

EME Operations From 3YØX, Peter 1 Island, 2006

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The 3YØX DXpedition to Peter the First Island in February 2006 was the largest and most expensive DXpedition in history. As part of the effort, three EME stations were assembled, tested and shipped to the island. 114 QSOs were made on 2m, and the 6m signal was copied. This paper describes the equipment, the preparations and the operations.

Peter the First Island (P1) is the most remote and difficult DXCC entity to activate. At 68S/90W, this uninhabited island is further south than the majority of Antarctic bases. It can only be reached after a sea voyage of over 1,600 km and all equipment and personnel must be transferred from the ship via helicopter as there is no suitable spot to offload directly to the island. There were 22 team members and 11 tons of equipment on our vessel, the MV DAP Mares. Travel involved commercial air transportation to Punta Arenas, the southernmost city in Chile. From there, a charter flight took the team to a Chilean base on King George Island in the South Shetland group. We met the ship there, already loaded with the 40-foot shipping container with all the equipment, and commenced a four day voyage across the Bellingshausen Sea to P1. Our contract with the vessel called for us to have a total of 16 days “in the vicinity of” P1.

Three EME stations were assembled for the trip. For 6m, an Icom 756 Pro 3 fed an Alpha 6 amplifier giving 1.5 kW. The antenna was a 7-element M². 100 feet of LMR 400 comprised the feedline, and a Mirage preamp was available between the radio and linear.

The 2m station comprised an Icom 910 and a TE Systems 2m amplifier/preamp, capable of 350 Watts. Four 9-element M² antennas were mounted on an H-frame with full az-el capability, although manually operated. The amplifier was located 100 feet from the shack, along with a battery and charger. There was an additional 30 feet of LMR 400 from the amplifier to the antenna.

The 70cm station used another 910 and an Alpha/RFC 110W 70 cm amplifier. The amplifier was also mounted remotely and shared the same battery and charger as the 2m amplifier. There was a Landwehr preamp mounted at the antenna feedpoint. Four K1FO style yagis were mounted on an H-frame, and an Alfaspid az-el rotator was available to give full azimuth and elevation control.

Home-built interfaces were used between the radios and computer sound cards. The latest version of WSJT (5.9.3) was installed. Moonsked was available as well as NMEATIME with a Holux GPS-mouse for synchronizing the PC clocks. All stations were checked out for the appropriate version of JT65 as well as CW.

EME contacts were made in Boulder, Colorado, on each band using the actual hardware. The stations were then disassembled and made ready for shipment and either packed in

the team container or (in the case of the 70cm station, which was the last to be completed) shipped by air directly to the offices of our agent, DAP, in Punta Arenas. All preparations and travel to the island went according to plan. The MV DAP Mares, based in Punta Arenas, is entirely suitable for this type of operation, and her crew were competent and supportive.

When we arrived at the island, plan and execution began to part company. The weather was unsuitable for helicopter operations for the first two days (Feb 6 and most of 7th). This meant that our original plan to spend these two days getting the 9 HF stations on the air had to be modified. When the weather broke there was only enough of a window to get a portion of the equipment and 18 of the team on the island. The base was built and HF stations put on the air incrementally over the 9th through the 12th, in the face of high winds, snow and rain. The surface of the ice field (Radiosletta) on which the base was built was consequently extremely slushy making movement difficult and manual movement of some of the heavier items impossible. The team worked hard, with few breaks for sleep, and with most of the kitchen equipment being among the last items to arrive on the island, with rather unappetizing food.

No moon was visible until the 13th. The original plan had called for the period after the HF stations had been assembled to be used to set up the EME gear, but when the 12th dawned we were still conducting helicopter operations, setting up base infrastructure and getting the HF signals on the air. Clearly we could not get three EME stations assembled in the few remaining hours, in the face of poor weather and exhausted personnel. A decision was made to get the 2m station going on the 12th, and see if more could be done on the other bands later.

After some frenzied activity, 2m was activated at “first moon”. Pointing was done by compass, as the weather was completely overcast, windy and snowing. Successful contacts were made with several stations, although we were inadvertently using JT65A instead of JT65B as had been originally advertised. This can only be put down to tiredness on our part. JT65B was used for subsequent contacts. The first QSO was W5UN, whom we subsequently worked on CW as well. Most of the assembly was done by PA5M and myself, with lots of help from other team members. But we had only had a few hours sleep in the preceding few days, and that was in cold and wet conditions. The battery charger system proved to be a huge problem. The charger was the one piece of equipment that had not been checked out in Boulder prior to shipment. It had been procured in Atlanta and sent directly down. It was a modern switchmode unit, with a microprocessor for control, and could be set for different charge rates and battery types. On paper it appeared ideal for the purpose. However, the controller in this unit proved to be extremely sensitive to the RF floating around from the HF stations. The unit would reset itself and stop charging frequently, requiring manual intervention. We checked almost every time we adjusted the antenna pointing, but the severity of the problem only became apparent over time, as the battery became seriously over-discharged.

