project meteorologist for the SOAR project. It highlighted accomplishments during the SPECTRA experiment in 2004 and 2005 wherein microphysical properties of clouds in Texas were sampled and also drop size distributions in clouds seeded hygroscopically with milled Dead Sea salt and unseeded clouds were measured and compared. Axisa presented suggestions on how the state should proceed in terms of additional research in weather modification in Texas. The next series of presentations were given by each project meteorologist summarizing operations for the year in their respective programs. This was followed by a presentation of the Texas Operational Analysis by Ruiz, outlining the radar analysis results for each project and also showing preliminary analyses of hygroscopic seeding cases as well as one hail suppression case. With the midday break, a nice lunch was had at the PGCD office.

On Thursday afternoon, Bomar gave a very informative presentation on state rules and regulations in weather modification along with some proposed changes in the fundamental definitions of terms within these rules and regulations. This presentation generated interesting discussion among the project meteorologists and Bomar. The final presentation of the day was given by SWTREA Meteorologist Stephanie Beall showing a historical rainfall comparison in south Texas; specifically, comparing monthly rainfall in and near the SWTREA target area since the existence of the SWTREA program to months prior to the start of the program. The first day of the workshop ended with dinner at the home of PGCD Meteorologist Jennifer Puryear in nearby Pampa. Mother Nature even showed up to dinner, providing us with several hours of thunderstorm activity.

Friday morning discussions were focused on hygroscopic seeding theory presented by Ruiz as the projects have been increasing their use of hygroscopic flares. This involved, in true Ruiz fashion, delving into mathematics and number crunching. The workshop ended after lunch with a brief round-table discussion on the next state newsletter, continuing education for weather modification board members and managers, and a break-down of tasks still remaining to be completed with the proposed Texas Weather Modification Association handbook. All in all it was a successful workshop with the participants getting familiar with the other projects' activities and some new knowledge gleaned from the presentations.

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February 2010 was a cold month (one of the coldest Februaries) with appreciable snow, especially over north Texas.

When March arrived, El Niño, as expected, continued to dominate the Equatorial Pacific Ocean. Above average SSTs were observed across the central and eastern Equatorial Pacific Ocean with anomalies about 1 °C above normal (even greater in some regions) with low level easterly winds weaker than average. Convection had been enhanced as well over the Eastern Pacific. El Niño conditions were again expected to continue during the spring and probably going to weaken later, by the end of June. The first quarter of 2010 was in general colder and wetter than normal for Texas. April started with El Niño conditions across the Equatorial Pacific Ocean although with some weakening signs. By the end of the month, SSTs anomalies had decreased and became less than 0.5 °C during the May-June-July quarter. Weather patterns began their return to a normal behavior which in turn affected the cloud resources for cloud seeding operations.

The return to normal weather patterns also brought the typical severe weather to the State. April had plenty of severe weather for Texas, whereas May and June were drier than normal across the State.

July brought Hurricane Alex, and especially South Texas received appreciable rainfall. Places in west and central Texas also received great benefits: San Angelo (1.73 in), Lubbock (7.14 in) and Abilene (6.20 in) reported precipitation values above normal for July. At the beginning of August, SSTs along the Equator in the eastern and central Pacific Ocean were below normal values indicating the development of La Niña conditions. The forecast then expected La Niña conditions to be fully developed by the end of the summer. For the month of August, the experts described that scenario as a borderline La Niña. August resulted to be dry and hot across the State.

La Niña conditions reinforced during the month of September when SSTs went below average across most of the central and eastern Equatorial Pacific Ocean. There was a large reservoir of cold subsurface water in the aforementioned zone, whereas cloudiness and thunderstorm activities remained suppressed. Enhanced low-level easterly trade winds continued also over the region. La Niña was then predicted to persist for the rest of the year. Those conditions usually imply below average values of precipitation for Texas due to the storm scarcity.

La Niña conditions built up even more during October and were predicted to strengthen further during the coming winter and to last at least into the spring 2011. The forecast proved to be correct, and year 2010 closed with moderate to strong La Niña conditions in

the Tropical Pacific with SSTs ranging among 1 to 3 ° C below normal values. The corresponding subsurface temperatures were also below normal to a depth of about 650 feet. Convection was reduced over the region whereas low level easterly winds are enhanced.

