PHYSIOLOGY

Seven-Mile Jumps

Dogfights 35,000 to 40,000 Feet Above the Earth Necessitated New Oxygen Apparatus for Bailing Out

By JANE STAFFORD

DEFENSE against bombers is speeding ahead in medical research laboratories these days as well as in airplane and anti-aircraft factories. The doctors are giving us a new means of combatting high-flying night bombers.

Fighting planes and commercial airliners can now climb to the sub-stratosphere. It is this high flying that gives the odds to the attackers. It causes the failure of the defending air force.

At seven or eight miles up in the night air, planes can elude searching beacon lights, anti-aircraft guns and fighter planes, to drop bombs on sleeping cities and vital factories or rail centers, then speed safely away.

Occasionally a plane dropping destruction from 35,000 to 40,000 feet above the earth's surface does not get away safely. During World War days the pilot, when his plane was hit and disabled during a dogfight, could bail out. Supported by his parachute, he drifted safely to the ground. That was when planes flew only a mile or so above the surface of the earth.

Today super-charged engines drive modern planes to seven and eight times such altitudes. The flyer whose plane is disabled at these sub-stratosphere heights cannot be saved by his parachute alone. He would die on his way to earth even if he lived long enough to make the jump and pull the rip-cord of his 'chute. Latest aero-medical research shows that he would not have a chance even to make the jump, unless he made certain vital preparations.

The reason why no parachute alone could save a flyer bailing out at 35,000 feet altitude is that the air at this distance from the earth's surface does not contain enough oxygen to support life. Pilots can only fly at these heights because their planes are equipped with oxygen tanks. The pilots of bombing planes and others ascending to high altitudes wear masks or mouthpieces connected with a tank of oxygen which constantly supplies them with this vital gas.

When they are forced to bail out, they must leave this life-protecting equipment behind. Unless they carry their personal supply of oxygen with them, they might just as well not try to jump. It takes nearly 15 minutes to get down from 35,000 feet or 40,000 feet to a level where the oxygen pressure will be high enough for the parachute jumper to live. Emphasizing this danger to the pilot, Dr. Walter M. Boothby, of the Mayo Clinic, states:

"If he gets into a dogfight up in those high altitudes, and his plane bursts into flames, he is a gone duck unless, after bailing out, he can be kept alive for at least 10 minutes with oxygen until he floats down to the 18,000-foot level."

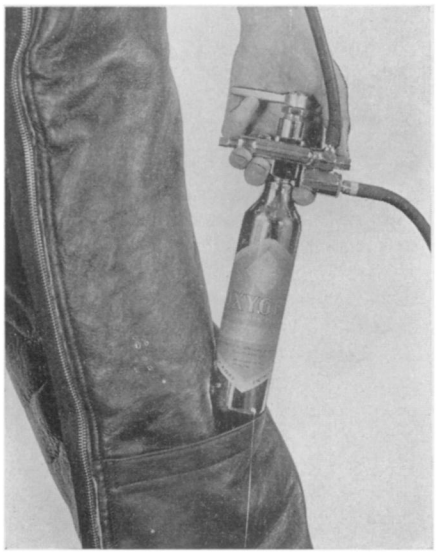
Dr. Boothby is one of a group of aero-medical researchers who have been and are still working to guard flyers against the danger of oxygen lack at high altitudes. For their researches, Dr. Boothby, Dr. Harry G. Armstrong, captain, U. S. Army Medical Corps, and Dr. William Randolph Lovelace, 2d, of the Mayo Clinic, were awarded the Collier Trophy, one of the most important national awards in aviation. In awarding the trophy, the committee gave special credit to Dr. Arthur H. Bulbulian, also of the Mayo Clinic, for his work in developing a special mask for delivering oxygen to flyers.

In the latest investigations, Captain Otis O. Benson, Jr., U. S. Army Medical Corps, Dr. Howard Burchell, of the Mayo Clinic, and Milo G. Burcham, well-known test pilot of the Lockheed Aircraft Corporation, have taken part.

These scientists have come to the rescue of the pilot faced with the danger of having to jump for his life from an altitude of 35,000 or 40,000 feet—the world's longest and most hazardous jump. Before Captain Benson and Dr. Lovelace and Mr. Burcham themselves

OUTFIT

What the well-dressed parachute jumper will wear. The emergency oxygen tank goes in a pocket on his left. The tube to the right connects with the main supply but can quickly be disconnected for a jump, when the emergency supply is used.



38 QUARTS

A close view of the emergency oxygen tank, carried in the special trouser leg pocket. It holds 38 quarts of the life-giving gas.

made such jumps in tests at the Mayo Clinic, no one, so far as could be learned, not even the most daring Caterpillar Club member, had dared to jump from higher than 20,000 feet above the earth's surface. The test jumps were not made in the air in actual parachute jumps but in the low pressure chamber at the Mayo Clinic. The potential danger of death from lack of oxygen, however, was just as great as it would have been in an actual parachute jump, in that the air in the chamber was converted into the same rarefied atmosphere encountered at sub-stratosphere levels. Mr. Burcham, in fact, passed out and was only rescued in the nick of time by his observer who promptly supplied him with 100% oxygen.

The reason this test pilot, a man in excellent physical condition who has proved he is less susceptible to oxygen lack than the average normal person, passed out in the test jump was because he delayed too long in transferring from the plane's oxygen supply to his own emergency supply.

