

HEADQUARTERS
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
BROOKS AIR FORCE BASE, TEXAS

NOTES TO ACCOMPANY SLIDE SERIES:

Aerospace Medicine Heritage

1. Flight of Aerien: 1783. Joseph and Etienne Montgolfier designed this linen and paper balloon, inflated it with hot air from a fire of chopped straw and on June 5, 1783 it made a flight, heralding the start of the balloon era. On September 19, 1783, a cage, containing a sheep, duck and a rooster, was suspended from the balloon and rose to 1500 feet. The only injury was a broken wing for the rooster in a hard landing.
2. Montgolfier Bros., 1783. The brothers Montgolfier invented the hot-air balloon inaugurating the art of aeronautics with a successful flight on 5 June 1783. They were the sons of a wealthy paper manufacturer of Annonay, France.
3. P. de Roziere, 1783. On 15 October 1783 de Roziere, a surgeon-apothecary of Metz, became the first man to fly in a balloon after volunteering to replace a condemned criminal who was scheduled for the ascent. Approximately a year later he became the first aeronautical fatality when he crashed in a hydrogen and fire balloon of his own design.
4. Jeffries and Blanchard, 1785. John Jeffries, an American physician and Jean-Pierre Blanchard made the first balloon voyage across the English Channel (January 17, 1785). They were the first to carry air mail and Jeffries wrote the first book on aeronautics.
5. P. Bert, 1833-1886. Physiologist, politician and administrator. Author of the classic "La Pression Barometrique" in which he first described lack of oxygen as the essential cause of altitude sickness. Prior to Bert's book there had appeared to be no relationship between the studies of air, gases, vapor pressures, blood, mountains and the problems of flight. Bert's work merged these diverse investigations into the beginnings of aviation medicine.
6. Bert's Twin Chamber. Paul Bert in his twin-steel altitude chamber. He is studying the effects of respiration of air enriched with oxygen at low barometric pressures.
7. Bert's Syringe. Paul Bert's syringe for collecting blood for the study of effects of low pressure.

8. Bert's Hg Pump. Mercury pump employed by Paul Bert for extracting gas from blood. A. Barometric chamber. B. Mobile reservoir connecting with A by rubber and glass tube. C. Mercury basin for collecting gas. D. Balloon plunged into hot water where, when a vacuum is created, blood is introduced by the stopcock r. Large glass tube emanating from D is surrounded by a water jacket which cools the gas and causes hydraulic closing. E. Three-way stopcock capable of closing the barometric chamber completely (position 1), or connecting A with C (position 2), or A with D (position 3).

9. Jourdanet's Chamber, 1875. An apparatus for the therapeutic use of compressed and expanded air. Denis Jourdanet, who had personal experience with mountain sickness, maintained that the essential cause of altitude sickness is lack of oxygen.

10. The Zenith, 1875. The epochal but tragic flight of the Zenith on 15 April 1875 in France during which a maximum altitude of 8,600 meters was reached. In the picture Tissandier reads the barometer, Crocé-Spinelli inhales oxygen and at 7,450 meters Sivel cuts the ropes to empty the ballast bags of gravel and sends the balloon still higher. The oxygen mixture as prescribed by Paul Bert was satisfactory but the total supply carried was not enough. Only Tissandier survived the flight.

11. Wrights' glider launching - Kitty Hawk 1902. On the wind-swept dunes of Kitty Hawk, on the coast of North Carolina, Wilbur and Orville Wright experimented with glider flight in 1900, 1901 and 1902. They solved the riddle of flight in a motor driven plane on December 17, 1903 in a flight of 12 seconds for 120 feet.

12. 1908 - Orville Wright in flight at Fort Myers, Virginia. The Army signed a contract with the Wrights for the first Army airplane on February 10, 1908.

13. 1908 - First Army airplane. This airplane was purchased from the Wrights by the U.S. Army - Price:\$30,000. The first pilots were subject only to general military duty physical standards.

14. Lt. T. Selfridge, 1908. Thomas Selfridge of the Army Signal Corps, the first American officer to be killed in an airplane accident (September 17, 1908); the pilot, Orville Wright, was severely injured. Portraits of Lieutenant Selfridge are rare; the present portrait is of interest as he is shown standing with Alexander Graham Bell, who had been fascinated by aerial flight since boyhood, and made thousands of experiments before the brothers Wright flew over Kitty Hawk.

15. 1910 - Orville Wright and his flying students at Montgomery, Alabama.

16. 1910 - Walter Brookins is here shown making the first Night flight.

17. 1910 - Orville Wright and Walter Brookins (first night flight), together in Montgomery, Alabama.

