

Wired for sound...and email...and video

Imagine a time when you will arrive in Antarctica from Australia by aircraft after a five-hour flight. Your mobile phone will tell you that you are at Casey and what the weather forecast is for the next day. The latest news service will be running on video monitors, while you log in to check your email. You will spend the next few weeks setting up your research project, which will be remotely operated from Australia during the winter, before boarding the aircraft for your return flight.

This scenario may be only a few years away, thanks to significant advances in communications technology over the past 25 years. When I joined the Australian Antarctic Division (AAD) in 1982, communications were very basic compared to today, but still a big improvement on what was available to Douglas Mawson when his Australasian Antarctic Expedition (1911-14) set up a transmitter at Commonwealth Bay, and a relay station on Macquarie Island. At that time a rotary-arc transmitter and Morse code were used to send weather information and personal messages to Hobart.

I spent my first year in Antarctica at Australia's most distant station – Mawson. During my ship voyage to Mawson in January 1983, I was able to send a few short telex messages that were typed into the telex machine by the radio operator, and transmitted to Mawson by radio for relay to Australia. On arrival, I soon learnt how busy the Mawson radio station, 'VLV', was. Each day, as part of my job, I produced a long paper tape which contained the day's cosmic ray observatory data. I would then hand this to one of the four radio operators in VLV, who would add it to the tapes waiting to be relayed to Australia via Casey over high frequency (HF) radio circuits. Mawson also acted as a meteorological data collection centre for a number of other nation's stations in that part of Antarctica.

HF radio also provided the only voice communications between Mawson and Australia. Each day for an hour in the morning, there would be a small queue of people waiting in VLV for their 'radphone' (radio telephone) call. These people had booked their call several days in advance, and if they were lucky they would have a few short minutes of poor quality radio conversation with their families.

The poor signal quality could work to your advantage. Each Thursday morning a radio 'sched' was held with the newly established radio station at Kingston. On a number of occasions when my supervisor and I were discussing new tasks in my works programme, the conversation was cut short by a fading radio signal.

The introduction of satellite communications in the late 1980s revolutionised communication between Australia and its four Antarctic/subantarctic stations. The network, known as ANARESAT, uses Intelsat geostationary satellites to provide telecommunication links between Australia and the stations. The first satellite earth-station, which includes a 7.3 m dish



The Mawson ANARESAT radome was commissioned in January 1988. This satellite network infrastructure, established on each of Australia's stations, allows expeditioners to use satellite-based phone, email, internet and fax services to communicate with Australia. Radio masts can be seen in the background.

antenna, was installed and commissioned at Davis in March 1987. Mawson was commissioned in January 1988, Casey in March 1988, and Macquarie Island in December 1988.

Initially, just one phone line and one 4800 bps (bits per second) modem line were established. The clarity of the phone line was incredible compared to the radphone, and the data line had a capacity of about 100 times the old telex circuit. In 1992 the data capacity was increased to 64 kbps (kilobits per second) with the establishment of a digital data service to replace the analogue modem line. Today the data capacity to each station is 128 kbps. Additional satellite bandwidth to cope with larger future demands can be added to the system when required, such as when ABC TV broadcast from Mawson for the millennium celebrations in 2000.

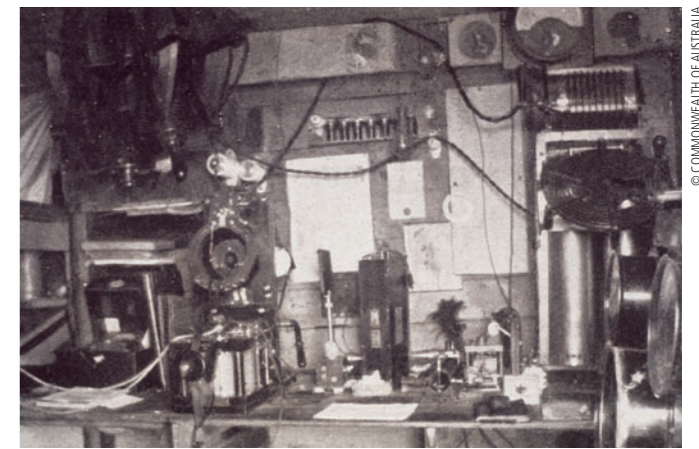
Today's expeditioner is able to make and receive direct dial telephone calls to almost anywhere in the world across high quality digital phone circuits. They can send and receive faxes and emails (including digital photos), and have full-time access to the internet.

One of the main uses of the satellite data connection is for the collection and transfer of large amounts of scientific data to Kingston. Remember that telex tape of cosmic ray data that I used to send each day? Well the cosmic ray counts are now sent continuously, 24 hours a day by the automated data logging system. Similarly, meteorological data is sent every minute from automatic weather stations, and forecasters at Casey receive the latest model data from Melbourne.

Communications technology for expeditioners at field camps and on the resupply ships has also improved. Mobile satellite systems, such as Inmarsat and Iridium, provide phone and email services to expeditioners travelling on the *Aurora Australis* and other ships. Imagery of ice conditions can be received directly onboard the *Aurora* from several satellites. When the ship is unloading at a station, it is connected to the ANARESAT system by a microwave link. A similar link enables scientific data transfers from the penguin monitoring site on Béchervaise Island near Mawson, as well as providing Voice over Internet Protocol phone and email communication. Modern technology has also meant that HF radio is again used for data transmission – the new airfield near Casey had a continuous email connection via HF data during the 2005-06 summer season.

More changes are expected in the future. The most immediate improvement will be increases in data capacity due to decreases in the cost of satellite circuits, and the use of data compression and management technology. Trials of this type of equipment are now underway. Increased circuit bandwidth will see new services introduced, including video conferencing and telemedicine technology such as remote ultrasound diagnostics. The AAD's Polar Medicine Unit currently uses the network for the transmission of digitised X-ray images, digital photos and phone consultations with specialists. In addition, expeditioners could soon receive podcasts and radio stations streamed to stations. An edited package of video news could be sent to the stations each day. Certainly more video footage will be transferred from the stations on a regular basis, for use in news services in Australia.

Other changes will include the increased use of Iridium portable satellite phones by field parties. The planned introduction of the Inmarsat Maritime Broadband Global Area Network service in 2007 will provide increased data services to ships and major field programmes. Marine science requirements may see the installation of ANARESAT-style satellite communications on research ships. Already we can view the positions of ships and some penguins and seals on-line, but I anticipate that greater use of satellite tracking of



Communication technology has come a long way since the days of Mawson's 1911-14 expedition when a rotary-arc transmitter and Morse code were used to send weather information and personal messages (top). Today the communications room at Mawson station (above) contains the main control console and associated equipment.

vehicles and field parties will be made for operational reasons, as well as continued use of Global Positioning System navigation and route finding.

Is there life without a mobile phone? In Antarctica there is, but not for much longer. We trialed a mobile phone system at Casey in 2005 and I suspect this type of technology will soon be taken for granted at all our stations. Short Message Service (SMS) will be one of the first uses of the phone for alerting technical staff to equipment alarms, replacing the existing paging system. Expeditioners could also receive SMS notification of the status of their intercontinental flight from Casey.

Much of the future scientific exploration of Antarctica will be done using satellite remote sensing. Capturing the data that covers the Australian Antarctic Territory will require the establishment of s/x-band satellite reception facilities at Casey or Davis. This would also replace the aging l-band weather satellite reception facility at Casey. In the coming decades, modern communications technology will continue to play an important part in Antarctic operations.

—PETER YATES

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