

Remembering Grahame Sands



Grahame Sands

It has been 25 years since the demise of (Duncan) Grahame Sands in an aircraft accident on 27th February 1986. Grahame was 40. The accident also took the life of pilot, Brian Mickelberg. Physicist, Bob Groves was the sole survivor.

It is in Grahame's memory and honour that the award known as the Grahame Sands Award for 'Innovation in Applied Geophysics' is awarded to nominated recipients who significantly contribute to the advancement of geophysical exploration. The award was inaugurated in 1986 and has been presented by the ASEG, on 11 occasions.

Grahame's introduction to exploration was as a vacation field assistant (1968) in Cloncurry, Queensland, with Australian Selection (Seltrust). After a brief flirtation with Vet Science at Sydney University terminated in colourful circumstance (a larrikin born), Grahame entered the Army Survey Corps as part of his National Service.

Serving a stint in New Guinea, Sapper Sands began a lifelong interest in surveying. The career of this free thinking scientist with a disdain for questionable regimentation had begun.

The next larrikin/scientist conflict occurred with a termination a year before graduation from the Bendigo School of Mines. His indiscretions are legend and have been subject to many interpretations and exaggerations by his peers over the years.

From Bendigo, Grahame and family were sent to Kalgoorlie (1971) by Seltrust. After a brief time in field work, he was assigned to estimating the ore reserves for the Perseverance nickel deposit. Grahame completed a degree in Mining Geology from the Kalgoorlie School of Mines based on this work. At this time,

Grahame learnt the 1970s limitations of computer power (Seltrust had purchased a HP9100), and the imprecise borehole measurement of dip and azimuth in magnetic ore bodies.

Grahame experimented with his home brand of computer to enable computation and graphics to be integrated. He met with some success and with his enthusiasm, plus the fact that he was being distracted from his assigned task, Grahame convinced Seltrust management to purchase a then state-of-the-art HP8945, a work station that preceded PCs.

His experimental directional borehole logger based on angular accelerometers was an object of curiosity in Seltrust's Kalgoorlie office. The instrument was later (1980) patented by Aerodata/Grahame Sands when Aerodata expanded its business into downhole logging.

His enthusiasm for computer evolution and applications was to be the catalyst for his joining fledgling airborne geophysical company, Aerodata.

In 1979, Seltrust, with Grahame as technical advisor, engaged Aerodata to conduct an airborne magnetic survey in the search for the potentially diamond bearing lamproite intrusives. Aerodata utilised a HP9825 computer as the controller for the aircraft acquisition system. With his previous Hewlett Packard experience, Grahame wrote algorithms and converted them to FORTRAN programs for the band width filters to extract the signature of the lamproites. Several lamproitic intrusions were thus identified.

Subsequently, with technical and social compatibility having been tested at Fitzroy Crossing, Grahame invested in and joined Aerodata as a director and technical driver.

With Aerodata's commitment to research and development, Grahame's innovations flourished. Some of his innovations were:

- The digitising of flight paths and the production of standard projection maps. This led to image processing of magnetic and radiometric data. Grahame launched an imaging project with Dr Frank Honey, resulting in Aerodata being an early leader in geophysical image processing.
- Demagnetisation of an aircraft's magnetic signature was poorly understood in the 1980s. Grahame

established the determination of induced and permanent component of an aircraft's magnetic field, allowing each component to be nulled individually and quantitatively.

Grahame died while testing a hybrid navigation system aimed at eliminating the use of aerial photography and radio triangulation as the primary sources of aircraft navigation. The system he pioneered utilised the Navstar Global Positioning System (begun in 1984 by the US Air Force) and the Omega Global Navigation System (GNS). The Omega system was instituted by the US Navy as a navigation aid. It comprised VLF signals from fixed transmitters and gave absolute accuracy of approximately 6km. With limited GPS satellite coverage at the time, Grahame developed an interface to take velocity and heading data from the Omega GNS system to provide 'x' and 'y' coordinates between GPS fixes. The 'z' component was obtained from a radar altimeter, fitted with a standard rubidium clock.

The first commercial survey utilising the GPS system occurred in 1988 when a survey was conducted in the Arafura Sea as part of the exploration of the Timor Gap. Full GPS satellite coverage for routine use was not completed until 1993 and is now routinely used as the primary navigation tool.

Grahame was posthumously awarded a Masters degree in Geophysics from Curtin University for his technical work on a horizontal airborne magnetic gradiometer system which he designed and built. After Grahame's death, the system as the first of its kind, continued to operate commercially. This system was the precursor of many systems in operation today. His written notes and ideas were compiled into thesis form by Aerodata's Gary Spencer with theory input from Bob Groves. His many and disparate unwritten ideas will never be known.

Widely revered by his peers this family man, friend, scientist, innovator and larrikin, Grahame created a legacy of innovation and technical excellence deservedly recognised by the award which bears his name.

'Do great talent and misfortune make a pair?' Nguyen Da, Vietnamese Poet

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