Antarctica Automatic Weather Station Field Report:
January – February 2005

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The January – February 2005 field season was conducted by Thomas R. Parish from the University of Wyoming and Mark W. Seefeldt from the University of Colorado – Boulder. Parish and Seefeldt both graduated from the University of Wisconsin – Madison and have previous Antarctica automatic weather station field experience. The field season began on January 11 with Seefeldt's arrival in McMurdo. Parish arrived a week later on January 18. Both Seefeldt and Parish experienced seven day delays in Christchurch, en route to Antarctica. For Seefeldt it was a week of weather delays and for Parish it was due to mechanical problems with the aircraft.

The first visit into the field occurred on January 22 and it was completed by Parish, Seefeldt, and Alec Chin, a Rigger with Raytheon Polar Services (RPSC). A Twin Otter flight was made to Marilyn AWS. Initially the AWS was unable to be found by circling around the previous GPS location. After landing at the GPS location, the AWS was spotted with binoculars, and then the Twin Otter taxied to the AWS. Marilyn AWS had moved 2.5 nautical miles due north from the previous GPS location. The AWS was found to be in good working condition. The height of the sensor boom was 3.05 m above the surface.

A visit to Schwerdtfeger AWS was made after the stop at Marilyn AWS. Schwerdtfeger AWS was located 0.5 nm due north of the old GPS location. The station was found to be in good working condition. The sensor boom was 1.53 m above the surface, and it needed to be raised. The old Tri-Ex tower was still slightly above the surface. A 2.1 m Rohn tower section was added and the junction box was raised to the limit of one of the battery cables. A transmission was verified and the height of the sensor boom was 3.71 m above the surface.

The final site visited on January 22 was Vito AWS. During the previous year the wind direction and wind speed were not working at Vito AWS. Upon arrival the sensor boom was located 2.08 m above the surface. The original plan was to replace the AWS electronics, sensor boom, and wind system. It was decided to also do a sensor boom raise and a 1.5 m Rohn tower section was added. AWS electronics 8722 was removed and replaced with AWS electronics 8695, and the sensor boom was replaced. The wind system was not replaced as the replacement unit was not in acceptable working condition. The lower delta-T could not be re-installed as AWS electronics 8695 does not have the necessary connector plug. A transmission was verified and the height of the sensor boom was 3.51 m above the surface. A check-out of the removed sensor boom revealed that the boom was incorrectly wired resulting in the faulty wind direction and wind speed.

The second day into the field occurred on January 29. The field crew was comprised of Parish, Seefeldt, and Ryan Fogt of Byrd Polar Research Center at Ohio State University. A Twin Otter flight was made to the location of Elaine AWS. In 2004 an unsuccessful attempt was made to find Elaine AWS. The area was circled for approximately 20 minutes without successfully finding the AWS. After landing 2.0 nautical miles due north of the previous GPS position, and scanning the horizon with binoculars, it was determined that the old Elaine AWS had been buried. It was decided to do a new AWS installation at that location. A complete new installation was done with

the installation of AWS electronics 8987 and a Belfort aerovane. The boom was aligned with true north using a handheld GPS. A transmission was verified and the height of the sensor boom was 3.66 m above the surface.

A new AWS was installed near the Transantarctic Mountains between Elaine AWS and Marilyn AWS. The installation of this AWS was made with resources from the Ross Ice Shelf air stream (RAS) grant with principal investigators Parish and John J. Cassano. A standard new installation was completed with the installation of AWS electronics 8697, a RM Young – VM wind system, and a PRT lower delta-T. The boom was aligned with true north using a handheld GPS. A transmission was verified and the height of the sensor boom was 3.68 m above the surface. This site was given the name Eric, after the son of Parish.

The third day in the field was conducted by Twin Otter and occurred on January 31. The field team was made up of Parish, Seefeldt, and Levi Littrell, a Rigger with RPSC. The day started with the installation of a new AWS between Schwerdtfeger AWS and Gill AWS. The installation of this AWS was also a part of the Parish and Cassano RAS study. AWS electronics 8916 was installed along with a RM Young – VM wind system, and PRT type lower delta-T. The boom was aligned with true north using a handheld GPS. The height of the sensor boom was 3.73 m above the surface. A transmission was checked and not received from the AWS after completing the installation. Several unsuccessful attempts were made to isolate the problem. The site was left on that day without a known transmission. It was later confirmed by the AAWS project that 8916 was not transmitting. Another visit was made to this site later in the season, see below. This site was given then name Carolyn. It is named after the sister of Dr. Charles R. Stearns, the principle investigator of the AAWS project.