Buoyed by this first-night success, we decided to forego some more sleep and get the 6m station on the air. This was accomplished before the next moon, but it was immediately

obvious that we had a very noisy situation on our hands. With the Mirage preamp in circuit, we were getting S7 noise, some from the HF stations, and some from unidentified sources, most likely the switchmode chargers for all sort of equipment around the base. There was an unknown number of these, for everything from satellite phones to computers, network equipment and cordless drills. An attempt was made to locate the worst of these using an FT817 with a rubber duck antenna as a makeshift direction finder. All we could determine was that the worst interference was coming from "Op A" where the EME stuff was also located, but with HF QSOs being made at a great rate, we could not do the logical thing and turn everything off and then turn things on one at a time. Removing the antenna from the preamp, the S meter went down to S1, so we knew the noise was coming in through the antenna and not through the power supply or sound card interface. The worst HF interference came from 80m CW operations for some reason. The 80m HF ops were very accommodating, but much of our "horizon" moon time coincided with their best gray line operations, so there was a problem. In the end, W1JJ got one complete CQ decode from us on 6m. We never saw anything that looked like a JT65 signal.

At this point, we made the decision to *not* put up the 70cm equipment. The box containing this gear was the last one to be helicoptered to the island, so we had no chance to unpack and prepare anything. Given the poor weather and awful snow surface conditions, we had to be careful to be sure we could disassemble everything and be ready to leave in the appropriate amount of time. After a lot of discussion with the team leaders, we reluctantly left the 70cm equipment in its shipping container. Bear in mind when considering this that PA5M and myself were also trying to contribute to the total of HF QSOs, and moonbounce was an additional activity, albeit an important one.

For the middle part of the operations we existed on short "cat naps" of less than 2 hours, randomly distributed and very confusing for body clocks. Any spare time was spent trying to resolve the interference issues and make the stations work better. Mike single-handedly dragged another generator around to provide "isolated" power for the charger, and this helped a lot in terms of keeping our battery voltage up. I took the charger and added an impressive quantity of ferrites on the input and output wiring. We put both our batteries in parallel and coiled all the wiring up to provide additional "chokes". Toward the end, with these measures, the battery was just able to hold its own, and this is reflected in our increasing QSO totals. In some cases we were forced to go "barefoot", and with 130 feet of coax, this was only possible with bigger stations, and required considerable patience on both ends.

The team leaders were keeping an eagle eye on the weather, and "de-construction" of the camp started 2 days earlier than planned, as this was mandated by the weather. 6m was taken down first, as this was proving fruitless. 2m was kept on longer, as QSOs were still being made. Op B was disassembled, and CW/SSB and EME operations were confined to Op A. Team members began to leave the island, and eventually the whole camp was removed, although the weather was indeed a serious factor, and the decision to start early was probably the right one.

In the end 114 QSOs were made on 2m with 33 DXCC entities, and we had one “swl” report on 6m, from W1JJ. Given that weather ate into planned operations at both ends of our stay, this is perhaps not a bad result. Some of the pileups were impressive, and when things were “jumping” Mike and I had a lot of fun. On one occasion we were making more QSOs than the HF stations, as all the bands were dead.

In summary, this was a worthwhile effort. The failure of 6m was disappointing. There was clearly more going on than just our local interference. We were able to always put out more than 800W, frequently 1200+W. The antenna appeared fine, Mike and I checked the assembly twice, and the SWR was excellent (10W reflected for 1kW forward). There were many big gun stations listening, and we should have been heard by all of these. We monitored the transmission on the FT817, and it appeared clean. I would suggest that some propagation effect is responsible for this discrepancy, and this is an interesting result in itself. In retrospect, we might have done better to ignore 6m entirely and make an attempt to get the 70cm station QRV, but we could not have known this at the time.

Manual antenna pointing under these harsh conditions was marginally acceptable at best. To re-tie the Dacron antenna rope, we had to remove our gloves, and then the azimuth stakes had to be pulled out of the snow and “replanted”. When the wind was high and the temperature low, it was tough to get the antenna pointed- we had to use a flashlight to illuminate the compass, and site along the antenna booms since the moon was seldom visible. All this on unstable snow and with wind gusts that could almost blow you over. We had to unzip the flap of the tent and go out every 10-20 minutes, and this let in a blast of cold air and snow, sometimes to the annoyance of the HF ops. The Op tent was kept rather warm (about 90F), and repeated trips out into the cold air and snow were, to put it mildly, “bracing”. Both Mike and I had sinus/head/throat problems. I would suggest to anyone contemplating this type of operation that an antenna rotator would be well worth the extra effort and expense. Also, remote monitoring of battery charge condition would have been a big help. In the end, the zipper on the tent flap failed, and this is probably largely due to the number of trips out to the EME antennas. We found it easier when both of us were available, but with a good rotator setup and reliable remote power, a single operator would be adequate, and could probably handle two simultaneous bands with practice.

We had made a list of skeds before the trip, as a precaution against equipment problems etc, but in the end this proved to be unnecessary. Random operation was far superior in terms of results, and as our familiarity with the software improved, we were able to handle the “pileups” easily. Our EME pilot, Lance, W7GJ provided good feedback to us and allowed us to focus our efforts. We sent daily logs to him using Iridium dataphone hookups, and hopefully this allowed folks to relax when they saw their calls in the log.

The WSJT software works very well, and is resilient in the face of a surprising quantity of QRM from HF stations. One improvement would be if the “effective” decode area could be wider. We occasionally saw strong signals at frequencies above the “green line”,

and would have been curious to know who was up there while we were busy with a station down at 1250 Hz or lower.

In the end, I estimate that at least 6 man-hours of effort went into each QSO, when all the work is averaged out. The DXpedition is still struggling to make ends meet financially. Keep this in mind when sending in your QSL. Nevertheless, Mike and I have both asked ourselves “Was it all worth it?, and the answer is a resounding “You bet!”