A short journey through Aerodata and World Geoscience

A personal memoir by Pat Cunneen

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Acknowledgements: Contributions gratefully received from Dave Isles, Don Pridmore, Greg Street, Greg Reudavey, Ron Creagh, Andrew Duncan and John Stewart.

I've often been asked to write a history of Aerodata and World Geoscience but have not previously been persuaded to do so. Recently, however, the history committee of the Australian Society of Exploration Geophysicists prodded me to respond.

Aerodata Holdings Limited was the Australian parent company and World Geoscience Corporation was the more ambitious international sibling, dedicated to The Spirit of Creation symbolised in its logo, and to bringing to fruition the imminent creativity in each of its employees, helping them to discover their creativity and to apply it to their work.

1.0 Introduction

Geophysics with Western Mining

In 1963 I answered an advertisement by Western Mining Corporation (WMC) for geophysical assistants on their new induced polarisation (IP) crew. After hiring Anton Triglavcanin, a Croatian geophysicist, in conjunction with Broken Hill South, WMC had contracted a Canadian company, McPhar Geophysics, to conduct frequency domain IP exploration work in South Australia.

WMC subsequently bought frequency domain IP equipment from Applied Geoscience, a company owned by Tom Cantwell, who was a pioneer of the IP method. Also active in IP at the time were Harry Siegel, using time domain equipment, and Phil Hallof, working in the frequency domain with his McPhar Geophysics instruments.

With the other WMC trainee, Michael (Mike) Compton, I was sent to do an IP survey of a copper-nickel prospect at Murrin Murrin near Leonora in Western Australia. Murrin Murrin was later developed by Andrew Forrest in his Anaconda company as a major laterite nickel mine. We spent a lot of time in the White House Hotel, so named in honour of US President Herbert Hoover who in his youth had managed the adjacent Sons of Gwalia mine. Mike Compton and I challenged the town of Leonora to a chess tour and we were thrashed.

When I joined WMC in 1963, Roy Woodall was Chief Exploration Geologist, Laurence Brodie Hall was General Manager and Arvi Parbo had just joined.

Hooked on geophysics

As the son and grandson of prospectors, I was completely entranced to discover that with IP you could look into the Earth and 'see' the minerals. Exploration geophysics, for me, has never lost that first fascination. I was and remain ever curious as to its possibilities. Authorised or not, I was always conducting experiments to test those possibilities.

Early INPUT airborne electromagnetic system

I recall that in 1963 while at Murrin Murrin we came across a Selection Trust electromagnetics team following up on INPUT anomalies. They had numerous

anomalies to follow up because the regolith was both thick and conductive. The INPUT system was in its infancy, having been launched by Tony Barringer of Selco (a Canadian company) in 1961.

Moonta

Shortly after Murrin Murrin I was sent to Moonta in South Australia, later to Clunes in Victoria then back to Kalgoorlie in 1965 to head up the geophysical data processing centre. IP data from four crews were now streaming in and my team of three School of Mines students was hard put to keep up – with our slide rules running hot (no computers in those days).

Kambalda

In 1966 Kambalda was discovered. My friend and colleague, Mike Compton, ran the IP survey over the base metal gossan brought in by prospectors from what was then called Red Hill and the processing centre compiled the data. My boss, Anton Triglavcanin, informed me that the first drill hole had returned an intersection of 8.3% nickel. He showed me the dipole-dipole anomaly that had been the drill target and predicted sadly that the next few drill holes were destined to be duds as ‘the geologists insist on targeting anomalies which are clearly shales.’ And this proved to be true. Most geologists at the time had a deep suspicion of geophysics. In today’s terms they were ‘geophysics deniers’.

McPhar and GRD

In 1966 I left WMC and moved to Adelaide to work for McPhar. Ed Burnside was the Manager and John Bishop was Chief Geophysicist. They sent me to Captains Flat near Canberra where Lee Furlong was the crew leader and we were working for Electrolytic Zinc (EZ), then to Parkes and Condobolin in New South Wales, and then back to Michelago (New South Wales) as crew leader.

In 1967 I went to work for Geophysical Resources Development (GRD) in Sydney, a partnership of the companies of Lindsay Ingall, John Newman and Bob Reckeweg, which traded initially under Lindsay’s company, Wongela Geophysical Pty Ltd, until GRD was up and running.

The office was in Hunter Street, North Sydney, and there I met Louis Coremans, a French-speaking Belgian who worked for Lindsay on gravity surveys.

GRD had just bought time domain (Huntec) IP equipment, which I was employed to operate in Queensland, New South Wales and Victoria until the partnership broke up. Then I continued for a while with Lindsay Ingall on seismic and other things.

AMEG

I went to Kalgoorlie in 1967 to work for John Newman’s company, Australasian Mining and Engineering Geophysics (AMEG) on airborne magnetic surveys for nickel in the post-Kambalda boom. My co-workers were Louis Coremans, Dennis Lankester and Les Starkey.

AMEG tried various aircraft but finally settled on two Beavers provided by a crop-dusting firm, Air Ag, from Armidale in New South Wales.

The magnetometers we used were Barringer Proton Precision instruments, which John Newman was constantly modifying. I can still see him late at night with a soldering iron perched in the back of the aircraft, head down in the magnetometer console.

AMEG contracted Decca Hi-Fix from the UK to provide radio positioning but unfortunately the precision of their triangulation far exceeded the accuracy of the 1:50,000 maps provided by the WA Lands Department and the data were distorted.

The magnetic data at that time were collected on analog charts as this was the pre-digital era. A plastic set square was used to transfer ‘contour cuts’, or intersections, to the flight lines.

I left AMEG to return to IP work. I worked for Jim Hussan and was based in and around Kalgoorlie.

Marriage to Ann

In 1970 I married Ann and moved to Perth to work for Mibolog, a company started by three German ex-employees of Schlumberger who were offering downhole logging services to mineral explorers as well as oil explorers. MIBOLOG diversified into airborne magnetics and IP so I was able to be useful in those areas as well as plotting downhole logging structures by hand.

Scintrex

In 1971 I joined Siegel Associates (later became Scintrex Pty Ltd) as Chief Data Compiler, working with many instruments and in many roles, including Acting Manager in Perth when Graham Linford was overseas in South Africa and the Philippines. My main task was airborne data processing – with magnetics, radiometrics, Turair and helicopter frequency electromagnetics in the toolbox. Time domain IP and gravity were included and I contributed as a fieldy (field hand). I was put in charge of one of Harry Siegel's new ideas, a soil mercury measuring device. Mercury, the story went, is upwardly mobile as its vapour emanates from sulphide orebodies. Unfortunately, things were more complex than that as mercury also accumulates in plants, even the grasses above and around orebodies. Sharks, as feeders at the end of the food chain carry a lot of mercury and should not be eaten. Cigarettes are a source of mercury. The mercury science and the instrumentation were first class, but not useful in terms of finding orebodies.

Aerodata Services

In 1976 I was made redundant from Scintrex due to a cyclic downturn in exploration and, in 1977 after a year of selling air-conditioners, I attended a meeting with Les Starkey and Michael (Mike) McCauley in the Kings Park Café that Louis Coremans had called. Louis suggested that we start a new airborne geophysical company. I had taken John Stewart along as he also had previously proposed a similar idea when we worked together at Scintrex.

Les Starkey opted not to be involved but the remaining four of us bought in, investing $500 each as working capital. We named the business, at John's suggestion, Aerodata Services. Louis at the time was working for Woodside, John for Scintrex and Mike was busy with his air-charter business. I was the only 'loose cannon' so I was elected manager at zero salary to go out and find work. An agreed salary would commence when the first contract was signed. I had experience and contacts and hit the pavements around Perth. The first man I called on was Dick Irvine in the Perth office of BHP. Dick said something like, 'A new airborne geophysics company – that's a very brave move!'

Eneabba coal leases

In the slow time at the beginning, Tim Goyder and I did some resistivity work on prospective coal leases which he had pegged near Eneabba. It looked interesting but we didn't have the money to drill so we approached Hancock and Wright who were happy to look at them.

Radiometric survey

Jim Lissiman and Anton Triglavcanin, ex-WMC, were now involved in Allied Minerals NL, which in 1974 had discovered mineral sands deposits. These were later developed under the company Allied Eneabba Ltd.

While launching Aerodata Services, Louis Coremans and I were contracted by Les Starkey to fly the coastal strip from Perth to Geraldton in an Islander aircraft to explore for mineral sands.

The instrument we used was a McPhar AV4 gamma ray spectrometer. It was an ‘integral’ instrument, which meant that potassium, uranium and thorium were differentiated by having four channels – each with a different energy threshold. The survey was not successful.

2.0 The Building of Aerodata Services

There was a frustration at the time (1977) with the market leader, Geosearch Pty Ltd, a Kevin Radford company, because they could not deliver data in a timely manner. This created a market opportunity for Aerodata. It transpired that Geosearch was involved with Peko-Wallsend in the Austirex Project – a contract to fly 310,000 line kilometres of state-of-the art magnetic and radiometric data for the Shah of Iran as part of Iran’s nuclear program. We were later to inherit that program.

Competitors

McPhar had sold its business to some of its employees who had called themselves Geoex. They had two tail dragging Cessna 185s and Geometrics magnetometers in trailing ‘birds.’ Roger Henderson was one of the partners.

Geoex

Searching for diamonds, CRA flew magnetics and picked the potential kimberlite pipes directly off the analog charts. In about 1980 we were asked to send a plane to Wyndham (Western Australia) where CRA had previously conducted an aeromagnetic survey using Geoex. It turned that we were being used to provide a check on the Geoex data using our Stinger mounted magnetic sensor. It seems that their ‘bird’ oscillated slightly, causing an anomaly similar to a kimberlite pipe. I believe this contributed to the undoing of Geoex which happened soon after.

Geometrics

EG&G Geometrics, managed out of Sydney by Brian Lennon, was the major competition. EG&G was a major conglomerate whose primary work was as defence contractor to the US military. Among other activities they ran the Nevada Nuclear Test Range as EG&G/ Energy Management. They had acquired both Geometrics, a manufacturer of magnetometers from Sheldon Breiner & Associates and Exploranium, a manufacturer of radiometric equipment. They sold these under the Geometrics badge.

