

TED ELDRED

# The Australian Who Changed the World of Diving

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Ted Eldred was born in Victoria on the 16<sup>th</sup> of December 1920, he was an only child. His parents were hoteliers at the coastal township of Sorrento, south of Melbourne, where his parents ran a large guest house, whilst Ted went to boarding school in Melbourne. He would return to Sorrento each weekend aboard one of the beautiful paddle steamers, which plied Port Phillip in those days. It is believed Ted developed his mechanical interest during the trips on those steamers, where he had forged a friendship with the engineers, who would allow him to travel in the engine room.

With the sea all around him at Sorrento, Ted's passion for the sea developed and he spent much of his time snorkeling, swimming and even learning salvaging techniques, breath-hold diving to raise sunken fishing boats after storms. He used goggles similar to those worn by the Amah divers of Japan.

At age 16, Ted began a Fitting and Turning apprenticeship in Melbourne and also developed an interest in water polo. When World War Two began in 1939, he tried to enlist in the Australian Navy, but was barred due to his skills in what was considered an "essential service" industry, as he had just completed his apprenticeship in Production Tooling. So, during the War years, Ted was put in charge of a staff of 200 women manufacturing radar, electronic and medical equipment parts. It was during these War years that he also studied engineering and metallurgy, emerging after the War with two trades and an Engineering diploma. His sporting interest had moved on to ice hockey and reluctantly to figure skating, as a dancing partner. At this time, he was also experimenting with the production of his own oxygen re-breather equipment and diving with it, as well as reading about respiratory physiology, devouring all he could find on the subject.

In 1948, he married Elaine, and at the same time started a small Melbourne die-casting foundry, specializing in magnesium and zinc alloys.

During the immediate post-war period, Ted had entered his most creative diving equipment production years. Readers who are familiar with his *PORPOISE* scuba equipment of the 1950s, will be surprised to learn that before the commercial production his famous *PORPOISE* brand of air scuba equipment, Ted had applied the *PORPOISE* brand name to an oxygen circuit re-breather, which he had produced as a hobby. Many weekends were spent using and improving his circuit oxygen re-breather, along with his dive buddy Bill Taylor.

Bill Taylor met Ted Eldred shortly after WW2, whilst ice skating, as Bill was also a figure skater. After leaving school, Bill had joined the RAAF and flew Kittyhawk fighters with 76 Squadron in Borneo, New Guinea and the Philippines, during WW2. Following the war, he began studies at medical school and during their ice skating days, a firm friendship was forged with Ted, which very quickly extended into time spent diving together using the *PORPOISE* oxygen circuit re-breathers. They spent a lot of time off the beautiful beaches of the Mornington Peninsula, south of Melbourne, wearing only swimming trunks and football jumpers to protect them from the cold.

Bill's brother Geoff, a very capable amateur photographer, photographed many of the variations of diving equipment Ted and Bill shared during those developmental stages of both the *PORPOISE* oxygen and air scuba units.

Bill recalled that his interest in diving was further enhanced at the time, by the Hans Hass publications. During an interview (in 2003) with the author, Bill Taylor detailed the manufacture, use and improvements Ted made through three models of the *PORPOISE* oxygen units in the late 1940's and early 1950's, by referring to several of his brother's large black and white photographs,

Most oxygen re-breathers in recreational use during the late 1940's were World War Two surplus "Salvus" apparatus. Ted could see the advantage of improving such systems by making the breathing gas travel in a circuit, therefore more efficiently utilizing the soda lime absorbent and avoiding saturated "dead spots" in the chemical reservoir and the consequential steady and progressive increase in dangers. His first challenge was production of the breathing bags, which were very difficult to produce. They had to be hand-made from canvas, then dipped in rubber and vulcanized. The breathing tubes were salvaged from war surplus gas masks obtained from army disposal stores.

Longer hoses on the improved MK 2 & 3 units were achieved by joining two lengths together, to make them long enough to reach the diver comfortably.

Breathing hoses on the MK1 model were fitted with simple perforated disc valves, but in the later models, these were replaced by more efficient mitre-valves, oval-shaped rubber flaps, mounted obliquely across the tubes. These valves were mounted very close to the mouthpiece to keep "dead-space" to a minimum. Ted realised that the mitre-valves were 50% more efficient, as they produced a 'laminar' air flow and did not impede the gas, unlike the mushroom valves, which created turbulence during the change in direction of the gas flow. Breathing hose ends on the MK1 model, were simply pushed onto fittings on the breathing bag, whilst the later MK 2 & 3 models employed much safer clamp attachments. The hoses connected to the soda lime canister were also only pushed onto the fittings in the MK1 unit, whilst the MK 2 & 3 units had a safer screw-on fitting, similar to a garden hose/tap fittings, as used on early British Siebe Gorman regulators.