A second installation was completed on January 31 near the base of Mulock Glacier, which is just to the south of Minna Bluff. The installation at this location was the first to use the CR10X based AWS electronics. AWS-CR10X 8983 was installed at this location, with a RM Young – VM wind system, and an acoustic depth gauge instead of the lower delta-T sensor. The boom was aligned with true north using a handheld GPS. A transmission was verified and the data from the AWS-CR10X was determined to be reasonable. The height of the sensor boom was 3.81 m above the surface and the acoustic depth gauge sensor was at a height of 1.04 m. This site was installed as a part of the Parish and Cassano RAS study. The site was given the name Mary, after the sister of Stearns.

The field work for January 31 ended with a visit to Emilia AWS. During the previous year the transmission from Emilia AWS was inconsistent and the pressure values were low. AWS electronics 8928 was removed and AWS electronics 8919 was installed. The lower delta-T sensor was raised. The height of the sensor boom was 2.34 m above the surface. A transmission was verified.

The fourth and final day of Twin Otter operations was on February 2. The field crew for this day was Seefeldt and Parish. A return trip was made to Carolyn AWS. AWS electronics 8916 was removed and AWS electronics 8722 was installed. A transmission was verified. No measurements were taken as this site was visited just two days earlier.

Gill AWS was visited after repairing Carolyn AWS. The Twin Otter circled the location of the previous GPS for approximately 20 minutes without being able to locate the AWS. The Twin Otter landed 1.8 nm north of the previous location and the AWS was not able to be found by scanning the horizon with binoculars. The Twin Otter went airborne a second time, started heading directly north, and the AWS site was found. Gill AWS had moved 3.8 nm from the previous GPS position. Upon arriving at the site, the sensor boom was 1.57 m above the surface and the lower delta-T was buried 0.63 m below the snow surface. The site was determined to be in good working condition and a 2.1 m Rohn tower section was added. The junction box was raised to

the extent of the battery cables. A transmission was verified and the sensor boom was measured to be 3.84 m above the surface.

The first helicopter field work was completed on February 4 and was done with a United States Coast Guard helicopter. Cape Bird AWS was visited by Parish and Seefeldt. During the previous year the wind system had gone bad at Cape Bird AWS. Upon arrival the prop was observed to be missing from the wind system. The installed RM Young – standard wind system was removed and a new RM Young – standard wind system was installed. There was some corrosion on the mounting hardware of the wind system.

A second USCG flight was made on February 4 by Parish and Seefeldt to Ferrell AWS. A CR10X based acoustic depth gauge system was added to Ferrell AWS. The CR10X, temperature sensor, and ADG were mounted onto the AWS tower. The ADG was measured to be 1.06 m above the snow surface. The CR10X is powered by a battery, without a solar panel, and the battery was buried beneath the snow surface. The AWS equipment was not handled during this visit.

Windless Bight AWS was visited by a Bell 212 helicopter on February 5. The field crew for this work was Seefeldt and Seth of RPSC. The AWS was initially not found by the helicopter crew and some additional flying around was required. Eventually the AWS was found near the previous GPS position. The AWS sensor boom was found to be 0.23 m above the snow surface. The solar panel was half buried in the snow and all other equipment was completely buried. The top of the AWS electronics was 0.56 m below the snow surface. A hole was dug around the AWS tower and all of the equipment was removed for a sensor boom raise. When digging out the AWS electronics it was discovered that the weight of the accumulating snow pulled the antenna cable out of the cable connector at the base of the electronics. A 2.1 m Rohn tower section was added. The junction box was raised up to the extent of the battery cables. The AWS was modified to a new AWS-CR10X electronics. AWS-CR10X 8982, a RM Young – VM wind system, and acoustic depth gauge were installed. A transmission was verified and the initial data reported by the AWS-CR10X was reasonable. The height of the sensor boom was 2.57 m above the surface and the ADG sensor was 1.19 m above the surface.

On February 7 a Bell 212 helicopter flight was made out to Mulock Glacier for the installation of a new AWS towards the top of the glacier. The field crew for this flight was Seefeldt, Brennen Brunner, and Brian Johnson. Brunner and Johnson were from the Field Safety Training Program of RPSC. Upon getting close to Mulock Glacier it was determined that the weather conditions would not allow an attempt to find a location for the installation of a new AWS.

Pegasus South AWS was visited on the return flight from Mulock Glacier. The wind system at Pegasus South was no longer reporting. The wind system failed to move as the helicopter was landing near the AWS. The installed Belfort wind system was removed and a working Belfort wind system was installed. The height of the sensor boom was measured to be 2.62 m above the surface.