Greg Reudavey

Aerodata’s first contract was an IP job for Dave Wilson of Esso Minerals. I asked my friend, Roger Weiss, if he was available but he wasn’t and suggested a friend of his, Greg Reudavey. Greg and I worked on the job and he became Aerodata’s second employee – or equal first, depending on how you look at it. Greg was an experienced field hand having started geology at The University of Western Australia (UWA) and Western Australia Institute of Technology (WAIT, now Curtin University), worked for Falconbridge Nickel and mineral claim pegging for coal, base metals around the Teutonic Bore discovery and the Oscar Ranges and diamonds in the Kimberley for Metana Minerals (a Graham Hutton and Peter Ingram company backed by NW Mining’s Ron Wise).

Newmont

Newmont had suffered from Geosearch's tardiness and gladly gave us our first airborne survey contract in 1977. Contracts with Uranerz and Afmeco followed and we were up and away, although obviously undercapitalised with just $2,000 in the bank. We had to borrow and hire equipment and planes and I had to do the marketing, contracting, installations, data processing and accounts. My lounge room was the office. However, Aerodata now had Roger Weiss, Con Snow and Greg Reudavey on hand for the field work and Louis and I for the data processing (although Louis was still working for Woodside). We used Louis' contour cuts program which we ran at the ICL computer service. For the first time we had 'digital data acquisition'. It was a $10 printer from Dick Smith, which spewed out a paper tape of mag readings – one per second.

The typing pool at ICL would type out the readings onto two sets of computer punch cards and eliminate errors by shining light through the punch holes to ensure accuracy (check that holes matched up). The processing at ICL produced flight path maps with contour cuts printed on a large flatbed printer.

We were able to hire almost everything we needed – Geometrics magnetometer, tracking camera and so on – from a geologist friend of Les Starkey who had bought the equipment to hunt for iron ore (not very successfully apparently). We had everything except a fisheye lens for our tracking camera. This we had to buy for $600 from Camera Electronics. I proudly entered it in the balance sheet as 'Capital Equipment.' The $10 data acquisition system was written off as expenses.

Bob Smith at CRA gave us one of our first jobs out of Kimba in South Australia.

Lang Hancock

At times we even hired the fully equipped Scintrex plane (through a third party and Greg Reudavey) for scout work (not unusual in that uranium boom time). Secured with directors' guarantees, the bank loaned us the money to buy equipment – a Scintrex GAD-6 spectrometer with 8 litres (500 cubic inches) of sodium iodide crystal for $23,000. We bought it through the same third party. The third party was Lang Hancock. Tim Goyder and I had by this time sold our coal leases at Eneabba to Hancock and Wright, and Lang was willing to help, for a reasonable commission.

New equipment

We now bought Hewlett Packard 9825 computers and programmed them for both data acquisition and processing. This remarkable desktop computer was way before its time. The PC revolution came five years later in 1981 with the IBM Personal Computer. The Hewlett Packard 9825 recorded its data onto miniature cassette tapes.

We were also able to buy Geometrics G803 magnetometers and Geometrics GR-800B spectrometers with 16 litre slab NaI crystals.

Kim Stedman

Up until 1978 I had been doing the books without an accountant. I asked around, and Tim Mc Comish, a mutual friend and a law partner at Dwyer Durack & Dunphy recommended Kim Stedman. I'd told Tim that I wanted more than a bean counter; I needed someone who would help me to grow the business.

Tim recommended Kim as an astute financial advisor who had helped him with his own investments. I made an appointment with Kim and met him at Claude Keonig's accounting firm in Churchill Avenue, Subiaco. I showed him my books – ten pages in an 18-column cash book bought from the newsagents.

I explained that I had a problem. My income column exceeded my expense column by $10 and no matter how hard I tried I could not make them balance.

Kim took a very blunt pencil and wrote in the expense column ‘donation to the St Vincent de Paul Society, $10.’ Then he said, ‘Let’s go to lunch.’

Under Koenig’s banner Kim became our accountant and I moved Aerodata into a serviced office in Churchill Avenue, just next door to Koenig’s. We had one room but it was big – and we had a bar!

From the start Kim and I became a team. We devised an original code of accounts which enabled detailed profit-and-loss accounts for every job, with an accrual system that allowed us to be always on top of the situation in what was a fast-moving industry.

VH-ADH

There was much excitement when our first plane was delivered. The Cessna 206 VH-ADH was brand new and cost a mammoth $60,000! Years later, with 30,000 hours on the clock, we sold it for $60,000.

CRA and Ellendale Diamonds

In June 1977 Frank Hughes of CRA discovered a diamond in a lamproite pipe on Ellendale Station in the Kimberley.

By 1978 the Ellendale discovery had started a diamond rush and we sent Cessna 206 VH-ADH to service various clients in Fitzroy Crossing, where we set up a field office at the Crossing Inn. Unfortunately, the plane had to make a forced landing in the Great Sandy Desert after suffering an engine failure. Pilot and geophysicist, Ian Cook, landed it beautifully – without power – between the sand dunes.

A ground expedition – Greg Reudavey, Ian Cook and Paddy McHugh – then drove in, set up camp and established a bush landing zone next to the downed aircraft 250 km to the east of Sandfire. Two absolute heroes, Graham Woolcock (light aircraft engineer) and Brian Mickelberg (pilot), flew in a new engine and propellor in a Cessna 185, installed it in a few days and the aircraft made it to Fitzroy Crossing only 10 days late.

Our main client in the diamond rush was Selection Trust. Grahame Sands, a surveyor and geologist, was their technical man. Grahame saw the potential of Aerodata and we saw his, so we agreed in Fitzroy Crossing that he should join us.

CRA and the Injunction

Selection Trust wanted us to fly the CRA pipe on Ellendale Station but we were informed that it was out of bounds. We were told that under the *Mining Act 1978* it was illegal, and that we would fly it at our peril. We were adequately warned and we did not take that risk. Years later there fell into my hands a legal opinion, that CRA had paid for, which showed that this was a grey area (if not black). This was because the *Mining Act*, while full of the rights of leaseholders of various sorts did not mention – indeed, envisage – airborne geophysics, so that the matter defaulted to whatever was recorded in English Common Law; more precisely King Henry the Second’s King’s Common Law. The precedents raised related to such things as an arrow traversing over an estate to shoot a deer on someone else’s land!

By the time we were flying our multi-client surveys, the problem of flying over leases became a serious matter for us and I was able to recruit industry groups to support

me in persuading the WA Government to change the *Mining Act.* This they gladly did – making it legal to fly over leases – and other states quickly followed suit.

Grahame Sands

Grahame was a gun on Hewlett Packard 9825 computers and took over programming new filters that enhanced the visibility of diamond pipes, revealing many lamproites, some of which were later developed by Ellendale Diamonds. Clients now demanded we ‘do what you did for Selection Trust.’

Grahame became a director of Aerodata and Chief Geophysicist. He wasn’t a qualified geophysicist but he was a true polymath – a great mind and an enthusiastic innovator. It is very apt that the ASEG prize for innovation is called the Grahame Sands Award.

Rob Lindqvist and John Stewart

We decided to offer shares to those people who had the skills we needed to build the company. Grahame Sands and Rob Lindqvist were in this category. They bought in for $20,000 per share. Mike McCauley had already cashed out. Later Louis Coremans sold his share to Greg Reudavey for $40,000 but continued working after a short break. All shares were equal. John Stewart resigned from Scintrex and in 1979, and after a holiday in Canada, came to work for us.

Aerodata Mc Phar

In 1981 we were approached by Phil Allanson, President of McPhar Geophysics, Toronto. He wished to buy into Aerodata and market McPhar equipment through us. We sold half the company to McPhar and became Aerodata McPhar. When Phil came to Australia before the deal was done, we had just bought our first Aero Commander 500S and had signed the plane with the new name. When I went to Canada shortly after to seal the deal, his financial backers revealed to me that they were impressed with the output we'd achieved with a staff of only 21.

The reason for our high productivity was a policy of non-specialisation. Whatever the task, it was all hands to the wheel. Pilots, for instance, doubled as data processors and geophysicists cleaned the planes.

When McPhar got into financial trouble two years later, in 1983, we bought our half back again.

Ron Creagh, Peter Chambers, Peter Moore and Bob Taylor

In 1982 Ron Creagh left Scintrex and joined us, as did new Curtin graduate, Peter Chambers. Ron's job was working with Louis Coremans programming our new Hewlett Packard 1945 computers.

Equipment manufacturing and marketing

Peter Moore and Bob Taylor set up a business building geophysical equipment at Grahame's direction. This was equipment such as base station magnetometers, which sold well but the follow-up maintenance and support killed all the profits and we decided to abandon the project. We had the agency also for Mount Sopris downhole logging equipment and the whole range of McPhar instrumentation to market from the Hay Street office.

The Scuddles deposit

We pioneered in-the-field data processing with a large caravan moving into the survey area equipped with digitisers, computers (Hewlett Packard 9845 by this time) and printers. One such survey was for Dave Wilson of Esso in 1988 using a just-released Geometrics G813 magnetometer which could read the total magnetic intensity (TMI) field at 3 times per second and track the large magnetic field gradient.

The survey was at Golden Grove in the Murchison. We delineated the Scuddles polymetallic orebody (12 Mt – copper, zinc, gold and silver) with the G813 magnetometer - a 200nT anomaly. I had hand-contoured all the maps on a shop floor in Kalgoorlie where we had moved on to after Golden Grove.

The contours below are from a later survey.

(COPPER-LEAD-ZINC: Geophysical responses over the Scuddles VMS deposit, ASEG Special Publications (1994)1: 133–144).

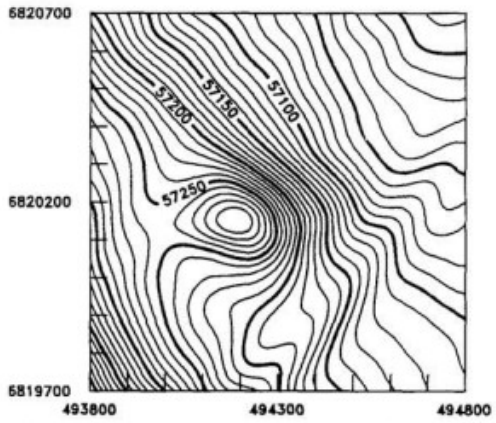

FIGURE 4 Contours of TMI from 1988 aeromagnetic survey. The contour interval is 10 nT, and ticks on the boundary are 100 m apart.

The Chief Geologist at Golden Grove was Stewart Robinson and the Project Geologist was Susan Belford after whom the discovery is named – or more correctly, it's named after her nickname 'Cuddles'. The chauvinists who gave her the nickname quickly inserted the 'S'.

