

MENDOZA HAIL MITIGATION PROJECT
(<http://www.antigranizo.com>)
FINAL REPORT 2000-2001 - EXECUTIVE SUMMARY

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This report summarizes the activities during the 2000-2001 field operations of the Mendoza Hail Mitigation Project. This was the second year of a 5 year contract between Weather Modification Inc. (WMI) of Fargo, North Dakota and the Ministry of Economy, Government of Mendoza. The two primary objectives of the Mendoza Hail Program are to reduce hail damage using airborne cloud seeding technology and to implement a research and technology transfer program for the people of Argentina.

It was a very successful year for all parties associated with the program. The amount of hail damage to agriculture in the province was the lowest in more than 12 years, in spite of having many storms. The average hail damage per year for the last 3 years is 32% less than the average for the previous 10 years. We cannot eliminate all the hail. Our goal is to have an average of 50% less damage for the 5 years of cloud seeding, compared with the average for the previous 10 years.

The WMI Lear Jet and one Cheyenne aircraft were stationed in Mendoza, and two Cheyenne aircraft were stationed in San Rafael. WMI provided a spare Cheyenne in Mendoza, at no extra cost, to assure that there were always 4 aircraft available for seeding. The aircraft, radars, and all personnel performed very well this season with no interruptions or missed operations. Special 20-sec high-altitude delay flares were manufactured by Ice Crystal Engineering (ICE)

Inc. for the Lear Jet to conduct seeding over the foothills. This allowed storms which move off the mountains to be seeded earlier and more safely. The operations were as follows:

There were 358 aircraft flights (824 flight hours) conducted between the period October 15th, 2000 and March 31st, 2001 inclusive. Of these, 300 flights (738 hrs) were seeding flights, 58 flights (86 hrs) were for weather surveillance. A total of 360 severe storm complexes were seeded on 61 days. Approximately 17 hrs were flown to seed clouds near the fires in the south to increase rainfall to help reduce the fires. More than 463 hrs were flown during nighttime, and 361 hrs were flown during the daytime. The seeding consisted of 61328 drop-pable/ejectable flares (1226 kg seeding material), and 1995 burn-in-place flares (299 kg seeding material). The total mass of seeding material released was 1525 kg. More flares are being used because there are more storms than we expected.

Seeding was conducted in the north oasis on 46 days, with 152 missions dispensing 737 kg of seed material. There were 32 days with hail and 13 days with reported hail damage in the north.

Seeding was conducted in the central oasis on 36 days, with 69 missions dispensing 230 kg of seed material. There were 17 days with hail and 6 days with reported hail damage in the central oasis.

Operations were conducted in the south oasis on 53 days, with 130 missions dispensing 558 kg of seed material. There were 19 days

with hail and 7 days with reported hail damage in the south.

Significant progress was made this year towards the Technology Transfer Training Program. Highlights of the technology transfer are:

Two pilots from Argentina received additional training on the Alberta Hail Project from June to September 2000. One of these pilots progressed very quickly, was sent to Cheyenne Simulator School in the USA at WMI's expense, and was promoted to a Cheyenne Captain in San Rafael this season.

The Argentina staff on the project this year was 10 pilots, 1 manager, 2 administration and logistics support people, and 1 technician.

The Government completed the communications network in December providing a data link between the DPC offices in Mendoza and Tunuyan with the radar stations at San Martin, San Rafael, and Cruz Negra. In January, WMI installed the upgraded TITAN radar processing and display software on the MRL5 radars of the Government at San Martin and San Rafael.

Terri Bettencourt from the USA completed the networking and displays of the Government MRL5 radars at all the DPC stations and Cruz Negra. A TITAN Training Manual was produced and a detailed training course was given in early February for 38 Government and University technical personnel in San Rafael and Mendoza. The radar networking and training was completed successfully.

In the last year, a new Decree (No 683) was enacted to specify the relation between WMI and the Auditory Committee of the National University de Cuyo. WMI worked closely and collaborated with the Auditory

Committee to conduct audits of all storm activity that resulted in hail damages.

WMI has hired on a permanent basis Dr. Viktor Makitov, senior Russian scientist for 8 years in Mendoza, to be the local scientific expert for conducting further analyses during the off season, and scientific interactions with the DPC and University staff.

Dr. Brant Foote from the National Centre for Atmospheric Research (NCAR) in the USA came to Mendoza to conduct hail research and to promote and implement the Research Program for the Province of Mendoza. Dr. Foote worked closely with the Auditory Committee and WMI meteorologists to provide guidance in the future studies towards the evaluation of the program and advancement of the science and training.

Dr. Terry Krauss (WMI), Dr. Brant Foote (NCAR), and Dr. Roger Reinking, who was a special visitor to the program from the National Ocean and Atmospheric Administration (NOAA) in the USA, gave technical seminars in February at the University de Cuyo. WMI conducted an information seminar at the agricultural exposition in Junin. School tours were conducted at the Cruz Negra radar site and aircraft hangar facility in Mendoza. Numerous radio, television, newspaper, and magazine interviews and articles were written about the program.

Five scientific papers about the program were presented at the American Meteorological Society's Conference on Weather Modification held in Albuquerque, New Mexico, USA in January.

More public relations efforts were made this year. The WMI introductory ground school in October was open to the University and DPC personnel as well as Producers who expressed an interest.

Radar images from the WMI radar at Cruz Negra were made available to the public on the internet at 10 min intervals, and all of the project's radar data, meteorological data, aircraft data, and reports have been recorded onto CD-ROM for the archive at the National University of Cuyo. WMI continued to upgrade the facilities at the Cruz Negra radar and hangar in Mendoza. Communications antennas and radios were upgraded at Cruz Negra and Mendoza.

The WMI radars, aircraft systems, and personnel functioned as proposed. The operations and the training portion of the program were a tremendous success. Considerable knowledge about the meteorology, climate, and clouds of Mendoza storms has

been gained. However, our present state of knowledge still does not allow us to predict in advance how much hail would have fallen if the seeding had not taken place. A great foundation has been established upon which to build a more sophisticated research program in order to determine the effectiveness of the cloud seeding and the economic benefits of the program. The most important recommendation this year calls for a continued implementation of the proposed research program in order to attract more national and international experts and organizations so that the information collected on the program can be synthesized and integrated to advance the science and improve the operations. Much has been accomplished in the last two years, much more can be accomplished during the next 3 years by working together as a team.

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