A visit to Willie Field AWS was made by truck on February 7. The field team was Parish and Seefeldt. A CR10X based acoustic depth gauge system was added to the Willie Field AWS. The CR10X, temperature sensor, and ADG were mounted on the AWS tower. The ADG was installed at a height of 0.56 m above the snow surface. The CR10X is powered by a battery without a solar panel. The battery was partially buried at the base of the AWS tower. The lower delta-T sensor was raised. The height of the sensor boom was 3.56 m above the surface.

The field season for Parish and Seefeldt ended on February 9 with a return flight to Christchurch, New Zealand.

Beyond the work by Parish and Seefeldt, additional work was completed during January and February by non-affiliated field teams. The following is a summary of the work completed by these parties.

On January 18 Whitlock AWS on Franklin Island was serviced by Mike Willis, a member of the Terry Wilson research group, from Byrd Polar Research Center at Ohio State University. Earlier in the month Whitlock AWS had stopped transmitting. The power was disconnected and the reconnected in an attempt to start up the system. It was later determined that the AWS was still not transmitting. A GPS position of Whitlock AWS was also measured.

A return visit to Whitlock AWS was made by Willis on February 5. AWS electronics 8907 was removed and AWS electronics AWS 8935 was installed. There were large amounts of corrosion with all of the connectors to the AWS electronics. It was later determined than the AWS was not transmitting.

On February 10 a visit was made to Whitlock AWS by Lt. Greg Matyas of the USCG. The installed antenna and antenna cable were removed and a new antenna and antenna cable were installed. Unfortunately, this modification still did not result in Whitlock AWS transmitting.

On January 24 Clean Air AWS was serviced by John Gallagher of South Pole meteorology, RPSC. The power was disconnected to the AWS and the four battery boxes were removed from the site. The batteries were located approximately 1.8 m below the surface. The AWS equipment was further dismantled as the Clean Air AWS was decommissioned.

A Twin Otter visit was made to Nico AWS on January 31 by Gallagher and Tony Black of South Pole meteorology, RPSC. Three battery boxes, which were removed from Clean Air AWS, were installed at Nico AWS.

Table 1: University of Wisconsin – Automatic Weather Stations GPS Locations – January–February 2005 Field Season. The measurements in bold are the original units (either decimal degrees or degree-minutes).

	Decimal Deg.			Deg. – Min.	
AWS Site	**Latitude**	**Longitude**	**Elevation**	**Latitude**	**Longitude**
Cape Bird					
UNAVCO	**77.217395796ºS**	**166.439167594ºE**	**38.474**	77º 13.044' S	166º 26.350' E
Pilot	---	---	---	---	---
Hand-Held	77.2174º S	166.439º E	---	**77º 13.044' S**	**166º 26.345' E**
Carolyn					
UNAVCO	**79.963945053ºS**	**175.841755564ºE**	**52.356**	79º 57.837' S	175º 50.505' E
Pilot	79.9640º S	175.842º E	---	**79º 57.84' S**	**175º 50.51' E**
Hand-Held	79.9639º S	175.842º E	---	**79º 57.835' S**	**175º 50.506' E**
Elaine					
UNAVCO	**83.110647281ºS**	**174.316209725ºE**	**58.748**	83º 06.639' S	174º 18.973' E
Pilot	83.1105º S	174.317º E	---	**83º 06.63' S**	**174º 19.02' E**
Hand-Held	83.1106º S	174.316º E	---	**83º 06.638' S**	**174º 18.964' E**
Emilia					
UNAVCO	**78.502159228ºS**	**173.120731686ºE**	**52.304**	78º 30.130' S	173º 07.244' E
Pilot	78.5090º S	173.114º E	---	**78º 30.54' S**	**173º 06.84' E**
Hand-Held	78.5021º S	173.121º E	---	**78º 30.128' S**	**173º 07.242' E**
Eric					
UNAVCO	**81.504019626ºS**	**163.939784903ºE**	**45.264**	81º 30.241' S	163º 56.387' E
Pilot	81.5000º S	164.000º E	---	**81º 30.00' S**	**164º 00.00' E**
Hand-Held	81.5041º S	163.940º E	---	**81º 30.243 S**	**163º 56.374' E**
Ferrell					
UNAVCO	**77.871237429ºS**	**170.818738812ºE**	**45.807**	77º 52.274' S	170º 49.124' E
Pilot	---	---	---	---	---
Hand-Held	77.8712º S	170.819º E	---	**77º 52.270' S**	**170º 49.110' E**
Gill					
UNAVCO	**79.922360816ºS**	**178.585942241ºW**	**54.1**	79º 55.342' S	178º35.157' W
Pilot	79.9223º S	178.585º W	---	**79º 55.34' S**	**178º 35.11' W**
Hand-Held	79.9224º S	178.586º W	---	**79º 55.341' S**	**178º35.162' W**
Marilyn					
UNAVCO	**79.934621417ºS**	**165.378042268ºE**	**64.265**	79º 56.077' S	165º 22.683' E
Pilot	79.9347º S	165.379º E	**300'**	**79º 56.081' S**	**165º 22.723' E**
Hand-Held	---	---	---	---	---
Mary					
UNAVCO	**79.302867615ºS**	**162.968135140ºE**	**58.237**	79º 18.172' S	162º 58.088' E
Pilot	79.3000º S	163.000º E	---	**79º 18.00' S**	**163º 00.00' E**
Hand-Held	79.3029º S	162.968º E	---	**79º 18.171' S**	**162º 58.082' E**
Schwerdtfeger					
UNAVCO	**79.866705389ºS**	**170.141637633ºE**	**54.111**	79º 56.077' S	170º 08.498' E
Pilot	79.8667º S	170.143º E	**200'**	**79º 52.004' S**	**170º 08.553' E**
Hand-Held	---	---	---	---	---
Vito					
UNAVCO	**78.500684623ºS**	**177.753022227ºE**	**50.438**	78º 30.041' S	177º 45.181' E
Pilot	78.5005º S	177.754º E	**200'**	**78º 30.03' S**	**177º 45.21' E**
Hand-Held	---	---	---	---	---
Whitlock					
UNAVCO/OSU	76.1424° S	168.424° E	**206.082 m**	**76° 08.5466' S**	**168° 25.411' E**