Aerodata International

Before developing the World Geoscience business plan, Aerodata struggled to take its expertise overseas. 1n 1985 when Hunting Geophysics awarded us a survey in Thailand, we determined to make the most of it and offered free surveys to the Geological Surveys of both Malaysia and Indonesia. Malaysia accepted the offer and marked out a survey area over the old Bau gold mine in Sarawak. After a successful survey in Thailand, we flew the Bau survey and produced a report, which led to us flying the whole of Sarawak from Kuching for the Malaysian Government.

By now we were using Scintrex Caesium Vapour magnetometers.

Ash Wednesday 1983

In February 1983 a conference was held in Melbourne which was attended by some of my heroes in geophysics: Stan Ward, Phil Hallof, Tom Cantwell, Sheldon Breiner and others I forget.

I just had to go! Grahame Sands and I attended.

It was wonderful, and on 16 February we flew home. However, an enormous bushfire had broken out and ours was the last plane to escape Melbourne as smoke clouds ascended to 30,000 feet. With 75 lives lost and over 2,000 homes destroyed, the event is etched firmly in my memory.

Goldfields multi-client surveys

In 1982 we decided to fly the Kalgoorlie–Menzies greenstone belt and sell non-exclusive data over the by now tightly held exploration leases. This allowed explorers to purchase as much or as little data as they desired at considerably less than half of the contract acquisition cost. Despite some early scepticism ('gold is not magnetic!'!), the uptake was immediate and very strong. By 1986 coverage extended to the Leonora-Laverton area and the Murchison, and flying programs in other active goldfields in Australia such as Charters Towers (Queensland) and Pine Creek (Northern Territory) were underway. The goldfields aeromagnetic 'recipe' was 200 m line spacing flown at 60 m height. Radiometric data were also gathered routinely.

The continuity of 200 m line spacing data over very large areas yielded local (1:25,000 scale) structural and lithological detail as well as district and semi-regional scale (1:50,000 to 1:100,000 scale) – 'context' that had not been seen before. The previous attempts at broadly delineating the Archaean geology and structure gave way to incisive interpretations that could be closely related to on-ground observations. Later, image processing enabled even better delineation.

Image processing

BHP had pioneered the application of image processing to magnetic data and we were impressed. We offered to exchange data for their image processing technology. Phil Harman and Dave Isles were receptive, Tony Dorazio assisted and our old contour products were supplemented by stunning imagery –again, the geological community flocked to take advantage of this completely new and detailed view of the geology.

Committed now to image processing, we approached Frank Honey and began joint projects. Frank moved from CSIRO to Carr Boyd Minerals to serve the Carr Boyd Minerals Geoscan multi-spectral scanner, which targeted alteration zone clays around gold mineralisation.

We bought Frank's GIPSy imaging software and hardware from Carr Boyd and developed our own in-house expertise, with Gary Spencer leading the way.

Canning Basin multi-client survey

In 1984 we decided to generate a multi-client study of the Canning Basin. The survey was to consist of 440,000 line kilometres but only 144,000 were completed. The Minister for Mines at the time, David Parker, had agreed to fund it to the extent of $600,000 and to help me lobby the Australian Government to match this amount. David Parker and I met with Gareth Evans in Canberra (who agreed to match the WA Government funding), but David Parker later reneged on his contribution, leaving us with only industry funding, which was not enough and we did not complete the survey as planned.

Consultant, John Ashley, previously from Hunting Geophysics in the UK, directed the processing and produced a report with new depth-to-basement estimates.

The Canning Basin geomagnetic induction anomaly

Francois Chamalaun of Flinders University enlisted our help in burying 20 three-axis fluxgate magnetometers evenly throughout the Canning Basin during the period of the survey. The magnetometers took a reading once every minute for three months.

In his paper, Francois noted:

> *'The results from a large-scale magnetometer array study in the Canning Basin have revealed the existence of a substantial geomagnetic induction anomaly striking to the southeast from Broome right across the basin. The reversal in the vertical field fluctuation can be followed along the anomaly and indicates that the anomaly is essentially a line current. The anomaly appears to be associated with the Jurgurra and Barbwire Terraces of the Fenton Fault system. It is suggested that the anomaly may be caused by the pervasive halite deposits of the Silurian Carribuddy Formation, assuming that some moisture is available to enhance electrolytic conduction. A preliminary analysis of the effect of the induction anomaly on aeromagnetic survey data, suggests that it may introduce errors of tens of nanoTesla during magnetic*

> *quiet days and as large as a hundred nanoTesla during periods of substorm activity.'*

Once again, Brian Mickelberg with his Cessna 185 tail dragger exhibited outstanding flying skills in landing in the desert to place and retrieve the magnetometers.

3.0 The Building of Aerodata Holdings Limited

By 1984 we were profitable and Kim suggested we should list on the Australian Stock Exchange. By this time, he had taken over Claude Koenig's business and had new partners and a new shingle – Neil Nicholas & Stedman.

We commissioned Robert (Rob) De Crespigny, formerly Kim's fellow accounting student and now a partner with Hungerfords, to be the director of our initial public offering (IPO) campaign.

I called a lunch meeting with Kim and Rob. During lunch Rob seemed overtly interested in the Neil Nicholas & Stedman accounting business. By the end of lunch Kim had sold the business to Hungerfords and Aerodata's interests had not been considered!

However, Rob's partner took over and we got back on track. We found our underwriter, May & Mellor, in Melbourne, due largely to the assistance of Nic Limb, who was working there at the time. At the first meeting, John May asked us politely what he could do for us. Kim said, 'Well, we would like an underwriting agreement by lunchtime and after lunch we would like to play Royal Melbourne.' Luckily, John May had a sense of humour and we floated on the Australian Stock Exchange as Aerodata Holdings Limited in early 1985, raising $1.5 million. The board consisted of Ray Young as Chairman, myself as Managing Director, and Greg Reudavey, Kim Stedman and John Ashley.

At that time May & Mellor were also floating Saracen Resources, Guido Staltari's first public company. I knew Guido as a geophysicist at BHP and our paths were destined to cross years later when he was operating in a different capacity.

Diversifications

We were determined that Aerodata Holdings should be insulated from the violent instability of the exploration market. Exploration budgets rise and fall in cycles as the commodity in short supply becomes available due to exploration effort and success. The exploration industry is very efficient and can supply anything – given time. Typically, small exploration companies trade their prospects to large companies until the trade price becomes exorbitant, then the large companies set up their own exploration teams. When the large companies are successfully mining and exploiting their commodities their accountant-driven boards disband the exploration teams. The cycle continues, with the typical peak to trough being about 5 years.

Our business plan therefore was to acquire a business not subject to the exploration cycle.

Our first effort was a hostile takeover attempt in 1987 on Walter Wright Limited, an ASX-listed company engaged in crane hire. We failed to convince the major shareholders.

Western Electric

We next approached (in 1988) Dick Haffenden, the owner of Western Electric (Australia) Pty Ltd and WE Electric Motors Pty Ltd, operating from Perth.

Western Electric designed and manufactured special-purpose electric motors mainly for the underground coal mining industry in New South Wales and Queensland.

WE Electric Motors Pty Ltd imported electric motors in component form from what was then communist Czechoslovakia. The motors were assembled, modified and tested and then sold under the Western Electric name all over Australia.

Western Electric successfully provided the required stability to Aerodata Holdings profits and cash flow until 1995 when it was sold to Bobby Lim of Lindeteves-Jacoberg Limited in Singapore. In that year Western Electric contributed $22 million in revenue and $1.5 million in profits to Aerodata Holdings. World Geoscience contributed $44.5 million in revenue and $8.9 million in profit. A slump in exploration in 1997 made life difficult for Aerodata Holdings when the stabilising effect of Western Electric would have been most welcome.

Mincle Pty Ltd

We acquired 33% of Mincle in 1988 from brothers, Chris and Andrew Ellison. Mincle in turn held 33% of Monodelphous, which at that time was a struggling engineering company. We had no skills to bring to Monodelphous and we sold it to an engineering firm who knew what they were doing. Chris Ellison went on to found and list Mineral Resources Limited.

Austirex International Limited

In 1985 we bought Austirex International from Peko-Wallsend. The consideration was in Aerodata shares. Peko-Wallsend was given a place on the board in the person of Dave Sadlier.

Austirex had been formed solely to conduct surveys for uranium in Iran under contract to the Iranian Government and had put together a state-of-the-art magnetic and radiometric data acquisition and processing capability. The revolution of Ayatollah Khomeini had interrupted the survey but the processing was completed under a new contract and the data delivered by Austirex’s manager, Bob Duffin, in Tehran in September 1985. Between 1977 and 1978 Austirex had completed 290,000 line kilometres using an Australian made Nomad aircraft. The magnetometer was a Varian V85 proton precision and the spectrometer was a Geometrics GR-800D with 50 litres of NaI crystal looking down and 5 litres looking up.

With US aid, the Government of the Shah awarded three contracts – one to PRAKLA-SEISMOS (a German company), another to Compagnie Générale de Géophysique (CGG, a French company) and the third to Austirex International (**Aus**tralian **Ir**anian **Ex**ploration).

The equipment and the specifications were first class for the time (1977). When the survey was cut short Austirex flew its planes home – $US7 million was owing and never paid. Aerodata acquired the debt when it bought Austirex. Peko-Wallsend entered a new contract with Iran to complete the processing, which Aerodata also inherited.

Mike Barrett, who later joined World Geoscience, was working on the CGG contract in Iran. CGG lost a DC3 plane on their part of the survey, losing all on board. Mike later married Alyce, the wife of one of the crew who tragically died that day.

Mike joined Questor in Canada as Chief Engineer and we later brought him to Australia to assist in the build of SALTMAP. He went on to build XTEM, a helicopter-borne time domain electromagnetics system for GPX Surveys Pty Ltd some years later.

Austirex had a powerful Data General MV/10000 computer in Sydney and Ian Campbell used it well to improve our processing power. After some hard work on grids and splines, computer contouring progressed to the point where it replaced hand contouring. Later, guided by Don Pridmore, he programmed magnetic depth slicing, a matched filter technique that proved powerful when constrained by seismic derived horizons. Its value in the Irish Sea and on the North Slope of Alaska was particularly striking.

The Mickelberg Stitch

In 1982 the Perth Mint was swindled out of $650,000 worth of gold bars. Don Hancock, officer-in-charge of the Perth Criminal Investigation Branch, and his offsider, Tony Lewandowski, who later made a public confession before hanging himself, fabricated a case against the Mickelberg brothers, Ray, Brian and Peter. Peter was severely beaten by Hancock at the Midland police station. The brothers were found guilty and sentenced to between 14 and 20 years of imprisonment. Brian was released after 9 months when it was proven that he had been working in Port Hedland at the time, piloting supply helicopters to oil rigs, 1,200 km from the scene of the crime. Peter served 6 years of 14 and Ray did 8 years of 20. They were released on their eighth appeal after Lewandowski had confessed. By this time Don Hancock and an innocent friend had been murdered by a car bomb placed under Hancock's car. A bikie gang had committed the murder in revenge for the death of one of their members whom Hancock had shot while running the local pub at Ora Banda.

