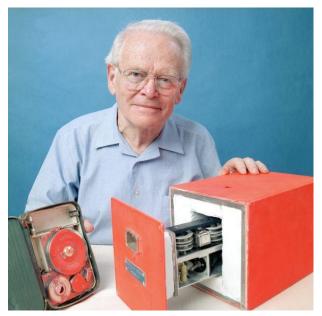**SOUTH AUSTRALIAN AVIATION MUSEUM**

SIGNIFICANT AVIATOR PROFILES

DR DAVID RONALD DE MEY WARREN AO, BSc (Sydney), PhD (London), DIC, DipEd (Melb), FAIE

David Warren with his prototype 'black box'
in crash-proof casing

David Warren was the inventor of what he called the ARL Flight Memory Unit. This was effectively the first prototype of what are now known as "CVRs" (cockpit voice recorders) and "FDRs" (flight data recorders) – or the ubiquitous "Black Boxes" (actually orange) carried on transport aircraft.
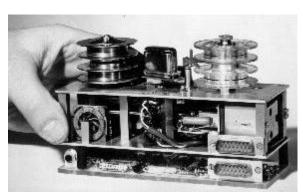
He was not South Australian and in fact his only connection with the State appears to be his two years as Scientific Officer spent at Woomera. The South Australian Aviation Museum has nevertheless decided to include his profile with our "Significant Aviator Profiles", which, with this exception, all profile aviators with particular significance to South Australia. This is because of the immense importance of his contribution to global aviation and because the Museum has a "Black Box" displayed in its collection.

Warren was born on 20 March 1925 at a Groote Eylandt mission station and sent to boarding school in Launceston at age 4 then to Trinity Grammar in Sydney. He was only 9 when his father was killed in the Holyman's Airways DH86 crash of *Miss Hobart* into Bass Strait in October 1934. A boyhood spent wondering about the circumstances of the crash may have sowed the seeds of his later determination to develop the black box.

He went on to graduate with a BSc in chemistry from the University of Sydney and to teach maths and chemistry at Geelong Grammar from 1944-1946, then to lecture in chemistry at the University of Sydney in 1948-1948. It was in 1948 that he commenced his two-year stint at the Woomera Rocket Range.

In 1952 he began a 30-year career with the Aeronautical Research Laboratories (ARL) in Melbourne, now part of the Defence Science and Technology Organisation, rising to Principal Research Scientist. During 1981-82 he also served as Scientific Adviser (Energy) to the Victorian Parliament.

His work in developing the 'black box' arose out of his involvement in the accident investigation into a Comet crash in 1953. He saw then that a cockpit voice recorder would be invaluable in determining the causes of otherwise unexplained accidents, but his ideas generated little interest. That prompted

David Warren's original 'black box' ARL Flight Memory Unit (1956)

him to design and build a prototype, which could record up to four hours of speech and flight instrument readings, to demonstrate his idea. The machine worked but he was still unable to attract

an Australian investor to fund its manufacture. It was not until 1958 that the Secretary of the UK Air Registration Board, Sir Robert Hardingham, saw the unit and was so enthused that he arranged for Warren to take it to England to be further developed. There he was given a team of scientists to help him refine the design, which was housed in a crash and fire-proof box.

The concept still faced opposition in Australia from the Department of Civil Aviation, the RAAF and, particularly, the Australian Federation of Airline Pilots who were not enamoured of the idea of 'big brother' intervening in their cockpits.

David Warren (left) with Ken Fraser of ARL with the prototype 'black box'

At last, in 1960, as a result of the Trans Australia Airlines F-27 *Abel Tasman* crash into the sea near Mackay in June, for which no probable cause was determined, Justice Spicer, the senior Board of Inquiry Judge, recommended that flight recorders be installed on all airline aircraft. This led to the Minister for Civil Aviation, Senator Shane Paltridge, announcing that from the beginning of 1963, all airline turbine-powered aircraft of maximum take-off weight of 12,500lbs or more must be equipped with instrument data and cockpit voice recorders.

David Warren and ARL's hope that this was the break-through they had been waiting for was dashed by the fact that still no Australian commercial manufacturer could be found to develop a production version of his flight recorder. S. Davall & Sons in the UK was prepared to, but it was waiting for the British Ministry of Aviation to specify details for flight recorder installation. This led in 1965 to the Davall Flight Deck Wire Recorder, based on Warren's original design, being ordered by several British and European airlines.