Table 2: Measurements of equipment at AWS sites. All measurements are given in meters and in inches in the parentheses. All measurements are measured to the bottom of the item, unless otherwise specified.

AWS Site	Sensor Boom	AWS Enc.	Solar Panel	Junction Box	Other	Other
Carolyn – new installation	3.73 (147)	1.52 (60)	2.74 (108)	1.17 (46)	[b] 1.07 (42)	
Elaine – new installation	3.66 (144)	1.70 (67)	2.79 (110)	1.27 (50)	[b] 1.14 (45)	
Emilia – arrival / departure	2.34 (92)	0.97 (38)	1.70 (67)	1.40 (55)	[b] 0.71 (28)	
Eric – new installation	3.68 (145)	1.78 (70)	2.92 (115)	1.27 (50)	[b] 1.14 (45)	
Ferrell - departure	4.90 (193)	[a]	[a]	[a]	[c] 1.07 (42)	[d] 1.50(59)
Gill – arrival	1.57 (62)	0.33 (13)	1.04 (41)	0.76 (30)	[b,f] -0.64(25)	
– departure	3.84 (151)	2.01 (79)	3.10 (122)	1.30 (51)	[b] 0.99 (39)	
Marilyn – arrival / departure	3.05 (120)	1.12 (44)	2.36 (93)	0.69 (27)		
Mary – new installation	3.81 (150)	1.75 (69)	2.92 (115)	1.42 (56)	[c] 1.04 (41)	
Pegasus South – arrival / departure	2.62 (103)	1.27 (50)	2.08 (82)	0.91 (36)	[b] 0.23 (9)	
Schwerdtfeger – arrival	1.53 (60)	[e] -0.53(21)	0.51 (20)	0 (0)	[b] 0 (0)	
– departure	3.71 (146)	1.83 (72)	2.54 (100)	0.86 (34)	[b] 1.22 (48)	
Vito – arrival	2.08 (82)	0.66 (26)	1.32 (52)	1.04 (41)	[b] 0.30 (12)	
– departure	3.51 (138)	1.96 (77)	3.35 (107)	1.65 (65)	[g]	
Willie Field – arrival / departure	3.56 (140)	1.12 (44)	3.23 (127)	1.60 (63)	[b] 0.64 (25)	[c] 0.56(22)
Windless Bight – arrival	0.23 (9)	[f] -1.07(42)	[e] -0.15(6)	[f] -0.66(26)		
– departure	2.57 (101)	1.57 (62)	2.24 (88)	0.30 (12)	[c] 1.19 (47)	

Notes:

- [a] – not measured
- [b] – lower delta-T sensor
- [c] – acoustic depth gauge (ADG), measurement to bottom of ADG sensor
- [d] – CR10X
- [e] – piece of equipment was partially buried in the snow
- [f] – piece of equipment was entirely buried in the snow
- [g] – piece of equipment was removed from AWS site

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Addendum

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Summary of Known Future Work:

Lettau – replace electronics, add new batteries, raise the sensor boom
Carolyn – replace electronics to correct malfunction wind speed / direction
Marilyn – replace wind system
Whitlock (Franklin Island) – repair non-transmitting AWS
Windless Bight – raise the sensor boom, move wand antenna, battery extension cables will be necessary
Proposed A – new install
Proposed B – new install

Additional Comments:

- The Twin Otter pilot and the fixed-wing ops greatly appreciated the mileage chart and map for the AWS on the Ross Ice Shelf.