Brian became our chief pilot until his untimely death with Grahame Sands in 1985.

I allowed a 'Free the Mickelbergs' campaign headed by another brother to work from our premises in Wellington Street, West Perth. We had recently sold our Eastern Goldfields multi-client data to the WA Government and one day I received a phone call from David Parker, the Minister for Mines in the Burke government. He told me that he'd been receiving faxes related to the Mickelberg saga from our fax machine. He went on to say, 'I expect that we'll be doing business with you for some years and I have to tell you that we don't like the Mickelbergs.'

I told the campaign committee to get their own fax machine and all was well again.

Our chief draftsman, Bill Hitch, was working for the committee proving that the fingerprint on the cheque which paid for the gold had been put there by the police – it was a clever forgery. The police had used a silicon replica of Ray's hand (one of Ray's hobbies) and simply rolled it onto a cheque, giving a very unnatural effect.

Deaths of Grahame Sands and Brian Mickelberg

Grahame Sands had successfully developed and patented a downhole surveying instrument based on accelerometers and was working on a hybrid GPS/VLF/Omega navigation system which predated the use of full satellite navigation by four years. The accuracy of the GPS system at that time suffered from limited availability as only some of the satellites were commissioned. Grahame's system used the precision of the satellites, when available, to calibrate the universal and ubiquitous VLF/Omega signal from the communication beacons.

In 1986, while testing the system near Perth, the plane, piloted by Brian Mickelberg, ran out of fuel and crashed, sadly killing both Grahame and Brian. Rob Groves, a young geophysicist was gravely injured but recovered with time.

Don Pridmore

In 1987 Don Pridmore was head hunted to be the Chief Geophysicist, replacing Grahame Sands. We were looking for someone with scientific excellence and flair, and Don has both in spades. While still searching I asked Jon Baird, CEO at Scintrex in Canada, if he knew such a person, describing Grahame in broad outline. Appalled, Jon said, ‘We wouldn’t have someone like that around here.’

China

In 1985 we received a surprise visit from two gentlemen from the China Nonferrous Metalliferous Corporation who were visiting Perth. Subsequently, Noel Mattocks of Tesla-10 and I were invited to visit China. We discovered later that it was the ASEG they thought they were courting. Anyway, Noel and I went to Beijing and were treated royally. Later Noel and I, accompanied by my wife, Ann, and youngest son, David, and Noel’s daughter, Marie Noel, were invited and attended a geophysical conference held in Xian in October 1986.

From left: Yves Lamontagne, Pat Cunneen, David Cunneen, Ann Cunneen, Marie Noel Mattocks and Noel Mattocks in Xian.

On this occasion I visited the Geological Survey in Beijing and was shown the proton precision magnetometer they had developed and some of their surveys. I decided that, purely because of their competence and momentum, they would not be a prime market for our own developing expertise.

We returned the hospitality when they sent a delegation to the ASEG conference held in February 1987 at Observation City Hotel in Scarborough, Perth. It was at this conference that Yves Lamontagne told me Questor was for sale.

World Geoscience Corporation Limited

In 1987 we incorporated World Geoscience Corporation Limited. The structure was an unlisted public company as it was the intention from the beginning that it should be an IPO. Our brokers, May & Mellor, agreed to the proposition that we should build a company with the best of the current airborne sensing capabilities and hire appropriate staff to enable a holistic service to be offered to oil and mineral explorers, and environmentalists. We were also to have an exploration division to develop in-house services and to market them at the level of exploration manager rather than to company geophysicists. May & Mellor agreed to underwrite the project up to $9 million.

On the back of this, we raised $1.2 million from seed investors in Sydney.

I wanted an airborne electromagnetic capability for Aerodata and had rung Tony Barringer to see whether we could get an INPUT licence, but was told this wasn't possible because Questor Surveys and Geoterrex had been given exclusive licences. But in the 1987 British Petroleum put Questor up for sale and we successfully purchased the company. It was completely shut down, with only some equipment and a defunct office in a hangar at Toronto airport. After significant teething troubles we moved Questor to Brantford, Ontario, which had a first- class airstrip. We first put first Steve Kilty and then Terry McConnell in charge.

In 1988 Questor was losing considerable money and it was decided that intervention was needed. I resigned from the board and moved to Questor, handing the position of CEO Aerodata Holdings to Kim Stedman. Jim Ross was a director and CEO of World Geoscience. The other board members were Greg Reudavey, Adrian de Bruin, Dick Haffenden, Jeffrey Reid, Alan Bunn and Ray Young (Chairman).

Our older kids loved the Canadian experience and made some life-long friends. David, then 6 years old, was unsettled by all the moving around and was not so happy.

4.0 The Building of World Geoscience Corporation Limited

Timmins Geophysics

In 1987 we bought Timmins Geophysics from Bob Timmins. Timmins Geophysics conducted ground-based electromagnetics, resistivity and IP surveys using SIROTEM electromagnetic and McPhar IP equipment. Lindsay (Sid) Greenham was hired as an operator/data processor.

Kim Francombe came on board to take over the ground geophysics and Bob Timmins became Operations Manager for the Australian flying operations, including Aerotrac, a division employing Baard Mahle to monitor farm paddocks for soil moisture, power poles for insulator breakdown and pipelines for water leaks using infra-red video and wireless technology installed in a light aircraft.

Kim was later switched to Manager of the QUESTEM surveys division of Aerodata.

1n 1987 we also bought Moniteq Limited, headed by Victor Ward. Moniteq was a Toronto-based company that was using multi-spectral scanning to assess growth stress in forests. We bought Apex Airborne Surveys from Ron Sheldrake. Apex was a Vancouver-based company engaged in frequency domain helicopter-borne electromagnetics. Tony Barringer initially agreed for Barringer Research to join the party but finally backed out. Robertson Research in Wales, UK, seriously considered it, but there was no deal. CGG in France was approached to sell Geoterrex but declined, declaring, '*You Anglo Saxons are only interested in money!'*

Zonge Engineering in Tucson, Arizona, was in Chapter 11 (US bankruptcy) and with Ken Zonge's approval we took over the position of the bank, with a view to reinstating the company and cancelling Chapter 11.

We put Aerodata's operational fixed assets and operational staff into World Geoscience and everything looked set, but in October 1987 the stock market went into free fall and our underwriting exit provisions were triggered, leaving us in trouble. Half our seed capitalists ($600,000), led by a company of which Bob Richardson was a director, were paid back and the other half, led by a Geoff Pickles consortium agreed to stick by us.

We were able to place shares with Emperor Mines of Fiji and other investors to cover the loss of seed investors and Aerodata's revenue and net profit was rising steadily, but our balance sheet now contained debt. Emperor had two directors appointed, Jeffrey Reid and Alan Bunn.

Conquest Mining Limited

The 1987 stock market crash had another deleterious effect. Greg Steemson, John Ashley, Chuck McCormack and I were on the verge of listing an exploration company called Conquest Mining Limited. The underwriters were in place and the prospectus had been printed when the crash came. Terrible timing!

Botswana and Kalahari Diamonds

In about 1986 entrepreneurial Esso geophysicist, Bill Hayden, was very interested in exploring for diamonds in the Kalahari and convinced Greg this was a good project. He just needed some seed to get the licences granted and raise more investment. Kim managed one of his famous lunchtime blunt pencil balance sheet deals on the back of a stained beer coaster (which is still in Bill's memorabilia collection). We knew the area was highly prospective as it was just east of the Orapa kimberlite pipe. The Orapa mine was a joint venture with Anglo American of South Africa and the Government of Botswana and was a major source of revenue for Botswana.

Kalahari Resources (Bermuda) Limited was formed and obtained a very large prospecting licence from the government. We were surprised how readily licences in this area were forthcoming until we realised we were being used as a pawn in the geopolitics between Anglo American and the Government of Botswana.

The government held the view that Anglo was underperforming in its exploration efforts in Botswana. The granting of leases to us sparked a diamond rush, with new players pouring in.

Anglo, for their part, vowed never to use any of our divisions – a promise they have diligently kept.

In 1990 we sold our interest in Kalahari Resources for a substantial profit.

A condition of our agreement with Bill Hayden was that World Geoscience would do the flying, processing and follow-up targeting. A small problem was that we needed an aircraft in Africa, but Sam Bullock was able to arrange a meeting with George Wood from AOC who conveniently owned an old Cessna 404 (N4489L) fitted for survey and it was for sale. A deal was done and the aircraft inspected and ferried from Jersey to Gaborone, Botswana, by our new chief pilot, Warren Kuech.

Greg and Paul McAuliffe took delivery and installed our system on the apron at the Gaborone airport.

Jim Ross

In 1987 I head hunted Jim Ross from Western Mining to be the CEO of World Geoscience. This was before the October financial crash and I thought he might pull out. But he was undeterred, and we had a true scientist/explorationist to develop major projects for us.

Canadian diamonds

In 1989 Jim Ross and I failed to do a deal with Diamet, a company in Kelowna, Canada. Diamet was owned by two men, Chuck Fipke and Stewy Blossom. Jim had

managed a joint venture with them for WMC in previous years and thought their ideas were sound.

The Diamet/WMC joint venture had been exploring Canada for diamonds. Micro diamonds and kimberlitic indicator minerals had been spread all over Canada by glaciers. Glaciology was the science Diamet were applying in their efforts; the manner of expansion of glaciers was the important knowledge they employed, tracing the diamonds to their source by tracing back the glacial till containing indicator minerals. Chuck Fipke was a very good geochemist and Stewy Blossom was a geologist/entrepreneur.

Jim offered $25,000 as a buy-in price for World Geoscience. It was refused. Diamet went on to successfully find the kimberlitic source of the diamonds in the Northwest Territories. By this time their partners were BHP Billiton who went on to develop the resulting diamond mines.

