CSRP Facilities

Aircraft Facilities and Platforms

Aircraft operational facilities are located at the Archerfield Airport. Archerfield is at 27.5697° S, 153.0005° E, which is about 17.5 km at 051° from CP2.

There were two aircraft used during the 2007-2008 season of this project (see Figures 1-2). The first aircraft (ZS-JRA; call sign SEEDA1) served a dual purpose: 1) primarily as a research aircraft to perform trace gas, aerosol, and microphysical measurements in the area and during the treatment of clouds; and 2) as a secondary seeding aircraft when conditions are ideal for multiple seeding aircraft. The second aircraft (N747RE; call sign WXMOD) was the primary seeding aircraft and carries instrumentation necessary for monitoring seeding operations (state parameters, GPS position, and flare events). SEEDA1 was equipped with a trace gas, aerosol, and cloud physics instrumentation package (see Table 1) to measure conditions that affect cloud properties and to document hypothesized microphysical responses in seeded clouds in support of the scientific physical basis for the experiment. Both aircraft were equipped with an instrumentation system that includes a telemetry link to the operations centre as well as a data acquisition system. Digital cameras are used to record flight conditions. SEEDA1 (WXMOD) are capable of carrying twenty (24) hygroscopic flares — two racks of 10 (12) flares each — or twenty (24) "end burning" silver iodide flares (interchangeable on the two racks). In addition, WXMOD was capable of carrying 306 ejectable silver iodide flares. The WXMOD base instrumentation included GPS position, temperature, pressure, and dewpoint sensors.

Instrument	Purpose / Comment	Range
	State Variables	
Rosemount Temperature, Static and Dynamic Pressure, and GPS parameters	Temperature, pressure, altitude, TAS, and location – recorded on telemetry box and on the data system (SAWS)	multiple
EG&G Dewpoint sensor (optional)	Moisture content (NCAR)	-50 to 50 C
Vaisala Temperature and Relative Humidity	Secondary temperature and moisture content (SAWS)	-50 to 50 C, 0-100%
	Cloud Physics	
PMS FSSP	Cloud droplet spectra (SAWS)	.5-47 mm
DMT SPP-100 FSSP	Cloud droplet spectra	.5-47 mm
PMS 2D-C	Small precipitation particle size, concentration and shape (SAWS)	25-800 mm
PMS 2D-P	Large precipitation particle size, concentration and shape (SAWS)	200 -6400 mm
PMS Hot-wire (King) Liquid Water Content Probe	Liquid water content (SAWS)	0.01 – 3 g m^{-3}
DMT CAPS probe	Aerosol through precipitation size spectrometer; LWC; static and dynamic pressure; temperature (NCAR)	multiple
	Aerosols	
DMT CCN Counter	Cloud condensation nuclei concentration and spectra (WITS)	Depends on Supersaturation
Texas A&M DMA	Fine mode aerosol spectra and concentration (NCAR)	0.01 to 1 mm
PCASP	Aerosol concentration and spectra (WITS)	0.1 to 3 mm
	Trace Gases	
TECO SO_2(43c)	Sulphur dioxide (WITS)	0-100 ppm
TECO CO (48c)	Carbon monoxide (WITS)	0-10,000 ppm
TECO O_3(49i)	Ozone (WITS)	0-200 ppm
TECO NO_y(42c)	Nitrogen oxides (NCAR)	0-100 ppm
	Cloud and Situation Imagery	
Digital still camera	To show development of clouds and treatment situations for historical purposes	N/A

Table 1. List of instrumentation that will be used on SEEDA1 (SAWS, NCAR). (click to enlarge)

During the 2008-2009 season, there is one aircraft (ZS-JRA; call sign SEEDA1) that serves as the research and seeding aircraft. The instrumentation onboard SEEDA1 will be nearly identical to that in the previous season (see Table 1), and it's seeding equipment capabilities are also the same as described above.

Radars – CP2 and BOM weather radar network

Primary and secondary seeding areas from a water resources perspective have been identified for the CSRP.

The **primary seeding area** is shown in Figure 3 (smaller black box) and includes:

- the Brisbane River Catchments flowing to the Wivenhoe Dam
- the Stanley River Catchments flowing to Somerset Dam, which also flows into Wivenhoe Dam
- North Pine River Catchments which flows into North Pine Dam.

The **secondary seeding area** shown in Figure 3 (larger black box) includes:

- catchments in southeast Queensland to the south of the Brisbane River
- the upper Condamine catchments to the west of the Great Divide.

These areas were selected based on water resources needs. The CP2 dual-wavelength (S- and X-band) polarimetric radar, located at Redbank Plains near Brisbane (Figure 4), is the primary research radar for the project. Operations therefore focus within a radius of 140 km from CP2. In addition, coordination with the Mount Stapylton Doppler weather radar identifies an additional priority area within the dual-Doppler lobes. The locations of the different radars are listed in Table 2. Clouds occurring in the dual-Doppler lobes provide a unique opportunity to substantially increase our understanding of potential cloud seeding effects on the dynamic evolution of convective clouds. Access to other BOM weather radars in the vicinity, brought together in a merged display, also provide information for nowcasting and aircraft operations. The BOM radars operate in a surveillance scanning mode, while the CP2 radar operates in varying scanning modes, depending on the mission and weather conditions.

Raindrop Disdrometer

Drop size distribution (DSD) measurements are made at ground with a video disdrometer provided by NCAR (Figure 5). The disdrometer is sited near the CP2 radar (roughly at a range of 17 km and an azimuth of 61°; at 27.5999° S, 153.0087° E, and 15 m MSL elevation) in order to provide supplemental calibration information for the radar power measurements (radar reflectivity and differential reflectivity) and for the development and verification of techniques for estimating drop size distributions in precipitation using polarimetric radar measurements. The disdrometer observations will be processed in 1-min intervals at the close of the field program. Computed parameters will include radar reflectivity, differential reflectivity, and specific differential phase. Other DSD attributes will include the governing parameters of truncated and untruncated exponential and gamma drop size distributions, the drop medium volume diameter, and the maximum drop diameter

Figure 1: Photos of the Aerocommander (SEEDA1) aircraft and its instrumentation. (click to enlarge)

Figure 2: Photos of the Piper Cheyenne II (WXMOD) aircraft. (click to enlarge)

Figure 3. River basin map of southeast Queensland, with cloud seeding operational areas marked by the black boxes. The CP2 radar site near Redbank Plains will be used as the Operations Center for the field efforts. (click to enlarge)

Figure 4: Photo of the CP2 radar at the Redbank Plains site. (click to enlarge)

Figure 5: Photo of the video disdrometer at its location in Queensland. (click to enlarge)