In general, the early inception of La Niña conditions in 2010 affected to some extension the natural cloud resources over south and west Texas. However, the year did classify as one with about normal cloud seeding activity, as table 8 shows below.

Year	# of Seeded Clouds	# of Target Operational Day
2005	494	184
2006	551	218
2007	228	110
2008	233	124
2009	466	171
2010	399	166
Average	395	162

Table 8 shows the number of seeded clouds and number of operational days throughout the Texas Projects for 2005-2010.

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between now and the summer of 2013, prospects for a new funding initiative in weather modification are infinitesimally small. Rather, House Bill 1916, recently introduced by Representative Bill Callegari (R-Houston), would remove the state weather modification program from its home at the Texas Department of Licensing and Regulation (TDLR) and assign responsibility for licensing and permitting of weather modification programs to county commissions.

The proposed legislation, if enacted, would end 44 years of state regulation of cloud seeding and other weather modification technologies. It would also remove the state from any role in promoting, and participating in, research and development of new cloud-seeding methodologies.

For those persons interested in providing input, a hearing on HB 1916 will afford an opportunity in the weeks ahead, likely by the House Government Reform Committee. TDLR is also interested in comments about HB 1916 from persons involved with the various rain-enhancement projects in west and south Texas, as well as folks who live within, and near, these project areas. Comments can be sent to TDLR's Executive Director, William H. Kuntz, at the following: (512) 463-3173; and Bill@license.state.tx.us.

Update on Hygroscopic Seeding in Texas Projects

By Robert Rhodes

In an effort to enhance weather modification practices in Texas; Texas Weather Modification Association began producing a hygroscopic flare to be used in conjunction with glaciogenic flares throughout the cloud seeding season. In addition to glaciogenic seeding, which speeds up the ice phase process by placing silver iodide (AgI) at the freezing level; hygroscopic (NaCl) flares introduce larger droplet sizes to the droplet spectrum in turn enhancing the coalescence of raindrops.

Hygroscopic flare, made by Ice Crystal Engineering, burning during a mission in the South Texas Weather Modification Association target area. This hygroscopic flare was composed of 1,000 grams of CaCl.

Throughout the 2009 and 2010 weather modification season; a randomized seeding of one small cloud with one hygroscopic flare occurred within 30 clouds. All clouds were also seeded with glaciogenic flares. Most cases were seeded within the first half of the clouds lifespan and analysis was performed by Active Influence and Scientific Management.

Analysis suggested results from dual seeding (hygroscopic and glaciogenic) appeared to be promising. Vigilantly, the number of cases with proper control was small and additional cases will be needed in the future. Nevertheless, it can be suggested that given a small dose of hygroscopic flare, especially within small clouds, the typical dosage of glaciogenic flare may be significantly less than has been necessary in the past.

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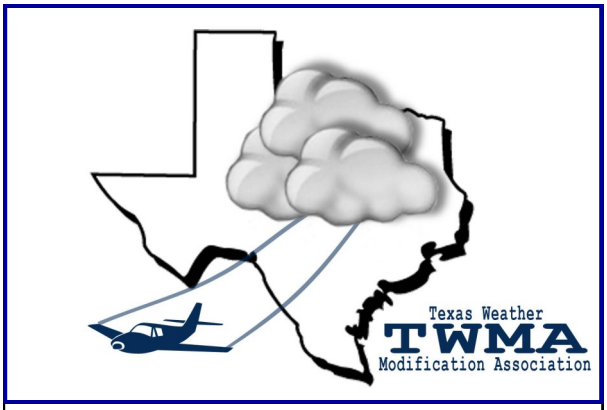
season remained about the same as previous years with the District cost of the program being $0.014 per acre-inch, and $0.047 per District acre.

This year's seeding season saw little changes with staff or equipment. Only one new pilot was added for training and back-up purposes. Aaron Woolsey joined our staff in April and was trained on the Piper Comanche 359P. After Woolsey was trained, Harrison Hoffman began training in the Piper Aztec N178G.



Texas Weather Modification Association Program Officers

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RETURN SERVICE REQUESTED