Jim then chose a diamond prospective area at La Ronge in Saskatchewan. We flew the area and joint ventured it to Cameco who proved up a gold prospect. Dave Isles picked several dipolar features as possible kimberlites but we found no trace of diamonds. A report was filed with the Saskatchewan Geological Survey. Then last December (2021) Dave received this email:

Hi David,

Your Saskatchewan kimberlites are mineralized pyroxenite pipes.
https://www.newsfilecorp.com/release/100702/Gem-Oil-Inc.-New-Copper-Nickel-Bearing-Pyroxenite-Pipe-Discovery-at-Sadler-Lake-in-Northern-Saskatchewan
Sadler is south of the Trade Lake anomalies you originally identified.
Thank you!
Shaun Spelliscy
GEM OIL
Box 1111
Regina, Saskatchewan

India

Greg Reudavey was in charge of our Indonesian ventures. In 1986 he met with Captain SP Singh in Jakarta**.** SP, recently retired from the Indian air force, was a helicopter pilot with Shreiner Helicopters (KLM) in Indonesia on secondment to Pelita Air of Indonesia. SP thought he had the connections to get us work in India. We set up an Indian company to market our aspirations – Crown Technical Services Pvt Ltd. Sam Bullock was our marketeer, working with SP. Many months of fruitless effort over many cups of tea followed.

Impatient because of the slow progress, I asked Jim Ross in 1988 to draw up a business plan to exploit gold in India. We noted that India had previously produced significant amounts of gold from the Kolar mine in Karnataka State. This mine had been depleted of gold by the modern era and 200 million ounces were presently being imported annually into India for the jewellery trade, mostly by servants doing menial and domestic work in the Middle East. We postulated that more gold could be found to replace this impost on the balance sheet of the Indian State.

Our plan required that Aerodata should be granted an option to mine all the gold we discovered anywhere in India, in return for which we would give India a nationwide magnetic and radiometric database. Each year our option would reduce by 50% so that in four years, it would comprise only 6.25% of the Indian State.

I was more than a little surprised, while eating my Weet-Bix one morning in Perth, to read on the front page of *The West Australian* that Bob Hawke was on a visit to India to discuss the 'Aerodata Plan' with Rajiv Ghandi.

Not surprisingly, it was rejected, with one speaker in the Indian Parliament describing it as 'a proposal to rape Mother India.'

We decided to change our tack by offering the same data package but with its purpose now to inform the development of water resources in India. Sam Bullock and SP went to work on this and it bore fruit. The State of Orissa was desperately short of water. Sam and SP took a proposal to the Chief Minister of Orissa whereby, financed by AusAID, World Geoscience would deliver a first-class digital database which would target, among other things, prospective sources of water.

The Chief Minister approved the proposal and AusAID approved a water exploration and delivery project for 350,000 km of detailed magnetics and radiometrics, hydrogeological interpretation, targeting, ground-based follow-up and proof-of-concept drilling and a pump testing program.

Ian Cook was placed in control of the project and moved his family to Bhubaneshwar, the capital of Orissa State, for the duration of the assignment. This was the biggest and most difficult project World Geoscience had undertaken. Captain SP Singh was employed on a commission basis to ensure supply at the Indian end and to seek out other projects.

Austrade arranged $17 million of Australian aid and the project survey began in 1991 with an initial proof-of-concept test area of 60nm × 60nm, or 50,000 line kilometres, completed in January 1992. Greg Street supervised the follow-up drilling, which produced ample water for the villages. The remainder of the survey was completed in late 1995.Prue Leeming, Colin Nash and then Leigh Rankin formed the data interpretation team.

Floating World Geoscience Limited

We had not given up on an IPO for World Geoscience and I decided to try in America for an underwriter. I took three months off and went to stay with our World Geoscience US director, Bill Burke, in New Hope, New Jersey, a short train ride from New York.

I had – after much work – obtained a verbal underwriting agreement from a Wall Street broker when the IPO market in the US heated up. This was not a good thing because a bit of reverse triage occurred and 'the small fish were thrown out of the basket'. We were definitely small fish.

A broker in New Orleans was interested enough to send a researcher to Australia to look us over. I hired Mike McCauley to fly the broker and I in a Cessna 206 to Newman and to our camp on the Canning Stock Route. On the 900 km track from Newman to the camp, we came across our broken-down supply truck (someone was coming to its rescue) with driver Pat Osmond below, gesticulating and pointing down his throat to clearly indicate he had no cold beer!

I told the man from New Orleans that this was the standard message indicating 'everything is alright'.

Advent International

With no money from New Orleans either, I went to Boston where Advent International, a venture capitalist, bought a one-third share of World Geoscience for $US6 million. Later we bought it back for $US9 million.

One prime reason that we got the money from Advent was that BHP were investing with them as part of their technology pursuits and indicated to Advent that we were the type of investment they favoured.

Dave Isles and the Aerodata University

While now operating under the World Geoscience banner, we still internally used ‘Aerodata’ to describe the Perth-based division, as ‘Austirex’ was the moniker for surveys out of Sydney. Aerodata Holdings Limited remained the now-diversified head company. This was confusing and properly understood only by people inside the companies.

Aerodata in its early days had a bias towards technicians over geophysicists, but this had to change. Exploration managers, not geophysicists, control budgets. Finding orebodies was the main concern of the exploration manager and finding orebodies therefore had to be a concern of ours. Only experienced geoscientists could convince exploration managers of the prospectivity of the projects we were generating.

Also, with the expansion of services to a wider range of airborne platforms, and the explosion of demand for the multi-client magnetic/radiometric data, there was an increased need for in-house ‘data users’ who could finesse products and market them effectively to industry users. Exploration managers and their senior geological staff were the main marketing target; the old ‘geophysicist-to-geophysicist’ approach was to be the second line of attack.

With Don Pridmore on board and high profile WMC Exploration Manager, Jim Ross, committed to follow, the stage was set to build a team at World Geoscience that could anticipate explorers’ needs, and guide, help and lead them through the processing/interpretation and targeting stages.

Dave Isles was the first cab off the rank. He was easy; he came through the door and said something like, ‘I want to be part of this adventure’. He had been a Project Geophysicist with BHP for 7 years and had become hooked, he said, on Aerodata’s multi-client data over the WA Goldfields. He joined in mid-1987 and immediately buried himself in interpretation projects using the multi-client data.

Don wanted to expand the interpretation group and sought talent from UWA. At that time, the structural interpretation of magnetics in the search for gold was all the rage and Lyall Harris and John Baxter at UWA were heading the charge with Tchalenko diagrams. Don astutely singled out Alasdair (Al) Cooke, a recent structural geology Honours graduate who had studied under Lyall. Al’s interview was quick and effective. Don and Dave both agreed he was the man, and Al could see the fun to be had in this young, fresh, innovative and rapidly expanding company. Next came Helen Anderson, also from UWA, and also strong on structural geology, but this time with a track record of solid geophysical study. Al became busy marketing and interpreting mainly WA Goldfields magnetic data, while Helen went to Toronto to introduce the geology/interpretation culture to World Geoscience’s Canadian operation.

In 1989, on John Ashley’s recommendation, the experienced Sam Bullock came into the group from Hunting UK. Sam added immense worldwide interpretation and marketing experience.

Along the way, Aerodata’s processing and imaging was breaking new ground (worldwide), led by the experience and genius of Ian Campbell at Austirex in Sydney and the youthful exuberance and raw talent of Gary Spencer, a Curtin geophysics graduate, who established Frank Honey’s GIPSy imaging system within the group in

Perth. The work volume and new product creation by both groups led to a need for more talent. Katherine McKenna, a Macquarie University geophysics graduate, was recruited for Austirex, and Catherine (Cathy) Norman, another Curtin graduate and old friend of Gary, who also had solid experience working for Pat Hillsdon, Tony Cramm and Paul Wilkes at ECS, came into Aerodata. Cathy and Katherine both added much to World Geoscience's growing processing and imaging capabilities, and quickly progressed to leadership roles as Helen Anderson had done in Toronto.

MIM survey

After the 1987 stock market crash, the World Geoscience growth momentum took a hit and work was hard to come by.

Pricing became cut-throat. Mount Isa Mines (MIM), after some interesting personnel changes at the top, elected to fly the whole of the Mount Isa Inlier and put this work out to tender. World Geoscience had the advantage of being able to offer in-field processing, daily image updates and a built-in interpretation option. These advantages won the day and although the line kilometres rate was slow, field efficiency and excellent rapport with client staff based in Mount Isa, particularly Nick Sheard, made the project very successful. Stalwart geophysicist, Bob Timmins, leading the acquisition on site was a critical factor in this success. Another geologist/magnetics data interpreter, Rosemary (Rose) Hegarty, joined World Geoscience to assist Dave Isles with the large volume of interpretation. Rose did a great job but fell in love with an MIM geologist (who is now AIG President) and left soon after to start a family.

MIM were seeking help in staff training in magnetics interpretation. We had done some ad hoc training before, but now Al Cooke took charge using his old technical links to Monash University (and the Monash link to Mount Isa and MIM). He formulated a 3-day course that included hands-on exercises. Al, Rick Valenta from Monash and Dave Isles presented the first of these for MIM's Mount Isa crew in March 1991 and soon after, a similar course for NTGS/Normandy in Darwin. Word spread and the demand for these courses blossomed, mostly conducted for exploration companies 'in-house', including at mine sites. State Geological Surveys requested courses and the milestone course was held for the Bureau of Mineral Resources (BMR) in Canberra (November 1991) – 45 geoscientists were subjected to the offerings of Dave Isles, Rick Valenta and Rosemary Hegarty. We modestly believe that this course and those subsequently conducted for all of the State Geological Surveys, along with the track record of Aerodata's multi-client magnetic/radiometric database, influenced the implementation of 400 m (or better) magnetics coverage of Australia's mineral provinces as part of the National Geoscience Mapping Accord (NGMA). The BMR were under pressure from the industry to produce detailed, regional data rather than their 1-mile spacing product.

Aerodata University

Despite their popularity, the interpretation courses were unprofitable. The fee charged for the course was reasonable but the costs, including for the obligatory Aerodata 'sundowner' event, were high and perceived by the board as the consultants taking their eye off the ball. A pivotal moment in the history of the courses came just before the big BMR course when I collared Alasdair and Dave to discuss the need to work on profit-making jobs. Alasdair convinced me that the marketing value of the courses far outweighed the small cost, and I conceded in writing (on the whiteboard!): 'Aerodata University is OK'. The courses' momentum continued as did the close engagement with clients who frequently had Aerodata flying sizeable surveys.

During the implementation of the NGMA, BMR hosted a Geoscience Exposé at which we had a booth highlighting the value of high-resolution magnetics in mineral exploration. It included some GeoMag products created by Alasdair and Dave, and Alasdair and Sam Bullock were ‘booth sitters’

Namibia

Sam Bullock met a Namibian delegation at the conference and subsequently went to Windhoek to seal a contract to apply the formula there.