The emergency supply consists of a pocket oxygen tank, about the size of a flashlight. It was designed especially for pilots forced to bail out at these deadly, if heavenly, altitudes. This baby oxygen tank carries about 38 quarts of oxygen, delivering at the rate of about two quarts per minute. The amount of oxygen in the baby tank was based on the assumption that it would take a pilot from 10 to 15 minutes to descend from altitudes of 35,000 or 40,000 feet to 18,000 feet where he would be safe from the danger of oxygen lack. When first made, the scientists could not be sure whether or not the tank actually contained enough oxygen for its life-saving purpose.

Captain Benson and Dr. Lovelace volunteered to test this crucial point by making the jumps with only the untried baby oxygen tank as their source of oxygen during what might prove a perilous descent. To guard against misfortune, they made the jumps alternately, each standing ready to supply the jumper with oxygen if the baby tank supply failed.

The jumps were made successfully. The total time occupied in going from 35,000 feet to 20,000 feet was seven minutes. In actual flight, the pilot would probably be even lower in seven minutes, because he would delay pulling his rip cord for 15 seconds, during which time he would gain quite a distance before he was slowed down by his parachute opening.

The calculated oxygen supply in the baby tanks proved ample, enough remaining in the cylinder to bring the men down still further than 20,000 feet. Only on the first descent when the subject was a little nervous and not breathing properly was there the slightest evidence of cyanosis.

Pilots can safely bail out in the substratosphere when carrying this personal oxygen supply, the experiments showed. Merely carrying the baby tank in the pocket of the flying suit, however, is dangerously not enough. It must be used, and used promptly. Mr. Burcham discovered this when he made his test jump.

The very first, vital thing the pilot must do when forced to bail out at altitudes of 35,000 or 40,000 feet is to change from the plane's oxygen supply apparatus to his own personal oxygen supply tank. Delaying to start the emergency oxygen apparatus, going without any oxygen for as short a time as 30 seconds, was nearly fatal to Mr. Burcham. In his test jump he used the wrong method.

Instead of adjusting his emergency oxygen mouthpiece immediately after removing the regular oxygen mask, he first went through the motions of trying to open a jammed cockpit cover, releasing the safety belt, and standing up as though to jump out. When at this point he started to adjust the emergency oxygen mouthpiece, he was fast losing consciousness. The emergency mouthpiece fell out of his mouth, he became completely unconscious, stopped breathing, turned blue and was out for 15 seconds until his companion could get a mask over his face and the 100% oxygen supply started. In actual flight conditions, there would of course be no such chance for rescue and the pilot

would probably not live to pull the cord on his parachute.

Before making the ascents to the artificial sub-stratosphere for the jumps, Mr. Burcham, Captain Benson and Dr. Lovelace had taken newly discovered precautions against the danger of aeroembolism. This condition has been popularly called "air-bends," because it is so like the bends which often afflict deep-sea divers, caisson workers and others descending to low atmospheric pressures.

Boring, gnawing pains about the joints, itching of the skin and eyelids, unconsciousness, convulsions and paralysis, including paralysis of the breathing muscles, are among the symptoms of aeroembolism. Small blood vessels in the lungs may be plugged by emboli, thus cutting off the blood supply. It would be easy to see what the result of such an attack would be to a pilot of a fast, heavy plane.

The condition, in which nitrogen bubbles form in the blood and body tissues, was discovered by Captain Armstrong. An altitude of 30,000 feet seems to be the critical point for development of air-bends. Recompression, that is descent to a lower altitude where the atmospheric pressure is higher, is the treatment for the condition.

ALTERNATE

Another form of mouthpiece for the oxygen supply. The jumper grips this between his teeth. It is less likely to be damaged by the rush of air as he jumps than the other type.

Air-bends can, however, be prevented, the Mayo Clinic investigators discovered. The method is almost like super-charging the pilot with oxygen before he takes off, the way his plane's engine is super-charged to carry him to high altitudes. Actually the pilot gets tanked up on oxygen rather than super-charged.

Seasoned pilots of Northwest Airlines, Inc., took part in experimental test ascents climbing to 40,000 feet at the rate of 4,000 feet per minute.

The pilots prepared for the flight by breathing pure oxygen for 30 minutes while walking two miles on a treadmill. With this preparation the pilots were able to make the ascents safely.

Science News Letter, January 18, 1941

RADIO

New Radio Direction Finder Useful For Small Boats

A RADIO direction finder that will tell the direction of signals from stations as far away as 200 miles yet weighs only 17 pounds has recently been introduced. It is expected to be useful for the smallest privately owned boats. (*Ansley Radio Corp., 4377 Bronx Blvd., N. Y. C.*)

Science News Letter, January 18, 1941

ASTRONOMY

"Wonderful" Star Mira Is Bubble Within Bubble

THE STAR Mira, the "wonderful," which sometimes is among the brightest in the sky and at other times so faint that a telescope is needed to see it, is really a bubble within a bubble, alternately expanding and contracting. Such a suggestion was made to the meeting of the American Astronomical Society by R. M. Scott, of the Harvard College Observatory.

The double bubble construction is necessary, he said, to explain the peculiar behavior of the star. It has been generally accepted that stars of the type known as Cepheid are pulsating, and efforts have been made to explain stars like Mira on the same basis. But difficulties arose when it was found that measures of the size of the star from the shifting of the dark lines that appeared in its spectrum differed from those measured by its heat radiation.

Mr. Scott proposed that the surface at which the temperature is measured is not the same as that where the absorption of the light, producing the dark lines, occurs, as it is in most stars. However, the apparent surface of the star seems to be the same as that where the bright lines of the spectrum originate.

Using the bright lines, he found he was able to obtain measurements which agreed closely with the light variation.

"It was found that these stars were considerably nearer the sun than previously was suggested and thus intrinsically fainter," he said. "The minimum diameter of the surface of measured temperature of Mira was placed at —2.1 a. u and the maximum at 3.0. It was