The mouthpieces on all units were fashioned from metal and dipped in latex, although they did not present an anatomical fit! The MK2 & 3 models were improved with a push/pull valve on the mouthpiece to close off the aperture, thus preventing the entry of water into the system if the diver removed the mouthpiece whilst in the water.

The oxygen supply cylinder was hung from the breathing bag by webbing and an Army surplus belt, fitted with a quick-release pin similar to a door hinge fitting, which allowed the whole unit to be jettisoned in an emergency situation, after the breathing-bag unit straps were let go.

Oxygen from the cylinder was bled into the system very carefully indeed on the MK1 model, as the unit had no pressure reduction-valve and the gas was admitted under direct pressure! A cylinder contents gauge was fitted, but as it was mounted on the neck of the cylinder, it was in a difficult position for the diver to read. A cylinder pressure-reducing constant flow valve, became a feature of the MK2 & 3 models.

A very interesting and innovative safety feature of the *PORPOISE* oxygen circuit units, was a depth-limiting valve, which Ted Eldred had invented to warn the diver as the maximum safe diving depth for oxygen approached. The system was simple. Two soft rubber tubes, which were part of the breathing circuit, passed through the body of the unit between two opposing blunt blades. One blade was fixed to the valve body and the other to a flexible diaphragm, which was acted upon by the ambient water pressure and adjusted by a spring, to select the depth at which it closed. At the selected depth, the flexible "knife edge" closed to its fixed fellow blade, squeezing the soft rubber breathing tubes and placing definite

breathing resistance to the circuit. The diver could not help but notice this warning! The device could be adjusted, or pre-set, by turning a knob located in the centre of the disc on the back of the unit. It was usually set to restrict gas flow at a depth of 8M, thus keeping the diver above the safe limit for breathing oxygen.

All units were fitted with a gas pressure-relief valve on the breathing bag, to avoid it over expanding on ascent. Again, this was a simple device, consisting of a length of bath-plug chain internally mounted to the back of the bag and across to the pressure relief valve. On ascent, as the bag expanded to the maximum length of the chain, it opened the relief valve and escaping gas traveled along a thin tube secured to the outside of one of the breathing hoses, to bubble out in full view of the diver. This way expanding/exiting gas could be monitored, by the diver.

The soda lime canister underwent several improvements from the MK1 to MK3 models, as Ted recognized the problems of internal condensation build-up. Bill Taylor recalls the soda lime canister developing terrific heat during a dive, even though it was submerged in cold sea water and it was very hot to touch. As a result, condensation formed within the canister, which on the MK1 unit, was drained off after the dive through a small gas cock fitting. The MK2 and MK3 units were fitted with double-walled canisters along the lines of a vacuum flask, to insulate them from the cold sea water, thus reducing condensation formation. Additionally, the ends of the canister were shaped like un-spillable ink-wells, so that any condensation that did form would be isolated within the end chambers, thus preventing it mixing with the soda lime.

This improvement appeared on the MK2 model, which had four wing nuts securing the removable end, whilst the MK3 model had a simpler single nut attachment, making it much easier to handle when replenishing the soda lime. All units were beautifully built, by Ted Eldred, his talent and skills in the machine shop being very apparent.

The MK3 oxygen unit carried Ted's *PORPOISE* brand nameplate for the first time. None of these oxygen units ever went into commercial production, as Ted very quickly learned that the future of safe recreational diving lay in air scuba units, which overcame the depth limitations and dangers associated with breathing oxygen underwater. In 1950, Ted began work on his *PORPOISE* air scuba system and his development of the *PORPOISE* **single hose scuba system** which eventually changed the world of scuba diving forever. Unfortunately, none of Ted's oxygen circuit units have survived the passage of time, so Dr. Bill Taylor's photographs are indeed a very precious record of Australian diving heritage.

### **CAPTIONS FOR PHOTOS:**

**Image No: 001** - Dr. Bill Taylor models the MK1 Unit (Photo: © W. Taylor)

**Image No: 002** - Front of the MK1 unit with features as marked. (Photo: © W. Taylor)

**Image No: 003** - L-R: Ted Eldred & Bill Taylor with rebreathers 1949 (Photo: © W. Taylor)

**Image No: 004** - Bill Taylor with MK2 model, showing gas-bag pressure-relief tube along right breathing tube. (Photo: © W. Taylor)

**Image No: 005** - Label on the back of this MK3 model reads "*The Porpoise Underwater Breathing Unit*". (Photo: © W. Taylor)

**Image No: 006** - MK2 model in colour. (Photo: © I. Howitt)

**Image No: 007** – L-R: Bill Young & Ted Eldred with MK2 models. (Photo: © I. Howitt)