The whole country has now (in 2022) been covered, thanks to work by several contractors, to produce what is undoubtedly the best such dataset in the world.

Oman

BMR invited a geological delegation from the Sultanate of Oman to attend and they were highly enthused by the magnetics and by the GeoMag products for Oman’s copper-prospective mountains. BMR subsequently chaperoned the Omanis around Australia, visiting various institutions of geoscience repute, and Aerodata, at the request of the Omanis, was included in this tour. The Omanis subsequently requested a proposal to do ‘that Aerodata stuff’ over the mountains and coastal strip.

Sam Bullock greatly assisted BMR in shaping this tender document to suit the Omanis’ request and World Geoscience compiled its tender document accordingly. Just prior to the tender lodgement deadline, the first Iraq war broke out and tenderers became nervous about the prospect of flying in the region. World Geoscience’s pilots gave management reassurance that the war would not impact on the survey and World Geoscience’s tender was lodged unchanged. We believe that competitors upped their charges to a point where World Geoscience’s tender was clearly the cheapest, and the project was ours.

Once again, the World Geoscience on-site team worked through the project, which this time included geological and exploration follow-up work. Bill (Chub) Witham (Al Cooke’s school and university mate, and also a structural geologist) became the Project Geologist. He and Dave worked with staff from the Omani Ministry of Mines and BMR geologists, and geophysicists ably led by David Denham who supervised the project. Two young Omani graduates were extensively trained in Oman and Australia.

The project culminated in ground geophysical surveys led by Steve Webster and a significant copper discovery being made. This encouraged the Omanis to extend the magnetic/geology coverage to a much larger ‘Phase 2’ where Katherine McKenna and Richard Flint led the interpretation and exploration targeting.

Around this time, Don initiated flying magnetics in sedimentary basins for oil and gas exploration. Al Cooke and Cathy Norman led the processing/interpretation push and a range of collaborations with government and industry ensued. Early projects in the West Texas Basin and the Arctic Circle were stunningly successful (thanks to some clever, new processing by Ian Campbell and Cathy Norman) and this arm of World Geoscience grew steadily. Cathy moved to the UK to head up an oil & gas focused operation in Europe and Africa (and hired oil/structural geologists, Richard Morgan and Colm Murphy, to lead the interpretation.) Al Cooke went to Houston to do similar.

Kim Hamer joined the interpretation group after a stint in the Austirex processing ‘monastery’ under ‘Abbot’ Ian Campbell. Anne-Marie Anderson did an Aerodata-sponsored Honours project on Magnetic Horizontal Gradiometry and then joined to assist the processing effort. Anne-Marie did a PhD project on data mining based on the Broomehill salinity program.

Prue Leeming produced a masterly report on geophysics and salinity.

Picodas

In 1989 we acquired Bob Pavlik's company, Picodas Group Inc., a Canadian instrument manufacturer (mainly of radiometric equipment).

Ken Zonge

Ken Zonge bought back the 50% of Zonge Engineering, which we had controlled, and resumed his independence, free of debt. We had saved Zonge Engineering but at some cost to ourselves.

BGM Airborne Surveys Inc.

In 1989 Don Pridmore set up BGM Airborne Surveys Inc.in Texas. It flew in Oregon and on the North Slope of Alaska as well as in Texas. Companies in the oil industry were the prime clients.

Airborne gravity

From the start (1985) we wanted to add airborne gravity systems to our toolbox. We were in consultation with UWA – they had developed a gradiometer that was partly funded by CRA. Some road trials were undertaken, which were promising, but that's as far as it went.

The end of the Cold War saw two airborne gravity systems made available for non-military use: one from the US and one from Russia.

In about 1994, Phil Harman, Ed Van Leeuwin and Tom Whiting spoke to us about the commercialisation of the airborne gravity system that they were working on (with Ken McCracken taking the lead). It was an adaptation of the Bell Aerospace version which the US Navy used in their Trident submarines. The Trident system was based on three orthogonal spinning discs studded with accelerometers, giving gradients in X, Y and Z directions. Distortions of the resulting sine waves yielded total gravity. Ken decided the vertical gradient was sufficient.

We visited Bell Aerospace in Buffalo, New York state, and were most impressed. Disappointingly, however, we weren't chosen as BHP's contractor in what became the Falcon system.

At this time, we were also talking directly with the Russian Air Force in Moscow about the commercialisation of their system. Dan Olsen, who joined us from Canadian Micro Gravity Ltd, was in charge. He hired a Russian scientist, Arkady Shabanov, to assist.

Kim Stedman, Don Pridmore, John McClure and I went to Moscow from time to time but we were not successful in concluding a deal.

ALF Mk3

In 1993 another Tony Barringer technology, airborne laser fluoro-sensing, was bought from British Petroleum (BP). As a condition of purchase BP built and delivered ALF Mk3 (Airborne Laser Fluorosensor Mark 3), which detected and analysed oil slicks on the sea surface, by inducing, with a laser of specific frequency, a fluorescence unique to the oil reservoir from which the slick emanated.

BP earned a place on the board, which was taken by Mike Preuveneers.

QUESTEM development

The Questor INPUT was an analog system – the decay currents, induced by reversing half sine wave transmitter pulses, were measured in six windows after current turn-off. The windows were recorded on a six-channel chart recorder and also on nine-track magnetic tape.

The first task then was to build a digital system. In 1988 Andrew Duncan was put in charge. He contracted John Lobach to write the software. John had been part of Peter Annan's team which had done the same thing for Geoterrex. Not surprisingly, the resultant QUESTEM system was very similar to the GEOTEM system. It was mounted on a Short Skyvan and proved very successful in Canada and the US.

The Cooperative Research Centre for Australian Mining and Exploration Technologies

In 1992 the Australian Government made research grants available for establishment of Cooperative Research Centres (CRCs). Andy Gables of CSIRO approached us to help apply for a CRC for geophysics. We gathered interested parties and met under the chairmanship of Sir Laurence Brodie-Hall. At the same time, leaders of the mining industry had determined that they should have a CRC and their main expectation was that it should deliver an airborne electromagnetics system capable of looking through the Australian regolith.

We abandoned our geophysical aspirations and joined forces with the industry.

The Cooperative Research Centre for Australian Mining and Exploration Technologies (CRCAMET) was formed to develop what became in time the TEMPEST (transient electromagnetic pulse emanation) electromagnetic system.

At the outset and against fierce opposition from the professional researchers at CSIRO, Macquarie and Curtin universities, I made it a condition of our proposal that the CRC should cease to operate after its
7-year program was completed. It shut down in 2002, on schedule, after meeting all its goals. TEMPEST remains today the most advanced fixed-wing electromagnetic system. Built by World Geoscience it has been usefully employed by Fugro Airborne Surveys, CGG and now by Xcalibur Multiphysics, but along the way it has not been improved, as should have happened. Its high specifications have in fact been somewhat compromised.

Picodas Prague

In 1993 Bob Pavlik asked us to help him start a company in his homeland. I went with him to Prague and with the help of Viktor Horschl, Pavel Jursa and Radim Roudny and others, Picodas Prague was born.

The main activity was identifying nuclear contamination, both that caused by the previous communist regime and remnants of the Chernobyl accident. Some venison on the plates in German restaurants was found to be radioactive, the result of fallout from the Chernobyl disaster that had been absorbed by deer in Czechoslovakia.

Picodas Prague were mainly occupied in tracking nuclear waste.

Viktor and Radim were later lost in a helicopter accident and Pavel took over the running of Picodas Prague.

IAGSA

By 1994 we had lost too many of our friends and colleagues in aircraft accidents: Grahame Sands, Brian Mickelberg, Ken Smith, Mark Wilson, Trevor Gauci, Viktor Horschl, Radim Roudny, Bruce Carter and Ray Storker.

When Aerodat of Toronto, Canada, lost an aircraft in Indonesia in particularly tragic circumstances I resolved to do something about it. One of the young men lost in the Aerodat plane was the son of the company's Operations Manager. The plane was never found and the boy's parents spent years, and a fortune, hunting for it.

I called Mario Steiner, President of Aerodat, to offer my sympathy and to suggest that he assemble all the main players in the airborne geophysical industry at a meeting in Toronto with a view to minimising the number of lives lost.

Mario succeeded in bringing representatives from his company, Aerodat, as well as Sanders Geophysics and Geoterrex to the meeting. Bevan Marshall and I attended for World Geoscience. The meeting participants agreed to form the International Airborne Geophysics Safety Association (IAGSA) and to contribute $20,000 from each company as seed. Later on, in a meeting during the ASEG Adelaide conference between myself, Peer Norgaard of Geoterrex and Mario Steiner, Peer Norgaard was elected as inaugural President (well, actually, he was press ganged by Mario and I). A CEO was hired and an office in Ottawa was set up.

The web page of IAGSA describes its aims as:

> *'The International Airborne Geophysics Safety Association (IAGSA) is a non-profit association supported by its members whose mandate is to promote and enhance safety in the airborne geophysics survey industry. With initial backing from some of the leading companies in worldwide geophysics, IAGSA was incorporated in November 1995 and is currently working on developing standards and recommended practices for the industry.'*

I believe, and the numbers reveal it to be so, that IAGSA has succeeded admirably. In 2014 I was granted Life Membership and I am a very proud member indeed.

5.0 Environmental Geophysics

Maralinga

In 1992 or thereabouts, the South Australian Government launched an initiative called the South Australian Exploration Initiative Survey (SAEIS) and we were successful in winning one of the contracts to fly an area south of Maralinga Village. We used the airstrip and billeted at the village.

Bob Timmins was Operations Manager and Grant Hamilton was the pilot of our Cessna 206, equipped with a Geometrics G803 Magnetometer and Geometrics GR-800B spectrometer with 30 litres of NaI crystal.

A series of seven atomic bomb tests were conducted by the British Government at Maralinga in 1956–57. From 1956 to 1963, several hundred minor tests involving radioactive material but not involving nuclear fission were also conducted at Maralinga. Three clean-ups, focusing on most contaminated areas adjacent to the blast sites, were conducted in 1964 and 1967 (by the British Government), and between 1994 and 1998 by the Australian Government.

In 1987 the Australian Government commissioned EG&G/EM, the US firm in charge of the Nevada Test Site to fly Maralinga in order to provide direction for a massive clean-up.

EG&G/EM flew the range with their own proprietary acquisition system using 26 litres of NaI crystal, consisting of 40 button-size crystals such as are used in hand-held instruments, all installed in a British-made helicopter.