The Department of Civil Aviation agreed to assist ARL with further flight testing of Warren's recorder, but it was clear that it would not be ready by the required installation date of 1 January 1963. This meant that ARL would have to find a manufacturer overseas for the device.

They were too late. Australia's domestic airlines, with the required date looming, jointly decided to order US flight recorders being developed by United Data Control. This was a bitter and final blow for David Warren and ARL.

The US flight recorders, however, were still not available by January 1963 so the DCA was forced to grant a two-year extension. Even then, after they were eventually delivered and fitted the cockpit voice recorders were found to be unacceptable because of tape jamming problems. In August 1966, they were all removed and returned to the US for modification.

A month later, when an Ansett-ANA Viscount 800, VH-RMI, developed a fire in its No. 2 engine while en route from Mt Isa to Brisbane and broke up in flight while on emergency descent west of Winton, its extensive wreckage trail yielded broken pieces of metal flight data recording tape, but no cockpit voice recording.

The subsequent inquiry was also chaired by Mr Justice Spicer. He again strongly emphasised the value of cockpit voice recorders, saying that every effort should be made to obtain satisfactory recorders. The Department later gave approval for the installation of more recently developed US Fairchild recorders as an alternative to the United Data Control equipment.

The final fatal airline crash in the saga of Australian flight recorder history occurred in north-west Western Australia on 31 December 1968. Near the end of a scheduled flight from Perth to Port Hedland, the starboard wing of a MacRobertson-Miller Viscount 700, VH-RMQ, separated in flight and the aircraft crashed and burned 28nm south of Port Hedland.

A modern cockpit voice and data recorder
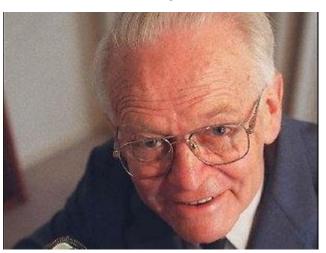(FA2100 CVDR L-3 Aviation Products)

For the first time, the investigation had the advantage of both flight data and cockpit voice recordings, both yielding information right up to the point of impact. This enabled the wing failure to be definitively attributed to a fatigue crack in the main spar and action to be taken to prevent future occurrences of the same nature.

Flight data and cockpit voice recorders are now essential equipment for all major airliners throughout the world and have helped solve many otherwise inexplicable accidents. But until 1999, David Warren's contribution to their development remained almost unknown. In October 1999, Time Magazine, to mark the 40th anniversary of its Australian publication, featured people who had been the Pacific's most outstanding contributors of the century. David Warren, described as 'the most neglected inventor', was included under the heading "*David Warren – with an ingenious invention, he helped make air travel safer for millions of people*."

David Warren in old age

So David Warren at last received his due recognition. He was awarded the Australian Institute of Energy's medal for 1999, the Hartnett Medal of the Royal Society of the Arts for 2000 and the Royal Aeronautical Society's Lawrence Hargrave Award for 2001. In 2002, he was officially recognised in the Australia Day Honours list, being appointed an Officer in the General Division of the Order of Australia for his *'service to the aviation industry, particularly through the early conceptual work and prototype development of the black box flight data recorder'*, and in November 2008, Qantas named one of its new Airbus A380s after him in honour of his services to aviation.

David Warren died on 19 July 2010, at the age of 85.

Career Summary

1944-46 Teacher of mathematics and chemistry, Geelong Grammar School, Victoria
1947-48 Lecturer in chemistry, University of Sydney
1948-51 Scientific Officer, Woomera Rocket Range and Imperial College, London
1952-83 Principal Research Scientist, Aeronautical Research Laboratories, Melbourne
1981-82 Scientific Adviser (Energy) to the Victorian State Parliament

Committees

Chairman of the Combustion Institute (Aust & NZ Section) 1958-1983
Committee Member, Chemical Society
Committee Member, the Institute of Fuiel
Committee Member, the Australian Institute of Energy
Morris Minor Car Club of Victoria, founding chairman and patron 1977-2002

Awards

FAIE – Fellow of the Australian Institute of Energy
The Australian Institute of Energy Medal (1999)
Hartnett Medal of the Royal Society of the Arts (2000)
Centenary Medal (2001)
Lawrence Hargrave Award of the Royal Aeronautical Society (2001)
Officer of the Order of Australia (AO) (2002)

Inducted into the Australian Aviation Hall of Fame (2013)

Mike Milln
History Group Member
South Australian Aviation Museum Inc
November 2012

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[1] From http://en.wikipedia.org/wiki/David_Warren_(inventor) 22/11/2013