18. 1911 - First Navy airplane. Pontoon replaced wheels as the sea plane was born.

19. 1911 - Eugene Ely landed on a battleship in 1911. Ship was the USS Pennsylvania.

20. General Theodore C. Lyster. General (then Major) Lyster, Medical Corps, U.S. Army, an ophthalmologist, began work on the physical standards for aviators in April 1914. Often referred to as the father of Aviation Medicine in America, he emphasized the importance of vision, ocular muscle balance, and the effect of refractive errors. He was appointed to the newly created position of Chief Surgeon, Aviation Section, Signal Corps, on 6 September 1917.

21. Dr. Yandell Henderson. Dr. Henderson was chairman of the Aviation Medicine Research Board, appointed on 18 October 1917 to study the high aircraft accident rate in flying training centers in the U.S. and among flyers in France. The Henderson-Pierce Rebreather was used extensively in early experiments to measure a flyer's tolerance to low oxygen tension.

22. 1918 - Colonel William H. Wilmer. Colonel Wilmer was the first Director of the Air Service Medical Research Laboratory at Mineola, which began operations on 19 January 1918. He later achieved distinction as an eye surgeon, and founded the Wilmer Institute of Ophthalmology at the Johns Hopkins University in Baltimore.

23. 1917 - Planning Aviation Medicine. Theodore C. Lyster, Isaac H. Jones, Eugene R. Lewis and William H. Wilmer met in Philadelphia in May 1917 to establish new physical standards for the Army Air Medical Service.

24. Research Lab, France, 1918. These buildings at the Third Aviation Instruction Center, A.E.F., Issoudon, France, housed the Air Medical Research Laboratory when it was deployed from New York to Europe at the request of General Pershing. His cabled request for aviation medical aid in August 1918 resulted in the rapid movement overseas of 33 officers and 15 enlisted men from the laboratory at Mineola, L.I. They were followed by their equipment which included a low-pressure chamber, the Henderson-Pierce rebreather, and the Dreyer nitrogen dilution apparatus. Through a remarkable feat of transportation and organization this unit was operational in France by October 1918.

25. Research Lab, France, 1918. One of the rooms of the Medical Research Laboratory, Third Aviation Instruction Center, A.E.F.

26. Research Lab, France, 1918. Low pressure tank in Medical Research Laboratory, Third Aviation Instruction Center, A.E.F.

27. 1917 - Members of the Medical Research Laboratory, Mineola, Long Island, 1917-1918. The directors of the research departments were as follows: Otology - Lt Colonel E.R. Lewis; Cardiovascular - Major James L. Whitney; Physiology - Major E.C. Schneider; Psychology - Major Knight Dunlap; Psychiatry and Neurology - Major Steward Paton; and Ophthalmology - Captain Conrad Behrens, Jr.

28. 1918 - Staff of Air Service Medical Research Laboratory at Mineola Field, Long Island.

29. Mineola, L.I., 1918. Early military aviation training at Mineola, Long Island. This was the site of the first U.S. Army School of Aviation Medicine.

30. Emergency Escape, World War I. This British observer, his balloon destroyed during the battle of Menin Road, in Flanders, descended into a treetop. While his comrades were climbing to his aid the observer succeeded in swinging on one of the ropes of his parachute to a nearby tree, from which he slid to safety.

31. Personal Equipment, 1917. With fur muffler, ear muffs and gloves a French military balloonist is prepared for a long stay in his open basket observing enemy operations. Photograph was made from a second basket suspended from the same balloon.

32. Anti-Windblast, 1917. Even at the slow flying speeds obtainable in open cockpit planes, keeping warm demanded thorough measures.

33. 1918 - Rebreathing Test. This test, utilizing the Henderson-Pierce Rebreathing Machine, was used to study the ability of individuals to withstand the effect of oxygen want at high altitudes.

34. 1918 - This graph shows typical results obtained in use of the Henderson-Pierce Rebreather.

35. 1918 - Major William R. Ream became the first Flight Surgeon killed in an aircraft accident in the line of duty. He was killed at Chamute Field, Illinois.

36. Barany Chair, 1918 (left). With head forward and eyes closed, the candidate is revolved 5 times to the left in 10 seconds. When the chair stops and he opens his eyes his head should drop to the left as shown in the picture.

(right) "Past Pointing" test to determine balance and sense of direction. After being whirled 10 times in 10 seconds the candidate raises left arm and with eyes closed attempts to touch examiner's hand. Here he has past pointed to the right away from the examiner's hand.