EG&G/EM set the lower energy threshold of their spectrometer to 38 keV, permitting the capture of the strong gamma peak at 59.5 keV emitted by the decay of Americium-241, which itself decays from Plutonium-241 (an associated element of Plutonium-239). Americium serves to measure the concentration of Plutonium-239 of a laboratory-derived factor for the Pu239/Am241 ratio. This ratio changes with each plutonium 'batch' coming from the reactor where Uranium-238 is bombarded with neutrons. Maralinga has a Pu239/Am241 ratio of 7.4. Plutonium-239 has a half-life of 24,000 years and is a problem forever.

Bob Timmins gained permission to fly the range 'just on spec', which we did over two days.

Our results were clearly much better than the 1987 US survey, highlighting the fact that EG&G/EM did not have a geophysicist at Maralinga. The authorities now in charge don't appear to have one either as they still rely on the US data to guide their management of the Maralinga range.

Mururoa Atoll

At the time of the Adelaide ASEG conference in 1995 we learned of the French Government's intention to conduct a final nuclear test at Mururoa Atoll in Tahiti in contravention of the ban on nuclear tests (to which they were a party). I sent a copy of our Maralinga data to *The Age* newspaper, which they printed on the front page and in an interview with their reporter, I offered to fly the atoll for free before and after the test. Of course, it was a tongue-in-cheek comment, but it elicited a very satisfactory response – Alexander Downing asking the government of the day in Federal Parliament if they intended to take up the offer by 'the Australian company'.

The French simply went ahead with their test.

QUESTEM for measuring extent of salinity

World Geoscience flew one of the Trislanders to Perth in 1989 to be fitted with QUESTEM and to offer surveys to mineral exploration companies and environmentalists in Australia.

Western Australia, like much of Australia, suffers from dryland salinity as a result of the over-clearing of native vegetation for farming purposes.

Several airborne surveys to monitor the extent of salinity had been flown from 1984 to guide remedial initiatives. These included two INPUT surveys by Geoterrex – in 1984 and 1986.

During the mid-1980s Greg Street, Senior Geophysicist at the Geological Survey of Western Australia, had been doing extensive work with magnetics, radiometrics and electromagnetics on the salinity problem in Western Australia. During a discussion in the bar in our Wellington Street office, I asked Greg if my daughter, Jane, could do work experience in the Geological Survey. Greg offered to arrange it and in return asked if we would fly a magnetic survey over an area at Yornaning which he was working on. I was interested anyway (no corruption here!) and he arranged some funding from the Department of Agriculture. This was to be the first airborne geophysical survey commissioned by the WA State Government. We flew magnetics, and VLF (very low frequency) surveys at the time and followed up by doing a thermal infra-red survey.

Jane reports that when Greg allowed her 15-year-old self to blow up dirt with gelignite and detonators, the dirt falling on her face was an epiphany. It was that moment which decided her pathway to a PhD in geoscience.

In 1987 Greg had reviewed the old INPUT work by Geoterrex and considered that it had promise. He asked World Geoscience to consider building an airborne electromagnetic system specially designed to map the salt content in the regolith. He and Bob Nulsen of the Department of Agriculture arranged for funding through the National Soil Conservation Program (NSCP).

In 1989 QUESTEM was flown at Yornaning to complement the results of the magnetic survey. Greg and technicians from GSWA led by Dave Reid had covered 2,000 hectares on the ground using a Geonics EM34 so we had something to compare against.

Lindsay Nothrop, head of the NSCP, came to Perth to view the results and liked what he saw. He went back to Canberra and raised about $300,0000 to repeat the work in all the states as a demonstration of this new geophysical technology.

In the meantime, we completed more surveys under the first grant money at Kent/Frankland River, Carnamah and Esperance.

About this time, we conducted QUESTEM surveys in the Eastern Goldfields to map palaeochannels. When interpreting the data, we concluded that the simple look-up table we used to convert conductance to conductivity was not useful in highly conductive areas where the signal became saturated. From then on, we used a combination of channels, combining decay and magnitude of response to measure apparent conductivity.

When the NSCP funding became available it was offered to all states that wanted to participate, and Tasmania, Victoria, New South Wales, Queensland and South Australia all offered areas for surveys. There was to be no tender until Geoterrex insisted. The NSCP decided instead that there should be a fly-off on an area near Wanilla on the Eyre Peninsula in South Australia. Both companies flew the same area and presented their results at a workshop in Port Lincoln.

Greg led a World Geoscience team that included Ann-Marie Anderson and Andrew Duncan. We flew the area twice with QUESTEM, which by this time Andrew had modified to obtain earlier time windows. We then flew it with magnetics and radiometrics at lower level to ensure good magnetic/radiometric data. The efforts that Andrew had put into data processing paid off, with Geoterrex results being affected by the high-conductivity saturation effects we had seen at Kalgoorlie. The NSCP then awarded the remainder of the work to World Geoscience.

World Geoscience carried out work at Serpentine, Victoria; Jemalong-Wyldes Plains, New South Wales; Pittsworth, Queensland and Cressy Longford, Tasmania.

SALTMAP

There looked to be some promise of a new revenue stream in environmental work, something that would minimise the effects of the cyclical mineral exploration industry. Greg thought we could do better if we addressed the problems very near surface. We agreed, and $1.7 million was raised in the form of a research and development grants from the Federal Government and the WA Government. A team headed by Andrew Duncan was put together to build what was to become SALTMAP. The build was a collaborative effort involving World Geoscience and the CSIRO divisions of Exploration Geoscience and Water Resources: Andrew Duncan, Guy Roberts, Paul Roocke and Ann-Marie Anderson from World Geoscience; G Buselli, J P Pik and R G Thorn from CSIRO Exploration Geoscience, and D R Williamson from CSIRO Water Resources.

The difference between SALTMAP and QUESTEM or GEOTEM was the broad bandwidth of the SALTMAP transmitter and receiver subsystems. Instead of a half sine wave transmitter output, with off-times for receiver measurements, SALTMAP employed a 100% duty cycle in a reversing square wave. As a result, the bandwidth was improved from 5 kHz to 50 kHz, and better. The use of the resulting higher frequencies ensured that conductivity distribution in the relatively near-surface depths could be assessed. The receiver measured a broad swathe of frequencies in X, Y and Z directions.

The project began in 1990. We recognised that in this market, supply of data was not enough and we would have to interpret the data right through to remedial farm planning. The first SALTMAP survey at Broomehill was set up and we tried to get all stakeholders engaged by involving CSIRO, the Water and Rivers Commission, WA Department of Agriculture as well as the local landcare group. We employed a farm planner, Simon Abbot, and environmental scientists, Gabriella Pracilio and Karina Tedesco, and set up a new group in World Geoscience known as Agraria Limited. Further surveys were conducted for landcare groups at Trayning, Nungarin and Wyalkatchem where the clients were farmers.

The Agraria method was basically the same as the Salinity Forum's *Strategy to Fix the Problem.*

The Salinity Forum

Having completed the build and testing of SALTMAP, the best airborne electromagnetics system ever conceived and one specifically designed to guide work to reverse saline soil degradation, we asked Greg for the government salinity strategy so that we could put it to work. There wasn't one. As is usual in government, there were many self-serving initiatives clearly intended to garner grants for particular departments, but no strategy. This was despite the EPA reporting at the time:

> *'The EPA is distressed by the extent of the salinity problem which, in 1995 affects some 1.6 million hectares of the State's most productive agricultural region and also is translated into water quality deterioration in streams and estuaries at the end of catchments. By the year 2010 it is estimated that 2.9 million hectares will be affected.'*

I started an incorporated community group called the Salinity Forum and signed up all stakeholders – farmers, environmentalists, the Greens, the politicians, the WA Department of Agriculture and the Environmental Protection Authority (EPA) – and guided them towards creation of the *Strategy to Fix the Problem.* The Western Australian wheatbelt covers 18 million hectares. We estimated salinity remediation costs would be $1.6 billion.

The Salinity Forum had among its notable members, then Governor of Western Australia Michael Jeffries, and the Member of Parliament for South Perth, Phil Pendal, MLA. Phil moved an amendment to the $970 million Alinta Gas sale bill to set aside $20 million for our salinity strategy but it was defeated.

In 1995 we hired journalist John Bell to help us with marketing. He arranged for us to give presentations in the Federal Parliament to all the political parties on our salinity strategy. We got a very good hearing from John Anderson who asked us to write a draft environmental program for the National Party in the upcoming election. The National Party took this up and soon after the election the National Action Plan for Salinity and Water Quality emerged and the coalition promised $1 million for further testing.

For the tests, Geoterrex offered the DIGHEM (a frequency domain multi-coil system system) and were given Liverpool Plains in New South Wales, and Chapman Valley in Western Australia.

SALTMAP was given three areas: Balfes Creek, Queensland; Willaura, Victoria and Toolibin Lake, Western Australia.

SALTMAP won the day. It was recognised that SALTMAP provided more information in the regolith and at depth. SALTMAP was very much the forerunner of the later TEMPEST system to be developed in the Cooperative Research Centre for Australian Mining and Exploration Technologies (CRCAMET).

For our environmental innovations we were awarded the *1995 Australian Landcare Research Award*. Greg Street and Guy Roberts accepted the award on our behalf at a dinner in the Great Hall in Parliament House in Canberra.

Awards

Among other awards given to Aerodata/World Geoscience were:

- Western Australian Company of the Year – 1993
- Western Australian Exporter of the Year (Services) – 1994
- Australian Exporter of the Year (Services) – 1994
- Diggers & Dealers Technical Services Award – 1996.

6.0 Separation of Aerodata and World Geoscience

In 1995 Don Pridmore was appointed Managing Director of World Geoscience.

Ray Young, Chairman of Aerodata Holdings Limited, Kim Stedman and myself as Managing Director, found a new office for Aerodata Holdings in Hay Street, West Perth, to underline our determination to separate the corporate activities of Aerodata Holdings from the World Geoscience operations, thus giving Don the freedom to shape the new World Geoscience in his own way.

World Geoscience now had 20 aircraft operating from offices in Perth, Sydney, London, Prague, Toronto, Houston, Santiago, Jakarta and New Delhi.

Oil Services

We had always struggled to become a serious player in oil exploration services which had been dominated by seismic companies. Our oil-related tools were ALF Mk3 (locating oil slicks) and SAM (sedimentary airborne magnetics) delineating structures in sedimentary basins. Our London office, with Cathy Norman in charge, was doing a great job linking these tools ably assisted by seismic interpreters Richard Morgan and Colm Murphy.