- The sites for future installation are now referred to as Proposed A and Proposed B. Proposed A is formerly referred to as the "top of Mulock Glacier". Proposed B is formerly Proposed 3 and is to be located near Roosevelt Island. The renaming to letters was been done to clarify the names from the previous two years of field operations.

- Proposed A is the last of the installations dedicated exclusively from the Parish/Cassano RAS grant. The installation location, 78° 54' S and 159° 0' E, is based on an aerial survey of the area by Brian Johnson, FSTP, and discussion with Parish and Seefeldt using a map. The installation can be done by helicopter and requires the use of two mountaineers to verify the glacier conditions. This year Brian Johnson and Brennen Brunner were the two mountaineers selected for the operation. The plan was for Brian Johnson to do a "hot probe" of the area with the helicopter running. Once that was determined to be safe then they would shut down and Brian and Brennen would continue probing for safety. Brian Johnson is the primary contact and holds the most familiarity with the installation of an AWS at this location. An installation is still not a guarantee and is dependent on the final survey of the area.

- Proposed B is to be placed near Roosevelt Island and is in support of multiple research programs. The suggested location is at 78° 30' S and 167° 0' W.

- An Elaine and Eric combination field service is doable with a Twin Otter using a full fuel load along with a 55 gallon drum of fuel. With this combination there is limited available flying time to search for the AWS sites. In order for it to be done, both AWS sites need to be found within 5-10 minutes of arriving on site.

- A visit to Whitlock AWS will be necessary for next year. Currently the AVDET (helicopters) are not expected to be a part of the Polar Star for next season. This is due to an upgrade of the Dolphin engines and the POPDIV helicopters are being allocated as lowest priority. There is talk that NSF can get a helicopter from PHI which can be used over open water. The next issue would be a fuel cache. The current fuel cache at Franklin Island, used by the Wilson group, is starting to run low. Setting up a new fuel cache might be difficult without being able to take helicopter flights off of the Polar Star. It was suggested to look into setting up a fuel cache on B-15A, if it remains near Franklin Island, as a Twin Otter could establish that fuel cache.

- With the use of helicopters off of the Polar Star in question for next year, and the long term plans for the Polar Star/Sea icebreakers up for debate, there was talk as to what can be done. It was mentioned that a year ago PHI did supply a helicopter which was able to work off of the Nathaniel B. Palmer. It may be advantageous to keep tabs as to any developments with helicopter work off of the NBP for AWS work along the Adelie Coast.

- At Gill and Ferrell AWS sites an attempt was made to determine a correction in the alignment of the boom to true north. After some discussions regarding the movement of an AWS on the ice shelf it was concluded that it was not a stretch that the AWS would "twist" as it moves, or that the alignment to true north will have changed. In using the hand-held GPS it was determined that the Gill AWS sensor boom is 30° east of north out of alignment to true north (this was determined after factoring in the 120° offset due to the change from the TriEx tower to the Rohn tower). It was also determined that the Ferrel AWS sensor boom is 15° east of north out of alignment with true north.

- Based on the above experience using the hand-held GPS it is suggested that when an AWS site is visited the alignment of the sensor boom to true north is checked on each visit. To do this the AWS site is entered as a waypoint in the hand-held GPS. You then walk in the direction which the sensor boom is aligned. A second person can also be used to ensure the walk is in alignment with the sensor boom. The hand-held GPS then provides the angle back to the waypoint (AWS site) and that provides the correction factor from 360°/0°.

- It is recommended that a sensor boom raise be done on Windless Bight during the 2005-06 field season. The wand-type antenna is also less than optimally installed as it is located within an inch of the senor boom and may contact the sensor boom in windy conditions. There was not enough time due to the incoming helicopter to make the adjustment at the time of installation.

- The use of a Rigger in the field for the installation of a new AWS was very helpful. The extra help was appreciated and the anchoring methods were definitely better than the chain / rope method. It can be advantageous to include Rigger support in the SIP whenever there completing a new AWS installation based out of McMurdo.