37. VFR, 1918. A landing field is indicated by huge numerals painted on the roof of a barn.

38. 1919 - Major Louis H. Bauer. In January 1919 Major Louis H. Bauer replaced Colonel William H. Wilmer as Director of the Medical Research Laboratory and School for Flight Surgeons. During his 7 years as Director, Major Bauer reorganized the Laboratory and staffed it with Regular Army Medical Corps Officers. He prepared a curriculum for a permanent course of instruction for flight surgeons and held the first class in May 1919. He left this position in 1925 to become the first Medical Director of the Aeronautical Branch of the Department of Commerce. Dr. Bauer published the first American textbook on Aviation Medicine in 1926.

39. 1919 - School of Aviation Medicine, Mitchell Field, Long Island. From November 1919 to March 1921, when the facility with all records was destroyed by fire, the School was located at Mitchell Field.

40. 1920 - Ruggles Orientator. This apparatus was used in the period around 1918-1920 to teach the flyer the disorienting effects of stunt flying. He was educated to disregard the disorienting effects of his stunts in the laboratory, rather than among the clouds.

41. 1920 - Ruggles Orientator. The movements which were possible in all directions except forward progression were controlled by the individual seated in the machine, using a set of controls resembling those of an airplane.

42. 1920-(approximate)-Altitude Classification Test. The main purpose of these tests was to provide research data, compiled in 1925 in the SAM Annual Report, pp 26-27.

43. 1920 - Depth Perception Test. The wooden screen hides the metal tripods on which are mounted the white "semaphores". The subject stood at 100 meters away and was required to tell which "semaphore" was nearer to him through 6 meters down to 1 meter separation in depth.

44. WW I - LVN Apparatus. The LVN test was devised and used on 7000 candidates at Mineola, L.I., during the First World War. It was an attempt to classify candidates in terms of their resistance to the effects of low oxygen tension. The name is appropriate because it calls for reactions to lights, changes in a voltmeter reading, and changes from the normal speed of a motor.

45. 1918 - Tachistoscope. This device, devised by Dr. C.E. Ferree, was used in studying the speed of accommodation of the eyes.

46. 1920 - Adaptometer. Apparatus used in determining the physical fitness of the aviator for night flying. His absolute sensitiveness for light was one datum sought. Another was his rate of recovery after the relative blinding following exposure to light for short periods.

Shown here, the test pattern appears on the square white surface on the end of the instrument and is not visible except in the dark. The white screen for the purpose of "blinding" the subject is below in the foreground.

47. 1920 - Liquid Oxygen Apparatus. To the Germans goes credit for devising and using more or less successfully the first liquid oxygen supply apparatus for aviators. The Allies of WW I first became acquainted with the apparatus after its capture from German airplanes such as the Gotha.

48. 1920 - Ambulance Experimentation. The DH-4 model plane was the first plane in the U.S. Army to have a fuselage which was designed primarily for transportation of the sick and wounded. Space provided was for a pilot, two litter patients, and a medical attendant.

49. 1920 - Oxygen Supply Test. Bell jar apparatus used at the Medical Research Laboratory to test the effectiveness of early oxygen regulators such as the "Prouty Oxygen Apparatus". The bell jar shown here contains the regulator, which is tested as the vacuum pump evacuates the bell jar.

50. 1921 - Protective Clothing.

51. 1922 - School of Aviation Medicine Class. In 1922 the first Naval Medical Officers to attend the Army School were graduated.

52. 1921 - First In-Flight Refueling. Wesley May demonstrates the "aerial filling station", in which he delivered 5 gallons of gasoline to another aircraft by climbing from one plane to another with a gas can strapped to his back.

53. Early Navy Parachutist.
54. 1921 - Eddie Rickenbacker beside transcontinental plane.
55. 1926 - Air Ambulance.
56. 1927 - Charles A. Lindbergh. In his Ryan-built "Spirit of St. Louis", Lindbergh made aviation history on 20-21 May 1927 with his non-stop flight, New York to Paris, 3610 miles, in 33 hours, 30 minutes.
57. 1927-1931 - School of Aviation Medicine Building. This building was occupied by the School of Aviation Medicine at Brooks AFB, Texas, from 1927-1931.
58. 1927 - School of Aviation Medicine Class.
59. 1927 - Thorne Reaction Time Apparatus. Designed in 1925 by Major Frederic H. Thorne, MC, of SAM, this machine measured simple and discriminatory reaction time in hundredths of a second. The candidate received a visual or an auditory stimulus and responded by pressing either a right or left telegraph key. In use from 1925-1930 under the direction of Major Thorne and Captain N.C. Mashburn, M.C.
60. 1927 - Complex Coordinator - WW II. The importance of the Complex Coordinator was summed up in 1945 by Brigadier General Eugene G. Reinartz: "During WW II the Complex Coordinator served as the backbone of the aptitude testing program of the Army Air Forces, involving to date the examination of well over half a million candidates for training as aircrew members. Performance on the Complex Coordinator - Mashburn, has had more to do with rendering a decision, in each individual case, as to who was to become an Army Pilot than has any other single measuring device."
61. 1929 - Navy OL-8 in carrier takeoff.
62. 1933 - School of Aviation Medicine, Randolph AFB, Texas.
63. 1932 - Crash Ambulance.