Scott Pickford

We needed to acquire a company servicing the oil industry. I hired Julian Glynn, whose background was in merchant banking, to seek out a company in oil services with whom we might effect a merger. In 1996 he came up with Scott Pickford NL on the second board of the London Stock Exchange. Under their CEO, Don Scott, they had acquired a great reputation for reservoir work, finding the last bit of oil in the mostly exploited fields of the North Sea. A group of employees and shareholders had mounted a take-over bid so we would be ‘buying into a fight’.

Julian and I moved to Guildford, near London, where our office was located, and threw our hat in the ring.

We hired a broker in ‘the City’. We had Don Scott on our side, naturally, but we had to win over the hostile shareholders. While talking to them in a pub – they were civilised geologists, nice people – I discovered they were friends of Chuck Mc Cormack. They had worked with him in Iran and were, in fact, old mates.

In November 1996 I rang Chuck in Perth who wasn’t doing anything in particular and said he would love a trip to London. A surprise reunion with much rejoicing followed and very soon we had the promise of the essential shares. We had raised $4 million from institutional investors and the purchase of shares was duly completed. We were in the final straight.

One of the highlights of the exercise for me was meeting The Takeover Panel who are like the high priests of the City and of British financial life. To be criticised by ‘The Panel’ was death to the career of a merchant banker. The Takeover Panel proved to be young, smart whiz kids – not old men in deep leather chairs as I had imagined them.

Then a bombshell! An American company called Core Labs had been watching from the sidelines. They now came in with an attractive all-cash bid in US dollars, comprehensively gazumping our all-scrip offer.

However, it wasn’t all bad. We went home with $7 million in our pockets: a $3 million greenmail profit from sale of the shares we had purchased plus the original $4 million we had raised from institutions.

But I had taken my eye off the ball. There had been a substantial slump in exploration activity in 1996 and World Geoscience was probably in loss. How much we didn’t know because our accounting department had gotten themselves into a right royal mess. The complex consolidations of all the subsidiaries in a time of falling revenue fully tested the system – and it had failed. Accounts were five or six months behind.

It seemed likely that when we had been raising the aforementioned capital, World Geoscience probably had already been in a loss. I didn’t know this at the time and had not disclosed it to investors. This was a fatal mistake for a Managing Director and my resignation was now inevitable.

Board reshuffle and the end of Aerodata

In August 1997 I persuaded board member, Ray Steedman, then CEO of the EPA and an old friend, to take over the reigns as Managing Director.

Our major shareholders, Chieftain Securities and Rothschilds were in consultation, and by October Kim Stedman, Jim Ross, Greg Reudavey, Don Pridmore and Mike Preuveneers had resigned as directors and Harvey Collins and Ron Cohen had come on to the board.

Ray Young resigned in November and Ron Cohen became Chairman.

I remained as a director.

Harvey Collins of Chieftain Securities was a reputable banker and Ron Cohen had recently been named Director of the Year by the Australian Institute of Company Directors.

I thought we had a first-rate board and, despite posting our first loss, we had $18 million in cash and lines of credit, and were well situated to restructure Aerodata Holdings Limited.

However, the board proved to be all at sea in directing a technical company. World Geoscience was in quick time sold to Fugro, who were already represented on the board, and a new chapter in airborne geophysics had begun. Aerodata Holdings Limited as an ASX-listed company had a ‘shell value’ of its own. It became a real estate company and then a medical researcher, changing its name for each iteration.

7.0 Staff and Contractors

Some of the valuable people who worked with Aerodata/World Geoscience are listed. It’s most likely I’ve unintentionally overlooked some. In the period roughly between 1994 and 1997, 105 geoscientists and 190 support staff – engineers, data processors, accountants and administrators/managers – stationed all around the world, worked very hard and I hope, happily. I thank them all.

GEOSCIENTISTS

Abbot, Simon
Abbott, Dave
Anderson, Helen
Anderson-Mayes, Ann-Marie
Ashley, John
Baigent, Mark
Batty, Steve
Becket, Kirsty
Bertolli, Andrew
Bird, Dale
Bullock, Sam
Campbell, Geoff
Campbell, Ian
Canaris, John
Cant, Greg
Cartwright, Paul
Chambers, Peter
Clark, Euan
Cook, Ian
Cook, Kim
Cooke, Alasdair
Crowe, Warwick
Cunneen, Jane
Davitt, Tom
Droine, Bill
Duffin, Bob
Duncan, Andrew
Flint, Richard
Fowler, Rod
Francombe, Kim
Gabell, Andy
Greenham, Syd
Groves, Bob
Haederle, Mike
Harvey, Bruce
Hegarty, Rosemary
Hender, Adam
Hildenbrand, Jörge
Hinojosa, Carlos
Horschl, Viktor
Isles, Dave
Italiano, Pamela
Jones, Mike
Jursa, Pavel
Kerr, Tom
Kilty, Steve
Kita, Jo
Lane, Richard
Larkin, Paul
Larson, Brad
Lawrence, Matt
Leeming, Prue
Long, Andrew
Lynch, Steve
Matos, Darci
Mayes, Keith
McClure, John
McConnell, Terry
McKenna, Katherine
Mejzr, Ivo
Morgan, Richard
Mund Rao, Madhumita
Murphy, Colm
Mutton, Paul
Nallanchakravartula, Prasanth
Nash, Colin
Norman, Cathy
Nunn, Jeff
Owers, Matt
Palmer, Ron
Paulak, Anna
Pavlik, Bob
Pearson, Mike
Perry, Alan
Philips, Joe
Plunkett, Caleb
Pracillio, Gabriella
Pridmore, Don
Randell, Kevin
Rankin, Leigh
Rarapa, Bismita
Ridsdill-Smith, Tom
Robinson, Phil
Ross, Jim
Rutherford, Jasmine
Sands, Grahame
Sattel, Daniel
Saul, Steve
Shabanov, Arkady
Sheldrake, Ron
Stenning, Linda
Street, Greg
Tedesco, Karina
Thompson, Francis
Timmins, Bob
Tipper, Gary
Triggs, Dave
Van Reed, Emmet
Ward, Victor
Webster, Steve
White, Bob
Williams, Alan
Williams, Steve
Willing, John
Wilmore, Allan
Witham, Bill
Zonge, Ken

SUPPORT STAFF

Ahrens, Jason
al Kindy, Suhail
Anderson, John
Ayers, Julia
Bailey, John
Bailey, Tim
Baird, Arnold
Barrett, Mike
Barron-Hay, Stuart
Barwise, Richard
Belford, Sandy
Bell, Phil
Bellinger, John
Bennett Danny
Bertolli, Marcello
Blizzard, Bob
Bottos, Frank
Bower, Nicholas
Brackfield, Philip
Brockelman, Richard
Burke, Bill
Butler, Dick
Butler, Honor
Car, Cathy
Carline, Catie
Caron, Marc
Carpenter, Mark
Carrion, Gloria
Chkvorets, Oleg
Churchward, Bill
Cora, Ettore
Coremans, Louis
Cove, Tracy
Creagh, Ron
Culpepper, Harold
Cunneen, Pat
Curley, Darryl
Davidson, Kevin
Deaver, Ken
Dundas, Anita
Durko, Sue
Edwards, Andrew
Edwards, Ian
Ellis, Christian
Elvey, Dan
Evans, Stuart
Ferreira, Arthur
Finnan, Pauline
Flowers, Stuart
Fogliani, Louie
Fuller, Noel
Fundak, Craig
Garcia, Thomas
Gentle, Chris
Golding, Chris
Grace, Andrew
Greenham, Syd
Groves, Bob
Hall, Bradley
Hamilton, Grant
Hannington, Mike
Harrington, Kevin
Harrison, Chris
Harrison, Melanie
Hart, Trevor
Heasley, Jason
Heffron, Dave
Hender, Adam
Hickmot, Barry
Hiskins, Peter
Hitch, Bill
Hockley, Peter
Holmes, Melissa
Hongell, Geoff
Horton, James
Isles, Heather
Jacobcova, Simona
Jensen, Harold
Jesson, Tony
Jones, Mark
Jones, Owad
Kelledy, David
Kennedy, David
Kirkwood, Daren
Kotasek, Heli
Krammer, Darrell
Kriesa, Phil
Kuech, Warren
Laberge, Paul
Ladyman, Marty
Lara, Calida
Law, Isaac
Lawrence, Matt
Lindqvist, Aaron
Lindqvist, Rob
Litchfield, Kelly
Litchfield, Nathan
Lomas, Carol
Lumsden, Zoe
Lutz, Tom
Lynch, Huw
MacNaughton, Cameron
MacRitchie, Brian
Mariusz, Jawor
Marshall, Bevan
Martin, Wendy
Matechuck, William
Matthews, Leon
McCambridge, Terry
McCambridge, Tony
McCoy, Darryl
McDonald, Megan
McGarty, Grant
McNally, Matthew
Merryweather, Reg
Miller, Dean
Moore, Lori
Moore, Peter
Mullineaux, Aaron
Nelson, Mike
Newman, Anisa
Nguyen, Trang
Nguyen, Lai
Nitcha, Paul
Noack, Amanda
Noble, Greg
O'Callaghan, John
O'Keefe, Kristine
Osmond, Pat
Owen, David
Owen-Jones, Dianne
Parker, Kim
Paterson, Gary
Payne, Ian
Perry, Bill
Phillips, Joe
Pickles, Ann
Pieraccini, Fabio
Powlack, Anna
Price, Anthony
Price, Glen
Puffr, Martin
Randell, Kevin
Rathlou, Simon
Ray Tarnchyna,
Reudavey, Greg
Reudavey, Jan
Rhoden, Tamara
Rich, David
Richards, Brad
Richards, Kevin
Richardson, Natalie
Roberts, Craig
Roberts, Guy
Roberts, Peter
Roocke, Paul
Roy, Andre
Sanders, Suellen
Sargeant, Richard

Scott, Brendan
Shakespeare, Mark
Shaw, Simon
Simmons, Bill
Sjoblom, Patrik
Skeet, Ray
Slade, John
Smith, Robin
Sparks, Amanda
Spurling, Todd
Stacey, Mark
Stedman, Kim
Stewart, Grant
Stewart, John
Swan, Todd
Tamchyna, Radka
Taylor, Bob
Tetlaw, Nathan
Thompson, Francis
Trevenen, Ben
Trevenen, Matthew
Trinder, Sam
Tuckett, Helen
Tylka, Rick
Ufnal, Claire
Wallert, Andrew
Webber, Tim
Wells, Geoff
Whitmore, Warren
Williams, Stephen
Willing, John
Woodham, Mike