# Walter M. Boothby, Pioneer in Aviation Medicine

AVIATION medicine lost one of its pioneers with the death of Walter M. Boothby at Albuquerque, New Mexico, 3 July 1953. He was born and educated in Boston, receiving his A.B., M.D., and M.A. degrees from Harvard University. After experience in surgery, anesthesia, respiration, and metabolism in Boston, he joined the Mayo Clinic in 1916, where he organized the Metabolism Laboratory. His name soon became familiar to every center of clinical investigation because of the standards of basal metabolism in health and its variations in disease that he established. His early interest in respiration was sustained; he and Henry Plummer were associated in studies of oxygen therapy, particularly for postoperative patients with anoxia. In the 1930's, he and two Mayo Clinic associates, Randolph Lovelace and Arthur Bulbulian, developed a mask for oxygen therapy. This came into wide use and is still known as the BLB mask.

He served overseas as a medical officer, with the rank of captain and then of major, in World War I. His assignments in France included those of director, 1st Corps Gas School, CWS; instructor in the Army Medical School at Lange; and chief of a surgical team in the battles of St. Mihiel and Argonne. This was the beginning of 35 years of leadership in military medicine. His interests in respiration and oxygen therapy soon were directed to the solution of the problem of supplying oxygen to pilots at high altitudes. When the Aero Medical Laboratory began functioning at Wright Field under Harry G. Armstrong in 1934, Walter Boothby became an adviser. Studies in its altitude chamber and in flights soon led to supplanting the oxygen tube, inherited from World War I, with the BLB mask, designated by the Air Corps as the A-8 mask. In 1939, in recognition of their research in aviation medicine, Boothby, Lovelace, and Armstrong were corecipients of the Collier trophy, aviation's highest award; the airlines shared the award in recognition of their safety record.

In 1939, with war imminent, Otis O. Benson, Jr., then a captain in the Medical Corps, was picked to succeed Armstrong as chief of the Aero Medical Laboratory. He was sent for a few months' training, first to Boothby's laboratory, and then to the Harvard Fatigue Laboratory. When I was assigned to the Aero Medical Laboratory in January 1941, I was at once indoctrinated in the use of oxygen equipment, particularly the A-8 mask, and in the use of an experimental mask being developed by Cecil Drinker and his associates at the Harvard School of Public Health under NDRC support. Experience in high-altitude flight and in refrigerated altitude chambers proved that the A-8 mask was unsafe in extreme cold and at altitudes above 25,000 ft. The Drinker mask, known as the A-10, began to supplant the A-8 mask, but it too had deficiencies. Used with the new demand valve, the seal to the face was crucial, and leakage became hazardous at altitudes above 25,000 ft. In flights of long duration, it sometimes became unbearable because of pressure points. By 1943, the best features of each mask were incorporated in the A-14; in this development, the Mayo Section of Aviation Medicine, headed by Boothby, had a major role. Throughout World War II, many scientists came to him for training or advice; one of these men was F. J. W. Roughton, another was Charles A. Lindbergh. The experience that Lindbergh gained while carrying out research with Dr. Boothby at the Mayo Aero-Medical Laboratory may have saved his life some months later when he ran out of oxygen at 36,000 ft because of a faulty gage reading [C. A. Lindbergh, *Flight and Life* (Scribner's, New York, 1948), p. 6].

Dr. Boothby was not in good health when he reached emeritus status at the Mayo Clinic in 1948. He nevertheless thoroughly enjoyed his next 2 years at the University of Lund, and the King of Sweden subsequently awarded him the order of the Commander of the North Star "in recognition of services rendered to Sweden." When he returned, Otis Benson, commandant of the School of Aviation Medicine, invited him to spend a year with him as scientific director. His final tour of duty was with the Lovelace Clinic. As always, he found time for laboratory studies. One of his last, "Rate of pulmonary and tissue gaseous nitrogen elimination as a measure of pulmonary efficiency," was published posthumously in the *Journal of the American Medical Association* [**152**, 1000 (1953)]. During these 2 years, he edited for the Air Force a compendium of information on respiratory data for aviation medicine. He is said to have outworked his colleagues and to have completed the last important step late in the evening preceding his death.

Dr. Boothby is survived by two daughters and by his wife, Catherine, who was a tower of strength to him, especially during his last years of ill health. His fellow physiologists treasure his accomplishments in research; aviation treasures his contributions to the well-being of air crews at high altitudes.

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