64. 1932 - Apparatus for determination of visual acuity.
65. 1932 - Wobblemeter. A test for determining pilot fatigue, found to have little or no value in this regard in 1932.
66. 1932 - Ocker Box. In 1926, Captain David A. Myers, M.C., and Captain W.C. Ocker, did the original research on the physiology of blind flight, upon which all our present knowledge and blind flying equipment is based. It has been said that the work of Captain Myers was the greatest contribution ever made by a flight surgeon to modern aviation. The "Ocker Box" was used by Captain Ocker to demonstrate the effectiveness of his bank and turn indicator.
67. 1932 - Barany Chair Equilibrium Test. This picture shows the physician timing nystagmus after turning.
68. 1934 - Colonel A. B. Tuttle. Colonel Tuttle, who succeeded Colonel A. P. Clark as Commandant of the School of Aviation Medicine in 1934, continued the efforts of the latter to organize the research program of the School.
69. 1934 - Wiley Post Suit. The first full pressure suit with any degree of practicality was originated by Wiley Post and designed and fabricated by the B. F. Goodrich Company in 1934. Post made quite a few flights in this equipment.
70. 1935 - German Pressure Suit. The initial German pressure suit was of silk and rubber and latticed silk webs. It was unsuccessful because of ballooning and rigidity.
71. Experimental Italian Pressure Suit. "The Man In The Iron Mask" was well off compared to the one who had to squeeze into this suit through the aperture on the back. Although a bold and unconventional attempt to provide high altitude protection, its weight and immobility rendered it impractical for production use.

72. 1937 - Italian Cuirass. The "cuirass" or corset of the Italian pressure suit was designed to maintain the shape of the torso of the rubber garment when the latter was inflated. Another function of this corset was to provide support and connection for the heavy helmet.

73. 1937 - Flight Lieutenant Adams leaving the Bristol 138a in which he flew to approximately 54,000 feet in June 1937. Helmet and suit are the RAF full pressure suit.

74. 1940 - German Pressure Suit. One of the approaches toward attaining a full pressure suit undertaken by the Germans during WW II was the metallic design that resembled the devices worn by knights in the legendary days of history.

75. Major General Malcolm C. Grow. As Air Surgeon in Office of the Army Air Corps, he recognized the need for and was instrumental in the establishment in 1934 of the Aeromedical Research Laboratory at Wright Field, Ohio. As Surgeon of the 8th Air Force during World War II, he introduced the "flak suit". He became the first USAF Surgeon General in 1949.

76. 1938 - Self balancing test being administered to a candidate.

77. 1938 - Equilibrium Test is administered to a candidate. This self-balancing chair was built from blue prints obtained from the Dutch East Indies Air Service. The ability of an individual blindfolded to return to a level position was determined.

78. 1938 - On November 20, 1938, the Navy established its own School of Aviation Medicine at Pensacola, Florida, having previously detailed officers to the Air Corps School of Aviation Medicine.

79. Major General David N. W. Grant. Air Surgeon, AAF, WW II, aggressively worked to improve the stature of Aviation Medicine and the quality of medical care to AAF units.

80. Dr. Louis H. Bauer. In 1926, Dr. Bauer resigned his commission in the regular Army to become the first medical director of the aeronautics branch of the Bureau of Air Commerce. The founding of the Aero Medical Association and its Journal were both first suggested and came into being through the efforts of Dr. Bauer. He was the first president of the Association and editor of the Journal for 25 years. In 1930 he resigned from the Bureau of Air Commerce to enter private practice. In 1952 he became the president of the American Medical Association. In 1948 he began service as Secretary General of the World Health Association. His contributions to aviation medicine have been monumental.

ACKNOWLEDGMENTS

Gratitude is extended to the following organizations for slides, photographs and books as indicated:

1. Ciba Pharmaceutical Company--slides 2, 3, 4, 5, 6, 7, 8, 9, 14, 24, 25, 26.
2. National Geographic Magazine--slides 11, 30, 31, 32, 36, 37, 54.
3. Thermix Corporation--slides 69, 70, 71, 72, 73, 74.
4. U.C.L.A. Biomedical Library--books in exhibit as indicated. Pictures in side panels of exhibit.